LETTER OF TRANSMITTAL FOR VAPOR INTRUSION ANALYSIS FOR FUTURE MOTOR TRANSPORT FACILITY AT SITE 27 EQUIPMENT PARADE DECK WITH ATTACHMENTS
MCRD PARRIS ISLAND SC
12/20/2007
NAVAL FACILITIES ENGINEERING COMMAND SOUTHEAST

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND SOUTHEAST
JACKSONVILLE, FL 32212-0030

OPC6
December 20, 2007

Ms. Meredith Amick
South Carolina Department of Health and Environmental Control
Bureau of Land and Waste Management
Corrective Action Engineering Section
2600 Bull Street
Columbia, SC 29201

Subj: VAPOR INTRUSION ANALYSIS

Dear Ms. Amick:

Enclosed is the vapor intrusion analysis that was performed for the future Motor Transport (Motor T) facility at Installation Restoration (IR) Site 27 at Marine Corps Recruit Depot (MCRD), Parris Island, SC.

Based on modeling results, installation of a vapor barrier provides a margin of safety for facility occupants that will accommodate any foreseeable changes in ground water concentrations. As such, a vapor barrier will be installed during construction of the facility. A description of the vapor barrier will be included in a design drawing and provided for public record upon completion of the facility design. Based on the current schedule, the design will be complete in approximately three months. Further, other buildings will also be evaluated for vapor intrusion as part of the on-going Remedial Investigation as appropriate.

We look forward to discussing our findings. Should you have any questions regarding this submittal, please contact Charles Cook, PE, at (904) 542-6409 or e-mail charles.cook2@navy.mil.

Sincerely,

KA Stewart

KATHRYN A. STEWART, P.E.
Restoration Section Head
South Central Integrated Product Team

Enclosure:
(1) Vapor Intrusion Analysis

Copy to:
MCRD Parris Island (Tim Harrington, Heber Pitman)
Tetra Tech (Mark Sladic)
EPA(Lila Llamas, Mac McRae)

SITE 27 SOIL BORINGS

NAVFAC provides the following discussion/interpretation items for this site:

1) determination if data indicates radial movement of water away from an off site source:

Survey data and one recent round of water levels do indicate a radial movement of groundwater, broadly described as being in directions perpendicular to an arc north-through-northwest-through-west of MW-6. Most of the proposed soil borings are in this area of radial outward groundwater flow. The source of groundwater contamination does appear to be just off-site of the proposed Motor-T development area, but still within MCRD.

2) Does the data indicate vehicle drop off in concentration due to ground water moving faster at the surface and diffusion downward thru lenses of connected ground water , or does the data indicate immediate surface release that could be spread by borings:

The groundwater data appears to indicate that a release to shallow unsaturated soils or directly into shallow groundwater (or vadose soils) has migrated into the unconsolidated formation groundwater. Additional characterization is required prior to being able to support a conceptual model that includes more specific transport mechanisms.

3) If the contamination is spread from borings , does this matter in the future approach to the site . Is a removal action a potential in this area. (would additional sampling or discrete split spoon sampling confirm , no potential for removal action?:

Current data does not support significant likelihood of a removal action in the vicinity of the proposed geotechnical borings. A source removal action is likely, but this is not in the proposed geotechnical borings area. As there is already evidence of contaminant vertical migration, the incremental impact from employment of careful drilling practices used for geotechnical borings should not be significant.

VAPOR INTRUSION MODELING RESULTS
SITE 27 - PARADE DECK
MCRD PARRIS ISLAND, SOUTH CAROLINA

Chemical	Maximum Detected Concentration[1] (ug/L)	Residential[2]		Industrial[3]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Benzene	230	0.4	4E-05	0.04	3E-06
Chlorobenzene	2500	2	NA	0.2	NA
alpha-BHC	470	NA	4E-05	NA	3E-06
gamma-BHC	540	0.07	1E-05	0.006	8E-07
	Total	**2**	**1E-04**	**0.2**	**7E-06**

Notes:

1 - Maximum detected concentration in all the monitoring wells located any where on site.

2 - Residential risks were calculated using the model default values for on-slab construction and the following assumptions:
On-slab construction - 6 inches.
Depth to groundwater - 5 ft.
Soil type - Loamy Sand (LS)
Average groundwater temperature - 20 C.

3 - Industrial risks were calculated using the following assumptions:
Building dimensions - 70 ft x 270 ft x 10 ft.
Air exchange rate - 0.83 per hour (ASTM, 2005).
On-slab construction - 6 inches.
Depth to groundwater - 5 ft.
Soil type - Loamy Sand (LS)
Average groundwater temperature - 20 C.
Exposure frequency - 250 days/yr.
Exposure duration - 25 years.

DATA ENTRY SHEET

GW-SCREEN
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
71432	2.30E+02	Benzene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	150	LS	20	

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
LS			LS	1.62	0.39	0.076

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
8.80E-02	9.80E-06	5.54E-03	25	7,342	353.24	562.16	5.89E+01	1.79E+03	7.8E-06	3.0E-02

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
135	0.314	0.079	1.65E-08	0.957	1.58E-08	18.75	0.39	0.087	0.303	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
1.69E+04	1.00E+06	4.00E-04	15	8,019	4.39E-03	1.83E-01	1.78E-04	1.22E-02	1.79E-04	1.18E-03

Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
135	15	4.20E+04	0.10	1.56E+01	1.22E-02	4.00E+02	7.44E+13	3.32E-04	1.39E+01	7.8E-06	3.0E-02

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.79E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
4.5E-05	4.5E-01

MESSAGE SUMMARY BELOW:

END

DATA ENTRY SHEET

GW-SCREEN
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
108907	2.50E+03	Chlorobenzene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	150	LS	20	

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
LS			LS	1.62	0.39	0.076

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.30E-02	8.70E-06	3.69E-03	25	8,410	404.87	632.40	2.19E+02	4.72E+02	0.0E+00	4.9E-02

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
135	0.314	0.079	1.65E-08	0.957	1.58E-08	18.75	0.39	0.087	0.303	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
1.69E+04	1.00E+06	4.00E-04	15	9,702	2.79E-03	1.16E-01	1.78E-04	1.01E-02	1.53E-04	1.01E-03

Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
135	15	2.90E+05	0.10	1.56E+01	1.01E-02	4.00E+02	5.27E+16	2.98E-04	8.63E+01	NA	4.9E-02

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	4.72E+05	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	1.7E+00

MESSAGE SUMMARY BELOW:

END

DATA ENTRY SHEET

GW-SCREEN
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
319846	4.70E+02	alpha-HCH (alpha-BHC)

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	150	LS	20	

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
LS			LS	1.62	0.39	0.076

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($(\mu g/m^3)^{-1}$)	Reference conc., RfC (mg/m^3)
1.42E-02	7.34E-06	1.06E-05	25	15,000	596.55	839.36	1.23E+03	2.00E+00	1.8E-03	0.0E+00

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
135	0.314	0.079	1.65E-08	0.957	1.58E-08	18.75	0.39	0.087	0.303	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
1.69E+04	1.00E+06	4.00E-04	15	20,915	5.79E-06	2.41E-04	1.78E-04	2.01E-03	3.77E-03	2.15E-03

Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
135	15	1.13E+02	0.10	1.56E+01	2.01E-03	4.00E+02	2.28E+84	4.65E-04	5.26E-02	1.8E-03	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	2.00E+03	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
3.9E-05	NA

MESSAGE SUMMARY BELOW:

END

DATA ENTRY SHEET

GW-SCREEN
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
58899	5.40E+02	gamma-HCH (Lindane)

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	150	LS	20	

MORE ↓

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LS			LS	1.62	0.39	0.076

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

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1.42E-02	7.34E-06	1.40E-05	25	15,000	596.55	839.36	1.07E+03	7.30E+00	3.7E-04	1.1E-03

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
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Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
1.69E+04	1.00E+06	4.00E-04	15	20,915	7.65E-06	3.18E-04	1.78E-04	2.00E-03	2.86E-03	2.09E-03

Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
135	15	1.72E+02	0.10	1.56E+01	2.00E-03	4.00E+02	5.54E+84	4.59E-04	7.87E-02	3.7E-04	1.1E-03

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	7.30E+03	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1.2E-05	7.2E-02

MESSAGE SUMMARY BELOW:

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

END

DATA ENTRY SHEET

GW-ADV
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
71432	2.30E+02	Benzene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
20	15	150	150	0	0	A	LS	LS		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
LS	1.62	0.390	0.076	LS	1.62	0.39	0.076	LS	1.59	0.399	0.148

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
15	40	2135	8230	305	0.1	0.83	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	25	25	250	1.0E-06	1
				Used to calculate risk-based groundwater concentration.	

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
8.80E-02	9.80E-06	5.54E-03	25	7,342	353.24	562.16	5.89E+01	1.79E+03	7.8E-06	3.0E-02

END

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
7.88E+08	135	0.314	0.314	0.251	0.079	1.65E-08	0.957	1.58E-08	18.75	0.39	0.087	0.303	20,730

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.24E+06	1.76E+07	1.18E-04	15	8,019	4.39E-03	1.83E-01	1.78E-04	1.22E-02	0.00E+00	0.00E+00	1.79E-04	1.18E-03	135

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	4.20E+04	0.10	8.09E+01	1.22E-02	2.07E+03	6.42E+20	4.30E-05	1.80E+00	7.8E-06	3.0E-02

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.79E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
3.4E-06	4.1E-02

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

GW-ADV
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
108907	2.50E+03	Chlorobenzene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
20	15	150	150	0	0	A	LS	LS		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
LS	1.62	0.390	0.076	LS	1.62	0.39	0.076	LS	1.59	0.399	0.148

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
15	40	2135	8230	305	0.1	0.83	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	25	25	250	1.0E-06	1

Used to calculate risk-based groundwater concentration.

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.30E-02	8.70E-06	3.69E-03	25	8,410	404.87	632.40	2.19E+02	4.72E+02	0.0E+00	4.9E-02

END

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
7.88E+08	135	0.314	0.314	0.251	0.079	1.65E-08	0.957	1.58E-08	18.75	0.39	0.087	0.303	20,730

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.24E+06	1.76E+07	1.18E-04	15	9,702	2.79E-03	1.16E-01	1.78E-04	1.01E-02	0.00E+00	0.00E+00	1.53E-04	1.01E-03	135

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	2.90E+05	0.10	8.09E+01	1.01E-02	2.07E+03	1.21E+25	4.05E-05	1.17E+01	NA	4.9E-02

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	4.72E+05	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	1.6E-01

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

GW-ADV
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
319846	4.70E+02	alpha-HCH (alpha-BHC)

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
20	15	150	150	0	0	A	LS	LS		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
LS	1.62	0.390	0.076	LS	1.62	0.39	0.076	LS	1.62	0.39	0.076

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
15	40	2135	8230	305	0.1	0.83	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	25	25	250	1.0E-06	1.0

Used to calculate risk-based groundwater concentration.

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
1.42E-02	7.34E-06	1.06E-05	25	15,000	596.55	839.36	1.23E+03	2.00E+00	1.8E-03	0.0E+00

END

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
7.88E+08	135	0.314	0.314	0.314	0.079	1.65E-08	0.957	1.58E-08	18.75	0.39	0.087	0.303	20,730

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.24E+06	1.76E+07	1.18E-04	15	20,915	5.79E-06	2.41E-04	1.78E-04	2.01E-03	0.00E+00	0.00E+00	3.77E-03	2.15E-03	135

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1.13E+02	0.10	8.09E+01	2.01E-03	2.07E+03	3.44E+126	5.08E-05	5.75E-03	1.8E-03	NA

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	2.00E+03	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
2.5E-06	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

DATA ENTRY SHEET

GW-ADV
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
58899	5.40E+02	gamma-HCH (Lindane)

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
20	15	150	150	0	0	A	LS	LS		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
LS	1.62	0.390	0.076	LS	1.62	0.39	0.076	LS	1.59	0.399	0.148

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
15	40	2135	8230	305	0.1	0.83	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	25	25	250	1.0E-06	1

Used to calculate risk-based groundwater concentration.

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
1.42E-02	7.34E-06	1.40E-05	25	15,000	596.55	839.36	1.07E+03	7.30E+00	3.7E-04	1.1E-03

END

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
7.88E+08	135	0.314	0.314	0.251	0.079	1.65E-08	0.957	1.58E-08	18.75	0.39	0.087	0.303	20,730

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.24E+06	1.76E+07	1.18E-04	15	20,915	7.65E-06	3.18E-04	1.78E-04	2.00E-03	0.00E+00	0.00E+00	2.86E-03	2.09E-03	135

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1.72E+02	0.10	8.09E+01	2.00E-03	2.07E+03	1.30E+127	5.05E-05	8.66E-03	3.7E-04	1.1E-03

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	7.30E+03	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
7.9E-07	5.7E-03

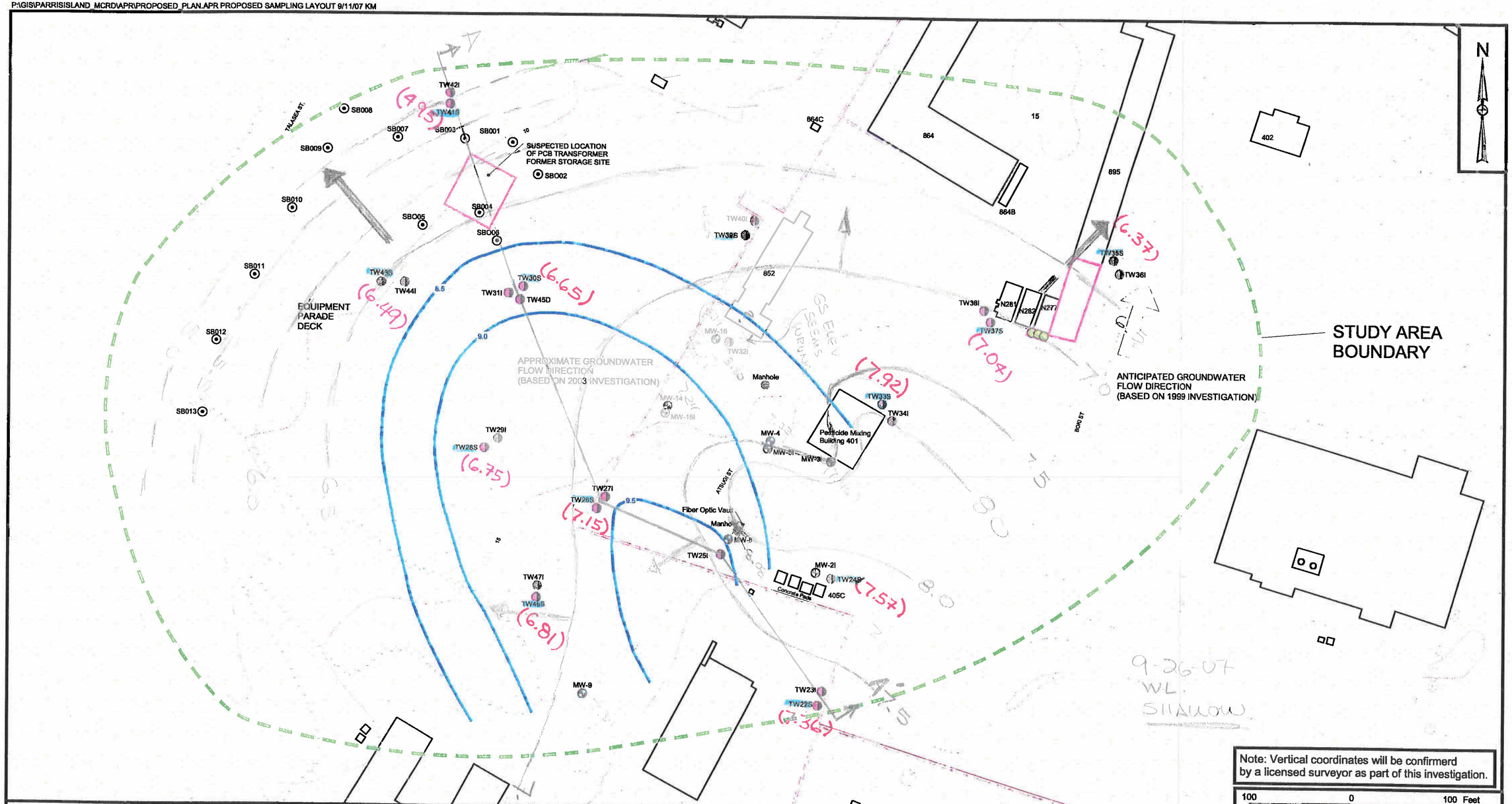
MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

END

P:\GIS\PARRISISLAND_MCRD\APR\PROPOSED_PLAN.APR PROPOSED SAMPLING LAYOUT 9/11/07 KM



Note: Vertical coordinates will be confirmerd by a licensed surveyor as part of this investigation.

