Appendix C

Pneumatic Conductivity Test Work Plan, Soil Gas Interim Remedial Measure, Operable Unit 3 – Former Grumman Settling Ponds, Bethpage, New York.

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Appendix C

Pneumatic Conductivity Test Work Plan

Operable Unit 3 - Soil Gas Interim Remedial Measure Work Plan, Former Grumman Settling Ponds, Bethpage, New York.

February 16, 2007

ARCADIS

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Pneumatic Conductivity Test Work Plan

Operable Unit 3 - Soil Gas Interim Remedial Measure Work Plan, Former Grumman Settling Ponds, Bethpage, New York

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Tables

Figures

Attachment

1. Introduction

This Operable Unit 3 (OU3) Pneumatic Conductivity Test (PCT) Work Plan (the Work Plan) was prepared as an appendix to the Soil Vapor Interim Remedial Measures (IRM) Work Plan both by ARCADIS of New York, Inc. (ARCADIS) on behalf of Northrop Grumman Systems Corporation (Northrop Grumman), and is being submitted pursuant to the Order On Consent (Consent Order or CO) Index # W1-0018-04-01 that was executed by the New York State Department of Environmental Conservation (NYSDEC) and Northrop Grumman Systems Corporation (Northrop Grumman), effective July 4, 2005 (NYSDEC 2005).

The present day Bethpage Community Park property (Park), which the NYSDEC has termed the "Former Grumman Settling Ponds Area" and designated as OU3, is referred to herein as the Site. Adjoining the Park property to the south is the former Plant 24 Access Road Property, which is a partially asphalt-paved/partially grassed area that runs east-west along the Park southern boundary. The Former Plant 24 Access Road Property is owned by Northrop Grumman.

The CO allows the implementation of IRMs for OU3. In response to NYSDEC's December 22, 2006 letter to Northrop Grumman, Northrop Grumman has elected to implement a soil gas mitigation system as an IRM. The purpose of this Work Plan is to present the methodology for conducting PCTs at the Site. The PCTs will be used to obtain site-specific design parameters for the design of the full-scale soil gas IRM. The Work Plan is organized in the following sections:

- Section 2 summarizes the PCT objectives.
- Section 3 describes the PCT locations and selection criteria.
- Section 4 provides the PCT methodology, including the proposed well network and installation details, the equipment requirements and the test methodology and monitoring program.
- Section 5 describes the waste management plan.
- Section 6 provides the reporting and evaluation plan.

2. Objectives

The main objective of the PCT is to collect site-specific field data for use in designing the full-scale soil gas IRM. To design an appropriate testing program, several sub-objectives have been established and include:

- Determine the site-specific pneumatic conductivity along the southern boundary of the former Plant 24 Access Road above and below the Low Permeability Zone (LPZ).
- Estimate the quantity of surface leakage in wells screened above the LPZ.
- Estimate the quantity of water generation during subsurface depressurization.
- Estimate the influent vapor concentration and contaminant mass loading rate; and,
- Obtain additional site specific geologic data within the test area(s).

In addition to the above, active (e.g, traditional negative pressure generating blower) and passive (e.g. natural "barometric pumping" and/or the use of wind turbines or alternative measures) systems may be evaluated and compared. Finally, the site-specific pneumatic conductivity and/or surface leakage may be estimated in both capped (e.g., paved) and uncapped conditions. All of these objectives will be focused on, in addition to the overall goals set forth in the Soil Gas IRM Work Plan (listed in Section 4 of the Soil Gas IRM Work Plan).

3. Pneumatic Conductivity Test Locations

Proposed test locations and relevant cross-sections are presented in Figure C-1.

PCTs will be performed at a minimum of two locations along the southern boundary of the former Plant 24 Access Road. In addition, two vertical horizons of vadose zone soils will be evaluated at both locations. Specifically, one test will be performed above and one below the LPZ that was identified at several locations along the southern boundary of the former Plant 24 Access Road. These locations were selected based on the following criteria:

- The distribution of soil gas, as currently understood and reported in the OU-3 Soil Gas IRM Work Plan.
- To determine pneumatic conductivity in vadose zone soils within multiple lateral and vertical zones along the southern boundary of the former Plant 24 Access Road.
- To determine the rate of water generation in multiple areas along the former Plant 24 Access Road; and,
- To determine the mean mass loading rate in both an area of relatively higher and lower volatile organic compound (VOC) soil gas concentration.
- Finally, the well locations were selected in areas such that they can be incorporated into the full-scale soil gas IRM.

A description of the proposed PCB methodology is provided below.

4. Pneumatic Conductivity Test Methodology

The PCTs will be conducted using a network of vertical extraction wells (herein referred to as depressurization wells [DWs]), monitoring wells (herein referred to as vacuum monitoring well clusters [Vacuum Monitoring Well Clusters (VMWC)]), existing groundwater monitoring wells, a temporary negative pressure generation system and associated process and monitoring equipment. The work referenced herein will be completed in accordance with the Site-Specific Health and Safety Plan (HASP), prepared by ARCADIS.

