Operable Unit III

Area of Concern 32

Building 452 Freon-11 Plume Remediation System

Project Work Plan and Design Report

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For

U.S. Department of Energy
Brookhaven Site Office

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OU III, AOC 32
Building 452 Freon-11 Plume Remediation System
Project Work Plan and Design Report

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1.0 Background

From April to early August 2011, BNL characterized the vertical and horizontal extent of Freon-11 (Trichlorofluoromethane) in the groundwater in the vicinity of Building 452. The Freon-11 plume was found to extend from Building 452 approximately 600 feet to the south. The highest concentration of Freon-11 detected in the plume was 36,000 micrograms per liter (µg/L). The New York State Ambient Water Quality Standard (NYS AWQS) for Freon-11 is 5 µg/L. The regulatory agencies have agreed with DOE's recommendation to prepare an Explanation of Significant Differences (ESD) under the Operable Unit (OU) III Record of Decision (ROD) to conduct the remediation of the Freon-11 contamination. BNL is currently in the process of installing a groundwater treatment system to remediate the Freon-11 plume. A new groundwater extraction well has been installed approximately 250 feet downgradient of Building 452 to capture the high concentration portion of the Freon-11 plume. The existing Building 96 extraction well RTW-1 will be used to remediate the southern, lower concentration portion of the Freon-11 plume.

2.0 Plume Characterization

Starting in December 2010, Freon-11 began to be routinely detected in extraction well RTW-1 at concentrations greater than the minimum detection limit (MDL) of 0.5 µg/L. In January 2011, Freon-11 concentrations in RTW-1 reached 4.6 µg/L. The NYS AWQS for Freon-11 is 5 µg/L. Extraction well RTW-1 is used to remediate the northern portion of the Former Building 96 Tetrachloroethylene (PCE) plume. In early April 2011, BNL received analytical data indicating Freon-11 concentrations of 46 µg/L in a newly installed shallow groundwater monitoring well 085-378 (B96-MW02-2010) located in the northern (upgradient) portion of the Former Building 96 area (AOC 26B). In accordance with BNL's Groundwater Contingency Plan, BNL immediately re-sampled well 085-378, and confirmed the presence of Freon-11 in the groundwater at concentrations exceeding the NYS AWQS (**Figures 1 and 2**). BNL also evaluated the potential use of other nearby wells to help determine the source and extent of the Freon-11 contamination. The direction of groundwater flow in the area is to the south-southeast. The closest upgradient facility is Building 452, a site maintenance facility where compressor oils and refrigerants from decommissioned air conditioning units are recovered prior to recycling. Additionally, BNL maintained an inventory of refrigerant gasses (including Freon-11) in a trailer located 30 feet to the east of Building 452. To evaluate groundwater quality in the Building 452 area, shallow monitoring well 085-73 was sampled on April 7, 2011. Well 085-73 was originally installed as part of the HFBR tritium plume investigation, and is located approximately 100 feet downgradient of Building 452. Freon-11 was detected in the sample from well 085-73 at a concentration of 4,000 µg/L.

Following the detection of high levels of Freon-11 in well 085-73, BNL conducted an investigation to determine the source of the Freon-11 contamination and characterize the vertical and horizontal extent of this compound in the groundwater. From April through early August 2011, 42 temporary groundwater monitoring wells were installed in a series of east-west transects (**Figure 1; Table 1**). Approximately 350 groundwater samples were collected from the temporary wells. Analytical results for the temporary wells are provided in **Appendix A**. As described below, a plume of Freon-11 was found to extend from the Building 452 area approximately 600 feet downgradient to Former Building 96 groundwater treatment well RTW-1 (**Figure 1**). Based upon the length of the plume, groundwater flow rates at BNL, and low retardation rates for Freon-11 in groundwater, it is believed that a significant release of Freon-11 occurred near Building 452 approximately two to three years ago.

Table 1. Temporary wells installed during the Building 452 Freon-11 plume characterization effort.

Monitoring Area	Temporary Wells Installed
Upgradient	GP-10, GP-11, GP-12, GP-13
Storage Trailer Area	GP-18, GP-19, GP-20
Building 452 South Paved Area	GP-06, GP-07, GP-08, GP-09, GP-14, GP-15, GP-16, GP-17
Rowland Street	GP-01, GP-02, GP-03, GP-04, GP-05, GP-21, GP-23, GP-24, GP-32
Former Building 96 Foundation	GP-34, GP-35, GP-36, GP-37, GP-38, GP-39, GP-40
Southern Plume Area	GP-25, GP-26, GP-27, GP-28, GP-29, GP-30, GP-31, GP-42, GP-43, GP-44

Upgradient Area: Four temporary wells were installed immediately upgradient of Building 452 and the adjacent refrigerant storage trailer. In the upgradient wells, only a trace level of Freon-11 was detected in one sample from well B452-GP-13, at an estimated concentration of 0.45 µg/L (detection limit is 0.5 µg/L).

Storage Trailer Area: Three temporary wells were installed close to the refrigerant storage trailer. Two wells (B452-GP-18 and B452-GP-19) were installed in the paved area adjacent to the trailer where spills may have occurred. Freon-11 was detected in both wells in samples collected close to the water table, with a maximum concentration of 79 µg/L detected in B452-GP-19. Freon-11 was also detected at concentration of 31.8 µg/L in temporary well B452-GP-20, which was installed adjacent to a side wall vent on the north side of the storage trailer.

Building 452 South Paved Area: Eight temporary wells were installed in the paved work area immediately downgradient of Building 452 and downgradient of the refrigerant storage trailer. Freon-11 was detected in all eight wells, with the highest Freon-11 concentrations detected in samples collected close to the water table (**Figure 2**). Four of the temporary wells had Freon-11 concentrations above 1,000 µg/L, with a maximum concentration of 4,160 µg/L detected in B452-GP-17, which is located immediately downgradient of Building 452. Freon-11 concentrations up to 1,880 µg/L were detected in B452-GP-08, which is located approximately 75 feet downgradient of the refrigerant storage trailer. Although a number of other VOCs were detected in groundwater samples (e.g., chloroform, methyl chloride, and carbon tetrachloride), they were primarily detected at concentrations that were below their applicable NYS AWQS. Methyl chloride was detected in one sample from temporary well B452-GP-06 at a concentration 8 µg/L and methylene chloride was detected in one sample from B452-GP-16 at a concentration of 37.3 µg/L. The NYS AWQS for both compounds is 5 µg/L.

Rowland Street Area: The highest Freon-11 concentrations detected in the plume were found in temporary wells installed along Rowland Street, which is approximately 100 feet downgradient of Building 452. Freon-11 concentrations exceeded the 5 µg/L NYS AWQS in all 10 wells installed along Rowland Street, with concentrations exceeding 30,000 µg/L in three of the wells; B452-GP-22 (30,800 µg/L), B452-GP-23 (31,500 µg/L) and B452-GP-01 (36,000 µg/L). Along Rowland Street, the plume was found to be approximately 300 feet wide, and the highest Freon-11 concentrations were detected approximately 10-15 feet below the water table. As with the temporary wells installed immediately downgradient of Building 452, a number of other VOCs were detected in groundwater samples (e.g., chloroform, methyl chloride, and carbon tetrachloride). Although most of these compounds were detected at concentrations that were below their applicable NYS AWQS, 1,2,4-trimethylbenzene was detected in several samples from temporary well B452-GP-04, at a maximum concentration 7.8 µg/L. The NYS AWQS for this compound is 5 µg/L.

Former Building 96 Foundation Area: Freon-11 concentrations exceeded the NYS AWQS in five of the seven wells installed along an east-west transect approximately 100 feet downgradient of Rowland Street. Freon-11 concentrations exceeded 5,000 µg/L in two wells; B452-GP-36 (3,340 µg/L) and B452-GP-37 (7,310 µg/L). Although a number of other VOCs were detected in groundwater samples (e.g., chloroform, methyl chloride, and carbon tetrachloride), they were detected at concentrations that were below their applicable NYS AWQS.

Southern Plume Area: Lower levels of Freon-11 were detected in the area between the former Building 96 foundation and Building 96 groundwater extraction well RTW-1 (AOC 26B), which is used to remediate the northern portion of the former Building 96 PCE plume. In the 10 temporary wells installed in this area, Freon-11 concentrations exceeded the 5 µg/L NYS AWQS in four wells, with a maximum concentration of 150 µg/L detected in well B452-GP-27. In addition to Freon-11, PCE was detected in eight of the temporary wells, at concentrations up to 994 µg/L, and 1,1,1-trichloroethane (TCA) was detected in five wells at concentrations up to 23.5 µg/L. The PCE and TCA contamination originates from the former Building 96 spill area (which was excavated in 2010), and is being remediated by extraction well RTW-1. Freon-11 was first detected in extraction well RTW-1 at concentrations above the 0.5 µg/L MDL in December 2010. Since that time, the highest level of Freon-11 in RTW-1 was observed in June 2011 at a concentration of 8.1 µg/L.

3.0 Source of the Freon-11 Contamination

Freon-11 has been used at BNL for many years in large (>200 ton) centrifugal chiller units. Until recently, BNL maintained an inventory of Freon-11 in a storage trailer located at Building 452. Freon-11 has a boiling point of 74.8 degrees Fahrenheit. Therefore, if released to the environment when atmospheric temperatures are below this point, this compound will be in the form of a liquid. As described above, in the areas immediately downgradient of Building 452, Freon-11 is detected in high levels in the groundwater close to the water table. This suggests that the Freon-11 entered the groundwater in the immediate vicinity of Building 452. Although the apparent cause of the release of Freon-11 was improper handling and/or storage practices, the exact locations and volumes of the releases could not be determined during the groundwater

investigation. BNL is currently planning on collecting soil samples in the Building 452 area in an effort to identify the source of the release(s) and determine the amount of Freon-11 that might be present in the soils above the water table.

4.0 Regulatory Approach

Since April 2011, DOE and BSA have had routine communications with the regulatory agencies regarding the efforts to characterize the plume, and more recently about plans to remediate the impacted groundwater. In accordance with Section X.D of the FFA, in October 2011 DOE recommended to the regulators that the Building 452 Freon-11 Source Area and Groundwater Plume be identified as AOC 32 (Holland, 2011). This new plume is within the boundaries of OU III and DOE recommended that remediation of this AOC be performed as an ESD to the OU III ROD. Active remediation of this plume is necessary in order to ensure that the OU III ROD cleanup goals of achieving drinking water standards in the Upper Glacial aquifer in 30 years or less (by 2030) and preventing or minimizing further migration of VOCs in the aquifer are met. In November 2011, the EPA and NYSDEC concurred with this approach (Mollin, 2011; Ng, 2011).

5.0 Groundwater Treatment and Monitoring System Design

The physical location of the Freon-11 plume is between Building 452 and former Building 96 extraction RTW-1, and is fully contained within the boundaries of OU III. The performance goals for treatment of the Freon-11 plume will be identical to the cleanup goals specified in the OU III ROD (i.e., prevent or minimize further migration of VOCs and reach drinking water standards in the Upper Glacial aquifer in 30 years or less). Groundwater modeling results indicate that with the addition of a new extraction well and the continued operation of RTW-1, the Freon-11 plume can be successfully remediated within approximately two to five years assuming that the source is controlled/eliminated (see **Appendix B** for the modeling report). Therefore, neither the existing OU III cleanup goals nor performance period would be modified.

The groundwater modeling results indicated that the Freon-11 plume can be most effectively remediated using a combination of a new extraction well (designated EW-18) installed approximately 350 feet downgradient of Building 452 (see **Figure 3**) and the planned ongoing operation of Building 96 extraction well RTW-1. Extraction well EW-18 would be used to aggressively remediate the areas of the plume with the highest levels of Freon-11, while extraction well RTW-1 would remediate the lower concentration (southern) parts of the plume that cannot be captured by EW-18. The design drawings for the Freon-11 treatment system are provided in **Appendix C**. These drawings provide detailed information for the installation and construction of the new extraction well, treatment system shed, air stripping tray, water pipeline, electrical supply, and communications systems. Extraction well EW-18 will have a 5 HP electrical submersible pump capable of flow rates up to 120 gallons per minute (gpm). Based upon the model results, the initial extraction rate for EW-18 will be set at 75 gpm and RTW-1 will be maintained at its current rate of 30 gpm. Following system startup, BNL will determine whether modifications to the pumping rates of EW-18 and RTW-1 will be required. The

extracted groundwater from EW-18 will be piped approximately 350 feet south to a newly installed treatment shed, which is located close to RTW-1 (**Figure 4**). The contaminated groundwater will be treated with an air stripper tray system located in the new shed (Figure 5). The treated groundwater will be discharged into the existing buried treated water line used for RTW-1, and the combined effluent will be discharged into a stormwater water culvert that leads to BNL recharge basin HS. BNL will submit a new SPDES equivalency permit application for the Building 452 Freon-11 treatment system, and a request to modify the existing Building 96 SPDES equivalency permit to include the reporting of Freon-11 in the discharge. Following the construction of the treatment system, BNL will prepare an Operations and Maintenance (O&M) Manual that will contain as built drawings, start-up and operation, maintenance, and system shut-down/exit strategies.

A preliminary review of the potential atmospheric emissions using the New York State air emissions modeling (DAR-1) process shows that the release of Freon-11 from this system will not pose short-term or long-term impacts (**Appendix D**). For this preliminary air emissions assessment, it was assumed that the Freon-11 concentrations in the extracted groundwater would be 36,000 µg/L (i.e., the worst case scenario based upon highest Freon-11 concentration detected in the temporary wells). At this concentration, the maximum annual impact was determined to be 111 $\mu g/m^3$ (Annual Guidance Concentration = 1,000 $\mu g/m^3$), and the short-term impact was 7,215 $\mu g/m^3$ (Short-term Guidance Concentration = 68,000 $\mu g/m^3$). It is expected that the initial Freon-11 concentrations in extracted groundwater will be significantly less than 36,000 µg/L, and that the influent concentrations will decrease with time. A final emissions assessment will be provided in the NYSDEC Air Discharge Permit application for the Building 452 Freon-11 treatment system.

A new groundwater monitoring well network has been installed to monitor the Building 452 source area and to evaluate the effectiveness of the cleanup actions (**Figure 3, Table 2**). The wells were installed in September 2011, and the first set of groundwater samples were collected in early November 2011. During 2012, the monitoring wells will be sampled on a quarterly basis. During the November sample period, the highest level of Freon-11 was detected in new well 085-382 at a concentration of 38,800 µg/L (**Appendix E**). Well 085-382 is positioned along Rowland Street, and is at the same location as temporary well B452-GP-22, which had Freon-11 concentrations up to 30,800 µg/L in June 2011.

6.0 References

D.B. Bennett, 2011. Groundwater Modeling, Building 452 Freon-11 Groundwater Plume, Brookhaven National Laboratory. August 31, 2011.

M. Holland (USDOE), 2011. Letter to C.B. Ng (NYSDEC) and J. Mollin (USEPA) titled "Brookhaven National Laboratory (BNL) Proposed Regulatory Approach for the Freon-11 Contamination at Building 452." October 20, 2011.

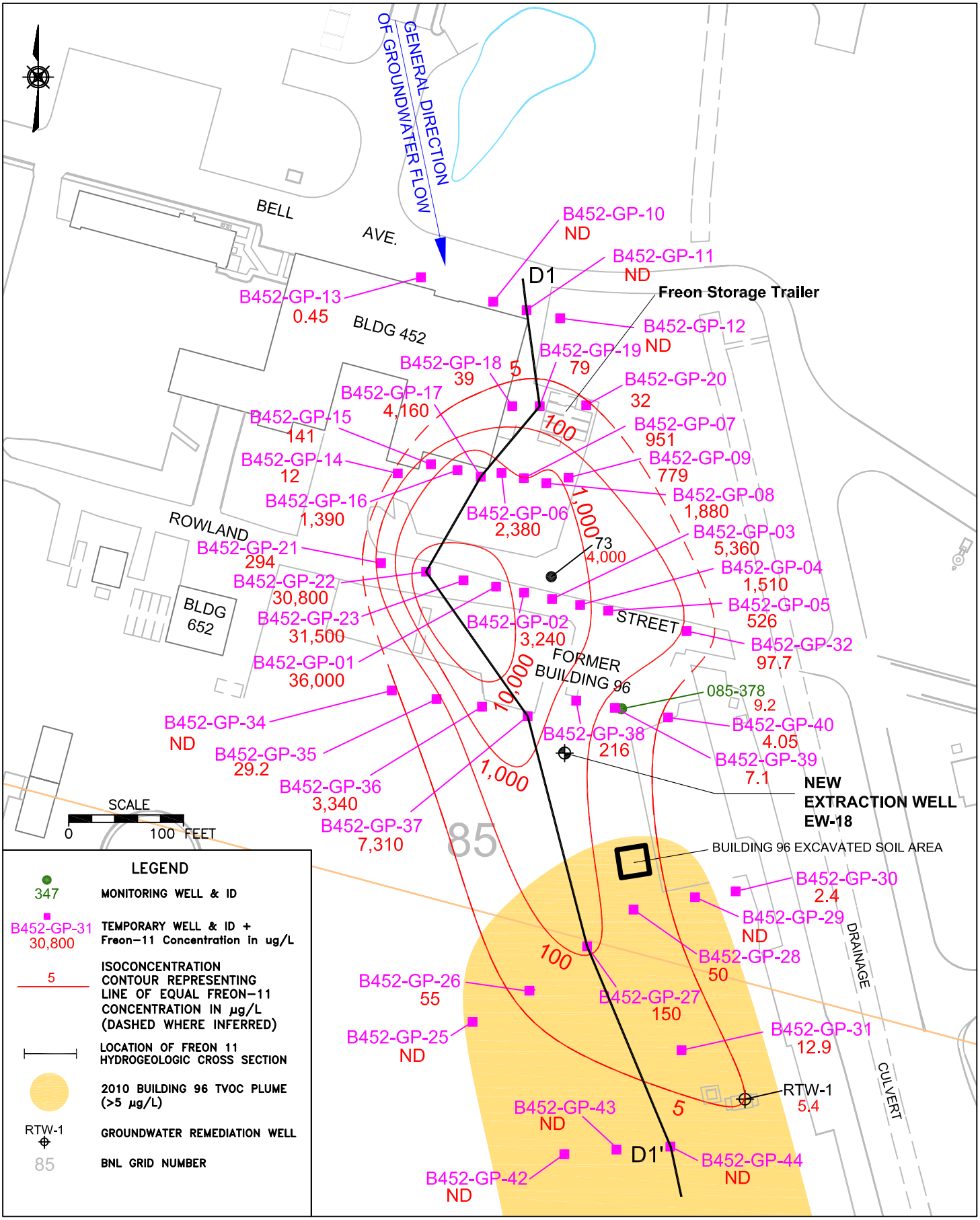
J. Mollin (USEPA), 2011. E-mail Letter to T. Kneitel (USDOE) titled "Freon." November 3, 2011.

C. Ng (NYSDEC), 2011. Letter to M. Holland (USDOE) titled "Brookhaven National Laboratory (BNL) Proposed Regulatory Approach for the Freon-11 Contamination at Building 452." November 8, 2011.

Table 2: Building 452 Freon Plume Groundwater Extraction and Monitoring Wells

New Well Temporary ID	Permanent Well ID	Screen Interval (MSL)	Screen Interval (BGS)	Objective
	RTW-1 095-151	5'-15'	48'-58'	Building 96 extraction well to capture low concentration segment of plume.
B452-EW-18	EW-18 085-389	0'-10'	55'-65'	Building 452 Freon-11 extraction well to capture high concentration segment of plume.
	085-43	35'-45'	21'-31'	Source area monitoring.
	085-73	27'-32'	35'-40'	Source area monitoring.
B452-MW01	085-380	30'-50'	22'-42'	Source area monitoring. Installed at location of B452-GP-17.
B452-MW02	085-381	30'-50'	22'-42'	Source area monitoring. Installed at location of B452-GP-08.
B452-MW03	085-382	21'-36'	30'-45'	Source area monitoring. Installed at location of B452-GP-22.
B452-MW04	085-383	21'-36'	30'-45'	Source area monitoring. Installed at location of B452-GP-01.
B452-MW05	085-384	21'-36'	30'-45'	Source area monitoring. Installed between locations B452-GP-4 and B452-GP-05.
B452-MW06	085-385	10'-25'	40'-55'	Monitor high concentration segment of the plume west of EW-18. Installed at location of B452-GP-36.
B452-MW07	085-386	10'-25'	40'-55'	Monitor low concentration segment of the plume west of EW-18. Installed at location of B452-GP-37.
B452-MW08	095-313	0'-15'	45'-60'	Monitor low concentration segment of the plume northwest of RTW-1. Installed at location of B452-GP-26.
B452-MW09	085-387	0'-15'	47'-62'	Monitor low concentration segment of the plume northwest of RTW-1. Installed at location of B452-GP-27.
B452-MW10	085-388	0'-15'	50'-65'	Monitor low concentration segment of the plume northwest of RTW-1. Installed at location of B452-GP-30.
B452-MW11	095-314	0'- ¯20'	60'-80'	Bypass Monitoring. Installed at location of B452-GP-42.
B452-MW12	095-315	0'- ¯20'	60'-80'	Bypass Monitoring. Installed at location of B452-GP-44.

MSL = Relative to Mean Sea Level
BGS = Below Ground Surface



BROOKHAVEN NATIONAL LABORATORY
ENVIRONMENTAL PROTECTION DIVISION

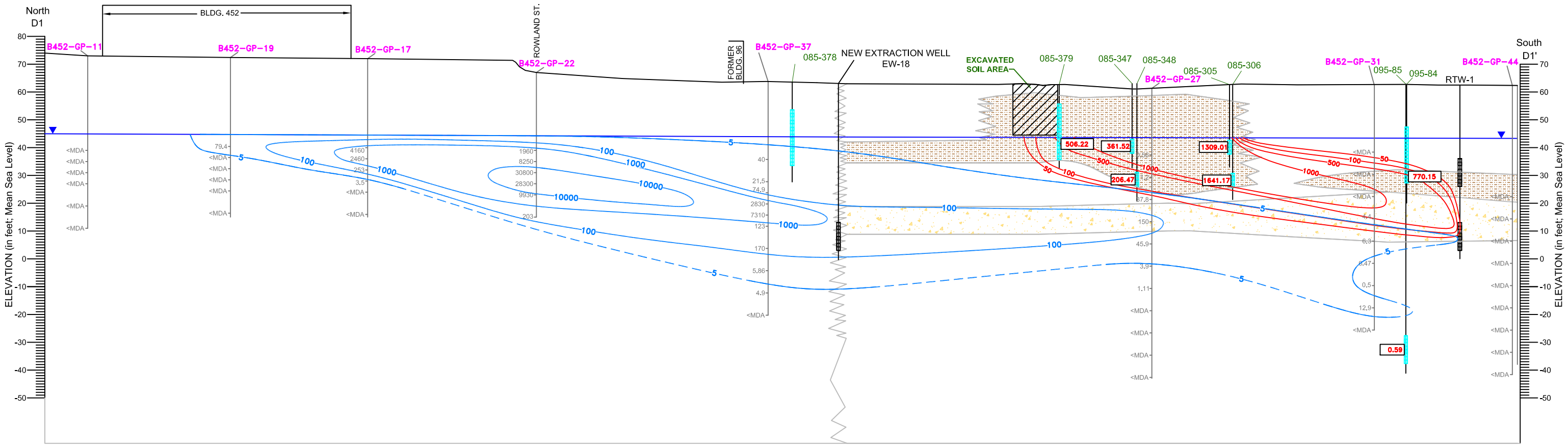
TITLE:

BUILDING 452 AREA FREON-11 INVESTIGATION MAY – AUGUST 2011

Design Report

DWN:	VT: HZ.:	DATE:	PROJECT NO.:
AJZ	–	09/13/11	–
CHKD:	APPD:	REV.:	NOTES:
DP	WRD	JEB	–

FIGURE NO.: 1



LEGEND

Upper Glacial aquifer

Fine to coarse sand, trace to little silt and/or fine to medium gravel.

Very fine sand and/or silt, with silt and sand lenses interbedded.

Coarse to very coarse sand, with or without gravel or gravel with sand.

095-85 BNL Monitoring Well ID

104.94 TVOC Concentration (µg/L)

50 TVOC Contour (µg/L) (Dashed Where Inferred)

5 Freon 11 Contour (µg/L) (Dashed Where Inferred)

RTW–1 Recirculation Well

Monitoring Well Screen

Extraction Well Screen With Blank

Water Table As Of November 1–4, 2010

TVOC – Total Volatile Organic Compound

µg/L – Micrograms Per Liter

PCE – Tetrachloroethylene

B452-GP-37
7310
123

Temporary well location with Freon 11 results (in µg/L), samples obtained during second quarter 2011.

HORIZONTAL SCALE
0 30 60
FEET

NOTES:

1) GEOLOGIC INFORMATION SHOWN IS BASED ON LITHOLOGIC DATA COLLECTED JUNE 2004 FOR GP BORING DESIGNATIONS AND NOV. 2004 FOR S BORING DESIGNATIONS SUPPLEMENTED WITH GEOLOGIC DATA FROM 1999.

2) TVOC PLUME DISTRIBUTION BASED ON FOURTH QUARTER 2010 BLDG 96 SAMPLING EVENT.

3) FREON 11 PLUME DISTRIBUTION BASED ON SECOND QUARTER 2011 VERTICAL PROFILE BORING SAMPLING EVENT.

4) CONTOUR INTERVAL IS AS SHOWN.

5) BNL WELL ID COLOR CORRESPONDS TO LONG–TERM MONITORING PROGRAM WELL LOCATION MAP.

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BROOKHAVEN NATIONAL LABORATORY
ENVIRONMENTAL PROTECTION DIVISION

TITLE:

OU III BUILDING 452 AREA
HYDROGEOLOGIC CROSS SECTION (D1–D1')
MAY – AUGUST 2011

Design Report

DWN:	VT:HZ.:	DATE:	PROJECT NO.:
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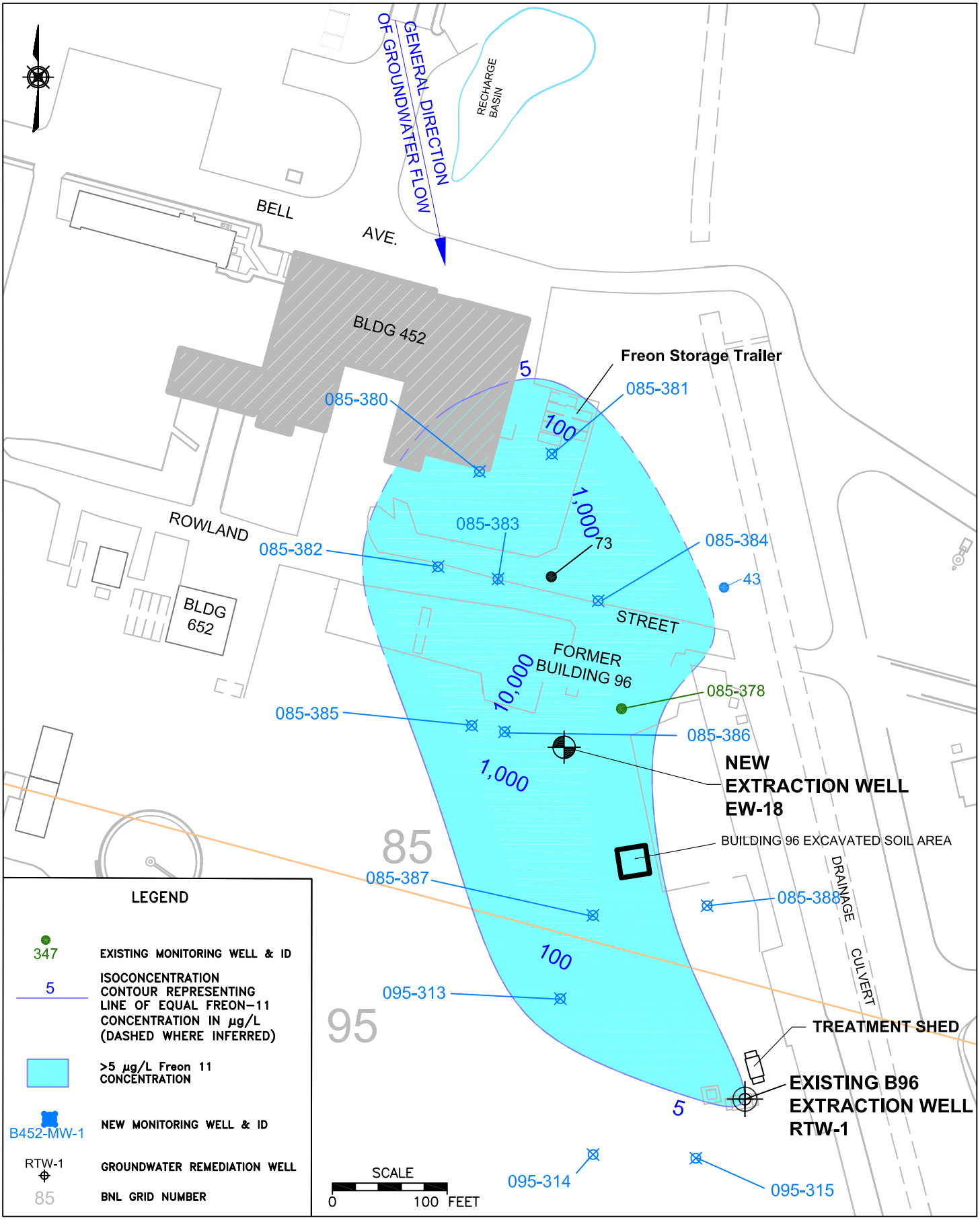
CHKD:	APPD:	REV.:	NOTES:
JEB	WRD	JEB	–
FIGURE NO.:			
2			



BROOKHAVEN NATIONAL LABORATORY
ENVIRONMENTAL PROTECTION DIVISION

TITLE:
BUILDING 452 AREA
FREON-11
LOCATIONS OF NEW EXTRACTION WELL AND MONITORING WELLS
Design Report

DWN:	VT: HZ.:	DATE:	PROJECT NO.:
AJZ	–	12/12/11	–
CHKD:	APPD:	REV.:	NOTES:
DP	WRD	JEB	–

FIGURE NO.: 3

Figure 4. Installation of water, electrical and communications lines between extraction well EW-18 and the Freon-11 groundwater treatment shed.

