Volume I - Report of Findings

TNT Area B Remedial Investigation
Former Plum Brook Ordnance Works
Sandusky, Ohio

Prepared for:

U.S. Army Corps of Engineers, Nashville District
P. O. Box 1070
Nashville, Tennessee 37202-1070

Prepared by:

IT Corporation
312 Directors Drive
Knoxville, Tennessee 37923

IT Project No. 775616

Revision 1

August 2000

Date

ROUTING AND TRANSMITTAL SLIP

9 November 2000

TO: *(Name, office symbol, room number, building, Agency/Post)*	Initials	Date
1. Mr. Rick Meadows CELRH-PM-P		
2.		
3.		
4.		
5.		

	Action	X	File		Note and Return
	Approval		For Clearance		Per Conversation
	As Requested		For Correction		Prepare Reply
	Circulate		For Your Information		See Me
	Comment		Investigate		Signature
	Coordination		Justify		

REMARKS

ached are three (3) copies , Control Copies 6, 7, and 8 of the TNT Area B Remedial Investigation, Former a Brook Ordnance Works, Sandusky, Ohio, dated August 2000 for your files. We did a review of the documents in-house prior to releasing.

I have also enclosed a copy of the letters where I sent to NASA, Ohio EPA, and CHPPM.

DO NOT use this form as a RECORD of approvals, concurrences, disposals, clearances, and similar actions

FROM: *(Name, org. symbol, Agency/Post)*	Room No.-Bldg.
NDA S. INGRAM ELRN-EC-R-M	Phone No. (615) 736-7122

DOD EXCEPTION TO OF41
APPROVED BY GSA/IRMS 4/89

OPTIONAL FORM 41 (Rev. 7-76)
Prescribed by GSA
FPMR (41 CFR) 101-11.206

USAPPC V2.10

NOV 09 2000

Technical Management Section

US Army Center for Health Promotion
And Preventive Medicine
Attention: Mr. Dennis E. Druck, MCHB-TS-EHR
5158 Blackhawk Road
Aberdeen Proving Grounds
Edgewood Area, Maryland 21010-5422

SUBJECT: Submittal of the Final TNT Area B Remedial Investigation, Former Plum Brook Ordnance Works, Sandusky, Ohio.

Dear Mr. Druck,

Our contractor, IT Corporation, has submitted the subject report dated August 2000. We have reviewed the report prior to release to insure that all comments on the draft have been addressed. However, should you have any comments on the documents, please let us know within 45 days of receipt of the documents. Control copies 14 and 15 are enclosed.

Our Technical Coordinator on this project is Ms. Linda S. Ingram. All comments or questions should be directed to her at this office. Ms. Ingram may be contacted by telephone at (615) 736-7122, or fax at (615) 736-7676. Thank you for your cooperation.

Sincerely,

for Mike Z.
Thomas W. Waters, P.E.
Chief, Engineering-Construction
Division

Enclosure

Copy Furnished:
CELRH-PM-P (Mr. Richard Meadows)

Terrell/EC-R
Hall/EC-R
Miller/EC
Waters/EC

NOV 09 2000

Environmental Restoration Branch

Mr. Richard Kunath
NASA Plum Brook Station
Environmental Coordinator
6100 Columbus Avenue
Sandusky, Ohio 44870

Subject: Submittal of the Final TNT Area B Remedial Investigation, Former Plum Brook Ordnance Works, Sandusky, Ohio

Dear Mr. Kunath:

Our contractor, IT Corporation, has submitted the subject report dated August 2000. We have reviewed the report prior to release to insure that all comments on the draft have been addressed. However, should you have any comments on the documents, please let us know within 45 days of receipt of the documents. Control copies 9 and 10 are enclosed.

Our Technical Coordinator on this project is Ms. Linda Ingram. All comments or questions should be directed to her at this office. Ms. Ingram may be contacted by telephone at (615) 736-7122, or fax at (615) 736-7676. Thank you for your cooperation.

Sincerely,

/s/ mike Z.
for Thomas W. Waters, P.E.
Chief, Engineering-Construction Division

Enclosure

Copy Furnished:
CELRH-DL-M (Rick Meadows)

Terrell 11/8/00
Hall/ED 11/8/00
Miller/ED
Waters/ED 11/8/00

DEPARTMENT OF THE ARMY
NASHVILLE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1070
NASHVILLE, TENNESSEE 37202-1070

NOV 09 2000

IN REPLY REFER TO

Technical Management Section

Mr. Ron Nabors
Ohio Environmental Protection Agency
Environmental Specialist
347 North Dunbridge Road
Bowling Green, Ohio 43402

SUBJECT: Submittal of the Final TNT Area B Remedial Investigation, Former Plum Brook Ordnance Works, Sandusky, Ohio.

Dear Mr. Nabors,

Our contractor, IT Corporation, has submitted the subject report dated August 2000. We have reviewed the report prior to release to insure that all comments on the draft have been addressed. However, should you have any comments on the documents, please let us know within 45 days of receipt of the documents. Control copies 11 and 12 are enclosed; control copy 13 has been furnished directly to Ms. Laurie Moore Eggert.

Our Technical Coordinator on this project is Ms. Linda S. Ingram. All comments or questions should be directed to her at this office. Ms. Ingram may be contacted by telephone at (615) 736-7122, or fax at (615) 736-7676. Thank you you for your cooperation.

Sincerely,

for Thomas W. Waters, P.E.
Chief, Engineering-Construction Division

Enclosure

Copy Furnished:
CELRH-PM-P (Mr. Richard Meadows)
Laurie Moore Eggert
Risk Assessment Coordinator
Ohio EPA-Southwest District Office
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IT Corporation
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A Member of The IT Group

November 7, 2000

Commander
U.S. Army Engineer District, Nashville
ATTN: CELRN-EP-R-M (Mrs. Linda Ingram)
Estes Kefauver Federal Building
801 Broadway
Nashville, Tennessee 37202-1070

Submittal of the Revised Final Report for the Remedial Investigation and Feasibility Study, TNT Area B, Former Plum Brook Ordnance Works, Sandusky, Ohio; Contract Number DACA62-94-D-0030; IT Project Number 775616

Dear Mrs. Ingram:

In accordance with the requirements of Delivery Order Number 0034 of Contract Number DACA62-94-D-0030 and as discussed, IT Corporation is pleased to submit the revised final report for the Remedial Investigation and Feasibility Study of TNT Area B at the former Plum Brook Ordnance Works (PBOW) in Sandusky, Ohio. The final report has been revised based upon review comments received from the USACE on the August 31, 2000 submittal. The revised final report submittal includes a complete revision of Volume I, Report of Findings. Additional changes to Volume II, Human Health Risk Assessment, and Volume III, Ecological Risk Assessment, are provided in the form of replacement pages as necessary.

Enclosed are fifteen copies of Volume I and replacement pages for Volumes II and III for the revised final report. Should you have any questions or require additional information regarding this submittal, please do not hesitate to call me at (860) 688-1151.

Sincerely,

Mikael L. Spangberg
Project Manager

Enclosures

IT CORPORATION
A Member of The IT Group

DISCIPLINE SIGN-OFF REVIEW

Client Name: U.S. Army Engineer District, Nashville; CELRN-EP-R-M

Project Description: Remedial Investigation and Feasibility Study, TNT Area B, Former Plum Brook Ordnance Works, Sandusky, Ohio

Contract Number: DACA62-94-D-0030 Delivery Order Number: 0034

Project Number: 775616 Task / Phase Number: 09000000

Document Type	Identify specific section or segment covered by this checkprint	Document Origin
☐ Technical / Cost Proposal		☒ Originator Developed
☐ RFP		☐ Edited Standard
☐ Contract / Subcontract		☐ Client Furnished
☐ SAP, SSAP, CDAP, or QAPP		
☐ SHP or SSHP		**Document Status**
☒ _____ Report	Draft RI Report, Volumes I, II, and III; Revision 1, August 2000	☐ Preliminary
☐ Risk Assessment / Evaluation		☐ Internal Draft
☐ Specifications & Plans		☐ Draft
☐ Design Calculations		☐ Draft Final
☐ Tables		☒ Final
☐ Drawings / Figures		☐ Other: _____
☐ Other: _____		

	Required Person	Signature	Date
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Technical Reviewer	M. Spangberg		8-31-00
Quality Assurance Officer	P. Gray	P. Gray	8-31-00
Project Manager	M. Spangberg		8-31-00

NOTICE: By signature above, parties certify that the subject document has been prepared by and/or reviewed by them (as appropriate), that all review comments have been resolved, and that the document is ready for submittal.

RESPONSE TO OHIO EPA TECHNICAL REVIEW COMMENTS ON THE TNT AREA B REMEDIAL INVESTIGATION AT THE FORMER PLUM BROOK ORDNANCE WORKS IN SANDUSKY OHIO

Reference: *Ohio EPA Letter dated April 14, 2000 from Ron Nabors to the U.S. Army Corps of Engineers, Nashville District (Linda Ingram)*

Volume II – Human Health Risk Assessment

Comment 1: **Executive summary, page ES-2: *"Certain metals and polycyclic aromatic hydrocarbon chemicals were identified as natural or anthropogenic background constituents at the site. Background chemicals were not eliminated, but were included in an evaluation of background risk"***

In general, comparison with naturally occurring levels is applicable only to inorganic chemicals because the majority of organic chemicals are not naturally occurring, even though they may be ubiquitous. Do not eliminate anthropogenic chemicals from the site risk evaluation because it is extremely difficult to conclusively show that such chemicals are present at a site due to operations not related to the site or surrounding area. The presence of anthropogenic background chemicals can be discussed in the uncertainties section, however these constituents should be retained and evaluated in the site-related risk. Compounds evaluated in background risk should include only those constituents detected in the samples collected from background locations. Background locations are classified as unimpacted areas that are not influenced by site activity.

Response: Please see response to Comments 10 and 11. The statement in question will be revised as follows: "Certain metals were identified as background chemicals at the site. Background chemicals were not eliminated..."

Comment 2: **Executive Summary, page ES-2: *"The groundskeeper represents a site worker exposure to surface soil in the current and future (industrial) land-use scenario."***

There are no restrictions on this property to prevent future residential land use. Clarify this sentence to indicate that current land-use is industrial and future land use is residential, for example. "The groundskeeper represents a site worker exposure to surface soil in the current (industrial) and the future (residential) land-use scenario."

Response: The future use of the site is described in the third paragraph on page ES-1. This paragraph will be added to Section 3.1.1 (page 3-2). The statement in question on page ES-2 will be revised by removing the term "(industrial)" as follows: "The groundskeeper represents a site worker exposed to surface soil

in the current and future site-use scenario." The first sentence in Section 3.1.3.1 will be revised as follows: "The groundskeeper scenario was designed to evaluate the upper bound for site worker exposure to surface soil in the current and future site-use scenario."

Comment 3: **Executive Summary, page ES-3:** ***"The construction worker....Relevant pathways evaluated were incidental ingestion and dermal contact with soil and inhalation of volatile organic compound (VOC) vapor and dust."***

There is potential for the construction worker to have exposure to contaminated groundwater during excavation activities, utility repair, etc. Include this pathway or justification for excluding it.

Response: USACE agrees that construction worker exposure to shallow groundwater (inhalation of airborne VOCs and dermal contact) is plausible and will be developed and evaluated when groundwater data are complete (please see response to Comment 9). The executive summary, however, only mentions the pathways that were evaluated in this risk assessment. The potential for exposure to groundwater was not included in the executive summary for any of the receptors, although it is included in Figure 3-1 and Table 3-1.

Comment 4: **Executive Summary, page ES-3:** ***"Inhalation of VOC emissions from surface water and sediment is possible, but the large volume of ambient air is assumed to dilute airborne concentrations to toxicologically insignificant levels, and this inhalation pathway was not quantified."***

Documentation is needed to support this statement. If justification for this statement cannot be provided, this pathway will be evaluated in a quantitative risk assessment.

Response: This issue was discussed at length with OEPA during development of the approved RAWP. The justification for choosing to not quantify this inhalation pathway is intuitive, because validated models for airborne concentrations of VOCs from surface water and sediment are not available. The intuitive justification mentioned in the document includes dilution in the large volume of ambient air. Further intuitive justification that could be cited includes natural air currents, which hasten dispersion in ambient air. The issue, however, is a moot point, because VOCs were not identified as COPC in either surface water or sediment.

The uncertainty analysis will be significantly expanded to include the major sources of uncertainty in the risk assessment. Potentially complete exposure pathways that are not quantified, including this one, will be discussed as a source of non-conservative bias to the risk and hazard estimates.

Comment 5: **Executive Summary, page ES-3:** ***"It is assumed, however, that the large volume of outdoor air would effectively dilute airborne concentrations to toxicological insignificant levels, and this inhalation pathway was not quantified."***

See comment #4.

Response: Please see response to Comment 4.

Comment 6: **Executive Summary, page ES-3:** ***"The total ILCR from all groundwater exposure pathways is within the 1E-6 to 1E-4 range considered acceptable by Ohio EPA...."***

Ohio EPA evaluates risk within the range of 1E-6 to 1E-4, with a point of departure at 1E-6. Risks at or greater than 1E-6 are to be reported in the Remedial Investigation report. Risks falling in this range will be evaluated in the feasibility study. Revise this statement to clarify that Ohio EPA evaluates risks within the range of 1E-6 to 1E-4.

Response: ILCRs less than 1E-6 will be described as sufficiently protective; an ILCR of 1E-6 will be described as the point of departure, ILCRs within the 1E-6 to 1E-4 range will be described as falling within the risk management range, and ILCRs greater than 1E-4 will be described as clearly unacceptable. The statement in question will be revised as follows: "The total ILCR from all groundskeeper exposure pathways is within the 1E-6 to 1E-4 risk management range requiring further evaluation, and the total HI exceeds the acceptable value of 1."

Comment 7: **Executive Summary, page ES-4:** ***"The total ILCR from all construction worker exposure pathways is within the 1E-6 to 1E-4 range considered acceptable by Ohio EPA...."***

See comment #6.

Response: Please see response to Comment 6. The statement in question will be revised as follows: "The total ILCR from all construction worker exposure pathways is within the 1E-6 to 1E-4 risk management range requiring further evaluation, and the total HI exceeds the acceptable value of 1."

Comment 8: **Executive Summary, page ES-4:** ***"The above risk assessment for hypothetical future residents and construction workers is based on the assumption that the exposures would occur t any randomly selected location within TNT Area B. Examination of the soil sampling data shows that the above risk estimates are based primarily on samples obtained from the northeast quadrant of the site."***

Contamination may be unevenly distributed across a site, resulting in hot spots (i.e., areas of high contamination relative to other areas of the site). If a hot spot is located, exposure to the hot spot should be assessed separately (RAGS Volume 1, USEPA, 1989).

Response: USACE agrees that exposures to hot spots should be evaluated separately from exposures in which random access across the entire site (i.e., across the entire data set) is assumed. The possibility of hot spots arises from two problematic samples that showed high concentrations of TNT but nondetects for the other nitroaromatics of interest. Please see response to Comment 17.

Comment 9: **Section 1.0, Introduction, page 1-3: *"....groundwater is transient and not considered a potential source of potable water. There are no plausible pathways by which the receptors would be continually exposed to shallow groundwater."***

The construction worker is a receptor for both the current and future land use scenarios. It is possible for the construction worker to contact shallow groundwater during excavation activities, utility repairs, and other construction activities. Revise the text to include this pathway or justification for excluding it.

Response: USACE agrees with the reviewer that construction worker exposure to shallow groundwater is plausible and should be evaluated. However, it has been established as a programmatic matter that all evaluation of groundwater, shallow and deep, will be performed at some future date when the groundwater has been adequately characterized. The scenario for construction worker exposure to shallow groundwater will be developed fully at that time. The current document, however, will be revised to include exposure to shallow groundwater as a complete pathway. To this end:

- The sentence in question on page 1-3 ("There are no plausible pathways...") will be deleted.
- Figure 3-1 will be revised to include dermal contact with shallow groundwater and inhalation of VOC emissions from shallow groundwater by the construction worker.
- Section 3.1.2 (page 3-2) will be expanded to include volatilization of VOCs from groundwater to air.
- Footnote "c" of Table 3-1 will be revised as follows: "No groundwater data are available at this writing. Future groundwater exposures will be assessed when data become available."

Comment 10: **Section 2.1.3., Identifying Site-Related Chemicals, page 2-2:** ***"Chemicals that were detected at the site, but were also detected at locations not affected by site operations are termed background chemicals."***

The background screen is applicable only to naturally occurring, inorganic constituents because the majority of organic constituents are not naturally occurring, even though they may be ubiquitous in the environment. Naturally occurring background is defined as ambient concentrations of chemicals that are present in the environment and have not been influenced by humans and the concentrations have not been increased by anthropogenic sources (RAGS Volume I, USEPA 1989). The presence of organic chemicals in background samples may indicate that the sample was collected in an area influenced by site contamination and thus does not quality as a true background sample. Such samples should be included with site samples in the risk assessment. Ubiquitous, anthropogenic background is often from nonpoint sources. Do not eliminate these constituents from the quantitative risk assessment for site risk because it is difficult to show that such chemicals are present at the site due to operations not related to the sit or surrounding area.

Response: USACE agrees that "it is difficult to show that such chemicals are present at the site due to operations not related to the site..." However, it is not necessary to unequivocally show that such chemicals were not site related; it is only necessary to show that their concentrations do not exceed natural or anthropogenic background levels. The presence of organic compounds in soil samples collected as background may or may not suggest that the sample location was influenced by site contamination. For example, the presence of herbicides in agricultural areas used for crop production or PAHs in areas of industrial activity may not reflect site contamination. PAHs are the only chemicals in this assessment whose designation as background is challenged. USACE agrees that the ATSDR background levels are not sufficient to screen the PAHs from the list of site-related chemicals. PBOW-specific background data, which would be sufficient for this purpose, are not and will not be available. Therefore, PAHs will be considered to be site related contaminants.

The statement in question on page 2-2 appears to be consistent with OEPA's position and will not be changed. However, other parts of the document will be revised in response to this clarification (e.g., please see response to Comment 11).

Comment 11: **Section 2.1.3, Identifying Site-Related Chemicals, page 2-2 to 2-3:** ***"PAHs generally are ubiquitous in the environment, and background levels in urban, rural and agricultural soil have been compiled (ATSDR, 1995). Organic chemicals identified as anthropogenic background were not eliminated from RA; instead, they were included and evaluated in Total Site Risk and Background Risk, but not in site-related risk."***

Remove this statement and reference from this section of he report. discussion of this source (i.e., ATSDR, 1995) with respect to site conditions is more appropriate placed in the Uncertainties Section. Evaluate PAHs in the quantitative risk assessment for site-related risk. See comment #10. Remove background values for PAHs from ATSRD (1995) in Table 2-6.

Response: Please see response to Comment 10. The paragraph in question will be revised as follows: "***Organic Chemicals.*** For most organic chemicals, identification at concentrations above levels in blanks (considering the 5x, 10x rule; see Section 2.1.2) is presumptive evidence of site-related activity. Some organic chemicals, however, may occur as a result of activity not associated with site-related releases. Such chemicals, designated anthropogenic background, may include herbicides in agricultural areas where crops are grown, and polynuclear aromatic hydrocarbons (PAH), which form by natural or anthropogenic combustion of organic matter, including fossil fuels. PAHs were detected in samples collected at the site. However, the data are not sufficient to determine whether the concentrations measured represent anthropogenic background or site-related releases. In the absence of sufficient background data, all the PAHs in all media are considered to be site-related chemicals."

Background screening criteria for PAHs will be deleted from Tables 2-1, 2-2 and 2-3; Table 2-7 will be removed.

Comment 12: **Section 2.1.3, Identifying Site-Related Chemicals, page 2-4: *"Therefore, the MDC of the background data set is conservatively selected as the BSC for nonparametric background data sets."***

This methodology should be used when the calculated UTL value for a constituent exceeds the maximum detected concentration for that constituent. Independent of the statistical distribution. Therefore, when the calculated UTL value for a constituent exceeds the maximum detected concentration for that constituent, default to the maximum detected concentration. For example, in Table 2-6, for aluminum the 95% UTL = 26,900 ppm and the maximum detected concentration =15,500 ppm, therefore the Background Screening Criterion (BSC) should be conservatively selected as 15,500 ppm. Make the necessary corrections to Table 2-6 and sections of the text with respect to defaulting to the maximum detected value.

Response: The USACE respectfully disagrees with the statement that the UTL for normal and lognormal distributions should not exceed the MDC. The numerical value of the UTL is directly related to statistical variability contained within the data set. Defaulting to the MDC essentially ignores the variability that should be taken into account in the calculation of a background

statistic. Development of the UTL methodology was one of the issues resolved by collaboration and presented in the RAWP.

Comment 13: **Section 2.1.3, Identifying Site-Related Chemicals, page 2-5:** ***"Metals and organic chemicals identified as anthropogenic background were not eliminated from the RA; instead they were included and evaluated in total site risk and background risk, but not in site-related risk....Anthropogenic background concentration of PAH compounds are shown in Table 2-7."***

See comment #10 & #11.

Remove Table 2-7 from this section. The information in this table and the ATSDR reference is or appropriately discussed in the uncertainties section. Remove background values for PAHs from ATSDR (1995) in table 2-6.

Response: Please see response to Comments 10 and 11. The reference to Table 2-6 is unclear; no data regarding PAHs is presented therein. The paragraph in question will be revised as follows: "Metals identified as background were not eliminated from the RA; instead, they were included and evaluated in total site risk and background risk, but not in site-related risk. These designations are described fully in Chapter 5.0."

Comment 14: **Section 2.14 Risk Based Screening, page 2-5 to 2-8:** ***"The mechanisms by which receptors are exposed to sediment are similar to those for soil....The residential soil PRGs are not adjusted downward when applied to sediment ....In other words, the unadjusted residential soil PRGs are considered to reflect an ILCR of 1E-7 and Hi of 0.1 when used for screening chemical concentrations in sediment. Similarly the EPA tap water PRGs are adopted for surface water...."***

Revise text for agreement between adjusting PRGs and the ILCR risk level that the adjustment reflects. For instance, USEPA Region IX PRGs reflect an ILCR of 1E-6 when they are not adjusted. The text, as written, is confusing because the text states that the PRGs were not adjusted for surface water and sediment screens, but reflect an ILCR of 1E-7.

Response: Implicit, but not clearly articulated in this section, is the assumption that the soil RBSCs, which reflect an ILCR of 1E-7 or an HI of 0.1, are adjusted upward by an order of magnitude when applied to sediment. This adjustment reflects the judgement that exposure to sediment is likely to be an order of magnitude less intensive than exposure to sediment. Similarly, exposure to surface water is likely to be an order of magnitude less intensive than exposure to tap water. The paragraph in question will be revised for clarity as follows: "The mechanisms by which receptors are exposed to sediment are similar to those for soil, but exposure to sediment is likely to be far less intensive. Therefore, the soil RBSCs are adjusted upward by an order of

magnitude for application to sediment. In other words, the unadjusted EPA (1998) residential soil PRGs are considered to reflect an ILCR of 1E-7 and an HI of 0.1 when used for screening chemical concentrations in sediment. Similarly, exposure to surface water is likely to far less intensive than exposure to tap water. Therefore, the tap water RBSCs are adjusted upward by an order of magnitude for application to surface water. In other words, the unadjusted EPA (1998) tap water PRGs are considered to reflect an ILCR of 1E-7 and an HI of 0.1 when used for screening chemical concentrations in surface water."

Comment 15: **Section 2.1.5 Evaluating Essential Nutrients, page 2-6:** ***"Essential nutrients such as calcium, chloride, iodine, magnesium, phosphorus, potassium, and sodium were eliminated as COPC...."***

Using the essential nutrient status as the basis for the COPC screen should be limited to calcium iron, magnesium, potassium, and sodium. Without consideration of the levels that may be associated with toxicity for these other inorganics, it is not appropriate to screen them out.

Response: The text in question will be revised as follows: "Essential nutrients such as calcium, iron, magnesium, potassium, and sodium are usually eliminated as COPC because they are generally considered innocuous in environmental media. Other essential nutrients including chloride, iodine and phosphorus may be eliminated as COPC, provided that their presence in a particular medium is judged to be unlikely to cause adverse effects on human health." Please note that only calcium, magnesium, potassium, and sodium were eliminated as COPC based on their status as essential nutrients.

Comment 16: **Section 2.1.6.1 Surface Soil, Background COPC, page 2-7:** ***"The following PAH COPC were detected at maximum concentrations consistent with background soil concentrations reported by the ATSDR...."***

See comment #10-13. Revise text.

Response: Please see response to Comments 10 and 11; the text in question will be deleted.

Comment 17: **Section 2.1.6.1 Surface Soil, Risk Based Screening, page 2-7:** ***"When such elevated detection limits are encountered. EPA (1989a) guidance provides for removal of the values from the data set if they are greater than the maximum quantitated concentration."***

RAGS Volume I part a (USEPA, 1989) states, "If there is reason to believe that the chemical is present in a sample at a concentration below the sample quantitation limit (SQL), use one-half of the SQL as proxy concentration. The SQL, value itself can be used if there is reason to

believe the concentration is closer to it than to one-half the SQL. Do not simply omit results from the risk assessment.

Throughout Section 2.1.6 Summary of COPC Selection, page 2-8 to page 2-11, constituents with elevated detection limits appear to have been thrown out or removed from the data set simply because the detection limits were elevated, without further evaluation or justification. The methodology used to justify dropping these data points is inappropriate during the screening process. RAGS part a (USEPA, 1989) stated, "If the SQLs cannot be reduced by re-analyzing the sample, exclude the sample from the quantitative risk assessment if they cause the calculated exposure point concentration to exceed the maximum detected concentration for a particular sample set." As stated in the text of section 2.2.1, "Unusually high values are included in the calculation of the UCL because high values seldom appear as statistical outliers in the environmental data and may identify areas that require evaluation as hot spots. Inclusion of outliers increases the overall conservatism of the risk estimate." Revise Section 2.1.6 Summary of COPC Selection and all subsections from page 2-8 to page 2-11 to include data with elevated SQLs until a formal review of the data can be completed.

Response: USACE believes that a defensible case can be made either for retaining or excluding the questionable samples. Clearly, EPA (1989) states that samples may be excluded from the risk assessment if they have unusually high quantitation limits; however, EPA (1989) also states that one-half the detection limit should be used as a proxy concentration for chemicals believed to be present at a concentrations less than their detection limits. The elevated detection limits for the two samples in question arise from the fact that dilution was required to quantify unusually high levels of TNT. The presence of high levels of TNT raises concern that other nitroaromatics may also be present, probably at levels well above their RBSCs.

One option is to simply reinstate the two samples in question, using one-half the detection limit as a proxy concentration for the nondetected nitroaromatics. The net effect of exercising this option will be elevation of exposure-point concentrations for some of the nitroaromatics, with a concomitant increase in risk and hazard estimates. The conclusions of the risk assessment will not change because the risk assessment without the questionable samples failed for all receptors evaluated. However, a great deal of uncertainty will be introduced, because the risk-driving COPC and their exposure-point concentrations will arise primarily from samples in which the risk-driving concentrations were nondetects and the proxy concentrations reflect a 1000-fold dilution factor.

The better approach is to reexamine the existing data set (excluding the questionable samples) to determine whether concentrations of nitroaromatics other than TNT in locations near those from which the samples in question

were taken are comparable to concentrations in samples taken from other areas of the site. Two conditions must be satisfied to establish that concentrations are comparable across the site: (1) detected concentrations are comparable, and (2) detection limits for the nondetects are comparable and not unusually high (which could mask the presence of high concentrations). If both of these conditions are satisfied, confidence is increased that excluding the questionable samples does not obscure potentially high levels of aromatics. If both of these conditions are not satisfied, considerable doubt remains, in which case it would be wise to re-analyze the samples using techniques that can quantify the nondetected nitroaromatics in the presence of high levels of TNT. It may also be necessary to take additional samples near locations SO13 and SO14 (from which the samples in question were taken) to better characterize the extent of contamination.

Reinstating the two samples in question requires the following revisions to be made to the document. Tables 2-1, 2-2 and 2-3 would be revised to reinstate the samples in question. The four paragraphs in Section 2.1.6.1 (pages 2-7 and 2-8) describing the exclusion of the two samples would be deleted. The paragraph under ***Frequency of Detection*** in Section 2.1.6.3 would be revised as follows: "The frequency of detection for all chemicals detected in combined surface and subsurface soil samples was greater than 5 percent except for two nitroaromatic compounds (Table 2-3). However, there is reason to believe that nitroaromatics are the primary contaminants associated with the site. Therefore, no chemicals were excluded as COPC because of low frequency of detection." The last paragraph under ***Risk-Based Screening*** in Section 2.1.6.3 (page 2-10) would be deleted.

Comment 18: **Section 2.2.1 Soil, Surface Water, and Sediment, page 2-13, *"Judgement is used in those cases where dilution drove the SQL unusually high."***

RAGS Volume I part a (USEPA, 1989) states, "If there is reason to believe that the chemical is present in a sample at a concentration below the sample quantitation limit (SQL), use one-half of the SQL as proxy concentration. The SQL value itself can be used if there is reason to believe the concentration is closer to it than to one-half the SQL. Do not simply omit results from the risk assessment without further evaluation.

Response: USACE shares the reviewer's concern regarding excluding samples with large detection limits. Please see response to Comment 17.

Comment 19: **Section 2.2.1 Soil, Surface Water, and Sediment, page 2-13, *"To ensure that areas of potential high concentrations were not overlooked, USACE (1998a) specified that approximately 400 composite surface soil samples would be analyzed on the site for explosives by IMS."***

Was the purpose of collecting composite samples to screen the area for explosives? Were there any detections for explosives in the composite

samples? How were detections of explosives in the samples handled? Were discrete samples collected when there were detections?

Expand the text in this section to state the results of composite sampling and state the purpose for collecting composite samples.

Response: The objective of collecting composite soil screening samples was to delineate areas of nitroaromatic contamination within TNT Area B; historical results from the 1994 RI completed by Dames and Moore were used as a base for the screening sample locations. There were detections for nitroaromatic compounds during the field screening effort, and these results were used to place additional screening samples (surface and subsurface) as well as confirmation samples (discrete). Note that confirmation samples were collected at locations that had shown both detections and non-detections during the screening process.

The field screening sampling and analysis as well as confirmation samples are presented in detail in Volume I of the TNT Area B Remedial Investigation Report. Section 2.0 provides an overview of the field investigation, while Section 4.0 presents details of investigation results, both from field screening and confirmation samples. Because these topics are discussed in Volume I, the section has not been expanded to discuss sampling results – instead, a statement that this information is contained in Volume I has been added to the section.

Comment 20: **Figure 3-1, footnote 3:** ***"Although theoretically complete, large dilution of ambient air is assumed to render exposure point concentrations toxicologically insignificant."***

See comment #4. Remove this footnote and assess this pathway, unless documentation for excluding it can be provided and justified.

Response: The footnote in question pertains to VOC emissions from surface water and sediment (all receptors), and VOC emissions from groundwater used by the groundskeeper and construction worker as a source of potable water. Please see response to Comment 4 regarding airborne VOCs from surface water and sediment. Please see response to Comment 9 regarding construction worker exposure to shallow groundwater. The issue of groundskeeper and construction worker exposure to VOCs from potable water was discussed at length with OEPA during development of the approved RAWP. The justification for choosing to not quantify this inhalation pathway is intuitive, because validated models for airborne concentrations of VOCs from groundwater used as potable water are not available. The intuitive justification mentioned in the document includes dilution in the large volume of ambient air. Further intuitive justification that could be cited includes a short exposure time, natural air currents, which hasten dispersion in ambient air, and the assumption that inhalation exposure is expected to be far less

significant than ingestion of 1 L/day, which is quantified. The footnote for inhalation of VOCs from groundwater will be separated from the similar footnote for the other media and revised to incorporate the further justification described above.

Comment 21: **Figure 3-1, footnote 4:** ***"Contact with this medium, although plausible, is not part of this receptors normal or expected activities; therefore contact would be sporadic and is not quantified."***

Exposure to both surface water and sediment could, at times, be significant to construction worker and/or groundskeeper, if the receptors activities involve the installation or repair of utility liens that cross Ransom Brook or any bank stabilization/erosion control projects.

Response: The area around the origin of Ransom Brook at the northwest corner of TNT Area B and north of the site is low and wet (Fig. 1-6 and 2-2 of Volume 1 - Report of Findings) and is not suitable for building, landscaping, bank stabilization/erosion control measures, or maintenance. Exposure to surface water and sediment in this area would not arise from the normal or expected activities of a groundskeeper. Therefore, groundskeeper exposure to surface water and sediment will not be quantified. It is plausible, however, that construction workers could be exposed to these media during short-term projects such as installation of underground utilities. Dermal exposure to surface water and sediment and incidental ingestion of sediment will be included as exposure pathways during the a 1-month construction project. It is assumed that hands and forearms, approximately 2000 cm^2 (EPA, 1992), are exposed to surface water and sediment. Dermal exposure to surface water and sediment is assumed to occur on 4 hours/day, or one-half of the normal work day. A fraction term of 0.5 is assumed for both the soil and sediment pathways to apportion the construction worker's time equally between the two media. The incidental ingestion rate of sediment is assumed to be 480 mg/day. An AF for sediment of 0.24 mg/cm^2 is estimated for hands and forearms using the same method as described for the groundskeeper exposure to soil, using data for construction workers, utility workers and equipment operators. Figure 3-1, Table 3-1 and the description of the construction scenario (Section 3.1.3.2) will be revised accordingly.

Comment 22: **Figure 3-1, Receptor Exposure Scenarios, footnote d:** ***"Although theoretically complete this pathway was not quantified because the large volume of ambient air would effectively dilute concentrations to toxicologically insignificant levels."***

See comment #4 and #20.

Response: Please see response to Comments 4 and 20.

Comment 23: **Table 3-1: Receptor Exposure Scenarios, footnote b:** ***"Although contact with this medium is possible, exposure would be sporadic, rather than continuous...."***

See comment #21.

Response: Please see response to Comment 21.

Comment 24: **Section 3.1.3.1 Groundskeeper, page 3-3:** ***"The groundskeeper scenario was designed to evaluate the upper bound for site worker exposure to surface soil in the current and future (industrial) land use scenario."***

See comment #2.

Response: Please see response to Comment 2.

Comment 25: **Section 3.1.3.1 Groundskeeper, page 3-3:** ***"It was assumed that relatively high dust concentrations would be produced within the groundskeeper's breathing zone, with little opportunity for dilution by the large volume of ambient air."***

Remove "with little opportunity for dilution by the large volume of ambient air."

Response: It is unclear why the phrase in question should be removed. The reviewer offered no reason, and dilution by ambient air is an actual phenomenon included in many models used to estimate airborne concentrations of contaminants. Deleting the phrase will not change the risk estimates or their interpretation. The statement will remain as written.

Comment 26: **Section 3.1.3.1 Groundskeeper, page 3-3:** ***"Generally, surface soil that has been in place for extended periods is not a significant source of airborne VOCs because dissipation over time would have reduced the residues at the surface to toxicologically insignificant levels. VOCs were detected in surface soils....probably because surface soil samples may have included soil from a depth as great as 1 ft bgs."***

See comment #4.

Remove "Generally, surface soil that has been in place for extended periods is not a significant source of airborne VOCs because dissipation over time would have reduced the residues at the surface to toxicologically insignificant levels."

Revise the statement "....probably because surface soil samples may have included soil from a depth as great as 1 ft bgs." This statement gives the reader the impression that you are not sure what depth defines surface

soil. As stated in the work plan, surface soil is defined by the 0-1 ft bgs interval. Therefore, surface soil did include soil from the 0-1 foot bgs depth. Revise text without using "probably" or "may have included" since surface soil is clearly defined as the interval 0-1 ft bgs.

Response: It is unclear why the phrase "Generally, surface soil that has been in place..." should be removed. The reviewer offered no reason, and the observation stated is generally true, particularly when much time has elapsed since contamination may have occurred. Deleting the phrase will not change the risk estimates or their interpretation. The statement will be revised as follows: "Generally, surface soil that has been in place for extended periods and has not been recently contaminated is not a significant source of airborne VOCs because infiltration and dissipation over time would have reduced residues at the surface to toxicologically insignificant levels."

The reference to Comment 4, and its relevance to this comment, are unclear.

Agreed, that the statement "...probably because surface soil samples..." is confusing. The second sentence of this paragraph will be revised as follows: "VOCs, however, were detected in surface soil, albeit at concentrations below RBSCs, probably from soil at the bottom of the 0 to 1 ft bgs depth range from which surface soil samples were taken."

Comment 27: **Section 3.1.3.2 Construction Worker, page 3-4:** ***"Exposures to surface water and sediment are not plausible for the construction worker at TNT Area B, because Ransom Brook, ..., is located off the site and is not expected to be the site of future development."***

See comment #21.

Response: Please see response to Comment 21.

Comment 28: **Section 3.1.3.2 Construction Worker, page 3-4:** ***"Inhalation of airborne VOC emissions from surface water and sediment is possible, but the large volume of outdoor air is expected to dilute concentrations to toxicologically insignificant levels, and this pathway was not evaluated."***

See comment #4 and #20.

Response: Please see response to Comments 4 and 20.

Comment 29: **Section 3.1.3.2 Construction Worker, page 3-4:** ***"Excavation and soil grading activities resulting in intensive soil contact were assumed to last for 3 months; for the remaining 3 months, construction activities were assumed to result in less intensive soil contact."***

Define "intensive soil contact."

Many construction activities involve contact with soil for extended time periods, such as the installation or repair of utility lines, cable lines, sewer lines, water lines or if the construction worker is involved with the excavation and removal of contaminated soil, then the exposure would be "intense" for the duration of the removal activity.

Response: Agreed that many construction activities, such as the examples mentioned by the reviewer, result in intensive contact with soil throughout their duration. The assumption accepted in the approved RAWP is that these activities would not last for more than 3 months. Construction activities such as building would result in less intensive exposure to soil because they do not require constant contact with the soil or earth-moving or grading equipment. The assumption accepted in the approved RAWP is that these activities would not last for more than 3 months. The statement in question will be revised to clarify the distinction between intensive and less intensive exposure to soil as follows: "Excavation, grading, installation or repair of underground utilities and similar activities requiring constant contact with the soil or earth-moving or grading equipment result in intensive exposure to soil and were assumed to last for 3 months. Construction activities such as building erection result in less intensive exposure to soil and were also assumed to last for 3 months."

Comment 30: **Section 3.1.3.3 On-Site Resident, page 3-5:** ***"The resident could have access to Ransom Brook and could be exposed t surface water and sediment....it is assumed that the resident would visit the brook for 8 hours/day, 2 days/week during the warmer half of the year (i.e., 52 days/year)....However, because of the intermittent nature of the brook, it was assumed that surface water would be available for wading only 26 days/year....assumed to wade for 3 hours/day on 26 days/year....incidental of surface water in a wading scenario is assumed to be negligible."***

What are these assumptions based on? Does this stream go completely dry for a continuous period of time? If there is a trickle of water, then there will be surface water exposure.

Response: The assumptions are conjectures compiled, in collaboration with OEPA, to create a plausible scenario to evaluate residential exposure to surface water and sediment. Conjecture is necessary because there are no residents on site from which site-specific data can be obtained, and there is no known OEPA, EPA or other regulatory guidance for development of this exposure scenario. The scenario in the risk assessment is taken verbatim from the approved RAWP. Subsequent to the risk assessment, it was learned that pools of surface water are present, possibly as a result of groundwater discharge. Therefore, the exposure frequency for residential exposure to surface water will be increased from 26 to 52 days/year.

Comment 31: **Section 3.1.3.3 On-Site Resident, page 3-5:** ***"Inhalation of airborne VOCs emitted from surface water or sediment....It is assumed, however, that the large volume of outdoor air would effectively dilute airborne concentrations to toxicologically insignificant levels...."***

See comment #4.

Response: Please see response to Comment 4.

Comment 32: **Section 4.3 Target Organ Toxicity, page 4-5:** ***"When total HI for all media for a receptor exceeds 1 due to the contributions of several chemicals, it is appropriate to segregate the chemicals by route of exposure and mechanism of toxicity (i.e., target organ) and estimate separate HI values for each."***

Segregation of hazard indices by effect and mechanism of action can be complex and time-consuming because it is necessary to identify all of the major effects and target organs for each chemical and then to classify the chemicals according to target organ or mechanism of action. This analysis is not simple and should be performed by a toxicologist. If segregation is not carefully done, an underestimate of the true hazard could result. A strong case is required to indicate that two compounds which produce adverse effects on the same organ system, although by different mechanisms, should not be treated as dose additive (RAGS Volume 1, USEPA, 1989).

Response: USACE agrees that segregation of HI values by mechanism of toxicity must be done carefully. Insufficient care can result in either over or underestimating hazard. This is a moot point in this risk assessment because HI values greater than 1 are estimated for single chemicals (TNT, and in some cases other nitroaromatics as well), and there is no reason to segregate chemicals by mechanism of toxicity.

Comment 33: **Section 5.3.1. Groundskeeper, Page 5-4; Section 5.3.2 Construction Worker, page 5-5; Section 5.3.3 On-Site Resident, page 5-5:** ***"The total ILCR from all exposure pathways falls within the 1E-6 to 1E-4 range considered acceptable by EPA (1990)."***

Ohio EPA currently operates within the risk range of 10^{-5} to 10^{-4}, with the point of departure at 10^{-5}. Risks in the range of 10^{-5} to 10^{-4} must be acknowledged and discussed in the report. Risk less than 10^{-5} is considered to be protective and risk greater that 10^{-4} are considered not protective; however, risk falling within the range will need to be evaluated. The point at which to take remedial action and the final clean-up level will be a risk management decision. The use of the 10^{-5} point of departure does not reflect a presumption that the final remedial action should attain such goals.

Response:

Comment 34: **Section 5.3.4, Alternate On-Site Residential and Construction Site Locations, page 5-6:**

With respect to future land use, deed restrictions or other restrictions are not in place to designate which areas a resident could or could not develop. Therefore, the assumption that a future resident would randomly select a building site within the TNT Area B boundary is appropriate and the "alternate on-site residential and construction site locations" sections and associated risk assessment on the modified data sets is not necessary and should be removed. However, if the contractor feels that the concentrations in the northeast quadrant are indicative of a hotspot, then a separate quantitative hotspot analysis should be performed on this portion of the site.

Response: The first paragraph in Section 5.3.4 shows that the source-term and exposure-point concentrations developed in the risk assessment reflect the most highly contaminated parts of the site. No further hot-spot analysis is necessary unless questionable data excluded because of unusually high detection limits are reinstated, or unless additional data analysis or sampling reveals higher levels of nitroaromatics other than TNT in the northeast quadrant.

Comment 35: **Please provide the contents of Appendix A: Analytical Results for review.**

Response: Agreed; a complete data dump, including detections, nondetections and detection limits will be provided.

Comment 36: **Include the contents of Appendix C in the draft final.**

Response: Agreed!

Comment 37: **Include a Summary/Conclusions section at the end of Volume II Human Health Risk Assessment.**

Response: A Summary and Conclusions will section will be added following the Uncertainty Analysis section. It will consist of the human health risk assessment information summarized in the Executive Summary.

Comment 38: **Table 2-1 through Table 2-5, Table 5-10.**

Remove footnote b – background screening criteria for soil (Table 2-6) and references to background soil values. It is not appropriate to compare sediment concentrations to soil background concentrations as a "background screen." Sediment and soil are separate media. For a background comparison, sediment samples should be collected from a

background sediment location. Also remove PAH background values shown in Table 2-7.

Response: Agreed; it is inappropriate to compare site sediment concentrations with soil background concentrations for the purpose of selecting sediment COPC. Tables 2-5, 5-7 and 5-8 will be revised as requested. There is, however, some similarity between sediment and soil, and comparison of site sediment concentrations with soil background may be discussed in the Uncertainty Analysis or Summary and Conclusions Sections. Please see response to Comments 10 and 11 regarding PAH background.

Comment 39: **Tables 5-5 and 5-6 and 5-9:**

Include a footnote defining NA.

Response: Several tables were found in which "NA" was not defined. The definition of NA as "not applicable" will be added to Tables 5-1, 5-2, 5-3, 5-6, 5-9, 5-13 and 5-14.

Comment 40: **Table 5-8:**

Include a footnote defining ND.