The following subsections describe the PCT methodology including the proposed well network and installation, equipment set up and testing methodology.

4.1 Well Network and Installation

Proposed DW and VMWC locations are shown on Figure C-1. Typical DW and VMWC construction details are shown on Figure C-2. A summary of proposed DW and VMWC construction details is provided in Table C-1.

The Rotosonic drilling method will likely be employed to drill the boreholes. This drilling method will minimize the generation of drilling waste and will provide continuous cores

of the penetrated material for the purpose of hydrogeologic logging. A written log of the materials penetrated during drilling will be prepared by the ARCADIS geologist overseeing the drilling and monitoring well construction. The log will describe the color and character of the materials penetrated, relative proportions of the various material types, thicknesses of units, and moisture content.

A summary of the proposed construction details for the DWs and VMWCs is provided below. It should be noted that in addition to the procedures described below, in the event that perched water is encountered in boreholes (during drilling) that are planned to penetrate the LPZ, a steel casing will be installed and grouted into the LPZ (to case off the perched water) prior to drilling through the LPZ and the deepest VMWC will be installed in a separate borehole.

4.1.1 Depressurization Wells

As referenced previously, pairs of DWs will be installed at each of the proposed locations identified on Figure C-1. Each shallow DW will be constructed of 4-inch diameter, schedule 40 PVC well casing, fitted with a 7 or 15 foot (ft) long, 0.020-inch slot wire-wrapped PVC well screen. Each deep DW will be completed with a 5 or 15-ft long screen. Each DW will be set with a sand pack extending at least 2-ft above and below the well screen. The borehole annulus above the sand pack will be filled with a minimum of 3-ft of bentonite slurry, followed by bentonite grout to approximately 5 ft below grade; the remainder of the borehole annulus will be filled with sand. A 2-ft x 2-ft concrete pad will be set around the well at grade, and fitted with a minimum 8" diameter curb box. The well will be sealed with a J-plug. The final screen length and setting will be determined based upon conditions encountered during drilling; however, proposed construction details based on existing geologic data are provided in Table C-1.

The depressurization well pairs will be named DW-1 and DW-2, numbered in the order of installation. Individual wells associated with each pair will be labeled with an "S" or "D" to indicate shallow or deep screen settings. Upon completion, a well construction diagram will be prepared for each well upon completion, and will be accompanied by a plan view diagram referencing north and labeling the wells as described above.

4.1.2 Vacuum Monitoring Wells

As referenced previously, VMWCs will be installed at each of the proposed locations identified on Figure C-1. The wells forming the VMWCs will be installed within the

same borehole (see Figure C-2). Based on the geology found in the vadose zone, each vacuum monitoring well cluster will be constructed of three to four, three-quarter inch diameter, schedule 40 PVC well casings, each fitted with a 1-ft long, 0.010-inch slotted PVC well screen. Each screen will be set within a 5-ft sand pack, with 2-ft of sand below and above each screen. Screen locations were selected to evaluate both horizontal vacuum influence and the effect of surface leakage for shallow DWs. Accordingly, VMWCs screens will be situated both within the corresponding screen interval of their respective DW and above the DW (shallow) screen interval. Overlying the sand pack, 3-ft of bentonite slurry will be emplaced. The borehole will then be grouted to 2-ft below the next screen zone, where the sand pack and bentonite slurry for the next screen will be placed. Following installation of the shallowest screen, the borehole will be grouted to approximately 5 ft below grade. The remaining 5 ft of the borehole will be backfilled with sand and finished with a 2 ft x 2 ft concrete pad. A minimum 8" diameter curb box will be set in the concrete pad for access to the monitoring points. Each of the monitoring wells will be finished with a threaded plug. The final screen settings will be determined based upon conditions encountered during drilling; however, proposed construction details based on existing geologic data are provided in Table C-1.

Vacuum monitoring well clusters will be named VMWC-1 through VMWC-8. Shallow wells within each cluster will be labeled A through C to indicate relative depth (i.e., the 7 ft deep well in well cluster 1 will be identified as VMWC-1A) and the letters will ascend with depth. The deep well in each well cluster will be labeled with a D (i.e., the 44 ft deep well in well cluster 1 will be identified as VMWC-1D). A well construction diagram of each well in the cluster will be prepared upon completion. In addition, a plan view diagram of the well cluster will be prepared, referencing north and identifying the individual wells.

4.2 Equipment Setup

A process flow diagram of the proposed PCT system is shown on Figure C-3. In summary, the PCT system will include the following equipment:

- A regenerative-type extraction blower for generating negative pressure at the respective DW.
- A dilution valve installed on the influent (suction) side of the blower to adjust the vacuum level applied to the DW.

- An air-water knockout tank installed on the influent side of the blower.
- Vapor stream sample ports, vacuum and pressure gauges, and valves located throughout the system to allow for proper monitoring, control, and data collection during the test; and,
- A single 400-pound (lb) vapor phase granular activated carbon (VPGAC) canister to treat vapor emissions generated during the tests.

