Virginia Tech

Soil Genesis and Mined Land Reclamation

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Annual Monitoring Report for 2008 Calendar Year Weanack Dredge Spoil Utilization

To: Raymond Jenkins, Virginia DEQ, Piedmont Regional Office

From: W. Lee Daniels and G. Richard Whittecar (Old Dominion Univ.)

Re: Weanack Ground & Surface Water Monitoring for VPA Permit No. VPA00579

Date: **February 13, 2009**

Cc: Mike Baker, PCC
Charles Carter, Weanack
Charles Saunders, Marshall Miller & Assoc.

This memorandum and associated maps, attachments and data sets comprise our Annual Monitoring Report for all work conducted in **calendar year 2008** for inbound sediment analyses, ground and surface water monitoring, hydrogeologic modeling and beneficial use study requirements for VPA Permit No. VPA00579 at Weanack Land LLP in Charles City County. The original monitoring plan submitted to DEQ by American Land Concepts (ALC) in November, 2000, focused on the Woodrow Wilson Bridge (WWB) sediment utilization area (Fig. 1). This approved monitoring plan served as the basis for our protocols and designs through mid 2004. On September 7, 2004, Virginia DEQ approved a modification to the monitoring plan as outlined below that reduced the number of water quality sampling points and frequency. Subsequently, in June 2005, DEQ approved further modifications to the permit and monitoring requirements to allow placement of a new source of dredge materials (Earle Naval Weapons Station - Earle) into a separate utilization basin as shown in Fig. 2. In July of 2005, modifications to the Operations and Maintenance Manual and Monitoring Plans for both utilization areas were approved by DEQ.

In 2006, permit coordinate and liaison responsibilities for this permit were transferred from ALC to Marshall Miller & Associates (MMA) who we have worked with closely over the past three years. Virginia Tech and Old Dominion University (ODU) continue to serve as subcontractors to Weanack Land LLP to carry out monitoring and research as specified in the approved plans. This report covers calendar year 2008 and includes data and analyses relative to both utilization areas (WWB and Earle) plus an overall assessment of site hydrologic conditions for both basins as detailed later.

Over the 2008 monitoring year we also cooperated with Science Applications International Corporation (SAIC) and the Norfolk District of the U.S. Army Corps of Engineers in the continued monitoring of a small (35 x 120 feet) dredge sediment field experiment adjacent to the Earle Basin that is knows and the Landfarm Pilot Study (LPS). The SAIC/LPS study plan was approved on 7/25/07 to assess the ability of surfactants plus an added microbial consortium to degrade moderately contaminated (with PAH's) sediments from the nearby Appomattox River. A separate and detailed report on that project will be submitted to DEQ by SAIC in the near future once is has been reviewed by Norfolk District - COE.

