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FINAL TECHNICAL MEMORANDUM U S EPA REGION III ADDITIONAL CONCERNS REGARDING THE FORMER PENNIMAN SHELL LOADING PLANT AT CHEATHAM ANNEX FISC WILLIAMSBURG VA

12/24/2013

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United States Environmental Protection Agency, Region III's Additional Concerns Regarding the Former Penniman Shell Loading Plant at Cheatham Annex

PREPARED FOR: Cheatham Annex Partnering Team

PREPARED BY: CH2M HILL

DATE: December 24, 2013

Introduction

In September 2008, the United States Environmental Protection Agency (USEPA), Region III, expressed concern regarding various remnants of the former Penniman Shell Loading Plant (PSLP), which operated during World War I on the property that now houses Cheatham Annex (CAX). These areas were identified during a USEPA-directed study of the history and remains of the PSLP at CAX (Weston, 1999a and 1999b), but are neither part of the Penniman Area of Concern (AOC 6) nor listed in the CAX Federal Facility Agreement (FFA) (USEPA et al, 2005).

This Technical Memorandum (TM) addresses the USEPA's concerns, including a description and proposed path forward for each one, and was prepared under the United States Navy Comprehensive Long-term Environmental Action (CLEAN) Contract N62470-08-D-1000, for submittal to the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic Division, USEPA, and the Virginia Department of Environmental Quality (VDEQ). The Navy, USEPA, and VDEQ work jointly as the CAX Tier I Partnering Team.

Background

The PSLP was an explosives manufacturing facility operated by the DuPont de Nemours Company during World War I on what is now CAX and adjacent properties (**Figure 1**). This facility operated as a trinitrotoluene (TNT) manufacturing plant beginning in approximately 1916, and subsequently began loading artillery shells for the war effort in 1918; it was not in operation long before the November 1918 armistice ending the war was signed. Between 1918 and 1925, the facility was demolished and the property reverted to farmland. The Navy established CAX on a portion of this property in 1943.

CAX was commissioned as a satellite unit of the Fleet Industrial Supply Center, Norfolk to provide bulk storage facilities and serve as an assembly and overseas shipping point throughout World War II. Today, CAX's mission includes supplying Atlantic Fleet ships and providing recreational opportunities to military and civilian personnel. Prior to state and federal regulatory oversight of environmental activities at the installation, the Navy conducted the first environmental investigation at CAX in 1984 with the Initial Assessment Study (IAS) (C.C. Johnson & Associates and CH2M HILL, 1984). The IAS identified twelve

potentially contaminated areas and recommended additional investigation at Sites 1, 9, 10, and 11. In 1998, the Navy, USEPA, and VDEQ performed a site visit and identified five additional potential source areas and designated them as AOCs 1 through 5. In 1999, USEPA led a site investigation of the former PSLP property to "assess the potential contamination sources present at this site and to determine the need for additional investigation under [the Comprehensive Environmental Response, Compensation, and Liability Act] or other authority and, if appropriate, support site evaluation using the Hazard Ranking System (HRS) for proposal to the National Priorities List (NPL)" (Weston, 1999a)[1]. From this investigation, the CAX Partnering Team agreed to further investigate five former PSLP areas (Ammonia Settling Pits, TNT Graining House Sump, TNT Catch Box Ruins, Waste Slag Material, and 1918 Drum Storage) and designated the study area as AOC 6 – Penniman AOC (USEPA et al, 2005). In 2004, the Navy identified AOC 7 - a small surface debris diposal area containing numerous rusted, 10-gallon cans with "tetrachloroethene" labeled on them and a few rusted, 55-gallon drums. AOC 8, a disposal area, was initially thought to be the location of Site 7 (a World War I era disposal site); however, the debris was determined to be more recent than World War I. The actual Site 7 location was later identified approximately 500 feet to the north and the area previously thought to be Site 7 was redesignated at AOC 8.

In 2008, USEPA reviewed the workplan to conduct a site inspection (SI) at CAX AOCs 1, 2, 6, 7, and 8 (CH2M HILL, 2008). Subsequent to this review, USEPA expressed a concern with various PSLP remnants that were identified during the 1999 USEPA-led study, but not included as part of AOC 6. The concern is related to these items:

- In-ground Battery
- Mixing Tanks
- Large Drum with Site Port
- Detonation Craters
- Booster Test Pit (also referred to by USEPA as the "fuze pit")

The CAX Partnering Team discussed these items during the September 2008 Partnering Meeting and agreed to conduct more research, as needed, and conduct a site visit to view each one (**Attachment 1**). The site visit occurred in February 2009. The results of the research, site visit and subsequent March 2009 Partnering discussion (**Attachment 2**), geophysical survey around the Booster Test Pit, and sample collection within the Detonation Crater area, plus the path forward for each item, are discussed herein.

"In-ground Battery"

During a 1998 site visit of the former PSLP property in support of the 1999 USEPA-led study, USEPA discovered this unidentified item (**Figure 2**) near a roadside on what was then Department of Interior (DOI) property adjacent to CAX that the Navy had declared surplus and transferred to DOI in 1978 and that had housed a portion of the PSLP (**Figure 1**). The USEPA coined the name "in-ground battery" to describe the item (as in battery terminal, not ordnance storage). The use and age of this item is unknown, and it has not been mentioned or investigated in any previous study, including the former PSLP study

[1] CAX was included on the National Priorities List (NPL) in January 2001 with a Hazard Ranking System (HRS) score of 48.7.

(Weston, 1999b). In February 2009, the USEPA, VDEQ, and Navy conducted a site visit to look for the item and could not locate it. The USEPA requested another site visit to look for it further, but declined attempts to schedule the site visit. The conclusion from the February site visit was if the item is found later, the Navy will research its CERCLA applicability; otherwise, no further attempts to locate the "in-ground battery" are warranted.

"Mixing Tanks"

Underground "mixing tanks" (USEPA's term) were found during a site visit of the former PSLP property in support of the 1999 USEPA-led study, and they are included in the subsequent report (Weston, 1999b) (**Figure 3**). The USEPA had concern the tanks were used as part of the PSLP's production line. These tanks have been found at several locations, including CAX Site 11 (near Building 268) and AOC 6 (south of the Ammonia Settling Pit subarea), and their locations correlate to "kaustines" labeled on a historic PSLP Plant drawing (**Figure 4**). A "Society for Industrial Archeology" newsletter (R.H., 2000) was found via the Internet that included an article on the term "kaustine" and the PSLP (**Attachment 3, page 5 inset box**). The conclusion was the tanks were in fact privies.

During the AOC 6 SI fieldwork (and prior to the discovery of the aforementioned newsletter), the Navy agreed to collect one groundwater and two soil (one surface and one subsurface) samples via direct-push technology (DPT) near the tank found just south of the Ammonia Settling Pit subarea (**Figures 1, 4, and 5**) to determine if a CERCLA-related release had occurred. The samples were collected following the procedures described in the SI workplan (CH2M HILL, 2008) and analyzed for semivolatile organic compounds (SVOCs), explosives (including pentaerythritol trinitrate (PETN), nitroglycerin, 3,5-dinitroaniline, and nitroguanidine), inorganic constituents, and cyanide, plus total organic carbon and pH (for soil only). The analytical parameters for these samples were the same as the parameters for the AOC 6 SI samples as this area is near the AOC 6 Ammonia Settling Pit subarea.[2] **Tables 1, 2,** and **3** summarize all constituents detected in the privy tank area surface soil, subsurface soil, and groundwater, respectively, and provide a comparison of the detections to screening criteria, as identified in the workplan (CH2M HILL, 2008). If a detected concentration exceeded both the CAX 95% background upper tolerance limit (UTLs) and one or more of the other screening criteria, it was flagged as an exceedance. **Figures 6** and **7** graphically present the exceedances for soil and groundwater, respectively.

In addition, human health and ecological risk screens were conducted to identify potential risk to human health and the environment. The results of the human health and ecological risk screens for the privy tank area are presented in **Attachments 4** and **5**, respectively. The full analytical data, as well as the soil boring log, for this location are provided in **Attachment 6.**

The human health risk screen concluded that exposure to surface and subsurface soil within the privy tank area would not result in any unacceptable risks; however, exposure to groundwater could result in potential unacceptable human health risks associated with exposure to inorganic constituents. Groundwater is not currently used as a potable water

[2] Since the soil analytic results from the 1999 SI (Weston, 1999b) identified inorganics and explosives as constituents that exceeded the USEPA Region III residential risk-based concentrations (RBCs), the AOC 6 samples were not analyzed for VOCs, pesticides, or PCBs. The SVOC parameter was added at the request of USEPA. The CAX Partnering Team agreed to this approach with acceptance of the Multiple AOC SI work plan (CH2M HILL, 2008).

supply at the site or the base, and it is extremely unlikely that it ever would be used as a potable water supply.

The ecological risk screen concluded that exposure to surface or subsurface soil within the privy tank area would not result in any unacceptable ecological risks. In groundwater, the ecological risk screen identified aluminum and iron as COPCs; however, these two constituents were not identified as COPCs in the surface or subsurface soil.

With the discovery that the tank was a privy and no inorganic constituents were identified as human health or ecological COPCs in the surface and subsurface soil, it is unlikely the inorganic constituents in the groundwater are related to the tank. Inorganic constituents were identified as COPCs in groundwater at the AOC 6 Ammonia Settling Pit subarea, which is north of the privy tank area and where an expanded SI is recommended (CH2M HILL, 2012). Therefore, the groundwater will be addressed as part of the expanded SI and no further action related to the privy tank is necessary.

"Large Drum with Side Port"

A large (i.e., greater than 55 gallon) drum with a side port (**Figure 8**) was found during the USEPA's 1998 site visit to the former DOI property adjacent to CAX that had housed a portion of the PSLP (**Figure 1**). This drum is mentioned in the PSLP SI report as the "titanium tetrachloride (FM)/sulfur trioxide (FS) smoke drum" (Weston, 1999b). The USEPA had a concern that the drum might be related to chemical weapon production; however, there is no evidence to date that the PSLP manufactured chemical weapons or that the drum dates to the PSLP era. As part of the PSLP SI (Weston, 1999b), subsurface soil samples (6 to 12 inch depth) were collected beneath and downgradient of the "FM/FS smoke drum" and analyzed for volatile organic compounds (VOCs), SVOCs, pesticides, polychlorinated biphenyls (PCBs), nitroaromatics (i.e., explosive compounds), mustard decomposition, and inorganic constituents. The results were compared to USEPA Region III 1999 Risk-Based Concentrations (RBCs) for residential soil. Arsenic was reported to be a potential health threat; however, a human health risk assessment was not conducted. In addition, the detected arsenic concentrations (3.5 ppm and 2.8 ppm) are below the CAX subsurface soil background 95% UTL for arsenic (5.54 mg/kg) (CH2M HILL, 2011). A surface soil sample was collected near the "FM/FS smoke drum" in 2003 for the Environmental Baseline Survey (EBS) conducted prior to the Navy's reacquisition of the DOI property (Baker, 2004). The sample was analyzed for VOCs, SVOCs, pesticides, PCBs, and inorganic constituents, and the results were below the three screening criteria used to evaluate the sample results (i.e., USEPA Region III 2003 RBCs for residential soil, site-specific RBCs, and CAX Soil Association 2 maximum concentration background values for surface soil) (Baker, 2004). During the September 2008 Partnering Meeting (**Attachment 1**), the USEPA concurred that the "FM/FS smoke drum" had been adequately addressed and no further action is necessary. In addition, during the February 2009 site visit, the CAX Partnering Team viewed the drum in question, as it remains where it was found in 1998, and again concluded that no further action is needed with respect to this drum (documented in the March 2009 Partnering Meeting minutes - **Attachment 2**). This drum is the only known large drum with a side port on CAX and if similar drums are found at CAX in the future, the Navy will address as appropriate.

"Detonation Craters/Blast Holes"

Within the Magazine Area of the former DOI Property are numerous ground depressions the USEPA believes are detonation craters or blast holes (**Figure 9**) that were created when the PSLP was operational. During the PSLP SI (Weston, 1999b), two subsurface soil samples were collected (at 6 to 12 inch and 12 to 18 inch depth intervals) from the bottom of one of the ground depressions and analyzed for VOCs, SVOCs, pesticides, PCBs, nitroaromatics, mustard decomposition, and inorganic constituents. The results were compared to USEPA Region III 1999 RBCs for residential soil; arsenic and chromium were reported to be potential health threats. However, a human health risk assessment was not conducted. Three additional subsurface soil samples (12 to 16 inch depth interval) were collected in and around various ground depressions as part of the EBS conducted prior to the Navy's reacquisition of the DOI property (Baker, 2004). The samples were analyzed for VOCs, SVOCs, pesticides, PCBs, nitramine compounds (i.e., explosives), and inorganic constituents, and the results were below the three screening criteria used to evaluate the sample results (i.e., USEPA Region III 2003 RBCs for residential soil, site-specific RBCs, and CAX Soil Association 2 maximum concentration background values for surface soil) (Baker, 2004).

During the September 2008 Partnering Meeting discussion (**Attachment 1**), the Navy indicated that it believed the historic sampling had adequately addressed the area. However, the USEPA had a concern regarding whether or not there had been an impact to groundwater. The Navy agreed to collect one groundwater sample via DPT from directly beneath (if possible) or immediately adjacent to a ground depression within a highly concentrated area of ground depressions and to analyze it for explosives and inorganic constituents. In January 2011, a groundwater sample was collected from a boring drilled into the outer rim of a ground depression (**Figure 10**) following the sampling procedures described in the AOC 1, 2, 6, 7, and 8 SI workplan (CH2M HILL, 2008). Because the ground depressions could have been detonation craters, an unexploded ordnance (UXO) specialist was on-site to survey and clear the area prior to and during DPT activities. No munitions or explosives of concern were encountered, and the UXO specialist's professional opinion was the depressions were not detonation craters or blast holes. The groundwater sample was collected from the uppermost water-bearing unit, the Cornwallis Cave Aquifer, and analyzed for explosives (including PETN, nitroglycerin, 3,5-dinitroaniline, and perchlorate) and inorganic constituents to confirm the presence or absence of these constituents. The results were not validated or used to conduct a human health or ecological risk screening. The full analytical data, as well as the soil boring log, for this location are provided in **Attachment 7**.

Any detected constituents were compared to CAX background 95% UTLs for the Conwallis Cave Aquifer (CH2M HILL, 2011) (**Table 4**). One explosive, perchlorate, was detected at a very low concentration (0.21 J µg/L); however, the detected concentration is lower than the adjusted tap water RSL (2.5 µg/L) and the ecological screening value (9,300 µg/L). The only total inorganic constituent that exceeded the background 95% UTL was calcium, and it is an essential nutrient. Likewise, calcium exceeded the background 95% UTL in the dissolved fraction. The dissolved fraction for the inorganic constituent cadmium (0.378 µg/L) also exceeded the background 95% UTL (0.177 µg/L); however, it did not exceed the background concentration based upon the total cadmium concentration. As the results indicate, there

has been no significant impact to groundwater from the ground depressions, and no further action is necessary.

Booster Test Pit

The "fuze pit" (USEPA's term for the remains of the PSLP's Booster Test Pit building) was positively identified during the PSLP SI (Weston, 1999b); however, no sampling occurred. It is located northwest of AOC 2 (**Figures 11** and **12**). The USEPA's concern is whether or not this building had underground piping that connected it to other PSLP buildings for the transfer of explosives materials. In response to the USEPA's concerns, the Navy had a geophysical survey conducted around the building in April 2010 to identify potential underground piping (**Attachment 8**). It concluded that there are linear trends on the west and north side of the building that could possibly be indicative of piping (**Attachment 8, Figure 5**); however, these possible linear trends were based on only two anomalies. It is unlikely there is underground piping from the Booster Test Pit to other PSLP structures given that the building was located a considerable distance from any production line and the closest buildings to it were storage and shipping houses (**Figure 11**). In addition, an underground transport system seems too sophisticated for the PSLP timeframe (c. 1918) and it is doubtful, given the rail lines and above ground conveyors depicted on the historic drawings (Weston, 1999b) and historic photographs showing horse drawn carts.

Based on USEPA and VDEQ comments on the draft TM, additional research was conducted at the DuPont archive, the Hagley Museum and Library in Wilimington, Delaware, to try and determine the layout and function of the Booster Test Pit building. However, the available archive materials yielded no new information. After research within their respective organizations and more discussion during the September 2012, November 2012, and September 2013 Partnering Meetings, the CAX Partnering Team agreed the Booster Test Pit building did not appear to be part of a production line at the former PSLP, but rather a single building with limited use to test boosters; there is no evidence that there was any kind of transport of contaminants from this building to other areas. Therefore, there is no need to investigate the Booster Test Pit further.

No Further Action Consensus

The Navy, in partnership with the USEPA and VDEQ, has agreed the USEPA's concerns regarding the aforementioned PSLP remnants have been adequately addressed and require no further action. The inorganic constituents in groundwater underneath the privy tank area are not associated with the tank itself and will be addressed as part of the expanded SI for the AOC 6 Ammonia Settling Pit subarea.

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NAVFAC Mid-Atlantic _____ Date 1/9/14

Mr. Gerald Hoover
USEPA Region III _____ Date 12/31/13

Mr. Wade Smith
VDEQ _____ Date 12/26/2013

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Tables

TABLE 1
Privy Tank Area Surface Soil Detections and Comparison to Screening Criteria
Cheatham Annex, Williamsburg, Virginia
Additional Former PSLP Concerns Technical Memorandum

Station ID	**CLEAN CAX BKG SS**	**Eco Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted**	**CLEAN RSLs Residential Soil Adjusted**	CAA06-SO09	
Sample ID					CAA06-SS09-1108	CAA06-SS09P-1108*
Sample Date					11/06/08	11/06/08
Chemical Name						
Semivolatile Organic Compounds (UG/KG)						
2-Nitroaniline	--	--	600,000	61,000	1,200 U	**290 J**
Explosives (UG/KG)						
No Detections						
Total Metals (MG/KG)						
Aluminum	12,200	pH < 5.5	99,000	7,700	**8,740**	**8,420**
Arsenic	6.36	18.0	1.6	0.39	**4.1 L**	**3.3 L**
Barium	52.9	330	19,000	1,500	**79.9 K**	**66.3 K**
Beryllium	0.587	40.0	200	16	**0.73**	**0.65**
Cadmium	--	32.0	80	7	**0.12 J**	**0.09 J**
Calcium	2,290	--	--	--	**3,740**	**2,790**
Chromium	18.2	64.0	5.6	0.29	**8.8**	**8.2**
Cobalt	9.93	13.0	30	2.3	**3.2 J**	**2.8 J**
Iron	19,900	pH < 5 or > 8	72,000	5,500	**6,050**	**5,320**
Lead	17.4	120	800	400	**30.2**	**26**
Magnesium	1,070	--	--	--	**861**	**772**
Manganese	324	220	2,300	180	**284 L**	**243 L**
Mercury	0.111	0.10	31	2.3	**0.06 L**	**0.07 L**
Nickel	9.52	38.0	2,000	150	**6.2**	**5.9**
Potassium	708	--	--	--	**521 J**	**477 J**
Vanadium	27.9	130	520	39	**17.3**	**15.6**
Zinc	26.5	120	31,000	2,300	**25 K**	**19.9 K**
Wet Chemistry						
% Solids (pct)	--	--	--	--	**69**	**81**
pH (ph)	--	--	--	--	**6.3**	NA
Total organic carbon (TOC) (ug/g)	--	--	--	--	**52,000**	NA

Notes:

*Duplicate sample

Bold indicates detection

Exceeds Background UTL

-- - Screening value not detected, not available, or not applicable

U - The material was analyzed for, but not detected
J - Analyte present, value may or may not be accurate or precise
L - Analyte present, value may be biased low, actual value may be higher
K - Analyte present, value may be biased high, actual value may be lower
UG/KG - Micrograms per kilogram
MG/KG - Milligrams per kilogram
pct - Percent
ph - pH units
ug/g - Micrograms per gram
NA - Not analyzed

TABLE 2
Privy Tank Area Subsurface Soil Detections and Comparison to Screening Criteria
Cheatham Annex, Williamsburg, Virginia
Additional Former PSLP Concerns Technical Memorandum

Station ID	CLEAN CAX BKG SB	Eco Soil Screening Value	CLEAN RSLs Industrial Soil Adjusted	CLEAN RSLs Residential Soil Adjusted	CAA06-SO09	
Sample ID					CAA06-SB09-1108	CAA06-SB09P-1108*
Sample Date					11/06/08	11/06/08
Chemical Name						
Semivolatile Organic Compounds (UG/KG)						
No Detections						
Explosives (UG/KG)						
No Detections						
Total Metals (MG/KG)						
Aluminum	16,500	pH < 5.5	99,000	7,700	**8,540**	**8,980**
Arsenic	12.6	18.0	1.6	0.39	**3.3 L**	**3.4 L**
Barium	64.2	330	19,000	1,500	**32.6 K**	**32.8 K**
Beryllium	0.581	40.0	200	16	**0.48**	**0.49**
Calcium	2,190	--	--	--	**540**	**440**
Chromium	23.1	64.0	5.6	0.29	**9.2**	**9.3**
Cobalt	7.14	13.0	30	2.3	**2.6 J**	**2.7 J**
Iron	40,100	pH < 5 or > 8	72,000	5,500	**5,870**	**6,090**
Lead	10.7	120	800	400	**30**	**29**
Magnesium	1,050	--	--	--	**600**	**624**
Manganese	164	220	2,300	180	**104 L**	**99.3 L**
Nickel	9.95	38.0	2,000	150	**4.8**	**5**
Potassium	731	--	--	--	**381 J**	**410 J**
Selenium	--	0.52	510	39	**0.33 J**	2.5 U
Vanadium	45.7	130	520	39	**15.2**	**15.9**
Zinc	31.8	120	31,000	2,300	**14 K**	**14 K**
Wet Chemistry						
% Solids (pct)	--	--	--	--	**90**	**90**
pH (ph)	--	--	--	--	**6**	NA
Total organic carbon (TOC) (ug/g)	--	--	--	--	**16,000**	NA

Notes:
*Duplicate sample
Bold indicates detection
Exceeds Background UTL
-- - Screening value not detected, not available, or not applicable
U - The material was analyzed for, but not detected
J - Analyte present, value may or may not be accurate or precise
L - Analyte present, value may be biased low, actual value may be higher
K - Analyte present, value may be biased high, actual value may be lower
UG/KG - Micrograms per kilogram
MG/KG - Milligrams per kilogram
pct - Percent
ph - pH units
ug/g - Micrograms per gram
NA - Not analyzed

TABLE 3
Privy Tank Area Groundwater Detections and Comparison to Screening Criteria
Cheatham Annex, Williamsburg, Virginia
Additional Former PSLP Concerns Technical Memorandum

Station ID	**CLEAN CAX BKG 95% UTL Yortown-Eastover Aquifer**	**Eco Surface Water Screening Value - Fresh**	**CLEAN MCL-Groundwater**	**CLEAN RSLs Tapwater Adjusted**	CAA06-DW05
Sample ID					CAA06-DW05-1108
Sample Date					11/10/08
Chemical Name					
Semivolatile Organic Compounds (UG/L)					
No Detections					
Explosives (UG/L)					
No Detections					
Total Metals (UG/L)					
Aluminum	2,230	87.0	--	3,700	**74,900**
Arsenic	2.28	150	10	0.045	**123**
Barium	118	4.00	2,000	730	**151 J**
Beryllium	2.45	0.66	4	7.3	**5.6**
Cadmium	0.605	0.271	5	1.8	**10.8**
Calcium	169,000	--	--	--	**30,100**
Chromium	15.1	11.4	100	0.043	**198**
Cobalt	20.6	23.0	--	1.1	**43.1 J**
Copper	12.2*	9.33	1,300	150	**62.9**
Iron	894	1,000	--	2,600	**202,000**
Lead	21.3*	3.18	15	15	**93.9**
Magnesium	11,500	--	--	--	**8,580**
Manganese	57.9	120	--	88	**573**
Mercury	0.081*	0.91	2	1.1	**0.07 J**
Nickel	11.4	52.2	--	73	**91.6**
Potassium	12,700	--	--	--	**8,490**
Silver	NE	0.36	--	18	**3 J**
Sodium	64,500	--	--	--	**10,800**
Vanadium	26.2	20.0	--	18	**184**
Zinc	4.52	120	--	1,100	**376**
Dissolved Metals (UG/L)					
Aluminum	100*	87.0	--	3,700	**3,540**
Arsenic	1.37	150	10	0.045	**43.3**
Barium	127	4.00	2,000	730	**20.5 J**
Beryllium	NE	0.66	4	7.3	**0.28 J**
Calcium	113,000	--	--	--	**29,400**

TABLE 3
Privy Tank Area Groundwater Detections and Comparison to Screening Criteria
Cheatham Annex, Williamsburg, Virginia
Additional Former PSLP Concerns Technical Memorandum

Station ID	**CLEAN CAX BKG 95% UTL Yortown-Eastover Aquifer**	**Eco Surface Water Screening Value - Fresh**	**CLEAN MCL-Groundwater**	**CLEAN RSLs Tapwater Adjusted**	CAA06-DW05
Sample ID					CAA06-DW05-1108
Sample Date					11/10/08
Chemical Name					
Chromium	6.04	11.0	100	0.043	**8.8 J**
Cobalt	0.7*	23.0	--	1.1	**7 J**
Copper	3*	8.96	1,300	150	**8.5 J**
Iron	275	1,000	--	2,600	**50,100**
Lead	1.7*	2.52	15	15	**4.7 J**
Magnesium	11,200	--	--	--	**3,020 J**
Manganese	49.5	120	--	88	**391**
Nickel	12.2*	52.0	--	73	**7.7 J**
Potassium	12,600	--	--	--	**2,240 J**
Silver	NE	0.36	--	18	**1 J**
Sodium	62,800	--	--	--	**11,800**
Vanadium	4.3*	20.0	--	18	**8.2 J**
Zinc	NE	118	--	1,100	**24.3 J**

Notes:
Bold indicates detection
Concentration exceeds Background (BKG)
Concentration exceeds BKG and Eco
Concentration exceeds BKG and Tapwater RSL
Concentration exceeds BKG, Eco and Tapwater RSL
Concentration exceeds BKG, Eco and MCL
Concentration exceeds BKG, Tapwater RSL and MCL
Concentration exceeds BKG, Eco, Tapwater RSL and MCL
-- - Screening value not detected, not available, or not applicable
*Maximum BG value, as no 95% UTL established
NE - no 95% UTL established as constituent not detected
J - Analyte present, value may or may not be accurate or precise
NA - Not analyzed
U - The material was analyzed for, but not detected
UG/L - Micrograms per liter

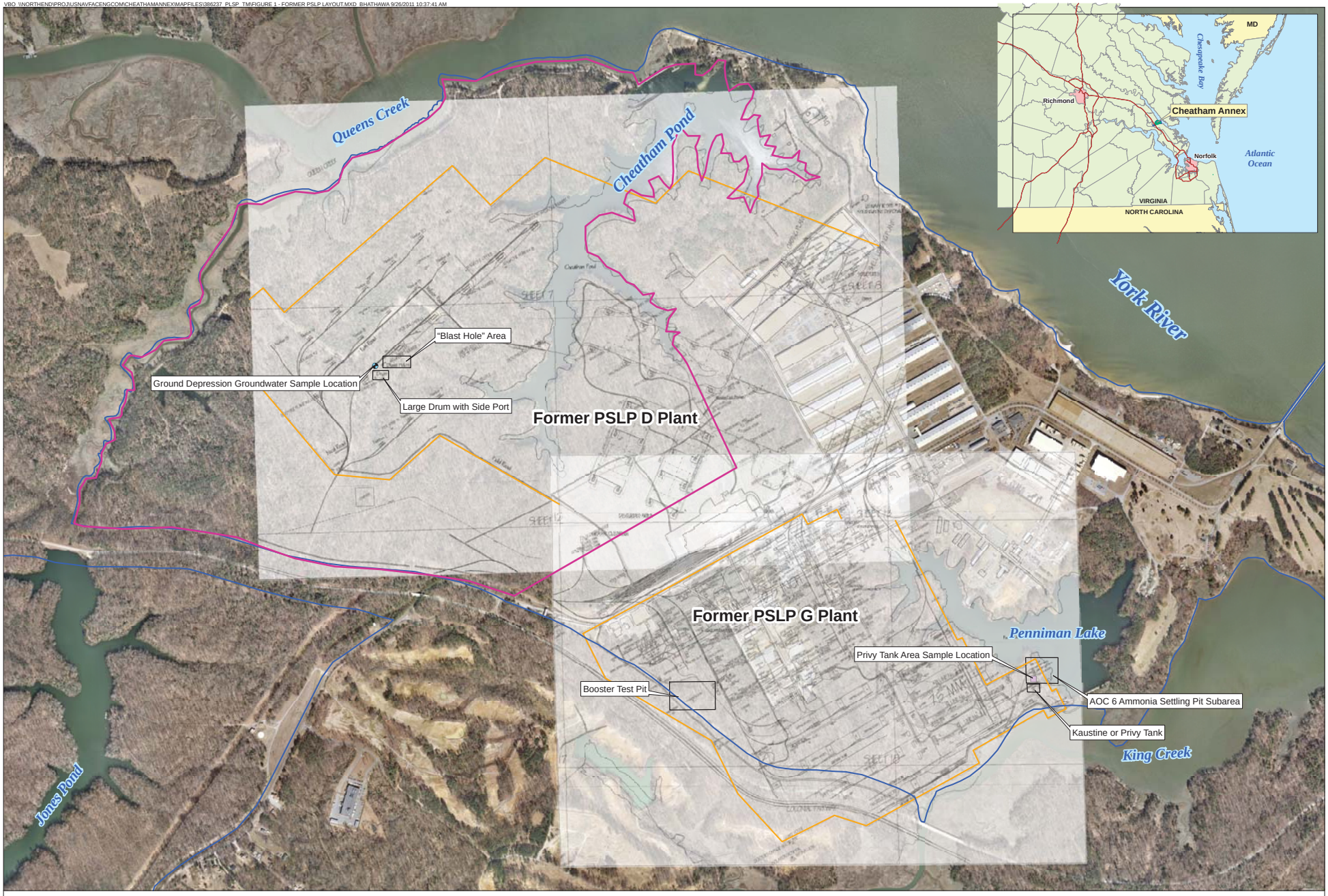
TABLE 4
Ground Depression Groundwater Detections and Comparison to Background
Cheatham Annex, Williamsburg, Virginia
Additional Former PSLP Concerns Technical Memorandum

Sample ID	**CLEAN CAX BKG 95% UTLs Cornwallis Cave Aquifer**	CABC-GWDPT-011111
Sample Date		1/11/11
Chemical Name		
Explosives (UG/L)		
Perchlorate	--	**0.21 J**
Total Metals (UG/L)		
Aluminum	2,230	**161 D**
Arsenic	2.28	**1.12 J**
Barium	118	**32.7**
Cadmium	0.605	**0.417 J**
Calcium	158,000	**170,000 D**
Chromium	15.1	**1.09 J**
Iron	3,590	**661**
Magnesium	3,600	**1,940**
Manganese	57.9	**20.9**
Nickel	11.4	**2.67**
Potassium	3,490	**705 J**
Sodium	9,920	**6,880**
Vanadium	26.2	**1.66 J**
Dissolved Metals (UG/L)		
Aluminum	100	**61 J, D**
Arsenic	1.37	**1.08 J**
Barium	127	**31.2**
Cadmium	0.177	**0.378 J**
Calcium	148,000	**168,000 D**
Iron	631	**494**
Magnesium	3,880	**1,930**
Manganese	49.5	**27.0**
Nickel	12.2	**2.99**
Potassium	1,710	**682 J**
Sodium	10,000	**6,900**

Notes:
Results were not validated or risk screened.
Bold indicated detection
Exceeds Background (BKG)
D - Compound identified in an analysis at a secondary dilution factor.
J - Analyte present. Value may or may not be accurate or precise
J, D - See 'J' and 'D'
UG/L - Micrograms per liter

Figures

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\386237_PLSP_TM\FIGURE 1 - FORMER PSLP LAYOUT.MXD BHATHAWA 9/26/2011 10:37:41 AM



Legend

- PSLP Boundaries
- CAX Boundary
- Former Department of Interior Property

Note:
Plant D and Plant G overlays from Figures 2 and 3, respectively, of the Weston SI Report (Weston, 1999b)

N
W E
S

0 800 1,600
Feet

Figure 1
Former Penniman Shell Loading Plant (PSLP) Layout
Additional Former PSLP Concerns Technical Memorandum
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

FIGURE 2
In-ground Battery
Additional PSLP Concerns Technical Memorandum
Cheatham Annex
Williamsburg, Virginia

(Photos taken 1998 and courtesy of Robert Thomson, USEPA)

Tank in ground

Tank out of ground and on side

FIGURE 3
Mixing Tanks
Additional PSLP Concerns Technical Memorandum
Cheatham Annex
Williamsburg, Virginia

(Photos taken 1998 and courtesy of Robert Thomson, USEPA)

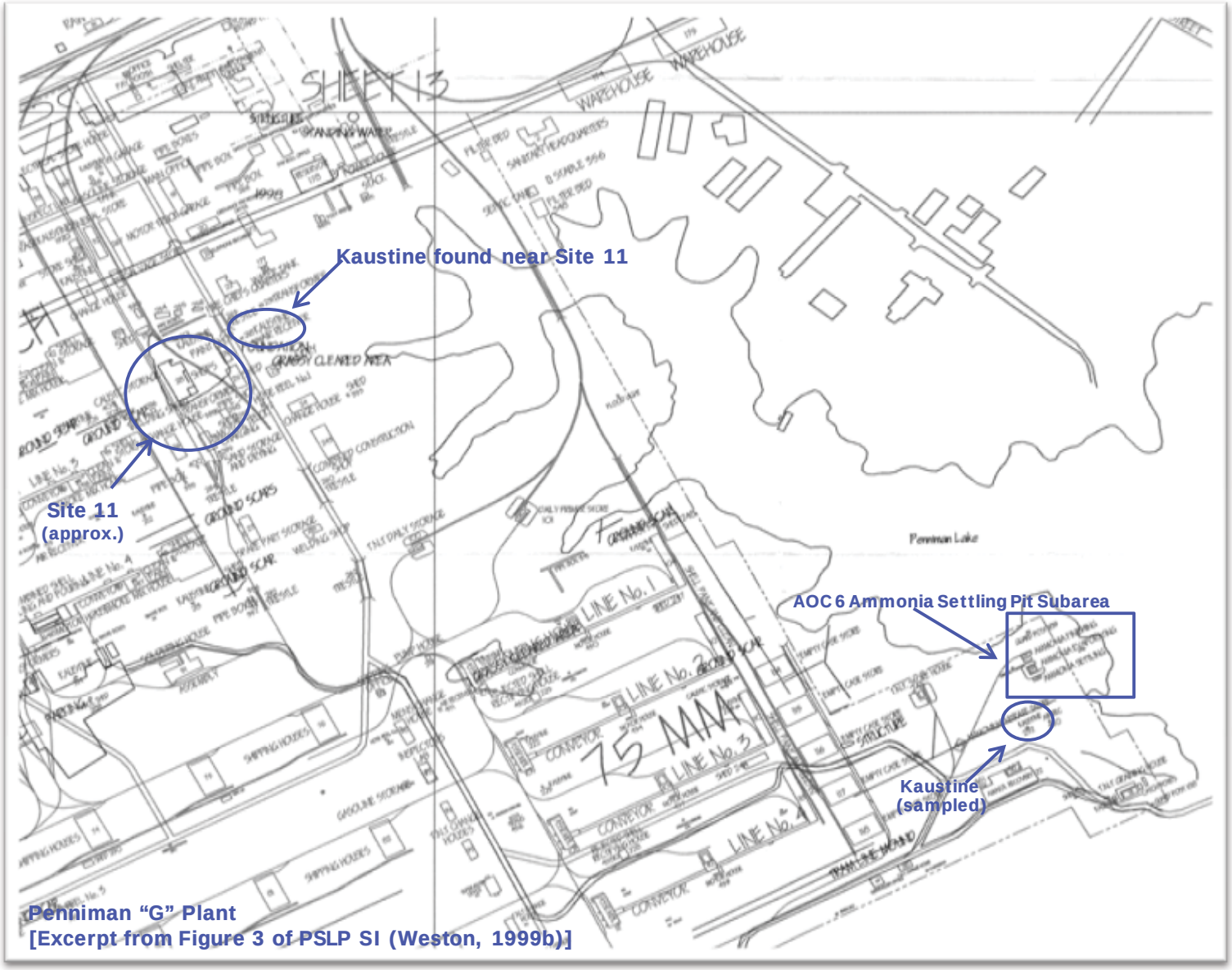


FIGURE 4
Kaustine Locations
Additional PSLP Concerns Technical Memorandum
Cheatham Annex
Williamsburg, Virginia

R:\USNAVFACENGCOM405450\CHEATHAMANNEX\MAPFILES\386237_PLSP_TM\FIGURE 5 - PRIVY TANK AREA DPT SAMPLE LOCATION.MXD JCROCKETT 12/11/2013 8:29:03 AM

Legend

- Groundwater/Soil Sample Location
- Privy Tank Location
- Topographic Surface Contour (feet above mean sea level)
- Approximate AOC 6 Study Area
- Former Buildings

N
W E
S

0 40 80
Feet

Figure 5
Privy Tank Area DPT Sample Location
Additional Former PSLP Concerns Technical Memorandum
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

Station ID	CAA06-SO09
Sample ID	CAA06-SB09-1108*
Sample Date	11/06/08
Depth	6-24"
Semivolatiles (UG/KG)	
No Detections	
Explosives (UG/KG)	
No Detections	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA06-SO09
Sample ID	CAA06-SS09-1108*
Sample Date	11/06/08
Depth	0-6"
Semivolatiles (UG/KG)	
No Exceedances	
Explosives (UG/KG)	
No Detections	
Total Metals (MG/KG)	
No Exceedances	

Legend

- Soil Sample Location
- Privy Tank Location
- Approximate AOC 6 Study Area
- Former Buildings

* Indicates a duplicate sample was taken.
The most conservative value was selected.

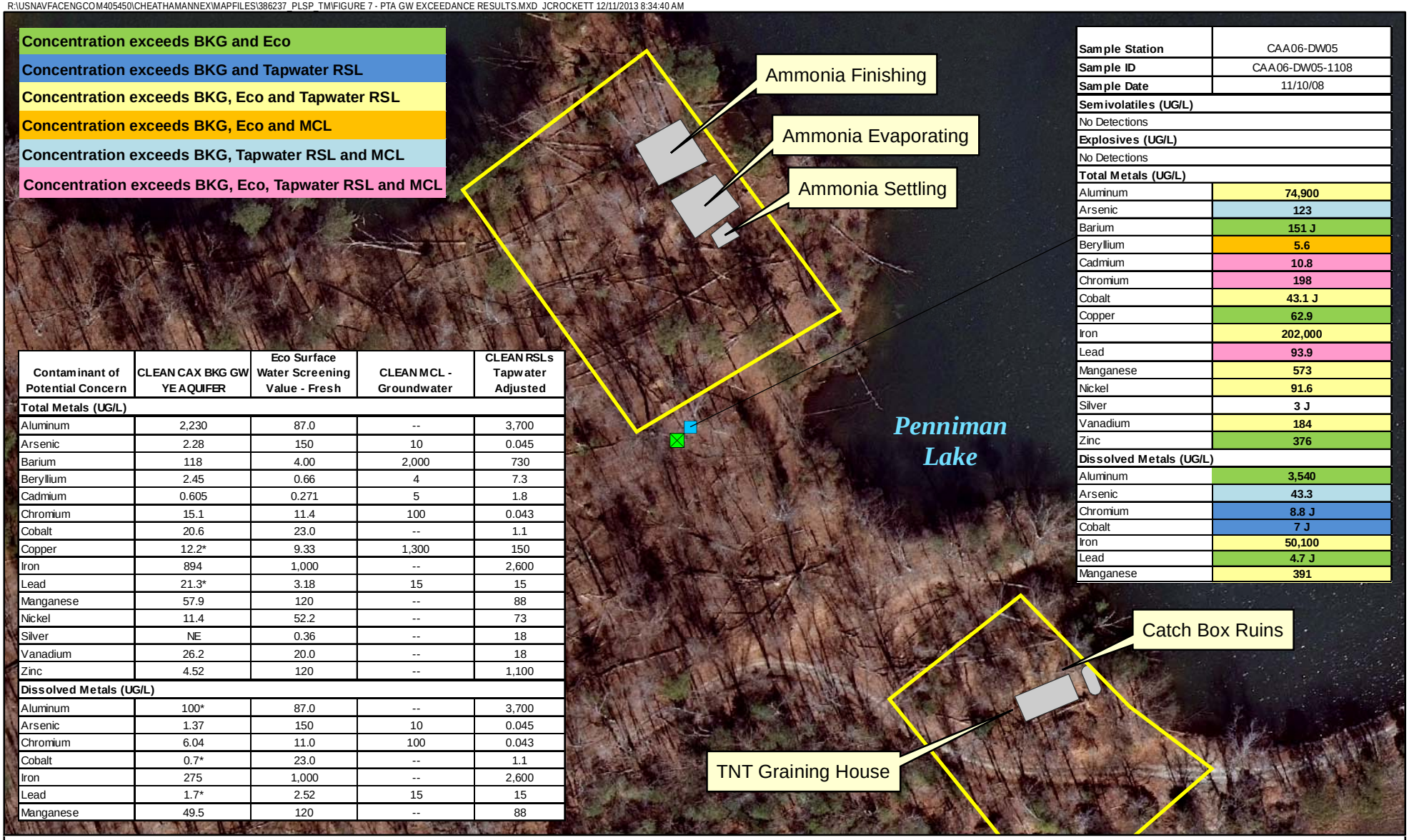
N
W E
S

0 40 80
Feet

Figure 6
Privy Tank Area Surface and Subsurface Soil Exceedance Results
Additional Former PSLP Concerns Technical Memorandum
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

R:\USNAVFACENGCOM405450\CHEATHAMANNEX\MAPFILES\386237_PLSP_TM\FIGURE 7 - PTA GW EXCEEDANCE RESULTS.MXD JCROCKETT 12/11/2013 8:34:40 AM



- Concentration exceeds BKG and Eco
- Concentration exceeds BKG and Tapwater RSL
- Concentration exceeds BKG, Eco and Tapwater RSL
- Concentration exceeds BKG, Eco and MCL
- Concentration exceeds BKG, Tapwater RSL and MCL
- Concentration exceeds BKG, Eco, Tapwater RSL and MCL

Contaminant of Potential Concern	CLEAN CAX BKG GW YE AQUIFER	Eco Surface Water Screening Value - Fresh	CLEAN MCL - Groundwater	CLEAN RSLs Tapwater Adjusted
Total Metals (UG/L)				
Aluminum	2,230	87.0	--	3,700
Arsenic	2.28	150	10	0.045
Barium	118	4.00	2,000	730
Beryllium	2.45	0.66	4	7.3
Cadmium	0.605	0.271	5	1.8
Chromium	15.1	11.4	100	0.043
Cobalt	20.6	23.0	--	1.1
Copper	12.2*	9.33	1,300	150
Iron	894	1,000	--	2,600
Lead	21.3*	3.18	15	15
Manganese	57.9	120	--	88
Nickel	11.4	52.2	--	73
Silver	NE	0.36	--	18
Vanadium	26.2	20.0	--	18
Zinc	4.52	120	--	1,100
Dissolved Metals (UG/L)				
Aluminum	100*	87.0	--	3,700
Arsenic	1.37	150	10	0.045
Chromium	6.04	11.0	100	0.043
Cobalt	0.7*	23.0	--	1.1
Iron	275	1,000	--	2,600
Lead	1.7*	2.52	15	15
Manganese	49.5	120	--	88

Sample Station	CAA06-DW05
Sample ID	CAA06-DW05-1108
Sample Date	11/10/08
Semivolatiles (UG/L)	
No Detections	
Explosives (UG/L)	
No Detections	
Total Metals (UG/L)	
Aluminum	74,900
Arsenic	123
Barium	151 J
Beryllium	5.6
Cadmium	10.8
Chromium	198
Cobalt	43.1 J
Copper	62.9
Iron	202,000
Lead	93.9
Manganese	573
Nickel	91.6
Silver	3 J
Vanadium	184
Zinc	376
Dissolved Metals (UG/L)	
Aluminum	3,540
Arsenic	43.3
Chromium	8.8 J
Cobalt	7 J
Iron	50,100
Lead	4.7 J
Manganese	391

Legend

- Groundwater Sample Location
- Privy Tank Location
- Approximate AOC 6 Study Area
- Former Buildings

UG/L - Micrograms per liter
-- No value available
*Maximum BG value, as no 95% UTL established
NE - no 95% UTL established as constituent not detected
J - Analyte present, value may or may not be accurate or precise

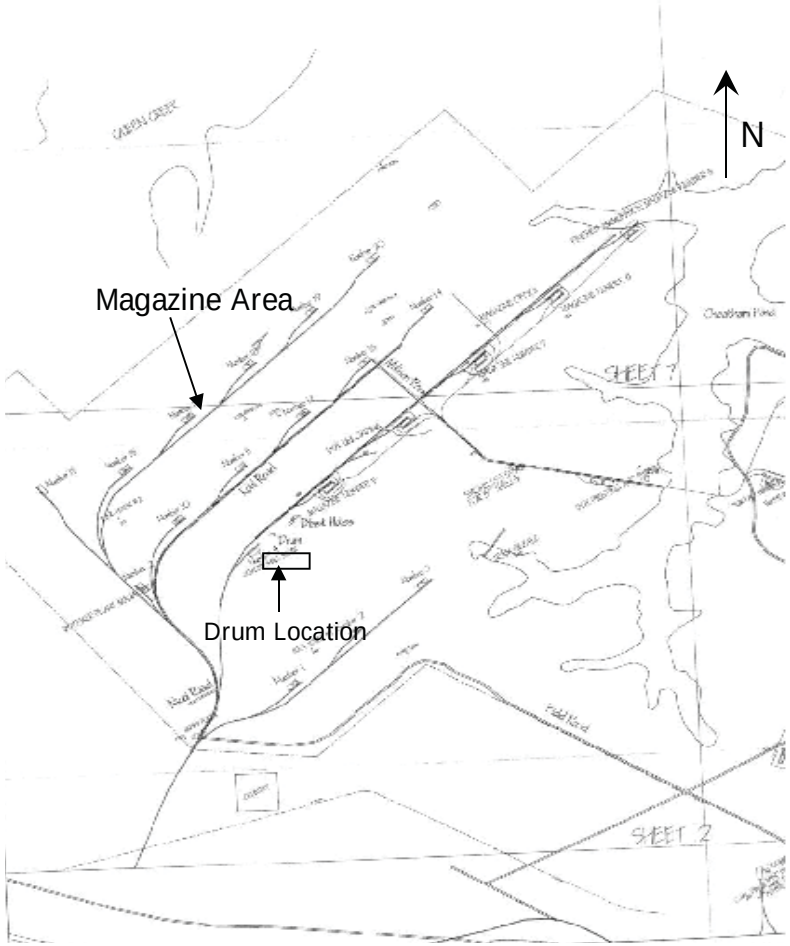
N
W E
S

0 40 80
Feet

Figure 7
Privy Tank Area Groundwater Exceedance Results
Additional Former PSLP Concerns Technical Memorandum
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

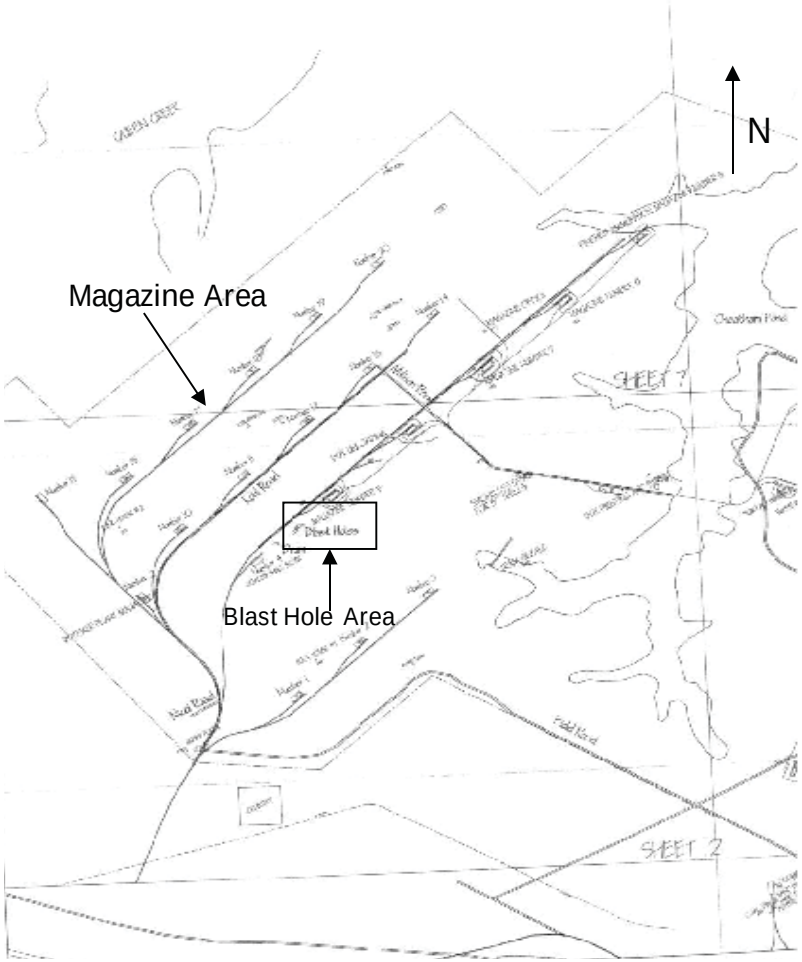
FM/FS Drum in magazine area near Magazine 5 on former DOI Property
[Photo from Final EBS (Baker, 2004)]



Penniman "D" Plant
[Excerpt from Figure 2 of Penniman Plant SI (Weston, 1999b)]

FIGURE 8
Large Drum with Side Port
Additional PSLP Concerns Technical Memorandum
Cheatham Annex
Williamsburg, Virginia

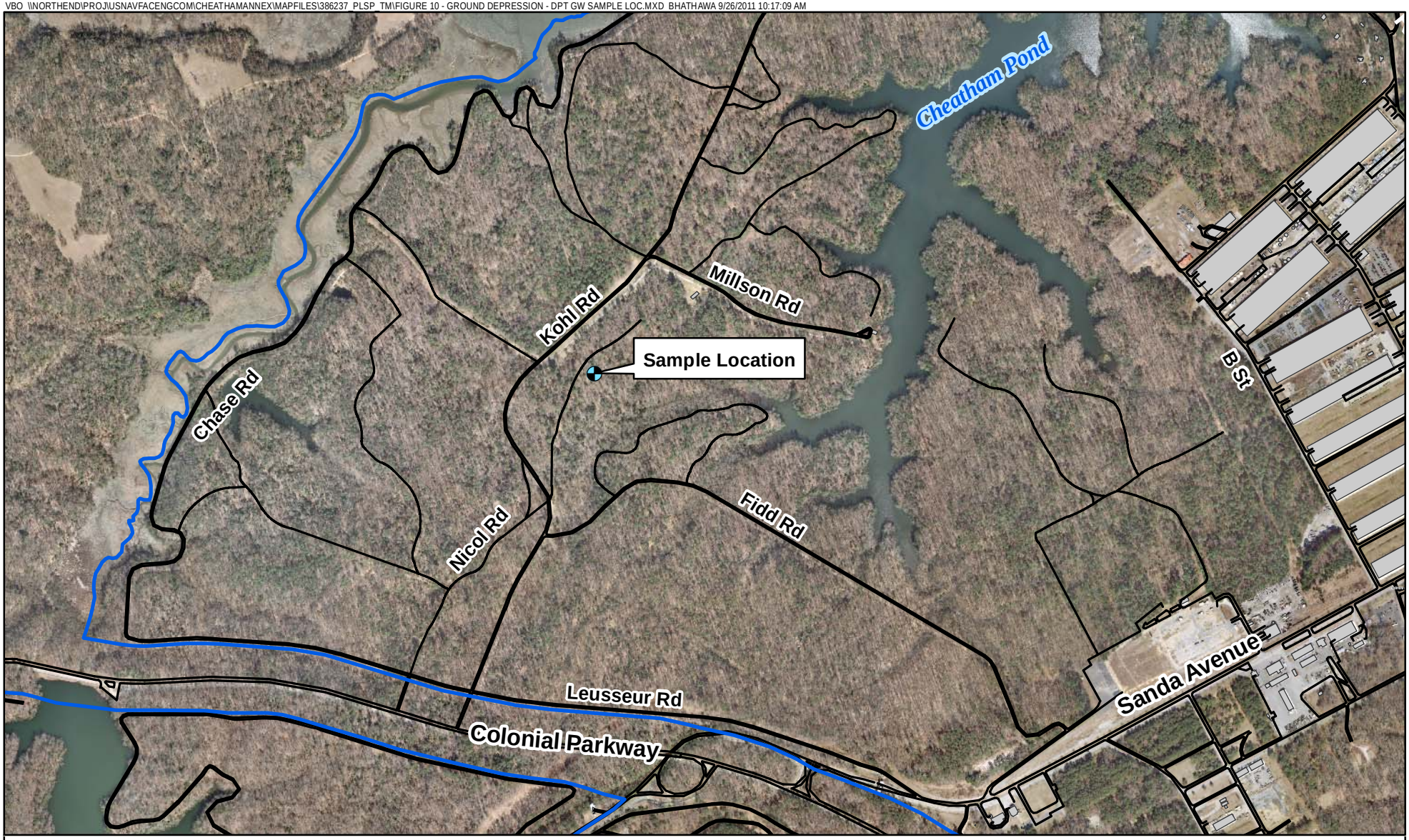
Blast hole in Magazine Area
[Photo from Final EBS (Baker, 2004)]



Penniman "D" Plant (former DOI Property)
[Excerpt from Figure 2 of Penniman Plant SI (Weston, 1999b)]

FIGURE 9
Blast Holes
Additional PSLP Concerns Technical Memorandum
Cheatham Annex
Williamsburg, Virginia

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\386237_PLSP_TM\FIGURE 10 - GROUND DEPRESSION - DPT GW SAMPLE LOC.MXD BHATHAWA 9/26/2011 10:17:09 AM



Legend

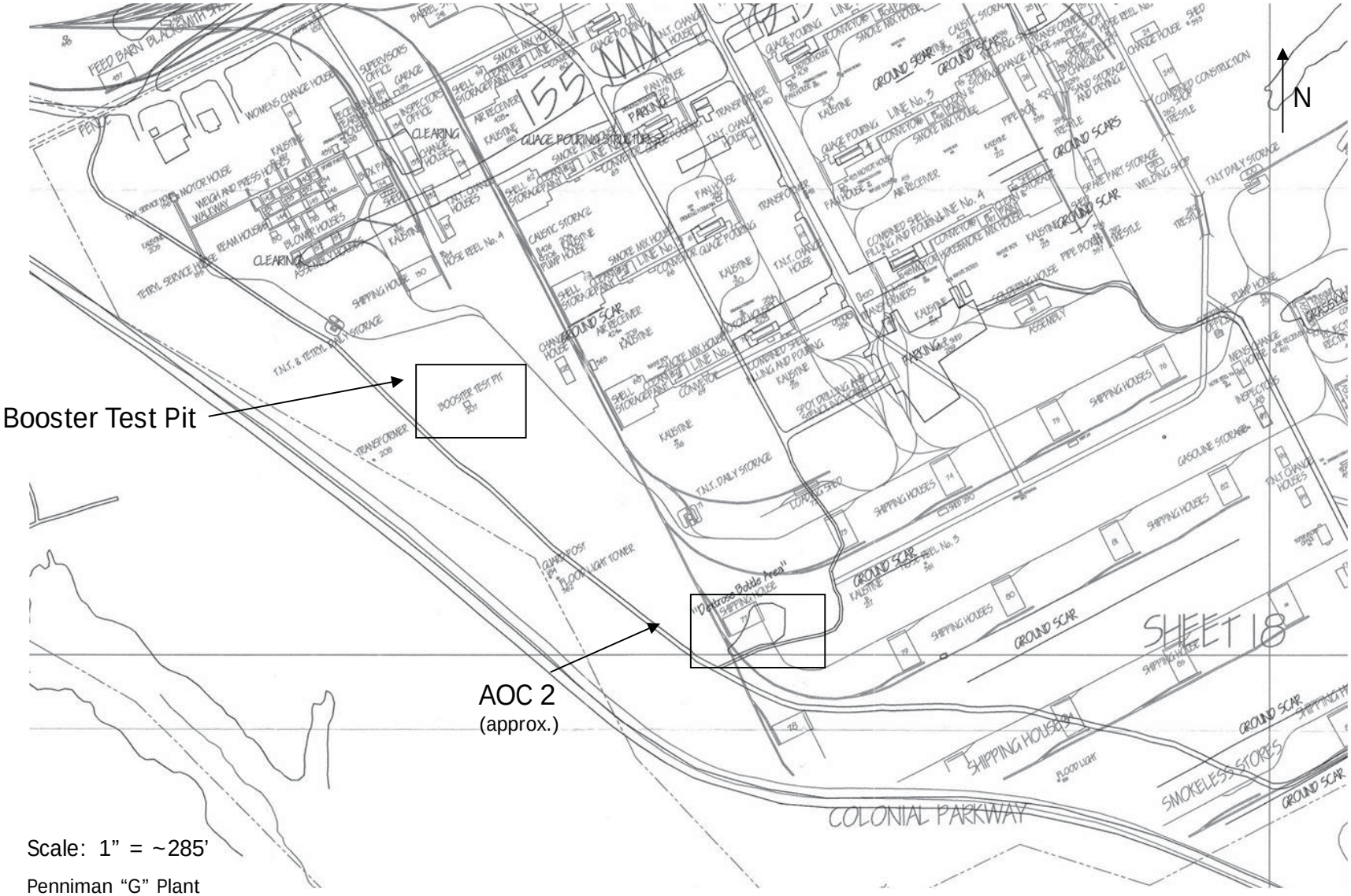
- Groundwater Sample Location
- Roads
- Buildings

N
W E
S

0 500 1,000
Feet

Figure 10
Ground Depression - DPT Groundwater Sample Location
Additional PSLP Concerns Technical Memorandum
Cheatham Annex
Williamsburg, Virginia

CH2MHILL



Scale: 1" = ~285'

Penniman "G" Plant
[Excerpt from Figure 3 of Penniman Plant SI (Weston, 1999b)]

FIGURE 11
Booster Test Pit Location
Additional PSLP Concerns Technical Memorandum
Cheatham Annex
Williamsburg, Virginia

Northeast View

East View

FIGURE 12
Booster Test Pit
Additional PSLP Concerns Technical Memorandum
Cheatham Annex
Williamsburg, Virginia

(Photos taken during February 2009 Site Visit)

Attachment 1

September 2008 Partnering Meeting Minutes Excerpt

Excerpt from the September 2008 Naval Weapons Station Yorktown/Cheatham Annex (CAX) Partnering Meeting Minutes:

Attendees:
Mr. Chris Murray (Navy Remedial Project Manager for CAX)
Ms. Donna Caldwell (Navy Technical Support)
Mr. Robert Thompson (USEPA, Region III Remedial Project Manager for CAX - outgoing)
Ms. Sue Haug (USEPA, Region III Remedial Project Manager for CAX – in coming)
Mr. Wade Smith (Virginia DEQ Remedial Project Manager for CAX)
Ms. Marlene Ivester (CH2M HILL)
Ms. Stephanie Sawyer (CH2M HILL)

Agenda Item: Penniman AOCs

Discussion Leader: Marlene I./CH2M HILL
Document/Prep Work: None
Desired Outcome: Informational
Discussion: Marlene noted that this is an informational presentation to discuss some of the concerns that Rob (EPA) has voiced with regards to the acquisition of the DOI property, specifically Penniman AOCs on that property. The Penniman Shell Loading Plant was primarily agricultural pre-WWI. In 1916 DuPont purchased the land for a TNT production facility named Penniman, it was later converted to a shell loading plant in 1917. From 1919-1926 the U.S. govt. operated the Penniman Facility as an Ordnance Depot, following the end of the war (1918). The facility was demolished, excess bulk explosives sold, and stored ammunition was either decommissioned or shipped to other depots. Most of the magazine area structures were decommissioned and demolished. From 1926 through 1942 the area was reverted back to farmland. In 1942, the U.S. govt. acquires property to establish a naval supply facility (CAX) on the York River. In 1979, a portion of the CAX property (786 acres) was transferred to DOI (also known as the NPS property). Navy agreed to manage the acreage under an interagency agreement in October 1992. In January 2004, the Final EBS determined that the property is suitable for Navy acquisition. The Navy acquired the "DOI property" between January 2004 and March 2005. The Final CAX FFA (March 2005) included the acquired property in the CAX acreage size (2,300 acres).

The CAX FFA identified the Penniman Facility as AOC 6, divided into five sub-areas. Marlene noted that all of the Penniman sub-areas with the exception of the waste slag will be investigated as part of the CAX multiple AOCs field work to begin October 2008. These four areas are (Ammonia Settling Pits, TNT Graining House Sump, TNT Catch Box Ruins, and 1918 Drum Storage). The reason that the waste slag may possibly be excluded is that the waste slag is related to a railroad system.

EPA provided Marlene with an e-mail noting their additional concerns beyond the sub-areas noted above. EPA Concern #1 was in-ground batteries which the Navy tried to locate and could not do so. Rob had seen them in 1998 on a site visit. Rob noted that it would be better to look for them in January or February once the vegetation had died off, which the Navy will do. EPA Concern #2 was mixing tanks that were also identified during the same site visit, south of the Bone Yard in the loading area. As part of the Final SI Narrative Report (Weston, 1999), a sample was collected from an underground mixing tank and analyzed for VOCs, SVOCs,

Pesticides/PCBs, Nitroaromatics and Mustard Decomposition, and inorganics. Comparing analytical results to EPA Region III residential RBCs, the report concluded that only arsenic, lead, and manganese were chemicals of concern. The Navy will conduct a desktop audit of the known available historic records and is planning a trip to the Hagley Museum to research the use of the mixing tanks and potential associated piping. The Navy will plan another site visit in the Winter 2008/2009 to try to locate the mixing tanks again, as they were not able to locate them on their first try. Additionally, Rob suggested getting a metal detector and trying to find additional tanks out there. EPA Concern #3 was old drums with side ports. Rob noted that some of these were located near some cabins in the center of the DOI property. A titanium tetrachloride (FM)/sulfur dioxide (FS) smoke drum was identified and a soil sample was collected under the drum found during the SI (Weston, 1999). The report concluded that only arsenic was a chemical of concern. As part of the 2003 EBS sampling, another surface soil sample was collected near this and there were no EPA Region III residential RBCs and background exceedances. The Navy feels that the area has been adequately addressed and no further investigation is necessary. Rob agreed that with this drum enough investigation has been done. However, if others are located then we need to investigate those. EPA Concern #4 was detonation craters in the magazine area. Samples were collected from the Weston 1999 SI and as part of the 2003 EBS three soil samples were collected from three different craters. The Weston report noted that only arsenic and chromium were chemicals of concern. The sample results were below EPA Region III residential RBCs and background from the EBS study. The Navy feels that the area has been adequately addressed and no further investigation is necessary. Rob noted that we don't know what all of the blast craters were used for and potentially could be part of the missing waste stream. Rob noted that if all of the craters were only in one specific area and that area had been sampled we should be fine; however, the craters are all over the place in the Magazine area. Rob suggested investigating at the Hagley what they were blowing up in the blast craters. Donna asked if taking a DPT groundwater sample could be a potential solution for investigating the crater area (or as close as we can get to the crater). We would analyze for explosives and metals. EPA Concern #5 was the appropriateness of collecting samples at the locations we had proposed in the AOC 6 area. The sampling plan for the upcoming AOC 6 site investigation, which includes the Ammonia Settling Pits, TNT Graining House Sump, TNT Catch Box Ruins, and 1918 Drum Storage, is a judgmental sampling approach biased toward areas of expected highest concentrations. Rob indicated that we would not be able to tell if there is some sort of underground piping network related to these sites based on our current sampling approach.

We will investigate AOC 6 in accordance with the Draft Final Work Plan for Site Investigation. Rob also suggested trenching around the Ammonia Settling Pits and TNT Graining House Sump. The Navy currently will proceed with the work plan as proposed and will continue to address any future concerns. The Navy will conduct desktop audits of known historic documents (Slides 7, 8, & 9), including the Hagley Museum archive. The Navy will conduct a site reconnaissance this winter. Rob added that the Navy should look into the "Fuse Pit" behind the firehouse.

Wrap-Up/Action Item: Rob/Sue will provide the following documents: Trip Report for the CAX Site Visit Conducted on 15 September 1998, Trip Report #1 USN Supply Center CAX, Report for CAX Munitions and Material Review Request, Penniman Shell Loading Plant Site-

LHP Inventory Review Report, Penniman Shell Loading Plant Site – LHP 1918 Panoramic Photograph Review, and the Penniman Shell Loading Plant-LHP 1918 Panoramic Photograph Review. Chris and Linda/Donna will elevate up to Tier II the possible exclusion of railway waste slag from the CERCLA process. A site visit will be conducted in the winter of 2008/2009 to try and find the additional drums/tanks/fuse pit that Rob has mentioned.

Attachment 2

March 2009 Partnering Meeting Minutes Excerpt

Excerpt from the March 2009 Cheatham Annex (CAX) Partnering Team Meeting Minutes:

Attendees:
Mr. Chris Murray (Navy Remedial Project Manager for CAX)
Ms. Sue Haug (USEPA, Region III Remedial Project Manager for CAX)
Mr. Wade Smith (Virginia DEQ Remedial Project Manager for CAX)
Ms. Marlene Ivester (CH2M HILL)
Ms. Stephanie Sawyer (CH2M HILL)

Agenda Item: Penniman Site Visit Discussion

Discussion Leader: CH2M HILL/Marlene Ivester

Document/Prep Work: None

Desired Outcome: Informational and Team Consensus on Penniman Course of Action

Additional Conference Call Participants: None

Discussion: The February 2009 site visit with the Navy, EPA, and VDEQ was recapped. The site visit included the DOI property and the Penniman Shell Loading Plant. Rob Thomson, EPA RPM for Yorktown and formerly of CAX, had previously identified items of concern during the September 2008 Partnering Meeting.

- In-ground batteries – discovered in 1999 by EPA. Could not be found during February 2009 site visit. Rob still wants the batteries to be found and requested an additional site visit to try to find the in-ground batteries. Plan to conduct another site visit in May 2009.
- Mixing Tanks – discovered in 1999 by EPA. Documentation of latrine (Kaustine) use was provided by CH2M HILL and VDEQ. Sampling results near one of the latrines indicate the absence of explosives. Based on the site visit and documentation, Rob agreed that the "mixing tanks" were in fact latrines/privies and no further action is necessary.
- Large Drums with side ports – discovered in 1999 by EPA. The drum, photographed in 1999, is still located at CAX (on the former DOI property that the Navy reaquired). EPA was concerned about the drum being used for chemical warfare. Soil surrounding the drum was sampled and nothing was detected. If others are found, additional investigations should be conducted, however at this time, no further action is needed.
- Detonation craters – observed in 1999 by EPA. The Partnering team agreed to collect one DPT soil and groundwater sample for explosives and metals near where craters are concentrated.
- Fuse Pit – mentioned by Rob in September 2008 Partnering Meeting. Listed as "booster test pit building" from 1999 Weston Report figure, Rob recommended excavating around the building to look for piping, if found, take pictures and contact the EPA. In addition, CH2M HILL recommended conducting an in-field TNT test if piping was found. The Navy plans on digging around the footer of the fuse pit to look for piping.

In addition, Rob requested that the Navy excavate around the other side of the berm adjacent to the TNT Catch Box Ruins and around the Ammonia Settling Pit (AOC 6) to look for piping. The Navy will be researching Penniman archives at the Hagley Museum for blueprints related to the TNT Catch Box Ruins, Ammonia Settling Pits, and booster test pit building. The EPA concerns will be documented in either the AOC 6 SI report or a separate tech memo.

The CAX team agreed to these actions for the five items of concern.

Wrap-Up/Action Item: Marlene to check with MWR (Ray Brake) on the status of the cabins near the lake on the DOI property. Wade to send the team information on EXPRAY.

Attachment 3

Society for Industrial Archeology Newsletter

SOCIETY FOR INDUSTRIAL ARCHEOLOGY

NEWSLETTER

Volume 29 Spring 2000 Number 1

THE UPS AND DOWNS OF IA IN SYRACUSE

Syracuse might be most famous these days as the home of a top collegiate basketball team or as the snowiest major U.S. city, but it also has a rich industrial heritage. The Onondaga Historical Association (OHA) serves as Greater Syracuse's largest museum of local history. Recently, it has been working on several projects to preserve and re-interpret a variety of IA heritage.

In 1996, the OHA Museum opened a permanent exhibit on the Franklin Manufacturing Co., Syracuse's contribution to automobile history. The Franklin auto was produced in Syracuse from 1902 until the Depression killed it in 1934. The Franklin was a well-engineered vehicle, most distinctive because it was air-cooled with no radiator. This feature allowed for some creative styling. During the 1920s, it was Syracuse's largest employer, topping 5,000 workers during one year. Its huge complex was leveled in the 1970s. However, the Lipe Machine Shop, sometimes called the "Cradle of Syracuse Industry" for its role in helping give birth to many local industrial inventions, still stands nearby. Key parts for the prototype Franklins were made there, including some for the oldest existing Franklin, a 1902 model that recently became part of the OHA exhibit. The car is on extended loan from the Smithsonian.

The OHA Museum is opening another permanent exhibit this year on the Syracuse China Co. This firm was founded on the city's west side in 1871. Its present factory complex has portions dating from the early 1920s. The company produced America's first true vitreous china in 1888. It soon became a national leader in the manufacture and distribution of both commercial and household fine china. The company maintains an extensive corporate archives including valuable film footage documenting production techniques of the 1920s.

On the railroad front, Syracuse has a citywide passenger shuttle called OnTrack. Operated by the Delaware & Otsego Railroad, it uses self-propelled Budd cars from the 1950s. Another OHA pro-

(continued on page 2)

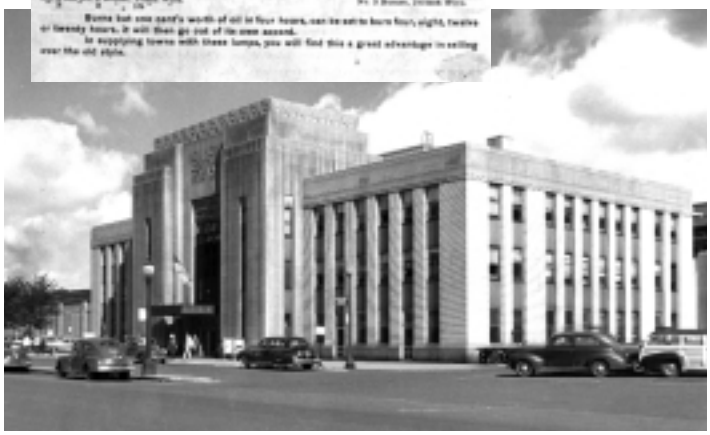
All photos courtesy OHA Collections

Franklin assembly line, 1923.

Published by the Society for Industrial Archeology
Department of Social Sciences, Michigan Technological University, Houghton, Michigan 49931-1295

SYRACUSE (continued from page 1)

Advertisement for Dietz street lamps, ca. 1890.



New York Central Passenger Station at Syracuse, ca. 1945. This 1936 building is currently empty as the community seeks new uses.

Gambrinus statue perched on the main facade of the Haberle Brewery about 1962 is now on exhibit in Syracuse's OHA Museum.

ject developed a computer-run narrative for use on board the cars. The route uses former New York Central and Delaware, Lackawanna & Western RR tracks, which pass through some of the city's older industrial districts. The narrative presents much Syracuse industrial history, including the fact that cars pass over one of the area's few surviving Erie Canal bridges, a 1901 trapezoidal truss with a 118-ft. clear span.

On the threatened list is the 1936 **New York Central Passenger Station**. It is a modest but handsome Art Deco gem that saw its last train in 1962. It was used for years after that as a Greyhound bus terminal. That operation moved over a year ago and the structure has yet to find a new use. Also in imminent danger is the last vestige of the once-sprawling, soda-ash plant of the **Solvay Process Co.** started in 1881. Solvay was America's first facility to produce soda ash through a chemical process. When it was closed by Allied-Signal in 1986, it was the last such operating plant in the U.S. Key parts of the original operation were photographed by HAER's Jet Lowe prior to demolition. One of OHA's pending projects is to assemble former plant engineers to help prepare descriptions of the images. Over the last 14 years, most of the extensive Solvay site was demolished or sold off for development. Many hoped that the last surviving building, the Solvay Process Office Building, could find a new use. It was begun in 1889, and its romantic-styling led everyone to call it "The Castle." But one of the new firms on the site, a paper recycler called Solvay Paperboard, intends to expand and wants the office demolished. Just before the time Allied pulled the plug in 1986, local company officials made sure that many of Solvay's original records, photographs, and documents were turned over to a local library. Now faced with growing space problems, the library is transferring the collection to the OHA.

Also in the realm of preserving IA documents, OHA has just become the designated repository for records from the **R. E. Dietz Co.** Dietz started in 1840 and became one of America' largest producers of kerosene lamps. Dietz was the lantern of choice for many of the country's railroads. Dietz began in New York City but moved to Syracuse in 1897, occupying a couple of local plants. The firm shut down its Syracuse plant in the early 1990s (Dietz lamps are now made in China). The company maintained a sizable archive, which was moved to the OHA this spring.

Like most cities, Syracuse was once home to several breweries. One of the few that survived both Prohibition and the Depression was the **Haberle Brewery**. When it did close in 1962, the hand-

The *SIA Newsletter* is published quarterly by the Society for Industrial Archeology. It is sent to SIA members, who also receive the Society's journal, IA, published annually. SIA promotes the identification, interpretation, preservation, and re-use of historic industrial and engineering sites, structures, and equipment. Annual membership: individual $35; couple $40; full-time student $20; institutional $40; contributing $60; sustaining $125; corporate $250. Send check or money order payable in U.S. funds to the Society for Industrial Archeology to SIA-HQ, Dept. of Social Sciences, Michigan Technological University, 1400 Townsend Drive, Houghton, MI 49931-1295; (906) 487-1889; *e-mail: SIA@mtu.edu;* Website: *www.ss.mtu.edu/IA/SIA.html*.

Mailing date for Vol. 29,1 (Spring 2000), June 2000. If you have not received an issue, apply to SIA-HQ (address above) for a replacement copy.

The *SIA Newsletter* welcomes material and correspondence from members, especially in the form of copy already digested and written! The usefulness and timeliness of the newsletter depends on you, the reader, as an important source of information and opinion.

TO CONTACT THE EDITOR: Patrick Harshbarger, Editor, SIA Newsletter, 305 Rodman Road, Wilmington, DE 19809; (302) 764-7464; e-mail: *phsianews@aol.com*.

SYRACUSE (continued from page 2)

The Solvay Process office complex in the early 20th century.

some brick Victorian-era complex was soon demolished. But its most distinctive feature, an 11-ft. tall statue of the medieval brewing King Gambrinus, was moved to the roof of a nearby German restaurant. It remained there until 1996, when its owners offered it for sale. OHA raised funds from a descendent of the brewery's original founder and acquired the local icon to keep it from leaving the area. The painted metal figure, which dates from the 1880s, was fully restored in 1999. It went on display with an accompanying exhibit last October.

If business or pleasure brings you to Central New York, make a point to visit OHA Museum in downtown Syracuse and discover some varied and distinctive IA history. Info: Dennis Connors, Curator of History, OHA, 311 Montgomery St., Syracuse, NY 13202; (315) 428-1864; fax 471-2133; e-mail: *djcoha@juno.com*.

D.C.

Wheeling Bridge Conference Marks 150th Anniversary

On October 21, 1999, 170 civil engineers, bridge scholars, and enthusiasts from all across the world gathered at the McLure House in downtown Wheeling, West Virginia, to celebrate the 150th anniversary of the opening of the Wheeling Suspension Bridge. This was the sixth in a series of conferences on historic bridges begun in Columbus, Ohio, in 1985. The themes of earlier conferences had included historical and engineering studies and had ranged from local to state, national, and international perspectives. Because of the emphasis on the Wheeling Bridge, the history and rehabilitation of suspension bridges was the primary theme of the Wheeling program. Due to the momentous nature of the anniversary, participants from Europe and Australia were invited to present papers.

Wheeling achieved major status as a transportation hub during the 1850s. Overland travel arrived via the National Road, rail transportation came through the Baltimore & Ohio Railroad, and the city was terminus for Ohio River traffic. Billy Joe Peyton, now working as a preservation consultant in Charleston, introduced these topics and set the stage for the conference with a paper on the design and construction of the National Road. Emory Kemp, one of the conference organizers, explained the technological basis of Charles Ellet's Wheeling Bridge design, as well as the subsequent history of the bridge. Michael Cuddy, an engineer with Lichtenstein Consulting Engineers, followed this historical study with an overview of the recently completed $6.5 million rehabilitation of the bridge. This project included preservation work on the cables, repairs or in-kind replacement of deteriorated hangers and stiffening truss members, and the installation of new open-grid deck and fiberglass walkways. The original red (trusses), white (cables), and blue (hangers) color scheme was restored and a dramatic new lighting plan added.

The inspiration for Ellet's Wheeling design came from in France. Michel Cotte, a historian at the University of Technology of Belfort-Montbeliard, described Marc Seguin's 1820s development of thin-wire suspension bridge technology in the Rhône Valley of southern France. Donald Sayenga took advantage of his long experience in the wire-rope industry to cover the technological history of wrought-iron wire and early examples of American bridges that had incorporated it. David A. Simmons, who also served on the program committee, followed with an analysis of the 25-year period of suspension bridge "popularity" in the Ohio Valley that followed the completion of the Wheeling Bridge. Elizabeth Monroe of Indianapolis presented a condensation of her definitive volume on the 1850s Wheeling Bridge case before the U.S. Supreme Court. In the evening, conferees gathered for a reception sponsored by the West Virginia Department of Culture and History at West Virginia's Independence Hall, where a rare segment of early 19th-century wrought-iron cable was on display. Dinner at a Civil War-era Catholic girls' school known as Mount de Chantel Visitation Academy was followed by a show-and-tell session hosted by Wheeling attorney Patrick Cassidy.

Rehabilitation and engineering were the theme of the second day's proceedings. Case Western University civil engineering professor Dario Gasparini outlined the history and variety of suspension bridge stiffening methods. HNTB engineer William J. Vermes described the recent rehabilitation of the massive, two-level Detroit-Superior High Level Bridge in Cleveland. Ted Ruddock of the University of Edinburgh discussed a remarkable group of early 19th-century blacksmith-inspired and -fabricated suspension bridges in Ireland and Scotland. Penn State's Thomas Boothby spoke on the history and application of graphic funicular analysis to methods of the last century and their application to modern rehabilitation studies for arches. Retired Australian civil engineer Donald Fraser treated the evolution of timber-truss bridges in New South Wales. Hota Ganga Rao of West Virginia University's Constructed Faclities Center discussed the success and failures of an electronic force measurement device devised by his agency, following which Karen Young of the Ohio Department of Transportation presided over a lively discussion of the rehabilitation project of an 1828 National Road stone arch in eastern Ohio.

Attendees were then led on a guided tour of the Wheeling Suspension Bridge. The closing-night banquet was followed by a coffee and birthday cake dessert hosted by the Wheeling National Heritage Area Corp. The evening was capped off with a preview of the new lighting on the bridge.

A Saturday morning bus tour of Wheeling-area stone and metal truss bridges completed the conference. The 194-page proceedings, edited by Emory Kemp and published by West Virginia University Press are available for $38.50 ppd. by contacting WVU Press, Box 6295, Morgantown, WV 26506-6295; (304) 293-3107, ext. 407; e-mail: *mmarshal@wvu.edu.*.

D.A.S.

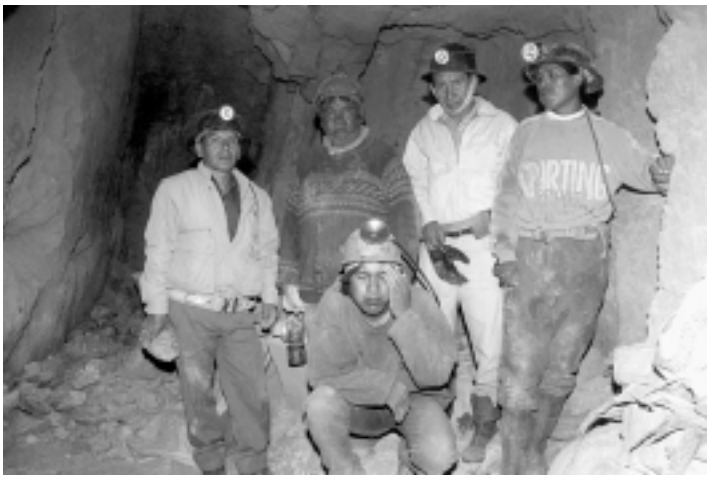
A Visit to Potosí, Bolivia II

With great interest I read Mark Hufstetler's article "El Cerro Rico," (*SIAN* v.28, 2 Summer 1999) on Bolivia's famous silver mines. This past autumn I was teaching a course on mining engineering in Bolivia, so I took the opportunity for a private tour of one of the cooperative mines and had a very similar experience. My guide was a miner who attended my lectures. He hopes to advise the miners on ways to make the mines safer.

Our tour started at the miners' market with the purchase of a small bag of coca leaves, which are chewed by the miners as a stimulant. Nearby were the typical small shops with mining equipment—shovels, picks, lamps, dynamite, and fuses. I was struck by the cavalier attitude toward explosives. Everybody can buy them and does, not only for use in the mines but for the production of fireworks, which are burned in the streets during festivals and elections. Fuses and dynamite are stored together next to food and lamps, and children play in the houses and sometimes eat their meals next to the explosives. They know nothing of the health hazards from breathing degassing nitroglycol or nitroglycerin.

Miners are unwilling to use geologic maps showing the location of the stopes and veins, even when such maps are available. They find a vein and start working, without any consideration of other possible openings in the neighborhood. Most of the veins I saw were only 1-inch thick or even less. The lead-zinc ores do have a very high silver content, several hundred grams per ton, but the miners do not analyze the ore. From time to time, a woman ore-dealer comes by the mine and assesses the ore content by its color. She buys the ore and sells it to private processing plants.

Since the miners tend to follow the richest ore veins, whether the veins go up or down, the mine I visited was not level and haulage with cars was impossible. All blasted ore has to be carried out in sacks on the miners' backs. At one point, the miners in my mine found a hole going to a bigger opening, probably a stope from an abandoned mine, but nobody knows for sure. If this was an old stope, they must have found rich ores judging by its size. The miners dump their waste rock down the hole, but they are unsure of the depth of the opening. To improve ventilation, the miners want to make a connection to another mine, situated some distance above, but until now there has been no ventilation, no fan, and no second exit.



Potosí silver miners.

Jurgen Weyer photos

Before leaving the mine, we made the obligatory visit to the Tio, the statue representing the patron god of miners and the underworld, which was surrounded by countless small bottles with alcohol and other stuff. If a miner is thirsty, he can borrow a bottle from Tio, but he has to put it (and a second one) back the very next day.

The processing of the ore is also done in Potosí. The tailings are disposed of in a small creek where a muddy gray liquid, like melted lead, flows downhill to the next river. A disaster for the environment! If one of the old processing plants stops working, then the buildings and machines go to ruin.

Surprisingly, some of the old mining equipment is preserved in town in an old stamp mill converted to a café and museum. Outside the restaurant is a water flume at the top of a wall, which formerly drove a water wheel that powered the stamps. Inside the café, some jigs and shaking tables are preserved.

On the weekend, I had time to make a longer trip to Uyuni, a

(continued on page 5)

Jig, shaking table, and line shafting of a former stamp mill, now a café in Potosí.

Salt bricks cut by hand axe from the Uyuni salt flats. The bricks will be shipped and sold for use as salt licks.

Historic American Engineering Record 30th Anniversary Exhibition

National Building Museum,
Washington, D.C.

October 26, 2000 through April 2001

The National Building Museum (NBM) is producing an exhibition celebrating the 30th anniversary of the Historic American Engineering Record (HAER). The show promises to be an engaging overview of the wide range of significant industrial sites and structures that HAER has documented, and it will explore American history from the perspective of engineering, industrial, and technological achievements. The 3,000-sq.-ft. exhibition will transform the galleries into an image bank, using layered projections to show HAER's drawings and photos next to the sites, structures, and objects they document. The show will encourage visitors to look at the built world with heightened understanding of its engineering while presenting the history of HAER and its unique archives.

The current concept for the exhibit divides America's engineering history into four categories: Mills, Foundries, and Factories; Power Plants, Fuel Production, Mines, Wells, and Waterworks; Bridges, Roadways, Railways, and Waterways; and Miscellaneous Structures from Monuments to Missile Sites.

The exhibition will be complemented by public education programs, including evening lectures and a symposium of engineers, architects, and historians. Students can visit the exhibition after attending the museum's popular engineering-themed school programs including "Arches and Trusses: The Tension Builds" and "To Bridge the Cap", among others. The museum will publish a free color brochure to accompany the exhibit, which is expected to travel to other museums and sites across the country after it closes at the NBM at the end of April 2001. The exhibit is supported by the American Society of Civil Engineers and the

(continued on page 16)

On the Trail of Kaustine

The writer, having retired after 30 years as a curator at a gunpowder manufacturing site (Hagley Museum), was contacted to identify a series of 78 buildings at a WW I shell-loading plant in Penniman, Virginia. Among these many buildings were several labeled KAUSTINE. After studying both Hagley's and my own considerable library on explosive material and coming up empty, I called the local great guru of explosives, retired from DuPont, manager of Penniman, who had no idea what Kaustine was. Next, I called California where another of the great living experts resides, and he did not have any idea either. After talking to the assistant head of the University of Delaware's chemistry department without getting any further, I called the curator of the U. S. Army Ordnance museum at Aberdeen, Maryland, and he kindly checked out every manual from shell loading to fire suppression—without luck.

After spending considerable time studying maps and photographs, it became apparent that the Kaustine buildings made no sense to the production flow. In fact, if I did not know better, I would have thought they were privies. The next step was to call Susan Hengel, head of the imprints department at the Hagley Library, and tell her of the problem and my suspicion. She was asked if she would check it out. Bingo! In Buffalo, New York, there was the Kaustine Company, which made sewage disposal units that did not need sewers. Since the Penniman Plant was at low elevation, next to the James River, it made perfect sense. Later research determined the Kaustine firm began about 1914 and ceased operations under the name Kaustine about 1926.

The firm for which I was working was informed of the findings. After the requisite amount of levity at the writer's expense, they stated that they had found a group of buried tanks whose use was a mystery. But it isn't now! There is, of course, one problem with this finding ... telling the people whom you asked for helpful information what a Kaustine house turned out to be.

R.H.

Potosí, Bolivia II *(Continued from page 4)*

city about 130 miles south of Potosí. The Salar de Uyuni is a great salt-flat of about 12,100 sq. km. Local residents use axes to cut out salt bricks, sold as lick-salt for animals, and even as a building material. The Hotel de Sal (salt hotel) is built of salt bricks, except for the roof. The salt bricks are even used to fashion the hotel's chairs, tables, and beds.

Many other ancient technologies remain in use in Bolivia, from traditional clay brick making to hand spinning. So if we want to look for them, they're there, only 11,000-ft. above sea level, in the Andes.

Jurgen Weyer
Insitute of Mining Engineering
Freiberg, Germany

Interior view of Hotel de Sal. The chairs, tables and walls are built of bricks cut from the salt flats.

SIA Fall Tour 2000
Ontario Oil Heritage District

October 19-21

Ontario's oil and gas industry, from its beginnings in the 19th century to the present day, will be the focus of the 2000 SIA Fall Tour, Oct. 19-21.

SIAers will stay in Sarnia, Ontario, one of Canada's main petro-chemical centers. Tentatively scheduled Friday tours include the Bayer rubber manufacturing facility (formerly Polysar); the Imperial Oil refinery (petroleum test lab and control room); and, Safety Cleen, a state-of-the-art hazardous waste incineration and burial facility.

On Saturday, the focus shifts from the new to the old when SIAers will travel to the towns of Oil Springs and Petrolia, home to North America's earliest oil industry. We will be welcomed at Fairbank Oil, an active company using older methods of extraction. There are plans to demonstrate the pulling of a well using the original system of a three-pole derrick and horses. Tour participants will also visit Bain's Machine Shop, Petrolia Oil Well Supply Company, the Petrolia Discovery Historic Site, and the Oil Museum of Canada.

Registration materials and more details will be sent to members later this summer. For further info: The Petrolia Discovery, Box 1480, Petrolia, Ontario N0N 1R0; (519) 882-0897; fax 882-4209; e-mail: *petdisc@xcelco.on.ca*; Web site: *www.petroliadiscovery.com*. ■

Protecting the Irreplaceable in Cleveland

Last year, the National Trust for Historic Preservation named the four great Hulett iron-ore unloaders [NR, HAER, ASME] on Lake Erie at Cleveland, Ohio, to its annual list of "America's 11 Most Endangered Historic Places." However, as SIA Vice President Carol Poh Miller reported in these pages [SIAN, Summer 1999], even before the list was publicly announced, National Trust Midwest regional director James Mann wrote to the Cleveland Landmarks Commission endorsing a compromise plan calling for the destruction of two Hulett machines and the disassembly and mothballing of two others for future reassembly as part of a canal theme park on the Cuyahoga River. In his letter, Mann called the plan a "win-win solution."