Figure 5. Installation of the air stripper trays in the Freon-11 treatment shed.

APPENDIX A

Groundwater Investigation Sample Results

Building 452 Freon-11 Groundwater Investigation
VOCs Detected Above MDL

Site ID : B452-GP-1

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Trichlorofluoromethane	**5/12/2011**	**363**	**2.5**	**5**	**UG/L**	**24**	
Trichlorofluoromethane	**5/12/2011**	**973**	**10**	**5**	**UG/L**	**28**	
Trichlorofluoromethane	**5/12/2011**	**1930**	**25**	**5**	**UG/L**	**32**	
Trichlorofluoromethane	**5/12/2011**	**36000**	**250**	**5**	**UG/L**	**36**	
Trichlorofluoromethane	**5/12/2011**	**1850**	**25**	**5**	**UG/L**	**40**	
Trichlorofluoromethane	**5/12/2011**	**196**	**2.5**	**5**	**UG/L**	**44**	
Chloroform	5/12/2011	0.15	0.5	7	UG/L	52	J

Site ID : B452-GP2

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Trichlorofluoromethane	**4/27/2011**	**518**	**0.5**	**5**	**UG/L**	**28**	**E**
Methylene chloride	4/27/2011	0.37	0.5	5	UG/L	28	J
Toluene	4/27/2011	0.16	0.5	5	UG/L	28	J
Methyl chloride	4/27/2011	0.36	0.5	5	UG/L	28	J
Chloroform	4/27/2011	0.26	0.5	7	UG/L	28	J
Methyl chloride	4/27/2011	0.3	0.5	5	UG/L	32	J
Methylene chloride	4/27/2011	0.26	0.5	5	UG/L	32	J
Trichlorofluoromethane	**4/27/2011**	**1470**	**12.5**	**5**	**UG/L**	**32**	
Trichlorofluoromethane	**4/27/2011**	**2190**	**25**	**5**	**UG/L**	**36**	
Methylene chloride	4/27/2011	0.4	0.5	5	UG/L	36	J
Chloroform	4/27/2011	0.22	0.5	7	UG/L	36	J
Methyl chloride	4/27/2011	0.51	0.5	5	UG/L	36	
Chloroform	4/27/2011	0.3	0.5	7	UG/L	40	J
Trichlorofluoromethane	**4/27/2011**	**3240**	**50**	**5**	**UG/L**	**40**	
Methylene chloride	4/27/2011	0.31	0.5	5	UG/L	44	J
Chloroform	4/27/2011	0.21	0.5	7	UG/L	44	J
Trichlorofluoromethane	**4/27/2011**	**71.1**	**0.5**	**5**	**UG/L**	**44**	
Methylene chloride	4/27/2011	0.38	0.5	5	UG/L	48	J
Methyl chloride	4/27/2011	0.29	0.5	5	UG/L	48	J
Chloroform	4/27/2011	0.13	0.5	7	UG/L	48	J
Chloroform	4/27/2011	0.2	0.5	7	UG/L	52	J
Methylene chloride	4/27/2011	0.36	0.5	5	UG/L	52	J
Toluene	4/27/2011	0.13	0.5	5	UG/L	52	J
Trichlorofluoromethane	4/27/2011	0.63	0.5	5	UG/L	52	
Methyl chloride	4/27/2011	0.2	0.5	5	UG/L	52	J
Methyl chloride	4/26/2011	0.24	0.5	5	UG/L	56	J
Chloroform	4/26/2011	0.14	0.5	7	UG/L	56	J
Methylene chloride	4/26/2011	0.39	0.5	5	UG/L	56	J
Methylene chloride	4/26/2011	0.5	0.5	5	UG/L	60	
Methyl chloride	4/26/2011	0.3	0.5	5	UG/L	60	J
Methylene chloride	4/26/2011	0.6	0.5	5	UG/L	64	

Building 452 Freon-11 Groundwater Investigation
VOCs Detected Above MDL

Site ID : B452-GP3

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Trichlorofluoromethane	**4/26/2011**	**430**	**0.5**	**5**	**UG/L**	**24**	**E**
Methyl chloride	4/26/2011	0.24	0.5	5	UG/L	24	BJ
Toluene	4/26/2011	0.11	0.5	5	UG/L	24	J
Benzene	4/26/2011	0.12	0.5	1	UG/L	24	J
Methyl chloride	4/26/2011	0.21	0.5	5	UG/L	28	BJ
Trichlorofluoromethane	**4/26/2011**	**730**	**5**	**5**	**UG/L**	**28**	
Trichlorofluoromethane	**4/26/2011**	**1610**	**12.5**	**5**	**UG/L**	**32**	
Carbon tetrachloride	4/26/2011	0.19	0.5	5	UG/L	32	J
Trichlorofluoromethane	**4/26/2011**	**5360**	**50**	**5**	**UG/L**	**36**	
Chloroform	4/26/2011	0.34	0.5	7	UG/L	36	J
Methyl chloride	4/26/2011	0.33	0.5	5	UG/L	36	BJ
Methylene chloride	4/26/2011	25.8	2.5	5	UG/L	40	**B**
Trichlorofluoromethane	**4/26/2011**	**217**	**2.5**	**5**	**UG/L**	**40**	
Trichlorofluoromethane	**4/26/2011**	**90.6**	**0.5**	**5**	**UG/L**	**44**	
Methyl chloride	4/26/2011	0.22	0.5	5	UG/L	44	BJ
Chloroform	4/26/2011	0.18	0.5	7	UG/L	48	J
Chloroform	4/26/2011	0.17	0.5	7	UG/L	52	J
Methyl chloride	4/26/2011	0.26	0.5	5	UG/L	52	BJ
Methyl chloride	4/25/2011	0.27	0.5	5	UG/L	60	BJ
Methyl chloride	4/25/2011	0.3	0.5	5	UG/L	64	BJ
Methylene chloride	4/25/2011	0.36	0.5	5	UG/L	64	J

Site ID : B452-GP4

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Trichlorofluoromethane	**4/28/2011**	**304**	**2.5**	**5**	**UG/L**	**24**	
Trichlorofluoromethane	**4/28/2011**	**893**	**10**	**5**	**UG/L**	**28**	
Benzene, 1,2,4-trimethyl	**4/28/2011**	**7.8**	**10**	**5**	**UG/L**	**28**	**J**
Trichlorofluoromethane	**4/28/2011**	**936**	**10**	**5**	**UG/L**	**32**	
m/p xylene	4/28/2011	2.2	10	5	UG/L	36	J
Trichlorofluoromethane	**4/28/2011**	**1510**	**10**	**5**	**UG/L**	**36**	
Benzene, 1,2,4-trimethyl	**4/28/2011**	**6.6**	**10**	**5**	**UG/L**	**36**	**J**
Trichlorofluoromethane	**4/28/2011**	**912**	**10**	**5**	**UG/L**	**40**	
Methylene chloride	4/28/2011	0.33	0.5	5	UG/L	44	J
Trichlorofluoromethane	4/28/2011	1.76	0.5	5	UG/L	44	
Trichlorofluoromethane	4/28/2011	1.27	0.5	5	UG/L	48	
Methylene chloride	4/28/2011	0.31	0.5	5	UG/L	48	J
Chloroform	4/28/2011	0.28	0.5	7	UG/L	48	J
Methyl chloride	4/28/2011	0.24	0.5	5	UG/L	48	J
Methylene chloride	4/28/2011	0.35	0.5	5	UG/L	52	J
Methyl chloride	4/28/2011	0.33	0.5	5	UG/L	52	J

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Chloroform	4/28/2011	0.23	0.5	7	UG/L	52	J
Chloroform	4/28/2011	0.15	0.5	7	UG/L	56	J
Methylene chloride	4/28/2011	0.34	0.5	5	UG/L	56	J
Methyl chloride	4/28/2011	0.23	0.5	5	UG/L	56	J
Methyl chloride	4/28/2011	0.24	0.5	5	UG/L	64	J
Methylene chloride	4/28/2011	0.31	0.5	5	UG/L	64	J

Site ID : B452-GP-5

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Chloroform	5/12/2011	1.79	0.5	7	UG/L	24	
Trichlorofluoromethane	**5/12/2011**	**14.2**	**0.5**	**5**	**UG/L**	**24**	
Trichlorofluoromethane	**5/12/2011**	**59.4**	**0.5**	**5**	**UG/L**	**28**	
Chloroform	5/12/2011	2.55	0.5	7	UG/L	28	
Trichlorofluoromethane	**5/12/2011**	**526**	**5**	**5**	**UG/L**	**32**	
Chloroform	5/12/2011	1.3	5	7	UG/L	32	J
Trichlorofluoromethane	**5/12/2011**	**113**	**1**	**5**	**UG/L**	**36**	
Trichlorofluoromethane	5/12/2011	4.09	0.5	5	UG/L	40	
Trichlorofluoromethane	**5/12/2011**	**25.4**	**0.5**	**5**	**UG/L**	**44**	
Chloroform	5/12/2011	0.3	0.5	7	UG/L	44	J
Chloroform	5/12/2011	0.32	0.5	7	UG/L	52	J

Site ID : B452-GP-6

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Trichlorofluoromethane	**5/11/2011**	**2380**	**25**	**5**	**UG/L**	**32**	
Methylene chloride	**5/11/2011**	**8.05**	**2.5**	**5**	**UG/L**	**40**	**B**
Trichlorofluoromethane	**5/11/2011**	**358**	**2.5**	**5**	**UG/L**	**40**	
Chloroform	5/11/2011	1.4	2.5	7	UG/L	40	J
Trichlorofluoromethane	5/11/2011	0.42	0.5	5	UG/L	44	J
Chloroform	5/11/2011	0.5	0.5	7	UG/L	44	
Chloroform	5/11/2011	0.29	0.5	7	UG/L	48	J

Site ID : B452-GP-7

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Trichlorofluoromethane	**5/10/2011**	**951**	**5**	**5**	**UG/L**	**32**	
Trichlorofluoromethane	**5/10/2011**	**420**	**5**	**5**	**UG/L**	**36**	
Chloroform	5/10/2011	0.36	1	7	UG/L	40	J
Methyl chloride	5/10/2011	0.42	1	5	UG/L	40	J
Trichlorofluoromethane	**5/10/2011**	**140**	**1**	**5**	**UG/L**	**40**	
Chloroform	5/10/2011	0.56	0.5	7	UG/L	44	
Methyl chloride	5/10/2011	0.26	0.5	5	UG/L	44	J
Trichlorofluoromethane	**5/10/2011**	**50.5**	**0.5**	**5**	**UG/L**	**44**	
Chloroform	5/10/2011	0.37	0.5	7	UG/L	48	J

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Site ID : B452-GP-8

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Trichlorofluoromethane	**5/11/2011**	**1880**	**25**	**5**	**UG/L**	**32**	
Trichlorofluoromethane	**5/11/2011**	**1290**	**10**	**5**	**UG/L**	**36**	
Trichlorofluoromethane	**5/11/2011**	**584**	**5**	**5**	**UG/L**	**40**	
Methyl chloride	5/11/2011	0.38	0.5	5	UG/L	44	J
Chloroform	5/11/2011	1	5	7	UG/L	44	J
Trichlorofluoromethane	**5/11/2011**	**373**	**5**	**5**	**UG/L**	**44**	
Chloroform	5/11/2011	1.09	0.5	7	UG/L	48	
Methyl chloride	5/11/2011	0.39	0.5	5	UG/L	48	J
Methyl chloride	5/11/2011	1.33	0.5	5	UG/L	56	

Site ID : B452-GP-9

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Methylene chloride	5/9/2011	3.5	5	5	UG/L	32	BJ
Trichlorofluoromethane	**5/9/2011**	**779**	**5**	**5**	**UG/L**	**32**	
Methylene chloride	5/9/2011	3.4	5	5	UG/L	36	BJ
Trichlorofluoromethane	**5/9/2011**	**665**	**5**	**5**	**UG/L**	**36**	
Methylene chloride	5/9/2011	0.58	1	5	UG/L	40	BJ
Trichlorofluoromethane	**5/9/2011**	**142**	**1**	**5**	**UG/L**	**40**	
Chloroform	5/9/2011	0.54	1	7	UG/L	40	J
Chloroform	5/9/2011	0.46	0.5	7	UG/L	44	J
Chloroform	5/9/2011	0.49	0.5	7	UG/L	48	J
Chloroform	5/9/2011	0.24	0.5	7	UG/L	56	J
Methylene chloride	5/9/2011	0.44	0.5	5	UG/L	56	BJ

Site ID : B452-GP-10

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Chloroform	5/13/2011	0.11	0.5	7	UG/L	32	J

Site ID : B452-GP11

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Methyl chloride	4/29/2011	0.21	0.5	5	UG/L	32	J
Methyl chloride	4/29/2011	0.34	0.5	5	UG/L	36	J
Methyl chloride	4/29/2011	0.25	0.5	5	UG/L	40	J
Benzene, 1,2,4-trimethyl	4/29/2011	0.11	0.5	5	UG/L	40	J
Benzene, 1,2,4-trimethyl	4/29/2011	0.1	0.5	5	UG/L	60	J

Site ID : B452-GP-12

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Chloroform	5/13/2011	1.08	0.5	7	UG/L	32	
Chloroform	5/13/2011	0.49	0.5	7	UG/L	40	J

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Site ID : B452-GP-13

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Trichlorofluoromethane	7/14/2011	0.38	0.5	5	UG/L	32	J

Site ID : B452-GP-14

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Trichlorofluoromethane	**6/24/2011**	**12.4**	**0.5**	**5**	**UG/L**	**32**	
Trichlorofluoromethane	**6/24/2011**	**1.62**	**0.5**	**5**	**UG/L**	**36**	
Chloroform	6/24/2011	0.2	0.5	7	UG/L	36	J
Trichlorofluoromethane	**6/24/2011**	**6.1**	**0.5**	**5**	**UG/L**	**40**	
Chloroform	6/24/2011	0.18	0.5	7	UG/L	40	J
Trichlorofluoromethane	**6/24/2011**	**8.05**	**0.5**	**5**	**UG/L**	**44**	

Site ID : B452-GP-15

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Trichlorofluoromethane	**6/23/2011**	**141**	**1**	**5**	**UG/L**	**32**	
Chloroform	6/23/2011	0.21	0.5	7	UG/L	36	J
Trichlorofluoromethane	**6/23/2011**	**51**	**0.5**	**5**	**UG/L**	**36**	
Chloroform	6/23/2011	0.22	0.5	7	UG/L	40	J

Site ID : B452-GP-16

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Methylene chloride	**6/15/2011**	**37.3**	**12.5**	**5**	**UG/L**	**32**	
Trichlorofluoromethane	**6/15/2011**	**1390**	**12.5**	**5**	**UG/L**	**32**	
Trichlorofluoromethane	**6/15/2011**	**338**	**2.5**	**5**	**UG/L**	**36**	
Trichlorofluoromethane	**6/15/2011**	**8.51**	**0.5**	**5**	**UG/L**	**40**	
Trichlorofluoromethane	**6/15/2011**	**9.04**	**0.5**	**5**	**UG/L**	**44**	
Chloroform	6/15/2011	0.24	0.5	7	UG/L	44	J
Chloroform	6/15/2011	0.3	0.5	7	UG/L	48	J

Site ID : B452-GP-17

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Trichlorofluoromethane	**6/14/2011**	**4160**	**50**	**5**	**UG/L**	**32**	
Carbon tetrachloride	6/14/2011	0.71	0.5	5	UG/L	32	
Chloroform	6/14/2011	0.27	0.5	7	UG/L	32	J
Trichlorofluoromethane	**6/14/2011**	**2460**	**25**	**5**	**UG/L**	**36**	
Chloroform	6/14/2011	0.48	0.5	7	UG/L	36	J
Trichlorofluoromethane	**6/14/2011**	**253**	**2.5**	**5**	**UG/L**	**40**	
Methyl chloride	6/14/2011	0.4	0.5	5	UG/L	44	J
Methylene chloride	6/14/2011	0.78	0.5	5	UG/L	44	
Trichlorofluoromethane	6/14/2011	3.55	0.5	5	UG/L	44	
1,2,3-Trichlorobenzene	6/14/2011	0.22	0.5	5	UG/L	48	BJ
Methyl chloride	6/14/2011	0.36	0.5	5	UG/L	56	J

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Site ID : B452-GP-18

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Trichlorofluoromethane	**6/16/2011**	**39.4**	**0.5**	**5**	**UG/L**	**32**	
Chloroform	6/16/2011	0.4	0.5	7	UG/L	32	J
Trichlorofluoromethane	6/16/2011	3.34	0.5	5	UG/L	36	
Chloroform	6/16/2011	0.57	0.5	7	UG/L	36	
Chloroform	6/16/2011	0.55	0.5	7	UG/L	40	
Chloroform	6/16/2011	0.25	0.5	7	UG/L	44	J

Site ID : B452-GP-19

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Chloroform	6/16/2011	0.27	0.5	7	UG/L	32	J
Trichlorofluoromethane	**6/16/2011**	**79.4**	**0.5**	**5**	**UG/L**	**32**	
Chloroform	6/16/2011	0.38	0.5	7	UG/L	36	J
Chloroform	6/16/2011	0.36	0.5	7	UG/L	40	J
Chloroform	6/16/2011	0.41	0.5	7	UG/L	44	J

Site ID : B452-GP-20

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Chloroform	6/17/2011	0.59	0.5	7	UG/L	32	
m/p xylene	6/17/2011	0.14	0.5	5	UG/L	32	J
Toluene	6/17/2011	0.33	0.5	5	UG/L	32	J
Trichlorofluoromethane	**6/17/2011**	**31.8**	**0.5**	**5**	**UG/L**	**32**	
Chloroform	6/17/2011	1.94	0.5	7	UG/L	36	
Trichlorofluoromethane	**6/17/2011**	**27.2**	**0.5**	**5**	**UG/L**	**36**	
Chloroform	6/17/2011	0.7	0.5	7	UG/L	40	
Chloroform	6/17/2011	0.48	0.5	7	UG/L	44	J

Site ID : B452-GP-21

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Trichlorofluoromethane	**6/16/2011**	**39.4**	**0.5**	**5**	**UG/L**	**32**	
Chloroform	6/16/2011	0.4	0.5	7	UG/L	32	J
Chloroform	6/16/2011	0.57	0.5	7	UG/L	36	
Trichlorofluoromethane	6/16/2011	3.34	0.5	5	UG/L	36	
Chloroform	6/16/2011	0.55	0.5	7	UG/L	40	
Chloroform	6/16/2011	0.25	0.5	7	UG/L	44	J

Site ID : B452-GP-21 (re-install)

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Chloroform	6/20/2011	0.2	0.5	7	UG/L	28	J
Trichlorofluoromethane	6/20/2011	4.13	0.5	5	UG/L	28	
Trichlorofluoromethane	**6/20/2011**	**5.06**	**0.5**	**5**	**UG/L**	**32**	
Chloroform	6/20/2011	0.12	0.5	7	UG/L	32	J

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Trichlorofluoromethane	**6/20/2011**	**35.7**	**0.5**	**5**	**UG/L**	**36**	
Chloroform	6/20/2011	0.16	0.5	7	UG/L	36	J
Trichlorofluoromethane	**6/20/2011**	**294**	**5**	**5**	**UG/L**	**40**	
Chloroform	6/20/2011	0.15	0.5	7	UG/L	40	J
Trichlorofluoromethane	**6/20/2011**	**123**	**2.5**	**5**	**UG/L**	**44**	
Chloroform	6/20/2011	0.22	0.5	7	UG/L	44	J
Trichlorofluoromethane	**6/20/2011**	**14.8**	**0.5**	**5**	**UG/L**	**48**	
Chloroform	6/20/2011	0.31	0.5	7	UG/L	48	J
Trichlorofluoromethane	6/20/2011	0.64	0.5	5	UG/L	52	
Chloroform	6/20/2011	0.6	0.5	7	UG/L	60	
Methylene chloride	6/20/2011	0.83	0.5	5	UG/L	60	
Methylene chloride	6/20/2011	0.42	0.5	5	UG/L	64	J
Chloroform	6/20/2011	2.28	0.5	7	UG/L	64	

Site ID : B452-GP-22

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Carbon tetrachloride	6/9/2011	0.19	0.5	5	UG/L	28	J
Methyl chloride	6/9/2011	0.3	0.5	5	UG/L	28	J
Chloroform	6/9/2011	0.45	0.5	7	UG/L	28	J
Trichlorofluoromethane	**6/9/2011**	**2010**	**0.5**	**5**	**UG/L**	**28**	**E**
Methyl chloride	6/9/2011	0.64	0.5	5	UG/L	32	
Trichlorofluoromethane	**6/9/2011**	**8250**	**100**	**5**	**UG/L**	**32**	
Chloroform	6/9/2011	1.84	0.5	7	UG/L	32	
Carbon tetrachloride	6/9/2011	4.42	0.5	5	UG/L	36	
1,2,3-Trichlorobenzene	6/9/2011	0.19	0.5	5	UG/L	36	J
1,1,1-Trichloroethane	6/9/2011	0.53	0.5	5	UG/L	36	
1,1-Dichloroethylene	6/9/2011	0.16	0.5	5	UG/L	36	J
Chloroform	6/9/2011	4.78	0.5	7	UG/L	36	
Dichlorodifluoromethane	6/9/2011	1.46	0.5	5	UG/L	36	
Trichlorofluoromethane	**6/9/2011**	**30800**	**500**	**5**	**UG/L**	**36**	
Toluene	6/9/2011	0.27	0.5	5	UG/L	36	J
1,1,1-Trichloroethane	6/9/2011	0.38	0.5	5	UG/L	40	J
1,1-Dichloroethylene	6/9/2011	0.13	0.5	5	UG/L	40	J
1,2,3-Trichlorobenzene	6/9/2011	0.21	0.5	5	UG/L	40	J
Carbon tetrachloride	6/9/2011	4.66	0.5	5	UG/L	40	
Chloroform	6/9/2011	3.72	0.5	7	UG/L	40	
Methyl chloride	6/9/2011	0.29	0.5	5	UG/L	40	J
Trichlorofluoromethane	**6/9/2011**	**28300**	**500**	**5**	**UG/L**	**40**	
Dichlorodifluoromethane	6/9/2011	1.61	0.5	5	UG/L	40	
1,2,3-Trichlorobenzene	6/9/2011	0.23	0.5	5	UG/L	44	J
Carbon tetrachloride	6/9/2011	1.18	0.5	5	UG/L	44	
Chloroform	6/9/2011	1.08	0.5	7	UG/L	44	
Dichlorodifluoromethane	6/9/2011	0.28	0.5	5	UG/L	44	J
Trichlorofluoromethane	**6/9/2011**	**9930**	**250**	**5**	**UG/L**	**44**	

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Methyl chloride	6/9/2011	0.26	0.5	5	UG/L	44	J
Chloroform	6/9/2011	0.27	0.5	7	UG/L	52	J
Methyl chloride	6/9/2011	0.29	0.5	5	UG/L	52	J
Trichlorofluoromethane	**6/9/2011**	**203**	**2.5**	**5**	**UG/L**	**52**	

Site ID : B452-GP-23

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Toluene	6/9/2011	0.12	0.5	5	UG/L	28	J
Trichlorofluoromethane	**6/9/2011**	**2880**	**50**	**5**	**UG/L**	**28**	
Chloroform	6/9/2011	0.66	0.5	7	UG/L	28	
Carbon tetrachloride	6/9/2011	0.28	0.5	5	UG/L	28	J
Methyl chloride	6/9/2011	0.7	0.5	5	UG/L	28	
1,1-Dichloroethylene	6/9/2011	0.11	0.5	5	UG/L	32	J
Toluene	6/9/2011	0.18	0.5	5	UG/L	32	J
Carbon tetrachloride	6/9/2011	2.92	0.5	5	UG/L	32	
Methyl chloride	6/9/2011	0.25	0.5	5	UG/L	32	J
1,2,3-Trichlorobenzene	6/9/2011	0.1	0.5	5	UG/L	32	J
Chloroform	6/9/2011	4.84	0.5	7	UG/L	32	
Dichlorodifluoromethane	6/9/2011	0.91	0.5	5	UG/L	32	
1,1,1-Trichloroethane	6/9/2011	0.4	0.5	5	UG/L	32	J
Trichlorofluoromethane	**6/9/2011**	**27200**	**500**	**5**	**UG/L**	**32**	
1,1,1-Trichloroethane	6/9/2011	0.55	0.5	5	UG/L	36	
1,1-Dichloroethylene	6/9/2011	0.14	0.5	5	UG/L	36	J
1,2,3-Trichlorobenzene	6/9/2011	0.16	0.5	5	UG/L	36	J
Carbon tetrachloride	6/9/2011	3.69	0.5	5	UG/L	36	
Chloroform	6/9/2011	6.68	0.5	7	UG/L	36	
Dichlorodifluoromethane	6/9/2011	1.33	0.5	5	UG/L	36	
m/p xylene	6/9/2011	0.13	0.5	5	UG/L	36	J
Methyl chloride	6/9/2011	0.38	0.5	5	UG/L	36	J
Toluene	6/9/2011	0.34	0.5	5	UG/L	36	J
Trichlorofluoromethane	**6/9/2011**	**31500**	**500**	**5**	**UG/L**	**36**	
Carbon tetrachloride	6/8/2011	0.62	0.5	5	UG/L	40	
m/p xylene	6/8/2011	0.12	0.5	5	UG/L	40	J
Methyl chloride	6/8/2011	0.38	0.5	5	UG/L	40	J
Trichlorofluoromethane	**6/8/2011**	**8260**	**100**	**5**	**UG/L**	**40**	
Toluene	6/8/2011	0.17	0.5	5	UG/L	40	J
Chloroform	6/8/2011	1.38	0.5	7	UG/L	40	
Chloroform	6/8/2011	0.78	0.5	7	UG/L	44	
Carbon tetrachloride	6/8/2011	0.53	0.5	5	UG/L	44	
m/p xylene	6/8/2011	0.12	0.5	5	UG/L	44	J
Toluene	6/8/2011	0.12	0.5	5	UG/L	44	J
Trichlorofluoromethane	**6/8/2011**	**6010**	**100**	**5**	**UG/L**	**44**	
Methyl chloride	6/8/2011	0.34	0.5	5	UG/L	44	J
Methyl chloride	6/8/2011	0.43	0.5	5	UG/L	52	J

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Trichlorofluoromethane	**6/8/2011**	**18**	**0.5**	**5**	**UG/L**	**52**	
Methylene chloride	6/8/2011	0.68	0.5	5	UG/L	52	
Toluene	6/8/2011	0.14	0.5	5	UG/L	52	J
Methylene chloride	6/8/2011	0.84	0.5	5	UG/L	60	
Trichlorofluoromethane	6/8/2011	1.24	0.5	5	UG/L	60	
Toluene	6/8/2011	0.11	0.5	5	UG/L	60	J
Methyl chloride	6/8/2011	0.56	0.5	5	UG/L	60	