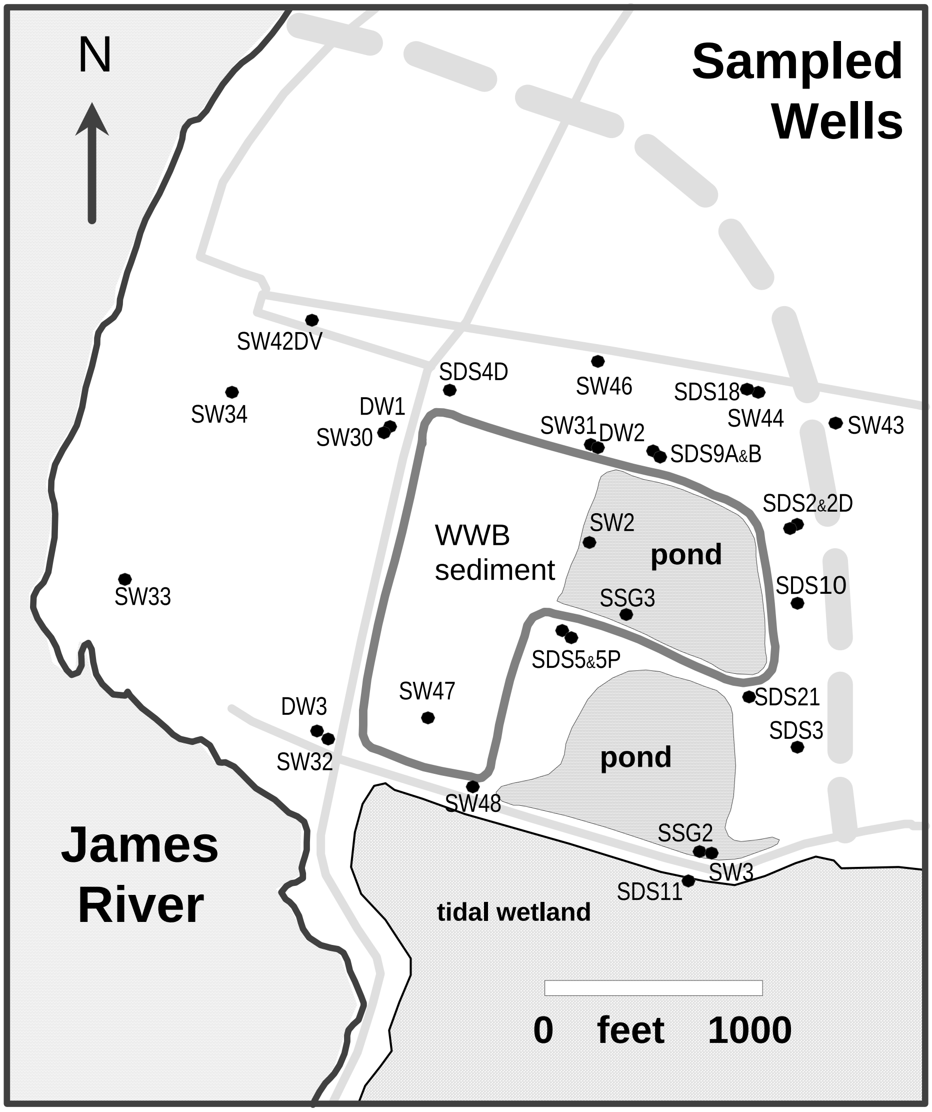

Figure 1. Map of basin location and monitoring wells around the Woodrow Wilson Bridge (WWB) sediments discussed in this report. The Shirley Plantation drinking well (SP) in the NW corner of the map area was also sampled but is not shown. The dashed line corresponds to a local terrace scarp which defines the base of older river sediments to the West. Please note that this map shows all wells installed over time around the WWB basin. Detailed monitoring locations are detailed below.

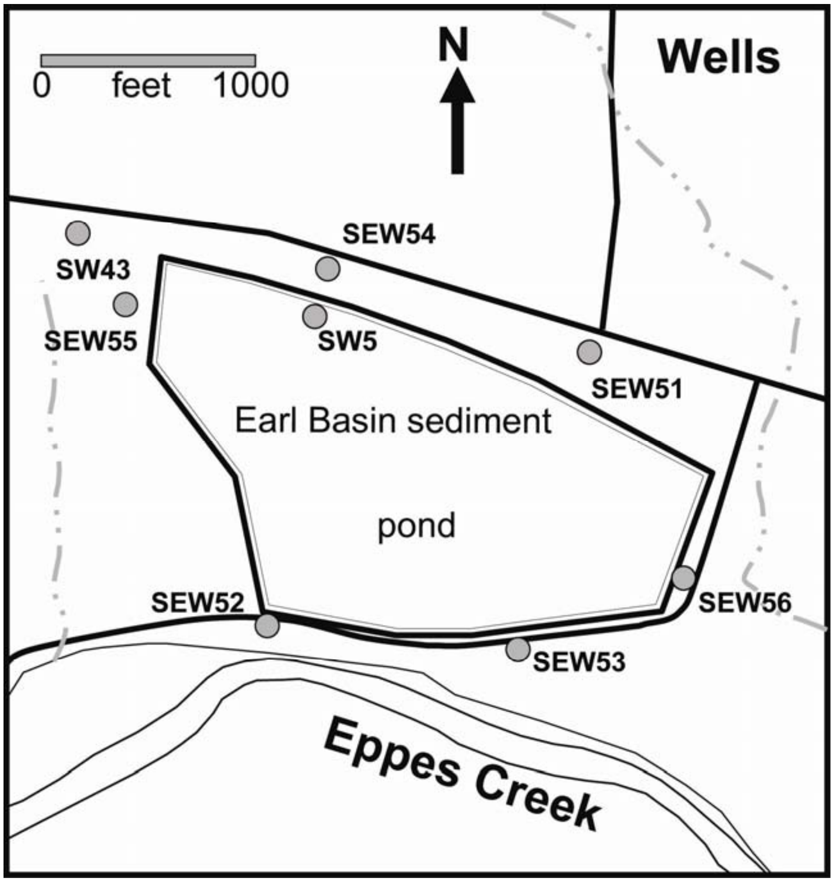

Figure 2. Map of basin location and monitoring wells sampled around the Earle sediment basin as discussed in this report. The WWB basin lies to west, across the ephemeral drain shown running south towards Eppes Creek. FYI: The LPS project is located to the southeast of well SEW 51 and approximately 50 feet uphill from the original edge of sediments deposited into this basin. Another monitoring well (SEW 57) is not shown on this figure but lies just downgradient from the LPS cells very close to the NE corner of the Earle pond boundary.

Water Quality Monitoring Methods

WWB Monitoring Locations

Under the approved 9/7/04 monitoring plan revision for WWB, we reduced our routine monitoring frequency for temperature, pH, EC, and DOC to quarterly (Jan/Apr/July/Oct). Furthermore, our detailed water quality sampling locations were modified from all wells available on-site to a minimum of the six specified below. These locations and labels were further clarified via Email and memo interactions with DEQ over the summer of 2006. For 2008, a “Partial Suite” water sampling was required during the month of October for all groundwater and drinking water locations. Thus, the following set of locations (see Fig. 1) was used for detailed water quality sampling:

Upgradient ground-water wells: **SDS 3 and SW 43**

Downgradient ground-water wells**: SW 30 and SW 31**

Surface water: **SW2** has been sampled over time from the continuous water body present within the dikes (SSG3 is the staff gage reading in that pond). The old mining slimes pond to the south of the WWB basin has been dry for the vast majority of sampling dates since 2005, and therefore reporting on that location (SSG 2/SW 3) was discontinued. However, Table 2 required 2008 sampling for only groundwater and drinking water locations, so SW2 was not sampled in October of 2008.