100 0 100 Feet

LEGEND

- Shallow Monitoring Well (2002)
- Intermediate Monitoring Well (2002)
- Manhole
- Building
- Proposed Temporary Monitoring Well
- Proposed Soil Sample
- 9.0 Groundwater Contour Shallow Surficial Aquifer
- Aerial Pipe
- Topographic Contour
- Tree Line
- Sidewalk
- Road

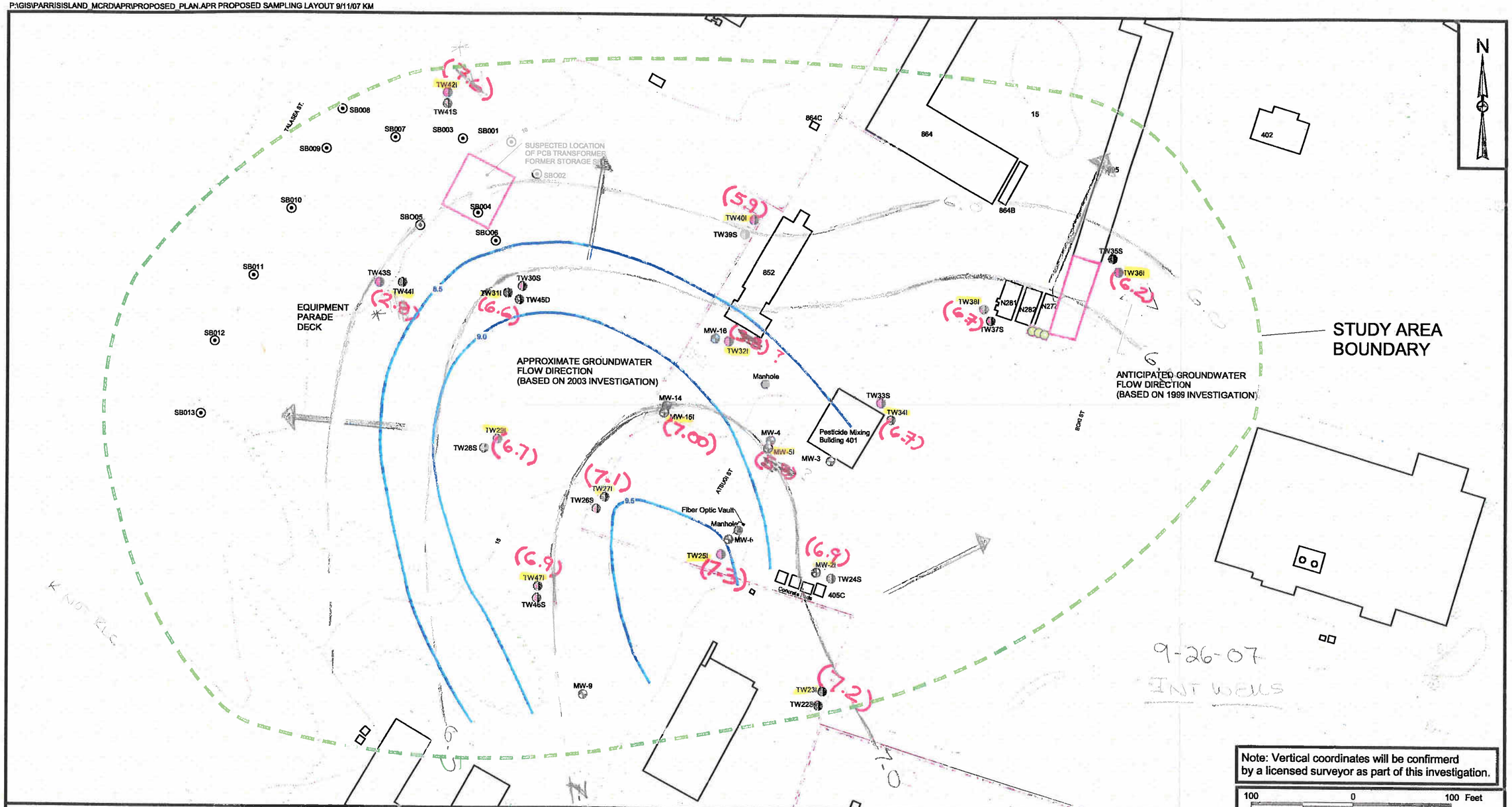
DRAWN BY K. PEILA	DATE 10/21/03
CHECKED BY S. HANEY	DATE 9/11/07
REVISED BY K. MOORE	DATE 9/11/07
SCALE AS NOTED	

NAVFAC

~~PROPOSED SAMPLING LOCATION MAP~~
CROSS-SECTION LINE AND SHALLOW WELL POTENTIOMETRIC SURFACE MAP
SITES 9, 16, 27, AND 55
MCRD PARRIS ISLAND
PARRIS ISLAND, SOUTH CAROLINA

CONTRACT NO. 0039	
OWNER NO. —	
APPROVED BY —	DATE —
DRAWING NO. FIGURE 5-1	REV. 0

P:\GIS\PARRISISLAND_MCRD\APR\PROPOSED_PLAN.APR PROPOSED SAMPLING LAYOUT 9/11/07 KM



Note: Vertical coordinates will be confirmerd by a licensed surveyor as part of this investigation.

100 0 100 Feet

LEGEND

- Shallow Monitoring Well (2002)
- Intermediate Monitoring Well (2002)
- Manhole
- Building
- Proposed Temporary Monitoring Well
- Proposed Soil Sample
- 9.0 Groundwater Contour Shallow Surficial Aquifer
- Aerial Pipe
- Topographic Contour
- Tree Line
- Sidewalk
- Road

DRAWN BY K. PEILA	DATE 10/21/03
CHECKED BY S. HANEY	DATE 9/11/07
REVISED BY K. MOORE	DATE 9/11/07
SCALE AS NOTED	

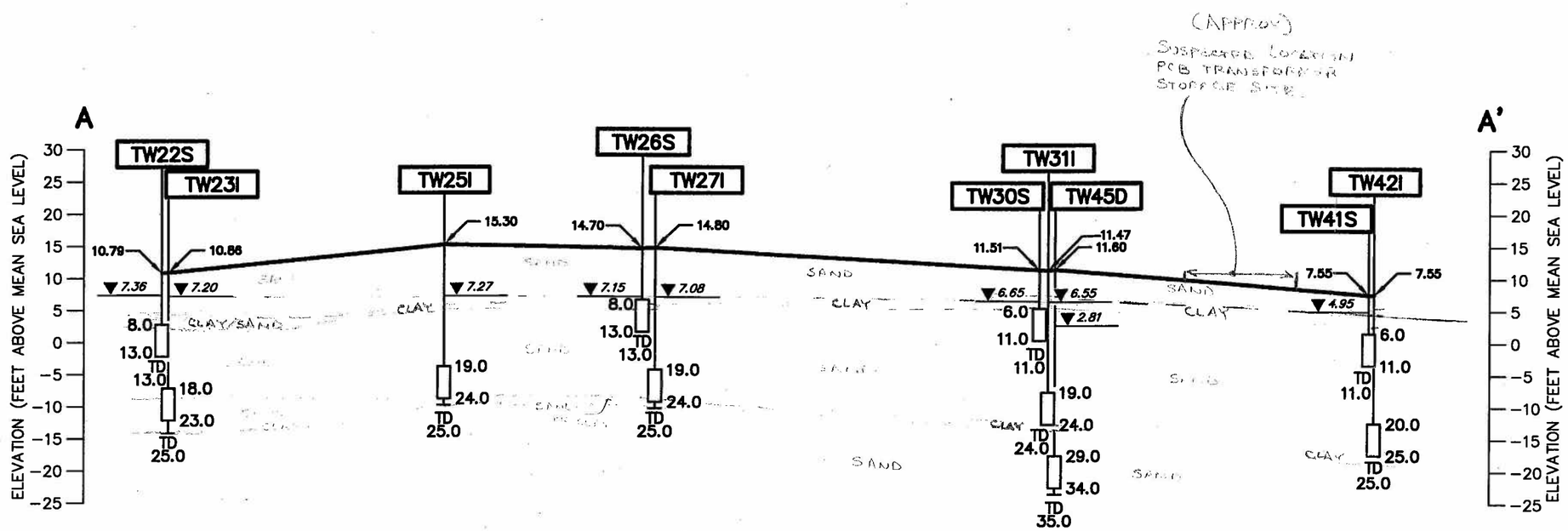
NAVFAC

PROPOSED SAMPLING LOCATION MAP
SITES 9, 16, 27, AND 55
MCRD PARRIS ISLAND
PARRIS ISLAND, SOUTH CAROLINA

CONTRACT NO. 0039	
OWNER NO. —	
APPROVED BY	DATE
DRAWING NO. FIGURE 5-1	REV. 0

DRAFT

ACAD:0455GX02.dwg 12/17/07 MF PIT



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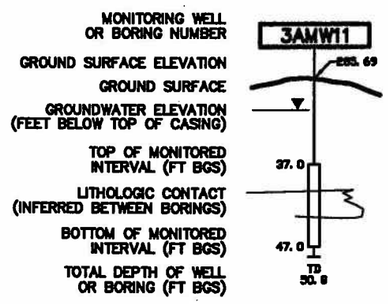


- WATER LEVELS TAKEN ON 9-20-07
- WATER LEVEL OF 45D [illegible] AT THE TIME TAKEN.

0 80 160
HORIZONTAL SCALE IN FEET

0 20 40
VERTICAL SCALE IN FEET

DRAWN BY MF	DATE 12/17/07	NAVFAC	MCRD PARRIS IS SITE 20 X SECT A-A'
CHECKED BY	DATE		MAJOR SUBJECT MINOR SUBJECT SUBJECT COVERED CLIENT NAME PROJECT LOCATION
REVISED BY	DATE		
SCALE AS NOTED			

CONTRACT NO. 0455	
OWNER NO.	
APPROVED BY	DATE
DRAWING NO. FIGURE	REV. 0

FORM CADD NO. SDIV-BH.DWG - REV 2 - 6/19/06

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW-22S
DATE: 9-21-07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0								SEE 23I				
									FOR DETAILS				
	5												
				8									
	10												
				13									
	15												
							SCREEN 8-13						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW-22S

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW-23I
DATE: 9-21-07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
					LOOSE	BRN	TOP 3" TOPSOIL			—			0
S-1 @			3/5			TO	SILTY SAND	SM	DAMP	—			
1445										163			
						TAN			↓	121			
	5		▼						MOIST	145			0
									5→7 WET PERCHED?	—			
S-2 @				6.5									
					STIFF	GRAY		CL	MOIST	71			
1450			4/5	7.7			SILTY CLAY		(SLIGHT ODOR)	71			
				8.6	M DENSE		CLAYEY SAND	SC					
				9.0	STIFF	GRAY	SILTY CLAY	CL		77			
	10		±	▼	M DENSE	GRAY	CLAYEY SAND	SC/SM	MOIST →	50			0
						ORANG			WET ~10'	—			
S-3 @						GRAY BRN	SILTY SAND	SM	WET	54			
1455			4/5							60			
										—			
	15			14.5	M STIFF	GRAY	SANDY CLAY	SC	WET	63			
				16			TO			—			
S-4 @							SILTY SAND	SM	POOR REC	0			
1500			3/5							—			
				19±						0			
	20				M	GRAY	SILTY CLAY -	SC					
					STIFF		TR SAND			0			
S-5 @			3/5							—			
1505									SCREEN	0			
									18-23	—			
	25												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: THIS BORING ALSO DIFFERENT FROM PREVIOUS BORINGS - MORE CLAY AT DEPTH - DECIDE TO SET SCREEN 18-23.

Converted to Well: Yes TW No _____ Well I.D. #: TW-23I

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW-24S
DATE: 9-21-07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0				LOOSE	BRN	TOP 4" TOPSOIL			0			
S-1 @ 1340			5/5			TO TAN	SILTY SAND-TR ROOTS	SM	MOIST	500			
						BRN	TR WOOD @ 4'		NO ODOR?	>1000			
										500			
	5			▼					4.5' WET	300			
									PERCHED H2O				
S-2 @ 1345			5/5	7' 8'	STIFF	GRAY	SILTY CLAY TO	CL	MOIST				
					M DENSE		CLAYEY SAND	SC					
	10			9.5 ▼									
					M DENSE	GRAY	SILTY SAND	SM	WET @ 9.5				
S-3 @ 1350			5/5			BRN			AGAIN				
				13.0 13.5	STIFF	GRAY	SILTY CLAY	CL					
	15			15	M DENSE		SILTY SAND						
				TD									
							SCREEN 9-14'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW-24S

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW-25I
DATE: 9-21-07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
					LOOSE	BRN	TOP 4" TOPSOIL SILTY SAND - TR ROOTS, COAL & ROCK	SM	MOIST	0			0
S-1 @ 1400			5/5				TO		NO ODOR	200			
									↓	200			
										165			
	5					GRAY	SILTY SAND	SM	TO	100		50	0
									FUEL ODOR	200			
S-2 @ 1405			4/5	7±					/CHEMICAL ODOR	400			
							CLAYEY SAND	SC	MOIST	300			
				9					↓WET	250			
	10			10'±	STIFF	GRAY	SILTY CLAY-TR		≈ 9.5 TO 10'	500		100	
					M		SAND, @ 10			165			0
S-3 @ 1410			4/5		DENSE	GRAY	SILTY SAND - TR CLAY	SM	WET	250			
										163			
										150			
	15					TO				500		100	0
						TAN				100			
S-4 @ 1420			2/5			BRN	SILTY SAND	SM	WET	—			
										50			
										—			
	20									—	0	50	0
										100			
S-5 @ 1425			4/5	23±					SCREEN	—			
				24'±		GRAY	SILTY SAND		19-24	120			
	25				LOOSE	GRAY	CLAYEY SAND/ SANDY CLAY	SC	WET	100		25	0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks:

Converted to Well: Yes TW No _____ Well I.D. #: TW-25I

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW-26S
DATE: 9120107
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
							FOR LITHOLOGY						0
							SEE TW-27I						
	5												0
				8'									
	10												0
				13'									
	15												0
							SCREEN 8-13'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW-26S

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW-27I
DATE: 9-20-07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
					LOOSE	BRN	TOP 3" TOPSOIL SILTY SAND	SM	DAMP	0			
S-1			4/5							0			
@ 1020									↓	0			
										0			
	5								MOIST	0			0
										0			
S-2 @			4/5							13			
1025										0			
				9						0			
	10		▼	9.5	STIFF M	GRAY OLIVE	SILTY CLAY	CL	NOT WET, TILL ~9.5 ▼	400			0
					LENSE	GRAY	SILTY SAND	SM	SL ODOR	370			
S-3 @			4.5/5						TO STRONG FUEL	265			
1030										45			
										100			
	15					TO				0			0
						YELLOW BRN	SILTY SAND	SM	WET	0			
S-4 @										0			
1040			2/5							0			
										0			
	20									0			0
										0			
S-5 @			5/5							0			
1050									SCREEN	0			
				23.5	DENSE	OLIVE GRAY	SILTY SAND	SM	19-24±	0			
	25						TR CLAY			0			0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole.. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW-27I

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW-28S
DATE: 9-20-07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
							FOR LITHOLOGY						0
							SEE TW-29I						
	5												0
				7'									
			▼						8'± H_2O TABLE				
	10												0
				12'									
	15						SCREEN 7-12						0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW-28S

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW-29I
DATE: 9-20-07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
					LOOSE	BRN	3" ASPHALT		DAMP	0			
S-1						TO TAN	SILTY SAND	SM		0			
@ 1220			3.5/5			BRN				0			
										0			
	5						LAST 2" CLAYEY SAND		MOIST	0			
				6±			TO			0			
S-2			4/5		STIFF	GRAY	SILTY CLAY	CL	MOIST	0			
@ 1225				8±					WET @ 8' JUST	0			
				9'	M DENSE	BRN GRAY	CLAYEY SAND	SC	BELOW CLAY	0			
	10				M	ORANGE				0			
					DENSE	GRAY BRN	SILTY SAND	SM		0			
S-3			5/5			TO YELLOW				0			
@ 1235						BRN GRAY	SILTY SAND	SM	WET → SAT	0			
										0			
	15									0			
										0			
S-4			2/5							0			
@ 1245										0			
										0			
	20				M			SM		0			
					DENSE		SILTY SAND			0			
S-5			4/5			TO				0			
@ 1255						GRAY				0			
				24'±					19-24	0			
	25						SANDY CLAY	SC	WET	0			

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: LOC IN SCRAPYARD (FENCED IN)

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW-29I

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW-30S
DATE: 9-19-07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
							SEE LOG FOR						0
							TW-45D FOR						
							LITHOLOGY						
	5												0
	10												
	11			11.0									0
							SCREEN						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW-30S

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW 31 I
DATE: 9-19-07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0						FOR LITHOLOGY				0		0
							SEE LOG FOR						
							TW-45D						
	5												0
	10												0
	15												0
	20												0
									SCREEN SET				
									19-24				
									@1210 ±				
	24			24'									0
				TD									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW-31I

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW-32I
DATE: 9/20/07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
	0						4" ASPHALT						
										0			
S-1 @ 1625			4/5		M DENSE	BRN TO	SILTY SAND	SM	MOIST	0			
										0			
						TAN BRN				0			
	5									0			
										0			
									MOIST → WET	0			
S-2 @ 1630			5/5	6.5									
				CLAY						0			
					STIFF	GRAY	SILTY CLAY	CL	MOIST	0			
			▼	9.3?					WET ~9'	0			
	10				M					0			
					DENSE	YELLOW BRN	SILTY SAND	SM	WET	0			
S-3 @ 1635			5/5			GRAY			→ SAT	0			
										0			
										0			
	15									0			
									WET	0			
S-4 @ 1640			3/5			TO				0			
						BRN				0			
	20					GRAY				0			
										0			
S-5 @ 1645			4/5						SCREEN	0			
									19-24'	0			
				24		TO				0			
	25					OLIVE GRAY	SILTY SAND - TR CLAY	SM	MOIST	0			

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW-32I

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW-33S
DATE: 9-21-07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ*	Borehole**	Driller BZ**
	0												
							FOR LITHOLOGY						0
							SEE TW-34I						
	5												0
	10												0
				13' CLAY									
	15												0
							SCREEN						
	20												0
				21									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW-33S