As described above and shown on FigureC-3, the PCT system will allow for the generation of negative pressure at the proposed DW. The selected extraction blower will be sized to generate sufficient vacuum to achieve a target radius of influence of approximately 50-feet. If it is determined that the selected blower generates more vacuum than desired (e.g., if substantial quantities of moisture are extracted from the subsurface), the dilution valve will be used to balance the vacuum to an acceptable level. Water will be conveyed to a portable storage device for transfer to the disposal location (see Section 5). Vapor emissions will be treated through the 400-lb VPGAC unit.

A description of the proposed test methodology and monitoring program is provided in the following section.

4.3 Test Methodology and Monitoring Program

The PCT will be implemented using the locations and equipment setup described previously. During implementation, each DW will be operated as a single test for approximately 4 to 6 hours. For each individual test, there will be three phases of operation. The first phase will involve the collection of data with full (100%) vacuum applied to the wellhead. However, if significant quantities of water are generated under full vacuum, the vacuum will be reduced to a level that does not result in significant water generation. The second and third phases will involve collecting data at approximately 75% and 50% of the applied vacuum of the first phase.

Following the start of each test, system parameters and samples will be collected on the following schedule:

- Influent and effluent photoionization detector (PID) readings at 30-minutes, 1-hour, and every hour thereafter at the DW wellhead during each phase of testing.

- Influent flow rate and total applied vacuum from the DW and induced vacuum measurements from VMWC at 30-minutes, 1-hour, and every hour thereafter during each phase of testing. In addition, baseline readings will be collected from all groundwater monitoring and MVWCs.

- The quantity of moisture generated will be recorded every hour for each testing location.

- A total of four (4) vapor samples will be collected during the PCT (i.e., one influent vapor sample will be taken during the fourth hour of the first vacuum phase at each test location).

- An effluent vapor sample (i.e., following air treatment) will be taken at the conclusion of the entire testing program.

- Four (4) water samples will be collected during the PCT. The water samples will be collected as grab samples directly from the liquid knockout tank and will be collected at the end of each individual test.

All field parameters and physical measurements will be recorded on standard forms. Sample forms for shallow zone and deep zone testing have been provided herein as Attachment A. All vapor samples will be submitted to Columbia Analytical, located in Rochester, New York for VOC analysis using USEPA Method TO-15. All water samples will be submitted to Columbia Analytical, located in Rochester, New York for VOC analysis using USEPA Method 8260. Table C-2 provides a summary of the proposed laboratory analyte list for both vapor and water samples.

5. Waste Management

Liquid waste from the vapor system knockout tank will be discharged to the local POTW under the existing agreement for well sampling activities. The remaining wastes generated during the pneumatic conductivity tests will be containerized, characterized, transported, and disposed of in accordance with applicable local, state and federal regulations and the specific requirements of the disposal facility. Transportation and disposal facilities will be qualified to handle, transport, and dispose of the respective waste.

6. Reporting and Evaluation

Following completion of the PCT, the data will be summarized and evaluated. These data will be transmitted to the NYSDEC in the form of electronic mail correspondence. A PCT summary report will be prepared and submitted to the NYSDEC as a part of the 50 to 75 % design report. The summary report will present the results of system operational parameters and analytical data collected during the pilot program. Following presentation of the PCT results, conclusions and recommendations will be made with respect to implementation of the full-scale soil gas IRM.

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Attachment A

Field Monitoring Forms

Table C-1. Summary of Pneumatic Conductivity Test Depressurization and Monitoring Wells, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

Well Designation	Well Purpose	Approximate Well Diameter (inches)	Approximate Screened Interval(s) (feet bls)	Approximate Total Depth (feet bls)	Approximate Distance from Extraction Point[1] (feet)
Extraction Wells					
DW-1S	Depressurization Well	4	15 to 30	32	NA
DW-1D[3]	Depressurization Well	4	42 to 47	49	NA
Vacuum Monitoring Wells					
VMWC-1A	Vacuum Monitoring	0.75	7 to 8	10	10
VMWC-1B	Vacuum Monitoring	0.75	12 to 13	15	10
VMWC-1C	Vacuum Monitoring	0.75	20 to 35	37	10
VMWC-1D[3]	Vacuum Monitoring	0.75	44 to 45	47	10
VMWC-2A	Vacuum Monitoring	0.75	7 to 8	10	25
VMWC-2B	Vacuum Monitoring	0.75	12 to 13	15	25
VMWC-2C	Vacuum Monitoring	0.75	22 to 23	25	25
VMWC-2D[3]	Vacuum Monitoring	0.75	44 to 45	47	25
VMWC-3A	Vacuum Monitoring	0.75	7 to 8	10	50
VMWC-3B	Vacuum Monitoring	0.75	12 to 13	15	50
VMWC-3C	Vacuum Monitoring	0.75	22 to 23	25	50
VMWC-3D[3]	Vacuum Monitoring	0.75	44 to 45	47	50
VMWC-4A	Vacuum Monitoring	0.75	7 to 8	10	35 [2]
VMWC-4B	Vacuum Monitoring	0.75	12 to 13	15	35 [2]
VMWC-4C	Vacuum Monitoring	0.75	22 to 23	25	35 [2]
VMWC-4D[3]	Vacuum Monitoring	0.75	44 to 45	47	35 [2]

Footnotes on last page.