Response: Several tables were found in which "ND" was not defined. The definition of ND as "no data" will be added to Table 4-1. ND in Tables 5-3, 5-4, 5-5, 5-7, 5-8, 5-11 and 5-12 will be changed to "NA" (please see response to Comment 39).

Comments for Volume III – Ecological Risk Assessment:

Comment 1: **Section 2.1.1 General Site Background, page 2-1: "PBS, approximately 6,453 acres in size....."**

To avoid confusion for the reader, use consistency when referring to the site name. Previously in the report, the site has been referred to as Plum Brook Ordnance Works (PBOW) and in the section is called the Plum Brook Station (PBS). Revise text for consistency.

Response: Text will be revised to refer to the Site as PBOW.

Comment 2: **Section 2.2.2 Descriptive Statistical Calculations, page 2-11: "Nondetects are assumed to be present at one-half the SQL, although judgement may be used in those cases where matrix interference or other phenomena drive the SQL unusually high."**

Define the judgement criteria that is used when evaluating data with unusually high SQL and how the data is handled in the risk assessment. Provide a list of the samples where judgement criteria was applied.

Response: The most common cause of elevated SQL is sample dilution, usually necessitated because one or more chemicals are present at concentrations exceeding the range of the method calibration curve. SQLs are typically designated as unusually high when they are considerably above the highest positive detection. Their use in the data set may result in the 95% UCL exceeding the maximum detected concentration (MDC), which would impart a bias to the RA. Unusually high SQL results such as these are typically deleted from the data set. A list of samples where judgement criteria were applied are provided in the report (footnotes to Tables 2-9 and 2-10).

Comment 3: **Section 2.2.4 Natural Site Constituents (Background and essential Nutrients), page 2-12: "This comparison is generally valid for inorganic chemicals, but not for organic chemicals, because inorganic chemicals are naturally occurring and most organic chemicals, besides PAHs, are not."**

This statement gives the impression that PAHs are only from natural sources. As defined in RAGS, part a (EPA, 1989), <u>naturally occurring levels</u> are ambient concentrations of chemicals present in the environment that have not been influenced by humans, and <u>anthropogenic levels</u> are concentrations of chemicals that are present in the environment due to human-made, non-site sources. PAHs are anthropogenic and ubiquitous, although these chemicals may be present in the environment from natural sources (e.g., forest fires).

In general, comparison with naturally occurring levels is applicable only to inorganic chemicals because the majority of organic chemicals are not naturally occurring, even though they may be ubiquitous. Do not eliminate anthropogenic chemicals because it is extremely difficult to conclusively show that such chemicals are present at a site due to operations not related to the site or surrounding area. The presence of anthropogenic background chemicals can be discussed in the uncertainties section, however, these constituents should be retained and evaluated in the site-related risk.

Response: The USACE respectfully disagrees with the statement that it is necessary to "...conclusively show that...chemicals are present at a site due to operations not related to the site..." in order to designate them as anthropogenic background. It is only necessary to show that their concentrations do not exceed anthropogenic background levels. Granted, the ATSDR Toxicity Profile on the PAHs is not the most relevant data set for background for PBOW. Furthermore, site-specific background data are not available and there are no plans to generate such data for the future. Therefore, the document will be revised so that PAHs are not screened against background.

PAHs selected as COPECs will be carried through the ecological risk assessment. Should PAHs be identified as risk drivers, arguments will be developed in the uncertainty section for their presence, including vehicular traffic, annual burning of grasslands, etc. associated with post-DOD activities.

Comment 4: **Section 2.2.4 Natural Site Constituents (Background and Essential Nutrients), page 2-13: "Essential nutrients such as calcium, chloride, iodine, magnesium, phosphorus, potassium and sodium may be eliminated as COPEC...."**

It is not appropriate to apply the essential nutrient methodology, which is used in the human health risk assessment, to ecological risk assessments considering that recommended daily allowances have not been established for ecological organisms. Without consideration of the levels that may be associated with toxicity for these inorganics to the receptor, it is not appropriate to screen them out.

Response: Essential nutrients were not eliminated from the ERA, unless they were below background. As shown in summary tables 5-4 and 5-5, some essential nutrients were found to be hazard drivers for ecological receptors (e.g., iron). The sentence in question will be revised to avoid the impression that nutritional essentiality for humans is somehow involved in COPEC selection for ecological receptors.

Comment 5: **Section 5.1 Terrestrial Plant Impact Assessment, page 5-1: "Although one bare soil area was noted during the site reconnaissance....."**

Were discrete samples taken from the bare spot and analyzed?

Response: A discrete soil sample was not collected from the bare spot itself. The chemical analytical results from the surface soil sample collected closest to the "one bare soil area" are discussed in the text in Section 5.1. In addition, the text discusses why the presence of the bare soil area is not believed to be related to site-related chemicals. As shown in Photo No. 8, the substrate appears to be gravel, and this may be the reason vegetation is not growing at the "one bare soil area."

Comment 6: **Section 5.3 Predictive Risk Estimation for Terrestrial and Aquatic Wildlife, page 5-3: "It should be noted that the maximum 2,4,6-TNT concentration in surface so (6,900 mg/kg) was used as the source-term concentration (due to the unmodified data distribution), while the arithmetic mean concentration was 261 mg/kg. This estimate of central tendency is 26 times lower than the maximum concentration and the suggests that using the maximum concentration is overly conservative. It should also be noted that the maximum aluminum and iron concentrations measured in surface water were used as the source-term concentrations due to the limited number of samples and additional**

sampling effort could potentially reduce the hazard estimate." Page 5-4: It should be noted that the maximum concentration of many of the COPECs measured in surface water and sediment were used as the source-term concentrations due to limited number of samples, and additional sampling effort could potentially reduce the hazard estimate. It should also be noted that there are significant uncertainties...."

Statements regarding the uncertainties associated with calculating hazard indices and HQs should be removed from this section of the text and discussed in the "Uncertainties" section of the report.

Response: The cited discussion of uncertainties will be moved to the "Uncertainties Section" of the report.

Comment 7: **Section 5.5 Risk Description, page 5-6: "Based on uncertainties of toxicity, and on the fact that no RTE species have been confirmed at the site, remedial actions may not be warranted at this time for soil"....."Based on uncertainties of toxicity, estimating concentrations in aquatic insects, and limited sample size, no remedial actions are warranted at this time for surface water or sediment."**

This is a risk management decision. CERCLA and the NCP state "protection of human health and the environment" this is not limited only to the protection of threatened and endangered species.

Statements should be limited to recommendations for more investigations or justification supporting that a thorough ecological risk assessment has been completed. Considering that there are HI>1 at this site for several or the ecological receptors, recommending that no remedial actions are warranted is inappropriate.

Response: The report states "[Based on this information].... no remedial actions are warranted at this time." The report does not recommend that no remedial actions are warranted at any future date. This information was presented in the report to add risk management decisions, and to discuss the point that even though hazards were estimated to be above 1.0 for some ecological receptors, the weight-of-evidence, including consideration of the significant uncertainties, did not support remediation at the present time. Further sampling for additional background data is recommended.

Comment 8: **Table 5-1 Terrestrial Plant Impact Assessment:**

It is not appropriate to assume that the benchmark was not exceeded, when a benchmark concentration is not available. In this situation (I.e., when a benchmark concentration is not available for a specific constituent", the constituent should be retained and carried through the ecological risk assessment. In this table, please remove the "No" from the

last column titles "Benchmark Exceeded" when a benchmark concentration for a constituent is not applicable. A footnote could be added in place of the "No" which states something to the effect "Constituent Retained Due to Lack of Benchmark Information."

Response: Table 5-1 will be revised. Where no benchmark is available, the "Benchmark Exceeded?" column will present "NBA" and will be defined in a new footnote as "NBA = no benchmark available." It should be noted that Table 5-1 is not a screening table for selection of constituents to retain and carry through the ERA (this screening was done in Table 2-9 for surface soil).

Response to USACE Technical Review Comments on the Draft TNT Area B Remedial Investigation Report, Plum Brook Ordnance Works, Sandusky, Ohio; June 1999

1. Volume I: Please include a brief Executive Summary.

   Response: Agreed. A brief Executive Summary has been included to be consistent with other USACE reports.

2. Volume I, page 1-4, section 1.3.1.2, 2nd Paragraph, 3rd Sentence. Delete natural from this sentence.

   Response: The sentence has been changed from "Hydrogen sulfide, natural benzene, toluene, ethylbenzene, and xylene (BTEX) compounds..." to "Hydrogen sulfide and benzene, toluene, ethylbenzene, and xylene (BTEX) compounds...".

3. Volume I, Page 1-4, Section 1.3.1.3, 1st Paragraph, 3rd Sentence. Please cite the source of the well yield information.

   Response: The information was obtained from Dames and Moore (1997) TNT Areas Investigation. This reference will be added to section as requested.

4. Volume I, Page 4-1, Section 4.1.1 and throughout the document. Please insert a statement to indicate that the field screening surface soil samples were composited and the method that was used.

   Response: The method of compositing soil samples was previously discussed in Section 2.2.4. Reiterating this information for each building investigated would be repetitious. No change to text.

5. Volume I, Page 4-21, last three lines: Discussion of SO01 and SO05 seems out of place.

   Response: Agreed. The samples SO01 and SO05 were collected adjacent to Building 456 (Wash House). This paragraph will be deleted from Section 4.5.4.2.

6. Volume I, Page 5-1, Section 5.1.2 heading: Shouldn't the heading be Wastewater <u>Disposal</u> Settling Tanks <u>(Building 417)</u> and Associated Pipelines?

   Response: Agreed. The text will be modified as requested.

7. Volume I, Page 5-2, two sentences just prior to Section 5.1.3: Edit for clarity.

   Response: Agreed. The paragraph will be revised as follows: "Surface and subsurface soil samples collected from along the underground wastewater pipelines indicate nitroaromatics

are limited in extent. Only one boring (Boring SS370 at a depth of 4.0 to 4.5 ft bgs) drilled along the wastewater pipeline showed elevated concentrations of nitroaromatics. This boring was completed along the wastewater pipeline within 20 feet of the Wash House Catch Basin (Building 466). Because of the close proximity to the Wash House and evidence from other borings adjacent to the Wash Houses, this contamination cannot definitively be attributed to the pipeline.

8. Volume I, Page 5-2, Section 5.1.3, 2nd Paragraph. Provide the field screening value that confirms the historical data at TNTB-S18.

   Response: Agreed. Sections 4.3.2.1 and 5.1.3 will be revised to more clearly state evidence that only one area of subsurface soil contamination is present.

9. Volume I, Page 5-5, 1st Complete Paragraph, 2nd Sentence. Figure 4.15 states that 2A4,6-DNT was detected at 1.6 ppm while the text in this section states that the compound was detected at 1.7 ppm. Please correct.

   Response: Agreed. The text has been revised to the correct value of 1.6 ppm.

10. Volume I, General Comment. In many instances, we conclude that nitroaromatic contamination, other than 2,4,6-TNT, is not present based solely on the results from IMS screening. Is this appropriate considering the difficulties associated with the calibration curves and extraction during IMS analysis?

    Response: Agreed. The text will be reviewed and text modified to discuss only those compounds detected.

11. Volume I, General Comment. It might be helpful to identify those samples that were analyzed by both field screening using IMS and field screening using immunoassay techniques.

    Response: Disagree. The immunoassay data has been presented to the USACE under a separate cover and presenting it in this report would not provide any additional meaningful data.

12. Volume I, Page 5-5, Building 472 Bi-Tri House. I recommend that this section be revised to indicate more then one subsurface sample had nitroaromatic contamination. As it is currently written, this section infers that only one subsurface sample had nitroaromatic contamination.

    Response: Agreed. The third sentence in this paragraph will be revised as follows: "TNT and 2A4,6-DNT were detected in three of five borings completed, with maximum concentrations detected of 27 ppm and 3.07 ppm, respectively."

13. Volume I, General Comment. In many sections PAH contamination is believed to be the result of atmospheric deposition, I suggest that PAH contamination could also be the result of demolition of the buildings, since the buildings were burned.

    Response: Agreed. Discussions of potential sources of PAH contamination throughout the text have been revised to include the burning of TNT B buildings as potential sources for PAHs.

14. Volume 1, Appendix B: Were SO borings logged? If they were the logs are missing. If not, then add SO# (and actual land survey data if available) to the appropriate SS log.

Response: The "SO" designation applies to confirmation samples whereas the "SS" designation applies to screening samples. Therefore, either designation can apply to a surface or subsurface sample. As agreed during negotiations and work plan development, only subsurface direct push locations were logged; sample information for surface soil locations were recorded on a sample collection log. Because subsurface confirmation samples were collected from the same locations as subsurface screening locations, the boring was not logged a second time.

15. Volume I, Typing Errors-

    Pg 1-2, paragraph just prior to Section 1.2, third line after bullets: Change "using a Ion" to "using an Ion" .

    Response: Agreed.

    Pg 2-3, first line: Spelling of photo documentation.

    Response: Agreed. The spelling of "photo documentation" has been corrected.

    Pg 4-17, Section 4.4.6.1, first line: Change "Building 459" to "Building 469".

    Response: Agreed.

    Pg 5-3, Building 459 discussion, second line: Change "180 ft south-southeast" to "180 ft south-southwest".

    Response: Agreed.

    Figure 1-3: Bring the label for the Nitrogen Dewars equivalent to that for the Hypersonic Testing Facility.

    Response: Agreed.

    Figure 2-1: Label both nail houses. Some buildings are mistakenly crosshatched as tanks while the wastewater disposal tanks are not crosshatched.

Response: Agreed.

The photo sheet with photos A-1 and A-2 on it was missing.

Response: Agreed. The photo sheet will be included in the final report.

Photo A-8: Shouldn't the "Building 473" label on the photo read "Building 472" or is the photo caption incorrect?

Response: Agreed. The caption will be revised as follows: BUILDING 472 BI-TRI HOUSE (FOREGROUND) AND BUILDING 473 FORTIFIER HOUSE (BACKGROUND). BORING SS390, DRILLED AT BUILDING 472, SHOWN AT THE STAKED LOCATION IN THE FOREGROUND. LOCATION OF BUILDING 473 SEEN IN THE BACKGROUND AT HIGH BRUSHY AREA. PHOTOGRAPH TAKEN BY IT CORPORATION, NOVEMBER 13, 1998.

16. Volume II, Page ES-1 and 1-1, first paragraph, last sentence: Provide clarification concerning the hunter access to the site (or PBS in general). Although hunters are allowed on PBS during hunting seasons(s) it is not an open gate situation. There are still restrictions placed on the hunters (and the fences and security patrols continue to be present).

    Response: Agreed. The statement will be revised to clarify that it is a "controlled" hunt at a closed NASA reservation.

17. Volume II, Page 1-2, second paragraph from end of page: Shouldn't the nitrogen dewars area be included as NASA active?

    Response: Agreed. The paragraph will be revised as follows: "TNT Area B is largely overgrown with grass, brush, and small trees. Two NASA facilities, the Hypersonic Testing Facility and Nitrogen Dewars, are located in the northwest and central portions of TNT Area B, respectively. Except for these two facilities, TNT Area B is unused (USACE, 1998b). Current site use is considered industrial."

18. Volume II, Typing Errors-

    Pg ES-1, seventh line: "portions of the site are [?] by other agencies"

    Response: The text will be revised to "portions of the site are used by other agencies"

    Pg ES-2, first large paragraph, second line: Change "in accordance approved" to in accordance with approved".

    Response: Agreed. The text will be modified as requested.

Pg ES-3, third paragraph, first line: Here and elsewhere in Volume II, change "both an adults and children" to "both an adult and children".

Response: Agreed. The text will be changed as requested.

Pg 2-1, Section 2.1.2, first sentence: Edit.

Response: Agreed. The text will be changed to read "The data validation process incorporated qualifiers to the analytical results that reflect the level of confidence in the reported measurements."

Pg 2-3, Frequency of Detection, second paragraph, second to last line: Change "analyzed for medium" to "analyzed for a medium".

Response: Agreed.

Pg 2-6, Section 2.1.5, first line: Insert a comma between iodine and magnesium.

Response: Agreed.

19. Volume III, Page 2-2, second complete paragraph, first and last sentence: Shouldn't the mention of "the red water ponds" be "TNT Area B"? (Watch tense in last sentence "are" to "is".)

    Response: Yes. The text has been revised.

20. Volume III, Typing Errors-

    Pg 1-1 and through out volume: Is "BEA" throughout volume suppose to be "BERA" as defined in first line on page 1-1?

    Response. "BEA" is incorrectly shown and will be changed to "BERA" throughout the document.

    Pg 7-1, first paragraph: Change "march wren" to "marsh wren".

    Response: Agreed.

21. Page 1-9. Second Paragraph. Number 3. Provide a brief discussion of the procedures involved in a three (3) X and a five (5) X decontamination process.

    Response: IT has been unable to locate a reference for the procedures involved in a three (3) X and a five (5) X decontamination process. Therefore, the text has not been changed.

22. Page 5-3. First Paragraph. Last Sentence. Borings could not be completed in areas where the presence of underground utilities associated with the nitrogen pipeline interfered. Correct text accordingly.

    Response: It is unclear what statement on Page 5-3 of Volume III that the reviewer is requesting be changed.

23. TABLES. Shade areas in which the result from this investigation exceeds regulatory criteria.

    Response: Agreed. Shading is currently used to highlight detections above the reporting limits. Data will be shown in bold for concentrations exceeding risk based remediation concentrations as presented in Volume II of this report.

24. According to Section 3.0, field screened results that were non-detect were changed to "U" to be consistent with the more widely used qualifiers used in the independent third party validation. Tables do not reflect this change.

    Response: Agreed. Data tables will be modified as requested.

RESPONSE TO COMMENTS
FROM U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE ON THE DRAFT
REPORT FOR THE REMEDIAL INVESTIGATION AND THE FEASIBILITY STUDY, TNT AREA B
FORMER PLUM BROOK ORDNANCE WORKS, SANDUSKY, OHIO

Volume II – Baseline Human Health Risk Assessment.

Comment 1: **Page 1-2, Section 1.0, M. Hawkins, L. Tannenbaum**
Introduction
Comment: "No explosive residues were identified by the analysis of one surface water and one sediment sample from this area." Also, the text notes that additional surface water and sediment samples were taken, although it appears that only one additional sample of each medium is what is being referenced (see detection frequency column in Table 2-4). One of two samples from each media are not enough to analyze statistically and seem inadequate for the characterization of the media in question.
Recommendation: Please provide justification for the minimal sampling of environmental media (i.e., one or two samples) being technically defensible in characterizing the presence or absence of chemicals onsite. If a sufficient justification cannot be obtained, consider increasing the sample size so that the site media can be characterized appropriately.

Response 1: As stated in the text, one surface water and sediment sample was collected during the previous investigation (Dames and Moore, 1997). To supplement this data, five collocated surface water and sediment samples were planned for Ransom Brook in the TNT B area. During the field work conducted in October and November, 1998, the occurrence of surface water was limited to two small stagnant pools in the upper reaches of Ransom Brook. Because of this, only two surface water samples could be collected.

Comment 2: **Page 2-1, Section 2.0, M. Hawkins**
Data Evaluation
Comment: Data Collection is located in Volume I of the risk assessment and Data Evaluation is located in Volume II. It would be easier to follow if Data Collection and Data Evaluation were located in the same volume and were in the same section.
Recommendation: Consider changing the heading for Section 2.0 to Data Collection and Data Evaluation, and include collection and evaluation methodologies in this section.

Response 2: As the reviewer noted, data collection is described in Volume I of the

Remedial Investigation, which is more descriptively called a Report of Findings. The Report of Findings does present an evaluation of the data; i.e., Section 4.0, Investigation Results, evaluates the data in terms of the nature and extent of contamination. Volume II provides a baseline human health risk assessment, in which the risk to human health of exposure to potentially contaminated media is investigated. Data evaluation, in the context of human health risk assessment, refers to identifying chemicals of potential concern for human health, and estimating a source-term concentration for each of these chemicals using assumptions and procedures that are peculiar to risk assessment (as explained in Chapter 1 of the baseline human health risk assessment). It would be confusing to place the Data Evaluation step of the risk assessment in volume I, but the exposure assessment, toxicity assessment and risk characterization steps of the risk assessment in Volume II. Additional clarification will be provided by revising the second sentence in the last paragraph that starts on the bottom of p. 1-3 as follows: "Chapter 2.0 describes data evaluation for the risk assessment, which includes selection of chemicals of potential concern..."

Comment 3: **Page 2-1, Section 2.1.2, R. Kramp**
Evaluating Data Quality
<u>Comment</u>: Includes the phrase "that indicate that reflect".
<u>Recommendation</u>: Please delete "that reflect."

Response 3: Agreed.

Comment 4: **Page 2-2, Section 2.1.3, M. Hawkins**
Identifying Site-Related Chemicals
<u>Comment</u>: "Chemicals that were detected at the site, but also were detected at locations not affected by site operations are termed background chemicals." A site that hasn't been affected by past or present chemical contamination is called a background site. Make sure that no past or present chemical contamination exists so that the site can be considered a background or reference site.
<u>Recommendation</u>: Please change accordingly.

Response 3: We do not agree entirely with the reviewer's definition of background site. A background site with regard to PBOW is a site that was not contaminated by activities related to army use of the facility. Potential contamination from activities of site users before or after army use of the facility may be termed anthropogenic background and could be included in the "background" risk assessment. For example, agricultural areas (part of PBOW was used for agriculture before army use) may exhibit detectable levels of pesticides and herbicides, and industrial areas or areas near highways may exhibit detectable levels of PAHs. However, neither

pesticides/herbicides nor PAHs were used or were expected to have been released by the army during the production of ordnance or during the cleanup activities that followed. The sentence in question will be revised as follows: "Chemicals present at naturally occurring concentrations or those present because of human activity entirely unrelated to army activity are termed background chemicals."

Comment 5: **Pages 2-2 to 2-11, Section 2.1.3 to 2.1.6.5, L. Tannenbaum Identifying Site-Related Chemicals/Risk-Based Screening, etc.**
<u>Comment</u>: The approach adopted in the risk assessment of partitioning risk into background, site-related, and total components is atypical and in some respects unnecessary.
<u>Recommendation</u>: In the modified report, acknowledge that calculating risk for the site background is an atypical approach in risk assessments, not being described for example, in Risk Assessment Guidance for Superfund (RAGS). Also, acknowledge that for inorganics in soil and other media, the list of contaminants to retain for quantitative assessment could have been established through one of several established statistical comparisons of onsite and background concentrations (e.g., EPA Region IV supplementary guidance to RAGS).

Response 5: We agree that presenting separate risk estimates for total, site-related and background COPC is not described in RAGS Part A, but it is far from atypical. We have successfully used this approach with many projects whose regulatory bodies do not permit excluding background chemicals from the quantitative risk assessment. (OEPA does not permit eliminating chemicals from the COPC list if their concentrations are comparable to background. EPA Region IV, mentioned by the reviewer, does.) Segregating risk in this manner provides additional information and perspective that is useful for site management. The third paragraph on p. 5-1 will be revised as follows: "Risk characterization is limited to those chemicals selected as COPC; i.e., present at concentrations that exceed RBSCs (Section 2.1.4). OEPA requires characterizing risk for all chemicals whose concentrations exceed their RBSCs, regardless of whether their concentrations are comparable to background. This approach, although consistent with EPA (1989a), obscures the risk associated with background chemicals, and may leave the impression that the entire risk estimate is due to site-related activity. This potential impression is avoided by providing three separate risk estimates: total site risk, which includes all COPC identified; background risk, which includes the inorganic and organic COPC identified as natural or anthropogenic background; and site-related risk, which is limited to COPC not identified as background and presumed to be present as a result of former PBOW activity. Segregating risk estimates in this manner provides maximum

useful information for site management."

Comment 6: **Page 2-3, Section 2.1.3, M. Hawkins**
Background Occurrence, Table 2-6
<u>Comment</u>: "The primary approach involves comparing the maximum detected concentration (MDC) from site data with a background screening criterion (BSC). The BSC represents a theoretical upper limit on background; i.e., if the MDC of site data does not exceed the BSC it is likely that site concentrations reflect background conditions rather than a site-related release, and the chemical is considered a "background chemical." Why not collect samples off-site or in areas not influenced by contamination for each media of concern? It seems like there is a lot of uncertainty involved with the above approach. Also, Table 2-6 has a column titled "Percent Non-Detects." The column heading should be titled "Percent Detects."
<u>Recommendation</u>: Consider selecting background or reference sites and collecting samples from those particular sites to represent background information. Change the column heading in Table 2-6 to "Percent Detects."

Response 6: The BSCs used in the risk assessment are calculated from a data set consisting of the results of samples taken from areas believed to be free of contamination. Six soil borings were installed in preselected locations to establish sitewide background concentrations for metals. As noted in the comment, these sites were selected because they are believed to represent areas not influenced by site-related contamination. Further information on site background data may be found in the Site Investigation of Acid Areas (IT, 1998). Table 2-6 will be revised as requested.

Comment 7: **Page 2-3, Section 2.1.3, M. Hawkins**
Chemicals Used During Area B Operations
<u>Comment</u>: "The exception was analyzed for explosives only." Explain why one soil sample was analyzed for explosives and not for nitroaromatic compounds, metals, PCBs, and VOCs.
<u>Recommendation</u>: Please explain in detail why one soil sample was analyzed for explosives only.

Response 7: The sample referred to is SO13 collected near Building 452 (Bi-Tri House). This sample had an excessively high concentration of explosives (2,4,6-Trinitroluene at 6,900 mg/kg). Because of potential dangers in the analysis of this sample, VOCs, SVOCs, PCBs and metals analysis were not completed.

Comment 8: **Page 2-4, Section 2.1.2.1, Tannenbaum**
Statistical Summary and COPC Selection of Surface Water Samples
Comment: There is no need for the table's second column ("Percent hits"), as the first column ("Detection Frequency") provides necessary information.
Recommendation: Delete the table's second column. Note that in other tables of human health risk assessment, the more appropriate term "detections" is used rather than the term "hits."

Response 8: Table 2-4 will be re-formatted to correspond to the other Statistical Summary and COPC Selection tables.

Comment 9: **Page 2-6, Section 2.1.5, M. Hawkins**
Evaluating Essential Nutrients
Comment: "Essential nutrients such as calcium, chloride, iodine, magnesium, phosphorus, potassium, and sodium were eliminated as COPC, because it was judged that they are unlikely to cause adverse effects on human health at the concentrations measured." Was a literature search conducted to determine acceptable levels? Also, RAGS lists only iron, magnesium, calcium, potassium, and sodium as essential nutrients to be evaluated in risk assessments. In this risk assessment, however, three additional nutrients (chlorine, iodine, and phosphorus) were evaluated. Why were these additional nutrients included in this evaluation?
Recommendation: Provide the reader with references (facts) that justify your judgement. Also, explain why chloride, iodine, and phosphorus were included in the evaluation.

Response 9: Chloride, iodine and phosphorus were not analyzed in the media evaluated in this risk assessment. The paragraph in question will be revised as follows: "Essential nutrients such as calcium, iron, magnesium, potassium, and sodium are usually eliminated as COPC because they are generally considered innocuous in environmental media. Other essential nutrients including chloride, iodine and phosphorus may be eliminated as COPC, provided that their presence in a particular medium is judged to be unlikely to cause adverse effects on human health."

Comment 10: **Page 3-2, Section 3.1.1, M. Hawkins**
Physical Setting
Comment: "Greater detail is provided in USACE (1998a) and D&M (1997)." Is climate and vegetation described in these other documents? Anything describing the physical setting of the site should be provided in this risk assessment.
Recommendation: Please include climate and vegetation in the description of the physical setting.

Response 10: Agreed, the site description provided in Chapter 1 requires expansion. The first sentence of the penultimate paragraph on p. 1-2 will be revised as follows: "TNT Area B consists largely of old meadows overgrown by Allegheny blackberry, dewberry and Queen Anne's lace. Further details are provided in Section 1.3.1 of Volume I and Section 2.1 of Volume III."

Comment 11: **Page 3-3, Section 3.1.3.1, M. Hawkins**
Groundskeeper
<u>Comment</u>: "Generally, surface soil that has been in place for extended periods is not a significant source of airborne VOCs because dissipation over time would have reduced residue at the surface to toxicologically insignificant levels." How long does it take for VOCs to dissipate from the soil surface? Can you provide a reference for this?
<u>Recommendation</u>: Please provide information on the duration it takes for VOCs to dissipate from the soil surface and a reference to support this statement.

Response 11: The statement in question is a generalization based on our experience with soil contamination and risk assessment; it is not based on published data. The statement will be revised as follows: "Generally, in IT Corporation (IT) experience, surface soil that has been in place for extended periods and has not been recently contaminated is not a significant source of airborne VOCs because infiltration and dissipation over time would have reduced residues at the surface to toxicologically insignificant levels."

Comment 12: **Page 3-4, Section 3.1.3.1, R. Kramp**
Groundskeeper
<u>Comment</u>: The document assumes that the groundskeeper will be exposed to dust 250 days per year. In the Sandusky area the ground is usually wet or frozen from November to March.
<u>Recombination</u>: Consider using 200 days per year for exposure to the groundskeeper.

Response 12: We agree that the exposure frequency (EF) of 250 days/year may overestimate exposure to dust because the ground is wet or frozen for a substantial part of that time. Nonetheless, the EF of 250 days/year is a standard EPA assumption for workers, and includes indoor as well as outdoor exposure. Also, the groundskeeper is selected as the upper bound for site worker exposure to soil, and greenhouse activities could result in exposure to airborne dust from site soil throughout the year. Incidentally, reducing the EF from 250 to 200 days would reduce the estimate for inhalation exposure only by 20 percent.

Comment 13: **Page 3-5, Section 3.1.3.3, M. Hawkins**
On-Site Resident
<u>Comment</u>: "The body regions evaluated for construction workers include approximately 11,300 cm^2." What body regions were selected for the construction workers?
<u>Recommendation</u>: Provide the reader with the body regions that were selected for the construction worker so that it is easy to figure out how to calculate the numbers to equal 11,300 cm^2.

Response 13: Agreed, the sentence in question requires additional information, and will be revised as follows: "The body regions evaluated for construction workers include the hands, arms, legs, feet and face, which total approximately 11,300 cm^2.

Comment 14: **Page 3-7, Section 3.1.3.4, M. Hawkins**
Other Receptors Not Considered
<u>Comment</u>: "Furthermore, experience has shown that the game ingestion pathway generally is insignificant for contaminates other than the (PCDD/PCDF), and the previously described receptors would represent the upper bound for exposure to soil, surface water, and sediment." Is there a reference to support this?
<u>Recommendation</u>: Please provide a reference to support this statement.

Response 14: The statement in question is a generalization based on our experience with soil contamination and risk assessment; it is not based on published data. The statement will be revised as follows: "Furthermore, IT's experience has been that the game ingestion pathway..."

Comment 15: **Page 4-5, Section 4.3, L. Tannenbaum**
Target Organ Toxicity
<u>Comment</u>: The text recognizes that true noncancer hazard (the hazard index, HI) can only be expressed as the sum of the individual hazard quotients of those chemicals that have a common toxic mode of action (e.g., produce a common systemic effect). It does not appear that where initial HIs *were* above 1.0, that recalculations of final HIs were performed.
<u>Recommendation</u>: Where initial HIs exceeded 1.0, ensure that the risk assessment presents HI information for chemicals that produce a common systemic endpoint.

Response 15: It may be an overstatement to say that HI can "only" be expressed as the sum of the individual hazard quotients of those chemicals that have a common toxic mode of action. EPA (1989a) as a matter of policy defines the HI as the sum of the HQs across chemicals, pathways and media for a

given receptor. EPA (1989a) then adds the qualifier that HI calculated as described above is probably overly conservative unless all the chemicals summed have a common mechanism of toxicity (which is almost never the case). Section 4.3 of the risk assessment document states that it is appropriate to segregate the chemicals by route of exposure and mechanism of toxicity and estimate separate HIs for each, but it does state that it is necessary or always helpful to do so. In fact, given that EPA's definition of HI is based on policy at least as much as science, in a CERCLA baseline risk assessment it is probably appropriate to segregate HI only if the total HI exceeds 1 and only if there is an "advantage" from doing so. The advantage would be to demonstrate that no mechanism of toxicity has an HI exceeding 1. In the case of TNT Area B, several individual chemical/pathway HQ values exceeded 1; therefore, there would be no advantage from segregating HI values by mechanism of toxicity.

Comment 16: **Pages 5-1 to 5-9, and 5-11 to 5-14, L. Tannenbaum**
Cancer Risk and Noncancer Hazard Index
<u>Comment</u>: The tables in this section lack page numbers. Also, the column titled "Source-Term Concentration" should be changed to "Exposure Point Concentration." Most of the tables are difficult to interpret because of the manner in which they are formatted. Specifically, the inability to show all the pathways of a given receptor on one page impedes the extracting of information. Similarly, the interruption of chemical lists (i.e., their carry-overs from a previous page) hampers the reader's ability to summarize the risk information. Also, the use of the word "dose" (as in "cancer dose") in many of the column headings is confusing. The standard terminology is "intake." Last, Table 5-9 doesn't provide a breakout of the risks and hazards by the various operative contaminant uptake pathways (e.g., dermal uptake, incidental ingestion). It also does not indicate if noncancer hazard is unacceptable, when hazard quotients for just those chemicals with a common systemic endpoint are summed.
<u>Recommendation</u>: Please provide page numbers for the tables and consider changing "Source-Term Concentration" to "Exposure Point Concentration." Consider reformatting the tables to allow the reader to either view at one time, all pathways considered for a given receptor, or only one pathway at a time. Also, don't allow chemical lists evaluated to be truncated (especially within a list of chemicals for one of the three groupings, i.e., total-, background-, or site-related risk), and carried over to the next page. Change "dose" to "intake" as instructed by the comment. In risk summary tables (such as Table 5-9), indicate the risks and hazards associated with each exposure <u>pathway</u>. Ensure that final HIs are provided in a summary table.

Response 16: Agreed; the risk/hazard tables leave a few things to be desired and will be revised. Source-term concentration will be changed to exposure-point concentration; dose will be changed to intake. The format will be changed, including reduction in font size, to include all pathways for a given chemical on one row. If necessary, certain non-essential columns (e.g., DA, concentration in air) will be hidden to make room. No risk evaluation (total, background or site-related) will be separated by intervening pages. A summary table, providing only ILCR and HI sums for each pathway, medium and receptor, will be added.

Comment 17: **Page 5-8, Section 5.4, L. Tannenbaum**
Risk-Based Remediation Criteria Development
Comment: The text here appears contradictory. In the process of RBRC development, the first bullet point speaks to a comparison of COPC and medium-specific ARARs. However, the page's next-to-last paragraph say that there are no ARARs for soil, surface water, or sediment.
Recommendation: Please address the inconsistency.

Response 17: Agreed; the first bullet will be revised as follows: "The concentration of the COPC exceeds its medium-specific ARAR, provided one is available."

Comment 1: **Page 1-1, Section 1.0, M. Hawkins, L. Tannenbaum**
Introduction
Comment: BERA and BEA are not located in the acronym list. The term "BEA" should be changed to "BERA" as this is the convention adopted within the ecological risk assessment community. Note also that in the first sentence of Volume III (page 1-1), the acronym "BERA" is used.
Recommendation: Please make the global change of "BEA" to "BERA," and place BERA in the acronym list.

Response 1: Agreed. The text, tables, and figures will be edited globally as recommended, as appropriate.

Comment 2: **Page 2-5, Section 2.1.5, L. Tannenbaum**
Species Inventory
Comment: Is there an implication in the text when it notes that only one mammalian species (deer) of some 43 expected for the region were actually observed onsite?
Recommendation: Enhance the text so as to clarify whether or not the field observation had any particular relevance.

Response 2: The text on Page 2-5, Section 2.1.5 will be edited to indicate that other species were most likely not observed at the site due to the short duration of the ecological field survey.

Comment 3: **Page 2-6, Section 2.1.5, L. Hawkins**
Species Inventory
Comment: Were sections of the stream electroshocked or seined to determine the number of different species that were inhabiting the site?
Recommendation: Describe how observations were made with regard to fishes in the stream.

Response 3: The text on Page 2-6, Section 2.1.5 will be edited to add a discussion of how observations were made with regard to fish species.

Comment 4: **Page 2-12, Section 2.2.3, L. Tannenbaum**
Frequency of Detection
Comment: The phase "chemicals detected infrequently at high concentrations" is vague.
Recommendation: Please qualify to the extent possible, what is meant by "high" in the indicated usage.

Response 4: The text on Page 2-12, Section 2.2.3 will be edited as requested.

Comment 5: **Page 2-21, Section 2.4.2, L. Tannenbaum**
Measurement Endpoints
<u>Comment</u>: The text should indicate a preferred hierarchy of the measured responses to the stressors. Note that on page 4-1, a preference of sorts *is* mentioned.
<u>Recommendation</u>: Provide the preferential order of use for the measured responses. Consider moving the text at the bottom of the page forward to page 2-21.

Response 5: The text on Page 4-1, Section 4.2 will be revised to add a discussion of the preferred hierarchy used in selection of measurement endpoints for this BERA. Additionally, the text on Page 2-21, Section 2.4.2 will be revised to refer the reader to Section 4.2 for a discussion of the measurement endpoint hierarchy.

Comment 6: **Page 2-13, Section 2.2.4, L. Tannenbaum**
Evaluating Essential Nutrients
<u>Comment</u>: A reference is not provided for the list of essential nutrients for wildlife.
<u>Recommendation</u>: Rather than document author(s) judging the list of chemicals to be unlikely to cause adverse effects to wildlife, provide the necessary citations to support this statement.

Response 6: The text on Page 2-13, Section 2.2.4 will be edited as requested.

Comment 7: **Page 2-14, Section 2.2.5, M. Hawkins**
Comparison to Risk-Based Screening Ecotoxicity Values/Soil
<u>Comment</u>: A list of sources used to find soil screening values were provided. Are the sources listed as a hierarchy for locating soil screening values?
<u>Recommendation</u>: Please describe how you used the available sources to locate soil screening values.

Response 7: Appendix Tables C-1 through C-3 present the compilation of risk-based screening ecotoxicity values utilized in the BERA for soil, surface water and sediment, respectively. As described by these tables, the screening values utilized in the BERA were the lowest toxicity concentration from the available sources, which are documented in the tables and in the BERA text on Page 2-14, Section 2.2.5. No change has been made to the text regarding this comment.

Comment 8: **Page 2-14, Section 2.2.5, M. Hawkins**
Comparison to Risk-Based Screening Ecotoxicity Values/Sediment

<u>Comment</u>: Ontario Ministry of the Environment and Energy (OME, 1993) should be changed to OMEE.
<u>Recommendation</u>: Please change the acronym OME to OMEE.

Response 8: Agreed. The recommended change will be made globally to the text, tables, and figures, as appropriate.

Comment 9: **Page 2-17, Section 2.3.1, M. Hawkins**
Terrestrial Receptors
<u>Comment</u>: "Foraging factors were conservatively set at 100 percent for mouse, shrew, rabbit, wren, and raccoon, due to their relatively small home ranges." The most commonly used term in Ecological Risk Assessment Guidance for Superfund (ERAGS) is "Area-use factors."
<u>Recommendation</u>: Consider changing "Foraging factors" to "Area-use factors."

Response 9: Agreed. The recommended change will be made to Page 2-17, Section 2.3.1, as requested.

Comment 10: **Page 3-1, Section 3.1, M. Hawkins, L. Tannenbaum**
Exposure Analysis
<u>Comment</u>: "Ecological routes of exposure for biota may be direct (bioconcentration) or through the food web via the consumption of contaminated organisms (biomagnification)." To describe the terms bioconcentration and biomagnification appropriately, it would be beneficial to define the terms initially. The use of the terms is misleading.
<u>Recommendation</u>: Consider defining the terms so that they make more sense to the reader in this sentence.

Response 10: The terms have been defined in the Glossary of Terms, Appendix F. The text on Page 3-1, Section 3.1 will be rearranged to clarify the text in this section.

Comment 11: **Page 3-1, Section 3.1, M. Hawkins**
Exposure Analysis
<u>Comment</u>: The glossary of terms (Appendix F) was not referenced.
<u>Recommendation</u>: Please provide a reference for these terms if they were obtained from an outside source.

Response 11: References have been added to the Glossary of Terms provided in Appendix F, as requested.

Comment 12: **Page 3-2, Section 3.1, M. Hawkins**
Exposure Analysis
<u>Comment</u>: "The first step in estimating exposure rates for terrestrial wildlife involves the calculation of feeding and watering rates for site receptors. More appropriate terms for "feeding" and "watering rates" are "food ingestion" and "drinking water intake".
<u>Recommendation</u>: Consider changing the terms.

Response 12: Agreed. The text on page 3-2, Section 3.1 will be revised as recommended.

Comment 13: **Page 3-9, Section 3.1, L. Tannenbaum**
Groundwater Exposure Pathway
<u>Comment</u>: The text of the second paragraph requires explanation to include two critical points.
<u>Recommendation</u>: Have the text note that the subject document may not be reporting total site risks because the potential for contaminated groundwater influences is not addressed. If it is established that there is groundwater discharge to surface water occurring, ensure that waterbody sediment and surface water are collected and evaluated and <u>not</u> groundwater itself.

Response 13: Based on existing data for the TNT B Area, groundwater is not discharging to surface water at the site. Since groundwater is not discharging to surface water and sediment and surface water data were utilized in the BERA, the risk evaluation conducted does, in fact, represent a total evaluation of risk for the TNT B Area receptors. No change has been made to the text regarding this comment.

Comment 14: **Page 5-1, Section 5.0, L. Tannenbaum**
Risk Characterization
<u>Comment</u>: The text of the page's second paragraph is misleading. HQs, as stated clearly in RAGS, are not measures of risk, but rather measures of levels of concern. As such, by themselves, HQs do not automatically confer (unacceptable) risk on receptors when values exceed unit (1.0). HQ values of three-digits, four digit, and higher can occur with no apparent signs of stress or impact noted in the field.
<u>Recommendation</u>: Modify the text here and in the wrap-around paragraph at the top of page 5-3 to acknowledge the points expressed in the comment.

Response 14: Agreed. The text on Page 5-1, Section 5.0 will be edited as recommended.

Comment 15: **Page 5-3, Table 5-4, L. Tannenbaum**

Comment: The HI values produced with the exception of those for the deer and the hawk are unthinkable and unrealistic, reflecting the inadequacy of the hazard quotient method to express risk. If true field exposures followed the HIs, there could not possibly be any surviving receptors. Note that adjusting the HIs by being less conservative (an approach discussed later in the document), would still produce HI values that are meaningless.
Recommendation: Ensure that adequate text accompanies the reporting of HIs that tells the reader that the values are not reflective of risk, and that the conservatism incorporated in the assessment is not the factor that explains the difficulty now encountered. Have the text note that the hazard quotient method is flawed in essence.

Response 15: An additional uncertainty will be added to Table 5-6 to demonstrate the uncertainty of the HI methodology and its relative magnitude in this BERA. IT has not revised the text to state that the HI methodology is flawed, as doing so would fundamentally conflict with the HQ/HI approach presented and approved in the work plan, and utilized in this BERA.

Comment 16: **Table 2-8, L. Tannenbaum**
Background Concentrations of Metals in Soils
Comment: The heading of the second column in unusual. Conventionally, the "percent detected" is what is reported.
Recommendation: Check to see that what was intended to be reported was in fact the percent detected. In either case, change the column heading to "percent detected."

Response 16: Agreed. Table 2-8 will be revised as recommended.

Comment 17: **Table 2-9, L. Tannenbaum**
Statistical Summary and COPEC Selection of Surface Soil Sample Analyses
Comment: The last five chemicals in the table should have been determined to not be COPECs based on the frequency of detection. For a number of tables, the column titled "Source Term Concentration: should read "Exposure Point Concentration."
Recommendation: Explain why the compounds in question were not eliminated from the COPEC list on the basis of frequency of detection. Change the column heading in all of the tables where applicable.

Response 17: The last five chemicals in Table 2-9 were excluded based on frequency, as well as the fact that their maximum detected concentrations were less than

the screening criteria. Both exclusion criteria were sited in the table. No change has been made to Table 2-9 regarding this comment.

Additionally, IT feels that the use of the term "source-term concentration" is most appropriate for the BERA, because the BERA models plant and animal COPEC concentrations for site-related food chain interactions that ultimately result from direct COPEC exposure. Modeled concentrations in prey would be more appropriately termed "exposure point concentrations," however, use of both terms would be confusing. The concentrations presented in Table 2-9 and succeeding tables are site-representative source term concentrations utilized for the ecological model. No change has been made to Table 2-9 or subsequent tables regarding this comment.