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW-34I
DATE: 9-21-07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
	0				LOOSE	BRN	4" TOPSOIL		DAMP	0			
S-1 @ 1100			4/5		M DENSE	TO TAN	SILTY SAND	SM		0			
									↓	0			
						BRN				0			
	5								MOIST	0			
						TO	SILTY SAND	SM		0			
S-2 @ 1110			4.5/5	▽ 7'					WET ~ 7'±	0			
						GRAY	TR CLAY @ 8' → 8.2		NO LAYER OF CLAY ENCOUNTERED HERE UNTIL SEE BELOW	0			
	10					TO				0			
						TAN			WET	0			
S-3 @ 1115			4.5/5	13						0			
					M STIFF	BRN GRAY	SILTY CLAY - TR SAND	CL	MOIST	0			
	15					TO				0			
						D. GRAY	SILTY CLAY	CL		0			
S-4 @ 1125			4.6/5	CLAY						0			
										0			
	20						TR SAND →		LAST 1'	0			
				21					POOR REC - NOT SURE WHERE CLAY ENDS	0			
S-5 @ 1135			2/5		M DENSE	GRAY	LESS SOFT @ 21' SILTY SAND — TR CLAY		SCREEN 20-25	0			
	25									0			

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW-34I

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW-35S
DATE: 9-21-07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
							FOR LITHOLOGY						0
							SEE TW-36 I						
	5												0
				8									
	10			▼									0
				13									
				TD									
	15												0
							SCREEN						
							8 TO 13						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW-35S

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW-36I
DATE: 9/21/07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
					M DENSE	BRN	TOPSOIL 4" SILTY SAND		DAMP	0			
						TO				0			
S-1 @ 0830			5/5			TAN				0			
						BRN	TR CLAY 4→4.3'		↓	0			
	5					TO			MOIST	0			
						ORANG BRN			SOME WETNESS 6→7-PERCHED	200			
S-2 @ 0845			5/5	7'						300			
				8	STIFF	GRAY	SILTY CLAY	CL		50			
				9	M DENSE		CLAYEY SAND	SC	MOIST	500			
	10					TO	SILTY SAND-TR	SM	WET ~9.5	100			
							V. THIN CLAY STRINGERS (1/8")		WET	50			
S-3 @ 0900			4/5			BRN			NO ODOR NOTICED	45			
						GRAY				50			
	15									0			
										0			
									POOR REC	0			
S-4 @ 0910			2/5							0			
										0			
	20									0			
						TAN	SILTY SAND-TR		WET	0			
S-5 @ 0915			4/5			GRAY	TO SOME SHELL FRAGS			6			
									SCREEN 19-24	0			
				24.0					23.8 or 23.9	0			
	25				M STIFF	GRAY	SILTY CLAY		STARTS CLAY	0			

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW-36I

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW-37S
DATE: 9-21-07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
							FOR LITHOLOGY						0
							SEE TW-						
	5												0
				8									
			▼	~									
	10												0
				TD									
				13'									
	15												0
							SCREEN 8-13						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW-37S

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW-38I
DATE: 9-21-07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
					M DENSE	BRN	TOP 3" TOPSOIL/ ROCK FRAGS		MOIST	0			
S-1 @ 0955			4.1/5			TO TAN	SILTY SAND	SM		0			
						BRN				0			
	5									0			
										0			
S-2 @ 1000			5/5	7.5						0			
				8.6	STIFF	GRAY	SILTY CLAY	CL	MOIST	0			
	10				M DENSE	GRAY BRN	SILTY SAND	SM	WET ~9'± BELOW THE CLAY	0			
S-3 @ 1005			5/5							0			
				14						0			
	15				M DENSE	GRAY	SILTY SAND-TR CLAY	SM	WET	0			
S-4 @ 1015			3/5			TO				0			
						TAN				0			
	20					BRN				0			
S-5 @ 1020			3/5	23					SCREEN 18-23	0			
				24	M STIFF	D. GRAY	SILTY CLAY	CL	MOIST	0			
	25				M DENSE	GRAY	SILTY SAND-TR SHELLS			0			

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW-

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW 39S
DATE: 9/20/07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0						FOR LITHOLOGY						
							SEE TW-40 I						
	5												
				6									
				CL									
				Ap									
				9.3									
	10												
	15												
							SCREEN 8-13						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes ✓ No ____ Well I.D. #: TW-39S

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW-40I
DATE: 9/20/07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
					LOOSE	TAN	TOP 3" TOPSOIL			1			
S-1						BRN	SILTY SAND -TR	SM	DAMP	1			
@ 1505			3/5				ROOTS			23			
										22			
	5									0			
				6.0						0			
S-2					STIFF	GRAY	SILTY CLAY	CL	MOIST	0			
@ 1510			5/5							0			
										0			
				9.3						0			
	10		▼		M				WET JUST BELOW CLAY	0			
					DENSE	GRAY	SILTY SAND	SM	~9.5'	0			
S-3						TAN TO YELLOW BRN				0			
@ 1520			5/5						WET → SAT	0			
						GRAY				0			
	15							SM		0			
										0			
S-4			2/5			TO			WET → SAT	0			
@ 1530						TAN				0			
										0			
	20									0			
										0			
S-5			4/5							0			
@									WET	0			
1535					M DENSE	OLIVE GRAY	SILTY SAND	SM	SCREEN	0			
	25						TR CLAY		19-24	0			

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW-40I

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW-41S
DATE: 9-20-07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
							SEE LOG				0		0
							TW 42I FOR						
							LITHOLOGY						
	5										0		0
	10										0		0
	11			11' BOTM									
							SCREEN 6-11						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW-41S

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW 42 I
DATE: 9/20/07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
					M DENSE	BRN	SILTY SAND - TR ROCK FR	SM	DAMP	0			
S-1 e 0925			5/5	2	STIFF	YELLOW BRN	SILTY CLAY	CL	↓	0			
						GRAY			MOIST	0			
	5			5					TR SAND AT BOTM (5')	0			
					M STIFF		SANDY CLAY TO	SC	WET	0			
S-2 e 0930			4/5	▽ 8'			↓ CLAYEY SAND		WET ~ 7'±	0			
										0			
						GRAY TO YELLOW BRN	SILTY SAND	SM	WET	0			
	10									0			
					LOOSE				WET → SAT	0			
S-3 e 0935			4/5							0			
										0			
										0			
	15									0			
					M DENSE	GRAY	SILTY SAND	SM	WET	0			
S-4 e 0940			3/5						POOR REC	0			
									NOT SURE WHEN MATL CHANGES COLOR.	0			
							- TR MED			0			
	20						SAND			0			
						TO			1" Φ	0			
S-5 e 0945			4.5/5			BRN GRAY			SCREEN	0			
									20-25 ±	0			
							- TR CLAY			0			
	25			24.8	M STIFF	OLIVE GRAY	SILTY CLAY/SANDY CLAY	SC	WET	0			

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: START ~ 0925 - STILL RAINING

Drilling Area Background (ppm): 0

Converted to Well: Yes ✓ No _____ Well I.D. #: TW42 I

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW-43S
DATE: 9-19-07
GEOLOGIST: Conti
DRILLER:

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0						SEE LOG 44I						0
							FOR LITHOLOGY						
	5												0
	10		▼						▼ ± 9.8/10.0				0
	15			14.5 TD									0
							SCREEN 9.5-14.5						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No ____ Well I.D. #: TW-43S

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW 44 I
DATE: 9-19-07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
	0				M DENSE	YELLOW	4" ASPHALT		DAMP	0			
S-1 @ 1500			3.5/5			BRN TO GRAY BRN	SILTY SAND - TR ROCK FRAGS		↓	0			
									MOIST	0			
	5			?					MORE WET @ 4.5 - PERCHED	0			
				6' ±					WATER HERE	0			
S-2 @ 1505			5/5	C L A Y	STIFF	BLUE GRAY	SILTY CLAY	CL	MOIST	0			
									(FILL CLAY?)	0			
									NOT SURE	0			
	10		▼	9.8±					TRACE SAND @ 9.8	0			
					M DENSE	YELLOW BRN	SILTY SAND	SM	WET · JUST	0			
S-3 @ 1515			3/5						BELOW CLAY.	0			
										0			
						TO				0			
	15					GRAY				0			
							SILTY SAND	SM	WET	0			
S-4 @ 1520			3/5							0			
										0			
										0			
	20					BLUE				0			
						GRAY		SM	WET	0			
S-5 @ 1525			3/5							0			
									SCREEN	0			
						TO			19.5 → 24.5	0			
	25					BRN GRAY				0			

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW-44I

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW 45D
DATE: 9/19/07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
					M	BRN	3" ASPHALT			0			
					DENSE								
S-1						TO	SILTY SAND	SM	DAMP	0			
@			3.5/5			TAN							
1000						BRN				0			
				4						0			
	5				STIFF	GRAY	SILTY CLAY	CL	MOIST	0			
				6.5									
						MOTTLED				0			
S-2					M	ORANGE							
@				▼ 7'	DENSE	BRN	SILTY SAND	SM	WET ~ 7'± HIT H2O ~ 7'	0			
1005			5/5			GRAY				0			
										0			
	10					TO				0			
						BRN							
						GRAY	SILTY SAND	SM	WET → SAT	0			
S-3						TO				0			
@			5/5										
1015										0			
						GRAY				0			
	15					BRN				0			
										0			
										0			
S-4				17±						0			
@					M	OLIVE							
1025			3/5		DENSE	GRAY	SILTY SAND - TR CLAY	SM	MOIST → WET	0			
									DISTINCT CHANG IN COLOR TO OLIVE GRAY	0			
	20					TO				0			
									POOR REC.	0			
S-5						GRAY	SILTY SAND	SM		0			
@													
1035			2.5/5							0			
				24.3±						0			
	25			25'±	STIFF	GRAY	SILTY CLAY	CL	GOOD CONTACT @ 24.3'±	0			

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW-45D

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW 45D
DATE: 9/19/07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	25												
					M DENSE	GRAY BRN	SILTY SAND		CLAY WAS ONLY ± 1' THICK 24-25	0			
S6 @ 1050			3/5							0			
										0			
										0			
	30					TO				0			
					M DENSE	GRAY	SILTY SAND - TR	SM	MOIST → WET	0			
S7 @ 1105			5/5				V. THIN 1/4" CLAY LENSES ~ 32'			0			
										0			
										0			
	35			35 TD						0			
							BOTM @ 35' 1" SCREEN						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW 45D

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW-46S
DATE: 9/20/07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
							FOR LITHOLOGY						0
							SEE TW-47I						
	5												0
				8'									
	10								HIT H_2O @ 10' ±				0
				13									
	15						SCREEN 8-13						0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW-46S

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: MCRD Parris Is.-Site 27
PROJECT NUMBER: G00455
DRILLING COMPANY: Vironex, Inc.
DRILLING RIG: DPT

BORING No.: TW-47I
DATE: 9/20/07
GEOLOGIST: Conti
DRILLER: GAMWELL

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0				LOOSE		TOP 3" TOPSOIL/PINES		DAMP	0			
S-1						YELLOW BRN	SILTY SAND	SM		0			
@ 1125			4/5		M DENSE					0			
										0			
	5									0			
										0			
S-2			5/5							0			
@ 1130										7			
				8.4									
				9.2	STIFF	OLIVE GRAY	SILTY CLAY	CL	MOIST	20			
	10				LOOSE	GRAY	SILTY SAND-TR CLAY		SL ODOR	35			
					LOOSE	GRAY			WET ~9.8→10'	0			
S-3			4.5/5			YELLOW BRN	SILTY SAND	SM	WET	0			
@ 1136									SOMEWHAT MOTTLED	0			
										0			
	15									0			
					M			SM	WET	0			
S-4 @			2.5/5		DENSE								
1140													
	20												
S-5 @			4.5/5						SCREEN				
1145								SM	19-24±				
				24'±									
	25				LOOSE	OLIVE GRAY	SILTY SAND-TR CLAY	SM/SC					

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

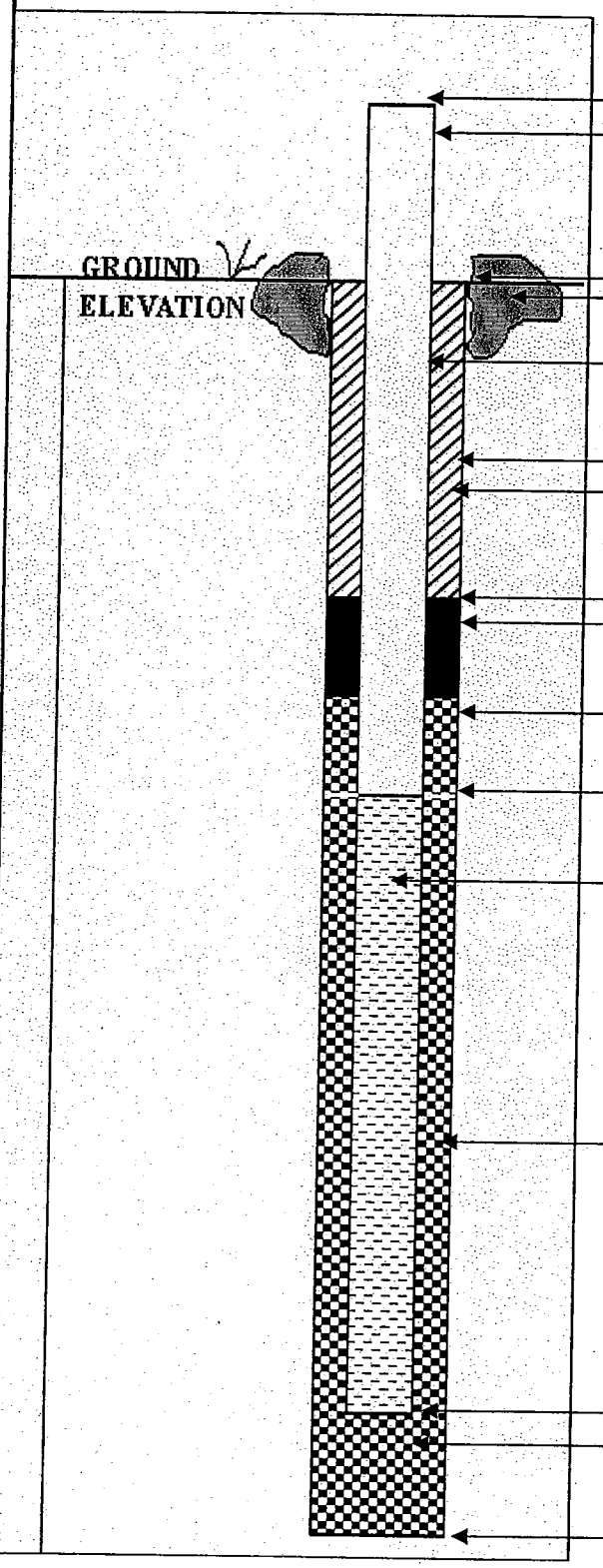
Drilling Area Background (ppm): 0

Converted to Well: Yes TW No _____ Well I.D. #: TW-47I

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

BORING NO.: TW-22S

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-22S
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9-21-07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	188709.67
GEOLOGIST:	Conti	DEV. METHOD:		EASTING:	2094619.66



ELEVATION OF TOP OF RISER PIPE: 12.27

RISER STICK-UP ABOVE GROUND SURFACE: 1.48

GROUND ELEVATION: 10.79

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: / —

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: / —

ELEVATION / DEPTH TOP OF SCREEN: / 8

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10SL X 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: / 13

ELEVATION / DEPTH BOTTOM OF FILTER PACK: / NA

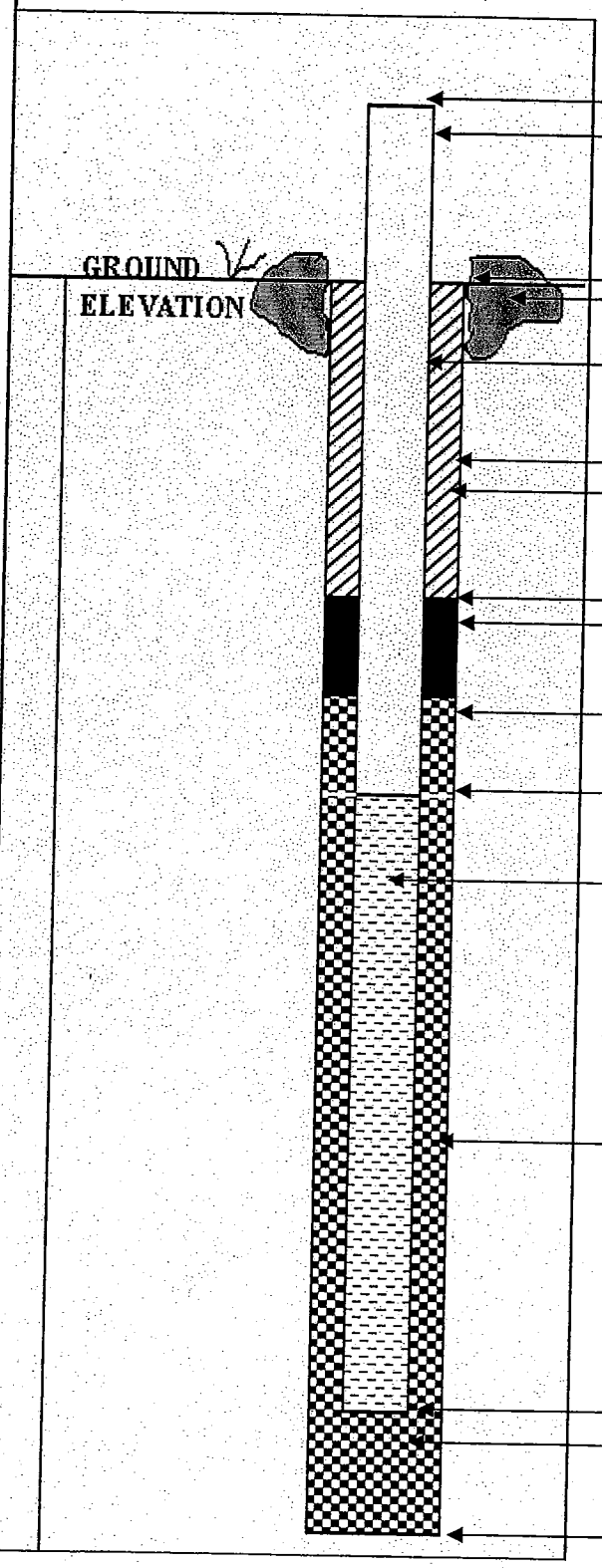
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: / 13