Table C-1. Summary of Pneumatic Conductivity Test Depressurization and Monitoring Wells, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

Well Designation	Well Purpose	Approximate Well Diameter (inches)	Approximate Screened Interval(s) (feet bls)	Approximate Total Depth (feet bls)	Approximate Distance from Extraction Point[1] (feet)
Extraction Wells					
DW-2S	Depressurization Well	4	10 to 17	19	NA
DW-2D[3]	Depressurization Well	4	32 to 47	49	NA
Vacuum Monitoring Wells					
VMWC-5A	Vacuum Monitoring	0.75	7 to 8	10	10
VMWC-5B	Vacuum Monitoring	0.75	13 to 18	20	10
VMWC-5D[3]	Vacuum Monitoring	0.75	39 to 40	42	10
VMWC-6A	Vacuum Monitoring	0.75	7 to 8	10	25
VMWC-6B	Vacuum Monitoring	0.75	14 to 15	17	25
VMWC-6D[3]	Vacuum Monitoring	0.75	39 to 40	42	25
VMWC-7A	Vacuum Monitoring	0.75	7 to 8	10	50
VMWC-7B	Vacuum Monitoring	0.75	14 to 15	17	50
VMWC-7D[3]	Vacuum Monitoring	0.75	39 to 40	42	50
VMWC-8A	Vacuum Monitoring	0.75	7 to 8	10	35 [2]
VMWC-8B	Vacuum Monitoring	0.75	14 to 15	17	35 [2]
VMWC-8D[3]	Vacuum Monitoring	0.75	39 to 40	42	35 [2]

Notes & Abbreviations:

(1) - Distances of vacuum monitoring wells are measured from DW-1 for VMWC-1 through VMWC-4, and from DW-2 for VMWC-5 through VMWC-8.
(2) - Monitoring wells are to be installed 35 ft north of vapor depressurization well.
(3) - In the event perched water is encountered above the low permeability zone (LPZ), then before drilling through the LPZ a steel casing will be installed and grouted into the LPZ to case-off the perched water and the well that penetrates the LPZ will be installed in a separate borehole.
NA - Not applicable.

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Table C-2. Summary of Pneumatic Conductivity Test Soil Gas Laboratory Analytes, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

Constituent
1,1,1-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
1,2,4-Trimethylbenzene
1,3-Butadiene
1,4-Dichlorobenzene
2,2,4-Trimethylpentane
Methyl Ethyl Ketone
4-Ethyltoluene
Acetone
Benzene
Carbon Disulfide
Carbon Tetrachloride
Chlorobenzene
Chloroform
Chloromethane
cis-1,2-Dichloroethene
Cyclohexane
Dichlorodifluoromethane (Freon 12)
Ethylbenzene
Freon TF
Freon 22
Methyl Butyl Ketone
Methylene Chloride
Methyl tert-Butyl Ether
n-Heptane
n-Hexane
Styrene
tert-Butyl Alcohol
Tetrachloroethene
Toluene
trans-1,2-Dichloroethene
Trichloroethene
Trichlorofluoromethane
Xylene (m,p)
Xylene (o)
Xylene (total)

Notes:
(1) Soil Gas samples will be analyzed, for the above reduced TCL VOC analyte list based on site specific contaminants, via USEPA Method TO-15.
(2) Water samples will be analyzed, using Target Compound List for VOCs, via NYSDEC ASP Method 2000.

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Attachment A

Field Monitoring Forms

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Attachment A-1. Pneumatic Conductivity Test, Depressurization Well 1-Shallow Field Monitoring Form, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	DW-1S Wellhead Vacuum	DW-1S Wellhead Temperature	VCS Air Flow	Wellhead Effluent PID	Knockout Tank Totalizer	Blower Influent Vacuum	Blower Effluent Pressure	Carbon Effluent Pressure	Carbon Effluent Temperature	Carbon Effluent PID
		(iwc)	(F)	(fpm)	(ppm)	(gallons)	(iwc)	(iwc)	(iwc)	(F)	(ppm)
Baseline[5]											
30 min											
1 hr											
2 hr											
3 hr											
4 hr [3]											
5 hr / 75%											
6 hr / 50%											

Initials:	Date:	(+/-)[2]
Barometric Pressure (inHg)		
Ambient Temperature (F)		
Ambient Conditions		

Notes:

(1) Radial Distances for VMWCs 1-4 are measured from DW-1S.
(2) + indicates increasing, - indicates decreasing
(3) Air samples shall be collected in 6-liter suma canisters and submitted to Columbia Analytical Labs, Rochester, New York for TO-15 analysis. Pre-carbon sample shall be collected at test hour 4 and a post carbon treatment sample shall be collected at hour 6 of final (4th) test.
(4) One water sample will be collected from the moisture separator at the end of the test and submitted to Columbia Analytical Labs, Rochester, New York for VOC analysis (Method ASP 2000).
(5) Initial measurement after start-up for wellhead vacuum.