Recent correspondence between structural engineer Justin Spivey [SIA] of Arlington, VA, and Richard Moe, president of the National Trust, raises important questions about the issue of historical integrity. Preserved intact and in situ, the four Huletts—stunning monuments to Cleveland's maritime and industrial heritage and the last of their kind on Lake Erie—almost certainly would have qualified for National Historic Landmark status. Their removal now precludes that distinction. Did the National Trust act responsibly? Is it enough to mothball two Hulett machines, then reassemble them, out of context, on another site? And, if we do that, can we still call it "preservation"?

As this issue goes to press, all four Huletts have been removed from the Cleveland lakefront. Two have been scrapped, while the body pieces of two others lie nearby, awaiting an uncertain fate.

—Editor

5 November 1999

Dear Mr. Moe:

I was disappointed to learn that the National Trust for Historic Preservation had endorsed a "compromise" plan for "preserving" the Hulett ore unloaders in Cleveland by dismantling two of them. As a former student of historic preservation, I stand behind James Marston Fitch's assertion that *reconstitution* (i.e., disassembly followed by reassembly elsewhere), while falling under the umbrella term of "preservation," is nonetheless an activity different from *preservation in place*. If and when two Huletts are re-erected in a park on the Cuyahoga River, they will be robbed of their connection to Cleveland's steel industry. We need only look at a Bessemer converter, surrounded by outdoor café tables in Pittsburgh's Station Square, to see that large industrial objects no longer make sense when taken out of context.

The Committee to Save Cleveland's Huletts, with the assistance of a former C&P Ore Dock employee, found that the Huletts could have been left in place while expanding the dock to the capacity desired by the Cleveland-Cuyahoga County Port Authority. The Trust apparently joined the Port Authority and the Cleveland Landmarks Commission in ignoring this possibility. That the Trust would immediately endorse the dismantling of two Huletts, without first advocating for the preservation of all four in situ, seems contrary to its name and its stated mission of "protecting the irreplaceable." Nowhere else in the world are there four Hulett ore unloaders in the proper context of a waterfront industrial site. Why did the Trust not use its substantial influence and resources to protect this irreplaceable historic site?

What incensed me to the point of writing this letter was the "11-Most

Update" in the November-December [1999] issue of *Preservation*. The Trust shamelessly reported that the Huletts "were almost relegated to the scrap heap," after supporting a plan that would scrap two of them! I am shocked that the Trust would attempt to shine a positive light on this loss of an endangered historic site, unabashedly using a 91-year-old woman's words in its own defense: "It's better to have half a loaf than no bread at all." Ms. [Frances] Lesser's gift toward dismantling two Huletts is no doubt generous. But the Trust endorsed a plan to throw half the loaf away, then dismantle the other [half] without the certainty of re-erection, which may leave only crumbs.

I feel that my membership dues are not being used to advance the cause of historic preservation. I would like the Trust to explain how its support of the Hulett "compromise" plan is consistent with its mission of "protecting the irreplaceable," and provide a convincing reason why I should not cancel my membership and urge others to do the same.

Sincerely,

Justin M. Spivey

November 12, 1999

Dear Mr. Spivey:

In response to your November 5th letter, I want to assure you that the National Trust has been and continues to be invested in securing the future of the Hulett Ore Unloaders. Our commitment is emphasized by an unprecedented announcement of the Huletts' placement on our 1999 list of America's Most Endangered Historic Places prior to the scheduled release date in order to thwart the momentum for their outright demolition. We appreciate your concern for the Hullett's [*sic*].

It is concerned National Trust members like yourself that give us the strength to tackle these complex preservation challenges. The National Trust is working with our local, state and national partners to find a solution that preserves the life and integrity of this important historic resource. The National Trust has joined with others in the preservation community in supporting the Canal Basin Park proposal initially developed by the Ohio Canal Corridor and Cleveland Waterfront Coalition.

This proposal merits support by the National Trust for the reasons stated in our letter to Cleveland Landmarks Commission Chairman Richard Schanfarber, dated June 1, 1999, that stated ". . . the preferred and best approach to preservation of the four Huletts is for them to remain *in situ* . . ." It is through our intense involvement and analysis that we concur with our preservation partners on the win-win solution that will enable two Huletts to be preserved and interpreted rather than see four demolished. A contributing factor is our understanding that placement of at least two Huletts in the Canal Basin Park will not jeopardize their National Register status. Hulett Ore Unloaders historically could be found along the lakefront and Cuyahoga River—often in pairs of two.

Thank you again for your interest and concern. Please contact Evan Lafer in our Midwest Office at 312-939-5547 if you have any additional questions.

Sincerely,

Richard Moe

4 December 1999

Dear Mr. Moe:

I appreciate your taking time to respond to my letter of 5 November 1999. Your letter of 12 November 1999, however, did little to answer my concerns about Cleveland's Hulett ore unloaders:

In response to my concerns about historical context, you stated, "Hulett Ore Unloaders historically could be found along the lake front and Cuyahoga River - often in pairs of two." My concern was not about the number of Huletts, but about their removal from an active industrial site to a park setting with no obvious connection to Cleveland's steel industry.

You offered no explanation as to why the Trust apparently ignored a consultant's finding that the Huletts could have been left in place while expanding the dock to the desired capacity.

You neither confirmed nor denied my assertion that the Huletts would be dismantled without guaranteed funding for re-erection.

I appreciate that the National Trust initially advocated for the *in situ* preservation of the Huletts, but I fail to understand why the Trust later abandoned this position. Lacking more complete knowledge of the situation, I can only wonder why the Trust did not employ means such as court action to ensure the Huletts' preservation. At any rate, I do not agree that the current plan is a " 'win-win' solution."

If and when it became apparent that the Huletts could not be preserved in place, the Trust should have disassociated itself from the compromise solution. Instead, the Trust continues to claim this as a preservation victory, setting the unfortunate precedent that dismantling historic structures is a preferable means of preserving them.

I will not continue to support an organization which, in my opinion, has worked against the cause of historic preservation. This letter is to resign from my membership in the National Trust. Please remove my name from your membership rolls and your mailing lists.

Sincerely,

Justin M. Spivey

December 9, 1999

Dear Mr. Spivey:

Thank you for your letter of December 4th regarding the Hulett ore unloaders. I think it's apparent from our recent correspondence that we have a serious and probably irreconcilable disagreement on the best strategy to save the Huletts. I do understand your position but I'm afraid I don't agree with it.

I regret that you no longer find it possible to support the National Trust because of our position. I want you to know that we very much appreciate your support in the past and I hope that in the future you will reconsider your decision and rejoin our ranks. In the meantime, I wish you all the best.

Sincerely,

Richard Moe

LETTER TO THE EDITOR

On Paterson's National Historic Landmark District

To the Editor:

Thank you for providing an additional forum for the discussion of the future of the historic resources in Paterson, New Jersey (*SIAN*, Summer 1999 & Winter 1999). There is obviously local interest in the future of Paterson and the Great Falls Society for Establishing Useful Manufactures (SUM) National Historic Landmark (NHL) District and perhaps some of your members will remain interested in, and contribute to, the efforts in Paterson. The history of this NHL is important to the story of how we came to be the nation we are today. National Park Service (NPS) involvement in Paterson has focused on the preservation of those resources that can tell the story of Paterson and its citizens to future generations of Americans.

The NPS role in Paterson stems from funds placed by Congress in the 1992 budget. The appropriation, called the New Jersey Urban History Initiative (UHI), provided funding for Trenton, Perth Amboy, and Paterson to conduct historic preservation projects that encourage economic development. The city of Paterson received $4.147 million. The NPS administers these projects under a cooperative agreement with the city. The city has assembled an advisory group consisting of city officials, the Paterson Historic Preservation Commission, the SHPO, representatives of the business community, and interested citizens, to advise the NPS on the identification and administration of the UHI projects for Paterson. This group has recommended UHI funding for an exciting variety of preservation projects. Many of the projects are designed to raise public awareness of the district and, through this awareness, increase public interest and involvement in protecting the resources that tell the stories of Paterson.

Ongoing and completed projects include: a condition assessment of buildings in the NHL District; development of design guidelines for the district; an AmeriCorps project to make the district more attractive and accessible to visitors by repairing trails around the raceway system and modifying the visitors' center; an oral history project and ethnographic study conducted by the Library of Congress' American Folklife Center; the development of a $75,000 community grant program for historic, artistic, or cultural projects related to the UHI; the stabilization of the ruins of the Colt Gun Mill using UHI funds as part of a match for a New Jersey Historic Trust grant to the city; and a cultural resource study, including archeological work and removal of hazardous materials on the Allied Textile Printing (ATP) site.

The ATP site is one of the more complicated and challenging projects. Given its size—seven acres—and central location in the district, its ultimate reuse will play a major role in the future of the district and this area of the city. ATP ceased operations in 1983, and the property was purchased by a developer. In June of that year, the first of a dozen fires occurred at the site leaving, now, only ruins of mill buildings. In 1994, the city of Paterson acquired the property through foreclosure.

No matter what the new use on the ATP site may be, it is clear that steps need to be taken quickly to gather information from the historic resources and ruins that remain before they are gone forever. A preliminary study of the site was completed in 1996, the "Historic Industrial Site Analysis" prepared by Susan Maxman Assoc. While some have called this report incomplete, they fail to recognize the nature of the report as a survey-level document and overlook the many recommendations in the report for further research and archeological field work by a qualified industrial archeologist.

Currently, the NPS is working with 40 individuals and groups, including Sandy Norman, President, SIA; Lance Metz, President, Roebling Chapter of SIA, and SIA members Ed Rutsch and Patricia Condell, in developing a process by which the work on the site will proceed. This consultation is occurring under the requirements of Section 106 of the National Historic Preservation Act, as amended, because the city will be using federal dollars. A process is being developed with public input on how the very issues David Soo raised in his article [*SIAN*, Summer 1999] will be addressed. The proposed process is found in a draft programmatic agreement now under review by these 40 individuals and groups. It describes the manner by which the work on the site will be conducted, not the specific details of each element of work. This is because so many future decisions about how to proceed will depend on information yet to be gathered. For instance, the identification of a repository for any artifacts and reports will be dependent upon the significance, size, and nature of the artifact and the capability of a repository to care for the artifact and so cannot be determined at this time. However, the programmatic agreement describes the overall process of how that decision will be made. It describes similar steps for work that will be conducted including: completion of the cultural resources survey, archeological site work, evaluation of the results of this work, revisions of site plans based on this research, public review of reports, public review of building and site design, archeological monitoring of the site during construction, curation of artifacts and reports, and requirements of the city and developer to ensure the completion of the entire project.

The city is also about to begin work to stabilize the ruins of the Colt Gun Mill, one of the oldest structures

(continued on page 13)

Barbara Small photo

Great Falls, Paterson, NJ

SOCIETY FOR INDUSTRIAL ARCHEOLOGY
NEWSLETTER

PUBLICATIONS OF INTEREST

A Supplement to Vol. 29, No. 1 Spring 2000

COMPILED BY
Mary Habstritt, New York, NY; and Patrick Harshbarger, SIAN *editor.*

GENERAL INTEREST

- American Memory: Historical Collections for the National Digital Library. Web Site: *http://memory.loc.gov/ammem/amhome*. The Library of Congress Web site allows searches for images, documents, and sound recordings in various historical collections, including HABS/HAER; railroad maps; the Farm Security Admin. photographs; and the Detroit Publishing Co. photographs, a collection of 25,000 glass negatives and transparencies from a project where a specially outfitted railroad car was sent across the country in 1902 to document the former frontier. There is a wealth of images related to industry and technology. The search engine allows searching by keyword or subject. Some individual collections allow searching by photographer or geographic location.

- Canal History and Technology Proceedings, Vol. XIX. Canal History and Technology Press (30 Centre Square, Easton, PA 18042-7743), 2000. 235 pp., illus. $22.75 ppd. Papers from the annual symposium. Edited by Lance Metz. Includes: Vince Hydro, *The Lehigh Coal and Navigation Company's Mauch Chunk RR, Part III: Panther Creek Operations & the Switchback RR;* Kenneth C. Wolensky, *A Working Class Haven in the Pocono Mts.: Unity House—ILGWU;* Jean Whitford Turcott, *"The Vortex of Party Strife," The Funding Debate and Construction of the New York & Erie RR, 1832-1851;* Lance E. Metz, *The Prosecution of the Molly Maguires in Carbon County;* Michael E. Workman, *The Kay Moor Mine, 1901-1962: A Case Study of Underground Mechanization in the Bituminous Coal Fields of Southern West Virginia;* Robert J. Kapsch, *Benjamin Wright and the Design and Construction of the Monocacy Aqueduct*.

- Chronicle of the Early American Industries Assoc. is published quarterly and available with membership in the EAIA (see info elsewhere in this issue). Vol. 52, 3 (Sept. 1999) includes Kay Gibson, *The Golden Age of Farm-Produced Butter in New England and the Mid-Atlantic Region, 1700s to 1800s;* Andrew Hall, *The History of the Lawn Mower, Part 2: 1900-1940;* Kenneth E. Turner, *When is a Turf Mallet Not a Mallet?;* Jim Packham, *Shears and Scissors;* Donald A. Armistead, *Different Applications of Simple Metallurgical Activity;* Thomas A. Lamond, *Spokeshaves and Similar Tools;* Mary Ann Landis, *Labor and Coal: The Beginnings of a Regional Union in the Anthracite Fields of Pennsylvania, 1854-1874, Part 1*. Vol. 52,4 (Dec. 1999) includes Donna Parker and Jonathan Jeffrey, *Fulling Around: The Shaker Fulling Mill at South Union, KY;* Mary Ann Landis, *Labor and Coal, Part II;* Walter W. Jacob, *Brace Up for a Bit of Stanley History,* 1869-1908; James I. Walsh, *Capacity and Guage Standards for Barrels and Casks of Early America;* Debbie Henderson, *The Making of a Felt Hat;* Allan Klenman, *An Australian Oddity* (special hatchet for safely opening oil-products crates).

- Henry Cleere. Putting Industry on the World Heritage List. *TICCIH Bulletin*. (Autumn 1999), pp. 3-5. Under-represented historic industrial sites on the UNESCO World Heritage list.

- John Holusha. New Jersey Brownfields Are Drawing Developers, *New York Times* (Sun. Oct. 17, 1999), sec. 11, pp. 1, 8. NJ law protects buyers of brownfields and innovative use of dredged material from NY Harbor for capping material. A boom in the commercial development of brownfields for shopping centers and golf courses.

- Arnold Pacey. Meaning in Technology. MIT Press, 1999. 272 pp., illus., $27.50. How an individual's sense of purpose and meaning in life can affect the shape and use of technology.

- Eusebi Casanalles Rahola. The Museum Interpretation of Industrialization. *Industrial Patrimony*, v. 2, pp. 27-32. History and development of Museum of Science and Technology in Catalunya, Spain.

- Christine M. Rosen. Costs and Benefits of Pollution Control in PA, NY, & NJ, 1840-1906. *Geographical Review*, v. 88,2 (April 1998), pp. 219-240. PA judges saw abatement costs too high; NY and NJ judges didn't.

- Small Town America: Stereoscopic Views from the Robert Dennis Collection. Web site: *http://digital.nypl.org/stereoviews*. The NY Public Library has digitized selected historical collections, and this is one of the first collections of photographs to be put on its Web site. (Another on the history of transportation is due soon.) The stereoviews of small towns and cities in NY, NJ, and CT are grouped by location and can be searched by keyword. Many images of bridges, mills, and transportation.

- Edward Tenner. Why Things Bite Back: Technology and the Revenge of Unintended Consequences. Knopf, 1996; 1997 pap. 346 pp., bibliog., index. $26; $13 pap. 20th-c. technology that improved conditions only later to develop adverse consequences or "revenge effects." Examples include automobiles, which were viewed as solving the sanitary problems of horse-drawn vehicles only to result in a different kind of pollution as well as traffic jams; football helmets, which have led to more violent play; and carpal tunnel syndrome, brought on by improvements in office technology, but which goes back to the days of telegraph operators, who developed "glass arm."

- George M. Winder. **The North American Manufacturing Belt in 1880: A Cluster of Regional Industrial Systems or One Large Industrial District?** *Economic Geography* v. 75, 1, Jan. 1999, pp. 71-92.
- David Worth. **A Smoke Belching Congestion of Factories.** *Industrial Patrimony* v. 2, pp. 65-72. Cape Town, South Africa's neglected industrial heritage.
- G. Pascal Zachary. **Endless Frontier: Vannevar Bush, Engineer of the American Century.** MIT Press, 1999. 528 pp., illus. $22. Biography of cofounder of Raytheon, whose initial success was based on long-lasting radio tubes, and President Roosevelt's engineering advisor, who oversaw the work of the Manhattan Project.
- Dennis Zembala. **The Baltimore Museum of Industry: A Working Museum for a Working City.** *Industrial Patrimony*, v. 2, pp. 57-58.

Mines & Mining

- Geofffrey L. Buckley. **The Environmental Transformation of an Appalachian Valley, 1850-1906.** *Geographical Review*, v. 88,2 (Apr. 1998), pp. 175-198. Coal mining in the George's Creek valley west of Cumberland, MD, transformed the natural landscape.
- Grenville A. J. Cole. **Memoir of Localities of Minerals of Economic Importance and Metalliferous Mines in Ireland.** Mining Heritage Society of Ireland (Avail: c/o Matthew Parkes, Geological Survey of Ireland, Beggars Bush, Haddington Rd., Dublin 4, Ireland), 1999. 155 pp. £ 11. Facsimile ed. of the 1922 survey is rich in detail and historical references. Includes forward, biography of the author, new and old photos of mine sites, and some plans and sections from mine records.
- Janet L. Finn. **Tracing the Veins: Of Copper, Culture, and Community from Butte to Chuquicamata.** Univ. of Calif. Pr., 1998. 309 pp., bibliog., index, maps. $45; $16.95 pap. Double history of two Anaconda mining communities: Chuquicamata, Chile, and Butte, Montana. Connections between people in company towns in the First and Third Worlds.
- J. S. Holliday. **Rush for Riches: Gold Fever and the Making of California.** Univ. of Calif. Pr., 1999. 336 pp., illus. $50. Frames the gold rush years within the larger story of the state's transformation from a Mexican hinterland to the forefront of capitalism.
- A. Bernard Knapp, Vincent C. Pigott & Eugenia W. Herbert, eds. **Social Approaches to an Industrial Past: The Archaeology and Anthropology of Mining.** Routledge, 1998. 306 pp., bibliog., index. $75.00. Iron production in Cyprus in the Iron Age, in Thailand, in the Alps in the Bronze Age, in pharoanic Egypt, and in Africa during the colonial period; and modern mining communities in Australia, the U.S., and Cornwall. Social life in mining communities with respect to gender issues, prostitution, religious institutions, class, and race.
- P. R. Moore and N. A. Ritchie. **In-Ground Ore-Roasting Kilns on the Hauraki Goldfield, Coromandel Peninsula, New Zealand.** *Australasian Historical Archaeology* v. 16, pp. 45-59.
- Frank Sanders, et al. **Wetlands Treat Mine Runoff.** *Civil Engineering*, Jan. 1999, pp. 52-55. Building a filtration system that incorporates local wetland plants for the treatment of runoff at the abandoned Mike Horse and Anaconda mines, northeast of Missoula.

Logging & Lumbering

- J. P. Bertrand. **Timber Wolves: Greed and Corruption in Northwestern Ontario's Timber Industry, 1875-1960.** Thunder Bay Historical Museum Soc. (Thunder Bay, ON), 1997. 162 pp., $16.45 ppd. This is the "long-unpublished but oft-cited manuscript account" completed by the author in 1961. It weaves together stories of pioneer loggers, pulpwood operators, timber speculators, and mill promoters of the northern U.S. as well as Ontario. Bertrand was once a timber co. employee.
- Ken Drushka. **Tie Hackers to Timber Harvesters: The History of Logging the BC Interior.** Harbour Pub. (Box 219, Madeira Park, BC V0N 2H0, Canada), 1999. 240 pp., photos. $44.95. Overview of logging and lumbering in eastern British Columbia,1850s to present. Rev: *Timber Times* (Issue 21), p. 5.
- Steven R. Gatke. **Photos from the Blair Family Album, Stimson Lbr. Co. 1938/39.** *Timber Times* (Issue 21, June 1999), pp. 8-12. Photo history of family lumber business near Forest Grove, OR. Shows how a lumber camp was set up during the 1930s.
- Gilbert H. Hoffman. **Steam Whistles in the Piney Woods.** Longleaf Pr. (Box 15723, Harrisburg, MS 39404), ca. 1999. 194 pp., illus. $53.95 ppd. Sawmills and logging railroads of Forrest and Lamar counties, Mississippi. Rev: *Timber Times* (Issue 21), p. 5.
- Thad J. Sitton and James H. Conrad. **Nameless Towns: Texas Sawmill Communities, 1880-1942.** Univ. of Texas Pr., 1998. 271 pp., photos. $37.50; $18.95 pap. Sawmill communities in Texas from oral history, company records, and other archives. The companies that ran the mills, the jobs involved in logging and milling, and the rough-hewn towns themselves.

Agriculture & Food Processing

- Martin Carney. **A Cordial Factory at Parramatta, New South Wales.** *Australasian Historical Archaeology* v. 16, pp. 80-93.
- **Donation to Archives Center Reveals One Inventor's Life.** *Lemelson Center News* (Summer 1999), pp. 1-2. Avail: Lemelson Center, Smithsonian NMAH, 14th St. and Constitution Ave. NW, Washington, DC 20560. Everett H. Bickley (1888-1972), noteworthy as the developer of a photoelectric bean sorter widely used in canneries and storage elevators.
- Warwick Pearson. **Water-Powered Flourmilling on the New England Tablelands of New South Wales.** *Australasian Historical Archaeology* v. 16, pp. 30-44.
- **Seagram Company Ltd. and Bronfman Family.** Hagley Museum & Library (Box 3630, Wilmington, DE 19807; 302-658-2400), 2000. No charge. Guide to the Seagram archive recently opened for research.
- Brian Townsend. **The Lost Distilleries of Ireland.** Neil Wilson Pub. (303A, Pentagon Centre, Washington St., Glasgow, G3 8AZ, UK), 1997. Illus., $24.95. A thoughtful look at one of Ireland's great industries and what is left of its

once numerous distilleries. The golden years of Irish distilling were just over 100 years ago, but during the first two decades of the 20th century, the industry was in chaos from loss of the American market to Prohibition and the English market to politics following the establishment of the Irish Free State. Only in recent years has the industry made a comeback.

Iron & Steel

- James R. Bennett. **Tannehill and the Growth of the Alabama Iron Industry.** Avail: Tannehill Ironworks, 12632 Confederate Parkway, McCalla, AL 35111; (205) 477-5711. 488 pp., illus., photos, maps. $22.95 paper. $38.95 hardback. Daniel Hillman's ironworks from 1830 to its destruction by Union soldiers in 1865.
- Charles R. Isleib and Jack Chard. **The West Point Foundry & Parrott Gun: A Short History.** Purple Mt. Press (1060 Main St., Box 309, Fleishmanns, NY 12430), 2000. 38 pp., illus., $10 ppd., paper. Concise history of the Cold Spring, NY, foundry and its most famous product, Robert Parrot's gun, renowned for range and accuracy during the Civil War.
- Ken Kobus, ed. **Steel: The Diary of a Furnace Worker. The Original 1922 Edition by Charles Rumford Walker.** Iron & Steel Society (186 Thorn Hill Road, Warrendale, PA 15086; 724-776-1535), 1999. 175 pp. A young man's first-hand impressions of working at the Jones & Laughlin Steel Co.'s Aliquippa Works. Operations of the blast furnace, open hearth, Bessemer converter. Difficult work conditions, ethnic prejudices, and the need for reform. Preface and afterword by Kobus place the diary in context.

Textiles

- Patricia Lowry. **Pittsburgh Wool Co.'s Factory: A Run for Posterity.** *Pittsburgh Post-Gazette*. Sunday, Jan. 9, 2000. SIA members Christopher Marston and Tom Behrens record America's last wool pulling factory for the Historic American Engineering Record. [See *SIAN* Fall 1999].
- **World Heritage Textile Industry Sites.** *TICCIH Bulletin 7* (Winter 1999), pp. 3-4. How sites of the textile industry might be assessed for inclusion on UNESCO's World Heritage List.
- Claudio Zanier. **The Valorisation of Silk Heritage in Italy. Building Viable Tourist Itineraries around Historical Uniqueness.** *Industrial Patrimony*, v. 2, pp. 9-14. Efforts to develop silk factories as tourist sites in Italy.

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With thanks

Misc. Industries

- Stephen B. Adams and Orville R. Butler. **Manufacturing the Future: A History of Western Electric.** Cambridge Univ. Pr., 1999. 270 pp., illus. $34.95. First full-length history of the Western Electric Co. Telegraphs, telephones, radios, and an early computing machine, demonstrate that vertical integration, after WE's acquisition by Bell Telephone in 1882, was a lengthy process rather than a single event; maturation of industrial psychology; civil rights in corporate America.
- Frederick Allen. **Rear Guard of the Information Revolution.** *I&T* (Fall 1999), pp. 6-7. Ko-Rec-Type Co. still makes fabric typewriter ribbons, old printer cartridges, carbon paper.
- Reginald Bennett. **The Mountains Look Down: A History of Chichester, A Company Town in the Catskills.** Purple Mt. Press (Box E3, Fleischmanns, NY 12430-0378; 914-254-4062; *www.catskill.net/purple*), 1999. 143 pp., $18.50 ppd., paper. An anecdotal history by a resident of a self-contained Catskill furniture-making town, which thrived in the late-19th century and fell on increasingly hard times in the 20th century, until the whole place was auctioned in 1939. The technology of the mills and the broader web of personal, social, and economic factors.
- Wayne Cocroft. **Dangerous Energy: The Archaeology of Gunpowder and Military Explosives Manufacture.** English Heritage, 1999. Sites and monuments associated with the explosives industry in Britain. Includes gazetteer of 385 sites. Generously illustrated. Rev: *IAN* (Autumn 1999), p. 15.
- Catherine Greenman. **An Old Craft Learns New Tricks.** *New York Times*, Thurs., June 10, 1999, Circuits section, p. G1. Steinway & Sons is incorporating computer technology into its traditional piano crafting, primarily in drying and storage of the wood.
- Richard Hayman and Wendy Horton. **Broseley Pipeworks.** *IAR*, v. 21:1 (June 1999), pp. 25-39. The only surviving clay pipe manufactory in Britain.
- Charles Petrillo. **Albert Lewis: The Bear Creek Lumber and Ice King.** (Avail. from the author, 95 Miner St., Wilkes-Barre, PA 18702), 1998. 237 pp. $14.95 paper. After lumber played out in the 1880s, Lewis of Bear Creek, PA, turned to shipping ice. Primarily of local interest, but a good case study of the ice industry in Pennsylvania. Rev: *RH* (Spring 1999), p. 163.

Power Generation

- Charles V. Bagli. **In Manhattan, A Battle over Nine Acres w/Rvr Vu.** *New York Times*. Dec. 29, 1999, pp. A1, A22. Plans to demolish 1900 Con Ed Waterside Steam Plant.
- T. Lindsay Baker, ed. **Windmillers' Gazette.** Quarterly. Avail: Box 507, Rio Vista, TX 76093. Vol. 19, 2 (Spring 2000) includes *Windmills for Pumping Oil; "Posed with the Windmill": Windmills Used in Composition of Historic Photographs; Prefabricated Steel Towers for "Fairbury" Windmills*.
- Charles Bazerman. **The Languages of Edison's Electric Light.** MIT Press, 1999. 478 pp., illus. $39.50. How Edison and his colleagues represented light and power to themselves and to others as the technology was transformed from an idea to a daily fact of life.

- Richard F. Hirsh. **Power Loss: The Origins of Deregulation and Restructure in the American Electric Utility Industry.** MIT Press, 1999. 448 pp., illus. $50. Early 20th century efforts by utility companies to protect their industry from competition led to a regulated system. Unanticipated events beginning in the 1970s placed increasing pressure to deregulate.

- David Rhinelander. **This Inventor Knew Where the Wind Was Blowing.** *Hartford Courant*. Dec. 24, 1999. David Halladay of Coventry, CT, invents the self-governing windmill in 1854.

- Kathryn Young. **Wedded to Electricity.** *Ottawa Citizen*. Dec. 11, 1999. Friday Life Series. Impact of electricity on homes. Features Louise Trottier [SIA], Curator, National Museum of Science and Technology, Ottawa.

Buildings & Structures

- Rowland J. Mainstone. **Structure in Architecture: History, Design and Innovation.** Ashgate, 1999. 436 pp., illus. Innovation in structural design with a focus on architecture prior to the Industrial Revolution.

- Anne Elizabeth Powell. **Back from the Brink,** *Civil Engineering* (Oct. 1999), pp. 52-57. Two-decade-long decision-making process that finally ended in the successful move of the Cape Hatteras Lighthouse in the summer of 1999. The engineering challenges of the move itself are also discussed.

- Richard White. **Gentlemen Engineers: The Careers of Frank and Walter Shanley.** Univ. of Toronto Pr., 1999. 280 pp. The working lives of two well-known 19th-c. Canadian civil engineers and businessmen, who finally completed the Hoosac Tunnel (1876).

Water Control & Reclamation

- Diane Galusha. **Liquid Assets: A History of New York City's Water System.** Purple Mt. Press (Box E3, Fleischmanns, NY 12430; 914-254-4062; *www.catskill.net/purple*), 1999. 303 pp., $40.50 ppd., hardbound. Amazingly, the history of New York City's immense water supply system has never before been recounted in a full-length book. The social, economic, political, engineering, and technological history of this vast three-century, multibillion-dollar enterprise, whose branches reach out across lower NY State.

- Lance Helwig, et al. **Safe Passage.** Re-design of the fish bypass system at the Bonneville Dam on the Columbia River. Although the dam incorporated a fish ladder when it was built in 1938, many improvements have been made over the years, of which this is but the latest.

- Barbara Vilander. **Hoover Dam: The Photographs of Ben Glaha.** Univ. of Arizona Pr., 1999. 168 pp., photos, $24.95. Glaha was the project photographer assigned to record every aspect of the construction of Hoover Dam. His photos were used to demonstrate the progress and financial viability of the project, but he also produced photos that were exhibited as works of art in galleries and museum. His work is placed within the context of western landscape art.

- Anna Wong. **Colonial Sanitation, Urban Planning and Social Reform in Sydney, New South Wales, 1788-1857.** *Australasian Historical Archaeology* v. 17, pp. 58-69. And, **"...the foul reality." An Archaeological and Historical Study of Colonial Drainage Systems.** M. A. Thesis, Univeristy of Sydney, 1997.

Railroads

- George Drury. **Union Pacific Across Sherman Hill: Big Boys, Challengers, and Streamliners.** Kalmbach Pub., 1999. 128 pp., photos, map. Sherman Hill, WY, provides a fitting backdrop for a photo essay on monster steam locomotives.

- Robert A. LeMassena. **David Moffat's Double Dilemma.** *R&LHS Newsletter* (Spring 2000), pp. 3-5. The Denver, Northwestern & Pacific RR conquers the continental divide west of Denver with an unorthodox arrangment of curves and loops in its line, 1903-09.

- **Steeling a Ride.** *Lake Superior Magazine* (April/May 1999). Burlington Northern-Santa Fe ore dock operations in Superior, WI.

- Jeff Wilson. **F Units: The Diesels That Did It.** Kalmbach Pub., 1999. 128 pp., illus., photos. $19.95. Photo essay on the diesel locomotives that ran steam engines out of operation between 1945 and 1960.

ABBREVIATIONS:

I&T	=	American Heritage of Invention & Technology
IAN	=	Industrial Archaeology News
IAR	=	Industrial Archaeology Review (UK)
R&LHS	=	Railway & Locomotive Historical Society
RH	=	Railroad History
TICCIH	=	The International Committee for the Conservation of the Industrial Heritage

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A Brief History of the Parma Reservoir

An uncommon structure in Parma, a west side suburb of Cleveland, Ohio, is the 1933-37 Parma Reservoir. The 23-million gallon reservoir is formed by a 326 × 306-ft. earth-covered concrete tank, technically referred to as a basin, with a Gothic-style facade resembling a 14th-century English castle.

In the early part of the 20th century, Parma residents experienced water shortages. The detailed 1920s plans for the "Parma Reservoir Park" included a reservoir surrounded by a large, casually landscaped park with picnic areas, a lake, and horse trails, but the Depression caused the city to scale back plans and only one of two basins and the pump house were completed.

G. W. Hamilin was the engineer of the concrete basin, according to 1933 blueprints. The basin resembles a concrete tank with double walls. An inner concrete wall is not attached directly to an outer brick wall, thus creating an air space. This was done, it was said, to allow water drainage. There is a 3-in. weephole at the bottom of the brick wall at each of the four corners. The inner wall is 34-ft. high and varies from 2-ft. thick at the top to 4-ft. 6-in. thick at the base. The concrete footer for the wall extends outward some 32 ft.

Several individuals have said that they believe that the earthen roof was placed to avoid detection and bombing from enemy planes during wartime. Although an earth roof would be harder to detect from the air, there is no supporting evidence for this hypothesis. The earth roof was designed as insulation to keep the water cool in the summer months and warm in the winter months. Also, the covering may have aided in sanitation by keeping out airborne dirt, pollutants and bacteria.

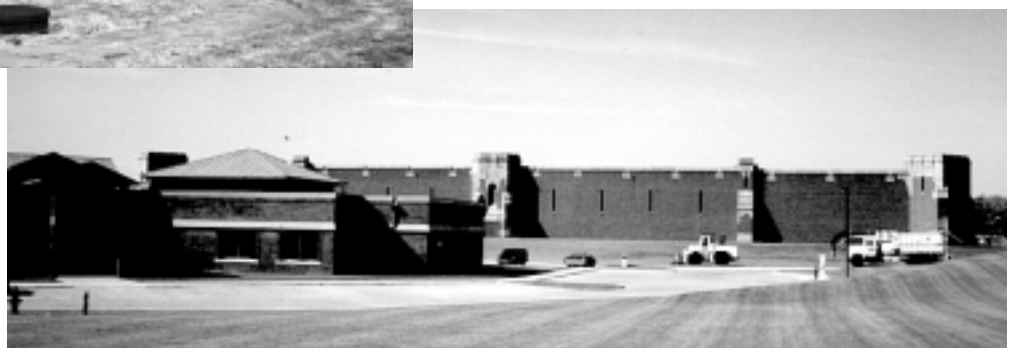
The most outwardly striking aspect of the reservoir is the Gothic-style architectural features designed by Herman Kregelius. Crenelated stone towers and walls give the reservoir a fortress-like appearance, but there are details that speak to its water supply function, including stone carvings in the shapes of fish above the tower entrance doors. The architectural design of the reservoir anticipated that a second basin would be built at the first basin's southwest corner. Since the second basin was never built, the reservoir from a distance appears architecturally unbalanced.

The contractor for the Parma Reservoir was the Hunkin-Conkey Construction Co., but like many Depression-era public works projects, labor was provided by the Works Progress Administration (WPA) as a New Deal unemployment relief measure. There was some labor trouble during the construction of the outer wall in 1936. Paychecks were late, workers complained of cold weather, and government property was destroyed during a riot. On Jan. 26, 1936, the rioters lost their jobs and sheriffs deputies were assigned to protect the remaining workers.

Local residents have begun to appreciate the history of the reservoir, which is still providing water today. Since 1993, the facility has offered tours to the public during National Clean Water Week. The reservoir has been undergoing renovation, and it will be lighted at night beginning in 2003.

K.J.L.

A view on the roof of the reservoir.



Parma Reservoir.

Ken Lavelle photos.

LETTER TO THE EDITOR

(continued from page 8)

on the ATP site. Like all of the ruins on the site, the gun mill is deteriorating daily. Stabilization of the ruins will allow for a preservation plan to be developed identifying the long-term treatment of this resource, including the removal of hazardous materials.

Given the critical condition of the remaining resources on the ATP site, the NPS is hopeful that a process can be agreed upon in the near future that will allow work to proceed on the ATP site that will meet the Secretary of the Interior's "Treatment for Historic Properties." We look forward to the input of SIA members throughout this process and during the review of documents produced by this process. Members interested in learning more about the project should contact Alisa McCann, Architectural Historian, NPS, Philadelphia Support Office, U.S. Custom House, 200 Chestnut Street, Philadelphia, PA 19106.

Alisa McCann
Architectural Historian, NPS

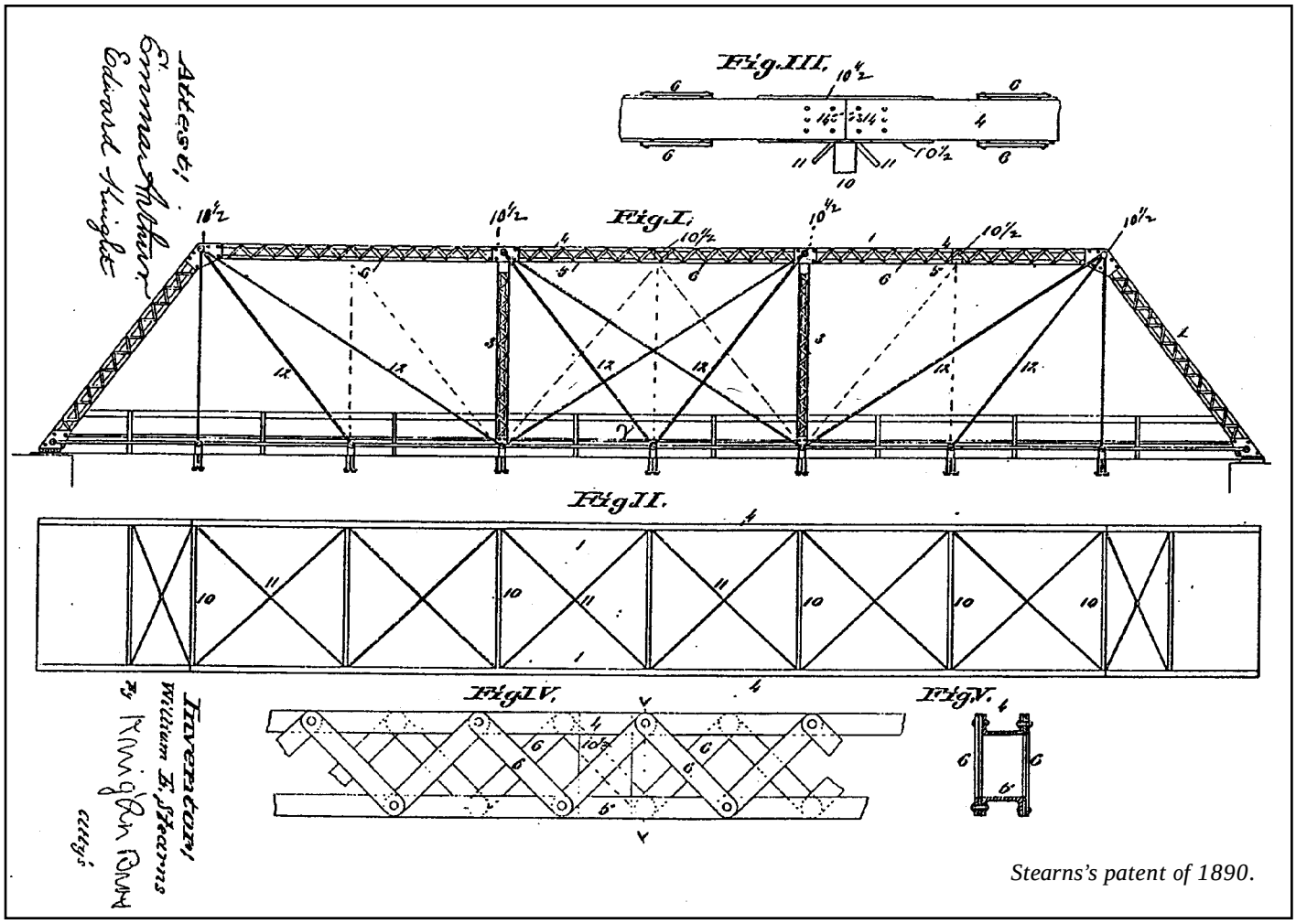
Elusive American Truss Bridges

David Guise [SIA] is researching the evolution of the 19th-century American truss bridge for an upcoming book. His goal is to demonstrate why a large variety of truss designs were developed and examine how the introduction of new materials, progress in construction techniques, and expansion of theoretical knowledge, combined to cause a particular truss type to be superseded by a different, "better," configuration. In the second installment in a series to appear in SIAN, *he shares his research to date on the Stearns truss [See Winter 1999 for the Kellogg Truss]. Articles on other elusive truss configurations will appear in subsequent newsletters. The series is intended to serve as a catalyst to elicit additional information, especially the location of historic photos, plans, descriptions or surviving examples.*

Stearns Truss

In 1890 William Stearns patented a light-weight variation on the popular Pratt truss. His design enjoyed a brief period of use for relatively short-span steel highway bridges. In his patent application, Stearns compared his truss to the Pratt, going as far as to show, by dotted lines, the Pratt vertical web members his design eliminated.

The rationale behind Stearns's concept was a desire to use less material than the Pratt truss, and thus reduce weight and cost. In 1881, nine years before Stearns obtained his patent, another engineer, Frank Leers, appears to have hit upon a similar configuration, but apparently never patented or built it. Along with other engineers and bridge-building firms, both Leers and Stearns were trying to obtain an advantage in a very competitive market by eliminating some of the heavy vertical compression members in



Stearns's patent of 1890.

the prevailing truss forms. All of these weight-saving attempts ultimately suffered a similar fate of extinction.

The web panels in a Stearns truss were double the length of a Pratt truss of same overall span length. Longer panels required the top chord to be beefier (again in comparison to a Pratt truss) in order to resist any tendency to buckle. Another ramification of the Stearns design was that in order to prevent the diagonals' degree of slope from becoming too horizontal (the greater the horizontalness, the higher the stress), the overall height of the truss had to be increased. This requirement made a Stearns truss as much as 25 percent higher than a Pratt truss.

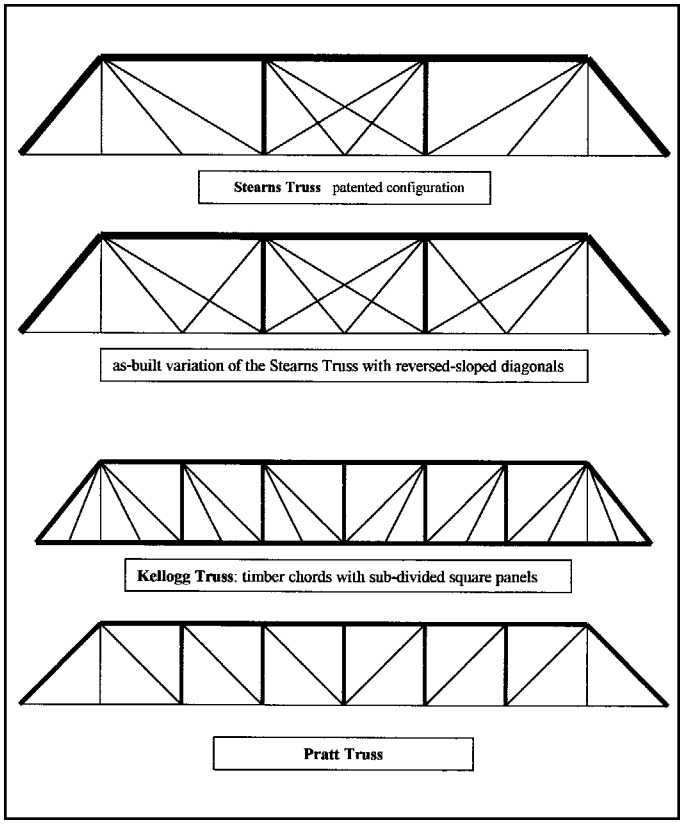
Stearns's metal truss and Charles Kellogg's timber chord truss (see *SIAN*, Winter 1999), which was patented 20 years earlier, appear to be similar in intent. Both eliminated compression verticals from their webs to save weight. Both added a tension diagonal within each panel. Kellogg subdivided the square panels of his truss with a tension diagonal secured to the bottom chord at a point midway between panel points. Stearns's horizontally elongated panels were similarly subdivided at their mid point; however, the much greater length of the rectangular panels forced the slope of the main diagonals to be flatter (and therefore less efficient) than Kellogg's.

Stearns's more daring approach (longer distances between vertical web-struts) was possible because his steel eye-bar bottom chords did not receive a direct load from the bridge deck (as was the case with the Kellogg truss). The Stearns deck was supported on joists placed parallel to the bridge, the joists transferring their load to the truss through floorbeams located at panel points at the web verticals and sub-panel points located half-way between the verticals. The timber bottom chords of the Kellogg were subjected to bending between support points because the deck joists were perpendicular to the length of the bridge and rested directly on the truss's bottom chord. Kellogg's second set of diagonals was needed to support the bending stresses in the chord. Stearns's truss avoided this particular issue.

Stearns claimed that by reducing the number of verticals he had made his design 12.5 percent lighter than the Pratt configuration. However, his assertion of weight reduction appears to be high, as it apparently did not take into account the weight gained by the thicker and taller remaining verticals and sloping end posts, the bulkier top chords, as well as all the additional cumulative length of the tensile diagonals.

Additional factors in the Stearns configuration caused concern. A photograph and drawing published in 1892 in *Engineering News* show a third, opposite-sloped diagonal added to the original patented end panel configuration. It produced a V-shaped support for the bottom chord. This configuration has become the image now associated with the Stearns truss. At what point in time, why, and by whom this diagonal was introduced remains unclear. The third diagonal is redundant, and engineers could only guess at the actual stress on it. Engineers at that time were also concerned that Stearns's heavy top chord (fabricated from members riveted together in a way that effectively made it a one piece continuous girder spanning the full length of the bridge) would be subjected to secondary stresses, or moments, which they could not accurately determine.

One of the most popular engineering texts of the era cautioned against using the Stearns truss. As in the case of the Kellogg design, the truss did not prove to be usable except for short-span highway bridges. In longer situations, the lack of omitted verticals created insurmountable problems in its ability to resist vibrations. The attempt to save weight was admirable, but the amount actually saved appears to be less than anticipated, and the loss of stability proved fatal.



William Stearns was a member of the engineering staff at the Berlin Iron Bridge Company. One can't avoid speculating whether the truss would ever have been built if Berlin had not promoted the design. The only identified extant example located to date, of what is claimed to be a Stearns truss, is a 76-ft. long abandoned bridge in Pulaski County, Indiana. Erected by the Winamac Bridge Company in 1905, it possesses light verticals at the sub-panel points, making it unclear whether this structure is a modified Stearns, a unique variation of a Whipple truss, or a type that should be called a Winamac. It would be interesting to be able to determine definitively if any firm other than the Berlin Bridge Company actually built a "true" Stearns truss.

Neither Stearns's nor Kellogg's attempts to reduce weight and costs by eliminating verticals proved practical when subjected to the ultimate test of use. However, both designs provide fascinating insights into the trial and error, survival-of-the-fittest approach at the time. As the 19th century came to a close, the rational options for modest span steel truss configurations had been essentially narrowed to two choices, the Pratt and the Warren.

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Kenneth Hudson, 1916–1999

"Kenneth Hudson, questioning, questioning, always questioning."

How sad it is to report the death last December of one of the larger-than-life figures of the industrial archeological community. Kenneth Hudson will be known to most of you as the 'inventor,' the 'patron saint,' the 'great exponent' of our field, the first to really put it on the map of public consciousness through his innumerable books, articles, and public appearances—not to mention his generous, kind-spirited encouragement—very often amounting to mentorship—of any and all who exhibited a common interest in IA. The first of the books—the pioneering *Industrial Archaeology*—appeared in 1963, going far to capture the imagination of historians, curators, and a great number of others concerned with examining the history of industry and technology in general through surviving artifacts, from flint axe heads to railroad systems to massive steel-making complexes, and all in between. In 1964 he further solidified matters by becoming the founding editor of the *Journal of Industrial Archaeology*, the first serial publication in the field, predating our own IA by some ten years. It lives on in the form of its direct descendant, the Association for Industrial Archaeology's *Industrial Archaeology Review*.

Kenneth's capacity for intellectual productivity was nothing less than colossal. He once stunned me by mentioning that every morning he wrote some 5,000 words *before breakfast*. This was not a boast but a simple statement of fact, easy to believe when we realize that in his lifetime he produced no fewer than 54 books, at one high point turning out four a year. All were of very real substance, on a breathtaking variety of subjects (not all IA-related by any means).

So active a mind could not remain for long in one discipline. As fundamentally a social historian, Kenneth moved gradually into the IA of the 20th Century which then led him to wonder why our museums—especially our technical museums—had so little to say about the human context of the machines displayed. Operating from that viewpoint he embraced with his customary zeal the world of museology (but quite consciously excluding what he regarded as the overheated subworld of art museums). This became literally the driving force of the remainder of his life, justified, he once explained, ". . . because no one else is doing it." It manifested itself in a number of highly constructive ways, the most widely known of which was to be the prodigious *World Directory of Museums* which first appeared in 1975. With his collaborator Ann Nicholls he updated it in 1980 and again in 1985. Lest it be thought that only "major" museums are included, let me cite a recent incident. Last fall, travelling in Northern Italy and stopping for several days in the small town of Stresa on Lake Maggiore, we learned of a museum of umbrellas and parasols in a hamlet up on the mountain top way above. Having nothing better to do, and being museum folk, it was natural that we visit, driving up the very long, very twisty, very steep road to this unlikely location of a former umbrella works, the reason for so unlikely a museum there. "Aha," I think to myself. "Here's one that the great international museum authority can't possibly have known about and noted in his directory. What a coup to get one up on Hudson!' On arriving home and checking the directory, there of course it was, properly indexed under 'U.'

Kenneth's other great accomplishment was the establishment in 1977 of the European Museum of the Year Award, the entire mechanism of which—including forming an international jurying committee and creating a framework of standards—sprang entirely from his own fertile mind. The annual awards have come to be highly prized by the recipient museums and highly regarded by the entire European museum community. The scheme has operated from the outset under the auspices of the Council of Europe, which in 1989 awarded Kenneth its Medal of Honor. His own nation awarded him the Order of the British Empire in 1997 for services to museums.

Kenneth Hudson was born in Harlesden in northwest London on July 4th, 1916, and died at his home in Ditcheat, Somerset, on December 28th, 1999. He is survived by Hope, his wife of 61 years, three children, and a world of friends who shall never see his like again.

R.M.V.

HAER 30th Anniversary Exhibition

(continued from page 5)

National Park Service, in cooperation with the Library of Congress.

The NBM is uniquely suited to present this exhibition. Chartered by Congress in 1980 as a private, non-profit organization, the museum is the only institution in the country dedicated solely to educating the public about the built environment. The museum is funded through a combination of public and private sources and has individual members throughout the U.S. In a typical year, the museum presents more than a dozen exhibitions, as well as more than 1,500 education programs for children and adults.

HAER, established in 1969, documents America's industrial, maritime, and engineering history, producing measured and interpretive drawings, historical reports, and large format photographs of significant sites nationwide. This information is housed and maintained in the HABS/HAER collection at the Library of Congress, Prints and Photographs Division, where they are made available to the public. Over the years, many SIA members have worked on HAER projects.

E.D.

Central Mine Preservation Project

David Thomas of the Keweenaw County Historical Society (KCHS) updates progress at the Central Mine, Michigan, which was a tour stop of the 1997 SIA Annual Conference to the Upper Peninsula.

Soon after Douglass Houghton, Michigan's state geologist, reported finding copper in 1836, mining companies were organized along the Keweenaw Peninsula. Some were profitable, but many failed. In November 1854, the Central Mining Co. began operations, and it was the first mine to show a profit in its first year of operation. Central Mine, the name of the mine and the company town, grew to a population of 1,200, with a store, doctor, churches, post office, and school. In 1898, after extracting 54 million pounds of copper, the vein ran out, the mine closed, and the miners moved on to find work at other mines.

In 1907, many of the former miners and their families gathered at the Central Mine Methodist Episcopal Church and held a first annual reunion. This tradition has been maintained and on July 30, the church will hold its 94th reunion service. Descendants of those who lived and worked at Central Mine attend each year.

Over the years, the town's buildings have fallen into disrepair. Some were dismantled for the lumber, and others fell victim to neglect, storms, and heavy snow loads. Summer residents lease most of the remaining homes, and the reunion organizers maintain the church. During the 1960s, Universal Oil Products, successors to Calumet and Hecla, Inc., demolished all but one of the mine buildings.

Preservation efforts began early in the 1950s when the Stetter family began renovation of the mine agent's home, which they had leased since 1935. By 1965, they had opened it as a house museum commemorating the history of Central Mine. Charles Stetter successfully worked to have the Central Mine townsite listed on the National Register. The Stetter property along with two other dwellings and the ruin of a boiler house have since been bought by the Liddicoat family, who continue to have a keen interest in Central Mine's history.

In 1996, the KCHS acquired approximately 40 acres that included ten dwellings and the church. The historical society deeded the church to the Central Mine ME Church Corp. and leased seven of the ten houses. The three houses not presently leased are the focus of current preservation efforts. Fund raising started several years ago. Donations and receipts from sales of a book entitled, *Central Mine: Years of Hard Work—Lives of Pain and Hope*, have permitted KCHS to begin restoration of the unoccupied houses. Siding has been reattached or replaced, windows have been repaired, roofs secured, and exteriors painted. What remains of Central Mine is in good hands, but there is a long way to go.

Neil Harri photo.

Aerial view of Central Mine.

During 2000, KCHS will open a visitor center and begin work on a series of projects to interpret Central Mine. The historical society is anxious to share the Central Mine's history with visitors. KCHS already owns and operates other historic sites on the peninsula, including the Eagle Harbor Lighthouse, the Rathbone School Museum in Eagle Harbor, and the Church of the Assumption Museum and the Bammert Blacksmith Shop Museum in Phoenix.

For a sample copy of the historical society's newsletter, "The Superior Signal," as well as information about supporting preservation efforts at Central Mine contact: Dave Thomas, c/o KCHS, HC-1, Box 265L, Eagle Harbor, MI 49950; (906) 337-4471. ■

SITES & STRUCTURES

Dean & Westbrook Phoenix-Column Pony Truss Available. The U. S. Army Corps of Engineers NY District will begin construction of the Ramapo River Flood Protection Project in Oakland, Bergen County, NJ, in 2000. The historic Doty Road Bridge must be removed as it causes an obstruction in times of flooding. The Corps is seeking appropriate parties interested in acquiring the trusses. The bridge is a single-span, 80 ft.-long, single-lane, 5-panel, wrought-iron Pratt pony truss with Phoenix-column upper chord sections. The distinctive columns are made of four segments, flanged and riveted together to form a hollow circular member. Dean & Westbrook, highway bridge agents for the Phoenix Bridge Co., erected the bridge in 1891. The bridge was condemned in 1983 and a Baily bridge, which is removable, was inserted in 1984 to bear the traffic load. The bridge was determined eligible for the National Register in 1989. Due to deterioration of the deck and stone substructure, just the 1891 trusses are available for reuse, to be provided free. Cost to relocate them will depend on such factors as conditions at the relocation site and applicable state regulations. The bridge may contain lead paint. The corps may be able to provide limited assistance to the recipient. Info: Lynn Rakos, Project Archeologist, US Army Corps of Engineers, CENAN-PL-EA, 26 Federal Plaza, New York, NY 10278; (212) 264-0229; e-mail: *rakos@nan02.usace,army.mil*.

U.S. Army Corps of Engineers photo.

The 1891 Doty Road Bridge.

Thru Truss Available. The County Commissioners of Garrett County, Maryland, are offering an 83'-long, single-span, single-lane, thru truss bridge to parties interested in moving and rehabilitating the bridge. The former River Road Bridge over the Casselman River was built ca. 1900. It has been removed in one piece from its abutments and temporarily stored. The recipient must agree to rehabilitate the structure to the Secretary of Interior's Standards, as well as agree to accept title, maintain the bridge and its historical significance, and assume all future liability and financial responsibility. Written proposals must be submitted by June 20. Info: Lee Thorne, Administrative Engineer, Garrett County Roads Department, 12778 Garrett Highway, Oakland, MD 21550; (301) 334-3988.

The National Historic Landmarks newsletter *Network* (Winter 1999) reports that 3 of 19 new National Historic Landmarks under consideration for designation are IA-related. **Shenandoah-Dives (Mayflower) Mill,** San Juan County, Colorado, is a late-19th-century stamp mill that used the innovative flotation process to efficiently and economically concentrate complex valuable minerals that were practically impossible to treat by earlier methods. **Kennebec Arsenal,** Augusta, Maine, is the most intact early-19th-century munitions depot in the nation. It was built between 1828 and 1838 in direct response to the boundary dispute with Canada. The 1869 **Bollman Truss Bridge,** Savage, Maryland, is the country's sole surviving example of its type. The job of the National Historic Landmarks Survey (NHL), in partnership with other National Park Service offices, is to foster the nomination of nationally significant places and shepherd them through the designation process. Currently, over 2,770 places are National Historic Landmarks. Anyone can prepare an NHL nomination, and to assist the public in preparing nominations, the NHL has recently published *How To Prepare National Historic Landmark Nominations*. Free copies are available from (202) 343-8012 or *www.cr.nps.gov/nr/nrpubs*. The NHL Web site is *www.nps.gov/nhl*. Also of note is *National Landmarks, America's Treasures*, a comprehensive guide to NHL's published by the National Park Foundation and John Wiley & Sons, Inc. (800) 225-5945; e-mail: *custser@wiley.com*. SIA members and chapters are encouraged to consider nominating sites that deserve landmark status.

Barbara Ferris Van Liew [SIA] reports that the Society for the Preservation of Long Island (NY) Antiquities is assisting with an effort to nominate remaining sections of the1907-11 **Long Island Motor Parkway** to the National Register. William K. Vanderbilt, Jr., and his motorist friends had the 65-mile-long road built as one of the nation's first attempts to create a limited-access, dust-free automobile highway. The narrow 16-ft.-wide parkway had 65 bridges for grade separation. Extant portions are found in Cunningham Park, Queens. There also are a few scattered remnants in Nassau County and a relatively intact 14-mile section in Suffolk County. ■

IA EXHIBITS

Making the Dirt Fly, an exhibition at the Smithsonian's National Museum of American History, interprets the Panama Canal as a marvel of scientific and engineering achievement. Organized by the Smithsonian Institution Libraries and curator William E. Worthington, Jr., the exhibit is meant to place the canal in historic engineering context in this year when most of the focus has been on the politics and transfer of the canal from the United States to Panama. Sketches, photographs, books, and manuscripts make up the bulk of the exhibit, although visitors are greeted at the exhibit entrance by the dipper from one of the 70-ton steam shovels that worked on the canal. The exhibit runs through January 5, 2001. It can also be viewed on the Internet at *www.sil.si.edu/exhibitions/make-the-dirt-fly*.

Historic Columbia River Highway, 1913-1922 is an exhibition of 27 architectural and interpretive drawings and a selection of photos from the 1995 HAER project. The exhibit opened in August 1997 at the Maryhill Museum of Art, Goldendale, WA. It will be at the Columbia Gorge Discovery Center, Dalles, OR, through mid-August when it will move to the Oregon State Capitol Galleria in Salem, in September. The exhibit is raising public awareness of and appreciation for the road as an important accomplishment in highway engineering and construction. Oregon DOT also has a Historic Columbia River Highway Web page: *www.odot.state.or.us/hcrh*.

(*(continued on back page)*

NOTES & QUERIES

Steel-Frame Gasholders. The brick gasholder is the symbol of the SIA and an important part of the iconography of American IA. Recently, the more prosaic steel-framed gasholder entered the aesthetic consciousness as the symbol of the 1998 SIA Annual Conference in Indianapolis. However, the recent demolition of a pair of steel-frame gasholders in Pawtucket, Rhode Island, and the imminent demolition of two more in nearby Providence provokes the question: "How many of these things are actually left?" I am interested in assembling a complete list of the locations of survivors in the U.S. and Canada as soon as possible. Any supporting information would also be appreciated. Matthew Kierstead, President, Southern New England Chapter SIA, 22 Rosewood St., #3F, Pawtucket, RI 02860. *Editor's Note—The brick structures are, strictly speaking, not gasholders, but gasholder houses, in that they did not contain gas but enclosed (or housed) iron- or steel-frame gasholders.*

Reel Lawn Mowers. For the past several years, I have been working on a book project about the history of the reel lawn mower as manufactured in the U.S. This has included the collection of printed matter, and of course, hand-, horse-, and motor-powered mowers of the 19th and early 20th century. The reel, or cylinder, mower was patented in 1830 by Edwin Beard Budding of Stroud, Gloucestershire, England. The first American example was produced about 1856. Many companies were formed after the Civil War as the demand for lawn mowers increased. To date, I have identified about 150 companies. I am seeking information on the location of company records, photographs, trade catalogs and related ephemera. James B. Ricci, 30 North Farm Rd., Haydenville, MA 01039-9724; (413) 268-7863; e-mail: *jricci@reellawnmower.com*.

IA in Philately. An initiative was launched at the 11th International Windmillers' Trade Fair to recommend to the U.S. Citizen's Stamp Advisory Committee (CSAC) that the U.S. Postal Service issue a commemorative stamp for American windmills in 2004, the 150th anniversary of the invention of the first commercially successful self-governing windmill. In 1854, Daniel Halladay patented the "Halladay Standard" windmill, manufactured first in Connecticut and later in Illinois. This windmill could turn to face changing wind directions without human attention and could regulate its own speed of operation so that it did not destroy itself by running too fast. Halladay's invention and others based on similar principles were fabricated by the tens of thousands and played an important role in the settlement of the West. Arnold Carlson [SIA] of Coventry, Connecticut, where Halladay had his first windmill factory, writes that SIAers can support a windmill commemorative stamp by writing a letter or note of support to CSAC, c/o Stamp Development, USPS, 475 L'Enfant Plaza, SW, Room 4474E, Washington, D.C., 20260-2437.

Early American Industries Association (EAIA) is an international non-profit group founded in 1933. It provides a forum for anyone interested in early American technology, its roots and products. EAIA is welcoming new members who collect, use, display, or sell early tools or who investigate and teach about tool makers, early trades, and industries. Members receive the quarterly magazine *Chronicles* (see Publications of Interest), the newsletter *Shavings*, special book sale lists, access to the association library, and notices of meetings. Info: Elton W. Hall, Exec. Dir., 167 Bakerville Rd., S. Dartmouth, MA 02748; (508) 993-4198; Web site: *www.EAIAinfo.org*.

International Mining Heritage Tours. Atalaya Tours have run study tours to major international mining regions since 1988. Itineraries cover aspects of mining history and archeology, both ancient and modern, and the geological setting. Tourists are accompanied by expert guides and, where possible, feature visits to working mines. This year, tours include southern Spain, Mexico, northern Spain and Portugal, Germany, western Britain, Peru, Greece, and Cyprus. For info and further details: Atalaya Tours, Ceinionfa, Capel Dewi, Aberystwyth, SY23 3HR, United Kingdom; phone/fax 011-44-1970-828989; Web site, *www.atalaya.co.uk*.

Call for Papers. *American Society for Environmental History and the Forest History Society* invite panel and paper proposals for their joint meeting, Mar. 28-Apr. 1, 2001, Durham, NC. Papers that examine any aspect of human-environment interactions over time are welcome, but a special conference theme this year is "Making Environmental History Relevant in the 21st Century." Papers and panels might focus on examples of how environmental history informs public policy, resource management, pollution control, local and international development, social conflict, and the understanding of environmental problems. Proposals should include five copies of the following: (1) for panel proposals, a cover sheet with the title, full name and affiliation of each participant, and titles of each paper; (2) for each paper proposal (including those on organized panels), a 250-wd. abstract, and; (3) a 2-page (max) resume for each participant, including full name, address, phone, fax, and e-mail. Proposals should be postmarked no later than Aug. 1, 2000, to Dale Goble, College of Law, Univ. of Idaho, Moscow, ID 83844; (208) 855-4977; e-mail: *gobled@uidaho.edu*. ■

CHAPTER NEWS

Roebling (Greater NY-NJ) held its annual meeting at Drew University in January. The chapter has plans for a series of tours of New York Harbor defenses during the upcoming year. In April the chapter visited Fort Wadsworth at the western end of the Verrazano Narrows Bridge on Staten Island, and in May they visited Fort Tilden, east of Breezy Point in Queens. New York's harbor fortifications date from the War of 1812 to the Cold War, reflecting over 150 years of military engineering.

Southern (Birmingham, AL) toured the Gorgas Steam Plant and the Alabama Mining Museum earlier this spring. In May, the chapter sponsored a Shelby Ironworks Park work day to help set up a new air hammer and prepare the Catalan forge site for demonstrations.

Oliver Evans (Philadelphia) held a lecture in February on the Schuylkill Valley Metro, a light rail commuter system proprosed for the historic industrial corridor along the Schuylkill River. At its annual banquet in March, Alexander S. MacK. Gibson spoke on the history of containerization of seaborne cargo since its beginnings in the 1950s. In April, Jane Mork Gibson presented an illustrated talk on the Kinne Collection of water turbines (See *SIAN*, Fall 1999).

Northern and Southern New England, in conjunction with Plymouth (NH) State College Institute for New Hampshire Studies, held a joint meeting in February. A day-long paper session on New England IA was followed by a tour of the college's Brown Paper Co. photo collection and archeology lab. ■

CALENDAR

2000

July 14-18: First International Conference, National Association of Mining History Organizations, Cornwall, England. Sponsored by Carn Brea Mining Society and Camborne School of Mines. Info: Maureen Holmes, Rivergarth, Bar Meadows, Malpas, Truro TR1 1SS, UK; e-mail: *namho@csm.ac.uk*.

Aug. 17-20: Society for the History of Technology (SHOT) Annual Meeting, Munich, Germany. Info: SHOT Office, Dept. of History, Auburn Univ., Auburn, AL 36849. Web site: *http://shot.press.jhu.edu/associations/shot*.

Aug. 23-26: Society for Commercial Archeology Annual Conference, Manitou Springs, CO. Conference theme: Automobile culture in the Rocky Mt. West. Web site: *www.sca-roadside.org*.

Aug. 30-Sept. 7: TICCIH 2000: The Millennium Congress, London, England. Three days of working sessions in London, followed by choice of 4 days of regional touring of industrial sites in either Cornwall, Wales, or Scotland. Info:TICCIH2000, 42 Devonshire Rd., Cambridge CB1 2BL, UK; e-mail: *cc@conference-contact.co.uk*.

Sept. 8-14: Association for Industrial Archaeology Conference 2000, Manchester, England. Theme: "Manchester, the Archetypal City of the Industrial Revolution." Info: Conference Secretary, 62 Marley Rd., Rye, Sussex, TN31 7BD, UK.

Sept. 16-24: 10th International Symposium on Molinology, Stratford, VA. Info: Derek Ogden, TIMS America, HCR 5, Box 339, Madison, VA 22727; (540) 672-1303; fax 672-0218; e-mail: *butler_j@mediasoft.net*.

Sept. 19-24: Association of Railway Museums, Annual Convention, Steamtown National Historic Site, Scranton, PA. Info: Steamtown NHS, 150 S. Washington Ave., Scranton, PA 18503; (507) 340 5201.

Sept. 20-23: American Association for State & Local History, Annual Meeting, New Orleans, LA. Info: AASLH, 1717 Church St., Nashville, TN 37203; (615) 320-3203; fax, 327-9013; Web Site: *www.aaslh.org*.

Oct. 11-13: Preserving the Recent Past II, Philadelphia, PA. Info: Box 75207, Washington, D.C. 20013-5207. Web site: *www2.cr.nps.gov/tps/recentpast2.htm*.

Oct. 12-14: Pioneer American Society Annual Conference, Richmond, VA. Theme: "19th-Century Industrial Development." Historic industrial sites tour, river cruise. Paper proposal deadline is Sept. 1. Info: Marshall E. Bowen, Geography Dept., Mary Washington College, Fredericksburg, VA 22401; (540) 654-1493; fax, 654-1074; e-mail: *mbowen@mcw.edu*.

Oct. 19-22: SIA Fall Tour, Sarnia, Ont. The Ontario oil district, including Petrolia Discovery, the Oil Museum of Canada, the Don gas field, and Fairbank oil. Tour headquarters will be in Sarnia, across the Blue Water Bridge from Port Huron, MI. Info: Petrolia Discovery (519) 882-0897. Further info and registration materials will be sent to members over the summer. ■

IA EXHIBITS

(continued from page 18)

Rediscovering Portland's Willamette River Bridges, an exhibit at the American Institute of Architects (AIA) gallery in downtown Portland, featured drawings and photographs of ten bridges, and a number of artifacts, including a trolley-type controller from the movable Burnside Bridge and a scale model of the Fremont Bridge. The exhibit, which was open only during February, was sponsored by Oregon DOT, the Portland Chapter of the AIA, HAER, and Multnomah County. The materials for the exhibit were the efforts of the HAER Willamette River Bridges Recording Project team. Plans are under way for the exhibit to travel to the Oregon Museum of Science and Industry later this year. ■

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Attachment 4

Privy Tank Area – Human Health Risk Screening

ATTACHMENT 4

Privy Tank Human Health Risk Screening

A conservative human health risk screening (HHRS) was performed to determine the potential for human health risks associated with exposure to site media (surface soil, subsurface soil, and groundwater) near the privy tank found near the Area of Concern (AOC 6), Ammonia Settling Pit subarea. The results of the HHRS provide a preliminary indication of potential risks from exposure to chemicals of potential concern (COPCs) identified for each medium, and are used to help determine whether the area requires further evaluation (e.g., a baseline risk assessment or additional data collection) or future unrestricted (i.e., residential) use of the site is acceptable based on human health risks.

Human Health Conceptual Site Model

The human health conceptual site model (CSM) presents an overview of site conditions, potential contaminant migration pathways, and exposure pathways to potential receptors. The human health CSM for soil and groundwater for the privy tank area is presented in **Figure A4-1**.

The mission of CAX includes supplying Atlantic Fleet ships and providing recreational opportunities to military and civilian personnel. Outdoor recreational facilities and activities available include: 13 cabins, 19 recreational vehicle (RV) sites, camp sites, an 18-hole golf course, swimming pool, ball fields, freshwater and saltwater fishing, boating, wildlife watching and hunting (Navy, 1998). The privy tank is currently located in a wooded area near the AOC 6, Ammonia Settling Pit subarea. AOC 6, excluding the 1918 Drum Storage Area, is currently used for recreational activities, such as jogging, hunting, and fishing. The 1918 Drum Storage Area currently includes grassed areas, a paved parking lot, and two office buildings. Land use at AOC 6 is not expected to change and will likely continue as recreational and industrial (for the 1918 Drum Storage Area) for the foreseeable future.

Potential current receptors at the AOC 6, Ammonia Settling Pit subarea, and thus the privy tank area, include recreational users/visitors, trespassers, and maintenance workers. The potential current receptors may come in contact with surface soil; exposure routes may include incidental ingestion of and dermal contact with the surface soil, and inhalation of volatile and particulate emissions from the surface soil.

Potential future receptors include the current receptors, and future residents and construction workers. Future receptors could be exposed to subsurface soil if future recreational facilities, or piping/utilities, or residential houses are constructed at the site. In the risk evaluation, subsurface soil is evaluated as soil from 0.5 – 10 ft below ground surface, which is the depth assumed to be potentially exposed during construction activities. Exposure routes for future exposure to the subsurface soil are the same as those for current surface soil, incidental ingestion of and dermal contact with the soil, and inhalation of volatile and particulate emissions from the soil.

Potable water supplies for CAX are provided by the City of Newport News Water Works. Groundwater is not used as a source of water on the base. However, a potable use scenario was evaluated in this risk assessment. It was conservatively assumed if future residential development of the site occurs; the residents could use the groundwater as a potable water supply. The residents would be exposed through ingestion, and dermal contact and inhalation while bathing. Additionally, due to the depth to groundwater (less than10 feet below ground surface in a number of monitoring wells) at several areas on base, construction workers could be exposed to the groundwater through dermal contact and inhalation of vapors in an excavation during construction activities.

There is no future planned construction of any industrial or residential structures at the Ammonia Settling Pit subarea, and thus the privy tank area. Therefore, vapor intrusion from groundwater to indoor air is not considered a current or likely future exposure pathway and was not evaluated in the screening human health risk evaluation.

Human Health Risk Screening Methodology

The human health risk screening is normally conducted in three steps using a risk ratio technique (Navy, 2000). However, since only one sample was collected at the Privy Tank Area, the third step of the process was not performed because five or more samples are needed to perform the statistical calculations necessary to estimate the Step 3 exposure concentration. COPCs identified in Step 1 were evaluated in Step 2. The risk screening evaluation for the privy tank is presented in **Tables A4-1, A4-2, A4-3,** and **A4-4** of this attachment. The screening process is described below.

Step 1

The maximum detected constituent concentrations for surface soil, subsurface soil, and groundwater were compared to the 95% upper tolerance limit (UTL) background concentrations (CH2M HILL, 2011). Concentrations of naturally occurring constituents (metals) were compared to accepted background UTLs. If the constituent concentration was below background, it was eliminated from further evaluation. If there were no background data or the constituent concentration was greater than background concentration, it was then compared to the USEPA human health regional screening levels (RSL) (USEPA 2011), and other human health risk screening levels (if appropriate). The RSLs based on noncarcinogenic effects were adjusted by dividing by 10 to account for exposure to multiple constituents (i.e., were adjusted to a hazard quotient of 0.1, from the hazard quotient of 1.0 used on the USEPA RSL table). The RSLs based on carcinogenic endpoints were used as presented in the RSL table, and are based on a carcinogenic risk of 1×10^{-6}.

The surface and subsurface soil data were compared to residential and industrial soil RSLs. Although recreational users and maintenance workers are the most likely receptors at the Ammonia Settling Pit subarea, and thus the privy tank area, construction workers and industrial workers are potential receptors, in addition to residential receptors. Residential soil RSLs are more conservative (i.e., lower) than industrial soil RSLs, and are therefore protective of all potential receptors (e.g., recreational users, visitors, trespassers, residents, industrial workers, and construction workers). Therefore, if the maximum detected concentration was less than the industrial RSL but greater than the residential soil RSL, the constituent was carried forward to Step 2.

The groundwater data was compared to tap water RSLs and maximum contaminant levels (MCLs) (USEPA, 2009). An exceedance of either, or both criteria, was used to identify the groundwater COPCs, which were then carried forward to Step 2. Although filtered and unfiltered groundwater samples were collected, only unfiltered samples were analyzed in the risk screening evaluation.

If the maximum detected concentration of an analyte in surface soil, subsurface soil, or groundwater exceeded the background concentration, if available, and the appropriate screening value (e.g., RSL, MCL), the analyte was identified as a COPC and the screening level risk evaluation proceeded to Step 2.

Lead is not evaluated in the same manner as the other COPCs, but is regulated by USEPA based on blood-lead uptake using a physiologically based pharmacokinetic model called the Integrated Exposure Uptake Biokinetic (IEUBK) Model. As a screening tool, lead is screened at 400 mg/kg in soil based on residential exposure. The model uses the average lead concentration, not the maximum detected lead concentration. If the average lead concentration is greater than 400 mg/kg, it is retained as a COPC. For groundwater, the maximum detected concentration of lead is screened at 15 µg/L in groundwater based on the federal action level (USEPA, 2009). If the lead concentrations are greater than the action level, it is retained as a COPC.

Step 2

For constituents identified as COPCs in Step 1, a corresponding risk level was calculated using the following equation:

$$\text{corresponding risk level} = \frac{\text{concentration x acceptable risk level}}{\text{RSL}}$$

The concentration is the maximum detected concentration (the same concentration that was used in Step 1). The acceptable risk level is 1 for noncarcinogens and 10^{-6} for carcinogens. RSLs for noncarcinogenic effects are not adjusted by 10 as was done in Step 1; they are used as presented in the RSL table. All of the corresponding risk levels for each constituent within a media are summed to calculate the cumulative corresponding hazard index (for noncarcinogens) and cumulative corresponding carcinogenic risk (for carcinogens). A cumulative corresponding hazard index is also calculated for each target organ/effect. If the cumulative corresponding hazard index for a target organ/effect is greater than the risk-ratio screening benchmark of 0.5, or the cumulative corresponding carcinogenic risk is greater than the 5×10^{-5} risk-ratio screening benchmark, the chemicals contributing to these values are retained as COPCs and carried forward to Step 3.

Human Health Risk Screening Results

The human health risk-based screening and risk ratio evaluation were performed for surface soil, subsurface soil, and groundwater collected near the privy tank.

Surface Soil

Table A4-1 of this attachment presents the risk-based screening evaluation for surface soil at the privy tank area. No COPCs were retained for evaluation in Step 2. Therefore, exposure

to surface soil in the privy tank area would not be expected to result in any unacceptable human health risks based on potential human exposure.

Subsurface Soil

Table A4-2 of this attachment presents the risk-based screening evaluation for subsurface soil at the privy tank area. No COPCs were retained for evaluation in Step 2. Therefore, exposure to subsurface soil in the privy tank area at AOC 6 would not be expected to result in any unacceptable human health risks based on potential human exposure.

Groundwater

Tables A4-3 and **A4-4** of this attachment present the risk-based screening evaluation for groundwater at the privy tank area. Eleven metals (aluminum, arsenic, beryllium, cadmium, chromium, cobalt, iron, lead, manganese, nickel, and vanadium) were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations), all metals except nickel were identified as COPCs. The detected lead concentration in the one groundwater sample is 93.9 µg/L, which is greater than the lead screening level. Therefore, lead was retained as a COPC in groundwater.

Human Health Risk Screening Conclusion

Exposure to surface soil and subsurface soil within the privy tank area would not result in any unacceptable risks. Exposure to groundwater could result in potential unacceptable human health risks, associated with exposure to metals.

It should be noted that the groundwater is not currently used as a potable water supply at the site or the base, and is extremely unlikely that it ever would be used as a potable water supply.

References

CH2M HILL. 2011. *Final Background Study Report, Naval Weapons Station Yorktown, Yorktown, Virginia and Cheatham Annex, Williamsburg, Virginia*. May.

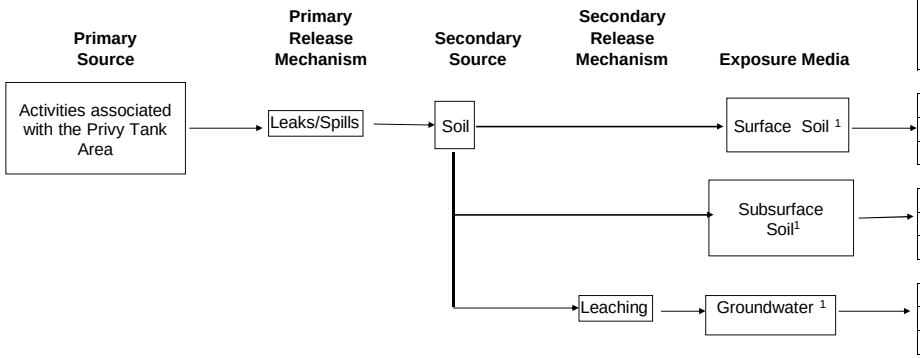
Department of Navy (Navy). 1998. *Environmental Assessment for Recreational Cabins at Fleet and Industrial Supply Center Cheatham Annex*. December.

Navy. 2000. *Overview of Screening, Risk Ratio, and Toxicological Evaluation*. Procedures for Northern Division Human Health Risk Assessments. May.

United States Environmental Protection Agency (USEPA). 2009. *2009 Edition of the Drinking Water Standards and Health Advisories* U.S. Environmental Protection Agency. Office of Water. EPA 816-F-09-004.

USEPA. 2011. *Regional Screening Levels for Chemicals at Superfund Sites*. June.

Privy Tank Area
CSM Figure



	Potential Human Receptors					
	Current/Future				Future	
Exposure Route	**Recreational Users/Visitors**	**Trespassers**	**Maintenance Worker**	**Industrial Worker**	**Residents**	**Construction Worker**
Ingestion	X	X	X	X	X	X
Dermal Contact	X	X	X	X	X	X
Inhalation	X	X	X	X	X	X
Ingestion	X	X	X	X	X	X
Dermal Contact	X	X	X	X	X	X
Inhalation	X	X	X	X	X	X
Ingestion	NA	NA	NA	NA	X	NA
Dermal Contact	NA	NA	NA	NA	X	X
Inhalation	NA	NA	NA	NA	X	X

[1] Screening level evaluation for the Privy Tank Area
[2] For recreational user/visitor, current exposure to surface sediment and future exposure to subsurface sediment.

NA - Not Applicable or pathway is incomplete
X - Potentially complete exposure pathways

FIGURE A4-1

Conceptual Site Model for HHRA - Privy Tank
Cheatham Annex, Privy Tank Area, Williamsburg, Virginia
Additional PSLP Concerns Technical Memorandum

Privy Tank Area

Human Health Risk Screening Tables

Table A4 -1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Cheatham Annex - Privy Tank Area, Williamsburg, Virginia

Additional PSLP Concerns Technical Memorandum

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Surface Soil	88-74-4	2-Nitroaniline	2.9E-01 J	2.9E-01 J	MG/KG	CAA06-SS09P-1108	1/1	1 - 1.2	2.9E-01	N/A	N/A	6.1E+01 N	NO	6.0E+02 N	NO	BSL
Privy Tank	7429-90-5	Aluminum	8.7E+03	8.7E+03	MG/KG	CAA06-SS09-1108	1/1	21 - 23	8.7E+03	1.2E+04	NO	7.7E+03 N	N/A	9.9E+04 NM	N/A	BBK
Area	7440-38-2	Arsenic	4.1E+00 L	4.1E+00 L	MG/KG	CAA06-SS09-1108	1/1	1.1 - 1.2	4.1E+00	6.4E+00	NO	3.9E-01 C*	N/A	1.6E+00 C	N/A	BBK
	7440-39-3	Barium	8.0E+01 K	8.0E+01 K	MG/KG	CAA06-SS09-1108	1/1	21 - 23	8.0E+01	5.3E+01	YES	1.5E+03 N	NO	1.9E+04 NM	NO	BSL
	7440-41-7	Beryllium	7.3E-01	7.3E-01	MG/KG	CAA06-SS09-1108	1/1	0.53 - 0.58	7.3E-01	5.9E-01	YES	1.6E+01 N	NO	2.0E+02 N	NO	BSL
	7440-43-9	Cadmium	1.2E-01 J	1.2E-01 J	MG/KG	CAA06-SS09-1108	1/1	0.53 - 0.58	1.2E-01	1.5E+00	NO	7.0E+00 N	N/A	8.0E+01 N	N/A	BBK
	7440-70-2	Calcium	3.7E+03	3.7E+03	MG/KG	CAA06-SS09-1108	1/1	530 - 580	3.7E+03	2.3E+03	YES	N/A	NUT	N/A	NUT	NUT
	7440-47-3	Chromium	8.8E+00	8.8E+00	MG/KG	CAA06-SS09-1108	1/1	1.1 - 1.2	8.8E+00	1.8E+01	NO	2.9E-01 C	N/A	5.6E+00 C	N/A	BBK
	7440-48-4	Cobalt	3.2E+00 J	3.2E+00 J	MG/KG	CAA06-SS09-1108	1/1	5.3 - 5.8	3.2E+00	9.9E+00	NO	2.3E+00 N	N/A	3.0E+01 N	N/A	BBK
	7439-89-6	Iron	6.1E+03	6.1E+03	MG/KG	CAA06-SS09-1108	1/1	11 - 12	6.1E+03	2.0E+04	NO	5.5E+03 N	N/A	7.2E+04 NM	N/A	BBK
	7439-92-1	Lead	3.0E+01	3.0E+01	MG/KG	CAA06-SS09-1108	1/1	1.1 - 1.2	3.0E+01	1.7E+01	YES	4.0E+02 NL	NO	8.0E+02 NL	NO	BSL
	7439-95-4	Magnesium	8.6E+02	8.6E+02	MG/KG	CAA06-SS09-1108	1/1	530 - 580	8.6E+02	1.1E+03	NO	N/A	N/A	N/A	N/A	BBK
	7439-96-5	Manganese	2.8E+02 L	2.8E+02 L	MG/KG	CAA06-SS09-1108	1/1	1.6 - 1.7	2.8E+02	3.2E+02	NO	1.8E+02 N	N/A	2.3E+03 N	N/A	BBK
	7439-97-6	Mercury	7.0E-02 L	7.0E-02 L	MG/KG	CAA06-SS09P-1108	1/1	0.11 - 0.15	7.0E-02	1.1E-01	NO	2.3E+00 N	N/A	3.1E+01 N	N/A	BBK
	7440-02-0	Nickel	6.2E+00	6.2E+00	MG/KG	CAA06-SS09-1108	1/1	4.3 - 4.7	6.2E+00	9.5E+00	NO	1.5E+02 N	N/A	2.0E+03 N	N/A	BBK
	7440-09-7	Potassium	5.2E+02 J	5.2E+02 J	MG/KG	CAA06-SS09-1108	1/1	530 - 580	5.2E+02	7.1E+02	NO	N/A	N/A	N/A	N/A	BBK
	7440-62-2	Vanadium	1.7E+01	1.7E+01	MG/KG	CAA06-SS09-1108	1/1	5.3 - 5.8	1.7E+01	2.8E+01	NO	3.9E+01 N	N/A	5.2E+02 N	N/A	BBK
	7440-66-6	Zinc	2.5E+01 K	2.5E+01 K	MG/KG	CAA06-SS09-1108	1/1	6.4 - 7	2.5E+01	2.7E+01	NO	2.3E+03 N	N/A	3.1E+04 NM	N/A	BBK

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concenentrations were then compared to RSLs.

[4] Background values from Cheatham Annex/Yorktown background surface soil samples; values represent the 95% UTL.

[5] Oak Ridge National Laboratory (ORNL). June, 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Residential Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[6] Oak Ridge National Laboratory (ORNL). June, 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Industrial Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml
RSL value for Chromium(VI) used as surrogate for chromium.
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.

[7] Rationale Codes

Selection Reason: Above Residential Soil Screening Levels (ASL-Res)
Above Industrial Soil Screening Levels (ASL-Ind)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
C* = where: N RSL < 100X C RSL
C** = where N RSL < 10X C RSL, therefore, N RSL used
N = Noncarcinogenic
N/A = Not available or Not applicable
M = Concentration may exceed ceiling limit

Table A4-2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Cheatham Annex - Privy Tank Area, Williamsburg, Virginia

Additional PSLP Concerns Technical Memorandum

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Privy Tank Area Subsurface Soil	7429-90-5	Aluminum	9.0E+03	9.0E+03	MG/KG	CAA06-SB09P-1108	1/1	-	9.0E+03	1.3E+04	NO	7.7E+03 N	N/A	9.9E+04 NM	N/A	BBK
	7440-38-2	Arsenic	3.4E+00 L	3.4E+00 L	MG/KG	CAA06-SB09P-1108	1/1	-	3.4E+00	5.5E+00	NO	3.9E-01 C*	N/A	1.6E+00 C	N/A	BBK
	7440-39-3	Barium	3.3E+01 K	3.3E+01 K	MG/KG	CAA06-SB09P-1108	1/1	-	3.3E+01	8.5E+01	NO	1.5E+03 N	N/A	1.9E+04 NM	N/A	BBK
	7440-41-7	Beryllium	4.9E-01	4.9E-01	MG/KG	CAA06-SB09P-1108	1/1	-	4.9E-01	5.2E-01	NO	1.6E+01 N	N/A	2.0E+02 N	N/A	BBK
	7440-70-2	Calcium	5.4E+02	5.4E+02	MG/KG	CAA06-SB09-1108	1/1	-	5.4E+02	2.4E+03	NO	N/A	N/A	N/A	N/A	BBK
	7440-47-3	Chromium	9.3E+00	9.3E+00	MG/KG	CAA06-SB09P-1108	1/1	-	9.3E+00	3.4E+01	NO	2.9E-01 C	N/A	5.6E+00 C	N/A	BBK
	7440-48-4	Cobalt	2.7E+00 J	2.7E+00 J	MG/KG	CAA06-SB09P-1108	1/1	-	2.7E+00	5.2E+00	NO	2.3E+00 N	N/A	3.0E+01 N	N/A	BBK
	7439-89-6	Iron	6.1E+03	6.1E+03	MG/KG	CAA06-SB09P-1108	1/1	-	6.1E+03	3.2E+04	NO	5.5E+03 N	N/A	7.2E+04 NM	N/A	BBK
	7439-92-1	Lead	3.0E+01	3.0E+01	MG/KG	CAA06-SB09-1108	1/1	-	3.0E+01	8.8E+00	YES	4.0E+02 NL	NO	8.0E+02 NL	NO	BSL
	7439-95-4	Magnesium	6.2E+02	6.2E+02	MG/KG	CAA06-SB09P-1108	1/1	-	6.2E+02	1.1E+03	NO	N/A	N/A	N/A	N/A	BBK
	7439-96-5	Manganese	1.0E+02 L	1.0E+02 L	MG/KG	CAA06-SB09-1108	1/1	-	1.0E+02	1.8E+02	NO	1.8E+02 N	N/A	2.3E+03 N	N/A	BBK
	7440-02-0	Nickel	5.0E+00	5.0E+00	MG/KG	CAA06-SB09P-1108	1/1	-	5.0E+00	1.8E+01	NO	1.5E+02 N	N/A	2.0E+03 N	N/A	BBK
	7440-09-7	Potassium	4.1E+02 J	4.1E+02 J	MG/KG	CAA06-SB09P-1108	1/1	-	4.1E+02	9.0E+02	YES	N/A	NUT	N/A	NUT	NUT
	7782-49-2	Selenium	3.3E-01 J	3.3E-01 J	MG/KG	CAA06-SB09-1108	1/1	-	3.3E-01	6.4E-01	NO	3.9E+01 N	N/A	5.1E+02 N	N/A	BBK
	7440-62-2	Vanadium	1.6E+01	1.6E+01	MG/KG	CAA06-SB09P-1108	1/1	-	1.6E+01	4.8E+01	NO	3.9E+01 N	N/A	5.2E+02 N	N/A	BBK
	7440-66-6	Zinc	1.4E+01 K	1.4E+01 K	MG/KG	CAA06-SB09-1108 : CAA06-SB09P-1108	1/1	-	1.4E+01	2.8E+01	NO	2.3E+03 N	N/A	3.1E+04 NM	N/A	BBK

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concenentrations were then compared to RSLs.