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

BORING NO.: TW-23I

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-23I
PROJECT No.:	G00455	DRILLER:		DATE COMPLETED:	9-21-07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	188713.54
GEOLOGIST:	Conti	DEV. METHOD:		EASTING:	2094621.20



ELEVATION OF TOP OF RISER PIPE: 11.88

RISER STICK-UP ABOVE GROUND SURFACE: 1.02

GROUND ELEVATION: 10.86

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: / NA

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: / NA

ELEVATION / DEPTH TOP OF SCREEN: / 18

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 SL X 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: / 23

ELEVATION / DEPTH BOTTOM OF FILTER PACK: / NA

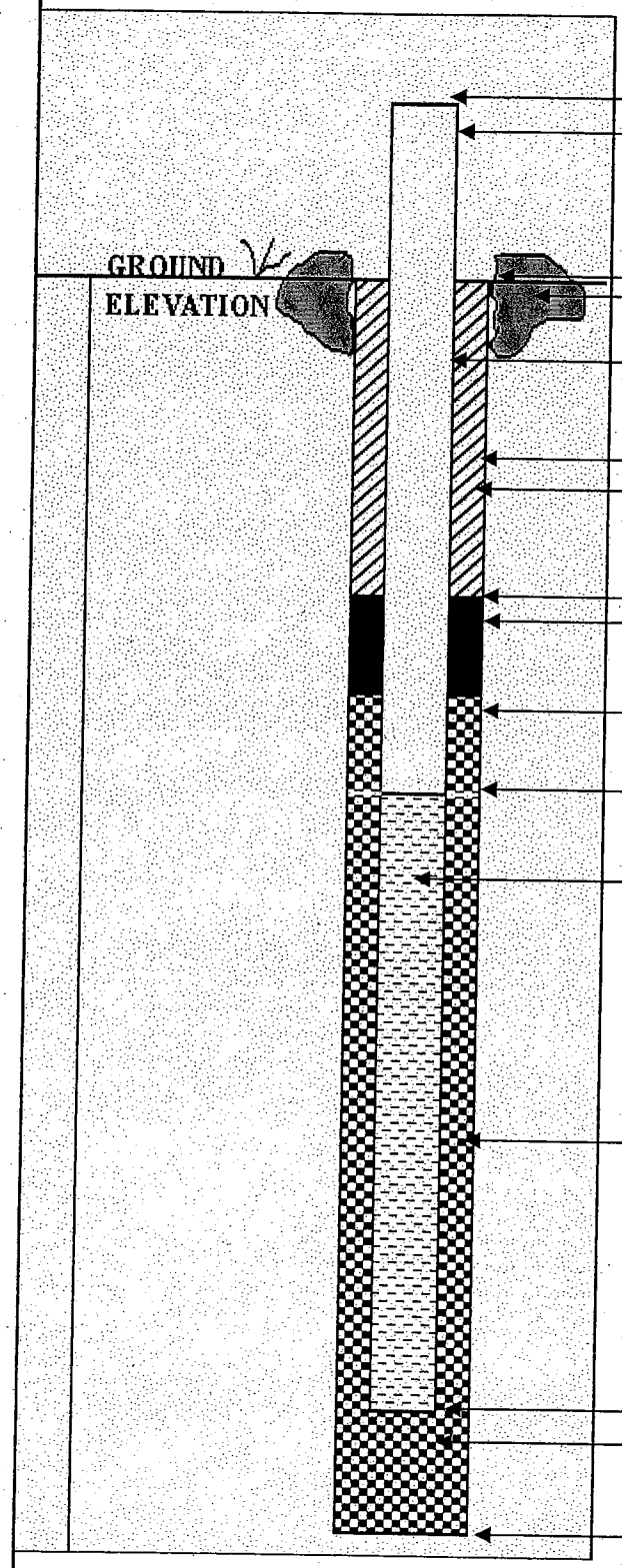
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: / 25

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

BORING NO.: TW-245

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-245
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9-21-07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	188837.83
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094644.56



ELEVATION OF TOP OF RISER PIPE: 12.88

RISER STICK-UP ABOVE GROUND SURFACE: 1.16

GROUND ELEVATION: 11.72

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: /—

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: /—

ELEVATION / DEPTH TOP OF SCREEN: /9'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10SL x 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: /14'

ELEVATION / DEPTH BOTTOM OF FILTER PACK: /NA

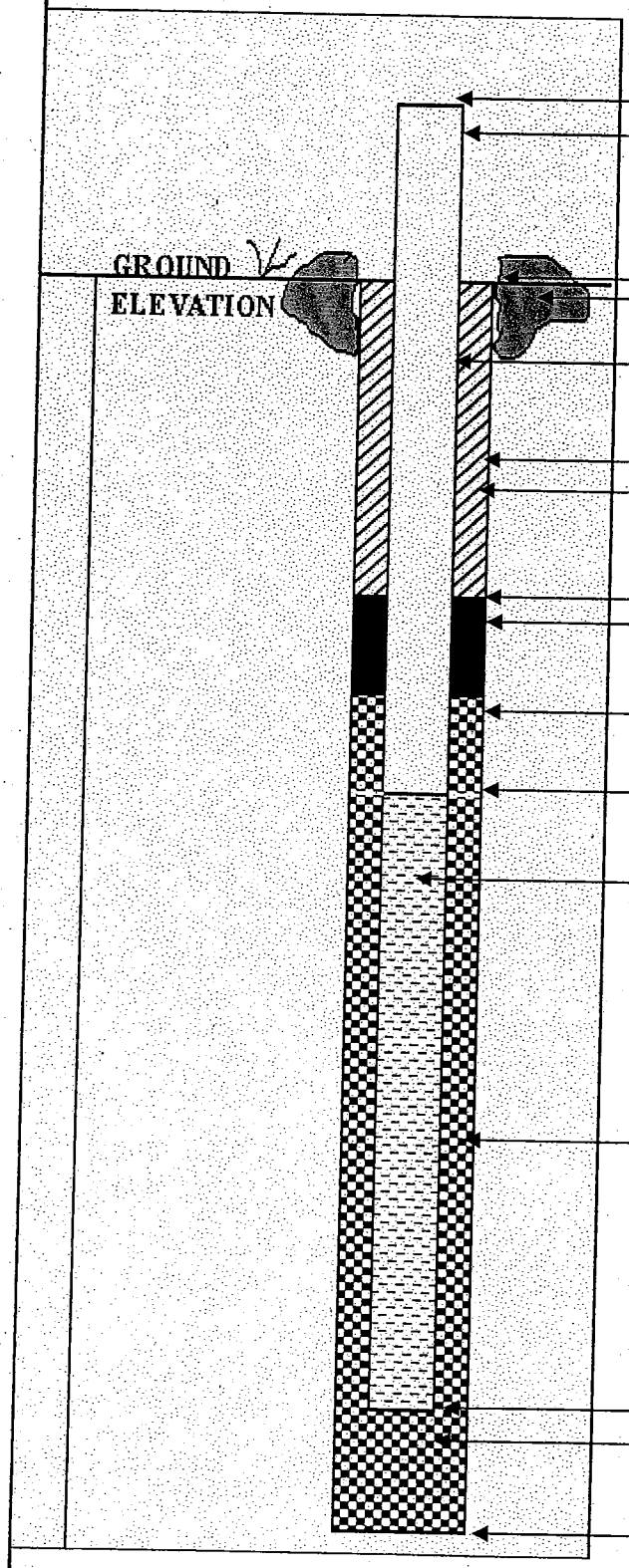
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: /15'

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

BORING NO.: TW-25I

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-25I
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9-21-07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	188852.39
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094524.59



ELEVATION OF TOP OF RISER PIPE: 15.85

RISER STICK-UP ABOVE GROUND SURFACE: 0.55

GROUND ELEVATION: 15.30

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: / —

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: / —

ELEVATION / DEPTH TOP OF SCREEN: / 19

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 SL x 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: / 24

ELEVATION / DEPTH BOTTOM OF FILTER PACK: / NA

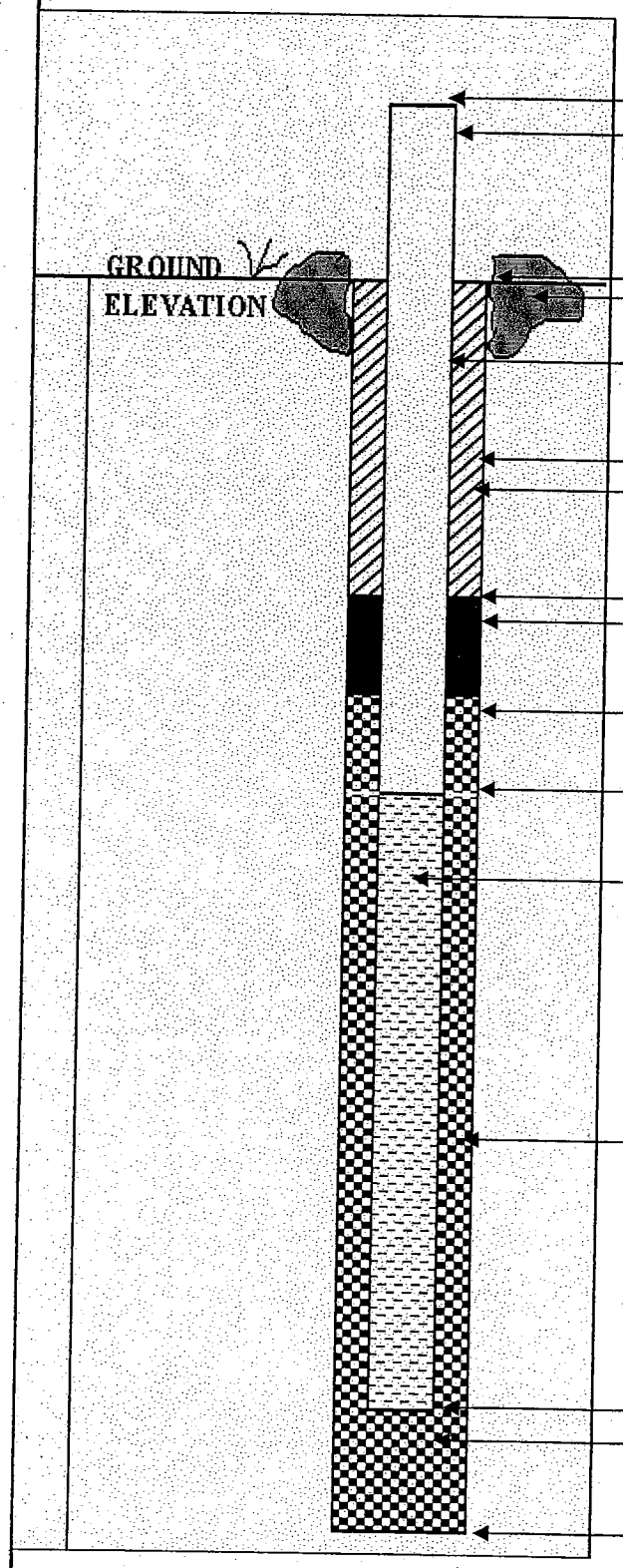
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: / 25

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

BORING NO.: TW-26S

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-26S
PROJECT No.:	G00455	DRILLER:	SAMWELL	DATE COMPLETED:	9/20/07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	188901.09
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094412.71



ELEVATION OF TOP OF RISER PIPE: 16.43

RISER STICK-UP ABOVE GROUND SURFACE: 1.73

GROUND ELEVATION: 14.70

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: / —

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: / —

ELEVATION / DEPTH TOP OF SCREEN: / 8

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 SL x 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: / 13

ELEVATION / DEPTH BOTTOM OF FILTER PACK: / NA

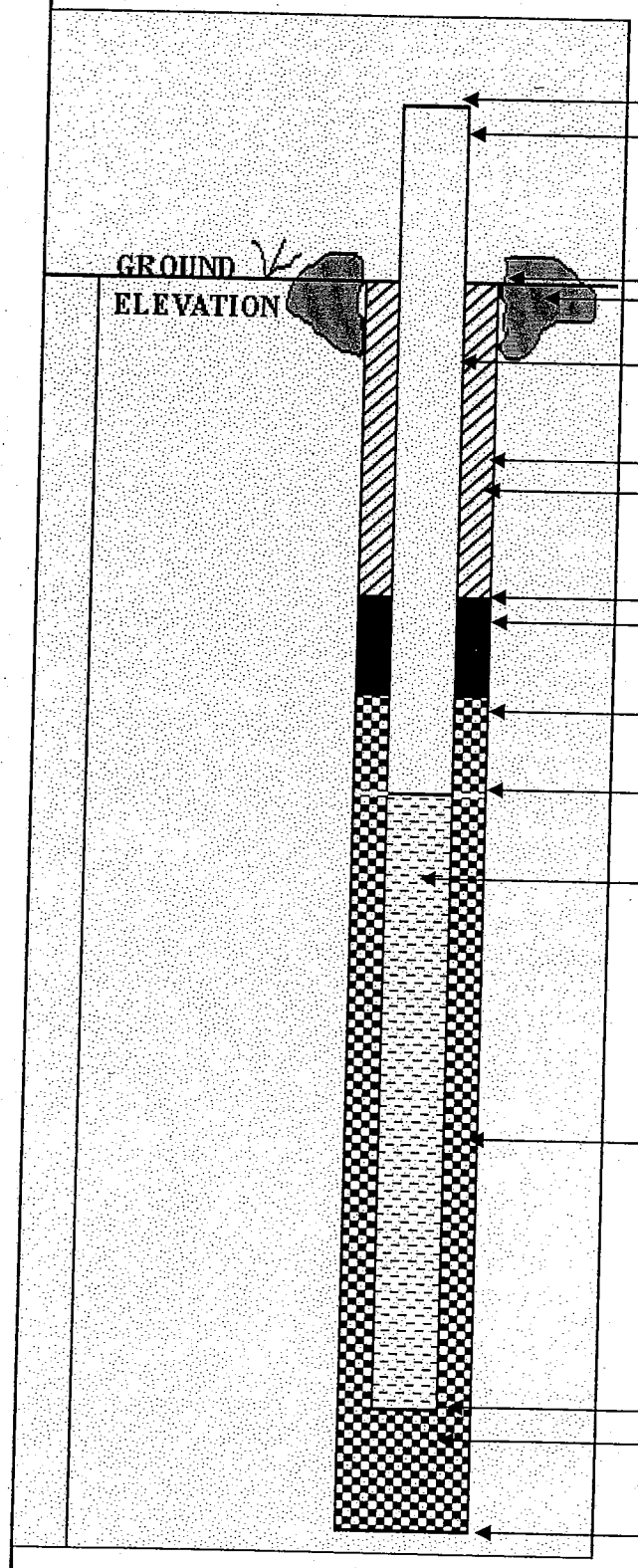
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: / 13

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

BORING NO.: TW-27I

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-27 I
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9/20/07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	188907.37
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094417.44



ELEVATION OF TOP OF RISER PIPE: 15.75

RISER STICK-UP ABOVE GROUND SURFACE: 0.95

GROUND ELEVATION: 14.80

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: /NA

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: /NA

ELEVATION / DEPTH TOP OF SCREEN: / 19

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 SL x 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: / 24

ELEVATION / DEPTH BOTTOM OF FILTER PACK: / NA

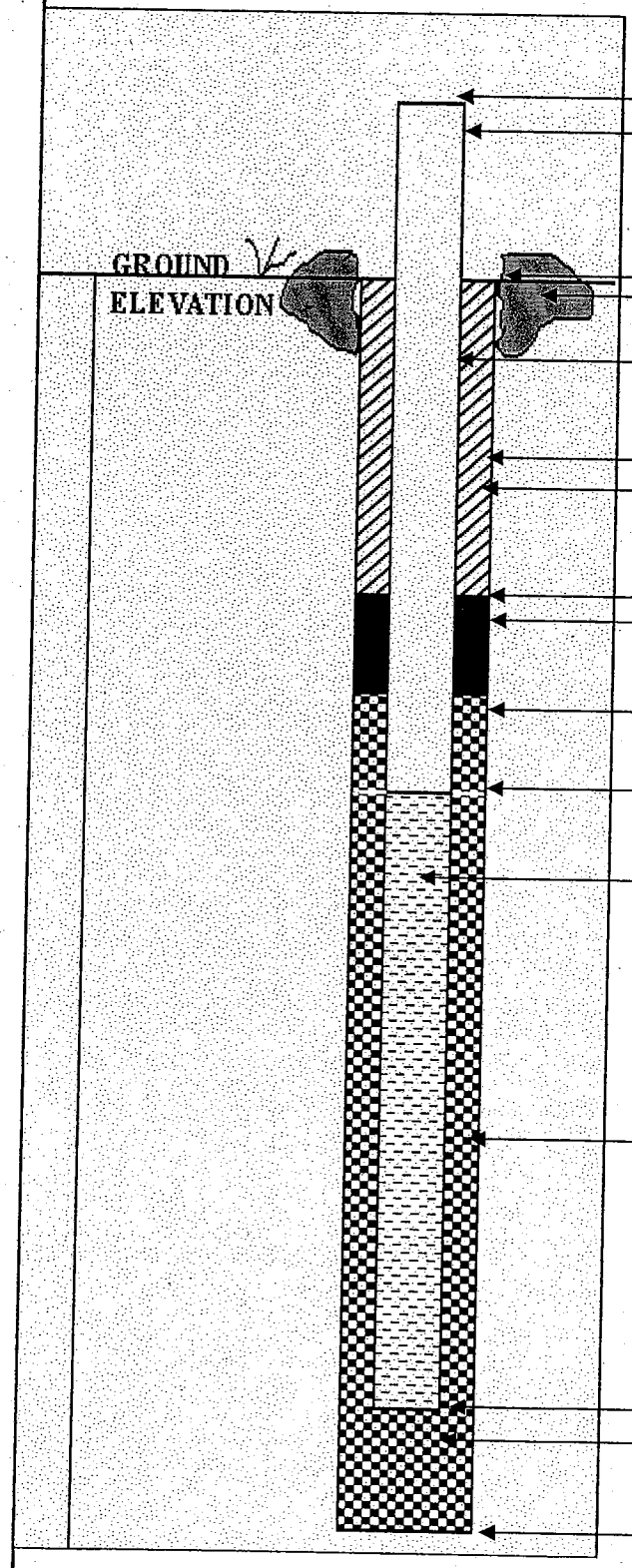
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: / 25