Owner's drinking well: **SP-well**

The locations specified above were sampled for detailed "partial suite" of water quality analyses in October of 2008 as set forth in Tables 1 and 2 of the 2004 water quality monitoring revision.

Earle Monitoring Locations

Procedures and rationale for the location, installation and sampling of the primary water quality monitoring points for the Earle Basin were included in the 2005 permit revision materials and in the 2006 annual report. The following set of locations (see Fig. 2) was used for "partial suite" sampling and analysis in October of 2008. However, due to a mix-up between the analytes listed in the respective Table 2's between the Earle Basin and WWB, sampling at location SW 5 (surface water) was omitted and several parameters (Cl, Mn, Phenol, DDT and gamma-BHC) were not analyzed on the groundwater samples. Therefore, we returned to the site in January and re-sampled all Earle sample points and submitted them to AWS for analysis to complete the full Table 2 requirements.

Upgradient ground-water wells: **SEW 51 and SEW 54**

Downgradient ground-water wells: **SEW 52 and SW 53**

Surface water: **SW 5** is sampled from within the Earle Basin ponded portion as shown in Figure 2.

In addition to the detailed sampling events described above, we conducted routine quarterly monitoring (Jan/Apr/July/Oct) of wells around the WWB and Earle Basin sites for water level, pH, conductivity, temperature, and DOC.

Inbound Dredge Spoil Testing

No inbound sediments were received or tested in 2008.

Hydrogeologic Analyses and Results for 2008

Water flow analyses for the two basins are combined onto one map (Figure 3) due to the close proximity of the basins. This more comprehensive view gives a larger perspective of the relationships of water flow through this topographically and stratigraphically complex setting.

Woodrow Wilson Bridge site

After dropping steadily through 2007, water levels in the pond inside of the WWB berm (measured at SSG3) stabilized during 2008 at an average level (10.65 feet), lower than during any previous year. Pond levels are maintained by a combination of direct precipitation and groundwater inflow from the sediment mound deposited in the western end of the disposal area. Water levels in most monitoring wells dropped throughout the year. These declines reflect the low rainfall afflicting many states in the Southeastern U.S. during 2007 and 2008, as well as seasonal heating/evaporation.

Analyses of water flow direction for the WWB disposal site shown in Figure 3 indicate no important change in flow directions from previous analyses, despite the general lowering of the water table system due to the drought. As is usual, minor changes were observed over time and over short distances. Shallow wells and wells close to storm water drainage ditches proved to be the most responsive to rainfall events, being the most likely to rise after one of the few rain showers. The close relationship between the shape of the berm and groundwater contours reflects the permeable connection between the fill sediments, the pond, and the surrounding aquifer. Variations in hydraulic conductivity of these permeable sediments over short distances cause the locally steep gradients in the water table.

Earle Basin site

The groundwater flow analyses of the Earle Basin site (Figure 3) also show no important change in flow directions from previous analyses. Overall, water levels in the pond inside of the berm (measured at SSG5) have been dropping throughout 2008. Water levels in monitoring wells indicate disposal pond water does not influence the groundwater flow patterns surrounding the Earle Basin sediments in any measurable way. The clay-rich substrate across the floor of the basin, purposefully compacted and smeared to reduce its permeability, effectively retains most basin water. The gentle ground water ridge that lies several meters below the level of the pond existed before the sediment basin was constructed and our data do not indicate that it has changed in any important way due to the filling of the basin.

The water pH and conductivity readings for the monitoring wells around the Earle Basin are values typical for groundwater in this hydrogeologic setting. The water in the Earle Basin sediment retention basin is brackish, reflecting the pore water quality of the estuarine sediments placed in the basin. Fluctuations in pH and EC values during the year also reflect the influence of rainfall events within a few days of sampling times, as well as the dry conditions during much of the year.

The one exception is that the conductivity values for SEW53 - the down-gradient monitoring well closest to the disposal area – continued to increase during 2008. From July 2007 to October 2008 it had risen from relatively stable values of approximately 300 uS to 748 uS. This trend suggests that seepage water from the basin has reached that monitoring well site which is confirmed by higher Cl values (Attachment 1.1b). Water quality readings in the other down-gradient well (SEW 52) are still within the range of values common in aquifer water in this study area.