[4] Background values from Cheatham Annex/Yorktown background subsurface soil samples; values represent the 95% UTL.

[5] Oak Ridge National Laboratory (ORNL). June, 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Residential Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[6] Oak Ridge National Laboratory (ORNL). June, 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Industrial Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
RSL value for Chromium(VI) used as surrogate for chromium.
RSL value for Manganese (water) used as surrogate for manganese.
RSL value for Mercury (inorganic salts) used as surrogate for mercury.

[7] Rationale Codes

Selection Reason: Above Residential Soil Screening Levels (ASL-Res)
Above Industrial Soil Screening Levels (ASL-Ind)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
C* = where: N RSL < 100X C SL
N = Noncarcinogenic
RSL = Regional Screening Levels
N/A = Not available or Not applicable
M = Concentration may exceed ceiling limit
ND = Not detected

Table A4-3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Cheatham Annex - Privy Tank Area, Williamsburg, Virginia

Additional PSLP Concerns Technical Memorandum

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] MCL [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Privy Tank Area Groundwater	**7429-90-5**	**Aluminum**	**7.5E+04**	**7.5E+04**	**UG/L**	**CAA06-DW05-1108**	**1/1**	**200 - 200**	**7.5E+04**	**2.2E+03**	**YES**	**3.7E+03 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-38-2	**Arsenic**	**1.2E+02**	**1.2E+02**	**UG/L**	**CAA06-DW05-1108**	**1/1**	**10 - 10**	**1.2E+02**	**2.3E+00**	**YES**	**4.5E-02 C**	**YES**	**1.0E+01**	**YES**	**ASL-RSL, ASL-MCL**
	7440-39-3	Barium	1.5E+02 J	1.5E+02 J	UG/L	CAA06-DW05-1108	1/1	200 - 200	1.5E+02	1.2E+02	YES	7.3E+02 N	NO	2.0E+03	NO	BSL
	7440-41-7	**Beryllium**	**5.6E+00**	**5.6E+00**	**UG/L**	**CAA06-DW05-1108**	**1/1**	**5 - 5**	**5.6E+00**	**2.5E+00**	**YES**	**7.3E+00 N**	**NO**	**4.0E+00**	**YES**	**ASL-MCL**
	7440-43-9	**Cadmium**	**1.1E+01**	**1.1E+01**	**UG/L**	**CAA06-DW05-1108**	**1/1**	**5 - 5**	**1.1E+01**	**6.1E-01**	**YES**	**1.8E+00 N**	**YES**	**5.0E+00**	**YES**	**ASL-RSL, ASL-MCL**
	7440-70-2	Calcium	3.0E+04	3.0E+04	UG/L	CAA06-DW05-1108	1/1	5000 - 5000	3.0E+04	**1.6E+05**	NO	N/A	N/A	N/A	N/A	BBK
	7440-47-3	**Chromium**	**2.0E+02**	**2.0E+02**	**UG/L**	**CAA06-DW05-1108**	**1/1**	**10 - 10**	**2.0E+02**	**1.5E+01**	**YES**	**4.3E-02 C**	**YES**	**1.0E+02**	**YES**	**ASL-RSL, ASL-MCL**
	7440-48-4	**Cobalt**	**4.3E+01 J**	**4.3E+01 J**	**UG/L**	**CAA06-DW05-1108**	**1/1**	**50 - 50**	**4.3E+01**	**2.1E+01**	**YES**	**1.1E+00 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-50-8	Copper	6.3E+01	6.3E+01	UG/L	CAA06-DW05-1108	1/1	25 - 25	6.3E+01	2.1E+01	YES	1.5E+02 N	NO	1.3E+03	NO	BSL
	7439-89-6	**Iron**	**2.0E+05**	**2.0E+05**	**UG/L**	**CAA06-DW05-1108**	**1/1**	**100 - 100**	**2.0E+05**	**3.6E+03**	**YES**	**2.6E+03 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7439-92-1	**Lead**	**9.4E+01**	**9.4E+01**	**UG/L**	**CAA06-DW05-1108**	**1/1**	**10 - 10**	**9.4E+01**	**2.1E+01**	**YES**	**N/A**	**N/A**	**1.5E+01**	**YES**	**ASL-MCL**
	7439-95-4	Magnesium	8.6E+03	8.6E+03	UG/L	CAA06-DW05-1108	1/1	5000 - 5000	8.6E+03	3.6E+03	YES	N/A	NUT	N/A	NUT	NUT
	7439-96-5	**Manganese**	**5.7E+02**	**5.7E+02**	**UG/L**	**CAA06-DW05-1108**	**1/1**	**15 - 15**	**5.7E+02**	**5.8E+01**	**YES**	**8.8E+01 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7439-97-6	Mercury	7.0E-02 J	7.0E-02 J	UG/L	CAA06-DW05-1108	1/1	0.2 - 0.2	7.0E-02	8.1E-02	NO	1.1E+00 N	N/A	2.0E+00	N/A	BBK
	7440-02-0	**Nickel**	**9.2E+01**	**9.2E+01**	**UG/L**	**CAA06-DW05-1108**	**1/1**	**40 - 40**	**9.2E+01**	**1.1E+01**	**YES**	**7.3E+01 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-09-7	Potassium	8.5E+03	8.5E+03	UG/L	CAA06-DW05-1108	1/1	5000 - 5000	8.5E+03	3.5E+03	YES	N/A	NUT	N/A	NUT	NUT
	7440-22-4	Silver	3.0E+00 J	3.0E+00 J	UG/L	CAA06-DW05-1108	1/1	10 - 10	3.0E+00	ND	YES	1.8E+01 N	NO	N/A	N/A	BSL
	7440-23-5	Sodium	1.1E+04	1.1E+04	UG/L	CAA06-DW05-1108	1/1	5000 - 5000	1.1E+04	9.9E+03	YES	N/A	NUT	N/A	NUT	NUT
	7440-62-2	**Vanadium**	**1.8E+02**	**1.8E+02**	**UG/L**	**CAA06-DW05-1108**	**1/1**	**50 - 50**	**1.8E+02**	**2.6E+01**	**YES**	**1.8E+01 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-66-6	Zinc	3.8E+02	3.8E+02	UG/L	CAA06-DW05-1108	1/1	60 - 60	3.8E+02	4.5E+00	YES	1.1E+03 N	NO	N/A	N/A	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concenentrations were then compared to RSLs and MCLs.

[4] Background values from CAX/Yorktown groundwater background; values represent the 95% UTL.
Screening Steps: The maximum concentrations were compared to background concentrations. If exceedances, the maximum concentrations were then compared to RSLs and MCLs.

[5] Oak Ridge National Laboratory (ORNL). June, 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Available: http://epa-prgs.ornl.gov/chemicals/index.shtml. Adjusted (noncarcinogenic RSLs adjusted by dividing by 10) tap water RSLs.

[6] Drinking water Maximum Contaminant Level (MCL) (USEPA, 2009). Available: http://water.epa.gov/drink/contaminants/index.cfm
RSL value for Chromium(VI) used as surrogate for chromium.

[7] Rationale Codes

Selection Reason: Above Tap Water Screening Levels (ASL-RSL)
Above Maximim Contaminant Levels (ASL-MCL)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
J = Estimated Value
C = Carcinogenic
N = Noncarcinogenic
N/A = Not Available or Not Applicable
ND = Not Detected

TABLE A4-4

Step 2 Groundwater Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Privy Tank Area, Williamsburg, Virginia

Additional PSLP Concerns Technical Memorandum

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Tap Water RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (ug/L)								
Aluminum	1 / 1	7.5E+04	CAA06-DW05-1108	3.7E+04	1	2	NA	Developmental, Neurological
Arsenic	1 / 1	1.2E+02	CAA06-DW05-1108	4.5E-02	1E-06	NA	3E-03	NA
Beryllium	1 / 1	5.6E+00	CAA06-DW05-1108	7.3E+01	1	0.1	NA	Gastrointestinal
Cadmium	1 / 1	1.1E+01	CAA06-DW05-1108	1.8E+01	1	0.6	NA	Kidney
Chromium	1 / 1	2.0E+02	CAA06-DW05-1108	4.3E-02	1E-06	NA	5E-03	NA
Cobalt	1 / 1	4.3E+01 J	CAA06-DW05-1108	1.1E+01	1	4	NA	Thyroid
Iron	1 / 1	2.0E+05	CAA06-DW05-1108	2.6E+04	1	8	NA	Gastrointestinal
Lead	1 / 1	9.4E+01	CAA06-DW05-1108	NA	NA	NA	NA	NA
Manganese	1 / 1	5.7E+02	CAA06-DW05-1108	8.8E+02	1	0.7	NA	CNS
Nickel	1 / 1	9.2E+01	CAA06-DW05-1108	7.3E+02	1	0.1	NA	Decreased Body Weight, Decreased Organ Weight
Vanadium	1 / 1	1.8E+02	CAA06-DW05-1108	1.8E+02	1	1	NA	Kidney
Cumulative Corresponding Hazard Index[c]						**16**	NA	
Cumulative Corresponding Cancer Risk[d]							**7E-03**	

Total Developmental HI =	**2**
Total CNS/Neurological HI =	**3**
Total Kidney HI =	**2**
Total Thyroid HI =	**4**
Total Gastrointestinal HI =	**8**
Total Decreased Body Weight HI =	0.1
Total Decreased Organ Weightl HI =	0.1

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central nervous System

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

NA = Not available/not applicable

Attachment 5

Privy Tank Area – Ecological Risk Screening

ATTACHMENT 5

Ecological Risk Screening

An ecological risk screening was performed to determine the potential for ecological risks associated with direct exposure to surface soil (0 to 6 inches) and subsurface soil (6 to 24 inches), and potential ecological risks in receiving water bodies from groundwater transport near the privy tank found near the Area of Concern (AOC) 6, Ammonia Settling Pit subarea. The results of the ecological risk screening provide a preliminary indication of potential risks from exposure to chemicals of potential concern (COPCs) identified for the area, and are used to help determine whether the sites require further evaluation (e.g., a baseline risk assessment or additional data collection) or if risks are acceptable.

Ecological Conceptual Site Model

The ecological conceptual site model (CSM) provides a brief summary of site conditions, potential contaminant migration pathways, and exposure pathways to potential receptors.

The privy tank area is a very small wooded area located just south of the Ammonia Settling Pits subarea of AOC 6. Complete exposure pathways exist to lower trophic level terrestrial receptors (i.e., plants and soil invertebrates). Due to the small size of the area (less than one acre), exposures to terrestrial upper trophic level receptors (i.e., birds and mammals) are not considered significant and are not evaluated. There is the potential for groundwater transport and subsequent discharge from each area to Penniman Lake (freshwater).

Ecological Risk Screening Methodology

The ecological risk screening was conducted using a two step process within the overall decision analysis process described below, which is comprised of three steps. The ecological risk assessment (ERA) process falls within Steps 2a and 2b of this overall process.

Step 1—Determination of Potential CERCLA Eligibility and, if CERCLA-Eligible, Has a CERCLA-Related Release Occurred at the Site?

The first phase of Step 1 in the decision analysis is to determine if an area is potentially Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-eligible by evaluating information included in historical records, aerial photographs, and site visit observations. If the area is determined to be CERCLA-eligible—that is, if it is reasonable to assume CERCLA hazardous substances may have been released at the site—site-specific analytical data are evaluated, if available.

It is assumed that the privy tank area is potentially CERCLA-eligible, and the second phase of Step 1 is conducted to determine if there has been a potential CERCLA-related release. A "CERCLA-related release" is a release of hazardous substances, pollutants, and contaminants eligible for CERCLA response as defined in CERCLA Sections 101(14) and 101(33).

A potential release is suspected if any inorganic constituent inconsistent with background concentrations are detected or if any non-inorganic constituents are detected. To help determine whether site-specific inorganic concentrations are inconsistent with background inorganic concentrations, at a minimum, discrete sample concentrations are compared to the CAX background concentrations for individual inorganics. If it is determined that a release has occurred, the process continues to Step 2.

Step 2—Does the CERCLA Release Pose Potential Unacceptable Risks to Human Health and the Environment?

Step 2a—Comparison to Conservative Screening Values

If a CERCLA-related release is suspected, site-specific data (that exceed background, if available) are compared in Step 2a to conservative screening values, which comprise (as applicable), the following:

- USEPA Regional Soil Screening Levels (SSLs) for protection of groundwater (soil) (November 2010)
- USEPA Regional Screening Levels (RSLs) for industrial and residential soil (soil), residential soil (sediment), and Tap Water (groundwater and surface water), adjusted as appropriate (for non-carcinogenic effects) (November 2010)
- Federal Safe Drinking Water Act (Title 40 of the Code of Federal Regulations [CFR], Part 141) Maximum Contaminant Levels (MCLs) (groundwater)
- Ecological screening values (ESVs) (soil and groundwater; sources included in Tables A5-1 and A5-2)
- Background soil and groundwater values for inorganics (CH2M HILL, 2011).

Additionally, on a site-specific basis, other screening criteria are used for data comparison. Toxicity Characteristic Leaching Procedure (TCLP) sample screening criteria used during the sampling for investigation-derived waste (IDW) are provided in USEPA SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.*

It is appropriate to compare only those site-specific concentrations above background to risk-based screening criteria because the objective of the technical memorandum is to not only determine whether a CERCLA-related release has occurred, but also to assess if the release warrants further investigation or action. Background, therefore, must be considered as part of this process. The CAX background UTLs are documented in the Final Background Report (CH2M HILL, 2011).

Step 2b—Conduct a Qualitative Risk Evaluation Using More Realistic Assumptions

For constituents that are found above the conservative screening values during Step 2a, an additional evaluation using more realistic assumptions is conducted in Step 2b to help determine if further investigation or action is warranted. For the purposes of this technical memorandum, and as documented in the Multiple AOC Site Inspection Work Plan under which the privy tank samples were collected (CH2M HILL, 2008), this more realistic evaluation involves completing a qualitative risk screening to determine if those

constituents exceeding conservative screening values pose a potential risk to human health and the environment.

Step 3—Is Further Investigation or Action Required?

As a final check before exiting the decision analysis with a no action (NA) or no further action (NFA) decision, the historical site information and spatial distribution of constituents and constituent concentrations are evaluated to ensure that the potential source area for a CERCLA-related release has been sufficiently characterized. If so, NA or NFA is recommended via an NA or NFA decision document. If not, recommendations for a path forward will be provided.

Application of the Decision Analysis Process to the Privy Tank Area

If a CERCLA-related release is suspected (Step 1 of the overall decision process), site-specific analytical data for detected constituents are compared to conservative ecological screening values and background 95 percent upper tolerance limits (UTLs), where available (Step 2a). Medium-specific screening values used in the assessment, which are based upon lower trophic level exposures per the CSM, are contained in **Tables A5-1** (soil) and **A5-2** (surface water; used to screen groundwater). Soil screenings were conducted for both surface samples (0 to 6 inches) and subsurface samples (6 to 24 inches) since ecological exposures are generally considered to be confined to the top two feet of the soil column. The surface water values used to screen groundwater considered the salinity of the receiving water body to determine whether to apply freshwater or marine values. As such, freshwater values were used for the privy tank area.

Although both total and dissolved groundwater data are included in the screening tables, only dissolved metals data are considered when selecting COPCs because chemicals in groundwater are most likely to travel dissolved in water rather than adhered to particles since they must travel through soil pores or fractured rock. Similarly, when groundwater discharges to a water body (at which time ecological exposures become possible), the bulk of the discharged chemicals are likely to be dissolved in water since the discharge must pass through the pores in the underlying sediments. Thus, the dissolved concentrations are likely to be more representative of what would be transported via the groundwater than the total concentrations. Once discharged, the dissolved metal fraction in water (filtered samples) is more representative of the bioavailable fraction to aquatic receptors than the total metal fraction (unfiltered samples) (USEPA, 1996). This is reflected in how the most recent Ambient Water Quality Criteria have been developed for many metals, that is, they are based upon the dissolved fraction (USEPA, 2009).

Although ecological receptors do not typically have direct exposure to groundwater, surface water screening values were compared to analytical groundwater data (with and without dilution factors) in order to provide a conservative evaluation of the potential for significant contaminant transport via groundwater to downgradient receiving water bodies. In the absence of site-specific dilution factors for groundwater, Buchman (1999) recommends using a dilution factor of 10 to account for the dilution expected during migration and upon discharge of groundwater to surface water.

The background UTLs were facility-specific values derived for CAX (CH2M HILL, 2011). At the privy tank area, the groundwater was collected from the Yorktown-Eastover aquifer, as the shallower Cornwalis Cave aquifer does not exist in this area.

If the maximum detected concentration exceeded both ecological screening values and background UTLs, exceeded either screening values or UTLs if only one of the two were available for a constituent, or neither a screening value or UTL was available, the constituent was retained as an initial COPC for that medium. This constituted Step 2a of the decision process and also corresponds to a screening level ERA (which is Step 2 of the ERA process outlined in USEPA [1997] and NAVFAC [2003]).

For the screening value and background exceedances that are likely attributable to a historic CERCLA-related release, an evaluation of the data using more realistic assumptions, if possible, was done. This more realistic evaluation (Step 2b of the decision process) was performed to help ensure appropriate perspective is considered regarding the release such that informed decisions on the need for further investigation or action can be made (which is Step 3 of the decision process). Step 2b of the decision process corresponds to the first step of a baseline ERA (which is Step 3A of the ERA process outlined in NAVFAC [2003]).

Where there are exceedances of the ecological screening values and background, more realistic evaluations consider the following types of information:

- The size of the site
- The type and quality of the habitat present on the site and in surrounding areas, and the potential receptors likely to be present
- The frequency and magnitude of screening value and background exceedances
- Average exposure concentrations
- The spatial pattern of exceedances
- Additional screening values from the literature, where applicable
- Other site-specific factors that might be relevant to assessing potential exposures (e.g., soil type, bioavailability, fate, transport properties).

Where more realistic evaluations of the data are conducted, the rationale for those evaluations is included in the discussion. It is recognized that these more realistic evaluations may have uncertainty due to the limited amount of data generally available at this stage. However, these additional risk evaluations provide yet another line of evidence that, when considered with all other site-specific information and evaluations, increase the level of confidence by which conclusions are drawn.

Ecological Risk Screening Results

The ecological risk screening was performed for surface soil, subsurface soil and groundwater at the privy tank area.

Privy Tank Area Risk Screening Results

The results of the risk evaluation for the privy tank area are presented in **Tables A5-3** through **A5-8**.

Surface Soil

No constituent exceeded screening values based upon maximum detected concentrations and also exceeded background UTLs, where available (**Tables A5-3** and **A5-4**). A screening value was not available for 2-nitroaniline. Thus, this constituent was identified as an initial COPC.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- 2-Nitroaniline, which did not have a screening value, was detected at a maximum concentration (290 µg/kg) that was less than soil screening values for other, similar semi-volatile organic compounds (**Table A5-1**). Thus, this constituent was not identified as a refined COPC.

No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with this medium.

Subsurface Soil

No constituent exceeded screening values based upon maximum detected concentrations and also exceeded background UTLs, where available (**Tables A5-5** and **A5-6**). Thus, there are no unacceptable ecological risks associated with this medium.

Groundwater

Fourteen inorganics (aluminum, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, silver, vanadium, and zinc) exceeded screening values based upon maximum detected concentrations in unfiltered sample and also exceeded background UTLs, where available (**Tables A5-7** and **A5-8**). Aluminum, iron, lead, manganese, and silver exceeded screening values based upon maximum detected concentrations in filtered sample and also exceeded background UTLs, where available. Thus, aluminum, iron, lead, manganese, and silver were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- While the mean HQs for lead, manganese, and silver exceeded one based upon undiluted concentrations, the mean HQs did not exceed one when a dilution factor of 10 was applied. Thus, none of these three constituents were identified as a refined COPC.
- The mean HQs for aluminum and iron exceeded one with a dilution factor of 10 applied. Thus, aluminum and iron were identified as refined COPCs.

Ecological Risk Screening Conclusion

The COPCs identified in the privy tank area groundwater (aluminum and iron) were not identified as COPCs in the surface or subsurface soil.

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Privy Tank Area

Ecological Risk Screening Tables

TABLE A5-1
Ecological Screening Values - Soil
Cheatham Annex, Williamsburg, Virginia
Additional Former PSLP Concerns Technical Memorandum

Chemical	Screening Value	Units	Reference	Comments
Explosives				
1,3,5-Trinitrobenzene	NSV	--	--	
1,3-Dinitrobenzene	NSV	--	--	
2,4,6-Trinitrotoluene	10,000	ug/kg	Talmage et al. 1999	Plant
2,4-Dinitrotoluene	11,000	ug/kg	NRCC 2006	Plant/Invertebrate
2,6-Dinitrotoluene	8,500	ug/kg	NRCC 2006	Plant/Invertebrate
2-Amino-4,6-dinitrotoluene	80,000	ug/kg	Talmage et al. 1999	Plant
2-Nitrotoluene	NSV	--	--	
3,5-Dinitroaniline	NSV	--	--	
3-Nitrotoluene	NSV	--	--	
4-Amino-2,6-dinitrotoluene	80,000	ug/kg	2-Amino-4,6-dinitrotoluene	Plant
4-Nitrotoluene	NSV	--	--	
HMX	10,000	ug/kg	Talmage et al. 1999	Invertebrate
Nitrobenzene	2,260	ug/kg	Efroymson et al. 1997b	LC50 of 226,000; UF of 100
Nitroglycerine	NSV	--	--	
Nitroguanidine	NSV	--	--	
Perchlorate	1,000	ug/kg	USEPA 2002	Invertebrate
PETN	NSV	--	--	
RDX	10,000	ug/kg	Talmage et al. 1999	Invertebrate
Tetryl	10,000	ug/kg	Talmage et al. 1999	Plant
Inorganics				
Aluminum	pH < 5.5	--	USEPA 2003a	Eco-SSL
Antimony	78.0	mg/kg	USEPA 2005a	Eco-SSL - Invertebrate
Arsenic	18.0	mg/kg	USEPA 2005b	Eco-SSL - Plant
Barium	330	mg/kg	USEPA 2005c	Eco-SSL - Invertebrate
Beryllium	40.0	mg/kg	USEPA 2005d	Eco-SSL - Invertebrate
Cadmium	32.0	mg/kg	USEPA 2005e	Eco-SSL - Plant
Chromium	64.0	mg/kg	CCME 2007	Soil Quality Guideline
Cobalt	13.0	mg/kg	USEPA 2005f	Eco-SSL - Plant
Copper	70.0	mg/kg	USEPA 2007a	Eco-SSL - Plant
Cyanide	15.8	mg/kg	MHSPE 2000	Geomean of target/intervention - complex
Iron	pH < 5 or > 8	--	USEPA 2003b	Eco-SSL
Lead	120	mg/kg	USEPA 2005g	Eco-SSL - Plant
Manganese	220	mg/kg	USEPA 2007b	Eco-SSL - Plant
Mercury	0.10	mg/kg	Efroymson et al. 1997b	Invertebrate

TABLE A5-1
Ecological Screening Values - Soil
Cheatham Annex, Williamsburg, Virginia
Additional Former PSLP Concerns Technical Memorandum

Chemical	Screening Value	Units	Reference	Comments
Nickel	38.0	mg/kg	USEPA 2007c	Eco-SSL - Plant
Selenium	0.52	mg/kg	USEPA 2007d	Eco-SSL - Plant
Silver	560	mg/kg	USEPA 2006c	Eco-SSL - Plant
Thallium	1.00	mg/kg	Efroymson et al. 1997a	Plant
Vanadium	130	mg/kg	CCME 2007	Soil Quality Guideline
Zinc	120	mg/kg	USEPA 2007e	Eco-SSL - Invertebrate
Pesticides/PCBs				
4,4'-DDD	583	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
4,4'-DDE	114	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
4,4'-DDT	100	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Aldrin	3.63	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
alpha-BHC	226	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
alpha-Chlordane	11.0	ug/kg	MHSPE 2000	Geomean of target/intervention
Aroclor-1016	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
Aroclor-1221	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
Aroclor-1232	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
Aroclor-1242	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
Aroclor-1248	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
Aroclor-1254	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
Aroclor-1260	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
beta-BHC	342	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
delta-BHC	226	ug/kg	alpha-BHC	
Dieldrin	10.5	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Endosulfan I	6.32	ug/kg	MHSPE 2000	Geomean of target/intervention
Endosulfan II	6.32	ug/kg	MHSPE 2000	Geomean of target/intervention
Endosulfan sulfate	6.32	ug/kg	Endosulfan	
Endrin	1.95	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Endrin aldehyde	1.95	ug/kg	Endrin	
Endrin ketone	1.95	ug/kg	Endrin	
gamma-BHC (Lindane)	7.75	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
gamma-Chlordane	11.0	ug/kg	MHSPE 2000	Geomean of target/intervention
Heptachlor	52.9	ug/kg	MHSPE 2000	Geomean of target/intervention
Heptachlor epoxide	52.9	ug/kg	Heptachlor	
Methoxychlor	500	ug/kg	Beyer 1990	B value
Toxaphene	500	ug/kg	Beyer 1990	B value

TABLE A5-1
Ecological Screening Values - Soil
Cheatham Annex, Williamsburg, Virginia
Additional Former PSLP Concerns Technical Memorandum

Chemical	Screening Value	Units	Reference	Comments
Semivolatile Organic Compounds				
1,1-Biphenyl	13,600	ug/kg	Efroymson et al. 1997a	EC50 (68,000); UF of 5
1,2,3-Trichlorobenzene	1,150	ug/kg	Efroymson et al. 1997b	LC50 of 115,000; UF of 100
1,2,4-Trichlorobenzene	1,270	ug/kg	Efroymson et al. 1997b	LC50 of 127,000; UF of 100
1,2-Dichlorobenzene	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
1,3-Dichlorobenzene	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
1,4-Dichlorobenzene	1,280	ug/kg	Efroymson et al. 1997b	LC50 of 128,000; UF of 100
2,2'-Oxybis(1-chloropropane)	NSV	--	--	
2,4,5-Trichlorophenol	1,350	ug/kg	Efroymson et al. 1997a	Plant NOEC
2,4,6-Trichlorophenol	580	ug/kg	Efroymson et al. 1997b	LC50 of 58,000; UF of 100
2,4-Dichlorophenol	500	ug/kg	Beyer 1990; CCME 2007	B value; IRC
2,4-Dimethylphenol	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
2,4-Dinitrophenol	20,000	ug/kg	Efroymson et al. 1997a	Plant NOEC
2,4-Dinitrotoluene	11,000	ug/kg	NRCC 2006	Plant/Invertebrate
2,6-Dinitrotoluene	8,500	ug/kg	NRCC 2006	Plant/Invertebrate
2-Chloronaphthalene	LMW PAH	--	--	
2-Chlorophenol	500	ug/kg	Beyer 1990; CCME 2007	B value; IRC
2-Methylnaphthalene	LMW PAH	--	--	
2-Methylphenol	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
2-Nitroaniline	NSV	--	--	
2-Nitrophenol	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
3,3'-Dichlorobenzidine	NSV	--	--	
3-Nitroaniline	NSV	--	--	
4,6-Dinitro-2-methylphenol	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
4-Bromophenyl-phenylether	NSV	--	--	
4-Chloro-3-methylphenol	500	ug/kg	Beyer 1990; CCME 2007	B value; IRC
4-Chloroaniline	500	ug/kg	MHSPE 2000	Geomean of target/intervention
4-Chlorophenyl-phenylether	NSV	--	--	
4-Methylphenol	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
4-Nitroaniline	NSV	--	--	
4-Nitrophenol	380	ug/kg	Efroymson et al. 1997b	LC50 of 38,000; UF of 100
Acenaphthene	LMW PAH	--	--	
Acenaphthylene	LMW PAH	--	--	
Acetophenone	NSV	--	--	
Anthracene	LMW PAH	--	--	

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Chemical	Screening Value	Units	Reference	Comments
Atrazine	11.9	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Benzaldehyde	NSV	--	--	
Benzo(a)anthracene	HMW PAH	--	--	
Benzo(a)pyrene	HMW PAH	--	--	
Benzo(b)fluoranthene	HMW PAH	--	--	
Benzo(g,h,i)perylene	HMW PAH	--	--	
Benzo(k)fluoranthene	HMW PAH	--	--	
Benzoic acid	NSV	--	--	
Benzyl alcohol	NSV	--	--	
bis(2-Chloroethoxy)methane	NSV	--	--	
bis(2-Chloroethyl)ether	NSV	--	--	
bis(2-Ethylhexyl)phthalate	30,000	ug/kg	CCME 2007	Plant; IRC
Butylbenzylphthalate	30,000	ug/kg	CCME 2007	Plant; IRC
Caprolactam	NSV	--	--	
Carbazole	NSV	--	--	
Chrysene	HMW PAH	--	--	
Dibenz(a,h)anthracene	HMW PAH	--	--	
Dibenzofuran	NSV	--	--	
Diethylphthalate	26,800	ug/kg	Efroymson et al. 1997a	EC50 (134,000); UF of 5
Dimethyl phthalate	10,640	ug/kg	Efroymson et al. 1997b	LC50 of 1,064,000; UF of 100
Di-n-butylphthalate	40,000	ug/kg	Efroymson et al. 1997a	LOEC (200,000); UF of 5
Di-n-octylphthalate	30,000	ug/kg	CCME 2007	Plant; IRC
Fluoranthene	LMW PAH	--	--	
Fluorene	LMW PAH	--	--	
Hexachlorobenzene	1,000	ug/kg	Beyer 1990	B value
Hexachlorobutadiene	NSV	--	--	
Hexachlorocyclopentadiene	2,000	ug/kg	Efroymson et al. 1997a	LOEC (10,000); UF of 5
Hexachloroethane	NSV	--	--	
Indeno(1,2,3-cd)pyrene	HMW PAH	--	--	
Isophorone	NSV	--	--	
Naphthalene	LMW PAH	--	--	
Nitrobenzene	2,260	ug/kg	Efroymson et al. 1997b	LC50 of 226,000; UF of 100
n-Nitroso-di-n-propylamine	NSV	--	--	
n-Nitrosodiphenylamine	1,090	ug/kg	Efroymson et al. 1997b	LC50 of 109,000; UF of 100
PAH (HMW)	18,000	ug/kg	USEPA 2007f	Eco-SSL - Invertebrate

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Chemical	Screening Value	Units	Reference	Comments
PAH (LMW)	29,000	ug/kg	USEPA 2007f	Eco-SSL - Invertebrate
Pentachlorophenol	5,000	ug/kg	USEPA 2007g	Eco-SSL - Plant
Phenanthrene	LMW PAH	--	--	
Phenol	1,880	ug/kg	Efroymson et al. 1997b	LC50 of 188,000; UF of 100
Pyrene	HMW PAH	--	--	
Volatile Organic Compounds				
1,1,1-Trichloroethane	1,025	ug/kg	MHSPE 2000	Geomean of target/intervention
1,1,2,2-Tetrachloroethane	5,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NSV	--	--	
1,1,2-Trichloroethane	2,000	ug/kg	MHSPE 2000	Geomean of target/intervention
1,1-Dichloroethane	548	ug/kg	MHSPE 2000	Geomean of target/intervention
1,1-Dichloroethene	173	ug/kg	MHSPE 2000	Geomean of target/intervention
1,2,3-Trichlorobenzene	1,150	ug/kg	Efroymson et al. 1997b	LC50 of 115,000; UF of 100
1,2,4-Trichlorobenzene	1,270	ug/kg	Efroymson et al. 1997b	LC50 of 127,000; UF of 100
1,2-Dibromo-3-chloropropane	NSV	--	--	
1,2-Dibromoethane	300	ug/kg	CCME 2007	IRC
1,2-Dichlorobenzene	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
1,2-Dichloroethane	2,190	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
1,2-Dichloropropane	38,800	ug/kg	Efroymson et al. 1997b	LC50 of 3,880,000; UF of 100
1,3-Dichlorobenzene	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
1,4-Dichlorobenzene	1,280	ug/kg	Efroymson et al. 1997b	LC50 of 128,000; UF of 100
2-Butanone	NSV	--	--	
2-Hexanone	NSV	--	--	
4-Methyl-2-pentanone	NSV	--	--	
Acetone	NSV	--	--	
Benzene	1,140	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Bromochloromethane	NSV	--	--	
Bromodichloromethane	NSV	--	--	
Bromoform	300	ug/kg	CCME 2007	Plant; IRC
Bromomethane	NSV	--	--	
Carbon disulfide	NSV	--	--	
Carbon tetrachloride	3,400	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Chlorobenzene	2,400	ug/kg	Efroymson et al. 1997b	LC50 of 240,000; UF of 100
Chloroethane	5,000	ug/kg	CCME 2007	IRC
Chloroform	1,844	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC

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Chemical	Screening Value	Units	Reference	Comments
Chloromethane	5,000	ug/kg	CCME 2007	IRC
cis-1,2-Dichloroethene	447	ug/kg	MHSPE 2000	Geomean of target/intervention
cis-1,3-Dichloropropene	5,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
Cumene (isopropylbenzene)	NSV	--	--	
Cyclohexane	6,000	ug/kg	Beyer 1990	B value
Dibromochloromethane	NSV	--	--	
Dichlorodifluoromethane(Freon-12)	NSV	--	--	
Ethylbenzene	1,815	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Methyl acetate	NSV	--	--	
Methylcyclohexane	NSV	--	--	
Methylene chloride	1,250	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Methyl-tert-butyl ether (MTBE)	NSV	--	--	
Styrene	64,000	ug/kg	Efroymson et al. 1997a	EC50 (320,000); UF of 5
Tetrachloroethene	179	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Toluene	40,000	ug/kg	Efroymson et al. 1997a	EC50 (200,000); UF of 5
trans-1,2-Dichloroethene	447	ug/kg	MHSPE 2000	Geomean of target/intervention
trans-1,3-Dichloropropene	5,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
Trichloroethene	500	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Trichlorofluoromethane(Freon-11)	NSV	--	--	
Vinyl chloride	412	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Xylene, total	1,300	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC

NSV - No Screening Value

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Chemical	Freshwater				Reference	Comments
	Screening Value	Units	Hardness (mg/L)	pH		
Explosives						
1,3,5-Trinitrobenzene	11.0	ug/L			Talmage et al. 1999	SCV
1,3-Dinitrobenzene	17.0	ug/L			Talmage et al. 1999	SCV
2,4,6-Trinitrotoluene	93.0	ug/L			Talmage et al. 1999	SCV
2,4-Dinitrotoluene	44.0	ug/L			USEPA 2006b	SCV
2,6-Dinitrotoluene	81.0	ug/L			USEPA 2006b	SCV
2-Amino-4,6-dinitrotoluene	19.0	ug/L			Talmage et al. 1999	SCV
2-Nitrotoluene	3,400	ug/L			NAVFAC 2007	
3,5-Dinitroaniline	59.0	ug/L			Talmage et al. 1999	SCV
3-Nitrotoluene	750	ug/L			USEPA 2006b	
4-Amino-2,6-dinitrotoluene	19.0	ug/L			2-Amino-4,6-dinitrotoluene	
4-Nitrotoluene	1,900	ug/L			USEPA 2006b	
HMX	330	ug/L			Talmage et al. 1999	SCV
Nitrobenzene	270	ug/L			USEPA 2001	Acute/10
Nitroglycerine	138	ug/L			USEPA 2006b	
Nitroguanidine	220	ug/L			NAVFAC 2007	NOEC
Perchlorate	9,300	ug/L			Dean et al. 2004	CCC
PETN	85,000	ug/L			USEPA 2006b	
RDX	186	ug/L			Talmage et al. 1999	SCV
Tetryl	NSV	--			--	
Dissolved Metals						
Aluminum	87.0	ug/L			USEPA 2009	AWQC
Antimony	30.0	ug/L			Suter and Tsao 1996	FCV
Arsenic	150	ug/L			USEPA 2009	AWQC
Barium	4.00	ug/L			Suter and Tsao 1996	SCV
Beryllium	0.66	ug/L			Suter and Tsao 1996	SCV
Cadmium	0.25	ug/L	100		USEPA 2009	AWQC
Chromium	11.0	ug/L			USEPA 2009	AWQC
Cobalt	23.0	ug/L			Suter and Tsao 1996	SCV
Copper	8.96	ug/L	100		USEPA 2006a	AWQC
Iron	1,000	ug/L			USEPA 2009	AWQC
Lead	2.52	ug/L	100		USEPA 2009	AWQC
Manganese	120	ug/L			Suter and Tsao 1996	SCV
Mercury	0.77	ug/L			USEPA 2009	AWQC

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Chemical	Freshwater				Reference	Comments
	Screening Value	Units	Hardness (mg/L)	pH		
Nickel	52.0	ug/L	100		USEPA 2009	AWQC
Selenium	4.61	ug/L			USEPA 2009	AWQC
Silver	0.36	ug/L			Suter and Tsao 1996	SCV
Thallium	12.0	ug/L			Suter and Tsao 1996	SCV
Vanadium	20.0	ug/L			Suter and Tsao 1996	SCV
Zinc	118	ug/L	100		USEPA 2009	AWQC
Inorganics (Total)						
Aluminum	87.0	ug/L			USEPA 2009	AWQC
Antimony	30.0	ug/L			Suter and Tsao 1996	FCV
Arsenic	150	ug/L			USEPA 2009	AWQC
Barium	4.00	ug/L			Suter and Tsao 1996	SCV
Beryllium	0.66	ug/L			Suter and Tsao 1996	SCV
Cadmium	0.27	ug/L	100		USEPA 2009	AWQC
Chromium	11.4	ug/L			USEPA 2009	AWQC
Cobalt	23.0	ug/L			Suter and Tsao 1996	SCV
Copper	9.33	ug/L	100		USEPA 2006a	AWQC
Cyanide	5.20	ug/L			USEPA 2009	AWQC
Iron	1,000	ug/L			USEPA 2009	AWQC
Lead	3.18	ug/L	100		USEPA 2009	AWQC
Manganese	120	ug/L			Suter and Tsao 1996	SCV
Mercury	0.91	ug/L			USEPA 2009	AWQC
Nickel	52.2	ug/L	100		USEPA 2009	AWQC
Selenium	5.00	ug/L			USEPA 2009	AWQC
Silver	0.36	ug/L			Suter and Tsao 1996	SCV
Thallium	12.0	ug/L			Suter and Tsao 1996	SCV
Vanadium	20.0	ug/L			Suter and Tsao 1996	SCV
Zinc	120	ug/L	100		USEPA 2009	AWQC
Pesticides/PCBs						
4,4'-DDD	0.011	ug/L			Suter and Tsao 1996	SCV
4,4'-DDE	0.013	ug/L			DDT value	
4,4'-DDT	0.013	ug/L			USEPA 1996	SCV
Aldrin	0.30	ug/L			USEPA 2001	Acute AWQC/10
alpha-BHC	2.20	ug/L			Suter and Tsao 1996	SCV
alpha-Chlordane	0.17	ug/L			Suter and Tsao 1996	SCV

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Chemical	Freshwater				Reference	Comments
	Screening Value	Units	Hardness (mg/L)	pH		
Aroclor-1016	0.14	ug/L			Suter and Tsao 1996	SCV
Aroclor-1221	0.28	ug/L			Suter and Tsao 1996	SCV
Aroclor-1232	0.58	ug/L			Suter and Tsao 1996	SCV
Aroclor-1242	0.053	ug/L			Suter and Tsao 1996	SCV
Aroclor-1248	0.081	ug/L			Suter and Tsao 1996	SCV
Aroclor-1254	0.033	ug/L			Suter and Tsao 1996	SCV
Aroclor-1260	0.14	ug/L			Suter and Tsao 1996	SCV
beta-BHC	2.20	ug/L			Suter and Tsao 1996	SCV
delta-BHC	2.20	ug/L			Suter and Tsao 1996	SCV
Dieldrin	0.056	ug/L			USEPA 2009	AWQC - FCV
Endosulfan I	0.056	ug/L			USEPA 2009	AWQC
Endosulfan II	0.056	ug/L			USEPA 2009	AWQC
Endosulfan sulfate	0.056	ug/L			Endosulfan value	
Endrin	0.036	ug/L			USEPA 2009	AWQC - FCV
Endrin aldehyde	0.15	ug/L			Buchman 2008	
Endrin ketone	0.15	ug/L			Endrin aldehyde value	
gamma-BHC (Lindane)	0.08	ug/L			USEPA 1996	FCV
gamma-Chlordane	0.17	ug/L			Suter and Tsao 1996	SCV
Heptachlor	0.0069	ug/L			USEPA 1996	SCV
Heptachlor epoxide	0.0069	ug/L			Heptachlor value	
Methoxychlor	0.03	ug/L			USEPA 2009	AWQC
Toxaphene	0.011	ug/L			USEPA 1996	SCV
Semivolatile Organic Compounds						
1,1-Biphenyl	14.0	ug/L			USEPA 1996	SCV
1,2,3-Trichlorobenzene	8.00	ug/L			USEPA 2006b	
1,2,4-Trichlorobenzene	110	ug/L			Suter and Tsao 1996	SCV
1,2-Dichlorobenzene	14.0	ug/L			USEPA 1996	SCV
1,3-Dichlorobenzene	71.0	ug/L			USEPA 1996	SCV
1,4-Dichlorobenzene	15.0	ug/L			USEPA 1996	SCV
2,2'-Oxybis(1-chloropropane)	NSV	--			--	
2,4,5-Trichlorophenol	63.0	ug/L			Buchman 2008	
2,4,6-Trichlorophenol	4.90	ug/L			Buchman 2008	
2,4-Dichlorophenol	11.0	ug/L			USEPA 2006b	SCV
2,4-Dimethylphenol	100	ug/L			Buchman 2008	

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Chemical	Freshwater				Reference	Comments
	Screening Value	Units	Hardness (mg/L)	pH		
2,4-Dinitrophenol	19.0	ug/L			Buchman 2008	
2,4-Dinitrotoluene	44.0	ug/L			USEPA 2006b	SCV
2,6-Dinitrotoluene	81.0	ug/L			USEPA 2006b	SCV
2-Chloronaphthalene	0.40	ug/L			Buchman 2008	
2-Chlorophenol	24.0	ug/L			USEPA 2006b	FCV
2-Methylnaphthalene	330	ug/L			Buchman 2008	
2-Methylphenol	13.0	ug/L			Suter and Tsao 1996	SCV
2-Nitroaniline	NSV	--			--	
2-Nitrophenol	1,920	ug/L			USEPA 2006b	
3,3'-Dichlorobenzidine	4.50	ug/L			USEPA 2006b	FCV
3-Nitroaniline	NSV	--			--	
4,6-Dinitro-2-methylphenol	2.30	ug/L			USEPA 2001	
4-Bromophenyl-phenylether	1.50	ug/L			USEPA 1996	SCV
4-Chloro-3-methylphenol	0.30	ug/L			USEPA 2001	
4-Chloroaniline	232	ug/L			USEPA 2006b	
4-Chlorophenyl-phenylether	NSV	--			--	
4-Methylphenol	543	ug/L			USEPA 2006b	
4-Nitroaniline	NSV	--			--	
4-Nitrophenol	300	ug/L			Suter and Tsao 1996	SCV
Acenaphthene	23.0	ug/L			USEPA 1996	FCV
Acenaphthylene	4,840	ug/L			Buchman 2008	
Acetophenone	NSV	--			--	
Anthracene	0.73	ug/L			Suter and Tsao 1996	SCV
Atrazine	1.80	ug/L			USEPA 2006b	
Benzaldehyde	NSV	--			--	
Benzo(a)anthracene	0.027	ug/L			Suter and Tsao 1996	SCV
Benzo(a)pyrene	0.014	ug/L			Suter and Tsao 1996	SCV
Benzo(b)fluoranthene	9.07	ug/L			Buchman 2008	
Benzo(g,h,i)perylene	7.64	ug/L			Buchman 2008	
Benzo(k)fluoranthene	9.07	ug/L			Benzo(b)fluoranthene value	
Benzoic acid	42.0	ug/L			Suter and Tsao 1996	SCV
Benzyl alcohol	8.60	ug/L			Suter and Tsao 1996	SCV
bis(2-Chloroethoxy)methane	NSV	--			--	
bis(2-Chloroethyl)ether	1,900	ug/L			Buchman 2008	

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Chemical	Freshwater				Reference	Comments
	Screening Value	Units	Hardness (mg/L)	pH		
bis(2-Ethylhexyl)phthalate	32.0	ug/L			USEPA 1996	SCV
Butylbenzylphthalate	19.0	ug/L			USEPA 1996	SCV
Caprolactam	NSV	--			--	
Carbazole	NSV	--			--	
Chrysene	NSV	--			--	
Dibenz(a,h)anthracene	NSV	--			--	
Dibenzofuran	3.70	ug/L			Suter and Tsao 1996	SCV
Diethylphthalate	270	ug/L			USEPA 2008	SCV
Dimethyl phthalate	330	ug/L			USEPA 2001	
Di-n-butylphthalate	35.0	ug/L			Suter and Tsao 1996	SCV
Di-n-octylphthalate	22.0	ug/L			USEPA 2006b	
Fluoranthene	8.10	ug/L			USEPA 1996	FCV
Fluorene	3.90	ug/L			USEPA 1996	SCV
Hexachlorobenzene	3.68	ug/L			Buchman 2008	
Hexachlorobutadiene	1.30	ug/L			USEPA 2006b	
Hexachlorocyclopentadiene	1.04	ug/L			Buchman 2008	LOEL/5
Hexachloroethane	12.0	ug/L			USEPA 1996	SCV
Indeno(1,2,3-cd)pyrene	4.31	ug/L			Buchman 2008	
Isophorone	1,170	ug/L			USEPA 2001	
Naphthalene	12.0	ug/L			Suter and Tsao 1996	SCV
Nitrobenzene	270	ug/L			USEPA 2001	Acute/10
n-Nitroso-di-n-propylamine	NSV	--			--	
n-Nitrosodiphenylamine	210	ug/L			Suter and Tsao 1996	SCV
Pentachlorophenol	15.0	ug/L		7.8	USEPA 2009	AWQC
Phenanthrene	6.30	ug/L			USEPA 1996	FCV
Phenol	110	ug/L			Suter and Tsao 1996	SCV
Pyrene	0.025	ug/L			USEPA 2006b	
Volatile Organic Compounds						
1,1,1-Trichloroethane	11.0	ug/L			Suter and Tsao 1996	SCV
1,1,2,2-Tetrachloroethane	610	ug/L			Suter and Tsao 1996	SCV
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NSV	--			--	
1,1,2-Trichloroethane	1,200	ug/L			Suter and Tsao 1996	SCV
1,1-Dichloroethane	47.0	ug/L			Suter and Tsao 1996	SCV
1,1-Dichloroethene	25.0	ug/L			Suter and Tsao 1996	SCV

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Chemical	Freshwater				Reference	Comments
	Screening Value	Units	Hardness (mg/L)	pH		
1,2,3-Trichlorobenzene	8.00	ug/L			USEPA 2006b	
1,2,4-Trichlorobenzene	110	ug/L			Suter and Tsao 1996	SCV
1,2-Dibromo-3-chloropropane	NSV	--			--	
1,2-Dibromoethane	NSV	--			--	
1,2-Dichlorobenzene	14.0	ug/L			USEPA 1996	SCV
1,2-Dichloroethane	910	ug/L			Suter and Tsao 1996	SCV
1,2-Dichloropropane	525	ug/L			USEPA 2001	
1,3-Dichlorobenzene	71.0	ug/L			USEPA 1996	SCV
1,4-Dichlorobenzene	15.0	ug/L			USEPA 1996	SCV
2-Butanone	14,000	ug/L			Suter and Tsao 1996	SCV
2-Hexanone	99.0	ug/L			Suter and Tsao 1996	SCV
4-Methyl-2-pentanone	170	ug/L			Suter and Tsao 1996	SCV
Acetone	1,500	ug/L			Suter and Tsao 1996	SCV
Benzene	130	ug/L			Suter and Tsao 1996	SCV
Bromochloromethane	NSV	--			--	
Bromodichloromethane	NSV	--			--	
Bromoform	320	ug/L			USEPA 1996	SCV
Bromomethane	110	ug/L			USEPA 2001	
Carbon disulfide	0.92	ug/L			Suter and Tsao 1996	SCV
Carbon tetrachloride	240	ug/L			USEPA 1996	SCV
Chlorobenzene	64.0	ug/L			Suter and Tsao 1996	SCV
Chloroethane	NSV	--			--	
Chloroform	28.0	ug/L			Suter and Tsao 1996	SCV
Chloromethane	5,500	ug/L			USEPA 2001	
cis-1,2-Dichloroethene	590	ug/L			Suter and Tsao 1996	SCV
cis-1,3-Dichloropropene	24.4	ug/L			USEPA 2001	
Cumene (isopropylbenzene)	2.60	ug/L			USEPA 2006b	
Cyclohexane	NSV	--			--	
Dibromochloromethane	NSV	--			--	
Dichlorodifluoromethane(Freon-12)	NSV	--			--	
Ethylbenzene	290	ug/L			USEPA 1996	SCV
Methyl acetate	NSV	--			--	
Methylcyclohexane	NSV	--			--	
Methylene chloride	2,200	ug/L			Suter and Tsao 1996	SCV

TABLE A5-2
Ecological Screening Values - Water
Cheatham Annex, Williamsburg, Virginia
Additional Former PSLP Concerns Technical Memorandum

Chemical	Freshwater				Reference	Comments
	Screening Value	Units	Hardness (mg/L)	pH		
Methyl-tert-butyl ether (MTBE)	11,070	ug/L			USEPA 2006b	
Styrene	72.0	ug/L			USEPA 2006b	
Tetrachloroethene	98.0	ug/L			Suter and Tsao 1996	SCV
Toluene	9.80	ug/L			Suter and Tsao 1996	SCV
trans-1,2-Dichloroethene	590	ug/L			Suter and Tsao 1996	SCV
trans-1,3-Dichloropropene	24.4	ug/L			USEPA 2001	
Trichloroethene	47.0	ug/L			Suter and Tsao 1996	SCV
Trichlorofluoromethane(Freon-11)	NSV	--			--	
Vinyl chloride	930	ug/L			USEPA 2006b	FCV
Xylene, total	13.0	ug/L			Suter and Tsao 1996	SCV

NSV - No Screening Value

TABLE A5-3
Ecological Screening Statistics - Privy Tank Area Surface Soil
Cheatham Annex, Williamsburg, Virginia
Additional Former PSLP Concerns Technical Memorandum

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Semivolatile Organic Compounds (UG/KG)																			
2-Nitroaniline	-- - --	1 / 1	290	290	CAA06-SS09-1108	290	--	--	290	NSV	-- / --	NSV	--	-- / --	--	YES	NSV	NSV	NO
Inorganics (MG/KG)																			
Aluminum	-- - --	1 / 1	8,740	8,740	CAA06-SS09-1108	8,740	--	--	8,740	pH < 5.5	0 / 1	--	--	-- / --	--	NO	--	--	NO
Arsenic	-- - --	1 / 1	4.10	4.10	CAA06-SS09-1108	4.10	--	--	4.10	18.0	0 / 1	0.23	--	-- / --	--	NO	--	--	NO
Barium	-- - --	1 / 1	79.9	79.9	CAA06-SS09-1108	79.9	--	--	79.9	330	0 / 1	0.24	--	-- / --	--	NO	--	--	NO
Beryllium	-- - --	1 / 1	0.73	0.73	CAA06-SS09-1108	0.73	--	--	0.73	40.0	0 / 1	0.02	--	-- / --	--	NO	--	--	NO
Cadmium	-- - --	1 / 1	0.12	0.12	CAA06-SS09-1108	0.12	--	--	0.12	32.0	0 / 1	0.004	--	-- / --	--	NO	--	--	NO
Calcium [2]	-- - --	1 / 1	3,740	3,740	CAA06-SS09-1108	3,740	--	--	3,740	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Chromium	-- - --	1 / 1	8.80	8.80	CAA06-SS09-1108	8.80	--	--	8.80	64.0	0 / 1	0.14	--	-- / --	--	NO	--	--	NO
Cobalt	-- - --	1 / 1	3.20	3.20	CAA06-SS09-1108	3.20	--	--	3.20	13.0	0 / 1	0.25	--	-- / --	--	NO	--	--	NO
Iron	-- - --	1 / 1	6,050	6,050	CAA06-SS09-1108	6,050	--	--	6,050	pH < 5 or > 8	0 / 1	--	--	-- / --	--	NO	--	--	NO
Lead	-- - --	1 / 1	30.2	30.2	CAA06-SS09-1108	30.2	--	--	30.2	120	0 / 1	0.25	--	-- / --	--	NO	--	--	NO
Magnesium [2]	-- - --	1 / 1	861	861	CAA06-SS09-1108	861	--	--	861	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Manganese	-- - --	1 / 1	284	284	CAA06-SS09-1108	284	--	--	284	220	1 / 1	1.29	324	0 / 1	0.88	NO	--	--	NO
Mercury	-- - --	1 / 1	0.070	0.070	CAA06-SS09-1108	0.070	--	--	0.070	0.10	0 / 1	0.70	--	-- / --	--	NO	--	--	NO
Nickel	-- - --	1 / 1	6.20	6.20	CAA06-SS09-1108	6.20	--	--	6.20	38.0	0 / 1	0.16	--	-- / --	--	NO	--	--	NO
Potassium [2]	-- - --	1 / 1	521	521	CAA06-SS09-1108	521	--	--	521	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Vanadium	-- - --	1 / 1	17.3	17.3	CAA06-SS09-1108	17.3	--	--	17.3	130	0 / 1	0.13	--	-- / --	--	NO	--	--	NO
Zinc	-- - --	1 / 1	25.0	25.0	CAA06-SS09-1108	25.0	--	--	25.0	120	0 / 1	0.21	--	-- / --	--	NO	--	--	NO
Other Parameters																			
Total organic carbon (MG/KG)	-- - --	1 / 1	52,000	52,000	CAA06-SS09-1108	52,000	--	--	52,000	--	-- / --	--	--	-- / --	--	--	--	--	--
pH	-- - --	1 / 1	6.30	6.30	CAA06-SS09-1108	6.30	--	--	6.30	--	-- / --	--	--	-- / --	--	--	--	--	--

NSV - No Screening Value
1 - Count of detected samples exceeding or equaling Screening Value
2 - Macronutrient - Not considered to be a COPC

TABLE A5-4
Exceedances - Privy Tank Area Surface Soil
Cheatham Annex, Williamsburg, Virginia
Additional Former PSLP Concerns Technical Memorandum

Station ID	**Ecological Soil Screening Value**	**95% UTL**	CAA06-SO09	
Sample ID			CAA06-SS09-1108	CAA06-SS09P-1108
Sample Date			11/06/08	11/06/08
Semivolatile Organic Compounds (UG/KG)				
2-Nitroaniline	--	--	1,200 U	**290 J**
Explosives (UG/KG)				
No Detections	--	--	NA	NA
Inorganics (MG/KG)				
Aluminum	pH < 5.5	12,200	**8,740**	**8,420**
Arsenic	18.0	6.36	**4.1 L**	**3.3 L**
Barium	330	52.9	**79.9 K**	**66.3 K**
Beryllium	40.0	0.587	**0.73**	**0.65**
Cadmium	32.0	1.50	**0.12 J**	**0.09 J**
Chromium	64.0	18.2	**8.8**	**8.2**
Cobalt	13.0	9.93	**3.2 J**	**2.8 J**
Iron	pH < 5 or > 8	19,900	**6,050**	**5,320**
Lead	120	17.4	**30.2**	**26.0**
Manganese	220	324	**284 L**	**243 L**
Mercury	0.10	0.111	**0.06 L**	**0.07 L**
Nickel	38.0	9.52	**6.2**	**5.9**
Vanadium	130	27.9	**17.3**	**15.6**
Zinc	120	26.5	**25.0 K**	**19.9 K**
Other Parameters				
Total organic carbon (MG/KG)	--	--	**52,000**	NA
pH	--	--	**6.3**	NA

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

TABLE A5-5
Ecological Screening Statistics - Privy Tank Area Subsurface Soil
Cheatham Annex, Williamsburg, Virginia
Additional Former PSLP Concerns Technical Memorandum

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Inorganics (MG/KG)																			
Aluminum	-- - --	1 / 1	8,980	8,980	CAA06-SB09-1108	8,980	--	--	8,980	pH < 5.5	0 / 1	--	--	-- / --	--	NO	--	--	NO
Arsenic	-- - --	1 / 1	3.40	3.40	CAA06-SB09-1108	3.40	--	--	3.40	18.0	0 / 1	0.19	--	-- / --	--	NO	--	--	NO
Barium	-- - --	1 / 1	32.8	32.8	CAA06-SB09-1108	32.8	--	--	32.8	330	0 / 1	0.10	--	-- / --	--	NO	--	--	NO
Beryllium	-- - --	1 / 1	0.49	0.49	CAA06-SB09-1108	0.49	--	--	0.49	40.0	0 / 1	0.01	--	-- / --	--	NO	--	--	NO
Calcium [2]	-- - --	1 / 1	540	540	CAA06-SB09-1108	540	--	--	540	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Chromium	-- - --	1 / 1	9.30	9.30	CAA06-SB09-1108	9.30	--	--	9.30	64.0	0 / 1	0.15	--	-- / --	--	NO	--	--	NO
Cobalt	-- - --	1 / 1	2.70	2.70	CAA06-SB09-1108	2.70	--	--	2.70	13.0	0 / 1	0.21	--	-- / --	--	NO	--	--	NO
Iron	-- - --	1 / 1	6,090	6,090	CAA06-SB09-1108	6,090	--	--	6,090	pH < 5 or > 8	0 / 1	--	--	-- / --	--	NO	--	--	NO
Lead	-- - --	1 / 1	30.0	30.0	CAA06-SB09-1108	30.0	--	--	30.0	120	0 / 1	0.25	--	-- / --	--	NO	--	--	NO
Magnesium [2]	-- - --	1 / 1	624	624	CAA06-SB09-1108	624	--	--	624	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Manganese	-- - --	1 / 1	104	104	CAA06-SB09-1108	104	--	--	104	220	0 / 1	0.47	--	-- / --	--	NO	--	--	NO
Nickel	-- - --	1 / 1	5.00	5.00	CAA06-SB09-1108	5.00	--	--	5.00	38.0	0 / 1	0.13	--	-- / --	--	NO	--	--	NO
Potassium [2]	-- - --	1 / 1	410	410	CAA06-SB09-1108	410	--	--	410	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Selenium	-- - --	1 / 1	0.33	0.33	CAA06-SB09-1108	0.33	--	--	0.33	0.52	0 / 1	0.63	--	-- / --	--	NO	--	--	NO
Vanadium	-- - --	1 / 1	15.9	15.9	CAA06-SB09-1108	15.9	--	--	15.9	130	0 / 1	0.12	--	-- / --	--	NO	--	--	NO
Zinc	-- - --	1 / 1	14.0	14.0	CAA06-SB09-1108	14.0	--	--	14.0	120	0 / 1	0.12	--	-- / --	--	NO	--	--	NO
Other Parameters																			
Total organic carbon (MG/KG)	-- - --	1 / 1	16,000	16,000	CAA06-SB09-1108	16,000	--	--	16,000	--	-- / --	--	--	-- / --	--	--	--	--	--
pH	-- - --	1 / 1	6.00	6.00	CAA06-SB09-1108	6.00	--	--	6.00	--	-- / --	--	--	-- / --	--	--	--	--	--

NSV - No Screening Value
1 - Count of detected samples exceeding or equaling Screening Value
2 - Macronutrient - Not considered to be a COPC

TABLE A5-6
Exceedances - Privy Tank Area Subsurface Soil
Cheatham Annex, Williamsburg, Virginia
Additional Former PSLP Concerns Technical Memorandum

Station ID	**Ecological Soil Screening Value**	**95% UTL**	CAA06-SO09	
Sample ID			CAA06-SB09-1108	CAA06-SB09P-1108
Sample Date			11/06/08	11/06/08
Semivolatile Organic Compounds (UG/KG)				
No Detections	--	--	NA	NA
Explosives (UG/KG)				
No Detections	--	--	NA	NA
Inorganics (MG/KG)				
Aluminum	pH < 5.5	13,000	**8,540**	**8,980**
Arsenic	18.0	5.54	**3.3 L**	**3.4 L**
Barium	330	84.5	**32.6 K**	**32.8 K**
Beryllium	40.0	0.52	**0.48**	**0.49**
Chromium	64.0	33.7	**9.2**	**9.3**
Cobalt	13.0	5.18	**2.6 J**	**2.7 J**
Iron	pH < 5 or > 8	32,000	**5,870**	**6,090**
Lead	120	8.79	**30.0**	**29.0**
Manganese	220	176	**104 L**	**99.3 L**
Nickel	38.0	17.6	**4.8**	**5.0**
Selenium	0.52	0.64	**0.33 J**	2.5 U
Vanadium	130	48.3	**15.2**	**15.9**
Zinc	120	28.0	**14.0 K**	**14.0 K**
Other Parameters				
Total organic carbon (MG/KG)	--	--	**16,000**	NA
pH	--	--	**6.0**	NA

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

TABLE A5-7
Ecological Screening Statistics - Privy Tank Area Groundwater
Cheatham Annex, Williamsburg, Virginia
Additional Former PSLP Concerns Technical Memorandum

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?	Refined COPC with DF of 10?
Inorganics (UG/L)																				
Aluminum	-- - --	1 / 1	74,900	74,900	CAA06-DW05-1108	74,900	--	--	74,900	87.0	1 / 1	861	2,230	1 / 1	33.6	(NO)	--	861	(NO)	(NO)
Arsenic	-- - --	1 / 1	123	123	CAA06-DW05-1108	123	--	--	123	150	0 / 1	0.82	--	-- / --	--	NO	--	--	NO	NO
Barium	-- - --	1 / 1	151	151	CAA06-DW05-1108	151	--	--	151	4.00	1 / 1	37.8	118	1 / 1	1.28	(NO)	--	37.8	(NO)	(NO)
Beryllium	-- - --	1 / 1	5.60	5.60	CAA06-DW05-1108	5.60	--	--	5.60	0.66	1 / 1	8.48	2.45	1 / 1	2.29	(NO)	--	8.48	(NO)	NO
Cadmium	-- - --	1 / 1	10.8	10.8	CAA06-DW05-1108	10.8	--	--	10.8	0.27	1 / 1	39.9	0.605	1 / 1	17.9	(NO)	--	39.9	(NO)	(NO)
Calcium [2]	-- - --	1 / 1	30,100	30,100	CAA06-DW05-1108	30,100	--	--	30,100	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Chromium	-- - --	1 / 1	198	198	CAA06-DW05-1108	198	--	--	198	11.4	1 / 1	17.4	15.1	1 / 1	13.1	(NO)	--	17.4	(NO)	(NO)
Cobalt	-- - --	1 / 1	43.1	43.1	CAA06-DW05-1108	43.1	--	--	43.1	23.0	1 / 1	1.87	20.6	1 / 1	2.09	(NO)	--	1.87	(NO)	NO
Copper	-- - --	1 / 1	62.9	62.9	CAA06-DW05-1108	62.9	--	--	62.9	9.33	1 / 1	6.74	12.2	1 / 1	5.16	(NO)	--	6.74	(NO)	NO
Iron	-- - --	1 / 1	202,000	202,000	CAA06-DW05-1108	202,000	--	--	202,000	1,000	1 / 1	202	894	1 / 1	226	(NO)	--	202	(NO)	(NO)
Lead	-- - --	1 / 1	93.9	93.9	CAA06-DW05-1108	93.9	--	--	93.9	3.18	1 / 1	29.5	21.3	1 / 1	4.41	(NO)	--	29.5	(NO)	(NO)
Magnesium [2]	-- - --	1 / 1	8,580	8,580	CAA06-DW05-1108	8,580	--	--	8,580	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Manganese	-- - --	1 / 1	573	573	CAA06-DW05-1108	573	--	--	573	120	1 / 1	4.78	57.9	1 / 1	9.90	(NO)	--	4.78	(NO)	NO
Mercury	-- - --	1 / 1	0.070	0.070	CAA06-DW05-1108	0.070	--	--	0.070	0.91	0 / 1	0.08	--	-- / --	--	NO	--	--	NO	NO
Nickel	-- - --	1 / 1	91.6	91.6	CAA06-DW05-1108	91.6	--	--	91.6	52.2	1 / 1	1.76	11.4	1 / 1	8.04	(NO)	--	1.76	(NO)	NO
Potassium [2]	-- - --	1 / 1	8,490	8,490	CAA06-DW05-1108	8,490	--	--	8,490	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Silver	-- - --	1 / 1	3.00	3.00	CAA06-DW05-1108	3.00	--	--	3.00	0.36	1 / 1	8.33	--	-- / --	--	(NO)	--	8.33	(NO)	NO
Sodium [2]	-- - --	1 / 1	10,800	10,800	CAA06-DW05-1108	10,800	--	--	10,800	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Vanadium	-- - --	1 / 1	184	184	CAA06-DW05-1108	184	--	--	184	20.0	1 / 1	9.20	26.2	1 / 1	7.02	(NO)	--	9.20	(NO)	NO
Zinc	-- - --	1 / 1	376	376	CAA06-DW05-1108	376	--	--	376	120	1 / 1	3.14	4.52	1 / 1	83.2	(NO)	--	3.14	(NO)	NO
Dissolved Metals (UG/L)																				
Aluminum	-- - --	1 / 1	3,540	3,540	CAA06-DW05-1108	3,540	--	--	3,540	87.0	1 / 1	40.7	100	1 / 1	35.4	YES	--	40.7	YES	YES
Arsenic	-- - --	1 / 1	43.3	43.3	CAA06-DW05-1108	43.3	--	--	43.3	150	0 / 1	0.29	--	-- / --	--	NO	--	--	NO	NO
Barium	-- - --	1 / 1	20.5	20.5	CAA06-DW05-1108	20.5	--	--	20.5	4.00	1 / 1	5.13	127	0 / 1	0.16	NO	--	--	NO	NO
Beryllium	-- - --	1 / 1	0.28	0.28	CAA06-DW05-1108	0.28	--	--	0.28	0.66	0 / 1	0.42	--	-- / --	--	NO	--	--	NO	NO
Calcium [2]	-- - --	1 / 1	29,400	29,400	CAA06-DW05-1108	29,400	--	--	29,400	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Chromium	-- - --	1 / 1	8.80	8.80	CAA06-DW05-1108	8.80	--	--	8.80	11.0	0 / 1	0.80	--	-- / --	--	NO	--	--	NO	NO
Cobalt	-- - --	1 / 1	7.00	7.00	CAA06-DW05-1108	7.00	--	--	7.00	23.0	0 / 1	0.30	--	-- / --	--	NO	--	--	NO	NO
Copper	-- - --	1 / 1	8.50	8.50	CAA06-DW05-1108	8.50	--	--	8.50	8.96	0 / 1	0.95	--	-- / --	--	NO	--	--	NO	NO
Iron	-- - --	1 / 1	50,100	50,100	CAA06-DW05-1108	50,100	--	--	50,100	1,000	1 / 1	50.1	275	1 / 1	182	YES	--	50.1	YES	YES
Lead	-- - --	1 / 1	4.70	4.70	CAA06-DW05-1108	4.70	--	--	4.70	2.52	1 / 1	1.87	1.70	1 / 1	2.76	YES	--	1.87	YES	NO
Magnesium [2]	-- - --	1 / 1	3,020	3,020	CAA06-DW05-1108	3,020	--	--	3,020	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Manganese	-- - --	1 / 1	391	391	CAA06-DW05-1108	391	--	--	391	120	1 / 1	3.26	49.5	1 / 1	7.90	YES	--	3.26	YES	NO
Nickel	-- - --	1 / 1	7.70	7.70	CAA06-DW05-1108	7.70	--	--	7.70	52.0	0 / 1	0.15	--	-- / --	--	NO	--	--	NO	NO
Potassium [2]	-- - --	1 / 1	2,240	2,240	CAA06-DW05-1108	2,240	--	--	2,240	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Silver	-- - --	1 / 1	1.00	1.00	CAA06-DW05-1108	1.00	--	--	1.00	0.36	1 / 1	2.78	--	-- / --	--	YES	--	2.78	YES	NO
Sodium [2]	-- - --	1 / 1	11,800	11,800	CAA06-DW05-1108	11,800	--	--	11,800	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Vanadium	-- - --	1 / 1	8.20	8.20	CAA06-DW05-1108	8.20	--	--	8.20	20.0	0 / 1	0.41	--	-- / --	--	NO	--	--	NO	NO
Zinc	-- - --	1 / 1	24.3	24.3	CAA06-DW05-1108	24.3	--	--	24.3	118	0 / 1	0.21	--	-- / --	--	NO	--	--	NO	NO

NSV - No Screening Value
1 - Count of detected samples exceeding or equaling Screening Value
2 - Macronutrient - Not considered to be a COPC

TABLE A5-8
Exceedances - Privy Tank Area Groundwater
Cheatham Annex, Williamsburg, Virginia
Additional Former PSLP Concerns Technical Memorandum

Station ID	**Eco Surface Water Screening Value - Fresh**	**95% UTL Yorktown-Eastover**	CAA06-DW05
Sample ID			CAA06-DW05-1108
Sample Date			11/10/08
Semivolatile Organic Compounds (UG/L)			
No Detections	--	--	NA
Explosives (UG/L)			
No Detections	--	--	NA
Inorganics (UG/L)			
Aluminum	87.0	2,230	**74,900**
Arsenic	150	2.28	**123**
Barium	4.00	118	**151 J**
Beryllium	0.66	2.45	**5.6**
Cadmium	0.271	0.605	**10.8**
Chromium	11.4	15.1	**198**
Cobalt	23.0	20.6	**43.1 J**
Copper	9.33	12.2	**62.9**
Iron	1,000	894	**202,000**
Lead	3.18	21.3	**93.9**
Manganese	120	57.9	**573**
Mercury	0.91	0.081	**0.07 J**
Nickel	52.2	11.4	**91.6**
Silver	0.36	--	**3.0 J**
Vanadium	20.0	26.2	**184**
Zinc	120	4.52	**376**
Dissolved Metals (UG/L)			
Aluminum	87.0	100	**3,540**
Arsenic	150	1.37	**43.3**
Barium	4.00	127	**20.5 J**
Beryllium	0.66	--	**0.28 J**
Chromium	11.0	6.04	**8.8 J**
Cobalt	23.0	0.70	**7.0 J**
Copper	8.96	3.00	**8.5 J**
Iron	1,000	275	**50,100**
Lead	2.52	1.70	**4.7 J**
Manganese	120	49.5	**391**
Nickel	52.0	12.2	**7.7 J**
Silver	0.36	--	**1.0 J**
Vanadium	20.0	4.3	**8.2 J**
Zinc	118	--	**24.3 J**

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

Attachment 6

Privy Tank Area Laboratory Analytical Results and Boring Log

Full Analytical Results

Attachment 6
Privy Tank Area Surface Soil Laboratory Analytical Results
Additional PSLP Concerns Technical Memorandum
Cheatham Annex, Williamsburg, Virginia

Station ID	CAA06-SO09	
Sample ID	CAA06-SS09-1108	CAA06-SS09P-1108
Sample Date	11/06/08	11/06/08
Chemical Name		
Semivolatile Organic Compounds (UG/KG)		
1,1-Biphenyl	480 U	410 U
2,2'-Oxybis(1-chloropropane)	480 U	410 U
2,4,5-Trichlorophenol	1,200 U	1,000 U
2,4,6-Trichlorophenol	480 U	410 U
2,4-Dichlorophenol	480 U	410 U
2,4-Dimethylphenol	480 U	410 U
2,4-Dinitrophenol	1,200 U	1,000 U
2,4-Dinitrotoluene	100 U	100 U
2,6-Dinitrotoluene	100 U	100 U
2-Chloronaphthalene	480 U	410 U
2-Chlorophenol	480 U	410 U
2-Methylnaphthalene	480 U	410 U
2-Methylphenol	480 U	410 U
2-Nitroaniline	1,200 U	290 J
2-Nitrophenol	480 U	410 U
3,3'-Dichlorobenzidine	480 U	410 U
3-Nitroaniline	1,200 U	1,000 U
4,6-Dinitro-2-methylphenol	1,200 U	1,000 U
4-Bromophenyl-phenylether	480 U	410 U
4-Chloro-3-methylphenol	480 U	410 U
4-Chloroaniline	480 U	410 U
4-Chlorophenyl-phenylether	480 U	410 U
4-Methylphenol	480 U	410 U
4-Nitroaniline	1,200 U	1,000 U
4-Nitrophenol	1,200 R	1,000 R
Acenaphthene	480 U	410 U
Acenaphthylene	480 U	410 U
Acetophenone	480 U	410 U
Anthracene	480 U	410 U
Atrazine	480 U	410 U
Benzaldehyde	480 U	410 U
Benzo(a)anthracene	480 U	410 U
Benzo(a)pyrene	480 U	410 U
Benzo(b)fluoranthene	480 U	410 U
Benzo(g,h,i)perylene	480 U	410 U
Benzo(k)fluoranthene	480 U	410 U
bis(2-Chloroethoxy)methane	480 U	410 U
bis(2-Chloroethyl)ether	480 U	410 U
bis(2-Ethylhexyl)phthalate	480 U	410 U
Butylbenzylphthalate	480 U	410 U
Caprolactam	480 U	410 U
Carbazole	480 U	410 U
Chrysene	480 U	410 U
Dibenz(a,h)anthracene	480 U	410 U
Dibenzofuran	480 U	410 U
Diethylphthalate	480 U	410 U
Dimethyl phthalate	480 U	410 U
Di-n-butylphthalate	480 U	410 U
Di-n-octylphthalate	480 U	410 U
Fluoranthene	480 U	410 U
Fluorene	480 U	410 U
Hexachlorobenzene	480 U	410 U
Hexachlorobutadiene	480 U	410 U
Hexachlorocyclopentadiene	480 U	410 U
Hexachloroethane	480 U	410 U
Indeno(1,2,3-cd)pyrene	480 U	410 U
Isophorone	480 U	410 U
Naphthalene	480 U	410 U
n-Nitroso-di-n-propylamine	480 U	410 U
n-Nitrosodiphenylamine	480 U	410 U
Nitrobenzene	100 U	100 U
Pentachlorophenol	1,200 U	1,000 U
Phenanthrene	480 U	410 U
Phenol	480 U	410 U
Pyrene	480 U	410 U
Explosives (UG/KG)		
1,3,5-Trinitrobenzene	100 U	100 U
1,3-Dinitrobenzene	100 U	100 U
2,4,6-Trinitrotoluene	100 U	100 U
2-Amino-4,6-dinitrotoluene	100 U	100 U
2-Nitrotoluene	200 U	200 U
3,5-Dinitroaniline	100 UJ	100 UJ
3-Nitrotoluene	200 U	200 U
4-Amino-2,6-dinitrotoluene	100 U	100 U
4-Nitrotoluene	200 U	200 U
HMX	200 U	200 U
Nitroglycerin	5,000 U	5,000 U
Nitroguanidine	130 U	120 U
PETN	500 U	500 U
RDX	200 U	200 U
Tetryl	200 U	200 U
Total Metals (MG/KG)		
Aluminum	8,740	8,420
Antimony	6.4 UL	7 UL
Arsenic	4.1 L	3.3 L
Barium	79.9 K	66.3 K
Beryllium	0.73	0.65
Cadmium	0.12 J	0.09 J

Attachment 6
Privy Tank Area Surface Soil Laboratory Analytical Results
Additional PSLP Concerns Technical Memorandum
Cheatham Annex, Williamsburg, Virginia

Station ID	CAA06-SO09	
Sample ID	CAA06-SS09-1108	CAA06-SS09P-1108
Sample Date	11/06/08	11/06/08
Chemical Name		
Calcium	3,740	2,790
Chromium	8.8	8.2
Cobalt	3.2 J	2.8 J
Copper	4.6 B	4.7 B
Cyanide	0.7 U	0.55 U
Iron	6,050	5,320
Lead	30.2	26
Magnesium	861	772
Manganese	284 L	243 L
Mercury	0.06 L	0.07 L
Nickel	6.2	5.9
Potassium	521 J	477 J
Selenium	3.7 U	4.1 U
Silver	1.1 U	1.2 U
Sodium	31.4 B	29.2 B
Thallium	2.7 U	2.9 U
Vanadium	17.3	15.6
Zinc	25 K	19.9 K
Wet Chemistry		
% Solids (pct)	69	81
Carbon (ug/g)	52,000	NA
pH (ph)	6.3	NA
Total organic carbon (TOC) (ug/g)	NA	NA

Notes:

B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
NA - Not analyzed
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram

Attachment 6
Privy Tank Area Subsurface Soil Laboratory Analytical Results
Additional PSLP Concerns Technical Memorandum
Cheatham Annex,Williamsburg, Virginia

Station ID	CAA06-SO09	
Sample ID	CAA06-SB09-1108	CAA06-SB09P-1108
Sample Date	11/06/08	11/06/08
Chemical Name		
Semivolatile Organic Compounds (UG/KG)		
1,1-Biphenyl	360 U	360 U
2,2'-Oxybis(1-chloropropane)	360 U	360 U
2,4,5-Trichlorophenol	920 U	920 U
2,4,6-Trichlorophenol	360 U	360 U
2,4-Dichlorophenol	360 U	360 U
2,4-Dimethylphenol	360 U	360 U
2,4-Dinitrophenol	920 U	920 U
2,4-Dinitrotoluene	100 U	100 U
2,6-Dinitrotoluene	100 U	100 U
2-Chloronaphthalene	360 U	360 U
2-Chlorophenol	360 U	360 U
2-Methylnaphthalene	360 U	360 U
2-Methylphenol	360 U	360 U
2-Nitroaniline	920 U	920 U
2-Nitrophenol	360 U	360 U
3,3'-Dichlorobenzidine	360 U	360 U
3-Nitroaniline	920 U	920 U
4,6-Dinitro-2-methylphenol	920 U	920 U
4-Bromophenyl-phenylether	360 U	360 U
4-Chloro-3-methylphenol	360 U	360 U
4-Chloroaniline	360 U	360 U
4-Chlorophenyl-phenylether	360 U	360 U
4-Methylphenol	360 U	360 U
4-Nitroaniline	920 U	920 U
4-Nitrophenol	920 R	920 R
Acenaphthene	360 U	360 U
Acenaphthylene	360 U	360 U
Acetophenone	360 U	360 U
Anthracene	360 U	360 U
Atrazine	360 U	360 U
Benzaldehyde	360 U	360 U
Benzo(a)anthracene	360 U	360 U
Benzo(a)pyrene	360 U	360 U
Benzo(b)fluoranthene	360 U	360 U
Benzo(g,h,i)perylene	360 U	360 U
Benzo(k)fluoranthene	360 U	360 U
bis(2-Chloroethoxy)methane	360 U	360 U
bis(2-Chloroethyl)ether	360 U	360 U
bis(2-Ethylhexyl)phthalate	360 U	360 U
Butylbenzylphthalate	360 U	360 U
Caprolactam	360 U	360 U
Carbazole	360 U	360 U
Chrysene	360 U	360 U
Dibenz(a,h)anthracene	360 U	360 U
Dibenzofuran	360 U	360 U
Diethylphthalate	360 U	360 U
Dimethyl phthalate	360 U	360 U
Di-n-butylphthalate	360 U	360 U
Di-n-octylphthalate	360 U	360 U
Fluoranthene	360 U	360 U
Fluorene	360 U	360 U
Hexachlorobenzene	360 U	360 U
Hexachlorobutadiene	360 U	360 U
Hexachlorocyclopentadiene	360 U	360 U
Hexachloroethane	360 U	360 U
Indeno(1,2,3-cd)pyrene	360 U	360 U
Isophorone	360 U	360 U
Naphthalene	360 U	360 U
n-Nitroso-di-n-propylamine	360 U	360 U
n-Nitrosodiphenylamine	360 U	360 U
Nitrobenzene	100 U	100 U
Pentachlorophenol	920 U	920 U
Phenanthrene	360 U	360 U
Phenol	360 U	360 U
Pyrene	360 U	360 U
Explosives (UG/KG)		
1,3,5-Trinitrobenzene	100 U	100 U
1,3-Dinitrobenzene	100 U	100 U
2,4,6-Trinitrotoluene	100 U	100 U
2-Amino-4,6-dinitrotoluene	100 U	100 U
2-Nitrotoluene	200 U	200 U
3,5-Dinitroaniline	100 UJ	100 UJ
3-Nitrotoluene	200 U	200 U
4-Amino-2,6-dinitrotoluene	100 U	100 U
4-Nitrotoluene	200 U	200 U
HMX	200 U	200 U
Nitroglycerin	5,000 U	5,000 U
Nitroguanidine	130 U	130 U
PETN	500 U	500 U
RDX	200 U	200 U
Tetryl	200 U	200 U
Total Metals (MG/KG)		
Aluminum	8,540	8,980
Antimony	4.9 UL	4.3 UL
Arsenic	3.3 L	3.4 L
Barium	32.6 K	32.8 K
Beryllium	0.48	0.49
Cadmium	0.02 B	0.02 B

Attachment 6
Privy Tank Area Subsurface Soil Laboratory Analytical Results
Additional PSLP Concerns Technical Memorandum
Cheatham Annex,Williamsburg, Virginia

Station ID	CAA06-SO09	
Sample ID	CAA06-SB09-1108	CAA06-SB09P-1108
Sample Date	11/06/08	11/06/08
Chemical Name		
Calcium	540	440
Chromium	9.2	9.3
Cobalt	2.6 J	2.7 J
Copper	3 B	3.1 B
Cyanide	0.55 U	0.55 U
Iron	5,870	6,090
Lead	30	29
Magnesium	600	624
Manganese	104 L	99.3 L
Mercury	0.11 UL	0.11 UL
Nickel	4.8	5
Potassium	381 J	410 J
Selenium	0.33 J	2.5 U
Silver	0.81 U	0.71 U
Sodium	22.1 B	23.6 B
Thallium	2 U	1.8 U
Vanadium	15.2	15.9
Zinc	14 K	14 K
Wet Chemistry		
% Solids (pct)	90	90
Carbon (ug/g)	16,000	NA
pH (ph)	6	NA
Total organic carbon (TOC) (ug/g)	NA	NA

Notes:

B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
NA - Not analyzed
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram

Attachment 6
Privy Tank Area Groundwater Laboratory Analytical Results
Additional PSLP Concerns Technical Memorandum
Cheatham Annex, Williamsburg, Virginia

Station ID	CAA06-DW05
Sample ID	CAA06-DW05-1108
Sample Date	11/10/08
Chemical Name	
Semivolatile Organic Compounds (UG/L)	
1,1-Biphenyl	9 U
2,2'-Oxybis(1-chloropropane)	9 U
2,4,5-Trichlorophenol	24 U
2,4,6-Trichlorophenol	9 U
2,4-Dichlorophenol	9 U
2,4-Dimethylphenol	9 U
2,4-Dinitrophenol	24 U
2,4-Dinitrotoluene	0.2 U
2,6-Dinitrotoluene	0.2 U
2-Chloronaphthalene	9 U
2-Chlorophenol	9 U
2-Methylnaphthalene	9 U
2-Methylphenol	9 U
2-Nitroaniline	24 U
2-Nitrophenol	9 U
3,3'-Dichlorobenzidine	9 U
3-Nitroaniline	24 U
4,6-Dinitro-2-methylphenol	24 U
4-Bromophenyl-phenylether	9 U
4-Chloro-3-methylphenol	9 U
4-Chloroaniline	9 U
4-Chlorophenyl-phenylether	9 U
4-Methylphenol	9 U
4-Nitroaniline	24 U
4-Nitrophenol	24 U
Acenaphthene	9 U
Acenaphthylene	9 U
Acetophenone	9 U
Anthracene	9 U
Atrazine	9 U
Benzaldehyde	9 U
Benzo(a)anthracene	9 U
Benzo(a)pyrene	9 U
Benzo(b)fluoranthene	9 U
Benzo(g,h,i)perylene	9 U
Benzo(k)fluoranthene	9 U
bis(2-Chloroethoxy)methane	9 U
bis(2-Chloroethyl)ether	9 U
bis(2-Ethylhexyl)phthalate	9 U
Butylbenzylphthalate	9 U
Caprolactam	9 U
Carbazole	9 U
Chrysene	9 U
Dibenz(a,h)anthracene	9 U
Dibenzofuran	9 U
Diethylphthalate	9 U
Dimethyl phthalate	9 U
Di-n-butylphthalate	9 U
Di-n-octylphthalate	9 U
Fluoranthene	9 U
Fluorene	9 U
Hexachlorobenzene	9 U
Hexachlorobutadiene	9 U
Hexachlorocyclopentadiene	9 U
Hexachloroethane	9 U
Indeno(1,2,3-cd)pyrene	9 U
Isophorone	9 U
Naphthalene	9 U
n-Nitroso-di-n-propylamine	9 U
n-Nitrosodiphenylamine	9 U
Nitrobenzene	0.2 U
Pentachlorophenol	24 U
Phenanthrene	9 U
Phenol	9 U
Pyrene	9 U
Explosives (UG/L)	
1,3,5-Trinitrobenzene	0.2 U
1,3-Dinitrobenzene	0.2 U
2,4,6-Trinitrotoluene	0.2 U
2-Amino-4,6-dinitrotoluene	0.2 U
2-Nitrotoluene	0.4 U
3,5-Dinitroaniline	0.2 U
3-Nitrotoluene	0.4 U
4-Amino-2,6-dinitrotoluene	0.2 U
4-Nitrotoluene	0.4 U
HMX	0.4 U
Nitroglycerin	1,000 U
Nitroguanidine	10 U
PETN	1 U
RDX	0.4 U
Tetryl	0.4 U
Total Metals (UG/L)	
Aluminum	74,900
Antimony	60 U
Arsenic	123
Barium	151 J
Beryllium	5.6

Attachment 6
Privy Tank Area Groundwater Laboratory Analytical Results
Additional PSLP Concerns Technical Memorandum
Cheatham Annex, Williamsburg, Virginia

Station ID	CAA06-DW05
Sample ID	CAA06-DW05-1108
Sample Date	11/10/08
Chemical Name	
Cadmium	10.8
Calcium	30,100
Chromium	198
Cobalt	43.1 J
Copper	62.9
Cyanide	10 U
Iron	202,000
Lead	93.9
Magnesium	8,580
Manganese	573
Mercury	0.07 J
Nickel	91.6
Potassium	8,490
Selenium	35 U
Silver	3 J
Sodium	10,800
Thallium	25 U
Vanadium	184
Zinc	376
Dissolved Metals (UG/L)	
Aluminum, Dissolved	3,540
Antimony, Dissolved	60 U
Arsenic, Dissolved	43.3
Barium, Dissolved	20.5 J
Beryllium, Dissolved	0.28 J
Cadmium, Dissolved	0.35 B
Calcium, Dissolved	29,400
Chromium, Dissolved	8.8 J
Cobalt, Dissolved	7 J
Copper, Dissolved	8.5 J
Iron, Dissolved	50,100
Lead, Dissolved	4.7 J
Magnesium, Dissolved	3,020 J
Manganese, Dissolved	391
Mercury, Dissolved	0.2 UL
Nickel, Dissolved	7.7 J
Potassium, Dissolved	2,240 J
Selenium, Dissolved	35 U
Silver, Dissolved	1 J
Sodium, Dissolved	11,800
Thallium, Dissolved	25 U
Vanadium, Dissolved	8.2 J
Zinc, Dissolved	24.3 J

Notes:

B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
L - Analyte present, value may be biased low, actual value may be higher
NA - Not analyzed
R - Unreliable Result
U - The material was analyzed for, but not detected
UL - Analyte not detected, quantitation limit is probably higher
UG/L - Micrograms per liter

Boring Log

CH2MHILL	PROJECT NUMBER	BORING NUMBER	
	358846.SI.SI	CAA06-DW05	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI — LOCATION Cheatham Annex

ELEVATION : — DRILLING CONTRACTOR : American Environmental Drilling

DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves

WATER LEVELS : — START : 11/10/08 — END : 11/10/08 — LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
					0'-3"- Topsoil w/ wood, root & leaf organics, sandy SILT (OL), mois 2.5Y 3/2 v. dark grayish brown	
5	1-5'	60"	1		**3"-1.5'-** sandy SILT (ML), loose, dry, poorly graded, 2.5Y 6/4 lt. yellowish brown	
					1.5'-7'- sandy SILT (ML), stiff to med. stiff, dry to moist, poorly grad 2.5Y 6/8 olive yellow	
W.T. @ ~10' 10	5'-10'	60"	2		**7'-10'-** silty CLAY (CL), moist, stiff, 2.5Y 7/1 lt. gray to 2.5Y 6/6 olive yellow	
					10'-13'- SAND (SW), wet, fine to med. grained, loose, well graded, 2.5Y 6/6 olive yellow, coarsens downward	
					13'-15'- silty CLAY (CL), stiff, wet, 2.5Y 7/1 lt. gray w/ iron mottling	
15	10'-15'	60"	3		**End macrocore sampling @ 15'**	
20	15'-20'		4			
25	20'-25'		5			
30	25'-30'		6			
35	30'-35'		7			
40	35'-40'		8			
45	40'-45'		9			
50	45'-50'		10			
55	50'-55'		11			

Attachment 7

Ground Depression Laboratory Analytical Results and Boring Log

Full Analytical Results

Attachment 7
Ground Depression Groundwater Laboratory Analytical Results
Additional PSLP Concerns Technical Memorandum
Cheatham Annex, Williamsburg, Virginia

Sample ID	CABC-GWDPT-011111
Sample Date	1/11/11
Chemical Name	
Explosives (UG/L)	
1,3,5-Trinitrobenzene	0.16 U
1,3-Dinitrobenzene	0.16 U
2,4,6-Trinitrotoluene	0.16 U
2,4-Dinitrotoluene	0.16 U
2,6-Dinitrotoluene	0.16 U
2-Amino-4,6-dinitrotoluene	0.16 U
2-Nitrotoluene	0.16 U
3-Nitrotoluene	0.16 U
4-Amino-2,6-dinitrotoluene	0.16 U
4-Nitrotoluene	0.16 U
HMX	0.16 U
Nitrobenzene	0.16 U
Nitroglycerin	0.4 U
Perchlorate	0.21 J
PETN	0.4 U
RDX	0.16 U
Tetryl	0.16 U
Total Metals (UG/L)	
Aluminum	161 D
Antimony	2 UX
Arsenic	1.12 J
Barium	32.7
Beryllium	0.5 U
Cadmium	0.417 J
Calcium	170,000 D
Chromium	1.09 J
Cobalt	2.5 U
Copper	2 U
Iron	661
Lead	1.5 U
Magnesium	1,940
Manganese	20.9
Mercury	0.2 U
Nickel	2.67
Potassium	705 J
Selenium	1.25 U
Silver	0.5 U
Sodium	6,880
Thallium	1 U
Vanadium	1.66 J
Zinc	5 U
Dissolved Metals (UG/L)	
Aluminum	61 J, D
Antimony	2 UX
Arsenic	1.08 J
Barium	31.2
Beryllium	0.5 U
Cadmium	0.378 J
Calcium	168,000 D
Chromium	1 U
Cobalt	2.5 U
Copper	2 U
Iron	494
Lead	1.5 U
Magnesium	1,930
Manganese	27
Mercury	0.2 U
Nickel	2.99
Potassium	682 J
Selenium	1.25 U
Silver	0.5 U
Sodium	6,900
Thallium	1 U
Vanadium	2.5 U
Zinc	5 U

Notes:

D - Compound identified in an analysis at a secondary dilution factor.
J - Analyte present. Value may or may not be accurate or precise
J, D - See 'J' and 'D'
U - The material was analyzed for, but not detected
UX - The material was analyzed for, but not detected; parameter shows a potential positive bias on a reported concentration dueto an ICV or CCV exceeding the upper control limit on the high side.
UG/L - Micrograms per liter
Results not validated

Boring Log

PROJECT NUMBER: 379183.SI.SI	BORING NUMBER: CABC-GWDPT-011111	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Cheatham Annex (CAX) Site 07 Site Inspection, Williamsburg, VA LOCATION :

GROUND ELEVATION : DRILLING CONTRACTOR : Parratt-Wolff Inc.\K. White

DRILLING METHOD AND EQUIPMENT : Track mounted CME-55, 4.25-inch I.D. hollow stem augers, 4ft macro core sampler, 4ft acetate liners

WATER LEVELS : 12.5 ft below ground surface START : 1/11/2011 END : 1/11/2011 LOGGER : T. Stewart

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (in)	SAMPLE ID (TIME)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
				ORGANIC SILT (OH) 0.0-0.2' - 7.5YR 4/2, brown, moist, (soft)		
				CLAYEY SAND (SC) 0.2-5.0' - 7.5YR 5/6, Strong brown, moist, (medium stiff), fine to medium grained, medium to high plasticity, 5-15% light greenish gray fine to medium grains, trace roots 3.0-4.0' - 20-30% fine to medium black grains, trace black wood/organics 3.5' - 20% reddish brown mottling		
5	5.0					
				SILTY SAND (SM) 5.0-16.0' - 2.5Y 6/4, Yellowish brown, moist, (very loose to loose), fine to medium grained, 40% shell fragments (fine to coarse shell gravel)		
				8.0-12.0' - layered black and white shell lenses		
10						
				12.5' - wet		
15						
	16.0					
				Bottom of Boring at 16.0 ft below ground surface		

Attachment 8

Booster Test Pit Geophysical Survey Report

NAeVA GEOPHYSICS INC.