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

BORING NO.: TW 28 S

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-28S
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9/20/07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	189003.17
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094268.00



ELEVATION OF TOP OF RISER PIPE: 13.07

RISER STICK-UP ABOVE GROUND SURFACE: 1.09

GROUND ELEVATION: 11.98

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: —

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: / —

ELEVATION / DEPTH TOP OF SCREEN: / 7

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10SL X 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: / 12

ELEVATION / DEPTH BOTTOM OF FILTER PACK: / NA

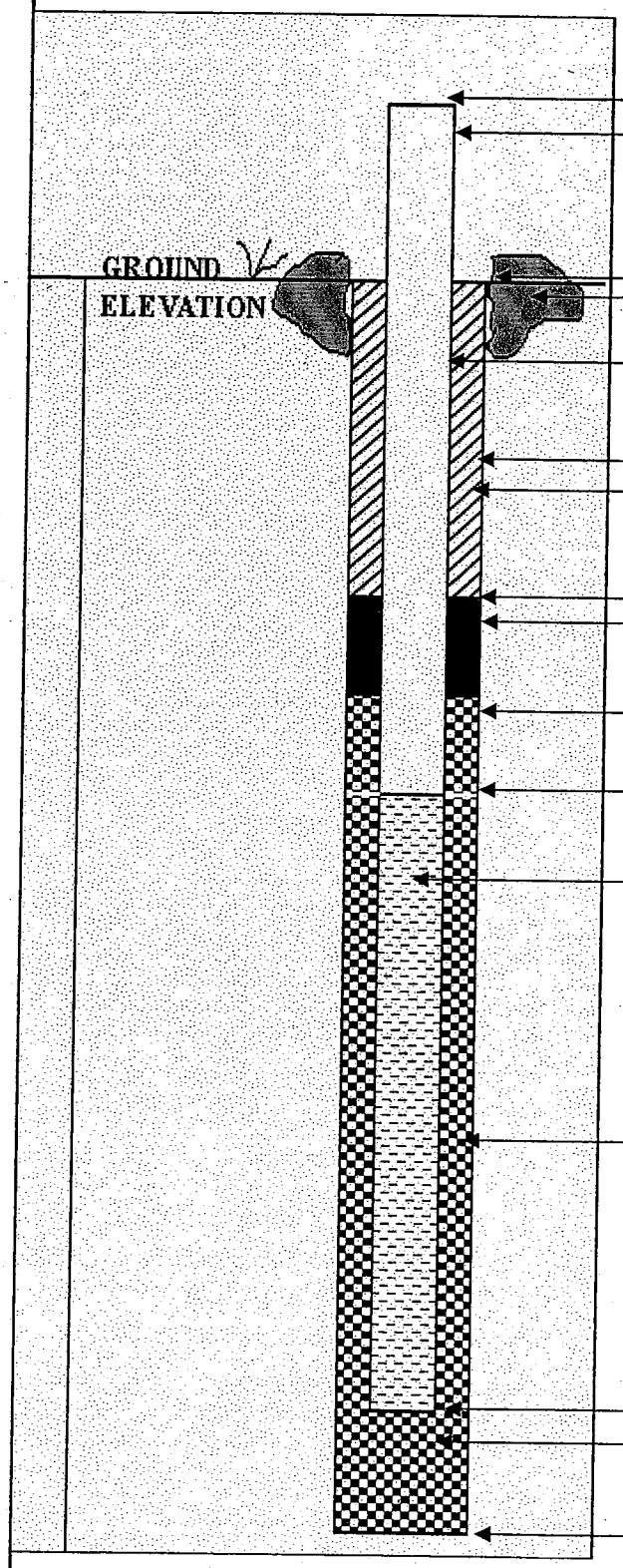
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: / 12

BORING NO.: TW 29F

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW 29 F
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9/20/07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	189001.33
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094271.02



ELEVATION OF TOP OF RISER PIPE: 13.11

RISER STICK-UP ABOVE GROUND SURFACE: 1.01

GROUND ELEVATION: 12-10

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: /—

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: /—

ELEVATION / DEPTH TOP OF SCREEN: / 19

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 SL x 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: / 24

ELEVATION / DEPTH BOTTOM OF FILTER PACK: / NA

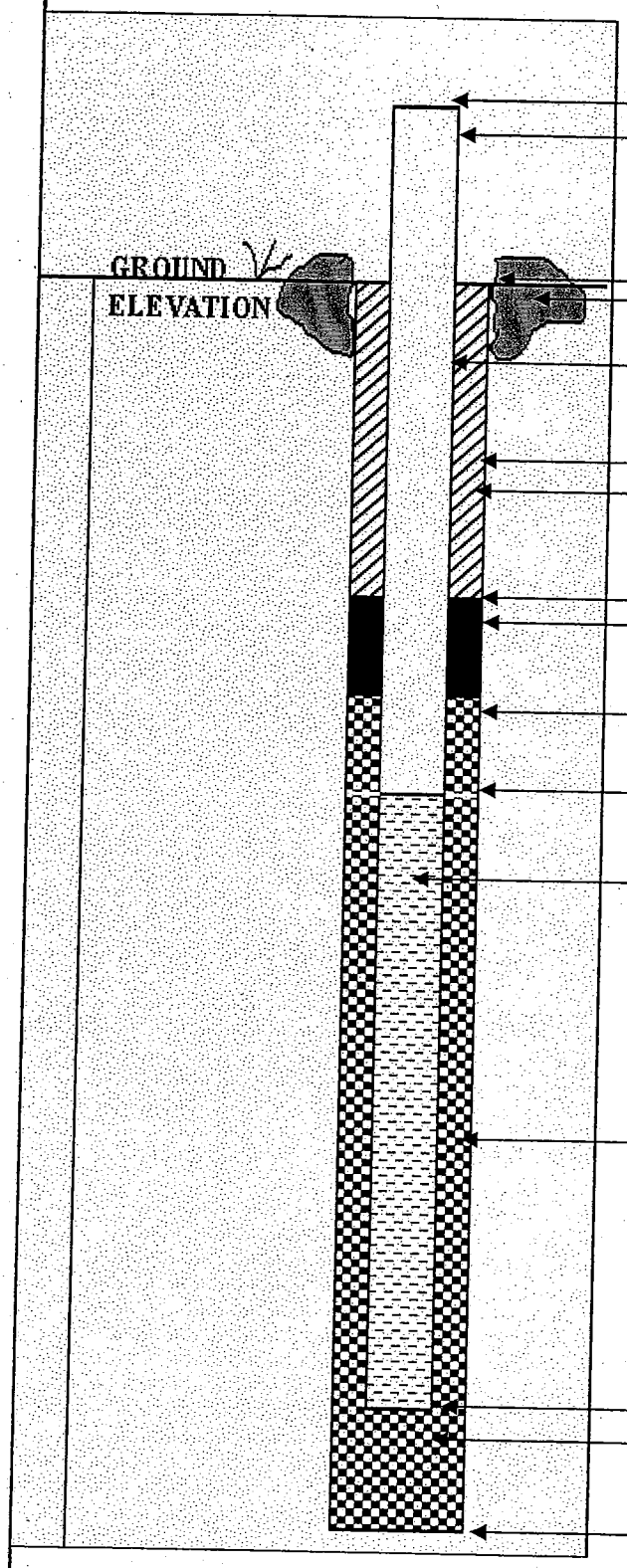
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: / 24

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

BORING NO.: TW-30S

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-30S
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9-19-07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	189124.42
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094324.42



ELEVATION OF TOP OF RISER PIPE: 12.43

RISER STICK-UP ABOVE GROUND SURFACE: 0.92

GROUND ELEVATION: 11.51

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: / —

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: / —

ELEVATION / DEPTH TOP OF SCREEN: / 6

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 SL X 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: / 11

ELEVATION / DEPTH BOTTOM OF FILTER PACK: / NA

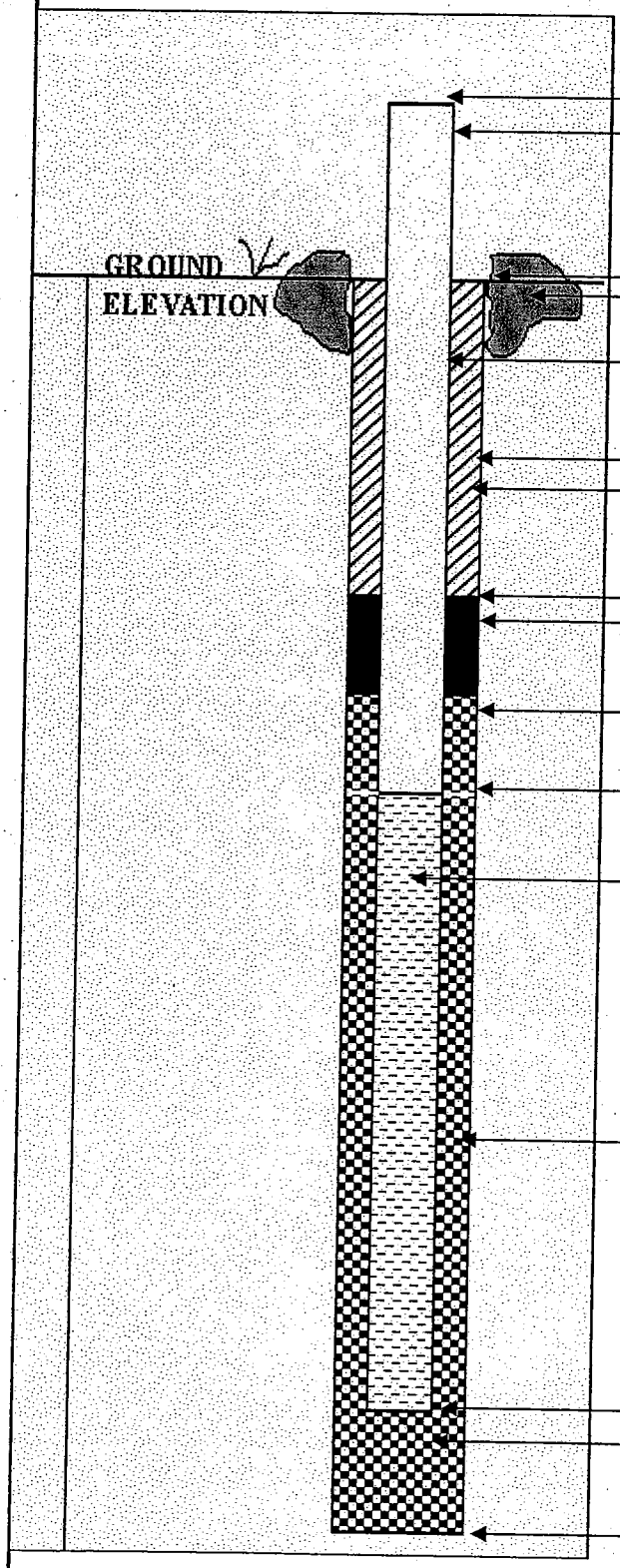
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: / 11

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

BORING NO.: TW-31I

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-31 I
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9-19-07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	189121-00
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094320.38



ELEVATION OF TOP OF RISER PIPE: 11.87

RISER STICK-UP ABOVE GROUND SURFACE: 0.40

GROUND ELEVATION: 11.47

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: / NA

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: / NA

ELEVATION / DEPTH TOP OF SCREEN: / 19

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 SL x 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: / 24

ELEVATION / DEPTH BOTTOM OF FILTER PACK: / NA

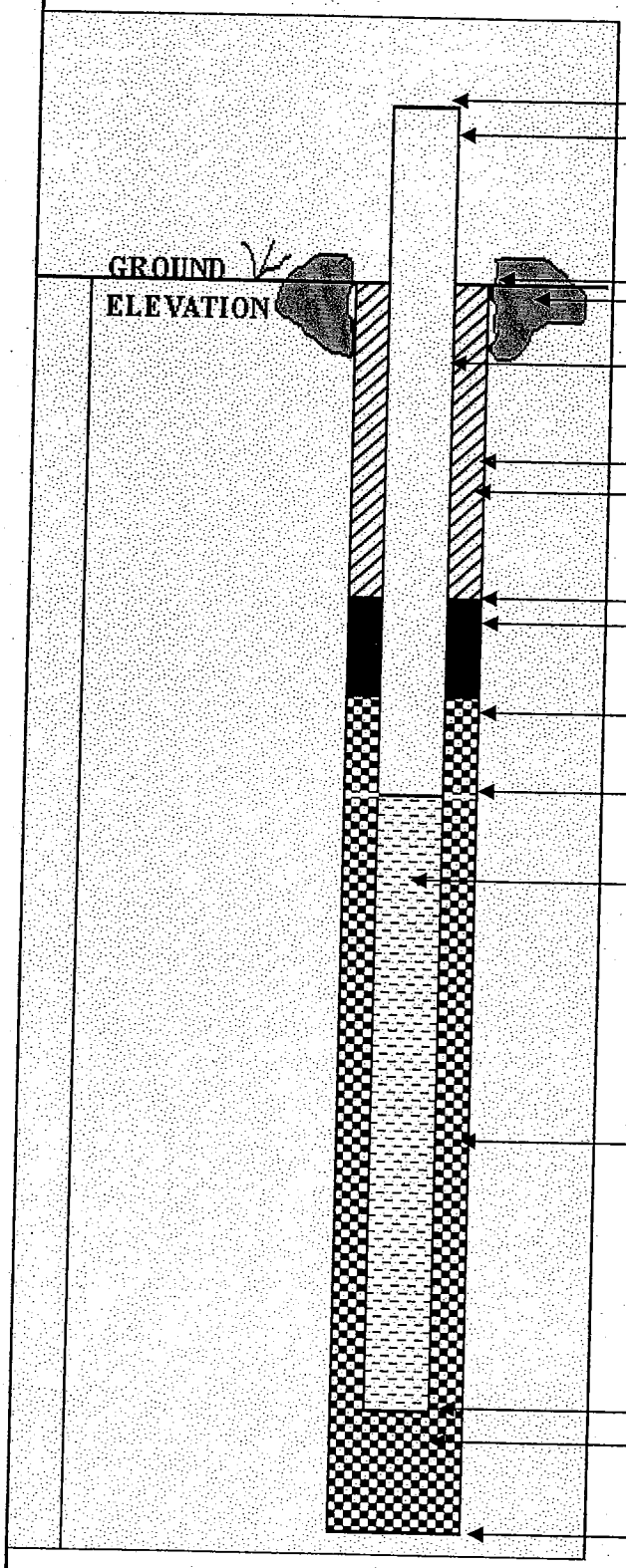
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: / 24

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

BORING NO.: TW-32I

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-32 I
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9/20/07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	189080.97
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094523.70



ELEVATION OF TOP OF RISER PIPE: 11.77

RISER STICK-UP ABOVE GROUND SURFACE: .47

GROUND ELEVATION: 11.30 ?