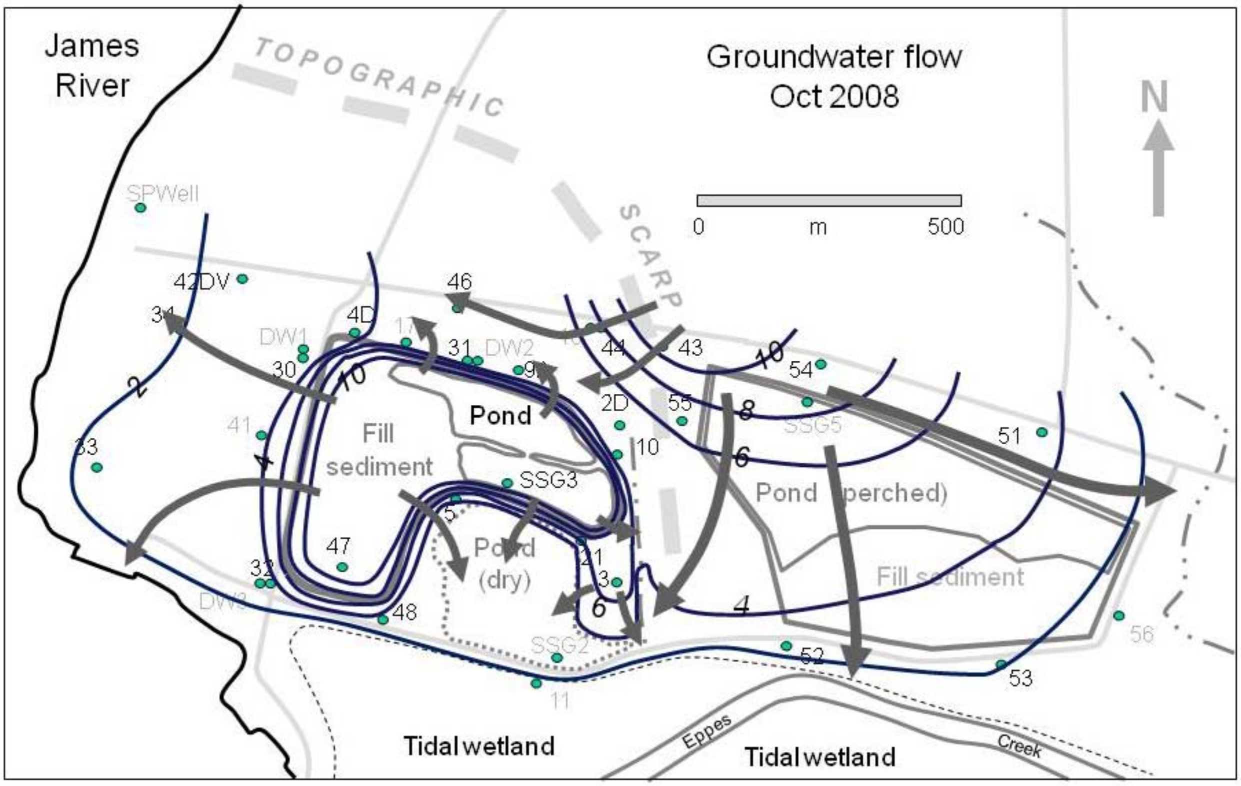

Figure 3. Ground water flow around the disposal site for the Woodrow Wilson Bridge sediments (western disposal basin) and the Earle Basin sediments (eastern disposal basin). Wells are marked with the number of their label; wells and ponds marked with grey labels were not used in the analysis of flow on this day (10/28/08). Contours show the shape of the water table surface and are in feet elevation. Grey lines denote roads, creeks, and the compacted sediment berms that contain the disposal sediment. The large dashed line notes location of a distinct scarp between a higher terrace that underlies the Earle Basin and the lower terrace that underlies the Woodrow Wilson Bridge sediment disposal site.

Water Quality Results for 2008

Woodrow Wilson Bridge Basin

With the exception of moderate sulfate levels discussed below, we have not been able to detect any significant detrimental effects of sediment placement upon ground- or surface-water quality in or around the WWB dredge utilization area (see Attach. 1.1). All quarterly data for water levels, EC, pH and DOC are reported in Attachment 1.2. As reported for the past several years, quarterly ground-water levels of DOC appear to be dropping with time relative to previous years, although the DOC levels continue to be quite variable. Similarly, pH and EC levels continue to reflect what appears to be background sulfur oxidation to a limited extent in either the surrounding Shirley formation or possibly the dewatering and oxidation of lower portions of the WWB sediments.

Review of the October 2008 partial suite data (Attach. 1.1) reveals no notable up- vs. down-gradient effects of the dredge materials weathering and leaching over time with the exception of total sulfate, which as reported last year, continues to be significantly higher in both downgradient wells. These higher sulfate levels also continue to be reflected in higher EC values at these two locations (SW 30 and SW 31). As pointed out in previous reporting, the presence of appreciable amounts of sulfidic materials in the directly underlying Shirley Formation sediments greatly complicates this analysis and also appears to contribute to higher levels of Al, Fe and Mn at many WWB locations and occasional detectable levels of Ni, Zn and Pb. We have noted and reported similar wide fluctuations in pH, Fe and Al in ground-water at various well locations around the site on several occasions since 2001. Observed sulfate levels in 2008 were considerably lower than reported in 2007, however, one location (SW 30) remained above the secondary drinking water standard of 250 mg/L. We continue to presume these variations are due to well disturbance and water level fluctuations interacting with the sulfidic sediments at depth.