Comment 18: **Table 4-2, L. Tannenbaum**
Uncertainty Factors for Ecological RTV Extrapolations
Comment: Wentsel et al. (1996) is not an accurate citation for the uncertainty factors shown here and mentioned in other places in the document.
Recommendation: Please replace Wentsel et al (1996) with the Ford et al. citation.

Response 18: The Ford reference is unknown. Uncertainty factors reported in Table 4-2 and shown on Figure 4-1 were taken directly from Figure 12 in the Tri-Service Procedural Guidelines for Ecological Risk Assessments. No change has been made to the text or tables regarding this comment.

Volume I - Report of Findings

TNT Area B Remedial Investigation
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List of Acronyms

ASTM	American Society for Testing and Materials
bgs	below ground surface
BTEX	benzene, toluene, ethyl benzene, and xylene
CRQL	contract-required quantitation limit
D&M	Dames and Moore, Inc.
DERP	Defense Environmental Restoration Program
DNT	dinitrotoluene
DOD	U.S. Department of Defense
EPA	U.S. Environmental Protection Agency
ft/day	feet per day
ft/ft	foot per foot
FUDS	Formerly Used Defense Site
FS	feasibility study
gpm	gallons per minute
GRC	John Glenn Research Center
GSA	General Services Administration
GWI	groundwater investigation
HTF	Hypersonic Testing Facility
HTRW	hazardous toxic and radiologic waste
ICI	International Consultants Incorporated
IDL	Instrument Detection Limit
IDW	investigation-derived waste
IMS	Ion Mobility Spectrometer
IT	IT Corporation
µg/L	micrograms per liter
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
MK	Morrison-Knudsen Ferguson Corporation
NASA	National Aeronautics and Space Administration
OD	outside diameter
ODNR	Ohio Department of Natural Resources
PAH	polynuclear aromatic hydrocarbons

List of Acronyms *(Continued)*

PBOW	Plum Brook Ordnance Works
PID	photoionization detector
PBS	Plum Brook Station
PCB	polychlorinated biphenyl
PRG	Preliminary Remediation Goals
Quanterra	Quanterra Environmental Services, Inc.
RBC	risk-based concentrations
RI	remedial investigation
SAP	sampling and analysis plan
SCS	Soil Conservation Service
SMCL	secondary maximum contaminant level
SOW	statement of work
SVOC	semivolatile organic compounds
TAL	target analyte list
TNB	trinitrobenzene
TNTA	TNT Area A
TNTB	TNT Area B
TNTC	TNT Area C
TOC	total organic carbon
TSS	total suspended solids
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compound

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Executive Summary

Site Description. The Former Plum Brook Ordnance Works (PBOW) was built in the early 1941 as a manufacturing plant for 2,4,6-trinitrotoluene (TNT), dinitrotoluene (DNT), and pentolite. Production of explosives at PBOW began on December 16, 1941 and continued until 1945. It is estimated that more than 1 billion pounds of nitroaromatic explosives were manufactured during the 4-year operating period. The three explosive manufacturing areas were designated TNT Area A (TNTA), TNT Area B (TNTB), and TNT Area C (TNTC). Twelve process lines were used in the manufacture of TNT: four lines at TNTA, three lines at TNTB, and five lines at TNTC.

The TNTB manufacturing site consisted of widely scattered buildings of wood frame construction with asbestos and sheet metal coverings. It also included a series of buried and/or overhead flumes and pipes used to transport the substances.

Historical Activities. After plant operations ceased in 1945, decontamination of TNT, acid, pentolite, and DNT processing lines began. The lines were decontaminated during the last quarter of 1945. During decontamination, all structures, equipment, and manufacturing debris were removed and burned.

The property was initially transferred to the Ordnance Department, then to the War Assets Administration after it was certified by the U.S. Army to be decontaminated. In 1949, PBOW was transferred to the General Services Administration.

In the summer of 1955, a significant effort was made to decontaminate the surface and subsurface soil at the TNT Areas. Decontamination was performed first at TNTA. At TNTA the decontamination process included the removal of contaminated surface and subsurface soil around the wash houses, bi-tri houses, fortifier buildings, the DNT sweating and graining building, the DNT nitrating building, and nail houses. They also removed wooden and ceramic waste disposal sewers containing from 1.0 to 2.5 inches of TNT. In addition, in TNTA concrete catch basins, thousands of pounds of TNT were discovered overlain by wood and scrap lumber. This lumber and TNT were removed and transported to the Burning Grounds where they were burned. Decontamination of TNTB and TNTC was supposed to be modified to address only surface contamination detected by visual inspection, leaving underground flumes in place. It is unknown whether this

modification in the procedure took place as part of the 1955 decontamination of TNTB and TNTC.

The National Aeronautics and Space Administration acquired PBOW on March 15, 1963 and currently utilizes the site. The General Services Administration decontaminated the TNT Manufacturing Areas to facilitate transfer. The decontamination is believed to have occurred in 1963 and included removing contaminated surface soil above the drain tiles, flumes, etc., destruction of all buildings by fire, then removal of all soil, debris, sumps, and concrete foundations. All the materials, including the earth in those areas, was flashed; the area was then rough graded. The decontamination process also included the burning of nitroaromatic-filled flumes that were excavated. As shown in the 1997 Dames and Moore records review, this was performed on July 10, 1963 near the intersection of Fox Road and Snake Road.

Summary of Previous Soil Investigations. In 1993, Morrison-Knudsen Ferguson Corporation collected two surface soil samples in the vicinity of TNTB. Each sample was analyzed for volatile organic compounds (VOC), semivolatile organic compounds (SVOC), and nitroaromatics. The two surface soil samples locations were SB09 and SS13. SB09 was collected from the borehole for MK-MW17. Sample SS13 was collected in the vicinity of the railroad tracks southwest of the Fortifier House, Building 463. VOCs (toluene and xylene), SVOCs (bis[2-ethylhexyl]phthalate) and nitroaromatics (2,4,6-TNT and 2,6-DNT) were detected in the surface soil. Nitroaromatics were present at SB09 with 2,4,6-TNT detected at a concentration of 12 milligrams per kilogram (mg/kg).

In October 1994, as part of the TNT Areas site investigation, Dames and Moore sampled the soil at 26 locations at TNTB. Each sample was analyzed for nitroaromatics and metals. All the samples were collected between 0.5 and 3.5 feet below ground surface (bgs). Eighteen of the 26 locations were sampled at 1 depth and 8 locations were sampled at 2 depths. Nitroaromatics were detected in 18 of the 26 locations and most locations had at least 1 sample with concentrations greater than 1.0 mg/kg. Concentrations of nitroaromatics in excess of 10,000 mg/kg were present in soils at the Bi-Tri House for Line 5 (Building 452) and the DNT Sweating and Graining House (Building 412). Four compounds, 2,4,6-TNT, 1,3,5-trinitrobenzene, 2,4-DNT, and 2,6-DNT, were detected at concentrations exceeding the U.S. Environmental Protection Agency Region III residential and industrial scenario risk-based criteria.

Current Investigation. Nitroaromatic field screening analysis involved collection of 391 soil samples. Field screening samples were analyzed using ion mobility spectrometry (IMS) at an on-site mobile laboratory. On-site analytical data allowed for field screening, real-time interpretation, and the iterative selection of additional sampling locations necessary to delineate the extent of TNT contamination. The criteria for delineation was to establish the points and depths at which all constituents analyzed were detected at concentrations below risk-based concentrations.

To supplement the on-site screening analysis, 40 confirmation soil samples were collected for standard laboratory analysis. Locations for confirmation soil sample collection were based on IMS results. Confirmation samples were selected to support IMS results and risk assessments. To further investigate possible contaminant migration, 2 surface water and 5 sediment samples were collected near TNTB. Both surface water and sediment samples were analyzed for nitroaromatic compounds, VOCs, SVOCs, target analyte list metals, and polychlorinated biphenyls (PCB).

Findings from the current remedial investigation are summarized by TNT process line in the following sections.

DNT Process Buildings. Of the 22 surface and subsurface soil samples collected at Building 412 (DNT Sweating and Graining Building), only 4 had nitroaromatics exceeding 1 mg/kg. Based on these results, contamination exceeding risk-based concentrations is limited to the immediate areas surrounding historical borings (TNTB-S24, TNTB-S25, and TNTB-S26). Contamination is limited in depth to approximately 3 to 5 feet bgs based on historical data (TNTB-S24) and direct-push data from this investigation. These data show that, although high levels of nitroaromatics were observed in the surface soils (2,4-DNT), contamination decreases rapidly with depth. The detection of 2,4-DNT at this site is consistent with the historical use of this building, although 2,6-DNT would also be expected to be present. Field screening results for Building 415 (DNT Nitrating Building) and the associated loading dock and ditch indicate only very low levels of nitroaromatics in the surface soils.

Wastewater Settling Tanks and Associated Pipelines. Two limited areas of contamination exist to the north and south of the Wastewater Settling Tanks.

Nitroaromatics detected in this remedial investigation and historical samples indicate that concentrations are generally below 10 mg/kg. Numerous SVOCs (primarily polynuclear aromatic hydrocarbon [PAH]), PCBs, and lead were also detected in the samples collected. The PAHs and lead likely are the result of burning of the TNT process buildings and road runoff and/or atmospheric deposition. Lead only marginally exceeded the established background concentration for PBOW soils, and may not be related to anthropogenic sources. PCBs, because of their low mobility, may be site-related; however, it has not been established that PCBs were used at PBOW during TNT-production operations.

Surface and subsurface samples collected from along the underground wastewater pipelines indicate nitroaromatics are limited in extent. Only one boring (SS370) in close proximity to Building 466 (Wash House) showed elevated concentrations of nitroaromatics.

Process Line 5 Buildings. Six buildings (Buildings 451, 452, 453, 456, 459, and the Northeast Nail House) were investigated. Nitroaromatics were detected at low concentrations (less than 1 mg/kg) in a limited number of samples from Buildings 451 and the Northeast Nail House. Based on the field screening and fixed-base data, no discernable pattern of nitroaromatic contamination was evident at these buildings. Numerous VOCs, SVOCs, PCBs, and metals were detected in the confirmation sample from the Northeast Nail House. The VOCs (ethyl benzene, toluene, xylenes), SVOCs (primarily PAHs), and metals (primarily lead) detected indicate the source of these compounds is likely the result of burning of the TNT process buildings and road runoff and/or atmospheric deposition of contaminants from motor vehicles. PCBs, because of their low mobility, may be site related; however, it has not been established that PCBs were used at PBOW during TNT-production activities.

Field screening and fixed based results confirmed historical findings of nitroaromatic contamination at Building 452 (Bi-Tri House), Building 453 (Fortifier House), and Building 456 (Wash House). Confirmation sampling also indicates the presence of Aroclor-1260 (2.8 mg/kg) and lead (61.4 mg/kg) at Building 453. Lead may be site-related but more likely is the result of road runoff. PCBs, because of their low mobility, may be site-related; however, it has not been established that PCBs were used at PBOW during TNT-production activities.

Process Line 6 Buildings. Nitroaromatics were detected at low concentrations from Building 461 (Mono House), Building 462 (Bi-Tri House), and Building 469 (Acid and Fume Recovery Building). Based on field screening results, no discernable pattern of nitroaromatic contamination is evident at these buildings. Confirmation data also indicate impacts by SVOCs (all PAHs) in surface soils at Building 462. The detection of low levels of PAHs is consistent with atmospheric deposition, road runoff, and burning of TNT-process buildings.

Surface soil samples at Building 463 (Fortifier House) showed only low levels of nitroaromatics in field screening data. One direct-push boring showed TNT, 2,4-DNT, and 2,4,6-DNT at concentrations exceeding 40 mg/kg at 10 feet bgs. Two additional borings completed at the site indicate subsurface contamination is limited to less that 20 feet from the building; however, the contamination may not be adequately defined. Subsurface confirmation samples collected at SS389 indicate that elevated levels of nitroaromatics are present in the subsurface at much higher concentrations (708 mg/kg total nitroaromatics) than were in the field screening data (55 mg/kg total nitroaromatics).

Limited surface soil contamination was detected at Building 466 (Wash House). Field screening data indicates nitroaromatics are present at low (less than 1 mg/kg) concentrations. Fixed-base confirmation samples indicate higher levels of nitroaromatics present in the surface soils, with TNT detected at up to 7.6 mg/kg. Subsurface soil contamination was confirmed at historic boring TNTB-S6, with concentrations exceeding 100 mg/kg in both field screening and fixed-base analytical results. Additional subsurface contamination was detected at the subsurface waste line leading from the catch basin to the wastewater settling tanks. Limited SVOCs were detected in confirmation samples. As with other confirmation samples, these SVOCs are indicative of burning of TNT-process buildings, atmospheric deposition, or road runoff. The metals lead and beryllium are likely site related. PCBs, because of their low mobility, may be site related; however, it has not been established that PCBs were used at PBOW during TNT-production operations.

Only one area along the former conveyor belt between the Northwest Nail House and Building 466 (Wash House) had elevated concentrations of nitroaromatics. Based on subsurface soil sampling, this contamination is limited to the upper 3 feet of soil. SVOCs

(PAHs) and PCBs were detected in surface soil confirmation samples at low (less than 0.1 mg/kg) concentrations. As with other sampling results, the PAHs likely are the result of burning of TNT-process buildings or atmospheric deposition. PCBs, because of their low mobility, may be site related; however, it has not been established that PCBs were used at PBOW during TNT-production operations.

Process Line 7 Buildings. Nitroaromatics were detected at low concentrations from Building 471 (Mono House) and Building 479 (Acid and Fume Recovery Building). Based on field screening results, no discernable pattern of nitroaromatic contamination is evident at these buildings.

Nitroaromatic compounds (TNT and 2,4,6-DNT) were detected at concentrations below 1 mg/kg in four surface samples collected at Building 472 (Bi-Tri House). Based on this data, no discernable pattern of surface soil contamination is evident. TNT was detected at concentrations up to 27.0 mg/kg in one subsurface boring. Data from subsurface soil samples indicate the soil contamination is limited to a depth of between 5 and 8 feet bgs.

Surface soil samples at Building 473 (Fortifier House) showed only low levels of nitroaromatics in field screening data. Subsurface sampling indcate nitroaramatic contamination is present but limited to less than 20 feet from the building. Fixed-base analyses indicate limited surface soil contamination by SVOCs, PCBs, and metals. SVOCs detected were primarily PAH and are indicative of burning of TNT process buildings or atmospheric deposition. In addition, lead only slightly exceeded established background concentration. PCBs were also detected at up to 4.6 mg/kg at this building. Given the low mobility of PCBs, these detections may be site related; however, it has not been established that PCBs were used at PBOW during TNT-production operations.

Surface soil contamination was detected at Building 476 (Wash House). Field screening data indicates nitroaromatics are present at elevated (up to 720 mg/kg) concentrations. Depth of contamination could not be delineated due to undergound utilities; however, overburden thickness in this area is interpreted to be less than 3 feet based on geologic cross sections. As with other sites, fixed-base analytical data indicate that numerous PAHs are present. Again, these compounds are likely the result of burning of TNT-process buildings and road runoff and/or atmospheric deposition. PCBs were detected at low (less than 0.3 mg/kg) concentrations. These PCB detections may be site related;

however, as previously stated, it has not been determined if PCBs were used during TNT-production operations.

Ransom Brook Surface Water and Sediment

Surface Water. Analytical results indicate only VOCs and metals are present in surface water. Only three VOCs were detected, all at concentrations below 1.2 µg/L. Two of these compounds, 2-butanone and carbon disulfide, were also detected in TNTB soils. The detection of 2-butanone could be laboratory contamination introduced during extraction and sample analysis. However, based on the low concentrations in the soils and surface water, and the fact that these compounds are not attributable to former site activities, it is unlikely that TNTB is a major source of these constituents. In addition, the lack of nitroaromatics in surface water and sediment also suggest that TNTB is not a current source of contamination to Ransom Brook.

Sediment. Analytical results for sediment indicate that VOCs, SVOCs, and metals are present in sediment. As with surface water, VOCs were detected at low concentrations. In addition, the detection of acetone and 2-butanone could be laboratory contaminants introduced during analysis. Six SVOCs were detected in sediment. As with TNTB soils, most of these are PAHs which result from incomplete combustion. It is most likely that the source of PAHs in both TNTB soils and Ransom Brook sediments is burning of the TNT-process buildings and atmospheric deposition and/or road runoff. However, if TNT B were the source of the SVOCs, nitroaromatic compounds detected at much higher concentrations in TNT B soils would also be expected to be present in the sediment.

Recommendations

- Based on the analytical results from this investigation, no additional soil sampling is required to delineate surface soil contamination.
- Additional subsurface sampling may be required to delineate contamination detected in this investigation.
- Future application of IMS for the analysis of nitroaromatics should continue to be assessed pending further development of the technology. In its present form, IMS does not offer improvements over existing screening technologies (i.e., colorimetric).

1.0 Introduction

The U.S. Army is conducting studies of the environmental impact of suspected hazardous waste sites at properties previously owned by the U.S. Department of Defense (DOD). The U.S. Army Corps of Engineers (USACE) is pursuing this work under the Defense Environmental Restoration Program (DERP) for Formerly Used Defense Site (FUDS). The former Plum Brook Ordnance Works (PBOW) located in Sandusky, Erie County, Ohio is a DERP FUDS project and is being managed and technically overseen by the Nashville District USACE. Figure 1-1 shows the geographic location of the former PBOW site.

IT Corporation (IT) performed a remedial investigation (RI) of surface and subsurface soil of TNT Area B (TNTB) at PBOW in October and November 1998. This work was part of a larger RI/feasibility study (FS) contract to be completed under Delivery Order Number 0034 of Contract Number DACA62-94-D-0030. This report of findings is the first volume of a four volume RI/FS report. The other three volumes to follow will be completed under separate covers. Volumes II through IV will include the following:

- ***Volume II, Human Health Risk Assessment.*** IT will prepare a document describing all points and findings of the human health risk assessment of TNTB.
- ***Volume III, Ecological Risk Assessment.*** IT will prepare a document that describes all points and findings of the ecological risk assessment of TNTB.
- ***Volume IV, Feasibility Study.*** This document volume will describe all points and findings of the focused FS for TNTB.

1.1 Scope of Work and Project Objectives for the Remedial Investigation

As specified in the statement of work (SOW) (USACE, 1997), the RI included preparation of site-specific work plans, completion of field investigation activities, evaluation of analytical results from samples collected during the field investigation, preparation and submittal of reports characterizing activities, conclusions, and recommendations for further actions. Based on the findings of previous investigations, this RI acquired supplemental data on the vertical and lateral extent of soil contamination at TNTB.

Specifically, the objectives of the RI were to:

- Define site physical features and characteristics
- Determine the nature and extent of source areas
- Determine whether contaminant distribution is consistent with DOD activities.

Activities completed during the field investigation included surface and subsurface soil sampling, sediment sampling, surface water sampling, a land survey, and handling of investigation-derived waste (IDW). Surface and subsurface soils were analyzed for selected nitroaromatics using an Ion Mobility Spectrometer (IMS). To confirm the IMS results and support risk assessment requirements, approximately 10 percent of the soil samples were sent to a fixed-base laboratory for analysis. Sediment and surface water samples were only analyzed at the fixed-base laboratory.

1.2 Summary of Site Conditions

The 9,009-acre PBOW site was built in early 1941 as a manufacturing plant for 2,4,6-trinitrotoluene (TNT), dinitrotoluene (DNT), and pentolite (International Consultants Incorporated [ICI], 1995). The site of the former PBOW is located approximately 4 miles south of Sandusky, Ohio and 59 miles west of Cleveland (Figure 1-1). Although primarily in Perkins and Oxford Townships, the eastern edge of the site extends into Huron and Milan Townships. PBOW is bounded on the north by Bogart Road, on the south by Mason Road, on the west by County Road 43, and on the east by U.S. Highway 250. The area surrounding PBOW is mostly agricultural and residential (IT, 1999 - Summary Report).

The former PBOW site is currently owned by the National Aeronautics and Space Administration (NASA) and is operated as the Plum Brook Station (PBS) of the John Glenn Research Center at Lewis Field. Most of the aerospace testing facilities built in the 1960s at the site are in standby or inactive status. On April 18, 1978, NASA declared approximately 2,152 acres of PBOW as excess. The Perkins Township Board of Education acquired 46 acres of the excess acreage and uses this area as a bus transportation center. General Services Administration (GSA) retains the remaining acreage and currently has a use agreement with the Ohio National Guard for 604 acres of the land. NASA presently controls approximately 6,400 acres and is using the site to conduct space research as a satellite operation of the John Glenn Research Center at Lewis Field in Cleveland, Ohio. The details of these land transactions are listed in the site management plan (ICI, 1995) and can be found at the NASA PBS.

TNTB comprises an area of approximately 55 acres at the south-central portion of PBOW immediately north of West Sheid Road as shown on Figure 1-2. All the buildings that were present during the TNT manufacturing were demolished and the site regraded. However, significant aboveground evidence of former PBOW facilities exist at TNTB in the form of roads, hydrants, and ditches. In addition, aboveground water valves indicate the presence of underground utilities. Two NASA facilities are present at the site and are currently active, the Hypersonic Tunnel Facility (HTF) and Nitrogen Dewar Tanks (Figure 1-3). The HTF is located in the northwest portion of TNTB and consists of a single building, above and below-ground piping and utilities, and paved parking areas. The Nitrogen Dewar Tanks are located in the center of TNTB with aboveground piping and underground utilities leading to the northwest (HTF) and to the northeast offsite (Dames and Moore, Inc. [D&M], 1997a).

1.3 Physical Setting

1.3.1 PBOW Physical Setting

1.3.1.1 Physiography, Topography, and Drainage

PBOW is located within the Eastern Lake Region of the Central Lowland Province (Soil Conservation Service [SCS], 1971). Erie County is overlain by lake, glacial outwash, and glacial till sediment. The surface is a plain with a slight slope to the north-northeast toward Lake Erie at approximately 25 feet per mile. Surface features were formed primarily by glacial scouring and deposition.

The elevation of PBOW ranges from approximately 680 feet above mean sea level at the south-central portion of the installation to 625 feet at the northern side of the site. In general, the topography of PBOW is characterized by a flat ground surface with occasional low hummocks. PBOW lies in the eastern region of the Pickeral Creek-Pipe Creek Basin, which is part of the St. Lawrence River drainage basin. Eleven streams exist within the site and flow north-northeast toward Lake Erie located 3.5 miles north of the site. The 11 streams are part of 4 drainage areas: (1) Sawmill Creek (southern PBOW); (2) Plum Brook (central PBOW); (3) Pipe Creek (western PBOW); and (4) Storrs-Hemminger Ditch, all of which flow into Sandusky Bay. The drainage pattern is dendritic where streams are incised into bedrock and poorly developed where they have not yet downcut to the bedrock (D&M, 1997a).

1.3.1.2 Geology and Soils

Bedrock in northern Ohio consists of Devonian and Silurian carbonates (limestone and dolomite) and clastics (shale, siltstone, and sandstone). These units unconformably overlie older sedimentary sequences of Ordovician and Cambrian Age rocks that unconformably overlie Pre-Cambrian basement rocks. The local bedrock is situated on the eastern flanks of the Findlay Arch. Beds in the vicinity of PBOW dip to the southeast at an angle of approximately 10 to 30 feet per mile (D&M, 1997a).

At PBOW, the lowermost bedrock unit is the Delaware Limestone, which is a hard, dense, finely crystalline, limestone and dolomite. It is often described as buff-colored and fossiliferous. Hydrogen sulfide and benzene, toluene, ethylbenzene, and xylene (BTEX) compounds may naturally occur in the Delaware. The Olentangy Shale overlies the Delaware Limestone. The Olentangy Shale consists of two members: a lower unit called the Plum Brook Shale and an upper unit called the Prout Limestone. The Plum Brook Shale is a 35-foot-thick unit of bluish gray, soft, fossiliferous shale containing thin layers of dark, hard, fossiliferous limestone. The Prout Limestone is a 15-foot-thick unit with dark gray to blue, very hard, siliceous, fossiliferous limestone or dolomitic mudstone. Overlying the Olentangy Shale is the Ohio Shale which is made up of one member in the vicinity of PBOW, the Huron Shale. The Huron Shale has been described as a black and thinly bedded shale. Occasional large pyrite/carbonate concretions are also present in the Huron Shale with some as large as 6 feet in diameter (IT, 1999).

Overburden at PBOW is interpreted to be derived predominantly from Pleistocene glacial lacustrine deposits. The overburden ranges from 1 foot at the south-central portion of the site to greater than 25 feet at the northern side of the site. Four soil associations are present across PBOW. These four associations are Kibbie-Elnor-Tuscola-Colwood, Castalia-Millsdale-Milton-Ritchey, Hornell-Fries-Colwood, and Pewamo-Bennington (IT, 1999).

1.3.1.3 Hydrogeology

Regional groundwater flow is to the north-northeast towards Lake Erie, although flow may vary locally with topography. The largest producing wells are in the limestone with water coming from joints and bedding planes or from solutionally enlarged openings (Dames and Moore, 1997). Limestones in the central portion of Erie County provide well yields of up to 500 gallons per minute (gpm). Wells installed in the shales or glacial overburden yield substantially less groundwater with production often less than 10 gpm.

1.3.2 TNTB Physical Setting

1.3.2.1 TNTB Topography and Drainage

TNTB is relatively flat with a few low hummocks. Elevation at the site ranges from approximately 659 feet along the northern boundary of the site to 682 feet on a raised area located on the eastern side of TNTB (Figure 1-3). Many of the buildings at the TNTB area were either placed on topographic highs or fill material used to raise the ground elevation. Surface water drains off the site to the north, east, and south. Surface water on the northern side of the site drains to ditches that are tributaries to Ransom Brook which flows to the north of the site. Surface water on the southern side of the site drains to tributaries flowing into Plum Brook which begins southeast of TNTB and flows to the north-northeast.

1.3.2.2 TNTB Geology and Soils

The bedrock across most of the site is the Ohio Shale, but bedrock in the southwestern corner of the site consists of Olentangy Shale (Figure 1-4). The overburden at TNTB consists predominantly of glacially derived silt overlying silty clay. The upper few feet of the silts and clays in the vicinity of TNTB have been grouped into the Hornell-Fries-Colwood Association. The Hornell-Fries-Colwood soils are described as moderately deep to deep, somewhat poorly to very poorly drained soils formed on nearly level to gently sloping topography (Ohio Department of Natural Resources [ODNR], 1994; IT, 1999). Underneath the silts and clays is a layer of weathered shale.

Cross-sections were drawn along lines shown on Figure 1-4. As shown on cross-sections A-A' (Figure 1-5) and B-B' (Figure 1-6), the depth of the overburden ranges from 1 to 2 feet along the northwest side of TNTB to greater than 10 feet beneath hummocks at the site. The base of the overburden consists of weathered shale. This weathered shale horizon is typically 0.5 to 1.0 foot thick; however, on the west side of the site it is as thick as 5 feet. This thickness of the weathered zone at the site appears to be lithologically controlled. The lithologic descriptions at TNTB indicate that the Olentangy Shale has weathered to a greater depth (5 feet) than the Ohio Shale (0.5 to 1 foot).

1.3.2.3 TNTB Hydrogeology

1.3.2.3.1 Overburden

Because the overburden is relatively thin at TNTB, little groundwater is present in the overburden water-bearing zone (IT, 1999). As shown on cross-section B-B' (Figure 1-6), two areas where overburden groundwater is present are shown: northwest of the site in the vicinity of well MK-MW17 and on the east side of the site, west of the small hill upon which Building 452 was situated. Cross-section A-A' (Figure 1-5) shows what is possibly a perched zone at boring SS-389 which is located beneath the hill upon which Building 463 was situated. The average hydraulic gradient in the overburden at PBOW was calculated to be approximately 0.005 foot per foot (ft/ft) to the north. No hydraulic conductivity tests (slug tests or pump tests) have been performed in the vicinity of TNTB. Four overburden monitoring wells tested at other areas of PBOW had hydraulic conductivity measurements ranging from 0.7 foot per day (ft/day) to 212 ft/day (IT, 1999).

1.3.2.3.2 Bedrock

Well TNTB-BEDGW-001 was installed in the Olentangy Shale downgradient (north) of the site and well TNTB-BEDGW-002 monitors the Ohio Shale upgradient (south) of the site. The piezometric surface of the groundwater in the shale bedrock across TNTB is less than 5 feet below grade. Groundwater in the bedrock flows to the north with an average hydraulic gradient of approximately 0.006 ft/ft. The hydraulic conductivity upgradient of the site in the Olentangy Shale well (TNTB-BEDGW-002) was calculated to be 0.059 ft/day. In contrast, the hydraulic conductivity in the Ohio Shale well (TNTB-BEDGW-001) located downgradient of the site was calculated to be approximately 18 ft/day (IT, 1999).

1.4 Summary of Nitroaromatic Manufacturing Process

Production of explosives at PBOW began on December 16, 1941 and continued until 1945. It is estimated that more than 1 billion pounds of nitroaromatic explosives were manufactured during the 4-year operating period. The three explosive manufacturing areas were designated TNT Area A (TNTA), TNTB, and TNT Area C (TNTC). Twelve process lines were used in the manufacture of TNT: four lines at TNTA, three lines at TNTB, and five lines at TNTC (D&M, 1997a).

The TNTB manufacturing site consisted of widely scattered buildings of wood frame construction with asbestos and sheet metal coverings. It also included a series of buried and/or overhead flumes and pipes used to transport the substances (D&M, 1997). The historical locations, names, and numbers of the buildings at TNTB during TNT manufacturing are shown on Figure 1-3.

1.4.1 TNT Nitration Process

A three-step nitration process was performed at TNTB to produce 2,4,6-TNT. The process fluids were all transported through abovegrade lines. The nitration process was performed by mixing oleum (a solution of sulfur trioxide in sulfuric acid) with nitric acid and then heating the mixture. The complete process was performed independently along three process streams which at TNTB were called Lines 5, 6, and 7. Each nitration step was progressively more difficult and each required a stronger acid solution. The first nitration occurred in the Mono-Houses (Buildings 451, 461, and 471 along Lines 5, 6, and 7, respectively). It produced three nitrotoluene isomers (2-nitrotoluene, 3-nitrotoluene, and 4-nitrotoluene) and a layer of waste acid. The nitrotoluene was transferred to the Bi-Tri Houses (Buildings 452, 462, and 472 along Lines 5, 6, and 7, respectively). The second and third nitrations occurred at the Bi-Tri-Houses. The second nitration produced six DNT isomers of which 2,4-DNT, 2,6-DNT, and 3,4-DNT were the most abundant. The third nitration produced a liquid of 95 percent 2,4,6-TNT (which was the desired product) and approximately 5 percent "impurities" (D&M, 1997a).

In each of the nitration steps, not all of the isomers were converted to their desired isomer (e.g., most nitrotoluenes were converted to DNT in nitration step two and most DNT was converted to TNT in step three). Unconverted isomers were termed "impurities" and were carried through until the final washing step. This final washing step was performed at the Wash Houses (Buildings 456, 466, and 476 along Lines 5, 6, and 7, respectively). The washing was performed by adding soda ash to the TNT solution (which neutralized the acid), crystallizing the TNT solution with cold water, then adding sodium sulfite (sellite) to the crystalline 2,4,6-TNT. The sellite bound the impurities which were then removed in a water wash. The wastewater from this wash (called red water) was piped to a catch basin located at each line. The remaining pure 2,4,6-TNT was melted, dried, then solidified to a flake form. The flaked 2,4,6-TNT was transported along open conveyor belts to either the Northeast or the Northwest Nail Houses for packing.

1.4.2 Acid Process Stream

Acid used in the 2,4,6-TNT production flowed opposite the nitration stream. More concentrated, fresh nitric acid (with additional oleum) was provided to the third nitration. Spent acid from the third nitration (fortified with additional nitric acid) was used for the second nitration, and spent acid (fortified with additional nitric acid) from the second nitration was used for the first nitration. Acid and acid fume recovery occurred at Buildings 459, 469, and 479 along Lines 5, 6, and 7, respectively. Acid fortification was performed at Buildings 453, 463, and 473, along Lines 5, 6, and 7, respectively (D&M, 1997a).

1.4.3 DNT Process Stream

An additional aspect of the process was that DNT was also produced at the DNT Nitrating Facility (Building 415). The layout of the process lines and historical information of the manufacturing process appear to indicate that DNT from the Nitrating Facility was piped to Building 412 (the Sweating and Graining Facility) for purification. Based on engineering drawings, the DNT was used in the Mono Houses and Bi-Tri Houses for TNT production.

1.4.4 Wastewater Stream

Process wastewater was transported from Lines 5, 6, and 7 to a common waste water disposal facility called the Wastewater Disposal Settling Tanks (Building 417) through a series of buried wooden and ceramic pipes. Pipes occasionally became plugged with TNT. When a pipe became plugged, it was replaced with a new line laid in close proximity. Exact locations of new lines were not recorded; plugged lines were abandoned in place (D&M, 1997a). Wastewater from the Wastewater Disposal Settling Tanks at TNTB was transported to the Raw Wastewater Storage Tank located at Wastewater Disposal Plant No. 1. From the raw wastewater tank, it was transported approximately 1,000 feet through an elevated 12-inch diameter discharge pipe to the Pentolite Road Red Water Ponds (originally called the Waste Disposal Area No. 1) (D&M, 1997b).

1.5 Post-1945 Decontamination Efforts

After plant operations ceased in 1945, decontamination of TNT, acid, pentolite, and DNT processing lines began. The lines were decontaminated during the last quarter of 1945. During decontamination, all structures, equipment, and manufacturing debris were removed and burned (D&M, 1997a).

The property was initially transferred to the Ordnance Department, then to the War Assets Administration after it was certified by the U.S. Army to be decontaminated. In 1949, PBOW was transferred to the GSA (D&M, 1997a).

In the summer of 1955, a significant effort was made to decontaminate the surface and subsurface soil at the TNT Areas (D&M, 1997a). Decontamination was performed first at TNTA. At TNTA the decontamination process included the removal of contaminated surface and subsurface soil around the wash houses, bi-tri houses, fortifier buildings, DNT sweating and graining building, DNT nitrating building, and nail houses. They also removed wooden and ceramic waste disposal sewers containing from 1.0 to 2.5 inches of TNT. In addition, in TNTA concrete catch basins, thousands of pounds of TNT was discovered overlain by wood and scrap lumber. This lumber and TNT was removed and transported to the Burning Grounds where it was burned. Decontamination of TNTB and C was supposed to be modified to address only surface contamination detected by visual inspection leaving underground flumes in place. It is unknown whether this modification in the procedure took place as part of the 1955 decontamination of TNTB and TNTC (D&M, 1997a).

The NASA acquired PBOW on March 15, 1963 and currently utilizes the site. GSA decontaminated the TNT Manufacturing Areas to facilitate transfer. The decontamination is believed to have occurred in 1963 (D&M, 1997a). This work was accomplished in five steps:

1. Inspecting then removing contaminated surface soil above the drain tiles, flumes, etc.

2. Spot checking of subsurface soil in the vicinity of drain tiles, flumes, etc. to determine where the contaminated tiles and plumes were located. Where contamination was found, the flumes, tiles, etc. were removed in sections.

3. Removal of some items previously decontaminated to three X (XXX) condition to a storage facility and additional decontamination of the remainder of the items to a five X (XXXXX) condition in order to be sold.

4. Destruction of all buildings by fire then removal of all debris and concrete foundations. All the materials including the earth in those areas was flashed and the area was then rough graded.

5. Decontamination of all sump basins and removal of the concrete.

The decontamination process also included the burning of nitroaromatic-filled flumes that were excavated. As shown in the records review (D&M, 1997b) this was performed on July 10, 1963 near the intersection of Fox Road and Snake Road.

1.6 Summary of Previous Environmental Studies

1.6.1 Surface Water, Sediment, and Soil Investigations

In 1993, Morrison-Knudsen Ferguson Corporation (MK) collected two surface water, two sediment, and two surface soil samples in the vicinity of TNTB. Each sample was analyzed for volatile organic compounds (VOC), semivolatile organic compounds (SVOC), nitroaromatics, and dissolved metals. The surface water and sediment locations were called SW07/SD07 and SW08/SD08. SW07 and SD07 were collected near the beginning of Ransom Brook approximately 250 feet north of Magazine Road near a former location of red water settling tanks. SW08 and SD08 were collected north of TNTB approximately 200 feet south of Fox Road and approximately 3,000 feet downgradient of SW07 and SD07 (ICI, 1995). As shown in Table 1-1, the surface water samples had no detections of VOCs or SVOCs. No metals were detected in the surface water that exceeded a maximum contaminant level (MCL) or a secondary maximum contaminant level (SMCL). The sediment sample collected at SD07 had detections of five VOCs and fourteen SVOC compounds. The only nitroaromatic compound detected was 2,4,6-TNT at a concentration of 25 milligrams per kilogram (mg/kg). Sediment sample SD08 had eleven organic compounds, all detected at concentrations at or below 0.1 mg/kg. Detected organic compounds included two VOCs and nine SVOCs, eight of which were polynuclear aromatic hydrocarbons (PAH). The two surface soil samples locations were SB09 and SS13 (Table 1-2). SB09 was collected from the borehole for MK-MW17 shown on Figure 1-3. Sample SS13 was collected in the vicinity of the railroad tracks southwest of the Fortifier House, Building 463 (ICI, 1995). As shown in Table 1-1, VOCs (toluene and xylene), SVOCs (bis[2-ethylhexyl]phthalate) and nitroaromatics (2,4,6-TNT and 2,6-DNT) were detected in the surface soil. Nitroaromatics were present at SB09 with 2,4,6-TNT detected at a concentration of 12 mg/kg.

In October 1994, as part of the TNT Areas site investigation, D&M sampled the soil at 26 locations at TNTB at the points shown on Figure 1-7. Each sample was analyzed for nitroaromatics and metals. All the samples were collected between 0.5 and 3.5 feet below ground surface (bgs). Eighteen of the 26 locations were sampled at one depth and 8 locations were sampled at 2 depths. As shown in Table 1-2, nitroaromatics were detected in 18 of the 26

locations and most locations had at least 1 sample with concentrations greater than 1.0 mg/kg. Concentrations of nitroaromatics in excess of 10,000 mg/kg were present in soils at the Bi-Tri House for Line 5 (Building 452) and the DNT Sweating and Graining House (Building 412). Four compounds, 2,4,6-TNT, 1,3,5-trinitrobenzene (TNB), 2,4-DNT, and 2,6-DNT, were detected at concentrations exceeding the U.S. Environmental Protection Agency (EPA) Region 3 residential and industrial scenario risk-based criteria.

1.6.2 Groundwater Investigations

1.6.2.1 Overburden Water-Bearing Zone Results

Two overburden monitoring wells were installed at TNTB in July 1993 by MK (Table 1-2). Well MK-MW16 is located upgradient and well MK-MW17 is located downgradient of TNTB at the locations shown on Figure 1-3. Samples collected from both wells were analyzed for VOCs, SVOCs, nitroaromatics, and dissolved metals. No VOCs or nitroaromatics were detected in either of the wells. Metals were not detected at levels that exceeded MCLs or SMCLs. One SVOC, bis(2-ethylhexyl)phthalate, was detected at a concentration of 12 micrograms per liter (µg/L) in MK-MW17.

In December 1994, D&M sampled both MK-MW16 and MK-MW17 as part of the TNT Areas site investigation. Samples from the wells were analyzed for nitroaromatics, nitrates, and total and dissolved concentrations of 14 metals which consisted of the 13 priority pollutant metals plus manganese. MK-MW16 did not exhibit any detections of nitroaromatics. The downgradient well MK-MW17 did have 2,4,6-TNT at a concentration of 6.5 µg/L and 3-nitrotoluene at a concentration of 5.3 µg/L (Table 1-3). Nitrates were detected, but at concentrations below risk-based concentrations (RBC). Ten metals were detected in overburden groundwater. These were antimony, arsenic, beryllium, cadmium, copper, lead, manganese, nickel, thallium, and zinc. Six of the metals, copper, lead, manganese, nickel, thallium, and zinc, were detected in both wells. Nickel, manganese, and thallium were the only metals that exceeded regulatory action levels (D&M, 1997a).

IT collected groundwater samples from MK-MW16 and MK-MW17 as part of the site-wide groundwater investigation (GWI). The first sampling event occurred in September and October 1996. Both samples from the two wells were analyzed for VOCs, SVOCs, metals, pesticides and polychlorinated biphenyls (PCB), cyanide, and nitroaromatics (IT, 1997). SVOCs, pesticides, PCBs, and cyanide were not detected and VOCs were not detected above RBCs. The metals

detected above RBCs included aluminum, arsenic, iron, lead, and nickel as shown on Table 1-3. Five nitroaromatics were detected above RBCs at MK-MW17. The maximum concentration of any nitroaromatic detected in MK-MW17 was 11 µg/L of 2,6-DNT (IT, 1999).

In November 1997 and May 1998 as part of the semi-annual monitoring investigation portion of the GWI overburden wells MK-MW16 and MK-MW17 were sampled by IT (IT, 1999). Overburden groundwater samples were analyzed for VOCs, SVOCs, nitroaromatics, metals (total and dissolved), cyanide, and water quality parameters (alkalinity, chloride, hardness, sulfate, nitrate, total dissolved solids, total organic carbon [TOC], and total suspended solids [TSS]). No VOCs, SVOCs, cyanide, or water quality parameters were detected at concentrations exceeding RBCs. Dissolved overburden groundwater samples analyzed for dissolved metals exceeded RBCs for aluminum, arsenic, iron, lead, manganese, and nickel in MK-MW17 and iron, manganese, and nickel in downgradient well MK-MW16. Only one nitroaromatic compound, 4-amino-2,6-DNT, was detected above RBCs. This exceedence occurred only in downgradient well MK-MW17 (IT, 1999).

1.6.2.2 Bedrock Water-Bearing Zone Results

In 1997, IT installed two bedrock wells near TNTB. TNTB-BED-GW001 was installed northwest of the site to monitor bedrock groundwater downgradient of TNTB and TNTB-BED-GW002 was installed southeast of TNTB to monitor bedrock groundwater upgradient of the site (Figure 1-3). Both bedrock wells were sampled in November 1997 and May 1998 as part of the semi-annual monitoring investigation portion of the GWI. Both wells were analyzed for VOCs, SVOCs, nitroaromatics, metals (total and dissolved), cyanide, and water quality parameters (alkalinity, chloride, hardness, sulfate, nitrate, total dissolved solids, TOC, and TSS). No SVOCs, cyanide, or water quality parameters were detected at concentrations exceeding RBCs. One VOC, benzene, was detected at a concentration above the RBC in well TNTB-BED-GW001 (Table 1-3). No nitroaromatics were detected in either well. Filtered bedrock groundwater samples analyzed for metals exhibited RBC exceedences for barium, iron, and manganese (IT, 1999).

1.6.3 Background Metal Concentrations

In May 1998, IT collected site soils (surface and subsurface) to evaluate background concentrations of various metals that were previously established by Dames & Moore (D&M) and reported in their 1997 report.

IT's 1998 investigation found a suite of 18 metals present in the surface soil samples and a suite of 16 metals present in the subsurface soil samples. Of the 18 metal suites, 8 metals were detected at concentrations exceeding their RBCs. The metals exceeding RBCs included aluminum, antimony, arsenic, barium, beryllium, iron, manganese, and thallium. Detected metals in this suite with concentrations below their respective RBCs included chromium, cobalt, copper, lead, mercury, nickel, selenium, silver, vanadium, and zinc. The 16 metal suites present in the subsurface soil samples consisted of seven metals exceeding their respective RBCs. These included aluminum, antimony, arsenic, beryllium, iron, manganese, and thallium. Detected metals with concentrations below their respective RBCs included barium, chromium, cobalt, copper, lead, nickel, selenium, vanadium, and zinc.

A detailed description with a map and tables are described in Chapter 4.0 of the Site Investigation of Acid Areas report (IT, 1998).

2.0 Field Investigation

2.1 Investigation Summary

Field activities were conducted by IT and subcontractors during the months of October and November 1998. Mr. Keith Peecook, the environmental coordinator of NASA PBS, acted as the project contact, provided logistical support, and approved extended work hours during the course of the project. All direct-push sampling locations were cleared by Mr. Don Young, NASA PBS Maintenance Department.