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: / —

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: / —

ELEVATION / DEPTH TOP OF SCREEN: / 19

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 SL x 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: / 24

ELEVATION / DEPTH BOTTOM OF FILTER PACK: / —

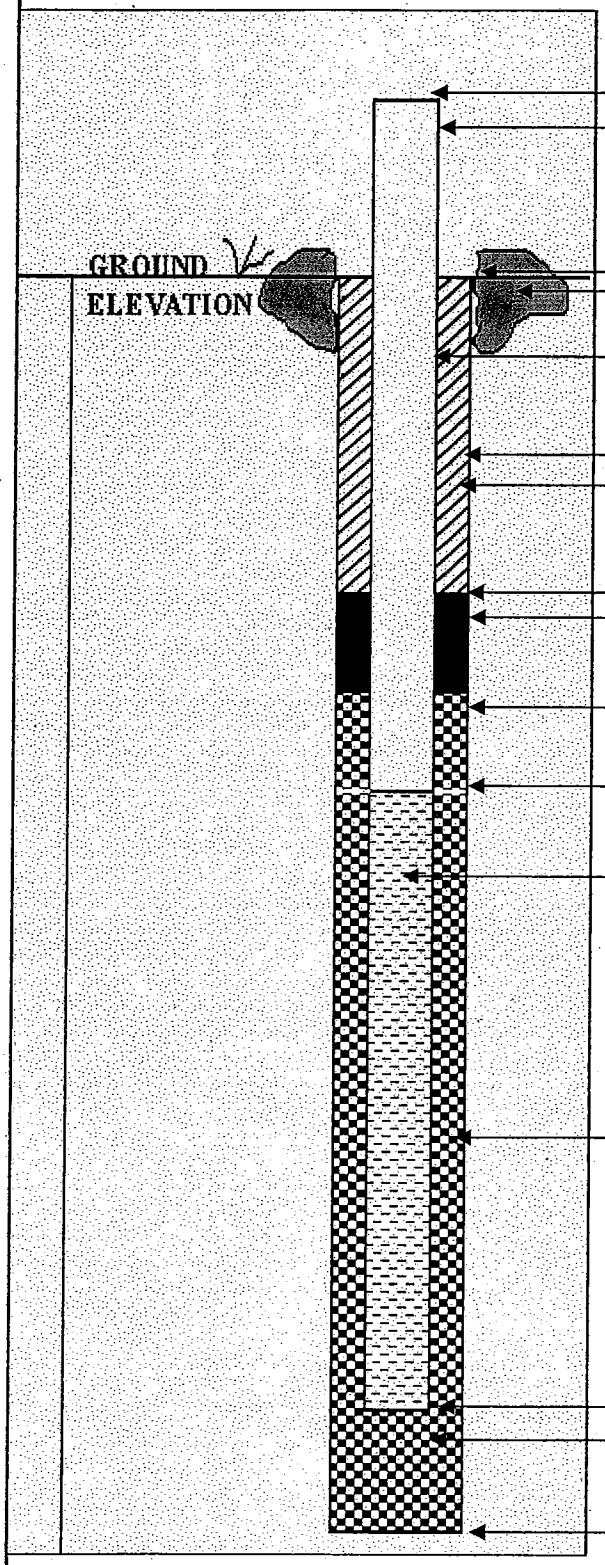
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: / 25

BORING NO.: TW-33S

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-33S
PROJECT No.:	G00455	DRILLER:	SAMWELL	DATE COMPLETED:	9/21/07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	188991.56
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094693.48



ELEVATION OF TOP OF RISER PIPE: 13.95

RISER STICK-UP ABOVE GROUND SURFACE: .85

GROUND ELEVATION: 13.10

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: /—

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: /—

ELEVATION / DEPTH TOP OF SCREEN: /8

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 SL X 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: /13

ELEVATION / DEPTH BOTTOM OF FILTER PACK: /13

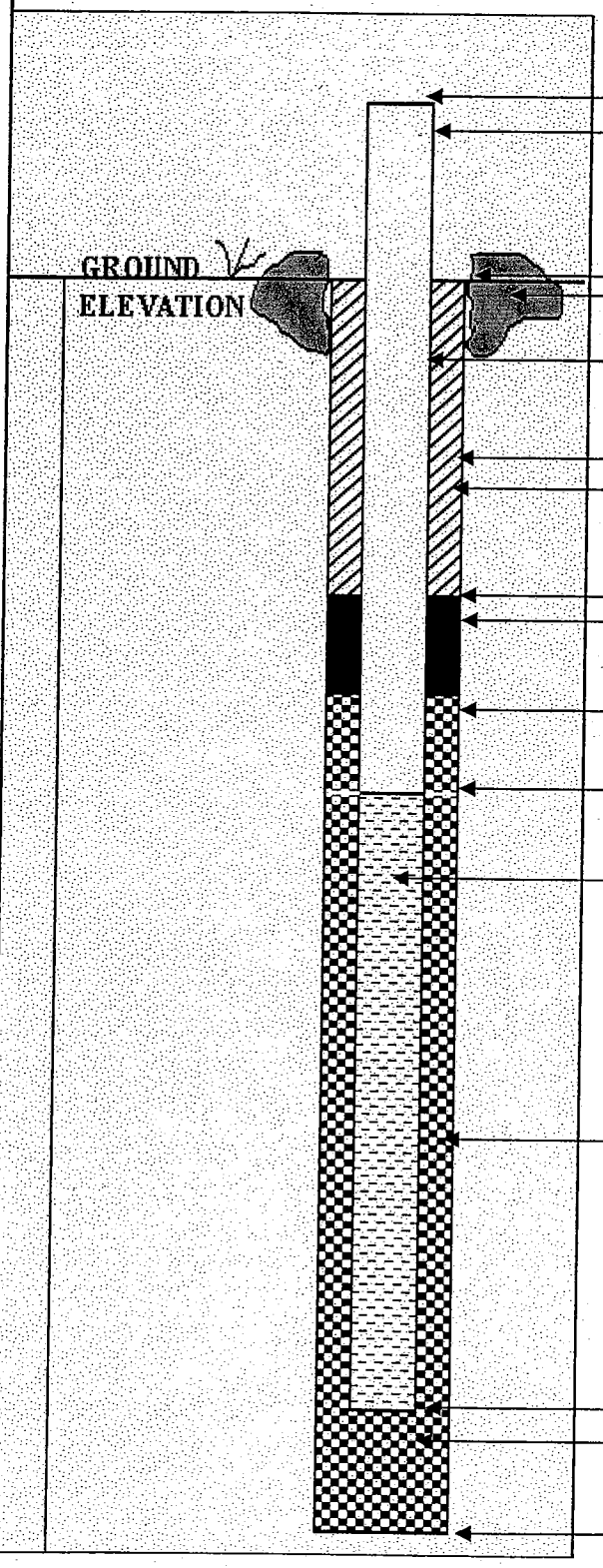
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: /13

BORING NO.: TW-34I

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-34 I
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9-21-07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	188987.57
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094691.64



ELEVATION OF TOP OF RISER PIPE: 13.87

RISER STICK-UP ABOVE GROUND SURFACE: .80

GROUND ELEVATION: 13.07

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: / —

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: / —

ELEVATION / DEPTH TOP OF SCREEN: / 20

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 SL X 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: / 25

ELEVATION / DEPTH BOTTOM OF FILTER PACK: / 25

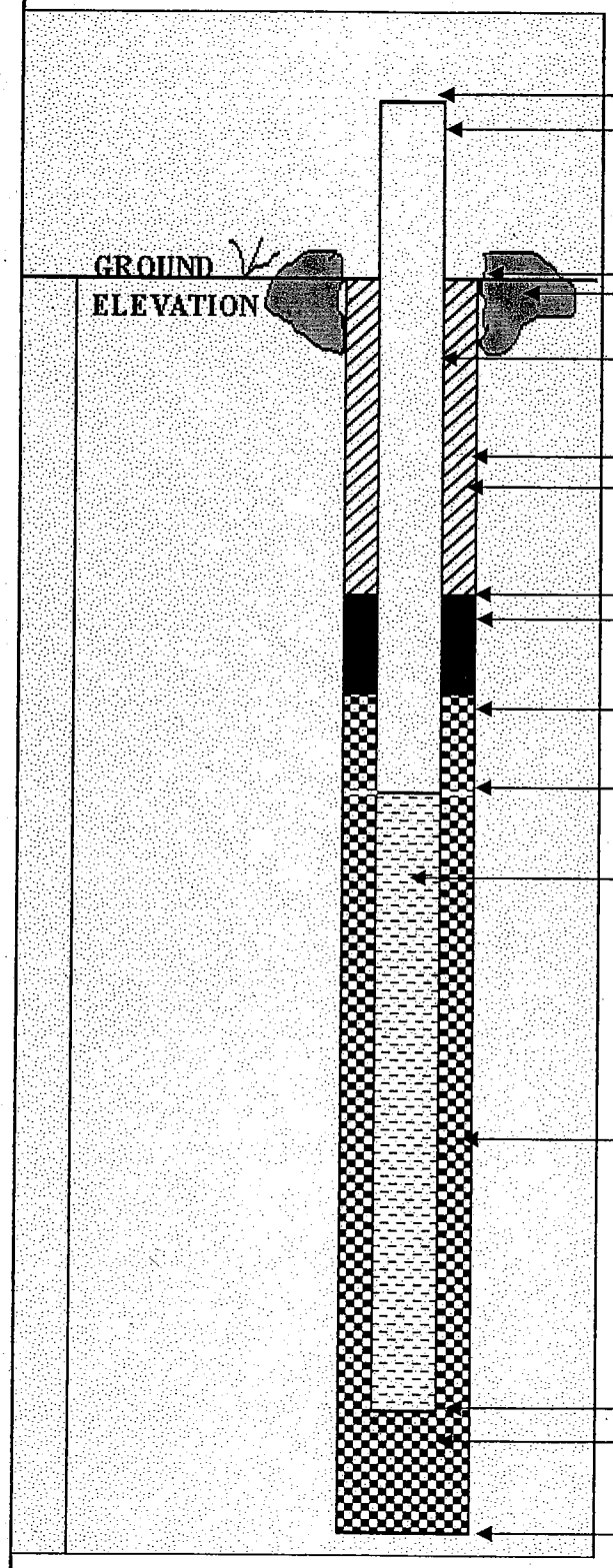
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: / 25

BORING NO.: TW-35S

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-35S
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9-21-07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	189152.94
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094924.36



ELEVATION OF TOP OF RISER PIPE: 13.84

RISER STICK-UP ABOVE GROUND SURFACE: 2.01

GROUND ELEVATION: 11.83

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: / —

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: / —

ELEVATION / DEPTH TOP OF SCREEN: / 8

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10SL X 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: / 13

ELEVATION / DEPTH BOTTOM OF FILTER PACK: / 13

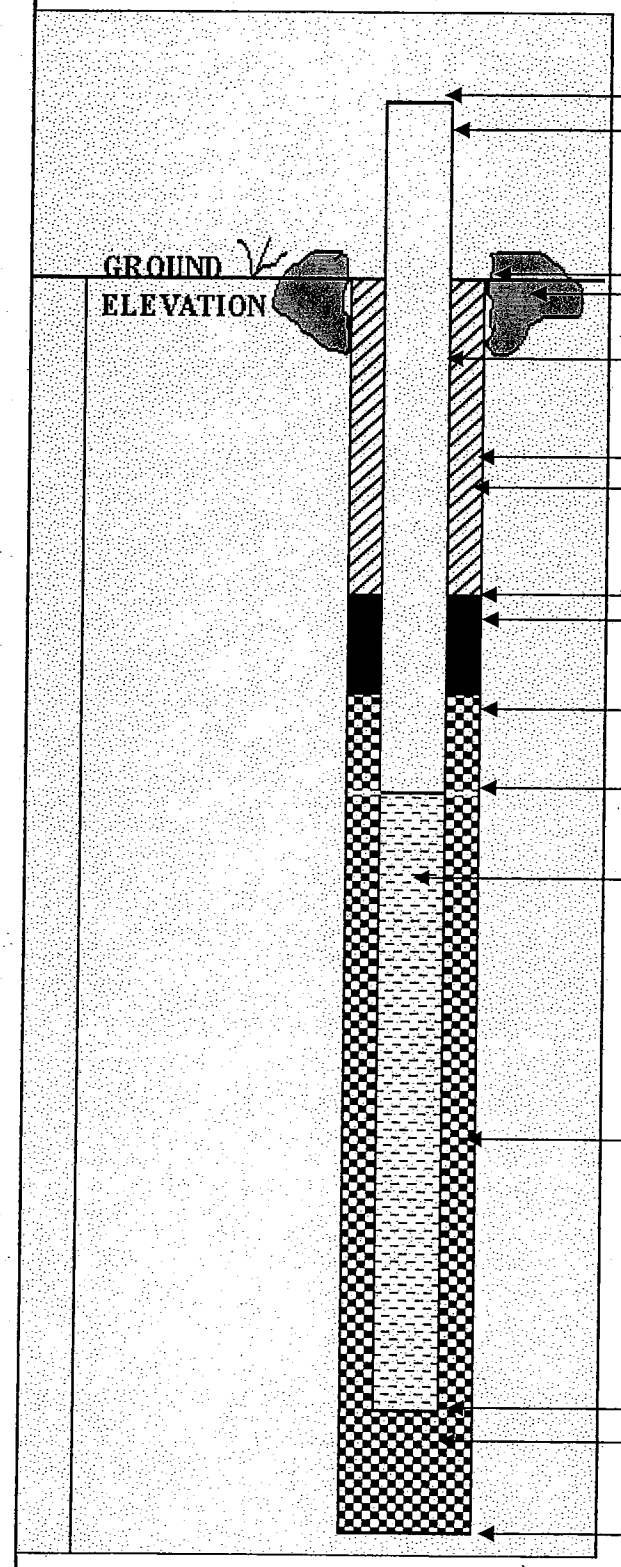
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: / 13

BORING NO.: TW-36I

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-36I
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9/21/07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	189147.39
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094922.24



ELEVATION OF TOP OF RISER PIPE: 12.39

RISER STICK-UP ABOVE GROUND SURFACE: 0.54

NA

GROUND ELEVATION: 11.85

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: / —

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: / —

ELEVATION / DEPTH TOP OF SCREEN: / 19

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10SL X 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: / 24

ELEVATION / DEPTH BOTTOM OF FILTER PACK: / —

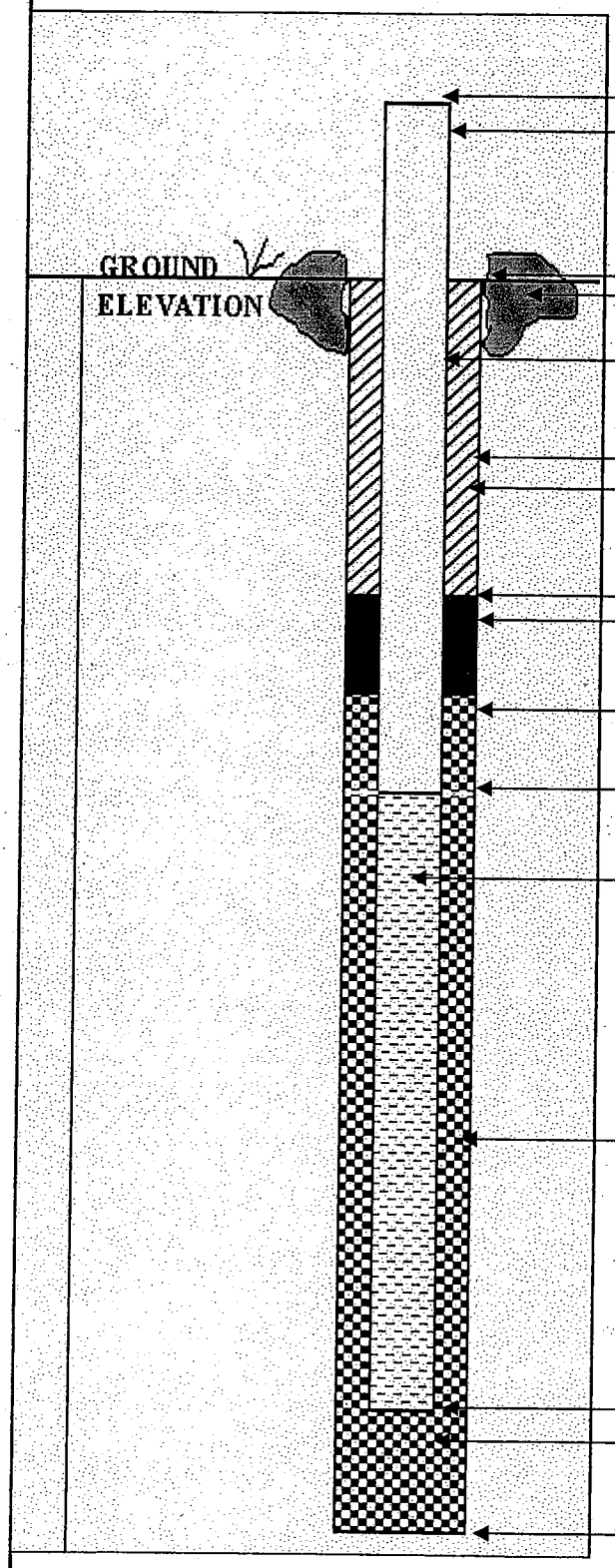
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: / 25

BORING NO.: TW-37S

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-37S
PROJECT No.:	G00455	DRILLER:	SAMWELL	DATE COMPLETED:	9/21/07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	189094.95
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094800.32



ELEVATION OF TOP OF RISER PIPE: 13.17

RISER STICK-UP ABOVE GROUND SURFACE: .30

GROUND ELEVATION: 12.87

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: /—

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: /—

ELEVATION / DEPTH TOP OF SCREEN: /8

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10SLx5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: /13