Site ID : B452-GP-24

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Well Not Installed	NA	NA	NA	NA	NA	NA	NA

Site ID : B452-GP-25

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Tetrachloroethylene	7/12/2011	0.87	0.5	5	UG/L	24	
Tetrachloroethylene	7/12/2011	0.73	0.5	5	UG/L	32	
Tetrachloroethylene	7/12/2011	3.71	0.5	5	UG/L	40	
Tetrachloroethylene	7/12/2011	1.46	0.5	5	UG/L	48	
1,1,1-Trichloroethane	7/12/2011	0.68	0.5	5	UG/L	48	
Tetrachloroethylene	7/12/2011	0.27	0.5	5	UG/L	56	J
1,1-Dichloroethylene	7/12/2011	0.65	0.5	5	UG/L	64	
Tetrachloroethylene	7/12/2011	0.83	0.5	5	UG/L	64	
1,1,1-Trichloroethane	7/12/2011	2.36	0.5	5	UG/L	64	

Site ID : B452-GP-26

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Tetrachloroethylene	**7/13/2011**	**18.1**	**0.5**	**5**	**UG/L**	**24**	
Tetrachloroethylene	**7/13/2011**	**360**	**5**	**5**	**UG/L**	**32**	
1,1,1-Trichloroethane	**7/13/2011**	**6.4**	**5**	**5**	**UG/L**	**32**	
cis-1,2-Dichloroethylene	7/13/2011	1.6	5	5	UG/L	32	J
1,1,1-Trichloroethane	7/13/2011	0.24	0.5	5	UG/L	40	J
Tetrachloroethylene	**7/13/2011**	**12.5**	**0.5**	**5**	**UG/L**	**40**	
Tetrachloroethylene	**7/13/2011**	**5.54**	**0.5**	**5**	**UG/L**	**48**	
1,1,1-Trichloroethane	7/13/2011	1.05	0.5	5	UG/L	48	
1,1-Dichloroethylene	7/13/2011	0.22	0.5	5	UG/L	48	J
Tetrachloroethylene	7/12/2011	3.46	0.5	5	UG/L	56	
Trichlorofluoromethane	7/12/2011	0.47	0.5	5	UG/L	56	J
Trichlorofluoromethane	7/12/2011	3.79	0.5	5	UG/L	64	
Trichlorofluoromethane	**7/12/2011**	**54.9**	**0.5**	**5**	**UG/L**	**72**	
Trichlorofluoromethane	**7/20/2011**	**53.8**	**0.5**	**5**	**UG/L**	**72**	
Chloroform	7/20/2011	1.53	0.5	7	UG/L	88	
Chloroform	7/20/2011	1.23	0.5	7	UG/L	96	
Chloroform	7/20/2011	0.41	0.5	7	UG/L	104	J

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Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
1,1,1-Trichloroethane	6/29/2011	0.34	0.5	5	UG/L	24	J
Tetrachloroethylene	**6/29/2011**	**118**	**1**	**5**	**UG/L**	**24**	
Trichlorofluoromethane	6/29/2011	0.59	0.5	5	UG/L	24	
Trichlorofluoromethane	6/29/2011	1.22	0.5	5	UG/L	32	
1,1,1-Trichloroethane	6/29/2011	0.82	0.5	5	UG/L	32	
Tetrachloroethylene	**6/29/2011**	**30.8**	**0.5**	**5**	**UG/L**	**32**	
Trichlorofluoromethane	**6/29/2011**	**37.8**	**0.5**	**5**	**UG/L**	**40**	
Trichlorofluoromethane	**6/29/2011**	**150**	**1**	**5**	**UG/L**	**48**	
Trichlorofluoromethane	**6/29/2011**	**45.9**	**0.5**	**5**	**UG/L**	**56**	
Trichlorofluoromethane	6/29/2011	3.89	0.5	5	UG/L	64	
Chloroform	6/29/2011	0.11	0.5	7	UG/L	64	J
Trichlorofluoromethane	7/21/2011	1.11	0.5	5	UG/L	72	
Chloroform	7/21/2011	0.12	0.5	7	UG/L	72	J
Chloroform	7/21/2011	1.02	0.5	7	UG/L	88	
Chloroform	7/20/2011	2.28	0.5	7	UG/L	96	
Chloroform	7/20/2011	1.12	0.5	7	UG/L	104	

Site ID : B452-GP-28

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
1,1,1-Trichloroethane	**6/28/2011**	**18.3**	**0.5**	**5**	**UG/L**	**24**	
1,1-Dichloroethane	6/28/2011	3.16	0.5	5	UG/L	24	
cis-1,2-Dichloroethylene	**6/28/2011**	**10.9**	**0.5**	**5**	**UG/L**	**24**	
Trichloroethylene	6/28/2011	2.59	0.5	5	UG/L	24	
Trichlorofluoromethane	6/28/2011	0.34	0.5	5	UG/L	24	J
Tetrachloroethylene	**6/28/2011**	**994**	**10**	**5**	**UG/L**	**24**	
1,1-Dichloroethylene	6/28/2011	0.15	0.5	5	UG/L	24	J
1,1,1-Trichloroethane	6/28/2011	1.06	0.5	5	UG/L	32	
Tetrachloroethylene	**6/28/2011**	**61.6**	**0.5**	**5**	**UG/L**	**32**	
Trichloroethylene	6/28/2011	0.24	0.5	5	UG/L	32	J
cis-1,2-Dichloroethylene	6/28/2011	1.35	0.5	5	UG/L	32	
Chloroform	6/28/2011	0.34	0.5	7	UG/L	40	J
Tetrachloroethylene	6/28/2011	0.56	0.5	5	UG/L	40	
Trichlorofluoromethane	6/28/2011	0.35	0.5	5	UG/L	40	J
Chloroform	6/28/2011	1.72	0.5	7	UG/L	48	
Trichlorofluoromethane	6/28/2011	0.87	0.5	5	UG/L	48	
Chloroform	6/28/2011	1.24	0.5	7	UG/L	56	
Trichlorofluoromethane	6/28/2011	1.08	0.5	5	UG/L	56	
Chloroform	6/28/2011	0.61	0.5	7	UG/L	64	
Trichlorofluoromethane	6/28/2011	1	0.5	5	UG/L	64	
Trichlorofluoromethane	**6/28/2011**	**50.2**	**0.5**	**5**	**UG/L**	**72**	
Chloroform	6/28/2011	0.31	0.5	7	UG/L	72	J
Chloroform	7/22/2011	0.3	0.5	7	UG/L	72	J

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Trichlorofluoromethane	7/22/2011	0.79	0.5	5	UG/L	80	
Chloroform	7/21/2011	0.55	0.5	7	UG/L	88	
Chloroform	7/21/2011	1.03	0.5	7	UG/L	96	
Chloroform	7/21/2011	1.72	0.5	7	UG/L	104	

Site ID : B452-GP-29

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Chloroform	6/29/2011	1.61	0.5	7	UG/L	24	
Chloroform	6/30/2011	3.2	0.5	7	UG/L	32	
Bromodichloromethane	6/30/2011	0.54	0.5	50	UG/L	32	
Chloroform	6/30/2011	2.05	0.5	7	UG/L	40	
Chloroform	6/30/2011	0.3	0.5	7	UG/L	48	J
Chloroform	6/29/2011	0.12	0.5	7	UG/L	72	J

Site ID : B452-GP-30

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Tetrachloroethylene	**6/30/2011**	**15.5**	**0.5**	**5**	**UG/L**	**24**	
Tetrachloroethylene	**6/30/2011**	**33.6**	**0.5**	**5**	**UG/L**	**32**	
1,1,1-Trichloroethane	6/30/2011	0.45	0.5	5	UG/L	32	J
Chloroform	6/30/2011	1.57	0.5	7	UG/L	40	
Bromodichloromethane	6/30/2011	0.38	0.5	50	UG/L	48	J
Chloroform	6/30/2011	2.62	0.5	7	UG/L	48	
Chloroform	6/30/2011	0.58	0.5	7	UG/L	56	
Chloroform	6/30/2011	0.19	0.5	7	UG/L	64	J
Trichlorofluoromethane	6/30/2011	2.4	0.5	5	UG/L	64	

Site ID : B452-GP-31

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Trichloroethylene	7/14/2011	0.18	0.5	5	UG/L	24	J
Tetrachloroethylene	**7/14/2011**	**829**	**5**	**5**	**UG/L**	**24**	
1,1,1-Trichloroethane	7/14/2011	0.45	0.5	5	UG/L	24	J
cis-1,2-Dichloroethylene	7/14/2011	0.13	0.5	5	UG/L	32	J
Tetrachloroethylene	**7/14/2011**	**819**	**5**	**5**	**UG/L**	**32**	
Trichloroethylene	7/14/2011	0.25	0.5	5	UG/L	32	J
1,1,1-Trichloroethane	7/14/2011	2.93	0.5	5	UG/L	32	
1,1,1-Trichloroethane	7/14/2011	0.45	0.5	5	UG/L	40	J
Tetrachloroethylene	**7/14/2011**	**12.9**	**0.5**	**5**	**UG/L**	**40**	
Trichlorofluoromethane	7/13/2011	4.38	0.5	5	UG/L	48	
Chloroform	7/13/2011	0.35	0.5	7	UG/L	48	J
Tetrachloroethylene	7/13/2011	0.72	0.5	5	UG/L	48	
Tetrachloroethylene	7/13/2011	0.43	0.5	5	UG/L	56	J

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Trichlorofluoromethane	**7/13/2011**	**6.3**	**0.5**	**5**	**UG/L**	**56**	
Chloroform	7/13/2011	0.18	0.5	7	UG/L	56	J
Tetrachloroethylene	7/13/2011	0.21	0.5	5	UG/L	64	J
Trichlorofluoromethane	7/13/2011	0.47	0.5	5	UG/L	64	J
Chloroform	7/13/2011	0.73	0.5	7	UG/L	64	
Chloroform	7/13/2011	0.24	0.5	7	UG/L	72	J
Trichlorofluoromethane	7/13/2011	0.53	0.5	5	UG/L	72	
Trichlorofluoromethane	**7/13/2011**	**12.9**	**0.5**	**5**	**UG/L**	**80**	

Site ID : B452-GP-32

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Chloroform	7/14/2011	0.96	0.5	7	UG/L	24	
Trichlorofluoromethane	**7/14/2011**	**7.39**	**0.5**	**5**	**UG/L**	**24**	
Chloroform	7/14/2011	3.15	0.5	7	UG/L	28	
Dibromochloromethane	7/14/2011	0.21	0.5	5	UG/L	28	J
Trichlorofluoromethane	**7/14/2011**	**18.4**	**0.5**	**5**	**UG/L**	**28**	
Bromodichloromethane	7/14/2011	0.33	0.5	50	UG/L	28	J
Trichlorofluoromethane	**7/14/2011**	**97.7**	**0.5**	**5**	**UG/L**	**32**	
Chloroform	7/14/2011	0.63	0.5	7	UG/L	32	
Trichlorofluoromethane	7/14/2011	0.64	0.5	5	UG/L	36	
Chloroform	7/14/2011	1.06	0.5	7	UG/L	36	
Trichlorofluoromethane	7/14/2011	1.39	0.5	5	UG/L	40	
Chloroform	7/14/2011	1.43	0.5	7	UG/L	40	
Chloroform	7/14/2011	0.4	0.5	7	UG/L	44	J
Trichlorofluoromethane	**7/14/2011**	**5.75**	**0.5**	**5**	**UG/L**	**44**	
Chloroform	7/14/2011	0.47	0.5	7	UG/L	52	J
Trichlorofluoromethane	**7/14/2011**	**34**	**0.5**	**5**	**UG/L**	**52**	

Site ID : B452-GP-33

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Well Not Installed	NA	NA	NA	NA	NA	NA	NA

Site ID : B452-GP-34

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Methyl chloride	7/25/2011	0.73	0.5	5	UG/L	28	
Methyl chloride	7/25/2011	0.6	0.5	5	UG/L	36	
Chloroform	7/25/2011	0.33	0.5	7	UG/L	36	J
Methyl chloride	7/25/2011	0.89	0.5	5	UG/L	40	
Chloroform	7/25/2011	0.14	0.5	7	UG/L	60	J
Chloroform	7/22/2011	3.51	0.5	7	UG/L	68	
Chloroform	7/22/2011	4.19	0.5	7	UG/L	76	
Chloroform	7/22/2011	4.64	0.5	7	UG/L	84	

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Site ID : B452-GP-35

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Trichlorofluoromethane	7/26/2011	1.19	0.5	5	UG/L	28	
Trichlorofluoromethane	7/26/2011	1.88	0.5	5	UG/L	40	
Trichlorofluoromethane	7/26/2011	1.74	0.5	5	UG/L	44	
Trichlorofluoromethane	7/26/2011	1.32	0.5	5	UG/L	52	
Trichlorofluoromethane	**7/26/2011**	**29.2**	**0.5**	**5**	**UG/L**	**60**	
Trichlorofluoromethane	**7/26/2011**	**9.62**	**0.5**	**5**	**UG/L**	**68**	
Chloroform	7/26/2011	0.23	0.5	7	UG/L	68	J
Chloroform	7/26/2011	1.73	0.5	7	UG/L	76	
Chloroform	7/25/2011	1.46	0.5	7	UG/L	84	

Site ID : B452-GP-36

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Trichlorofluoromethane	**7/27/2011**	**21.7**	**0.5**	**5**	**UG/L**	**28**	
Tetrachloroethylene	7/27/2011	0.3	0.5	5	UG/L	28	J
Trichlorofluoromethane	**7/27/2011**	**9.82**	**0.5**	**5**	**UG/L**	**36**	
Methyl chloride	7/27/2011	0.53	0.5	5	UG/L	36	
Trichlorofluoromethane	**7/27/2011**	**20.9**	**0.5**	**5**	**UG/L**	**40**	
Trichlorofluoromethane	**7/27/2011**	**601**	**5**	**5**	**UG/L**	**44**	
Chloroform	7/27/2011	0.18	0.5	7	UG/L	44	J
Chloroform	7/27/2011	0.35	0.5	7	UG/L	48	J
Trichlorofluoromethane	**7/27/2011**	**3340**	**25**	**5**	**UG/L**	**48**	
Trichlorofluoromethane	**7/27/2011**	**1200**	**12.5**	**5**	**UG/L**	**52**	
Chloroform	7/27/2011	0.17	0.5	7	UG/L	52	J
Methyl chloride	7/27/2011	0.45	0.5	5	UG/L	60	J
Trichlorofluoromethane	**7/27/2011**	**162**	**1**	**5**	**UG/L**	**60**	
Methyl chloride	7/27/2011	0.5	0.5	5	UG/L	68	

Site ID : B452-GP-37

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Trichlorofluoromethane	**7/28/2011**	**40**	**0.5**	**5**	**UG/L**	**28**	
Tetrachloroethylene	7/28/2011	0.25	0.5	5	UG/L	28	J
Methyl chloride	7/28/2011	0.59	0.5	5	UG/L	28	
Trichlorofluoromethane	**7/28/2011**	**21.5**	**0.5**	**5**	**UG/L**	**36**	
Trichlorofluoromethane	**7/28/2011**	**74.9**	**0.5**	**5**	**UG/L**	**40**	
Chloroform	7/28/2011	0.64	0.5	7	UG/L	44	
Methyl chloride	7/28/2011	0.79	0.5	5	UG/L	44	
Trichlorofluoromethane	**7/28/2011**	**2830**	**25**	**5**	**UG/L**	**44**	
Toluene	7/28/2011	0.1	0.5	5	UG/L	44	J
Carbon tetrachloride	7/28/2011	0.94	0.5	5	UG/L	48	
Chloroform	7/28/2011	1.08	0.5	7	UG/L	48	
Methyl chloride	7/28/2011	1.06	0.5	5	UG/L	48	

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Trichlorofluoromethane	**7/28/2011**	**7310**	**100**	**5**	**UG/L**	**48**	
Chloroform	7/28/2011	0.46	0.5	7	UG/L	52	J
Trichlorofluoromethane	**7/28/2011**	**123**	**1**	**5**	**UG/L**	**52**	
Trichlorofluoromethane	**7/28/2011**	**170**	**1**	**5**	**UG/L**	**60**	
Chloroform	7/28/2011	0.39	0.5	7	UG/L	60	J
Methyl chloride	7/28/2011	0.61	0.5	5	UG/L	60	
Toluene	7/28/2011	0.12	0.5	5	UG/L	60	J
Toluene	7/28/2011	0.12	0.5	5	UG/L	68	J
Methyl chloride	7/28/2011	0.61	0.5	5	UG/L	68	
Trichlorofluoromethane	**7/28/2011**	**5.86**	**0.5**	**5**	**UG/L**	**68**	
Chloroform	7/28/2011	0.11	0.5	7	UG/L	76	J
Trichlorofluoromethane	7/28/2011	4.9	0.5	5	UG/L	76	
Toluene	7/28/2011	0.12	0.5	5	UG/L	76	J
Chloroform	7/28/2011	1.98	0.5	7	UG/L	84	
Toluene	7/28/2011	0.12	0.5	5	UG/L	84	J

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Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Chloroform	7/29/2011	0.77	0.5	7	UG/L	28	
Trichlorofluoromethane	**7/29/2011**	**57.1**	**0.5**	**5**	**UG/L**	**28**	
Trichlorofluoromethane	**7/29/2011**	**6.95**	**0.5**	**5**	**UG/L**	**36**	
Trichlorofluoromethane	7/29/2011	4.25	0.5	5	UG/L	40	
Trichlorofluoromethane	**7/29/2011**	**43.2**	**0.5**	**5**	**UG/L**	**44**	
Trichlorofluoromethane	**7/29/2011**	**65.1**	**0.5**	**5**	**UG/L**	**48**	
Trichlorofluoromethane	**7/29/2011**	**19.8**	**0.5**	**5**	**UG/L**	**52**	
Chloroform	7/29/2011	0.16	0.5	7	UG/L	52	J
Trichlorofluoromethane	**7/29/2011**	**216**	**2.5**	**5**	**UG/L**	**60**	
Methyl chloride	7/29/2011	0.72	0.5	5	UG/L	76	
Methyl chloride	7/29/2011	0.73	0.5	5	UG/L	84	

Site ID : B452-GP-39

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Bromodichloromethane	8/1/2011	0.29	0.5	50	UG/L	28	J
Chloroform	8/1/2011	4.49	0.5	7	UG/L	28	
Trichlorofluoromethane	8/1/2011	2.71	0.5	5	UG/L	28	
Trichlorofluoromethane	**8/1/2011**	**7.1**	**0.5**	**5**	**UG/L**	**36**	
Trichlorofluoromethane	8/1/2011	0.67	0.5	5	UG/L	52	
Trichlorofluoromethane	8/1/2011	3.26	0.5	5	UG/L	60	

Site ID : B452-GP-40

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Cymene	8/2/2011	0.53	0.5	5	UG/L	28	
Chloroform	8/2/2011	2.98	0.5	7	UG/L	28	
Toluene	8/2/2011	0.4	0.5	5	UG/L	28	J

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Trichlorofluoromethane	8/2/2011	4.05	0.5	5	UG/L	28	
Chloroform	8/2/2011	2.03	0.5	7	UG/L	36	
Toluene	8/2/2011	0.42	0.5	5	UG/L	36	J
Cymene	8/2/2011	0.44	0.5	5	UG/L	36	J
Trichlorofluoromethane	8/2/2011	3.48	0.5	5	UG/L	36	
Toluene	8/2/2011	0.11	0.5	5	UG/L	44	J
Chloroform	8/2/2011	0.73	0.5	7	UG/L	44	
Cymene	8/2/2011	0.2	0.5	5	UG/L	52	J
Trichlorofluoromethane	8/2/2011	3.26	0.5	5	UG/L	52	

Site ID : B452-GP-41

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Well Not Installed	NA	NA	NA	NA	NA	NA	NA

Site ID : B452-GP-42

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Trichloroethylene	8/3/2011	0.33	0.5	5	UG/L	40	J
Chloroform	8/3/2011	0.66	0.5	7	UG/L	40	
Tetrachloroethylene	**8/3/2011**	**416**	**5**	**5**	**UG/L**	**40**	
1,1,1-Trichloroethane	**8/3/2011**	**23.5**	**0.5**	**5**	**UG/L**	**40**	
1,1-Dichloroethane	8/3/2011	0.84	0.5	5	UG/L	40	
1,1-Dichloroethylene	8/3/2011	1.45	0.5	5	UG/L	40	
Trichloroethylene	8/3/2011	0.15	0.5	5	UG/L	48	J
1,1,1-Trichloroethane	8/3/2011	4.48	0.5	5	UG/L	48	
Tetrachloroethylene	**8/3/2011**	**163**	**2.5**	**5**	**UG/L**	**48**	
1,1-Dichloroethylene	8/3/2011	0.54	0.5	5	UG/L	48	
1,1,1-Trichloroethane	8/3/2011	2.3	0.5	5	UG/L	56	
Tetrachloroethylene	**8/3/2011**	**36.5**	**0.5**	**5**	**UG/L**	**56**	
1,1,1-Trichloroethane	8/3/2011	0.52	0.5	5	UG/L	64	
Tetrachloroethylene	8/3/2011	1.75	0.5	5	UG/L	64	
Tetrachloroethylene	8/3/2011	0.45	0.5	5	UG/L	72	J
1,1,1-Trichloroethane	8/3/2011	0.27	0.5	5	UG/L	72	J

Site ID : B452-GP-43

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
1,1,1-Trichloroethane	**8/4/2011**	**16.2**	**5**	**5**	**UG/L**	**40**	
Tetrachloroethylene	**8/4/2011**	**440**	**5**	**5**	**UG/L**	**40**	
Tetrachloroethylene	**8/4/2011**	**22.9**	**0.5**	**5**	**UG/L**	**48**	
1,1,1-Trichloroethane	8/4/2011	1.08	0.5	5	UG/L	48	
Tetrachloroethylene	**8/4/2011**	**21**	**0.5**	**5**	**UG/L**	**56**	
1,1,1-Trichloroethane	8/4/2011	1.3	0.5	5	UG/L	56	
1,1,1-Trichloroethane	8/4/2011	0.34	0.5	5	UG/L	64	J
Tetrachloroethylene	8/4/2011	2.41	0.5	5	UG/L	64	
Tetrachloroethylene	8/4/2011	0.25	0.5	5	UG/L	72	J

Building 452 Freon-11 Groundwater Investigation
VOCs Detected Above MDL

Chloroform	8/3/2011	0.42	0.5	7	UG/L	96	J

Site ID : B452-GP-44

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Depth	Qual
Tetrachloroethylene	**8/5/2011**	**305**	**5**	**5**	**UG/L**	**40**	
1,1,1-Trichloroethane	**8/5/2011**	**7.92**	**0.5**	**5**	**UG/L**	**40**	
Trichloroethylene	8/5/2011	0.11	0.5	5	UG/L	40	J
1,1,1-Trichloroethane	**8/5/2011**	**5.82**	**0.5**	**5**	**UG/L**	**48**	
Tetrachloroethylene	**8/5/2011**	**614**	**5**	**5**	**UG/L**	**48**	
Trichloroethylene	8/5/2011	0.14	0.5	5	UG/L	48	J
1,1-Dichloroethylene	8/5/2011	0.4	0.5	5	UG/L	48	J
1,1,1-Trichloroethane	8/5/2011	3.56	0.5	5	UG/L	56	
1,1-Dichloroethylene	8/5/2011	0.53	0.5	5	UG/L	56	
Tetrachloroethylene	**8/5/2011**	**56.6**	**0.5**	**5**	**UG/L**	**56**	
Chloroform	8/4/2011	0.74	0.5	7	UG/L	88	
Chloroform	8/4/2011	0.74	0.5	7	UG/L	96	
Chloroform	8/4/2011	0.53	0.5	7	UG/L	104	

APPENDIX B

Building 452 Freon-11 Plume Groundwater Modeling Report

Groundwater Modeling
Building 452 Freon 11 Groundwater Plume
Brookhaven National Laboratory

August 31, 2011

In April 2011, a plume of Freon -11 was been detected in groundwater in the vicinity of Building 452 by BNL's Groundwater Protection Group. During April through early August 2011, groundwater characterization efforts defined the extent of the plume. The groundwater quality data which define the plume indicate that the contamination is dispersed over a large area in the Building 452 area. At this time, the exact location of the Freon-11 release and its migration pathway to groundwater is still being investigated.

BNL requested that D.B. Bennett, P.E., P.C. to perform groundwater model analyses to assist in developing groundwater remediation strategies.

Groundwater Flow Model

The existing BNL Groundwater Flow model (MODFLOW2000) was used to simulate groundwater flow directions and rates in the vicinity of the Freon-11 plume. Specifically, the former Building 96 sub-model was used.

The direction of groundwater flow has been determined using groundwater monitoring data collected by BNL. The measured direction of groundwater flow in the Upper Glacial aquifer (as represented by a flow arrow) is compared with the model predicted flow direction (as represented by water table contours) in **Figure 1**. There is good agreement between the observed and the predicted groundwater flow directions suggesting the model is able to adequately track the flow direction of the Freon-11 plume.

Particle Tracking

MODPATH was initially used to track the direction of flow of the Freon-11 plume. The tracks were used to estimate whether any potable supply wells were threatened by the plume and whether any existing groundwater remediation systems could capture this recently discovered plume.

The tracks and groundwater flow patterns predict that no potable water supply wells are threatened by the Freon-11 plume.

The tracks from the area where the plume appears to have originated are predicted to travel to the existing groundwater extraction well RTW-1 in about 2 years. RTW-1 is pumping at a rate of 30 gpm and is located about 600 feet downgradient of the apparent source area. RTW-1 was designed to treat VOC groundwater contamination from the former Building 96 Area of Concern.

Because Freon-11 is being detected in former Building 96 extraction well RTW-1, using RTW-1 was identified as Option A for remediating the Freon-11 plume.

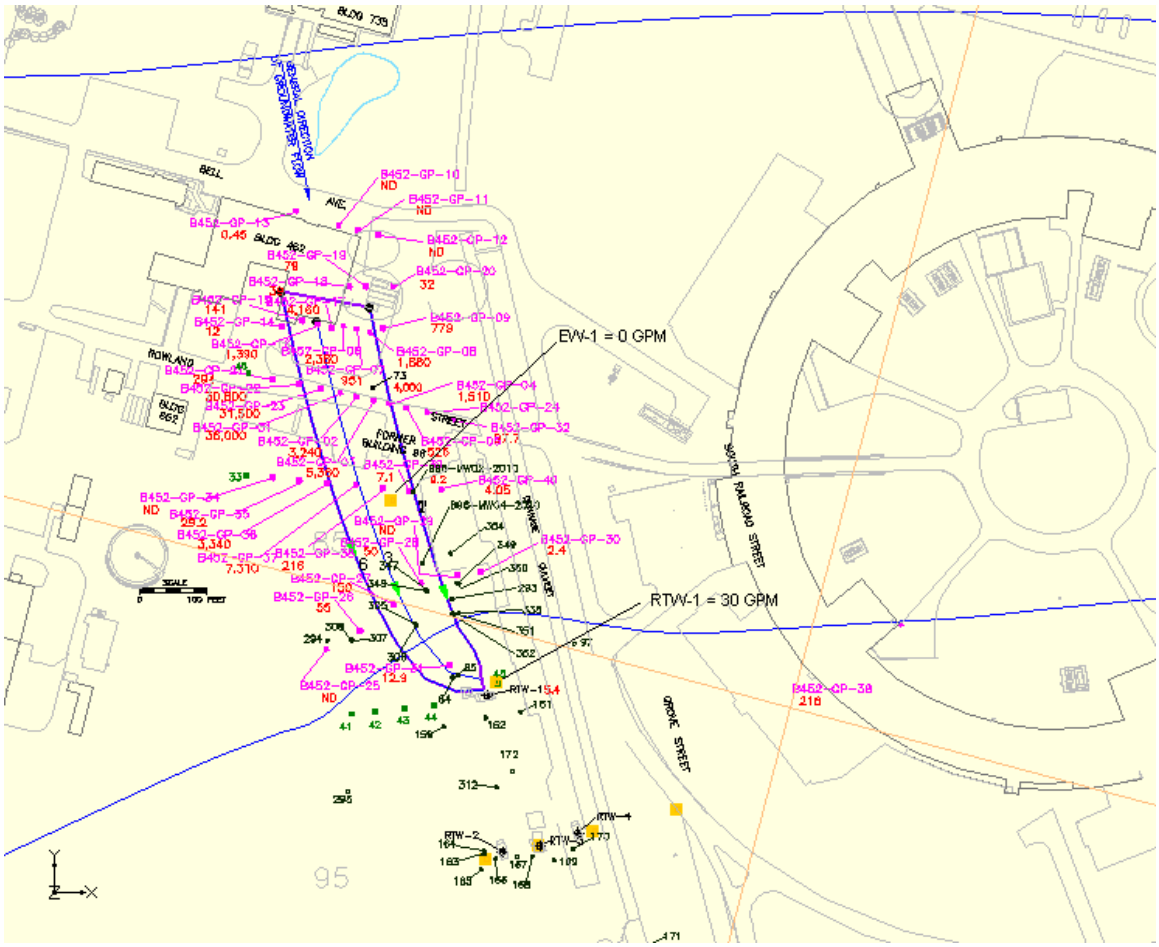

Figure 1 – Predicted Groundwater Flow Direction & Particle Tracking – Existing RTW-1 at 30 gpm.