Three hundred ninety one soil samples were collected for field screening analysis of nitroaromatics (Table 2-1, Figure 2-1). Field screening samples were analyzed using an IMS at an on-site mobile laboratory. On-site analytical data allowed for field screening, real-time interpretation, and the iterative selection of additional sampling locations necessary to delineate the extent of TNT contamination. The criteria for delineation was to establish the points and depths at which all constituents analyzed were detected at concentrations below preliminary remediation goals (PRG). However, because PRGs were not available for all nitroaromatic constituents (specifically 2A4,6-DNT and 4A2,6-DNT), RBCs from the direct-push investigation were used (IT, 1999b). RBC values for all constituents were lower than the PRGs.

To supplement the on-site screening analysis, 40 confirmation soil samples were collected and transported to Quanterra Environmental Services, Inc. (Quanterra) in Knoxville, Tennessee for standard laboratory analysis (Table 2-1). Locations for confirmation soil sample collection were based on IMS results. Confirmation samples were selected to support IMS results and risk assessments. Specific analyses requested were VOCs by EPA Method 8260A, SVOCs by Methods 3540C/8270C, PCBs by Methods 3540B/8082, target analyte list (TAL) metals by Methods 3050B/6010B/7471A, and nitroaromatic explosives by Method 8330. In addition, 10 percent of all screening samples were analyzed for explosives by colorimetric Method 8515 to provide confirmation during the field program.

To further investigate possible contaminant migration, two surface water and five sediment samples were collected near TNTB (Table 2-1, Figure 2-2). Both surface water and sediment samples were analyzed by Quanterra for nitroaromatic compounds using EPA Method 8330 (modified), VOCs using Method 8260A, SVOCs using Methods 3540C/8270C, TAL metals

(total and dissolved) using Methods 3050B/6010B/7471A, and PCBs using Methods 3540B/8082.

2.2 Investigative Procedures

2.2.1 Utility Clearing

All direct-push sampling locations were cleared by Mr. Don Young, PBS Maintenance Department. Underground utilities were limited in TNTB to inactive water mains used during TNT production, and utilities associated with the HTF, Nitrogen Dewars and aboveground nitrogen lines. Two former building locations (Buildings 476 and 456) were directly impacted and subsurface samples could not be collected due to the potential for underground utilities. The HTF area encompasses all of the former Building 476 location and could not be cleared for subsurface sample collection. In addition, aboveground and underground utilities are associated with the Nitrogen Dewar Tanks and associated aboveground nitrogen lines at TNTB. Because of this, the southern portion of Building 456 could not be cleared for subsurface sample collection.

2.2.2 Sampling Rationale

Soil sample locations were selected to provide adequate coverage of areas with the potential to be contaminated based on past site usage, previous analytical results at the site (D&M, 1997a), and to cover suspected source areas identified during investigations at similar TNT production facilities (West Virginia Ordnance Works and Volunteer Army Ammunition Plant). After collection of the initial round of samples, data were reviewed, and additional sampling points installed, as needed to delineate contamination. Field screening data were also reviewed to determine if discernable patterns of contamination were evident.

During initial soil sampling, it was determined that there were errors in the historical maps, both in locations of historical samples and locations of some buildings. The errors were most extensive in the northeast corner of TNTB, where building locations and historic boring locations shown on existing maps were 35 to 50 feet from the actual locations. Although all building foundations (except for nail houses and Building 478 Drowning Tank) are no longer present, roads, fire hydrants, water valves and storm drains are still present and were used to locate the actual position of the buildings. The observed changes most greatly affected Buildings 452, 453, and 456. To compensate for this problem, additional samples were placed in what was interpreted to be the correct area. In addition, the locations of the conveyors leading to nail

houses were also in question. To compensate for this, additional samples were placed perpendicular to the conveyors to provide coverage for plausible map errors. In addition, vegetation changes were observed that outlined the former location of some buildings (e.g., Buildings 466, 469, 473, 479). Photodocumentation of selected sites is presented in Appendix A. Generally, these areas were dominated by low grassy areas rather than the low woody type shrubs that cover over most of TNTB.

2.2.3 Soil Sampling

Soil sampling procedures were used for collection of nitroaromatic screening and confirmation soil samples at 408 locations at TNTB (Figure 2-1). Samples were collected with either a decontaminated stainless-steel trowel, a decontaminated stainless-steel drive sampler, or by direct-push methodology. Of the 408 locations, 360 were surface (0 to 1 foot bgs) and 48 were subsurface (depths ranging to 10 feet) sample locations. Because of multiple surface soil confirmation samples, a total of 395 samples were collected from the 360 locations. In addition, multiple subsurface soil samples resulted in a total of 87 soil samples collected from the 48 subsurface locations.

2.2.4 Surface Soil Sampling

Surface soil sampling was performed by collecting five individual samples from a depth of 0 to 1 foot bgs within a 1-square foot area. Surface soil samples were collected using a decontaminated stainless-steel trowel or a decontaminated drive sampler. Before collection of a sample, visible debris such as rocks, twigs, grass, roots, leaves, and construction debris were removed from the surface. Sample collection using a stainless-steel trowel involved removal of soil to a maximum depth of 1 foot bgs from each of the five locations with placement into a decontaminated stainless-steel mixing bowl. The soil was then homogenized and transferred to a labeled sample jar. The jar was placed on ice, a sample collection log completed, and the sample was transported to the appropriate laboratory for analysis. The stainless-steel trowel and mixing bowl were then decontaminated and the borehole was backfilled with any remaining borehole cuttings. A total of 113 screening soil samples were collected using trowels.

In addition to trowels, soil screening samples also were collected using a stainless-steel drive sampler. As with the trowels, visible debris was removed prior to sample collection. With a drive sampler, a 2-inch outside diameter (OD) by 8-inch long soil core sampler was driven approximately 8 to 12 inches into the soil at the desired location. Overdriving the sample aided

in sample retention in loose, sandy soils. The inside of the soil core sampling body was lined with a 6-inch butyrate liner into which the soil sample was collected. For field screening samples, the sample was extracted from the core sampler and placed in a decontaminated stainless-steel mixing bowl. This procedure was performed at the four other sample locations within the 1-square foot area. The five soil samples were then thoroughly mixed to form a composite sample before transferring to a labeled sample jar. The jar was placed on ice, a sample collection log completed, and the sample was transported to the appropriate laboratory for analysis.

For VOC sample collection, a 2-inch stainless-steel liner was used. VOC samples were not homogenized. After collection of soil samples from within the one-square foot area, the slide hammer sampling apparatus was disassembled, the liner with the sample removed, and the sampling body decontaminated. The 2-inch liner was sealed with Teflon™ tape and the ends capped with polyethylene liner caps for shipping to the lab. The borehole was backfilled with remaining borehole cuttings. A total of 243 soil samples (214 for screening and 29 for confirmation) were collected using a drive sampler.

One screening surface soil sample (SS307) was collected at the base of an abandoned manhole from a depth of approximately 10 feet. Soil sample collection required attaching a Teflon jar to a pole and scraping the soil into the jar. Upon removal, the soil was placed into a sample bottle, a sample collection log was completed, and the sample was transported to the on-site mobile laboratory.

2.2.5 Subsurface Soil Sampling

The direct-push technique was used to collect subsurface soil. It consisted of a hydraulic drive unit, stainless-steel sampling point, and sampling rods. The hydraulic drive unit was positioned at the selected boring location. A hydraulically powered percussion hammer drove a 2-inch OD sampling core to the required depth. When the probe reached the desired depth, the sampling point was retracted, the soil sampler driven forward, and an 18-inch acetate™ liner filled.

After the sampling probe with liner was removed from the borehole, the liner was extruded from the sampling tube. For soil samples requiring a VOC analysis, polyethylene liner caps were immediately placed on each end of the liner and the caps were sealed with Teflon tape. For samples used for surface screening that were advanced only 1 foot into the soil, information

including sample location, analytical parameters requested, and the sample collection method were listed on a sample collection log. If the borehole was to be advanced past a depth of 1 foot bgs, a hazardous toxic and radiologic waste (HTRW) drilling log (Appendix B) and sample collection log were constructed. On the HTRW drill log, the field geologist recorded a lithologic description of the soil and other information including drilling methods, total depth, photoionization detector (PID) measurement, and a sample location sketch. The sample was labeled with the identification number, depth collected, and stored on ice for transport to the appropriate laboratory. The sample location was then staked and flagged for later land survey. Direct-push drilling and sampling procedures were used for collection of subsurface soil at 87 locations (63 screening and 24 confirmation).

After the required soil samples were collected, any soil remaining from direct-push activities was disposed of back into the borehole. The remaining space in the borehole was filled to the surface with a bentonite-cement slurry grout. No tremie pipe was used.

2.2.6 Surface Water Sampling

Two surface water samples (SW01 and SW02) were collected from tributaries to Ransom Brook at locations nearest to TNTB. The work plan listed ten surface water and ten sediment samples to be collected from Ransom Brook. A site walkover by the on-site USACE representative and IT field personnel in conjunction with the ecological risk assessors determined that, due to the limited extent of water and sediment in the drainage ditch, fewer samples were required. Because of the lack of precipitation, both surface water samples were collected from standing pools of water. Sample collection was performed by dipping the appropriate sample container into the standing water. Sample bottles were sealed, placed on ice, proper paperwork completed, and transported to Quanterra. The sample location was then staked and flagged for later land survey.

2.2.7 Sediment Sampling

Five sediment samples were collected (SD01-SD05) for analysis (Figure 2-2). Samples SD01 and SD02 were collected from sediment below surface water samples SW01 and SW02, in Ransom Brook tributaries. Sediment samples SD03, SD04, and SD05 were also collected from Ransom Brook tributaries but at locations with no standing water present.

Sediment sample collection was performed using a decontaminated stainless-steel spoon and mixing bowl. Sediment was placed into the mixing bowl, homogenized, and placed into the appropriate sample jars. When sampling for VOCs, sediment was packed directly into the sample jar without headspace, before homogenizing. The sample containers were then labeled, placed on ice, and the proper paperwork completed. The sample location was staked and flagged for later land survey.

2.3 Decontamination Procedures

Decontamination of sampling equipment was performed in accordance with the procedures prescribed in Section 4.4.3 of the sampling and analysis plan (SAP) (IT, 1996a). Decontamination of sampling equipment used for collection of screening samples was conducted in the field at a mobile decontamination pad. A decontamination pad for the drill rig and sampling equipment was set up on the north side of the red barn, east of Campbell Street. The sampling equipment was decontaminated according to the following procedures:

Field Screening Samples:

- Deionized water/low phosphate detergent wash
- Deionized water rinse (American Society for Testing and Materials [ASTM] Type II)
- Isopropyl alcohol rinse
- Final rinse with ASTM Type II water; the volume of water used was at least five times greater than the volume of isopropyl alcohol used
- Air dry
- Wrap in aluminum foil.

Confirmation Samples:

- Wash and scrub using a brush with nonphosphate detergent
- Rinse with potable water
- Rinse with ASTM Type II water
- Rinse with methanol

- Final rinse with ASTM Type II water; the volume of water used was at least five times greater than the volume of methanol used
- Air dry
- Wrap in aluminum foil.

2.4 Investigation-Derived Wastes

A limited amount of IDW was generated during the RI (decontamination water, disposable personnel protective equipment, and lab wastes). IDW was managed and handled in accordance with procedures described in the SAP (IT, 1996a).

Decontamination water was collected in drums prior to removal of the decontamination pad. All drums were labeled with the contained materials, content volume, date of generation, and source of origin as applicable. IDW drums were staged in the IDW storage area north of the Pentolite Road during the investigation and moved to a magazine for temporary storage pending disposal. Personal protective equipment was double-bagged and placed in the on-site industrial dumpster. Laboratory wastes (acetone, hexane, explosive residues and calibration standards) were drummed, labeled, and stored at the PBS Hazardous Waste Storage Area prior to disposal. The two drums of laboratory wastes were shipped offsite to Ensco Inc. and incinerated.

2.5 Land Surveying

Two rounds of surveying were completed during the RI fieldwork by an Ohio registered professional land surveyor. Horizontal coordinates were surveyed to the closest 1.0 foot and referenced to the Ohio State Plane Coordinate System. Initially, seven north-south trending gridlines spaced 300-feet apart with nodes on 100-feet centers were surveyed to aid in locating sampling points adjacent to former buildings (Figure 2-1). The gridlines allowed for determination of field sample locations based on alphanumeric coordinates. Gridlines were labeled A through H (east to west) and numerically from 0 to 18 (north to south). For example, the sample coordinate G+40, 5-50 corresponds to gridline G plus 40 feet to the east and node 5 minus 50 feet to the north. All sample gridline coordinates were translated to Ohio State Plane Coordinates (Appendix C). While this method aided in sample locations, the accuracy of the method was affected by topography and vegetative cover. In addition, accuracy is expected to decrease with distance from surveyed nodes.

A second round included surveying selected borehole locations after the soil sampling was complete. Surface and subsurface sample locations surveyed included those that exhibited elevated levels of nitroaromatics. During field reconnaissance and soil sampling, it was determined that either historical sampling locations were inaccurately shown on report figures or the map itself was inaccurate. To rectify potential map discrepancies, road intersections and locations interpreted to be building corners were also surveyed (see Section 4.1). The updated survey data are presented in Appendix C. A comparison between estimated and surveyed data points is also included in Appendix C.

3.0 Analytical Program

Field screening samples were analyzed on-site by DP Consultants LLC. All primary samples were analyzed by Quanterra. Data validation was performed by E & I Technologies, an independent third party contractor, located in Oak Ridge, Tennessee. The validation summaries are provided in Appendix D. The analytical reports include a data summary of analytical results, field screening results, and a blank-evaluated detected hits summary (Appendix E). In order to clarify DP Consultants' laboratory qualifiers, they were changed to more widely used qualifiers. Results that were estimated because of variability or calibration and were qualified "E" or "Q", were qualified "J" by the IT project chemist. Nondetects "ND" were changed to "U".

Chemical data were evaluated by the IT project chemist for conformance with QA/QC protocols during the field sampling and laboratory analysis of the samples. It was determined that there were no significant problems observed in the fixed-base laboratory results that would adversely affect the usability of the data. It was concluded that the data obtained from the IMS screening of explosives is of comparable quality to other screening data. There is a correlation between the IMS method and SW-846 8330 in the detection of TNT.

3.1 Analytical Program and Methodologies

Chemical analyses for the investigation were performed in accordance with the guidelines detailed in the EPA *Test Methods for Evaluating Solid Waste* (SW-846), Physical/Chemical Methods, Third Edition, September 1986 and subsequent revisions. The field samples and associated QA/QC samples were analyzed for VOCs, SVOCs, PCBs, metals, and explosives. Methods used for analysis are summarized in Table 3-1.

Ion Mobility Spectroscopy (IMS) was used to screen soil samples for the presence of nitroaromatic explosives. IMS is the practice of identifying chemical substances by their unique ion mobility. It has been used successfully for detecting chemical warfare agents and toxic vapors in air. Its potential for low detection limits and cost makes it appealing for analytical use. Since no EPA-promulgated method exists for explosives' screening by IMS, colorimetric tests and confirmation by EPA SW-846 Method 8330 were used to determine the effectiveness of IMS technology. The colorimetric analyses are based on EPA SW-846 Method 8515. A discussion of the IMS data is found in the *Quality Assurance Quality Control Report* submitted by DP Consultants and in the data quality evaluation in Appendix F.

All analytical samples collected for the generation of definitive data were reported in EPA Level IV CLP-like data packages. A 100 percent Level III data validation was performed using EPA guidelines presented in the *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* and *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* dated February 1994. The criteria for blank evaluation were based on those detailed in *Region III Modifications to National Functional Guidelines for Organic Data Review* (September 1994) and *Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses* (April 1993).

3.2 Blank Evaluation

The purpose of blank analysis is to determine the existence of contamination resulting from laboratory and field activities. Blank evaluation involves qualification of data based on the results of associated field blanks, trip blanks, equipment rinsates, and laboratory method blanks. The criteria for blank evaluation are as follows:

- If a parameter is found in a blank but not detected in the sample, no action is taken.
- For organics, if the sample result is greater than the contract-required quantitation limit (CRQL), but is less than the 5X or 10X multiple of the blank result, the sample result is qualified "B".
- For organics, if the sample result is less than the CRQL and less than the 5X or 10X multiple of the blank result, the sample result is qualified "B". The "J" qualifier is not used.
- For inorganics, if the sample result is greater than the instrument detection limit (IDL) but less than the 5X multiple of the blank result, the sample result is qualified "B".
- If the sample result is greater than the 5X or 10X multiple of the blank result, the sample result is not qualified.

In instances where more than one blank is associated with a given sample, qualification is based upon a comparison with the associated blank having the highest concentration of a contaminant.

4.0 Investigation Results

This section presents the analytical results from IMS field screening and fixed-base laboratories for TNTB. Analytical data are presented sequentially by building number for the DNT process buildings, the wastewater settling tanks and associated subsurface piping, for each TNT process line, and for Ransom Brook surface water and sediment samples. All fixed-base laboratory soil data are presented in Table 4-1. Field screening data are presented in Table 4-2 through Table 4-22. Surface water and sediment fixed-base laboratory data are presented in Tables 4-23 and 4-24.

4.1 DNT Process Buildings

4.1.1 Building 412, DNT Sweating and Graining Building

Twenty field screening surface soil samples and two subsurface field screening samples were collected adjacent to Building 412 (Table 4-2, Figure 4-1). Surface soil delineation samples were placed in close proximity to historical detections (TNTB-S24, TNTB-S25, TNTB-S26) and adjacent to the building foundation. One direct-push boring (SS387) with the two subsurface screening samples was completed at D&M boring TNTB-S25 to delineate the vertical extent of nitroaromatic compounds.

4.1.1.1 Field Screening Results

The only nitroaromatic detected in surface soil was 2,4-DNT in three samples (SS111, SS114, and SS305) ranging from 8.2 mg/kg to 23 mg/kg. Two subsurface soil samples (2.5 to 3.0 feet, 5.0 to 6.0 feet) were collected from direct-push boring SS387. Boring SS387 was located at boring TNTB-S25, the highest historic detection of DNT at the site. The only detection in SS387 field screening samples was 2,4-DNT at 17.3 mg/kg in the 2.5-to 3.0-feet sample.

4.1.1.2 Fixed-Base Analytical Results

No confirmation samples were submitted for fixed-base analysis because all IMS detections were below RBCs and samples had been analyzed by Method 8330 in the initial investigation (D&M, 1997). In addition, access to the site was limited by relatively large trees.

4.1.2 Building 415, DNT Nitrating Building

A total of 11 surface soil samples were collected in the vicinity of Building 415 (Table 4-3, Figure 4-2). Nine of the 11 surface soil samples were collected from areas immediately adjacent to Building 415. One surface soil sample (SS190) was collected from a railroad loading dock and 1 surface soil sample (SS191) was collected from a drainage ditch approximately 120 feet north of Building 415. One direct-push location (SS373) was advanced in close proximity to Building 415 but was drilled to investigate subsurface wastewater lines. Wastewater lines are addressed in Section 4.2 (Wastewater Settling Tanks and Associated Pipelines).

4.1.2.1 Field Screening Results

Only trace levels (less than 0.2 mg/kg) of TNT were detected in two surface soil samples (SS122, SS123).

4.1.2.2 Fixed-Base Laboratory Data

No confirmation soil samples were collected at this location due to lack of contamination.

4.2 Wastewater Settling Tanks and Associated Pipelines

4.2.1 Building 417, Wastewater Disposal Settling Tanks

Twenty-five field screening surface soil samples and two subsurface soil samples were collected at the Wastewater Disposal Settling Tank (Table 4-4, Figure 4-3). Five confirmation samples and duplicate samples were also submitted for both field screening analysis and fixed-base analysis.

4.2.1.1 Field Screening Results

Nitroaromatic compounds were detected in numerous surface soil samples north of the settling tanks, all concentrations were below 1 mg/kg. One direct-push boring (SS363) was drilled to 6 feet bgs north of the settling tanks to determine the vertical extent of contamination in this area. Weathered shale was encountered at 1.5 feet bgs; therefore, field screening samples were not collected.

In addition, a limited area (SS237 and SS239) south of the settling tanks had detections of nitroaromatic compounds (TNT and 2A4,6DNT) exceeding 1 mg/kg in the surface soil screening samples. A direct-push boring (SS364) was completed approximately 35 feet south of these

locations. Although completed to 7 feet, shale bedrock was encountered at 0.5 feet bgs in boring SS364; therefore, soil samples were not collected.

Based on historical information, other settling tanks (i.e., TNTA) were found to contain large amounts of nitroaromatic compounds prior to decontamination. To determine if decontamination had been completed, four surface soil samples and two subsurface direct-push samples were collected from within the tank. Both direct-push borings hit refusal on concrete between 4.5 feet and 6 feet bgs, interpreted to be the bottom of the Wastewater Disposal Settling Tank. Subsurface soil samples were collected immediately above the concrete. Within the settling tank, TNT was detected in three of the four surface soil samples (SS282, SS283 and SS284) at concentrations below 0.5 mg/kg. 2,4,6-DNT was detected in one sample (SS284) at a concentration of 0.34 mg/kg. The only nitroaromatic detected in subsurface samples was TNT at a concentration of 0.28 mg/kg in boring SS362.

Five surface soil confirmation samples (SO15 through SO19) were also analyzed for nitroaromatic compounds using IMS. TNT was detected in all samples at concentrations ranging from 0.24 mg/kg to 0.80 mg/kg. 2,4,6-DNT was detected in four of five samples at concentrations ranging from 0.04 mg/kg to 0.29 mg/kg.

4.2.1.2 Fixed-Base Results

Five surface soil samples (SO15 through SO19) were submitted for analysis of VOCs, SVOCs, nitroaromatic compounds, PCBs, and metals (Table 4-1).

VOCs. VOCs were not detected in any confirmation samples.

SVOCs. A total of thirteen SVOCs, primarily PAHs, were detected in the soil confirmation samples. The highest analyte detected was benzo(k)fluoranthene at a concentration of 0.25 mg/kg.

Nitroaromatics. Three nitroaromatic compounds (TNT, 2A4,6-DNT, 4A2,6-DNT) were detected at similar concentrations in four of the five confirmation samples. TNT ranged from 0.59 mg/kg to 4.6 mg/kg, 2A4,6-DNT ranged from 0.78 mg/kg to 4.4 mg/kg and 4A4,6-DNT ranged from 0.6 mg/kg to 4.2 mg/kg. The only other nitroaromatic detected was 2,4-DNT at 0.39 mg/kg (SO15) and 0.76 mg/kg (SO17).

PCBs. PCBs were detected in all confirmation samples. Aroclor-1254 was detected in SO15 and SO16 at 0.530 mg/kg and 0.120 mg/kg, respectively. Aroclor-1260 was detected in SO17 (0.099 mg/kg), SO18 (0.050 mg/kg) and SO19 (0.110 mg/kg).

Metals. Lead, detected at 54.8 mg/kg in SO17, was the only metal to exceed established PBOW background concentrations.

4.2.2 Wastewater Pipelines

Five surface soil samples and 10 subsurface soil samples were collected for field screening analysis in the vicinity of underground wastewater pipelines (Table 4-5, Figures 2-1 and 4-4). Planned subsurface soil samples could not be collected from three pipeline borings (SS363, SS364, and SS367) in the northwest portion of TNTB because of limited (0.5 to 1.5 feet) overburden thickness. Confirmation samples (one surface and one subsurface) were also collected at each of the former underground pipelines northeast of Building 456 (SO01) and north of Building 415 (SO02).

4.2.2.1 Field Screening Results

The only nitroaromatic detected in surface soil was TNT in sample SS296 (0.12 mg/kg). TNT and 2A4,6-DNT were detected in trace (less than 0.20 mg/kg) concentrations in two subsurface soil samples (SS368, SS371). Higher concentrations were observed in boring SS370 (Figure 4-4). The shallow subsurface sample (2 to 2.5 feet bgs) from SS370 had both TNT (0.52 mg/kg) and 2A4,6-DNT (0.38 mg/kg) with the deeper (4 to 4.5 feet) sample having only TNT (25 mg/kg).

One surface soil confirmation sample (SO01) and one subsurface confirmation sample (SO02) were also analyzed by IMS. The only analyte detected was TNT in both samples at concentrations below 0.2 mg/kg.

4.2.2.2 Fixed-Base Results

One surface soil confirmation sample (SO01) and one subsurface confirmation sample (SO02) were submitted for confirmation analysis (Table 4-1).

VOCs. Acetone (0.56 mg/kg) and toluene (0.0034 mg/kg) were detected in SO01 and SO02, respectively.

SVOCs. SVOCs were not detected in SO01. The only SVOCs detected in SO02 were 2,4-DNT (0.66 mg/kg), 2,6-DNT (0.15 mg/kg), 2-methylnaphthalene (0.12 mg/kg), and phenanthrene (0.048 mg/kg).

Nitroaromatics. Nitroaromatic compounds were not detected in surface sample SO01. TNT (0.27 mg/kg), 2,4-DNT (1.6 mg/kg), and 2,6-DNT (0.49 mg/kg) were detected in subsurface sample SO02.

PCBs. The only PCB detected was Aroclor-1254 (0.14 mg/kg) in subsurface sample SO02.

Metals. All metals detected were below established PBOW background concentrations.

4.3 Process Line 5 Analytical Results

4.3.1 Building 451, Mono House

Twenty-one surface soil samples and six subsurface samples were collected for field screening in areas adjacent to Building 451 (Table 4-6, Figure 4-5). One confirmation sample and duplicate sample were submitted for field screening and fixed base analysis.

4.3.1.1 Field Screening Results

TNT was detected in two surface soil samples (SS139 and SS270) and 2A4,6DNT detected in one sample (SS139) at trace concentrations (less than 0.20 mg/kg). Both TNT (0.84 mg/kg) and 2,4-DNT (0.06 mg/kg) were also detected in one subsurface sample from boring SS384 in the 8- to 10-feet bgs sample; however, the 4- to 6-feet bgs sample from this boring was below detection limits for all analytes.

4.3.1.2 Fixed-Base Results

One confirmation (SO34) surface soil sample was collected from the same location as SS149 and analyzed at the offsite laboratory for VOCs, SVOCs, nitroaromatic compounds, PCBs and metals (Table 4-1).

VOCs. VOCs were not detected.

SVOCs. The only SVOC detected was fluoranthene at a concentration of 0.039 mg/kg.

Nitroaromatics. Nitroaromatic compounds were not detected in this sample.

PCBs. PCBs were not detected in this sample.

Metals. All metals detected were below established PBOW background concentrations.

4.3.2 Building 452, Bi-Tri House

Thirty-two surface soil samples and six subsurface samples were collected for field screening analysis (Table 4-7, Figure 4-6). Surface soil delineation samples were placed in close proximity to historical detections (TNTB-S18, TNTB-S19, TNTB-S20) and adjacent to the building foundation. Subsurface samples were collected at the locations of historical detections. Three confirmation samples and sample duplicates were submitted for field screening and fixed-base analysis.

4.3.2.1 Field Screening Results

TNT was detected in 14 surface soil samples at concentrations below 1 mg/kg. Four of these surface soil samples (SS194, SS263, SS266, and SS324) also had detections of 2A4,6-DNT at concentrations below 0.50 mg/kg. Only two surface soil samples, SS262 and SS290, had detections of TNT exceeding 1 mg/kg (66 mg/kg and 14 mg/kg, respectively).

Two subsurface (4 to 6 feet, 8 to 10 feet) soil samples were collected from SS375, the location of historical boring TNTB-S18. TNT was detected in both intervals at concentrations of 6,100 mg/kg and 76 mg/kg, respectively. Two other borings were completed at the site. Boring SS380 was completed at historic sample TNTB-S20 and SS381 at historic sample TNTB-S19. Subsurface samples from two other borings (SS380 and SS381) had trace concentrations (less than 0.50 mg/kg) of TNT and 2A4,6-DNT.

Two surface soil confirmation samples (SO23 and SO33) and one subsurface soil confirmation sample (SO13) were analyzed for nitroaromatic compounds using IMS. TNT was the only nitroaromatic detected in SO13 and SO23 at concentrations of 5,200 mg/kg and 33 mg/kg, respectively. No other nitroaromatic compounds were detected in these two samples. Nitroaromatic compounds were not detected in sample SO33.

4.3.2.2 Fixed-Base Results

Three confirmation samples (SO13, SO23, and SO33) were also submitted for fixed base analysis for VOCs, SVOCs, nitroaromatic compounds, PCBs, and metals (Table 4-1). Due to high concentrations of TNT in sample SO13, VOC, SVOC, PCB, and metals analyses were not performed due to potential hazards associated with TNT in the sample.

VOCs. VOCs were not detected in confirmation samples SO23 and SO33. VOCs were not analyzed for sample S013 due to the potential hazards associated with high concentrations of TNT in the sample.

SVOCs. SVOCs were not detected in confirmation samples SO23 and SO33. SVOCs were not analyzed for sample S013 because of the potential hazards associated with high TNT concentrations in the sample.

Nitroaromatics. TNT was detected at a concentration of 6,900 mg/kg in SO13. Both TNT (0.68 mg/kg) and 4A2,6-DNT (0.35 mg/kg) were detected in SO23. Nitroaromatic compounds were not detected in SO33.

PCBs. Aroclor-1260 was detected in SO23 and SO33 at concentrations of 0.14 mg/kg and 0.54 mg/kg, respectively. PCBs were not analyzed in S013 due to the potential hazard associated with high TNT concentrations.

Metals. Metals were not detected above established background concentrations for samples SO23 and SO33. Metals were not analyzed for in sample SO13 due to the potential hazard associated with high concentration of TNT.

4.3.3 Building 453 Fortifier House

Ten surface soil samples and two subsurface soil samples were collected for field screening analysis (Table 4-8, Figure 4-7). Surface soil delineation samples were placed in close proximity to the historical detection (TNTB-S17) adjacent to the building foundation. One direct-push boring was completed at TNTB-S17 to vertically delineate subsurface soil contamination. One subsurface confirmation sample (SO06) and duplicate sample were submitted for both field screening analysis and fixed-base analysis. Surface and subsurface soils had been sampled in previous investigations with concentrations of nitroaromatic compounds exceeding 390 mg/kg.

4.3.3.1 Field Screening Results

The only nitroaromatic compounds detected were TNT and 2A4,6-DNT in surface soil sample SS268 at 0.77 mg/kg and 0.05 mg/kg, respectively. Because of the limited contamination detected in field screening, a single direct-push boring (SS379) was completed at this site to vertically delineate contamination associated with historic boring TNTB-S17. Two subsurface soil (4.0 to 5.0 feet bgs, 7.5 to 8.0 feet bgs) samples were collected from SS379. The only nitroaromatic detected in these subsurface soil samples was TNT at a concentration of 18 mg/kg in the 4.0- to 5.0-feet bgs sample.

TNT was also detected in the confirmation sample SO06 (collocated with SS379 4.0- to 5.0-feet sample) at a concentration of 650 mg/kg.

4.3.3.2 Fixed-Base Results

One confirmation subsurface sample SO06 was submitted for fixed-base analysis (Table 4-1).

VOCs. Acetone was detected at 0.022 mg/kg.

SVOCs. Four SVOCs were detected in sample SO06. Two nitroaromatic compounds 2,4-DNT and 2,6-DNT, were detected at 3.6 mg/kg and 2.4 mg/kg, respectively. In addition, 4,6-dinitro-2-methylphenol was detected at 0.17 mg/kg and benzo(b)fluoranthene was detected at 0.041 mg/kg.

Nitroaromatics. TNT was the only nitroaromatic detected at a concentration of 2,200 mg/kg.

PCBs. Aroclor-1260 was detected at 2.8 mg/kg.

Metals. Lead, detected at 61.4 mg/kg, was the only metal to exceed established PBOW background concentrations.

4.3.4 Building 456 Wash House

Thirty-nine surface soil samples and two subsurface soil samples were collected for field screening at Building 456 (Table 4-9, Figure 4-8). Surface soil delineation samples were placed in close proximity to historical detections (TNTB-S10, TNTB-S11) and adjacent to the building foundation. In addition, nine confirmation samples (eight surface soil samples and one

subsurface soil sample) were submitted for both field screening and fixed-base analysis (Figure 4-8b).

4.3.4.1 Field Screening Results

Of the 39 surface soil screening samples, all but four samples had detectable levels of either 2A4,6-DNT or TNT. Twelve samples had 2A4,6-DNT greater than 0.18 mg/kg; however, only three of these samples (SS176, SS222 and SS292) had concentrations exceeding 1 mg/kg with a maximum of 3.1 mg/kg in sample SS222. TNT was detected in 35 surface soil samples with concentrations exceeding 1 mg/kg in 10 samples. The maximum concentration detected in surface soil samples was 2,800 mg/kg in SS211. No other nitroaromatic compounds were detected in surface soils.

One subsurface soil sample was collected from SS374 (3 to 4 feet bgs) near the location of the highest detection of TNT in IMS field screening data and also the location of historic boring TNTB-S10. One subsurface sample was also collected from SS378 (2.5 to 3.5 feet bgs) at historic boring TNTB-S11. Both borings were terminated in shale bedrock. Only low levels of nitroaromatic compounds were detected, with concentrations below 1 mg/kg for 2A4,6-DNT and TNT. Vertical delineation at three locations (SS222/SS293, SS174 and SS176) with elevated TNT detections in surface soils could not be determined due to the potential presence of subsurface utilities.

TNT was detected in all seven surface soil confirmation samples with a maximum concentration of 450 mg/kg detected in SO14. In addition, all samples except SO29 exceeded 1 mg/kg TNT. 2A4,6-DNT also was detected in three samples (SO27, SO28 and SO29) ranging in concentration from 0.38 mg/kg to 4.9 mg/kg. TNT was also detected in the one subsurface confirmation sample (SO05) at a concentration of 56 mg/kg.

4.3.4.2 Fixed-Base Results

Seven surface soil samples (SO09, SO14, SO24, SO27, SO28, SO29 and SO31) and 1 subsurface soil sample (SO05) were submitted for fixed base analysis (Table 4-1).

VOCs. Trichloroethylene was detected in surface soil sample SO24 at 0.0018 mg/kg. In the subsurface sample SO05, acetone and toluene were detected at 0.044 mg/kg and 0.0041 mg/kg, respectively.

SVOCs. SVOCs were detected in six or seven surface soil samples. Eleven different SVOCs were detected in these samples with concentrations of individual analytes less than 0.5 mg/kg. Detected SVOCs ranged in concentration from 0.028 mg/kg to 0.23 mg/kg, excluding sample SO28. Sample SO28 was the only surface soil sample that did not have reportable concentrations of SVOCs; however, this likely was due to elevated detection limits in that sample. SVOCs were not detected in the subsurface sample SO05.

Nitroaromatics. TNT was detected in all surface soil samples ranging in concentration from 1 mg/kg to 490 mg/kg. The nitroaromatic degradation products 2A4,6-DNT and 4A4,6-DNT were detected in all surface soils except SO09 and SO14. Maximum concentrations of 2A4,6-DNT and 4A4,6-DNT were 7.6 mg/kg and 8.8 mg/kg, respectively. In subsurface sample SO05, nitroaromatic compounds detected included TNT (44 mg/kg), 2A4,6-DNT (12 mg/kg) and 2A4,6-DNT (15 mg/kg).

PCBs. Aroclor-1254 was detected in four of seven surface soil samples with a maximum concentration of 0.32 mg/kg (SO09). Aroclor-1260 was detected in three of seven samples with a maximum concentration of 15 mg/kg detected in SO24. PCBs were not detected in the subsurface soil sample.

Metals. Lead exceeded background (51.2 mg/kg) in four samples (SO09, SO14, SO24, SO31) at concentrations ranging from 53 mg/kg to 245 mg/kg.

4.3.5 Northeast Nail House

Nineteen surface soil samples were collected for field screening in areas adjacent to the Northeast Nail House and the conveyor belt leading from Building 456 Wash House (Table 4-10, Figure 4-9). One surface soil sample was also submitted for field screening and fixed base analysis.

4.3.5.1 Field Screening Results

TNT was detected in eight field screening samples with the maximum concentration detected in sample SO32 at 1.1 mg/kg. Trace levels (less than 0.3 mg/kg) of 2A4,6-DNT were detected in four samples.

4.3.5.2 Fixed-Base Results

One surface soil sample (SO32) was submitted for fixed base analysis (Table 4-1).

VOCs. Carbon disulfide (0.0022 mg/kg), ethyl benzene (0.0017 mg/kg), toluene (0.011 mg/kg), and total xylene (0.0084 mg/kg) were detected in the surface soil confirmation sample.

SVOCs. Twenty SVOCs, mainly PAHs, were detected in sample SO32. Total SVOC concentrations in this sample exceeded 27 mg/kg, with the maximum concentration of 5 mg/kg observed in fluoranthene.

Nitroaromatics. TNT (7.6 mg/kg), 2,4-DNT (0.38 mg/kg), 2A4,6-DNT (3.7 mg/kg) and 4A2,6-DNT (4.0 mg/kg) were detected in sample SO32.

PCBs. Aroclor-1260 was detected at a concentration of 0.99 mg/kg.

Metals. Copper (445 mg/kg) and lead (153 mg/kg) were reported at concentrations exceeding established PBOW background concentrations.

4.3.6 Building 459, Acid and Fume Recovery

Eleven surface soil samples were collected from areas adjacent to Building 459 (Table 4-11, Figure 4-10).

4.3.6.1 Field Screening Results

Only trace levels of TNT (less than 0.5 mg/kg) were detected in three samples (SS127, SS130, and SS199). In addition, 2,4-DNT was also detected in sample SS199 at a concentration of 7.0 mg/kg.

4.3.6.2 Fixed-Base Results

No confirmation samples were collected for this site.

4.4 Process Line 6 Analytical Results

4.4.1 Building 461, Mono House

Ten surface soil samples and seven subsurface samples were collected for field screening in areas adjacent to Building 461 (Table 4-12, Figure 4-11). No confirmation samples were collected.

4.4.1.1 Field Screening Results

TNT was detected in nine of ten surface soil samples collected. The maximum concentration of TNT detected was 1.2 mg/kg in sample SS095. In addition, 2,4-DNT was detected in three samples (SS091, SS092 and SS250) at concentrations ranging from 0.3 mg/kg to 6.2 mg/kg. TNT was detected in two subsurface soil samples (SS391 and SS401) at 2.4 mg/kg and 0.05 mg/kg, respectively.

4.3.1.2 Fixed-Base Results

No confirmation samples were collected for this site.

4.4.2 Building 462, Bi-Tri House

Thirteen surface soil samples and two subsurface samples were collected for field screening (Table 4-13, Figure 4-12). Two confirmation samples and sample duplicates were submitted for both field screening and fixed-base analysis.

4.4.2.1 Field Screening Results

TNT was detected in all of the surface soil samples; however, only 4 samples exceeded 0.20 mg/kg with a maximum concentration detected at SS087 of 0.87 mg/kg. No other nitroaromatic compounds were detected in surface soils.

Two subsurface soil samples were collected from SS392 (3 to 5 feet and 6 to 8 feet bgs). Similar to the surface soil samples, TNT was detected at low concentrations in both the shallow and deep subsurface soil samples (0.37 mg/kg and 0.64 mg/kg, respectively). In addition to TNT, 2A4,6-DNT was also detected at 0.37 mg/kg (3 to 5 feet) and 0.04 mg/kg (6 to 8 feet).

In the confirmation sample duplicates submitted for field screening, nitroaromatic compounds were not detected.

4.4.2.2 Fixed-Base Results

One surface soil confirmation sample (SO39) was submitted for fixed base analysis (Table 4-1).

VOCs. VOCs were not detected.

SVOCs. Seven SVOCs, benzo(a)anthracene (0.050 mg/kg), benzo(a)pyrene (0.055 mg/kg), benzo(b)fluoranthene (0.044 mg/kg), benzo(k)fluoranthene (0.055 mg/kg), chrysene (0.54 mg/kg), fluoranthene (0.100 mg/kg), and pyrene (0.071 mg/kg) were detected in the confirmation sample.

Nitroaromatics. Nitroaromatic compounds were not detected in confirmation sample SO39.

PCBs. PCBs were not detected in confirmation sample SO39.

Metals. Metals were not detected above established background concentrations in sample SO39.

4.4.3 Building 463 Fortifier House

Six surface soil samples and six subsurface soil samples were collected for field screening analysis (Table 4-14, Figure 4-13). One surface confirmation sample and two subsurface confirmation samples were submitted for field screening and fixed-base analysis.

4.4.3.1 Field Screening Results

TNT was detected in all surface soils samples with a maximum concentration of 0.50 mg/kg in SS062. In addition, 2A4,6-DNT was detected in three of the six surface soil samples with a maximum concentration of 0.06 mg/kg in surface soil sample SS063.

A total of six subsurface soil samples were collected from direct-push borings SS389 (4 to 6 feet, 8 to 10 feet), SS398 (3 to 4 feet, 5 to 6 feet), and SS399 (4 to 6 feet, 8 to 10 feet). In boring SS389, only TNT was detected in the shallow subsurface sample at 1.6 mg/kg. TNT (46 mg/kg), 2A4,6-DNT (42 mg/kg), and 2,4-DNT (254.5 mg/kg) were detected in the deeper SS389 subsurface soil sample. Two delineation borings were installed west (SS389) and south (SS399). Drilling to the east of SS389 could not be accomplished because of the potential of underground utilities associated with the aboveground nitrogen line. TNT (0.28 mg/kg and 0.29 mg/kg) and 2A4,6-DNT (0.39 mg/kg and 0.53 mg/kg) were detected in both subsurface samples from SS398. Nitroaromatic compounds were not detected in SS399.

TNT was detected in the field screening results for the surface soil confirmation sample (SO36) at 0.27 mg/kg. Field screening results for the two subsurface (4 to 6 feet, 8 to 10 feet)

confirmation samples (SO10 and SO11) showed low levels (0.36 mg/kg) of TNT in the shallow subsurface sample with much higher concentrations of both TNT (43 mg/kg) and 2A4,6-DNT (12 mg/kg) in the deeper sample.

4.4.3.2 Fixed-Base Results

One surface soil confirmation sample (S036) was collected at this site. Two subsurface (4 to 6 feet, 8 to 10 feet) confirmation samples (SO10 and SO11) were collected from direct-push boring SS389 to confirm deep detections at this location (Table 4-1).

VOCs. Toluene (0.0026 mg/kg) was the only VOC detected in SO10. Acetone (0.11 mg/kg), 2-butanone (0.015 mg/kg), toluene (0.021 mg/kg). and total xylenes (0.0024 mg/kg) were detected in SO11. No samples for VOC analysis were collected for SO36.

SVOCs. The only SVOCs detected in SO10 was 2,4-DNT at 0.044 mg/kg. In sample SO11, both 2,4-DNT and 2,6-DNT were detected at concentrations of 110 mg/kg and 68 mg/kg, respectively. Twenty SVOCs were detected in surface confirmation sample SO36 with fluoranthene having the highest concentration of 3.9 mg/kg.

Nitroaromatics. TNT (1.1 mg/kg) was the only nitroaromatic detected in the SO10. Elevated concentrations of nitroaromatic compounds were detected in the deeper (8 to 10 feet) confirmation sample SO11. TNT (24 mg/kg), 2,4-DNT (240 mg/kg), 2,6-DNT (180 mg/kg), 2-Nitrotoluene (82 mg/kg) and 4-Nitrotoluene (67 mg/kg) were detected. In addition, the breakdown products 2A4,6-DNT (70 mg/kg) and 4A2,6-DNT (45 mg/kg) were also detected. TNT (0.4 mg/kg) was the only nitroaromatic compound detected in SO36.

PCBs. PCBs were not detected in either confirmation sample. Tentatively identified was Aroclor-1260 at a concentration of 0.091 mg/kg in surface confirmation sample SO36.

Metals. Metals were not detected above established PBOW background concentrations in either the surface or subsurface samples.

4.4.4 Building 466 Wash House

Twenty-three surface soil samples and four subsurface soil samples were collected for field screening adjacent to Building 466 (Table 4-15, Figure 4-14). Surface soil delineation samples

were placed in close proximity to historical detections (TNTB-S5, TNTB-S6, TNTB-S7) and adjacent to the building foundation. Two subsurface samples collected from direct-push boring SS370 immediately east of Building 466 were collected to evaluate the subsurface wastewater lines and were previously discussed in Section 4.2. In addition, four confirmation samples (two surface soil and two subsurface soil) and sample duplicates were submitted for field screening and fixed-base analysis.