ELEVATION / DEPTH BOTTOM OF FILTER PACK: /13

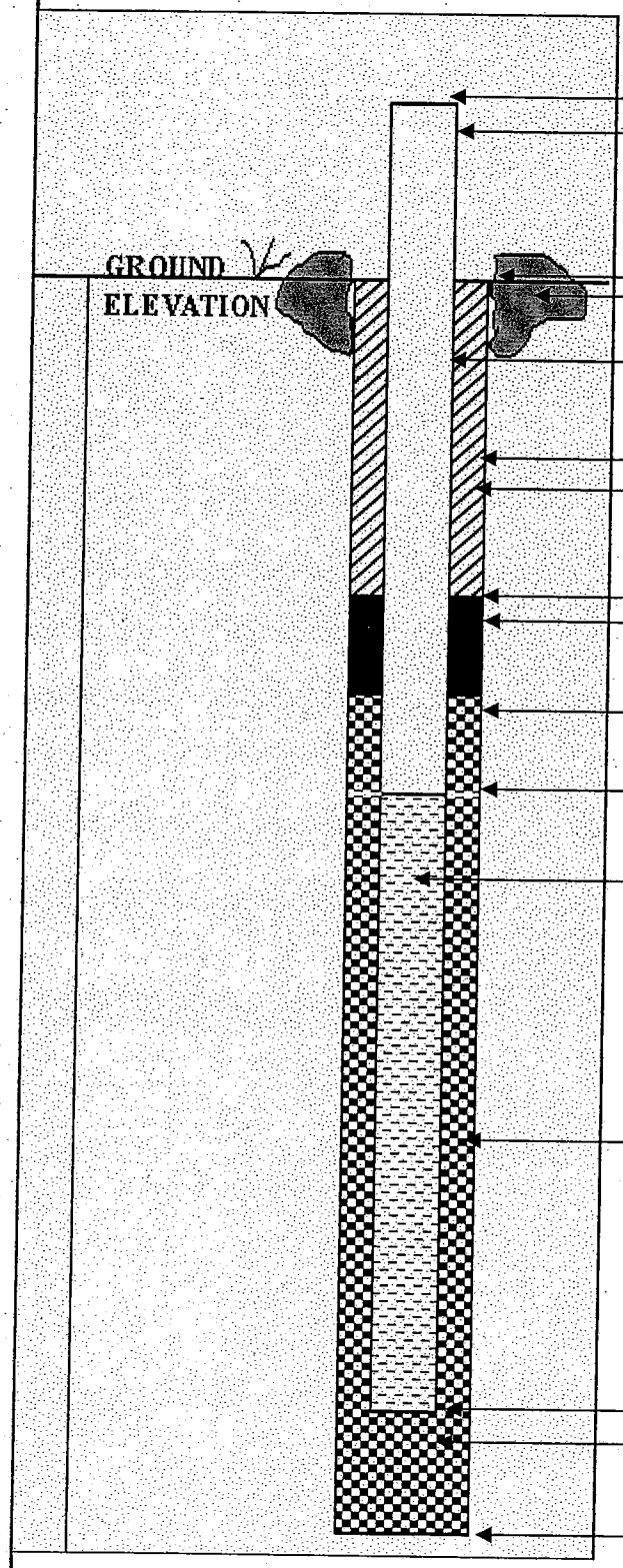
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: /13

BORING NO.: TW-38I

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-38I
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9/21/07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	189097.22
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094796.92



ELEVATION OF TOP OF RISER PIPE: 13.22

RISER STICK-UP ABOVE GROUND SURFACE: .25

GROUND ELEVATION: 12.97

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: / —

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: / —

ELEVATION / DEPTH TOP OF SCREEN: / 18

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 SL X 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: / 23

ELEVATION / DEPTH BOTTOM OF FILTER PACK: / —

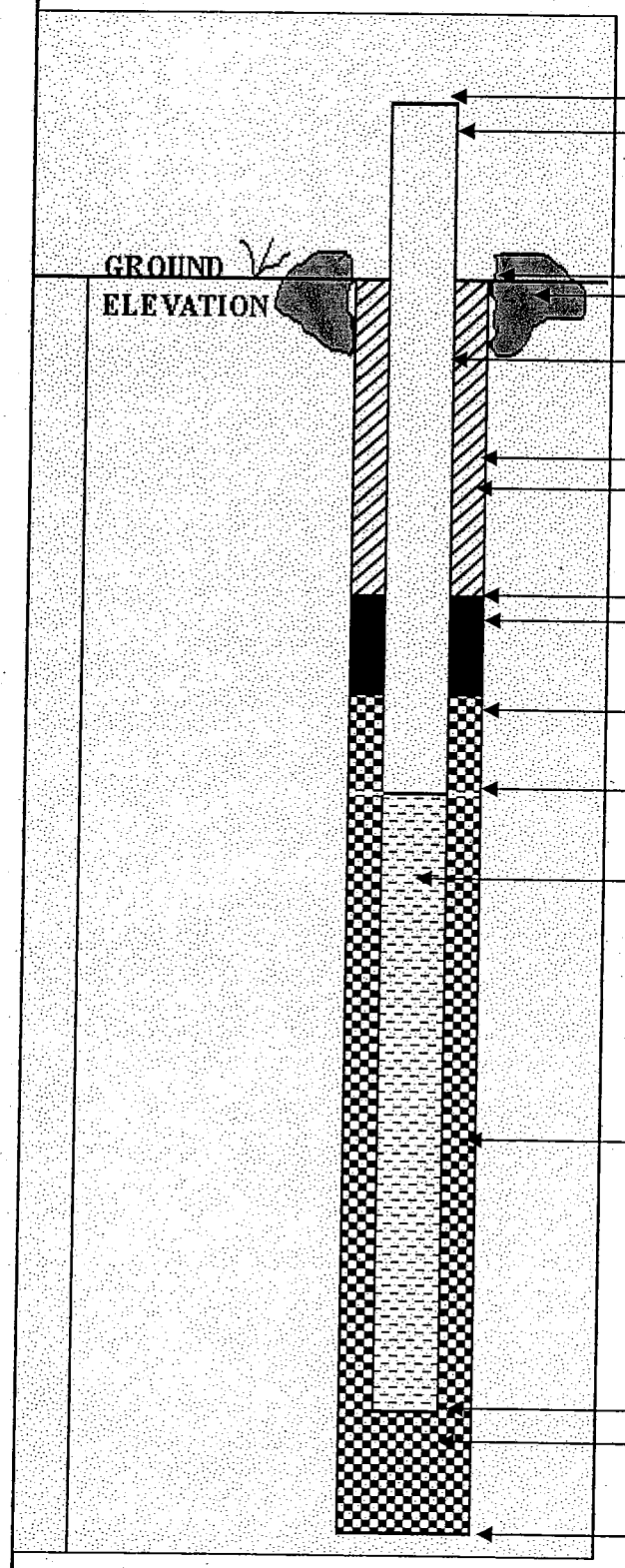
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: / 25

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

BORING NO.: TW-39S

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-39S
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9/20/07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	189189.03
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094553.57



ELEVATION OF TOP OF RISER PIPE: —

RISER STICK-UP ABOVE GROUND SURFACE: NA

GROUND ELEVATION: 13.94

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: / —

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: / —

ELEVATION / DEPTH TOP OF SCREEN: / 8

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 SL X 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: / 13

ELEVATION / DEPTH BOTTOM OF FILTER PACK: / —

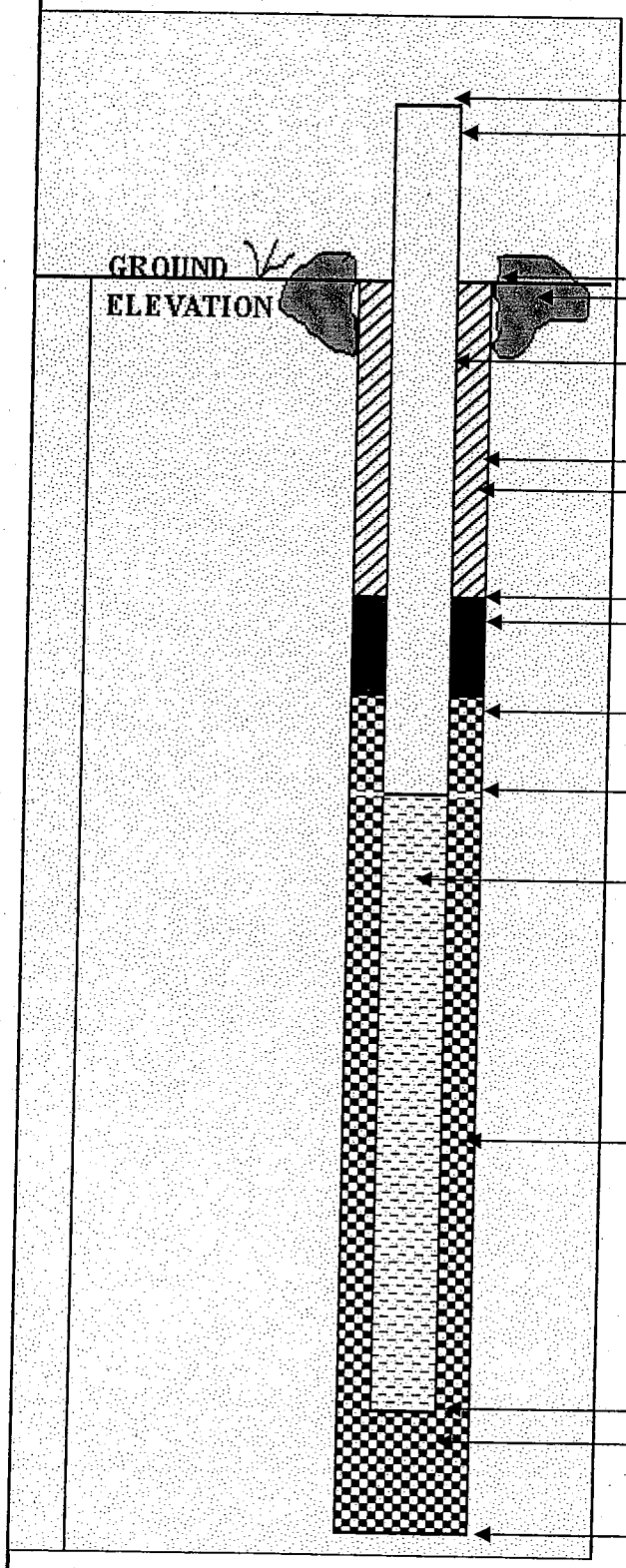
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: / 13

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

BORING NO.: TW 40I

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-40I
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9/20/07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	189192.22
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094556.21



ELEVATION OF TOP OF RISER PIPE: 14.53

RISER STICK-UP ABOVE GROUND SURFACE: .58

NA

GROUND ELEVATION: 13.95

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: /—

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: /—

ELEVATION / DEPTH TOP OF SCREEN: /19

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10SL x 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: /24

ELEVATION / DEPTH BOTTOM OF FILTER PACK: /—

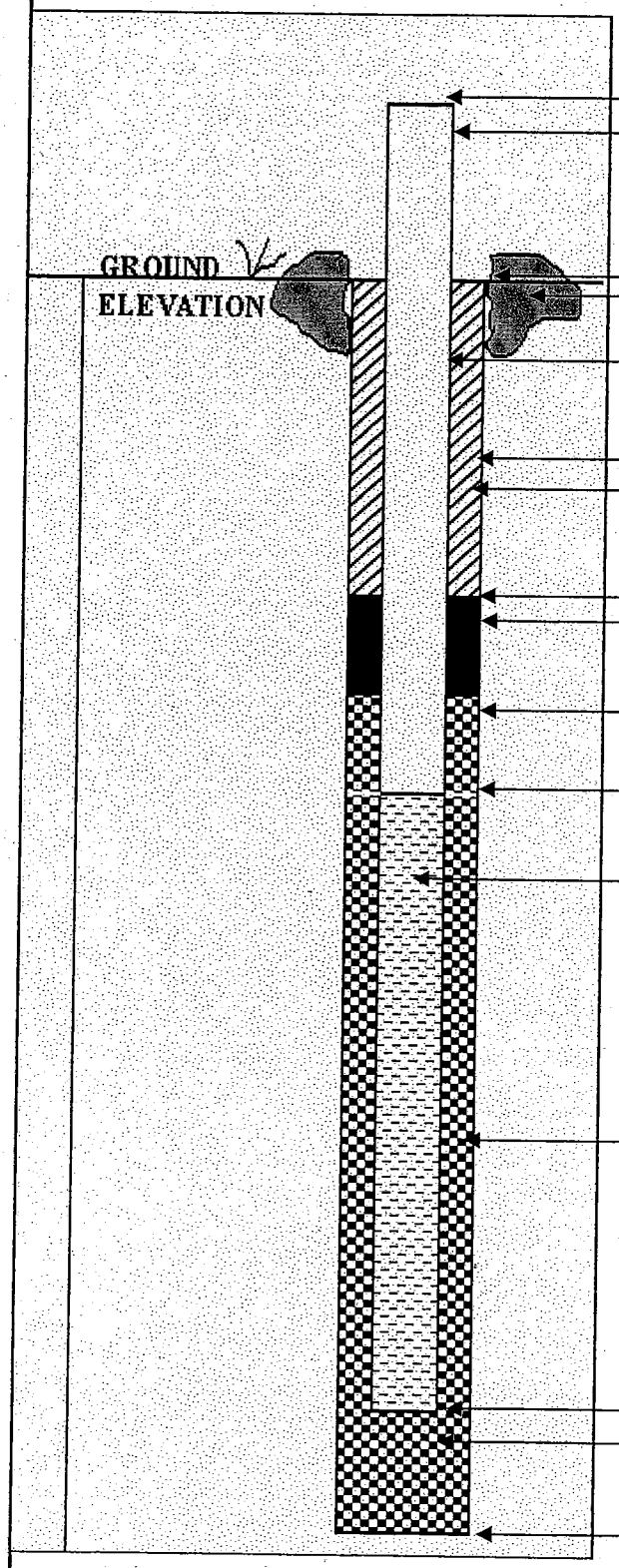
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: /25

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

BORING NO.: TW-41S

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-41S
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9/20/07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	189279.51
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094214.73



ELEVATION OF TOP OF RISER PIPE: 8.77

RISER STICK-UP ABOVE GROUND SURFACE: 1.22

GROUND ELEVATION: 7.55

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: / —

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: / —

ELEVATION / DEPTH TOP OF SCREEN: / 6

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10SL x 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: / 11

ELEVATION / DEPTH BOTTOM OF FILTER PACK: / NA

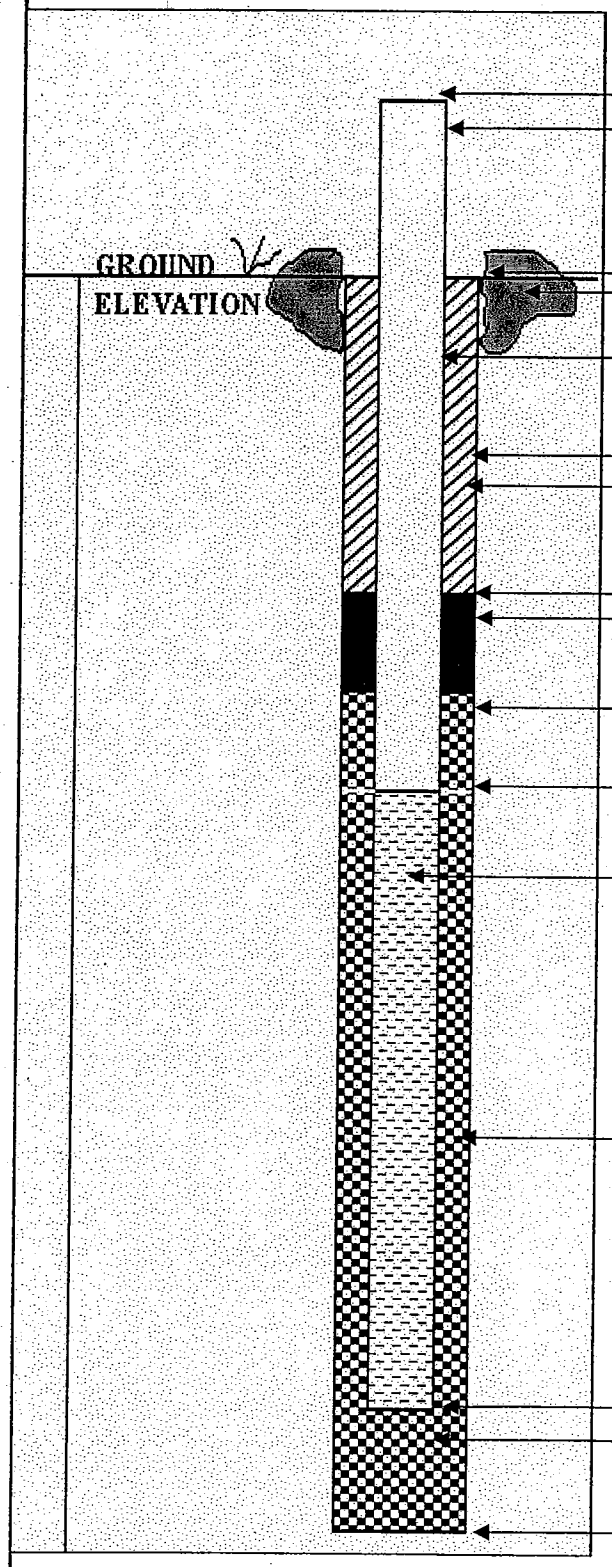
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: / 11

BORING NO.: TW-42I

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-42I
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9-20-07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	189282.37
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094216.61



ELEVATION OF TOP OF RISER PIPE: 7.97

RISER STICK-UP ABOVE GROUND SURFACE: .42

GROUND ELEVATION: 7.55

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: /—

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: /—

ELEVATION / DEPTH TOP OF SCREEN: /20

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10SL x 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: /25