Groundwater Quality Modeling

The groundwater flow model (MODFLOW) was coupled with MT3D to simulate the fate and transport of Freon-11 contamination in groundwater.
Key modeling assumptions include:

- The principal VOC contaminant is Freon-11. Based on published literature, Freon-11 is estimated to undergo little retardation in the aquifer. Based on literature and model calibrations, Freon-11 is assumed to have a retardation factor of 1.3. The biodegradation rate of Freon-11 is assumed to be negligible.

- The tight saturated silt zone in the vicinity of the source area is assumed to have a horizontal hydraulic conductivity of 20 ft/day and a vertical hydraulic

conductivity of 2.0 ft/day. The surrounding Upper Glacial outwash hydraulic conductivity is assumed to be 250 ft/day horizontal and 25 ft/day vertical.

- For modeling purposes, it is assumed that a continuing source of Freon-11 soil contamination no longer exists.

- It is assumed that there is no “tailing effect” from the source area.

- It is assumed that the HFBR Weaver Drive wells EW-11 and EW-16 are operating at pumping rates of 40 gpm and 150 gpm, respectively.

- The extent and concentration of the subject contamination is assumed to be as mapped and reported in the Plume Characterization Map (BNL map dated 8/9/11). Based upon the plume characterization results, the peak initial concentration in the source area is assumed to be 36,000 ug/L.

Option A – RTW-1 at 30 gpm

The first option considered for remediation of the Freon-11 plume is to allow the plume to migrate 500 feet to the existing remediation well RTW-1. VOC contaminated (principally PCE) water is treated at RTW-1 by air stripping, which also appears to be effective for removing Freon-11. RTW-1 is programmed to pump at a rate of 30 gpm for a few more years.

The model predictions for the plume in April 2012 (6 months), November 2012 (1 year) and November 2013 (2 years) are shown in **Figures 2, 3, & 4,** respectively.

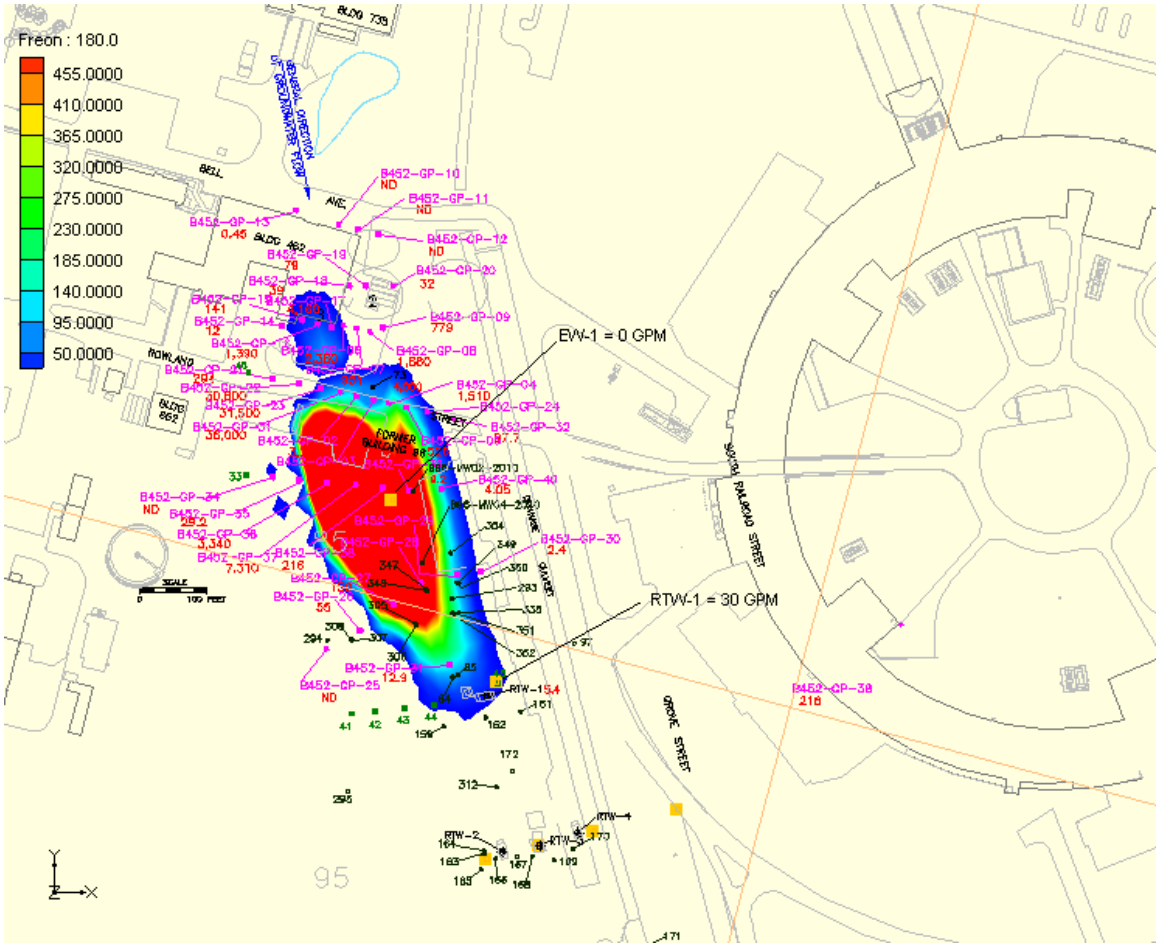

Figure 2 - Option A – Existing RTW-1 at 30 gpm. – After 180 days of pumping

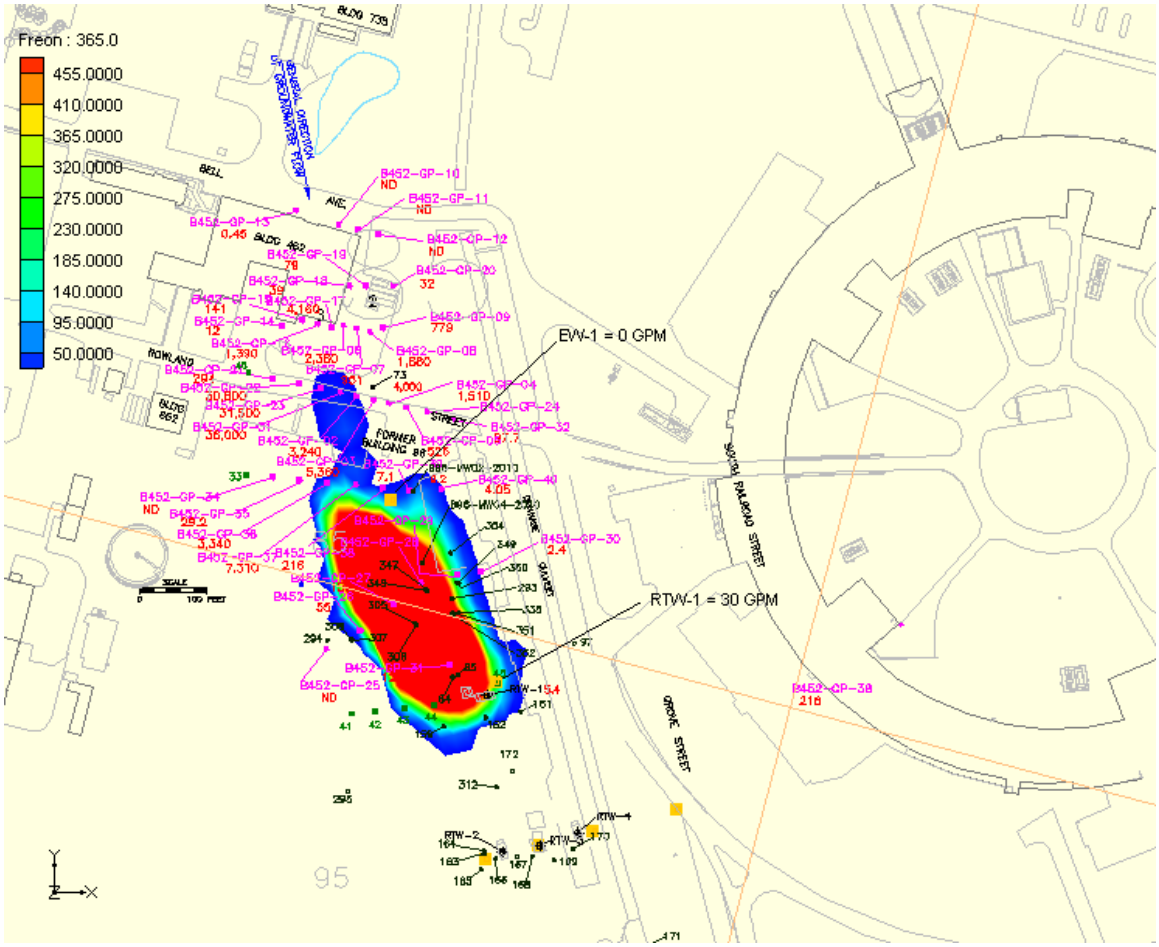

Figure 3 - Option A – Existing RTW-1 at 30 gpm. – After 1 year of pumping

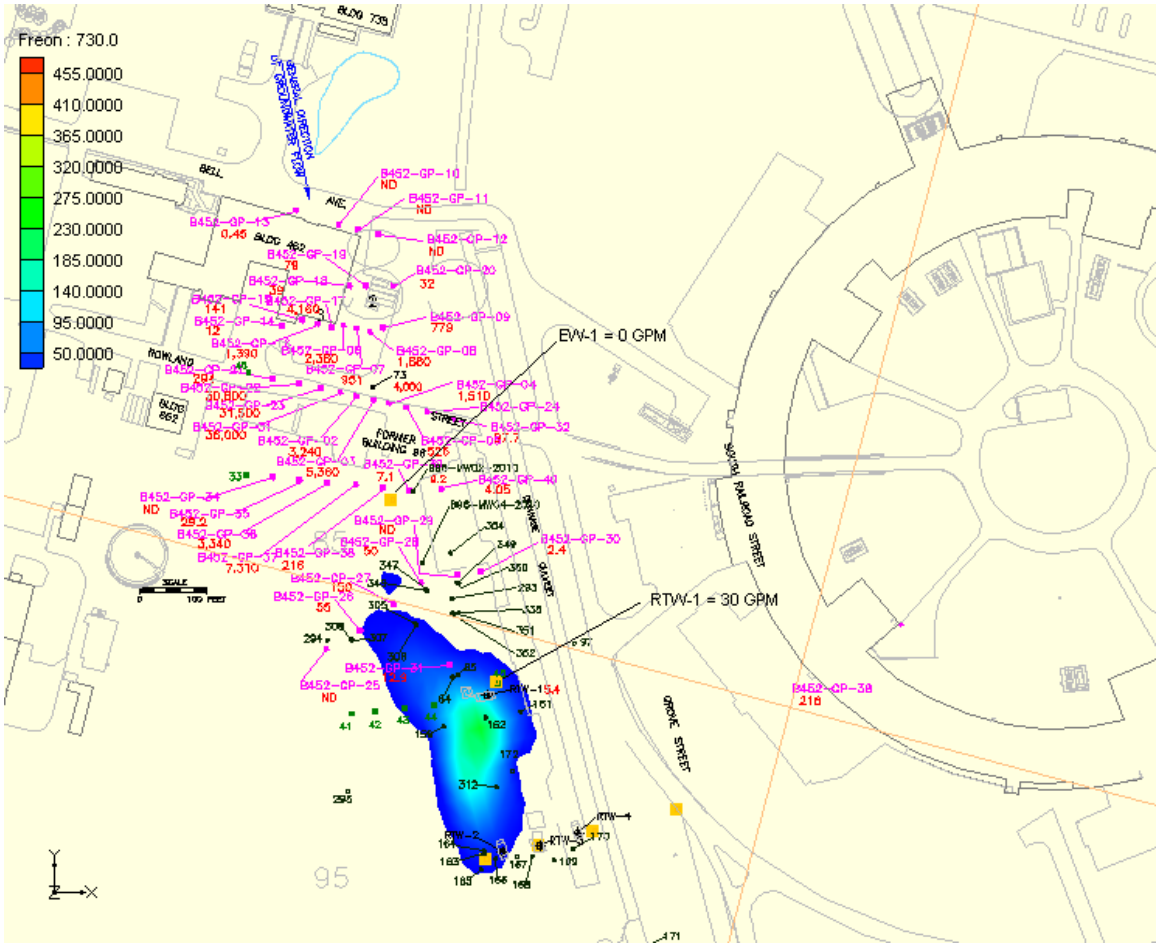

Figure 4 - Option A – Existing RTW-1 at 30 gpm. – After 2 years of pumping

The model predicts that while the existing RTW-1 extraction well is capable of capturing a significant portion of the Freon-11 plume, a significant segment of the plume will not be captured and treated and will continue to migrate south, beyond the former Building 96 remediation system. It is possible that treatment well RTW-2 could be used to provide additional treatment of the Freon-11 plume not captured by RTW-1 in this scenario.

The cons to relying on RTW-2 for additional treatment are that it uses in-well recirculation technology which has limits in its plume capture ability and it could prolong the pump and treat operation another 2 to 4 years.

The existing RTW-1 well is not centered downgradient of the Freon-11 plume and is somewhat shallower than the Freon-11 plume. These are the reasons that RTW-1 is predicted to be unable to totally control the Freon-11 plume.

Option B – EW-1 at 75 gpm

Option B was developed as a more aggressive approach to addressing the contamination. In Option B, a new extraction well (EW-1) is installed about 25-50 feet south of B452-GP-36. This well is simulated to pump at a rate of 75 gpm and is located

immediately downgradient of the source area and the highest concentrations of Freon-11 in groundwater.

The model predictions for the plume in April 2012 (6 months) and November 2012 (1 year) are shown in **Figures 5 & 6,** respectively.

The model predicts that EW-1 at 75 gpm is capable of capturing the plume in its entirety and reduces concentrations in groundwater to less than 5 ppb after approximately 1 year of pumping. Low levels of Freon-11 (e.g. 5 to 15 ppb) are located somewhat downgradient of EW-1 and are predicted not to be captured by EW-1. These low levels can be captured by RTW-1 if necessary to achieve cleanup goals.

For this scenario, existing RTW-1 was turned off to aid in evaluating the potential benefit of a well extraction well. In reality, existing RTW-1 is programmed to operate until 2016.

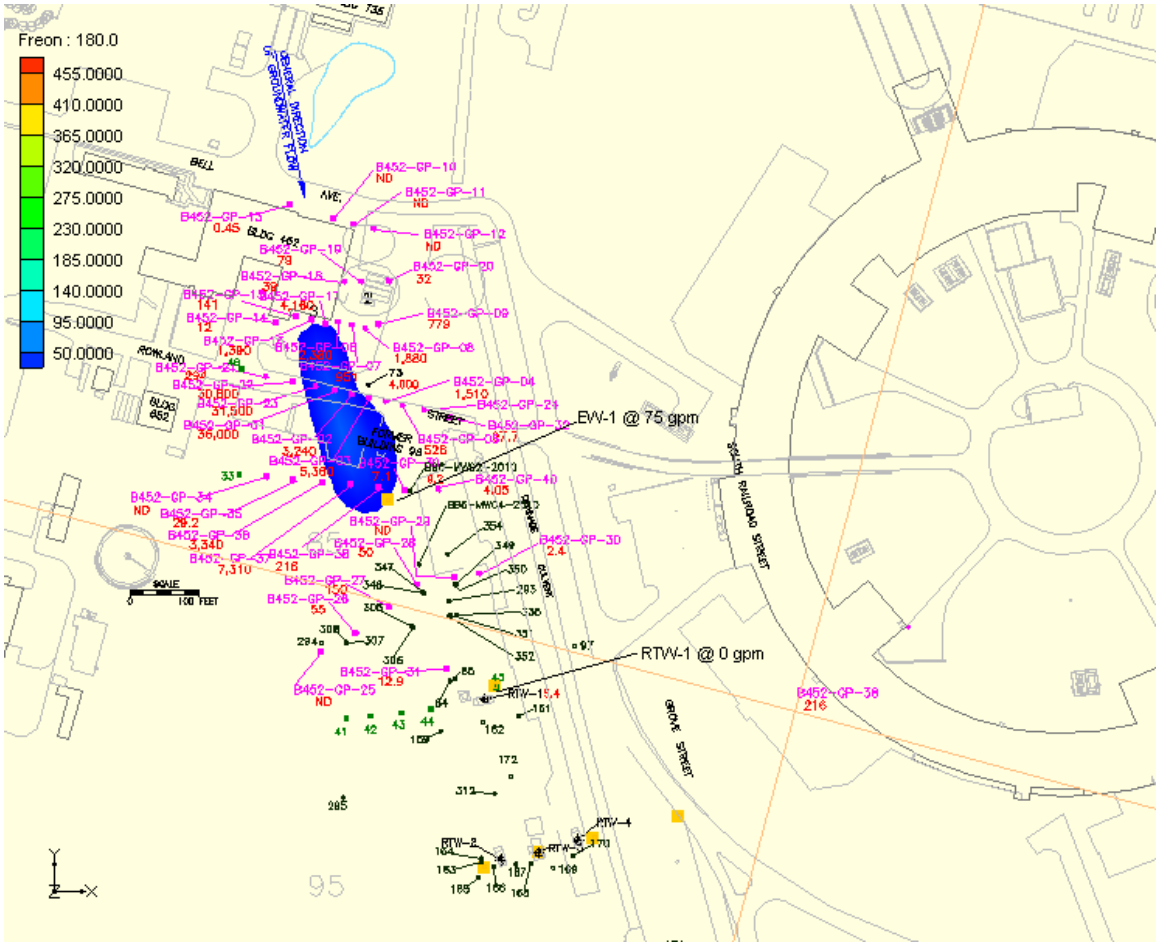

Figure 5 - Option B – New Extraction Well EW1 at 75 gpm. – After 180 days of pumping

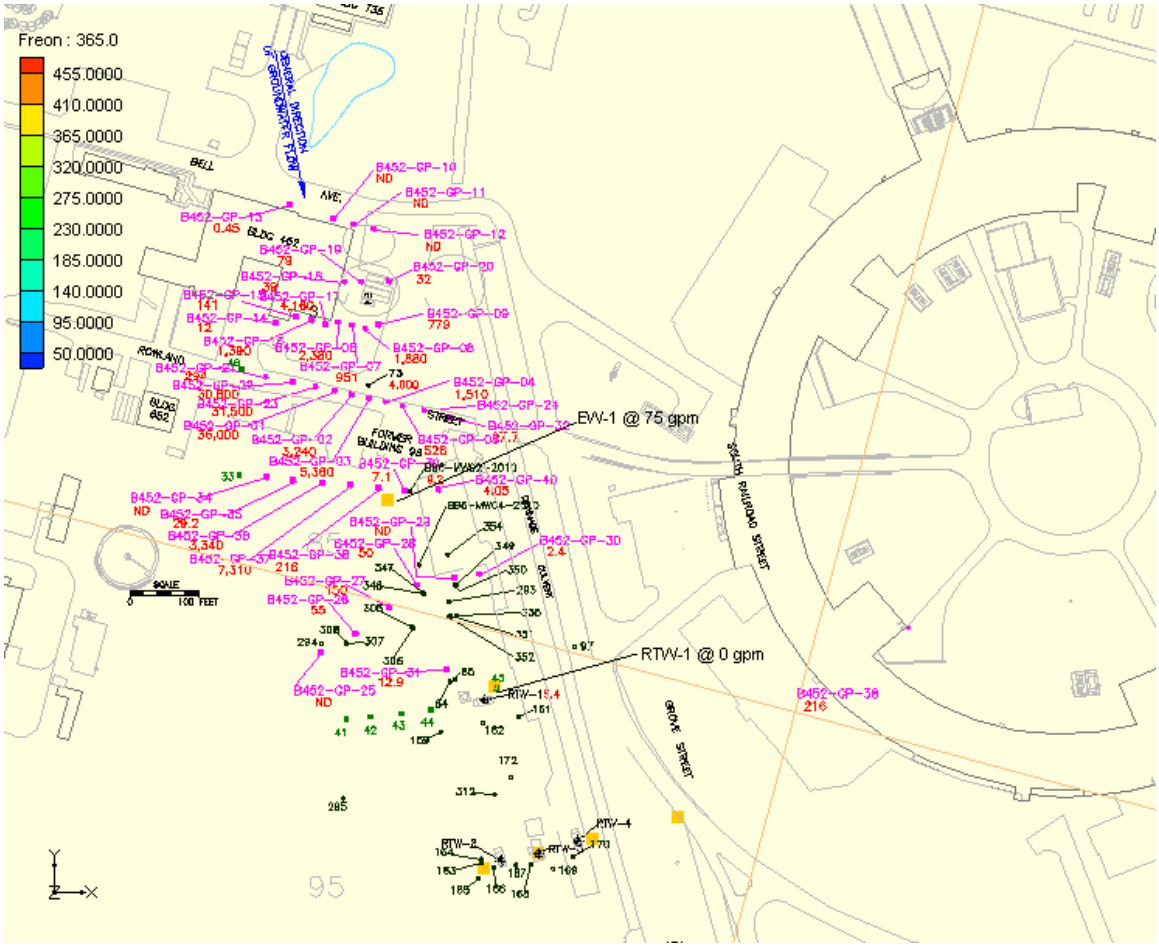

Figure 6 - Option B – New Extraction Well EW1 at 75 gpm. – After 1 year of pumping

Option C – RTW-1 at 70 gpm

Option C was developed as an attempt to capture and treat the Freon-11 plume without installing a new extraction well. The pumping and treatment capacity of RTW-1 is limited to 70 gpm. (Note: In this option, the proposed Extraction Well EW-1in Option B does not exist).

The model predictions for the plume in April 2012 (6 months), November 2012 (1 year), and November 2013 (2 years) are shown in **Figures 7, 8, & 9,** respectively.

The model predicts that RTW-1 at the higher 70 gpm is capable of capturing the plume and reduce concentrations in groundwater to less than 5 ppb after approximately 2 years of pumping. The existing RTW-1 well is not centered downgradient of the Freon-11 plume and is somewhat shallower than the Freon-11 plume and therefore relies on a much higher flow rate for control of the plume. However, the 70 gpm flow rate in RTW-1 would require a treatment plant upgrade to achieve.