Earle Basin

The quarterly pH, conductivity (EC), and DOC values for the monitoring wells around the Earle Basin are typical for groundwater in this hydrogeologic setting (Attach. 1.2). The water in the Earle sediment retention basin is brackish, reflecting the pore water quality of the estuarine sediments placed in the basin. As reported in past years, the water within the surface ponded portion of the basin (SW 5) is moderately saline and the pH of this water gradually increased to greater than 9.0 in 2006 and 2007 as expected due to sodium dominance in the cation/bicarbonate buffering system. In 2008, the pH continued to vary between 8.0 and 9.8 depending on season of sampling and pond level/dilution factors.

Detailed water quality samples were taken in late October 2008 (partial suite) and January of 2009 (re-sampling for missed location/parameters) per the approved monitoring plan and reported in Attachment 1.1. Differential analysis (up- vs. down-gradient) of the October 2008 partial suite analysis reveals no significant effect of dredge spoil placement on ground-water quality to date. It is interesting to note that similar to the 2006 and 2007 data for this basin (and the WWB wells), a number of up- and down-gradient wells generated high Fe and Al levels, and several wells were high in nitrate-N. We assume that similar mechanisms (well disturbance/sulfidic sediment interactions and agriculture) are probably responsible.

As noted earlier, the one potential effect to date of dredge placement in the Earle Basin may be the continued slow increase in EC for well 53 as discussed earlier. However, downgradient well SEW 52 still appears unaffected. It is also important to point out that the EC levels (primarily due to Cl; SO_4 is low) in well SEW 53 are considerably lower than those in almost all wells around the WWB basin.

LPS Study

As mentioned earlier, we continued detailed monitoring of soil and water quality associated with the Landfarm Prototype Study (LPS) cells through the fall of 2008. The lead contractor on the program is SAIC and they have prepared a detailed draft final report for the Norfolk District COE which is currently under review. We will submit a revised version of that report to DEQ as soon as it is released by COE and SAIC. As a part of our study component, we monitored water quality in external upgradient (SEW 51) and downgradient (SEW 57) wells and within the bottom of each cell (Lysimeters A&B). No effects of the LPS cells were noted on downgradient water quality even though very high levels of nitrate-N and EC were noted in the lower portion of the soil remediation zone (in Lysimeters A&B) due to the addition of N fertilizers that were used to stimulate the bacterial consortium used to enhance PAH degradation. You will note that certain data contained in Attachment 1.2 refer to the downgradient well (SEW 57).

Soil Formation/Beneficial Use Conversion Studies

As of late 2008, the majority of the surface of the Earle sediments remained ponded or too low in bearing strength to allow appropriate gridded and composite soil sampling and observations. This will be accomplished in the near future once the materials de-water sufficiently. However, Mr. Carter has successfully planted several cover crops around the drier portions of the surface which have grown well over the past year. We also have noted a number of native annuals invading the drier edges of the Earle surface over the past year.

Overall Monitoring Summary

Our overall long-term conclusion remains that the WWB materials appear benign with respect to potential ground- or surface water degradation. We have yet to detect any significant contaminants in inbound dredge spoils, dewatered dredge soils, or water samples in and around the disposal/utilization area. The elevated levels of sulfate observed in 2007 at the two downgradient locations moderated considerably in 2008. We will continue to monitor this trend over 2009 and beyond.

The Earle basin materials differ from the WWB dredge sediments in that they contain a much higher inbound salt load, are slightly higher in total heavy metals, and do contain detectable levels of certain organics (PAHs) as discussed in previous reports. We have yet to detect any potential migration or mobility of these contaminants, however. Future soil and water quality monitoring efforts will be focused on these parameters to determine net degradation, attenuation, or any potential for movement with time. It does appear that some soluble salts from this basin have migrated to one of the downgradient wells, although the effect is relatively minor. The ponded water within the Earle Basin remains high in salts, but the pH of both the surrounding dewatered sediments and surface water is declining as expected.

Acknowledgments

We deeply appreciate the continuing support of Mr. Charles Carter of Weanack/Shirley and Mr. Mike Baker of Potomac Crossing Consultants/Woodrow Wilson Bridge Project in our efforts. The assistance in the field of Julie Burger, Nick Haus, Steve Nagle, W.T. Price, Emmett Rafferty, Wesley Powell, Matt Richardson, Dani Morgan-Smith, Tanique Rush, and Abbey Wick was also essential to our continuing efforts. The sediment and water data sets contained herein were compiled by Sue Brown. Finally, thanks to Chee Saunders of Marshall Miller & Associates for coordination of permit monitoring requirements and to Carmela Tombes of Air, Water & Soil Labs in Richmond for assistance with the waters quality analyses.