ELEVATION / DEPTH BOTTOM OF FILTER PACK: /NA

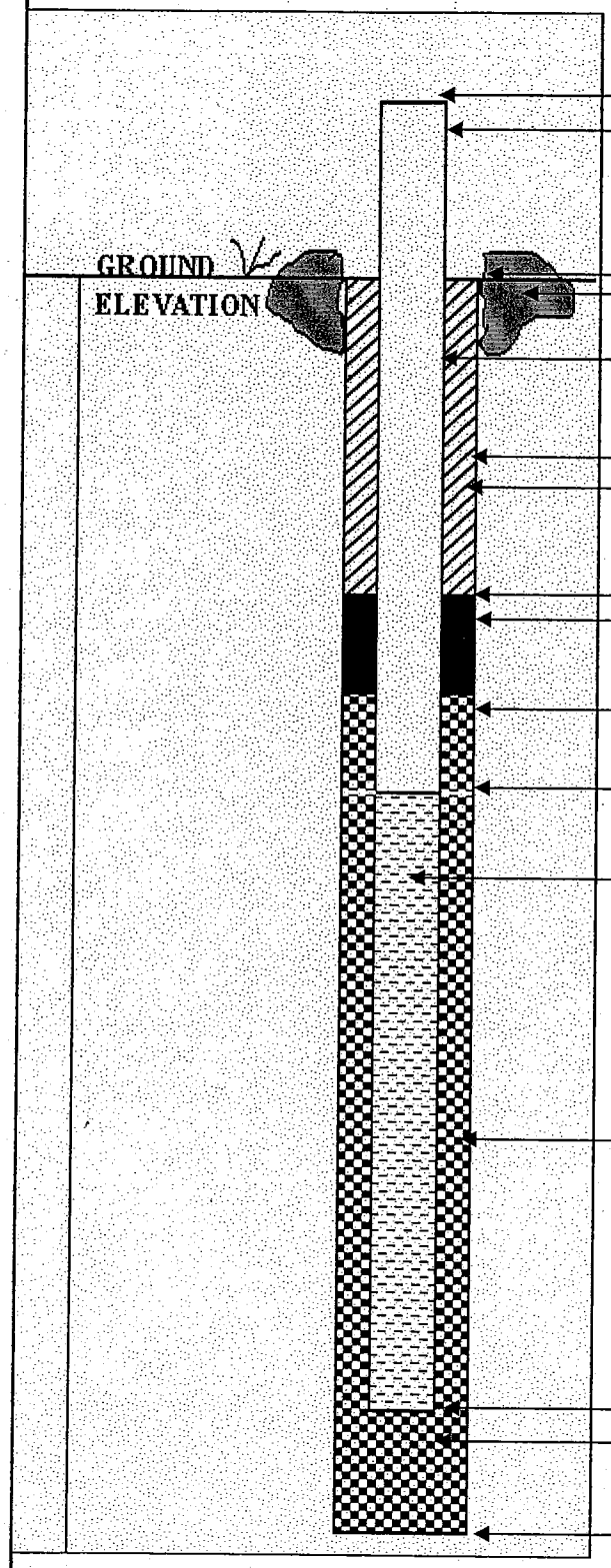
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: /25

BORING NO.: TW43S

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-43S
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9-19-07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	189115.86
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094215.30



ELEVATION OF TOP OF RISER PIPE: 9.88

RISER STICK-UP ABOVE GROUND SURFACE: .52

GROUND ELEVATION: 9.36

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: / —

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: / NA

ELEVATION / DEPTH TOP OF SCREEN: /9.5

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10SL x 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: /14.5

ELEVATION / DEPTH BOTTOM OF FILTER PACK: / NA

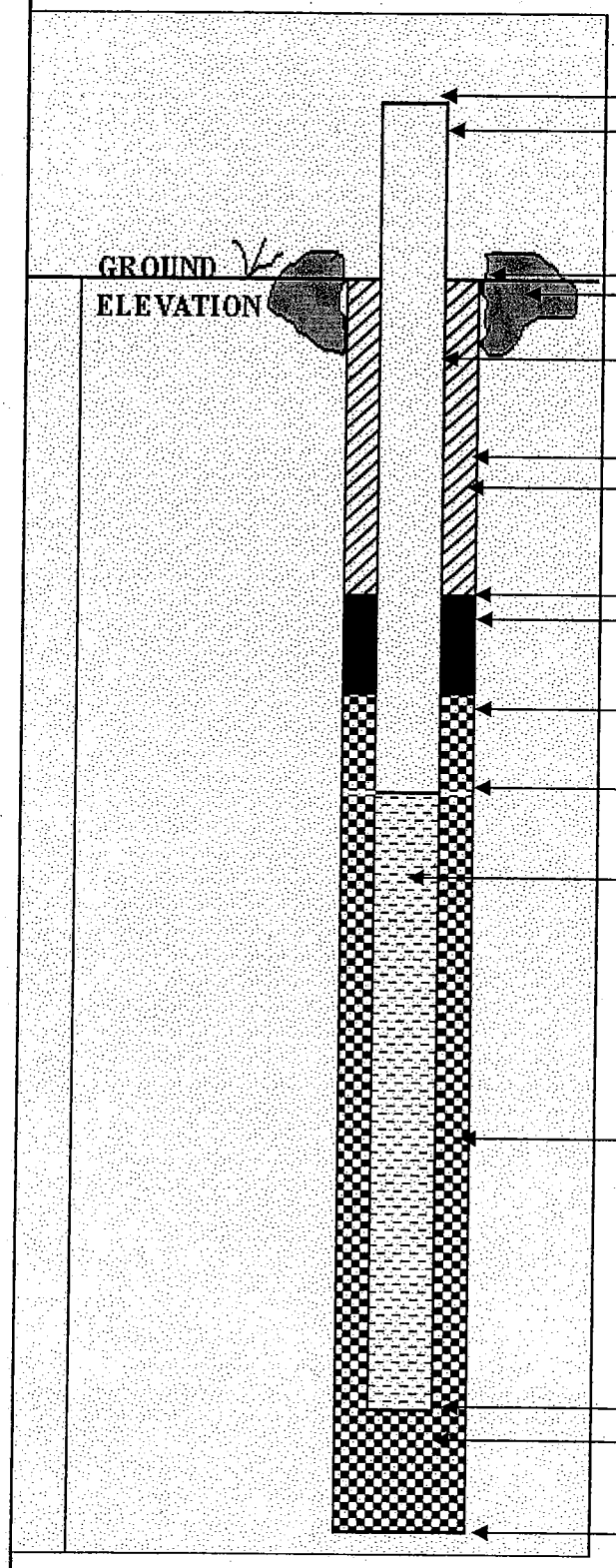
TYPE OF BACKFILL BELOW WELL:

ELEVATION / DEPTH OF BOREHOLE: /14.5

BORING NO.: TW-44I

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW 44I
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9-19-07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	189113.49
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094218.58



ELEVATION OF TOP OF RISER PIPE: 10.02

RISER STICK-UP ABOVE GROUND SURFACE: .58

GROUND ELEVATION: 9.44

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: / —

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: / —

ELEVATION / DEPTH TOP OF SCREEN: / 19.5

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10SLX 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: / 24.5

ELEVATION / DEPTH BOTTOM OF FILTER PACK: / NA

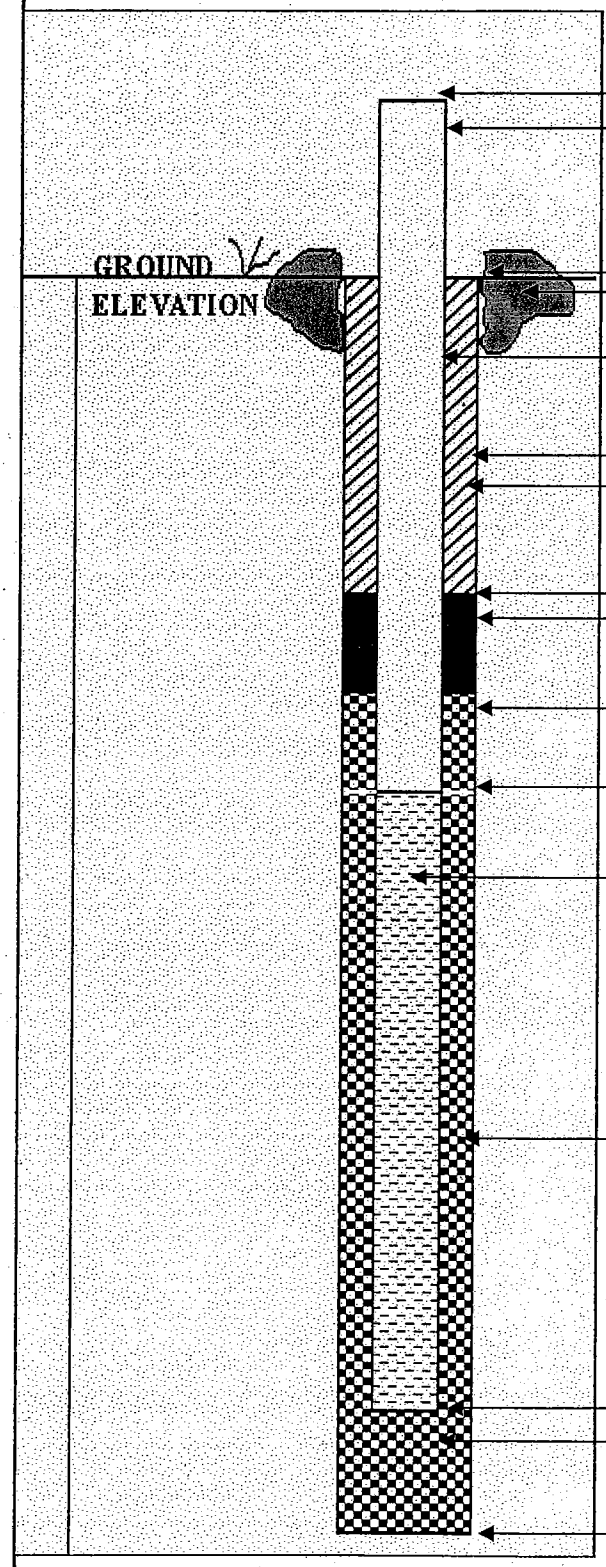
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: / 25

BORING NO.: TW 45D

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-45D
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9-19-07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	189119.73
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094324.45



ELEVATION OF TOP OF RISER PIPE: 11.99

RISER STICK-UP ABOVE GROUND SURFACE: .39

GROUND ELEVATION: 11.60

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: / NA

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: / NA

ELEVATION / DEPTH TOP OF SCREEN: / 29

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10SL x 5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: /34

ELEVATION / DEPTH BOTTOM OF FILTER PACK: / NA

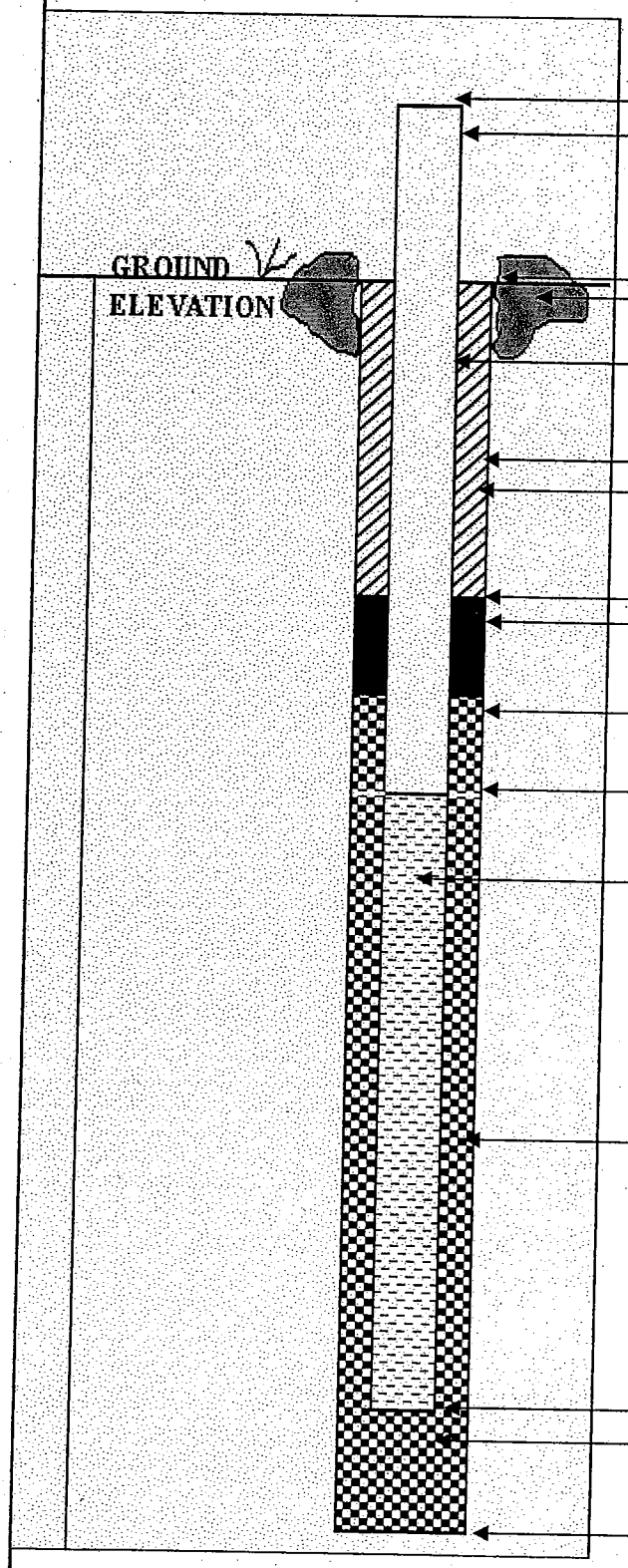
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: / 35

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

BORING NO.: TW46S

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW46S
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9/20/07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	188824.74
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094354.72



ELEVATION OF TOP OF RISER PIPE: 15.87

RISER STICK-UP ABOVE GROUND SURFACE: 1.75

GROUND ELEVATION: 14.12

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: / —

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: / —

ELEVATION / DEPTH TOP OF SCREEN: / 8

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10SLX5'

I.D. OF SCREEN: 1"

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: / 13

ELEVATION / DEPTH BOTTOM OF FILTER PACK: / NA

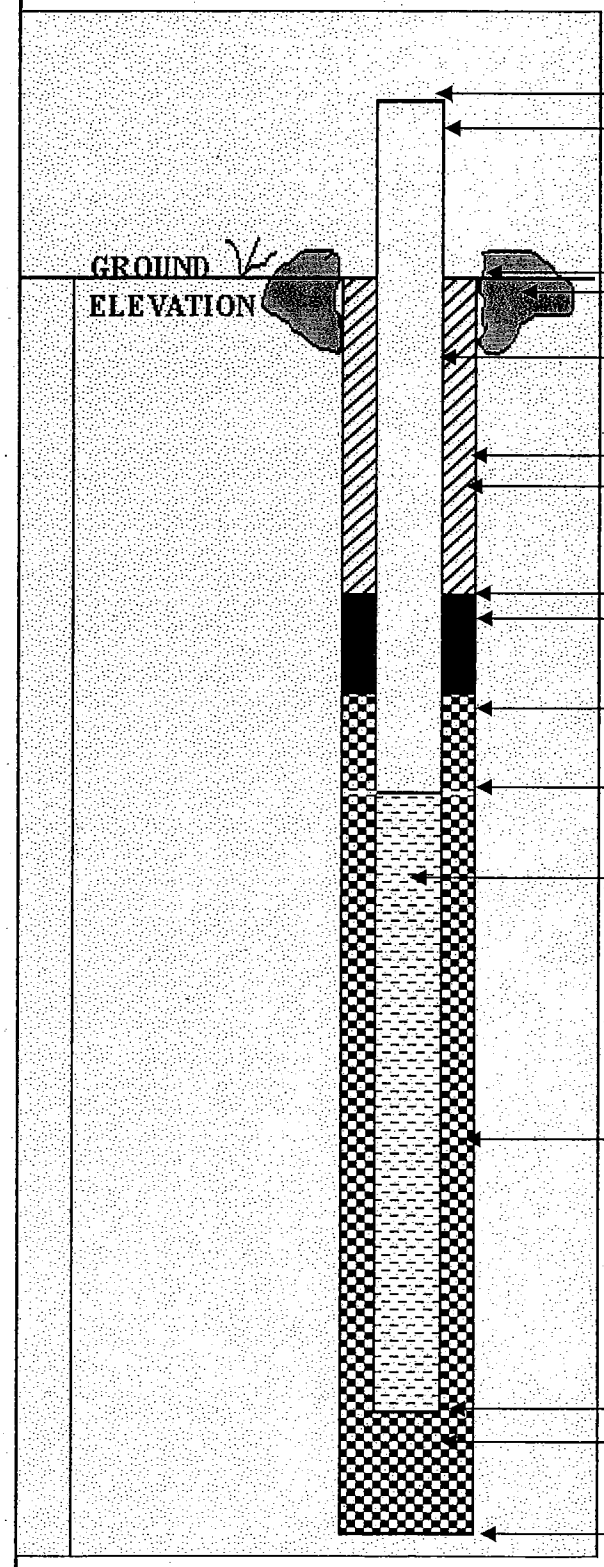
TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: / 13

BORING NO.: TW-47I

Tetra Tech NUS, Inc. **TEMPORARY MONITORING WELL SHEET**

PROJECT:	MCRD Parris Island	DRILLING Co.:	Vironex	BORING No.:	TW-47I
PROJECT No.:	G00455	DRILLER:	GAMWELL	DATE COMPLETED:	9/20/07
SITE:	Site 27	DRILLING METHOD:	DPT	NORTHING:	188828.50
GEOLOGIST:	Conti	DEV. METHOD:	PERISTALTIC	EASTING:	2094356.56



ELEVATION OF TOP OF RISER PIPE: 15.21

RISER STICK-UP ABOVE GROUND SURFACE: 1.12

GROUND ELEVATION: 14.09

TYPE OF SURFACE SEAL: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 3"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: /—

TYPE OF SEAL: NA

ELEVATION / DEPTH TOP OF FILTER PACK: /—

ELEVATION / DEPTH TOP OF SCREEN: / 19

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 SL x 5'

I.D. OF SCREEN: 1

TYPE OF FILTER PACK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: / 24

ELEVATION / DEPTH BOTTOM OF FILTER PACK: / NA

TYPE OF BACKFILL BELOW WELL: NA

ELEVATION / DEPTH OF BOREHOLE: / 25