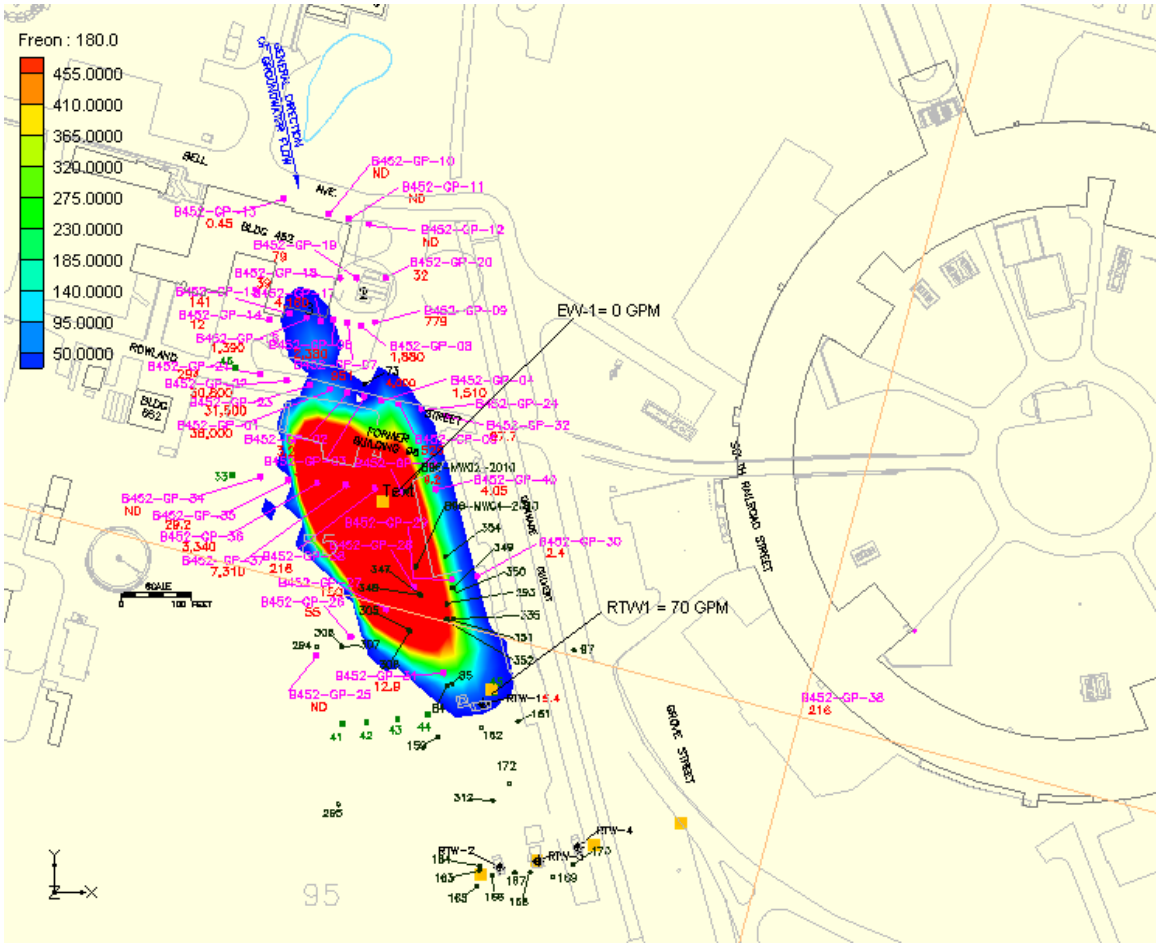

Figure 7 - Option C – Existing RTW1 at 70 gpm. – After 180 days of pumping

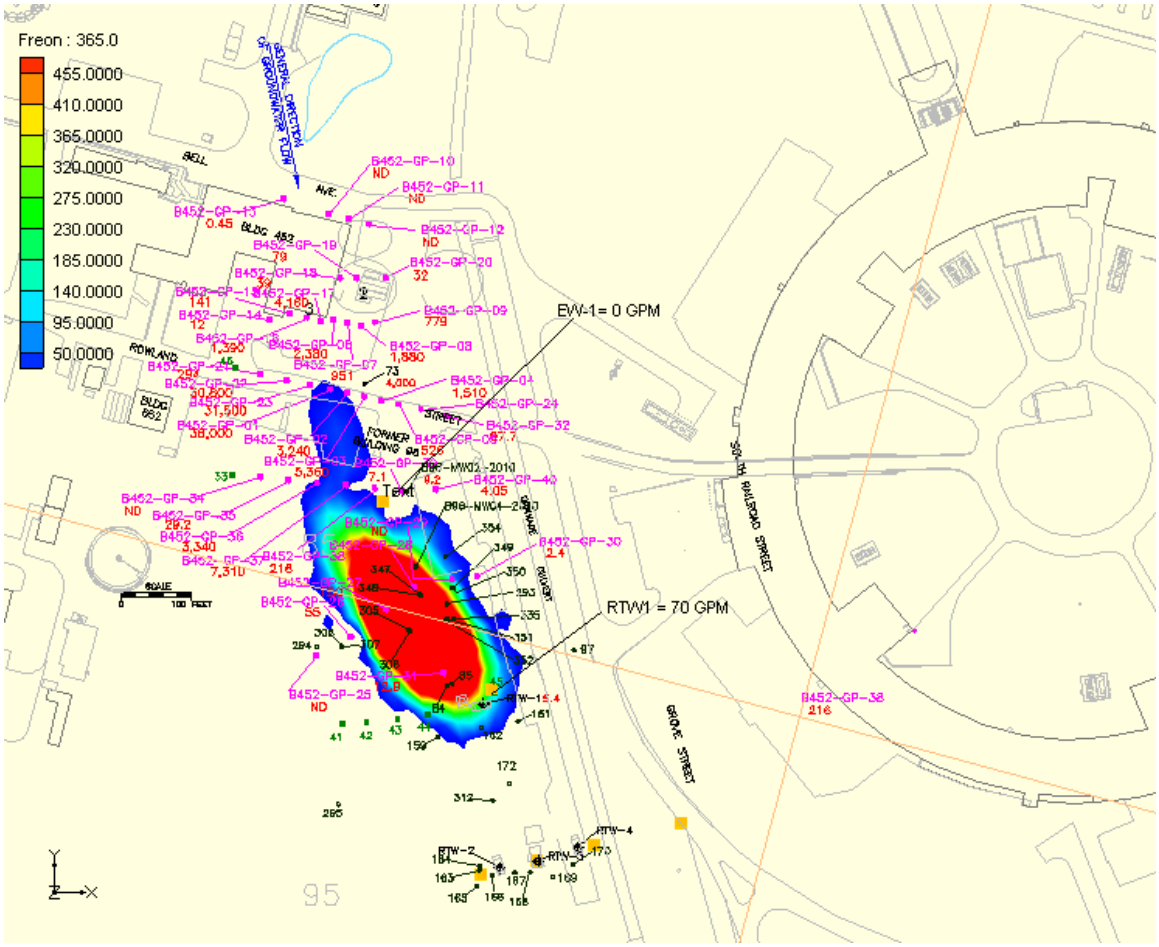

Figure 8 - Option C – Existing RTW1 at 70 gpm. – After 1 year of pumping

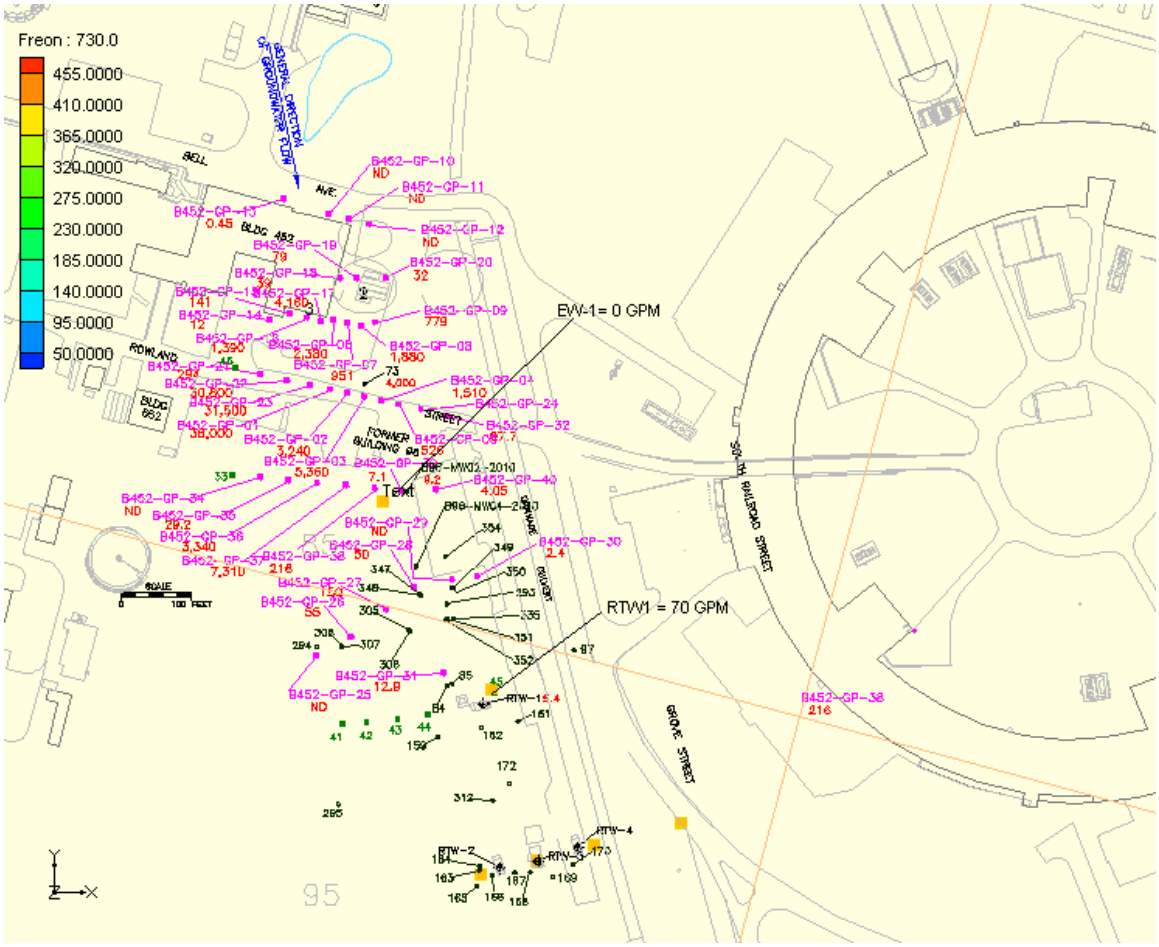

Figure 9 - Option C – Existing RTW1 at 70 gpm. – After 2 years of pumping

As noted earlier, it is assumed that there is no "tailing" effect from the vadose zone source after it is removed and it is assumed that the saturated silt zone does not contain NAPL. BNL experience has found that some tailing affect should be expected. However, without precise characterization data which is capable of determining the remaining pounds of contamination that remain in the ground, it is difficult and impractical to simulate the tailing affect with computer models.

The model simulations predict that RTW-1 is properly located and can substantially reduce the VOC contamination if the pumping rate is increased to 70 gpm as simulated in Option C. Assuming some "tailing", a reasonable period of Option 3, RTW-1 operation is estimated to be 4 to 5 years.

Option D – Proposed EW-1 at 75 gpm and Existing RTW-1 at 30 gpm

Option D was developed as a variation of Option B. In Option B, potential low levels of Freon-11 are downgradient of the EW-1. In this scenario, RTW-1 is left running at 30 gpm as a second line of treatment and protection to prevent potential plume growth.

The model predictions for the plume in April 2012 (6 months) and November 2012 (1 year) are shown in **Figures 10 & 11,** respectively.

The model predicts that the combination of proposed EW-1 pumping at 75 gpm and RTW-1 at 30 gpm is capable of capturing the plume in its entirety with a large factor of safety and reduces concentrations in groundwater to less than 5 ppb after approximately 2 years of pumping.

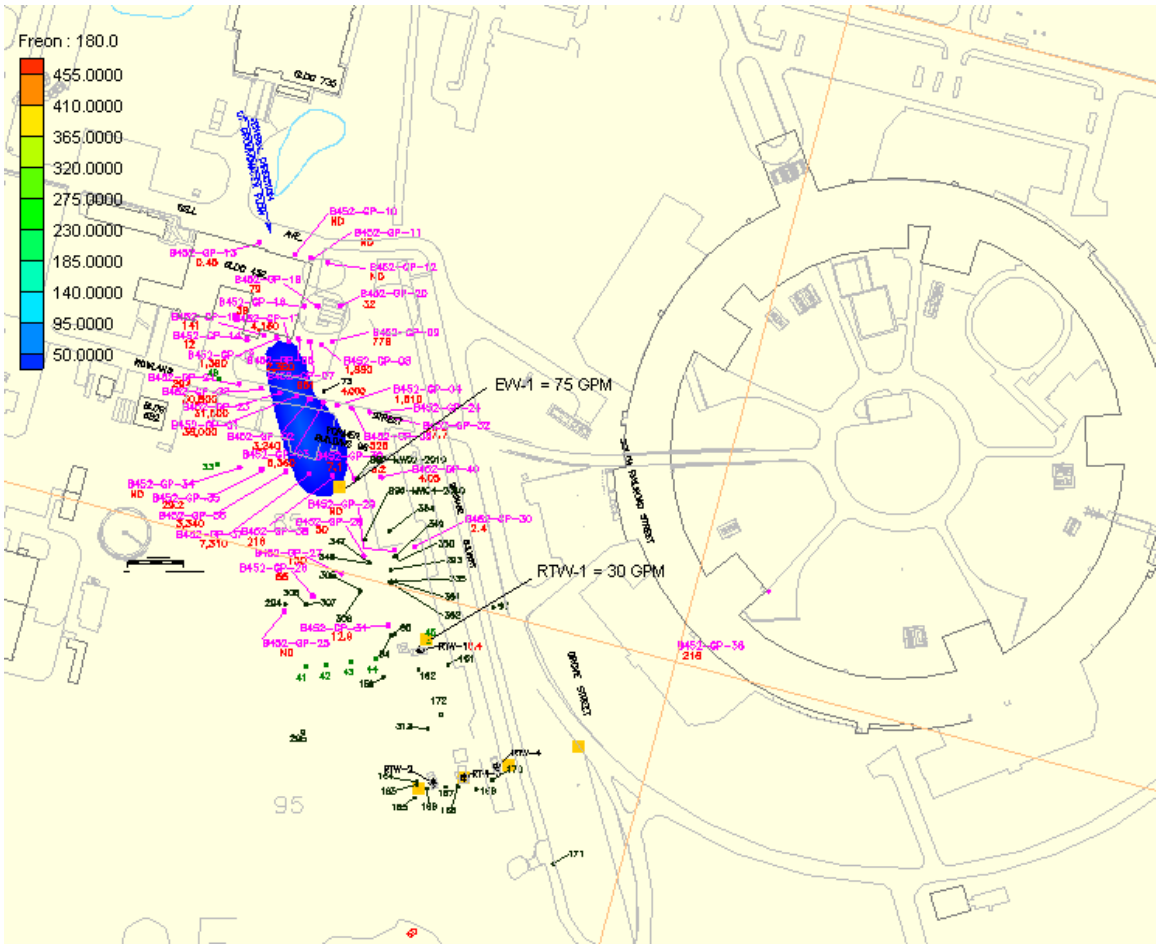

Figure 10 - Option D – Proposed EW-1 at 75 gpm and Existing RTW-1 at 30 gpm After 180 days of pumping.

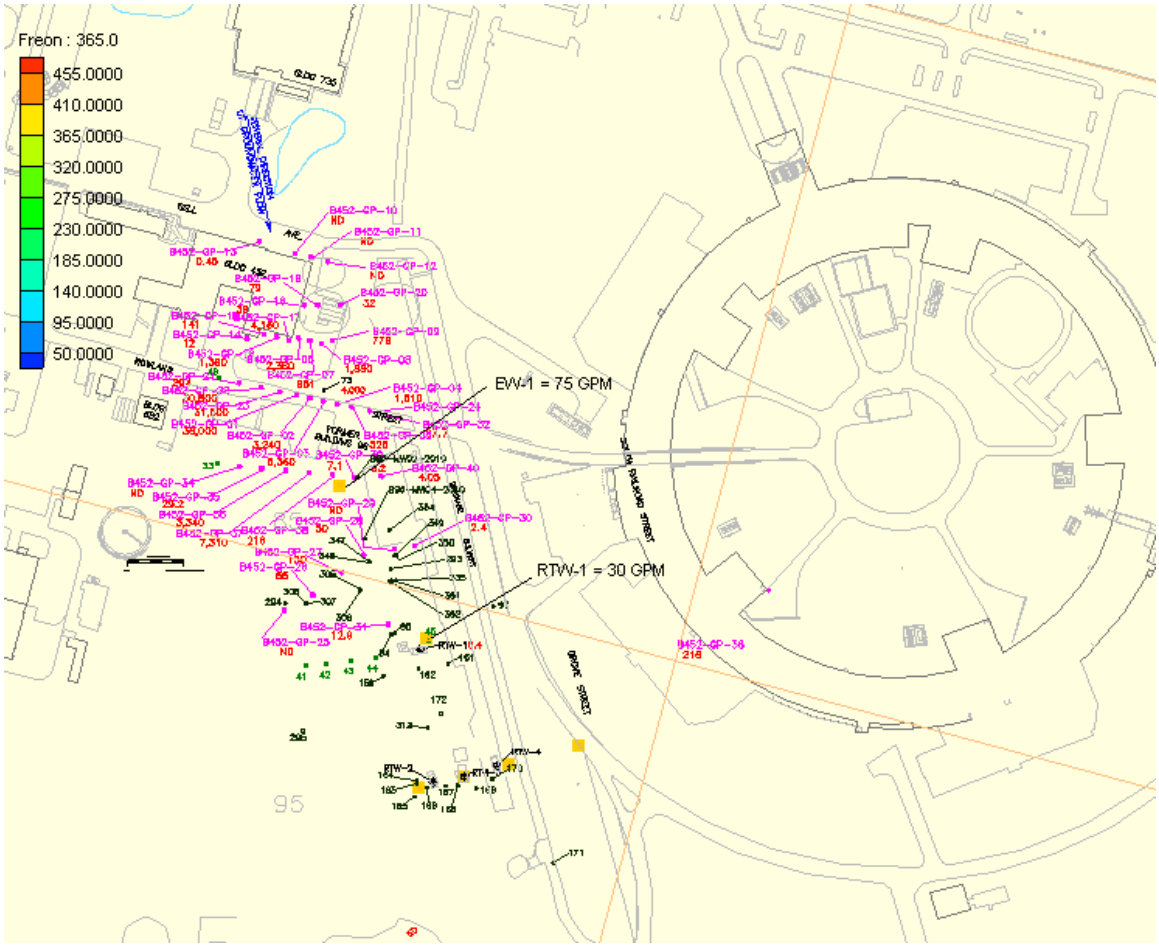

Figure 11 - Option D – Proposed EW-1 at 75 gpm and Existing RTW-1 at 30 gpm After 1 year of pumping.

Summary

Implementing a new extraction well aggressively remediates the areas of the plume with the highest levels of contamination and would be effective in remediating additional contamination that may be released from the vadose zone beneath the Building 452 source area. Maintaining the existing well RTW-1 in operation at 30 gpm does not interfere with the Freon-11 hot spot treatment and provides a backup capture and groundwater polishing system for low levels of contamination that may go un-captured. The RTW-1 provides a large measure of factor of safety to the cleanup strategy for this matter.

Assuming some “tailing”, a reasonable period of operation for Option D is estimated to be 2 to 3 years. Option D is the most effective at addressing sub-surface and contaminant uncertainty. It also clearly prevents “plume growth” which is a cleanup goal of Operable Unit III.

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August 31, 2011

APPENDIX C

Building 452 Freon-11 Plume Treatment System Construction Drawings

Drawings

T-1 Title Sheet: Location Plan and Drawing Index

S-1 Site Plan

A-1 New Treatment System Building Construction Details

A-2 New Treatment System Building Tie-Down Details

E-1 New Treatment System Building Electrical Floor Plan

E-2 Electrical Single Line and Control Block Diagrams

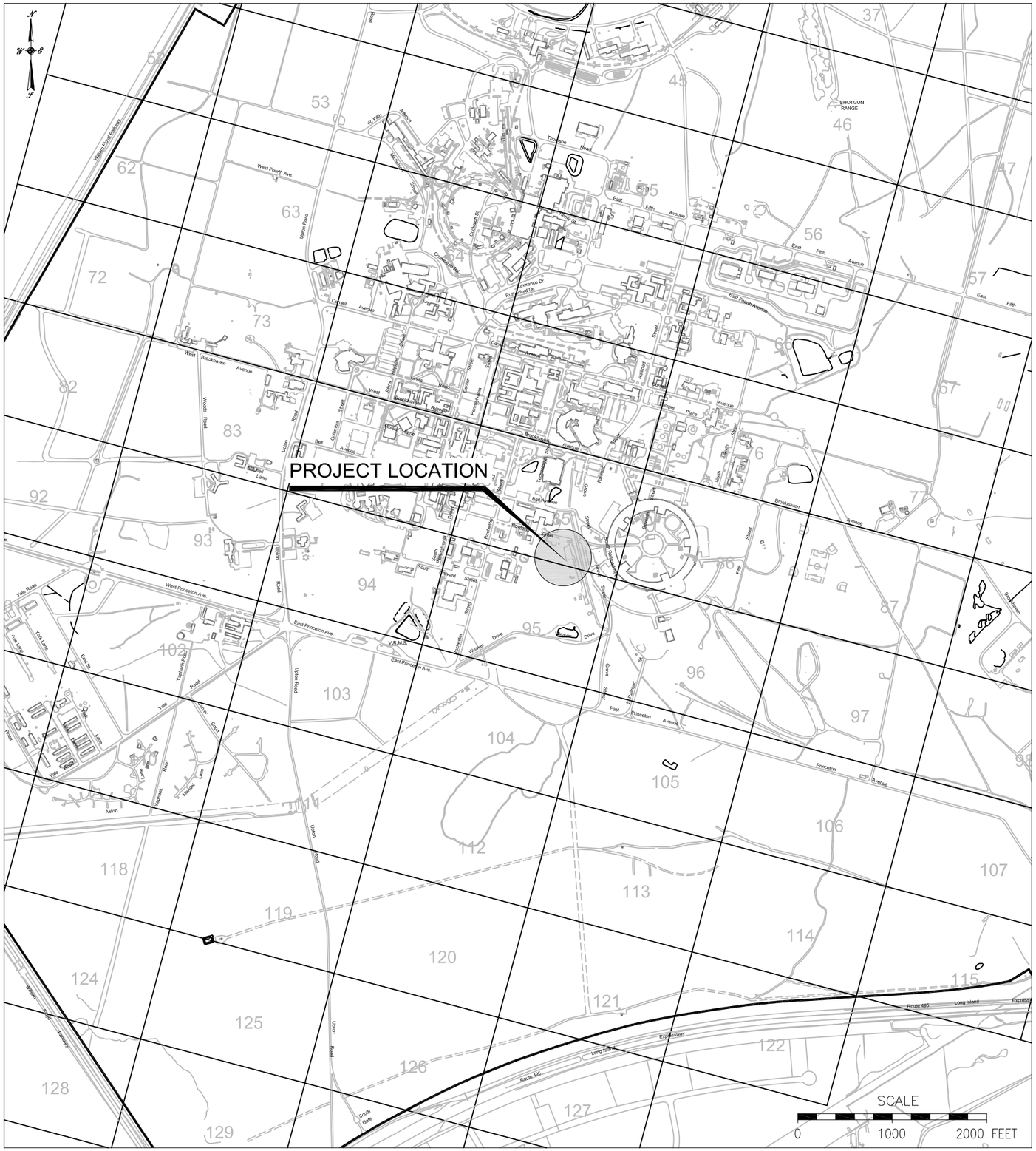
M-1 New Treatment System Mechanical Floor Plan and Section

M-2 Mechanical Treatment System Details

W-1 Monitoring and Extraction Well Details

CD-1 Controls Drawings Ladder Wiring Diagram

CD-2 Controls Drawings Local Control Panels



LOCATION MAP

Building 452 Area - Freon 11 Groundwater Treatment System

DRAWING LIST

SHEET	DRAWING	TITLE
1	T-1	TITLE SHEET, LOCATION PLAN & DRAWING INDEX
2	S-1	SITE PLAN
3	A-1	NEW TREATMENT BUILDING CONSTUCTION DETAILS
4	A-2	NEW TREATMENT BUILDING TIE-DOWN DETAILS
5	E-1	NEW TREATMENT BUILDING ELECTRICAL FLOOR PLAN
6	E-2	ELECTRICAL SINGLE LINE & CONTROL BLOCK DIAGRAMS
7	M-1	NEW TREATMENT BUILDING MECHANICAL FLOOR PLAN & SECTION
8	M-2	MECHANICAL TREATMENT SYSTEM DETAILS
9	W-1	MONITORING AND EXTRACTION WELL DETAILS
10	CD-1	CONTROLS DRAWINGS - LADDER WIRING DIAGRAM
11	CD-2	CONTROLS DRAWINGS - LOCAL CONTROL PANELS

		2	ADD ROOF AIR DISCHARGE PIPE	11/01/11	AJZ	JRH
		1	BNL REVIEW MEETING 10-03-11	10/10/11	AJZ	JRH
JOB NO.	SHEET	NO	REVISION	DATE	DWN.	APP'D.

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ENVIRONMENTAL MANAGEMENT DIRECTORATE &
PLANT ENGINEERING DIVISION
UPTON, NEW YORK 11973

JOB TITLE: BUILDING 452 AREA – FREON 11 GROUNDWATER TREATMENT SYSTEM		DWG. TITLE: TITLE SHEET, LOCATION PLAN & DRAWING INDEX	
ILR,GPP,LNI, HEM: –	DATE: 09/15/11	ACCT. NO.: –	SHEET 1 OF 9
SCALE: AS SHOWN	DWN. BY: AJZ	JOB NO.: –	DWG. NO.: T-1
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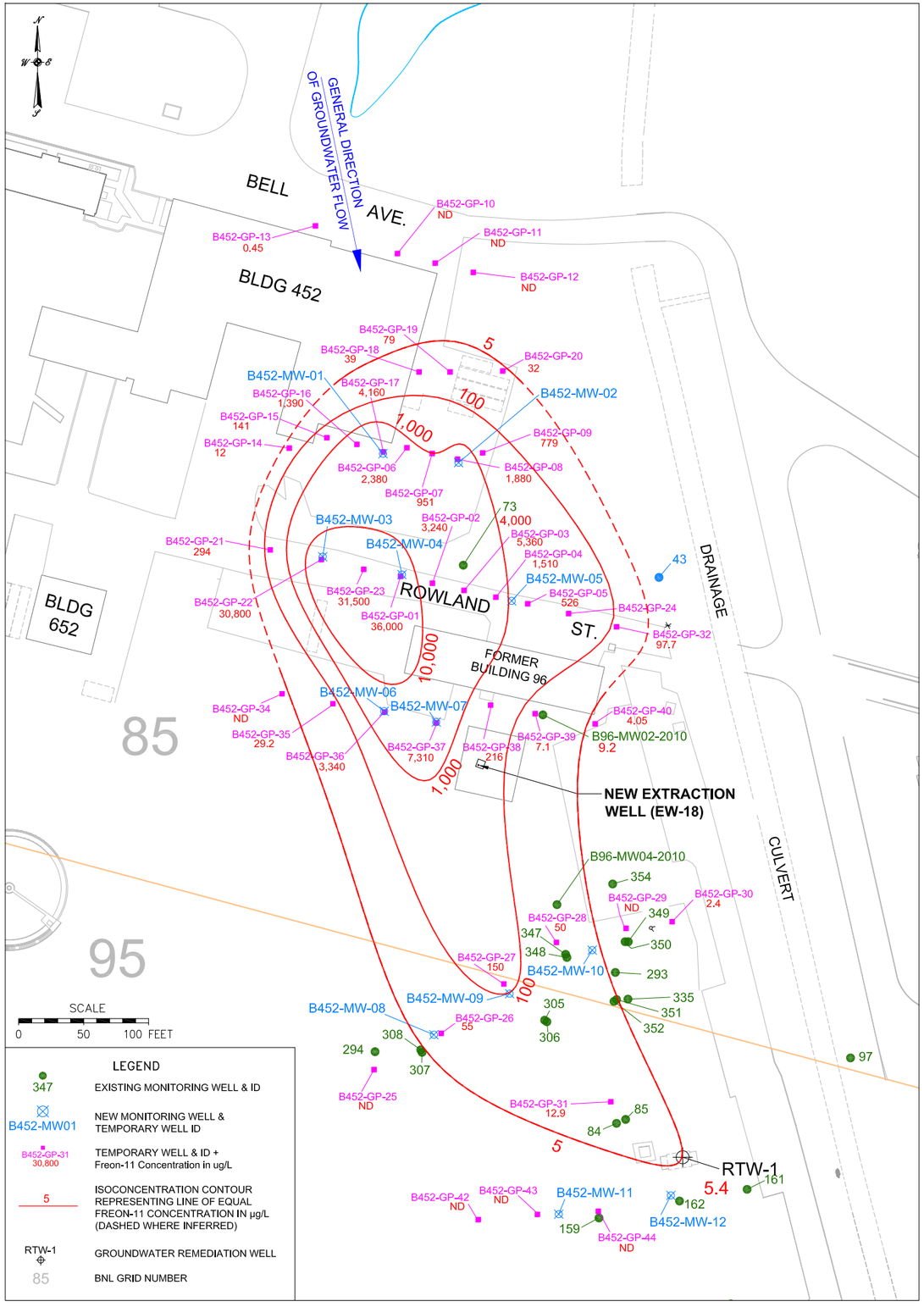
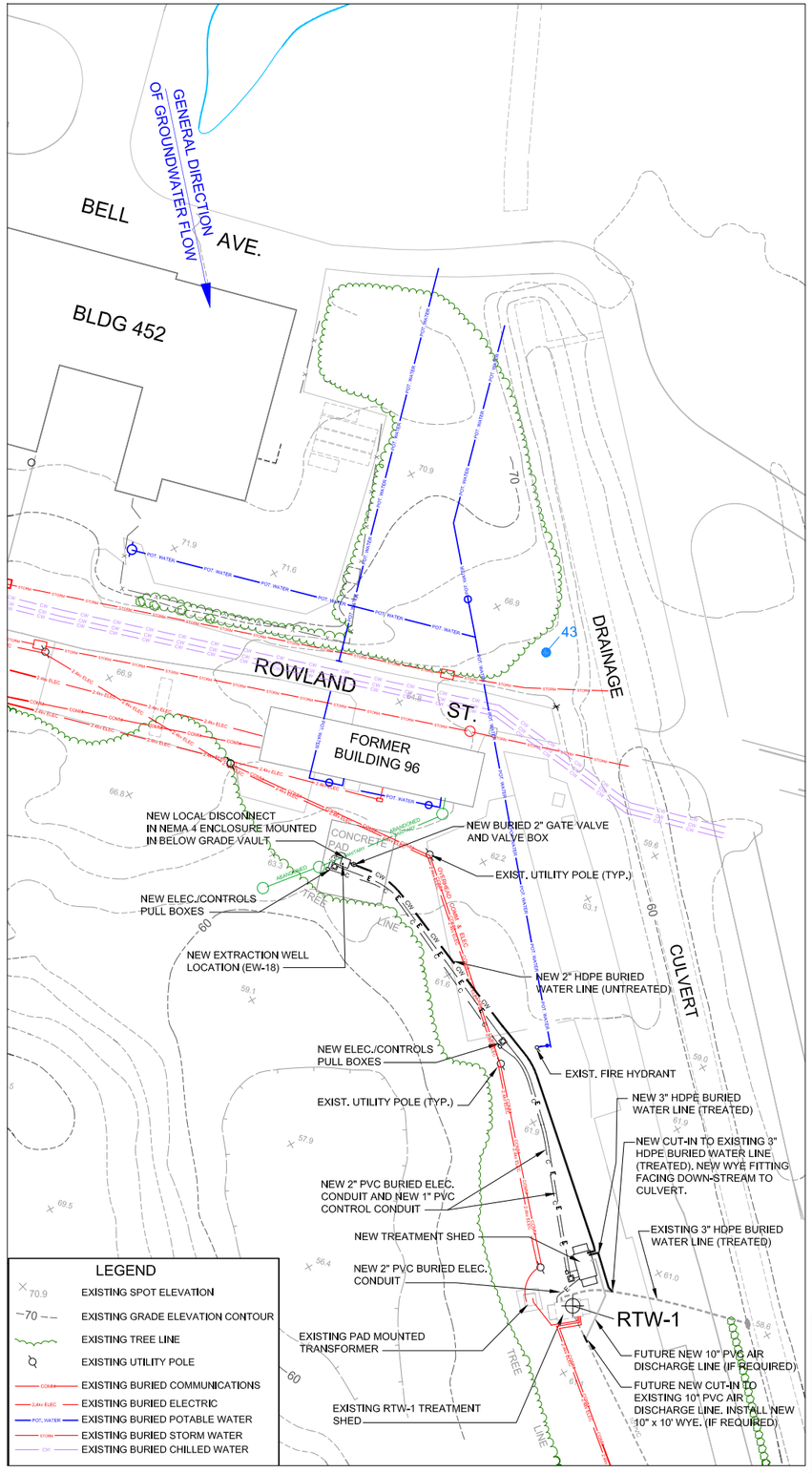
PATH: –			