THE LEADER IN SUBSURFACE DETECTION

Subsurface Geophysical Surveys

GPR
MAGNETICS
ELECTROMAGNETICS
SEISMICS
RESISTIVITY
UTILITY LOCATION
UXO DETECTION
BOREHOLE CAMERA
STAFF SUPPORT

GEOPHYSICAL INVESTIGATION REPORT

Naval Weapons Station Yorktown, Cheatham Annex
Williamsburg, Virginia

Task Order CTO-0054

Date of Investigation:

April 1, 2010

Final Submittal
June 8, 2010

PREPARED FOR

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APPENDIX & CD

Appendix A: QC Test Results
Contents of CD: Project deliverables

ACRONYMS AND ABBREVIATIONS

AHA	Activity Hazard Analysis
ASCII	American Standard Code for Information Interchange
CD	Compact Disc
DGM	Digital Geophysical Mapping
FTP	File Transfer Protocol
GPS	Global Positioning Satellites
HAZWOPER	Hazardous Waste Operations and Emergency Response Standard
ISO	Industry Standard Object
MEC	Munitions and Explosives of Concern
mV	Millivolts
NAD83	North American Datum of 1983
NMEA	National Marine Electronics Association
NRL	Naval Research Laboratory
OSHA	Occupational Safety and Health Administration
QA	Quality Assurance
QC	Quality Control
SBAS	Satellite-Based Augmentation System
SOPs	Standard Operating Procedures
SOW	Scope of Work
TNT	Trinitrotoluene
UTM	Universal Transverse Mercator

1.0 INTRODUCTION

1.1 BACKGROUND AND OBJECTIVES

NAEVA Geophysics was contracted to perform one day of meandering path digital geophysical mapping (DGM) using an EM61-MK2 with sub-meter Global Positioning System (GPS) for positioning at Naval Weapons Station Yorktown, Cheatham Annex (CAX), Williamsburg, Virginia. The primary objective of the investigation was to identify metallic piping (if present) leading away from structures at four different locations (see **Figure 1**), the former Booster Test Pit building (previously referred to as the "fuze pit"), and three Area of Concern (AOC) 6 subareas (the Ammonia Settling Pits and the collocated Trinitrotoluene (TNT) Graining House Sump and TNT Catch Box Ruins). A CH2M HILL representative directed NAEVA as to which areas should be surveyed.

1.2 SCOPE OF WORK

NAEVA Geophysics provided personnel and geophysical survey equipment for the purpose of performing geophysical surveys at the aforementioned locations. Vegetation removal was not conducted prior to NAEVA's arrival at the site. However, limited vegetation clearance was performed by the CH2M HILL representative in advance of the data collector to limit brush catching on the operator and the equipment. Data was then collected in areas accessible with the EM61-MK2. All production data was processed, interpreted and delivered to the CH2M HILL Project Geophysicist on the schedule and in the formats specified in the DGM Scope of Work (SOW) (CH2M HILL, 2010).

1.3 SITE LOCATION AND DESCRIPTION

CAX is located on the site of the former Penniman Shell Loading Plant, which was a large powder and shell-loading facility operated during World War I. The Penniman facility closed in 1918 and between 1918 and 1923 was dismantled. Between 1923 and 1943, the property was either used for farming or left idle until CAX was commissioned in 1943 as a satellite unit of the Naval Supply Depot to provide bulk storage facilities and serve as an assembly and overseas shipping point throughout World War II.

2.0 EQUIPMENT

2.1 GEONICS EM61-MK2

The geophysical instrument used for the investigation at CAX was the Geonics EM61-MK2 metal detector. The EM61-MK2 is a high resolution time-domain electromagnetic instrument designed to detect, with high spatial resolution, shallow ferrous and non-ferrous metallic objects (Geonics,

2005). In comparison with other metal detectors, especially magnetometers, it is much better suited for work in close proximity to man-made structures and in areas of dense subsurface metallic debris.

The EM61-MK2 system consists of two 1 meter by 0.5 meter air-cored coils, a digital data recorder, batteries, and processing electronics. The EM61-MK2's transmitter generates a pulsed primary magnetic field, which then induces eddy currents in nearby metallic objects. The receivers either measure the eddy currents at three distinct time intervals in the bottom coil and one time interval in the top coil or four intervals in the bottom coil if no top coil measurements are recorded. For the work at CAX the latter method was chosen. Earlier time gates provide enhanced detection of smaller metallic objects. Secondary voltages induced in both coils are measured in millivolts (mV). The arrangement of coils is such that there is a vertical separation of 40 cm from the ground to the bottom coil. Based on the sub-meter accuracy of the GPS, target resolution of approximately 1.5 to 2 meters can be expected. The data are collected using Geonics' EM61-MK2 program and temporarily stored in a Juniper Allegro CX data logger prior to downloading to a laptop computer.

2.2 TRIMBLE GEOXH

Trimble's GeoXH sub-meter standalone (no base station) GPS was used to acquire positional data with the EM61-MK2. This alternative to centimeter accuracy GPS is better suited for use in areas with tree canopy and when the goal is characterization rather than target removal. The GeoXH consists of a handheld computer with an integrated internal GPS receiver and an external Zephyr antenna. This system is a 26-channel dual frequency receiver that uses L1, L2 and satellite-based augmentation system (SBAS) frequencies. For configuration with the EM61-MK2, the rover is set to output a NMEA (National Marine Electronics Association) GGA string at 1 Hz, which is captured into the NAV61MK2 program and temporarily stored on the Juniper Allegro CX.

3.0 METHODOLOGY

3.1 DGM SURVEY ACTIVITIES

No on-site activities were required prior to commencing DGM. The method of surveying for all locations was EM61-MK2 in wheel mode configuration.

3.1.1 Wheel Mode

In wheel mode, the EM61-MK2 bottom coil (which contains both a transmitter and receiver coil) is mounted on two manufacturer-supplied 40 cm wheels and has four plastic spacers which are used to separate the top coil from the bottom coil. A tripod for mounting the GPS antenna was attached to the top coil. Readings were collected at the standard rate of 10 per second.

3.1.2 Trimble GeoXH Global Positioning System

A Trimble GeoXH GPS system was used for the real-time acquisition of positional data during geophysical data collection. Readings were collected at a rate of 1 per second and the positional data were stored along with the EM61-MK2 readings in a single file on a Juniper Allegro handheld computer for later downloading and editing.

3.2 DATA PROCESSING AND INTERPRETATION

3.2.1 Data Storage and Initial Editing

EM61-MK2 data are temporarily stored in an Allegro data logger via Geonics's NAV61MK2 v1.22 software and then downloaded into a laptop computer for further on-site processing using Geonics's TrackMaker61MK2 software version 1.64a.

All daily logs, field notes, and sketches were input digitally into Hewlett Packard IPAQ personal digital assistant (PDA). At the end of each day, this information was uploaded in compressed format to the CH2M HILL project File Transfer Protocol (FTP) site for use in processing the geophysical data.

Initial data processing was performed by the field team which included reviewing data for integrity and repeatability.

3.2.2 Preprocessing

Converted raw data files were imported into Geosoft's Oasis Montaj to perform the following:

- Review and finalize all QC tests (cable shake, personnel and static) prior to processing of the DGM data for that day
- Projection of coordinates to North American Datum (NAD) 83 Universal Transverse Mercator (UTM) Zone 18 North coordinates
- Evaluate data density
- Apply auto leveling and instrument drift corrections
- Apply default lag correction
- Generate preliminary contour map(s) from gridded data
- Generate preliminary original vs. repeat profiles by grid block
- Generate formatted American Standard Code for Information Interchange (ASCII) files containing preprocessed data by grid block
- Generate Raw Data Delivery Reports in excel format

3.2.3 Final Processing

After completion of preprocessing, the data were further evaluated and processed to generate final processed data files. Final processing steps included:

- Evaluation and refinement of auto leveling and instrument drift corrections in the channel selected for analysis (Channel 3)
- Evaluation and refinement of lag correction in the channel selected for analysis (Channel 3)

- Additional digital filtering and enhancement, as necessary, in the channel selected for analysis (Channel 3)
- Generation of formatted ASCII files containing processed data by grid block
- Generation of final maps for AOC showing contoured gridded data and culture
- Generation of final original vs. repeat profiles by grid block
- Generation of Final Data Delivery Reports in excel format

3.2.4 Analysis and Target Selection

No individual targets were selected since the objective was to try to locate piping.

All raw, preprocessed, and processed data have been submitted to CH2M HILL's project geophysicist and can be found on the enclosed compact disc (CD) (see Contents of CD).

4.0 RESULTS

4.1 SUMMARY OF WORK PERFORMED

Meandering path digital geophysical mapping of CAX took place on April 1, 2010. The CAX DGM consisted of three grid blocks around: (1) the former Booster Test Pit building, (2) the Ammonia Settling Pits, and (3) the collocated TNT Graining House Sump and TNT Catch Box Ruins. DGM was completed in one working day. The site had heavy brush and required brush clearance in advance of the field team to create passable transects around the building ruins.

4.2 MOBILIZATION AND SITE SETUP

Prior to mobilization an Activity Hazard Analysis (AHA) and Standard Operating Procedures (SOPs) were provided to CH2M HILL, and all personnel had current 8-hour and/or 40-hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) training.

NAEVA mobilized one field crew to Williamsburg, Virginia on March 31, 2010. DGM began at the site on April 1, 2010 and was completed the same day. A site-specific health and safety brief was given by the CH2M HILL site manager prior to the start of work. No equipment was staged on site.

4.3 DGM SURVEY ACTIVITIES

A total of 0.32 acres were mapped: 0.13 acres at the former Booster Test Pit building, 0.08 acres at the Ammonia Settling Pits, and 0.11 acres at the TNT Graining House Sump and Catch Box Ruins. No targets were selected as the survey was looking for pipes leading away from each of the building remains. Cultural objects noted on the site were reinforced concrete posts (**Figure 2**), a steel bollard on the surface (**Figure 3**) at the Ammonia Settling Pits, and a culvert (**Figure 4**) running beneath the road near the former Booster Test Pit building.

4.4 DATA PROCESSING AND INTERPRETATION

All data were processed as described in Section 3.2. Part of the process included analyzing channel decay in order to identify possible noise or other false positive responses. All recorded culture information is noted and identified on the individual grid block maps (**Figures 5 - 7**). There are several anomalies on the west and north sides of the Former Booster Test Pit Building that possibly represent piping leading away from the building since there is a linear trend across multiple transects (see red arrows on **Figure 5**). South of both the TNT Graining House Sump and the TNT Catch Box Ruins (**Figure 6**), anomalies are found on the nearest transect. However, there are no anomalies following the same linear trend on the adjacent transects. At the Ammonia Settling Pits (**Figure 7**), only a few anomalies were unexplained by culture debris on the surface and these were not representative of piping. Additionally, the high response areas to the north of the Ammonia Settling Pits are caused by reinforced concrete posts scattered throughout the area. Ambient and instrument noise levels at the CAX site were generally low.

Final data delivery reports list down-line data density statistics, leveling, lag, and gridding parameters used in processing each grid block. Overview mosaic maps are included as **Figures 8 and 9**.

5.0 QUALITY CONTROL

To establish confidence in the data reliability, Quality Control (QC) tests were conducted during the project. Tests were conducted prior to, during, and after all data collection sessions. All QC tests for the EM61-MK2 were conducted after a minimum 15 minute warm-up period for the electronics. Sample graphical displays of QC data are included in Appendix A.

5.1 QC TEST DESCRIPTIONS AND ACCEPTANCE CRITERIA

The following QC procedures were performed and documented during the data collection process and reviewed by a qualified geophysicist on a daily basis:

1. **Static Background and Static Spike:** Static tests were performed by positioning the survey equipment in an area free of metallic response and collecting data for a 3-minute period. During this time, the instrument was held in a fixed position. A static test is the primary measurement of instrument functionality and consists of one minute without a spike, one minute with a spike (a wooden board fitted to the bottom coil with a small Industry Standard Object (ISO) suspended 48 centimeters above it), and then one minute without a spike. The ISO that was used for this survey was a 1 inch by 4 inch steel pipe (part # 4415K466) from the McMaster –Carr on-line catalog (http://www.mcmaster.com/). The purpose of the static

test is to determine whether unusual levels of instrument or ambient noise exist. Acceptance criteria of ± 20% of the spike response after background correction were compared to instrument response curves for this ISO. These curves were developed by the Naval Research Laboratory (NRL) (Nelson, et al, 2009). The static background and static spike tests were conducted at the beginning and end of each grid block.

2. **Cable Shake Test:** At the beginning of the day, the instrument connections were checked for their response to vibrations in the cables. The response was observed in the field for immediate corrective action, transmitted back to a processor, analyzed, and checked for spikes in the data that can possibly create false anomalies. The cable shake test was conducted at the beginning of the survey operation for each workday, and cables were not disconnected during the day.

3. **Personnel Test:** This test checks the response of instruments to personnel and their clothing/proximity to the system. At the beginning of the day, the instrument was checked for its response to the personnel operating the system. The response was observed in the field for immediate corrective action and transmitted back to a processor, analyzed, and checked for spikes in the data that can possibly create false anomalies. The personnel test was conducted at the beginning of the survey operation for each workday.

5.2 QC TEST RESULTS

QC data were evaluated using Geosoft's Quality Assurance (QA)/Quality Control software. Static, cable shake, and personnel test profiles were plotted with a criterion of ± 2 mV from the mean in channel 3. The following provides a summary of the QC results:

1. **Static Background / Spike Test:** All static and spike tests were within acceptance criteria; stable, repeatable, and without spikes.

2. **Cable Shake Test:** No spikes were observed in any of the tests.

3. **Personnel Test:** No deviation from background response was observed.

All QC tests were well within acceptance criteria and were conducted in the vicinity of the grid block.

6.0 CONCLUSIONS

All tasks involved in the DGM of the four sites at Cheatham Annex were completed as scoped. Supporting QC data and all other DQO's as outlined in the geophysical investigation plan were

within specifications. The survey was completed in one day and covered 0.32 acres in three grid blocks.

In general, anomaly density was low for all three sites with the majority of the unexplained anomalies occurring at the Former Booster Test Pit Building Area. The TNT Catch Box Ruins, the TNT Graining House Sump and the Ammonia Settling Pits do not show any indication of underground piping. It is possible on the west and north side that underground piping exists based at the three linear trends leading away from the Former Booster Test Pit Area. However, all possible linear trends are based on only two anomalies and it is very easy to turn any two points into a line. To confirm the actual existence of piping at the Former Booster Test Pit Area there are two options. One is to conduct additional surveying to confirm that a linear trend does exist by detecting additional anomalies along the trend. If the additional surveying proves that a linear trend does exist then intrusively investigate the linear anomalies. Or two, just intrusively investigate the three possible linear trends without further geophysical surveying.

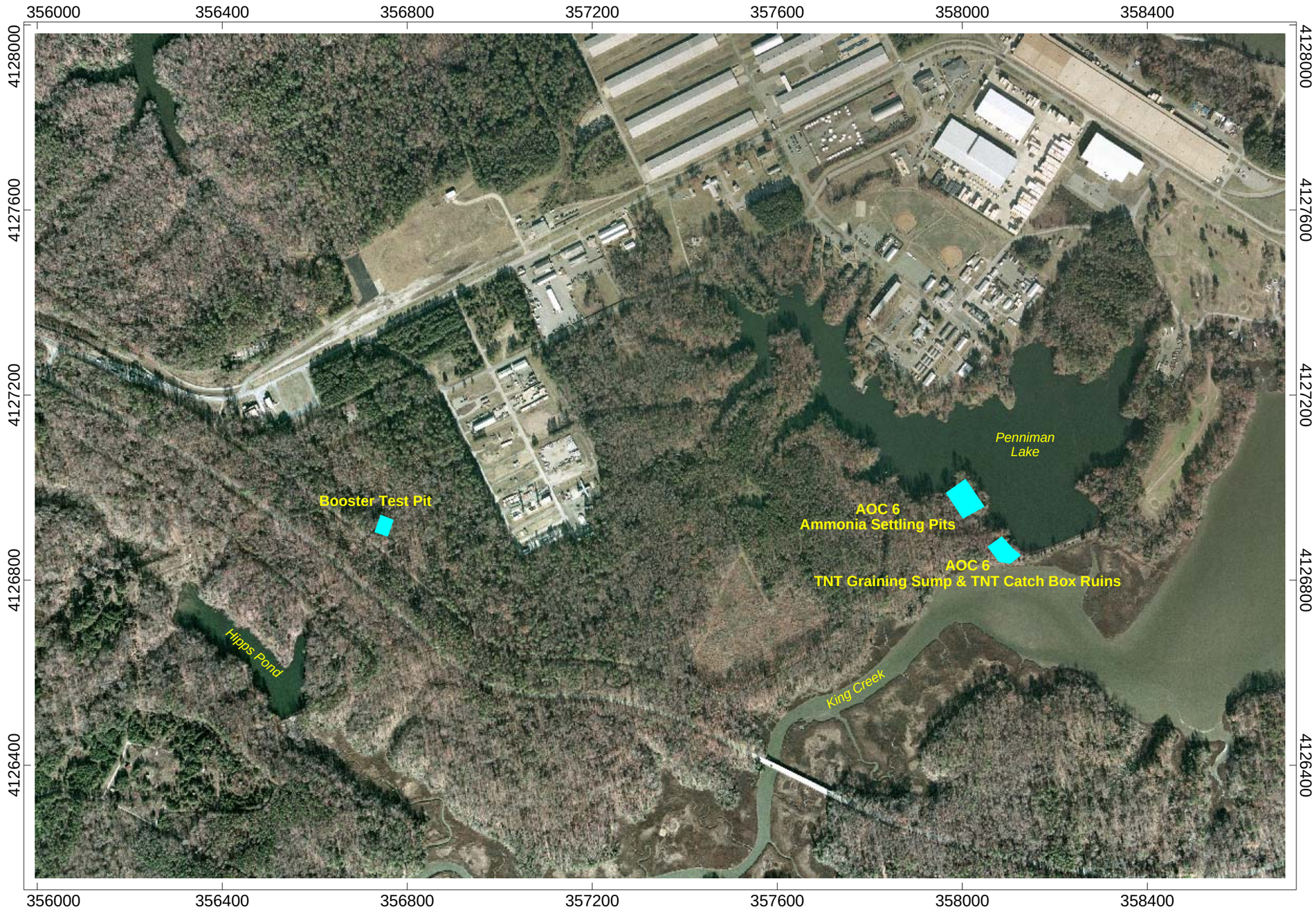
7.0 REFERENCES

CH2M HILL. 2010. *Clean 1000 CTO-0054, Scope of Work, Digital Geophysical Mapping Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, VA.* March.

Geonics Limited. 2005. *EM61-MK2 and EM61-MK2HP 4 Channel High Sensitivity Metal Detectors Operating Manual.* July.

Nelson, H.H., T. Bell, J. Kingdon, N. Khadr, and D. Steinhurst. 2009. *EM61-MK2 Response of Three Munitions Surrogates. NRL/MR/6110-09-9183*. March

FIGURES



Legend

Area of Concern (AOC) for DGM

100 0 100 200 300 400

(meters)

NAD83 / UTM zone 18N

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THE LEADER IN SUBSURFACE DETECTION
Subsurface Geophysical Surveys

Figure 1

CH2M HILL

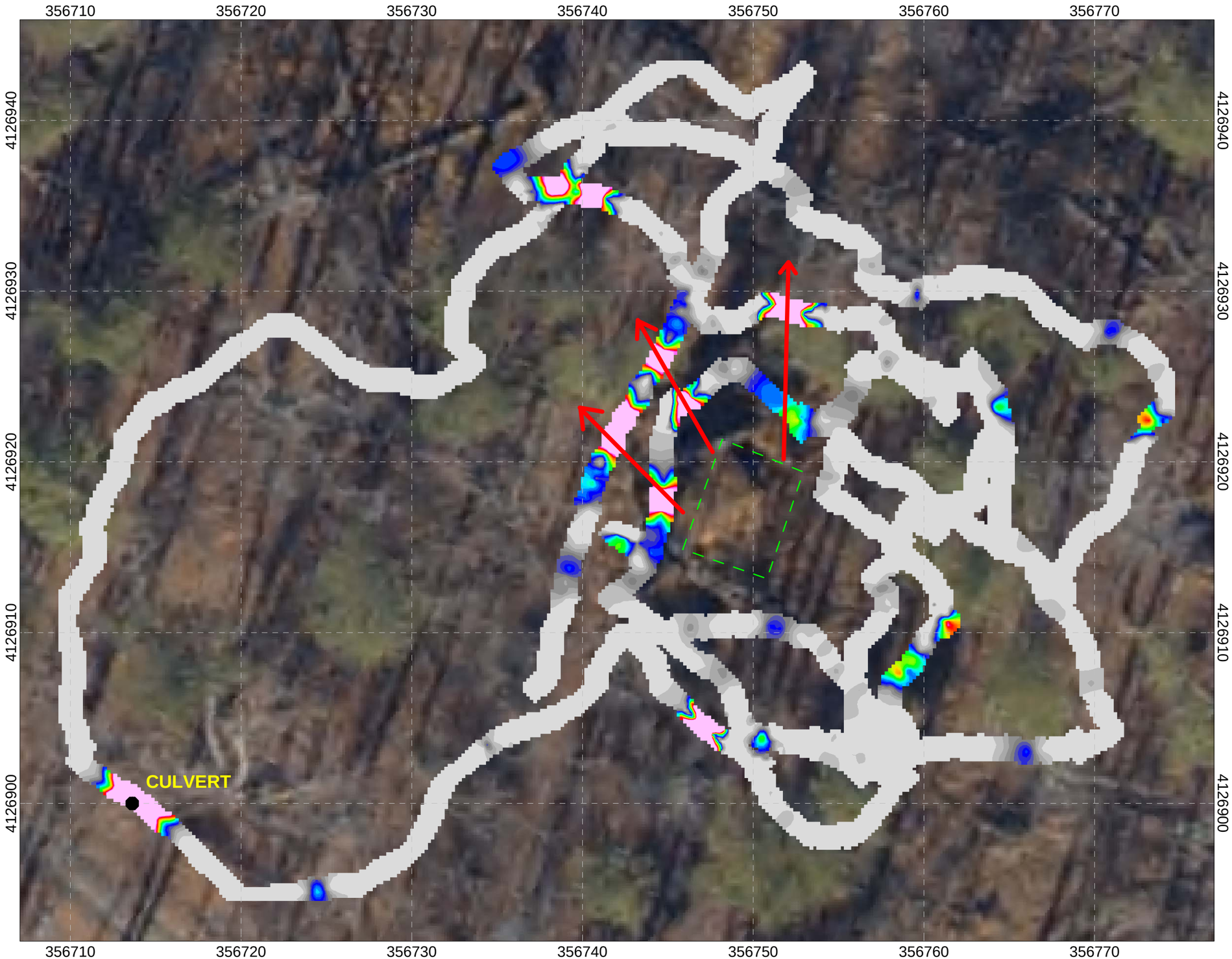
Overview of Digital Geophysical Mapping (DGM)
Naval Weapons Station Yorktown
Cheatham Annex, Virginia

Date of Survey: 04/01/2010

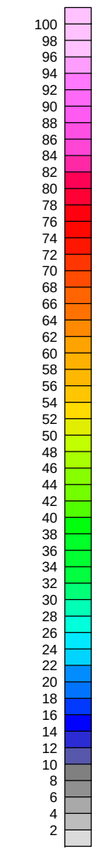
Figure 2: Reinforced Concrete near Ammonia Settling Pits

Figure 3: Steel Bollard on Surface within Ammonia Settling Pits

Figure 4: Culvert beneath road at Booster Test Pit area



NAeVA GEOPHYSICS INC.
THE LEADER IN SUBSURFACE DETECTION
Subsurface Geophysical Surveys

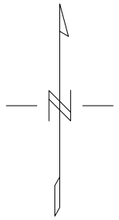


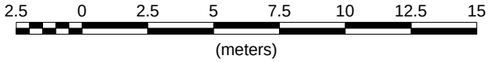
Legend

brush
Culture (if noted)

Former Building Location (Approximate)

Possible Linear Trends





NAD83 / UTM zone 18N

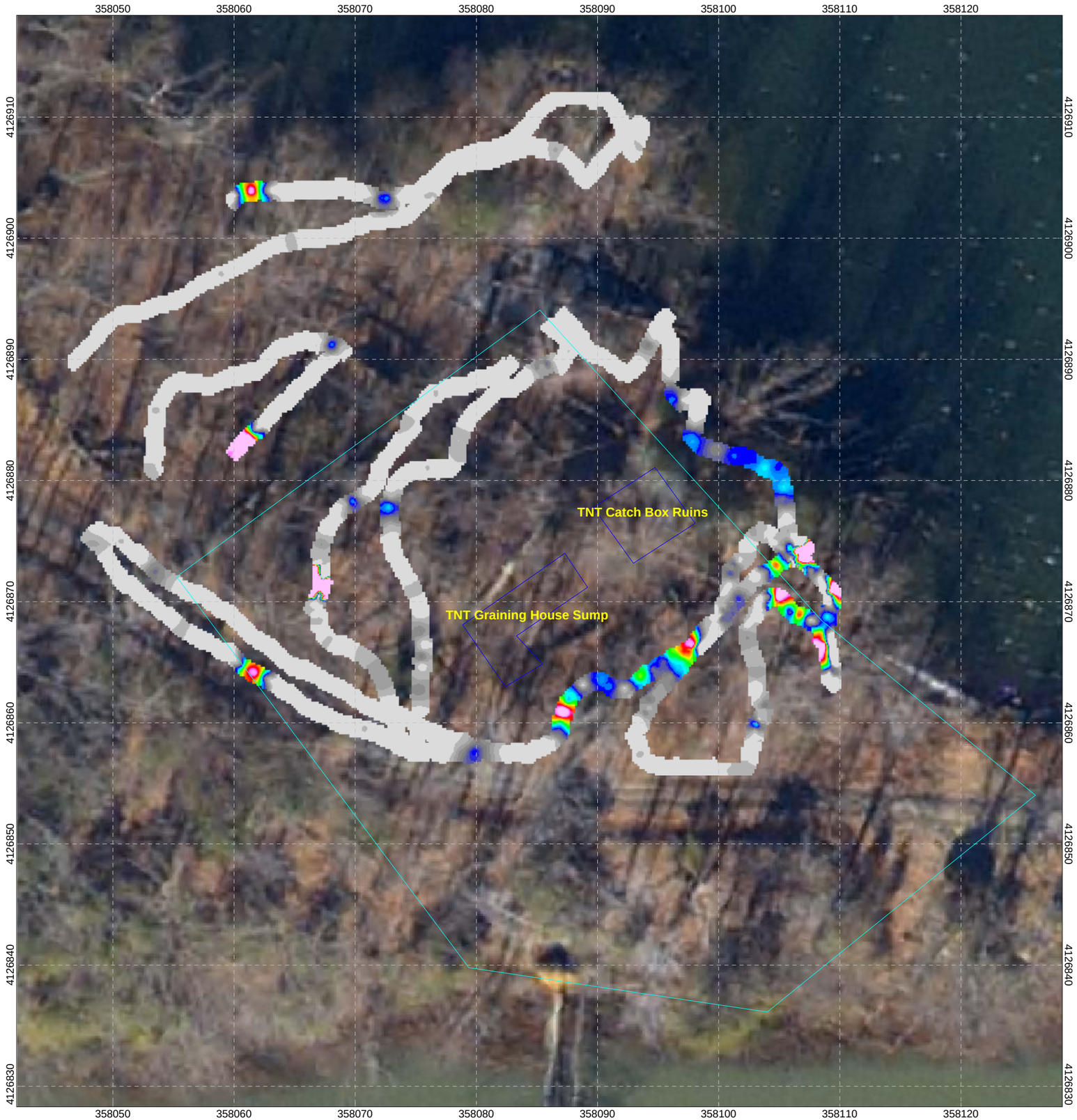
Figure 5

Client: CH2M HILL

EM61 MK2 Bottom Coil
Former Booster Test Pit Building Area
NWS Yorktown - Cheatham Annex, Virginia

Date of Survey 04/01/2010
Date of Creation 04/09/2010

Map Approver: Jon Guillard



NAeVA GEOPHYSICS INC.
THE LEADER IN SUBSURFACE DETECTION
Subsurface Geophysical Surveys

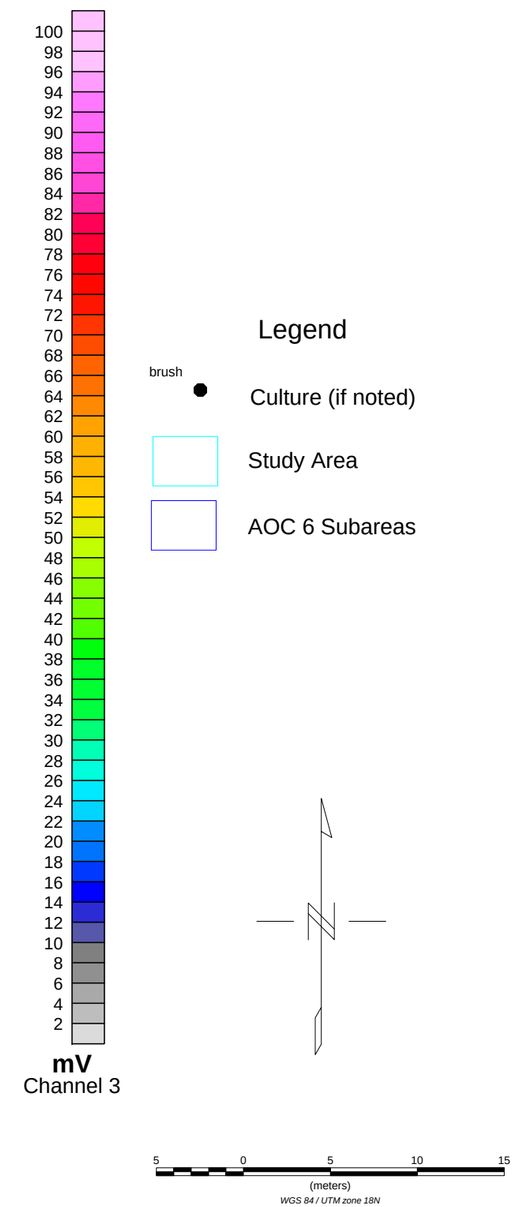
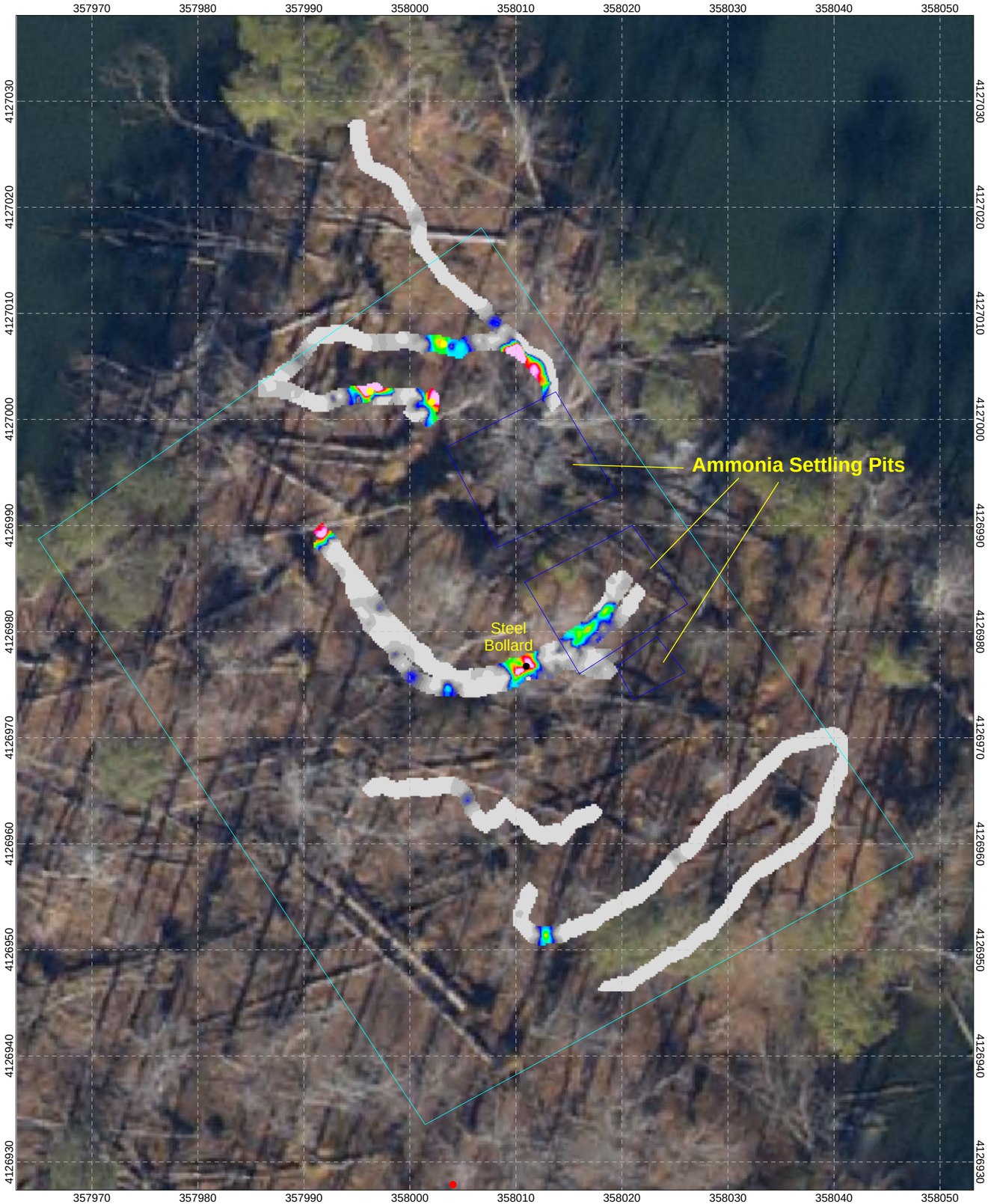


Figure 6

Client: CH2M HILL
EM61 MK2 Bottom Coil AOC 6 Subareas: TNT Graining House Sump and TNT Catch Box Ruins NWS Yorktown - Cheatham Annex, Virginia
Date of Survey 04/01/2010 Date of Creation 04/09/2010
Map Approver: Jon Guillard



NAeVA GEOPHYSICS INC.
THE LEADER IN SUBSURFACE DETECTION
Subsurface Geophysical Surveys

Legend

brush
- Culture (if noted)
- Vent
- Reinforced Concrete
- Study Area
- AOC 6 Subareas

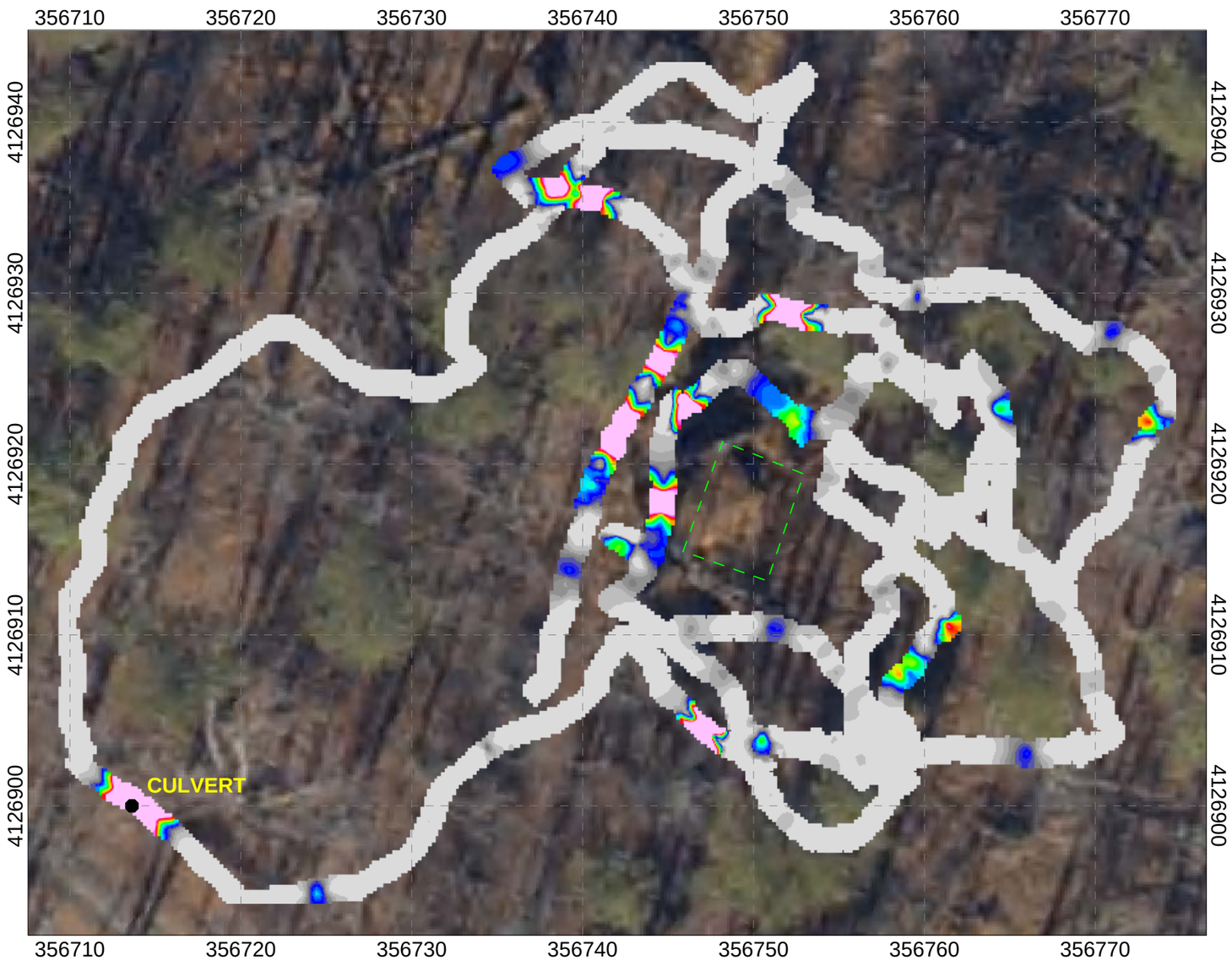
100, 98, 96, 94, 92, 90, 88, 86, 84, 82, 80, 78, 76, 74, 72, 70, 68, 66, 64, 62, 60, 58, 56, 54, 52, 50, 48, 46, 44, 42, 40, 38, 36, 34, 32, 30, 28, 26, 24, 22, 20, 18, 16, 14, 12, 10, 8, 6, 4, 2

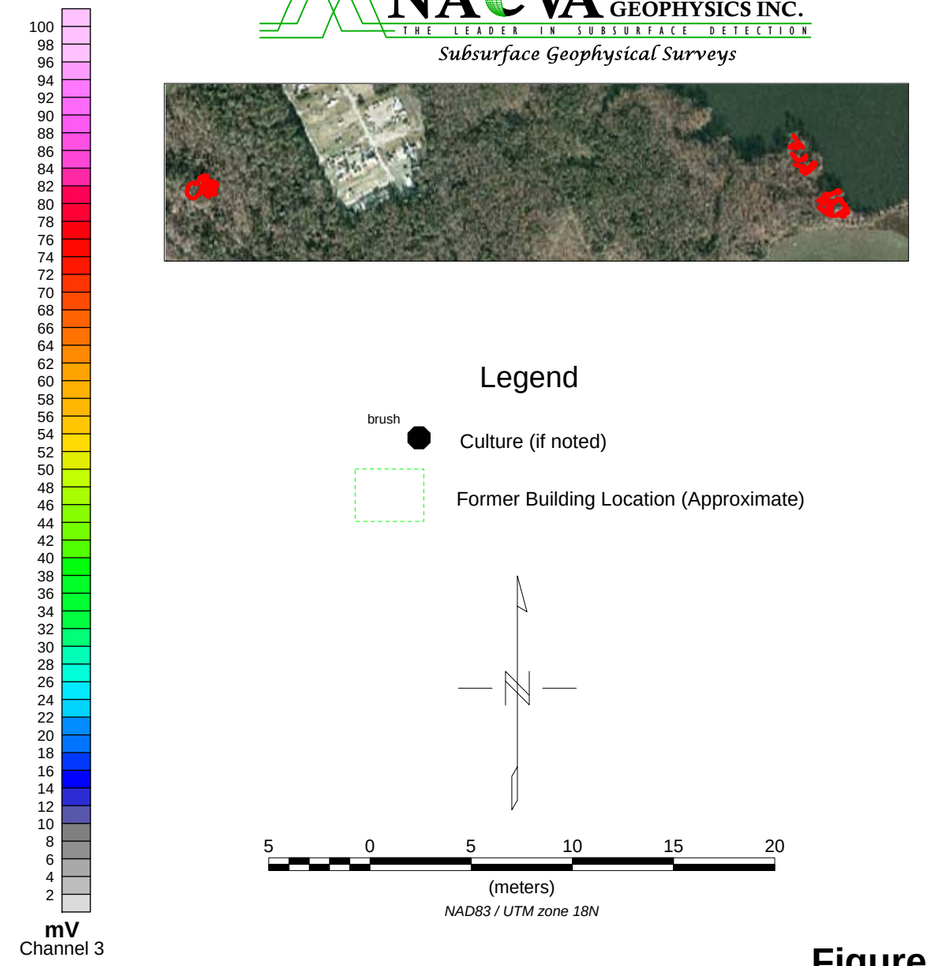
mV
Channel 3

5 0 5 10 15 20
(meters)
NAD83 / UTM zone 18N

Figure 7

Client: CH2M HILL
EM61 MK2 Bottom Coil AOC 6 Subareas: Ammonia Settling Pits NWS Yorktown - Cheatham Annex, Virginia
Date of Survey 04/01/2010 Date of Creation 04/09/2010
Map Approver: Jon Guillard





NAeVA GEOPHYSICS INC.
THE LEADER IN SUBSURFACE DETECTION
Subsurface Geophysical Surveys

Legend

brush

Culture (if noted)

Former Building Location (Approximate)

5 0 5 10 15 20

(meters)

NAD83 / UTM zone 18N

Figure 8

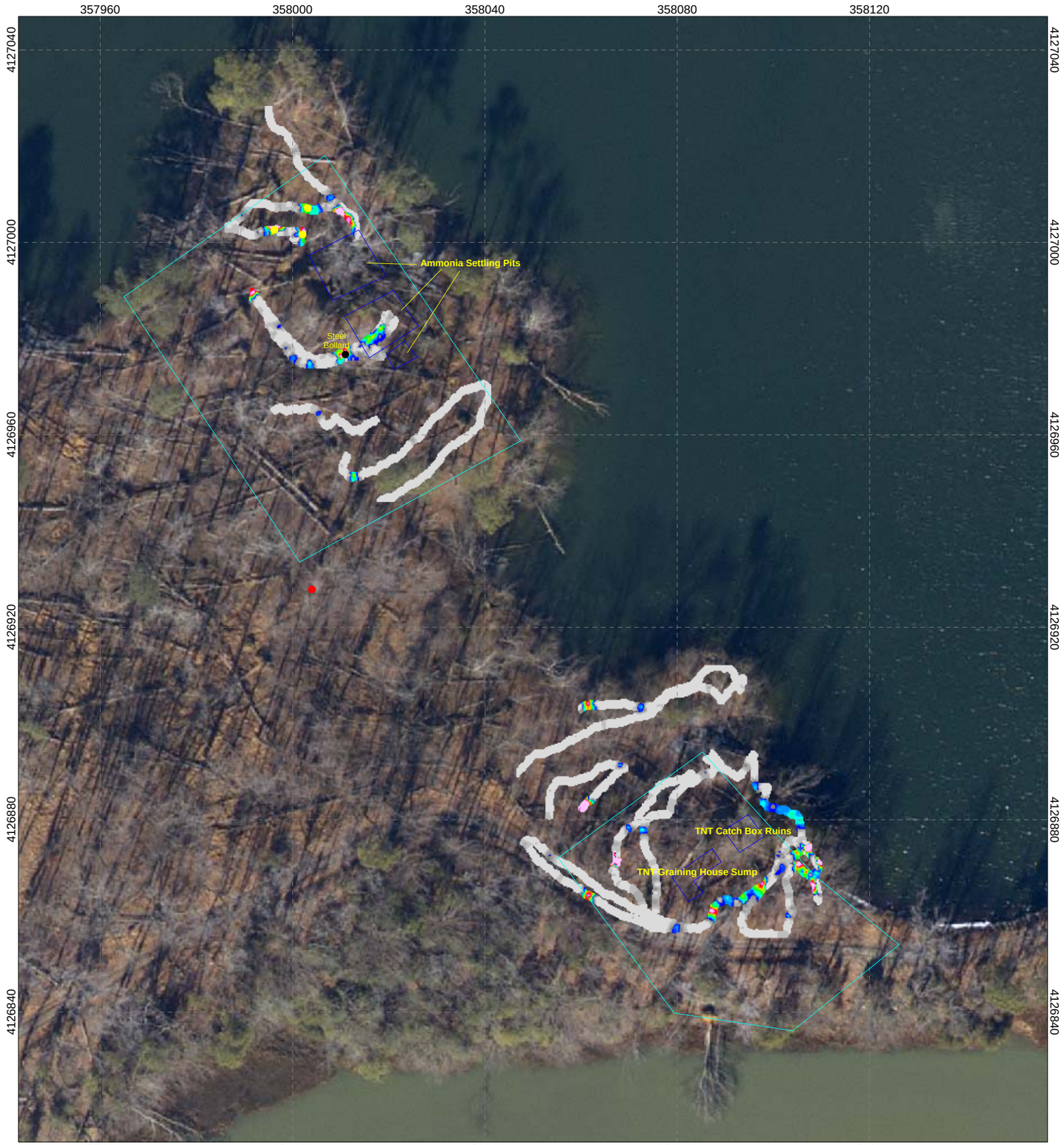
CH2M HILL

EM61 MK2 Bottom Coil
Former Booster Test Pit Building Area Mosaic
NWS Yorktown - Cheatham Annex, Virginia

Date of Creation 04/09/2010

Map Approver: Jon Guillard

NAEVA GEOPHYSICS INC.
THE LEADER IN SUBSURFACE DETECTION
Subsurface Geophysical Surveys



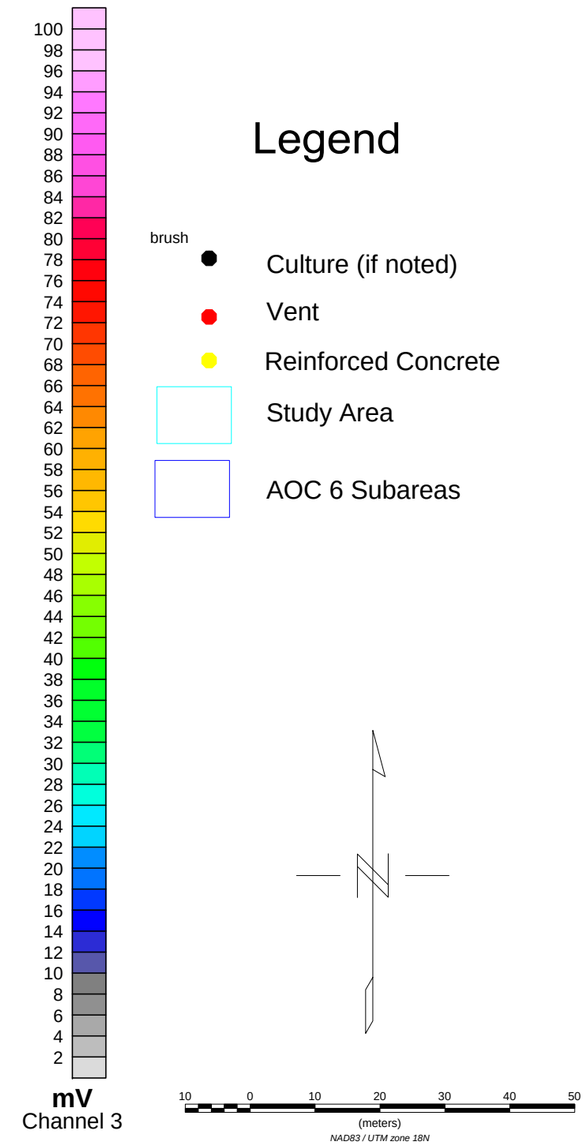


Figure 9

CH2M HILL
EM61 MK2 Bottom Coil AOC 6 Subareas: Ammonia Settling Pits, TNT Graining House Sump and TNT Catch Box Ruins Mosaic NWS Yorktown - Cheatham Annex, Virginia
Date of Creation 04/09/2010
Map Approver: Jon Guillard

APPENDIX A:

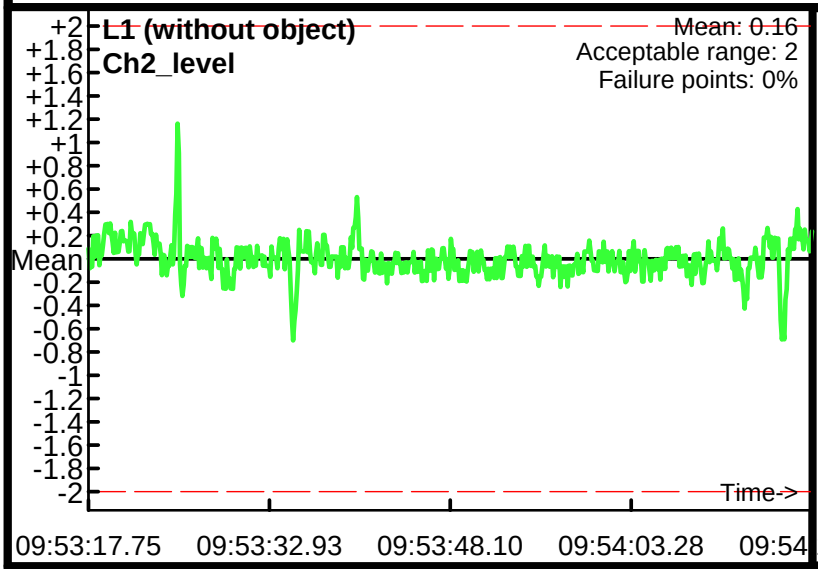
QC Test Result

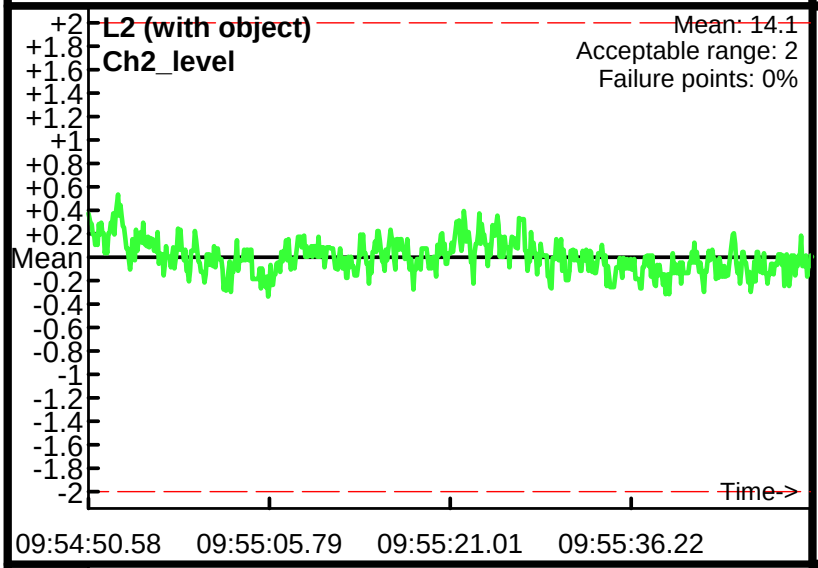
Static Calibration Test

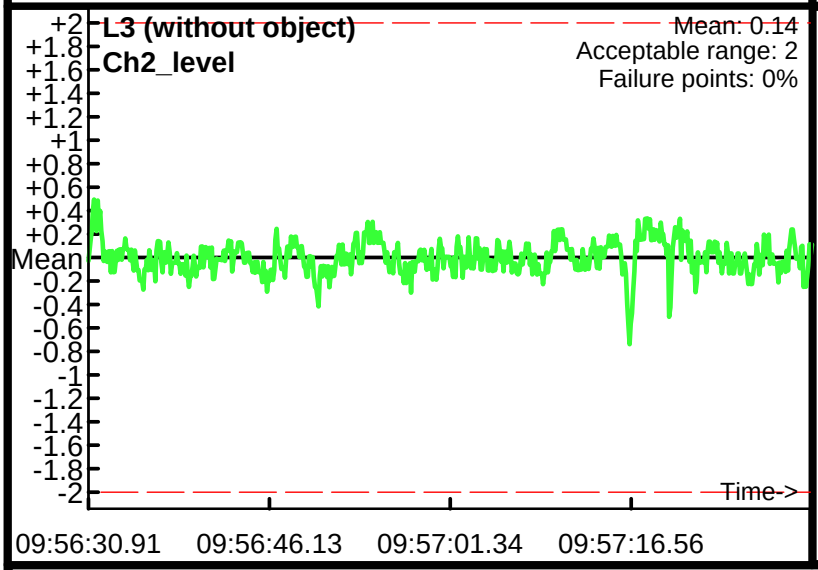
Project: NWS Yorktown - Cheatham Annex
Equipment: EM-61 Mark II
Grid/Location: 0401T-1

Outside range
Acceptable limits

AM test
Operator: GeoA
Date: 4/1/2010







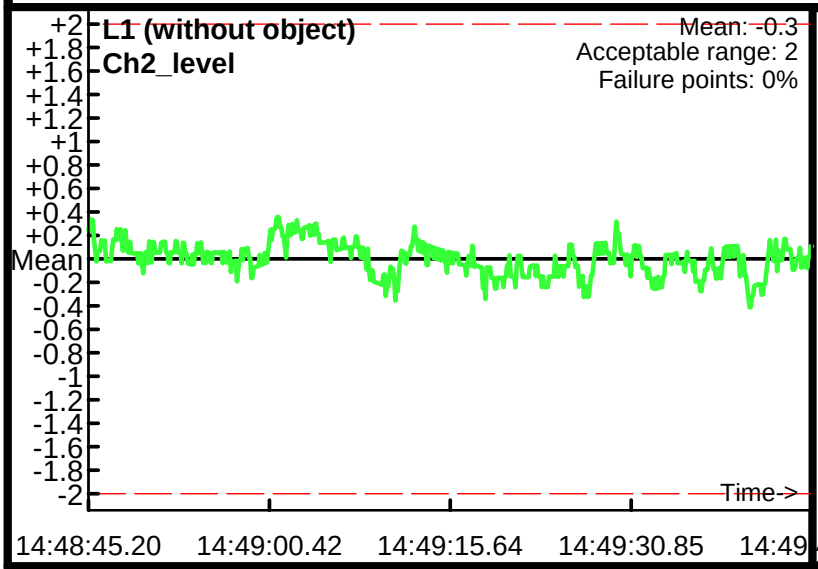
Database: q:\virginia office\ch2m hill\cheatham annex\Data\Geosoft\QC\0401QC\0401QC1.gdb
Line Name: L1 L2 L3

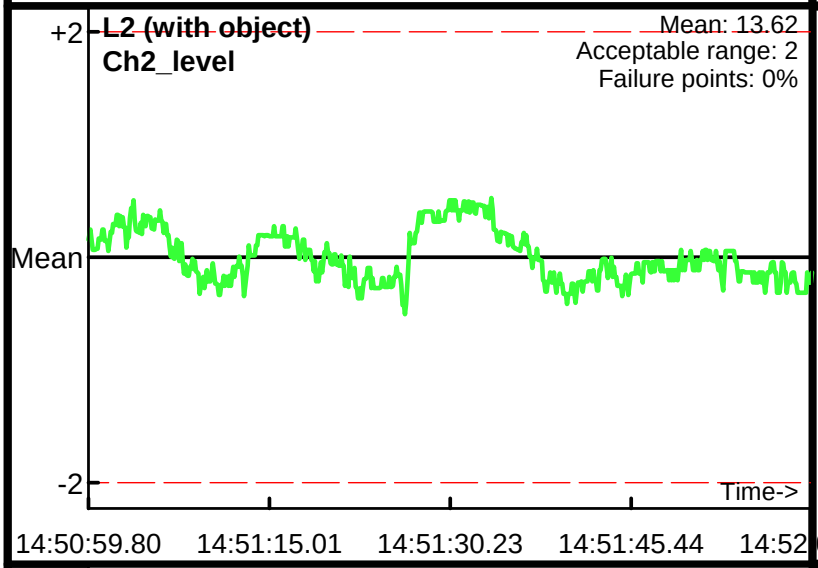
Static Calibration Test

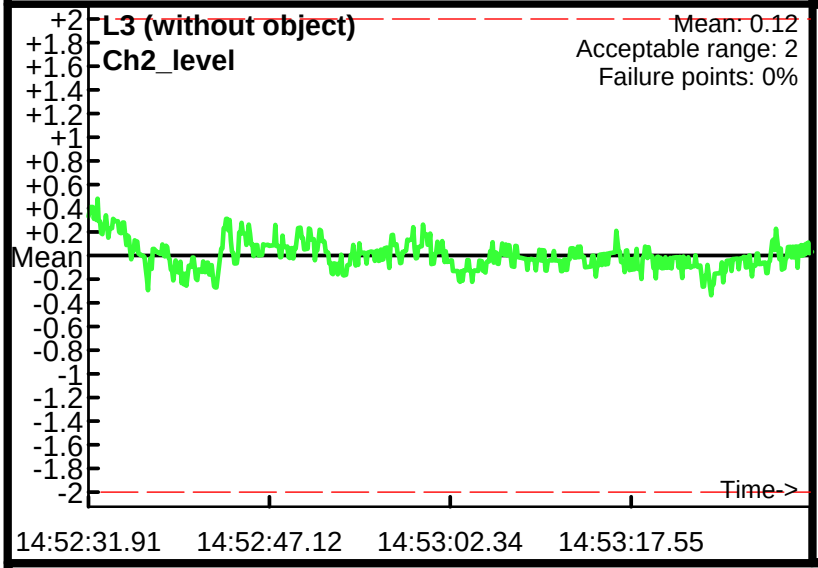
Project: NWS Yorktown - Cheatham Annex
Equipment: EM-61 Mark II
Grid/Location: 0401T-3

Outside range
Acceptable limits

PM test
Operator: GeoA
Date: 4/1/2010







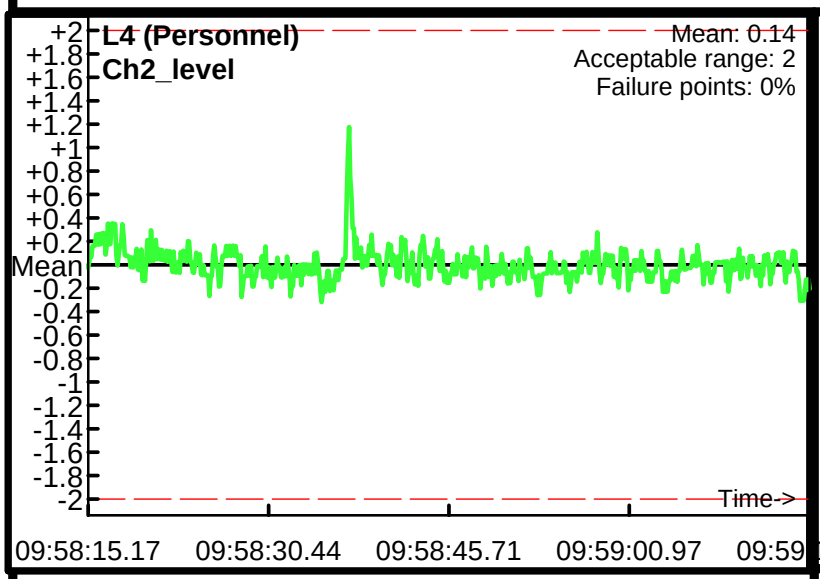
Database: Q:\Virginia Office\CH2M HILL\Cheatham Annex\Data\Geosoft\QC\0401QC\0401QC2.gdb
Line Name: L1 L2 L3

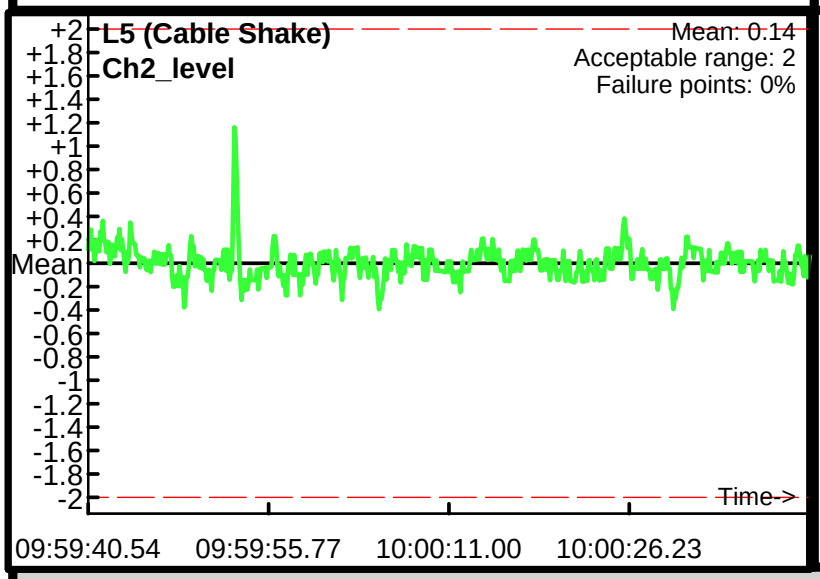
Personnel & Cable Shake Tests

Project: NWS Yorktown - Cheatham Annex
Equipment: EM-61 Mark II
Grid/Location: 0401T-1

Outside range
Acceptable limits

AM test
Operator: GeoA
Date: 4/1/2010

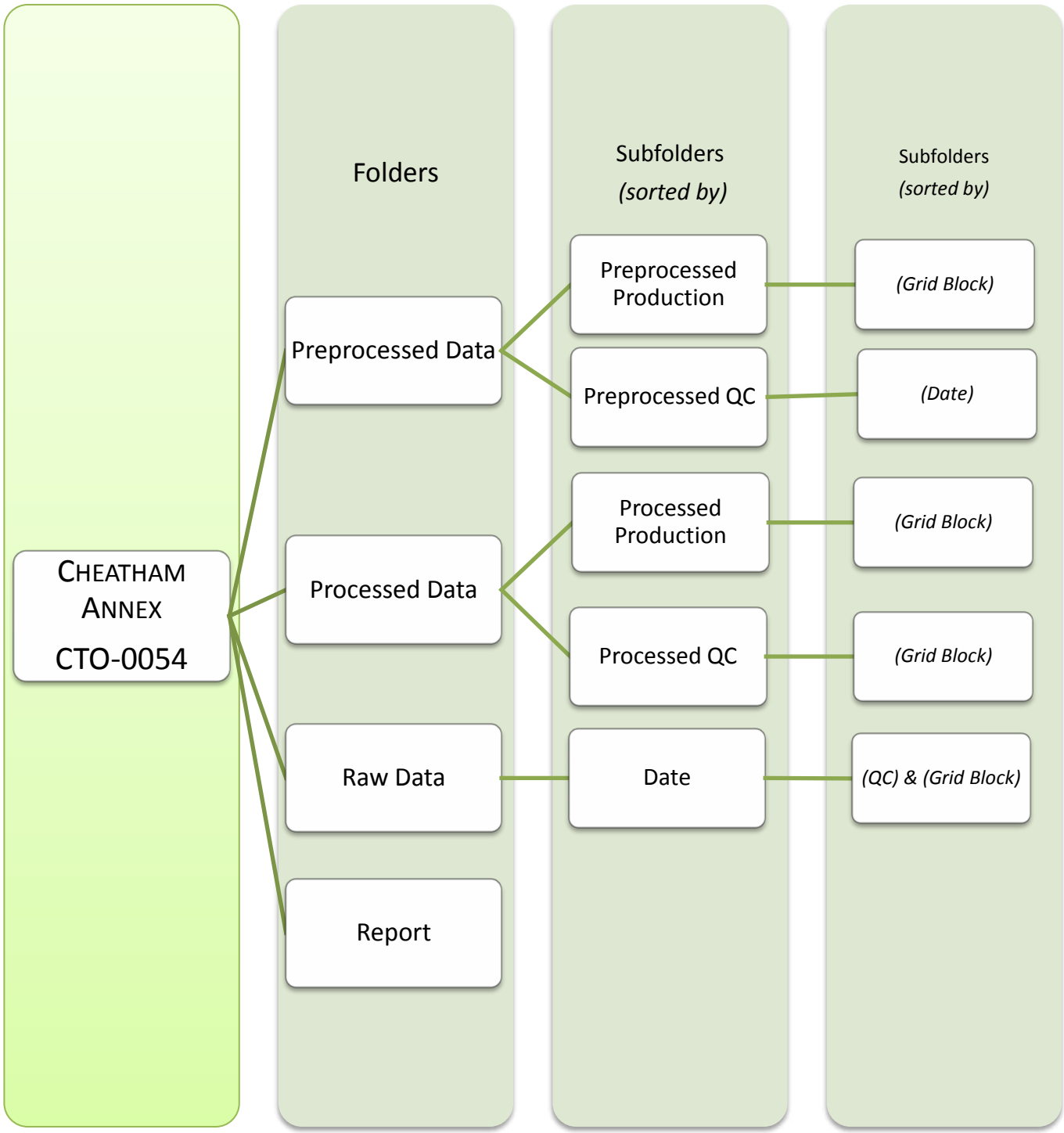




Database: q:\virginia office\ch2m hill\cheatham annex\Data\Geosoft\QC\0401QC\0401QC1.gdb
Line Name: L4 L5 L5

CONTENTS of CD

CONTENTS OF CD



Preprocessed Data

Preprocessed Production

0401T-1

Site ID:	NWS Yorktown - Cheatham Annex, VA
Grid Block Id:	0401T-1
Grids within Grid block:	0401T-1
Date of Collection:	4/1/2010
Raw associated QC Files:	0401QC1.P61,0401QC2.P61
Raw Data Files:	0401T-1_GPS_Corrected.XYZ
Field Note Files:	0401Daily_Log.xls,Cheatham culture.csv
Preprocessor:	Alison Paski
Data Processing Software:	Geosoft Oasis Montaj with UX-detect
Has header been added to file?	Yes
File Contains Grids as Stated?	Yes
Data translated from local coordinates?	N/A
Line gaps have been accounted for?	Yes
Coordinates are correct?	GPS corrections were applied
Background noise was reasonable?	Yes
Crosstrack distance btwn lines acceptable?	N/A, meandering path collection
Downline density OK?	N/A
Mean Sample Separation (Downline):	N/A
% of points outside downline data DQO:	N/A
% of grid covered:	100%
Preprocessed Data file Names:	0401T-1_Preprocessed.xyz
Preprocessing Comments:	GPS corrections were applied to fix some positioning issues.
Date preprocessing Complete:	4/5/2010
Geophysicist QC Name:	Karen Lemley
Geophysicist QC Date:	4/5/2010
Geophysicist QC Comments:	
Preprocessing Delivery date:	4/5/2010

0401T-2

Site ID:	NWS Yorktown - Cheatham Annex, VA
Grid Block Id:	0401T-2
Grids within Grid block:	0401T-2
Date of Collection:	4/1/2010
Raw associated QC Files:	0401QC1.P61,0401QC2.P61
Raw Data Files:	0401T-2_GPS_Corrected.XYZ
Field Note Files:	0401Daily_Log.xls,Cheatham culture.csv
Preprocessor:	Alison Paski
Data Processing Software:	Geosoft Oasis Montaj with UX-detect
Has header been added to file?	Yes
File Contains Grids as Stated?	Yes
Data translated from local coordinates?	N/A
Line gaps have been accounted for?	Yes
Coordinates are correct?	GPS corrections were applied
Background noise was reasonable?	Yes
Crosstrack distance btwn lines acceptable?	N/A, meandering path collection
Downline density OK?	N/A
Mean Sample Separation (Downline):	N/A
% of points outside downline data DQO:	N/A
% of grid covered:	100%
Preprocessed Data file Names:	0401T-2_Preprocessed.xyz
Preprocessing Comments:	GPS corrections were applied to fix some positioning issues.
Date preprocessing Complete:	4/5/2010
Geophysicist QC Name:	Karen Lemley
Geophysicist QC Date:	4/5/2010
Geophysicist QC Comments:	
Preprocessing Delivery date:	4/5/2010

0401T-3

Site ID:	NWS Yorktown - Cheatham Annex, VA
Grid Block Id:	0401T-3
Grids within Grid block:	0401T-3
Date of Collection:	4/1/2010
Raw associated QC Files:	0401QC1.P61,0401QC2.P61
Raw Data Files:	0401T-2_GPS_Corrected.XYZ
Field Note Files:	0401Daily_Log.xls,Cheatham culture.csv
Preprocessor:	Alison Paski
Data Processing Software:	Geosoft Oasis Montaj with UX-detect
Has header been added to file?	Yes
File Contains Grids as Stated?	Yes
Data translated from local coordinates?	N/A
Line gaps have been accounted for?	Yes
Coordinates are correct?	GPS corrections were applied
Background noise was reasonable?	Yes
Crosstrack distance btwn lines acceptable?	N/A, meandering path collection
Downline density OK?	N/A
Mean Sample Separation (Downline):	N/A
% of points outside downline data DQO:	N/A
% of grid covered:	100%
Preprocessed Data file Names:	0401T-3_Preprocessed.xyz
Preprocessing Comments:	GPS corrections were applied to fix some positioning issues.
Date preprocessing Complete:	4/5/2010
Geophysicist QC Name:	Karen Lemley
Geophysicist QC Date:	4/5/2010
Geophysicist QC Comments:	
Preprocessing Delivery date:	4/5/2010

Preprocessed QC

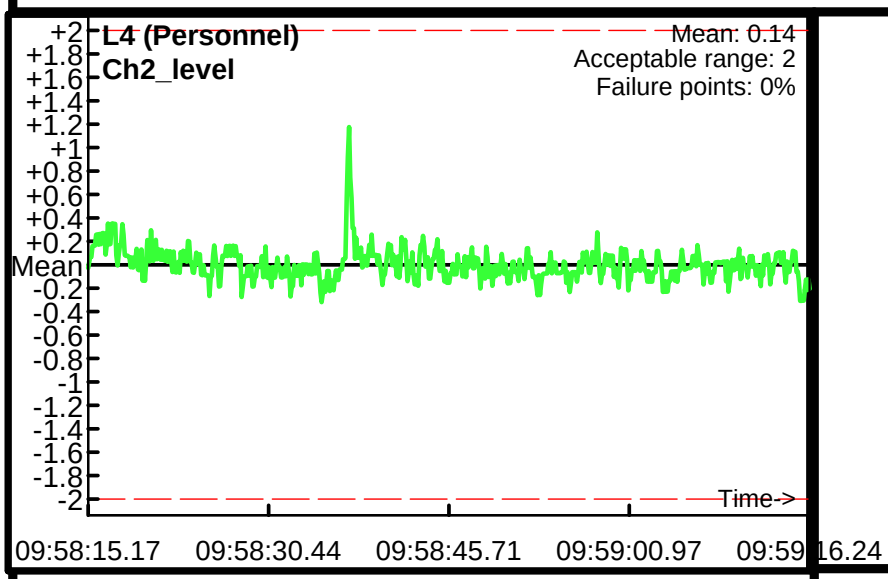
040110QC

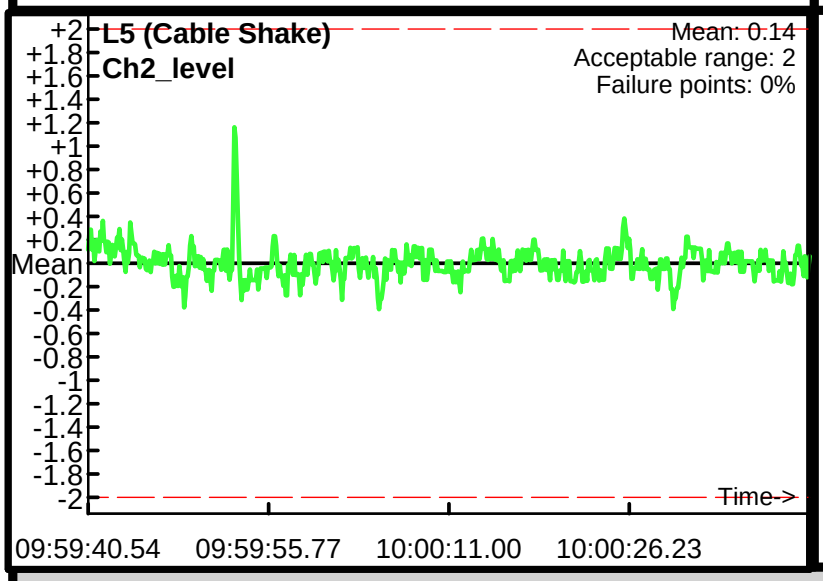
Personnel & Cable Shake Tests

Project: NWS Yorktown - Cheatham Annex
Equipment: EM-61 Mark II
Grid/Location: 0401T-1

Outside range
Acceptable limits

AM test
Operator: GeoA
Date: 4/1/2010





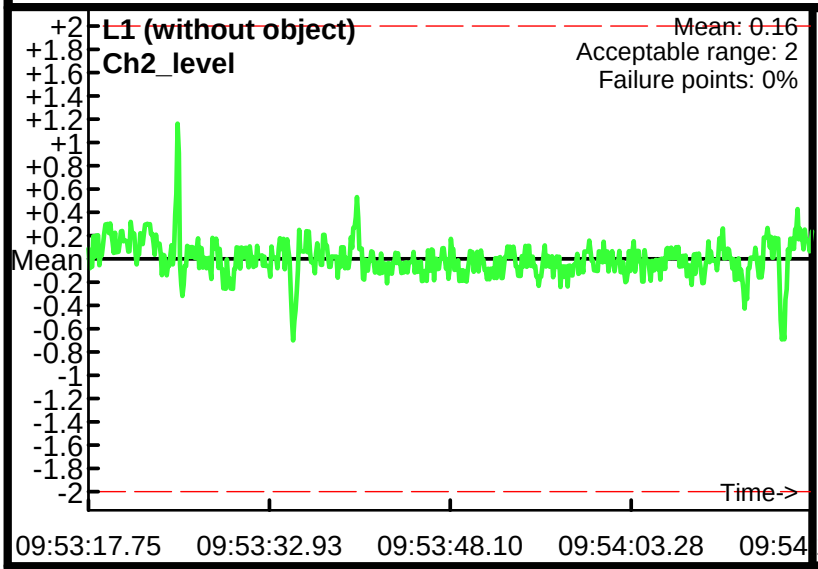
Database: q:\virginia office\ch2m hill\cheatham annex\Data\Geosoft\QC\0401QC\0401QC1.gdb
Line Name: L4 L5 L5

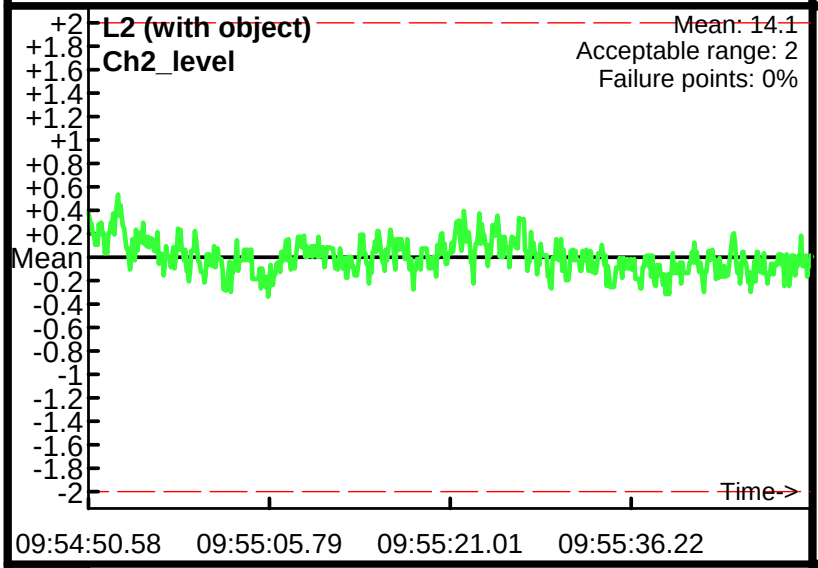
Static Calibration Test

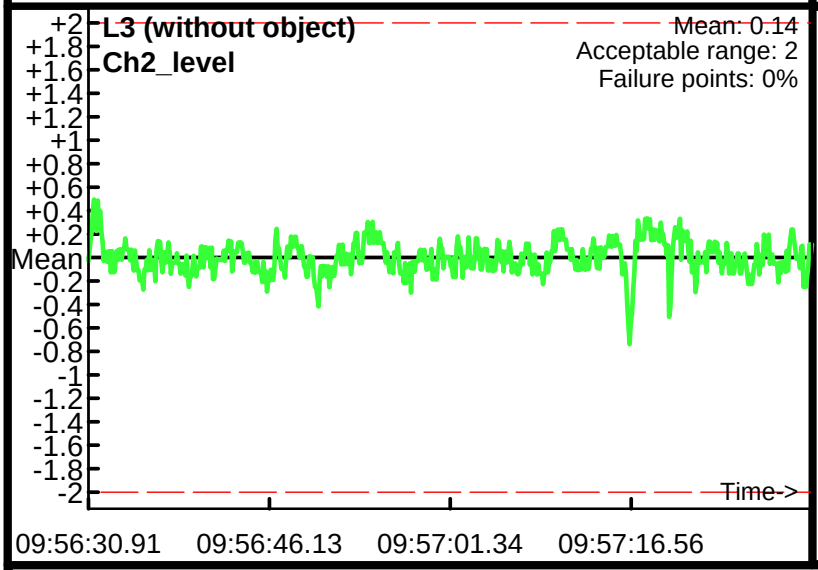
Project: NWS Yorktown - Cheatham Annex
Equipment: EM-61 Mark II
Grid/Location: 0401T-1

Outside range
Acceptable limits

AM test
Operator: GeoA
Date: 4/1/2010







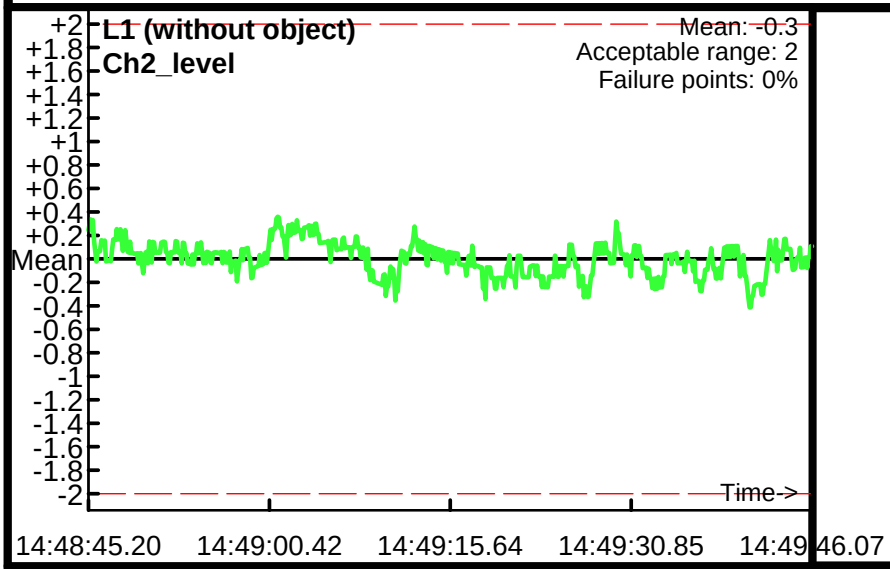
Database: q:\virginia office\ch2m hill\cheatham annex\Data\Geosoft\QC\0401QC\0401QC1.gdb
Line Name: L1 L2 L3

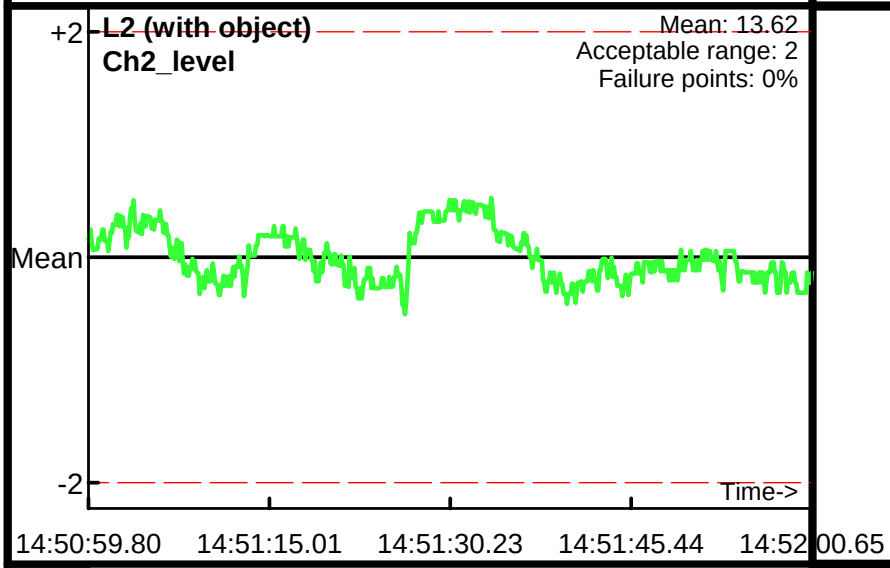
Static Calibration Test

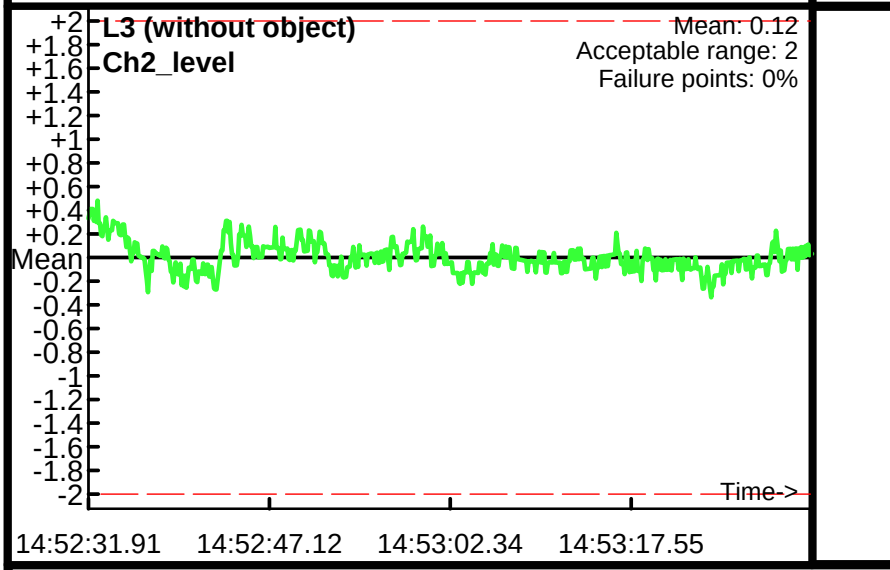
Project: NWS Yorktown - Cheatham Annex
Equipment: EM-61 Mark II
Grid/Location: 0401T-3

Outside range
Acceptable limits

PM test
Operator: GeoA
Date: 4/1/2010







Database: Q:\Virginia Office\CH2M HILL\Cheatham Annex\Data\Geosoft\QC\0401QC\0401QC2.gdb
Line Name: L1 L2 L3