4.4.4.1 Field Screening Results

Of the 23 surface soil screening samples, 15 had detectable levels of TNT with the maximum concentration (0.72 mg/kg) detected in SS067. In addition, 2A4,6-DNT was also sporadically detected (6 of 23 samples) with a maximum concentration of 0.70 mg/kg in SS066.

Because of the limited surface soil detections, direct-push borings were completed at the three historical detections of nitroaromatic compounds (TNTB-S5, TNTB-S6 TNTB-S7) to delineate vertical extent. Four subsurface soil samples were collected from direct-push borings SS376 (3 to 4 feet, 7 to 7.5 feet), SS385 (2.5 to 3.5 feet), and SS386 (4 to 4.5 feet). Subsurface samples SS376 (7 to 7.5 feet), SS385, and SS386 were collected immediately above the shale bedrock. Both TNT (110 mg/kg) and 2A4,6-DNT (17 mg/kg) were detected in SS376 (3 to 4 feet); only TNT was detected in the deeper (7 to 7.5 feet) sample at 2.7 mg/kg. Both subsurface soil samples in SS385 and SS386 were below detection limits for nitroaromatic compounds.

TNT was detected in all confirmation sample duplicates analyzed by IMS. Concentrations ranged from less than 1 mg/kg (SO04, SO25 and SO35) to 100 mg/kg (SO03). In addition, 2A4,6-DNT was detected in three of the confirmation samples at concentrations ranging from 0.06 mg/kg to 11 mg/kg.

4.4.4.2 Fixed-Base Results

Two surface soil samples (SO25 and SO35) and two subsurface soil samples (SO03, SO04) were submitted for fixed base analysis (Table 4-1). The two subsurface samples, SO03 and SO04, were collected from boring SS376 at 3 to 4 feet and 7 to 7.5 feet, respectively.

VOCs. VOCs were not detected in any of the surface soil confirmation samples. In the subsurface soils, xylenes were detected in SO03 at 0.0025 mg/kg and acetone (0.047 mg/kg) and toluene (0.0039 mg/kg) were detected in SO04.

SVOCs. Benzo(a)pyrene (0.037 mg/kg), benzo(b)fluoranthene (0.039 mg/kg), fluoranthene (0.045 mg/kg) and pyrene (0.037 mg/kg) were detected in surface soil sample SO35. SVOCs were not detected in surface soil sample SO25.

Thirteen SVOCs were detected in subsurface sample SO03 ranging in concentration from 0.033 mg/kg to 0.96 mg/kg (excluding 2,4-DNT and 2,6-DNT detected at 13 mg/kg and 3 mg/kg, respectively). The only SVOC detected in SO04 was 2,4-DNT at 0.28 mg/kg.

Nitroaromatics. TNT (0.26 mg/kg), 2A4,6-DNT (1.7 mg/kg), and 4A2,6-DNT (1.1 mg/kg) were detected in surface sample SO25. In surface soil sample SO35, TNT (7.6 mg/kg), 2,4-DNT (1.6 mg/kg), 2,6-DNT (0.28 mg/kg) and 2A4,6-DNT (0.48 mg/kg) were detected.

Subsurface soils samples SO03 (3.5 to 4 feet) and SO04 (5 to 6 feet), collected from the same location as boring SS376 samples, showed elevated concentrations of nitroaromatic compounds. In the 3.5 to 4 feet sample, TNT (620 mg/kg), 2,4-DNT (27 mg/kg) and 2A4,6-DNT (93 mg/kg) were detected. In the deeper sample from this location, concentrations of TNT (4.8 mg/kg), 2,4-DNT (1.4 mg/kg) and 2A4,6-DNT (1 mg/kg) decreased by at least an order of magnitude. 4A2,6-DNT was also detected in SO04 at 1.7 mg/kg.

PCBs. One surface soil sample (SO25) had Aroclor-1260 at 0.089 mg/kg. Aroclor-1254 and Aroclor-1260 were detected in two subsurface soil samples (SO03 and SO04) at 1.3 mg/kg and 0.063 mg/kg, respectively.

Metals. Two metals, lead and beryllium, exceeded background concentrations in three soil samples. Lead exceeded background (51.2 mg/kg) in one surface soil sample (SO25 at 126 mg/kg) and one subsurface soil sample (SO03 at 80.7 mg/kg). Beryllium exceeded background in SO03 (1 mg/kg) and SO04 (1.2 mg/kg).

4.4.5 Northwest Nail House

Eighteen surface soil samples and one subsurface soil sample were collected for field screening analysis adjacent to the Northeast Nail House and along the conveyor belt leading from Building 466 (Table 4-16, Figure 4-15). Two confirmation surface soil samples and sample duplicates were submitted for both field screening analysis and fixed-base analysis.

4.4.5.1 Field Screening Results

Twelve of eighteen samples collected had detections of TNT; however, only two samples (SS207 at 1.4 mg/kg and SS208 at 23 mg/kg) exceeded 1.0 mg/kg. The only other nitroaromatic detected was 2A4,6-DNT in seven samples. Only one sample (SS207 at 1.6 mg/kg) exceeded 1 mg/kg with all other results were less than 0.30 mg/kg.

TNT was detected at 0.22 mg/kg and 0.03 mg/kg in confirmation samples SO26 and SO30. These two samples were collected at the same locations as screening samples SS207 and SS208.

4.4.5.2 Fixed-Base Results

Two surface soil samples (SO26 and SO30) were submitted for fixed-base analysis (Table 4-1). Samples SO26 and SO30 were collected from field screening locations SS207 and SS308, respectively.

VOCs. VOCs were not detected in any confirmation samples.

SVOCs. The only SVOC detected in sample SO26 was fluoranthene at 0.046 mg/kg. Seven SVOCs, primarily PAHs, were detected in Sample SO30 at concentrations up to 0.064 mg/kg. Total SVOCs in sample SO30 was 0.372 mg/kg.

Nitroaromatics. TNT was detected at 0.43 mg/kg and 0.56 mg/kg in samples SO26 and SO30, respectively. In addition, 4A2,6-DNT was detected at 0.34 mg/kg in SO30.

PCBs. Aroclor-1254 and Aroclor-1260 were detected in sample SO30 and SO26 at 0.19 mg/kg and 0.048 mg/kg, respectively.

Metals. Metals were not detected above established PBOW background concentrations in either sample.

4.4.6 Building 469, Acid and Fume Recovery

Fourteen surface soil samples and one sediment sample were collected for field screening (Table 4-17, Figure 4-16). Two of the surface soil samples (SS280 and SS281) were collected from drainage ditches interpreted to drain the Building 469 area. The ditch from which SS280 was

collected also receives drainage from the Mono House (Building 461). The sediment sample (SS307) was collected from the bottom of a concrete manhole partially filled with water.

4.4.6.1 Field Screening Results

Twelve surface soil samples were collected from areas adjacent to Building 469. TNT was the only nitroaromatic detected (six of twelve samples) with a maximum concentration of 0.39 mg/kg in SS096. In addition, 2,4-DNT was detected in SS096 (2.6 mg/kg) and SS098 (4.3 mg/kg). Of the two soil samples collected from the drainage ditches, TNT was the only analyte detected at a concentration of 0.36 mg/kg in sample SS281. Nitroaromatic compounds were not detected in the sediment sample (SS307).

4.4.6.2 Fixed-Base Results

Confirmation samples were not collected for this site.

4.5 Process Line 7 Analytical Results

4.5.1 Building 471, Mono House

Seven surface soil samples were collected for field screening in areas adjacent to Building 451 (Table 4-18, Figure 4-17). No confirmation samples were collected from this area.

4.5.1.1 Field Screening Results

TNT was detected in one surface soil sample (SS002) at 0.11 mg/kg. No other nitroaromatic compounds were detected.

4.5.1.2 Fixed-Base Results

No confirmation samples were collected from this site.

4.5.2 Building 472, Bi-Tri House

Twelve surface soil samples and seven subsurface samples were collected for field screening (Table 4-19, Figure 4-18). Two confirmation samples and duplicate samples were also submitted for field screening and fixed-base analysis.

4.5.2.1 Field Screening Results

TNT was detected in trace (less than 0.01 mg/kg) concentrations in four surface soil samples. In addition, 2A4,6-DNT was detected in three surface soil samples with the maximum concentration being 0.25 mg/kg in sample SS017.

In the seven direct-push subsurface samples collected, three (SS390, SS393, SS394) had elevated concentrations of one or both TNT and 2A4,6-DNT. TNT concentrations in subsurface soils ranged from 18 mg/kg to 27 mg/kg. Two of these samples (SS390 and SS393) also had elevated detections of 2A4,6-DNT. These detections of nitroaromatic compounds were in the shallow samples (4 to 5 feet bgs) in each boring; however, it should be noted that SS390 boring was terminated in shale at 5 feet bgs.

Two confirmation sample duplicates (SO12, SO40) were analyzed by IMS. TNT was the only analyte detected at 11 mg/kg in SO12.

4.5.2.2 Fixed-Base Results

One surface soil confirmation sample (SO40) and one subsurface soil confirmation sample (SO12) were collected and analyzed offsite (Table 4-1).

VOCs. Acetone was detected in surface soil sample SO40 at 0.010 mg/kg. Toluene was detected in subsurface soil sample SO12 at 0.0032 mg/kg.

SVOCs. The only SVOC detected in the surface soil sample (SO40) was 2,4-DNT at 0.054 mg/kg. The only SVOCs detected in confirmation subsurface soil sample SO12 were 2,4-DNT (4.4 mg/kg) and 2,6-DNT (0.620 mg/kg).

Nitroaromatics. TNT (39 mg/kg), 2,4-DNT (2.6 mg/kg), 2A4,6-DNT (4 mg/kg), and 4A2,6-DNT (11 mg/kg) were detected in sample SO12. Only 2,4-DNT (0.26 mg/kg) was detected in sample SO40.

PCBs. PCBs were not detected in either the surface or subsurface confirmation samples.

Metals. One metal was detected above established background concentrations for surface soil sample SO40. Selenium was detected at 2.4 mg/kg, marginally exceeding the background

concentration of 2.39 mg/kg. Metals did not exceed background for subsurface soil sample SO12.

4.5.3 Building 473 Fortifier House

Eight surface soil samples and five subsurface soil samples were collected for field screening analysis (Table 4-20, Figure 4-19). Three confirmation samples and sample duplicates were submitted for both field screening and fixed-base analysis.

4.5.3.1 Field Screening Results

The only nitroaromatic compounds detected were TNT and 2A4,6-DNT in three samples (SS020, SS021, and SS320). Maximum concentrations of TNT and 2A4,6-DNT were 0.83 mg/kg and 0.13 mg/kg, respectively.

One subsurface soil (3 to 4 feet bgs) sample was collected from SS388. The only nitroaromatic detected was TNT at a concentration of 5.2 mg/kg. Two additional direct-push borings (SS396 and SS397) were drilled in close proximity to delineate the subsurface contamination. Subsurface screening samples for SS396 (3 to 4 feet, 8 to 10 feet) and SS397 (3 to 4 feet and 5 to 6 feet) indicated low levels (less than 0.30 mg/kg) of TNT and 2A4,6-DNT in these samples. A third boring location to the northeast of SS388 could not be completed due to access limitations (steep topography).

Three confirmation sample duplicates surface soil samples (SO07, SO37, SO38) were analyzed by IMS. TNT and 2A4,6-DNT were detected in both samples SO07 and SO37.

4.5.3.2 Fixed-Base Results

Three surface soil samples (SO07, SO37, and SO38) were submitted for fixed base analysis (Table 4-1).

VOCs. VOCs were not detected in any of the confirmation samples.

SVOCs. Thirteen SVOCs were detected in the two surface soil samples SO37 and SO38. Maximum concentrations of individual SVOCs (excluding 2,4-DNT and 2,6-DNT) were approximately 0.1 mg/kg in both samples. In subsurface sample SO07, the only SVOCs detected were 2,4-DNT and 2,6-DNT at less than 0.5 mg/kg.

Nitroaromatics. TNT (4.3 mg/kg), 2,4-DNT (2.3 mg/kg), 2,6-DNT (0.83 mg/kg), 2A4,6-DNT (1.7 mg/kg) and 4A2,6-DNT (2.5 mg/kg) were detected in surface soil sample SO37. Lower concentrations (less than 1 mg/kg) of TNT, 2,4-DNT, and 4A2,6-DNT were detected in surface sample SO38. In subsurface soil sample SO07, total nitroaromatic compounds exceeded 17 mg/kg, with TNT, 2A4,6-DNT and 4A4,6-DNT all detected at concentrations between 5 mg/kg and 6 mg/kg. 2,4-DNT was also detected at 1.9 mg/kg.

PCBs. Aroclor-1260 was detected in all three confirmation samples ranging in concentration from 0.450 mg/kg to 4.6 mg/kg.

Metals. Lead (53.5 mg/kg) exceeded established PBOW background concentrations in subsurface sample SO07. In addition, lead (58.4 mg/kg) also exceeded background in surface sample SO37.

4.5.4 Building 476 Wash House

Seventeen surface soil samples were collected for field screening adjacent to Building 476 (Table 4-21, Figure 4-20). In addition, three surface soil confirmation samples and sample duplicates were submitted for both field screening and fixed-base analysis. Subsurface soil samples could not be collected at this location due to the potential presence of underground utilities associated with the HTF.

4.5.4.1 Field Screening Results

Fourteen of 17 surface soil samples collected contained TNT; however only three samples (SS037, SS235, SS311) exceeded 1 mg/kg. The maximum concentration of TNT detected was 720 mg/kg in sample SS311. 2A4,6-DNT was detected in ten samples with the maximum concentration (2 mg/kg) detected in SS037. All other detections were below 1 mg/kg.

Confirmation sample duplicates (SO20, SO21, and SO22) all had both TNT and 2A4,6-DNT detected at concentrations below 1 mg/kg.

4.5.4.2 Fixed-Base Results

Three surface soil samples (SO20, SO21, and SO22) were submitted for fixed base analysis (Table 4-1).

VOCs. VOCs were not detected in any surface soil confirmation samples.

SVOCs. Twelve SVOCs were detected in the samples collected. Six compounds, 2,4-DNT, benzo(a)pyrene, chrysene, fluoranthene, and pyrene were detected in all three samples. The concentrations of SVOCs detected, excluding nitroaromatic compounds, were less than 0.11 mg/kg.

Nitroaromatics. TNT was detected in all surface soil samples ranging in concentration from 0.31 mg/kg to 2.5 mg/kg. One or both of the breakdown products 2A4,6-DNT and 4A4,6-DNT were detected in all surface soils. Maximum concentrations of 2A4,6-DNT and 4A4,6-DNT were 2.6 mg/kg and 2.0 mg/kg, respectively.

Nitroaromatic compounds were not detected in subsurface sample SO01. In subsurface sample SO05, nitroaromatic compounds detected included TNT (44 mg/kg), 2A4,6-DNT (12 mg/kg) and 4A2,6-DNT (15 mg/kg).

PCBs. Aroclor-1260 was detected in all surface soil samples with concentrations ranging from 0.100 mg/kg to 0.270 mg/kg.

Metals. Metals were not detected above established PBOW background concentrations in surface soil samples.

4.5.5 Building 479, Acid and Fume Recovery

Eleven surface soil samples were collected from areas adjacent to Building 459 (Table 4-22, Figure 4-21).

4.5.5.1 Field Screening Results

Only trace levels of TNT (less than 0.2 mg/kg) were detected in three samples (SS025, SS027 and SS035).

4.5.5.2 Fixed-Base Results

No confirmation samples were collected for this site.

4.6 Surface Water and Sediment

Two surface water (unfiltered) and five sediment samples were collected from Ransom Brook in October 1998 (Table 4-23 and 4-24; Figure 4-22). The majority of Ransom Brook near TNTB had no water due to lack of precipitation. Each of the surface water samples were therefore collected from stagnant pools. Samples were analyzed for VOCs, SVOCs, nitroaromatic compounds, metals, and PCBs. Each of the sediment samples was collected from 0 to 0.5 feet below top of the sediment and was analyzed for VOCs, SVOCs, nitroaromatic compounds, metals, and PCBs.

4.6.1 Surface Water Results

VOCs. Three VOCs were detected in the two surface water samples (Table 4-24). Carbon disulfide (1.2 µg/L) and 2-butanone (1.2 µg/L) were detected in sample SW01. The only VOC detected in sample SW02 was 1,1-dichloroethane at 0.51 µg/L.

SVOCs. SVOCs were not detected in either surface water sample.

Nitroaromatics. Nitroaromatic compounds were not detected in either surface water sample.

PCBs. PCBs were not detected in either surface water sample.

Metals. Fourteen metals were detected in the two unfiltered samples. Aluminum, arsenic, calcium, chromium, iron, lead, magnesium, manganese, sodium, and zinc were detected in both samples. Copper, nickel, and potassium were detected in sample SW01 but not SWO2. Selenium was only detected in SWO2.

4.6.2 Sediment Results

VOCs. Three VOCs, 2-butanone, acetone, and carbon disulfide were detected in four of the five sediment samples (Table 4-24). Acetone, ranging in concentration from 0.048 mg/kg to 0.27 mg/kg and 2-butanone, ranging in concentration from 0.0072 mg/kg to 0.062 mg/kg were detected in four samples. Carbon disulfide was only detected in sample SD02 at a concentration of 0.0025 mg/kg.

SVOCs. Six SVOCs were detected in two sediment samples. In sample SD02, 2-methylnaphthalene (0.38 mg/kg), naphthalene (0.078 mg/kg) and phenanthrene (0.17 mg/kg) were detected. Benzo(a)pyrene (0.047 mg/kg), fluoranthene (0.082 mg/kg) and pyrene (0.059 mg/kg) were detected in sample SD05.

Nitroaromatics. Nitroaromatic compounds were not detected in any sediment samples.

PCBs. PCBs were not detected in any sediment samples.

Metals. Sixteen metals were detected in at least one sediment sample. Eleven of these metals, aluminum, arsenic, barium, calcium, chromium, copper, iron, lead, manganese, nickel, and zinc were detected in all samples collected.

5.0 Conclusions and Recommendations

This chapter presents conclusions and recommendations for the TNTB RI at the former PBOW based on the analytical results presented in Chapter 4.0. The objectives of the RI were to determine the nature and extent of contamination in TNTB surface soil, subsurface soil, surface water, and sediment to support risk assessments and a potential future remedial action.

5.1 Conclusions of the Remedial Investigation

5.1.1 DNT Process Buildings

Of the 22 surface and subsurface soil samples collected at Building 412 (DNT Sweating and Graining Building), only four had nitroaromatics exceeding 1 mg/kg. Based on these results, contamination exceeding RBCs is limited to the immediate areas surrounding historical borings (TNTB-S24, TNTB-S25, and TNTB-S26). Contamination is limited in depth to approximately 3 to 5 feet bgs based on historical data (TNTB-S24) and direct-push data from this investigation. These data show that, although high levels of nitroaromatics (2,4-DNT) were observed in the surface soils, contamination decreases rapidly with depth. The detection of 2,4-DNT at this site is consistent with the historical use of this building, although 2,6-DNT would also be expected to be present.

Field screening results for Building 415 (DNT Nitrating Building) indicate only very low levels of nitroaromatics in the surface soils. In addition, field screening samples collected from the loading dock and drainage ditch north of the site also indicate limited impact at this site from historical TNT-production processes.

5.1.2 Wastewater Disposal Settling Tanks and Associated Pipelines

Two limited areas of contamination exist to the north and south of the Wastewater Settling Tanks. Nitroaromatics detected in this RI and historical samples indicate that concentrations are generally below 10 mg/kg. Numerous SVOCs (primarily PAHs), PCBs, and lead were also detected in the samples collected. The PAHs and lead likely are the result of road runoff and/or atmospheric deposition. In addition, PAHs may be the result of burning of the TNT process building. Lead only marginally exceeded the established background concentration for PBOW soils and may not be related to anthropogenic sources. PCBs, because of their low mobility, may be site-related; however, it has not been established that PCBs were used at PBOW during TNT-production operations.

Based on lithologic sampling from three direct-push borings, the overburden thickness (and therefore vertical extent of soil contamination) in this area is limited to less than 1.5 feet in areas outside the settling tanks. Subsurface soil samples collected from within the former settling tanks indicate the tanks were decontaminated prior to backfilling.

Surface and subsurface samples collected from along the underground wastewater pipelines indicate nitroaromatics are limited in extent. Only one boring (Boring SS370 at a depth of 4.0 to 4.5 ft bgs) drilled along the wastewater pipeline showed elevated concentrations of nitroaromatics. This boring was completed along the wastewater pipeline within 20 feet of the Wash House Catch Basin (Building 466). Because of the close proximity to the Wash House and evidence from other borings adjacent to the Wash House, this contamination cannot definitely be attributed to the pipeline.

5.1.3 Process Line 5 Buildings

Building 451 Mono House. Nitroaromatics were detected at low concentrations (less than 1 mg/kg) in a limited number of samples at this site. Based on the field screening and fixed-base data, no discernable pattern of contamination was evident at this building.

Building 452 Bi-Tri House. Field screening results confirmed historical findings (D&M, 1994) that one limited area of surface and subsurface soil contamination exists near boring TNTB-S18. Historical soil data from TNTB-S18 collected from 0.5 to 1.5 ft bgs showed TNT at concentrations up to 20,000 mg/kg. IMS data collected from SS154 (0 to 1 ft bgs) only detected TNT at 0.20 mg/kg. It is, therefore, concluded that high concentrations (i.e., >1,000 mg/kg) in soil begin at approximately 1 ft bgs, but decline rapidly with depth. This interpretation is supported by IMS subsurface soil data showing TNT concentrations declining sharply in the 4 to 6 feet sample (6,100 mg/kg) and 8 to 10 feet sample (76 mg/kg). Shale bedrock was encountered at 10 ft bgs.

Building 453 Fortifier House. As with Building 452, field screening results indicate only limited contamination at the Fortifier House. Vertical delineation near existing D&M boring TNTBS-17 indicates nitroaromatics are limited to a depth of 7 feet bgs. The most significant detections were TNT (2,200 mg/kg), Aroclor-1260 (2.8 mg/kg) and lead (61.4 mg/kg) in the 4.0 to 5.0 ft bgs sample. TNT is considered a site-related contaminant introduced by the explosives

manufacturing process. Lead may be site-related but more likely is the result of road runoff. PCBs, because of their low mobility, may be site-related; however, it has not been established that PCBs were used at PBOW during TNT-production activities.

Building 456 Wash House. Surface and subsurface analytical data indicate that four areas of contamination exist. Two of these areas were previously identified by D&M at borings TNTB-S10 and TNTB-S11. Data from this investigation, however, found a much higher concentration (up to 2,800 mg/kg TNT) of nitroaromatics in surface soil at these two locations. The vertical extent of contamination was delineated at TNTB-S10 and TNTB-S11, with contamination limited to the overburden thickness in the area (3.5 to 4 feet bgs). Two other limited areas near the aboveground nitrogen pipeline (and former catch basin) were also identified but with much lower concentrations of TNT. Borings could not be completed at other detections at this site due to the presence of underground utilities associated with the nitrogen pipeline; however, based on data from the other direct-push borings at this site, the overburden soils thickness is interpreted to be less than 4 feet.

Northeast Nail House. Based on field screening and confirmation sample results, there appears to be minimal impact from the Northeast Nail House and associated conveyor belt due to nitroaromatics. Numerous VOCs, SVOCs, PCBs, and metals were detected in the confirmation sample. The VOCs (ethlybenzene, toluene, xylenes), SVOCs (primarily PAHs) and metals (primarily lead) detected indicate the source of these compounds is likely road runoff and/or atmospheric deposition of contaminants from motor vehicles. Burning of the Nail House as part of the demolition process may also have resulted in PAHs. Therefore, the presence of these compounds is not considered to be site related. PCBs, because of their low mobility, may be site related; however, it has not been established that PCBs were used at PBOW during TNT-production activities.

Building 459 Acid & Fume Recovery Building. Only one sample (SS199) showed elevated levels of nitroaromatics. In sample SS199, located approximately 180 ft south-southwest of Building 459 at the railroad loading dock, TNT (0.31 mg/kg) and 2,4-DNT (7.0 mg/kg) were both detected. Based on these limited field screening detections, no discernable pattern of contamination is evident.

5.1.4 Process Line 6 Buildings

Building 461 Mono House. Nitroaromatics were detected in surface soil samples from this site. TNT was detected in numerous samples with a maximum concentration of 1.2 mg/kg. Three surface soil samples contained 2,4-DNT at concentrations ranging from 0.3 to 6.2 mg/kg. Only TNT was detected in deeper samples at low (2.4 mg/kg) concentration. Based on field screening results, no discernable pattern of contamination is evident at this site, although low levels of nitroaromatics are present.

Building 462 Bi-Tri House. Nitroaromatics were detected at concentrations below 1 mg/kg in all surface and subsurface soil samples collected at this site. Therefore, environmental impacts to the site by former process activities is interpreted to be limited. In addition, confirmation data also indicate minimal impacts by SVOCs. Six SVOCs (all PAHs) were detected in surface soils at low concentrations. The detection of low levels of PAHs is consistent with atmospheric deposition and/or road runoff and may not be site related. However, burning of building during site demolition may also have generated PAHs.

Building 463 Fortifier House. Surface soil samples at this location showed only low levels of nitroaromatics in field screening data. One direct-push boring (SS389) showed TNT, 2,4-DNT, and 2A4,6-DNT at concentrations exceeding 40 mg/kg at 10 feet bgs. Two additional borings completed at the site indicate subsurface contamination is limited to less that 20 feet from the building; however, the contamination may not be adequately defined. Subsurface confirmation samples collected at SS389 indicate that elevated levels of nitroaromatics are present in the subsurface at much higher concentrations (708 mg/kg total nitroaromatics) than were in the field screening data (55 mg/kg total nitroaromatics).

Building 466 Wash House. Limited surface soil contamination was detected at Building 466. Field screening data indicates nitroaromatics are present at low (less than 1 mg/kg) concentrations. Fixed-base confirmation samples indicate higher levels of nitroaromatics present in the surface soils, with TNT detected at up to 7.6 mg/kg. Subsurface soil contamination was confirmed at historic boring TNTB-S6, with concentrations exceeding 100 mg/kg in both field screening and fixed-base analytical results. Additional subsurface contamination was detected at the subsurface waste line leading from the catch basin to the wastewater settling tanks.

Acetone detected in confirmation samples is probably attributable to lab contaminants. Limited SVOCs were detected. As with other confirmation samples, these SVOCs are indicative of

atmospheric deposition or runoff and may not be site related. However, burning of buildings during site demolition may also have generated PAHs. The metals lead and beryllium are likely site related. PCBs, because of their low mobility, may be site related; however, it has not been established that PCBs were used at PBOW during TNT-production operations.

Northwest Nail House. Only one area (samples SS207 and SS208) along the former conveyor belt had elevated concentrations of nitroaromatics. TNT and 2A4,6-DNT were both detected at maximum concentrations of 23 mg/kg and 1.6 mg/kg in samples SS207 and SS208, respectively. Based on subsurface soil sampling, this contamination is limited to the upper 3 ft of soil. SVOCs (PAHs) and PCBs were detected in surface soil confirmation samples at low (less than 0.1 mg/kg) concentrations. As with other sampling results, the PAHs may be the result of atmospheric deposition; however, the PAHs may have resulted from burning of buildings during site demolition. PCBs, because of their low mobility, may be site related; however, it has not been established that PCBs were used at PBOW during TNT-production operations.

Building 469 Acid & Fume Recovery Building. Nitroaromatics were only detected at low concentrations (less than 0.5 mg/kg) at this site. Based on the limited detections in field screening data, no pattern of significant contamination is evident.

5.1.5 Process Line 7 Buildings

Building 471 Mono House. The only nitroaromatic compound detected at this site was TNT in one sample. Based on field screening results, no discernable patter of contamination is evident.

Building 472 Bi-Tri House. Nitroaromatic compounds (TNT and 2A4,6-DNT) were detected at concentrations below 1 mg/kg in four surface samples collected at this site. Based on this data, no discernable pattern of surface soil contamination is evident. TNT and 2A4,6-DNT were detected in three of five borings completed with maximum concentrations detected at 27 mg/kg 3.07 mg/kg, respectively. Data from subsurface soil samples indicate the soil contamination is limited to a depth of between 5 and 8 ft bgs.

Building 473 Fortifier House. Surface soil samples at this location showed only low levels of nitroaromatics in field screening data. One direct-push boring (SS388) showed TNT at 5.2 mg/kg at 3 to 4 feet bgs. Two additional borings completed at the site indicate subsurface

contamination is limited to less than 20 feet from the building. Fixed-base analyses indicate limited surface soil contamination by SVOCs, PCBs, and metals. SVOCs detected were primarily PAHs and are indicative of atmospheric deposition either from combustion of fuels or from burning of TNT-process buildings. PAHs and lead are probably the result of combustion of fuels and/or burning of buildings during site demolition. In addition, lead only slightly exceeded established background concentration. PCBs were detected at up to 4.6 mg/kg at this site. Given the low mobility of PCBs, these detections may be site related; however, it has not been established that PCBs were used at PBOW during TNT-production operations.

Building 476 Wash House. Limited surface soil contamination was detected at Building 476. Field screening data indicates nitroaromatics are present at elevated (up to 720 mg/kg) concentrations. Depth of contamination could not be delineated due to undergound utilities; however, overburden thickness in this area is interpreted to be less than 3 feet based on geologic cross sections. As with other sites, fixed-base analytical data indicate that numerous PAHs are present. Again, these compounds may be the result of road runoff atmospheric deposition or burning of buildings during site demolition. PCBs were detected at low (less than 0.3 mg/kg) concentrations. These PCB detections may be site related; however, as previously stated, it has not been determined if PCBs were used during TNT-production operations.

Building 479 Acid & Fume Recovery Building. Nitroaromatics were only detected at low concentrations (less than 0.20 mg/kg) at this site. Based on the limited detections, in the field screening data, no discernable pattern of significant contamination is evident..

5.1.6 Ransom Brook Surface Water and Sediment

Surface Water. Analytical results indicate only VOCs and metals are present in surface water. Only three VOCs were detected, all at concentrations below 1.2 g/L. Two of these compounds, 2-butanone and carbon disulfide, were also detected in TNTB soils. The detection of 2-butanone could be laboratory contamination introduced during extraction and sample analysis. However, based on the low concentrations in the soils and surface water and that these compounds are not attributable to former site activities, it is unlikely that TNTB is a major source of these constituents. In addition, the lack of nitroaromatics in surface water and sediment also suggest that TNTB is not a current source of contamination to Ransom Brook.

Sediment. Analytical results for sediment indicate that VOCs, SVOCs, and metals are present in sediment. As with surface water, VOCs were detected at low concentrations. In addition, the detection of acetone and 2-butanone could be laboratory contaminants introduced during analysis. Six SVOCs were detected in sediment. As with TNTB soils, most of these are PAHs which result from incomplete combustion of fossil fuels. It is most likely that the source of PAHs in both TNTB soils and Ransom Brook sediments is atmospheric deposition and/or road runoff and not sediment transport from a source at TNTB. If TNTB were the source of the SVOCs, nitroaromatic compounds detected at much higher concentrations in TNTB soils, would also be expected to be present in the sediment.

5.2 Recommendations

- Based on the analytical results from this investigation, no additional soils sampling is required to delineate surface soil contamination. Further evaluation of required sampling is dependent on results of the soil risk assessment for these areas.

- Additional subsurface sampling may be required to delineate contamination detected in this investigation. As with surface soil sampling, further evaluation of required sampling is dependent on results of the soil risk assessment for these areas.

- Future application of IMS for the analysis of nitroaromatics should continue to be assessed pending further development of the technology (i.e., promulgated methods with defined QC-requirements). In its present form, IMS does not offer improvements over existing screening technologies (i.e., colorimetric).

6.0 References

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TABLES

Table 1-1

Detected Surface Water and Sediment Analytical Summary Compared to RBC's (1994)[a] TNT Area B - RI Report Former Plum Brook Ordnance Works, Sandusky, Ohio

Sample ID	Date	Media	Unit	PARAMETER	RBC	RESULT	VQ
MK02SW07	7/5/93	SW	µg/L	Aluminum	37000	891	
				Lead	15	4	
				Magnesium - Unfiltered	NA	25500	
				Magnesium - Filtered	NA	26400	
				Manganese - Unfiltered	730	1930	
				Manganese - Filtered	730	1860	
				Nickel	730	32.2	B
				Arsenic	0.45	21	
				Barium - Unfiltered	2600	74.2	B
				Barium - Filtered	2600	38.7	B
				Copper	1500	10.5	B
				Zinc	1100	34.5	
MK02SD07	7/5/93	SD	mg/kg	Aluminum	78000	9220	*
				Lead	400	27.5	
				Magnesium	NA	2340	*
				Manganese	1600	165	*
				Nickel	1600	110	
				Arsenic	4.3	29.3	N*
				Barium	5500	56.5	B
				Cadmium	39	0.5	BN
				Chromium	390	13.6	
				Cobalt	4700	54.2	
				Copper	3100	46	
				Vanadium	550	25.1	*
				Zinc	23000	188	*
				Acetone	7800	0.053	
				Methylene chloride	850	0.001	J
				1,1-Dichloroethane	7800	0.002	J
				2-Butanone	47000	0.01	J
				2,4,6-Trinitrotoluene	39	25	
MK02SW08	7/5/93	SW	ug/L	Aluminum	78000	2000	
				Magnesium - Unfiltered	NA	26000	
				Magnesium - Filtered	NA	26700	
				Manganese - Unfiltered	730	1960	
				Manganese - Filtered	730	2020	
				Nickel	730	36.9	B
				Arsenic	0.45	8	B
				Barium - Unfiltered	2600	99.4	B
				Barium - Filtered	2600	68.2	B
				Zinc	11000	21.2	

Table 1-1

Detected Surface Water and Sediment Analytical Summary
Compared to RBC's (1994)[a]
TNT Area B - RI Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

Sample ID	Date	Media	Unit	PARAMETER	RBC	RESULT	VQ
MK02SD08	7/9/93	SD	mg/kg	Aluminum	78000	8650	
				Lead	400	24.7	
				Magnesium	NA	4330	
				Manganese	1600	3450	
				Nickel	1600	136	
				Arsenic	4.3	12.6	
				Barium	5500	285	
				Beryllium	160	0.84	
				Cadmium	39	0.96	B
				Chromium	390	18.1	
				Cobalt	4700	47.1	
				Copper	3100	23.6	
				Vanadium	550	31.8	B
				Zinc	23000	174	
				Mercury	23	0.03	
				Toluene	16000	0.001	J
				Acetone	7800	0.021	
				bis(2-Ethylhexyl)phthalate	460	0.061	J
				Pyrene	2300	0.08	J
				Benzo(b)fluoranthene	8.7	0.066	J
				Fluoranthene	3100	0.1	J
				Benzo(k)fluoranthene	87	0.028	J
				Chrysene	880	0.049	J
				Benzo(a)pyrene	0.87	0.046	J
				Benzo(a)anthracene	8.7	0.06	J
				Phenanthrene	310	0.026	J

[a] Morrison Knudsen, (1994a).
VQ - Validation qualifier.
SW - Surface water.
NA - RBC not developed for parameter.
SD - Sediment
Only the detected analytical results are shown.
The nutritionally essential elements calcium, iron, potassium, and sodium are not included.
J - Indicates an estimated value.
B - Compound found also in the associated blank.
N - Spiked analyte recovery is outside stated control limits.
* Relative percent difference between two duplicates is outside stated control limits.

Table 1-2

Detected Soil Analytical Results
Compared to RBC's (1993 and 1994)
TNT Area B - RI Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

TNTB Location or Associated Bldg	Sample ID	Date	Unit	PARAMETER	RBC	RESULT	VQ
Subsurface Soil samples collected by Morrison Knudsen, (MK, 1994a).							
General (From monitoring well MK-MW16)	MK02SB08	7/1/93	mg/kg	Magnesium	NA	1430	
	MK02SB08	7/1/93	mg/kg	Benzo(b)fluoranthene	0.87	0.032	J
	MK02SB08	7/1/93	mg/kg	Fluoranthene	310	0.023	J
	MK02SB08	7/1/93	mg/kg	Phenanthrene	31	0.039	J
	MK02SB08	7/1/93	mg/kg	Naphthalene	310	0.013	J
	MK02SB08	7/1/93	mg/kg	2-Methylnaphthalene	310	0.032	J
Surface Soil samples collected by Morrison Knudsen, (MK, 1994a).							
General (From monitoring well MK-MW17)	MK02SB09	7/5/93	mg/kg	Total xylenes	16000	0.004	J
	MK02SB09	7/5/93	mg/kg	Naphthalene	310	0.072	J
	MK02SB09	7/5/93	mg/kg	2,4,6-Trinitrotoluene	3.9	12	
	MK02SB09	7/5/93	mg/kg	2,6-Dinitrotoluene	7.8	0.06	
Near trough (Wash House - Line 6 - Bldg 466)	MK02SS13	7/9/93	mg/kg	Magnesium	NA	2020	
	MK02SS13	7/9/93	mg/kg	Toluene	1600	0.033	
	MK02SS13	7/9/93	mg/kg	Chloroform	78	0	J
	MK02SS13	7/9/93	mg/kg	Bis(2-Ethylhexyl)phthalate	46	0.044	J
Soil samples collected by Dames & Moore, (D&M, 1997a)							
Wastewater Disposal Settling Tanks - Bldg 417	TNTB-S1-0.0/1.5	10/14/94	mg/kg	Antimony	3.1	8.6	
	TNTB-S1-0.0/1.5	10/14/94	mg/kg	Chromium	39	15	
	TNTB-S1-0.0/1.5	10/14/94	mg/kg	2,4,6-Trinitrotoluene	3.9	6.9	
	TNTB-S1-0.0/1.5	10/14/94	mg/kg	2,4-Dinitrotoluene	16	0.5	
	TNTB-S1-0.0/1.5	10/14/94	mg/kg	4-Amino-2,6-dinitrotoluene	0.47	0.3	
	TNTB-S1-0.0/1.5	10/14/94	mg/kg	2-Amino-4,6-dinitrotoluene		0.5	
	TNTB-S1-0.0/1.5	10/14/94	mg/kg	3,4-Dinitrotoluene		0.3	
	TNTB-S1-1.5/3.0	10/14/94	mg/kg	Arsenic	0.43	20	
	TNTB-S1-1.5/3.0	10/14/94	mg/kg	2,4,6-Trinitrotoluene	3.9	2.3	
	TNTB-S1-1.5/3.0	10/14/94	mg/kg	2,4-Dinitrotoluene	16	0.4	
	TNTB-S1-1.5/3.0	10/14/94	mg/kg	4-Amino-2,6-dinitrotoluene	0.47	0.4	
	TNTB-S1-1.5/3.0	10/14/94	mg/kg	2-Amino-4,6-dinitrotoluene		0.8	
	TNTB-S2-0.0/1.0	10/19/94	mg/kg	2,4,6-Trinitrotoluene	3.9	1.6	
	TNTB-S2-0.0/1.0	10/19/94	mg/kg	2,4-Dinitrotoluene	16	0.8	
	TNTB-S2-0.0/1.0	10/19/94	mg/kg	4-Amino-2,6-dinitrotoluene	0.47	0.3	
	TNTB-S2-0.0/1.0	10/19/94	mg/kg	2-Amino-4,6-dinitrotoluene		1	
	TNTB-S2-0.0/1.0	10/19/94	mg/kg	3,4-Dinitrotoluene		0.5	

Table 1-2

Detected Soil Analytical Results
Compared to RBC's (1993 and 1994)
TNT Area B - RI Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

TNTB Location or Associated Bldg	Sample ID	Date	Unit	PARAMETER	RBC	RESULT	VQ
Wastewater Disposal Settling Tanks - Bldg. 417 (continued)	TNTB-S2-1.0/2.5	10/19/94	mg/kg	2,4,6-Trinitrotoluene	3.9	1.2	
	TNTB-S2-1.0/2.5	10/19/94	mg/kg	2,4-Dinitrotoluene	16	0.4	
	TNTB-S2-1.0/2.5	10/19/94	mg/kg	2-Amino-4,6-dinitrotoluene	0.47	0.6	
	TNTB-S2-1.0/2.5	10/19/94	mg/kg	3,4-Dinitrotoluene		0.4	
	TNTB-S3-0.0/1.0	10/19/94	mg/kg	Lead	400	55	
	TNTB-S3-0.0/1.0	10/19/94	mg/kg	2,4,6-Trinitrotoluene	3.9	1.4	
	TNTB-S3-0.0/1.0	10/19/94	mg/kg	2,4-Dinitrotoluene	16	0.3	
	TNTB-S3-0.0/1.0	10/19/94	mg/kg	4-Amino-2,6-dinitrotoluene	0.47	1	
	TNTB-S3-0.0/1.0	10/19/94	mg/kg	2-Amino-4,6-dinitrotoluene		2.4	
	TNTB-S3-0.0/1.0	10/19/94	mg/kg	3,4-Dinitrotoluene		0.3	
	TNTB-S3-1.0/2.0	10/19/94	mg/kg	Antimony	3.1	11	
	TNTB-S3-1.0/2.0	10/19/94	mg/kg	2,4,6-Trinitrotoluene	3.9	2.7	
	TNTB-S3-1.0/2.0	10/19/94	mg/kg	2,4-Dinitrotoluene	16	0.6	
	TNTB-S3-1.0/2.0	10/19/94	mg/kg	4-Amino-2,6-dinitrotoluene	0.47	0.7	
	TNTB-S3-1.0/2.0	10/19/94	mg/kg	2-Amino-4,6-dinitrotoluene		2.4	
	TNTB-S3-1.0/2.0	10/19/94	mg/kg	2,6-Dinitrotoluene	7.8	0.3	
	TNTB-S3-1.0/2.0	10/19/94	mg/kg	3,4-Dinitrotoluene		0.3	
	TNTB-S4-0.0/1.0	10/19/94	mg/kg	Antimony	3.1	11	
	TNTB-S4-0.0/1.0	10/19/94	mg/kg	2,4,6-Trinitrotoluene	3.9	5	
	TNTB-S4-0.0/1.0	10/19/94	mg/kg	2,4-Dinitrotoluene	16	3.2	
	TNTB-S4-0.0/1.0	10/19/94	mg/kg	4-Amino-2,6-dinitrotoluene	0.47	0.5	
	TNTB-S4-0.0/1.0	10/19/94	mg/kg	2-Amino-4,6-dinitrotoluene		2.4	
	TNTB-S4-0.0/1.0	10/19/94	mg/kg	2,6-Dinitrotoluene	7.8	0.3	
	TNTB-S4-0.0/1.0	10/19/94	mg/kg	3,4-Dinitrotoluene		0.5	
	TNTB-S4-0.0/1.0	10/19/94	mg/kg	1,3,5-Trinitrobenzene	230	0.3	
	TNTB-S4-0.0/1.0	10/19/94	mg/kg	1,3-Dinitrobenzene	230	0.3	
	TNTB-S4-1.0/1.5	10/19/94	mg/kg	2,4,6-Trinitrotoluene	3.9	8.8	
	TNTB-S4-1.0/1.5	10/19/94	mg/kg	2,4-Dinitrotoluene	16	4.5	
	TNTB-S4-1.0/1.5	10/19/94	mg/kg	4-Amino-2,6-dinitrotoluene	0.47	1.2	
	TNTB-S4-1.0/1.5	10/19/94	mg/kg	2-Amino-4,6-dinitrotoluene		4.1	
	TNTB-S4-1.0/1.5	10/19/94	mg/kg	2,6-Dinitrotoluene	7.8	0.5	
	TNTB-S4-1.0/1.5	10/19/94	mg/kg	3,4-Dinitrotoluene		1.6	
	TNTB-S4-1.0/1.5	10/19/94	mg/kg	1,3,5-Trinitrobenzene	230	0.5	
	TNTB-S4-1.0/1.5	10/19/94	mg/kg	1,3-Dinitrobenzene	230	0.4	

Table 1-2

Detected Soil Analytical Results
Compared to RBC's (1993 and 1994)
TNT Area B - RI Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