ATTACHMENT 1

Detailed Water Quality Analyses

Attachment 1.1a **EARLE**

				Sample Date:	**10/28/08**	**10/28/08**	**10/28/08**	**10/28/08**	***1/26/09**
				Well ID:	**SEW51**	**SEW52**	**SEW53**	**SEW54**	**SW5**
Water Partial Suite		Detection Limits							
Metals		LOD	LOQ	Units	Results	Results	Results	Results	Results
Aluminum	EPA 200.7	0.02	0.05	mg/L	41.5	68.8	31.4	25.1	0.124
Antimony	EPA 200.9	0.003	0.005	mg/L	BLOD	BLOD	BLOD	BLOD	<.005
Arsenic	EPA 200.7	0.003	0.01	mg/L	0.005 J	0.016	0.011	0.007 J	<0.01
Beryllium	EPA 200.7	0.002	0.01	mg/L	0.025	0.018	0.013	0.006 J	<0.01
Cadmium	EPA 200.7	0.002	0.01	mg/L	0.009 J	0.007 J	0.005 J	0.002 J	<0.01
Chromium	EPA 200.7	0.001	0.01	mg/L	0.065	0.109	0.071	0.031	<0.01
Copper	EPA 200.7	0.003	0.01	mg/L	0.05	0.104	0.04	0.031	<0.01
Iron	EPA 200.7	0.003	0.01	mg/L	124	81.9	60.4	30	0.314
Lead	EPA 200.7	0.006	0.01	mg/L	0.047	0.067	0.028	0.026	<0.01
Manganese	EPA 200.7	0.002	0.01	mg/L	2.09	2.28	0.686	0.516	0.173
Mercury	EPA 245.1	0.0002	0.0002	mg/L	BLOD	BLOD	BLOD	BLOD	<0.0002
Nickel	EPA 200.7	0.002	0.01	mg/L	0.062	0.109	0.042	0.023	<0.01
Selenium	EPA 200.9	0.002	0.003	mg/L	BLOD	0.004	BLOD	BLOD	0.003
Silver	EPA 200.7	0.002	0.01	mg/L	BLOD	BLOD	BLOD	BLOD	<0.01
Thallium	EPA 200.9	0.002	0.002	mg/L	BLOD	BLOD	0.17	BLOD	<0.002
Zinc	EPA 200.7	0.01	0.01	mg/L	0.237	0.415	25.1	0.125	<0.01
Nitrate+Nitrite	SM 18/4500-NO3 F	0.1	0.1	mg/L	8.4	1.7	7.4	13.4	<0.01
Phosphorus, Ortho	SM 18/4500-P E	0.01	0.01	mg/L	0.08	0.09	0.07	0.08	<0.01
Sulfate	EPA-300.0	1,0	1.0	mg/L	15.6	25.5	14.4	6.3	1490
Sulfide	SM 18/4500-S2 E	1.0	1.0	mg/L	BLOD	BLOD	BLOD	BLOD	<0.01
TKN	EPA 351.2	0.2	0.2	mg/L	0.8	1.3	1.1	1.8	3.6
Total Organic Carbon	SW9060	1.0	1.0	mg/L	1.2	3.4	1.6	BLOD	9.98
Cyanide	Kelada-01	0.01	0.01	mg/L	BLOD	BLOD	BLOD	BLOD	<0.01

BLOD = below detection * = later sample date J = analyte was detected, but below quantitation limit

Attachment 1.1b				**EARLE**				
			Sample Date:	***1/26/09**	***1/26/09**	***1/26/09**	***1/26/09**	***1/26/09**
Water Partial Suite			Well ID:	**SEW51**	**SEW52**	**SEW53**	**SEW54**	**SW5**
		Rep Limit	Units	Results	Results	Results	Results	Results
Manganese	SW6010C	0.010	mg/L	0.438	2.42	0.289	0.150	---
4,4-DDT	EPA608	0.010	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Gamma-BHC (Lindane)	EPA608	0.020	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Chloride	EPA300.0/R2.1	1.0	mg/L	9.5	15.1	211	34.9	1790
Total Recoverable Phenols	EPA420.1	0.05	mg/L	0.14	<0.05	<0.05	<0.05	<0.05