Processed Data

Processed Production

0401T-1

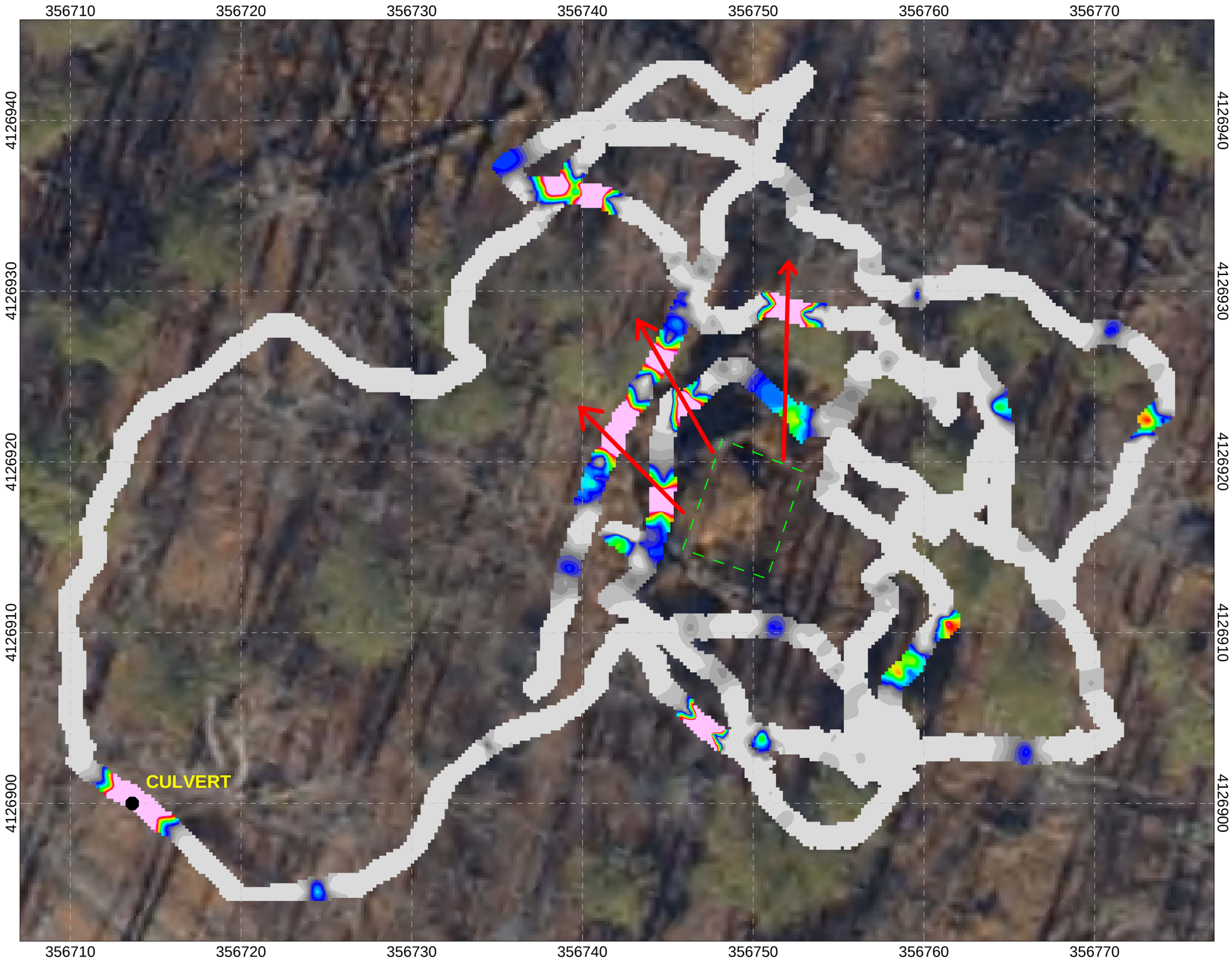
Final Data Delivery Report

Preprocessing Information

Site ID:	NWS Yorktown - Cheatham Annex, VA
Grid Block Id:	0401T-1
Grids within Grid block:	0401T-1
Date of Collection:	4/1/2010
Raw associated QC Files:	0401QC1.P61,0401QC2.P61
Raw Data Files:	0401T-1_GPS_Corrected.XYZ
Field Note Files:	0401Daily_Log.xls,Cheatham culture.csv
Preprocessor:	Alison Paski
Data Processing Software:	Geosoft Oasis Montaj with UX-detect
Has header been added to file?	Yes
File Contains Grids as Stated?	Yes
Data translated from local coordinates?	N/A
Line gaps have been accounted for?	Yes
Coordinates are correct?	GPS corrections were applied
Background noise was reasonable?	Yes
Crosstrack distance btwn lines acceptable?	N/A, meandering path collection
Downline density OK?	N/A
Mean Sample Separation (Downline):	N/A
% of points outside downline data DQO:	N/A
% of grid covered:	100%
Preprocessed Data file Names:	0401T-1_Preprocessed.xyz
Preprocessing Comments:	GPS corrections were applied to fix some positioning issues.
Date preprocessing Complete:	4/5/2010
Geophysicist QC Name:	Karen Lemley
Geophysicist QC Date:	4/5/2010
Geophysicist QC Comments:	
Preprocessing Delivery date:	4/5/2010

Processed Information

Processor:	Donald Smith
Lag correction:	N/A
Leveling:	Window statistical leveling with additional manual leveling on Channel 3. Low window=0%, High window=70%, window length=100.
Filters:	N/A
Gridding Method:	Kriging
Gridding Cell Size:	0.2
Gridding Blanking Distance:	0.6
Anomaly Selection details:	N/A
Processed Data file Names:	0401T-1_Processed.xyz
Map File Names:	0401T-1.map, 0401T-1.pdf
Anomaly Selection File Names:	N/A
Processing Comments:	There was a large cluster of culture points in this collection related to a building.
Date Processing Complete:	4/5/2010
Geophysicist QC Name:	Karen Lemley
Geophysicist QC Date:	4/5/2010
Geophysicist QC Comments:	
Final Delivery date:	4/5/2010



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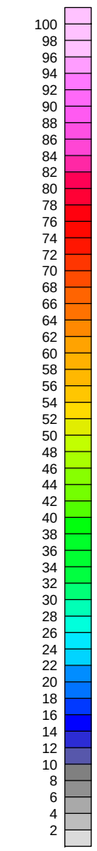
Subsurface Geophysical Surveys



Legend

brush
Culture (if noted)

Former Building Location (Approximate)

Possible Linear Trends

2.5 0 2.5 5 7.5 10 12.5 15
(meters)
NAD83 / UTM zone 18N

Figure 5

Client: CH2M HILL

EM61 MK2 Bottom Coil
Former Booster Test Pit Building Area
NWS Yorktown - Cheatham Annex, Virginia

Date of Survey 04/01/2010
Date of Creation 04/09/2010

Map Approver: Jon Guillard

0401T-2

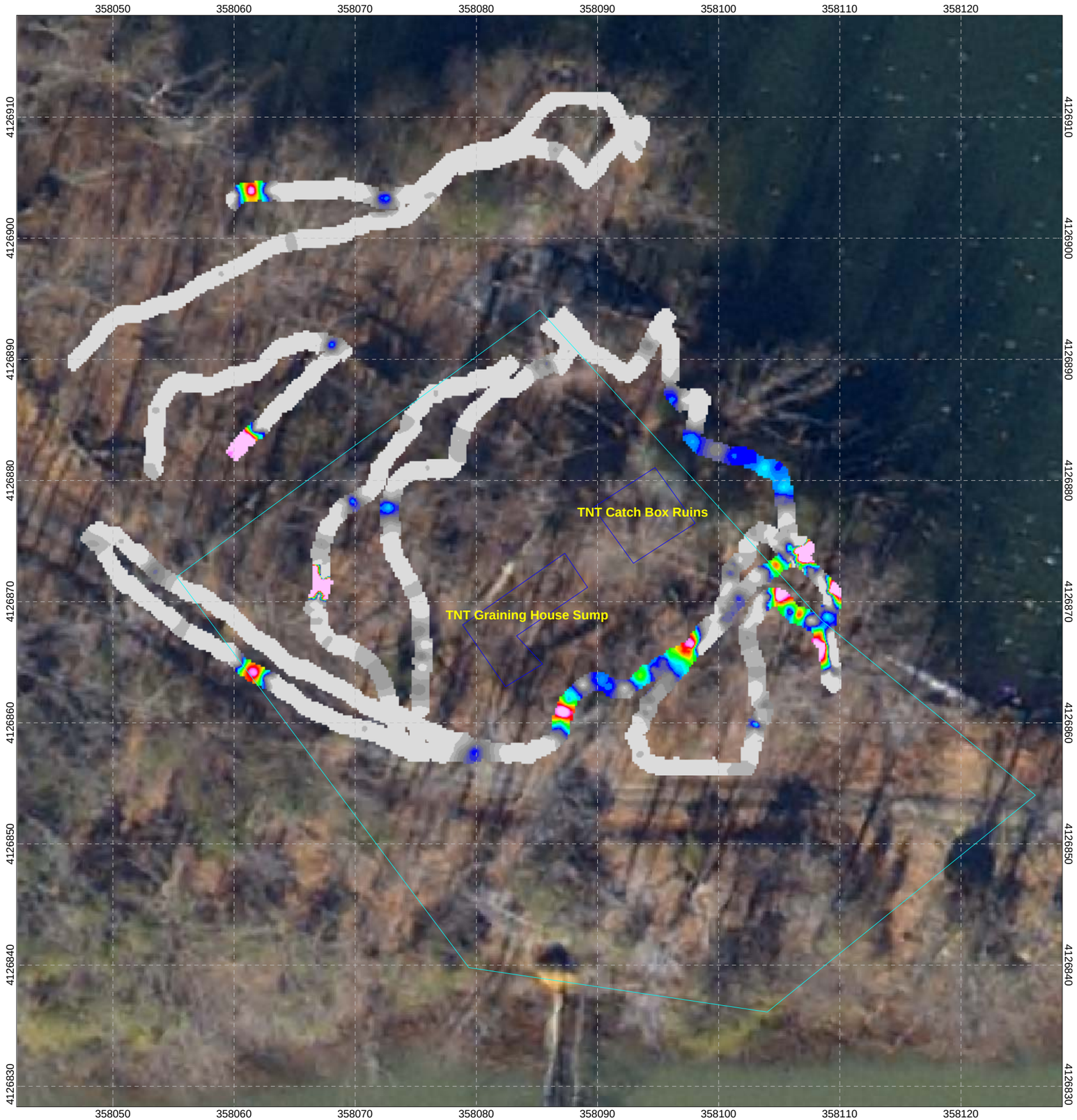
Final Data Delivery Report

Preprocessing Information

Site ID:	NWS Yorktown - Cheatham Annex, VA
Grid Block Id:	0401T-2
Grids within Grid block:	0401T-2
Date of Collection:	4/1/2010
Raw associated QC Files:	0401QC1.P61,0401QC2.P61
Raw Data Files:	0401T-2_GPS_Corrected.XYZ
Field Note Files:	0401Daily_Log.xls,Cheatham culture.csv
Preprocessor:	Alison Paski
Data Processing Software:	Geosoft Oasis Montaj with UX-detect
Has header been added to file?	Yes
File Contains Grids as Stated?	Yes
Data translated from local coordinates?	N/A
Line gaps have been accounted for?	Yes
Coordinates are correct?	GPS corrections were applied
Background noise was reasonable?	Yes
Crosstrack distance btwn lines acceptable?	N/A, meandering path collection
Downline density OK?	N/A
Mean Sample Separation (Downline):	N/A
% of points outside downline data DQO:	N/A
% of grid covered:	100%
Preprocessed Data file Names:	0401T-2_Preprocessed.xyz
Preprocessing Comments:	GPS corrections were applied to fix some positioning issues.
Date preprocessing Complete:	4/5/2010
Geophysicist QC Name:	Karen Lemley
Geophysicist QC Date:	4/5/2010
Geophysicist QC Comments:	
Preprocessing Delivery date:	4/5/2010

Processed Information

Processor:	Donald Smith
Lag correction:	N/A
Leveling:	Window statistical leveling with additional manual leveling on Channel 3. Low window=0%, High window=70%, window length=100.
Filters:	N/A
Gridding Method:	Kriging
Gridding Cell Size:	0.2
Gridding Blanking Distance:	0.6
Anomaly Selection details:	N/A
Processed Data file Names:	0401T-2_Processed.xyz
Map File Names:	0401T-2.map, 0401T-2.pdf
Anomaly Selection File Names:	N/A
Processing Comments:	There was no culture for this grid block.
Date Processing Complete:	4/5/2010
Geophysicist QC Name:	Karen Lemley
Geophysicist QC Date:	4/5/2010
Geophysicist QC Comments:	
Final Delivery date:	4/5/2010



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Subsurface Geophysical Surveys

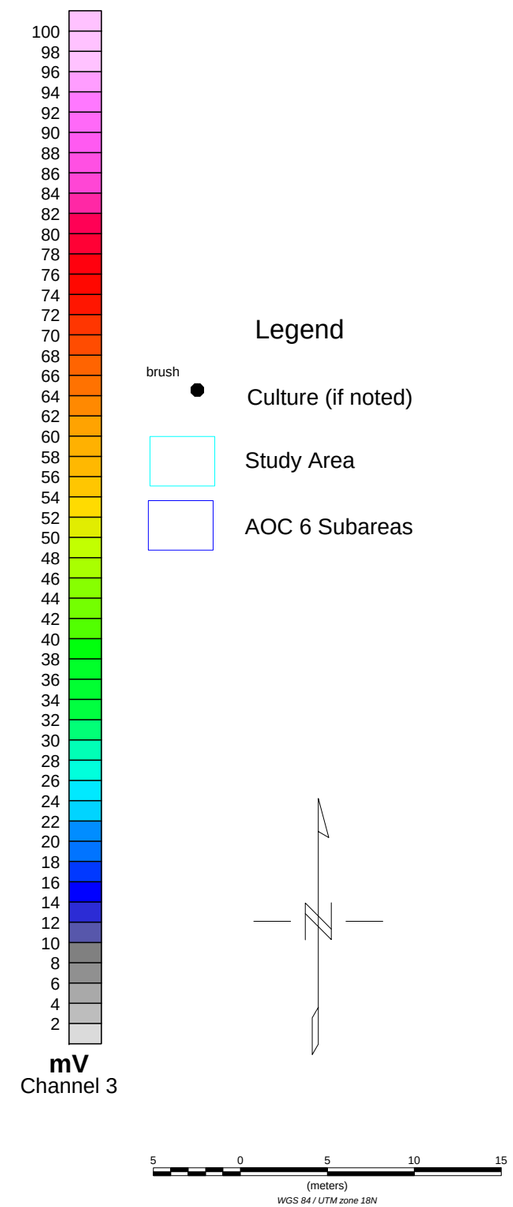


Figure 6

Client: CH2M HILL
EM61 MK2 Bottom Coil AOC 6 Subareas: TNT Graining House Sump and TNT Catch Box Ruins NWS Yorktown - Cheatham Annex, Virginia
Date of Survey 04/01/2010 Date of Creation 04/09/2010
Map Approver: Jon Guillard

0401T-3

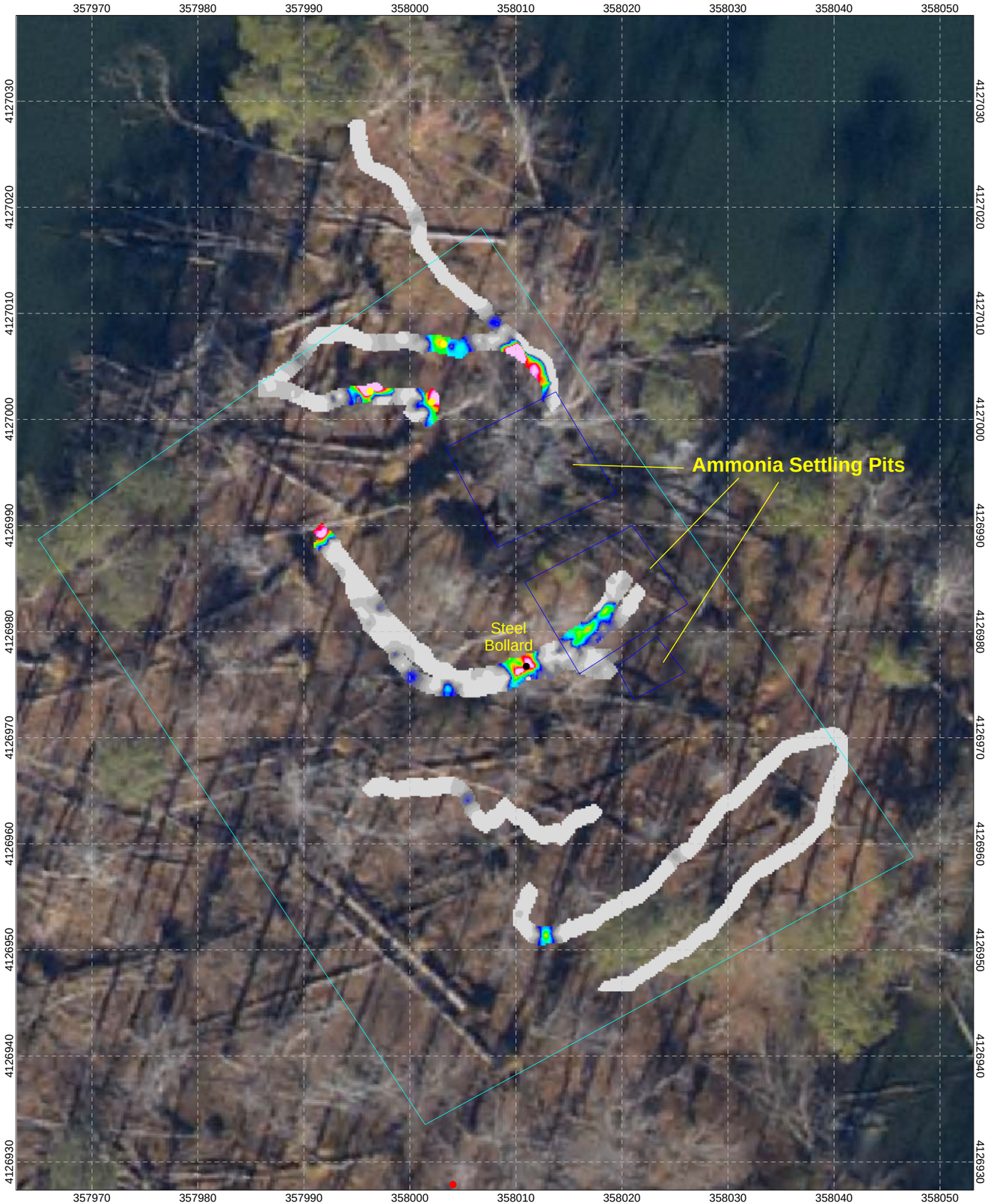
Final Data Delivery Report

Preprocessing Information

Site ID:	NWS Yorktown - Cheatham Annex, VA
Grid Block Id:	0401T-3
Grids within Grid block:	0401T-3
Date of Collection:	4/1/2010
Raw associated QC Files:	0401QC1.P61,0401QC2.P61
Raw Data Files:	0401T-3_GPS_Corrected.XYZ
Field Note Files:	0401Daily_Log.xls,Cheatham culture.csv
Preprocessor:	Alison Paski
Data Processing Software:	Geosoft Oasis Montaj with UX-detect
Has header been added to file?	Yes
File Contains Grids as Stated?	Yes
Data translated from local coordinates?	N/A
Line gaps have been accounted for?	Yes
Coordinates are correct?	GPS corrections were applied
Background noise was reasonable?	Yes
Crosstrack distance btwn lines acceptable?	N/A, meandering path collection
Downline density OK?	N/A
Mean Sample Separation (Downline):	N/A
% of points outside downline data DQO:	N/A
% of grid covered:	100%
Preprocessed Data file Names:	0401T-3_Preprocessed.xyz
Preprocessing Comments:	GPS corrections were applied to fix some positioning issues.
Date preprocessing Complete:	4/5/2010
Geophysicist QC Name:	Karen Lemley
Geophysicist QC Date:	4/5/2010
Geophysicist QC Comments:	
Preprocessing Delivery date:	4/5/2010

Processed Information

Processor:	Donald Smith
Lag correction:	N/A
Leveling:	Window statistical leveling with additional manual leveling on Channel 3. Low window=0%, High window=70%, window length=100.
Filters:	N/A
Gridding Method:	Kriging
Gridding Cell Size:	0.2
Gridding Blanking Distance:	0.6
Anomaly Selection details:	N/A
Processed Data file Names:	0401T-3_Processed.xyz
Map File Names:	0401T-3.map, 0401T-3.pdf
Anomaly Selection File Names:	N/A
Processing Comments:	There was no culture for this grid block.
Date Processing Complete:	4/5/2010
Geophysicist QC Name:	Karen Lemley
Geophysicist QC Date:	4/5/2010
Geophysicist QC Comments:	
Final Delivery date:	4/5/2010



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Subsurface Geophysical Surveys

Legend

brush
- Culture (if noted)
- Vent
- Reinforced Concrete
- Study Area
- AOC 6 Subareas

100, 98, 96, 94, 92, 90, 88, 86, 84, 82, 80, 78, 76, 74, 72, 70, 68, 66, 64, 62, 60, 58, 56, 54, 52, 50, 48, 46, 44, 42, 40, 38, 36, 34, 32, 30, 28, 26, 24, 22, 20, 18, 16, 14, 12, 10, 8, 6, 4, 2

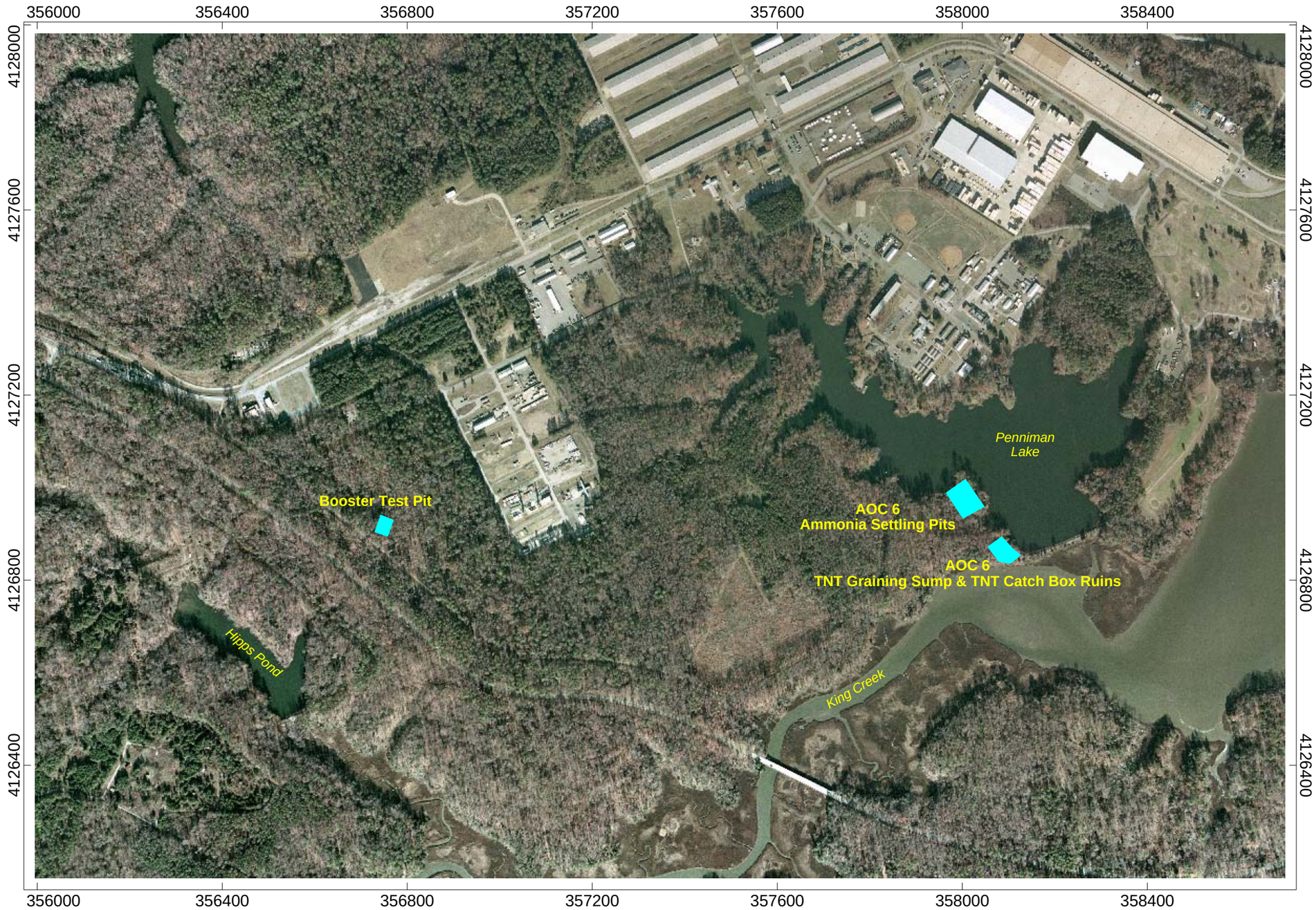
mV
Channel 3

5 0 5 10 15 20
(meters)
NAD83 / UTM zone 18N

Figure 7

Client: CH2M HILL
EM61 MK2 Bottom Coil AOC 6 Subareas: Ammonia Settling Pits NWS Yorktown - Cheatham Annex, Virginia
Date of Survey 04/01/2010 Date of Creation 04/09/2010
Map Approver: Jon Guillard

Mosaic



Legend

Area of Concern (AOC) for DGM

100 0 100 200 300 400

(meters)

NAD83 / UTM zone 18N

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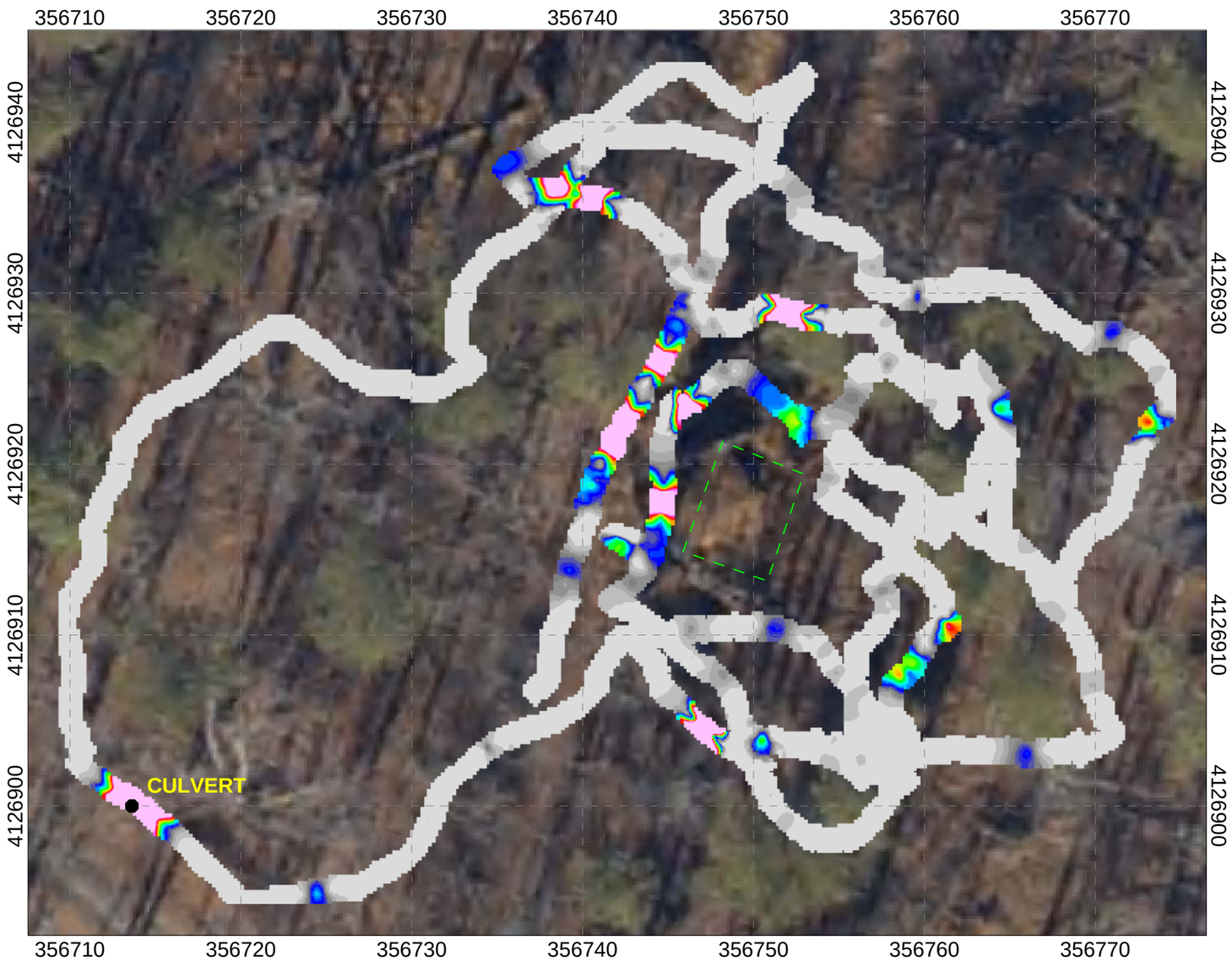
Subsurface Geophysical Surveys

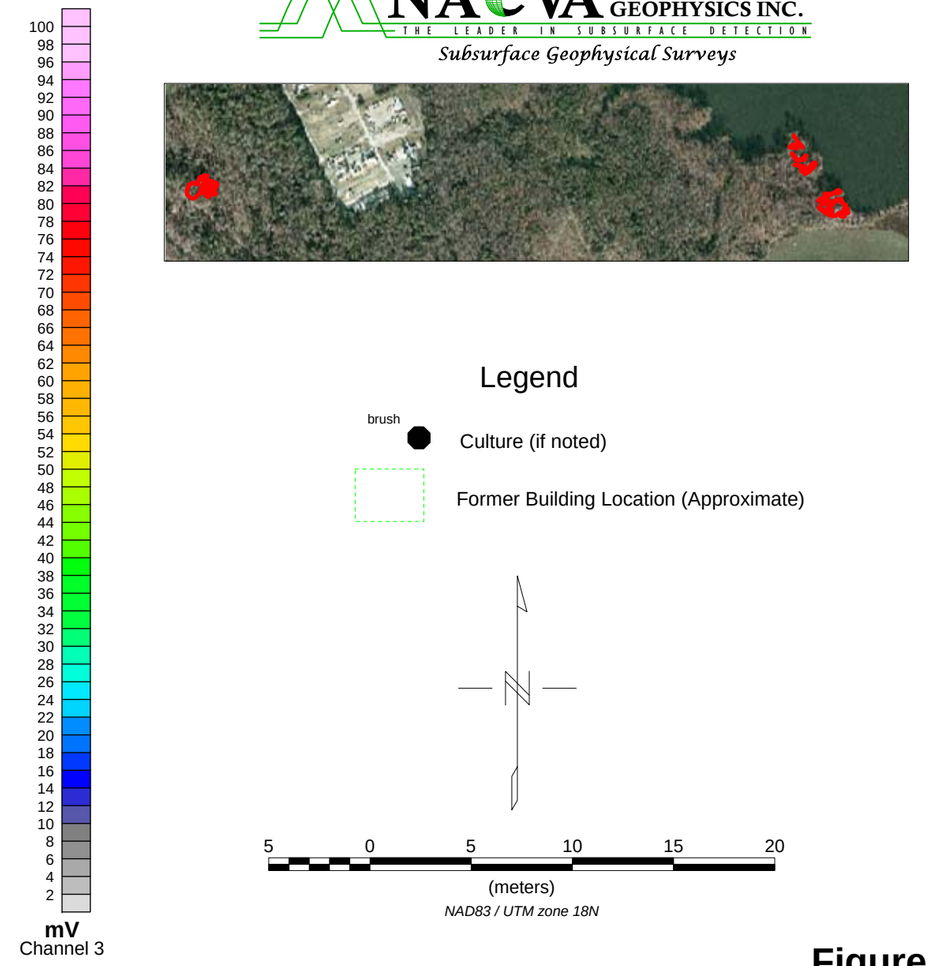
Figure 1

CH2M HILL

Overview of Digital Geophysical Mapping (DGM)
Naval Weapons Station Yorktown
Cheatham Annex, Virginia

Date of Survey: 04/01/2010





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THE LEADER IN SUBSURFACE DETECTION
Subsurface Geophysical Surveys

Legend

brush

Culture (if noted)

Former Building Location (Approximate)

5 0 5 10 15 20

(meters)

NAD83 / UTM zone 18N

Figure 8

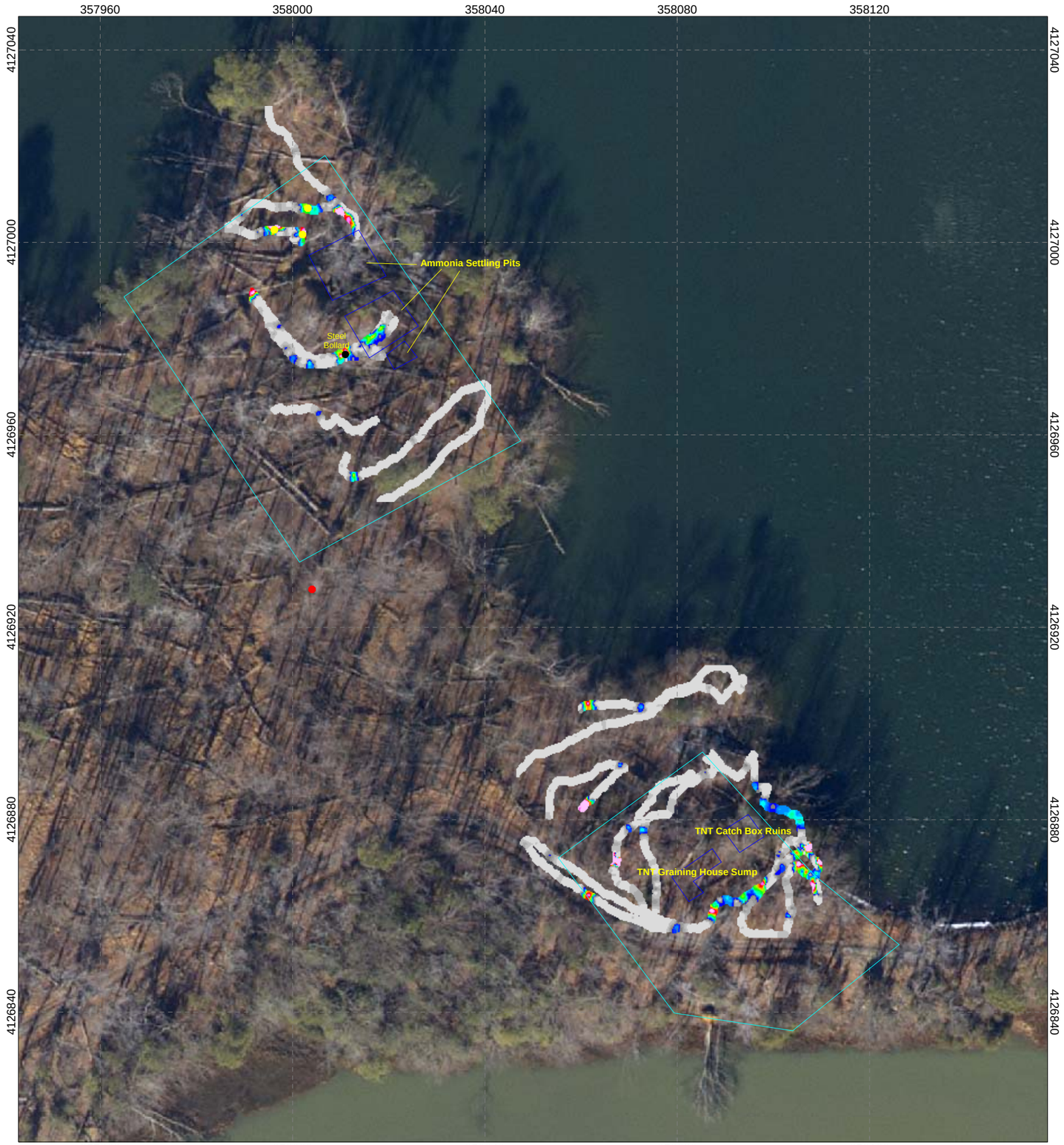
CH2M HILL

EM61 MK2 Bottom Coil
Former Booster Test Pit Building Area Mosaic
NWS Yorktown - Cheatham Annex, Virginia

Date of Creation 04/09/2010

Map Approver: Jon Guillard

NAEVA GEOPHYSICS INC.
THE LEADER IN SUBSURFACE DETECTION
Subsurface Geophysical Surveys



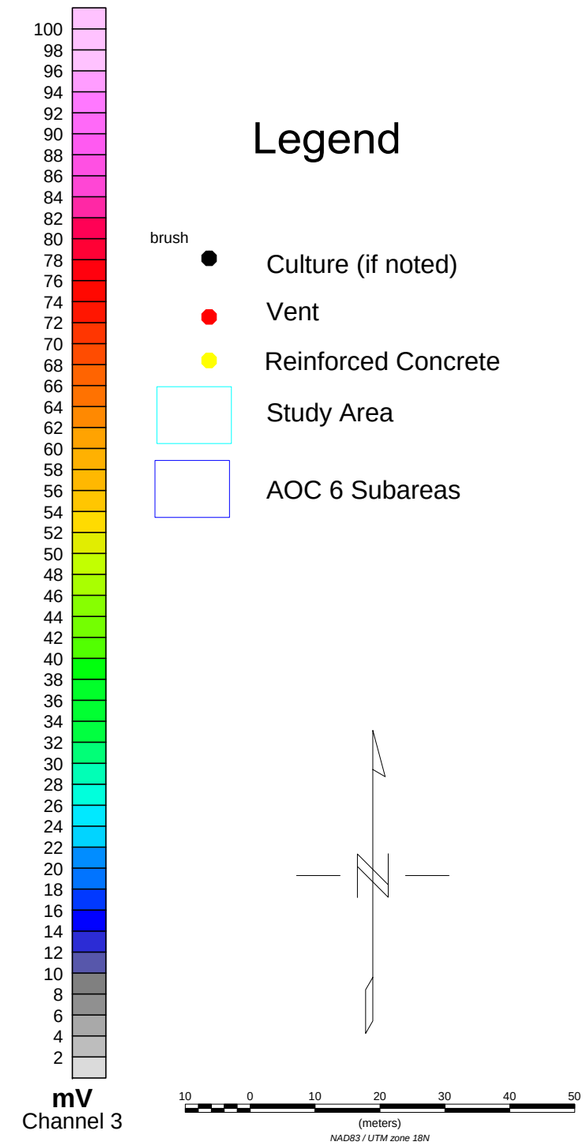


Figure 9

CH2M HILL
EM61 MK2 Bottom Coil AOC 6 Subareas: Ammonia Settling Pits, TNT Graining House Sump and TNT Catch Box Ruins Mosaic NWS Yorktown - Cheatham Annex, Virginia
Date of Creation 04/09/2010
Map Approver: Jon Guillard

Processed QC

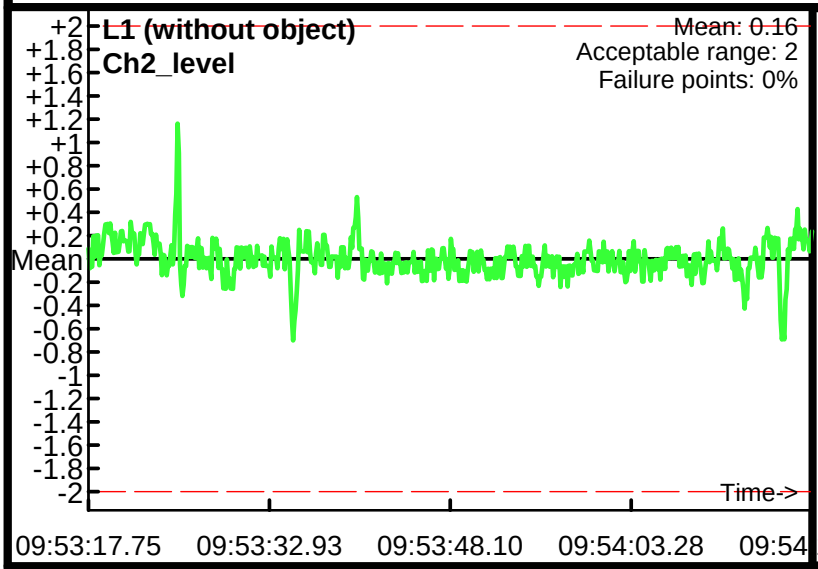
0401T-1_QC

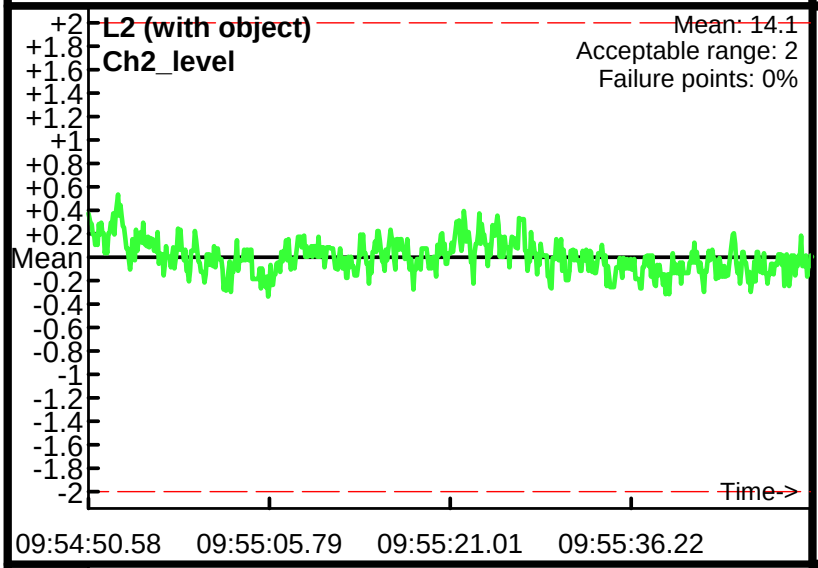
Static Calibration Test

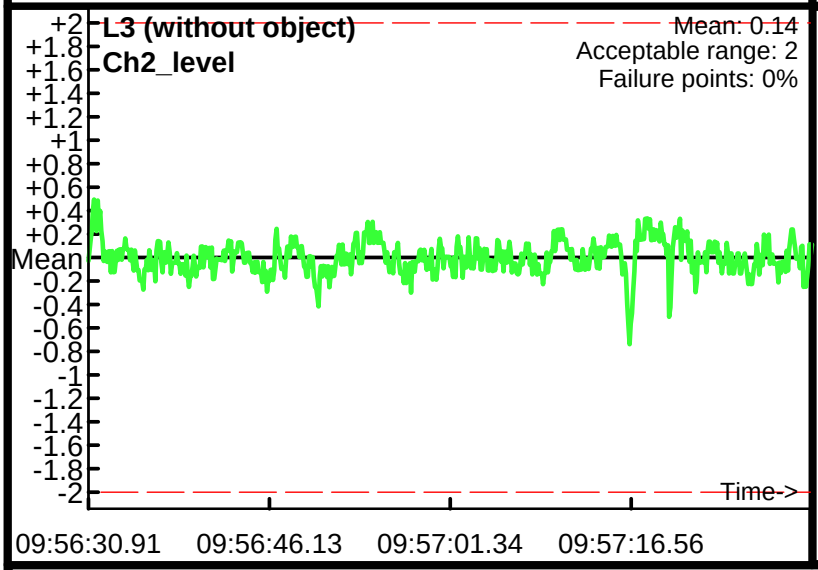
Project: NWS Yorktown - Cheatham Annex
Equipment: EM-61 Mark II
Grid/Location: 0401T-1

Outside range
Acceptable limits

AM test
Operator: GeoA
Date: 4/1/2010







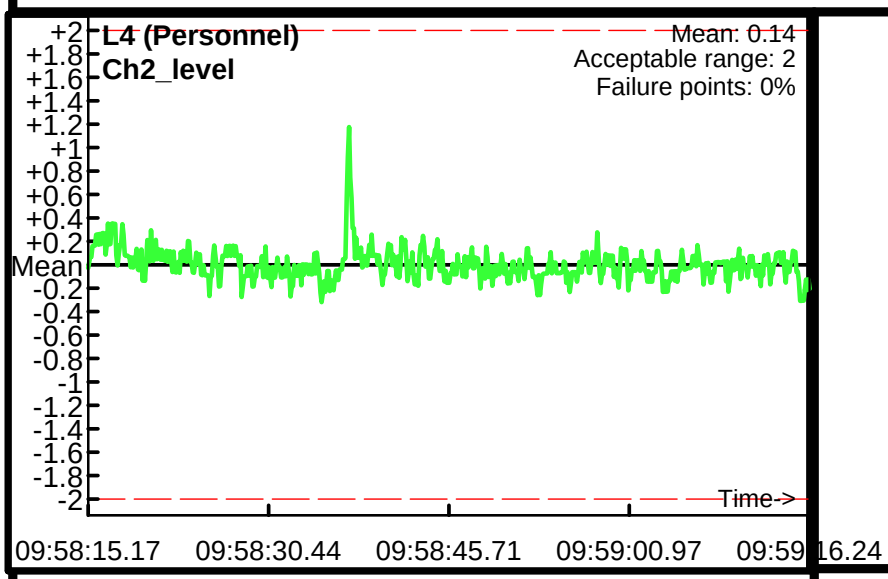
Database: q:\virginia office\ch2m hill\cheatham annex\Data\Geosoft\QC\0401QC\0401QC1.gdb
Line Name: L1 L2 L3

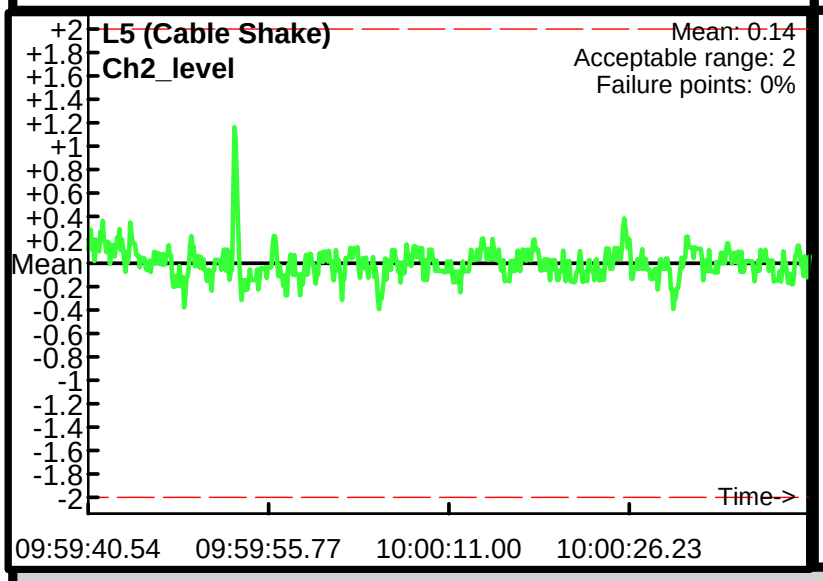
Personnel & Cable Shake Tests

Project: NWS Yorktown - Cheatham Annex
Equipment: EM-61 Mark II
Grid/Location: 0401T-1

Outside range
Acceptable limits

AM test
Operator: GeoA
Date: 4/1/2010





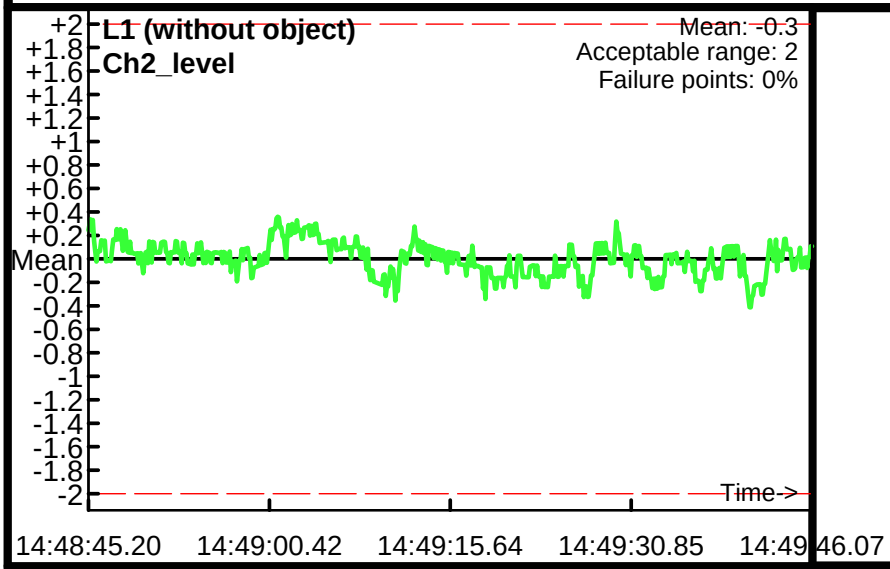
Database: q:\virginia office\ch2m hill\cheatham annex\Data\Geosoft\QC\0401QC\0401QC1.gdb
Line Name: L4 L5 L5

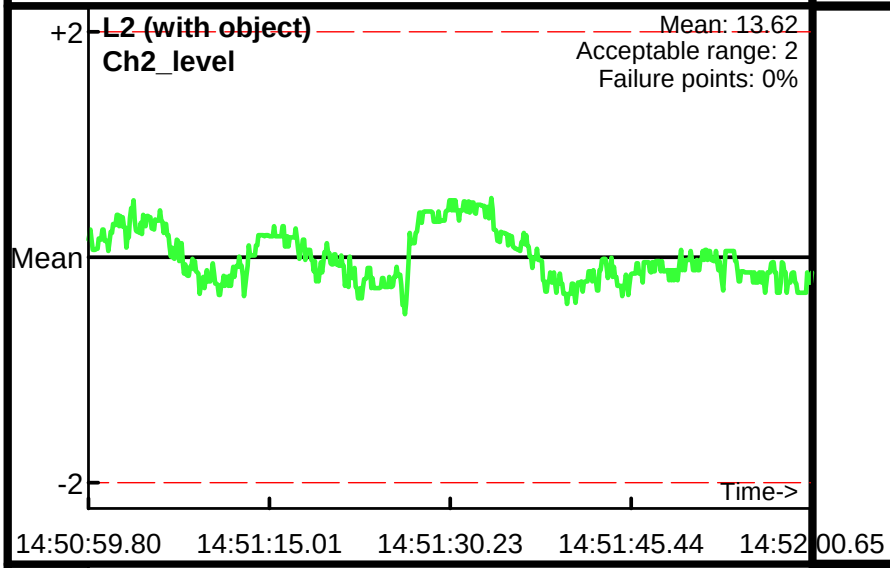
Static Calibration Test

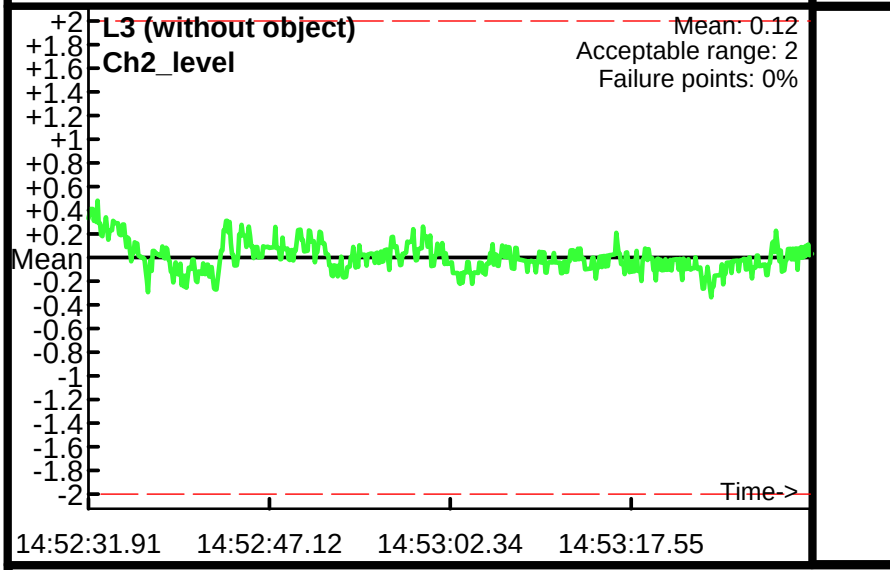
Project: NWS Yorktown - Cheatham Annex
Equipment: EM-61 Mark II
Grid/Location: 0401T-3

Outside range
Acceptable limits

PM test
Operator: GeoA
Date: 4/1/2010







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Line Name: L1 L2 L3

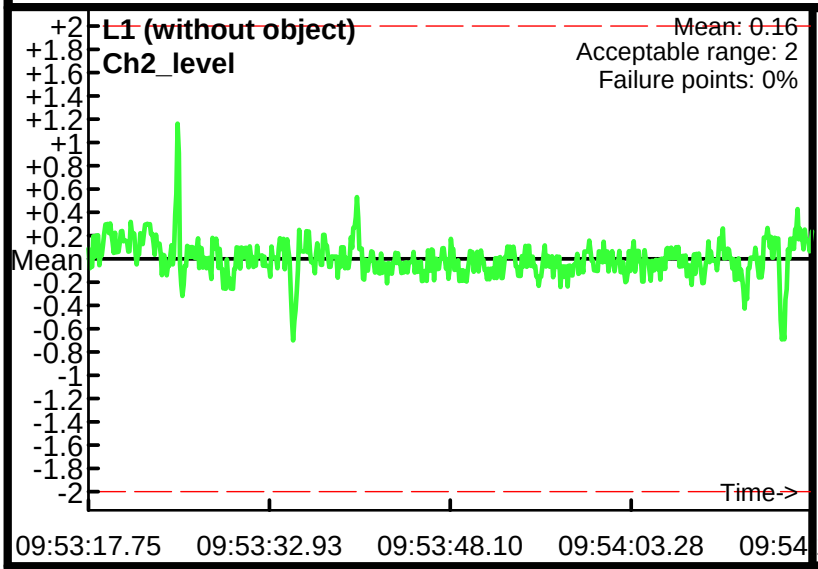
0401T-2_QC

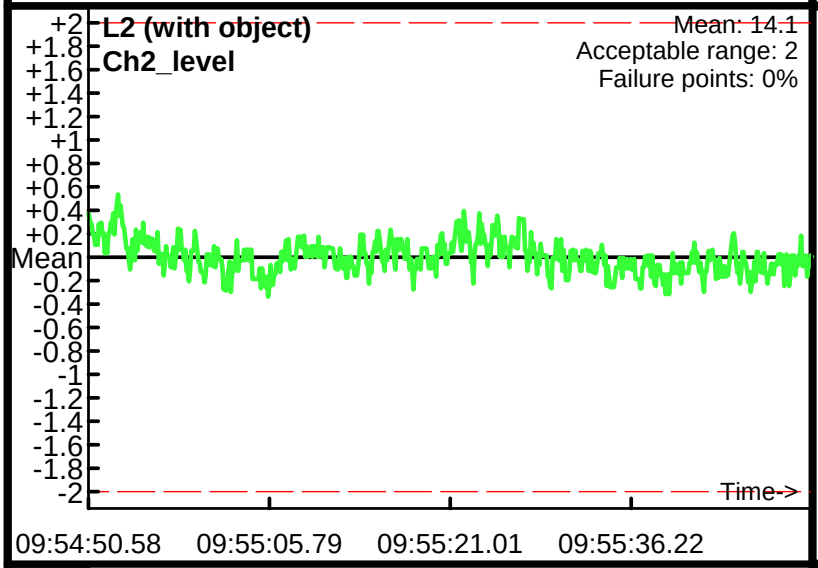
Static Calibration Test

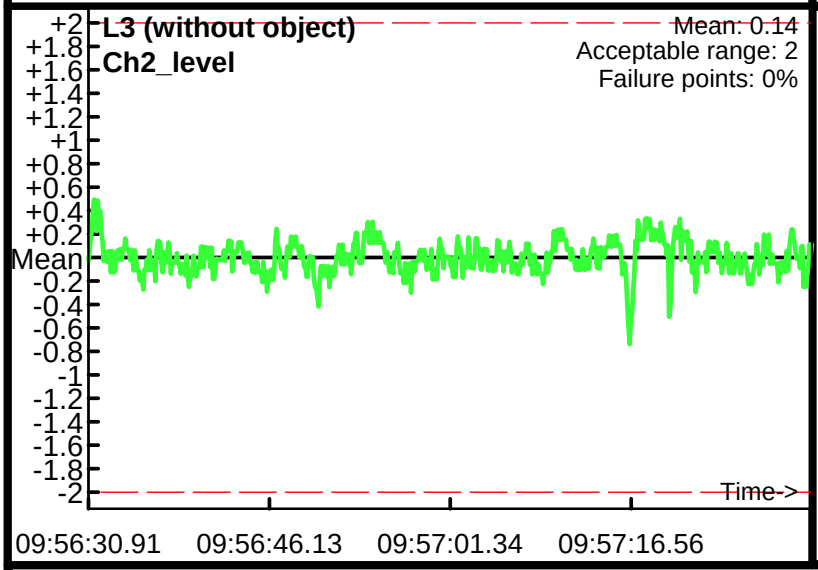
Project: NWS Yorktown - Cheatham Annex
Equipment: EM-61 Mark II
Grid/Location: 0401T-1

Outside range
Acceptable limits

AM test
Operator: GeoA
Date: 4/1/2010







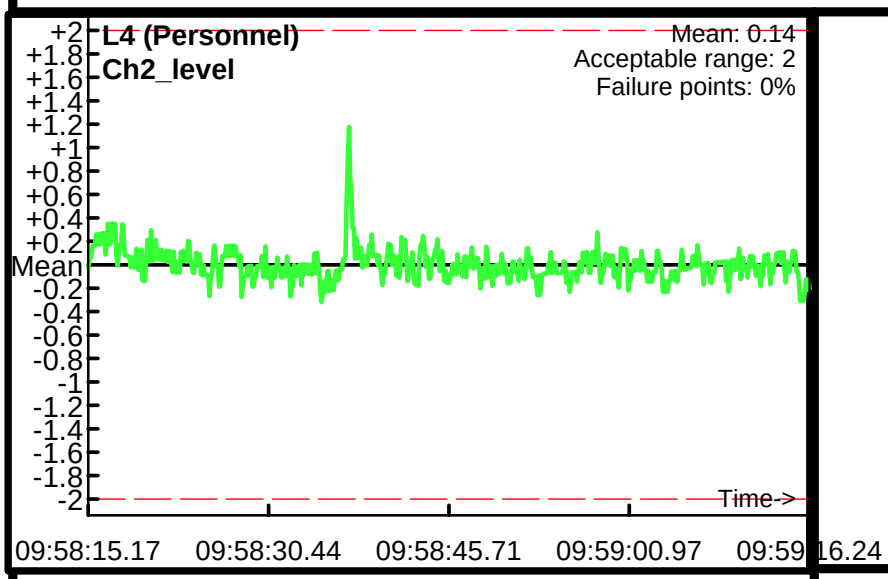
Database: q:\virginia office\ch2m hill\cheatham annex\Data\Geosoft\QC\0401QC\0401QC1.gdb
Line Name: L1 L2 L3

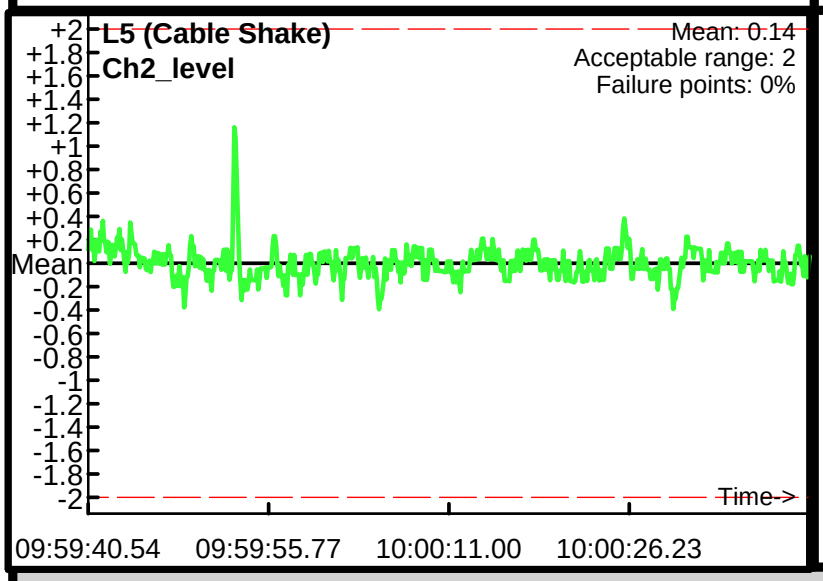
Personnel & Cable Shake Tests

Project: NWS Yorktown - Cheatham Annex
Equipment: EM-61 Mark II
Grid/Location: 0401T-1

Outside range
Acceptable limits

AM test
Operator: GeoA
Date: 4/1/2010





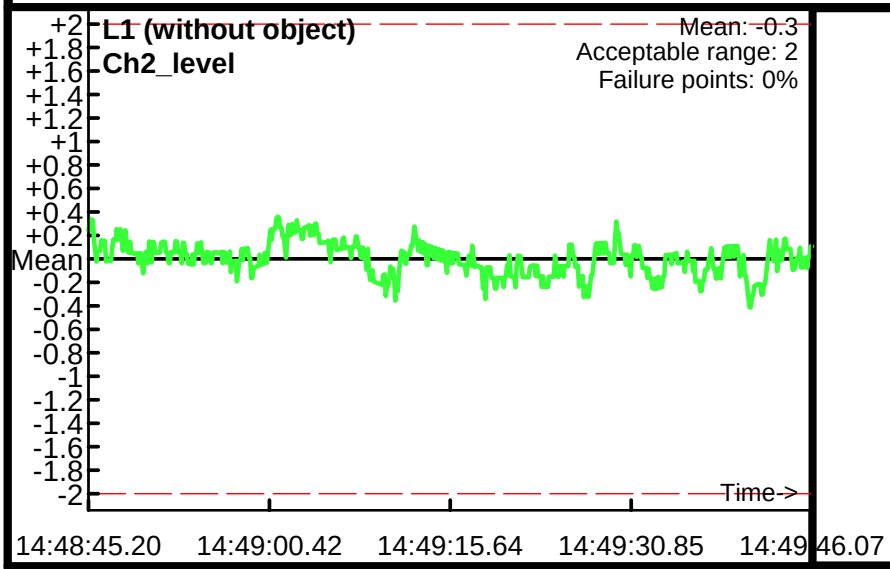
Database: q:\virginia office\ch2m hill\cheatham annex\Data\Geosoft\QC\0401QC\0401QC1.gdb
Line Name: L4 L5 L5

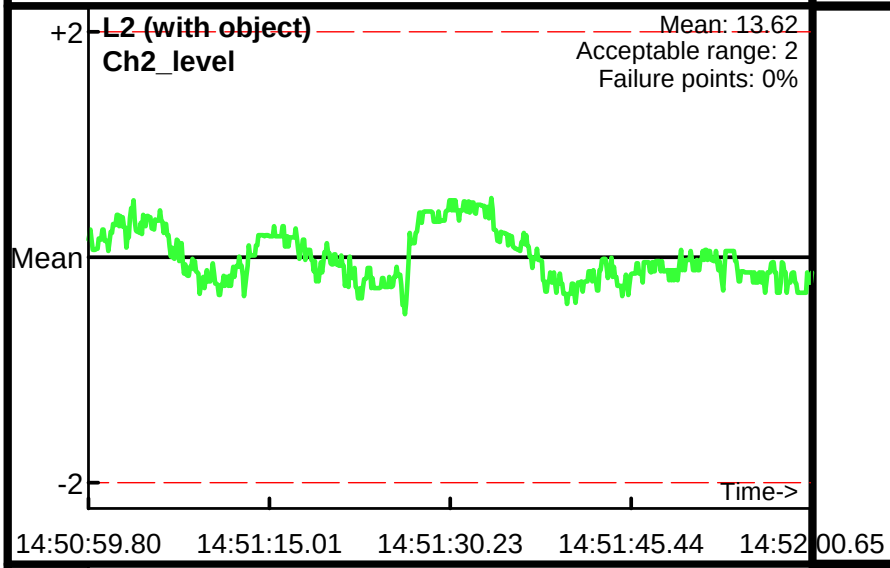
Static Calibration Test

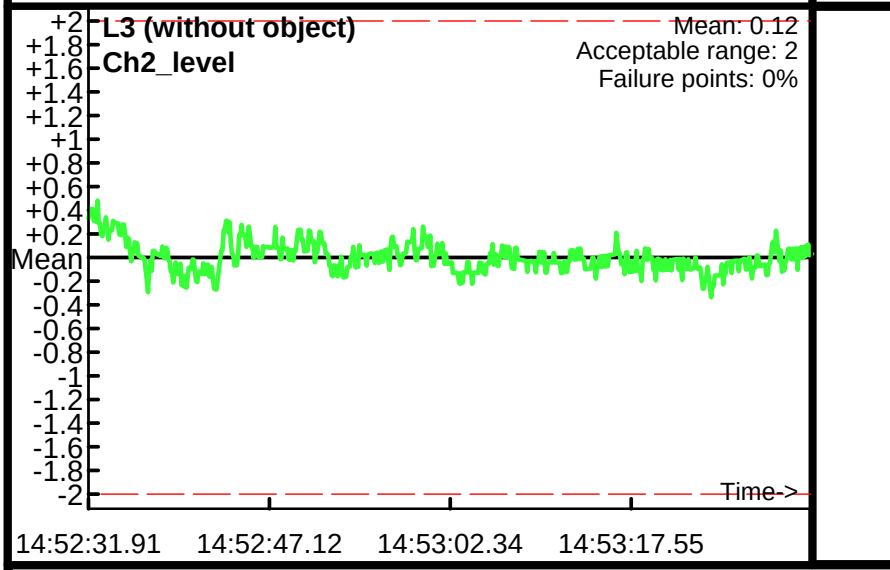
Project: NWS Yorktown - Cheatham Annex
Equipment: EM-61 Mark II
Grid/Location: 0401T-3

Outside range
Acceptable limits

PM test
Operator: GeoA
Date: 4/1/2010







Database: Q:\Virginia Office\CH2M HILL\Cheatham Annex\Data\Geosoft\QC\0401QC\0401QC2.gdb
Line Name: L1 L2 L3

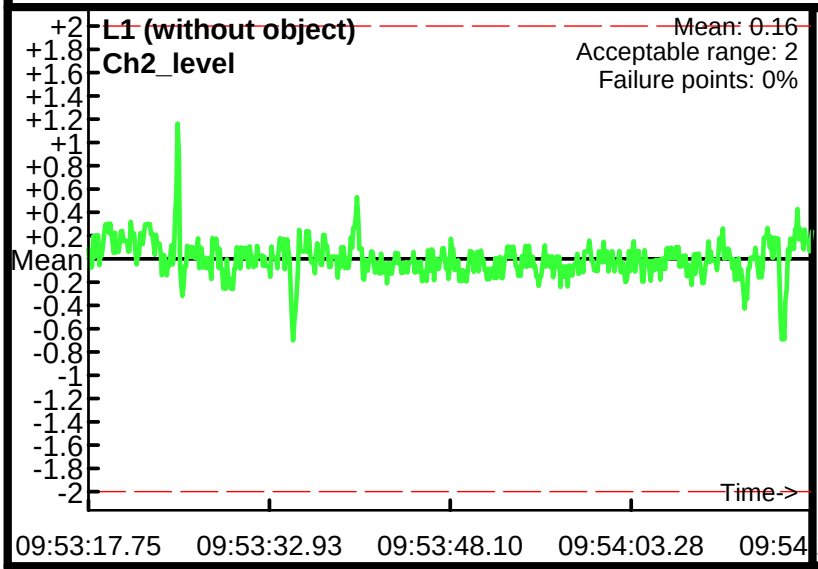
0401T-3_QC

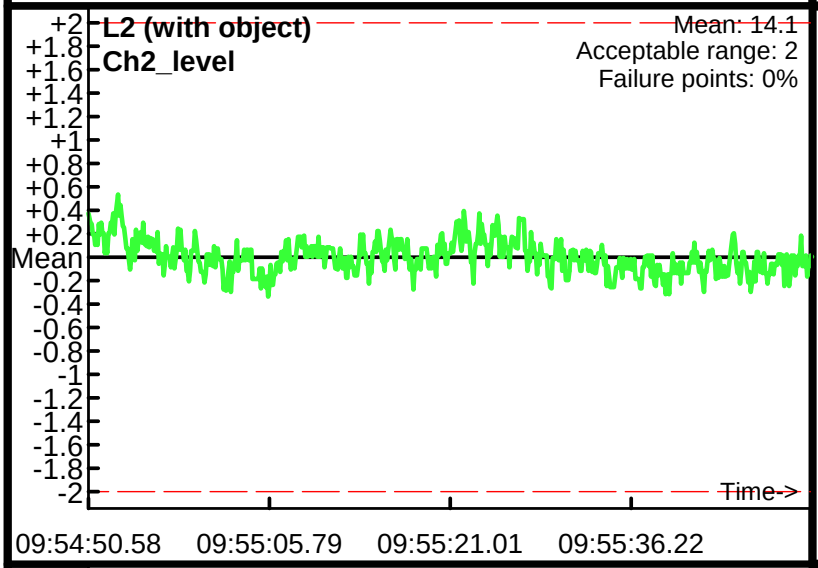
Static Calibration Test

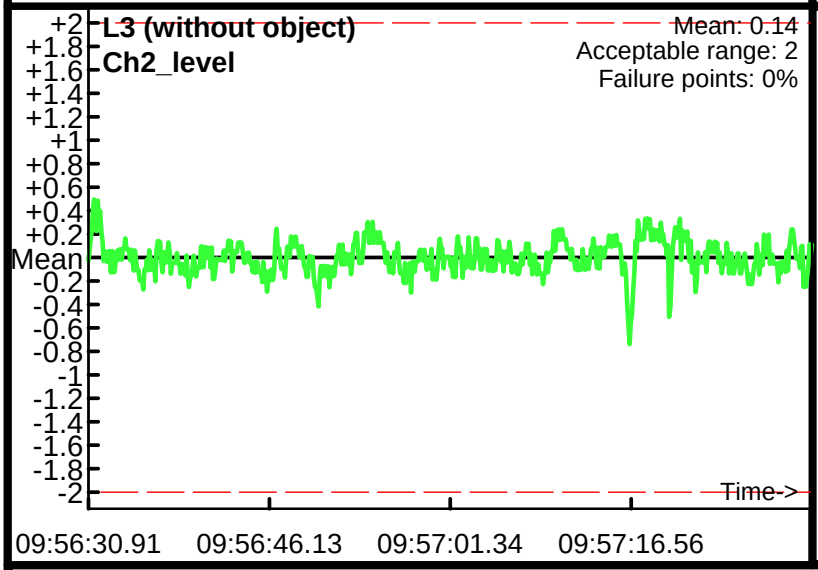
Project: NWS Yorktown - Cheatham Annex
Equipment: EM-61 Mark II
Grid/Location: 0401T-1

Outside range
Acceptable limits

AM test
Operator: GeoA
Date: 4/1/2010







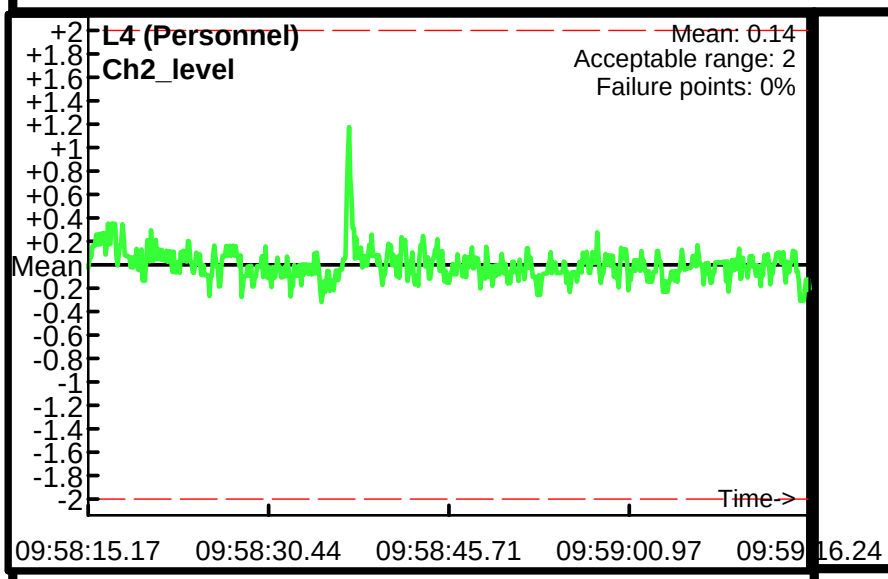
Database: q:\virginia office\ch2m hill\cheatham annex\Data\Geosoft\QC\0401QC\0401QC1.gdb
Line Name: L1 L2 L3

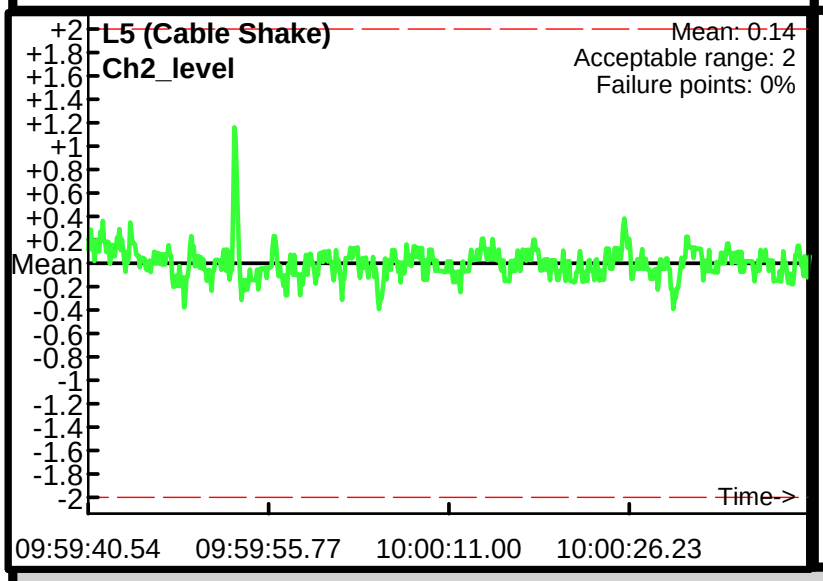
Personnel & Cable Shake Tests

Project: NWS Yorktown - Cheatham Annex
Equipment: EM-61 Mark II
Grid/Location: 0401T-1

Outside range
Acceptable limits

AM test
Operator: GeoA
Date: 4/1/2010





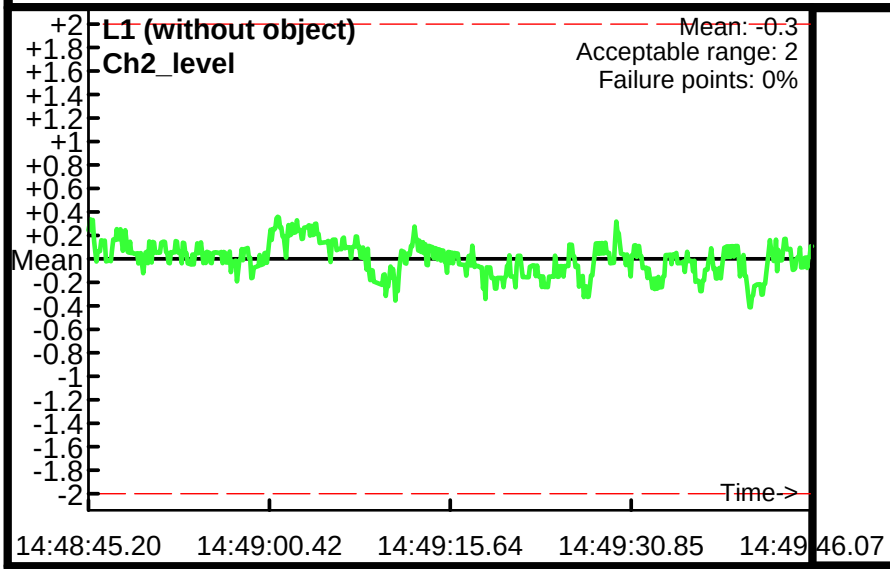
Database: q:\virginia office\ch2m hill\cheatham annex\Data\Geosoft\QC\0401QC\0401QC1.gdb
Line Name: L4 L5 L5

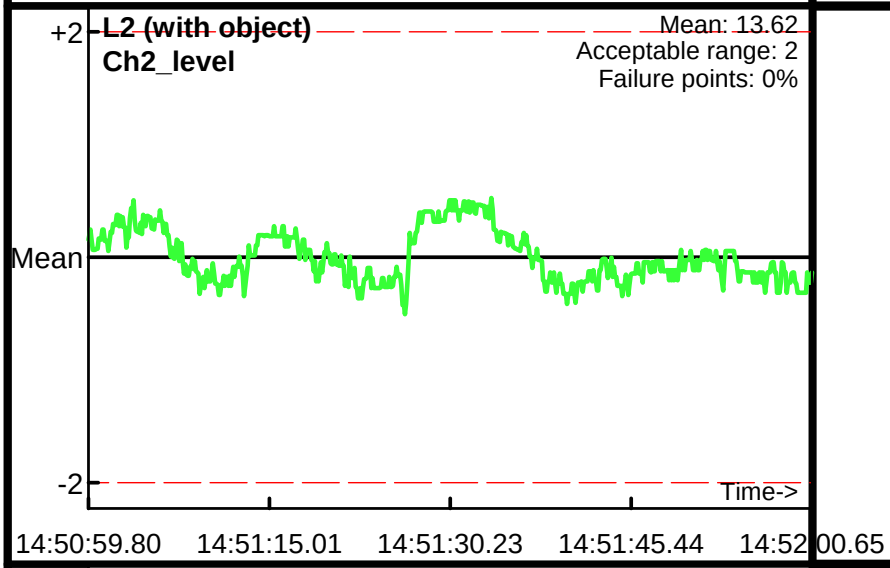
Static Calibration Test

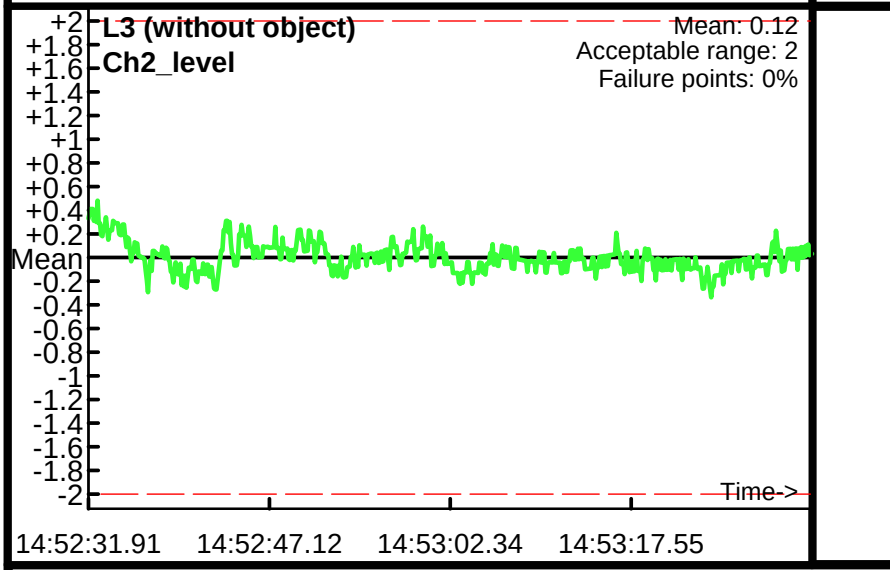
Project: NWS Yorktown - Cheatham Annex
Equipment: EM-61 Mark II
Grid/Location: 0401T-3

Outside range
Acceptable limits

PM test
Operator: GeoA
Date: 4/1/2010







Database: Q:\Virginia Office\CH2M HILL\Cheatham Annex\Data\Geosoft\QC\0401QC\0401QC2.gdb
Line Name: L1 L2 L3

Raw Data

040110

☐ QC checked by _____ Date: _____

Survey Area Report Form

☐ QA checked by _____ Date: _____

Project Name: _Cheatum Annex__ **Project Location:** Yorktown, Virginia

Geophysical Contractor: NAEVA Geophysics **Client POC:** CH2M HILL

Project Geophysicist: Tamir Klaff **Site Geophysicist:** Thanhan Nguyen & Megan Hoesly

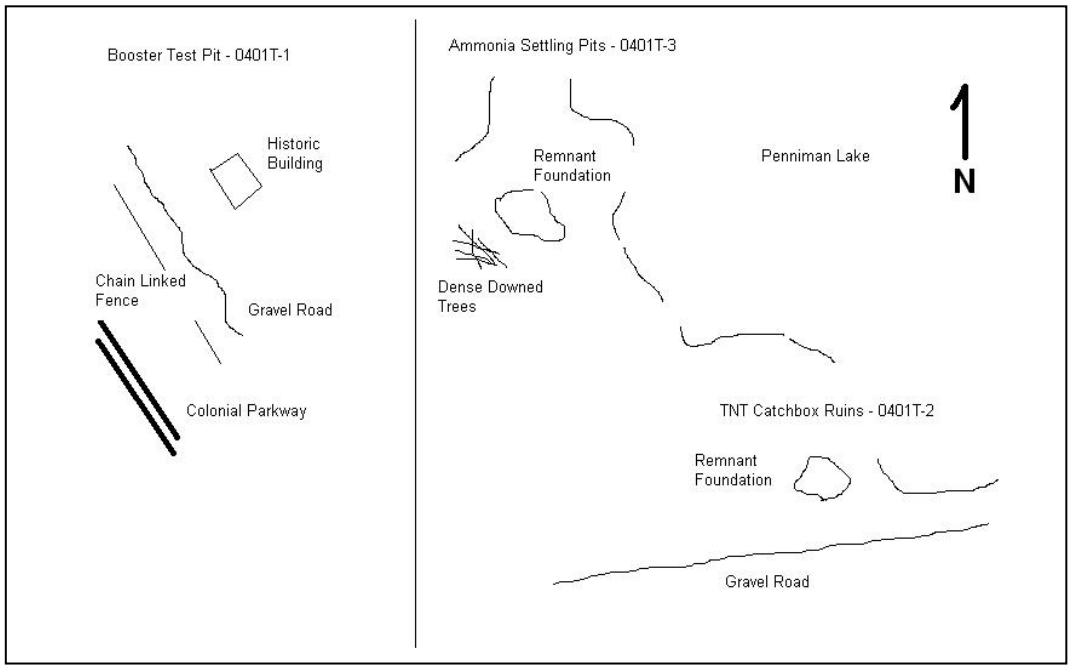
Survey Area ID: _____ **Date:** ____04/01/2010_____ **Field Team:** ___Geo A_____

Grids Covered in Dataset: _____

Survey Type: ☐Grid ☒Meandering Path ☐Transect ☐Other _____

Coordinate System: ☒UTM ☐State Plane NAD _____ ☐Local ☐Other _____ **Unit of Measure:** ☒ meters☐ feet

Sketch of Survey Area: **Approx. Scale:** _____ **North Arrow:**



_____

Terrain:
☐Level ☐Moderate Slope ☐Steep
☐Rolling ☒Ruts ☒Gullies
☐Rocky ☒Swampy ☐Dangerous

Tree Cover: **Tree Height:** ____
☐None ☐Light ☒Medium ☐Thick

Brush:
☐None ☐Light ☐Medium ☒Thick

Weather:
☒Sunny ☐Cloudy ☐Drizzle
☐Rain ☐Thunderstorms ☐Hot
☐Fog ☐Humid ☒Warm

	Start	End
Battery Voltage:	____12.6_	__12.45__
Static Background Value:	___0_____	____0____
Static Response Value start:	__14_____	____14____
Static Response Value end:	__14_____	___14____

Raw Data File Name: ___0401T-1, 0401T-2, 0401T-3_____

Repeat Data File Name: _____

Geophysical Instrumentation: EM61-MK2

Serial Number: _____0833_____

Start File Names: _____**0401QC1**_____ **Base Station:** _____

End File Names: _____**0401QC2**_____ **Serial Number:** _____

Navigation Method: _____Trimble GeoXH_____ **Serial Number:** _____4940438294_____

Instrument Warm-up At Least 15 min? ☒ **Instrument Position Relative to GPS Antenna Maintained (+/- 4 inches)?** ☒

Cable Shake During AM Static Test?☒ **Acceptable?**☒ **Personnel Test During AM Static Test?**☒ **Acceptable?**☒

Static Background and Static Response Test: AM? ☒ **Acceptable?** ☒ **PM?** ☒ **Acceptable?** ☒

Additional Comments: _____

_____

_____

_____

Date of Collection	4/1/2010
Team ID	GeoA
Team Members	Thanhan Nguyen & Megan Hoesly
Grids Collected	
Brief Summary	0800 Get pass and ID, 0830 Enter site, 0900 Safety Brief, 0915 instrument warm up/set up, 0930 QC test, 1000 Begin survey, 1200 Lunch, 1230 Resume survey, 1530 Debreif, 1545 Exit site
Work Delays	none
Lessons Learned	
Comments	Meandering transects with thick brush and deadfall obstructing much of the site.