TNTB Location or Associated Bldg	Sample ID	Date	Unit	PARAMETER	RBC	RESULT	VQ
Wash House - Line 6 - Bldg 466	TNTB-S5-1.0/2.0	10/15/94	mg/kg	2,4,6-Trinitrotoluene	3.9	1.5	
	TNTB-S5-1.0/2.0	10/15/94	mg/kg	4-Amino-2,6-dinitrotoluene	0.47	0.6	
	TNTB-S5-1.0/2.0	10/15/94	mg/kg	2-Amino-4,6-dinitrotoluene		1.5	
	TNTB-S6-1.0/2.0	10/15/94	mg/kg	2,4,6-Trinitrotoluene	3.9	1.2	
	TNTB-S6-1.0/2.0	10/15/94	mg/kg	4-Amino-2,6-dinitrotoluene	0.47	0.4	
	TNTB-S6-1.0/2.0	10/15/94	mg/kg	2-Amino-4,6-dinitrotoluene		0.4	
	TNTB-S6-2.5/3.5	10/15/94	mg/kg	Lead	400	76	
	TNTB-S6-2.5/3.5	10/15/94	mg/kg	Antimony	3.1	8.1	
	TNTB-S6-2.5/3.5	10/15/94	mg/kg	2,4,6-Trinitrotoluene	3.9	51	
	TNTB-S6-2.5/3.5	10/15/94	mg/kg	2,4-Dinitrotoluene	16	4.9	
	TNTB-S6-2.5/3.5	10/15/94	mg/kg	4-Amino-2,6-dinitrotoluene	0.47	7.7	
	TNTB-S6-2.5/3.5	10/15/94	mg/kg	2-Amino-4,6-dinitrotoluene		37	
	TNTB-S6-2.5/3.5	10/15/94	mg/kg	Nitrobenzene	3.9	18	
	TNTB-S6-2.5/3.5	10/15/94	mg/kg	1,3,5-Trinitrobenzene	230	0.9	
	TNTB-S6-2.5/3.5	10/15/94	mg/kg	1,3-Dinitrobenzene	230	1	
	TNTB-S7-1.0/2.0	10/15/94	mg/kg	2,4,6-Trinitrotoluene	3.9	1.9	
	TNTB-S7-1.0/2.0	10/15/94	mg/kg	4-Amino-2,6-dinitrotoluene	0.47	0.4	
	TNTB-S7-1.0/2.0	10/15/94	mg/kg	2-Amino-4,6-dinitrotoluene		0.5	
	TNTB-S7-2.5/3.5	10/15/94	mg/kg	Lead	400	725	
	TNTB-S7-2.5/3.5	10/15/94	mg/kg	2,4,6-Trinitrotoluene	3.9	910	
	TNTB-S7-2.5/3.5	10/15/94	mg/kg	4-Amino-2-nitrotoluene	0.47	0.5	
	TNTB-S7-2.5/3.5	10/15/94	mg/kg	2,4-Dinitrotoluene	16	18	
	TNTB-S7-2.5/3.5	10/15/94	mg/kg	2-Amino-4,6-dinitrotoluene		30	
	TNTB-S7-2.5/3.5	10/15/94	mg/kg	2,6-Dinitrotoluene	7.8	14	
	TNTB-S7-2.5/3.5	10/15/94	mg/kg	Nitrobenzene	3.9	13	
	TNTB-S7-2.5/3.5	10/15/94	mg/kg	3-Nitrotoluene	160	1.6	
	TNTB-S7-2.5/3.5	10/15/94	mg/kg	1,3,5-Trinitrobenzene	230	25	
	TNTB-S7-2.5/3.5	10/15/94	mg/kg	2-Amino-4-nitrotoluene		1.1	
	TNTB-S7-2.5/3.5	10/15/94	mg/kg	1,3-Dinitrobenzene	230	2.5	
	TNTB-S8-2.5/3.0	10/15/94	mg/kg	Antimony	3.1	8.4	
	TNTB-S8-2.5/3.0	10/15/94	mg/kg	Cadmium	3.9	1.4	
	TNTB-S9-1.5/2.7	10/15/94	mg/kg	Antimony	3.1	8.1	
	TNTB-S9-1.5/2.7	10/15/94	mg/kg	Beryllium	16	1.4	
	TNTB-S9-1.5/2.7	10/15/94	mg/kg	Cadmium	3.9	1.4	
	TNTB-S10-1.5/2.5	10/15/94	mg/kg	Antimony	3.1	10.5	
	TNTB-S10-1.5/2.5	10/15/94	mg/kg	Beryllium	16	1.3	
	TNTB-S10-1.5/2.5	10/15/94	mg/kg	Cadmium	3.9	1.3	
	TNTB-S10-1.5/2.5	10/15/94	mg/kg	2,4,6-Trinitrotoluene	3.9	0.9	
	TNTB-S10-1.5/2.5	10/15/94	mg/kg	4-Amino-2,6-dinitrotoluene	0.47	0.8	
	TNTB-S10-1.5/2.5	10/15/94	mg/kg	2-Amino-4,6-dinitrotoluene		1.6	

Table 1-2

Detected Soil Analytical Results
Compared to RBC's (1993 and 1994)
TNT Area B - RI Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

TNTB Location or Associated Bldg	Sample ID	Date	Unit	PARAMETER	RBC	RESULT	VQ
Wash House - Line 6 - Bldg 466	TNTB-S11-2.5/3.5	10/15/94	mg/kg	Antimony	3.1	11	
	TNTB-S11-2.5/3.5	10/15/94	mg/kg	Cadmium	3.9	1.3	
	TNTB-S11-2.5/3.5	10/15/94	mg/kg	2,4,6-Trinitrotoluene	3.9	2.2	
	TNTB-S11-2.5/3.5	10/15/94	mg/kg	4-Amino-2,6-dinitrotoluene	0.47	1.3	
	TNTB-S11-2.5/3.5	10/15/94	mg/kg	2-Amino-4,6-dinitrotoluene		3.8	
	TNTB-S12-1.0/2.0	10/15/94	mg/kg	Antimony	3.1	10.6	
	TNTB-S13-1.0/2.0	10/15/94	mg/kg	Antimony	3.1	9.2	
	TNTB-S13-1.0/2.0	10/15/94	mg/kg	Beryllium	16	1.3	
Fortifier House - Bldg 452	TNTB-S15-0.0/2.0	10/15/94	mg/kg	Lead	400	145	
	TNTB-S17-0.0/1.5	10/15/94	mg/kg	2,4,6-Trinitrotoluene	3.9	390	
	TNTB-S17-0.0/1.5	10/15/94	mg/kg	2,4-Dinitrotoluene	16	0.9	
	TNTB-S17-0.0/1.5	10/15/94	mg/kg	4-Amino-2,6-dinitrotoluene	0.47	3	
	TNTB-S17-0.0/1.5	10/15/94	mg/kg	2-Amino-4,6-dinitrotoluene		2	
	TNTB-S17-0.0/1.5	10/15/94	mg/kg	2,6-Dinitrotoluene	7.8	1.3	
	TNTB-S17-0.0/1.5	10/15/94	mg/kg	1,3,5-Trinitrobenzene	230	1.2	
Bi-Tri House - Bldg 452	TNTB-S18-0.05/1.5	10/16/94	mg/kg	Lead	400	962	
	TNTB-S18-0.05/1.5	10/16/94	mg/kg	Antimony	3.1	17	
	TNTB-S18-0.05/1.5	10/16/94	mg/kg	2,4,6-Trinitrotoluene	3.9	20000	
	TNTB-S18-0.05/1.5	10/16/94	mg/kg	2,4-Dinitrotoluene	16	150	
	TNTB-S18-0.05/1.5	10/16/94	mg/kg	4-Amino-2,6-dinitrotoluene	0.47	11	
	TNTB-S18-0.05/1.5	10/16/94	mg/kg	2,6-Dinitrotoluene	7.8	170	
	TNTB-S18-0.05/1.5	10/16/94	mg/kg	3,4-Dinitrotoluene		0.3	
	TNTB-S18-0.05/1.5	10/16/94	mg/kg	1,3,5-Trinitrobenzene	230	10	
	TNTB-S18-0.05/1.5	10/16/94	mg/kg	1,3-Dinitrobenzene	230	0.7	
	TNTB-S19-0.5/2.0	10/16/94	mg/kg	Lead	400	174	
	TNTB-S19-0.5/2.0	10/16/94	mg/kg	Cadmium	3.9	1.2	
	TNTB-S19-0.5/2.0	10/16/94	mg/kg	2,4,6-Trinitrotoluene	3.9	4.2	
	TNTB-S20-0.5/1.5	10/16/94	mg/kg	Lead	400	90	
	TNTB-S20-0.5/1.5	10/16/94	mg/kg	2,4,6-Trinitrotoluene	3.9	0.4	

Table 1-2

Detected Soil Analytical Results
Compared to RBC's (1993 and 1994)
TNT Area B - RI Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

TNTB Location or Associated Bldg	Sample ID	Date	Unit	PARAMETER	RBC	RESULT	VQ
Mono House - Bldg 451	TNTB-S21-0.0/2.0	10/16/94	mg/kg	2,4,6-Trinitrotoluene	3.9	0.3	
	TNTB-S22-0.0/2.0	10/16/94	mg/kg	2,4-Dinitrotoluene	16	0.4	
	TNTB-S22-0.0/2.0	10/16/94	mg/kg	2,6-Dinitrotoluene	7.8	0.9	
	TNTB-S23-0.0/2.0	10/16/94	mg/kg	Lead	400	105	
	TNTB-S23-0.0/2.0	10/16/94	mg/kg	Cadmium	3.9	3.4	
	TNTB-S23-0.0/2.0	10/16/94	mg/kg	2,4,6-Trinitrotoluene	3.9	0.3	
	TNTB-S23-0.0/2.0	10/16/94	mg/kg	2,4-Dinitrotoluene	16	1.1	
	TNTB-S23-0.0/2.0	10/16/94	mg/kg	4-Amino-2,6-dinitrotoluene	0.47	0.4	
	TNTB-S23-0.0/2.0	10/16/94	mg/kg	2,6-Dinitrotoluene	7.8	2.2	
DNT Sweating House and Graining House - Bldg 412	TNTB-S24-0.0/1.5	10/16/94	mg/kg	Lead	400	354	
	TNTB-S24-0.0/1.5	10/16/94	mg/kg	Copper	310	166	
	TNTB-S24-0.0/1.5	10/16/94	mg/kg	2,4,6-Trinitrotoluene	3.9	0.8	
	TNTB-S24-0.0/1.5	10/16/94	mg/kg	4-Amino-2-nitrotoluene	0.47	0.4	
	TNTB-S24-0.0/1.5	10/16/94	mg/kg	2,4-Dinitrotoluene	16	1600	
	TNTB-S24-0.0/1.5	10/16/94	mg/kg	3,4-Dinitrotoluene		12	
	TNTB-S24-0.0/1.5	10/16/94	mg/kg	2-Amino-4-nitrotoluene		0.4	
	TNTB-S24-0.0/1.5	10/16/94	mg/kg	4-Nitrotoluene	78	1.1	
	TNTB-S24-1.5/3.0	10/16/94	mg/kg	2,4-Dinitrotoluene	16	75	
	TNTB-S24-1.5/3.0	10/16/94	mg/kg	2,6-Dinitrotoluene	7.8	0.9	
	TNTB-S24-1.5/3.0	10/16/94	mg/kg	3,4-Dinitrotoluene		4.2	
	TNTB-S24-1.5/3.0	10/16/94	mg/kg	Nitrobenzene	3.9	2.7	
	TNTB-S25-0.0/1.0	10/16/94	mg/kg	Lead	400	8111	
	TNTB-S25-0.0/1.0	10/16/94	mg/kg	2,4,6-Trinitrotoluene	3.9	0.7	
	TNTB-S25-0.0/1.0	10/16/94	mg/kg	4-Amino-2-nitrotoluene	0.47	0.5	
	TNTB-S25-0.0/1.0	10/16/94	mg/kg	2,4-Dinitrotoluene	16	11000	
	TNTB-S25-0.0/1.0	10/16/94	mg/kg	2-Amino-4,6-dinitrotoluene		1.8	
	TNTB-S25-0.0/1.0	10/16/94	mg/kg	2,6-Dinitrotoluene	7.8	12000	
	TNTB-S25-0.0/1.0	10/16/94	mg/kg	3,4-Dinitrotoluene		48	
	TNTB-S26-0.0/1.5	10/16/94	mg/kg	Lead	400	1236	
	TNTB-S26-0.0/1.5	10/16/94	mg/kg	4-Amino-2-nitrotoluene	0.47	0.7	
	TNTB-S26-0.0/1.5	10/16/94	mg/kg	2,4-Dinitrotoluene	16	7700	
	TNTB-S26-0.0/1.5	10/16/94	mg/kg	2,6-Dinitrotoluene	7.8	8300	
	TNTB-S26-0.0/1.5	10/16/94	mg/kg	3,4-Dinitrotoluene		470	
	TNTB-S26-0.0/1.5	10/16/94	mg/kg	1,3,5-Trinitrobenzene	230	0.5	

Table 1-2

Detected Soil Analytical Results
Compared to RBC's (1993 and 1994)
TNT Area B - RI Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

TNTB Location or Associated Bldg	Sample ID	Date	Unit	PARAMETER	RBC	RESULT	VQ
QA Samples	TNTB-S27-2.5/3.5	10/16/94	mg/kg	Antimony	3.1	9	
	TNTB-S27-2.5/3.5	10/16/94	mg/kg	Nickel	160	80	
	TNTB-S27-2.5/3.5	10/16/94	mg/kg	Beryllium	16	1.3	
	TNTB-S27-2.5/3.5	10/16/94	mg/kg	2,4,6-Trinitrotoluene	3.9	1.8	
	TNTB-S27-2.5/3.5	10/16/94	mg/kg	4-Amino-2,6-dinitrotoluene	0.47	1.1	
	TNTB-S27-2.5/3.5	10/16/94	mg/kg	2-Amino-4,6-dinitrotoluene		3.3	
	TNTB-S28-0.5/1.5	10/16/94	mg/kg	Lead	400	1078	
	TNTB-S28-0.5/1.5	10/16/94	mg/kg	Copper	310	205	
	TNTB-S28-0.5/1.5	10/16/94	mg/kg	Zinc	2300	873	
	TNTB-S28-0.5/1.5	10/16/94	mg/kg	2,4,6-Trinitrotoluene	3.9	29000	
	TNTB-S28-0.5/1.5	10/16/94	mg/kg	4-Amino-2-nitrotoluene	0.47	0.3	
	TNTB-S28-0.5/1.5	10/16/94	mg/kg	2,4-Dinitrotoluene	16	810	
	TNTB-S28-0.5/1.5	10/16/94	mg/kg	2-Amino-4,6-dinitrotoluene		2.5	
	TNTB-S28-0.5/1.5	10/16/94	mg/kg	2,6-Dinitrotoluene	7.8	230	
	TNTB-S28-0.5/1.5	10/16/94	mg/kg	3,4-Dinitrotoluene		0.6	
	TNTB-S28-0.5/1.5	10/16/94	mg/kg	1,3,5-Trinitrobenzene	230	14	
	TNTB-S28-0.5/1.5	10/16/94	mg/kg	1,3-Dinitrobenzene	230	1	

QA sample TNTB-S27-2.5/3.5 is a split of TNTB-S11-2.5/3.5.
QA sample TNTB-S28-0.5/1.5 is a split of TNTB-S18-0.5/1.5.
QA sample TNTB-S29-0.0/2.0 is a split of TNTB-S16-0.0/2.0.
Only detected metals and explosives above background are shown.
Background concentrations for metals from the Investigation of Acid Areas report, (IT, 1998).
The nutritionally essential elements calcium, iron, potassium, and sodium are not included.
NA - Not applicable, no RBC developed for this parameter.
J - Indicates an estimated value.

Table 1-3

Historical Groundwater Analytical Results Above RBCs
TNT Area B - RI Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

TNTB Well Name	Unit	Parameter	RBC	Result
Samples collected by Morrison Knudsen in 1993, (MK, 1994)				
Total Metals (all samples were unfiltered)				
MK-MW16	µg/L	Aluminum	3700	15200
	µg/L	Arsenic	0.045	40.0 N
	µg/L	Cadmium	3.9	0.60 BN
	µg/L	Chromium	18	24.6
	µg/L	Iron	1100	53700
	µg/L	Lead	15	42.0 N
	µg/L	Manganese	73	2770
	µg/L	Nickel	73	209
	µg/L	Vanadium	26	37.0 B
MK-MW17	µg/L	Aluminum	3700	116000
	µg/L	Arsenic	0.045	124
	µg/L	Barium	260	1480
	µg/L	Beryllium	16	9
	µg/L	Cadmium	3.9	2.0 BN
	µg/L	Chromium	18	159
	µg/L	Copper	150	659
	µg/L	Iron	1100	361000
	µg/L	Lead	15	340
	µg/L	Manganese	73	2510 N
	µg/L	Nickel	73	542
	µg/L	Selenium	39	3.0 BN
	µg/L	Vanadium	26	294 B
Organics				
MK-MW16	µg/L	*None*		
MK-MW17	µg/L	bis(2-ethylhexyl) phthalate	4.8	12

Table 1-3

Historical Groundwater Analytical Results Above RBCs
TNT Area B - RI Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

TNTB Well Name	Unit	Parameter	RBC	Result
Samples collected by Dames and Moore in 1994, (D&M, 1997).				
		Metals		
MK-MW16	µg/L	Beryllium	16	2 / 2
	µg/L	Manganese	73	14,000 / 17,000
	µg/L	Nickel	73	150 / 180
	µg/L	Thallium	0.51	2.3 / 2.6
MK-MW17	µg/L	Antimony	1.5	< RBC / 2
	µg/L	Arsenic	0.045	13 / <RBC
	µg/L	Cadmium	3.9	2 / <RBC
	µg/L	Manganese	73	2200 / 2300
	µg/L	Nickel	73	320 / 320
	µg/L	Thallium	0.51	0.9 / <RBC
		Organics		
MK-MW16	µg/L	*None*		
MK-MW17	µg/L	2,4,6-TNT	1.8	6.5
Samples collected by IT in November 1997 (IT, 1998)				
		Metals		
MK-MW16	ug/kg	Aluminum	3700	4990 J / < RBC
	ug/kg	Iron	1100	19800 / 2410
	ug/kg	Manganese	73	6970 / 6900
MK-MW17	ug/kg	Arsenic	0.045	12.6 / < RBC
	ug/kg	Iron	1100	44300 / 34100
	ug/kg	Manganese	73	1410 / 1260
	ug/kg	Nickel	73	156 / 140
IT-TNTB-BED-GW001	µg/L	Iron	1100	41700 / 16300
	µg/L	Manganese	73	677 / 694
IT-TNTB-BED-GW002	µg/L	Barium	260	326 / 384
	µg/L	Manganese	73	85.4 / <RBC
		Organics		
MK-MW16	µg/L	*None*		
MK-MW17	µg/L	4-Amino -2,6-dinitrotoluene	0.22	3.6
IT-TNTB-BED-GW001	µg/L	*None*		
IT-TNTB-BED-GW002	µg/L	Benzene	0.36	0.91 J

Table 1-3

Historical Groundwater Analytical Results Above RBCs
TNT Area B - RI Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

TNTB Well Name	Unit	Parameter	RBC	Result (filtered/unfiltered)
Samples collected by IT in May 1998 (IT, 1999)				
		Metals		
MK-MW16	µg/L	Iron	1100	20700 J / 5970
	µg/L	Manganese	73	13600 / 8850
	µg/L	Nickel	73	108 / 81.7
MK-MW17	µg/L	Aluminum	3700	6920 J / 7430
	µg/L	Arsenic	0.045	18.7 / 22
	µg/L	Iron	1100	41900 / 41600
	µg/L	Lead	15	16.4 / 17
	µg/L	Manganese	73	1120 / 1170
	µg/L	Nickel	73	130 / 131
IT-TNTB-BED-GW001	µg/L	Arsenic	0.045	12.9 / <RBCs
	µg/L	Barium	260	1100 / 1040
	µg/L	Iron	1100	13000 / <RBCs
	µg/L	Manganese	73	196 / 278
IT-TNTB-BED-GW002	µg/L	Barium	260	406 / 414
		Organics		
MK-MW16	µg/L	*None*		
MK-MW17	µg/L	4-Amino -2,6-dinitrotoluene	0.22	5.7
IT-TNTB-BED-GW001	µg/L	*None*		
IT-TNTB-BED-GW002	µg/L	Benzene	0.36	0.91 J

Only the detected analytical results are shown.
The nutritionally essential elements calcium, potassium, and sodium are not included.
J - Indicates an estimated value. Compound was detected above the method detection limit but below the quantitation limit.
B - Compound found also in the associated blank.
N - Spiked analyte recovery is outside stated control limits.
* Relative percent difference between two duplicates is outside stated control limits.
404/414 - Unfiltered/filtered.

Table 2-1

Summary of Soil Sample Locations (1998)
TNT Area B - RI Report
Former Plum Brook Ordnance Works
Sandusky, Ohio

Sample Number	Location ID	Analytical Parameters	Depth (ft)		Associated Bldg. No.
PBOW-98-SO-TNTB-SO01-10500-01-02	SO01	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0.5	2	417-PL
PBOW-98-SO-TNTB-SO01-10505-01-02		IMS Field Screening	0.5	2	
PBOW-98-SO-TNTB-SO02-10510-03.5-04	SO02	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	3.5	4	417-PL
PBOW-98-SO-TNTB-SO02-10515-03.5-04		IMS Field Screening	3.5	4	
PBOW-98-SO-TNTB-SO03-10520-03-04	SO03	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	3	4	466
PBOW-98-SO-TNTB-SO03-10525-03-04		IMS Field Screening	3	4	
PBOW-98-SO-TNTB-SO04-10530-05-06	SO04	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	5	6	466
PBOW-98-SO-TNTB-SO04-10535-05-06		IMS Field Screening	5	6	
PBOW-98-SO-TNTB-SO05-10540-02.5-03.5	SO05	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	2.5	3.5	456
PBOW-98-SO-TNTB-SO05-10545-02.5-03.5		IMS Field Screening	2.5	3.5	
PBOW-98-SO-TNTB-SO06-10550-04-05	SO06	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	4	5	453
PBOW-98-SO-TNTB-SO06-10551-04-05		VOCs, SVOCs, Nitroaromatics, PCBs, Metals	4	5	
PBOW-98-SO-TNTB-SO06-10552-04-05		VOCs, SVOCs, Nitroaromatics, PCBs, Metals	4	5	
PBOW-98-SO-TNTB-SO06-10555-04-05		IMS Field Screening	4	5	
PBOW-98-SO-TNTB-SO07-10560-03-04	SO07	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	3	4	473
PBOW-98-SO-TNTB-SO07-10565-03-04		IMS Field Screening	3	4	
PBOW-98-SO-TNTB-SO08-10570-06-08	SO08	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	6	8	462
PBOW-98-SO-TNTB-SO08-10575-06-08		IMS Field Screening	6	8	
PBOW-98-SO-TNTB-SO09-10580-00-01	SO09	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	456
PBOW-98-SO-TNTB-SO09-10585-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO10-10590-04-06	SO10	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	4	6	463
PBOW-98-SO-TNTB-SO10-10595-04-06		IMS Field Screening	4	6	
PBOW-98-SO-TNTB-SO11-10600-08-10	SO11	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	8	10	463
PBOW-98-SO-TNTB-SO11-10605-08-10		IMS Field Screening	8	10	
PBOW-98-SO-TNTB-SO12-10610-04-05	SO12	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	4	5	472
PBOW-98-SO-TNTB-SO12-10615-04-05		IMS Field Screening	4	5	
PBOW-98-SO-TNTB-SO13-10620-00-01	SO13	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	452
PBOW-98-SO-TNTB-SO13-10625-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO14-10630-00-01	SO14	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	456
PBOW-98-SO-TNTB-SO14-10631-00-01		VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	
PBOW-98-SO-TNTB-SO14-10632-00-01		VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	
PBOW-98-SO-TNTB-SO14-10635-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO15-10640-00-01	SO15	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	417
PBOW-98-SO-TNTB-SO15-10645-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO16-10650-00-01	SO16	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	417
PBOW-98-SO-TNTB-SO16-10655-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO17-10660-00-01	SO17	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	417
PBOW-98-SO-TNTB-SO17-10665-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO18-10670-00-01	SO18	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	417
PBOW-98-SO-TNTB-SO18-10675-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO19-10680-00-01	SO19	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	417
PBOW-98-SO-TNTB-SO19-10685-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO20-10690-00-01	SO20	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	476
PBOW-98-SO-TNTB-SO20-10695-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO21-10700-00-01	SO21	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	476
PBOW-98-SO-TNTB-SO21-10705-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO22-10710-00-01	SO22	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	476
PBOW-98-SO-TNTB-SO22-10715-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO23-10720-00-01	SO23	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	452
PBOW-98-SO-TNTB-SO23-10725-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO24-10730-00-01	SO24	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	456
PBOW-98-SO-TNTB-SO24-10735-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO25-10740-00-01	SO25	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	466
PBOW-98-SO-TNTB-SO25-10745-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO26-10750-00-01	SO26	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	NWNH
PBOW-98-SO-TNTB-SO26-10751-00-01		VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	NWNH
PBOW-98-SO-TNTB-SO26-10752-00-01		VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	NWNH
PBOW-98-SO-TNTB-SO26-10755-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO27-10760-00-01	SO27	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	456
PBOW-98-SO-TNTB-SO27-10765-00-01		IMS Field Screening	0	1	

Table 2-1

Summary of Soil Sample Locations (1998)
TNT Area B - RI Report
Former Plum Brook Ordnance Works
Sandusky, Ohio

Sample Number	Location ID	Analytical Parameters	Depth (ft)		Associated Bldg. No.
PBOW-98-SO-TNTB-SO28-10770-00-01	SO28	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	456
PBOW-98-SO-TNTB-SO28-10775-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO29-10780-00-01	SO29	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	456
PBOW-98-SO-TNTB-SO29-10785-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO30-10790-00-01	SO30	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	NWNH
PBOW-98-SO-TNTB-SO30-10795-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO31-10800-00-01	SO31	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	456
PBOW-98-SO-TNTB-SO31-10805-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO32-10810-00-01	SO32	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	NENH
PBOW-98-SO-TNTB-SO32-10815-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO33-10820-00-01	SO33	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	452
PBOW-98-SO-TNTB-SO33-10825-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO34-10830-00-01	SO34	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	451
PBOW-98-SO-TNTB-SO34-10835-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO35-10840-00-01	SO35	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	466
PBOW-98-SO-TNTB-SO35-10841-00-01		VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	
PBOW-98-SO-TNTB-SO35-10842-00-01		VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	
PBOW-98-SO-TNTB-SO35-10845-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO36-10850-00-01	SO36	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	463
PBOW-98-SO-TNTB-SO36-10855-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO37-10860-00-01	SO37	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	473
PBOW-98-SO-TNTB-SO37-10865-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO38-10870-00-01	SO38	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	473
PBOW-98-SO-TNTB-SO38-10875-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO39-10880-00-01	SO39	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	462
PBOW-98-SO-TNTB-SO39-10885-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SO40-10890-00-01	SO40	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	0	1	472
PBOW-98-SO-TNTB-SO40-10895-00-01		IMS Field Screening	0	1	
PBOW-98-SO-TNTB-SS001-10000-00-01	SS001	IMS Field Screening	0	1	471
PBOW-98-SO-TNTB-SS002-10001-00-01	SS002	IMS Field Screening	0	1	471
PBOW-98-SO-TNTB-SS003-10002-00-01	SS003	IMS Field Screening	0	1	471
PBOW-98-SO-TNTB-SS004-10003-00-01	SS004	IMS Field Screening	0	1	471
PBOW-98-SO-TNTB-SS005-10004-00-01	SS005	IMS Field Screening	0	1	471
PBOW-98-SO-TNTB-SS006-10005-00-01	SS006	IMS Field Screening	0	1	471
PBOW-98-SO-TNTB-SS007-10006-00-01	SS007	IMS Field Screening	0	1	471
PBOW-98-SO-TNTB-SS008-10007-00-01	SS008	IMS Field Screening	0	1	472
PBOW-98-SO-TNTB-SS009-10008-00-01	SS009	IMS Field Screening	0	1	472
PBOW-98-SO-TNTB-SS010-10009-00-01	SS010	IMS Field Screening	0	1	472
PBOW-98-SO-TNTB-SS011-10010-00-01	SS011	IMS Field Screening	0	1	472
PBOW-98-SO-TNTB-SS012-10011-00-01	SS012	IMS Field Screening	0	1	472
PBOW-98-SO-TNTB-SS013-10012-00-01	SS013	IMS Field Screening	0	1	472
PBOW-98-SO-TNTB-SS014-10013-00-01	SS014	IMS Field Screening	0	1	472
PBOW-98-SO-TNTB-SS015-10014-00-01	SS015	IMS Field Screening	0	1	472
PBOW-98-SO-TNTB-SS016-10015-00-01	SS016	IMS Field Screening	0	1	472
PBOW-98-SO-TNTB-SS017-10016-00-01	SS017	IMS Field Screening	0	1	472
PBOW-98-SO-TNTB-SS018-10017-00-01	SS018	IMS Field Screening	0	1	472
PBOW-98-SO-TNTB-SS019-10018-00-01	SS019	IMS Field Screening	0	1	472
PBOW-98-SO-TNTB-SS020-10019-00-01	SS020	IMS Field Screening	0	1	473
PBOW-98-SO-TNTB-SS021-10020-00-01	SS021	IMS Field Screening	0	1	473
PBOW-98-SO-TNTB-SS022-10021-00-01	SS022	IMS Field Screening	0	1	473
PBOW-98-SO-TNTB-SS023-10022-00-01	SS023	IMS Field Screening	0	1	473
PBOW-98-SO-TNTB-SS024-10023-00-01	SS024	IMS Field Screening	0	1	473
PBOW-98-SO-TNTB-SS025-10024-00-01	SS025	IMS Field Screening	0	1	479
PBOW-98-SO-TNTB-SS026-10025-00-01	SS026	IMS Field Screening	0	1	479
PBOW-98-SO-TNTB-SS027-10026-00-01	SS027	IMS Field Screening	0	1	479
PBOW-98-SO-TNTB-SS028-10027-00-01	SS028	IMS Field Screening	0	1	479
PBOW-98-SO-TNTB-SS029-10028-00-01	SS029	IMS Field Screening	0	1	479
PBOW-98-SO-TNTB-SS030-10029-00-01	SS030	IMS Field Screening	0	1	479
PBOW-98-SO-TNTB-SS031-10030-00-01	SS031	IMS Field Screening	0	1	479
PBOW-98-SO-TNTB-SS032-10031-00-01	SS032	IMS Field Screening	0	1	479

Table 2-1

Summary of Soil Sample Locations (1998)
TNT Area B - RI Report
Former Plum Brook Ordnance Works
Sandusky, Ohio

Sample Number	Location ID	Analytical Parameters	Depth (ft)		Associated Bldg. No.
PBOW-98-SO-TNTB-SS033-10032-00-01	SS033	IMS Field Screening	0	1	479
PBOW-98-SO-TNTB-SS034-10033-00-01	SS034	IMS Field Screening	0	1	479
PBOW-98-SO-TNTB-SS035-10034-00-01	SS035	IMS Field Screening	0	1	479
PBOW-98-SO-TNTB-SS037-10036-00-01	SS037	IMS Field Screening	0	1	476
PBOW-98-SO-TNTB-SS038-10037-00-01	SS038	IMS Field Screening	0	1	476
PBOW-98-SO-TNTB-SS039-10038-00-01	SS039	IMS Field Screening	0	1	476
PBOW-98-SO-TNTB-SS040-10039-00-01	SS040	IMS Field Screening	0	1	476
PBOW-98-SO-TNTB-SS042-10041-00-01	SS042	IMS Field Screening	0	1	NWNH
PBOW-98-SO-TNTB-SS043-10042-00-01	SS043	IMS Field Screening	0	1	NWNH
PBOW-98-SO-TNTB-SS044-10043-00-01	SS044	IMS Field Screening	0	1	NWNH
PBOW-98-SO-TNTB-SS045-10044-00-01	SS045	IMS Field Screening	0	1	NWNH
PBOW-98-SO-TNTB-SS046-10045-00-01	SS046	IMS Field Screening	0	1	NWNH
PBOW-98-SO-TNTB-SS047-10046-00-01	SS047	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS048-10047-00-01	SS048	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS049-10048-00-01	SS049	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS050-10049-00-01	SS050	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS051-10050-00-01	SS051	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS052-10051-00-01	SS052	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS053-10052-00-01	SS053	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS054-10053-00-01	SS054	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS055-10054-00-01	SS055	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS056-10055-00-01	SS056	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS057-10056-00-01	SS057	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS058-10057-00-01	SS058	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS059-10058-00-01	SS059	IMS Field Screening	0	1	463
PBOW-98-SO-TNTB-SS060-10059-00-01	SS060	IMS Field Screening	0	1	463
PBOW-98-SO-TNTB-SS061-10060-00-01	SS061	IMS Field Screening	0	1	463
PBOW-98-SO-TNTB-SS062-10061-00-01	SS062	IMS Field Screening	0	1	463
PBOW-98-SO-TNTB-SS063-10062-00-01	SS063	IMS Field Screening	0	1	463
PBOW-98-SO-TNTB-SS064-10063-00-01	SS064	IMS Field Screening	0	1	463
PBOW-98-SO-TNTB-SS065-10064-00-01	SS065	IMS Field Screening	0	1	NENH
PBOW-98-SO-TNTB-SS066-10065-00-01	SS066	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS067-10066-00-01	SS067	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS068-10067-00-01	SS068	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS069-10068-00-01	SS069	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS070-10069-00-01	SS070	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS071-10070-00-01	SS071	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS072-10071-00-01	SS072	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS073-10072-00-01	SS073	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS074-10073-00-01	SS074	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS075-10074-00-01	SS075	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS076-10075-00-01	SS076	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS077-10076-00-01	SS077	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS078-10077-00-01	SS078	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS079-10078-00-01	SS079	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS080-10079-00-01	SS080	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS081-10080-00-01	SS081	IMS Field Screening	0	1	462
PBOW-98-SO-TNTB-SS082-10081-00-01	SS082	IMS Field Screening	0	1	462
PBOW-98-SO-TNTB-SS083-10082-00-01	SS083	IMS Field Screening	0	1	462
PBOW-98-SO-TNTB-SS084-10083-00-01	SS084	IMS Field Screening	0	1	462
PBOW-98-SO-TNTB-SS085-10084-00-01	SS085	IMS Field Screening	0	1	462
PBOW-98-SO-TNTB-SS086-10085-00-01	SS086	IMS Field Screening	0	1	462
PBOW-98-SO-TNTB-SS087-10086-00-01	SS087	IMS Field Screening	0	1	462
PBOW-98-SO-TNTB-SS088-10087-00-01	SS088	IMS Field Screening	0	1	462
PBOW-98-SO-TNTB-SS089-10088-00-01	SS089	IMS Field Screening	0	1	462
PBOW-98-SO-TNTB-SS090-10089-00-01	SS090	IMS Field Screening	0	1	462
PBOW-98-SO-TNTB-SS091-10090-00-01	SS091	IMS Field Screening	0	1	461

Table 2-1

Summary of Soil Sample Locations (1998)
TNT Area B - RI Report
Former Plum Brook Ordnance Works
Sandusky, Ohio

Sample Number	Location ID	Analytical Parameters	Depth (ft)		Associated Bldg. No.
PBOW-98-SO-TNTB-SS092-10091-00-01	SS092	IMS Field Screening	0	1	461
PBOW-98-SO-TNTB-SS093-10092-00-01	SS093	IMS Field Screening	0	1	461
PBOW-98-SO-TNTB-SS094-10093-00-01	SS094	IMS Field Screening	0	1	461
PBOW-98-SO-TNTB-SS095-10094-00-01	SS095	IMS Field Screening	0	1	461
PBOW-98-SO-TNTB-SS096-10095-00-01	SS096	IMS Field Screening	0	1	469
PBOW-98-SO-TNTB-SS097-10096-00-01	SS097	IMS Field Screening	0	1	469
PBOW-98-SO-TNTB-SS098-10097-00-01	SS098	IMS Field Screening	0	1	469
PBOW-98-SO-TNTB-SS099-10098-00-01	SS099	IMS Field Screening	0	1	469
PBOW-98-SO-TNTB-SS100-10099-00-01	SS100	IMS Field Screening	0	1	469
PBOW-98-SO-TNTB-SS101-10100-00-01	SS101	IMS Field Screening	0	1	469
PBOW-98-SO-TNTB-SS102-10101-00-01	SS102	IMS Field Screening	0	1	469
PBOW-98-SO-TNTB-SS103-10102-00-01	SS103	IMS Field Screening	0	1	469
PBOW-98-SO-TNTB-SS104-10103-00-01	SS104	IMS Field Screening	0	1	469
PBOW-98-SO-TNTB-SS105-10104-00-01	SS105	IMS Field Screening	0	1	469
PBOW-98-SO-TNTB-SS106-10105-00-01	SS106	IMS Field Screening	0	1	469
PBOW-98-SO-TNTB-SS107-10106-00-01	SS107	IMS Field Screening	0	1	412
PBOW-98-SO-TNTB-SS108-10107-00-01	SS108	IMS Field Screening	0	1	412
PBOW-98-SO-TNTB-SS109-10108-00-01	SS109	IMS Field Screening	0	1	412
PBOW-98-SO-TNTB-SS110-10109-00-01	SS110	IMS Field Screening	0	1	412
PBOW-98-SO-TNTB-SS111-10110-00-01	SS111	IMS Field Screening	0	1	412
PBOW-98-SO-TNTB-SS112-10111-00-01	SS112	IMS Field Screening	0	1	412
PBOW-98-SO-TNTB-SS113-10112-00-01	SS113	IMS Field Screening	0	1	412
PBOW-98-SO-TNTB-SS114-10113-00-01	SS114	IMS Field Screening	0	1	412
PBOW-98-SO-TNTB-SS115-10114-00-01	SS115	IMS Field Screening	0	1	412
PBOW-98-SO-TNTB-SS116-10115-00-01	SS116	IMS Field Screening	0	1	412
PBOW-98-SO-TNTB-SS117-10116-00-01	SS117	IMS Field Screening	0	1	412
PBOW-98-SO-TNTB-SS118-10117-00-01	SS118	IMS Field Screening	0	1	415
PBOW-98-SO-TNTB-SS119-10118-00-01	SS119	IMS Field Screening	0	1	415
PBOW-98-SO-TNTB-SS120-10119-00-01	SS120	IMS Field Screening	0	1	415
PBOW-98-SO-TNTB-SS121-10120-00-01	SS121	IMS Field Screening	0	1	415
PBOW-98-SO-TNTB-SS122-10121-00-01	SS122	IMS Field Screening	0	1	415
PBOW-98-SO-TNTB-SS123-10122-00-01	SS123	IMS Field Screening	0	1	415
PBOW-98-SO-TNTB-SS124-10123-00-01	SS124	IMS Field Screening	0	1	415
PBOW-98-SO-TNTB-SS125-10124-00-01	SS125	IMS Field Screening	0	1	415
PBOW-98-SO-TNTB-SS126-10125-00-01	SS126	IMS Field Screening	0	1	415
PBOW-98-SO-TNTB-SS127-10126-00-01	SS127	IMS Field Screening	0	1	459
PBOW-98-SO-TNTB-SS128-10127-00-01	SS128	IMS Field Screening	0	1	459
PBOW-98-SO-TNTB-SS129-10128-00-01	SS129	IMS Field Screening	0	1	459
PBOW-98-SO-TNTB-SS130-10129-00-01	SS130	IMS Field Screening	0	1	459
PBOW-98-SO-TNTB-SS131-10130-00-01	SS131	IMS Field Screening	0	1	459
PBOW-98-SO-TNTB-SS132-10131-00-01	SS132	IMS Field Screening	0	1	459
PBOW-98-SO-TNTB-SS133-10132-00-01	SS133	IMS Field Screening	0	1	459
PBOW-98-SO-TNTB-SS134-10133-00-01	SS134	IMS Field Screening	0	1	459
PBOW-98-SO-TNTB-SS135-10134-00-01	SS135	IMS Field Screening	0	1	459
PBOW-98-SO-TNTB-SS136-10135-00-01	SS136	IMS Field Screening	0	1	459
PBOW-98-SO-TNTB-SS137-10136-00-01	SS137	IMS Field Screening	0	1	451
PBOW-98-SO-TNTB-SS138-10137-00-01	SS138	IMS Field Screening	0	1	451
PBOW-98-SO-TNTB-SS139-10138-00-01	SS139	IMS Field Screening	0	1	451
PBOW-98-SO-TNTB-SS140-10139-00-01	SS140	IMS Field Screening	0	1	451
PBOW-98-SO-TNTB-SS141-10140-00-01	SS141	IMS Field Screening	0	1	451
PBOW-98-SO-TNTB-SS142-10141-00-01	SS142	IMS Field Screening	0	1	451
PBOW-98-SO-TNTB-SS143-10142-00-01	SS143	IMS Field Screening	0	1	451
PBOW-98-SO-TNTB-SS144-10143-00-01	SS144	IMS Field Screening	0	1	451
PBOW-98-SO-TNTB-SS145-10144-00-01	SS145	IMS Field Screening	0	1	451
PBOW-98-SO-TNTB-SS146-10145-00-01	SS146	IMS Field Screening	0	1	451
PBOW-98-SO-TNTB-SS147-10146-00-01	SS147	IMS Field Screening	0	1	451
PBOW-98-SO-TNTB-SS148-10147-00-01	SS148	IMS Field Screening	0	1	451
PBOW-98-SO-TNTB-SS149-10148-00-01	SS149	IMS Field Screening	0	1	451

Table 2-1

Summary of Soil Sample Locations (1998)
TNT Area B - RI Report
Former Plum Brook Ordnance Works
Sandusky, Ohio

Sample Number	Location ID	Analytical Parameters	Depth (ft)		Associated Bldg. No.
PBOW-98-SO-TNTB-SS150-10149-00-01	SS150	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS151-10150-00-01	SS151	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS152-10151-00-01	SS152	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS153-10152-00-01	SS153	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS154-10153-00-01	SS154	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS155-10154-00-01	SS155	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS156-10155-00-01	SS156	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS157-10156-00-01	SS157	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS158-10157-00-01	SS158	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS159-10158-00-01	SS159	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS160-10159-00-01	SS160	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS161-10160-00-01	SS161	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS162-10161-00-01	SS162	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS163-10162-00-01	SS163	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS164-10163-00-01	SS164	IMS Field Screening	0	1	453
PBOW-98-SO-TNTB-SS165-10164-00-01	SS165	IMS Field Screening	0	1	453
PBOW-98-SO-TNTB-SS166-10165-00-01	SS166	IMS Field Screening	0	1	453
PBOW-98-SO-TNTB-SS167-10166-00-01	SS167	IMS Field Screening	0	1	453
PBOW-98-SO-TNTB-SS168-10167-00-01	SS168	IMS Field Screening	0	1	453
PBOW-98-SO-TNTB-SS169-10168-00-01	SS169	IMS Field Screening	0	1	453
PBOW-98-SO-TNTB-SS170-10169-00-01	SS170	IMS Field Screening	0	1	453
PBOW-98-SO-TNTB-SS171-10170-00-01	SS171	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS172-10171-00-01	SS172	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS173-10172-00-01	SS173	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS174-10173-00-01	SS174	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS175-10174-00-01	SS175	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS176-10175-00-01	SS176	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS177-10176-00-01	SS177	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS178-10177-00-01	SS178	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS179-10178-00-01	SS179	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS180-10179-00-01	SS180	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS181-10180-00-01	SS181	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS182-10181-00-01	SS182	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS183-10182-00-01	SS183	IMS Field Screening	0	1	NENH
PBOW-98-SO-TNTB-SS184-10183-00-01	SS184	IMS Field Screening	0	1	NENH
PBOW-98-SO-TNTB-SS185-10184-00-01	SS185	IMS Field Screening	0	1	NENH
PBOW-98-SO-TNTB-SS186-10185-00-01	SS186	IMS Field Screening	0	1	NENH
PBOW-98-SO-TNTB-SS187-10186-00-01	SS187	IMS Field Screening	0	1	NENH
PBOW-98-SO-TNTB-SS188-10187-00-01	SS188	IMS Field Screening	0	1	NENH
PBOW-98-SO-TNTB-SS189-10188-00-01	SS189	IMS Field Screening	0	1	NENH
PBOW-98-SO-TNTB-SS190-10189-00-01	SS190	IMS Field Screening	0	1	415
PBOW-98-SO-TNTB-SS191-10190-00-01	SS191	IMS Field Screening	0	1	415
PBOW-98-SO-TNTB-SS192-10191-00-01	SS192	IMS Field Screening	0	1	469
PBOW-98-SO-TNTB-SS193-10192-00-01	SS193	IMS Field Screening	0	1	473
PBOW-98-SO-TNTB-SS194-10193-00-01	SS194	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS195-10194-00-01	SS195	IMS Field Screening	0	1	NWNH
PBOW-98-SO-TNTB-SS196-10195-00-01	SS196	IMS Field Screening	0	1	NWNH
PBOW-98-SO-TNTB-SS197-10196-00-01	SS197	IMS Field Screening	0	1	NENH
PBOW-98-SO-TNTB-SS198-10197-00-01	SS198	IMS Field Screening	0	1	NENH
PBOW-98-SO-TNTB-SS199-10198-00-01	SS199	IMS Field Screening	0	1	459
PBOW-98-SO-TNTB-SS200-10199-00-01	SS200	IMS Field Screening	0	1	461
PBOW-98-SO-TNTB-SS204-10203-00-01	SS204	IMS Field Screening	0	1	NWNH
PBOW-98-SO-TNTB-SS205-10204-00-01	SS205	IMS Field Screening	0	1	NWNH
PBOW-98-SO-TNTB-SS206-10205-00-01	SS206	IMS Field Screening	0	1	NWNH
PBOW-98-SO-TNTB-SS207-10206-00-01	SS207	IMS Field Screening	0	1	NWNH
PBOW-98-SO-TNTB-SS208-10207-00-01	SS208	IMS Field Screening	0	1	NWNH
PBOW-98-SO-TNTB-SS209-10208-00-01	SS209	IMS Field Screening	0	1	NWNH
PBOW-98-SO-TNTB-SS210-10209-00-01	SS210	IMS Field Screening	0	1	456