DW	Depressurization Well
DTW	depth to water
fpm	feet per minute
ft. bls	feet below land surface
ft. bmp	feet below measuring point
in Hg	inches of mercury
iwc	inches of water column
PID	photoionization detector
ppm	parts per million
VMWC	Vacuum Monitoring Well Cluster

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Attachment A-1. Pneumatic Conductivity Test, Depressurization Well 1-Shallow Field Monitoring Form,
Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	Induced Vacuum Readings (iwc) Vacuum Points											
		VMWC-1			VMWC-2			VMWC-3			VMWC-4		
		Radial Distance[1] 10 ft			Radial Distance[1] 25 ft			Radial Distance[1] 50 ft			Radial Distance[1] 35 ft		
		Depth A (7-8 ft bls)	Depth B (12-13 ft bls)	Depth C (20-35 ft bls)	Depth A (7-8 ft bls)	Depth B (12-13 ft bls)	Depth C (22-23 ft bls)	Depth A (7-8 ft bls)	Depth B (12-13 ft bls)	Depth C (22-23 ft bls)	Depth A (7-8 ft bls)	Depth B (12-13 ft bls)	Depth C (22-23 ft bls)
Baseline[5]													
30 min													
1 hr													
2 hr													
3 hr													
4 hr [5]													
5 hr / 75%													
6 hr / 50%													

Notes:

(1) Radial Distances for VMWCs 1-4 are measured from DW-1S.
(2) + indicates increasing, - indicates decreasing
(3) Air samples shall be collected in 6-liter sumа canisters and submitted to Columbia Analytical Labs, Rochester, New York for TO-15 analysis.
Pre-carbon sample shall be collected at test hour 4 and a post carbon treatment sample shall be collected at hour 6 of final (4th) test.
(4) One water sample will be collected from the moisture separator at the end of the test and submitted to Columbia Analytical Labs, Rochester, New York for VOC analysis (Method ASP 2000).
(5) Initial measurement after start-up for wellhead vacuum.

DW	Depressurization Well
DTW	depth to water
fpm	feet per minute
ft. bls	feet below land surface
ft. bmp	feet below measuring point
in Hg	inches of mercury
iwc	inches of water column
PID	photoionization detector
ppm	parts per million
VMWC	Vacuum Monitoring Well Cluster

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Attachment A-1. Pneumatic Conductivity Test, Depressurization Well 1-Shallow Field Monitoring Form, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

		Induced Vacuum Readings (iwc) Vacuum Points				Water Level Measurements			
Data Recording Interval	Time	Monitoring Wells (if applicable)				Monitoring Wells (if applicable)			Comments
		MW -	MW -	MW -		MW -	MW -	MW -	
						DTW	DTW	DTW	
		(ft bmp)	(ft bmp)	(ft bmp)		(ft bmp)	(ft bmp)	(ft bmp)	
Baseline[5]									
30 min									
1 hr									
2 hr									
3 hr									
4 hr [3]									
5 hr / 75%									
6 hr / 50%									

Notes:

(1) Radial Distances for VMWCs 1-4 are measured from DW-1S.
(2) + indicates increasing, - indicates decreasing
(3) Air samples shall be collected in 6-liter suma canisters and submitted to Columbia Analytical Labs, Rochester, New York for TO-15 analysis. Pre-carbon sample shall be collected at test hour 4 and a post carbon treatment sample shall be collected at hour 6 of final (4th) test.
(4) One water sample will be collected from the moisture separator at the end of the test and submitted to Columbia Analytical Labs, Rochester, New York for VOC analysis (Method ASP 2000).
(5) Initial measurement after start-up for wellhead vacuum.

DW	Depressurization Well
DTW	depth to water
fpm	feet per minute
ft. bls	feet below land surface
ft. bmp	feet below measuring point
in Hg	inches of mercury
iwc	inches of water column
PID	photoionization detector
ppm	parts per million
VMWC	Vacuum Monitoring Well Cluster

Attachment A-2. Pneumatic Conductivity Test, Depressurization Well 1-Deep Field Monitoring Form, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	DW-1D Wellhead Vacuum	DW-1D Wellhead Temperature	VCS Air Flow	Wellhead Effluent PID	Knockout Tank Totalizer	Blower Influent Vacuum	Blower Effluent Pressure	Carbon Effluent Pressure	Carbon Effluent Temperature	Carbon Effluent PID
		(iwc)	(F)	(fpm)	(ppm)	(gallons)	(iwc)	(iwc)	(iwc)	(F)	(ppm)
Baseline[5]											
30 min											
1 hr											
2 hr											
3 hr											
4 hr [3]											
5 hr / 75%											
6 hr / 50%											