SITE PLAN - MONITORING AND TEMPORARY WELL LOCATIONS



SITE PLAN - PIPING AND NEW EXTRACTION WELL LOCATION

Monitoring Wells

Monitoring Well Designation B452-MW	01	02	03	04	05	06
Approx. Grade Elevation at Well Head (msl)	72	71	67	66	65	65
Well Diameter (inches) SCH 40 PVC	2"	2"	2"	2"	2"	2"
Distance to Bottom of Screen (ft bgs)	42	42	45	45	45	55
Length of Screen (feet)	20	20	15	15	15	15
Screen Slot Size (inch/1000)	20	20	20	20	20	20

Monitoring Well Designation B452-MW	07	08	09	10	11	12
Approx. Grade Elevation at Well Head (msl)	64	57	58	61	59	61
Well Diameter (inches)	2"	2"	2"	2"	2"	2"
Distance to Bottom of Screen (ft bgs)	55	60	67	70	85	85
Length of Screen (feet)	15	15	15	15	20	20
Screen Slot Size (inch/1000)	20	20	20	20	20	20

Extraction Well

Extraction Well Designation	EW-18
Approx. Grade Elevation at Well Head (msl)	63
Well Diameter (inches)	6
Distance to Bottom of Screen (ft bgs)	60
Length of Screen (feet)	10
Screen Slot Size (inch/1000)	20

JOB NO.	SHEET NO	REVISION	DATE	DWN.	APP'D.	QA
	2	ADD ROOF AIR DISCHARGE PIPE	11/01/11	AJZ	JRH	
	1	BNL REVIEW MEETING 10-03-11	10/10/11	AJZ	JRH	

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UPTON, NEW YORK 11973

JOB TITLE	DWG. TITLE
BUILDING 452 AREA – FREON 11 GROUNDWATER TREATMENT SYSTEM	SITE PLAN

ILR,GPP,LNI, HEM	DATE	ACCT. NO.	SHEET 2 OF 9
–	09/15/11	–	
SCALE AS SHOWN	DWN. BY AJZ	JOB NO. –	DWG. NO. S-1
PROJ. QA A3–MINOR	APP'D. BY JRH	BLDG. NO. –	
PATH:			

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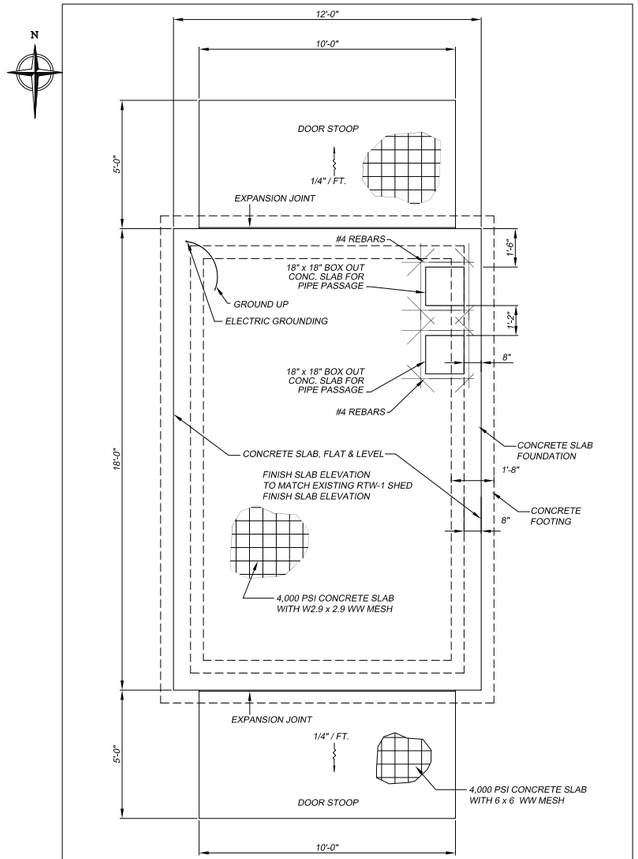
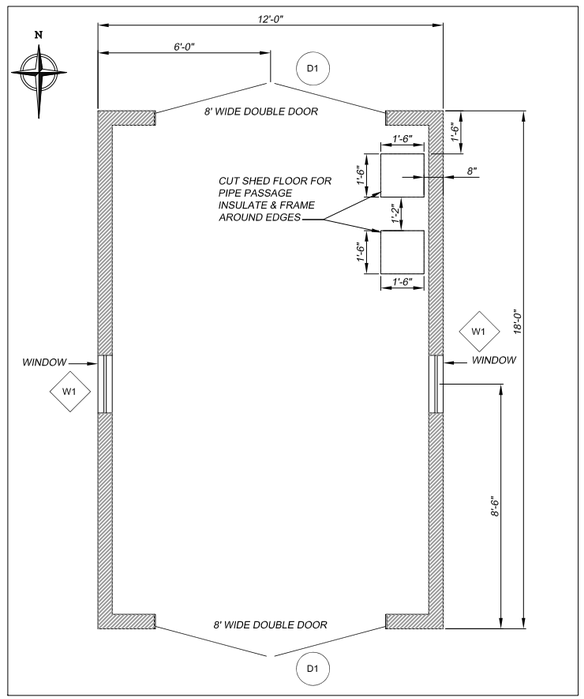
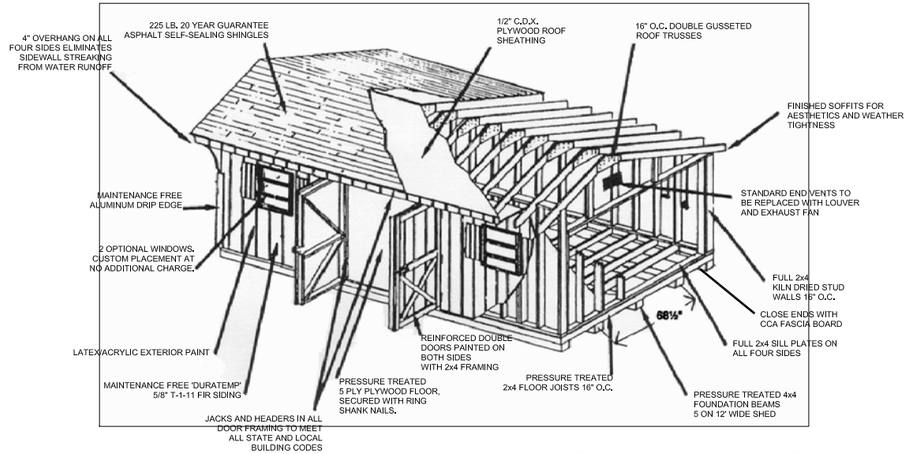


WOODEN SHED CONCRETE SLAB PLAN
N.T.S.

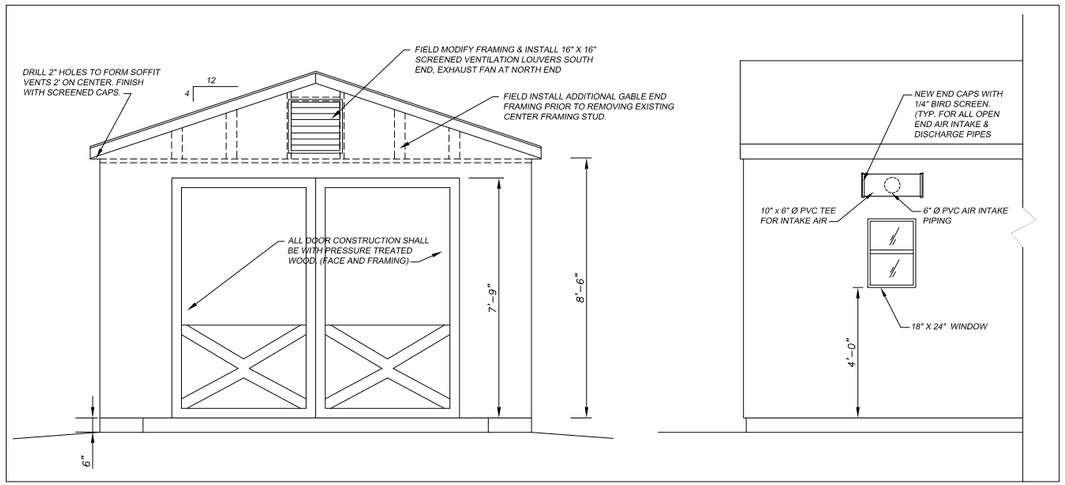


WOODEN SHED FLOOR PLAN
N.T.S.

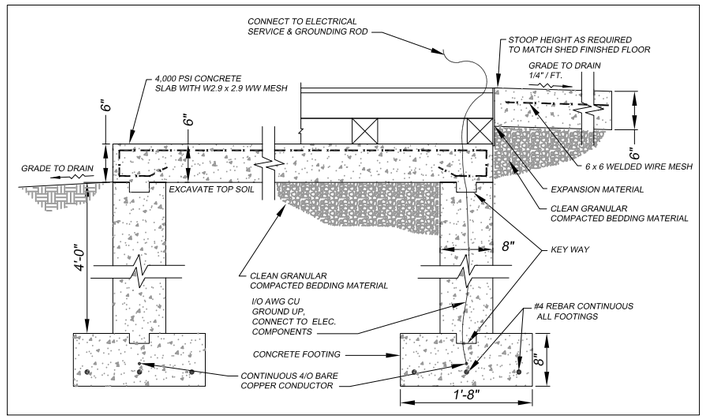


WOODEN SHED KIT
STANDARD FEATURES
FOR FREON 11 TREATMENT BUILDING

NOTE: SCHEMATIC - REFER TO TREATMENT SHED PLAN FOR DOOR AND WINDOW LAYOUT AND OVERALL DIMENSIONS.



WOODEN SHED ELEVATION DETAILS
N.T.S.



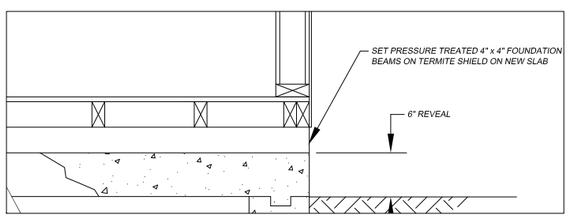
CONCRETE SLAB DETAIL
N.T.S.

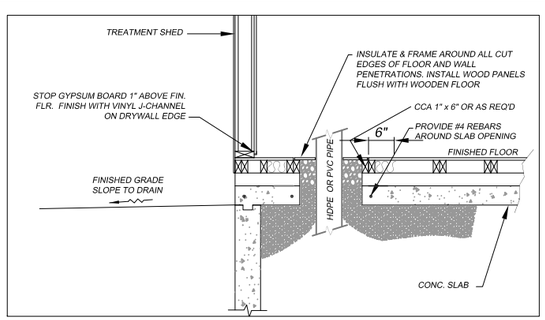
DOOR SCHEDULE

LABEL	SIZE	HARDWARE	NOTE
D1	(2) 4' x 7'-9"	Hasp and padlock, 4 hinges each	Wood - "Barn Door" L.H. top and foot bolt

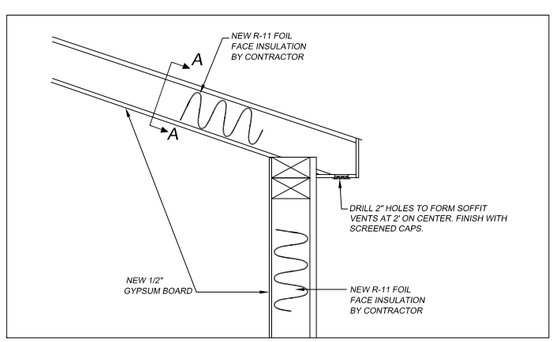
WINDOW SCHEDULE

LABEL	SIZE	NOTE
W1	24" x 24"	Stationary

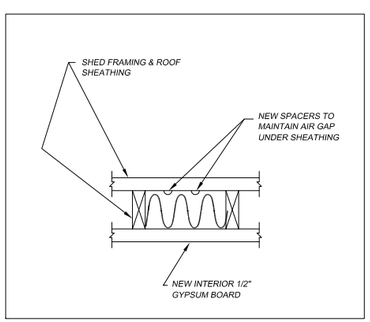




FRAMING DETAILS
N.T.S.



INSULATION / FINISH DETAIL
N.T.S.



A-A
N.T.S.

		2	ADD ROOF AIR DISCHARGE PIPE	11/01/11	AJZ	JRH	
		1	BNL REVIEW MEETING 10-03-11	10/10/11	AJZ	JRH	
JOB NO.	SHEET	NO	REVISION	DATE	DWN.	APP'D.	QA

BROOKHAVEN NATIONAL LABORATORY

UNDER CONTRACT WITH
UNITED STATES DEPARTMENT OF ENERGY
ENVIRONMENTAL MANAGEMENT DIRECTORATE & PLANT ENGINEERING DIVISION
UPTON, NEW YORK 11973

JOB TITLE: BUILDING 452 AREA - FREON 11 GROUNDWATER TREATMENT SYSTEM	DWG. TITLE: NEW TREATMENT BUILDING CONSTRUCTION DETAILS
ILR,GPP,LNI, HEM: -	DATE: 09/15/11
ACCT. NO.: -	SHEET 3 OF 9
SCALE: AS SHOWN	DWN. BY: AJZ
JOB NO.: -	DWG. NO.: A-1
PROJ. QA: A3-MINOR	APP'D. BY: JRH
BLDG. NO.: -	
PATH:	

STATE OF NEW YORK * JAMES R. HOLZMACHER * LICENSED PROFESSIONAL ENGINEER * 12-13-11 * No. 66054

J.R. HOLZMACHER P.E., LLC
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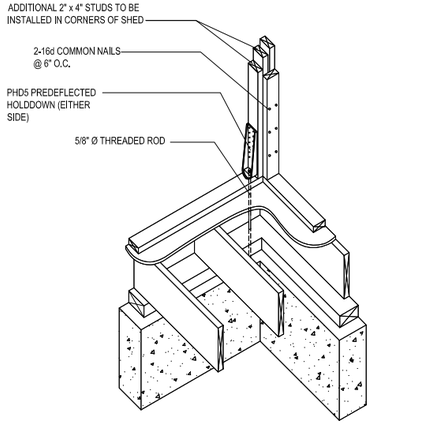
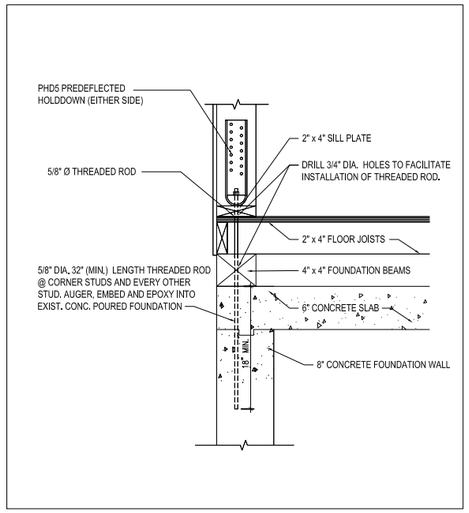
300 Wheeler Road, Suite 402, Hauppauge, NY 11788
PHONE: (631) 234-2220 FAX: (631) 234-2221 E-MAIL: info@jrholzmacher.com

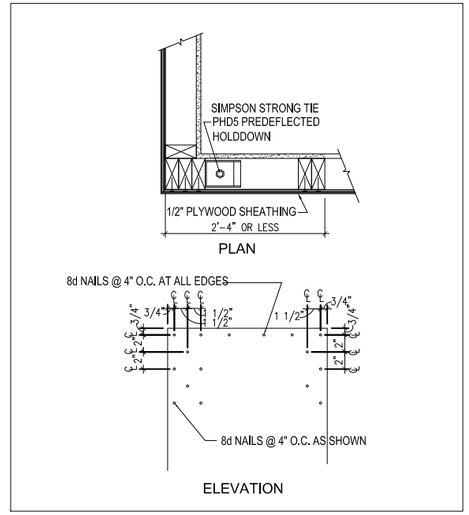


1 TYPICAL BASE HOLD-DOWN DETAIL

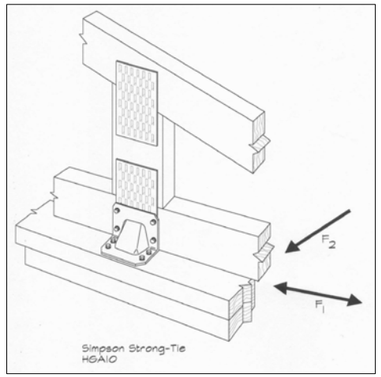
SHALL BE PLACED AT EACH CORNER ON THE LONG, (18 FT) SIDE OF SHED AND AT EVERY OTHER WALL STUD, WHICH ARE 16" O.C. TYP. TOTAL HOLD DOWNS INSTALLED SHALL BE 8 ON EACH 18 FT WALL LENGTH OF THE EXISTING SHED.



2 TYPICAL BASE HOLD-DOWN SECTION DETAIL

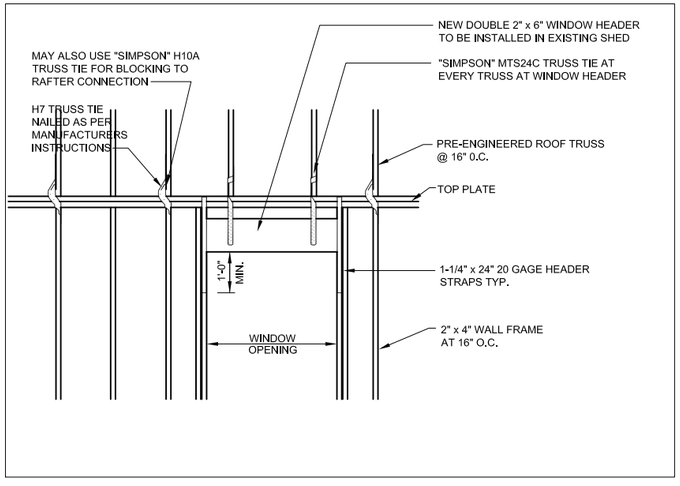


3 WALL BRACING DETAILS

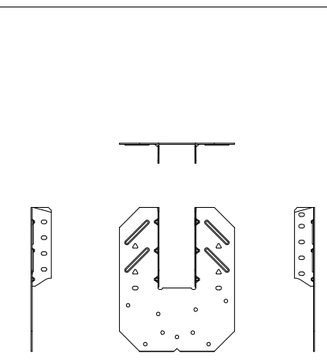


THE HGA10 ATTACHED TO GABLE END TRUSSES AT EVERY OTHER STUD PROVIDES LATERAL WIND RESISTANCE

4 GABLE END ROOF TRUSS HURRICANE TIE



6 TYPICAL TRUSS TO WALL BRACING DETAIL



THE "SIMPSON" H10A TIE ATTACHES TO INTERIOR TRUSSES AT EVERY OTHER STUD.

7 ROOF TRUSS TO TOP PLATE HURRICANE TIE

		2	ADD ROOF AIR DISCHARGE PIPE	11/01/11	AJZ	JRH	
		1	BNL REVIEW MEETING 10-03-11	10/10/11	AJZ	JRH	
JOB NO.	SHEET	NO	REVISION	DATE	DWN.	APP'D.	QA

BROOKHAVEN NATIONAL LABORATORY

UNDER CONTRACT WITH
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PLANT ENGINEERING DIVISION
UPTON, NEW YORK 11973

JOB TITLE: BUILDING 452 AREA - FREON 11 GROUNDWATER TREATMENT SYSTEM		DWG. TITLE: NEW TREATMENT BUILDING TIE-DOWN DETAILS	
ILR,GPP,LNI, HEM: -	DATE: 10/10/11	ACCT. NO.: -	SHEET 4 OF 9
SCALE: AS SHOWN	DWN. BY: AJZ	JOB NO.: -	DWG. NO.: A-2
PROJ. QA: A3-MINOR	APP'D. BY: JRH	BLDG. NO.: -	
PATH:			

STATE OF NEW YORK — JAMES R. HOLZMACHER — LICENSED PROFESSIONAL ENGINEER — 12-13-11 — No. 66054

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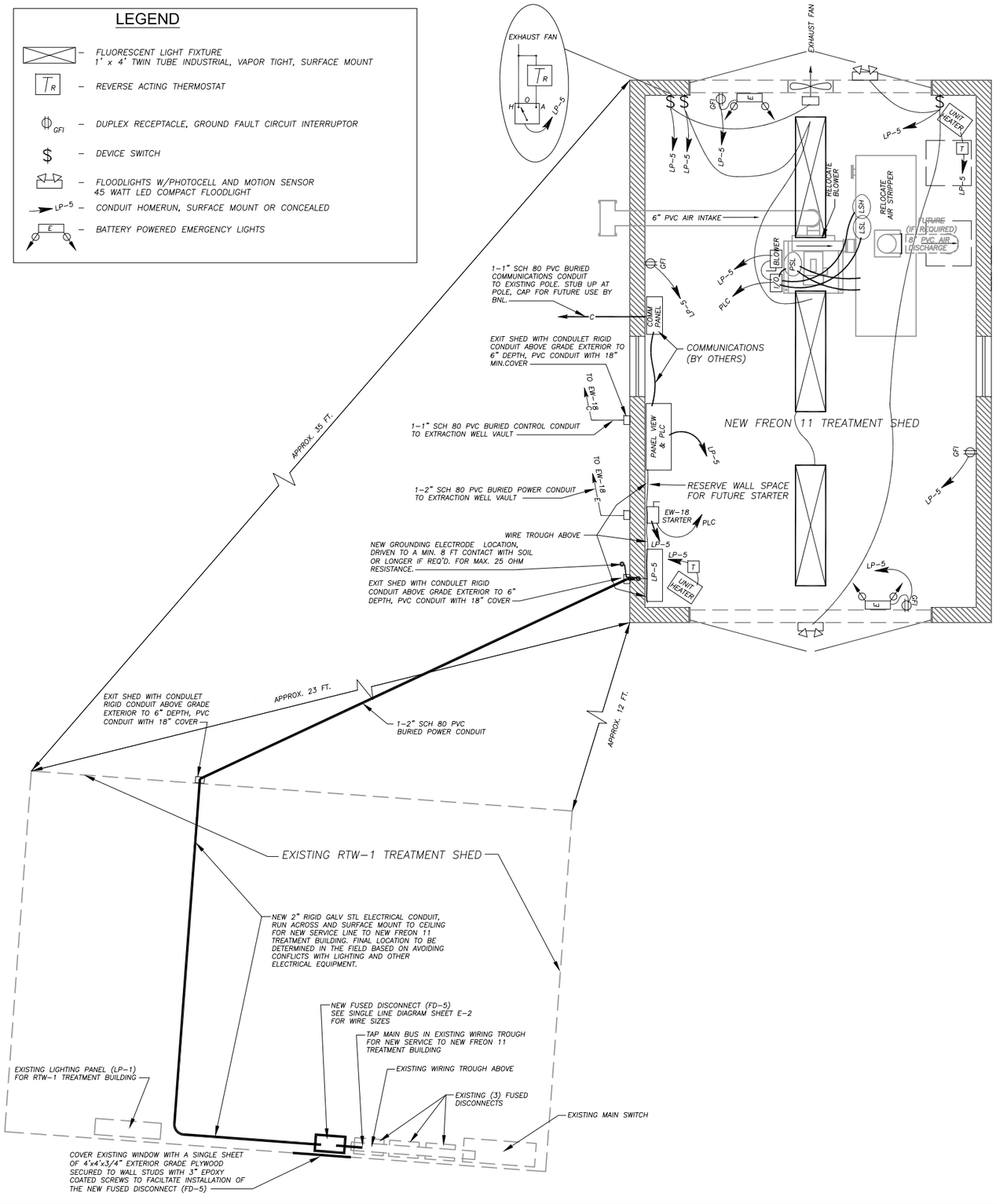
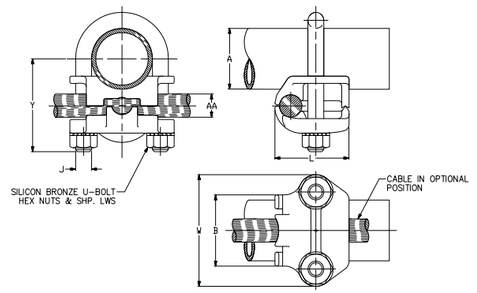
LEGEND

- FLUORESCENT LIGHT FIXTURE 1' x 4' TWIN TUBE INDUSTRIAL, VAPOR TIGHT, SURFACE MOUNT
- T_R – REVERSE ACTING THERMOSTAT
- GFI – DUPLEX RECEPTACLE, GROUND FAULT CIRCUIT INTERRUPTOR
- $ – DEVICE SWITCH
- FLOODLIGHTS W/PHOTOCELL AND MOTION SENSOR 45 WATT LED COMPACT FLOODLIGHT
- LP-5 – CONDUIT HOMERUN, SURFACE MOUNT OR CONCEALED
- E – BATTERY POWERED EMERGENCY LIGHTS



ELECTRICAL FLOOR PLANS
N.T.S.



A ROD ACCOMMODATED				AA COPPER CONDUCTOR ACCOMMODATED							
NOMINAL DIAMETER	ACTUAL DIAMETER			AWG MIN		AWG MAX		METRIC WIRE SIZE MIN		METRIC WIRE SIZE MAX	
(in)	(in)		(mm)	SIZE	DIA	SIZE	DIA	SIZE	DIA	SIZE	DIA
0.5	0.500		[13]	2/0 sol	0.365	250 kcmil	0.575	70mm²Str	[10.9]	120mm²str	[14.4]

B		Y		J		L		W		"U" BOLT	TORQUE	
(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)		Lb*in	N*m
1.75	[44]	1.88	[48]	3/8	[10]	1.81	[46]	1.88	[48]	271	240	27.0

NOTES:
1. MATERIAL: CAST COPPER ALLOY.
2. FINISH: BRIGHT DIPPED.
3. UL 467 LISTED FILE NO. E9999,
4. ACCEPTABLE FOR DIRECT BURIAL.