Table 2-1

Summary of Soil Sample Locations (1998)
TNT Area B - RI Report
Former Plum Brook Ordnance Works
Sandusky, Ohio

Sample Number	Location ID	Analytical Parameters	Depth (ft)		Associated Bldg. No.
PBOW-98-SO-TNTB-SS211-10210-00-01	SS211	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS212-10211-00-01	SS212	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS213-10212-00-01	SS213	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS215-10214-00-01	SS215	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS216-10215-00-01	SS216	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS217-10216-00-01	SS217	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS218-10217-00-01	SS218	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS219-10218-00-01	SS219	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS220-10219-00-01	SS220	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS221-10220-00-01	SS221	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS222-10221-00-01	SS222	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS223-10222-00-01	SS223	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS224-10223-00-01	SS224	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS225-10224-00-01	SS225	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS226-10225-00-01	SS226	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS227-10226-00-01	SS227	IMS Field Screening	0	1	NENH
PBOW-98-SO-TNTB-SS228-10227-00-01	SS228	IMS Field Screening	0	1	NENH
PBOW-98-SO-TNTB-SS229-10228-00-01	SS229	IMS Field Screening	0	1	NENH
PBOW-98-SO-TNTB-SS230-10229-00-01	SS230	IMS Field Screening	0	1	NENH
PBOW-98-SO-TNTB-SS231-10230-00-01	SS231	IMS Field Screening	0	1	NENH
PBOW-98-SO-TNTB-SS232-10231-00-01	SS232	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS233-10232-00-01	SS233	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS234-10233-00-01	SS234	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS235-10234-00-01	SS235	IMS Field Screening	0	1	476
PBOW-98-SO-TNTB-SS236-10235-00-01	SS236	IMS Field Screening	0	1	476
PBOW-98-SO-TNTB-SS237-10236-00-01	SS237	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS238-10237-00-01	SS238	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS239-10238-00-01	SS239	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS240-10239-00-01	SS240	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS241-10240-00-01	SS241	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS242-10241-00-01	SS242	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS243-10242-00-01	SS243	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS244-10243-00-01	SS244	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS245-10244-00-01	SS245	IMS Field Screening	0	1	462
PBOW-98-SO-TNTB-SS246-10245-00-01	SS246	IMS Field Screening	0	1	462
PBOW-98-SO-TNTB-SS247-10246-00-01	SS247	IMS Field Screening	0	1	461
PBOW-98-SO-TNTB-SS248-10247-00-01	SS248	IMS Field Screening	0	1	461
PBOW-98-SO-TNTB-SS249-10248-00-01	SS249	IMS Field Screening	0	1	461
PBOW-98-SO-TNTB-SS250-10249-00-01	SS250	IMS Field Screening	0	1	461
PBOW-98-SO-TNTB-SS251-10250-00-01	SS251	IMS Field Screening	0	1	412
PBOW-98-SO-TNTB-SS252-10251-00-01	SS252	IMS Field Screening	0	1	412
PBOW-98-SO-TNTB-SS253-10252-00-01	SS253	IMS Field Screening	0	1	412
PBOW-98-SO-TNTB-SS254-10253-00-01	SS254	IMS Field Screening	0	1	412
PBOW-98-SO-TNTB-SS255-10254-00-01	SS255	IMS Field Screening	0	1	412
PBOW-98-SO-TNTB-SS256-10255-00-01	SS256	IMS Field Screening	0	1	412
PBOW-98-SO-TNTB-SS257-10256-00-01	SS257	IMS Field Screening	0	1	412
PBOW-98-SO-TNTB-SS258-10257-00-01	SS258	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS259-10258-00-01	SS259	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS260-10259-00-01	SS260	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS261-10260-00-01	SS261	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS262-10261-00-01	SS262	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS263-10262-00-01	SS263	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS264-10263-00-01	SS264	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS265-10264-00-01	SS265	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS266-10265-00-01	SS266	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS267-10266-00-01	SS267	IMS Field Screening	0	1	453
PBOW-98-SO-TNTB-SS268-10267-00-01	SS268	IMS Field Screening	0	1	453
PBOW-98-SO-TNTB-SS269-10268-00-01	SS269	IMS Field Screening	0	1	451

Table 2-1

Summary of Soil Sample Locations (1998)
TNT Area B - RI Report
Former Plum Brook Ordnance Works
Sandusky, Ohio

Sample Number	Location ID	Analytical Parameters	Depth (ft)		Associated Bldg. No.
PBOW-98-SO-TNTB-SS270-10269-00-01	SS270	IMS Field Screening	0	1	451
PBOW-98-SO-TNTB-SS271-10270-00-01	SS271	IMS Field Screening	0	1	451
PBOW-98-SO-TNTB-SS272-10271-00-01	SS272	IMS Field Screening	0	1	451
PBOW-98-SO-TNTB-SS273-10272-00-01	SS273	IMS Field Screening	0	1	451
PBOW-98-SO-TNTB-SS274-10273-00-01	SS274	IMS Field Screening	0	1	NENH
PBOW-98-SO-TNTB-SS275-10274-00-01	SS275	IMS Field Screening	0	1	NENH
PBOW-98-SO-TNTB-SS276-10275-00-01	SS276	IMS Field Screening	0	1	NENH
PBOW-98-SO-TNTB-SS277-10276-00-01	SS277	IMS Field Screening	0	1	NENH
PBOW-98-SO-TNTB-SS278-10277-00-01	SS278	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS279-10278-00-01	SS279	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS280-10279-00-01	SS280	IMS Field Screening	0	1	469
PBOW-98-SO-TNTB-SS281-10280-00-01	SS281	IMS Field Screening	0	1	469
PBOW-98-SO-TNTB-SS282-10281-00-01	SS282	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS283-10282-00-01	SS283	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS284-10283-00-01	SS284	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS285-10284-00-01	SS285	IMS Field Screening	0	1	NWNH
PBOW-98-SO-TNTB-SS286-10285-00-01	SS286	IMS Field Screening	0	1	NWNH
PBOW-98-SO-TNTB-SS287-10286-00-01	SS287	IMS Field Screening	0	1	NWNH
PBOW-98-SO-TNTB-SS288-10287-00-01	SS288	IMS Field Screening	0	1	NWNH
PBOW-98-SO-TNTB-SS289-10288-00-01	SS289	IMS Field Screening	0	1	NWNH
PBOW-98-SO-TNTB-SS290-10289-00-01	SS290	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS291-10290-00-01	SS291	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS292-10291-00-01	SS292	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS293-10292-00-01	SS293	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS294-10293-00-01	SS294	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS295-10294-00-01	SS295	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS296-10295-00-01	SS296	IMS Field Screening	0	1	417-PL
PBOW-98-SO-TNTB-SS297-10296-00-01	SS297	IMS Field Screening	0	1	417-PL
PBOW-98-SO-TNTB-SS298-10297-00-01	SS298	IMS Field Screening	0	1	453
PBOW-98-SO-TNTB-SS299-10298-00-01	SS299	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS300-10299-00-01	SS300	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS301-10300-00-01	SS301	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS302-10301-00-01	SS302	IMS Field Screening	0	1	451
PBOW-98-SO-TNTB-SS303-10302-00-01	SS303	IMS Field Screening	0	1	451
PBOW-98-SO-TNTB-SS304-10303-00-01	SS304	IMS Field Screening	0	1	451
PBOW-98-SO-TNTB-SS305-10304-00-01	SS305	IMS Field Screening	0	1	412
PBOW-98-SO-TNTB-SS306-10305-00-01	SS306	IMS Field Screening	0	1	412
PBOW-98-SO-TNTB-SS307-10306-00-01	SS307	IMS Field Screening	0	1	469
PBOW-98-SO-TNTB-SS308-10307-00-01	SS308	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS309-10308-00-01	SS309	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS310-10309-00-01	SS310	IMS Field Screening	0	1	476
PBOW-98-SO-TNTB-SS311-10310-00-01	SS311	IMS Field Screening	0	1	476
PBOW-98-SO-TNTB-SS312-10311-00-01	SS312	IMS Field Screening	0	1	476
PBOW-98-SO-TNTB-SS313-10312-00-01	SS313	IMS Field Screening	0	1	476
PBOW-98-SO-TNTB-SS314-10313-00-01	SS314	IMS Field Screening	0	1	476
PBOW-98-SO-TNTB-SS315-10314-00-01	SS315	IMS Field Screening	0	1	476
PBOW-98-SO-TNTB-SS316-10315-00-01	SS316	IMS Field Screening	0	1	476
PBOW-98-SO-TNTB-SS317-10316-00-01	SS317	IMS Field Screening	0	1	476
PBOW-98-SO-TNTB-SS318-10317-00-01	SS318	IMS Field Screening	0	1	476
PBOW-98-SO-TNTB-SS319-10318-00-01	SS319	IMS Field Screening	0	1	417-PL
PBOW-98-SO-TNTB-SS320-10319-00-01	SS320	IMS Field Screening	0	1	473
PBOW-98-SO-TNTB-SS321-10320-00-01	SS321	IMS Field Screening	0	1	473
PBOW-98-SO-TNTB-SS322-10321-00-01	SS322	IMS Field Screening	0	1	462
PBOW-98-SO-TNTB-SS323-10322-00-01	SS323	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS324-10323-00-01	SS324	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS325-10324-00-01	SS325	IMS Field Screening	0	1	452
PBOW-98-SO-TNTB-SS326-10325-00-01	SS326	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS327-10326-00-01	SS327	IMS Field Screening	0	1	456

Table 2-1

Summary of Soil Sample Locations (1998)
TNT Area B - RI Report
Former Plum Brook Ordnance Works
Sandusky, Ohio

Sample Number	Location ID	Analytical Parameters	Depth (ft)		Associated Bldg. No.
PBOW-98-SO-TNTB-SS328-10327-00-01	SS328	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS329-10328-00-01	SS329	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS330-10329-00-01	SS330	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS331-10330-00-01	SS331	IMS Field Screening	0	1	456
PBOW-98-SO-TNTB-SS332-10331-00-01	SS332	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS333-10332-00-01	SS333	IMS Field Screening	0	1	466
PBOW-98-SO-TNTB-SS334-10333-00-01	SS334	IMS Field Screening	0	1	476
PBOW-98-SO-TNTB-SS335-10334-00-01	SS335	IMS Field Screening	0	1	476
PBOW-98-SO-TNTB-SS336-10335-00-01	SS336	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS337-10336-00-01	SS337	IMS Field Screening	0	1	417
PBOW-98-SO-TNTB-SS361-10360-03-04	SS361	IMS Field Screening	3	4	417
PBOW-98-SO-TNTB-SS362-10361-03-04	SS362	IMS Field Screening	3	4	417
PBOW-98-SO-TNTB-SS365-10364-04-04.5	SS365	IMS Field Screening	4	4.5	417-PL
PBOW-98-SO-TNTB-SS366-10365-03-04	SS366	IMS Field Screening	3	4	417-PL
PBOW-98-SO-TNTB-SS368-10367-03-04	SS368	IMS Field Screening	3	4	417-PL
PBOW-98-SO-TNTB-SS368-10368-06-07	SS368	IMS Field Screening	6	7	417-PL
PBOW-98-SO-TNTB-SS369-10369-02-04.5	SS369	IMS Field Screening	2	4.5	417-PL
PBOW-98-SO-TNTB-SS369-10370-07-07.5	SS369	IMS Field Screening	7	7.5	417-PL
PBOW-98-SO-TNTB-SS370-10371-02-02.5	SS370	IMS Field Screening	2	2.5	417-PL
PBOW-98-SO-TNTB-SS370-10372-04-04.5	SS370	IMS Field Screening	4	4.5	417-PL
PBOW-98-SO-TNTB-SS371-10373-02-02.5	SS371	IMS Field Screening	2	2.5	417-PL
PBOW-98-SO-TNTB-SS372-10374-01.5-02	SS372	IMS Field Screening	1.5	2	417-PL
PBOW-98-SO-TNTB-SS373-10375-0.35-04	SS373	IMS Field Screening	3.5	4	417-PL
PBOW-98-SO-TNTB-SS373-10376-07.5-08	SS373	IMS Field Screening	7.5	8	417-PL
PBOW-98-SO-TNTB-SS374-10377-03-04	SS374	IMS Field Screening	3	4	456
PBOW-98-SO-TNTB-SS375-10378-04-06	SS375	IMS Field Screening	4	6	452
PBOW-98-SO-TNTB-SS375-10379-08-10	SS375	IMS Field Screening	8	10	452
PBOW-98-SO-TNTB-SS376-10380-03-04	SS376	IMS Field Screening	3	4	466
PBOW-98-SO-TNTB-SS376-10381-07-07.5	SS376	IMS Field Screening	7	7.5	466
PBOW-98-SO-TNTB-SS377-10382-03-03.5	SS377	IMS Field Screening	3	3.5	NWNH
PBOW-98-SO-TNTB-SS378-10383-03-04	SS378	IMS Field Screening	2.5	3.5	456
PBOW-98-SO-TNTB-SS379-10384-04-05	SS379	IMS Field Screening	4	5	453
PBOW-98-SO-TNTB-SS379-10385-07.5-08.5	SS379	IMS Field Screening	7.5	8.5	453
PBOW-98-SO-TNTB-SS380-10386-04-06	SS380	IMS Field Screening	4	6	452
PBOW-98-SO-TNTB-SS380-10387-08-10	SS380	IMS Field Screening	8	10	452
PBOW-98-SO-TNTB-SS381-10388-04-06	SS381	IMS Field Screening	4	6	452
PBOW-98-SO-TNTB-SS381-10389-08-10	SS381	IMS Field Screening	8	10	452
PBOW-98-SO-TNTB-SS382-10390-04-06	SS382	IMS Field Screening	4	6	451
PBOW-98-SO-TNTB-SS382-10391-08-10	SS382	IMS Field Screening	8	10	451
PBOW-98-SO-TNTB-SS383-10392-04-06	SS383	IMS Field Screening	4	6	451
PBOW-98-SO-TNTB-SS383-10393-08-10	SS383	IMS Field Screening	8	10	451
PBOW-98-SO-TNTB-SS384-10394-04-06	SS384	IMS Field Screening	4	6	451
PBOW-98-SO-TNTB-SS384-10395-08-10	SS384	IMS Field Screening	8	10	451
PBOW-98-SO-TNTB-SS385-10396-02.5-0.35	SS385	IMS Field Screening	2.5	3.5	466
PBOW-98-SO-TNTB-SS386-10397-04.5-05	SS386	IMS Field Screening	4	4.5	466
PBOW-98-SO-TNTB-SS387-10398-02.5-03	SS387	IMS Field Screening	2.5	3	412
PBOW-98-SO-TNTB-SS388-10400-03-04	SS388	IMS Field Screening	3	4	473
PBOW-98-SO-TNTB-SS389-10401-04-06	SS389	IMS Field Screening	4	6	463
PBOW-98-SO-TNTB-SS389-10402-08-10	SS389	IMS Field Screening	8	10	463
PBOW-98-SO-TNTB-SS390-10403-04-05	SS390	IMS Field Screening	4	5	472
PBOW-98-SO-TNTB-SS391-10404-04-05	SS391	IMS Field Screening	4	5	461
PBOW-98-SO-TNTB-SS392-10405-03-05	SS392	IMS Field Screening	3	5	462
PBOW-98-SO-TNTB-SS392-10406-06-08	SS392	IMS Field Screening	6	8	462
PBOW-98-SO-TNTB-SS393-10407-04-05	SS393	IMS Field Screening	4	5	472
PBOW-98-SO-TNTB-SS393-10408-08-09	SS393	IMS Field Screening	8	9	472
PBOW-98-SO-TNTB-SS394-10409-04-05	SS394	IMS Field Screening	4	5	472
PBOW-98-SO-TNTB-SS394-10410-08-09	SS394	IMS Field Screening	8	9	472
PBOW-98-SO-TNTB-SS395-10411-04-05	SS395	IMS Field Screening	4	5	472

Table 2-1

Summary of Soil Sample Locations (1998)
TNT Area B - RI Report
Former Plum Brook Ordnance Works
Sandusky, Ohio

Sample Number	Location ID	Analytical Parameters	Depth (ft)		Associated Bldg. No.
PBOW-98-SO-TNTB-SS395-10412-08-09	SS395	IMS Field Screening	8	9	472
PBOW-98-SO-TNTB-SS396-10413-03-04	SS396	IMS Field Screening	3	4	473
PBOW-98-SO-TNTB-SS396-10414-08-10	SS396	IMS Field Screening	8	10	473
PBOW-98-SO-TNTB-SS397-10415-03-04	SS397	IMS Field Screening	3	4	473
PBOW-98-SO-TNTB-SS397-10416-05-06	SS397	IMS Field Screening	5	6	473
PBOW-98-SO-TNTB-SS398-10417-03-04	SS398	IMS Field Screening	3	4	463
PBOW-98-SO-TNTB-SS398-10418-05-06	SS398	IMS Field Screening	5	6	463
PBOW-98-SO-TNTB-SS399-10419-04-06	SS399	IMS Field Screening	4	6	463
PBOW-98-SO-TNTB-SS399-10420-08-10	SS399	IMS Field Screening	8	10	463
PBOW-98-SO-TNTB-SS400-10421-04-05	SS400	IMS Field Screening	4	5	461
PBOW-98-SO-TNTB-SS400-10422-08-09	SS400	IMS Field Screening	8	9	461
PBOW-98-SO-TNTB-SS401-10423-04-05	SS401	IMS Field Screening	4	5	461
PBOW-98-SO-TNTB-SS401-10424-08-10	SS401	IMS Field Screening	8	10	461
PBOW-98-SO-TNTB-SS402-10425-04-05	SS402	IMS Field Screening	4	5	461
PBOW-98-SO-TNTB-SS402-10426-08-10	SS402	IMS Field Screening	8	10	461
PBOW-98-SW-TNTB-SW01-12000-00-00	SW01	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	NA	NA	RBSW
PBOW-98-SD-TNTB-SD01-11000-00-00	SD01	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	NA	NA	RBSD
PBOW-98-SW-TNTB-SW02-12010-00-00	SW02	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	NA	NA	RBSW
PBOW-98-SD-TNTB-SD02-11010-00-00	SD02	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	NA	NA	RBSD
PBOW-98-SD-TNTB-SD03-11020-00-00	SD03	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	NA	NA	RBSD
PBOW-98-SD-TNTB-SD04-11030-00-00	SD04	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	NA	NA	RBSD
PBOW-98-SD-TNTB-SD05-11040-00-00	SD05	VOCs, SVOCs, Nitroaromatics, PCBs, Metals	NA	NA	RBSD

Notes:
Building No. 412 - DNT Sweating & Graining House
Building No. 415 - DNT Nitrating
Building No. 417 - Wastewater Disposal/Settling Tanks
Building No. 417-PL - Wastewater Disposal Pipeline
Building No. 451 - Mono House
Building No. 452 - Bi-Tri House
Building No. 453 - Fortifier House
Building No. 456 - Wash House
Building No. 459 - Acid & Fume Recovery
Building No. 461 - Mono House
Building No. 462 - Bi-Tri House
Building No. 463 - Fortifier House
Building No. 466 - Wash House
Building No. 469 - Acid & Fume Recovery
Building No. 471 - Mono House
Building No. 472 - Bi-Tri House
Building No. 473 - Fortifier House
Building No. 476 - Wash House
NENH - Northeast Nail House
NWNH - Northwest Nail House
RBSW - Ransom Brook Surface Water
RBSD - Ransom Brook Sediment

Table 3-1

Summary of Chemical Analyses and Methodologies
TNT Area B Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

Matrix	Analytical Parameters	Analytical Method
Soil/Sediment	TCL Volatile Organic Compounds	SW-846 8260A[a]
	TCL Semivolatile Organic Compounds	SW-846 3550B/8270C[b]
	TAL Metals	SW-846 3050B/6010B[b] for Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn 7471A[a] for Hg
	PCBs	SW-846 3550B/8082[b]
	Nitroaromatic Compounds	SW-846/8330[c]
Surface Water	TCL Volatile Organic Compounds	SW-846 8260A[a]
	TCL Semivolatile Organic Compounds	SW-846 3520C/8270C[b]
	TAL Metals	SW-846 3010A/6010B[b] for Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn 7470A[a] for Hg
	PCBs	SW-846 3520C/8082[b]
	Nitroaromatic Compounds	SW-846/8330[c] (modified)

[a]U.S. Environmental Protection Agency (EPA), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, Third Edition, Update II, September 1994.
[b]U.S. Environmental Protection Agency (EPA), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, Third Edition, Update III, December 1996.
[c]U.S. Environmental Protection Agency (EPA), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, Third Edition, Revision 1, December 1990

PCB - Polychlorinated biphenyl
TAL - Target analyte list
TCL - Target compound list

Table 4-1

Summary of Detected Analytes in Soils
TNTB RI Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

ASSOCIATED BLDG. NO.		417-PL		417-PL		466		466		456	
LOCATION		SO01		SO02		SO03		SO04		SO05	
SAMPLE NO		10500		10510		10520		10530		10540	
SAMPLE DATE		9-Nov-98		9-Nov-98		9-Nov-98		9-Nov-98		9-Nov-98	
SAMPLE DEPTH (ft)		0.5 - 2.0		3.5 - 4.0		3.0 - 4.0		5.0 - 6.0		2.5 - 3.5	
Parameter	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Volatile Organics											
2-Butanone	mg/kg										
Acetone	mg/kg	0.56	D					0.047	J	0.044	J
Carbon disulfide	mg/kg										
Ethylbenzene	mg/kg										
Toluene	mg/kg			0.0034	J			0.0039	J	0.0041	J
Total xylenes	mg/kg					0.0025	J				
Trichloroethene	mg/kg										
Semivolatile Organics											
2,4-Dinitrotoluene	mg/kg			0.66				0.28	J		
2,6-Dinitrotoluene	mg/kg			0.15	J						
2-Methylnaphthalene	mg/kg			0.12	J	0.96					
4,6-Dinitro-2-methylphenol	mg/kg										
Acenaphthene	mg/kg										
Acenaphthylene	mg/kg										
Anthracene	mg/kg										
Benzo(a)anthracene	mg/kg					0.037	J				
Benzo(a)pyrene	mg/kg					0.033	J				
Benzo(b)fluoranthene	mg/kg					0.053	J				
Benzo(ghi)perylene	mg/kg										
Benzo(k)fluoranthene	mg/kg					0.055	J				
Carbazole	mg/kg										
Chrysene	mg/kg					0.11	J				
Dibenz(a,h)anthracene	mg/kg										
Dibenzofuran	mg/kg					0.045	J				
Fluoranthene	mg/kg					0.13	J				
Fluorene	mg/kg										
Indeno(1,2,3-cd)pyrene	mg/kg										
Naphthalene	mg/kg					0.28	J				
Phenanthrene	mg/kg			0.048	J	0.28	J				
Pyrene	mg/kg					0.12	J				
Nitroaromatics											
2,4,6-Trinitrotoluene	mg/kg			0.27							
2,4-Dinitrotoluene	mg/kg			1.6				1.4			
2,6-Dinitrotoluene	mg/kg			0.49							
2-Amino-4,6-dinitrotoluene	mg/kg										
2-Nitrotoluene	mg/kg										
4-Amino-2,6-dinitrotoluene	mg/kg										
4-Nitrotoluene	mg/kg										
PCBs											
Aroclor 1254	mg/kg			0.14	NJ			0.063	N		
Aroclor 1260	mg/kg					1.3	N				
Metals											
Barium	mg/kg	496									
Beryllium	mg/kg	1.8				1		1.2			
Copper	mg/kg										
Lead	mg/kg					80.7					
Selenium	mg/kg	3.9	J								

Table 4-1

Summary of Detected Analytes in Soils
TNTB RI Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

ASSOCIATED BLDG. NO.		453		473		462		456		463	
LOCATION		SO06		SO07		SO08		SO09		SO10	
SAMPLE NO		10550		10560		10570		10580		10590	
SAMPLE DATE		9-Nov-98		10-Nov-98		9-Nov-98		11-Nov-98		10-Nov-98	
SAMPLE DEPTH (ft)		4.0 - 5.0		3.0 - 4.0		6.0 - 8.0		0.0 - 1.0		4.0 - 6.0	
Parameter	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Volatile Organics											
2-Butanone	mg/kg										
Acetone	mg/kg	0.022	J								
Carbon disulfide	mg/kg										
Ethylbenzene	mg/kg										
Toluene	mg/kg					0.0045	J			0.0026	J
Total xylenes	mg/kg										
Trichloroethene	mg/kg										
Semivolatile Organics											
2,4-Dinitrotoluene	mg/kg	3.6		0.43		3.2		0.15	J	0.044	J
2,6-Dinitrotoluene	mg/kg	2.4		0.15	J	0.49		0.046	J		
2-Methylnaphthalene	mg/kg										
4,6-Dinitro-2-methylphenol	mg/kg	0.17	J								
Acenaphthene	mg/kg										
Acenaphthylene	mg/kg										
Anthracene	mg/kg										
Benzo(a)anthracene	mg/kg										
Benzo(a)pyrene	mg/kg							0.028	J		
Benzo(b)fluoranthene	mg/kg	0.041	J					0.037	J		
Benzo(ghi)perylene	mg/kg										
Benzo(k)fluoranthene	mg/kg										
Carbazole	mg/kg										
Chrysene	mg/kg							0.042	J		
Dibenz(a,h)anthracene	mg/kg										
Dibenzofuran	mg/kg										
Fluoranthene	mg/kg							0.051	J		
Fluorene	mg/kg										
Indeno(1,2,3-cd)pyrene	mg/kg										
Naphthalene	mg/kg										
Phenanthrene	mg/kg										
Pyrene	mg/kg							0.04	J		
Nitroaromatics											
2,4,6-Trinitrotoluene	mg/kg	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.1	
2,4-Dinitrotoluene	mg/kg			1.9	J	2.1					
2,6-Dinitrotoluene	mg/kg					1					
2-Amino-4,6-dinitrotoluene	mg/kg			[illegible]	[illegible]	[illegible]	[illegible]				
2-Nitrotoluene	mg/kg										
4-Amino-2,6-dinitrotoluene	mg/kg			[illegible]	[illegible]	[illegible]	[illegible]				
4-Nitrotoluene	mg/kg										
PCBs											
Aroclor 1254	mg/kg							[illegible]	[illegible]		
Aroclor 1260	mg/kg	2.8	NJ	[illegible]	[illegible]	0.11	N				
Metals											
Barium	mg/kg										
Beryllium	mg/kg										
Copper	mg/kg										
Lead	mg/kg	61.4	J	53.5	J			53	J		
Selenium	mg/kg										

Table 4-1

Summary of Detected Analytes in Soils
TNTB RI Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

ASSOCIATED BLDG. NO.		463		472		452		456		417	
LOCATION		SO11		SO12		SO13		SO14		SO15	
SAMPLE NO		10600		10610		10620		10630		10640	
SAMPLE DATE		10-Nov-98		10-Nov-98		11-Nov-98		11-Nov-98		11-Nov-98	
SAMPLE DEPTH (ft)		8.0 - 10.0		4.0 - 5.0		0.0 - 1.0		0.0 - 1.0		0.0 - 1.0	
Parameter	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Volatile Organics											
2-Butanone	mg/kg	0.015	J								
Acetone	mg/kg	0.11	J								
Carbon disulfide	mg/kg										
Ethylbenzene	mg/kg										
Toluene	mg/kg	0.021	J	0.0032	J						
Total xylenes	mg/kg	0.0024	J								
Trichloroethene	mg/kg										
Semivolatile Organics											
2,4-Dinitrotoluene	mg/kg			4.4				0.49		0.19	J
2,6-Dinitrotoluene	mg/kg			0.62				0.065	J	0.093	J
2-Methylnaphthalene	mg/kg										
4,6-Dinitro-2-methylphenol	mg/kg										
Acenaphthene	mg/kg										
Acenaphthylene	mg/kg										
Anthracene	mg/kg									0.029	J
Benzo(a)anthracene	mg/kg							0.04	J	0.1	J
Benzo(a)pyrene	mg/kg							0.056	J	0.11	J
Benzo(b)fluoranthene	mg/kg							0.073	J	0.14	J
Benzo(ghi)perylene	mg/kg							0.037	J	0.076	J
Benzo(k)fluoranthene	mg/kg							0.074	J	0.1	J
Carbazole	mg/kg										
Chrysene	mg/kg							0.076	J	0.12	J
Dibenz(a,h)anthracene	mg/kg									0.032	J
Dibenzofuran	mg/kg										
Fluoranthene	mg/kg							0.11	J	0.16	J
Fluorene	mg/kg										
Indeno(1,2,3-cd)pyrene	mg/kg							0.037	J	0.076	J
Naphthalene	mg/kg										
Phenanthrene	mg/kg									0.083	J
Pyrene	mg/kg							0.084	J	0.14	J
Nitroaromatics											
2,4,6-Trinitrotoluene	mg/kg										
2,4-Dinitrotoluene	mg/kg			2.6						0.39	
2,6-Dinitrotoluene	mg/kg										
2-Amino-4,6-dinitrotoluene	mg/kg										
2-Nitrotoluene	mg/kg										
4-Amino-2,6-dinitrotoluene	mg/kg										
4-Nitrotoluene	mg/kg	67									
PCBs											
Aroclor 1254	mg/kg										
Aroclor 1260	mg/kg							0.23	N		
Metals											
Barium	mg/kg										
Beryllium	mg/kg										
Copper	mg/kg										
Lead	mg/kg							67.7	J		
Selenium	mg/kg										

Table 4-1

Summary of Detected Analytes in Soils
TNTB RI Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

ASSOCIATED BLDG. NO.		417		417		417		417		476	
LOCATION		SO16		SO17		SO18		SO19		SO20	
SAMPLE NO		10650		10660		10670		10680		10690	
SAMPLE DATE		11-Nov-98		11-Nov-98		11-Nov-98		11-Nov-98		11-Nov-98	
SAMPLE DEPTH (ft)		0.0 - 1.0		0.0 - 1.0		0.0 - 1.0		0.0 - 1.0		0.0 - 1.0	
Parameter	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Volatile Organics											
2-Butanone	mg/kg										
Acetone	mg/kg										
Carbon disulfide	mg/kg										
Ethylbenzene	mg/kg										
Toluene	mg/kg										
Total xylenes	mg/kg										
Trichloroethene	mg/kg										
Semivolatile Organics											
2,4-Dinitrotoluene	mg/kg	0.16	J	0.18	J	0.059	J			0.1	J
2,6-Dinitrotoluene	mg/kg	0.072	J	0.081	J						
2-Methylnaphthalene	mg/kg										
4,6-Dinitro-2-methylphenol	mg/kg										
Acenaphthene	mg/kg										
Acenaphthylene	mg/kg	0.075	J								
Anthracene	mg/kg	0.058	J	0.032	J						
Benzo(a)anthracene	mg/kg	0.16	J	0.07	J	0.056	J				
Benzo(a)pyrene	mg/kg	0.21	J	0.081	J	0.057	J			0.039	J
Benzo(b)fluoranthene	mg/kg	0.18	J	0.078	J	0.063	J			0.039	J
Benzo(ghi)perylene	mg/kg	0.13	J	0.059	J						
Benzo(k)fluoranthene	mg/kg	0.25	J	0.11	J	0.06	J				
Carbazole	mg/kg										
Chrysene	mg/kg	0.19	J	0.093	J	0.067	J			0.05	J
Dibenz(a,h)anthracene	mg/kg	0.068	J								
Dibenzofuran	mg/kg										
Fluoranthene	mg/kg	0.24	J	0.11	J	0.092	J			0.064	J
Fluorene	mg/kg										
Indeno(1,2,3-cd)pyrene	mg/kg	0.13	J	0.059	J						
Naphthalene	mg/kg										
Phenanthrene	mg/kg	0.082	J	0.047	J	0.046	J				
Pyrene	mg/kg	0.21	J	0.097	J	0.074	J			0.057	J
Nitroaromatics											
2,4,6-Trinitrotoluene	mg/kg	[illegible]		[illegible]		2.9				0.59	
2,4-Dinitrotoluene	mg/kg			0.76							
2,6-Dinitrotoluene	mg/kg										
2-Amino-4,6-dinitrotoluene	mg/kg	[illegible]		[illegible]		[illegible]				[illegible]	
2-Nitrotoluene	mg/kg										
4-Amino-2,6-dinitrotoluene	mg/kg	[illegible]		[illegible]		[illegible]				[illegible]	
4-Nitrotoluene	mg/kg										
PCBs											
Aroclor 1254	mg/kg	0.12	N								
Aroclor 1260	mg/kg			0.099	N	0.05	N	0.11	N	0.16	N
Metals											
Barium	mg/kg										
Beryllium	mg/kg										
Copper	mg/kg										
Lead	mg/kg			54.8							
Selenium	mg/kg										

Table 4-1

Summary of Detected Analytes in Soils
TNTB RI Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

ASSOCIATED BLDG. NO.		476		476		452		456		456	
LOCATION		SO21		SO22		SO23		SO24		SO25	
SAMPLE NO		10700		10710		10720		10730		10740	
SAMPLE DATE		11-Nov-98		11-Nov-98		11-Nov-98		11-Nov-98		11-Nov-98	
SAMPLE DEPTH (ft)		0.0 - 1.0		0.0 - 1.0		0.0 - 1.0		0.0 - 1.0		0.0 - 1.0	
Parameter	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Volatile Organics											
2-Butanone	mg/kg										
Acetone	mg/kg										
Carbon disulfide	mg/kg										
Ethylbenzene	mg/kg										
Toluene	mg/kg										
Total xylenes	mg/kg										
Trichloroethene	mg/kg							0.0018	J		
Semivolatile Organics											
2,4-Dinitrotoluene	mg/kg	0.082	J	0.41				0.23	J		
2,6-Dinitrotoluene	mg/kg			0.044	J			0.11	J		
2-Methylnaphthalene	mg/kg							0.053	J		
4,6-Dinitro-2-methylphenol	mg/kg										
Acenaphthene	mg/kg										
Acenaphthylene	mg/kg										
Anthracene	mg/kg										
Benzo(a)anthracene	mg/kg			0.06	J			0.08	J		
Benzo(a)pyrene	mg/kg	0.035	J	0.068	J			0.085	J		
Benzo(b)fluoranthene	mg/kg			0.086	J			0.1	J		
Benzo(ghi)perylene	mg/kg			0.067	J			0.051	J		
Benzo(k)fluoranthene	mg/kg			0.093	J			0.11	J		
Carbazole	mg/kg										
Chrysene	mg/kg	0.046	J	0.093	J			0.12	J		
Dibenz(a,h)anthracene	mg/kg										
Dibenzofuran	mg/kg										
Fluoranthene	mg/kg	0.062	J	0.16	J			0.16	J		
Fluorene	mg/kg										
Indeno(1,2,3-cd)pyrene	mg/kg			0.069	J			0.05	J		
Naphthalene	mg/kg										
Phenanthrene	mg/kg	0.046	J	0.076	J			0.071	J		
Pyrene	mg/kg	0.054	J	0.11	J			0.13	J		
Nitroaromatics											
2,4,6-Trinitrotoluene	mg/kg	0.31		2.5		0.68				0.26	
2,4-Dinitrotoluene	mg/kg										
2,6-Dinitrotoluene	mg/kg										
2-Amino-4,6-dinitrotoluene	mg/kg	0.3									
2-Nitrotoluene	mg/kg										
4-Amino-2,6-dinitrotoluene	mg/kg					0.35					
4-Nitrotoluene	mg/kg										
PCBs											
Aroclor 1254	mg/kg										
Aroclor 1260	mg/kg	0.27	N	0.1	N	0.14	N			0.089	N
Metals											
Barium	mg/kg										
Beryllium	mg/kg										
Copper	mg/kg										
Lead	mg/kg							245	J	126	J
Selenium	mg/kg										

Table 4-1

Summary of Detected Analytes in Soils
TNTB RI Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

ASSOCIATED BLDG. NO.		NWNH		456		456		456		NWNH	
LOCATION		SO26		SO27		SO28		SO29		SO30	
SAMPLE NO		10750		10760		10770		10780		10790	
SAMPLE DATE		11-Nov-98		11-Nov-98		11-Nov-98		11-Nov-98		11-Nov-98	
SAMPLE DEPTH (ft)		0.0 - 1.0		0.0 - 1.0		0.0 - 1.0		0.0 - 1.0		0.0 - 1.0	
Parameter	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Volatile Organics											
2-Butanone	mg/kg										
Acetone	mg/kg										
Carbon disulfide	mg/kg										
Ethylbenzene	mg/kg										
Toluene	mg/kg										
Total xylenes	mg/kg										
Trichloroethene	mg/kg										
Semivolatile Organics											
2,4-Dinitrotoluene	mg/kg			0.4	J			0.079	J		
2,6-Dinitrotoluene	mg/kg			0.1	J						
2-Methylnaphthalene	mg/kg			0.1	J						
4,6-Dinitro-2-methylphenol	mg/kg			0.062	J						
Acenaphthene	mg/kg										
Acenaphthylene	mg/kg										
Anthracene	mg/kg										
Benzo(a)anthracene	mg/kg			0.04	J			0.046	J	0.044	J
Benzo(a)pyrene	mg/kg			0.045	J			0.048	J	0.064	J
Benzo(b)fluoranthene	mg/kg			0.07	J			0.057	J	0.062	J
Benzo(ghi)perylene	mg/kg							0.034	J		
Benzo(k)fluoranthene	mg/kg			0.062	J					0.055	J
Carbazole	mg/kg										
Chrysene	mg/kg			0.091	J			0.058	J	0.051	J
Dibenz(a,h)anthracene	mg/kg										
Dibenzofuran	mg/kg										
Fluoranthene	mg/kg	0.046	J	0.11	J			0.096	J	0.049	J
Fluorene	mg/kg										
Indeno(1,2,3-cd)pyrene	mg/kg										
Naphthalene	mg/kg										
Phenanthrene	mg/kg			0.19	J			0.066	J		
Pyrene	mg/kg			0.11	J			0.064	J	0.047	J
Nitroaromatics											
2,4,6-Trinitrotoluene	mg/kg	0.43		[redacted]		1.1		1		0.56	
2,4-Dinitrotoluene	mg/kg										
2,6-Dinitrotoluene	mg/kg										
2-Amino-4,6-dinitrotoluene	mg/kg			[redacted]		[redacted]		[redacted]			
2-Nitrotoluene	mg/kg										
4-Amino-2,6-dinitrotoluene	mg/kg			[redacted]		[redacted]		[redacted]		0.34	
4-Nitrotoluene	mg/kg										
PCBs											
Aroclor 1254	mg/kg			[redacted]		[redacted]				[redacted]	
Aroclor 1260	mg/kg	0.048	N								
Metals											
Barium	mg/kg										
Beryllium	mg/kg										
Copper	mg/kg										
Lead	mg/kg										
Selenium	mg/kg										

Table 4-1

Summary of Detected Analytes in Soils
TNTB RI Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

ASSOCIATED BLDG. NO.		456		NEWH		452		451		466	
LOCATION		SO31		SO32		SO33		SO34		SO35	
SAMPLE NO		10800		10810		10820		10830		10840	
SAMPLE DATE		12-Nov-98		12-Nov-98		12-Nov-98		12-Nov-98		11-Nov-98	
SAMPLE DEPTH (ft)		0.0 - 1.0		0.0 - 1.0		0.0 - 1.0		0.0 - 1.0		0.0 - 1.0	
Parameter	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Volatile Organics											
2-Butanone	mg/kg										
Acetone	mg/kg										
Carbon disulfide	mg/kg			0.0022	J						
Ethylbenzene	mg/kg			0.0017	J						
Toluene	mg/kg			0.011	J						
Total xylenes	mg/kg			0.0084	J						
Trichloroethene	mg/kg										
Semivolatile Organics											
2,4-Dinitrotoluene	mg/kg	0.11	J	0.17	J						
2,6-Dinitrotoluene	mg/kg										
2-Methylnaphthalene	mg/kg	0.068	J	0.17	J						
4,6-Dinitro-2-methylphenol	mg/kg										
Acenaphthene	mg/kg			0.093	J						
Acenaphthylene	mg/kg			0.3	J						
Anthracene	mg/kg	0.027	J	0.92							
Benzo(a)anthracene	mg/kg	0.046	J	2.4							
Benzo(a)pyrene	mg/kg	0.068	J	[illegible]						0.037	J
Benzo(b)fluoranthene	mg/kg	0.075	J	1.8						0.039	J
Benzo(ghi)perylene	mg/kg	0.051	J	0.88							
Benzo(k)fluoranthene	mg/kg	0.093	J	2							
Carbazole	mg/kg			0.2	J						
Chrysene	mg/kg	0.087	J	2.4							
Dibenz(a,h)anthracene	mg/kg			0.55							
Dibenzofuran	mg/kg			0.18	J						
Fluoranthene	mg/kg	0.11	J	5				0.039	J	0.045	J
Fluorene	mg/kg			0.36	J						
Indeno(1,2,3-cd)pyrene	mg/kg	0.053	J	1							
Naphthalene	mg/kg	0.041	J	0.073	J						
Phenanthrene	mg/kg	0.083	J	3							
Pyrene	mg/kg	0.088	J	3.6						0.037	J
Nitroaromatics											
2,4,6-Trinitrotoluene	mg/kg	[illegible]		[illegible]						[illegible]	
2,4-Dinitrotoluene	mg/kg			0.38						1.6	J
2,6-Dinitrotoluene	mg/kg									0.28	J
2-Amino-4,6-dinitrotoluene	mg/kg	[illegible]		[illegible]						[illegible]	
2-Nitrotoluene	mg/kg										
4-Amino-2,6-dinitrotoluene	mg/kg	[illegible]		[illegible]							
4-Nitrotoluene	mg/kg										
PCBs											
Aroclor 1254	mg/kg										
Aroclor 1260	mg/kg	0.19	N	0.99	N	0.54	N			0.041	NJ
Metals											
Barium	mg/kg										
Beryllium	mg/kg										
Copper	mg/kg			445							
Lead	mg/kg	77.6		153							
Selenium	mg/kg										

Table 4-1

Summary of Detected Analytes in Soils
TNTB RI Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

ASSOCIATED BLDG. NO.		463		473		473		462		472	
LOCATION		SO36		SO37		SO38		SO39		SO40	
SAMPLE NO		10850		10860		10870		10880		10890	
SAMPLE DATE		12-Nov-98		12-Nov-98		12-Nov-98		12-Nov-98		12-Nov-98	
SAMPLE DEPTH (ft)		0.0 - 1.0		0.0 - 1.0		0.0 - 1.0		0.0 - 1.0		0.0 - 1.0	
Parameter	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Volatile Organics											
2-Butanone	mg/kg										
Acetone	mg/kg									0.01	J
Carbon disulfide	mg/kg										
Ethylbenzene	mg/kg										
Toluene	mg/kg										
Total xylenes	mg/kg										
Trichloroethene	mg/kg										
Semivolatile Organics											
2,4-Dinitrotoluene	mg/kg	0.057	J	0.53		0.083	J			0.054	J
2,6-Dinitrotoluene	mg/kg			0.16	J						
2-Methylnaphthalene	mg/kg	0.061	J			0.054	J				
4,6-Dinitro-2-methylphenol	mg/kg										
Acenaphthene	mg/kg	0.068	J								
Acenaphthylene	mg/kg	0.38	J								
Anthracene	mg/kg	0.56									
Benzo(a)anthracene	mg/kg	1.6		0.05	J	0.049	J	0.05	J		
Benzo(a)pyrene	mg/kg			0.055	J	0.077	J	0.055	J		
Benzo(b)fluoranthene	mg/kg	1.8		0.061	J	0.1	J	0.044	J		
Benzo(ghi)perylene	mg/kg	0.88		0.037	J	0.068	J				
Benzo(k)fluoranthene	mg/kg	1.5		0.058	J	0.087	J	0.055	J		
Carbazole	mg/kg	0.25	J								
Chrysene	mg/kg	1.8		0.07	J	0.091	J	0.054	J		
Dibenz(a,h)anthracene	mg/kg	0.48									
Dibenzofuran	mg/kg	0.13	J								
Fluoranthene	mg/kg	3.9		0.097	J	0.11	J	0.1	J		
Fluorene	mg/kg	0.17	J								
Indeno(1,2,3-cd)pyrene	mg/kg	0.96		0.037	J	0.062	J				
Naphthalene	mg/kg	0.05	J								
Phenanthrene	mg/kg	2.3		0.045	J	0.083	J				
Pyrene	mg/kg	2.7		0.071	J	0.086	J	0.071	J		
Nitroaromatics											
2,4,6-Trinitrotoluene	mg/kg	0.4				0.78					
2,4-Dinitrotoluene	mg/kg			2.3		0.34				0.26	
2,6-Dinitrotoluene	mg/kg			0.83							
2-Amino-4,6-dinitrotoluene	mg/kg										
2-Nitrotoluene	mg/kg										
4-Amino-2,6-dinitrotoluene	mg/kg					0.35					
4-Nitrotoluene	mg/kg										
PCBs											
Aroclor 1254	mg/kg										
Aroclor 1260	mg/kg	0.041	N	0.45	N	1.1	N				
Metals											
Barium	mg/kg										
Beryllium	mg/kg										
Copper	mg/kg										
Lead	mg/kg			58.4							
Selenium	mg/kg									2.4	

Table 4-1

Summary of Detected Analytes in Soils
TNTB RI Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

J - Indicates an estimated value.