Initials:	Date:	(+/-)[2]
Barometric Pressure (inHg)		
Ambient Temperature (F)		
Ambient Conditions		

Notes:

(1) Radial Distances for VMWCs 1-4 are measured from DW-1D.
(2) + indicates increasing, - indicates decreasing
(3) Air samples shall be collected in 6-liter suma canisters and submitted to Columbia Analytical Labs, Rochester, New York for TO-15 analysis. Pre-carbon sample shall be collected at test hour 4 and a post carbon treatment sample shall be collected at hour 6 of final (4th) test.
(4) One water sample will be collected from the moisture separator at the end of the test and submitted to Columbia Analytical Labs, Rochester, New York for VOC analysis (Method ASP 2000).
(5) Initial measurement after start-up for wellhead vacuum.

DW	Depressurization Well
DTW	depth to water
fpm	feet per minute
ft. bls	feet below land surface
ft. bmp	feet below measuring point
in Hg	inches of mercury
iwc	inches of water column
PID	photoionization detector
ppm	parts per million
VMWC	Vacuum Monitoring Well Cluster

Attachment A-2. Pneumatic Conductivity Test, Depressurization Well 1-Deep Field Monitoring Form, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	Induced Vacuum Readings (iwc)			
		Vacuum Points			
		VMWC-1	VMWC-2	VMWC-3	VMWC-4
		Radial Distance[1] 10 ft	Radial Distance[1] 25 ft	Radial Distance[1] 50 ft	Radial Distance[1] 35 ft
		Depth D	Depth D	Depth D	Depth D
		(44-45 ft bls)	(44-45 ft bls)	(44-45 ft bls)	(44-45 ft bls)
Baseline[5]					
30 min					
1 hr					
2 hr					
3 hr					
4 hr [3]					
5 hr / 75%					
6 hr / 50%					

Notes:

(1) Radial Distances for VMWCs 1-4 are measured from DW-1D.
(2) + indicates increasing, - indicates decreasing
(3) Air samples shall be collected in 6-liter suma canisters and submitted to Columbia Analytical Labs, Rochester, New York for TO-15 analysis. Pre-carbon sample shall be collected at test hour 4 and a post carbon treatment sample shall be collected at hour 6 of final (4th) test.
(4) One water sample will be collected from the moisture separator at the end of the test and submitted to Columbia Analytical Labs, Rochester, New York for VOC analysis (Method ASP 2000).
(5) Initial measurement after start-up for wellhead vacuum.

DW	Depressurization Well
DTW	depth to water
fpm	feet per minute
ft. bls	feet below land surface
ft. bmp	feet below measuring point
in Hg	inches of mercury
iwc	inches of water column
PID	photoionization detector
ppm	parts per million
VMWC	Vacuum Monitoring Well Cluster

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Attachment A-2. Pneumatic Conductivity Test, Depressurization Well 1-Deep Field Monitoring Form, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	Induced Vacuum Readings (iwc) VAC Points — Monitoring Wells (if applicable)			Water Level Measurements — Monitoring Wells (if applicable)			Comments
		MW -__	MW -__	MW -__	MW -__ DTW	MW -__ DTW	MW -__ DTW	
		(ft bmp)	(ft bmp)	(ft bmp)	(ft bmp)	(ft bmp)	(ft bmp)	
Baseline[5]								
30 min								
1 hr								
2 hr								
3 hr								
4 hr [3]								
5 hr / 75%								
6 hr / 50%								

Notes:

(1) Radial Distances for VMWCs 1-4 are measured from DW-1D.
(2) + indicates increasing, - indicates decreasing
(3) Air samples shall be collected in 6-liter suma canisters and submitted to Columbia Analytical Labs, Rochester, New York for TO-15 analysis.
Pre-carbon sample shall be collected at test hour 4 and a post carbon treatment sample shall be collected at hour 6 of final (4th) test.
(4) One water sample will be collected from the moisture separator at the end of the test and submitted to Columbia Analytical Labs, Rochester, New York for VOC analysis (Method ASP 2000).
(5) Initial measurement after start-up for wellhead vacuum.

DW	Depressurization Well
DTW	depth to water
fpm	feet per minute
ft. bls	feet below land surface
ft. bmp	feet below measuring point
in Hg	inches of mercury
iwc	inches of water column
PID	photoionization detector
ppm	parts per million
VMWC	Vacuum Monitoring Well Cluster

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Attachment A-3. Pneumatic Conductivity Test, Depressurization Well 2-Shallow Field Monitoring Form, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	DW-2S Wellhead Vacuum	DW-2S Wellhead Temperature	VCS Air Flow	Wellhead Effluent PID	Knockout Tank Totalizer	Blower Influent Vacuum	Blower Effluent Pressure	Carbon Effluent Pressure	Carbon Effluent Temperature	Carbon Effluent PID
		(iwc)	(F)	(fpm)	(ppm)	(gallons)	(iwc)	(iwc)	(iwc)	(F)	(ppm)
Baseline[5]											
30 min											
1 hr											
2 hr											
3 hr											
4 hr [3]											
5 hr / 75%											
6 hr / 50%											