0401PIPE	358010.4	4126973	5	pipe
0401CULVE	356714	4126899	5	culvert

Grid Block:	EM61Transects
Date:	4/1/2010
Team:	GeoA

Location:	**Booster test pit**
Files	**Comments**
0401T-1	
0401CULVERT	culvert noted under road, gps location shot in
0401BUILDING_CORNEF	gps location of building corner
0401BUILDING_CORNEF	gps location of building corner
0401BUILDING_CORNEF	gps location of building corner
0401BUILDING_CORNEF	gps location of building corner

Location:	**TNT Catch Box Ruins**
Files	**Comments**
0401T-2	

Location:	**Ammonia**
Files	**Comments**
0401T-3	
0401PIPE	gps location of pipe noted on surface

0401T-1

-76.616	37.27771	-20.569	-20.569	4/1/2010	14:28:20
-76.616	37.27771	-22.628	-22.628	4/1/2010	14:28:21
-76.616	37.27771	-22.62	-22.62	4/1/2010	14:28:22
-76.616	37.27771	-22.715	-22.715	4/1/2010	14:28:23
-76.616	37.27771	-22.593	-22.593	4/1/2010	14:28:24
-76.616	37.27771	-22.562	-22.562	4/1/2010	14:28:25
-76.616	37.27771	-22.538	-22.538	4/1/2010	14:28:26
-76.616	37.27771	-22.554	-22.554	4/1/2010	14:28:28
-76.616	37.27771	-22.41	-22.41	4/1/2010	14:28:29
-76.616	37.27774	-27.227	-27.227	4/1/2010	14:28:30
-76.616	37.27774	-27.366	-27.366	4/1/2010	14:28:31
-76.616	37.27774	-27.246	-27.246	4/1/2010	14:28:32
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-76.616	37.27774	-27.318	-27.318	4/1/2010	14:28:34
-76.616	37.27774	-27.202	-27.202	4/1/2010	14:28:35
-76.616	37.27774	-26.918	-26.918	4/1/2010	14:28:36
-76.616	37.27774	-26.746	-26.746	4/1/2010	14:28:37
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-76.616	37.27774	-26.418	-26.418	4/1/2010	14:28:39
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-76.616	37.27773	-26.048	-26.048	4/1/2010	14:28:42
-76.616	37.27773	-25.831	-25.831	4/1/2010	14:28:43
-76.616	37.27773	-25.726	-25.726	4/1/2010	14:28:44

-76.616	37.27773	-25.506	-25.506	4/1/2010	14:28:45
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-76.616	37.27774	-24.778	-24.778	4/1/2010	14:28:49
-76.616	37.27774	-24.71	-24.71	4/1/2010	14:28:50
-76.616	37.27774	-24.625	-24.625	4/1/2010	14:28:51
-76.616	37.27774	-24.579	-24.579	4/1/2010	14:28:52
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-76.616	37.27774	-23.789	-23.789	4/1/2010	14:28:57
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-76.6159	37.27779	-23.659	-23.659	4/1/2010	14:29:17
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-76.6159	37.2778	-23.927	-23.927	4/1/2010	14:29:19
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-76.6159	37.27783	-22.886	-22.886	4/1/2010	14:29:25
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-76.6159	37.27784	-22.64	-22.64	4/1/2010	14:29:27
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-76.6163	37.27778	-16.915	-16.915	4/1/2010	14:36:37
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-76.6163	37.27772	-13.901	-13.901	4/1/2010	14:36:49
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-76.6162	37.27762	-16.508	-16.508	4/1/2010	14:37:16
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-76.6156	37.27773	-20.923	-20.923	4/1/2010	14:40:39
-76.6156	37.27773	-18.629	-18.629	4/1/2010	14:40:40
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-76.6157	37.27783	-23.798	-23.798	4/1/2010	14:41:45
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-76.6156	37.2779	-18.392	-18.392	4/1/2010	14:50:59
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-76.6158	37.27769	-20.486	-20.486	4/1/2010	15:20:02
-76.6158	37.27769	-20.488	-20.488	4/1/2010	15:20:03
-76.6158	37.27769	-21.098	-21.098	4/1/2010	15:20:04
-76.6158	37.27769	-21.106	-21.106	4/1/2010	15:20:05
-76.6158	37.27769	-21.091	-21.091	4/1/2010	15:20:06
-76.6158	37.27769	-21.083	-21.083	4/1/2010	15:20:07
-76.6158	37.27769	-21.084	-21.084	4/1/2010	15:20:08
-76.6158	37.27771	-21.198	-21.198	4/1/2010	15:20:13
-76.6159	37.27773	-21.085	-21.085	4/1/2010	15:20:19
-76.6159	37.27773	-19.756	-19.756	4/1/2010	15:20:20
-76.6159	37.27774	-19.526	-19.526	4/1/2010	15:20:21
-76.6159	37.27774	-18.215	-18.215	4/1/2010	15:20:22
-76.6159	37.27775	-19.924	-19.924	4/1/2010	15:20:25
-76.6159	37.27777	-20.786	-20.786	4/1/2010	15:20:31
-76.6159	37.27777	-20.566	-20.566	4/1/2010	15:20:39
-76.6159	37.27777	-20.591	-20.591	4/1/2010	15:20:40
-76.6159	37.27777	-20.586	-20.586	4/1/2010	15:20:41
-76.6159	37.27777	-20.565	-20.565	4/1/2010	15:20:42
-76.6159	37.27777	-20.467	-20.467	4/1/2010	15:20:43
-76.6159	37.27777	-20.369	-20.369	4/1/2010	15:20:44
-76.6159	37.27777	-20.293	-20.293	4/1/2010	15:20:45
-76.6159	37.27777	-20.262	-20.262	4/1/2010	15:20:46
-76.6159	37.27777	-20.236	-20.236	4/1/2010	15:20:47

-76.6159	37.27777	-20.164	-20.164	4/1/2010	15:20:48
-76.6159	37.27777	-20.035	-20.035	4/1/2010	15:20:49
-76.6159	37.27777	-19.948	-19.948	4/1/2010	15:20:50
-76.6159	37.27778	-19.815	-19.815	4/1/2010	15:20:51
-76.6159	37.27778	-19.705	-19.705	4/1/2010	15:20:52
-76.6159	37.27778	-19.691	-19.691	4/1/2010	15:20:53
-76.6159	37.27778	-19.593	-19.593	4/1/2010	15:20:54
-76.6159	37.27778	-19.521	-19.521	4/1/2010	15:20:55
-76.6159	37.27778	-19.445	-19.445	4/1/2010	15:20:56
-76.6159	37.27778	-19.398	-19.398	4/1/2010	15:20:57
-76.6159	37.2778	-16.899	-16.899	4/1/2010	15:20:58
-76.6159	37.2778	-16.815	-16.815	4/1/2010	15:20:59
-76.6159	37.2778	-16.731	-16.731	4/1/2010	15:21:00
-76.6159	37.2778	-16.619	-16.619	4/1/2010	15:21:01
-76.6159	37.27778	-19.185	-19.185	4/1/2010	15:21:02
-76.6159	37.27778	-19.173	-19.173	4/1/2010	15:21:03
-76.6159	37.27778	-19.185	-19.185	4/1/2010	15:21:04
-76.6159	37.2778	-15.754	-15.754	4/1/2010	15:21:05
-76.6159	37.2778	-15.707	-15.707	4/1/2010	15:21:06
-76.6159	37.27783	-13.408	-13.408	4/1/2010	15:21:07
-76.6159	37.27783	-13.55	-13.55	4/1/2010	15:21:08
-76.6159	37.27783	-13.688	-13.688	4/1/2010	15:21:09
-76.6159	37.27783	-13.834	-13.834	4/1/2010	15:21:10

-76.6159	37.27782	-14.022	-14.022	4/1/2010	15:21:11
-76.6159	37.27782	-14.154	-14.154	4/1/2010	15:21:12
-76.6159	37.27782	-14.294	-14.294	4/1/2010	15:21:13
-76.6159	37.27782	-14.963	-14.963	4/1/2010	15:21:14
-76.6159	37.27782	-14.904	-14.904	4/1/2010	15:21:15
-76.6159	37.27782	-14.964	-14.964	4/1/2010	15:21:16
-76.6159	37.27778	-19.876	-19.876	4/1/2010	15:21:17
-76.6159	37.27778	-19.838	-19.838	4/1/2010	15:21:18
-76.6159	37.27778	-19.836	-19.836	4/1/2010	15:21:19
-76.6159	37.27778	-19.802	-19.802	4/1/2010	15:21:20
-76.6159	37.27778	-19.768	-19.768	4/1/2010	15:21:21
-76.6159	37.27785	-8.994	-8.994	4/1/2010	15:21:22
-76.6159	37.27785	-8.939	-8.939	4/1/2010	15:21:23
-76.6159	37.27785	-8.904	-8.904	4/1/2010	15:21:24
-76.6159	37.27785	-8.926	-8.926	4/1/2010	15:21:25
-76.6159	37.27785	-8.965	-8.965	4/1/2010	15:21:26
-76.6159	37.27778	-19.595	-19.595	4/1/2010	15:21:27
-76.6159	37.27778	-19.56	-19.56	4/1/2010	15:21:28
-76.6159	37.27778	-19.548	-19.548	4/1/2010	15:21:29
-76.6159	37.27778	-19.545	-19.545	4/1/2010	15:21:30
-76.6159	37.27778	-19.541	-19.541	4/1/2010	15:21:31
-76.6159	37.27778	-19.538	-19.538	4/1/2010	15:21:32
-76.6159	37.27778	-19.524	-19.524	4/1/2010	15:21:33
-76.6159	37.27778	-19.319	-19.319	4/1/2010	15:22:01

-76.6159	37.27778	-19.264	-19.264	4/1/2010	15:22:02
-76.6159	37.27778	-19.216	-19.216	4/1/2010	15:22:03
-76.6159	37.27778	-19.125	-19.125	4/1/2010	15:22:04

76.61597	37.27773	28:28.0	28:01.8	Differentia	2	28:01.8
76.61597	37.27773	28:29.0	28:02.8	Differentia	2	28:02.8
76.61597	37.27773	28:30.0	28:03.8	Differentia	2	28:03.8
76.61596	37.27773	28:31.0	28:04.8	Differentia	2	28:04.8
76.61596	37.27774	28:32.0	28:05.8	Raw (GPS)	2	28:05.8
76.61595	37.27775	28:33.0	28:06.8	Raw (GPS)	2	28:06.8
76.61596	37.27774	28:34.0	28:07.8	Differentia	2	28:07.8
76.61596	37.27774	28:35.0	28:08.8	Differentia	2	28:08.8
76.61596	37.27774	28:36.0	28:09.8	Differentia	2	28:09.8
76.61596	37.27774	28:37.0	28:10.8	Differentia	2	28:10.8
76.61596	37.27774	28:38.0	28:11.8	Differentia	2	28:11.8
76.61596	37.27774	28:39.0	28:12.8	Differentia	2	28:12.8
76.61596	37.27774	28:40.0	28:13.8	Differentia	2	28:13.8
76.61596	37.27774	28:41.0	28:14.8	Differentia	2	28:14.8
76.61596	37.27774	28:42.0	28:15.8	Differentia	2	28:15.8
76.61596	37.27774	28:43.0	28:16.8	Differentia	2	28:16.8
76.61596	37.27774	28:44.0	28:17.8	Differentia	2	28:17.8
76.61596	37.27774	28:45.0	28:18.8	Differentia	2	28:18.8
76.61596	37.27774	28:46.0	28:19.8	Differentia	2	28:19.8
76.61596	37.27774	28:47.0	28:20.8	Differentia	2	28:20.8
76.61596	37.27774	28:48.0	28:21.8	Differentia	2	28:21.8
76.61596	37.27774	28:49.0	28:22.8	Differentia	2	28:22.8
76.61596	37.27775	28:50.0	28:23.8	Differentia	2	28:23.8
76.61596	37.27775	28:51.0	28:24.8	Differentia	2	28:24.8
76.61596	37.27776	28:52.0	28:25.8	Differentia	2	28:25.8
76.61596	37.27776	28:53.0	28:26.8	Differentia	2	28:26.8
76.61595	37.27777	28:54.0	28:27.8	Raw (GPS)	2	28:27.8
76.61595	37.27778	28:55.0	28:28.8	Raw (GPS)	2	28:28.8
76.61595	37.27778	28:56.0	28:29.8	Raw (GPS)	2	28:29.8
76.61594	37.27778	28:57.0	28:30.8	Raw (GPS)	2	28:30.8
76.61595	37.27778	28:58.0	28:31.8	Differentia	2	28:31.8
76.61595	37.27778	28:59.0	28:32.8	Differentia	2	28:32.8
76.61595	37.27778	29:00.0	28:33.8	Differentia	2	28:33.8
76.61595	37.27779	29:01.0	28:34.8	Differentia	2	28:34.8
76.61595	37.27779	29:02.0	28:35.8	Differentia	2	28:35.8
76.61594	37.2778	29:03.0	28:36.8	Differentia	2	28:36.8
76.61594	37.2778	29:04.0	28:37.8	Differentia	2	28:37.8
76.61595	37.27781	29:05.0	28:38.8	Differentia	2	28:38.8
76.61594	37.27781	29:06.0	28:39.8	Differentia	2	28:39.8
76.61594	37.27782	29:07.0	28:40.8	Raw (GPS)	2	28:40.8
76.61594	37.27783	29:08.0	28:41.8	Raw (GPS)	2	28:41.8
76.61593	37.27783	29:09.0	28:42.8	Raw (GPS)	2	28:42.8
76.61593	37.27783	29:10.0	28:43.8	Differentia	2	28:43.8
76.61593	37.27784	29:11.0	28:44.8	Differentia	2	28:44.8
76.61593	37.27784	29:12.0	28:45.8	Differentia	2	28:45.8
76.61593	37.27785	29:13.0	28:46.8	Raw (GPS)	2	28:46.8
76.61593	37.27785	29:14.0	28:47.8	Raw (GPS)	2	28:47.8

76.61592	37.27786	29:15.0	28:48.8	Raw (GPS)	2.3	28:48.8
76.61593	37.27786	29:16.0	28:49.8	Differentia	2.3	28:49.8
76.61592	37.27786	29:17.0	28:50.8	Differentia	2.3	28:50.8
76.61592	37.27786	29:18.0	28:51.8	Differentia	1.3	28:51.8
76.61592	37.27786	29:19.0	28:52.8	Differentia	1.4	28:52.8
76.61592	37.27786	29:20.0	28:53.8	Differentia	1.5	28:53.8
76.61591	37.27787	29:22.0	28:55.8	Differentia	1.5	28:55.8
76.61591	37.27788	29:23.0	28:56.8	Raw (GPS)	2.4	28:56.8
76.6159	37.27789	29:27.0	29:00.8	Raw (GPS)	2.3	29:00.8
76.6159	37.27789	29:29.0	29:02.8	Differentia	2.3	29:02.8
76.6159	37.27789	29:30.0	29:03.8	Differentia	2.3	29:03.8
76.6159	37.27789	29:31.0	29:04.8	Differentia	2.3	29:04.8
76.61589	37.2779	29:32.0	29:05.8	Differentia	1.7	29:05.8
76.61589	37.27791	29:33.0	29:06.8	Raw (GPS)	2.3	29:06.8
76.61589	37.27791	29:34.0	29:07.8	Differentia	2.3	29:07.8
76.61589	37.27791	29:35.0	29:08.8	Differentia	2.3	29:08.8
76.61588	37.27792	29:36.0	29:09.8	Raw (GPS)	2.3	29:09.8
76.61587	37.27793	29:37.0	29:10.8	Raw (GPS)	1.4	29:10.8
76.61588	37.27793	29:38.0	29:11.8	Raw (GPS)	2.4	29:11.8
76.61587	37.27793	29:39.0	29:12.8	Raw (GPS)	2.4	29:12.8
76.61587	37.27794	29:41.0	29:14.8	Raw (GPS)	2.4	29:14.8
76.61586	37.27795	29:42.0	29:15.8	Raw (GPS)	2.4	29:15.8
76.61586	37.27795	29:43.0	29:16.8	Raw (GPS)	2.4	29:16.8
76.61586	37.27796	29:44.0	29:17.8	Raw (GPS)	1.5	29:17.8
76.61585	37.27796	29:45.0	29:18.8	Raw (GPS)	2	29:18.8
76.61585	37.27796	29:46.0	29:19.8	Differentia	2	29:19.8
76.61586	37.27796	29:47.0	29:20.8	Differentia	1.4	29:20.8
76.61585	37.27796	29:48.0	29:21.8	Differentia	1.4	29:21.8
76.61585	37.27797	29:49.0	29:22.8	Differentia	1.5	29:22.8
76.61585	37.27797	29:50.0	29:23.8	Differentia	1.5	29:23.8
76.61585	37.27797	29:51.0	29:24.8	Differentia	1.3	29:24.8
76.61586	37.27798	29:52.0	29:25.8	Differentia	1.4	29:25.8
76.61585	37.27798	29:53.0	29:26.8	Differentia	1.4	29:26.8
76.61585	37.27799	29:54.0	29:27.8	Raw (GPS)	1.7	29:27.8
76.61585	37.27799	29:55.0	29:28.8	Raw (GPS)	1.4	29:28.8
76.61584	37.278	29:56.0	29:29.8	Raw (GPS)	1.5	29:29.8
76.61584	37.278	29:57.0	29:30.8	Raw (GPS)	1.4	29:30.8
76.61583	37.278	29:58.0	29:31.8	Differentia	1.3	29:31.8
76.61583	37.278	29:59.0	29:32.8	Differentia	1.3	29:32.8
76.61583	37.278	30:00.0	29:33.8	Differentia	1.4	29:33.8
76.61583	37.27801	30:01.0	29:34.8	Differentia	1.4	29:34.8
76.61583	37.27801	30:02.0	29:35.8	Differentia	1.3	29:35.8
76.61583	37.27801	30:03.0	29:36.8	Differentia	1.3	29:36.8
76.61582	37.27802	30:04.0	29:37.8	Differentia	1.4	29:37.8
76.61582	37.27802	30:05.0	29:38.8	Differentia	1.4	29:38.8
76.61581	37.27803	30:06.0	29:39.8	Differentia	2.4	29:39.8
76.61582	37.27803	30:07.0	29:40.8	Differentia	1.3	29:40.8

76.61581	37.27804	30:08.0	29:41.8	Differentia	1.3	29:41.8
76.61581	37.27804	30:09.0	29:42.8	Differentia	1.3	29:42.8
76.61581	37.27804	30:10.0	29:43.8	Differentia	1.3	29:43.8
76.61581	37.27805	30:11.0	29:44.8	Differentia	1.4	29:44.8
76.6158	37.27805	30:12.0	29:45.8	Differentia	2	29:45.8
76.6158	37.27805	30:13.0	29:46.8	Differentia	2	29:46.8
76.6158	37.27806	30:14.0	29:47.8	Differentia	1.3	29:47.8
76.6158	37.27806	30:15.0	29:48.8	Differentia	1.3	29:48.8
76.6158	37.27806	30:16.0	29:49.8	Differentia	1.3	29:49.8
76.6158	37.27806	30:17.0	29:50.8	Differentia	1.3	29:50.8
76.6158	37.27805	31:32.0	31:05.6	Differentia	1.7	31:05.6
76.6158	37.27805	31:33.0	31:06.6	Differentia	1.7	31:06.6
76.6158	37.27805	31:34.0	31:07.6	Differentia	1.7	31:07.6
76.6158	37.27805	31:35.0	31:08.6	Differentia	1.7	31:08.6
76.61581	37.27806	31:36.0	31:09.6	Differentia	2.3	31:09.6
76.61582	37.27805	31:37.0	31:10.6	Differentia	2.3	31:10.6
76.61582	37.27805	31:38.0	31:11.6	Differentia	1.7	31:11.6
76.61582	37.27805	31:39.0	31:12.6	Raw (GPS)	1.7	31:12.6
76.61583	37.27804	31:40.0	31:13.6	Differentia	2	31:13.6
76.61583	37.27804	31:41.0	31:14.6	Differentia	1.4	31:14.6
76.61583	37.27804	31:42.0	31:15.6	Differentia	1.4	31:15.6
76.61584	37.27804	31:43.0	31:16.6	Differentia	1.3	31:16.6
76.61584	37.27804	31:44.0	31:17.6	Differentia	1.3	31:17.6
76.61584	37.27805	31:45.0	31:18.8	Differentia	1.3	31:18.8
76.61585	37.27805	31:46.0	31:19.6	Differentia	1.3	31:19.6
76.61585	37.27805	31:47.0	31:20.6	Differentia	1.3	31:20.6
76.61585	37.27805	31:48.0	31:21.6	Differentia	1.3	31:21.6
76.61586	37.27805	31:49.0	31:22.6	Differentia	1.3	31:22.6
76.61586	37.27806	31:50.0	31:23.7	Raw (GPS)	1.3	31:23.7
76.61585	37.27806	31:51.0	31:24.6	Raw (GPS)	1.5	31:24.6
76.61586	37.27806	31:52.0	31:25.6	Differentia	1.4	31:25.6
76.61586	37.27806	31:53.0	31:26.6	Differentia	1.3	31:26.6
76.61587	37.27806	31:54.0	31:27.6	Differentia	1.5	31:27.6
76.61587	37.27806	31:55.0	31:28.7	Differentia	1.5	31:28.7
76.61587	37.27806	31:56.0	31:29.6	Differentia	1.3	31:29.6
76.61587	37.27806	31:57.0	31:30.6	Differentia	1.3	31:30.6
76.61587	37.27806	31:58.0	31:31.6	Differentia	1.3	31:31.6
76.61587	37.27806	31:59.0	31:32.6	Differentia	1.3	31:32.6
76.61588	37.27806	32:17.0	31:50.6	Differentia	1.4	31:50.6
76.61589	37.27806	32:18.0	31:51.6	Differentia	1.4	31:51.6
76.61589	37.27806	32:19.0	31:52.6	Differentia	1.4	31:52.6
76.6159	37.27806	32:20.0	31:53.7	Differentia	1.4	31:53.7
76.61591	37.27805	32:21.0	31:54.6	Differentia	1.4	31:54.6
76.61591	37.27805	32:22.0	31:55.6	Differentia	1.4	31:55.6
76.61591	37.27804	32:23.0	31:56.6	Differentia	1.4	31:56.6
76.61592	37.27804	32:24.0	31:57.6	Raw (GPS)	1.4	31:57.6
76.61592	37.27803	32:25.0	31:58.7	Raw (GPS)	1.7	31:58.7

76.61593	37.27804	32:26.0	31:59.6	Raw (GPS)	1.4	31:59.6
76.61593	37.27803	32:27.0	32:00.6	Raw (GPS)	1.4	32:00.6
76.61593	37.27801	32:28.0	32:01.6	Differentia	1.7	32:01.6
76.61594	37.27801	32:29.0	32:02.6	Differentia	1.4	32:02.6
76.61595	37.27801	32:30.0	32:03.7	Raw (GPS)	2	32:03.7
76.61595	37.27801	32:31.0	32:04.6	Raw (GPS)	2	32:04.6
76.61595	37.278	32:32.0	32:05.6	Raw (GPS)	2	32:05.6
76.61595	37.278	32:33.0	32:06.6	Raw (GPS)	1.4	32:06.6
76.61595	37.27799	32:34.0	32:07.6	Differentia	1.4	32:07.6
76.61596	37.27798	32:35.0	32:08.7	Differentia	1.4	32:08.7
76.61597	37.27799	32:36.0	32:09.6	Raw (GPS)	2	32:09.6
76.61597	37.27798	32:37.0	32:10.6	Raw (GPS)	2.3	32:10.6
76.61597	37.27797	32:38.0	32:11.6	Raw (GPS)	1.7	32:11.6
76.61598	37.27797	32:39.0	32:12.6	Raw (GPS)	2.3	32:12.6
76.61598	37.27797	32:40.0	32:13.6	Differentia	1.4	32:13.6
76.61598	37.27796	32:41.0	32:14.6	Differentia	1.7	32:14.6
76.616	37.27797	32:42.0	32:15.6	Raw (GPS)	1.5	32:15.6
76.616	37.27797	32:43.0	32:16.6	Raw (GPS)	1.5	32:16.6
76.616	37.27796	32:44.0	32:17.6	Raw (GPS)	1.5	32:17.6
76.616	37.27797	32:45.0	32:18.7	Raw (GPS)	1.5	32:18.7
76.616	37.27796	32:46.0	32:19.6	Raw (GPS)	1.7	32:19.6
76.61602	37.27796	32:47.0	32:20.6	Raw (GPS)	1.5	32:20.6
76.61601	37.27795	32:48.0	32:21.6	Raw (GPS)	2.1	32:21.6
76.61602	37.27795	32:49.0	32:22.6	Raw (GPS)	1.5	32:22.6
76.61602	37.27795	32:50.0	32:23.7	Raw (GPS)	1.5	32:23.7
76.61602	37.27794	32:51.0	32:24.6	Raw (GPS)	1.5	32:24.6
76.61602	37.27793	32:52.0	32:25.6	Differentia	1.5	32:25.6
76.61602	37.27792	32:53.0	32:26.6	Differentia	1.5	32:26.6
76.61602	37.27792	32:54.0	32:27.6	Differentia	2	32:27.6
76.61602	37.27792	32:55.0	32:28.7	Differentia	2	32:28.7
76.61602	37.27792	32:56.0	32:29.6	Raw (GPS)	2	32:29.6
76.61602	37.27792	32:57.0	32:30.6	Raw (GPS)	1.4	32:30.6
76.61602	37.27791	32:58.0	32:31.6	Differentia	1.5	32:31.6
76.61601	37.2779	33:10.0	32:43.7	Differentia	1.4	32:43.7
76.61601	37.2779	33:11.0	32:44.6	Differentia	1.4	32:44.6
76.61602	37.2779	33:12.0	32:45.6	Differentia	1.4	32:45.6
76.61601	37.2779	33:13.0	32:46.6	Differentia	2	32:46.6
76.61602	37.2779	34:28.0	34:01.6	Differentia	1.4	34:01.6
76.61602	37.2779	34:29.0	34:02.6	Differentia	1.4	34:02.6
76.61602	37.2779	34:30.0	34:03.7	Differentia	1.4	34:03.7
76.61603	37.27789	34:31.0	34:04.6	Differentia	2	34:04.6
76.61603	37.27789	34:32.0	34:05.6	Differentia	2	34:05.6
76.61604	37.27789	34:33.0	34:06.6	Differentia	2	34:06.6
76.61605	37.27789	34:34.0	34:07.6	Differentia	2	34:07.6
76.61605	37.27789	34:35.0	34:08.6	Differentia	2	34:08.6
76.61606	37.27789	34:36.0	34:09.6	Differentia	2.4	34:09.6
76.61605	37.27789	34:37.0	34:10.6	Raw (GPS)	1.4	34:10.6

76.61605	37.27789	34:38.0	34:11.6	Raw (GPS)	1.4	34:11.6
76.61605	37.27789	34:39.0	34:12.6	Raw (GPS)	1.6	34:12.6
76.61606	37.27789	34:40.0	34:13.6	Differentia	2.4	34:13.6
76.61606	37.27789	34:41.0	34:14.6	Differentia	1.6	34:14.6
76.61607	37.2779	34:42.0	34:15.6	Raw (GPS)	2	34:15.6
76.61608	37.2779	34:43.0	34:16.6	Raw (GPS)	2.4	34:16.6
76.61607	37.2779	34:44.0	34:17.6	Raw (GPS)	1.4	34:17.6
76.61608	37.2779	34:45.0	34:18.6	Raw (GPS)	2.2	34:18.6
76.61608	37.27789	34:46.0	34:19.6	Differentia	1.4	34:19.6
76.61609	37.27789	34:47.0	34:20.6	Differentia	1.4	34:20.6
76.61609	37.2779	34:48.0	34:21.6	Raw (GPS)	1.4	34:21.6
76.6161	37.2779	35:34.0	35:07.6	Differentia	2	35:07.6
76.6161	37.2779	35:35.0	35:08.7	Differentia	2	35:08.7
76.6161	37.2779	35:36.0	35:09.6	Differentia	2	35:09.6
76.6161	37.2779	35:37.0	35:10.6	Differentia	2.3	35:10.6
76.61611	37.27791	35:38.0	35:11.6	Raw (GPS)	2	35:11.6
76.61612	37.27791	35:39.0	35:12.6	Raw (GPS)	1.4	35:12.6
76.61611	37.27792	35:40.0	35:13.6	Raw (GPS)	1.6	35:13.6
76.61612	37.27792	35:41.0	35:14.6	Raw (GPS)	1.5	35:14.6
76.61613	37.27792	35:42.0	35:15.6	Raw (GPS)	1.6	35:15.6
76.61613	37.27792	35:43.0	35:16.6	Raw (GPS)	1.6	35:16.6
76.61614	37.27792	35:44.0	35:17.6	Raw (GPS)	1.6	35:17.6
76.61615	37.27792	35:45.0	35:18.6	Raw (GPS)	1.6	35:18.6
76.61616	37.27791	35:46.0	35:19.6	Differentia	1.6	35:19.6
76.61616	37.27791	35:47.0	35:20.6	Differentia	1.4	35:20.6
76.61617	37.27791	35:48.0	35:21.6	Raw (GPS)	1.4	35:21.6
76.61618	37.2779	35:49.0	35:22.6	Raw (GPS)	1.4	35:22.6
76.61618	37.2779	35:50.0	35:23.6	Raw (GPS)	1.4	35:23.6
76.61618	37.2779	35:51.0	35:24.6	Raw (GPS)	2	35:24.6
76.61619	37.27789	35:52.0	35:25.6	Differentia	2	35:25.6
76.61619	37.27789	35:53.0	35:26.6	Differentia	2	35:26.6
76.6162	37.27789	35:54.0	35:27.6	Differentia	1.4	35:27.6
76.61625	37.27789	35:55.0	35:28.6	Differentia	1.4	35:28.6
76.61621	37.27789	35:56.0	35:29.6	Raw (GPS)	2	35:29.6
76.61621	37.27789	35:57.0	35:30.6	Raw (GPS)	1.4	35:30.6
76.61622	37.27788	35:58.0	35:31.6	Differentia	1.4	35:31.6
76.61622	37.27788	35:59.0	35:32.6	Differentia	1.4	35:32.6
76.61622	37.27788	36:00.0	35:33.7	Differentia	1.4	35:33.7
76.61623	37.27788	36:01.0	35:34.6	Differentia	1.8	35:34.6
76.61623	37.27788	36:02.0	35:35.6	Differentia	1.4	35:35.6
76.61623	37.27787	36:03.0	35:36.6	Differentia	1.4	35:36.6
76.61623	37.27787	36:04.0	35:37.6	Differentia	2.3	35:37.6
76.61623	37.27787	36:05.0	35:38.7	Differentia	1.4	35:38.7
76.61624	37.27786	36:06.0	35:39.6	Differentia	2	35:39.6
76.61623	37.27786	36:07.0	35:40.6	Raw (GPS)	2	35:40.6
76.61623	37.27786	36:08.0	35:41.6	Raw (GPS)	1.6	35:41.6
76.61623	37.27785	36:09.0	35:42.6	Raw (GPS)	1.6	35:42.6

76.61624	37.27785	36:10.0	35:43.7	Raw (GPS)	2.3	35:43.7
76.61625	37.27784	36:12.0	35:45.6	Raw (GPS)	2.3	35:45.6
76.61625	37.27783	36:13.0	35:46.6	Raw (GPS)	1.4	35:46.6
76.61625	37.27783	36:14.0	35:47.6	Raw (GPS)	1.8	35:47.6
76.61626	37.27783	36:15.0	35:48.6	Raw (GPS)	2	35:48.6
76.61626	37.27782	36:16.0	35:49.6	Raw (GPS)	2.3	35:49.6
76.61626	37.27782	36:17.0	35:50.6	Raw (GPS)	2.3	35:50.6
76.61626	37.27781	36:18.0	35:51.6	Raw (GPS)	2	35:51.6
76.61626	37.27781	36:19.0	35:52.6	Raw (GPS)	7	35:52.6
76.61626	37.2778	36:20.0	35:53.6	Raw (GPS)	2.4	35:53.6
76.61626	37.27779	36:21.0	35:54.6	Raw (GPS)	2.4	35:54.6
76.61627	37.27778	36:22.0	35:55.6	Differentia	2.4	35:55.6
76.61627	37.27778	36:23.0	35:56.6	Raw (GPS)	2	35:56.6
76.61627	37.27778	36:24.0	35:57.6	Raw (GPS)	2	35:57.6
76.61624	37.27777	36:25.0	35:58.6	Raw (GPS)	1.4	35:58.6
76.61624	37.27777	36:26.0	35:59.6	Raw (GPS)	1.4	35:59.6
76.61628	37.27777	36:27.0	36:00.6	Raw (GPS)	2	36:00.6
76.61628	37.27775	36:28.0	36:01.6	Differentia	2	36:01.6
76.61627	37.27775	36:29.0	36:02.6	Raw (GPS)	2.3	36:02.6
76.61627	37.27775	36:30.0	36:03.6	Raw (GPS)	2.3	36:03.6
76.61627	37.27774	36:31.0	36:04.6	Raw (GPS)	2.3	36:04.6
76.61627	37.27774	36:32.0	36:05.6	Raw (GPS)	2	36:05.6
76.61627	37.27773	36:33.0	36:06.6	Raw (GPS)	2.4	36:06.6
76.61628	37.27772	36:34.0	36:07.6	Differentia	2.4	36:07.6
76.61628	37.27772	36:35.0	36:08.6	Differentia	2.4	36:08.6
76.61627	37.27772	36:36.0	36:09.6	Raw (GPS)	2.4	36:09.6
76.61624	37.27771	36:37.0	36:10.6	Raw (GPS)	1.9	36:10.6
76.61627	37.27771	36:38.0	36:11.6	Raw (GPS)	2.4	36:11.6
76.61626	37.2777	36:39.0	36:12.6	Raw (GPS)	2.4	36:12.6
76.61626	37.27769	36:40.0	36:13.6	Differentia	2.4	36:13.6
76.61627	37.27769	36:41.0	36:14.6	Differentia	2	36:14.6
76.61627	37.27769	36:42.0	36:15.6	Differentia	1.4	36:15.6
76.61626	37.27769	36:43.0	36:16.6	Differentia	1.4	36:16.6
76.61625	37.27769	36:44.0	36:17.6	Raw (GPS)	2	36:17.6
76.61625	37.27769	36:45.0	36:18.6	Raw (GPS)	1.4	36:18.6
76.61623	37.27766	36:46.0	36:19.6	Differentia	1.8	36:19.6
76.61623	37.27766	36:47.0	36:20.6	Differentia	1.8	36:20.6
76.61623	37.27768	36:48.0	36:21.6	Raw (GPS)	1.6	36:21.6
76.61621	37.27766	36:49.0	36:22.6	Raw (GPS)	1.8	36:22.6
76.61621	37.27766	36:50.0	36:23.6	Raw (GPS)	1.8	36:23.6
76.6162	37.27766	36:51.0	36:24.6	Raw (GPS)	1.8	36:24.6
76.61621	37.27765	36:52.0	36:25.6	Differentia	1.4	36:25.6
76.6162	37.27764	36:53.0	36:26.6	Differentia	1.8	36:26.6
76.61619	37.27764	36:54.0	36:27.6	Raw (GPS)	2.3	36:27.6
76.6162	37.27765	36:55.0	36:28.6	Raw (GPS)	1.5	36:28.6
76.61619	37.27765	36:56.0	36:29.6	Raw (GPS)	1.5	36:29.6
76.61617	37.27763	36:57.0	36:30.6	Raw (GPS)	2.3	36:30.6

76.61617	37.27763	36:58.0	36:31.6	Differentia	1.5	36:31.6
76.61617	37.27762	36:59.0	36:32.6	Differentia	1.5	36:32.6
76.61616	37.27762	37:00.0	36:33.6	Differentia	1.5	36:33.6
76.61615	37.27762	37:01.0	36:34.6	Differentia	1.5	36:34.6
76.61614	37.27762	37:02.0	36:35.6	Differentia	1.5	36:35.6
76.61613	37.27763	37:03.0	36:36.6	Raw (GPS)	1.6	36:36.6
76.61611	37.27762	37:04.0	36:37.6	Raw (GPS)	2.3	36:37.6
76.6161	37.27762	37:05.0	36:38.6	Raw (GPS)	2.3	36:38.6
76.6161	37.27762	37:06.0	36:39.6	Raw (GPS)	1.6	36:39.6
76.61609	37.27763	37:07.0	36:40.6	Raw (GPS)	2	36:40.6
76.61609	37.27763	37:08.0	36:41.6	Raw (GPS)	1.6	36:41.6
76.61608	37.27763	37:09.0	36:42.6	Raw (GPS)	2	36:42.6
76.61608	37.27763	37:10.0	36:43.6	Raw (GPS)	1.4	36:43.6
76.61607	37.27763	37:11.0	36:44.6	Raw (GPS)	1.6	36:44.6
76.61605	37.27764	37:13.0	36:46.6	Raw (GPS)	2.3	36:46.6
76.61604	37.27764	37:14.0	36:47.6	Raw (GPS)	2	36:47.6
76.61604	37.27765	37:15.0	36:48.6	Raw (GPS)	2	36:48.6
76.61604	37.27765	37:16.0	36:49.6	Differentia	2	36:49.6
76.61604	37.27766	37:17.0	36:50.6	Raw (GPS)	2	36:50.6
76.61603	37.27766	37:18.0	36:51.6	Raw (GPS)	2.3	36:51.6
76.61606	37.27766	37:19.0	36:52.6	Raw (GPS)	1.4	36:52.6
76.61603	37.27767	37:20.0	36:53.6	Raw (GPS)	2	36:53.6
76.61603	37.27768	37:21.0	36:54.6	Raw (GPS)	2	36:54.6
76.61602	37.27768	37:22.0	36:55.6	Raw (GPS)	2	36:55.6
76.61602	37.27768	37:23.0	36:56.6	Raw (GPS)	2.4	36:56.6
76.61602	37.27769	37:24.0	36:57.6	Raw (GPS)	2	36:57.6
76.61601	37.2777	37:25.0	36:58.6	Raw (GPS)	2	36:58.6
76.61601	37.2777	37:26.0	36:59.6	Raw (GPS)	2	36:59.6
76.61599	37.27771	37:28.0	37:01.6	Raw (GPS)	2.3	37:01.6
76.61598	37.27771	37:29.0	37:02.6	Raw (GPS)	2	37:02.6
76.61598	37.27771	37:30.0	37:03.6	Raw (GPS)	2.3	37:03.6
76.61597	37.27772	37:31.0	37:04.6	Raw (GPS)	2.3	37:04.6
76.61597	37.27772	37:32.0	37:05.6	Raw (GPS)	2.3	37:05.6
76.61595	37.27771	37:33.0	37:06.6	Raw (GPS)	2	37:06.6
76.61594	37.27771	37:34.0	37:07.6	Raw (GPS)	2.3	37:07.6
76.61595	37.27772	37:35.0	37:08.6	Raw (GPS)	2	37:08.6
76.61597	37.27774	37:36.0	37:09.6	Raw (GPS)	2	37:09.6
76.61593	37.27772	37:37.0	37:10.6	Raw (GPS)	2.3	37:10.6
76.61593	37.27773	37:38.0	37:11.6	Raw (GPS)	2.3	37:11.6
76.61592	37.27774	37:39.0	37:12.6	Raw (GPS)	2.3	37:12.6
76.61593	37.27774	37:40.0	37:13.6	Differentia	2.3	37:13.6
76.61592	37.27775	37:41.0	37:14.6	Raw (GPS)	2	37:14.6
76.61592	37.27775	37:42.0	37:15.6	Raw (GPS)	2	37:15.6
76.61591	37.27775	37:43.0	37:16.6	Raw (GPS)	2.3	37:16.6
76.61591	37.27776	37:44.0	37:17.6	Raw (GPS)	2	37:17.6
76.6159	37.27776	37:45.0	37:18.6	Raw (GPS)	2.3	37:18.6
76.61589	37.27776	37:46.0	37:19.6	Differentia	1.4	37:19.6

76.61589	37.27777	37:47.0	37:20.6	Raw (GPS)	1.6	37:20.6
76.61587	37.27776	37:48.0	37:21.6	Raw (GPS)	1.9	37:21.6
76.61588	37.27778	37:49.0	37:22.6	Raw (GPS)	1.4	37:22.6
76.61588	37.27778	37:50.0	37:23.6	Raw (GPS)	2	37:23.6
76.61587	37.27777	37:51.0	37:24.6	Raw (GPS)	2.3	37:24.6
76.61588	37.27776	37:52.0	37:25.6	Differentia	2	37:25.6
76.61588	37.27777	38:14.0	37:47.6	Differentia	2	37:47.6
76.61587	37.27777	38:15.0	37:48.6	Differentia	2	37:48.6
76.61587	37.27776	38:16.0	37:49.6	Differentia	2	37:49.6
76.61587	37.27777	38:17.0	37:50.6	Raw (GPS)	2	37:50.6
76.61587	37.27777	38:18.0	37:51.6	Raw (GPS)	2	37:51.6
76.61586	37.27777	38:19.0	37:52.6	Raw (GPS)	2	37:52.6
76.61583	37.27777	38:20.0	37:53.7	Raw (GPS)	1.4	37:53.7
76.61585	37.27777	38:21.0	37:54.6	Raw (GPS)	2	37:54.6
76.61585	37.27776	38:22.0	37:55.6	Differentia	2	37:55.6
76.61584	37.27776	38:23.0	37:56.6	Differentia	2	37:56.6
76.61584	37.27777	38:24.0	37:57.6	Differentia	2	37:57.6
76.61581	37.27777	38:25.0	37:58.6	Raw (GPS)	1.6	37:58.6
76.61582	37.27777	38:26.0	37:59.6	Raw (GPS)	2.3	37:59.6
76.6158	37.27777	38:27.0	38:00.6	Raw (GPS)	1.4	38:00.6
76.6158	37.27776	38:28.0	38:01.6	Differentia	1.4	38:01.6
76.61579	37.27777	38:29.0	38:02.6	Raw (GPS)	1.4	38:02.6
76.6158	37.27777	38:30.0	38:03.6	Raw (GPS)	2	38:03.6
76.61579	37.27777	38:31.0	38:04.6	Raw (GPS)	2	38:04.6
76.61578	37.27776	38:32.0	38:05.6	Raw (GPS)	2.3	38:05.6
76.61578	37.27776	38:33.0	38:06.6	Raw (GPS)	2.3	38:06.6
76.61576	37.27775	38:34.0	38:07.6	Differentia	1.4	38:07.6
76.61577	37.27775	38:35.0	38:08.6	Differentia	2	38:08.6
76.61577	37.27775	38:36.0	38:09.6	Differentia	2.3	38:09.6
76.61577	37.27775	38:37.0	38:10.6	Raw (GPS)	5.5	38:10.6
76.61576	37.27775	38:38.0	38:11.6	Raw (GPS)	5.5	38:11.6
76.61576	37.27774	38:39.0	38:12.6	Raw (GPS)	2	38:12.6
76.61575	37.27773	38:40.0	38:13.6	Differentia	1.4	38:13.6
76.61576	37.27773	38:41.0	38:14.6	Differentia	2	38:14.6
76.61576	37.27774	38:42.0	38:15.6	Raw (GPS)	2	38:15.6
76.61576	37.27774	38:43.0	38:16.6	Raw (GPS)	2	38:16.6
76.61573	37.27773	38:44.0	38:17.6	Raw (GPS)	1.9	38:17.6
76.61573	37.27773	38:45.0	38:18.6	Raw (GPS)	1.4	38:18.6
76.61574	37.27772	38:46.0	38:19.6	Differentia	2	38:19.6
76.61574	37.27772	38:47.0	38:20.6	Differentia	2	38:20.6
76.61572	37.27772	38:48.0	38:21.6	Raw (GPS)	1.4	38:21.6
76.61573	37.27772	38:49.0	38:22.6	Raw (GPS)	2.5	38:22.6
76.61573	37.27772	38:50.0	38:23.6	Raw (GPS)	2	38:23.6
76.61573	37.27772	38:51.0	38:24.6	Raw (GPS)	2	38:24.6
76.61571	37.27771	38:52.0	38:25.6	Differentia	1.4	38:25.6
76.61573	37.27771	38:53.0	38:26.6	Differentia	2	38:26.6
76.61572	37.2777	38:54.0	38:27.6	Differentia	2	38:27.6

76.61571	37.2777	38:55.0	38:28.6	Differentia	2.3	38:28.6
76.61572	37.2777	38:56.0	38:29.6	Differentia	2.3	38:29.6
76.6157	37.27771	38:57.0	38:30.6	Raw (GPS)	1.6	38:30.6
76.6157	37.2777	38:58.0	38:31.6	Differentia	2	38:31.6
76.6157	37.2777	38:59.0	38:32.6	Differentia	2	38:32.6
76.6157	37.2777	39:00.0	38:33.6	Differentia	2	38:33.6
76.61569	37.27771	39:01.0	38:34.6	Differentia	2	38:34.6
76.61569	37.27771	39:02.0	38:35.6	Differentia	2	38:35.6
76.61568	37.2777	39:03.0	38:36.6	Differentia	2	38:36.6
76.61567	37.2777	39:04.0	38:37.6	Differentia	2	38:37.6
76.61567	37.2777	39:05.0	38:38.6	Differentia	2	38:38.6
76.61565	37.27771	39:06.0	38:39.6	Raw (GPS)	1.4	38:39.6
76.61565	37.27771	39:07.0	38:40.6	Raw (GPS)	2	38:40.6
76.61565	37.27771	39:08.0	38:41.6	Raw (GPS)	2	38:41.6
76.61564	37.2777	39:09.0	38:42.6	Raw (GPS)	2	38:42.6
76.61564	37.2777	39:10.0	38:43.6	Raw (GPS)	2	38:43.6
76.61563	37.27771	39:11.0	38:44.6	Raw (GPS)	2.3	38:44.6
76.61563	37.2777	39:12.0	38:45.6	Raw (GPS)	2	38:45.6
76.61563	37.27771	39:13.0	38:46.6	Raw (GPS)	2	38:46.6
76.61563	37.27771	39:14.0	38:47.6	Raw (GPS)	2	38:47.6
76.61559	37.27771	39:15.0	38:48.7	Raw (GPS)	1.5	38:48.7
76.61559	37.2777	39:16.0	38:49.6	Differentia	4.9	38:49.6
76.61559	37.27771	39:17.0	38:50.6	Differentia	1.4	38:50.6
76.61562	37.27772	39:19.0	38:52.6	Raw (GPS)	2.3	38:52.6
76.61561	37.27772	39:21.0	38:54.6	Raw (GPS)	2.3	38:54.6
76.61561	37.27771	39:22.0	38:55.6	Differentia	2	38:55.6
76.61561	37.27771	39:23.0	38:56.6	Differentia	2	38:56.6
76.61561	37.2777	40:08.0	39:41.2	Differentia	1.4	39:41.2
76.61561	37.2777	40:09.0	39:42.2	Differentia	1.4	39:42.2
76.61561	37.2777	40:10.0	39:43.3	Differentia	1.4	39:43.3
76.61561	37.2777	40:11.0	39:44.2	Differentia	1.4	39:44.2
76.6156	37.27771	40:12.0	39:45.2	Raw (GPS)	1.9	39:45.2
76.6156	37.27771	40:13.0	39:46.3	Raw (GPS)	1.9	39:46.3
76.61559	37.27771	40:14.0	39:47.2	Raw (GPS)	2	39:47.2
76.61558	37.27772	40:15.0	39:48.3	Raw (GPS)	2	39:48.3
76.61559	37.27771	40:16.0	39:49.2	Differentia	2	39:49.2
76.61558	37.27771	40:17.0	39:50.2	Differentia	1.4	39:50.2
76.61558	37.27771	40:18.0	39:51.2	Differentia	1.4	39:51.2
76.61558	37.27772	40:19.0	39:52.2	Differentia	3.8	39:52.2
76.6156	37.27773	40:20.0	39:53.3	Raw (GPS)	3.8	39:53.3
76.61559	37.27773	40:21.0	39:54.2	Raw (GPS)	1.9	39:54.2
76.61559	37.27772	40:22.0	39:55.2	Differentia	2	39:55.2
76.61559	37.27773	40:23.0	39:56.2	Differentia	2	39:56.2
76.61559	37.27773	40:24.0	39:57.2	Differentia	2	39:57.2
76.61559	37.27773	40:25.0	39:58.3	Differentia	1.4	39:58.3
76.6156	37.27773	40:26.0	39:59.2	Differentia	2	39:59.2
76.61559	37.27774	40:27.0	40:00.2	Raw (GPS)	2	40:00.2

76.6156	37.27774	40:28.0	40:01.2	Differentia	1.9	40:01.2
76.6156	37.27774	40:29.0	40:02.2	Differentia	2.5	40:02.2
76.6156	37.27774	40:30.0	40:03.3	Differentia	2	40:03.3
76.6156	37.27774	40:31.0	40:04.2	Differentia	1.4	40:04.2
76.6156	37.27774	40:32.0	40:05.2	Differentia	1.4	40:05.2
76.61559	37.27775	40:33.0	40:06.2	Raw (GPS)	1.4	40:06.2
76.6156	37.27775	40:34.0	40:07.2	Differentia	1.4	40:07.2
76.61561	37.27775	40:35.0	40:08.3	Differentia	1.9	40:08.3
76.6156	37.27776	40:36.0	40:09.2	Raw (GPS)	1.9	40:09.2
76.61561	37.27777	40:37.0	40:10.2	Raw (GPS)	2.3	40:10.2
76.61561	37.27777	40:38.0	40:11.2	Raw (GPS)	2.3	40:11.2
76.61561	37.27777	40:39.0	40:12.2	Raw (GPS)	2	40:12.2
76.6156	37.27777	40:40.0	40:13.3	Differentia	1.4	40:13.3
76.61562	37.27778	40:41.0	40:14.2	Differentia	2	40:14.2
76.61562	37.27778	40:42.0	40:15.2	Differentia	2	40:15.2
76.61563	37.27778	41:05.0	40:38.2	Differentia	2	40:38.2
76.61563	37.27778	41:06.0	40:39.2	Differentia	2	40:39.2
76.61563	37.27778	41:07.0	40:40.2	Differentia	2	40:40.2
76.61563	37.27779	41:08.0	40:41.2	Differentia	2	40:41.2
76.61563	37.27779	41:09.0	40:42.2	Differentia	2	40:42.2
76.61564	37.2778	41:10.0	40:43.2	Differentia	2	40:43.2
76.61564	37.27781	41:11.0	40:44.2	Raw (GPS)	2	40:44.2
76.61564	37.27781	41:12.0	40:45.2	Raw (GPS)	2	40:45.2
76.61564	37.27781	41:13.0	40:46.2	Raw (GPS)	2	40:46.2
76.61564	37.27781	41:14.0	40:47.2	Raw (GPS)	1.6	40:47.2
76.61566	37.27783	41:15.0	40:48.2	Raw (GPS)	2.6	40:48.2
76.61566	37.27782	41:16.0	40:49.2	Differentia	2.6	40:49.2
76.61566	37.27782	41:17.0	40:50.2	Differentia	2	40:50.2
76.61566	37.27782	41:18.0	40:51.2	Differentia	2	40:51.2
76.61566	37.27782	41:19.0	40:52.2	Differentia	2.3	40:52.2
76.61566	37.27783	41:21.0	40:54.2	Raw (GPS)	2.3	40:54.2
76.61566	37.27781	41:44.0	41:18.0	Differentia	2	41:18.0
76.61566	37.27781	41:45.0	41:19.0	Differentia	2	41:19.0
76.61566	37.27781	41:46.0	41:20.0	Raw (GPS)	1.6	41:20.0
76.61566	37.27782	41:47.0	41:21.0	Raw (GPS)	1.6	41:21.0
76.61567	37.27783	41:48.0	41:22.0	Raw (GPS)	2.3	41:22.0
76.61567	37.27783	41:49.0	41:23.0	Raw (GPS)	2.3	41:23.0
76.61567	37.27784	41:50.0	41:24.1	Raw (GPS)	2.3	41:24.1
76.61565	37.27784	41:51.0	41:25.0	Raw (GPS)	1.6	41:25.0
76.61567	37.27784	41:52.0	41:26.0	Differentia	2.3	41:26.0
76.61565	37.27785	41:53.0	41:27.0	Differentia	1.6	41:27.0
76.61566	37.27786	41:54.0	41:28.0	Raw (GPS)	2.3	41:28.0
76.61565	37.27788	41:55.0	41:29.0	Raw (GPS)	2.7	41:29.0
76.61567	37.27792	41:56.0	41:30.0	Raw (GPS)	3.4	41:30.0
76.61565	37.27788	41:57.0	41:31.0	Raw (GPS)	1.4	41:31.0
76.61565	37.27788	41:58.0	41:32.0	Differentia	1.6	41:32.0
76.61565	37.27788	41:59.0	41:33.0	Differentia	1.5	41:33.0

76.61567	37.27789	42:00.0	41:34.0	Differentia	1.4	41:34.0
76.61567	37.27789	42:01.0	41:35.0	Differentia	1.4	41:35.0
76.61567	37.27789	42:02.0	41:36.0	Differentia	1.5	41:36.0
76.61567	37.2779	42:03.0	41:37.0	Differentia	1.5	41:37.0
76.61568	37.2779	42:04.0	41:38.0	Differentia	1.5	41:38.0
76.61569	37.2779	42:05.0	41:39.0	Differentia	1.5	41:39.0
76.61569	37.2779	42:06.0	41:40.0	Differentia	1.5	41:40.0
76.61569	37.2779	42:07.0	41:41.0	Differentia	1.5	41:41.0
76.6157	37.27791	42:08.0	41:42.0	Raw (GPS)	2.7	41:42.0
76.6157	37.27791	42:09.0	41:43.0	Raw (GPS)	1.5	41:43.0
76.61571	37.2779	42:10.0	41:44.1	Differentia	1.5	41:44.1
76.61572	37.27791	42:11.0	41:45.0	Differentia	1.4	41:45.0
76.61572	37.27791	42:12.0	41:46.0	Differentia	1.4	41:46.0
76.61573	37.27791	42:13.0	41:47.0	Differentia	1.4	41:47.0
76.61573	37.27791	42:14.0	41:48.0	Differentia	2.7	41:48.0
76.61573	37.27792	42:15.0	41:49.0	Raw (GPS)	1.4	41:49.0
76.61575	37.27792	42:16.0	41:50.0	Raw (GPS)	2.3	41:50.0
76.61574	37.27793	42:17.0	41:51.0	Raw (GPS)	2	41:51.0
76.61575	37.27793	42:18.0	41:52.1	Raw (GPS)	2	41:52.1
76.61574	37.27793	42:19.0	41:53.0	Raw (GPS)	2.3	41:53.0
76.61568	37.27806	42:20.0	41:54.0	Raw (GPS)	18.2	41:54.0
76.61576	37.27793	42:21.0	41:55.0	Raw (GPS)	1.4	41:55.0
76.61578	37.27793	43:39.0	43:12.9	Differentia	1.4	43:12.9
76.61578	37.27793	43:40.0	43:14.0	Differentia	1.2	43:14.0
76.61578	37.27793	43:41.0	43:14.9	Differentia	1.2	43:14.9
76.6158	37.27793	43:42.0	43:15.9	Differentia	1.4	43:15.9
76.6158	37.27793	43:43.0	43:16.9	Differentia	1.4	43:16.9
76.6158	37.27794	43:44.0	43:17.9	Raw (GPS)	1.4	43:17.9
76.6158	37.27794	43:45.0	43:19.0	Raw (GPS)	1.4	43:19.0
76.61581	37.27793	43:46.0	43:19.9	Differentia	1.5	43:19.9
76.61581	37.27794	43:47.0	43:20.9	Raw (GPS)	1.5	43:20.9
76.61581	37.27794	43:48.0	43:21.9	Raw (GPS)	2.1	43:21.9
76.61582	37.27794	43:49.0	43:23.0	Raw (GPS)	1.4	43:23.0
76.61582	37.27794	43:50.0	43:23.9	Raw (GPS)	2.1	43:23.9
76.61582	37.27794	43:51.0	43:24.9	Raw (GPS)	2.1	43:24.9
76.61583	37.27793	44:02.0	43:35.9	Differentia	2.1	43:35.9
76.61583	37.27793	44:03.0	43:36.9	Differentia	2.1	43:36.9
76.61584	37.27793	44:04.0	43:37.9	Differentia	2.1	43:37.9
76.61584	37.27793	44:05.0	43:39.0	Differentia	2.1	43:39.0
76.61585	37.27793	44:06.0	43:39.9	Differentia	2.1	43:39.9
76.61584	37.27793	44:07.0	43:40.9	Raw (GPS)	2.1	43:40.9
76.61585	37.27793	44:08.0	43:41.9	Raw (GPS)	2.1	43:41.9
76.61586	37.27793	44:09.0	43:42.9	Raw (GPS)	2.6	43:42.9
76.61587	37.27793	44:10.0	43:44.0	Raw (GPS)	2.6	43:44.0
76.61586	37.27792	44:11.0	43:44.9	Raw (GPS)	1.4	43:44.9
76.61587	37.27794	44:12.0	43:45.9	Raw (GPS)	3	43:45.9
76.61586	37.27793	44:13.0	43:46.9	Raw (GPS)	1.6	43:46.9

76.61586	37.27794	44:14.0	43:47.9	Raw (GPS)	2.1	43:47.9
76.61588	37.27795	44:15.0	43:49.0	Raw (GPS)	3	43:49.0
76.61588	37.27794	44:16.0	43:49.9	Differentia	2.2	43:49.9
76.61588	37.27797	44:17.0	43:50.9	Raw (GPS)	3	43:50.9
76.61587	37.27796	44:18.0	43:51.9	Raw (GPS)	1.6	43:51.9
76.61588	37.27797	44:19.0	43:52.9	Raw (GPS)	2.6	43:52.9
76.61588	37.27797	44:20.0	43:54.0	Raw (GPS)	2.1	43:54.0
76.61588	37.27797	44:21.0	43:54.9	Raw (GPS)	2.1	43:54.9
76.61589	37.27797	44:22.0	43:55.9	Differentia	2.1	43:55.9
76.61589	37.27798	44:23.0	43:56.9	Raw (GPS)	1.4	43:56.9
76.6159	37.27798	44:24.0	43:57.9	Raw (GPS)	1.4	43:57.9
76.61591	37.27799	44:25.0	43:59.0	Raw (GPS)	3	43:59.0
76.61591	37.27799	44:26.0	43:59.9	Raw (GPS)	3	43:59.9
76.61591	37.27799	44:27.0	44:00.9	Raw (GPS)	1.4	44:00.9
76.61592	37.27799	44:28.0	44:01.9	Raw (GPS)	1.7	44:01.9
76.61592	37.27799	44:29.0	44:02.9	Raw (GPS)	2	44:02.9
76.61593	37.27799	44:30.0	44:04.0	Raw (GPS)	2	44:04.0
76.61593	37.278	44:31.0	44:04.9	Raw (GPS)	1.4	44:04.9
76.61594	37.278	44:32.0	44:05.9	Raw (GPS)	1.4	44:05.9
76.61595	37.278	44:33.0	44:06.9	Raw (GPS)	2	44:06.9
76.61596	37.27799	44:34.0	44:07.9	Differentia	2.2	44:07.9
76.61595	37.278	44:35.0	44:09.0	Raw (GPS)	1.4	44:09.0
76.61597	37.278	44:36.0	44:09.9	Raw (GPS)	2	44:09.9
76.61597	37.278	44:37.0	44:10.9	Raw (GPS)	2	44:10.9
76.61597	37.278	44:38.0	44:11.9	Raw (GPS)	1.5	44:11.9
76.61597	37.278	44:39.0	44:12.9	Raw (GPS)	2.1	44:12.9
76.61597	37.27799	44:40.0	44:13.9	Differentia	1.4	44:13.9
76.61598	37.278	44:41.0	44:14.9	Differentia	1.4	44:14.9
76.61599	37.278	44:42.0	44:15.9	Differentia	1.5	44:15.9
76.61598	37.278	44:43.0	44:16.9	Raw (GPS)	1.6	44:16.9
76.61599	37.278	44:44.0	44:17.9	Raw (GPS)	1.5	44:17.9
76.61599	37.278	44:45.0	44:18.9	Raw (GPS)	1.5	44:18.9
76.61599	37.278	44:46.0	44:19.9	Differentia	1.4	44:19.9
76.61599	37.278	44:47.0	44:20.9	Differentia	1.4	44:20.9
76.61599	37.278	44:48.0	44:21.9	Differentia	1.4	44:21.9
76.61599	37.27801	44:49.0	44:22.9	Differentia	1.4	44:22.9
76.61599	37.278	45:24.0	44:57.9	Differentia	2.7	44:57.9
76.61599	37.278	45:25.0	44:59.0	Differentia	2.7	44:59.0
76.61598	37.27801	45:26.0	44:59.9	Differentia	2.2	44:59.9
76.61598	37.27801	45:27.0	45:00.9	Differentia	1.8	45:00.9
76.61598	37.27801	45:28.0	45:01.9	Differentia	1.8	45:01.9
76.61597	37.27802	45:29.0	45:02.9	Differentia	1.8	45:02.9
76.61597	37.27803	45:30.0	45:03.9	Raw (GPS)	2.1	45:03.9
76.61596	37.27803	45:31.0	45:04.9	Raw (GPS)	2.1	45:04.9
76.61596	37.27803	45:32.0	45:05.9	Raw (GPS)	2.1	45:05.9
76.61594	37.27803	45:33.0	45:06.9	Raw (GPS)	2.2	45:06.9
76.61594	37.27802	45:34.0	45:07.9	Differentia	2.1	45:07.9

76.61594	37.27802	45:35.0	45:08.9	Differentia	2.1	45:08.9
76.61594	37.27804	45:36.0	45:09.9	Raw (GPS)	3.2	45:09.9
76.61593	37.27803	45:37.0	45:10.9	Raw (GPS)	2.1	45:10.9
76.61592	37.27804	45:38.0	45:11.9	Raw (GPS)	2.2	45:11.9
76.61591	37.27803	45:39.0	45:12.9	Raw (GPS)	2.2	45:12.9
76.61592	37.27803	45:40.0	45:14.0	Differentia	2.1	45:14.0
76.61592	37.27803	45:41.0	45:14.9	Differentia	2.1	45:14.9
76.61593	37.27803	45:42.0	45:15.9	Differentia	2.7	45:15.9
76.61592	37.27803	45:43.0	45:16.9	Differentia	2.1	45:16.9
76.61592	37.27803	45:44.0	45:17.9	Differentia	3.3	45:17.9
76.61592	37.27803	45:45.0	45:18.9	Differentia	1.6	45:18.9
76.6158	37.27822	45:46.0	45:19.9	Differentia	61.2	45:19.9
76.6159	37.27803	45:47.0	45:20.9	Differentia	1.4	45:20.9
76.6159	37.27802	45:48.0	45:21.9	Differentia	3.3	45:21.9
76.61589	37.27803	45:49.0	45:22.9	Raw (GPS)	2.2	45:22.9
76.61588	37.27803	45:50.0	45:23.9	Raw (GPS)	1.4	45:23.9
76.61587	37.27803	45:51.0	45:24.9	Raw (GPS)	1.4	45:24.9
76.61589	37.27803	45:52.0	45:25.9	Differentia	1.4	45:25.9
76.61588	37.27803	45:53.0	45:26.9	Raw (GPS)	1.5	45:26.9
76.61586	37.27803	45:54.0	45:27.9	Raw (GPS)	1.5	45:27.9
76.61586	37.27803	45:55.0	45:29.0	Raw (GPS)	1.7	45:29.0
76.61585	37.27803	45:56.0	45:29.9	Raw (GPS)	1.4	45:29.9
76.61584	37.27802	45:57.0	45:30.9	Raw (GPS)	1.4	45:30.9
76.61584	37.27801	45:58.0	45:31.9	Differentia	1.5	45:31.9
76.61583	37.27801	45:59.0	45:32.9	Raw (GPS)	1.4	45:32.9
76.61583	37.27802	46:00.0	45:34.0	Raw (GPS)	2.2	45:34.0
76.61581	37.27801	46:01.0	45:34.9	Raw (GPS)	1.5	45:34.9
76.61581	37.27801	46:02.0	45:35.9	Raw (GPS)	1.5	45:35.9
76.61581	37.278	46:03.0	45:36.9	Raw (GPS)	1.5	45:36.9
76.61582	37.27799	46:04.0	45:37.9	Differentia	1.7	45:37.9
76.6158	37.27799	46:05.0	45:39.0	Differentia	1.5	45:39.0
76.6158	37.27799	46:06.0	45:39.9	Raw (GPS)	1.5	45:39.9
76.61579	37.27799	46:07.0	45:40.9	Raw (GPS)	1.5	45:40.9
76.61579	37.27799	46:08.0	45:41.9	Raw (GPS)	1.5	45:41.9
76.61579	37.27799	46:09.0	45:42.9	Raw (GPS)	1.5	45:42.9
76.61581	37.27793	46:10.0	45:44.0	Raw (GPS)	2.4	45:44.0
76.61579	37.27798	46:11.0	45:44.9	Raw (GPS)	1.4	45:44.9
76.61578	37.27798	46:12.0	45:45.9	Raw (GPS)	1.4	45:45.9
76.61576	37.27798	46:13.0	45:46.9	Raw (GPS)	1.5	45:46.9
76.61575	37.27798	46:14.0	45:47.9	Raw (GPS)	2.2	45:47.9
76.61574	37.27797	46:15.0	45:49.0	Raw (GPS)	2	45:49.0
76.61576	37.27797	46:16.0	45:49.9	Raw (GPS)	1.5	45:49.9
76.61574	37.27797	46:17.0	45:50.9	Raw (GPS)	2.2	45:50.9
76.61574	37.27797	46:18.0	45:51.9	Raw (GPS)	2.2	45:51.9
76.61575	37.27797	46:19.0	45:53.0	Raw (GPS)	1.6	45:53.0
76.61575	37.27796	46:20.0	45:54.0	Raw (GPS)	1.4	45:54.0
76.61575	37.27794	46:21.0	45:54.9	Raw (GPS)	2.4	45:54.9

76.61575	37.27795	46:22.0	45:55.9	Differentia	1.4	45:55.9
76.61575	37.27795	46:23.0	45:57.0	Differentia	2	45:57.0
76.61575	37.27795	46:24.0	45:57.9	Raw (GPS)	1.4	45:57.9
76.61575	37.27795	46:25.0	45:59.0	Raw (GPS)	1.4	45:59.0
76.61574	37.27795	46:26.0	45:59.9	Raw (GPS)	1.4	45:59.9
76.61574	37.27795	46:27.0	46:00.9	Raw (GPS)	1.4	46:00.9
76.61573	37.27794	46:28.0	46:01.9	Differentia	1.7	46:01.9
76.61572	37.27794	46:29.0	46:02.9	Differentia	1.7	46:02.9
76.61578	37.27785	46:30.0	46:04.0	Raw (GPS)	40.9	46:04.0
76.61572	37.27795	46:31.0	46:04.9	Raw (GPS)	2.2	46:04.9
76.61571	37.27795	46:32.0	46:05.9	Raw (GPS)	2	46:05.9
76.61571	37.27795	46:33.0	46:06.9	Raw (GPS)	1.4	46:06.9
76.61571	37.27795	46:34.0	46:07.9	Differentia	1.1	46:07.9
76.61572	37.27794	46:35.0	46:09.0	Differentia	1.4	46:09.0
76.61572	37.27794	46:36.0	46:09.9	Differentia	1.4	46:09.9
76.61571	37.27796	46:37.0	46:10.9	Raw (GPS)	3.4	46:10.9
76.61571	37.27795	46:39.0	46:12.9	Raw (GPS)	1.6	46:12.9
76.61571	37.27795	46:40.0	46:14.0	Differentia	1.6	46:14.0
76.61571	37.27795	46:41.0	46:14.9	Differentia	1.6	46:14.9
76.61571	37.27795	46:42.0	46:15.9	Differentia	1.6	46:15.9
76.61572	37.27795	46:43.0	46:16.9	Differentia	1.6	46:16.9
76.61571	37.27795	46:44.0	46:17.9	Differentia	1.6	46:17.9
76.61571	37.27794	46:45.0	46:19.0	Differentia	3.4	46:19.0
76.6157	37.27795	46:46.0	46:19.9	Differentia	1.2	46:19.9
76.6157	37.27795	46:47.0	46:20.9	Differentia	1.4	46:20.9
76.6157	37.27795	46:48.0	46:21.9	Differentia	1.6	46:21.9
76.61569	37.27796	46:49.0	46:22.9	Raw (GPS)	1.6	46:22.9
76.61569	37.27796	46:50.0	46:24.0	Raw (GPS)	1.6	46:24.0
76.61568	37.27795	46:51.0	46:24.9	Raw (GPS)	3.4	46:24.9
76.61568	37.27795	46:52.0	46:25.9	Differentia	3.5	46:25.9
76.61568	37.27795	46:53.0	46:27.0	Differentia	3.5	46:27.0
76.61568	37.27795	46:54.0	46:27.9	Differentia	3.4	46:27.9
76.61568	37.27794	46:55.0	46:28.9	Differentia	3.5	46:28.9
76.61569	37.27796	48:29.0	48:02.9	Differentia	1.2	48:02.9
76.61569	37.27796	48:30.0	48:04.0	Differentia	1.2	48:04.0
76.61569	37.27795	48:31.0	48:04.9	Differentia	1.5	48:04.9
76.61568	37.27795	48:32.0	48:05.9	Differentia	1.5	48:05.9
76.61568	37.27795	48:33.0	48:06.9	Differentia	1.5	48:06.9
76.61568	37.27795	48:34.0	48:07.9	Differentia	1.6	48:07.9
76.61567	37.27795	48:35.0	48:09.0	Differentia	1.5	48:09.0
76.61566	37.27795	48:36.0	48:09.9	Differentia	2.2	48:09.9
76.61566	37.27795	48:37.0	48:10.9	Differentia	2.2	48:10.9
76.61565	37.27796	48:38.0	48:12.0	Raw (GPS)	2.2	48:12.0
76.61564	37.27795	48:39.0	48:12.9	Raw (GPS)	2.2	48:12.9
76.61564	37.27795	48:40.0	48:14.0	Differentia	1.6	48:14.0
76.61564	37.27794	48:41.0	48:15.0	Differentia	1.6	48:15.0
76.61564	37.27794	48:42.0	48:15.9	Differentia	1.6	48:15.9

76.61563	37.27794	48:43.0	48:17.0	Differentia	1.6	48:17.0
76.61564	37.27793	48:44.0	48:18.0	Differentia	1.6	48:18.0
76.61564	37.27793	48:45.0	48:19.0	Differentia	1.6	48:19.0
76.61563	37.27793	48:46.0	48:20.0	Differentia	4	48:20.0
76.61562	37.27793	49:18.0	48:52.0	Differentia	1.5	48:52.0
76.61562	37.27793	49:19.0	48:53.0	Differentia	1.5	48:53.0
76.61561	37.27793	49:20.0	48:54.0	Raw (GPS)	1.6	48:54.0
76.61561	37.27793	49:21.0	48:55.0	Raw (GPS)	1.6	48:55.0
76.61562	37.27793	49:22.0	48:55.9	Differentia	2.2	48:55.9
76.61561	37.27793	49:23.0	48:56.9	Differentia	2.2	48:56.9
76.61562	37.27793	49:24.0	48:57.9	Differentia	1.6	48:57.9
76.61561	37.27792	49:25.0	48:59.0	Differentia	1.6	48:59.0
76.61561	37.27792	49:26.0	48:59.9	Differentia	1.6	48:59.9
76.61559	37.27792	49:27.0	49:00.9	Raw (GPS)	1.5	49:00.9
76.61558	37.27792	49:28.0	49:02.0	Raw (GPS)	1.6	49:02.0
76.61559	37.27794	49:29.0	49:02.9	Raw (GPS)	2.3	49:02.9
76.61559	37.27794	49:30.0	49:04.0	Raw (GPS)	4.3	49:04.0
76.61558	37.27793	49:32.0	49:05.9	Raw (GPS)	4.3	49:05.9
76.61558	37.27791	50:30.0	50:04.0	Differentia	4.7	50:04.0
76.61558	37.27791	50:31.0	50:04.9	Differentia	4.7	50:04.9
76.61557	37.27793	50:32.0	50:05.9	Raw (GPS)	1.4	50:05.9
76.61558	37.27792	50:33.0	50:07.0	Raw (GPS)	2	50:07.0
76.61549	37.27825	50:34.0	50:07.9	Raw (GPS)	37.9	50:07.9
76.61555	37.27791	50:35.0	50:09.0	Raw (GPS)	1.4	50:09.0
76.61556	37.27789	50:36.0	50:09.9	Raw (GPS)	2.9	50:09.9
76.61555	37.2779	50:37.0	50:10.9	Raw (GPS)	1.5	50:10.9
76.61556	37.27791	50:38.0	50:11.9	Raw (GPS)	4.8	50:11.9
76.61556	37.27791	50:39.0	50:12.9	Raw (GPS)	4.8	50:12.9
76.61555	37.27789	50:40.0	50:14.0	Differentia	1.4	50:14.0
76.61555	37.27789	50:41.0	50:14.9	Differentia	1.4	50:14.9
76.61555	37.2779	51:09.0	50:42.9	Differentia	1.4	50:42.9
76.61555	37.2779	51:10.0	50:43.9	Differentia	1.4	50:43.9
76.61555	37.27789	51:11.0	50:44.9	Differentia	1.4	50:44.9
76.61555	37.27789	51:12.0	50:45.9	Differentia	1.4	50:45.9
76.61555	37.27789	51:13.0	50:46.9	Differentia	1.4	50:46.9
76.61554	37.27789	51:14.0	50:47.9	Raw (GPS)	1.4	50:47.9
76.61555	37.27789	51:15.0	50:49.0	Raw (GPS)	1.4	50:49.0
76.61555	37.27788	51:16.0	50:49.9	Differentia	1.5	50:49.9
76.61555	37.27788	51:17.0	50:50.9	Raw (GPS)	1.5	50:50.9
76.61555	37.27788	51:18.0	50:51.9	Raw (GPS)	1.4	50:51.9
76.61558	37.27789	06:30.0	06:03.8	Differentia	1.7	06:03.8
76.61558	37.27789	06:32.0	06:05.8	Differentia	1.7	06:05.8
76.61558	37.27789	06:33.0	06:06.8	Raw (GPS)	1.7	06:06.8
76.61559	37.27788	06:34.0	06:07.8	Differentia	1.7	06:07.8
76.61555	37.27781	06:38.0	06:11.8	Raw (GPS)	5.3	06:11.8
76.61558	37.27784	06:48.0	06:21.8	Differentia	1.2	06:21.8
76.61558	37.27784	06:49.0	06:22.8	Differentia	1.2	06:22.8

76.61558	37.27784	06:50.0	06:23.8	Differentia	1.2	06:23.8
76.61558	37.27784	06:51.0	06:24.8	Differentia	1.2	06:24.8
76.61558	37.27782	06:52.0	06:25.8	Differentia	1.3	06:25.8
76.61558	37.27781	06:53.0	06:26.8	Differentia	1.3	06:26.8
76.6156	37.27782	06:54.0	06:27.8	Differentia	1.4	06:27.8
76.61561	37.27784	06:55.0	06:28.8	Raw (GPS)	2.2	06:28.8
76.61559	37.27782	06:56.0	06:29.8	Raw (GPS)	1.4	06:29.8
76.61561	37.27783	06:57.0	06:30.8	Raw (GPS)	4.3	06:30.8
76.61558	37.27782	06:58.0	06:31.8	Differentia	1.5	06:31.8
76.61559	37.27782	06:59.0	06:32.8	Differentia	1.5	06:32.8
76.61561	37.2778	07:00.0	06:33.8	Differentia	1.4	06:33.8
76.61561	37.2778	07:01.0	06:34.8	Differentia	1.4	06:34.8
76.61561	37.27781	07:02.0	06:35.8	Raw (GPS)	1.4	06:35.8
76.61562	37.27781	07:03.0	06:36.8	Raw (GPS)	1.4	06:36.8
76.61558	37.27772	07:04.0	06:37.8	Raw (GPS)	5	06:37.8
76.61562	37.27778	07:05.0	06:38.8	Raw (GPS)	2.1	06:38.8
76.61562	37.27779	07:06.0	06:39.8	Raw (GPS)	2	06:39.8
76.61563	37.27779	07:07.0	06:40.8	Raw (GPS)	2.1	06:40.8
76.61563	37.2778	07:08.0	06:41.8	Raw (GPS)	2.1	06:41.8
76.6156	37.27772	07:09.0	06:42.8	Raw (GPS)	5.5	06:42.8
76.61566	37.27782	07:10.0	06:43.9	Differentia	1.4	06:43.9
76.61566	37.27782	07:11.0	06:44.8	Differentia	1.4	06:44.8
76.61566	37.27781	07:12.0	06:45.9	Differentia	1.4	06:45.9
76.61567	37.27782	07:13.0	06:46.8	Differentia	1.4	06:46.8
76.61564	37.27775	07:14.0	06:47.8	Raw (GPS)	4.9	06:47.8
76.61567	37.2778	07:16.0	06:49.8	Differentia	4.9	06:49.8
76.61569	37.27783	07:17.0	06:50.8	Differentia	1.4	06:50.8
76.61569	37.27783	07:18.0	06:51.9	Differentia	1.4	06:51.9
76.61569	37.27783	07:19.0	06:52.8	Differentia	1.4	06:52.8
76.6157	37.27785	07:20.0	06:53.8	Differentia	2	06:53.8
76.61569	37.27781	07:21.0	06:54.8	Differentia	4.8	06:54.8
76.6157	37.27783	07:22.0	06:55.8	Differentia	1.4	06:55.8
76.6157	37.27783	07:23.0	06:56.9	Differentia	1.4	06:56.9
76.61571	37.27783	07:24.0	06:57.9	Differentia	2	06:57.9
76.61571	37.27783	07:25.0	06:58.8	Differentia	2	06:58.8
76.61568	37.27779	07:26.0	06:59.8	Raw (GPS)	4.8	06:59.8
76.6157	37.27785	07:27.0	07:00.8	Raw (GPS)	1.2	07:00.8
76.61572	37.27784	07:28.0	07:01.8	Differentia	1.4	07:01.8
76.61572	37.27783	07:29.0	07:02.9	Differentia	4.7	07:02.9
76.61572	37.27784	07:30.0	07:03.8	Differentia	1.4	07:03.8
76.61572	37.27785	07:31.0	07:04.9	Raw (GPS)	1.4	07:04.9
76.61572	37.27785	07:32.0	07:05.9	Raw (GPS)	1.4	07:05.9
76.61572	37.27785	07:33.0	07:06.8	Raw (GPS)	1.4	07:06.8
76.61573	37.27785	07:34.0	07:07.8	Differentia	4.7	07:07.8
76.61574	37.27785	07:35.0	07:08.8	Differentia	4.7	07:08.8
76.61574	37.27785	07:36.0	07:09.8	Differentia	1.4	07:09.8
76.61576	37.27788	07:37.0	07:10.8	Differentia	25.2	07:10.8

76.61573	37.27783	07:38.0	07:11.8	Raw (GPS)	25.1	07:11.8
76.61573	37.27783	07:39.0	07:12.8	Raw (GPS)	25.1	07:12.8
76.61576	37.27788	07:40.0	07:13.8	Differentia	25.1	07:13.8
76.61575	37.27784	07:41.0	07:14.8	Differentia	4.6	07:14.8
76.61576	37.27786	07:42.0	07:15.8	Differentia	1.4	07:15.8
76.61576	37.27786	07:43.0	07:16.8	Differentia	1.4	07:16.8
76.61576	37.27786	08:04.0	07:38.0	Differentia	2	07:38.0
76.61576	37.27786	08:05.0	07:39.0	Differentia	4.4	07:39.0
76.61576	37.27785	08:06.0	07:40.0	Differentia	24.5	07:40.0
76.61576	37.27788	08:07.0	07:41.0	Raw (GPS)	1.4	07:41.0
76.61577	37.27789	08:08.0	07:42.0	Raw (GPS)	1.4	07:42.0
76.61577	37.27788	08:09.0	07:43.0	Raw (GPS)	1.4	07:43.0
76.61578	37.27788	08:10.0	07:44.0	Differentia	1.4	07:44.0
76.61577	37.27785	08:11.0	07:45.0	Differentia	4.4	07:45.0
76.61578	37.27785	08:12.0	07:46.0	Differentia	4.3	07:46.0
76.61576	37.27782	08:13.0	07:47.0	Raw (GPS)	4.4	07:47.0
76.61577	37.27785	08:14.0	07:48.0	Raw (GPS)	2.1	07:48.0
76.61577	37.27784	08:15.0	07:49.0	Raw (GPS)	2.1	07:49.0
76.6158	37.27786	08:16.0	07:50.0	Differentia	2	07:50.0
76.61578	37.27783	08:17.0	07:51.0	Differentia	2.1	07:51.0
76.61576	37.27786	08:18.0	07:52.1	Raw (GPS)	1.6	07:52.1
76.61577	37.27785	08:19.0	07:53.0	Raw (GPS)	1.7	07:53.0
76.61577	37.27785	08:20.0	07:54.1	Raw (GPS)	1.5	07:54.1
76.61577	37.27784	08:21.0	07:55.0	Raw (GPS)	1.4	07:55.0
76.61578	37.27783	08:22.0	07:56.1	Differentia	36.2	07:56.1
76.61578	37.27784	08:23.0	07:57.0	Differentia	1.7	07:57.0
76.61578	37.27784	08:24.0	07:58.0	Differentia	1.4	07:58.0
76.61577	37.27783	08:25.0	07:59.0	Differentia	2.2	07:59.0
76.61578	37.27784	08:26.0	08:00.0	Differentia	1.4	08:00.0
76.61577	37.27784	08:27.0	08:01.0	Differentia	1.4	08:01.0
76.61577	37.27783	08:28.0	08:02.1	Differentia	1.4	08:02.1
76.61577	37.27783	08:29.0	08:03.0	Differentia	1.4	08:03.0
76.61575	37.27783	08:30.0	08:04.0	Raw (GPS)	1.7	08:04.0
76.61575	37.27783	08:31.0	08:05.0	Raw (GPS)	1.4	08:05.0
76.61575	37.27783	08:32.0	08:06.0	Raw (GPS)	1.4	08:06.0
76.61574	37.27781	08:33.0	08:07.0	Raw (GPS)	4.6	08:07.0
76.61575	37.27782	08:34.0	08:08.0	Differentia	1.4	08:08.0
76.61575	37.27782	08:35.0	08:09.0	Differentia	4.2	08:09.0
76.61574	37.27782	08:36.0	08:10.0	Differentia	4.2	08:10.0
76.61572	37.27779	08:37.0	08:11.0	Raw (GPS)	4.2	08:11.0
76.61572	37.27783	08:38.0	08:12.0	Raw (GPS)	1.2	08:12.0
76.61573	37.27782	08:39.0	08:13.0	Raw (GPS)	1.4	08:13.0
76.61573	37.27782	08:40.0	08:14.0	Differentia	1.4	08:14.0
76.61573	37.27782	08:41.0	08:15.0	Differentia	1.4	08:15.0
76.61573	37.27781	09:03.0	08:37.0	Differentia	1.4	08:37.0
76.61573	37.27781	09:04.0	08:38.1	Differentia	1.4	08:38.1
76.61573	37.27781	09:05.0	08:39.1	Differentia	1.3	08:39.1

76.61573	37.27781	09:06.0	08:40.0	Differentia	1.3	08:40.0
76.61573	37.27781	09:07.0	08:41.0	Differentia	1.3	08:41.0
76.61572	37.27781	09:08.0	08:42.0	Differentia	1.3	08:42.0
76.61571	37.2778	09:09.0	08:43.0	Raw (GPS)	1.3	08:43.0
76.61572	37.2778	09:10.0	08:44.0	Differentia	1.3	08:44.0
76.61572	37.2778	09:11.0	08:45.2	Differentia	1.3	08:45.2
76.61571	37.27779	09:12.0	08:46.0	Raw (GPS)	1.3	08:46.0
76.61569	37.27777	09:13.0	08:47.0	Raw (GPS)	3.9	08:47.0
76.6157	37.27779	09:14.0	08:48.0	Raw (GPS)	1.4	08:48.0
76.6157	37.27779	09:15.0	08:49.0	Raw (GPS)	1.3	08:49.0
76.6157	37.27778	09:16.0	08:50.0	Differentia	1.4	08:50.0
76.6157	37.27778	09:17.0	08:51.1	Differentia	1.3	08:51.1
76.61569	37.27778	09:18.0	08:52.1	Raw (GPS)	1.3	08:52.1
76.61569	37.27775	09:19.0	08:53.0	Raw (GPS)	3.9	08:53.0
76.61569	37.27777	09:20.0	08:54.1	Raw (GPS)	1.3	08:54.1
76.61569	37.27777	09:21.0	08:55.0	Raw (GPS)	1.3	08:55.0
76.6157	37.27777	09:22.0	08:56.0	Differentia	2	08:56.0
76.6157	37.27777	09:23.0	08:57.1	Differentia	1.2	08:57.1
76.61571	37.27778	09:24.0	08:58.0	Differentia	1.9	08:58.0
76.61571	37.27776	09:25.0	08:59.0	Differentia	3.8	08:59.0
76.61571	37.27776	09:26.0	09:00.0	Differentia	3.8	09:00.0
76.61571	37.27775	09:27.0	09:01.0	Differentia	3.8	09:01.0
76.61572	37.27775	09:28.0	09:02.0	Differentia	3.8	09:02.0
76.61572	37.27775	09:29.0	09:03.0	Differentia	3.8	09:03.0
76.61572	37.27774	10:06.0	09:40.0	Differentia	1.3	09:40.0
76.61571	37.27771	10:07.0	09:41.0	Differentia	3.6	09:41.0
76.61569	37.27768	10:08.0	09:42.0	Raw (GPS)	3.6	09:42.0
76.61572	37.27774	10:09.0	09:43.0	Raw (GPS)	1.3	09:43.0
76.61574	37.27774	10:10.0	09:44.0	Differentia	1.3	09:44.0
76.61574	37.27774	10:11.0	09:45.0	Differentia	1.3	09:45.0
76.61574	37.27774	10:12.0	09:46.0	Differentia	1.3	09:46.0
76.61574	37.27774	10:13.0	09:47.0	Raw (GPS)	1.3	09:47.0
76.61571	37.27768	10:14.0	09:48.0	Raw (GPS)	3.6	09:48.0
76.61572	37.27767	10:15.0	09:49.0	Raw (GPS)	3.6	09:49.0
76.61574	37.2777	10:16.0	09:50.0	Differentia	3.5	09:50.0
76.61574	37.27769	10:17.0	09:51.0	Differentia	3.5	09:51.0
76.61573	37.27767	10:18.0	09:52.0	Raw (GPS)	3.6	09:52.0
76.61575	37.27772	10:19.0	09:53.0	Raw (GPS)	1.3	09:53.0
76.61573	37.27766	10:20.0	09:54.1	Raw (GPS)	3.5	09:54.1
76.61574	37.27766	10:21.0	09:55.0	Raw (GPS)	3.5	09:55.0
76.61576	37.27768	10:22.0	09:56.0	Differentia	3.5	09:56.0
76.61578	37.27771	10:23.0	09:57.0	Differentia	1.2	09:57.0
76.61576	37.27772	10:24.0	09:58.0	Raw (GPS)	1.4	09:58.0
76.61579	37.27771	11:35.0	11:08.9	Differentia	1.1	11:08.9
76.61579	37.27771	11:36.0	11:09.8	Differentia	1.1	11:09.8
76.61579	37.27771	11:37.0	11:10.8	Differentia	1.2	11:10.8
76.61579	37.27771	11:38.0	11:11.8	Differentia	1.4	11:11.8

76.61578	37.27771	11:39.0	11:12.8	Raw (GPS)	1.4	11:12.8
76.6158	37.27774	11:40.0	11:13.8	Raw (GPS)	2.3	11:13.8
76.61579	37.27774	11:41.0	11:14.8	Raw (GPS)	2.3	11:14.8
76.61576	37.27768	11:42.0	11:15.8	Raw (GPS)	3.3	11:15.8
76.61577	37.27772	11:43.0	11:16.8	Raw (GPS)	1.4	11:16.8
76.61574	37.27767	11:44.0	11:17.8	Raw (GPS)	3.5	11:17.8
76.61576	37.27773	11:45.0	11:18.8	Raw (GPS)	1.3	11:18.8
76.61578	37.27773	11:46.0	11:19.8	Differentia	1.3	11:19.8
76.61576	37.2777	11:47.0	11:20.8	Raw (GPS)	3.3	11:20.8
76.61575	37.2777	11:48.0	11:21.8	Raw (GPS)	3.1	11:21.8
76.61578	37.27772	11:49.0	11:22.8	Raw (GPS)	2.3	11:22.8
76.61575	37.27772	11:50.0	11:23.8	Raw (GPS)	3.1	11:23.8
76.61574	37.27772	11:51.0	11:24.8	Raw (GPS)	3.1	11:24.8
76.61576	37.27774	11:52.0	11:25.8	Differentia	3.1	11:25.8
76.61576	37.27775	11:53.0	11:26.8	Differentia	3.1	11:26.8
76.61577	37.2778	11:54.0	11:27.8	Differentia	1.9	11:27.8
76.61576	37.27775	11:55.0	11:28.8	Differentia	3.1	11:28.8
76.61575	37.27776	11:56.0	11:29.9	Differentia	3.1	11:29.9
76.61576	37.27776	11:57.0	11:30.8	Differentia	3.1	11:30.8
76.61575	37.27776	11:58.0	11:31.8	Differentia	3.1	11:31.8
76.61575	37.27777	11:59.0	11:32.8	Differentia	1.8	11:32.8
76.61574	37.27778	12:00.0	11:33.8	Raw (GPS)	1.5	11:33.8
76.61573	37.27782	12:01.0	11:34.9	Raw (GPS)	3.2	11:34.9
76.61574	37.27778	12:02.0	11:35.8	Raw (GPS)	1.8	11:35.8
76.61573	37.27779	12:03.0	11:36.9	Raw (GPS)	1.7	11:36.9
76.61575	37.27781	12:04.0	11:37.8	Differentia	3.2	11:37.8
76.61575	37.27779	12:05.0	11:38.8	Differentia	1.7	11:38.8
76.61575	37.27779	12:06.0	11:39.8	Differentia	1.7	11:39.8
76.61574	37.27779	12:07.0	11:40.8	Raw (GPS)	1.3	11:40.8
76.61574	37.27779	12:08.0	11:41.8	Raw (GPS)	1.2	11:41.8
76.61574	37.27779	12:09.0	11:42.8	Raw (GPS)	1.2	11:42.8
76.61575	37.2778	12:10.0	11:43.9	Differentia	1.3	11:43.9
76.61574	37.2778	12:11.0	11:44.8	Differentia	1.3	11:44.8
76.61574	37.27781	12:12.0	11:45.8	Differentia	1.3	11:45.8
76.61573	37.27779	12:13.0	11:46.8	Raw (GPS)	3.2	11:46.8
76.61573	37.2778	12:14.0	11:47.8	Raw (GPS)	1.3	11:47.8
76.61572	37.27782	12:15.0	11:48.9	Raw (GPS)	1.6	11:48.9
76.61572	37.27781	12:16.0	11:49.8	Differentia	3.3	11:49.8
76.61573	37.27781	12:17.0	11:50.8	Differentia	3.1	11:50.8
76.61573	37.27781	12:18.0	11:51.8	Differentia	3.1	11:51.8
76.61573	37.27784	12:19.0	11:52.8	Raw (GPS)	2	11:52.8
76.61573	37.27783	12:20.0	11:53.8	Raw (GPS)	1.8	11:53.8
76.61572	37.27783	12:21.0	11:54.8	Raw (GPS)	1.3	11:54.8
76.61572	37.27781	12:22.0	11:55.8	Differentia	3	11:55.8
76.61571	37.27781	12:23.0	11:56.9	Differentia	3	11:56.9
76.61569	37.27779	12:24.0	11:57.9	Raw (GPS)	3	11:57.9
76.61569	37.2778	12:25.0	11:58.8	Raw (GPS)	3	11:58.8