BLOD = below detection

* = later sample date

J = analyte was detected, but below quantitation limit

Attachment 1.1c

Woodrow Wilson Bridge

				Sample Date:	**10/28/08**	**10/28/08**	**10/28/08**	**10/28/08**	**10/28/08**	**10/28/08**
				Well ID:	**SDS3**	**SW30**	**SW31**	**SW43**	**SP Well**	**Field Blank**
Water Partial Suite		Detection Limits								
Metals		LOD	LOQ	Units	Results	Results	Results	Results	Results	Results
Aluminum	EPA 200.7	0.02	0.05	mg/L	10.8	2.21	3.57	123	0.02 J	BLOD
Antimony	EPA 200.9	0.003	0.005	mg/L	BLOD	BLOD	BLOD	BLOD	BLOD	BLOD
Arsenic	EPA 200.7	0.003	0.01	mg/L	0.007J	BLOD	BLOD	0.023	BLOD	BLOD
Beryllium	EPA 200.7	0.002	0.01	mg/L	0.005J	BLOD	0.002 J	0.048	BLOD	BLOD
Cadmium	EPA 200.7	0.002	0.01	mg/L	0.002J	BLOD	BLOD	0.017	BLOD	BLOD
Chromium	EPA 200.7	0.001	0.01	mg/L	0.012	0.017	0.009 J	0.21	BLOD	BLOD
Copper	EPA 200.7	0.003	0.01	mg/L	0.017	0.02	0.004 J	0.165	0.009 J	BLOD
Iron	EPA 200.7	0.003	0.01	mg/L	29.9	6.04	10.9	251	0.019	0.005 J
Lead	EPA 200.7	0.006	0.01	mg/L	0.023	BLOD	BLOD	0.133	BLOD	BLOD
Manganese	EPA 200.7	0.002	0.01	mg/L	0.304	21.8	1.67	1.6	0.009 J	0.004 J
Mercury	EPA 245.1	0.0002	0.0002	mg/L	BLOD	BLOD	BLOD	0.0004	BLOD	BLOD
Nickel	EPA 200.7	0.002	0.01	mg/L	0.011	0.015	0.016	0.123	BLOD	BLOD
Selenium	EPA 200.9	0.002	0.003	mg/L	BLOD	BLOD	BLOD	0.002 J	BLOD	BLOD
Silver	EPA 200.7	0.002	0.01	mg/L	BLOD	BLOD	BLOD	BLOD	BLOD	BLOD
Thallium	EPA 200.9	0.002	0.002	mg/L	BLOD	BLOD	BLOD	BLOD	BLOD	BLOD
Zinc	EPA 200.7	0.01	0.01	mg/L	0.045	0.046	0.029	0.651	0.023	BLOD
Nitrate+Nitrite	SM 18/4500-NO3 F	0.1	0.1	mg/L	BLOD	BLOD	1.4	1.3	0.36	BLOD
Phosphorus, Ortho	SM 18/4500-P E	0.01	0.01	mg/L	0.07	0.07	0.03	0.05	11.6	BLOD
Sulfate	EPA-300.0	1.0	1.0	mg/L	18.6	302	126	20.8	BLOD	BLOD
Sulfide	SM 18/4500-S2 E	1.0	1.0	mg/L	BLOD	BLOD	BLOD	BLOD	BLOD	BLOD
TKN	EPA 351.2	0.2	0.2	mg/L	2.1	2.8	0.8	12.1	BLOD	BLOD
Total Organic Carbon	SW9060	1.0	1.0	mg/L	6.9	5.1	3.2	1.8	BLOD	BLOD
Cyanide	Kelada-01	0.01	0.01	mg/L	BLOD	BLOD	BLOD	BLOD	BLOD	BLOD

BLOD = below detection

J = analyte was detected, but below quantitation limit

Attachment 1.1d

Woodrow Wilson Bridge

			Sample Date:	**1/26/09**	**1/26/09**
Water Partial Suite			Well ID:	**Field Blank**	**SP Well**
Metals		Rep Limit	Units	Results	Results
Aluminum	EPA 200.7	0.050	mg/L	<0.05	
Antimony	EPA 200.9	0.005	mg/L	<0.005	
Arsenic	EPA 200.7	0.010	mg/L	<0.01	
Beryllium	EPA 200.7	0.010	mg/L	<0.01	
Cadmium	EPA 200.7	0.010	mg/L	<0.01	
Chromium	EPA 200.7	0.010	mg/L	<0.01	
Copper	EPA 200.7	0.010	mg/L	<0.01	
Iron	EPA 200.7	0.010	mg/L	<0.01	
Lead	EPA 200.7	0.010	mg/L	<0.01	
Manganese	EPA 200.7	0.010	mg/L	<0.01	
Mercury	EPA 245.1	0.0002	mg/L	<0.0002	
Nickel	EPA 200.7	0.010	mg/L	<0.01	
Selenium	EPA 200.9	0.003	mg/L	<0.003	
Silver	EPA 200.7	0.010	mg/L	<0.01	
Thallium	EPA 200.9	0.002	mg/L	<0.002	
Zinc	EPA 200.7	0.010	mg/L	<0.01	
Nitrate+Nitrite	SM 18/4500-NO3 F	0.10	mg/L	<0.01	
Phosphorus, Ortho	SM 18/4500-P E	0.01	mg/L	<0.01	
Sulfate	EPA-300.0	1.0	mg/L	<1	
Sulfide	SM 18/4500-S2 E	1.0	mg/L	<1	
TKN	EPA 351.2	0.2	mg/L	<0.2	
Total Organic Carbon	SW9060	1.0	mg/L	<1	
Cyanide	Kelada-01	0.01	mg/L	<0.01	
Manganese	SW6010C	0.010	mg/L	---	<0.01
4,4-DDT	EPA608	0.010	µg/L	<0.01	<0.01
Gamma-BHC (Lindane)	EPA608	0.020	µg/L	<0.02	<0.02
Chloride	EPA300.0/R2.1	1.0	mg/L	<1	17
Total Recoverable Phenols	EPA420.1	0.05	mg/L	<0.05	<0.05