BURNDY CAT NO. GAR1129

ELECTRICAL GROUNDING RODS CONNECTION DETAIL
NOT TO SCALE

NO	REVISION	DATE	DWN.	APP'D.	QA
2	ADD ROOF AIR DISCHARGE PIPE	11/01/11	AJZ	JRH	
1	BNL REVIEW MEETING 10-03-11	10/10/11	AJZ	JRH	

STATE OF NEW YORK JAMES R. HOLZMACHER LICENSED PROFESSIONAL ENGINEER No. 66054 12-13-11

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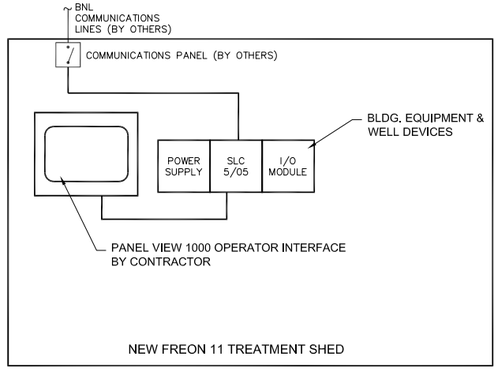
BROOKHAVEN NATIONAL LABORATORY

UNDER CONTRACT WITH
UNITED STATES DEPARTMENT OF ENERGY
ENVIRONMENTAL MANAGEMENT DIRECTORATE & PLANT ENGINEERING DIVISION
UPTON, NEW YORK 11973

JOB TITLE	DWG. TITLE
BUILDING 452 AREA - FREON 11 GROUNDWATER TREATMENT SYSTEM	NEW TREATMENT BUILDING ELECTRICAL FLOOR PLAN

ILR,GPP,LNI, HEM: -	DATE: 09/27/11	ACCT. NO.: -	SHEET 5 OF 9
SCALE: AS SHOWN	DWN. BY: AJZ	JOB NO.: -	DWG. NO.: E-1
PROJ. QA: A3-MINOR	APP'D. BY: JRH	BLDG. NO.: -	
PATH:			



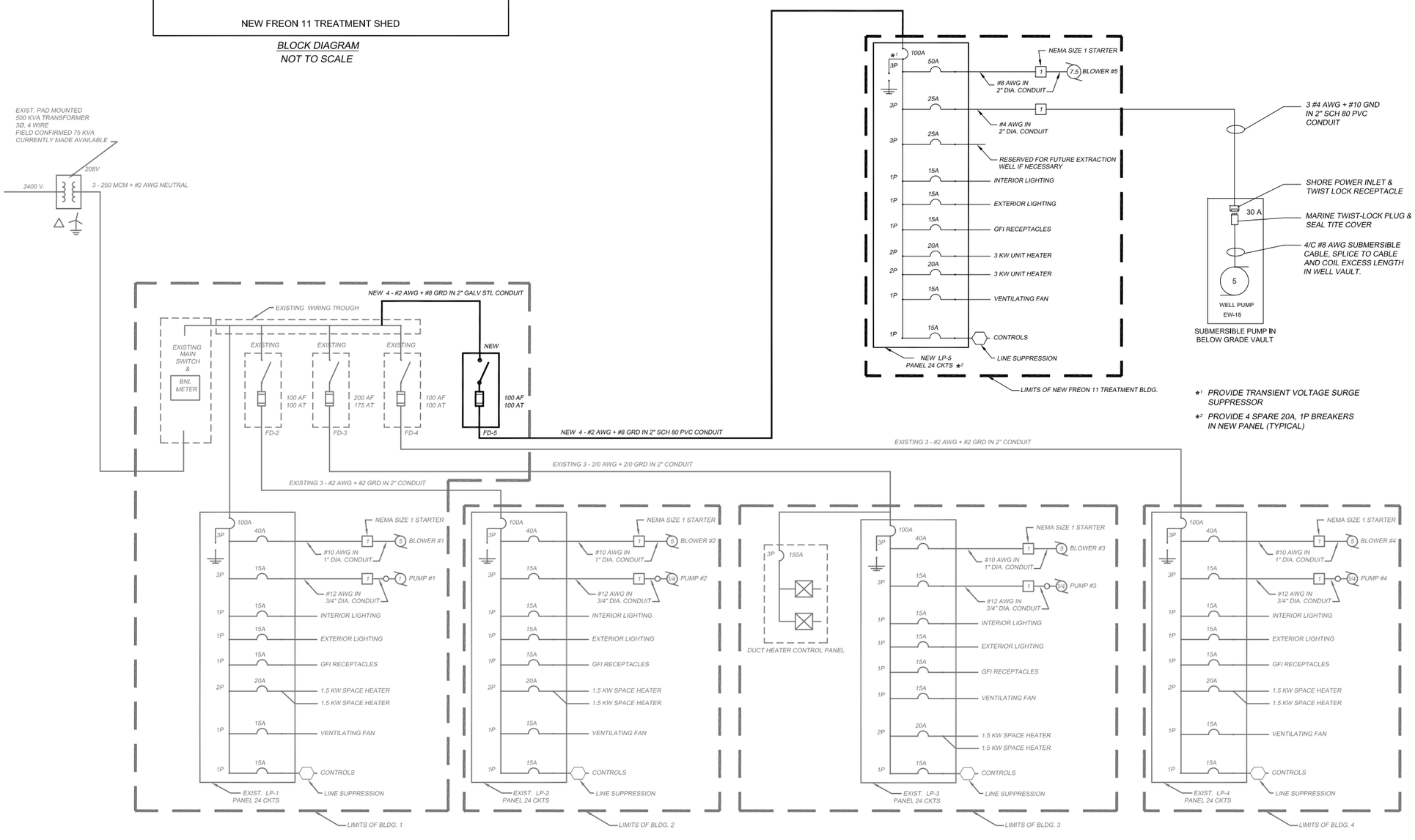
BLOCK DIAGRAM
NOT TO SCALE

Notes:

Contractor shall be responsible for electric service from existing RTW-1 treatment shed to new treatment shed.

All asphalt, concrete, grass and other areas disturbed by electric service shall be restored by contractor to original condition.

All electrical wire sizing and conduit sizing is shown in the single line power diagram on this sheet. Wire runs to and from sheds and below grade vault equipment is indicated on the site plan sheet 2 of 9.

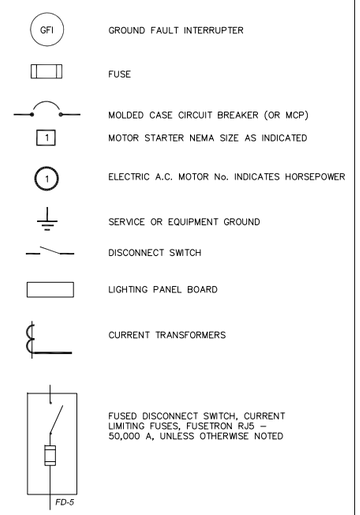


SINGLE LINE POWER DISTRIBUTION DIAGRAM
NOT TO SCALE

**1 PROVIDE TRANSIENT VOLTAGE SURGE SUPPRESSOR*

**2 PROVIDE 4 SPARE 20A, 1P BREAKERS IN NEW PANEL (TYPICAL)*

SINGLE LINE DIAGRAM SYMBOLS



		2	ADD ROOF AIR DISCHARGE PIPE	11/01/11	AJZ	JRH
		1	BNL REVIEW MEETING 10-03-11	10/10/11	AJZ	JRH
JOB NO.	SHEET	NO	REVISION	DATE	DWN.	APP'D. QA

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UPTON, NEW YORK 11973

JOB TITLE: BUILDING 452 AREA - FREON 11 GROUNDWATER TREATMENT SYSTEM		DWG. TITLE: ELECTRICAL SINGLE LINE & CONTROL BLOCK DIAGRAMS	
ILR,GPP,LNI, HEM: -	DATE: 09/27/11	ACCT. NO.: -	SHEET 6 OF 9
SCALE: AS SHOWN	DWN. BY: AJZ	JOB NO.: -	DWG. NO.: E-2
PROJ. QA: A3-MINOR	APP'D. BY: JRH	BLDG. NO.: -	
PATH:			

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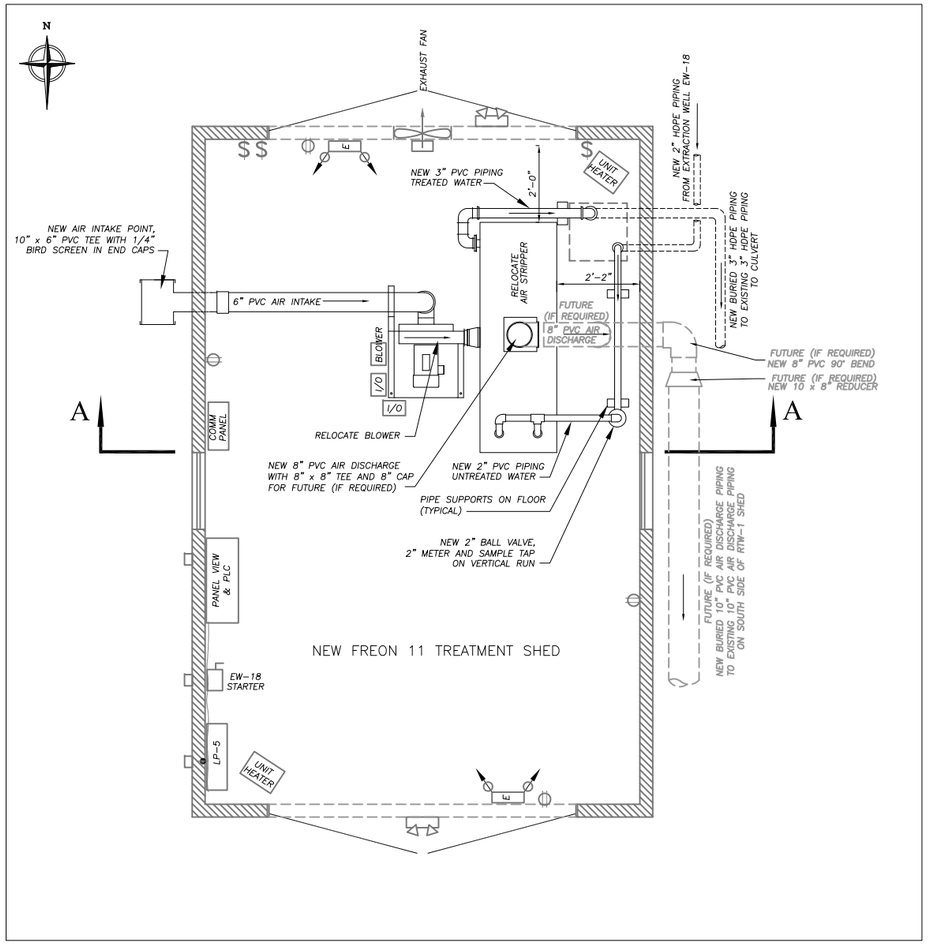
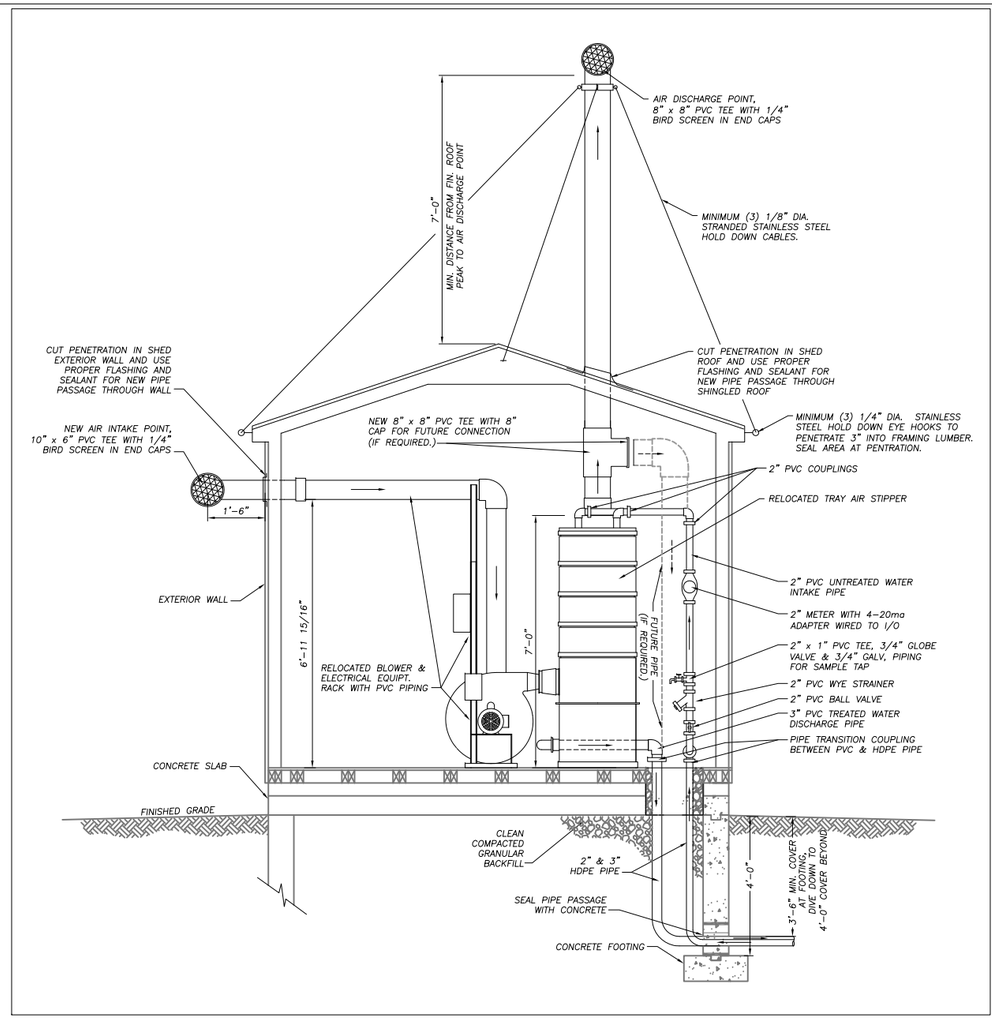


NEW SHED MECHANICAL FLOOR PLAN
N.T.S.



EQUIPMENT SECTION A - A
N.T.S.

		2	ADD ROOF AIR DISCHARGE PIPE	11/01/11	AJZ	JRH	
		1	BNL REVIEW MEETING 10-03-11	10/10/11	AJZ	JRH	
JOB NO.	SHEET	NO	REVISION	DATE	DWN.	APP'D.	QA

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ENVIRONMENTAL MANAGEMENT DIRECTORATE & PLANT ENGINEERING DIVISION
UPTON, NEW YORK 11973

JOB TITLE: BUILDING 452 AREA - FREON 11 GROUNDWATER TREATMENT SYSTEM		DWG. TITLE: NEW TREATMENT BUILDING MECHANICAL FLOOR PLAN & SECTION	
ILR,GPP,LNI, HEM: -	DATE: 09/15/11	ACCT. NO.: -	SHEET 7 OF 9
SCALE: AS SHOWN	DWN. BY: AJZ	JOB NO.: -	DWG. NO.: M-1
PROJ. QA: A3-MINOR	APP'D. BY: JRH	BLDG. NO.: -	
PATH:			

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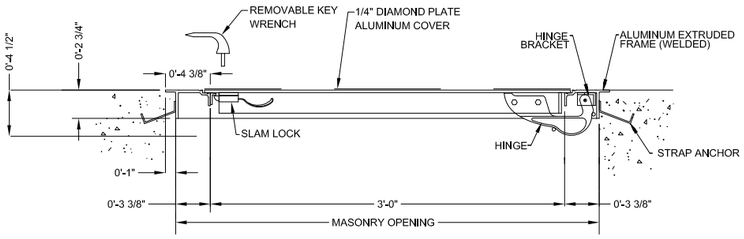
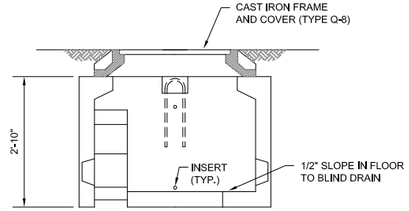
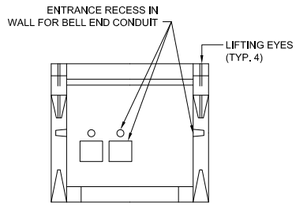
STATE OF NEW YORK · JAMES R. HOLZMACHER · LICENSED PROFESSIONAL ENGINEER · 09/13/11 · No. 66054

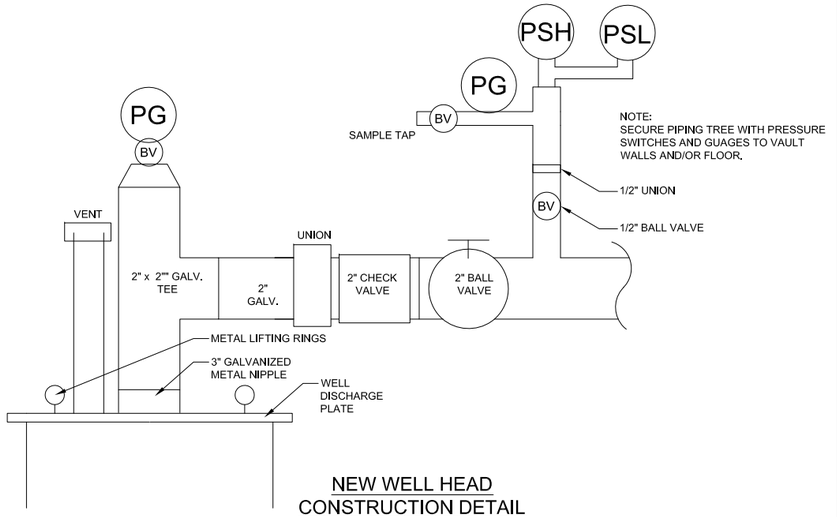




SECTION A-A

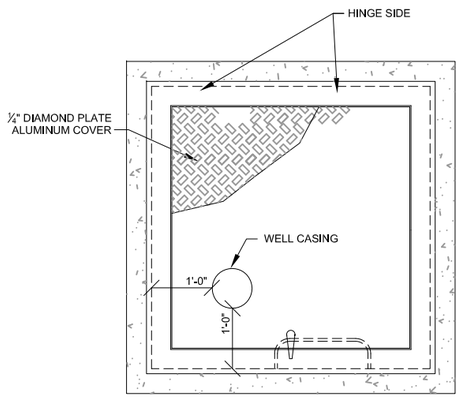


SECTION B-B

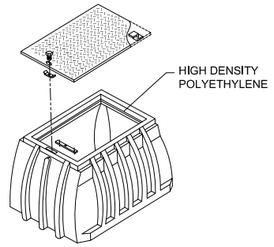


NEW WELL HEAD CONSTRUCTION DETAIL

SCALE: N.T.S.

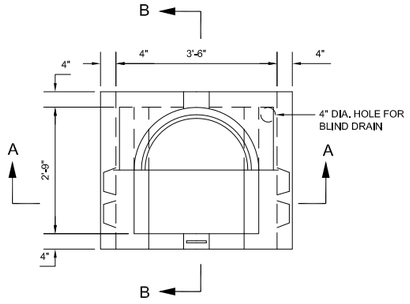


PLAN VIEW



SECONDARY SPLICE BOX (CONTROL WIRING)

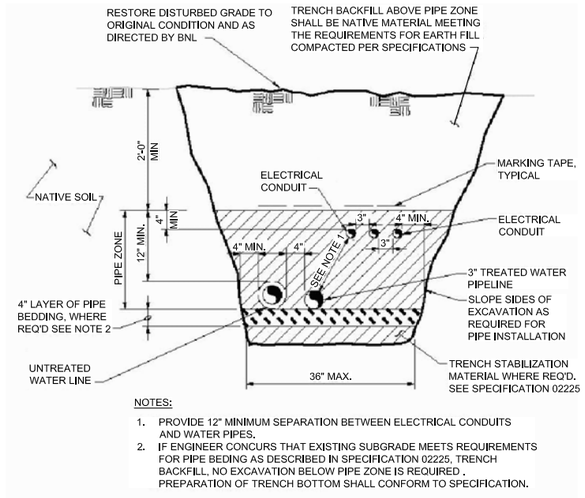
SCALE: N.T.S.



PLAN

ELECTRICAL HAND HOLE DETAIL

SCALE: N.T.S.



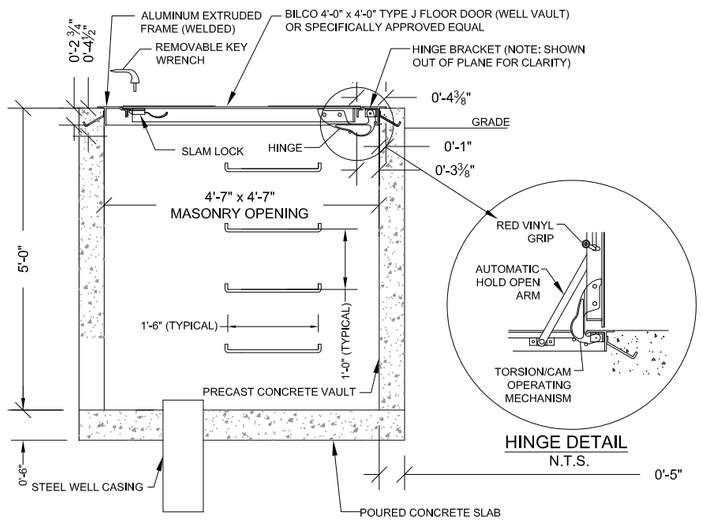
NOTES:

1. PROVIDE 12" MINIMUM SEPARATION BETWEEN ELECTRICAL CONDUITS AND WATER PIPES.
2. IF ENGINEER CONCURS THAT EXISTING SUBGRADE MEETS REQUIREMENTS FOR PIPE BEDING AS DESCRIBED IN SPECIFICATION 02225, TRENCH BACKFILL, NO EXCAVATION BELOW PIPE ZONE IS REQUIRED . PREPARATION OF TRENCH BOTTOM SHALL CONFORM TO SPECIFICATION.

TYPICAL TRENCH DETAIL

SCALE: N.T.S.

NOTE: PROVIDE GROUND CONNECTION TO METAL HATCH, PROVIDE GROUND ROD OR CONNECTION TO WELL CASING MEETING N.E.C. REQUIREMENTS



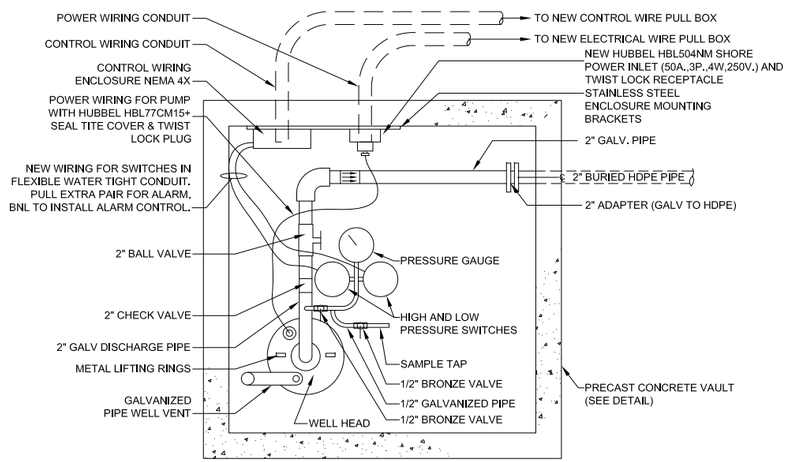
HINGE DETAIL

N.T.S.

SECTION VIEW

EXTRACTION WELL VAULT CONSTRUCTION DETAIL

SCALE: N.T.S.



EXTRACTION WELL VAULT
INTERIOR PIPING AND LAYOUT DETAIL

SCALE: N.T.S.

		2	ADD ROOF AIR DISCHARGE PIPE	11/01/11	AJZ	JRH
		1	BNL REVIEW MEETING 10-03-11	10/10/11	AJZ	JRH
JOB NO.	SHEET	NO	REVISION	DATE	DWN.	APP'D. QA

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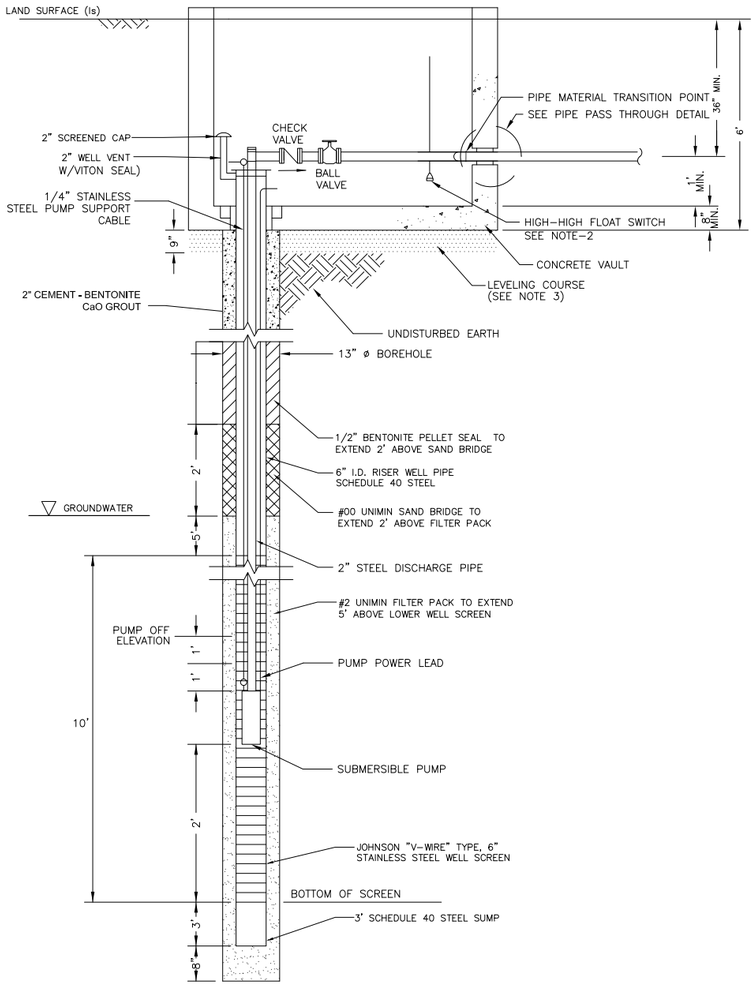
JOB TITLE		DWG. TITLE	
BUILDING 452 AREA – FREON 11 GROUNDWATER TREATMENT SYSTEM		MECHANICAL TREATMENT SYSTEM DETAILS	
ILR,GPP,LNI, HEM: –	DATE: 09/15/11	ACCT. NO.: –	SHEET 8 OF 9
SCALE: AS SHOWN	DWN. BY: AJZ	JOB NO.: –	DWG. NO.: M–2
PROJ. QA: A3–MINOR	APP'D. BY: JRH	BLDG. NO.: –	
PATH:			



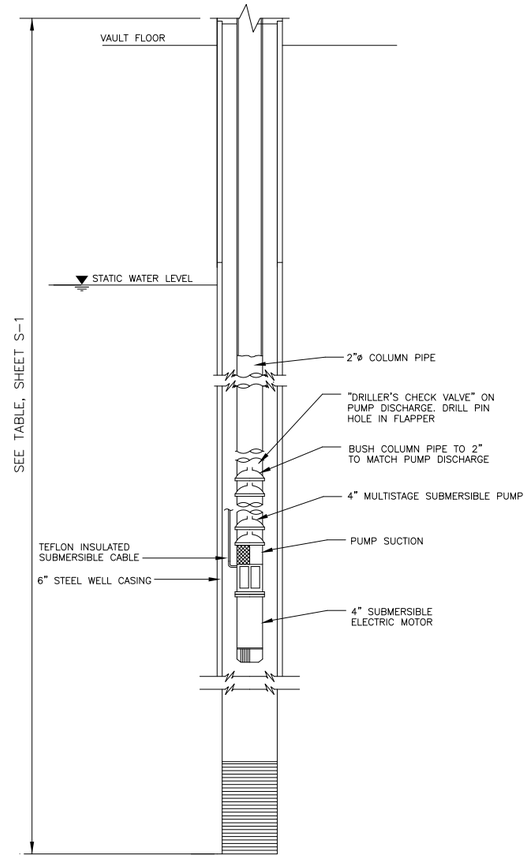
NEW EXTRACTION WELL IN VAULT

N.T.S.

WELL VAULT PIPING NOTES:

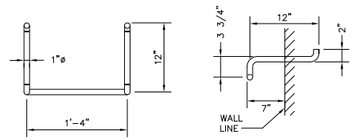
1) PRESSURE TRANSDUCER LEVEL CONTROL; HIGH-HIGH FLOAT SWITCH IS USED TO PROTECT THE WELL VAULT.
2) LEVELING COURSE SHALL BE NYSDOT TYPE 3 STONE.
3) CONTRACTOR TO DESIGN/INSTALL EXTRACTION WELL SCREEN PER SPECIFICATION 02520 PART II 2.03

NOTE: ALUMINUM MANHOLE STEPS (TYP.) (ASPHALT COAT EMBEDDED ALUMINUM)



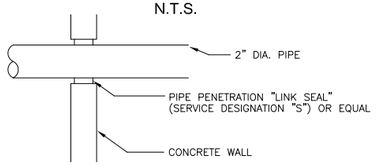
NEW SUBMERSIBLE EXTRACTION WELL PUMP INSTALLATION DETAIL

N.T.S.



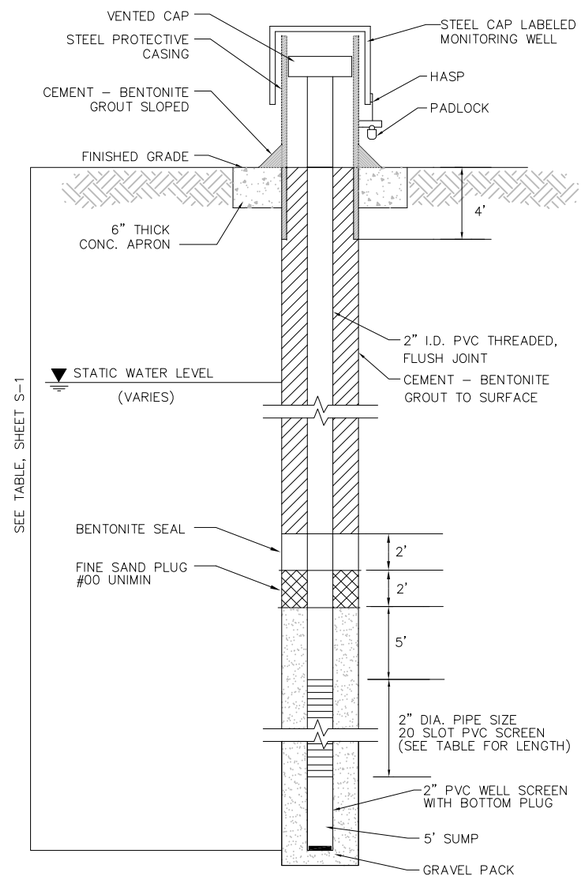
STRUCTURAL STEP DETAIL

N.T.S.