76.61569	37.2778	12:26.0	11:59.8	Raw (GPS)	3	11:59.8
76.6157	37.27784	12:27.0	12:00.8	Raw (GPS)	1.3	12:00.8
76.6157	37.27783	12:28.0	12:01.8	Differentia	3	12:01.8
76.6157	37.27783	12:29.0	12:02.8	Differentia	3	12:02.8
76.61571	37.27784	12:30.0	12:03.8	Differentia	1.4	12:03.8
76.61571	37.27783	12:31.0	12:04.8	Differentia	1.4	12:04.8
76.6157	37.27783	12:32.0	12:05.8	Differentia	1.3	12:05.8
76.6157	37.27783	12:33.0	12:06.8	Differentia	1.3	12:06.8
76.6157	37.27784	12:34.0	12:07.8	Differentia	1.4	12:07.8
76.61567	37.27777	12:35.0	12:08.8	Raw (GPS)	36.3	12:08.8
76.61567	37.2778	12:37.0	12:10.8	Raw (GPS)	3	12:10.8
76.61568	37.27785	12:38.0	12:11.8	Raw (GPS)	1.9	12:11.8
76.61567	37.27781	12:39.0	12:12.8	Raw (GPS)	2.9	12:12.8
76.61569	37.27783	12:40.0	12:13.8	Differentia	2.9	12:13.8
76.61569	37.27788	12:41.0	12:14.9	Differentia	1.9	12:14.9
76.61568	37.27787	12:42.0	12:15.8	Raw (GPS)	2.3	12:15.8
76.61567	37.27789	12:43.0	12:16.9	Raw (GPS)	2.4	12:16.9
76.61566	37.27779	12:44.0	12:17.8	Raw (GPS)	36.3	12:17.8
76.61568	37.27786	12:45.0	12:18.8	Raw (GPS)	1.4	12:18.8
76.61568	37.27786	12:46.0	12:19.8	Differentia	3.1	12:19.8
76.61569	37.27788	12:47.0	12:20.8	Differentia	2.3	12:20.8
76.61569	37.27787	12:48.0	12:21.8	Differentia	2.3	12:21.8
76.61566	37.27783	12:49.0	12:22.8	Differentia	3.5	12:22.8
76.61566	37.27788	12:50.0	12:23.8	Raw (GPS)	1.7	12:23.8
76.61566	37.27796	12:51.0	12:24.8	Raw (GPS)	36.3	12:24.8
76.61567	37.27788	12:52.0	12:25.9	Differentia	1.7	12:25.9
76.61567	37.27788	12:53.0	12:26.8	Differentia	1.7	12:26.8
76.61567	37.27788	12:54.0	12:27.8	Differentia	1.2	12:27.8
76.61567	37.27788	12:55.0	12:28.8	Differentia	1.4	12:28.8
76.61566	37.27788	12:56.0	12:29.8	Raw (GPS)	1.3	12:29.8
76.61566	37.27789	12:57.0	12:30.8	Raw (GPS)	1.3	12:30.8
76.61567	37.27789	12:58.0	12:31.9	Differentia	1.4	12:31.9
76.61567	37.27789	12:59.0	12:32.8	Differentia	1.4	12:32.8
76.61568	37.27791	13:01.0	12:34.8	Raw (GPS)	2.3	12:34.8
76.61568	37.27791	13:02.0	12:35.8	Raw (GPS)	2.3	12:35.8
76.61568	37.2779	13:03.0	12:36.9	Raw (GPS)	2	12:36.9
76.61568	37.2779	13:04.0	12:37.9	Differentia	2.3	12:37.9
76.61566	37.27789	13:05.0	12:38.9	Raw (GPS)	1.3	12:38.9
76.61566	37.27789	13:06.0	12:39.8	Raw (GPS)	1.3	12:39.8
76.61567	37.27789	13:07.0	12:40.9	Raw (GPS)	1.3	12:40.9
76.61566	37.27787	13:08.0	12:41.9	Raw (GPS)	2.3	12:41.9
76.61569	37.2779	13:09.0	12:42.8	Raw (GPS)	4.8	12:42.8
76.61568	37.2779	13:10.0	12:43.8	Differentia	2.3	12:43.8
76.6157	37.27791	13:11.0	12:44.8	Differentia	1.4	12:44.8
76.6157	37.2779	13:12.0	12:45.8	Differentia	1.2	12:45.8
76.6157	37.2779	13:13.0	12:46.8	Raw (GPS)	1.3	12:46.8
76.61571	37.2779	13:14.0	12:47.8	Raw (GPS)	1.3	12:47.8

76.61569	37.27787	13:15.0	12:48.8	Raw (GPS)	1.8	12:48.8
76.61571	37.2779	13:16.0	12:49.8	Differentia	1.3	12:49.8
76.61569	37.27787	13:17.0	12:50.9	Raw (GPS)	5.7	12:50.9
76.6157	37.27788	13:18.0	12:51.8	Raw (GPS)	1.8	12:51.8
76.6157	37.27789	13:19.0	12:52.8	Raw (GPS)	3.1	12:52.8
76.6157	37.27789	13:20.0	12:53.8	Raw (GPS)	3.1	12:53.8
76.6157	37.27789	13:21.0	12:54.8	Raw (GPS)	2.3	12:54.8
76.61573	37.27792	13:22.0	12:55.8	Differentia	1.4	12:55.8
76.61571	37.27789	13:23.0	12:56.8	Differentia	2.8	12:56.8
76.61574	37.27792	13:24.0	12:57.8	Differentia	3.1	12:57.8
76.61574	37.27792	13:25.0	12:58.8	Differentia	1.4	12:58.8
76.61574	37.27791	13:26.0	12:59.8	Differentia	1.3	12:59.8
76.61574	37.27791	13:27.0	13:00.8	Differentia	1.2	13:00.8
76.61575	37.27792	13:28.0	13:01.8	Differentia	1.3	13:01.8
76.61574	37.27791	13:29.0	13:02.8	Differentia	1.8	13:02.8
76.61574	37.2779	13:30.0	13:03.8	Differentia	2.8	13:03.8
76.61575	37.27791	13:31.0	13:04.8	Differentia	1.8	13:04.8
76.61575	37.27791	13:32.0	13:05.8	Differentia	1.8	13:05.8
76.61575	37.27791	13:33.0	13:06.8	Differentia	1.8	13:06.8
76.61575	37.2779	13:34.0	13:07.9	Differentia	1.8	13:07.9
76.61575	37.2779	13:35.0	13:08.9	Differentia	1.2	13:08.9
76.61576	37.2779	13:36.0	13:09.9	Differentia	1.2	13:09.9
76.61576	37.27789	13:37.0	13:10.8	Differentia	1.3	13:10.8
76.61575	37.27789	13:38.0	13:11.8	Differentia	2.8	13:11.8
76.61574	37.27788	13:39.0	13:12.9	Raw (GPS)	1.8	13:12.9
76.61575	37.27788	13:40.0	13:13.9	Differentia	2.8	13:13.9
76.61572	37.27771	13:41.0	13:14.9	Differentia	18	13:14.9
76.61576	37.27789	13:42.0	13:15.8	Differentia	1.3	13:15.8
76.61572	37.2777	13:43.0	13:16.8	Differentia	18	13:16.8
76.61576	37.27789	13:44.0	13:17.8	Differentia	1.4	13:17.8
76.61576	37.27789	13:45.0	13:18.8	Differentia	1.2	13:18.8
76.61576	37.27789	13:46.0	13:19.8	Differentia	1.2	13:19.8
76.61576	37.27789	13:47.0	13:20.8	Differentia	1.2	13:20.8
76.61577	37.27788	13:48.0	13:21.8	Differentia	1.3	13:21.8
76.61573	37.27784	13:49.0	13:22.8	Raw (GPS)	2.9	13:22.8
76.61576	37.27789	13:50.0	13:23.8	Raw (GPS)	1.4	13:23.8
76.61576	37.27788	13:51.0	13:24.8	Raw (GPS)	1.2	13:24.8
76.61575	37.27786	13:52.0	13:25.9	Differentia	2.7	13:25.9
76.61583	37.27789	13:54.0	13:27.8	Differentia	6.1	13:27.8
76.61582	37.27787	13:55.0	13:28.8	Raw (GPS)	5.8	13:28.8
76.61582	37.27787	13:56.0	13:29.8	Raw (GPS)	5.8	13:29.8
76.61575	37.27784	13:57.0	13:30.8	Raw (GPS)	2.7	13:30.8
76.61577	37.27788	13:58.0	13:31.8	Differentia	1.8	13:31.8
76.61577	37.27788	13:59.0	13:32.8	Differentia	1.8	13:32.8
76.61577	37.27787	14:00.0	13:33.8	Differentia	1.8	13:33.8
76.61576	37.27785	14:01.0	13:34.8	Raw (GPS)	2.7	13:34.8
76.61576	37.27785	14:02.0	13:35.8	Raw (GPS)	2.7	13:35.8

76.61578	37.27789	14:03.0	13:36.8	Raw (GPS)	1.3	13:36.8
76.61579	37.27787	14:04.0	13:37.8	Differentia	2.7	13:37.8
76.61579	37.27788	14:05.0	13:38.9	Differentia	2.7	13:38.9
76.61579	37.27788	14:06.0	13:39.8	Differentia	2.7	13:39.8
76.61579	37.27788	14:07.0	13:40.8	Differentia	2.7	13:40.8
76.6158	37.27788	14:08.0	13:41.8	Differentia	2.7	13:41.8
76.6158	37.27783	14:09.0	13:42.9	Differentia	36.4	13:42.9
76.6158	37.27783	14:10.0	13:43.8	Differentia	36.4	13:43.8
76.61579	37.27787	14:11.0	13:44.8	Raw (GPS)	2.7	13:44.8
76.61579	37.27787	14:12.0	13:45.9	Raw (GPS)	2.9	13:45.9
76.61579	37.27787	14:13.0	13:46.8	Raw (GPS)	2.9	13:46.8
76.61579	37.27787	14:14.0	13:47.8	Raw (GPS)	2.7	13:47.8
76.61579	37.27787	14:15.0	13:48.8	Raw (GPS)	2.7	13:48.8
76.61581	37.27789	14:16.0	13:49.8	Differentia	2.7	13:49.8
76.61582	37.27789	14:17.0	13:50.9	Differentia	2.7	13:50.9
76.6158	37.27787	14:18.0	13:51.8	Raw (GPS)	2.7	13:51.8
76.6158	37.27787	14:19.0	13:52.8	Raw (GPS)	2.6	13:52.8
76.61582	37.27789	14:20.0	13:53.8	Differentia	2.6	13:53.8
76.61582	37.2779	14:21.0	13:54.8	Differentia	2.6	13:54.8
76.61582	37.2779	14:22.0	13:55.8	Differentia	2.6	13:55.8
76.61583	37.2779	14:23.0	13:56.8	Differentia	1.3	13:56.8
76.61584	37.2779	14:24.0	13:57.8	Differentia	2.1	13:57.8
76.61585	37.27792	14:36.0	14:09.9	Differentia	1.8	14:09.9
76.61585	37.27792	14:37.0	14:10.8	Differentia	1.8	14:10.8
76.61585	37.27792	14:38.0	14:11.8	Differentia	1.8	14:11.8
76.61585	37.2779	14:39.0	14:12.8	Raw (GPS)	6	14:12.8
76.61586	37.27791	14:40.0	14:13.8	Differentia	2.6	14:13.8
76.61583	37.27788	14:41.0	14:14.8	Raw (GPS)	2.2	14:14.8
76.61586	37.27789	14:42.0	14:15.8	Raw (GPS)	6.1	14:15.8
76.61586	37.27789	14:43.0	14:16.9	Raw (GPS)	2.1	14:16.9
76.61587	37.27788	14:45.0	14:18.8	Raw (GPS)	2.7	14:18.8
76.61589	37.2779	14:46.0	14:19.8	Differentia	2.7	14:19.8
76.61589	37.27789	14:47.0	14:20.8	Differentia	2.6	14:20.8
76.61589	37.27789	14:48.0	14:21.8	Differentia	2.6	14:21.8
76.61588	37.27788	14:50.0	14:23.8	Raw (GPS)	1.8	14:23.8
76.61588	37.27787	14:51.0	14:24.8	Raw (GPS)	2.2	14:24.8
76.6159	37.27787	14:52.0	14:25.8	Differentia	2.6	14:25.8
76.61588	37.27781	15:00.0	14:33.8	Raw (GPS)	2.5	14:33.8
76.61589	37.27781	15:01.0	14:34.9	Raw (GPS)	2.7	14:34.9
76.61589	37.2778	15:02.0	14:35.8	Raw (GPS)	2.5	14:35.8
76.61589	37.2778	15:03.0	14:36.8	Raw (GPS)	2.5	14:36.8
76.61591	37.27782	15:04.0	14:37.8	Differentia	2.5	14:37.8
76.61591	37.27782	15:05.0	14:38.8	Differentia	2.5	14:38.8
76.61589	37.27779	15:06.0	14:39.8	Raw (GPS)	2.5	14:39.8
76.6159	37.2778	15:07.0	14:40.8	Raw (GPS)	2.7	14:40.8
76.61592	37.27783	16:20.0	15:53.8	Differentia	1	15:53.8
76.61592	37.27782	16:21.0	15:54.8	Differentia	1	15:54.8

76.61592	37.27782	16:22.0	15:55.8	Differentia	1	15:55.8
76.61592	37.27782	16:23.0	15:56.8	Differentia	1.3	15:56.8
76.61592	37.27781	16:24.0	15:57.8	Differentia	1.3	15:57.8
76.6159	37.27781	16:25.0	15:58.8	Raw (GPS)	1.3	15:58.8
76.6159	37.27781	16:26.0	15:59.8	Raw (GPS)	1.3	15:59.8
76.61589	37.27779	16:27.0	16:00.8	Raw (GPS)	2.4	16:00.8
76.61591	37.2778	16:28.0	16:01.8	Differentia	2.4	16:01.8
76.61591	37.27781	16:29.0	16:02.9	Differentia	1.2	16:02.9
76.61591	37.2778	16:30.0	16:03.9	Differentia	1	16:03.9
76.6159	37.2778	16:31.0	16:04.8	Differentia	1	16:04.8
76.61589	37.2778	16:32.0	16:05.8	Raw (GPS)	1.3	16:05.8
76.61589	37.2778	16:33.0	16:06.8	Raw (GPS)	1.3	16:06.8
76.61589	37.2778	16:34.0	16:07.8	Differentia	1.3	16:07.8
76.61589	37.2778	16:35.0	16:08.8	Differentia	1.3	16:08.8
76.61589	37.2778	16:36.0	16:09.8	Differentia	1	16:09.8
76.61592	37.27778	17:25.0	16:58.9	Differentia	1	16:58.9
76.61592	37.27778	17:26.0	16:59.9	Differentia	1	16:59.9
76.61592	37.27778	17:27.0	17:00.9	Differentia	1	17:00.9
76.61592	37.27779	17:28.0	17:01.9	Differentia	1.7	17:01.9
76.61592	37.27777	17:29.0	17:02.9	Differentia	1.3	17:02.9
76.61589	37.27778	17:30.0	17:04.0	Raw (GPS)	1.8	17:04.0
76.61589	37.27775	17:31.0	17:04.8	Raw (GPS)	2.2	17:04.8
76.61588	37.27775	17:32.0	17:05.8	Raw (GPS)	2.2	17:05.8
76.61588	37.27777	17:33.0	17:06.9	Raw (GPS)	1.2	17:06.9
76.61589	37.27777	17:34.0	17:07.9	Differentia	2.2	17:07.9
76.61589	37.27777	17:35.0	17:08.9	Differentia	2.2	17:08.9
76.61588	37.27777	17:36.0	17:09.9	Differentia	2.2	17:09.9
76.61587	37.27776	17:37.0	17:10.9	Raw (GPS)	1.7	17:10.9
76.61586	37.27775	17:38.0	17:12.0	Raw (GPS)	2.2	17:12.0
76.61585	37.27775	17:39.0	17:12.8	Raw (GPS)	2.2	17:12.8
76.61587	37.27776	17:40.0	17:13.9	Differentia	2.2	17:13.9
76.61584	37.27775	17:41.0	17:14.9	Raw (GPS)	2.2	17:14.9
76.61598	37.27794	17:42.0	17:15.8	Raw (GPS)	23.6	17:15.8
76.61598	37.27793	17:43.0	17:16.8	Raw (GPS)	23.8	17:16.8
76.61583	37.27774	17:44.0	17:17.8	Raw (GPS)	2.5	17:17.8
76.61583	37.27773	17:45.0	17:19.0	Raw (GPS)	2.5	17:19.0
76.61585	37.27774	17:46.0	17:20.0	Differentia	2.5	17:20.0
76.61583	37.27772	17:48.0	17:21.8	Raw (GPS)	2.2	17:21.8
76.61582	37.27772	17:49.0	17:22.8	Raw (GPS)	2.2	17:22.8
76.61583	37.27771	17:50.0	17:24.0	Raw (GPS)	2.2	17:24.0
76.61582	37.27771	17:51.0	17:24.9	Raw (GPS)	2.2	17:24.9
76.61584	37.27772	17:52.0	17:25.8	Differentia	2.2	17:25.8
76.61583	37.27772	17:53.0	17:26.8	Differentia	2.2	17:26.8
76.61581	37.2777	17:54.0	17:27.8	Raw (GPS)	2.2	17:27.8
76.61581	37.27771	17:55.0	17:28.8	Raw (GPS)	1.4	17:28.8
76.61588	37.27772	17:56.0	17:30.0	Raw (GPS)	3	17:30.0
76.61581	37.27771	17:58.0	17:31.8	Differentia	2	17:31.8

76.6158	37.27771	17:59.0	17:32.8	Differentia	1.3	17:32.8
76.61578	37.27772	18:00.0	17:33.9	Raw (GPS)	1.7	17:33.9
76.61578	37.27772	18:01.0	17:34.8	Raw (GPS)	2	17:34.8
76.61577	37.2777	18:02.0	17:35.9	Raw (GPS)	2	17:35.9
76.61577	37.2777	18:03.0	17:37.0	Raw (GPS)	2	17:37.0
76.61578	37.2777	18:04.0	17:37.8	Differentia	2.2	17:37.8
76.61576	37.27769	18:05.0	17:38.9	Raw (GPS)	2.4	17:38.9
76.61575	37.2777	18:06.0	17:39.8	Raw (GPS)	2.1	17:39.8
76.61575	37.2777	18:07.0	17:40.8	Raw (GPS)	2.1	17:40.8
76.61574	37.27768	18:08.0	17:41.8	Raw (GPS)	2.2	17:41.8
76.61575	37.2777	18:09.0	17:42.9	Raw (GPS)	1.3	17:42.9
76.61574	37.27767	18:11.0	17:44.9	Raw (GPS)	2.3	17:44.9
76.61575	37.27769	18:16.0	17:49.8	Differentia	1.8	17:49.8
76.61575	37.27769	18:17.0	17:50.8	Differentia	1.8	17:50.8
76.61575	37.27769	18:18.0	17:51.8	Differentia	1.8	17:51.8
76.61573	37.27771	18:19.0	17:52.8	Differentia	1.4	17:52.8
76.61573	37.27771	18:20.0	17:53.9	Differentia	1.4	17:53.9
76.61573	37.27771	18:21.0	17:54.8	Differentia	1.4	17:54.8
76.61574	37.2777	18:22.0	17:55.8	Differentia	1.4	17:55.8
76.61572	37.2777	18:23.0	17:56.8	Raw (GPS)	1.4	17:56.8
76.61573	37.27769	18:24.0	17:57.8	Raw (GPS)	1.8	17:57.8
76.61572	37.2777	18:25.0	17:58.9	Raw (GPS)	1.4	17:58.9
76.61572	37.27769	18:26.0	17:59.9	Raw (GPS)	1.4	17:59.9
76.61572	37.27769	18:27.0	18:01.0	Raw (GPS)	1.3	18:01.0
76.61572	37.27769	18:28.0	18:01.8	Raw (GPS)	1.3	18:01.8
76.61573	37.27769	18:29.0	18:02.8	Raw (GPS)	1.4	18:02.8
76.61573	37.27769	18:30.0	18:03.9	Raw (GPS)	1.4	18:03.9
76.61573	37.27768	18:31.0	18:04.8	Raw (GPS)	1.7	18:04.8
76.61571	37.27768	18:32.0	18:05.8	Raw (GPS)	1.4	18:05.8
76.61574	37.27768	18:33.0	18:06.8	Raw (GPS)	1.8	18:06.8
76.61576	37.27767	18:34.0	18:07.8	Differentia	1.8	18:07.8
76.61574	37.27768	18:35.0	18:08.9	Differentia	1.3	18:08.9
76.61576	37.27766	18:36.0	18:09.9	Differentia	1.5	18:09.9
76.61576	37.27766	18:37.0	18:10.8	Differentia	1.7	18:10.8
76.61574	37.27769	18:38.0	18:11.9	Raw (GPS)	3.6	18:11.9
76.61574	37.27766	18:39.0	18:12.8	Raw (GPS)	1.2	18:12.8
76.61575	37.27767	18:40.0	18:13.9	Differentia	1.2	18:13.9
76.61575	37.27767	18:41.0	18:14.9	Differentia	1.2	18:14.9
76.61576	37.27766	19:11.0	18:44.8	Differentia	2	18:44.8
76.61576	37.27766	19:12.0	18:45.8	Differentia	1.3	18:45.8
76.61576	37.27765	19:13.0	18:47.0	Raw (GPS)	1.4	18:47.0
76.61576	37.27765	19:14.0	18:47.8	Raw (GPS)	1.4	18:47.8
76.61576	37.27765	19:15.0	18:48.8	Raw (GPS)	1.4	18:48.8
76.61578	37.27766	19:16.0	18:49.9	Differentia	1.3	18:49.9
76.61577	37.27766	19:17.0	18:50.8	Raw (GPS)	1.7	18:50.8
76.61577	37.27766	19:18.0	18:51.8	Raw (GPS)	1.4	18:51.8
76.61578	37.27766	19:19.0	18:52.9	Raw (GPS)	1.3	18:52.9

76.61578	37.27766	19:20.0	18:53.9	Raw (GPS)	1.4	18:53.9
76.61578	37.27765	19:21.0	18:54.8	Raw (GPS)	2.2	18:54.8
76.6158	37.27766	19:22.0	18:55.8	Differentia	1.8	18:55.8
76.61581	37.27767	19:23.0	18:56.8	Differentia	1.3	18:56.8
76.6158	37.27767	19:24.0	18:57.9	Raw (GPS)	1.7	18:57.9
76.61581	37.27767	19:25.0	18:58.9	Raw (GPS)	1.3	18:58.9
76.6158	37.27767	19:26.0	18:59.9	Raw (GPS)	1.8	18:59.9
76.61581	37.27768	19:27.0	19:00.9	Raw (GPS)	1.7	19:00.9
76.61582	37.27768	19:29.0	19:02.8	Differentia	1.4	19:02.8
76.61581	37.27767	19:30.0	19:03.9	Raw (GPS)	1.7	19:03.9
76.61582	37.27769	19:31.0	19:04.8	Raw (GPS)	1.4	19:04.8
76.61581	37.27769	19:32.0	19:05.9	Raw (GPS)	1.3	19:05.9
76.61581	37.27769	19:33.0	19:06.8	Raw (GPS)	1.3	19:06.8
76.61583	37.27769	19:34.0	19:07.8	Differentia	1.3	19:07.8
76.61583	37.27769	19:52.0	19:25.8	Differentia	1.3	19:25.8
76.61583	37.27769	19:53.0	19:26.8	Differentia	1.3	19:26.8
76.61582	37.2777	19:54.0	19:27.8	Raw (GPS)	1.4	19:27.8
76.61581	37.27768	19:55.0	19:28.8	Raw (GPS)	2	19:28.8
76.61582	37.27769	19:56.0	19:29.8	Raw (GPS)	2.2	19:29.8
76.61582	37.27769	19:57.0	19:30.8	Raw (GPS)	2	19:30.8
76.61584	37.27771	19:58.0	19:31.8	Differentia	2	19:31.8
76.61584	37.27771	19:59.0	19:33.0	Raw (GPS)	1.3	19:33.0
76.61586	37.27772	20:02.0	19:35.8	Raw (GPS)	1.9	19:35.8
76.61586	37.27772	20:03.0	19:36.8	Raw (GPS)	1.3	19:36.8
76.61588	37.27773	20:04.0	19:37.8	Differentia	1.3	19:37.8
76.61588	37.27773	20:05.0	19:38.9	Differentia	1.4	19:38.9
76.61588	37.27774	20:06.0	19:39.8	Differentia	1.3	19:39.8
76.61588	37.27774	20:07.0	19:40.8	Differentia	1.1	19:40.8
76.61588	37.27773	20:08.0	19:41.8	Raw (GPS)	1.9	19:41.8
76.61588	37.27774	20:09.0	19:42.8	Raw (GPS)	1.3	19:42.8
76.61589	37.27775	20:10.0	19:43.9	Differentia	1.1	19:43.9
76.61589	37.27775	20:11.0	19:44.9	Raw (GPS)	1.6	19:44.9
76.61589	37.27774	20:12.0	19:45.9	Raw (GPS)	2	19:45.9
76.61597	37.27777	20:13.0	19:46.8	Raw (GPS)	8.3	19:46.8
76.6159	37.27777	20:14.0	19:47.8	Raw (GPS)	1.2	19:47.8
76.6159	37.27776	20:15.0	19:48.8	Raw (GPS)	1.7	19:48.8
76.61592	37.27777	20:16.0	19:49.9	Differentia	2	19:49.9

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76.60082	37.2775	52:31.0	52:05.4	Differentia	1.6	52:05.4
76.60082	37.2775	52:32.0	52:06.4	Differentia	1.6	52:06.4
76.60083	37.2775	52:33.0	52:07.4	Differentia	2.1	52:07.4
76.60084	37.2775	52:34.0	52:08.4	Differentia	1.3	52:08.4
76.60085	37.27751	52:35.0	52:09.5	Differentia	1.3	52:09.5
76.60086	37.27751	52:36.0	52:10.4	Differentia	1.7	52:10.4
76.60087	37.27751	52:37.0	52:11.4	Differentia	1.6	52:11.4
76.60087	37.27752	52:38.0	52:12.3	Differentia	2.1	52:12.3
76.60088	37.27752	52:39.0	52:13.4	Differentia	2.1	52:13.4
76.60089	37.27752	52:40.0	52:14.4	Differentia	3.8	52:14.4
76.60089	37.27752	52:41.0	52:15.4	Differentia	2.1	52:15.4
76.6009	37.27753	52:42.0	52:16.4	Differentia	2.1	52:16.4
76.60092	37.27752	52:43.0	52:17.4	Differentia	1.6	52:17.4
76.60092	37.27753	52:44.0	52:18.4	Differentia	2.1	52:18.4
76.60093	37.27754	52:45.0	52:19.4	Differentia	1.7	52:19.4
76.60094	37.27754	52:46.0	52:20.3	Differentia	2.1	52:20.3
76.60095	37.27754	52:47.0	52:21.3	Differentia	2.1	52:21.3
76.60096	37.27755	52:48.0	52:22.3	Differentia	2.1	52:22.3
76.60097	37.27755	52:49.0	52:23.3	Differentia	2.1	52:23.3
76.60098	37.27756	52:50.0	52:24.4	Differentia	2.1	52:24.4
76.60099	37.27756	52:51.0	52:25.4	Differentia	1.6	52:25.4
76.60099	37.27756	52:52.0	52:26.4	Differentia	1.3	52:26.4
76.601	37.27756	52:53.0	52:27.3	Differentia	1.3	52:27.3
76.60101	37.27757	52:54.0	52:28.4	Differentia	1.7	52:28.4
76.60101	37.27757	52:55.0	52:29.4	Differentia	1.7	52:29.4
76.60102	37.27758	52:56.0	52:30.3	Differentia	2.1	52:30.3
76.60103	37.27758	52:57.0	52:31.3	Differentia	2.1	52:31.3
76.60103	37.27758	52:58.0	52:32.3	Differentia	1.7	52:32.3
76.60104	37.27759	52:59.0	52:33.3	Differentia	2.1	52:33.3
76.60104	37.27759	53:00.0	52:34.4	Differentia	1.9	52:34.4
76.60104	37.27759	53:16.0	52:50.3	Differentia	1.9	52:50.3
76.60104	37.27759	53:17.0	52:51.3	Differentia	1.9	52:51.3
76.60105	37.2776	53:18.0	52:52.3	Differentia	1.9	52:52.3
76.60106	37.2776	53:19.0	52:53.3	Differentia	2.6	52:53.3
76.60107	37.2776	53:20.0	52:54.3	Differentia	2.6	52:54.3
76.60107	37.27761	53:21.0	52:55.3	Differentia	2.6	52:55.3
76.60109	37.2776	53:22.0	52:56.3	Differentia	3.4	52:56.3
76.60109	37.27761	53:23.0	52:57.4	Differentia	2.2	52:57.4
76.6011	37.27762	53:24.0	52:58.3	Differentia	2.2	52:58.3
76.6011	37.27762	53:25.0	52:59.4	Differentia	2.2	52:59.4
76.60111	37.27762	53:26.0	53:00.3	Differentia	2.2	53:00.3
76.60112	37.27763	53:27.0	53:01.3	Differentia	2.2	53:01.3
76.60112	37.27763	53:28.0	53:02.3	Differentia	1.7	53:02.3
76.60113	37.27763	53:29.0	53:03.4	Differentia	2.2	53:03.4
76.60113	37.27764	53:30.0	53:04.3	Differentia	1.7	53:04.3
76.60114	37.27764	53:31.0	53:05.3	Differentia	2.2	53:05.3
76.60115	37.27764	53:32.0	53:06.3	Differentia	2.2	53:06.3

76.60115	37.27765	53:33.0	53:07.3	Differentia	2.2	53:07.3
76.60115	37.27765	53:34.0	53:08.3	Differentia	1.7	53:08.3
76.60116	37.27765	53:35.0	53:09.4	Differentia	2.2	53:09.4
76.60117	37.27765	53:36.0	53:10.3	Differentia	2.2	53:10.3
76.60117	37.27765	53:37.0	53:11.3	Differentia	2.2	53:11.3
76.60118	37.27765	53:38.0	53:12.3	Differentia	2.2	53:12.3
76.60118	37.27765	53:39.0	53:13.3	Differentia	2.2	53:13.3
76.60117	37.27765	53:40.0	53:14.3	Differentia	1.7	53:14.3
76.60118	37.27764	53:41.0	53:15.3	Differentia	2.2	53:15.3
76.60117	37.27764	53:42.0	53:16.3	Differentia	1.7	53:16.3
76.60116	37.27763	53:43.0	53:17.3	Differentia	1.7	53:17.3
76.60116	37.27763	53:44.0	53:18.4	Differentia	2.2	53:18.4
76.60116	37.27762	53:45.0	53:19.3	Differentia	2.2	53:19.3
76.60115	37.27762	53:46.0	53:20.3	Differentia	2.2	53:20.3
76.60113	37.27761	53:47.0	53:21.3	Differentia	1.7	53:21.3
76.60113	37.27761	53:48.0	53:22.3	Differentia	2.2	53:22.3
76.60112	37.2776	53:49.0	53:23.3	Differentia	2.2	53:23.3
76.60112	37.2776	53:50.0	53:24.4	Differentia	2.2	53:24.4
76.60111	37.27759	53:51.0	53:25.3	Differentia	2.2	53:25.3
76.6011	37.27759	53:52.0	53:26.3	Differentia	2.2	53:26.3
76.6011	37.27758	53:53.0	53:27.3	Differentia	3.5	53:27.3
76.60109	37.27758	53:54.0	53:28.3	Differentia	2.2	53:28.3
76.60108	37.27758	53:55.0	53:29.4	Differentia	2.2	53:29.4
76.60107	37.27758	53:56.0	53:30.3	Differentia	2.2	53:30.3
76.60106	37.27757	53:57.0	53:31.3	Differentia	2.2	53:31.3
76.60105	37.27757	53:58.0	53:32.3	Differentia	1.7	53:32.3
76.60104	37.27757	53:59.0	53:33.4	Differentia	1.3	53:33.4
76.60104	37.27756	54:00.0	53:34.3	Differentia	2.2	53:34.3
76.60103	37.27755	54:01.0	53:35.3	Differentia	2.2	53:35.3
76.60102	37.27755	54:02.0	53:36.3	Differentia	2.2	53:36.3
76.60101	37.27755	54:03.0	53:37.4	Differentia	1.7	53:37.4
76.601	37.27754	54:04.0	53:38.3	Differentia	1.7	53:38.3
76.601	37.27754	54:05.0	53:39.4	Differentia	2.2	53:39.4
76.60099	37.27754	54:06.0	53:40.4	Differentia	1.7	53:40.4
76.60098	37.27753	54:07.0	53:41.3	Differentia	1.7	53:41.3
76.60097	37.27753	54:08.0	53:42.3	Differentia	1.7	53:42.3
76.60096	37.27752	54:09.0	53:43.3	Differentia	1.7	53:43.3
76.60096	37.27752	54:10.0	53:44.5	Differentia	1.7	53:44.5
76.60095	37.27752	54:11.0	53:45.3	Differentia	2.2	53:45.3
76.60094	37.27751	54:12.0	53:46.3	Differentia	2.2	53:46.3
76.60093	37.27751	54:13.0	53:47.3	Differentia	1.7	53:47.3
76.60092	37.27751	54:14.0	53:48.3	Differentia	1.7	53:48.3
76.60091	37.27751	54:15.0	53:49.3	Differentia	1.7	53:49.3
76.6009	37.27751	54:16.0	53:50.3	Differentia	1.7	53:50.3
76.60089	37.2775	54:17.0	53:51.3	Differentia	1.1	53:51.3
76.60088	37.2775	54:18.0	53:52.3	Differentia	1.8	53:52.3
76.60087	37.2775	54:19.0	53:53.4	Differentia	1.1	53:53.4

76.60086	37.2775	54:20.0	53:54.4	Differentia	1.7	53:54.4
76.60086	37.27749	54:21.0	53:55.3	Differentia	1.6	53:55.3
76.60085	37.27749	54:22.0	53:56.3	Differentia	2.2	53:56.3
76.60084	37.27749	54:23.0	53:57.3	Differentia	1.6	53:57.3
76.60083	37.2775	54:24.0	53:58.3	Raw (GPS)	1.6	53:58.3
76.60082	37.2775	54:25.0	53:59.4	Raw (GPS)	2.2	53:59.4
76.60081	37.2775	54:26.0	54:00.3	Raw (GPS)	2.2	54:00.3
76.60081	37.2775	54:27.0	54:01.3	Raw (GPS)	1.6	54:01.3
76.60079	37.27749	54:28.0	54:02.3	Differentia	1.6	54:02.3
76.60078	37.27749	54:29.0	54:03.3	Differentia	2.3	54:03.3
76.60077	37.27749	54:30.0	54:04.3	Differentia	1.6	54:04.3
76.60076	37.2775	54:31.0	54:05.3	Differentia	1.6	54:05.3
76.60076	37.27749	54:32.0	54:06.3	Differentia	2.2	54:06.3
76.60076	37.27749	54:33.0	54:07.3	Differentia	1.6	54:07.3
76.60075	37.2775	54:34.0	54:08.3	Differentia	1.3	54:08.3
76.60075	37.2775	54:35.0	54:09.4	Differentia	1.6	54:09.4
76.60074	37.27751	54:36.0	54:10.3	Differentia	1.6	54:10.3
76.60074	37.27751	54:37.0	54:11.3	Differentia	1.6	54:11.3
76.60074	37.27751	54:38.0	54:12.3	Differentia	1.6	54:12.3
76.60074	37.27752	54:39.0	54:13.4	Differentia	1.6	54:13.4
76.60074	37.27752	54:40.0	54:14.4	Differentia	1.6	54:14.4
76.60074	37.27753	54:41.0	54:15.3	Differentia	1.6	54:15.3
76.60073	37.27753	54:42.0	54:16.3	Differentia	2.3	54:16.3
76.60073	37.27754	54:43.0	54:17.3	Differentia	2.3	54:17.3
76.60072	37.27754	54:44.0	54:18.3	Differentia	2.3	54:18.3
76.60072	37.27755	54:45.0	54:19.4	Differentia	2.3	54:19.4
76.60071	37.27755	54:46.0	54:20.3	Differentia	1.6	54:20.3
76.60071	37.27755	54:47.0	54:21.3	Differentia	2.3	54:21.3
76.6007	37.27755	54:48.0	54:22.3	Differentia	2.3	54:22.3
76.60069	37.27755	54:49.0	54:23.3	Differentia	2.3	54:23.3
76.60069	37.27754	54:50.0	54:24.3	Differentia	3.6	54:24.3
76.60068	37.27754	54:51.0	54:25.3	Differentia	2.3	54:25.3
76.60067	37.27755	54:52.0	54:26.3	Differentia	2.3	54:26.3
76.60067	37.27755	54:53.0	54:27.3	Differentia	2.3	54:27.3
76.60066	37.27755	54:54.0	54:28.3	Differentia	2.3	54:28.3
76.60065	37.27756	54:55.0	54:29.4	Differentia	1.7	54:29.4
76.60065	37.27757	54:56.0	54:30.3	Raw (GPS)	2.3	54:30.3
76.60064	37.27758	54:57.0	54:31.3	Raw (GPS)	2.3	54:31.3
76.60064	37.27757	54:58.0	54:32.4	Differentia	2.3	54:32.4
76.60062	37.27757	54:59.0	54:33.3	Differentia	1.3	54:33.3
76.60062	37.27757	55:00.0	54:34.4	Differentia	1.3	54:34.4
76.60061	37.27757	55:01.0	54:35.3	Differentia	1.3	54:35.3
76.60061	37.27758	55:02.0	54:36.3	Differentia	1.3	54:36.3
76.60061	37.27758	55:03.0	54:37.3	Differentia	1.3	54:37.3
76.6006	37.27759	55:04.0	54:38.3	Differentia	1.7	54:38.3
76.60059	37.27759	55:05.0	54:39.3	Differentia	1.7	54:39.3
76.60059	37.27759	55:06.0	54:40.3	Differentia	1.7	54:40.3

76.60059	37.2776	55:07.0	54:41.3	Differentia	1.7	54:41.3
76.60059	37.2776	55:08.0	54:42.3	Differentia	1.7	54:42.3
76.60059	37.2776	55:09.0	54:43.3	Differentia	1.7	54:43.3
76.6006	37.27759	55:29.0	55:03.3	Differentia	2.3	55:03.3
76.6006	37.27759	55:30.0	55:04.4	Differentia	2.3	55:04.4
76.60058	37.27761	55:31.0	55:05.3	Differentia	2.9	55:05.3
76.60059	37.2776	55:32.0	55:06.3	Differentia	2.3	55:06.3
76.60058	37.2776	55:33.0	55:07.3	Differentia	1.7	55:07.3
76.60058	37.27761	55:34.0	55:08.3	Differentia	3.6	55:08.3
76.60059	37.2776	55:35.0	55:09.4	Differentia	2.3	55:09.4
76.60059	37.27761	55:36.0	55:10.3	Differentia	2.3	55:10.3
76.60058	37.27761	55:37.0	55:11.3	Differentia	2.3	55:11.3
76.60058	37.27762	55:38.0	55:12.3	Differentia	1.7	55:12.3
76.60058	37.27762	55:39.0	55:13.3	Differentia	2.3	55:13.3
76.60058	37.27763	55:40.0	55:14.4	Differentia	2.3	55:14.4
76.60058	37.27763	55:41.0	55:15.3	Differentia	2.3	55:15.3
76.60058	37.27764	55:42.0	55:16.3	Differentia	3.5	55:16.3
76.60059	37.27764	55:43.0	55:17.3	Differentia	3.5	55:17.3
76.60058	37.27764	55:44.0	55:18.3	Raw (GPS)	3.5	55:18.3
76.60057	37.27764	55:45.0	55:19.3	Raw (GPS)	3.5	55:19.3
76.60057	37.27764	56:04.0	55:38.0	Differentia	3	55:38.0
76.60057	37.27764	56:05.0	55:39.0	Differentia	3	55:39.0
76.60057	37.27764	56:06.0	55:39.9	Differentia	3.6	55:39.9
76.60057	37.27765	56:07.0	55:41.0	Differentia	3	55:41.0
76.60057	37.27765	56:08.0	55:41.9	Differentia	3	55:41.9
76.60055	37.27767	56:09.0	55:43.0	Raw (GPS)	3	55:43.0
76.60056	37.27767	56:10.0	55:43.9	Differentia	3	55:43.9
76.60056	37.27767	56:11.0	55:44.9	Differentia	3	55:44.9
76.60055	37.27766	56:46.0	56:19.8	Differentia	1.3	56:19.8
76.60055	37.27766	56:47.0	56:20.8	Differentia	1.3	56:20.8
76.60055	37.27766	56:48.0	56:21.8	Differentia	1.7	56:21.8
76.60054	37.27766	56:49.0	56:22.8	Differentia	1.7	56:22.8
76.60054	37.27765	56:50.0	56:23.9	Differentia	2.4	56:23.9
76.60054	37.27765	56:51.0	56:24.8	Differentia	2.4	56:24.8
76.60053	37.27765	56:52.0	56:25.8	Differentia	2.4	56:25.8
76.60053	37.27765	56:53.0	56:26.8	Differentia	2.4	56:26.8
76.60053	37.27764	56:54.0	56:27.8	Differentia	2.4	56:27.8
76.60053	37.27764	56:55.0	56:28.8	Differentia	1.6	56:28.8
76.60051	37.27766	56:56.0	56:29.8	Raw (GPS)	1.8	56:29.8
76.60051	37.27765	56:57.0	56:30.8	Raw (GPS)	1.8	56:30.8
76.60051	37.27766	57:48.0	57:22.1	Differentia	1.8	57:22.1
76.60051	37.27766	57:49.0	57:23.1	Differentia	1.8	57:23.1
76.60052	37.27765	57:50.0	57:24.2	Differentia	2.5	57:24.2
76.60052	37.27764	57:51.0	57:25.1	Differentia	1.8	57:25.1
76.60053	37.27764	57:52.0	57:26.1	Differentia	1.8	57:26.1
76.60057	37.27764	57:53.0	57:27.1	Raw (GPS)	3.8	57:27.1
76.60053	37.27764	57:54.0	57:28.1	Raw (GPS)	1.8	57:28.1

76.60055	37.27763	57:55.0	57:29.1	Raw (GPS)	2.5	57:29.1
76.60056	37.27763	57:56.0	57:30.1	Raw (GPS)	2.5	57:30.1
76.60056	37.27763	57:57.0	57:31.1	Raw (GPS)	2.5	57:31.1
76.60057	37.27761	57:58.0	57:32.1	Differentia	2.5	57:32.1
76.60057	37.27761	57:59.0	57:33.1	Differentia	1.8	57:33.1
76.60058	37.2776	58:00.0	57:34.2	Differentia	2.5	57:34.2
76.60058	37.2776	58:01.0	57:35.1	Differentia	1.8	57:35.1
76.60059	37.2776	58:02.0	57:36.1	Differentia	2.5	57:36.1
76.6006	37.2776	58:03.0	57:37.1	Differentia	1.8	57:37.1
76.6006	37.27759	58:04.0	57:38.1	Differentia	1.8	57:38.1
76.60061	37.27759	58:05.0	57:39.2	Differentia	1.8	57:39.2
76.60061	37.27758	58:06.0	57:40.1	Differentia	1.8	57:40.1
76.60061	37.27758	58:07.0	57:41.1	Differentia	1.8	57:41.1
76.60062	37.27757	58:08.0	57:42.1	Differentia	1.8	57:42.1
76.60062	37.27757	58:09.0	57:43.1	Differentia	1.8	57:43.1
76.60063	37.27756	58:10.0	57:44.1	Differentia	1.8	57:44.1
76.60063	37.27756	58:11.0	57:45.1	Differentia	1.8	57:45.1
76.60063	37.27756	58:12.0	57:46.1	Differentia	1.8	57:46.1
76.60064	37.27755	58:13.0	57:47.1	Differentia	1.3	57:47.1
76.60064	37.27755	58:14.0	57:48.1	Differentia	1.3	57:48.1
76.60065	37.27755	58:15.0	57:49.1	Differentia	1.3	57:49.1
76.60065	37.27754	58:16.0	57:50.1	Differentia	2.6	57:50.1
76.60066	37.27753	58:17.0	57:51.1	Differentia	2.6	57:51.1
76.60066	37.27753	58:18.0	57:52.1	Differentia	1.6	57:52.1
76.60066	37.27752	58:19.0	57:53.1	Differentia	1.6	57:53.1
76.60066	37.27752	58:20.0	57:54.2	Differentia	2.6	57:54.2
76.60066	37.27752	58:21.0	57:55.1	Differentia	1.6	57:55.1
76.60067	37.27751	58:22.0	57:56.1	Differentia	1.6	57:56.1
76.60067	37.27751	58:23.0	57:57.1	Differentia	2.6	57:57.1
76.60067	37.27751	58:24.0	57:58.1	Differentia	1.6	57:58.1
76.60067	37.2775	58:25.0	57:59.2	Differentia	2.6	57:59.2
76.60066	37.2775	58:26.0	58:00.1	Differentia	1.8	58:00.1
76.60066	37.27749	58:27.0	58:01.1	Differentia	2.6	58:01.1
76.60066	37.27749	58:28.0	58:02.1	Differentia	2.6	58:02.1
76.60065	37.27749	58:29.0	58:03.1	Differentia	2.6	58:03.1
76.60065	37.27749	58:30.0	58:04.1	Differentia	2.6	58:04.1
76.60064	37.27749	58:31.0	58:05.1	Differentia	2.6	58:05.1
76.60063	37.27749	58:32.0	58:06.1	Differentia	1.8	58:06.1
76.60062	37.27749	58:33.0	58:07.1	Differentia	1.8	58:07.1
76.60061	37.27749	58:34.0	58:08.1	Differentia	3	58:08.1
76.60061	37.27749	58:35.0	58:09.2	Differentia	2.6	58:09.2
76.60061	37.27749	58:36.0	58:10.1	Differentia	2.6	58:10.1
76.60061	37.27749	58:37.0	58:11.1	Differentia	2.6	58:11.1
76.6006	37.27749	58:38.0	58:12.1	Differentia	2.6	58:12.1
76.6006	37.27749	58:39.0	58:13.1	Differentia	1.6	58:13.1
76.60059	37.27748	58:40.0	58:14.2	Differentia	2.6	58:14.2
76.60059	37.27748	58:41.0	58:15.1	Differentia	2.6	58:15.1

76.60059	37.27748	58:42.0	58:16.1	Differentia	2.6	58:16.1
76.60058	37.27748	58:43.0	58:17.1	Differentia	2.6	58:17.1
76.60057	37.27749	58:44.0	58:18.1	Differentia	1.8	58:18.1
76.60057	37.27749	58:45.0	58:19.2	Differentia	1.8	58:19.2
76.60057	37.27748	59:12.0	58:46.1	Differentia	1.8	58:46.1
76.60057	37.27748	59:13.0	58:47.1	Differentia	1.8	58:47.1
76.60057	37.27748	59:14.0	58:48.1	Differentia	1.8	58:48.1
76.60056	37.27749	59:15.0	58:49.2	Differentia	1.8	58:49.2
76.60056	37.27749	59:16.0	58:50.1	Differentia	1.8	58:50.1
76.60056	37.2775	59:17.0	58:51.1	Differentia	1.8	58:51.1
76.60056	37.2775	59:18.0	58:52.1	Differentia	1.8	58:52.1
76.60056	37.27751	59:19.0	58:53.1	Differentia	1.6	58:53.1
76.60056	37.27752	59:20.0	58:54.1	Differentia	1.6	58:54.1
76.60056	37.27752	59:21.0	58:55.1	Differentia	1.6	58:55.1
76.60056	37.27752	59:22.0	58:56.1	Differentia	1.6	58:56.1
76.60055	37.27752	59:23.0	58:57.1	Differentia	1.6	58:57.1
76.60055	37.27752	59:24.0	58:58.1	Differentia	1.3	58:58.1
76.60055	37.27752	59:35.0	59:09.1	Differentia	1.6	59:09.1
76.60055	37.27752	59:36.0	59:10.1	Differentia	1.6	59:10.1
76.60055	37.27753	59:37.0	59:11.1	Differentia	1.6	59:11.1
76.60055	37.27753	59:38.0	59:12.1	Differentia	1.6	59:12.1
76.60055	37.27754	59:39.0	59:13.1	Differentia	1.8	59:13.1
76.60055	37.27754	59:40.0	59:14.2	Differentia	1.3	59:14.2
76.60055	37.27754	59:41.0	59:15.1	Differentia	1.3	59:15.1
76.60056	37.27755	59:42.0	59:16.1	Differentia	1.3	59:16.1
76.60056	37.27755	59:43.0	59:17.1	Differentia	1.3	59:17.1
76.60056	37.27755	59:44.0	59:18.1	Differentia	1.3	59:18.1
76.60055	37.27756	59:45.0	59:19.1	Differentia	1.9	59:19.1
76.60056	37.27756	59:46.0	59:20.1	Differentia	1.6	59:20.1
76.60056	37.27756	59:47.0	59:21.1	Differentia	1.8	59:21.1
76.60056	37.27757	59:48.0	59:22.1	Differentia	1.8	59:22.1
76.60056	37.27757	59:49.0	59:23.1	Differentia	1.8	59:23.1
76.60056	37.27758	59:50.0	59:24.1	Differentia	1.8	59:24.1
76.60056	37.27758	59:51.0	59:25.1	Differentia	1.8	59:25.1
76.60056	37.27758	59:52.0	59:26.1	Differentia	1.8	59:26.1
76.60057	37.27758	59:53.0	59:27.1	Differentia	1.8	59:27.1
76.60057	37.27759	59:54.0	59:28.1	Differentia	1.8	59:28.1
76.60056	37.27761	01:26.0	01:00.3	Differentia	1.8	01:00.3
76.60056	37.27761	01:27.0	01:01.2	Differentia	1.8	01:01.2
76.60056	37.27761	01:28.0	01:02.2	Differentia	1.8	01:02.2
76.60055	37.27761	01:29.0	01:03.2	Differentia	1.8	01:03.2
76.60055	37.27761	01:30.0	01:04.3	Differentia	1.8	01:04.3
76.60054	37.27761	01:31.0	01:05.2	Differentia	1.8	01:05.2
76.60054	37.27762	01:32.0	01:06.2	Differentia	1.8	01:06.2
76.60054	37.27761	01:33.0	01:07.2	Differentia	4.2	01:07.2
76.60053	37.27761	01:34.0	01:08.2	Differentia	4.2	01:08.2
76.60053	37.27761	01:35.0	01:09.2	Differentia	4.2	01:09.2

76.60052	37.2776	01:36.0	01:10.2	Differentia	3	01:10.2
76.60051	37.2776	01:37.0	01:11.3	Differentia	1.8	01:11.3
76.60051	37.2776	01:38.0	01:12.2	Differentia	1.8	01:12.2
76.60049	37.27761	01:39.0	01:13.2	Raw (GPS)	1.8	01:13.2
76.6005	37.27759	01:40.0	01:14.3	Differentia	2	01:14.3
76.6005	37.27759	01:41.0	01:15.2	Differentia	1.8	01:15.2
76.6005	37.27759	01:42.0	01:16.2	Differentia	1.8	01:16.2
76.6005	37.27759	01:43.0	01:17.2	Raw (GPS)	3.1	01:17.2
76.6005	37.27759	01:44.0	01:18.3	Raw (GPS)	3.1	01:18.3
76.6005	37.27759	01:45.0	01:19.2	Raw (GPS)	3.1	01:19.2
76.60049	37.27758	01:46.0	01:20.2	Differentia	3.1	01:20.2
76.60049	37.27757	01:47.0	01:21.2	Differentia	3.1	01:21.2
76.60049	37.27756	01:48.0	01:22.2	Differentia	3.1	01:22.2
76.60049	37.27756	01:49.0	01:23.2	Differentia	1.8	01:23.2
76.60048	37.27756	01:50.0	01:24.2	Differentia	1.8	01:24.2
76.60048	37.27756	01:51.0	01:25.2	Differentia	1.8	01:25.2
76.60048	37.27756	01:52.0	01:26.2	Differentia	1.8	01:26.2
76.60048	37.27755	01:53.0	01:27.3	Differentia	1.8	01:27.3
76.60048	37.27755	01:54.0	01:28.2	Differentia	1.8	01:28.2
76.60048	37.27755	02:16.0	01:50.2	Differentia	1.9	01:50.2
76.60048	37.27755	02:17.0	01:51.2	Differentia	1.9	01:51.2
76.60048	37.27756	02:18.0	01:52.2	Differentia	1.9	01:52.2
76.6005	37.27757	02:19.0	01:53.2	Raw (GPS)	3.2	01:53.2
76.6005	37.27758	02:20.0	01:54.3	Raw (GPS)	3.2	01:54.3
76.6005	37.27758	02:21.0	01:55.2	Raw (GPS)	3.2	01:55.2
76.60049	37.27758	02:22.0	01:56.2	Differentia	3.2	01:56.2
76.6005	37.27759	02:23.0	01:57.2	Raw (GPS)	3.2	01:57.2
76.6005	37.2776	02:24.0	01:58.2	Raw (GPS)	3.2	01:58.2
76.6005	37.2776	02:25.0	01:59.3	Raw (GPS)	3.2	01:59.3
76.60048	37.27763	02:26.0	02:00.2	Raw (GPS)	4.3	02:00.2
76.60049	37.27763	02:27.0	02:01.2	Raw (GPS)	2.1	02:01.2
76.60048	37.27761	02:28.0	02:02.2	Differentia	3.2	02:02.2
76.60047	37.27762	02:29.0	02:03.2	Differentia	3.2	02:03.2
76.6005	37.27763	02:30.0	02:04.3	Differentia	4.3	02:04.3
76.60051	37.27763	02:31.0	02:05.2	Differentia	2.1	02:05.2
76.60051	37.27763	02:32.0	02:06.2	Differentia	1.9	02:06.2
76.6005	37.27765	02:33.0	02:07.2	Raw (GPS)	1.9	02:07.2
76.60051	37.27764	02:34.0	02:08.2	Differentia	1.9	02:08.2
76.60052	37.27764	02:35.0	02:09.2	Differentia	1.9	02:09.2
76.60052	37.27765	02:36.0	02:10.2	Differentia	1.9	02:10.2
76.60052	37.27766	02:37.0	02:11.2	Differentia	1.9	02:11.2
76.60053	37.27766	02:38.0	02:12.2	Differentia	1.9	02:12.2
76.60053	37.27767	02:39.0	02:13.2	Differentia	1.9	02:13.2
76.60053	37.27768	02:40.0	02:14.3	Differentia	2.1	02:14.3
76.60053	37.2777	02:41.0	02:15.2	Raw (GPS)	1.9	02:15.2
76.60053	37.27772	02:42.0	02:16.2	Raw (GPS)	2.2	02:16.2
76.60052	37.27767	02:43.0	02:17.2	Raw (GPS)	1.9	02:17.2

76.60054	37.27772	02:44.0	02:18.2	Raw (GPS)	2.2	02:18.2
76.60054	37.27773	02:45.0	02:19.3	Raw (GPS)	1.9	02:19.3
76.60056	37.27771	02:46.0	02:20.2	Differentia	4	02:20.2
76.60058	37.27772	02:47.0	02:21.3	Raw (GPS)	3.3	02:21.3
76.60063	37.27772	02:48.0	02:22.2	Raw (GPS)	4.4	02:22.2
76.60059	37.27773	02:49.0	02:23.2	Raw (GPS)	3.3	02:23.2
76.60065	37.27773	02:50.0	02:24.3	Raw (GPS)	4.4	02:24.3
76.60058	37.27775	02:51.0	02:25.2	Raw (GPS)	4	02:25.2
76.6006	37.27776	02:52.0	02:26.2	Raw (GPS)	4.1	02:26.2
76.60061	37.27776	02:53.0	02:27.2	Raw (GPS)	3.3	02:27.2
76.60061	37.27776	02:54.0	02:28.2	Raw (GPS)	3.3	02:28.2
76.60062	37.27776	02:55.0	02:29.2	Raw (GPS)	3.3	02:29.2
76.60062	37.27776	02:56.0	02:30.2	Raw (GPS)	3.3	02:30.2
76.60063	37.27777	02:57.0	02:31.2	Raw (GPS)	3.3	02:31.2
76.60062	37.27775	02:58.0	02:32.2	Differentia	4.8	02:32.2
76.60063	37.27776	02:59.0	02:33.2	Differentia	1.9	02:33.2
76.60064	37.27776	03:00.0	02:34.3	Differentia	3.3	02:34.3
76.60064	37.27776	03:01.0	02:35.2	Differentia	1.9	02:35.2
76.60064	37.2778	03:58.0	03:31.8	Raw (GPS)	1.9	03:31.8
76.60064	37.2778	03:59.0	03:32.9	Raw (GPS)	1.9	03:32.9
76.60064	37.2778	04:00.0	03:33.9	Raw (GPS)	1.9	03:33.9
76.60064	37.27781	04:01.0	03:34.8	Raw (GPS)	1.9	03:34.8
76.60064	37.27781	04:02.0	03:35.8	Raw (GPS)	1.9	03:35.8
76.60066	37.2778	04:03.0	03:36.9	Raw (GPS)	3.6	03:36.9
76.60066	37.2778	04:04.0	03:37.9	Raw (GPS)	3.6	03:37.9
76.60065	37.27781	04:05.0	03:38.8	Raw (GPS)	3.6	03:38.8
76.60065	37.27781	04:06.0	03:39.8	Raw (GPS)	3.6	03:39.8
76.60065	37.27782	04:07.0	03:40.9	Raw (GPS)	3.6	03:40.9
76.60065	37.27782	04:08.0	03:41.8	Raw (GPS)	3.6	03:41.8
76.60064	37.27782	04:09.0	03:42.9	Differentia	3.6	03:42.9
76.60064	37.27782	04:10.0	03:43.9	Differentia	1.9	03:43.9
76.60064	37.27782	04:11.0	03:44.9	Differentia	3.6	03:44.9
76.60065	37.27782	04:12.0	03:45.9	Differentia	1.9	03:45.9
76.60065	37.27782	04:13.0	03:46.9	Differentia	1.9	03:46.9
76.60065	37.27782	04:14.0	03:47.9	Differentia	1.9	03:47.9
76.60065	37.27782	04:15.0	03:48.9	Differentia	1.9	03:48.9
76.60066	37.27781	04:16.0	03:49.9	Differentia	1.9	03:49.9
76.60066	37.2778	04:17.0	03:50.9	Differentia	1.9	03:50.9
76.60066	37.2778	04:18.0	03:51.9	Differentia	1.9	03:51.9
76.60066	37.2778	04:19.0	03:52.9	Differentia	1.9	03:52.9
76.60067	37.27779	04:20.0	03:53.9	Differentia	1.9	03:53.9
76.60067	37.27778	04:21.0	03:54.9	Differentia	1.9	03:54.9
76.60068	37.27778	04:22.0	03:55.8	Differentia	1.9	03:55.8
76.60068	37.27778	04:23.0	03:56.9	Differentia	1.9	03:56.9
76.60068	37.27778	04:24.0	03:57.9	Differentia	1.9	03:57.9
76.60068	37.27778	04:25.0	03:58.9	Differentia	1.9	03:58.9
76.60069	37.27778	04:26.0	03:59.9	Differentia	1.9	03:59.9

76.60069	37.27778	04:27.0	04:00.9	Differentia	1.9	04:00.9
76.60069	37.27778	04:28.0	04:01.9	Differentia	1.9	04:01.9
76.60069	37.27778	04:29.0	04:02.9	Differentia	1.9	04:02.9
76.60069	37.27778	04:30.0	04:03.9	Differentia	1.9	04:03.9
76.6007	37.27779	04:31.0	04:04.9	Differentia	1.9	04:04.9
76.6007	37.27779	04:32.0	04:05.9	Differentia	1.9	04:05.9
76.60071	37.27779	04:33.0	04:06.9	Differentia	1.9	04:06.9
76.60071	37.27779	04:34.0	04:07.9	Differentia	1.9	04:07.9
76.60071	37.27779	04:35.0	04:08.9	Differentia	1.9	04:08.9
76.60072	37.2778	04:36.0	04:09.9	Differentia	3.2	04:09.9
76.60072	37.2778	04:37.0	04:10.9	Differentia	1.9	04:10.9
76.60072	37.2778	04:38.0	04:11.9	Differentia	1.9	04:11.9
76.60072	37.2778	04:39.0	04:12.9	Differentia	1.9	04:12.9
76.60072	37.2778	04:40.0	04:13.9	Differentia	1.9	04:13.9
76.60072	37.2778	04:41.0	04:14.9	Differentia	1.9	04:14.9
76.60072	37.2778	04:42.0	04:15.9	Differentia	1.9	04:15.9
76.60072	37.2778	04:43.0	04:16.9	Differentia	1.9	04:16.9
76.60073	37.27781	04:44.0	04:17.9	Differentia	1.9	04:17.9
76.60073	37.27781	04:45.0	04:18.9	Differentia	1.9	04:18.9
76.60073	37.27781	04:46.0	04:19.9	Differentia	3.3	04:19.9
76.60073	37.27781	04:47.0	04:20.9	Differentia	3.3	04:20.9
76.60073	37.27781	04:48.0	04:21.9	Differentia	3.3	04:21.9
76.60073	37.27781	04:49.0	04:22.9	Differentia	3.3	04:22.9
76.60074	37.27782	04:50.0	04:23.9	Differentia	1.9	04:23.9
76.60074	37.27782	04:51.0	04:24.9	Differentia	1.9	04:24.9
76.60074	37.27782	04:52.0	04:25.9	Differentia	1.9	04:25.9
76.60074	37.27781	04:53.0	04:26.9	Differentia	1.9	04:26.9
76.60074	37.27781	04:54.0	04:27.9	Differentia	1.9	04:27.9
76.60074	37.27781	04:55.0	04:28.9	Differentia	1.9	04:28.9
76.60074	37.2778	04:56.0	04:29.9	Differentia	1.9	04:29.9
76.60074	37.2778	04:57.0	04:30.9	Differentia	1.9	04:30.9
76.60074	37.2778	04:58.0	04:31.9	Differentia	1.9	04:31.9
76.60075	37.27781	04:59.0	04:32.9	Differentia	1.9	04:32.9
76.60075	37.27781	05:00.0	04:33.9	Differentia	1.9	04:33.9
76.60075	37.27781	05:01.0	04:34.9	Differentia	1.9	04:34.9
76.60075	37.27781	05:02.0	04:35.9	Differentia	1.9	04:35.9
76.60075	37.27781	05:03.0	04:36.9	Differentia	1.9	04:36.9
76.60075	37.27781	05:04.0	04:37.9	Differentia	1.9	04:37.9
76.60075	37.27781	05:05.0	04:38.9	Differentia	1.9	04:38.9
76.60074	37.27781	05:06.0	04:39.9	Differentia	1.9	04:39.9
76.60074	37.2778	05:07.0	04:40.9	Differentia	1.9	04:40.9
76.60074	37.2778	05:08.0	04:41.9	Differentia	1.9	04:41.9
76.60073	37.2778	05:09.0	04:42.9	Differentia	1.9	04:42.9
76.60073	37.2778	05:10.0	04:43.9	Differentia	1.9	04:43.9
76.60073	37.27779	05:11.0	04:44.9	Differentia	1.9	04:44.9
76.60074	37.27779	05:12.0	04:45.9	Differentia	1.9	04:45.9
76.60074	37.27779	05:13.0	04:46.9	Differentia	1.9	04:46.9

76.60075	37.27778	05:14.0	04:47.9	Differentia	3.9	04:47.9
76.60075	37.27779	05:15.0	04:48.9	Differentia	1.9	04:48.9
76.60075	37.27779	05:16.0	04:49.9	Differentia	1.9	04:49.9
76.60075	37.27779	05:32.0	05:05.8	Differentia	1.9	05:05.8
76.60075	37.27779	05:33.0	05:06.8	Differentia	1.9	05:06.8
76.60076	37.27778	05:34.0	05:07.9	Differentia	1.9	05:07.9
76.60076	37.27778	05:35.0	05:08.9	Differentia	1.9	05:08.9
76.60077	37.27778	05:36.0	05:09.8	Differentia	1.9	05:09.8
76.60077	37.27778	05:37.0	05:10.9	Differentia	1.9	05:10.9
76.60077	37.27778	05:38.0	05:11.9	Differentia	1.9	05:11.9
76.60078	37.27777	05:39.0	05:12.9	Differentia	1.9	05:12.9
76.60078	37.27777	05:40.0	05:13.9	Differentia	1.9	05:13.9
76.60078	37.27777	05:41.0	05:14.9	Differentia	1.9	05:14.9
76.60078	37.27777	05:42.0	05:15.8	Differentia	1.9	05:15.8
76.60078	37.27777	05:57.0	05:30.9	Differentia	1.9	05:30.9
76.60078	37.27777	05:58.0	05:31.9	Differentia	1.9	05:31.9
76.60079	37.27777	05:59.0	05:32.9	Differentia	4.1	05:32.9
76.60078	37.27777	06:00.0	05:33.9	Differentia	1.9	05:33.9
76.60079	37.27777	06:01.0	05:34.9	Differentia	1.9	05:34.9
76.6008	37.27777	06:02.0	05:35.9	Differentia	1.9	05:35.9
76.6008	37.27777	06:03.0	05:36.9	Differentia	1.9	05:36.9
76.6008	37.27776	06:04.0	05:37.8	Differentia	1.9	05:37.8
76.60081	37.27776	06:05.0	05:38.9	Differentia	1.9	05:38.9
76.60082	37.27775	06:06.0	05:39.8	Differentia	2	05:39.8
76.60081	37.27774	06:07.0	05:40.8	Differentia	2	05:40.8
76.60083	37.27775	06:08.0	05:41.8	Differentia	3.4	05:41.8
76.60083	37.27774	06:09.0	05:42.8	Differentia	3.4	05:42.8
76.60083	37.27774	06:10.0	05:43.9	Differentia	3.4	05:43.9
76.60083	37.27774	06:11.0	05:44.8	Differentia	3.4	05:44.8
76.60084	37.27774	06:12.0	05:45.8	Differentia	3.2	05:45.8
76.60084	37.27773	06:13.0	05:46.9	Differentia	2	05:46.9
76.60084	37.27771	06:52.0	06:26.2	Differentia	2	06:26.2
76.60084	37.27771	06:53.0	06:27.2	Differentia	2	06:27.2
76.60084	37.27771	06:54.0	06:28.2	Differentia	2	06:28.2
76.60084	37.27771	06:55.0	06:29.2	Differentia	2	06:29.2
76.60085	37.27771	06:56.0	06:30.2	Differentia	2	06:30.2
76.60086	37.27771	06:57.0	06:31.2	Differentia	1.9	06:31.2
76.60086	37.27771	06:58.0	06:32.2	Differentia	1.9	06:32.2
76.60086	37.27771	06:59.0	06:33.2	Differentia	1.9	06:33.2
76.60086	37.27771	07:00.0	06:34.2	Differentia	1.9	06:34.2
76.60087	37.2777	07:01.0	06:35.2	Differentia	1.9	06:35.2
76.60088	37.2777	07:02.0	06:36.2	Differentia	2	06:36.2
76.60088	37.2777	07:03.0	06:37.2	Differentia	2	06:37.2
76.60089	37.27771	07:04.0	06:38.2	Differentia	3.4	06:38.2
76.60089	37.2777	07:05.0	06:39.2	Differentia	2	06:39.2
76.6009	37.2777	07:06.0	06:40.2	Differentia	3.4	06:40.2
76.6009	37.27769	07:07.0	06:41.2	Differentia	2	06:41.2

76.6009	37.27769	07:08.0	06:42.2	Differentia	2	06:42.2
76.6009	37.27768	07:09.0	06:43.2	Differentia	2	06:43.2
76.6009	37.27767	07:10.0	06:44.2	Differentia	2	06:44.2
76.6009	37.27767	07:11.0	06:45.2	Differentia	2	06:45.2
76.6009	37.27766	07:12.0	06:46.2	Differentia	2	06:46.2
76.6009	37.27765	07:13.0	06:47.2	Differentia	2	06:47.2
76.6009	37.27765	07:14.0	06:48.2	Differentia	2	06:48.2
76.6009	37.27765	07:15.0	06:49.2	Differentia	2	06:49.2
76.6009	37.27764	07:16.0	06:50.2	Differentia	2	06:50.2
76.60089	37.27764	07:17.0	06:51.2	Differentia	2	06:51.2
76.60089	37.27763	07:18.0	06:52.2	Differentia	2	06:52.2
76.60089	37.27763	07:19.0	06:53.2	Differentia	2	06:53.2
76.60088	37.27762	07:20.0	06:54.2	Differentia	2	06:54.2
76.60088	37.27762	07:21.0	06:55.2	Differentia	2	06:55.2
76.60088	37.27761	07:22.0	06:56.2	Differentia	2	06:56.2
76.60088	37.27761	07:23.0	06:57.2	Differentia	4.7	06:57.2
76.60088	37.27761	07:24.0	06:58.2	Differentia	2	06:58.2
76.60087	37.27763	07:25.0	06:59.2	Raw (GPS)	2	06:59.2
76.60087	37.27763	07:26.0	07:00.2	Raw (GPS)	2	07:00.2
76.60087	37.27762	07:27.0	07:01.2	Raw (GPS)	2	07:01.2
76.60087	37.27759	07:28.0	07:02.2	Differentia	2	07:02.2
76.60087	37.27759	07:29.0	07:03.2	Differentia	2	07:03.2
76.60087	37.27758	07:30.0	07:04.2	Differentia	6.4	07:04.2
76.60093	37.27754	07:31.0	07:05.2	Raw (GPS)	6.5	07:05.2
76.60089	37.27757	07:32.0	07:06.2	Raw (GPS)	4.8	07:06.2
76.60085	37.27759	07:33.0	07:07.2	Raw (GPS)	2	07:07.2
76.60086	37.27756	07:34.0	07:08.2	Differentia	2	07:08.2
76.60086	37.27756	07:35.0	07:09.2	Differentia	2	07:09.2
76.60089	37.27755	07:36.0	07:10.2	Raw (GPS)	5	07:10.2
76.60087	37.2775	09:06.0	08:40.3	Differentia	2	08:40.3
76.60087	37.2775	09:07.0	08:41.3	Differentia	2	08:41.3
76.60087	37.2775	09:08.0	08:42.3	Differentia	2	08:42.3
76.60087	37.2775	09:09.0	08:43.3	Differentia	2	08:43.3
76.60088	37.2775	09:10.0	08:44.3	Differentia	2	08:44.3
76.60088	37.2775	09:11.0	08:45.3	Differentia	2	08:45.3
76.60089	37.2775	09:12.0	08:46.3	Differentia	2	08:46.3
76.60089	37.27751	09:13.0	08:47.3	Differentia	2	08:47.3
76.60089	37.27752	09:14.0	08:48.3	Differentia	2	08:48.3
76.6009	37.27752	09:15.0	08:49.3	Differentia	2	08:49.3
76.60086	37.27754	09:16.0	08:50.3	Differentia	20.6	08:50.3
76.60091	37.27755	09:17.0	08:51.3	Differentia	3.4	08:51.3
76.60091	37.27756	09:18.0	08:52.3	Differentia	5.9	08:52.3
76.60091	37.27756	09:19.0	08:53.3	Differentia	5.9	08:53.3
76.60092	37.27756	09:20.0	08:54.3	Differentia	2	08:54.3
76.60093	37.27757	09:21.0	08:55.3	Differentia	5.9	08:55.3
76.60093	37.27757	09:22.0	08:56.3	Differentia	5.9	08:56.3
76.60094	37.27757	09:23.0	08:57.3	Differentia	7.5	08:57.3

76.60094	37.27757	09:24.0	08:58.3	Differentia	6	08:58.3
76.60095	37.27757	09:25.0	08:59.3	Differentia	6	08:59.3
76.60096	37.27758	09:26.0	09:00.3	Differentia	6	09:00.3
76.60096	37.27758	09:27.0	09:01.3	Differentia	6	09:01.3
76.60096	37.27758	09:28.0	09:02.3	Differentia	2	09:02.3
76.60096	37.27759	09:29.0	09:03.3	Differentia	2	09:03.3
76.60097	37.27759	09:30.0	09:04.3	Differentia	2	09:04.3
76.60097	37.27759	09:31.0	09:05.3	Differentia	2	09:05.3
76.60097	37.2776	09:32.0	09:06.3	Differentia	2	09:06.3
76.60097	37.2776	09:33.0	09:07.3	Differentia	6.1	09:07.3
76.60097	37.2776	09:34.0	09:08.3	Differentia	6.1	09:08.3
76.60097	37.2776	09:35.0	09:09.4	Differentia	2	09:09.4
76.60097	37.27761	09:36.0	09:10.4	Differentia	2	09:10.4
76.60096	37.27761	09:37.0	09:11.3	Differentia	2	09:11.3
76.60096	37.27762	09:38.0	09:12.3	Differentia	2	09:12.3
76.60096	37.27762	09:39.0	09:13.3	Differentia	2	09:13.3
76.60096	37.27762	09:40.0	09:14.3	Differentia	2	09:14.3
76.60096	37.27762	09:41.0	09:15.3	Differentia	6.2	09:15.3
76.60096	37.27762	09:42.0	09:16.3	Differentia	6.2	09:16.3
76.60095	37.27764	09:43.0	09:17.3	Differentia	2	09:17.3
76.60096	37.27763	09:44.0	09:18.3	Differentia	6.2	09:18.3
76.60096	37.27764	09:45.0	09:19.3	Differentia	6.2	09:19.3
76.60097	37.27764	09:46.0	09:20.3	Differentia	6.2	09:20.3
76.60097	37.27764	09:47.0	09:21.3	Differentia	6.2	09:21.3
76.60096	37.27766	09:48.0	09:22.3	Differentia	2	09:22.3
76.60097	37.27765	09:49.0	09:23.3	Differentia	6.3	09:23.3
76.60097	37.27766	09:50.0	09:24.3	Differentia	7.8	09:24.3
76.60096	37.27767	09:51.0	09:25.3	Differentia	6.3	09:25.3
76.60095	37.27768	09:52.0	09:26.3	Differentia	2.1	09:26.3
76.60095	37.27768	09:53.0	09:27.3	Differentia	6.3	09:27.3
76.60094	37.27768	09:54.0	09:28.3	Differentia	6.4	09:28.3
76.60094	37.27768	09:55.0	09:29.3	Differentia	6.4	09:29.3
76.60093	37.27768	09:56.0	09:30.3	Differentia	6.4	09:30.3
76.60092	37.27769	09:57.0	09:31.3	Differentia	6.4	09:31.3
76.60092	37.27769	09:58.0	09:32.3	Differentia	6.4	09:32.3
76.60091	37.27769	09:59.0	09:33.3	Differentia	6.4	09:33.3
76.60091	37.2777	10:00.0	09:34.4	Differentia	2.1	09:34.4
76.60091	37.2777	10:01.0	09:35.3	Differentia	2.1	09:35.3
76.60091	37.2777	10:02.0	09:36.3	Differentia	3.2	09:36.3
76.6009	37.27773	10:52.0	10:25.7	Differentia	2.1	10:25.7
76.6009	37.27773	10:53.0	10:26.7	Differentia	2.1	10:26.7
76.60092	37.27771	10:54.0	10:27.7	Differentia	7.3	10:27.7
76.60091	37.27772	10:55.0	10:28.7	Differentia	7.4	10:28.7
76.6009	37.27772	10:56.0	10:29.7	Differentia	7.4	10:29.7
76.60088	37.27773	10:57.0	10:30.7	Differentia	2.1	10:30.7
76.60088	37.27773	10:58.0	10:31.7	Differentia	2	10:31.7
76.60088	37.27773	10:59.0	10:32.7	Differentia	2	10:32.7

76.60088	37.27773	11:00.0	10:33.8	Differentia	2	10:33.8
76.60088	37.27774	11:01.0	10:34.7	Differentia	2.1	10:34.7
76.60089	37.27773	11:02.0	10:35.7	Differentia	7.5	10:35.7
76.60089	37.27773	11:03.0	10:36.7	Differentia	7.5	10:36.7
76.60088	37.27773	11:04.0	10:37.7	Differentia	7.5	10:37.7
76.60087	37.27775	11:05.0	10:38.7	Differentia	2.1	10:38.7
76.60088	37.27774	11:06.0	10:39.7	Differentia	7.6	10:39.7
76.60088	37.27774	11:07.0	10:40.7	Differentia	7.6	10:40.7
76.60086	37.27776	11:08.0	10:41.7	Differentia	2.1	10:41.7
76.60088	37.27775	11:09.0	10:42.7	Differentia	7.6	10:42.7
76.60087	37.27776	11:33.0	11:06.7	Differentia	2.1	11:06.7
76.60087	37.27776	11:34.0	11:07.7	Differentia	2.1	11:07.7
76.60086	37.27776	11:35.0	11:08.7	Differentia	2.1	11:08.7
76.60086	37.27777	11:36.0	11:09.7	Differentia	2.1	11:09.7
76.60085	37.27777	11:37.0	11:10.7	Differentia	2.1	11:10.7
76.60084	37.27777	11:38.0	11:11.7	Differentia	2.1	11:11.7
76.60083	37.27777	11:39.0	11:12.7	Differentia	2.1	11:12.7
76.60082	37.27777	11:40.0	11:13.7	Differentia	2.1	11:13.7
76.60081	37.27777	11:41.0	11:14.7	Differentia	2.1	11:14.7
76.60081	37.27778	11:42.0	11:15.7	Differentia	2.1	11:15.7
76.6008	37.27778	11:43.0	11:16.7	Differentia	2.1	11:16.7
76.6008	37.27778	11:44.0	11:17.7	Differentia	2.1	11:17.7
76.6008	37.27778	11:45.0	11:18.7	Differentia	2.1	11:18.7
76.6008	37.27778	11:46.0	11:19.7	Differentia	8.4	11:19.7
76.6008	37.27778	11:47.0	11:20.7	Differentia	8.4	11:20.7
76.60079	37.27778	11:48.0	11:21.7	Differentia	2.1	11:21.7
76.60105	37.27772	16:08.0	15:41.7	Differentia	2.2	15:41.7
76.60105	37.27772	16:09.0	15:42.7	Differentia	2.2	15:42.7
76.60104	37.27772	16:10.0	15:43.7	Differentia	2.2	15:43.7
76.60104	37.27772	16:11.0	15:44.7	Differentia	2.2	15:44.7
76.60104	37.27772	16:12.0	15:45.7	Differentia	2.2	15:45.7
76.60104	37.27773	16:13.0	15:46.7	Differentia	2.2	15:46.7
76.60103	37.27773	16:14.0	15:47.7	Differentia	2.2	15:47.7
76.60103	37.27773	16:15.0	15:48.8	Differentia	2.2	15:48.8
76.60102	37.27774	16:16.0	15:49.7	Differentia	2.2	15:49.7
76.60102	37.27774	16:17.0	15:50.7	Differentia	2.2	15:50.7
76.60102	37.27774	16:18.0	15:51.7	Differentia	2.2	15:51.7
76.60102	37.27773	16:19.0	15:52.7	Differentia	13.6	15:52.7
76.60103	37.27773	16:20.0	15:53.8	Differentia	13.6	15:53.8
76.60101	37.27775	16:21.0	15:54.7	Differentia	2.2	15:54.7
76.60102	37.27774	16:22.0	15:55.7	Differentia	13.5	15:55.7
76.601	37.27775	16:23.0	15:56.7	Differentia	2.2	15:56.7
76.60099	37.27776	16:24.0	15:57.7	Differentia	2.2	15:57.7
76.60099	37.27776	16:25.0	15:58.7	Differentia	2.2	15:58.7
76.60099	37.27776	16:26.0	15:59.7	Differentia	2.2	15:59.7
76.60099	37.27776	16:27.0	16:00.7	Differentia	2.2	16:00.7
76.60098	37.27777	16:28.0	16:01.7	Differentia	2.2	16:01.7

76.60098	37.27777	16:29.0	16:02.7	Differentia	2.2	16:02.7
76.60098	37.27778	16:30.0	16:03.7	Differentia	2.2	16:03.7
76.60097	37.27777	16:31.0	16:04.7	Differentia	2.2	16:04.7
76.60097	37.27778	16:32.0	16:05.7	Differentia	2.2	16:05.7
76.60097	37.27778	16:33.0	16:06.7	Differentia	2.2	16:06.7
76.60096	37.27778	16:34.0	16:07.7	Differentia	2.2	16:07.7
76.60095	37.27781	17:09.0	16:43.3	Differentia	2.2	16:43.3
76.60095	37.27781	17:10.0	16:44.4	Differentia	2.2	16:44.4
76.60095	37.2778	17:11.0	16:45.3	Differentia	2.2	16:45.3
76.60096	37.2778	17:12.0	16:46.3	Differentia	2.2	16:46.3
76.60096	37.2778	17:13.0	16:47.3	Differentia	2.2	16:47.3
76.60097	37.2778	17:14.0	16:48.3	Differentia	2.2	16:48.3
76.60098	37.2778	17:15.0	16:49.3	Differentia	2.2	16:49.3
76.60099	37.2778	17:16.0	16:50.3	Differentia	2.2	16:50.3
76.601	37.2778	17:17.0	16:51.3	Differentia	2.2	16:51.3
76.601	37.27779	17:18.0	16:52.3	Differentia	2.2	16:52.3
76.60101	37.27779	17:19.0	16:53.3	Differentia	2.2	16:53.3
76.60101	37.27779	17:20.0	16:54.3	Differentia	2.2	16:54.3
76.60102	37.27779	17:21.0	16:55.3	Differentia	2.2	16:55.3
76.60102	37.27778	17:22.0	16:56.3	Differentia	2.2	16:56.3
76.60102	37.27778	17:23.0	16:57.3	Differentia	2.2	16:57.3
76.60103	37.27778	17:24.0	16:58.3	Differentia	2.2	16:58.3
76.60103	37.27778	17:25.0	16:59.3	Differentia	2.2	16:59.3
76.60103	37.27777	17:26.0	17:00.3	Differentia	2.2	17:00.3
76.60104	37.27777	17:27.0	17:01.3	Differentia	2.2	17:01.3
76.60105	37.27777	17:28.0	17:02.3	Differentia	2.2	17:02.3
76.60105	37.27777	17:29.0	17:03.3	Differentia	2.2	17:03.3
76.60106	37.27777	17:30.0	17:04.4	Differentia	2.2	17:04.4
76.60107	37.27777	17:31.0	17:05.3	Differentia	2.2	17:05.3
76.60107	37.27776	17:32.0	17:06.3	Differentia	2.2	17:06.3
76.60108	37.27777	17:33.0	17:07.3	Differentia	2.2	17:07.3
76.60108	37.27777	17:34.0	17:08.3	Differentia	2.2	17:08.3
76.6011	37.27777	17:35.0	17:09.4	Differentia	11.7	17:09.4
76.60109	37.27777	17:36.0	17:10.3	Differentia	2.2	17:10.3
76.60111	37.27776	17:37.0	17:11.3	Differentia	11.7	17:11.3
76.6011	37.27777	17:38.0	17:12.3	Differentia	2.2	17:12.3
76.60111	37.27776	17:39.0	17:13.3	Differentia	2.2	17:13.3
76.60111	37.27776	17:40.0	17:14.4	Differentia	2.2	17:14.4
76.60112	37.27775	17:41.0	17:15.3	Differentia	2.2	17:15.3
76.60112	37.27775	17:42.0	17:16.3	Differentia	2.2	17:16.3
76.60112	37.27774	17:43.0	17:17.3	Differentia	2.2	17:17.3
76.60112	37.27774	17:44.0	17:18.3	Differentia	2.2	17:18.3
76.60112	37.27773	17:45.0	17:19.3	Differentia	2.2	17:19.3
76.60112	37.27773	17:46.0	17:20.4	Differentia	2.2	17:20.4
76.60112	37.27772	17:47.0	17:21.3	Differentia	2.2	17:21.3
76.60112	37.27772	17:48.0	17:22.3	Differentia	2.2	17:22.3
76.60112	37.27772	17:49.0	17:23.3	Differentia	11.3	17:23.3

76.60112	37.27771	17:50.0	17:24.3	Differentia	2.2	17:24.3
76.60112	37.2777	17:51.0	17:25.3	Differentia	2.2	17:25.3
76.60112	37.2777	17:52.0	17:26.3	Differentia	2.2	17:26.3
76.60112	37.2777	17:53.0	17:27.3	Differentia	2.2	17:27.3
76.60112	37.2777	17:54.0	17:28.3	Differentia	2.3	17:28.3
76.6012	37.27778	18:50.0	18:23.8	Differentia	3	18:23.8
76.6012	37.27778	18:51.0	18:24.8	Differentia	3	18:24.8
76.60119	37.27778	18:52.0	18:25.8	Differentia	3	18:25.8
76.60119	37.27779	18:53.0	18:26.8	Differentia	3	18:26.8
76.60118	37.27779	18:54.0	18:27.8	Differentia	3	18:27.8
76.60118	37.2778	18:55.0	18:28.8	Differentia	3	18:28.8
76.60117	37.27783	18:56.0	18:29.8	Raw (GPS)	3	18:29.8
76.60139	37.27766	18:57.0	18:30.8	Raw (GPS)	17.4	18:30.8
76.60116	37.27782	18:58.0	18:31.8	Differentia	3	18:31.8
76.60115	37.27782	18:59.0	18:32.8	Differentia	3	18:32.8
76.60115	37.27782	19:00.0	18:33.8	Differentia	3	18:33.8
76.60114	37.27782	19:01.0	18:34.8	Differentia	2.3	18:34.8
76.60113	37.27782	19:02.0	18:35.8	Differentia	3	18:35.8
76.60112	37.27782	19:03.0	18:36.8	Differentia	2.3	18:36.8
76.60111	37.27783	19:04.0	18:37.8	Differentia	3	18:37.8
76.6011	37.27783	19:05.0	18:38.8	Differentia	2.3	18:38.8
76.6011	37.27783	19:06.0	18:39.8	Differentia	2.3	18:39.8
76.60109	37.27783	19:07.0	18:40.8	Differentia	2.3	18:40.8
76.60109	37.27784	19:08.0	18:41.8	Differentia	2.3	18:41.8
76.60108	37.27784	19:09.0	18:42.8	Differentia	2.3	18:42.8
76.60107	37.27785	19:10.0	18:43.8	Differentia	2.3	18:43.8
76.60106	37.27785	19:11.0	18:44.8	Differentia	2.3	18:44.8
76.60105	37.27785	19:12.0	18:45.8	Differentia	2.3	18:45.8
76.60104	37.27786	19:13.0	18:46.8	Differentia	2.3	18:46.8
76.60103	37.27786	19:14.0	18:47.8	Differentia	9	18:47.8
76.60102	37.27787	19:15.0	18:48.8	Differentia	2.3	18:48.8
76.60101	37.27787	19:16.0	18:49.8	Differentia	2.3	18:49.8
76.601	37.27787	19:17.0	18:50.8	Differentia	2.3	18:50.8
76.601	37.27787	19:18.0	18:51.8	Differentia	2.3	18:51.8
76.60099	37.27788	19:19.0	18:52.8	Differentia	8.9	18:52.8
76.60098	37.27788	19:20.0	18:53.8	Differentia	2.3	18:53.8
76.60096	37.27788	19:21.0	18:54.8	Differentia	8.8	18:54.8
76.60096	37.27788	19:22.0	18:55.8	Differentia	2.3	18:55.8
76.60095	37.27788	19:23.0	18:56.8	Differentia	3	18:56.8
76.60095	37.27788	19:24.0	18:57.8	Differentia	2.3	18:57.8
76.60094	37.27788	19:25.0	18:58.8	Differentia	2.3	18:58.8
76.60094	37.27789	19:26.0	18:59.8	Differentia	2.3	18:59.8
76.60093	37.27788	19:27.0	19:00.8	Differentia	2.3	19:00.8
76.60092	37.27789	19:28.0	19:01.8	Differentia	2.3	19:01.8
76.60091	37.27789	19:29.0	19:02.8	Differentia	2.3	19:02.8
76.6009	37.27789	19:30.0	19:03.8	Differentia	2.3	19:03.8
76.6009	37.27789	19:31.0	19:04.8	Differentia	2.3	19:04.8

76.60089	37.27789	19:32.0	19:05.8	Differentia	2.3	19:05.8
76.60088	37.2779	19:33.0	19:06.8	Differentia	2.3	19:06.8
76.60088	37.2779	19:34.0	19:07.8	Differentia	2.3	19:07.8
76.60086	37.27791	19:35.0	19:08.8	Differentia	8.5	19:08.8
76.60086	37.27792	19:36.0	19:09.8	Differentia	2.3	19:09.8
76.60086	37.27792	19:37.0	19:10.8	Differentia	2.3	19:10.8
76.60085	37.27793	19:38.0	19:11.8	Differentia	2.3	19:11.8
76.60085	37.27793	19:39.0	19:12.8	Differentia	2.3	19:12.8
76.60084	37.27793	19:40.0	19:13.8	Differentia	2.3	19:13.8
76.60084	37.27793	19:41.0	19:14.8	Differentia	2.3	19:14.8
76.60083	37.27793	19:42.0	19:15.8	Differentia	2.3	19:15.8
76.60083	37.27794	19:43.0	19:16.8	Differentia	2.3	19:16.8
76.60082	37.27794	19:44.0	19:17.8	Differentia	2.3	19:17.8
76.60081	37.27794	19:45.0	19:18.8	Differentia	2.3	19:18.8
76.6008	37.27794	19:46.0	19:19.8	Differentia	2.3	19:19.8
76.6008	37.27794	19:47.0	19:20.8	Differentia	2.3	19:20.8
76.60079	37.27794	19:48.0	19:21.8	Differentia	2.3	19:21.8
76.60078	37.27795	19:49.0	19:22.8	Differentia	2.3	19:22.8
76.60078	37.27795	19:50.0	19:23.8	Differentia	2.1	19:23.8
76.60077	37.27795	19:51.0	19:24.8	Differentia	2.1	19:24.8
76.60076	37.27794	19:52.0	19:25.8	Differentia	2.3	19:25.8
76.60075	37.27794	19:53.0	19:26.8	Differentia	2.3	19:26.8
76.60075	37.27794	19:54.0	19:27.8	Differentia	2.3	19:27.8
76.60074	37.27794	19:55.0	19:28.8	Differentia	2.3	19:28.8
76.60074	37.27794	19:56.0	19:29.8	Differentia	2.3	19:29.8
76.60073	37.27795	19:57.0	19:30.8	Raw (GPS)	2.1	19:30.8
76.60072	37.27793	19:58.0	19:31.8	Differentia	2.1	19:31.8
76.60072	37.27792	19:59.0	19:32.8	Differentia	2.1	19:32.8
76.60071	37.27792	20:00.0	19:33.8	Differentia	2.1	19:33.8
76.60072	37.27793	20:24.0	19:58.3	Differentia	2.1	19:58.3
76.60072	37.27793	20:25.0	19:59.3	Differentia	2.3	19:59.3
76.60071	37.27793	20:26.0	20:00.3	Differentia	2.3	20:00.3
76.60071	37.27793	20:27.0	20:01.3	Differentia	2.3	20:01.3
76.60069	37.27793	20:28.0	20:02.3	Differentia	2.3	20:02.3
76.60068	37.27796	20:29.0	20:03.3	Raw (GPS)	2.3	20:03.3
76.60067	37.27797	20:30.0	20:04.3	Raw (GPS)	2.3	20:04.3
76.60067	37.27797	20:31.0	20:05.3	Raw (GPS)	2.3	20:05.3
76.60067	37.27798	20:32.0	20:06.3	Raw (GPS)	2.3	20:06.3
76.60068	37.27793	20:45.0	20:19.3	Differentia	2.3	20:19.3
76.60068	37.27794	20:46.0	20:20.3	Differentia	2.3	20:20.3
76.60068	37.27794	20:47.0	20:21.3	Differentia	2.3	20:21.3
76.60068	37.27795	20:48.0	20:22.3	Differentia	2.3	20:22.3
76.60068	37.27799	20:49.0	20:23.3	Raw (GPS)	2.3	20:23.3
76.60068	37.27799	20:50.0	20:24.3	Raw (GPS)	2.3	20:24.3
76.60069	37.27799	20:51.0	20:25.3	Raw (GPS)	2.3	20:25.3
76.6007	37.27797	20:52.0	20:26.3	Differentia	2.3	20:26.3
76.60071	37.27797	20:53.0	20:27.3	Differentia	2.3	20:27.3