Initials:	Date:	(+/-)[2]
Barometric Pressure (inHg)		
Ambient Temperature (F)		
Ambient Conditions		

Notes:

(1) Radial Distances for VMWCs 5-8 are measured from DW-2S.
(2) + indicates increasing, - indicates decreasing
(3) Air samples shall be collected in 6-liter suma canisters and submitted to Columbia Analytical Labs, Rochester, New York for TO-15 analysis.
Pre-carbon sample shall be collected at test hour 4 and a post carbon treatment sample shall be collected at hour 6 of final (4th) test.
(4) One water sample will be collected from the moisture separator at the end of the test and submitted to Columbia Analytical Labs, Rochester, New York for VOC analysis (Method ASP 2000).
(5) Initial measurement after start-up for wellhead vacuum.

DW	Depressurization Well
DTW	depth to water
fpm	feet per minute
ft. bls	feet below land surface
ft. bmp	feet below measuring point
in Hg	inches of mercury
iwc	inches of water column
PID	photoionization detector
ppm	parts per million
VMWC	Vacuum Monitoring Well Cluster

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Attachment A-3. Pneumatic Conductivity Test, Depressurization Well 2-Shallow Field Monitoring Form, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	Induced Vacuum Readings (iwc) Vacuum Points							
		VMWC-5		VMWC-6		VMWC-7		VMWC-8	
		Radial Distance[1] 10 ft		Radial Distance[1] 25 ft		Radial Distance[1] 50 ft		Radial Distance[1] 35 ft	
		Depth A (7-8 ft bls)	Depth B (13-18 ft bls)	Depth A (7-8 ft bls)	Depth B (14-15 ft bls)	Depth A (7-8 ft bls)	Depth B (14-15 ft bls)	Depth A (7-8 ft bls)	Depth B (14-15 ft bls)
Baseline[5]									
30 min									
1 hr									
2 hr									
3 hr									
4 hr [3]									
5 hr / 75%									
6 hr / 50%									

Notes:

(1) Radial Distances for VMWCs 5-8 are measured from DW-2S.
(2) + indicates increasing, - indicates decreasing
(3) Air samples shall be collected in 6-liter suma canisters and submitted to Columbia Analytical Labs, Rochester, New York for TO-15 analysis. Pre-carbon sample shall be collected at test hour 4 and a post carbon treatment sample shall be collected at hour 6 of final (4th) test.
(4) One water sample will be collected from the moisture separator at the end of the test and submitted to Columbia Analytical Labs, Rochester, New York for VOC analysis (Method ASP 2000).
(5) Initial measurement after start-up for wellhead vacuum.

DW	Depressurization Well
DTW	depth to water
fpm	feet per minute
ft. bls	feet below land surface
ft. bmp	feet below measuring point
in Hg	inches of mercury
iwc	inches of water column
PID	photoionization detector
ppm	parts per million
VMWC	Vacuum Monitoring Well Cluster

Attachment A-3. Pneumatic Conductivity Test, Depressurization Well 2-Shallow Field Monitoring Form, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	Induced Vacuum Readings (iwc) Vacuum Points			Water Level Measurements			Comments
		Monitoring Wells (if applicable)			Monitoring Wells (if applicable)			
		MW -	MW -	MW -	MW -	MW -	MW -	
					DTW	DTW	DTW	
		(ft bmp)	(ft bmp)	(ft bmp)	(ft bmp)	(ft bmp)	(ft bmp)	
Baseline[5]								
30 min								
1 hr								
2 hr								
3 hr								
4 hr [3]								
5 hr / 75%								
6 hr / 50%								

Notes:

(1) Radial Distances for VMWCs 5-8 are measured from DW-2S.
(2) + indicates increasing, - indicates decreasing
(3) Air samples shall be collected in 6-liter suma canisters and submitted to Columbia Analytical Labs, Rochester, New York for TO-15 analysis.
Pre-carbon sample shall be collected at test hour 4 and a post carbon treatment sample shall be collected at hour 6 of final (4th) test.
(4) One water sample will be collected from the moisture separator at the end of the test and submitted to Columbia Analytical Labs, Rochester, New York for VOC analysis (Method ASP 2000).
(5) Initial measurement after start-up for wellhead vacuum.