Attachment 1.2a

Water Levels

Monitoring Wells	**1/4/08**	**4/26/08**	**7/23/08**	**10/28/08**
SDS 2	9.89	12.31	8.15	9.29
SDS 2D	3.76	4.82	4	4.03
SDS 3	7.89	8.42	7.12	6.68
SDS 4D	2.73	6.49	2.97	2.5
SDS 5	4.78	5.59	2.05	3.89
SDS 5P	4.88	5.97	na	4.15
SDS 9A	3.61	na	3.96	3.97
SDS 9B	dry	na	dry	dry
SDS 10	5.92	8.24	4.64	4.9
SDS 11	na	na	na	na
SDS 18	15.69	na	na	na
SDS 21	6.48	7.91	5.02	5.78
SW 30	2.52	3.56	2.93	3.06
SW 31	1.71	3.85	3.07	3.01
SW 32	2.54	3.86	3.32	2.91
SW 33	2.01	5.5	1.6	2.42
SW 34	2.13	3.18	2.61	1.75
SSG 2	dry	dry	dry	dry
SSG 3	10.41	11.09	10.29	10.79
SW42DV	1.7	2.78	2.2	2.31
SW43	11.19	11.1	10.52	10.79
SW44	6.89	7.63	7	6.86
SW46	3.98	4.74	3.94	4.62
SW47	6.94	11.08	6.33	10.1
SW48	4.52	5.03	dry	3.7
SEW51	4.82	4.62	4.63	4.63
SEW52	2.89	3.71	1.85	2.36
SEW53	1.89	2.34	1.92	2.03
SEW54	8.92	9.42	9.54	9.38
SEW55	7.44	7.43	8.23	6.72
SEW56	7.76	na	na	na
SSG5	25.85	26.23	25.2	25.47

na = not available

Ft above sea level

Attachment 1.2b

pH

WWB	1/4/08	4/26/08	7/23/08	10/28/08
SDS 3	5.14	5.45	6.51	5.98
SW 30	5.54	5.94	6.34	5.87
SW 31	5.30	5.7	6.37	5.57
SW43	4.86	5.38	6.21	5.08
SW3(@SSG 2)	dry	dry	dry	dry
SW2(@SSG 3)	6.58	8.16	9.00	8.72
SPWell	7.18	6.67	7.94	7.29
Earle				
SEW51	4.95	na	6.04	5.24
SEW52	4.97	5.83	6.04	5.34
SEW53	4.76	5.17	5.84	5.20
SEW54	5.12	5.16	6.34	5.32
SW5(@SSG5)	8.00	9.82	9.68	8.13

na = not available

Attachment 1.2c

EC

WWB	1/4/08	4/26/08	7/23/08	10/28/08
SDS 3	144	92	239	175
SW 30	1125	1137	1089	1124
SW 31	596	666	687	587
SW 43	170	193	155	184
SW3(@SSG 2)	dry	dry	dry	dry
SW2(@SSG 3)	578	442	548	368
SPWell	461	452	453	418
Earle				
SEW51	199	na	186	192
SEW52	234	215	244	242
SEW53	528	618	674	742
SEW54	264	282	270	295
SW5(@SSG5)	6,400	8,700	10,470	10,980

na = not available EC – Conductance in uS/cm

Attachment 1.2d

DOC

WWB	1/08	4/08	7/08	8/08	10/08	11/08
SDS 3	5.97	6.44	8.37			
SW 30	10.75	5.48	15.20		5.1	
SW 31	4.50	3.06	9.57		3.2	
SW 43	2.00	1.70	6.36		1.8	
SW3(@SSG 2)	na					
SW2(@SSG 3)	13.95	10.9			29.90	
SPWell	2.03	1.42	1.86		BLOD	
Earle						
SEW51	1.40	1.74	1.42	0.61	1.2	4.47
SEW52	3.15	2.37	3.97		3.4	
SEW53	2.41	1.92	2.30		1.6	
SEW54	1.82	1.44	1.46		BLOD	
SEW57	2.29	2.80		1.44		1.26
SW5(@SSG5)	7.20	7.58			7.95	

na = not available DOC (mg/l)

Attachment 1.2e

Water Temps

WWB	1/4/08	4/26/08	7/23/08	10/28/08
SDS 3	12.1	5.45	24.6	14.9
SW 30	12.3	18.6	19.8	15.9
SW 31	11.3	18	20.7	17.4
SW 43	14.3	20.3	19.7	14.1
SW3(@SSG 2)	dry	dry	dry	dry
SW2(@SSG 3)	2	27.1	31.9	14.5
SPWell	5.5	24.2	26.5	15
Earle				
SEW51	15.3	na	20.7	15.3
SEW52	15.4	20.5	19.2	17.3
SEW53	15.7	19.3	19.3	15.5
SEW54	14.9	21	20.7	15.7
SW5(@SSG5)	5	30.4	34	14