76.60071	37.27797	20:54.0	20:28.3	Differentia	2.3	20:28.3
76.60071	37.278	20:55.0	20:29.4	Raw (GPS)	2.3	20:29.4
76.60071	37.278	20:56.0	20:30.3	Raw (GPS)	2.3	20:30.3
76.60073	37.278	20:57.0	20:31.3	Raw (GPS)	2.9	20:31.3
76.60073	37.27798	20:58.0	20:32.3	Differentia	2.3	20:32.3
76.60073	37.278	20:59.0	20:33.3	Differentia	2.3	20:33.3
76.60074	37.27798	21:00.0	20:34.3	Differentia	2.3	20:34.3
76.60075	37.27798	21:01.0	20:35.3	Differentia	2.3	20:35.3
76.60075	37.27798	21:02.0	20:36.3	Differentia	2.3	20:36.3
76.60076	37.27798	21:03.0	20:37.3	Differentia	2.9	20:37.3
76.60076	37.27798	21:04.0	20:38.3	Differentia	2.3	20:38.3
76.60077	37.27797	21:05.0	20:39.3	Differentia	2.3	20:39.3
76.60077	37.27797	21:06.0	20:40.3	Differentia	2.3	20:40.3
76.60078	37.27796	21:07.0	20:41.3	Differentia	2.3	20:41.3
76.60078	37.27796	21:08.0	20:42.3	Differentia	2.3	20:42.3
76.60079	37.27796	21:09.0	20:43.3	Differentia	2.3	20:43.3
76.60079	37.27795	21:10.0	20:44.3	Differentia	2.1	20:44.3
76.60079	37.27795	21:11.0	20:45.3	Differentia	2.3	20:45.3
76.6008	37.27795	21:12.0	20:46.3	Differentia	2.3	20:46.3
76.60081	37.27795	21:13.0	20:47.3	Differentia	2.3	20:47.3
76.60081	37.27794	21:14.0	20:48.3	Differentia	2.3	20:48.3
76.60082	37.27794	21:15.0	20:49.3	Differentia	2.3	20:49.3
76.60083	37.27794	21:16.0	20:50.3	Differentia	2.3	20:50.3
76.60084	37.27794	21:17.0	20:51.3	Differentia	2.3	20:51.3
76.60084	37.27794	21:18.0	20:52.3	Differentia	2.3	20:52.3
76.60085	37.27793	21:19.0	20:53.3	Differentia	2.1	20:53.3
76.60086	37.27793	21:20.0	20:54.3	Differentia	2.1	20:54.3
76.60086	37.27792	21:21.0	20:55.3	Differentia	2.1	20:55.3
76.60087	37.27792	21:22.0	20:56.3	Differentia	2.3	20:56.3
76.60087	37.27792	21:23.0	20:57.3	Differentia	2.3	20:57.3
76.60089	37.2779	21:24.0	20:58.3	Differentia	6.6	20:58.3
76.60088	37.27791	21:25.0	20:59.3	Differentia	2.3	20:59.3
76.60088	37.27791	21:26.0	21:00.3	Differentia	2.3	21:00.3
76.60089	37.27791	21:27.0	21:01.3	Differentia	2.3	21:01.3
76.6009	37.27791	21:28.0	21:02.3	Differentia	2.3	21:02.3
76.6009	37.27791	21:29.0	21:03.3	Differentia	2.3	21:03.3
76.60091	37.27791	21:30.0	21:04.3	Differentia	2.3	21:04.3
76.60092	37.27791	21:31.0	21:05.3	Differentia	2.3	21:05.3
76.60092	37.27791	21:32.0	21:06.3	Differentia	2.3	21:06.3
76.60093	37.27791	21:33.0	21:07.3	Differentia	2.9	21:07.3
76.60094	37.27791	21:34.0	21:08.3	Differentia	2.3	21:08.3
76.60094	37.27791	21:35.0	21:09.3	Differentia	2.3	21:09.3
76.60095	37.27791	21:36.0	21:10.3	Differentia	2.3	21:10.3
76.60096	37.27791	21:37.0	21:11.3	Differentia	2.3	21:11.3
76.60097	37.27791	21:38.0	21:12.3	Differentia	2.3	21:12.3
76.60097	37.27791	21:39.0	21:13.3	Differentia	2.3	21:13.3
76.60098	37.27791	21:40.0	21:14.3	Differentia	2.3	21:14.3

76.60099	37.27791	21:41.0	21:15.3	Differentia	2.3	21:15.3
76.601	37.27791	21:42.0	21:16.3	Differentia	2.3	21:16.3
76.60101	37.27791	21:43.0	21:17.3	Differentia	2.8	21:17.3
76.60101	37.27791	21:44.0	21:18.3	Differentia	2.3	21:18.3
76.60101	37.27794	21:45.0	21:19.3	Raw (GPS)	2.3	21:19.3
76.60103	37.27791	21:46.0	21:20.3	Differentia	2.3	21:20.3
76.60104	37.27791	21:47.0	21:21.3	Differentia	2.3	21:21.3
76.60104	37.27791	21:48.0	21:22.3	Differentia	2.3	21:22.3
76.60105	37.27791	21:49.0	21:23.3	Differentia	2.3	21:23.3
76.60105	37.27791	21:50.0	21:24.3	Differentia	2.3	21:24.3
76.60105	37.27791	21:51.0	21:25.4	Differentia	2.3	21:25.4
76.60105	37.27791	21:52.0	21:26.3	Differentia	2.3	21:26.3
76.60105	37.27791	21:53.0	21:27.3	Differentia	2.3	21:27.3
76.60105	37.27791	21:54.0	21:28.3	Differentia	2.3	21:28.3
76.60105	37.27791	21:55.0	21:29.3	Differentia	2.3	21:29.3
76.60105	37.27791	21:56.0	21:30.3	Differentia	2.3	21:30.3
76.60105	37.2779	21:57.0	21:31.3	Differentia	2.3	21:31.3
76.60105	37.2779	21:58.0	21:32.3	Differentia	2.3	21:32.3
76.60105	37.2779	21:59.0	21:33.3	Differentia	2.3	21:33.3
76.60105	37.2779	22:00.0	21:34.3	Differentia	2.3	21:34.3
76.60105	37.2779	22:01.0	21:35.3	Differentia	2.3	21:35.3
76.60105	37.2779	22:02.0	21:36.3	Differentia	2.3	21:36.3
76.60105	37.2779	22:03.0	21:37.3	Differentia	2.3	21:37.3
76.60105	37.2779	22:04.0	21:38.3	Differentia	2.3	21:38.3
76.60105	37.2779	22:05.0	21:39.3	Differentia	2.3	21:39.3

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76.60153	37.27829	26:00.0	25:33.9	Differentia	2	25:33.9
76.60152	37.27829	26:01.0	25:34.9	Differentia	2	25:34.9
76.60152	37.27829	26:02.0	25:35.9	Differentia	2	25:35.9
76.60151	37.27829	26:03.0	25:36.9	Differentia	2	25:36.9
76.6015	37.27829	26:04.0	25:37.9	Differentia	2.3	25:37.9
76.60149	37.2783	26:05.0	25:38.9	Differentia	2.3	25:38.9
76.60149	37.2783	26:06.0	25:39.9	Differentia	2.3	25:39.9
76.60148	37.2783	26:07.0	25:40.9	Differentia	2.3	25:40.9
76.60147	37.27831	26:08.0	25:41.9	Differentia	2.3	25:41.9
76.60146	37.27831	26:09.0	25:42.9	Differentia	2.3	25:42.9
76.60146	37.27832	26:10.0	25:44.0	Differentia	2.3	25:44.0
76.60145	37.27832	26:11.0	25:44.9	Differentia	2.3	25:44.9
76.60143	37.27833	26:12.0	25:45.9	Differentia	4.2	25:45.9
76.60142	37.27833	26:13.0	25:46.9	Differentia	4.2	25:46.9
76.60141	37.27833	26:14.0	25:47.9	Differentia	4.2	25:47.9
76.60144	37.27832	26:43.0	26:17.0	Differentia	2.3	26:17.0
76.60145	37.27832	26:44.0	26:18.0	Differentia	4.1	26:18.0
76.60144	37.27832	26:45.0	26:19.0	Differentia	4.1	26:19.0
76.60141	37.27834	26:46.0	26:20.0	Differentia	2.3	26:20.0
76.60141	37.27834	26:47.0	26:21.0	Differentia	2.3	26:21.0
76.6014	37.27835	26:48.0	26:22.0	Differentia	2.3	26:22.0
76.6014	37.27836	26:49.0	26:23.0	Differentia	2.3	26:23.0
76.60139	37.27836	26:50.0	26:24.0	Differentia	2.3	26:24.0
76.60139	37.27837	26:51.0	26:25.0	Differentia	2.3	26:25.0
76.60138	37.27838	26:52.0	26:26.0	Differentia	2.3	26:26.0
76.60138	37.27838	26:53.0	26:27.0	Differentia	2.3	26:27.0
76.60137	37.27839	26:54.0	26:28.0	Differentia	2.3	26:28.0
76.60136	37.27839	26:55.0	26:29.0	Differentia	2.3	26:29.0
76.60135	37.2784	26:56.0	26:30.0	Differentia	2.3	26:30.0
76.60134	37.2784	26:57.0	26:31.0	Differentia	2.3	26:31.0
76.60134	37.2784	26:58.0	26:32.0	Differentia	2.3	26:32.0
76.60133	37.27841	26:59.0	26:33.0	Differentia	2.3	26:33.0
76.60132	37.27841	27:00.0	26:34.0	Differentia	2.3	26:34.0
76.60131	37.27842	27:01.0	26:35.0	Differentia	2.3	26:35.0
76.60131	37.27842	27:02.0	26:36.0	Differentia	2.3	26:36.0
76.6013	37.27843	27:03.0	26:37.0	Differentia	2.3	26:37.0
76.6013	37.27843	27:04.0	26:38.0	Differentia	2.3	26:38.0
76.6013	37.27844	27:05.0	26:39.0	Differentia	2.3	26:39.0
76.6013	37.27844	27:06.0	26:40.0	Differentia	2.3	26:40.0
76.6013	37.27845	27:07.0	26:41.0	Differentia	2.3	26:41.0
76.60129	37.27845	27:08.0	26:42.0	Differentia	2.3	26:42.0
76.60129	37.27846	27:09.0	26:43.0	Differentia	2.3	26:43.0
76.60129	37.27846	27:10.0	26:44.0	Differentia	2.3	26:44.0
76.60129	37.27847	27:11.0	26:45.0	Differentia	2.3	26:45.0
76.60128	37.27848	27:12.0	26:46.0	Differentia	2.3	26:46.0
76.60128	37.27848	27:13.0	26:47.0	Differentia	2.3	26:47.0
76.60128	37.27848	27:14.0	26:48.0	Differentia	2.3	26:48.0

76.60127	37.27849	27:15.0	26:49.0	Differentia	2.3	26:49.0
76.60128	37.27849	27:16.0	26:50.0	Differentia	2.3	26:50.0
76.60128	37.2785	27:17.0	26:51.0	Differentia	2.3	26:51.0
76.60128	37.2785	27:18.0	26:52.0	Differentia	2.3	26:52.0
76.60129	37.27851	27:19.0	26:53.0	Differentia	2.3	26:53.0
76.60129	37.27851	27:20.0	26:54.0	Differentia	2.3	26:54.0
76.6013	37.2785	27:21.0	26:55.0	Differentia	2.3	26:55.0
76.60131	37.2785	27:22.0	26:56.0	Differentia	2.3	26:56.0
76.60131	37.2785	27:23.0	26:57.0	Differentia	2.3	26:57.0
76.60132	37.2785	27:24.0	26:58.0	Differentia	2.3	26:58.0
76.60133	37.2785	27:25.0	26:59.0	Differentia	2.3	26:59.0
76.60134	37.27849	27:26.0	27:00.0	Differentia	2.3	27:00.0
76.60134	37.27849	27:27.0	27:01.0	Differentia	2.3	27:01.0
76.60135	37.27849	27:28.0	27:02.0	Differentia	2.3	27:02.0
76.60135	37.27848	27:29.0	27:03.0	Differentia	2.3	27:03.0
76.60136	37.27848	27:30.0	27:04.0	Differentia	2.2	27:04.0
76.60137	37.27847	27:31.0	27:05.0	Differentia	2.2	27:05.0
76.60137	37.27847	27:32.0	27:06.0	Differentia	2.2	27:06.0
76.60138	37.27846	27:33.0	27:07.0	Differentia	2.2	27:07.0
76.60138	37.27846	27:34.0	27:08.0	Differentia	2.2	27:08.0
76.60139	37.27845	27:35.0	27:09.0	Differentia	2.2	27:09.0
76.6014	37.27845	27:36.0	27:10.0	Differentia	2.2	27:10.0
76.6014	37.27845	27:37.0	27:11.0	Differentia	2.2	27:11.0
76.6014	37.27845	27:38.0	27:12.0	Differentia	2.2	27:12.0
76.60141	37.27844	27:39.0	27:13.0	Differentia	2.2	27:13.0
76.60141	37.27844	27:40.0	27:14.0	Differentia	2.2	27:14.0
76.60142	37.27843	27:41.0	27:15.0	Differentia	2.2	27:15.0
76.60142	37.27843	27:42.0	27:16.0	Differentia	2.2	27:16.0
76.60143	37.27842	27:43.0	27:17.0	Differentia	2.2	27:17.0
76.60143	37.27842	27:44.0	27:18.0	Differentia	2.2	27:18.0
76.60143	37.27841	27:45.0	27:19.0	Differentia	2.2	27:19.0
76.60144	37.27841	27:46.0	27:20.0	Differentia	2.2	27:20.0
76.60144	37.27841	27:47.0	27:21.0	Differentia	2.2	27:21.0
76.60145	37.2784	27:48.0	27:22.0	Differentia	2.2	27:22.0
76.60146	37.2784	27:49.0	27:23.0	Differentia	2.2	27:23.0
76.60146	37.27839	27:50.0	27:24.0	Differentia	2.2	27:24.0
76.60147	37.27839	27:51.0	27:25.0	Differentia	2.2	27:25.0
76.60147	37.27838	27:52.0	27:26.0	Differentia	2.2	27:26.0
76.60148	37.27838	27:53.0	27:27.0	Differentia	2.2	27:27.0
76.60148	37.27838	27:54.0	27:28.0	Differentia	2.2	27:28.0
76.60149	37.27837	27:55.0	27:29.0	Differentia	2.2	27:29.0
76.60149	37.27837	27:56.0	27:30.0	Differentia	2.2	27:30.0
76.60149	37.27837	27:57.0	27:31.0	Differentia	2.2	27:31.0
76.6015	37.27836	27:58.0	27:32.0	Differentia	2.2	27:32.0
76.6015	37.27836	27:59.0	27:33.0	Differentia	2.2	27:33.0
76.60151	37.27836	28:00.0	27:34.0	Differentia	2.3	27:34.0
76.60151	37.27836	28:01.0	27:35.0	Differentia	2.2	27:35.0

76.60152	37.27836	28:02.0	27:36.0	Differentia	2.5	27:36.0
76.60152	37.27835	28:03.0	27:37.0	Differentia	2.2	27:37.0
76.60153	37.27835	28:04.0	27:38.0	Differentia	2.2	27:38.0
76.60153	37.27835	28:05.0	27:39.0	Differentia	2.2	27:39.0
76.60155	37.27834	28:06.0	27:40.0	Differentia	3.8	27:40.0
76.60155	37.27834	28:07.0	27:41.1	Differentia	2.2	27:41.1
76.60155	37.27834	28:08.0	27:42.0	Differentia	2.2	27:42.0
76.60156	37.27834	28:09.0	27:43.0	Differentia	2.2	27:43.0
76.60156	37.27834	28:10.0	27:44.0	Differentia	2.2	27:44.0
76.60156	37.27834	28:11.0	27:45.0	Differentia	2	27:45.0
76.60157	37.27833	28:12.0	27:46.0	Differentia	2.2	27:46.0
76.60158	37.27833	28:13.0	27:47.0	Differentia	2.2	27:47.0
76.60159	37.27833	28:14.0	27:48.0	Differentia	2.2	27:48.0
76.6016	37.27833	28:15.0	27:49.0	Differentia	3.7	27:49.0
76.6016	37.27833	28:16.0	27:50.0	Differentia	2.2	27:50.0
76.6016	37.27833	28:17.0	27:51.0	Differentia	2.2	27:51.0
76.60161	37.27833	28:18.0	27:52.0	Differentia	2.5	27:52.0
76.60161	37.27833	28:19.0	27:53.0	Differentia	2.2	27:53.0
76.60161	37.27834	28:20.0	27:54.0	Differentia	2.2	27:54.0
76.60162	37.27834	28:21.0	27:55.0	Differentia	3.7	27:55.0
76.60162	37.27834	28:22.0	27:56.0	Differentia	3.7	27:56.0
76.60162	37.27835	28:23.0	27:57.0	Differentia	3.7	27:57.0
76.60161	37.27836	28:24.0	27:58.0	Differentia	2.2	27:58.0
76.60161	37.27836	28:25.0	27:59.0	Differentia	2.2	27:59.0
76.60161	37.27836	28:26.0	28:00.0	Differentia	2.2	28:00.0
76.60161	37.27837	28:27.0	28:01.0	Differentia	2.5	28:01.0
76.60161	37.27837	28:28.0	28:02.0	Differentia	2.5	28:02.0
76.60161	37.27837	28:29.0	28:03.0	Differentia	2.5	28:03.0
76.60154	37.27844	30:57.0	30:31.6	Differentia	2.4	30:31.6
76.60154	37.27844	30:58.0	30:32.6	Differentia	2.4	30:32.6
76.60155	37.27843	30:59.0	30:33.6	Differentia	2.4	30:33.6
76.60156	37.27843	31:00.0	30:34.6	Differentia	2.4	30:34.6
76.60157	37.27843	31:01.0	30:35.6	Differentia	2.4	30:35.6
76.60158	37.27841	31:02.0	30:36.6	Differentia	2.2	30:36.6
76.60155	37.27842	31:03.0	30:37.6	Differentia	3.3	30:37.6
76.60159	37.27841	31:04.0	30:38.6	Differentia	2.2	30:38.6
76.60159	37.27841	31:05.0	30:39.6	Differentia	2.2	30:39.6
76.6016	37.2784	31:06.0	30:40.6	Differentia	2.2	30:40.6
76.6016	37.27842	31:07.0	30:41.6	Raw (GPS)	2.2	30:41.6
76.6016	37.27842	31:08.0	30:42.6	Raw (GPS)	2.2	30:42.6
76.60161	37.27842	31:09.0	30:43.6	Raw (GPS)	1.9	30:43.6
76.60161	37.27843	31:10.0	30:44.6	Raw (GPS)	2.2	30:44.6
76.60162	37.27843	31:11.0	30:45.6	Raw (GPS)	2.2	30:45.6
76.60162	37.27843	31:12.0	30:46.6	Raw (GPS)	1.9	30:46.6
76.60163	37.27843	31:13.0	30:47.6	Raw (GPS)	2.2	30:47.6
76.60163	37.27843	31:14.0	30:48.6	Raw (GPS)	2.2	30:48.6
76.60163	37.27844	31:15.0	30:49.6	Raw (GPS)	2.2	30:49.6

76.60164	37.27844	31:16.0	30:50.6	Raw (GPS)	2.2	30:50.6
76.60164	37.27844	31:17.0	30:51.6	Raw (GPS)	2.2	30:51.6
76.60164	37.27844	31:18.0	30:52.6	Raw (GPS)	2.2	30:52.6
76.60164	37.27844	31:19.0	30:53.6	Raw (GPS)	2	30:53.6
76.60167	37.27843	31:20.0	30:54.6	Raw (GPS)	3.3	30:54.6
76.60165	37.27843	31:21.0	30:55.6	Differentia	2.2	30:55.6
76.60165	37.27842	31:22.0	30:56.6	Differentia	2.2	30:56.6
76.60166	37.27842	31:59.0	31:33.4	Differentia	2.1	31:33.4
76.60166	37.27842	32:00.0	31:34.4	Differentia	2.1	31:34.4
76.60167	37.27843	32:01.0	31:35.4	Differentia	2.3	31:35.4
76.60167	37.27843	32:02.0	31:36.4	Differentia	2.1	31:36.4
76.60167	37.27843	32:03.0	31:37.4	Differentia	2.1	31:37.4
76.60167	37.27844	32:04.0	31:38.4	Differentia	2.1	31:38.4
76.60168	37.27844	32:05.0	31:39.4	Differentia	2.1	31:39.4
76.60168	37.27845	32:06.0	31:40.4	Differentia	2.1	31:40.4
76.60168	37.27845	32:07.0	31:41.4	Differentia	2.1	31:41.4
76.60169	37.27845	32:08.0	31:42.4	Differentia	2.1	31:42.4
76.60169	37.27846	32:09.0	31:43.4	Differentia	2.1	31:43.4
76.6017	37.27846	32:10.0	31:44.4	Differentia	2.1	31:44.4
76.60171	37.27846	32:11.0	31:45.4	Differentia	2.1	31:45.4
76.60171	37.27846	32:12.0	31:46.4	Differentia	2.1	31:46.4
76.60172	37.27845	32:13.0	31:47.4	Differentia	2.1	31:47.4
76.60172	37.27845	32:14.0	31:48.4	Differentia	2.1	31:48.4
76.60173	37.27845	32:15.0	31:49.4	Differentia	2.1	31:49.4
76.60174	37.27845	32:16.0	31:50.4	Differentia	2.1	31:50.4
76.60175	37.27845	32:17.0	31:51.4	Differentia	1.9	31:51.4
76.60175	37.27845	32:18.0	31:52.4	Differentia	2.1	31:52.4
76.60176	37.27845	32:19.0	31:53.4	Differentia	2.1	31:53.4
76.60177	37.27846	32:20.0	31:54.4	Differentia	2.1	31:54.4
76.60177	37.27846	32:21.0	31:55.4	Differentia	2.3	31:55.4
76.60178	37.27845	32:22.0	31:56.4	Differentia	2.1	31:56.4
76.60178	37.27845	32:23.0	31:57.4	Differentia	2.1	31:57.4
76.60184	37.27867	46:47.0	46:21.2	Differentia	1.9	46:21.2
76.60184	37.27867	46:48.0	46:22.2	Differentia	1.7	46:22.2
76.60183	37.27867	46:49.0	46:23.2	Differentia	1.7	46:23.2
76.60183	37.27866	46:50.0	46:24.3	Differentia	1.7	46:24.3
76.60183	37.27866	46:51.0	46:25.2	Differentia	1.7	46:25.2
76.60182	37.27865	46:52.0	46:26.2	Differentia	1.9	46:26.2
76.60182	37.27865	46:53.0	46:27.2	Differentia	1.7	46:27.2
76.60181	37.27864	46:54.0	46:28.2	Differentia	1.7	46:28.2
76.60183	37.27864	46:55.0	46:29.2	Raw (GPS)	1.8	46:29.2
76.60182	37.27864	46:56.0	46:30.2	Raw (GPS)	1.8	46:30.2
76.60181	37.27864	46:57.0	46:31.2	Raw (GPS)	1.5	46:31.2
76.6018	37.27863	46:58.0	46:32.2	Differentia	1.5	46:32.2
76.6018	37.27863	46:59.0	46:33.2	Differentia	1.7	46:33.2
76.60179	37.27862	47:00.0	46:34.2	Differentia	1.7	46:34.2
76.60178	37.27862	47:01.0	46:35.2	Differentia	1.7	46:35.2

76.60178	37.27861	47:02.0	46:36.2	Differentia	1.7	46:36.2
76.60178	37.2786	47:03.0	46:37.2	Differentia	1.7	46:37.2
76.60177	37.2786	47:04.0	46:38.2	Differentia	1.7	46:38.2
76.60176	37.2786	47:05.0	46:39.3	Differentia	1.7	46:39.3
76.60176	37.27859	47:06.0	46:40.2	Differentia	1.9	46:40.2
76.60175	37.27859	47:07.0	46:41.2	Differentia	1.6	46:41.2
76.60175	37.27858	47:08.0	46:42.2	Differentia	1.6	46:42.2
76.60174	37.27858	47:09.0	46:43.2	Differentia	1.8	46:43.2
76.60174	37.27857	47:10.0	46:44.2	Differentia	1.9	46:44.2
76.60173	37.27857	47:11.0	46:45.2	Differentia	1.7	46:45.2
76.60172	37.27856	47:12.0	46:46.2	Differentia	1.9	46:46.2
76.60172	37.27856	47:13.0	46:47.2	Differentia	1.9	46:47.2
76.60171	37.27856	47:14.0	46:48.3	Differentia	1.9	46:48.3
76.60171	37.27855	47:15.0	46:49.3	Differentia	11.7	46:49.3
76.6017	37.27855	47:16.0	46:50.2	Differentia	1.7	46:50.2
76.6017	37.27855	47:17.0	46:51.3	Differentia	1.9	46:51.3
76.60169	37.27855	47:18.0	46:52.2	Differentia	1.9	46:52.2
76.60168	37.27855	47:19.0	46:53.2	Differentia	1.9	46:53.2
76.60167	37.27855	47:20.0	46:54.3	Differentia	1.9	46:54.3
76.60167	37.27855	47:21.0	46:55.2	Differentia	1.7	46:55.2
76.60167	37.27855	47:22.0	46:56.2	Differentia	1.7	46:56.2
76.60166	37.27855	47:23.0	46:57.2	Differentia	1.4	46:57.2
76.60165	37.27855	47:24.0	46:58.2	Differentia	1.4	46:58.2
76.60163	37.27856	47:25.0	46:59.3	Differentia	1.7	46:59.3
76.60162	37.27856	47:26.0	47:00.2	Differentia	1.7	47:00.2
76.60162	37.27856	47:27.0	47:01.2	Differentia	1.7	47:01.2
76.60161	37.27856	47:28.0	47:02.2	Differentia	1.7	47:02.2
76.6016	37.27857	47:29.0	47:03.2	Differentia	1.7	47:03.2
76.6016	37.27857	47:30.0	47:04.2	Differentia	1.9	47:04.2
76.60159	37.27857	47:31.0	47:05.2	Differentia	1.7	47:05.2
76.60158	37.27858	47:32.0	47:06.2	Differentia	1.4	47:06.2
76.60158	37.27858	47:33.0	47:07.2	Differentia	1.9	47:07.2
76.60157	37.27858	47:34.0	47:08.2	Differentia	1.7	47:08.2
76.60156	37.27858	47:35.0	47:09.3	Differentia	1.4	47:09.3
76.60156	37.27859	47:36.0	47:10.2	Differentia	1.4	47:10.2
76.60155	37.27859	47:37.0	47:11.2	Differentia	1.9	47:11.2
76.60155	37.2786	47:38.0	47:12.2	Differentia	1.4	47:12.2
76.60154	37.2786	47:39.0	47:13.2	Differentia	1.9	47:13.2
76.60154	37.2786	47:40.0	47:14.2	Differentia	1.9	47:14.2
76.60154	37.27861	47:41.0	47:15.2	Differentia	1.9	47:15.2
76.60154	37.27861	47:42.0	47:16.2	Differentia	2.8	47:16.2
76.60153	37.27861	47:43.0	47:17.2	Differentia	1.4	47:17.2
76.60153	37.27862	47:44.0	47:18.2	Differentia	1.7	47:18.2
76.60153	37.27862	47:45.0	47:19.3	Differentia	1.7	47:19.3
76.60153	37.27862	47:46.0	47:20.2	Differentia	1.7	47:20.2
76.60153	37.27863	47:47.0	47:21.2	Differentia	1.7	47:21.2
76.60153	37.27863	47:48.0	47:22.2	Differentia	1.7	47:22.2

76.60153	37.27863	47:49.0	47:23.2	Differentia	1.9	47:23.2
76.60152	37.27863	47:50.0	47:24.3	Differentia	1.7	47:24.3
76.60152	37.27863	48:03.0	47:37.2	Differentia	1.7	47:37.2
76.60152	37.27863	48:04.0	47:38.2	Differentia	1.7	47:38.2
76.60152	37.27863	48:05.0	47:39.2	Differentia	1.7	47:39.2
76.60152	37.27863	48:06.0	47:40.3	Differentia	1.7	47:40.3
76.60152	37.27863	48:07.0	47:41.2	Differentia	1.7	47:41.2
76.60152	37.27863	48:08.0	47:42.2	Differentia	1.7	47:42.2
76.60152	37.27863	48:18.0	47:52.2	Differentia	1.7	47:52.2
76.60152	37.27863	48:19.0	47:53.2	Differentia	1.7	47:53.2
76.60152	37.27863	48:20.0	47:54.3	Differentia	1.9	47:54.3
76.60152	37.27863	48:21.0	47:55.2	Differentia	1.7	47:55.2
76.60151	37.27863	48:22.0	47:56.2	Differentia	1.7	47:56.2
76.60151	37.27863	48:23.0	47:57.2	Differentia	1.7	47:57.2
76.60152	37.27863	48:24.0	47:58.2	Differentia	1.7	47:58.2
76.60152	37.27863	48:25.0	47:59.2	Differentia	1.7	47:59.2
76.60152	37.27862	48:26.0	48:00.2	Differentia	1.7	48:00.2
76.60152	37.27862	48:27.0	48:01.2	Differentia	1.7	48:01.2
76.60153	37.27862	48:28.0	48:02.2	Differentia	1.7	48:02.2
76.60153	37.27862	48:29.0	48:03.2	Differentia	1.7	48:03.2
76.60153	37.27861	48:30.0	48:04.3	Differentia	1.7	48:04.3
76.60154	37.27861	48:31.0	48:05.2	Differentia	1.7	48:05.2
76.60154	37.2786	48:32.0	48:06.2	Differentia	1.7	48:06.2
76.60155	37.2786	48:33.0	48:07.2	Differentia	1.7	48:07.2
76.60155	37.27859	48:34.0	48:08.2	Differentia	1.4	48:08.2
76.60156	37.27859	48:35.0	48:09.3	Differentia	1.4	48:09.3
76.60157	37.27859	48:36.0	48:10.2	Differentia	1.4	48:10.2
76.60157	37.27858	48:37.0	48:11.2	Differentia	1.9	48:11.2
76.60158	37.27858	48:38.0	48:12.2	Differentia	1.4	48:12.2
76.60158	37.27857	48:39.0	48:13.2	Differentia	1.4	48:13.2
76.60159	37.27857	48:40.0	48:14.2	Differentia	1.4	48:14.2
76.6016	37.27856	48:41.0	48:15.2	Differentia	1.4	48:15.2
76.6016	37.27856	48:42.0	48:16.2	Differentia	1.4	48:16.2
76.60161	37.27856	48:43.0	48:17.2	Differentia	1.4	48:17.2
76.60162	37.27855	48:44.0	48:18.3	Differentia	1.4	48:18.3
76.60162	37.27855	48:45.0	48:19.3	Differentia	1.4	48:19.3
76.60163	37.27855	48:46.0	48:20.2	Differentia	1.4	48:20.2
76.60164	37.27855	48:47.0	48:21.2	Differentia	1.7	48:21.2
76.60165	37.27854	48:48.0	48:22.2	Differentia	1.7	48:22.2
76.60166	37.27854	48:49.0	48:23.2	Differentia	1.7	48:23.2
76.60166	37.27854	48:50.0	48:24.3	Differentia	1.7	48:24.3
76.60167	37.27854	48:51.0	48:25.2	Differentia	1.7	48:25.2
76.60168	37.27854	48:52.0	48:26.2	Differentia	1.7	48:26.2
76.60169	37.27855	48:53.0	48:27.2	Differentia	1.8	48:27.2
76.6017	37.27855	48:54.0	48:28.2	Differentia	1.8	48:28.2
76.6017	37.27855	48:55.0	48:29.3	Differentia	1.8	48:29.3
76.60171	37.27855	48:56.0	48:30.2	Differentia	1.8	48:30.2

76.60171	37.27856	48:57.0	48:31.2	Differentia	1.8	48:31.2
76.60172	37.27856	48:58.0	48:32.2	Differentia	1.8	48:32.2
76.60173	37.27856	48:59.0	48:33.2	Differentia	1.8	48:33.2
76.60173	37.27857	49:00.0	48:34.3	Differentia	1.7	48:34.3
76.60174	37.27857	49:01.0	48:35.2	Differentia	1.8	48:35.2
76.60175	37.27858	49:02.0	48:36.2	Differentia	1.7	48:36.2
76.60175	37.27858	49:03.0	48:37.2	Differentia	1.7	48:37.2
76.60176	37.27859	49:04.0	48:38.3	Differentia	1.7	48:38.3
76.60177	37.27859	49:05.0	48:39.3	Differentia	1.7	48:39.3
76.60177	37.27859	49:06.0	48:40.2	Differentia	1.8	48:40.2
76.60177	37.2786	49:07.0	48:41.2	Differentia	1.8	48:41.2
76.60178	37.2786	49:08.0	48:42.2	Differentia	1.8	48:42.2
76.60178	37.2786	49:09.0	48:43.2	Differentia	1.8	48:43.2
76.60178	37.27861	49:10.0	48:44.3	Differentia	1.5	48:44.3
76.60179	37.27862	49:11.0	48:45.2	Differentia	1.5	48:45.2
76.6018	37.27862	49:12.0	48:46.2	Differentia	1.7	48:46.2
76.6018	37.27863	49:13.0	48:47.2	Differentia	1.8	48:47.2
76.6018	37.27863	49:14.0	48:48.2	Differentia	1.5	48:48.2
76.6018	37.27863	50:04.0	49:38.2	Differentia	1.4	49:38.2
76.6018	37.27863	50:05.0	49:39.3	Differentia	1.6	49:39.3
76.60181	37.27864	50:06.0	49:40.2	Differentia	1.8	49:40.2
76.60181	37.27864	50:07.0	49:41.2	Differentia	1.8	49:41.2
76.60182	37.27865	50:08.0	49:42.2	Differentia	1.6	49:42.2
76.60182	37.27865	50:09.0	49:43.2	Differentia	1.8	49:43.2
76.60183	37.27866	50:10.0	49:44.3	Differentia	1.6	49:44.3
76.60183	37.27866	50:11.0	49:45.2	Differentia	1.7	49:45.2
76.60183	37.27866	50:12.0	49:46.2	Differentia	1.7	49:46.2
76.60184	37.27866	50:48.0	50:22.2	Differentia	1.3	50:22.2
76.60184	37.27866	50:49.0	50:23.2	Differentia	1.3	50:23.2
76.60184	37.27866	50:50.0	50:24.2	Differentia	1.3	50:24.2
76.60184	37.27866	50:51.0	50:25.2	Differentia	1.3	50:25.2
76.60183	37.27865	50:52.0	50:26.2	Differentia	1.7	50:26.2
76.60182	37.27865	50:53.0	50:27.2	Differentia	1.6	50:27.2
76.60182	37.27864	50:54.0	50:28.2	Differentia	1.6	50:28.2
76.60181	37.27864	50:55.0	50:29.2	Differentia	1.6	50:29.2
76.60181	37.27863	50:56.0	50:30.2	Differentia	1.6	50:30.2
76.6018	37.27863	50:57.0	50:31.2	Differentia	1.8	50:31.2
76.60181	37.27862	50:58.0	50:32.2	Differentia	1.4	50:32.2
76.6018	37.27862	50:59.0	50:33.2	Differentia	1.7	50:33.2
76.6018	37.27861	51:00.0	50:34.3	Differentia	1.6	50:34.3
76.6018	37.27861	51:01.0	50:35.2	Differentia	1.6	50:35.2
76.60179	37.27861	51:02.0	50:36.2	Differentia	1.8	50:36.2
76.60179	37.2786	51:03.0	50:37.2	Differentia	1.8	50:37.2
76.60179	37.2786	51:04.0	50:38.2	Differentia	1.6	50:38.2
76.60179	37.27859	51:05.0	50:39.2	Differentia	1.8	50:39.2
76.60178	37.27859	51:06.0	50:40.2	Differentia	1.6	50:40.2
76.60178	37.27859	51:07.0	50:41.2	Differentia	1.6	50:41.2

76.60177	37.27858	51:08.0	50:42.2	Differentia	1.8	50:42.2
76.60177	37.27858	51:09.0	50:43.2	Differentia	1.6	50:43.2
76.60176	37.27857	51:10.0	50:44.3	Differentia	1.6	50:44.3
76.60176	37.27857	51:11.0	50:45.2	Differentia	1.6	50:45.2
76.60176	37.27856	51:12.0	50:46.3	Differentia	1.6	50:46.3
76.60175	37.27856	51:13.0	50:47.2	Differentia	1.8	50:47.2
76.60175	37.27855	51:14.0	50:48.2	Differentia	1.6	50:48.2
76.60174	37.27855	51:15.0	50:49.3	Differentia	1.8	50:49.3
76.60173	37.27855	51:16.0	50:50.2	Differentia	1.8	50:50.2
76.60172	37.27854	51:17.0	50:51.2	Differentia	1.8	50:51.2
76.60172	37.27854	51:18.0	50:52.2	Differentia	1.8	50:52.2
76.60171	37.27854	51:19.0	50:53.2	Differentia	1.8	50:53.2
76.60171	37.27854	51:20.0	50:54.2	Differentia	1.8	50:54.2
76.6017	37.27854	51:21.0	50:55.2	Differentia	1.8	50:55.2
76.60169	37.27854	51:22.0	50:56.2	Differentia	1.7	50:56.2
76.60168	37.27854	51:23.0	50:57.2	Differentia	1.8	50:57.2
76.60167	37.27854	51:24.0	50:58.2	Differentia	1.6	50:58.2
76.60167	37.27854	51:25.0	50:59.3	Differentia	1.6	50:59.3
76.60167	37.27854	51:26.0	51:00.2	Differentia	1.6	51:00.2
76.60167	37.27854	51:27.0	51:01.2	Differentia	1.7	51:01.2
76.60166	37.27854	51:28.0	51:02.2	Differentia	1.7	51:02.2
76.60165	37.27855	51:29.0	51:03.2	Differentia	1.7	51:03.2
76.60164	37.27854	51:30.0	51:04.3	Differentia	1.9	51:04.3
76.60164	37.27855	51:31.0	51:05.2	Differentia	1.4	51:05.2
76.60164	37.27855	51:32.0	51:06.2	Differentia	1.4	51:06.2
76.60163	37.27855	51:33.0	51:07.2	Differentia	1.4	51:07.2
76.60162	37.27855	51:34.0	51:08.2	Differentia	1.4	51:08.2
76.60161	37.27855	51:35.0	51:09.3	Differentia	1.9	51:09.3
76.60159	37.27855	51:36.0	51:10.2	Differentia	2.9	51:10.2
76.60159	37.27856	51:37.0	51:11.2	Differentia	1.9	51:11.2
76.60158	37.27856	51:38.0	51:12.2	Differentia	1.9	51:12.2
76.60158	37.27857	51:39.0	51:13.2	Differentia	1.4	51:13.2
76.60157	37.27857	51:40.0	51:14.2	Differentia	1.9	51:14.2
76.60157	37.27857	51:41.0	51:15.2	Differentia	1.4	51:15.2
76.60156	37.27858	51:42.0	51:16.2	Differentia	1.4	51:16.2
76.60155	37.27858	51:43.0	51:17.2	Differentia	1.4	51:17.2
76.60155	37.27859	51:44.0	51:18.2	Differentia	1.4	51:18.2
76.60154	37.27859	51:45.0	51:19.3	Differentia	1.4	51:19.3
76.60154	37.27859	51:46.0	51:20.2	Differentia	1.4	51:20.2
76.60153	37.2786	51:47.0	51:21.2	Differentia	1.6	51:21.2
76.60153	37.2786	51:48.0	51:22.2	Differentia	1.4	51:22.2
76.60152	37.2786	51:49.0	51:23.2	Differentia	1.9	51:23.2
76.60152	37.27861	51:50.0	51:24.3	Differentia	1.4	51:24.3
76.60151	37.27861	51:51.0	51:25.2	Differentia	2.9	51:25.2
76.60151	37.27862	51:52.0	51:26.2	Differentia	1.6	51:26.2
76.6015	37.27862	51:53.0	51:27.2	Differentia	1.6	51:27.2
76.6015	37.27862	51:54.0	51:28.2	Differentia	1.4	51:28.2

76.60153	37.27857	59:10.0	58:44.7	Differentia	1.3	58:44.7
76.60153	37.27857	59:11.0	58:45.7	Differentia	1.3	58:45.7
76.60154	37.27857	59:12.0	58:46.6	Differentia	1.3	58:46.6
76.60154	37.27857	59:13.0	58:47.6	Differentia	1.3	58:47.6
76.60154	37.27857	59:14.0	58:48.6	Differentia	1.3	58:48.6
76.60155	37.27857	59:15.0	58:49.6	Differentia	1.5	58:49.6
76.60155	37.27857	59:16.0	58:50.6	Differentia	1.7	58:50.6
76.60155	37.27857	59:17.0	58:51.7	Differentia	1.3	58:51.7
76.60156	37.27858	59:18.0	58:52.7	Differentia	1.3	58:52.7
76.60156	37.27858	59:19.0	58:53.7	Differentia	1.3	58:53.7
76.60156	37.27858	59:20.0	58:54.7	Differentia	1.3	58:54.7
76.60157	37.27858	59:21.0	58:55.6	Differentia	1.3	58:55.6
76.60157	37.27858	59:22.0	58:56.6	Differentia	1.3	58:56.6
76.60156	37.27858	59:23.0	58:57.6	Differentia	1.3	58:57.6
76.60156	37.27857	59:24.0	58:58.7	Differentia	1.3	58:58.7
76.60156	37.27857	59:25.0	58:59.7	Differentia	1.3	58:59.7
76.60155	37.27857	59:26.0	59:00.6	Differentia	1.3	59:00.6
76.60155	37.27856	59:27.0	59:01.6	Differentia	1.3	59:01.6
76.60154	37.27856	59:28.0	59:02.6	Differentia	1.3	59:02.6
76.60154	37.27856	59:29.0	59:03.7	Differentia	1.3	59:03.7
76.60153	37.27856	59:30.0	59:04.7	Differentia	1.3	59:04.7
76.60153	37.27856	59:31.0	59:05.6	Differentia	1.7	59:05.6
76.60153	37.27856	59:32.0	59:06.6	Differentia	1.7	59:06.6
76.60154	37.27856	59:33.0	59:07.6	Differentia	1.6	59:07.6
76.60154	37.27856	59:34.0	59:08.6	Differentia	1.5	59:08.6
76.60155	37.27856	59:35.0	59:09.6	Differentia	1.5	59:09.6
76.60155	37.27856	59:36.0	59:10.6	Differentia	1.5	59:10.6
76.60155	37.27856	59:37.0	59:11.6	Differentia	1.6	59:11.6
76.60156	37.27856	59:38.0	59:12.7	Differentia	1.3	59:12.7
76.60157	37.27856	59:39.0	59:13.7	Differentia	1.3	59:13.7
76.60157	37.27856	59:40.0	59:14.7	Differentia	1.3	59:14.7
76.60157	37.27856	59:52.0	59:26.6	Differentia	1.3	59:26.6
76.60157	37.27856	59:53.0	59:27.6	Differentia	1.3	59:27.6
76.60157	37.27857	59:54.0	59:28.6	Differentia	1.3	59:28.6
76.60158	37.27857	59:55.0	59:29.6	Differentia	1.3	59:29.6
76.60158	37.27857	59:56.0	59:30.6	Differentia	1.3	59:30.6
76.60159	37.27857	59:57.0	59:31.6	Differentia	1.3	59:31.6
76.60159	37.27857	59:58.0	59:32.6	Differentia	1.3	59:32.6
76.6016	37.27857	59:59.0	59:33.6	Differentia	1.3	59:33.6
76.60159	37.27878	13:22.0	12:55.9	Differentia	1.6	12:55.9
76.60159	37.27878	13:23.0	12:56.9	Differentia	1.6	12:56.9
76.6016	37.27879	13:24.0	12:57.9	Differentia	1.6	12:57.9
76.6016	37.27879	13:25.0	12:58.9	Differentia	1.6	12:58.9
76.60159	37.2788	13:26.0	12:59.9	Differentia	1.2	12:59.9
76.6016	37.2788	13:27.0	13:00.9	Differentia	1.2	13:00.9
76.60161	37.27882	13:28.0	13:01.9	Differentia	2.7	13:01.9
76.60161	37.2788	13:29.0	13:02.9	Differentia	1.4	13:02.9

76.60161	37.27881	13:30.0	13:03.9	Differentia	1.4	13:03.9
76.60161	37.27882	14:11.0	13:45.8	Differentia	1.2	13:45.8
76.60161	37.27882	14:12.0	13:46.7	Differentia	1.2	13:46.7
76.60161	37.27881	14:13.0	13:47.7	Differentia	1.4	13:47.7
76.60162	37.27882	14:14.0	13:48.7	Differentia	1.2	13:48.7
76.60162	37.27882	14:15.0	13:49.7	Differentia	1.2	13:49.7
76.60163	37.27882	14:16.0	13:50.7	Differentia	1.2	13:50.7
76.60163	37.27883	14:17.0	13:51.7	Differentia	1.2	13:51.7
76.60164	37.27883	14:18.0	13:52.7	Differentia	1.2	13:52.7
76.60164	37.27883	14:19.0	13:53.7	Differentia	1.2	13:53.7
76.60165	37.27883	14:20.0	13:54.7	Differentia	1.2	13:54.7
76.60166	37.27884	14:21.0	13:55.7	Differentia	1.2	13:55.7
76.60167	37.27883	14:22.0	13:56.7	Differentia	1.5	13:56.7
76.60167	37.27883	14:23.0	13:57.7	Differentia	1.2	13:57.7
76.60168	37.27883	14:24.0	13:58.7	Differentia	1.2	13:58.7
76.60168	37.27883	14:25.0	13:59.7	Raw (GPS)	1.2	13:59.7
76.60169	37.27883	14:26.0	14:00.6	Raw (GPS)	1.2	14:00.6
76.60169	37.27883	14:27.0	14:01.6	Raw (GPS)	1.2	14:01.6
76.60169	37.27883	14:35.0	14:09.7	Differentia	1.5	14:09.7
76.60169	37.27883	14:36.0	14:10.6	Differentia	1.5	14:10.6
76.6017	37.27883	14:37.0	14:11.7	Differentia	1.2	14:11.7
76.6017	37.27883	14:38.0	14:12.6	Differentia	1.5	14:12.6
76.60171	37.27883	14:39.0	14:13.7	Differentia	1.5	14:13.7
76.60171	37.27883	14:40.0	14:14.7	Differentia	1.5	14:14.7
76.60171	37.27883	14:41.0	14:15.6	Differentia	12.3	14:15.6
76.60172	37.27883	14:42.0	14:16.6	Differentia	1.5	14:16.6
76.60173	37.27883	14:43.0	14:17.6	Differentia	1.7	14:17.6
76.60173	37.27883	14:44.0	14:18.6	Differentia	1.7	14:18.6
76.60174	37.27883	14:45.0	14:19.7	Differentia	1.5	14:19.7
76.60174	37.27883	14:46.0	14:20.6	Differentia	1.7	14:20.6
76.60175	37.27883	14:47.0	14:21.6	Differentia	1.7	14:21.6
76.60175	37.27883	14:48.0	14:22.6	Differentia	1.7	14:22.6
76.60176	37.27883	14:49.0	14:23.6	Differentia	1.7	14:23.6
76.60176	37.27883	14:56.0	14:30.6	Differentia	1.6	14:30.6
76.60176	37.27883	14:57.0	14:31.6	Differentia	1.6	14:31.6
76.60177	37.27883	14:58.0	14:32.6	Differentia	1.6	14:32.6
76.60177	37.27883	14:59.0	14:33.6	Differentia	1.7	14:33.6
76.60178	37.27883	15:00.0	14:34.7	Differentia	1.2	14:34.7
76.60178	37.27883	15:01.0	14:35.6	Differentia	1.2	14:35.6
76.60179	37.27883	15:02.0	14:36.6	Differentia	1.6	14:36.6
76.6018	37.27883	15:03.0	14:37.6	Differentia	1.7	14:37.6
76.60181	37.27884	15:04.0	14:38.6	Differentia	1.5	14:38.6
76.60181	37.27884	15:05.0	14:39.7	Differentia	1.5	14:39.7
76.60182	37.27884	15:06.0	14:40.6	Differentia	1.5	14:40.6
76.60182	37.27884	15:07.0	14:41.6	Differentia	1.2	14:41.6
76.60183	37.27884	15:08.0	14:42.6	Differentia	1.2	14:42.6
76.60184	37.27884	15:09.0	14:43.6	Differentia	1.2	14:43.6

76.60184	37.27884	15:10.0	14:44.7	Differentia	1.2	14:44.7
76.60184	37.27884	15:11.0	14:45.6	Differentia	1.2	14:45.6
76.60185	37.27884	15:12.0	14:46.6	Differentia	1.2	14:46.6
76.60185	37.27883	15:13.0	14:47.7	Differentia	1.2	14:47.7
76.60185	37.27883	15:14.0	14:48.7	Differentia	1.2	14:48.7
76.60185	37.27883	15:15.0	14:49.7	Differentia	1.2	14:49.7
76.60186	37.27883	15:16.0	14:50.6	Differentia	1.2	14:50.6
76.60186	37.27882	15:17.0	14:51.6	Differentia	1.5	14:51.6
76.60186	37.27882	15:18.0	14:52.6	Differentia	1.5	14:52.6
76.60186	37.27882	15:19.0	14:53.6	Differentia	1.2	14:53.6
76.60187	37.27881	15:20.0	14:54.7	Differentia	1.2	14:54.7
76.60187	37.27881	15:21.0	14:55.6	Differentia	1.2	14:55.6
76.60187	37.27881	15:22.0	14:56.6	Differentia	1.2	14:56.6
76.60188	37.27881	15:23.0	14:57.7	Differentia	1.2	14:57.7
76.60189	37.2788	15:24.0	14:58.7	Differentia	1.2	14:58.7
76.60189	37.2788	15:25.0	14:59.7	Differentia	1.6	14:59.7
76.60189	37.2788	15:26.0	15:00.6	Differentia	1.6	15:00.6
76.60189	37.2788	15:27.0	15:01.6	Differentia	1.6	15:01.6
76.60189	37.27879	15:28.0	15:02.6	Differentia	1.6	15:02.6
76.6019	37.27879	15:29.0	15:03.6	Differentia	1.6	15:03.6
76.6019	37.27879	15:30.0	15:04.7	Differentia	1.2	15:04.7
76.6019	37.2788	18:27.0	18:01.3	Differentia	1.5	18:01.3
76.60191	37.2788	18:28.0	18:02.3	Differentia	1.2	18:02.3
76.6019	37.27879	18:29.0	18:03.3	Differentia	1.2	18:03.3
76.6019	37.27879	18:30.0	18:04.4	Differentia	1.2	18:04.4
76.60188	37.27879	18:31.0	18:05.3	Differentia	1.5	18:05.3
76.60188	37.27879	18:32.0	18:06.3	Differentia	1.5	18:06.3
76.60188	37.27879	18:33.0	18:07.3	Differentia	1.5	18:07.3
76.60187	37.27879	18:34.0	18:08.3	Differentia	1.5	18:08.3
76.60187	37.27879	18:35.0	18:09.3	Differentia	1.5	18:09.3
76.60186	37.27878	18:36.0	18:10.3	Differentia	1.5	18:10.3
76.60186	37.27878	18:37.0	18:11.3	Differentia	1.5	18:11.3
76.60186	37.27878	18:38.0	18:12.3	Differentia	1.5	18:12.3
76.60185	37.27878	18:39.0	18:13.3	Differentia	1.5	18:13.3
76.60184	37.27878	18:40.0	18:14.3	Differentia	1.5	18:14.3
76.60184	37.27878	18:41.0	18:15.3	Differentia	1.5	18:15.3
76.60183	37.27878	18:42.0	18:16.3	Differentia	1.5	18:16.3
76.60183	37.27878	18:43.0	18:17.3	Differentia	1.5	18:17.3
76.60182	37.27878	18:44.0	18:18.3	Differentia	1.5	18:18.3
76.60182	37.27879	18:45.0	18:19.4	Differentia	1.5	18:19.4
76.60181	37.27879	18:46.0	18:20.3	Differentia	1.5	18:20.3
76.60181	37.27879	18:47.0	18:21.3	Differentia	1.5	18:21.3
76.6018	37.27879	18:48.0	18:22.3	Differentia	1.5	18:22.3
76.60181	37.27879	18:49.0	18:23.3	Differentia	1.3	18:23.3
76.6018	37.27879	18:50.0	18:24.3	Differentia	1.2	18:24.3
76.60178	37.27879	18:51.0	18:25.3	Differentia	1.7	18:25.3
76.60178	37.27879	18:52.0	18:26.3	Differentia	1.6	18:26.3

76.60178	37.27879	18:53.0	18:27.3	Differentia	1.7	18:27.3
76.60177	37.2788	18:54.0	18:28.3	Differentia	1.7	18:28.3
76.60177	37.2788	18:55.0	18:29.3	Differentia	1.7	18:29.3
76.60179	37.27879	19:23.0	18:57.3	Differentia	10.5	18:57.3
76.60179	37.27879	19:24.0	18:58.3	Differentia	10.4	18:58.3
76.60178	37.27879	19:25.0	18:59.4	Differentia	10.4	18:59.4
76.60178	37.27879	19:26.0	19:00.3	Differentia	10.4	19:00.3
76.60174	37.27879	19:27.0	19:01.3	Differentia	1.5	19:01.3
76.60173	37.27879	19:28.0	19:02.3	Differentia	1.7	19:02.3
76.60173	37.27878	19:29.0	19:03.3	Differentia	1.7	19:03.3
76.60173	37.27878	19:30.0	19:04.4	Differentia	1.5	19:04.4
76.60175	37.27877	19:31.0	19:05.3	Differentia	1.3	19:05.3
76.60174	37.27877	19:32.0	19:06.3	Differentia	1.8	19:06.3
76.60174	37.27877	19:33.0	19:07.3	Differentia	1.8	19:07.3
76.60174	37.27877	19:34.0	19:08.3	Differentia	1.8	19:08.3
76.60173	37.27877	19:35.0	19:09.4	Differentia	1.6	19:09.4
76.60173	37.27877	19:36.0	19:10.3	Differentia	1.6	19:10.3
76.60173	37.27877	19:37.0	19:11.3	Differentia	1.6	19:11.3
76.60173	37.27877	19:38.0	19:12.3	Differentia	1.6	19:12.3
76.60173	37.27877	19:39.0	19:13.3	Differentia	1.6	19:13.3
76.60173	37.27877	19:40.0	19:14.4	Differentia	1.2	19:14.4
76.60173	37.27877	19:41.0	19:15.3	Differentia	1.2	19:15.3
76.60172	37.27877	19:42.0	19:16.3	Differentia	1.6	19:16.3
76.60173	37.27877	19:43.0	19:17.4	Differentia	1.2	19:17.4
76.60173	37.27877	19:44.0	19:18.3	Differentia	1.2	19:18.3
76.60173	37.27877	19:45.0	19:19.4	Differentia	1.2	19:19.4
76.60173	37.27877	19:46.0	19:20.3	Differentia	1.2	19:20.3
76.60172	37.27877	19:47.0	19:21.3	Differentia	1.6	19:21.3
76.60172	37.27877	19:48.0	19:22.3	Differentia	1.6	19:22.3
76.6016	37.27881	25:17.0	24:51.6	Differentia	1.2	24:51.6
76.6016	37.27881	25:18.0	24:52.6	Differentia	1.2	24:52.6
76.6016	37.27881	25:19.0	24:53.6	Differentia	1.2	24:53.6
76.60161	37.27882	25:20.0	24:54.6	Differentia	1.4	24:54.6
76.60161	37.27882	25:21.0	24:55.7	Differentia	1.4	24:55.7
76.60161	37.27881	25:22.0	24:56.6	Differentia	1.4	24:56.6
76.60162	37.27882	25:23.0	24:57.7	Differentia	1.2	24:57.7
76.60163	37.27883	25:24.0	24:58.6	Differentia	1.2	24:58.6
76.60163	37.27883	25:25.0	24:59.7	Differentia	1.2	24:59.7
76.60164	37.27884	25:26.0	25:00.6	Differentia	1.7	25:00.6
76.60164	37.27884	25:27.0	25:01.7	Differentia	1.2	25:01.7
76.60164	37.27884	25:28.0	25:02.6	Differentia	1.2	25:02.6
76.60165	37.27885	25:29.0	25:03.7	Differentia	1.4	25:03.7
76.60166	37.27885	25:30.0	25:04.7	Differentia	1.4	25:04.7
76.60166	37.27885	25:31.0	25:05.7	Differentia	1.4	25:05.7
76.60167	37.27886	25:32.0	25:06.6	Differentia	1.4	25:06.6
76.60167	37.27887	25:33.0	25:07.7	Differentia	1.2	25:07.7
76.60168	37.27887	25:34.0	25:08.6	Differentia	1.2	25:08.6

76.60168	37.27887	25:35.0	25:09.7	Differentia	1.2	25:09.7
76.60169	37.27887	25:36.0	25:10.7	Differentia	1.2	25:10.7
76.6017	37.27888	25:37.0	25:11.6	Differentia	1.2	25:11.6
76.6017	37.27888	25:38.0	25:12.7	Differentia	1.2	25:12.7
76.6017	37.27888	25:39.0	25:13.7	Differentia	1.2	25:13.7
76.60171	37.27889	25:40.0	25:14.7	Differentia	1.2	25:14.7
76.60171	37.27889	25:41.0	25:15.6	Differentia	1.2	25:15.6
76.60172	37.27889	25:42.0	25:16.7	Differentia	1.2	25:16.7
76.60172	37.2789	25:43.0	25:17.7	Differentia	1.2	25:17.7
76.60172	37.2789	25:44.0	25:18.7	Differentia	1.2	25:18.7
76.60172	37.2789	25:45.0	25:19.7	Differentia	1.2	25:19.7
76.60173	37.27891	25:46.0	25:20.6	Differentia	1.2	25:20.6
76.60173	37.27891	25:47.0	25:21.6	Differentia	1.2	25:21.6
76.60174	37.27891	25:48.0	25:22.7	Differentia	1.2	25:22.7
76.60174	37.27892	25:49.0	25:23.7	Differentia	1.2	25:23.7
76.60174	37.27892	25:50.0	25:24.7	Differentia	1.2	25:24.7
76.60174	37.27893	25:51.0	25:25.6	Differentia	1.2	25:25.6
76.60174	37.27893	25:52.0	25:26.6	Differentia	1.2	25:26.6
76.60174	37.27893	25:53.0	25:27.6	Differentia	1.2	25:27.6
76.60174	37.27894	25:54.0	25:28.7	Differentia	1.2	25:28.7
76.60174	37.27894	25:55.0	25:29.7	Differentia	1.2	25:29.7
76.60174	37.27894	25:56.0	25:30.7	Differentia	1.2	25:30.7
76.60175	37.27894	25:57.0	25:31.6	Differentia	1.2	25:31.6
76.60175	37.27894	25:58.0	25:32.6	Differentia	1.4	25:32.6
76.60175	37.27895	25:59.0	25:33.6	Differentia	1.4	25:33.6
76.60176	37.27895	26:00.0	25:34.6	Differentia	1.2	25:34.6
76.60176	37.27896	26:01.0	25:35.6	Differentia	1.4	25:35.6
76.60176	37.27897	26:02.0	25:36.6	Differentia	1.2	25:36.6
76.60177	37.27897	26:03.0	25:37.6	Differentia	1.2	25:37.6
76.60177	37.27897	26:04.0	25:38.6	Differentia	1.2	25:38.6
76.60177	37.27898	26:05.0	25:39.7	Differentia	1.2	25:39.7
76.60178	37.27898	26:06.0	25:40.6	Differentia	1.2	25:40.6
76.60179	37.27898	26:07.0	25:41.6	Differentia	1.2	25:41.6
76.60179	37.27898	26:08.0	25:42.6	Differentia	1.4	25:42.6
76.6018	37.27898	26:09.0	25:43.7	Differentia	1.2	25:43.7
76.6018	37.27899	26:10.0	25:44.8	Differentia	1.4	25:44.8
76.6018	37.27899	26:11.0	25:45.6	Differentia	1.2	25:45.6
76.6018	37.279	26:12.0	25:46.6	Differentia	1.4	25:46.6
76.60181	37.279	26:13.0	25:47.6	Differentia	1.4	25:47.6
76.60181	37.27901	26:14.0	25:48.6	Differentia	1.6	25:48.6
76.60181	37.27901	26:15.0	25:49.7	Differentia	1.6	25:49.7
76.60181	37.27901	26:16.0	25:50.6	Differentia	1.6	25:50.6
76.60181	37.27902	26:17.0	25:51.6	Differentia	1.4	25:51.6
76.60181	37.27902	26:18.0	25:52.6	Differentia	1.8	25:52.6

QC

File: 0401QC1
Date: 4/1/2010

Battery: 12.6
Background Value: 1/0/1900
Object Value: 14mV

Line	Start	Stop	Comment
1	0	600	background
2	600	0	spike
3	0	600	background
4	600	0	cable shake
5	0	600	personnel test

File: 0401QC2
Date: 4/1/2010

Battery: 12.45
Background Value: 1/0/1900
Object Value: 14mV

Line	Start	Stop	Comment
1	0	600	background
2	600	0	spike
3	0	600	background

Response to Comments

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
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Douglas W. Domenech
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
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November 10, 2011

Ms. Krista Parra
NAVFAC MIDLANT, Building N-26
Hampton Roads Restoration Product Line, Code OPHREV4
9742 Maryland Avenue
Norfolk, VA 23511-3095

RE: Additional Concerns Regarding the Former Penniman Shell Loading Plant
Draft Technical Memorandum
Naval Weapons Station Yorktown
Cheatham Annex
Williamsburg, Virginia

Dear Ms. Parra:

The Virginia Department of Environmental Quality (DEQ) has received the *United States Environmental Protection Agency, Region 3's Additional Concerns Regarding the Former Penniman Shell Loading Plant at Cheatham Annex Draft Technical Memorandum* (Tech Memo). The September 28, 2011 Tech Memo, prepared by CH2M HILL, was received by the DEQ on October 3, 2011.

Thank you for providing the DEQ's Office of Remediation Programs the opportunity to review the above-referenced Tech Memo. Subsequent to DEQ's internal review, this office has the following comments:

In-ground Battery
The DEQ concurs that no further action is necessary; however, if similar item(s) are found at a later date, the Navy will notify the CAX Partnering Team and will research its CERCLA applicability.

Mixing Tanks
The DEQ concurs that no further action related to the mixing tanks (kaustines) is necessary, and the groundwater will be addressed as part of the expanded SI.

Large Drum with Side Port
The DEQ concurs that no further action is necessary; however, if similar item(s) are found at a later date, the Navy will notify the CAX Partnering Team and will address as appropriate.

Detonation Craters/Blast Holes
The DEQ concurs that no further action is necessary.

Booster Test Pit
The DEQ recommends additional research associated with the Booster Test Pit building. Researching Penniman archives at the Hagley Museum and/or from other archived documents would provide the CAX Partnering Team a better understanding of the typical building layout and actual building usage.

Please contact me at (804) 698-4125 or wade.smith@deq.virginia.gov with any additional questions.

Sincerely,

Wade M. Smith
Remediation Project Manager
Office of Remediation Programs

cc: John Burchette, EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

November 23, 2011

Ms. Krista Parra
NAVFAC MIDLANT, Building N-26
Hampton Roads Restoration Product Line, Code OPHREV4
9742 Maryland Avenue
Norfolk, VA 23511-3095

Subject: Draft Technical Memorandum. United States Environmental Protection Agency Region 3's Additional Concerns Regarding the Former Penniman Shell Loading Plant.

Ms. Parra:

Thank you for the opportunity to review the subject document. EPA would like to provide the following comments at this time.

EPA RPM Comment 1: Page 3: "In Ground Battery". EPA doesn't concur with the no further action determination for the in ground battery. Please try to reschedule the site visit with current team members. EPA generally prefers to make no further action determinations based on scientifically defensible data (sample data etc…).

EPA RPM Comment 2: Page 4: Please include the groundwater data as part of the AOC 6 Ammonia Settling Pit ESI.

EPA RPM Comment 3: Page 4: "Large Drum with Side Port". Three screening criteria used. 95% UCL or UTL of background should be used and not maximum (for screening purposes). Please rescreening accordingly. Please explain what "site specific RBC's" are.

EPA RPM Comment 4: Page 5: "Detonation Craters/Blast Holes". Page 5. See RPM Comment 3.

EPA RPM Comment 5: Page 5. Perchlorate should not have a background value. Please remove this discussion. Below the tap-water RSL is sufficient.

EPA RPM Comment 6: Page 6. Booster Test Pit. The geophysical survey was conducted to determine whether piping underground could be present. Potential linear anomalies were detected during the investigation. This should be investigated further. Additionally, have we ever/can we, go in to the structure? The top of it appeared to be removable, possibly it could just be pulled off and we could look down in it? My concern is that explosives were stored/are stored in the building primarily due to its' structure. Outside of the building is a double wall and the top looks like it was made to blow off. Structures like this were typically used to store explosives.

EPA RPM Comment 7: Figure 6. Why is the soil sample location so far from the Privy tank location?

EPA RPM comment 8: Attachment 2. First Page. Final Paragraph. Was the checking for piping ever completed?

EPA RPM Comment 9: Attachment 4. Page A4-4. Human Health Risk Screening Conclusion. "extremely unlikely that is ever would be used as a potable water supply". "is: is a typo and it should EPA's groundwater policy still applies as this would be considered a potentially potable source.

If you have any questions, please contact me at 215-814-3378.

Sincerely,

John Burchette
Remedial Project Manager

cc: Wade Smith, VDEQ

Response to VDEQ Comments
USEPA Region 3's Additional Concerns Regarding the Former Penniman Shell Loading Plant
Draft Technical Memorandum
Naval Weapons Station Yorktown Cheatham Annex
Williamsburg, VA
September 10, 2012

In-ground Battery: *The DEQ concurs that no further action is necessary; however, if similar item(s) are found at a later date, the Navy will notify the CAX Partnering Team and will research its CERCLA applicability.*

Response: Noted. If additional item(s) is/are found, the Navy will notify the CAX Partnering Team and will research its CERCLA applicability.

Mixing Tanks: *The DEQ concurs that no further action related to the mixing tanks (kaustines) is necessary, and the groundwater will be addressed as part of the expanded SI.*

Response: Noted.

Large Drum with Side Port: *The DEQ concurs that no further action is necessary; however, if similar item(s) are found at a later date, the Navy will notify the CAX Partnering Team and will address as appropriate.*

Response: Noted. If additional item(s) is/are found, the Navy will notify the CAX Partnering Team and will research its CERCLA applicability.

Detonation Craters/Blast Holes: *The DEQ concurs that no further action is necessary.*

Response: Noted.

Booster Test Pit: *The DEQ recommends additional research associated with the Booster Test Pit building. Researching Penniman archives at the Hagley Museum and/or from other archived documents would provide the CAX Partnering Team a better understanding of the typical building layout and actual building usage.*

Response: Additional research of the DuPont (thus, the Penniman Shell Loading Plant) archives at the Hagley Museum in Delaware was conducted and revealed no new information with respect to the Booster Test Pit. On-line searches for "booster test pits" and early 20th Century ordnance manufacture provided no new information as well. The Team will discuss the path forward for this item during September 2012 Partnering Meeting and the TM will be revised accordingly.

Response to EPA Comments
USEPA Region 3's Additional Concerns Regarding the Former Penniman Shell Loading Plant
Draft Technical Memorandum
Naval Weapons Station Yorktown Cheatham Annex
Williamsburg, VA
September 10, 2012

EPA RPM Comment 1: *Page 3: "In Ground Battery". EPA doesn't concur with the no further action determination for the in ground battery. Please try to reschedule the site visit with current team members. EPA generally prefers to make no further action determinations based on scientifically defensible data (sample data etc . . .).*

Response: The Navy does not agree with EPA's position regarding the so-called "In-Ground Battery." The comment that "EPA generally prefers to make no further action determinations based on scientifically defensible data (sample data etc…)" is based on an underlying premise that is false in this instance. The premise is that there is a known feature or location designated as a site, site screening area, or AOC by the Team where there is evidence that a potential CERCLA-regulated release may have occurred. In that situation, EPA may reasonably make a no further action determination based on analytical data or other scientific evidence. In this case, there is no known site, site screening area, or AOC designated by the Team and there is no compelling evidence associated with this feature to conclude that a CERCLA-related release has potentially occurred. Therefore, it is not necessary or applicable in this instance for EPA to make a "no further action" determination under CERCLA; the Team decision to be made is whether or not further attempts by the Navy to locate and examine this reported feature are warranted after an earlier, thorough attempt to find it indicated that it most likely no longer exists.

Here is a recap of what is known about this feature. In the first place, there is no clear evidence to indicate the "in-ground battery" is or was, in fact, a battery. It was discovered in 1998 along a roadside by a former Yorktown/CAX EPA RPM, Rob Thomson, as he was departing the former Department of the Interior (DOI) property. He observed it along the side of the road while driving past, stopped, and took pictures of it (Figure 2 of the TM). He subsequently asserted that it might represent an "in-ground battery." However, this was mere speculation. Based on its appearance, it is more likely to have been part of a former cathodic protection system or simply an access port to a defunct electrical system. In any case, there is no evidence or likelihood that it represents a CERCLA-related feature, or that it is related to the former Penniman Shell Loading Plant (PSLP).

Secondly, a thorough attempt to locate this feature in February 2009 proved fruitless. The Team spent several hours driving throughout the former DOI property in an attempt to locate this feature. Even though it was initially sighted with ease from a car passing by along the roadway, it could not be found during this site visit despite repeated passes along the DOI roadways and intensive searching. The day of the site visit, Rob Thomson conceded that the feature he had sighted earlier was likely gone eleven years later and said that if it happened to be found at a later date, the Navy should research or investigate it, but otherwise, no additional action was warranted. The following day at Partnering, he suggested making another attempt to look for it, but subsequently declined all requests to schedule another site visit.

Finally, it is important to note that this feature has never been designated by the Team as a unique site or AOC or as part of an existing site or AOC. It was not listed by the Team (which included Rob Thomson) in the 1999 SI of the former PSLP (Weston, 1999), nor was it used to score CAX for inclusion on the National Priorities List. The Team also did not designate this feature as part of the Penniman AOC (AOC 6) in the CAX FFA. In short, this feature has never been a concern of the Team as a potential CERCLA-regulated contaminant source. More recently, the Navy agreed to a Team site visit to look for it in February 2009 as a courtesy. As indicated earlier, after several hours driving the roads of the former DOI property and searching extensively, it could not be found. There is no reason to believe that a repeated attempt to locate this feature would be successful.

Since it is not appropriate to use the formal designation of "no further action" in the context of this feature, the text in the last sentence of the "In-Ground Battery" section will be revised from "…otherwise, no further action for the "in-ground battery" is necessary" to "…otherwise, no further attempts to locate the item are warranted."

EPA RPM Comment 2: *Page 4: Please include the groundwater data as part of the AOC 6 Ammonia Settling Pit ESI.*

Response: The groundwater data collected near the privy tank has been included in the ESI SAP for the AOC 6 Ammonia Settling Pit subarea. However, per Team agreement during the January 2012 scoping session, since the metals groundwater data collected for the privy tank and the AOC 6 SI were collected from direct-push technology points, the metals concentrations may not be representative of current groundwater conditions. Therefore, permanent groundwater monitoring wells will be installed and groundwater samples will be collected for the AOC 6 ESI, and the new metals groundwater data will be evaluated in the ESI in place of the privy tank and SI groundwater data.

EPA RPM Comment 3: *Page 4: "Large Drum with Side Port". Three screening criteria used. 95% UCL or UTL of background should be used and not maximum (for screening purposes). Please rescreening [sic] accordingly. Please explain what "site specific RBC's" are.*

Response: The referenced sentence about "three screening criteria used" is directly from the historic report (Environmental Baseline Study [EBS]) cited in the TM (i.e., Baker, 2004). The three screening criteria used in the EBS were USEPA Region 3 residential soil RBCs, CAX background concentrations from Soil Association 2, and "site-specific RBCs developed for the Penniman Property based on the Cheatham Annex Background samples" (Baker, 2004). An examination of the site-specific RBCs utilized in the EBS indicates that they were calculated using site-specific rather than default exposure factors; it is assumed that the site-specific exposure factors would be those used had a baseline risk assessment been performed on the data. See Appendix G of the EBS (Baker, 2004).

A comparison of the 2004 EBS sample data to the current Background 95% UTLs is shown in attached RTC Table 1, along with a comparison to the maximum background numbers used in the EBS. Of the ten inorganic constituents above the maximum background value (aluminum, barium, beryllium, copper, cyanide, iron, lead, mercury, vanadium, and zinc), only four of these exceed the 95% UTL (copper, cyanide, lead, and zinc). In summary, using the 95% UTL does not result in any additional COPCs; in fact, there are fewer. During the September 2008 Partnering discussion (Attachment 1 of this TM), Rob Thomson (former Yorktown/CAX EPA RPM) agreed that no further investigation activities with respect to the drum are necessary. In addition, during the February 2009 site visit, Rob again agreed that no further investigation related to this drum was required; the site visit wrap-up is captured in the March 2009 Partnering Meeting minutes (Attachment 2 of this TM).

EPA RPM Comment 4: *Page 5: "Detonation Craters/Blast Holes". Page 5. See RPM Comment 3.*

Response: A comparison of the 2004 EBS sample data to the current Background 95% UTLs is shown in attached RTC Table 2, along with a comparison to the maximum background numbers used in the EBS. Three samples, plus one duplicate, were collected in this area during the EBS. For each sample, the number of inorganic constituents detected above the maximum background value is greater than or equal to the number of inorganic constituents detected above the 95% UTL. In summary, using the 95% UTL does not result in any additional COPCs; in fact, there are fewer.

EPA RPM Comment 5: *Page 5. Perchlorate should not have a background value. Please remove this discussion. Below the tap-water RSL is sufficient.*

Response: The background discussion has been removed. The sentence now reads:

"One explosive, perchlorate, was detected at a very low concentration (0.21 J µg/L); however, the detected concentration is lower than the adjusted tap water RSL (2.5 µg/L) and the ecological screening value (9,300 µg/L)."

EPA RPM Comment 6: *Page 6. Booster Test Pit. The geophysical survey was conducted to determine whether piping underground could be present. Potential linear anomalies were detected during the investigation. This should be investigated further Additionally, have we ever/can we, go in to [sic] the structure? The top of it appeared to be removable, possibly it could just be pulled off and we could look down in it? My concern is that explosives were stored/are stored in the building primarily due to its' structure. Outside of the building is a double wall and the top looks like it was made to blow off. Structures like this were typically used to store explosives.*

Response: It is not certain if the top can be removed or not. The Team will discuss the path forward for this item during September 2012 Partnering Meeting and the TM will be revised accordingly.

EPA RPM Comment 7: *Figure 6. Why is the soil sample location so far from the Privy tank location?*

Response: The soil sample location is actually much closer to the privy tank location than is shown on Figure 6 and will be adjusted. The soil sample was collected within five feet of the privy tank location.

EPA RPM Comment 8: *Attachment 2. First Page. Final Paragraph. Was the checking for piping ever completed?*

Response: Yes, a geophysical survey was conducted in 2010 and replaced the initial suggestion to look for piping via excavation. The Team discussed and agreed on this approach during the March 2010 Partnering Meeting. The geophysical survey conclusions around the Booster Test Pit are presented in this TM, while the geophysical survey conclusions for the AOC 6 Ammonia Settling Pit and TNT Catch Box Ruins subareas is presented in the AOC 6 SI (CH2M HILL, 2012). See also the response to EPA RPM Comment 6.

EPA RPM Comment 9: *Attachment 4. Page A4-4. Human Health Risk Screening Conclusion. "extremely unlikely that is ever would used as a potable water supply." "is" is a typo and it should [sic] EPA's groundwater policy still applies as this would be considered a potentially potable source.*

Response: The typo has been corrected ("is" changed to "it"). Regarding EPA's groundwater policy, comment noted. As mentioned in the response to EPA RPM Comment 2, the groundwater in this area is being addressed as part of the ESI for the AOC 6 Ammonia Settling Pit subarea.

References:

Baker Environmental, Inc. (Baker). 2004. *Final Phase I (Modified) – Environmental Baseline Survey for Penniman Property, York County, Virginia.* January.

CH2M HILL, Inc. 2012. *Final Site Inspection Report, Areas of Concern 1, 2, 6, 7, and 8, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia*. May.

RTC Table 1. Maximum Background vs. 95% UTL Comparison

Inorganic Constituent[1]	DRUM-SS01-00 (0-4" bgs)			
	Surface Soil Max. Background - Soil Association 2 (mg/kg)[2]	Sample Results (mg/kg)[3]	Surface Soil Background 95% UTL (mg/kg)[4]	Sample Results (mg/kg)[3]
Alumium	4,570	**5,010**	12,200	5,010
Arsenic	4.10	3.6	6.36	3.6
Barium	29.4	**47.3 B**	52.9	47.3 B
Beryllium	ND	**0.48 B**	0.587	0.48 B
Calcium	3,320	3,100	2,290	**3,100**
Chromium	12.4	10.4	18.2	10.4
Cobalt	5.30	2.7 B	9.93	2.7 B
Copper	4.00	**5.3 B**	4.25	**5.3 B**
Cyanide	ND	**0.16 B**	NE	**0.16 B**
Iron	12,600	**13,600**	19,900	13,600
Lead	11.0	**64.7**	17.4	**64.7**
Magnesium	1,020	678 B	1,070	678 B
Manganese	257	168	324	168
Mercury	ND	**0.045 B**	0.111	0.045 B
Nickel	3.90	3.6 B	9.52	3.6 B
Potassium	1,210	738 B	708	**738 B**
Vanadium	15.2	**15.3**	27.9	15.3
Zinc	17.9	**46**	26.5	**46**

Notes:
ND = not detected
NE = not established
bgs = below ground surface

Result Qualifer:
B = Constituent was detected in a blank.

[1]Any constituent not listed above was a nondetect.
[2]Historic background number used in 2004 EBS (maximum detection for Soil Association 2) (Baker, 2004).
[3]Sample data from 2004 EBS (Baker, 2004).
[4]Current background UTL.
Shading represents exceedance of the background number.

RTC Table 2. Maximum Background vs. 95% UTL Comparison

	TC-SB01-01 (12-16" bgs)				TC-SB02-01 (12-16" bgs)				TC-SB03-01 (12-16" bgs)				TC-SB03-01D (12-16" bgs) (Duplicate Sample)			
Inorganic Constituent[1]	Shallow Subsurface Soil Background - Soil Association 2 (mg/kg)[2]	Sample Results (mg/kg)[3]	Subsurface Soil Background 95% UTL (mg/kg)[4]	Sample Results (mg/kg)[3]	Shallow Subsurface Soil Background - Soil Association 2 (mg/kg)[2]	Sample Results (mg/kg)[3]	Subsurface Soil Background 95% UTL (mg/kg)[4]	Sample Results (mg/kg)[3]	Shallow Subsurface Soil Background - Soil Association 2 (mg/kg)[2]	Sample Results (mg/kg)[3]	Subsurface Soil Background 95% UTL (mg/kg)[4]	Sample Results (mg/kg)[3]	Shallow Subsurface Soil Background - Soil Association 2 (mg/kg)[2]	Sample Results (mg/kg)[3]	Subsurface Soil Background 95% UTL (mg/kg)[4]	Sample Results (mg/kg)[3]
Alumium	12,600	6,270	13,000	6,270	12,600	12,400	13,000	12,400	12,600	**14,800**	13,000	**14,800**	12,600	**14,300**	13,000	**14,300**
Arsenic	15.9	2.9	5.54	2.9	15.9	11.5	5.54	11.5	15.9	13.3	5.54	**13.3**	15.9	11.9	5.54	**11.9**
Barium	48.5	**50.4**	84.5	50.4	48.5	**59.6**	84.5	59.6	48.5	30.3 B	84.5	30.3 B	48.5	29.6 B	84.5	29.6 B
Beryllium	ND	**0.57 B**	NE	**0.57 B**	ND	**0.88 B**	NE	**0.88 B**	ND	**1.5**	NE	**1.5**	ND	**1.5**	NE	**1.5**
Cadmium	ND	(Nondetect)	NE	(Nondetect)	ND	**0.15 B**	NE	**0.15 B**	ND	**0.30 B**	NE	**0.30 B**	ND	**0.34 B**	NE	**0.34 B**
Calcium	162,000	535 B	2,380	535 B	162,000	1,820	2,380	1,820	162,000	2,530	2,380	**2,530**	162,000	2,550	2,380	**2,550**
Chromium	26.4	11.0	33.7	11.0	26.4	25.1	33.7	25.1	26.4	**47.2**	33.7	**47.2**	26.4	**46.7**	33.7	**46.7**
Cobalt	7.30	2.6 B	5.18	2.6 B	7.30	5.0 B	5.18	5.0 B	7.30	5.0 B	5.18	5.0 B	7.30	4.7 B	5.18	4.7 B
Copper	5.00	1.4 B	3.17	1.4 B	5.00	**6.6**	3.17	**6.6**	5.00	**6.0**	3.17	**6.0**	5.00	**6.6**	3.17	**6.6**
Cyanide	ND	**0.086 B**	NE	**0.086 B**	ND	**0.18 B**	NE	**0.18 B**	ND	(Nondetect)	NE	(Nondetect)	ND	**0.12 B**	NE	**0.12 B**
Iron	30,000	9,920	32,000	9,920	30,000	**32,400**	32,000	**32,400**	30,000	**41,200**	32,000	**41,200**	30,000	**40,000**	32,000	**40,000**
Lead	8.30	5.2	8.79	5.2	8.30	**10.5**	8.79	**10.5**	8.30	**10.5**	8.79	**10.5**	8.30	**9.9**	8.79	**9.9**
Magnesium	3,340	757 B	1,120	757 B	3,340	1,480	1,120	1,480	3,340	**4,380**	1,120	**4,380**	3,340	**4,360**	1,120	**4,360**
Manganese	135	89.0	176	89.0	135	110	176	110	135	87.6	176	87.6	135	77.0	176	77.0
Mercury	ND	(Nondetect)	NE	(Nondetect)	ND	**0.067**	NE	**0.067**	ND	(Nondetect)	NE	(Nondetect)	ND	(Nondetect)	NE	(Nondetect)
Nickel	9.10	3.4 B	17.6	3.4 B	9.10	6.5 B	17.6	6.5 B	9.10	**10.8**	17.6	10.8	9.10	**9.7**	17.6	9.7
Potassium	2,100	639 B	901	639 B	2,100	1,450	901	**1,450**	2,100	**6,400**	901	**6,400**	2,100	**6,400**	901	**6,400**
Vanadium	33.2	14.6	48.3	14.6	33.2	**33.8**	48.3	33.8	33.2	**46.2**	48.3	46.2	33.2	**44.6**	48.3	44.6
Zinc	30.8	11.8	28	11.8	30.8	20.6	28	20.6	30.8	**42.7**	28	**42.7**	30.8	**40.9**	28	**40.9**

Notes:
ND = not detected
NE = not established
bgs = below ground surface

Result Qualifer:
B = Constituent was detected in a blank.

[1]Any constituent not listed above was a nondetect.
[2]Historic background number used in 2004 EBS (maximum detection for Soil Association 2) (Baker, 2004).
[3]Sample data from 2004 EBS (Baker, 2004).
[4]Current background UTL.
Shading represents exceedance of the background number.

Regulatory Acceptance

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

January 24, 2013

Mr. Scott Park
NAVFAC MIDLANT, Building N-26, Room 3208
Attention: Code OPHE3, Mr. Scott Park
9742 Maryland Avenue
Norfolk, VA 23511-3095

Subject: Additional Concerns Regarding the Former Penniman Shell Loading Plant, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia

Mr. Park:

Thank you for the opportunity to review the subject document. The U.S. Environmental Protection Agency accepts the comment responses and has no further comments. Please submit one final hard copy and CD of the report for our records.

If you have any questions, please contact me at 215-814-3394.

Sincerely,

Susanne Haug, P.E.
NPL/BRAC Federal Facilities Branch

cc: Wade Smith, VDEQ

Ivester, Marlene/VBO

To: Smith, Wade (DEQ)
Subject: RE: Penniman Shell Loading Plant Tech Memo - DEQ Concurrence

---

From: Smith, Wade (DEQ) [mailto:Wade.Smith@deq.virginia.gov]
Sent: Thursday, May 02, 2013 11:16 AM
To: scott.park@navy.mil
Cc: Ivester, Marlene/VBO; Sawyer, Stephanie/VBO; haug.susanne@epamail.epa.gov
Subject: CAX: Penniman Shell Loading Plant Tech Memo - DEQ Concurrence

Per our discussion of the comments during our CAX Partnering Meeting on November 14, 2012, the September 10, 2012 Response to VDEQ Comments adequately addresses all previous comments.

The DEQ has no additional comments.

Please let me know if you have any additional questions.

Thanks,
wade

Wade M. Smith
Remediation Project Manager
Virginia Department of Environmental Quality
Office of Remediation Programs
Phone: (804) 698-4125
wade.smith@deq.virginia.gov

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

December 17, 2013

Mr. Scott Park
NAVFAC MIDLANT, Building N-26, Room 3208
Attention: Code OPHE3, Mr. Scott Park
9742 Maryland Avenue
Norfolk, VA 23511-3095

Subject: Technical Memorandum, U.S. EPA Region III's Additional Concerns Regarding the Former Penniman Shell Loading Plant at Cheatham Annex, Williamsburg, Virginia, December 2013

Mr. Park:

Thank you for the opportunity to review the subject document. I have reviewed the red-line revisions to the subject document as it relates to EPA comments on an earlier draft of the document, and recent CAX Partnering Team discussions regarding the Booster Test Pit. In conjunction with EPA's letter dated January 24, 2013, accepting the Navy's response to comments for the subject document, EPA has no further comments on this document. Please submit a final copy of the subject document for our records. If you have any questions, please contact me at 215-814-2077.

Sincerely,

Gerald F. Hoover

Gerald F. Hoover, RPM
NPL/BRAC Federal Facilities Branch

cc: Wade Smith, VDEQ

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
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Douglas W. Domenech
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David K. Paylor
Director

(804) 698-4000
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December 18, 2013

Mr. Scott Park
NAVFAC MIDLANT, Building N-26
Hampton Roads Restoration Product Line, Code OPHREV4
9742 Maryland Avenue
Norfolk, VA 23511-3095

Technical Memorandum
Additional Concerns Regarding the Former Penniman Shell Loading Plant
Naval Weapons Station Yorktown
Cheatham Annex
Williamsburg, Virginia

Dear Mr. Park:

The Virginia Department of Environmental Quality (DEQ) has received the *Redline Technical Memorandum* (Tech Memo) for the Former Penniman Shell Loading Plant at Naval Weapons Station Yorktown, Cheatham Annex, Williamsburg, Virginia. The Tech Memo, prepared by CH2M HILL, was received by the DEQ (electronically) on December 7, 2013.

Thank you for providing the DEQ's Office of Remediation Programs the opportunity to review the above-referenced Tech Memo. Subsequent to DEQ's internal review, this office concurs with the proposed text revisions and recommends submittal of the *Final Technical Memorandum*.

Please contact me at (804) 698-4125 or wade.smith@deq.virginia.gov with any additional questions.

Sincerely,

Wade M. Smith
Remediation Project Manager
Office of Remediation Programs

cc: Jerry Hoover, EPA