DW	Depressurization Well
DTW	depth to water
fpm	feet per minute
ft. bls	feet below land surface
ft. bmp	feet below measuring point
in Hg	inches of mercury
iwc	inches of water column
PID	photoionization detector
ppm	parts per million
VMWC	Vacuum Monitoring Well Cluster

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Attachment A-4. Pneumatic Conductivity Test, Depressurization Well 2-Deep Field Monitoring Form, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	DW-2D Wellhead Vacuum	DW-2D Wellhead Temperature	VCS Air Flow	Wellhead Effluent PID	Knockout Tank Totalizer	Blower Influent Vacuum	Blower Effluent Pressure	Carbon Effluent Pressure	Carbon Effluent Temperature	Carbon Effluent PID
		(iwc)	(F)	(fpm)	(ppm)	(gallons)	(iwc)	(iwc)	(iwc)	(F)	(ppm)
Baseline[5]											
30 min											
1 hr											
2 hr											
3 hr											
4 hr [3]											
5 hr / 75%											
6 hr / 50%											

Initials:	Date:	(+/-)[2]
Barometric Pressure (inHg)		
Ambient Temperature (F)		
Ambient Conditions		

Notes:

(1) Radial Distances for VMWCs 5-8 are measured from DW-2D.
(2) + indicates increasing, - indicates decreasing
(3) Air samples shall be collected in 6-liter suma canisters and submitted to Columbia Analytical Labs, Rochester, New York for TO-15 analysis. Pre-carbon sample shall be collected at test hour 4 and a post carbon treatment sample shall be collected at hour 6 of final (4th) test.
(4) One water sample will be collected from the moisture separator at the end of the test and submitted to Columbia Analytical Labs, Rochester, New York for VOC analysis (Method ASP 2000).
(5) Initial measurement after start-up for wellhead vacuum.

DW	Depressurization Well
DTW	depth to water
fpm	feet per minute
ft. bls	feet below land surface
ft. bmp	feet below measuring point
in Hg	inches of mercury
iwc	inches of water column
PID	photoionization detector
ppm	parts per million
VMWC	Vacuum Monitoring Well Cluster

Attachment A-4. Pneumatic Conductivity Test, Depressurization Well 2-Deep Field Monitoring Form, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	Induced Vacuum Readings (Iwc)			
		Vacuum Points			
		VMWC-5	VMWC-6	VMWC-7	VMWC-8
		Radial Distance[1] 10 ft	Radial Distance[1] 25 ft	Radial Distance[1] 50 ft	Radial Distance[1] 35 ft
		Depth D	Depth D	Depth D	Depth D
		(39-40 ft bls)	(39-40 ft bls)	(39-40 ft bls)	(39-40 ft bls)
Baseline[5]					
30 min					
1 hr					
2 hr					
3 hr					
4 hr [3]					
5 hr / 75%					
6 hr / 50%					

Notes:

(1) Radial Distances for VMWCs 5-8 are measured from DW-2D.
(2) + indicates increasing, - indicates decreasing
(3) Air samples shall be collected in 6-liter suma canisters and submitted to Columbia Analytical Labs, Rochester, New York for TO-15 analysis. Pre-carbon sample shall be collected at test hour 4 and a post carbon treatment sample shall be collected at hour 6 of final (4th) test.
(4) One water sample will be collected from the moisture separator at the end of the test and submitted to Columbia Analytical Labs, Rochester, New York for VOC analysis (Method ASP 2000).
(5) Initial measurement after start-up for wellhead vacuum.

DW	Depressurization Well
DTW	depth to water
fpm	feet per minute
ft. bls	feet below land surface
ft. bmp	feet below measuring point
in Hg	inches of mercury
iwc	inches of water column
PID	photoionization detector
ppm	parts per million
VMWC	Vacuum Monitoring Well Cluster

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Attachment A-4. Pneumatic Conductivity Test, Depressurization Well 2-Deep Field Monitoring Form, Operable Unit 3, Former Grumman Settling Ponds, Bethpage, New York.

Data Recording Interval	Time	Induced Vacuum Readings (iwc) Vacuum Points — Monitoring Wells (if applicable)			Water Level Measurements — Monitoring Wells (if applicable)			Comments
		MW -__	MW -__	MW -__	MW -__ DTW	MW -__ DTW	MW -__ DTW	
		(ft bmp)	(ft bmp)	(ft bmp)	(ft bmp)	(ft bmp)	(ft bmp)	
Baseline								
30 min								
1 hr								
2 hr								
3 hr								
4 hr (3)								
5 hr / 75%								
6 hr / 50%								

Notes:

(1) Radial Distances for VMWCs 5-8 are measured from DW-2D.
(2) + indicates increasing, - indicates decreasing
(3) Air samples shall be collected in 6-liter suma canisters and submitted to Columbia Analytical Labs, Rochester, New York for TO-15 analysis. Pre-carbon sample shall be collected at test hour 4 and a post carbon treatment sample shall be collected at hour 6 of final (4th) test.
(4) One water sample will be collected from the moisture separator at the end of the test and submitted to Columbia Analytical Labs, Rochester, New York for VOC analysis (Method ASP 2000).
(5) Initial measurement after start-up for wellhead vacuum.

DW	Depressurization Well
DTW	depth to water
fpm	feet per minute
ft. bls	feet below land surface
ft. bmp	feet below measuring point
in Hg	inches of mercury
iwc	inches of water column
PID	photoionization detector
ppm	parts per million
VMWC	Vacuum Monitoring Well Cluster