PASS-THROUGH VAULT DETAIL

N.T.S.



TYPICAL NEW MONITORING WELL DETAIL

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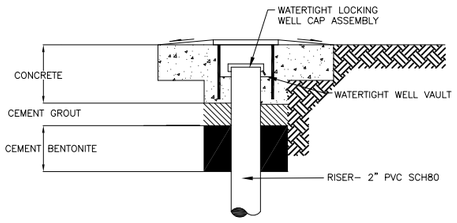


FLUSH MOUNT DETAIL

N.T.S.

		2	ADD ROOF AIR DISCHARGE PIPE	11/01/11	AJZ	JRH
		1	BNL REVIEW MEETING 10-03-11	10/10/11	AJZ	JRH
JOB NO.	SHEET	NO	REVISION	DATE	DWN.	APP'D.	QA

BROOKHAVEN NATIONAL LABORATORY

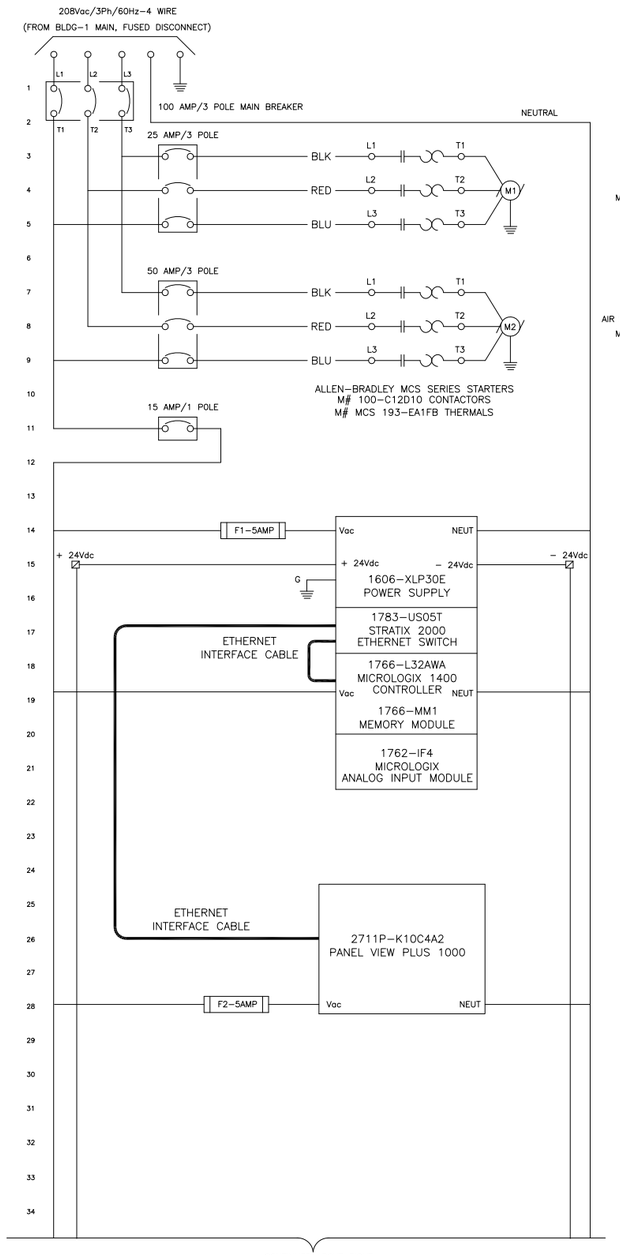
UNDER CONTRACT WITH
UNITED STATES DEPARTMENT OF ENERGY
ENVIRONMENTAL MANAGEMENT DIRECTORATE & PLANT ENGINEERING DIVISION
UPTON, NEW YORK 11973

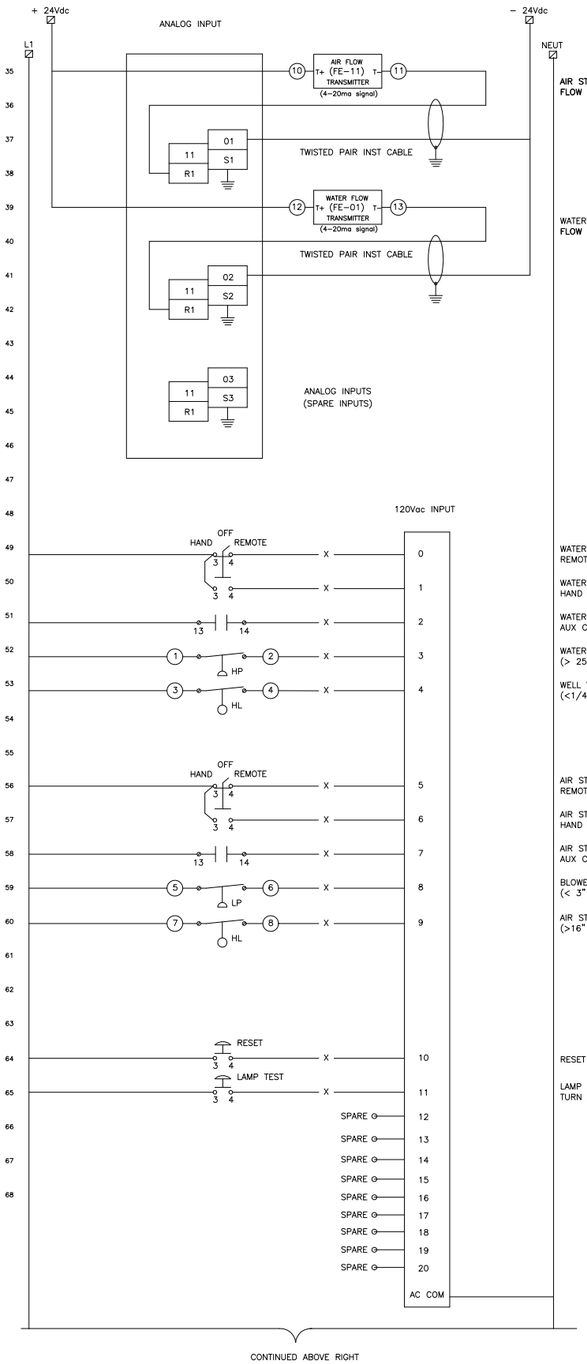
JOB TITLE	DWG. TITLE
BUILDING 452 AREA - FREON 11 GROUNDWATER TREATMENT SYSTEM	MONITORING & TREATMENT WELL DETAILS

ILR,GPP,LNI, HEM: -	DATE: 09/15/11	ACCT. NO.: -	SHEET 9 OF 9
SCALE: AS SHOWN	DWN. BY: AJZ	JOB NO.: -	DWG. NO.: W-1
PROJ. QA: A3-MINOR	APP'D. BY: JRH	BLDG. NO.: -	
PATH:			

STATE OF NEW YORK * JAMES R. HOLZMACHER * 12-13-11 * No. 66054 * LICENSED PROFESSIONAL ENGINEER

J.R. HOLZMACHER P.E., LLC
The Third Generation of Excellence in Water Supply, Water Resources, Civil and Environmental Engineering
300 Wheeler Road, Suite 402, Hauppauge, NY 11788
PHONE: (631) 234-3225 FAX: (631) 234-2221 E-MAIL: info@holzmacher.com





AIR STRIPPER BLOWER
FLOW TRANSMITTER (FE-11)

WATER PUMP
FLOW TRANSMITTER (FE-01)

WATER PUMP
REMOTE CONTROL (PLC)

WATER PUMP
HAND MODE (PUMP ON)

WATER PUMP STARTER
AUX CONTACT (PUMP ON)

WATER PUMP HIGH PRESSURE
(> 25" wc RISING-PSH)

WELL VAULT FLOOR HIGH LEVEL
(<1/4" ABOVE FLOOR-LSH)

AIR STRIPPER BLOWER
REMOTE CONTROL (PLC)

AIR STRIPPER BLOWER
HAND MODE (BLOWER ON)

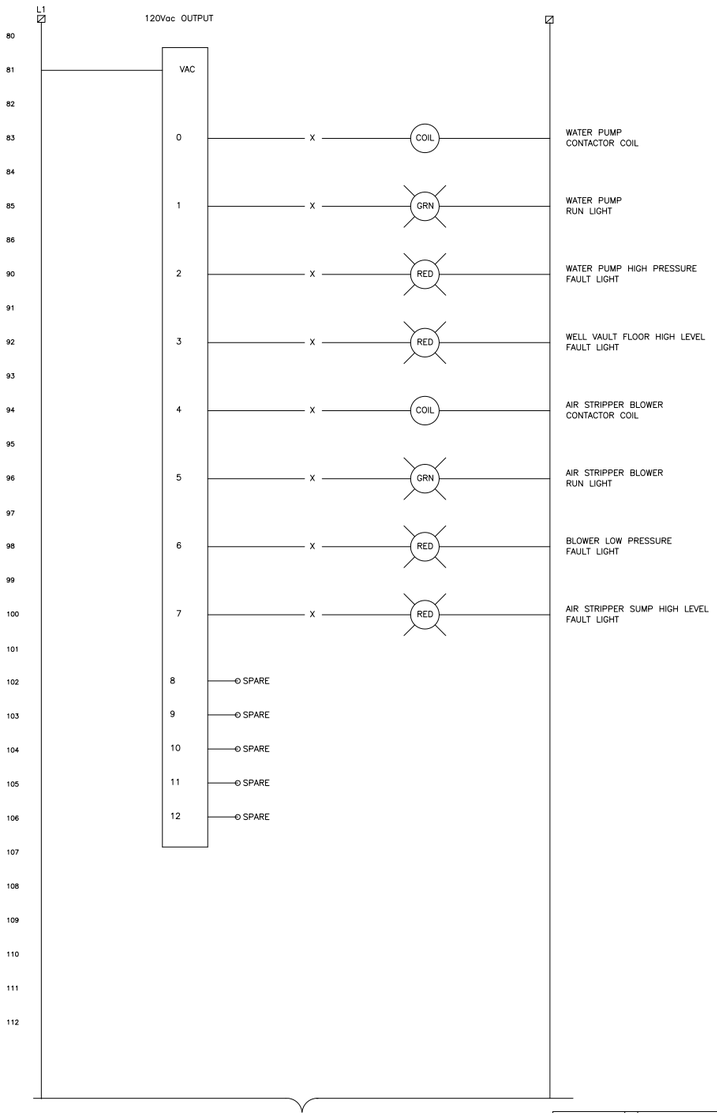
AIR STRIPPER BLOWER STARTER
AUX CONTACT (BLOWER ON)

BLOWER LOW PRESSURE
(< 3" wc DECREASING-PSL)

AIR STRIPPER SUMP AREA
(>16" ABOVE SUMP BOTTOM)

RESET SYSTEM

LAMP TEST
TURN ON ALL LIGHTS



CONTROLS LADDER WIRING DIAGRAM

JOB NO.	SHEET	NO	REVISION	DATE	DWN.	APP'D.	QA
		1	UPDATE EQUIPT. MODEL Nos.	12/13/11	AJZ		

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UPTON, NEW YORK 11973

JOB TITLE	DWG. TITLE
BUILDING 452 AREA – FREON 11 GROUNDWATER TREATMENT SYSTEM	CONTROLS DRAWINGS LADDER WIRING DIAGRAM

ILR,GPP,LNI, HEM	DATE	ACCT. NO.	SHEET 1 OF 2
–	11/30/11	–	
SCALE: AS SHOWN	DWN. BY: AJZ	JOB NO.: –	DWG. NO.: CD-1
PROJ. QA: A3-MINOR	APP'D. BY: JRH	BLDG. NO.: –	

PATH:

J.R. HOLZMACHER P.E., LLC
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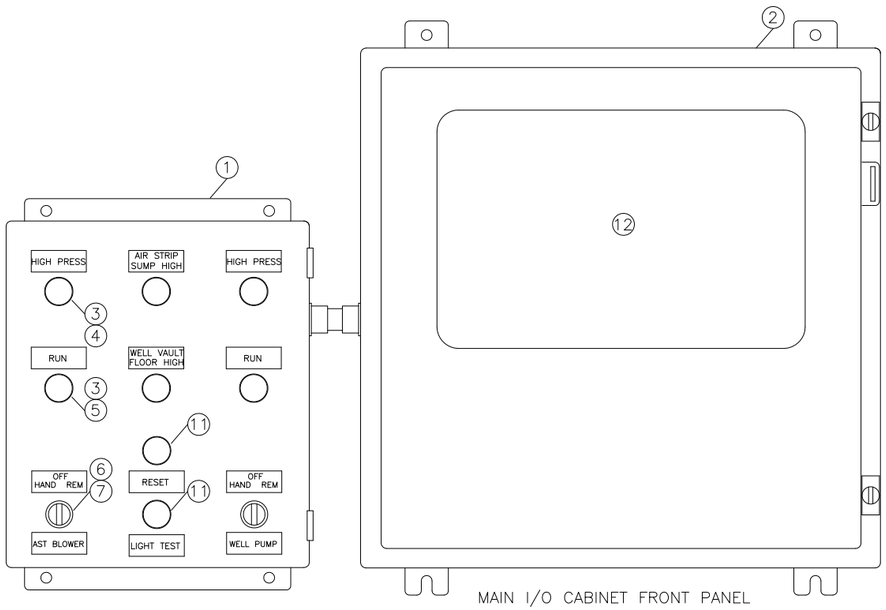
STATE OF NEW YORK · JAMES R. HOLZMACHER · LICENSED PROFESSIONAL ENGINEER · 12-13-11 · No. 66054

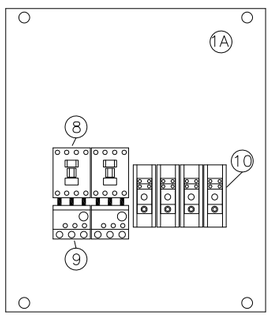


WELL PUMP/BLOWER FRONT PANEL

MAIN I/O CABINET FRONT PANEL

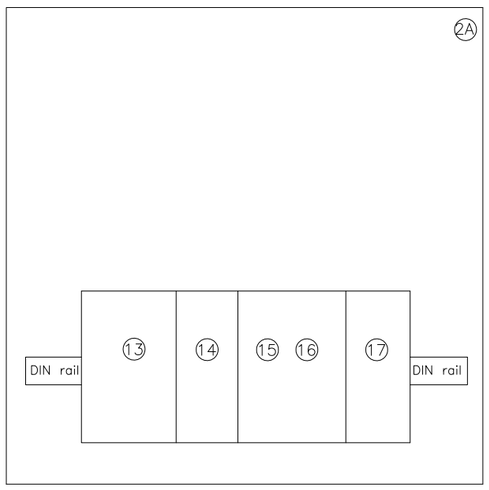
NO.	QTY	MANUFACT	PART #	DESCRIPTION
1	1	HOFFMAN	A-242408LP	CONTROL CABINET
1A	1	HOFFMAN	24P24	BACK PANEL
2	1	HOFFMAN	C-SD20166W	ENCLOSURE WITH WINDOW
2A	1	HOFFMAN	CP-2016	BACK PANEL
3	6	A-B	800E-2DL5	FULL VOLTAGE LIGHT MODULE
4	4	A-B	800EP-P4	RED LENS
5	2	A-B	800EP-P3	GREEN LENS
6	3	A-B	800EP-SL32	3 POSITION SELECTOR SWITCH
7	3	A-B	800E-4LX20	N.O. CONTACT BLOCKS
8	2	A-B	MCS100-C12D10	3 POLE CONTACTOR
9	2	A-B	193-EA2EB	SS OVERLOAD RELAY
10	4	A-B	1492-FBIC30	CLASS CC FUSEHOLDER
11	2	A-B	800E-PB4	N.O. PUSHBUTTON
12	1	A-B	2711P-K10C4A2	PANEL VIEW PLUS 1000
13	1	A-B	1606-XLP30E	24Vdc POWER SUPPLY MODULE
14	1	A-B	1783-US05T	STRATIX 2000 ETHERNET SWITCH
15	1	A-B	1766-L32AWA	MICROLOGIX 1400 CONTROLLER
16	1	A-B	1766-MM1	MEMORY MODULE
17	1	A-B	1762-IF4	MICROLOGIX ANALOG INPUT MODULE
18				
19				
20				
21				
22				
23				
24				
25				

NOTE: FUSE SIZES/TYPE TO BE CONFIRMED AND INDICATED BASED UPON FINAL EQUIPMENT SELECTIONS



WELL PUMP/BLOWER BACK PANEL

MAIN I/O CABINET BACK PANEL



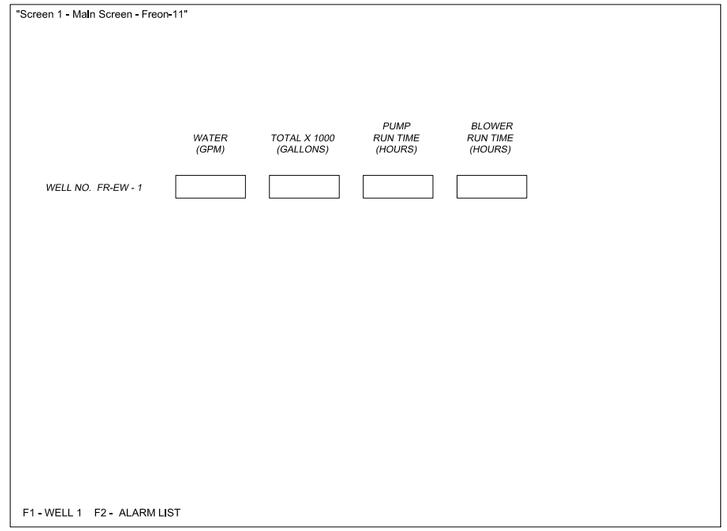
LOCAL CONTROL PANELS

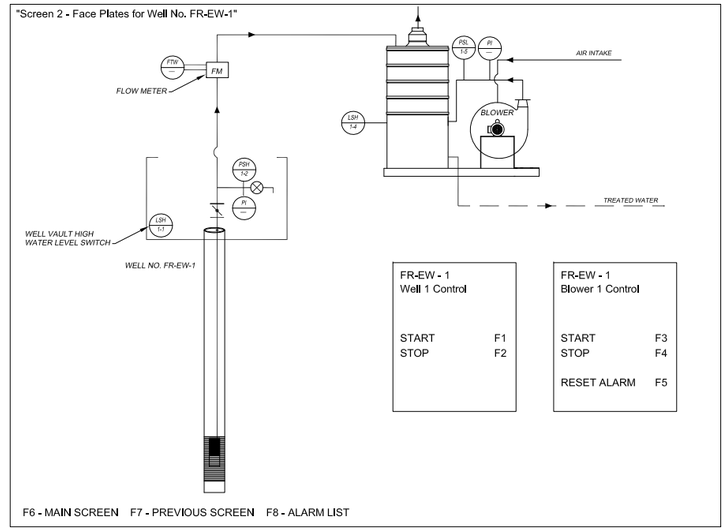
NOTE:
Controls contractor should be aware that the manufacturers product part numbers indicated may differ from current available products and should submit updated information in shop drawing form to BNL for approval prior to purchase.

Coordinate controls equipment installation with electrical contractors installation of new and existing equipment within the Freon-11 groundwater treatment system new shed.

Coordinate controls programing with BNL project manager, Vincent Racaniello.

The controls contractor shall use the Ladder Wiring Diagram and the Local Control Panels layouts as a guide for completing the intended work along with the Description of Controls and instrumentation information provided in the project specifications booklet. It is the responsibility of the controls contractor to provide a complete functioning controls system for operation of the groundwater treatment system components.

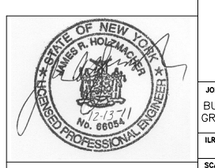




COMPUTER SCREENS CONTENT

KEY

PI = PRESSURE INDICATOR
FTW = WATER FLOW TRANSMITTER
PSH = PRESSURE SWITCH HIGH
PSL = PRESSURE SWITCH LOW
LSH = LEVEL SWITCH - HIGH LEVEL
LSL = LEVEL SWITCH - LOW LEVEL



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JOB NO.	SHEET NO.	REVISION	DATE	DWN.	APP'D.	QA
	1	UPDATE EQUIPT. MODEL Nos.	12/13/11	AJZ		

BROOKHAVEN NATIONAL LABORATORY

UNDER CONTRACT WITH
UNITED STATES DEPARTMENT OF ENERGY
ENVIRONMENTAL MANAGEMENT DIRECTORATE & PLANT ENGINEERING DIVISION
UPTON, NEW YORK 11973

JOB TITLE: BUILDING 452 AREA – FREON 11 GROUNDWATER TREATMENT SYSTEM		DWG. TITLE: CONTROLS DRAWINGS LOCAL CONTROL PANELS	
ILR,GPP,LNI, HEM: –	DATE: 11/30/11	ACCT. NO.: –	SHEET: 2 OF 2
SCALE: AS SHOWN	DWN. BY: AJZ	JOB NO.: –	DWG. NO.: CD-2
PROJ. QA: A3-MINOR	APP'D. BY: JRH	BLDG. NO.: –	
PATH:			

APPENDIX D

Preliminary Building 452 Freon-11 Plume Treatment System Air Emissions Modeling Results

Brookhaven National Laboratory
Emission Point 45201
Freon 11 Air Stripping Treatment System

Based on their investigation of groundwater contamination from the freon 11 (trichlorofluoromethane) incident, the Ground Water Protection Group has commenced planning for the installation of a new groundwater treatment system. They are considering using a QED Environmental Systems 4-tray or 6-tray air stripper unit that would be installed near the boundaries of the measured plume. The stripper unit would be housed in a treatment shed and would treat a maximum of 120 gallons of water per minute from a series of groundwater extraction wells. QED personnel has estimated that either a 4-tray EZ-Tray 12.4 or 6-tray EZ-Tray 12.6 model stripper would achieve a 100 percent freon 11 removal efficiency presuming an influent water flow rate of 120 gals/min and an influent concentration of 36,000 ug/L. The design stripper air flow rate will be 600 ft^3/min. Under these worst case operating conditions, the Environmental Protection Group has requested preliminary estimates of the impacts of stripper system emissions to determine whether additional engineering controls are needed.

Worst Case Scenario

Potential impacts of proposed treatment system emissions will be estimated using the NYSDEC DAR-1 Air Toxic screening procedure screening method. For this evaluation, it is assumed that the height of the treatment shed will be 7.5 feet and that the treatment system exhaust stack will extend 7 feet above the roof line in accordance with the SBMS Exhaust Ventilation Guidance Specifications. It is also assumed that the stack outlet diameter will be 12 inches .

Estimated Hourly and Annual Emissions

Trichlorofluoromethane Influent concentration - 36,000 ug/l
Influent pumping rate – 120 gals/min (454 l/min)
Estimated stripper removal efficiency - 100%

Hourly Emissions – $\frac{(36{,}000 \text{ ug/l})(454 \text{ l/min})(60 \text{ mins/hr})}{(10^6 \text{ ug/g})(453.6 \text{ g/lb})}$ = 2.16 lbs/hr

Annual Emissions – (2.16 lbs/hr) (8760 hrs/yr) = 18,922 lbs/yr

DAR-1 Air Toxics Assessment

Design Values:
Building Height (h_b) – 7.5 ft
Stack Height (h_s) - 14.5 ft
Stack Diameter - 1.0 ft
Exit Flow Rate – 600 ft^3/min
Stack Exit Velocity – 12.7 ft/sec
Sack Exit Temperature - 68 °F
Average Ambient Temperature – 50 °F
Distance to Nearest Property Line (D_{pl}) ≈ 3000 ft

AGC for trichlorofluoromethane – 1,000 ug/m^3
SGC for trichlorofluoromethane – 68,000 ug/m^3

Refined Cavity Impact Method:
The building cavity height (h_c) is equal to $1.5h_b$ or 11.25 ft. Since the stack height (h_s) is greater than the h_c, no short term cavity impacts occur.

Calculate the Momentum Flux (F_m) of the exhaust as follows:

$$F_m\ (ft^4/sec^2) = \frac{(T_a)\ (V^2)\ (R^2)}{T}$$

Where: T = exit temperature (°R)
V = exit velocity (ft/sec)
R = stack outlet radius (ft)
Ta = ambient temperature (°R)

$$F_m\ (ft^4/sec^2) = \frac{(510)\ (12.7^2)\ (0.5^2)}{528} = 38.9$$

Standard Point Source Method:
A_1. Calculate the effective stack height (h_e) from:

$$h_e = h_s + 1.1(F_m h_b)^{1/3}$$

$$h_e = 14.5 + 1.1(38.9 \times 7.5)^{1/3} = 21.8 \text{ ft}$$

Calculate the maximum annual impact (C_a) from the point source using the following equation:
A_2. $Ca\ (ug/m^3) = \frac{6.0 \times Q_a}{h_e^{2.25}}$

where Q_a is the annual emissions rate in lbs/yr

$$Ca\ (ug/m^3) = \frac{6.0 \times 18{,}922}{21.8^{2.25}} = 111\ ug/m^3$$

Since the air stripper treatment system will run continuously, the maximum potential annual impact (C_p) and C_a are equivalent

Now, calculate the maximum short term impact (C_{st}) using the following equation:

A_3. $C_{st} = C_p \times 65$

$$C_{st} = 111\ ug/m^3 \times 65 = 7{,}215\ ug/m^3$$

Since Ca and Cst are less than the AGC and SGC for trichlorofluoromethane respectively, the annual and short term impacts of emissions from the proposed QED air stripper treatment system do not present a potential health risk to the public.

APPENDIX E

Sample Results for New Building 452 Groundwater Monitoring Wells

Building 452 Freon-11 Groundwater Monitoring Wells
VOCs Detected Above MDL

Site ID : 085-43

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Qual
Trichlorofluoromethane	11/9/2011	1.14	0.5	5	UG/L	
Chloroform	11/9/2011	0.2	0.5	7	UG/L	J

Site ID : 085-73

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Qual
Trichlorofluoromethane	11/9/2011	1710	25	5	UG/L	
Chloroform	11/9/2011	0.37	0.5	7	UG/L	J
Carbon tetrachloride	11/9/2011	0.31	0.5	5	UG/L	J

Site ID : 085-380

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Qual
Trichlorofluoromethane	11/9/2011	2680	50	5	UG/L	

Site ID : 085-381

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Qual
Trichlorofluoromethane	11/9/2011	843	12.5	5	UG/L	

Site ID : 085-382

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Qual
Trichlorofluoromethane	11/9/2011	38800	1000	5	UG/L	

Site ID : 085-383

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Qual
Trichlorofluoromethane	11/9/2011	960	12.5	5	UG/L	

Site ID : 085-384

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Qual
Trichlorofluoromethane	11/9/2011	15.7	0.5	5	UG/L	
Chloroform	11/9/2011	0.56	0.5	7	UG/L	

Building 452 Freon-11 Groundwater Monitoring Wells
VOCs Detected Above MDL

Site ID : 085-385

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Qual
Trichlorofluoromethane	11/9/2011	2.37	0.5	5	UG/L	

Site ID : 085-386

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Qual
Trichlorofluoromethane	11/9/2011	5650	100	5	UG/L	

Site ID : 095-313

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Qual
Trichlorofluoromethane	11/9/2011	31.5	0.5	5	UG/L	
1,1,1-Trichloroethane	11/9/2011	0.93	0.5	5	UG/L	
1,1-Dichloroethylene	11/9/2011	0.13	0.5	5	UG/L	

Site ID : 085-387

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Qual
Trichlorofluoromethane	11/9/2011	530	10	5	UG/L	
Chloroform	11/9/2011	3.8	10	7	UG/L	J

Site ID : 085-388

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Qual
Trichlorofluoromethane	11/9/2011	ND	0.5	5	UG/L	
Chloroform	11/9/2011	1.61	0.5	7	UG/L	
Bromdichloromethane	11/9/2011	0.23	0.5	5	UG/L	J

Site ID : 095-314

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Qual
Trichlorofluoromethane	11/9/2011	ND	0.5	5	UG/L	

Site ID : 095-315

Chemical Name	Sample Date	Value	Detlim	STD Level	Units	Qual
Trichlorofluoromethane	11/9/2011	0.78	0.5	5	UG/L	
Chloroform	11/9/2011	0.38	0.5	7	UG/L	J