N - Compound is tentatively identified.

D - Sample required dilution in order to be within calibration range; reported values are adjusted to reflect the dilution.

Shaded text exceeds risk based remediation concentration presented in Volume II of this report.

Table 4-2

Building 412 DNT Sweating and Graining House
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS107	10106	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS108	10107	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS109	10108	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS110	10109	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS111	10110	0-1	0.18	U	0.17	U	[illegible]	[illegible]	4.0	U	0.18	UJ	0.18	UJ
SS112	10111	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS113	10112	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS114	10113	0-1	0.18	U	0.17	U	[illegible]	[illegible]	4.0	U	0.18	UJ	0.18	UJ
SS115	10114	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS116	10115	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS117	10116	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS251	10250	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS252	10251	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS253	10252	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS254	10253	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS255	10254	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS256	10255	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS257	10256	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS305	10304	0-1	0.18	U	0.17	U	[illegible]	[illegible]	4.0	U	0.18	UJ	0.18	UJ
SS306	10305	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS387	10398	2.5-3.0	0.18	U	0.17	U	[illegible]	[illegible]	4.0	U	0.18	UJ	0.18	UJ
SS387	10399	5-6	0.18	U	0.17	U	4.0	UD	4.0	UD	0.18	UJD	0.18	UJD

U - not detected above reporting limit
J - reported value is an estimated value.
D - sample required dilution in order to be within the calibration range; reported values are adjusted to reflect the dilution.
Shaded text indicates concentration above detection limit.
Bold text indicates concentration above risk based remediation concentration presented in Volume II of this report.

Table 4-3

Building 415 DNT Nitrating Building
Field Screening Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS118	10117	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS119	10118	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS120	10119	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS121	10120	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS122	10121	0-1	0.18	U			4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS123	10122	0-1	0.18	U			4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS124	10123	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS125	10124	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS126	10125	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS190	10189	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS191	10190	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ

U - not detected above reporting limit
J - reported value is an estimated value.
D - sample required dilution in order to be within the calibration range; reported values are adjusted to reflect the dilution.
Shaded text indicates concentration above detection limit.
Bold text indicates concentration above risk based remediation concentration presented in Volume II of this report.
<0.1 - compound present but at a non-quantifiable concentration.

Table 4-4

Building 417 Wastewater Disposal Settling Tanks
Field Screening Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

(Page 1 of 2)

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS047	10046	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS048	10047	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS049	10048	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS050	10049	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS051	10050	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS052	10051	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS053	10052	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS054	10053	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS055	10054	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS056	10055	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS057	10056	0-1	0.60	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS058	10057	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS237	10236	0-1	[illegible]	[illegible]	[illegible]	[illegible]	67	UD	67	UD	3.0	UJD	3.0	UJD
SS238	10237	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS239	10238	0-1	[illegible]	[illegible]	[illegible]	[illegible]	80	UD	80	UD	3.6	UJD	3.6	UJD
SS240	10239	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS241	10240	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS242	10241	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS243	10242	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS244	10243	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS282	10281	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS283	10282	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS284	10283	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS336	10335	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ

Table 4-4

Building 417 Wastewater Disposal Settling Tanks
Field Screening Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

(Page 2 of 2)

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS337	10336	0-1					4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS361	10360	3-4	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS362	10361	3-4	0.18	U			4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO15	10645	0-1					4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO16	10655	0-1					4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO17	10665	0-1					4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO18	10675	0-1					4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO19	10685	0-1	0.18	U			4.0	U	4.0	U	0.18	UJ	0.18	UJ

U - not detected above reporting limit.
J - reported value is an estimated value.
D - sample required dilution in order to be within the calibration range; reported values are adjusted to reflect the dilution.
Shaded text indicates concentration above detection limit.
Bold text indicates concentration above risk based remediation concentration presented in Volume II of this report.
<0.1 - compound present but at a non-quantifiable concentration.

Table 4-5

Wastewater Disposal Pipelines
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS296	10295	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS297	10296	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS319	10318	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS363	NC	NC	NC		NC		NC		NC		NC		NC	
SS364	NC	NC	NC		NC		NC		NC		NC		NC	
SS365	10364	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS366	10365	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS367	NC	NC	NC		NC		NC		NC		NC		NC	
SS368	10367	3-4	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS368	10368	6-7	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS369	10369	2.5-4.5	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS369	10370	7-7.5	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS370	10371	2-2.5	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS370	10372	4-4.5	18	U	[illegible]	[illegible]	400	UD	400	UD	18	UJD	18	UJD
SS371	10373	2-2.5	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS372	10374	1.5-2.0	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS373	10375	3.5-4	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS373	10376	7.5-8.0	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO01	10505	0.5-2.0	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO02	10515	3.5-4.0	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ

U - not detected above reporting limit.
J - reported value is an estimated value.
D - sample required dilution in order to be within the calibration range; reported values are adjusted to reflect the dilution.
Shaded text indicates concentration above detection limit.
Bold text indicates concentration above risk based remediation concentration presented in Volume II of this report.
<0.1 - compound present but at a non-quantifiable concentration.
NC- not collected, bedrock encountered ato 1.5 feet below ground surface.

Table 4-6

Building 451 Mono House
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

(Page 1 of 2)

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS137	10136	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS138	10137	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS139	10138	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS140	10139	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS141	10140	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS142	10141	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS143	10142	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS144	10143	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS145	10144	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS146	10145	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS147	10146	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS148	10147	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS149	10148	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS269	10268	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS270	10269	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS271	10270	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS272	10271	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS273	10272	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS302	10301	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS303	10302	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS304	10303	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS382	10390	4-6	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS382	10391	8-10	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS383	10392	4-6	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ

Table 4-6

Building 451 Mono House
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS383	10393	8-10	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS384	10394	4-6	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS384	10395	8-10					4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO34	10835	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ

U - not detected above reporting limit.
J - reported value is an estimated value.
D - sample required dilution in order to be within the calibration range; reported values are adjusted to reflect the dilution.
Shaded text indicates concentration above detection limit.
Bold text indicates concentration above risk based remediation concentration presented in Volume II of this report.
<0.1 - compound present but at a non-quantifiable concentration.

Table 4-7

Building 452 Fortifier House
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

(Page 1 of 2)

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS150	10149	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS151	10150	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS152	10151	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS153	10152	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS154	10153	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS155	10154	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS156	10155	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS157	10156	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS158	10157	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS159	10158	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS160	10159	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS161	10160	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS162	10161	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS163	10162	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS194	10193	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS258	10257	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS259	10258	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS260	10259	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS261	10260	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS262	10261	0-1	18	UD	[illegible]	[illegible]	400	UD	400	UD	18	UJD	18	UJD
SS263	10262	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS264	10263	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS265	10264	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS266	10265	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ

Table 4-7

Building 452 Fortifier House
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS290	10289	0-1	6	UD	[illegible]	[illegible]	130	UD	130	UD	6	UJD	6	UJD
SS291	10290	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS299	10298	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS300	10299	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS301	10300	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS323	10322	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS324	10323	0-1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	0.18	UJ	0.18	UJ
SS325	10324	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS375	10378	4-6	1800	U	[illegible]	[illegible]	40000	UD	40000	UD	1800	UJD	1800	UJD
SS375	10379	8-10	18	U	[illegible]	[illegible]	400	UD	400	UD	18	UJD	18	UJD
SS380	10386	4-6	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS380	10387	8-10	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS381	10388	4-6	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS381	10389	8-10	[illegible]	[illegible]	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO13	10625	4-5	1800	UD	[illegible]	[illegible]	40000	UD	40000	UD	1800	UJD	1800	UJD
SO23	10725	0-1	18	UD	[illegible]	[illegible]	400	UD	400	UD	18	UJD	18	UJD
SO33	10825	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ

U - not detected above reporting limit.
J - reported value is an estimated value.
D - sample required dilution in order to be within the calibration range; reported values are adjusted to reflect the dilution.
Shaded text indicates concentration above detection limit.
Bold text indicates concentration above risk based remediation concentration presented in Volume II of this report.
<0.1 - compound present but at a non-quantifiable concentration.

Table 4-8

Building 453 Bi-Tri House
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS164	10163	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS165	10164	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS166	10165	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS167	10166	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS168	10167	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS169	10168	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS170	10169	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS267	10266	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS268	10267	0-1					4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS298	10297	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS379	10384	4-5	6	UD			130	UD	130	UD	6.0	UJD	6.0	UJD
SS379	10385	7.5-8.5	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO06	10555	4-5	220	UD			5000	UD	5000	UD	220	UJD	220	UJD

U - not detected above reporting limit.
J - reported value is an estimated value.
D - sample required dilution in order to be within the calibration range; reported values are adjusted to reflect the dilution.
Shaded text indicates concentration above detection limit.
Bold text indicates concentration above risk based remediation concentration presented in Volume II of this report.
<0.1 - compound present but at a non-quantifiable concentration.

Table 4-9

Building 456 Wash House
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

(Page 1 of 3)

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS171	10170	0-1	0.092	U	0.086	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS172	10171	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS173	10172	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS174	10173	0-1	12.5	UD	2.30	UD	1000	UD	1000	UD	45	UJD	45	UJD
SS175	10174	0-1	0.19	U	0.172	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS176	10175	0-1	2.40	UD	2.57	UD	500	UD	500	UD	22.5	UJD	22.5	UJD
SS177	10176	0-1	0.19	U	0.179	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS178	10177	0-1	0.17	U	0.16	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS179	10178	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS180	10179	0-1	0.165	U	0.156	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS181	10180	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS182	10181	0-1	0.091	U	0.176	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS210	10209	0-1	360	UD	1.00	UD	8000	UD	8000	UD	360	UJD	360	UJD
SS211	10210	0-1	1800	UD	3.00	UD	40000	UD	40000	UD	1800	UJD	1800	UJD
SS212	10211	0-1	360	UD	1.70	UD	8000	UD	8000	UD	360	UJD	360	UJD
SS213	10212	0-1	0.531	UD	1.4	UD	13.3	UD	13.3	UD	0.6	UJD	0.6	UJD
SS215	10214	0-1	0.40	UD	0.0[illegible]	UD	8.0	UD	8.0	UD	0.36	UJD	0.36	UJD
SS216	10215	0-1	0.091	U	0.[illegible]	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS217	10216	0-1	0.165	U	0.156	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS218	10217	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS219	10218	0-1	0.091	U	0.176	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS220	10219	0-1	0.091	U	0.156	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ

Table 4-9

Building 456 Wash House
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS221	10220	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS222	10221	0-1	[illegible]	[illegible]	[illegible]	[illegible]	133	UD	133	UD	6.0	UJD	6.0	UJD
SS223	10222	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS224	10223	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS225	10224	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS226	10225	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS278	10277	0-1	0.18	U	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	0.18	UJ	0.18	UJ
SS292	10291	0-1	[illegible]	[illegible]	[illegible]	[illegible]	40	UD	40	UD	1.8	UJD	1.8	UJD
SS293	10292	0-1	18	UD	[illegible]	[illegible]	400	UD	400	UD	18	UJD	18	UJD
SS294	10293	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS295	10294	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS326	10325	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS327	10326	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS328	10327	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS329	10328	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS330	10329	0-1	1.8	UD	[illegible]	[illegible]	40	UD	40	UD	1.8	UJD	1.8	UJD
SS331	10330	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS374	10377	3-4	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS378	10383	2.5-3.5	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO05	10545	2.5-3.5	18	UD	[illegible]	[illegible]	400	UD	400	UD	18	UJD	18	UJD
SO09	10585	0-1	18	UD	[illegible]	[illegible]	400	UD	400	UD	18	UJD	18	UJD
SO14	10635	0-1	180	UD	[illegible]	[illegible]	4000	UD	4000	UD	1800	UJD	1800	UJD

Table 4-9

Building 456 Wash House
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SO24	10735	0-1	18	UD	[redacted]		400	UD	400	UD	18	UJD	18	UJD
SO27	10765	0-1	[redacted]		[redacted]		130	UD	130	UD	6.0	UJD	6.0	UJD
SO28	10775	0-1	[redacted]		[redacted]		40	UD	40	UD	1.8	UJD	1.8	UJD
SO29	10785	0-1	[redacted]		[redacted]		4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO31	10805	0-1	9.0	UD	[redacted]		200	UD	200	UD	9.0	UJD	9.0	UJD

U - not detected above reporting limit.
J - reported value is an estimated value.
D - sample required dilution in order to be within the calibration range; reported values are adjusted to reflect the dilution.
Shaded text indicates concentration above detection limit.
Bold text indicates concentration above risk based remediation concentration presented in Volume II of this report.
<0.1 - compound present but at a non-quantifiable concentration.

Table 4-10

Northeast Nail House
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS065	10064	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS183	10182	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS184	10183	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS185	10184	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS186	10185	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS187	10186	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS188	10187	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS189	10188	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS197	10196	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS198	10197	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS227	10226	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS228	10227	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS229	10228	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS230	10229	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS231	10230	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS274	10273	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS275	10274	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS276	10275	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS277	10276	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO32	10815	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ

U - not detected above reporting limit.
J - reported value is an estimated value.
D - sample required dilution in order to be within the calibration range; reported values are adjusted to reflect the dilution.
Shaded text indicates concentration above detection limit.
Bold text indicates concentration above risk based remediation concentration presented in Volume II of this report.
<0.1 - compound present but at a non-quantifiable concentration.

Table 4-11

Building 459 Acid Fume Recovery Building
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS127	10126	0-1					4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS128	10127	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS129	10128	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS130	10129	0-1	0.18	U	0.01	J	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS131	10130	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS132	10131	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS133	10132	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS134	10133	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS135	10134	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS136	10135	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS199	10198	0-1							4.0	U	0.18	UJ	0.18	UJ

U - not detected above reporting limit.
J - reported value is an estimated value.
D - sample required dilution in order to be within the calibration range; reported values are adjusted to reflect the dilution.
Shaded text indicates concentration above detection limit.
Bold text indicates concentration above risk based remediation concentration presented in Volume II of this report.
<0.1 - compound present but at a non-quantifiable concentration.

Table 4-12

Building 461 Mono House
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS091	10090	0-1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	0.18	UJ	0.18	UJ
SS092	10091	0-1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	0.18	UJ	0.18	UJ
SS093	10092	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS094	10093	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS095	10094	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS200	10199	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS247	10246	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS248	10247	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS249	10248	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS250	10249	0-1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	0.18	UJ	0.18	UJ
SS391	10404	4-5	0.45	U	[illegible]	[illegible]	10	UD	10	UD	0.45	UJD	0.45	UJD
SS400	10421	4-5	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS400	10422	8-9	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS401	10423	4-5	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS401	10424	8-9	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS402	10425	4-5	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS402	10426	8-9	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ

U - not detected above reporting limit.
J - reported value is an estimated value.
D - sample required dilution in order to be within the calibration range; reported values are adjusted to reflect the dilution.
Shaded text indicates concentration above detection limit.
Bold text indicates concentration above risk based remediation concentration presented in Volume II of this report.
<0.1 - compound present but at a non-quantifiable concentration.

Table 4-13

Building 462 Bi-Tri House
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS081	10080	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS082	10081	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS083	10082	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS084	10083	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS085	10084	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS086	10085	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS087	10086	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS088	10087	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS089	10088	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS090	10089	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS245	10244	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS246	10245	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS322	10321	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS392	10405	3-5	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS392	10406	6-8	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO08	10575	6-8	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO39	10885	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ

U - not detected above reporting limit.
J - reported value is an estimated value.
D - sample required dilution in order to be within the calibration range; reported values are adjusted to reflect the dilution.
Shaded text indicates concentration above detection limit.
Bold text indicates concentration above risk based remediation concentration presented in Volume II of this report.
<0.1 - compound present but at a non-quantifiable concentration.

Table 4-14

Building 463 Fortifier House
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS059	10058	0-1	0.18	U			4	U	4	U	0.18	UJ	0.18	UJ
SS060	10059	0-1					4	U	4	U	0.18	UJ	0.18	UJ
SS061	10060	0-1	0.18	U			4	U	4	U	0.18	UJ	0.18	UJ
SS062	10061	0-1					4	U	4	U	0.18	UJ	0.18	UJ
SS063	10062	0-1					4	U	4	U	0.18	UJ	0.18	UJ
SS064	10063	0-1	0.18	U			4	U	4	U	0.18	UJ	0.18	UJ
SS389	10401	4-6	0.45	U			10	UD	10	UD	0.45	UJD	0.45	UJD
SS389	10402	8-10							400	UD	18	UJD	18	UJD
SS398	10417	3-4					4	U	4	U	0.18	UJ	0.18	UJ
SS398	10418	5-6					4	U	4	U	0.18	UJ	0.18	UJ
SS399	10419	4-6	0.18	U	0.17	U	4	U	4	U	0.18	UJ	0.18	UJ
SS399	10420	8-10	0.18	U	0.17	U	4	U	4	U	0.18	UJ	0.18	UJ
SO10	10595	4-6	0.18	U			4	U	4	U	0.18	UJ	0.18	UJ
SO11	10605	8-10					400	UD	400	UD	18	UJD	18	UJD
SO36	10855	0-1	0.18	U			4	U	4	U	0.18	UJ	0.18	UJ

U - not detected above reporting limit.
J - reported value is an estimated value.
D - sample required dilution in order to be within the calibration range; reported values are adjusted to reflect the dilution.
Shaded text indicates concentration above detection limit.
Bold text indicates concentration above risk based remediation concentration presented in Volume II of this report.
<0.1 - compound present but at a non-quantifiable concentration.

Table 4-15

Building 466 Wash House
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

(Page 1 of 2)

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS066	10065	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS067	10066	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS068	10067	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS069	10068	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS070	10069	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS071	10070	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS072	10071	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS073	10072	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS074	10073	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS075	10074	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS076	10075	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS077	10076	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS078	10077	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS079	10078	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS080	10079	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS232	10231	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS233	10232	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS234	10233	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS279	10278	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS308	10307	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS309	10308	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS332	10331	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS333	10332	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS376	10380	3-4	[illegible]	[illegible]	[illegible]	[illegible]	400	UD	400	UD	18	UJD	18	UJD

Table 4-15

Building 466 Wash House
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

(Page 2 of 2)

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS376	10381	7.0-7.5	1.2	UD			27	UD	27	UD	1.2	UJD	1.2	UJD
SS385	10396	2.5-3.5	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS386	10397	4.0-4.5	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO03	10525	3-4					400	UD	400	UD	18	UJD	18	UJD
SO04	10535	5-6	0.06	JD			4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO25	10745	0-1					4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO35	10845	0-1	0.18	U			4.0	U	4.0	U	0.18	UJ	0.18	UJ

U - not detected above reporting limit.
J - reported value is an estimated value.
D - sample required dilution in order to be within the calibration range; reported values are adjusted to reflect the dilution.
Shaded text indicates concentration above detection limit.
Bold text indicates concentration above risk based remediation concentration presented in Volume II of this report.
<0.1 - compound present but at a non-quantifiable concentration.

Table 4-16

Northwest Nail House
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS042	10041	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS043	10042	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS044	10043	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS045	10044	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS046	10045	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS195	10194	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS196	10195	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS204	10203	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS205	10204	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS206	10205	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS207	10206	0-1	[illegible]	[illegible]	[illegible]	[illegible]	12	UD	12	UD	0.6	UJD	0.6	UJD
SS208	10207	0-1	18	UD	[illegible]	[illegible]	400	UD	400	UD	18	UJD	18	UJD
SS209	10208	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS285	10284	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS286	10285	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS287	10286	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS288	10287	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS289	10288	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS377	10382	3.0-3.5	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO26	10755	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO30	10795	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ

U - not detected above reporting limit.
J - reported value is an estimated value.
D - sample required dilution in order to be within the calibration range; reported values are adjusted to reflect the dilution.
Shaded text indicates concentration above detection limit.
Bold text indicates concentration above risk based remediation concentration presented in Volume II of this report.
<0.1 - compound present but at a non-quantifiable concentration.

Table 4-17

Building 469 Acid Fume Recovery Building
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS096	10095	0-1	0.18	U					4.0	U	0.18	UJ	0.18	UJ
SS097	10096	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS098	10097	0-1	0.18	U					4.0	U	0.18	UJ	0.18	UJ
SS099	10098	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS100	10099	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS101	10100	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS102	10101	0-1	0.18	U			4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS103	10102	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS104	10103	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS105	10104	0-1	0.18	U			4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS106	10105	0-1	0.18	U			4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS192	10191	0-1	0.18	U			4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS280	10279	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS281	10280	0-1	0.18	U			4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS307	10306	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ

U - not detected above reporting limit.
J - reported value is an estimated value.
D - sample required dilution in order to be within the calibration range; reported values are adjusted to reflect the dilution.
Shaded text indicates concentration above detection limit.
Bold text indicates concentration above risk based remediation concentration presented in Volume II of this report.
<0.1 - compound present but at a non-quantifiable concentration.

Table 4-18

Building 471 Mono House
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS001	10000	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS002	10001	0-1	0.18	U	[redacted]		4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS003	10002	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS004	10003	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS005	10004	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS006	10005	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS007	10006	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ

U - not detected above reporting limit.
J - reported value is an estimated value.
D - sample required dilution in order to be within the calibration range; reported values are adjusted to reflect the dilution.
Shaded text indicates concentration above detection limit.
Bold text indicates concentration above risk based remediation concentration presented in Volume II of this report.
<0.1 - compound present but at a non-quantifiable concentration.

Table 4-19

Building 472 Bi-Tri House
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS008	10007	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS009	10008	0-1	[illegible]	[illegible]	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS010	10009	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS011	10010	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS012	10011	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS013	10012	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS014	10013	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS015	10014	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS016	10015	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS017	10016	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS018	10017	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS019	10018	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS390	10403	4-5	[illegible]	[illegible]	[illegible]	[illegible]	80	UD	80	UD	3.6	UJD	3.6	UJD
SS393	10407	4-5	[illegible]	[illegible]	[illegible]	[illegible]	130	UD	130	UD	6.0	UJD	6.0	UJD
SS393	10408	8-9	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS394	10409	4-5	18	UD	[illegible]	[illegible]	400	UD	400	UD	18	UJD	18	UJD
SS394	10410	8-9	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS395	10411	4-5	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS395	10412	8-9	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO12	10615	4-5	18	UD	[illegible]	[illegible]	400	UD	400	UD	18	UJD	18	UJD
SO40	10895	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ

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J - reported value is an estimated value.
D - sample required dilution in order to be within the calibration range; reported values are adjusted to reflect the dilution.
Shaded text indicates concentration above detection limit.
Bold text indicates concentration above risk based remediation concentration presented in Volume II of this report.
<0.1 - compound present but at a non-quantifiable concentration.

Table 4-20

Building 473 Fortifier House
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS020	10019	0-1					4	U	4	U	0.18	UJ	0.18	UJ
SS021	10020	0-1					4	U	4	U	0.18	UJ	0.18	UJ
SS022	10021	0-1	0.18	U			4	U	4	U	0.18	UJ	0.18	UJ
SS023	10022	0-1	0.18	U	0.17	U	4	U	4	U	0.18	UJ	0.18	UJ
SS024	10023	0-1	0.18	U	0.17	U	4	U	4	U	0.18	UJ	0.18	UJ
SS193	10192	0-1	0.18	U	0.17	U	4	U	4	U	0.18	UJ	0.18	UJ
SS320	10319	0-1					4	U	4	U	0.18	UJ	0.18	UJ
SS321	10320	0-1	0.18	U			4	U	4	U	0.18	UJ	0.18	UJ
SS388	10400	3-4	3.60	JD			80	UD	80	UD	3.6	UJD	3.6	UJD
SS396	10413	3-4					4	U	4	U	0.18	UJ	0.18	UJ
SS396	10414	8-10	0.18	U	0.17	U	4	U	4	U	0.18	UJ	0.18	UJ
SS397	10415	3-4					4	U	4	U	0.18	UJ	0.18	UJ
SS397	10416	5-6	0.18	U			4	U	4	U	0.18	UJ	0.18	UJ
SO07	10565	3-4					27	UD	27	UD	1.2	UJD	1.2	UJD
SO37	10865	0-1					4	U	4	U	0.18	UJ	0.18	UJ
SO38	10875	0-1	0.18	U	0.17	U	4	U	4	U	0.18	UJ	0.18	UJ

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J - reported value is an estimated value.
D - sample required dilution in order to be within the calibration range; reported values are adjusted to reflect the dilution.
Shaded text indicates concentration above detection limit.
Bold text indicates concentration above risk based remediation concentration presented in Volume II of this report.
<0.1 - compound present but at a non-quantifiable concentration.

Table 4-21

Building 476 Wash House
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

Boring No.	Sample No.	Sample Depth (ft)	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS037	10036	0-1	[illegible]	[illegible]	[illegible]	[illegible]	20	UD	20	UD	0.9	UJD	0.9	UJD
SS038	10037	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	100	U	0.18	UJ	0.18	UJ
SS039	10038	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS040	10039	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS235	10234	0-1	[illegible]	[illegible]	[illegible]	[illegible]	20	UD	20	UD	0.9	UJD	0.9	UJD
SS236	10235	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS310	10309	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS311	10310	0-1	180	UD	[illegible]	[illegible]	4000	UD	4000	UD	180	UJD	180	UJD
SS312	10311	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS313	10312	0-1	0.18		[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS314	10313	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS315	10314	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS316	10315	0-1	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS317	10316	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS318	10317	0-1	0.18	U	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS334	10333	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS335	10334	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO20	10695	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO21	10705	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SO22	10715	0-1	[illegible]	[illegible]	[illegible]	[illegible]	4.0	U	4.0	U	0.18	UJ	0.18	UJ

U - not detected above reporting limit.
J - reported value is an estimated value.
D - sample required dilution in order to be within the calibration range; reported values are adjusted to reflect the dilution.
Shaded text indicates concentration above detection limit.
Bold text indicates concentration above risk based remediation concentration presented in Volume II of this report.
<0.1 - compound present but at a non-quantifiable concentration.

Table 4-22

Building 479 Acid and Fume Recovery Building
Field Screening Analytical Results
TNT B Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

Boring No.	Sample No.	Analysis Date	2A4,6 DNT		2,4,6 TNT		2,4 DNT		2,6 DNT		4A2,6 DNT		1,3,5 TNB	
			Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual	Result (ppm)	Qual
SS025	10024	11/12/98	0.18	U			4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS026	10025	11/12/98	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS027	10026	11/01/98	0.18	U			4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS028	10027	11/12/98	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS029	10028	11/12/98	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS030	10029	11/12/98	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS031	10030	11/12/98	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS032	10031	11/12/98	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS033	10032	11/12/98	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS034	10033	11/12/98	0.18	U	0.17	U	4.0	U	4.0	U	0.18	UJ	0.18	UJ
SS035	10034	11/01/98	0.18	U			4.0	U	4.0	U	0.18	UJ	0.18	UJ

U - not detected above reporting limit.
J - reported value is an estimated value.
D - sample required dilution in order to be within the calibration range; reported values are adjusted to reflect the dilution.
Shaded text indicates concentration above detection limit.
Bold text indicates concentration above risk based remediation concentration presented in Volume II of this report.
<0.1 - compound present but at a non-quantifiable concentration.

Table 4-23

Summary of Analytes Detected in Surface Water
TNTB Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

LOCATION		TNTB-SW01		TNTB-SW02	
SAMPLE NO.		12000		12010	
SAMPLE DATE		4-Nov-98		4-Nov-98	
Parameter	Units	Result	Qual	Result	Qual
VOCs					
1,1-Dichloroethane	µg/L			0.51	J
2-Butanone	µg/L	1.2	J		
Carbon disulfide	µg/L	1.2			
Metals					
Aluminum	µg/L	14900	J	969	J
Arsenic	µg/L	21.1		30.9	J
Calcium	µg/L	132000		124000	
Chromium	µg/L	18.8		11.5	J
Copper	µg/L	34.2			
Iron	µg/L	267		683	J
Lead	µg/L	20.5		7.8	J
Magnesium	µg/L	31900		24400	
Manganese	µg/L	555		855	
Nickel	µg/L	43.1			
Potassium	µg/L	13300			
Selenium	µg/L			6	J
Sodium	µg/L	20700		18500	
Zinc	µg/L	58.8		57.8	J

J - reported value is an estimated concentration

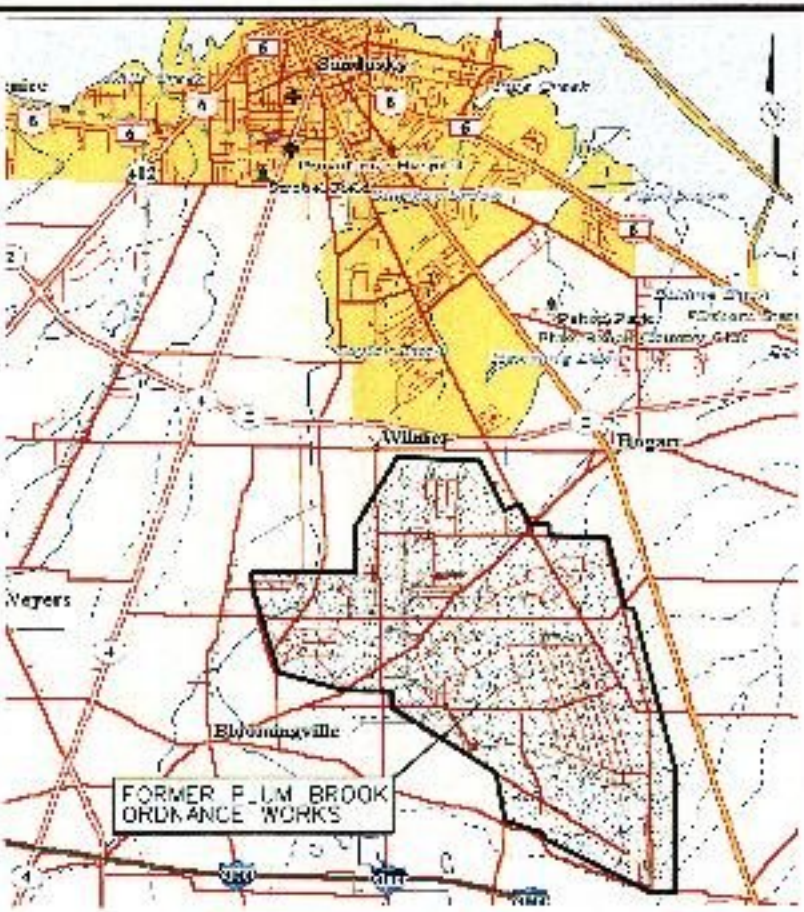
Table 4-24

Summary of Analytes Detected in Sediment
TNTB Remedial Investigation
Former Plum Brook Ordnance Works, Sandusky, Ohio

LOCATION		TNTB-SD01		TNTB-SD02		TNTB-SD03		TNTB-SD04		TNTB-SD05	
SAMPLE NO.		11000		11010		11020		11030		11040	
SAMPLE DATE		4-Nov-98		4-Nov-98		4-Nov-98		4-Nov-98		4-Nov-98	
SAMPLE DEPTH (FT)		0.0-0.5		0.0-0.5		0.0-0.5		0.0-0.5		0.0-0.5	
Parameter	Units	Result	Qual	Result	Qual	Result	Qual			Result	Qual
VOCs											
2-Butanone	mg/kg	0.062	J	0.012	J	0.047	J			0.0072	J
Acetone	mg/kg	0.27	J	0.061	J	0.24	J			0.048	J
Carbon disulfide	mg/kg			0.0025	J						
SVOCs											
2-Methylnaphthalene	mg/kg			0.38	J						
Benzo(a)pyrene	mg/kg									0.047	J
Fluoranthene	mg/kg									0.082	J
Naphthalene	mg/kg			0.078	J						
Phenanthrene	mg/kg			0.17	J						
Pyrene	mg/kg									0.059	J
Metals											
Aluminum	mg/kg	10200		4210		20000		19500		10700	
Arsenic	mg/kg	15.9	J	17.4	J	26.4	J	19.2	J	32.5	J
Barium	mg/kg	91.7		57.4		174		116		71.1	
Beryllium	mg/kg					6.9		6.9		1.4	
Calcium	mg/kg	3650		1580		6290		10200		2240	
Chromium	mg/kg	14.4		11.3		24.9		19.1		15.8	
Cobalt	mg/kg					137		74.2			
Copper	mg/kg	43.5		40.2		58.9		54.3		66	
Iron	mg/kg	28800		26400		175000		196000		42800	
Lead	mg/kg	22.7	J	15.4	J	24.8	J	16.4	J	25.8	J
Magnesium	mg/kg									1350	
Manganese	mg/kg	58.1		89.2		2060		542		104	
Nickel	mg/kg	31.2		15.9		165		178		36.4	
Potassium	mg/kg	1710		1450				3320		1810	
Selenium	mg/kg			0.86	J	3.4	J	4	J	1.8	J
Zinc	mg/kg	31.7		31.3		313		340		90.2	

J - reported value is an estimated concentration

FIGURES

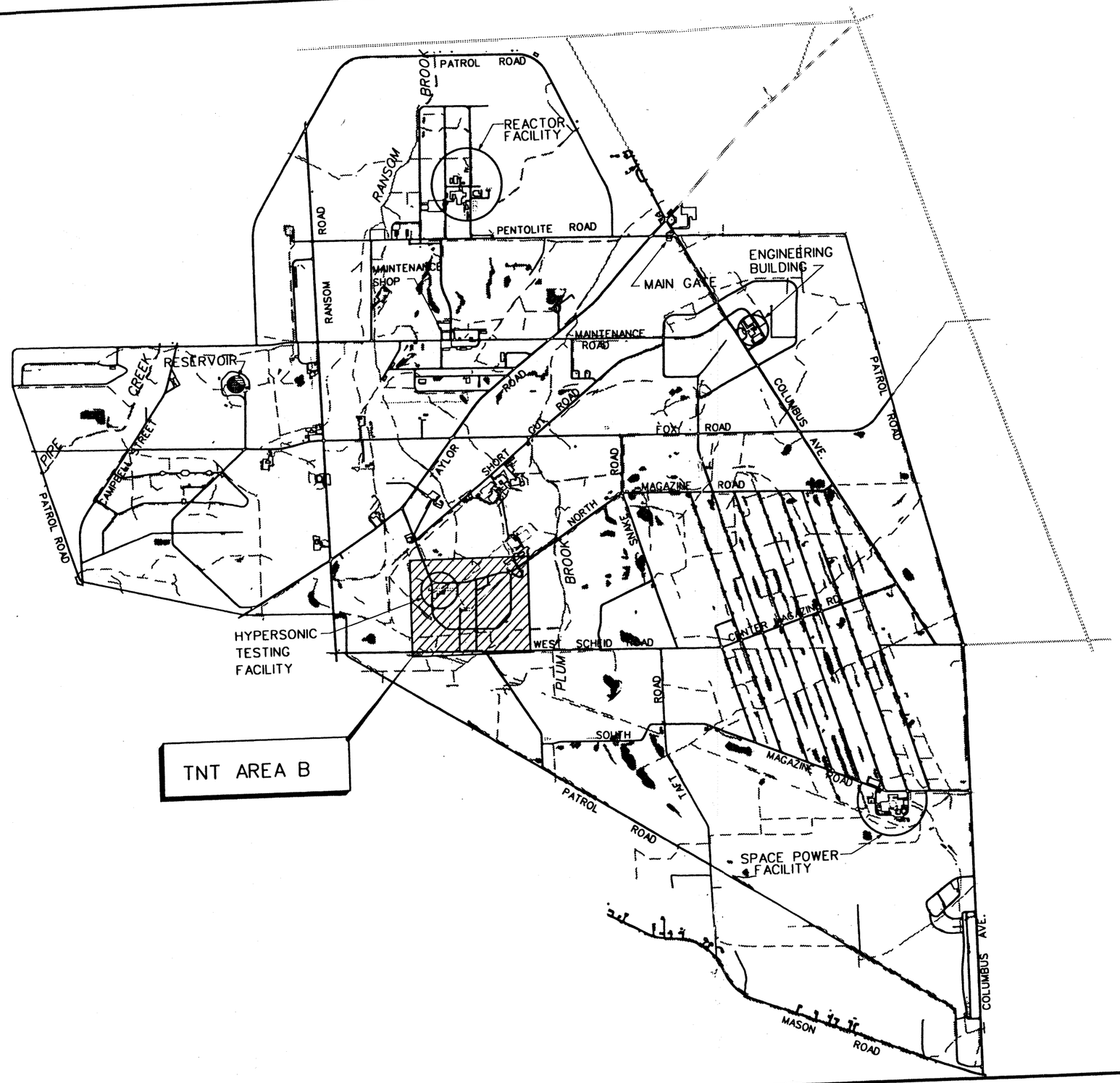


NOT TO SCALE

FIGURE 1-1
VICINITY MAP

FORMER PLUM BROOK ORDNANCE WORKS
SANDUSKY, OHIO

IT CORPORATION
A Member of The IT Group



LEGEND:

- BUILDINGS
- STREAMS OR DITCHES
- ROAD
- SURFACE WATER
- AREA OF CONCERN

SCALE

0 2400 4800 FEET

FIGURE 1-2
TNT AREA B LOCATION MAP

FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
A Member of The IT Group

STARTING DATE: 12/16/97	DATE LAST	DRAFT. CHCK. BY:	INITIATOR: D. KESSLER	DWG. NO. 616es.015
DRAWN BY: D. BILLINGSLEY	DRAWN BY:	ENGR. CHCK. BY: D. KESSLER	PROJ. MGR.: M.SPANGBERG	PROJ. NO.: 773701

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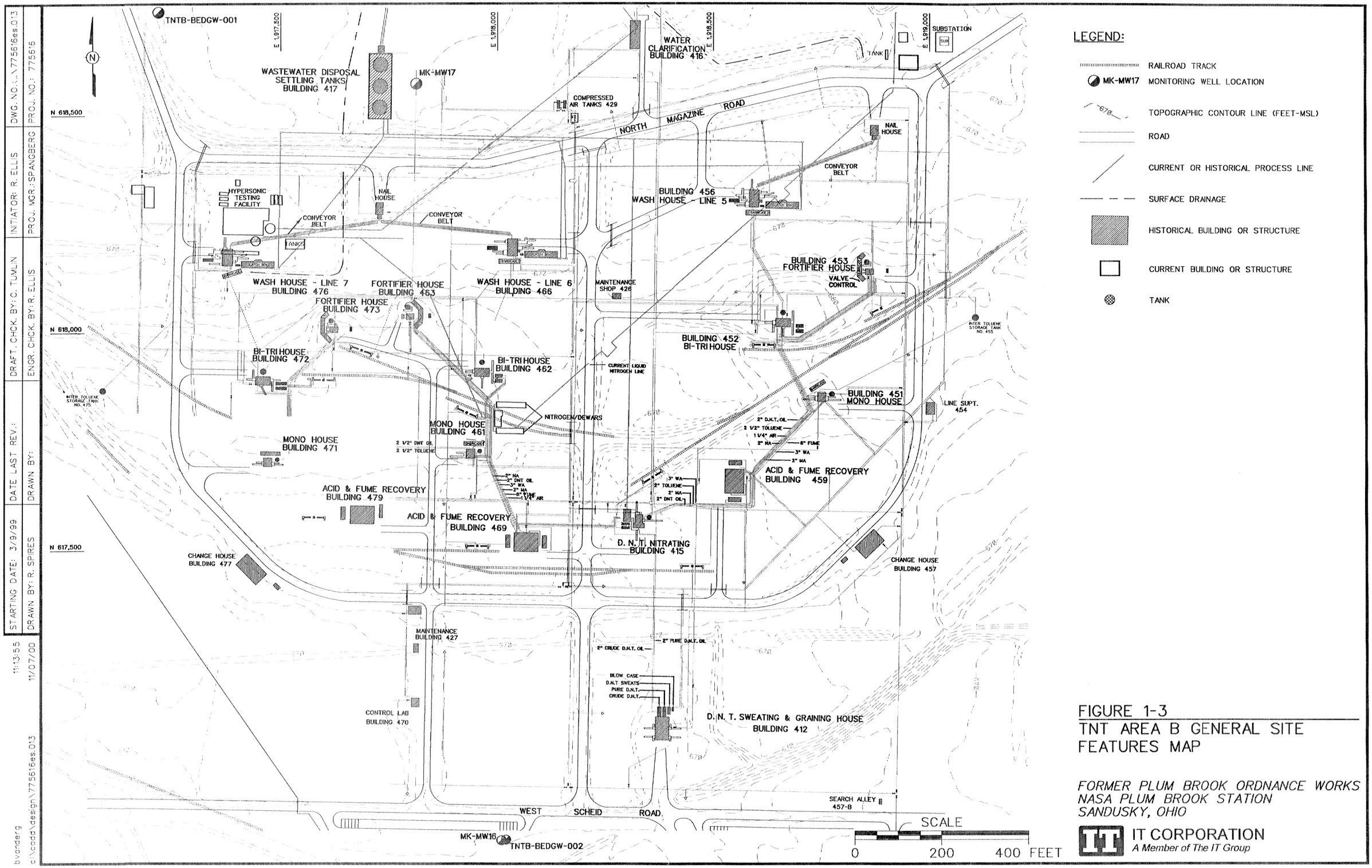

FIGURE 1-3
TNT AREA B GENERAL SITE FEATURES MAP

FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

STARTING DATE: 3/9/99 | DATE LAST REV.: | DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: R. ELLIS | DWG. NO.: \775616es013
DRAWN BY: R. SPIRES | DRAWN BY: | ENGR. CHCK. BY: R. ELLIS | PROJ. MGR: SPANGBERG | PROJ. NO.: 775616

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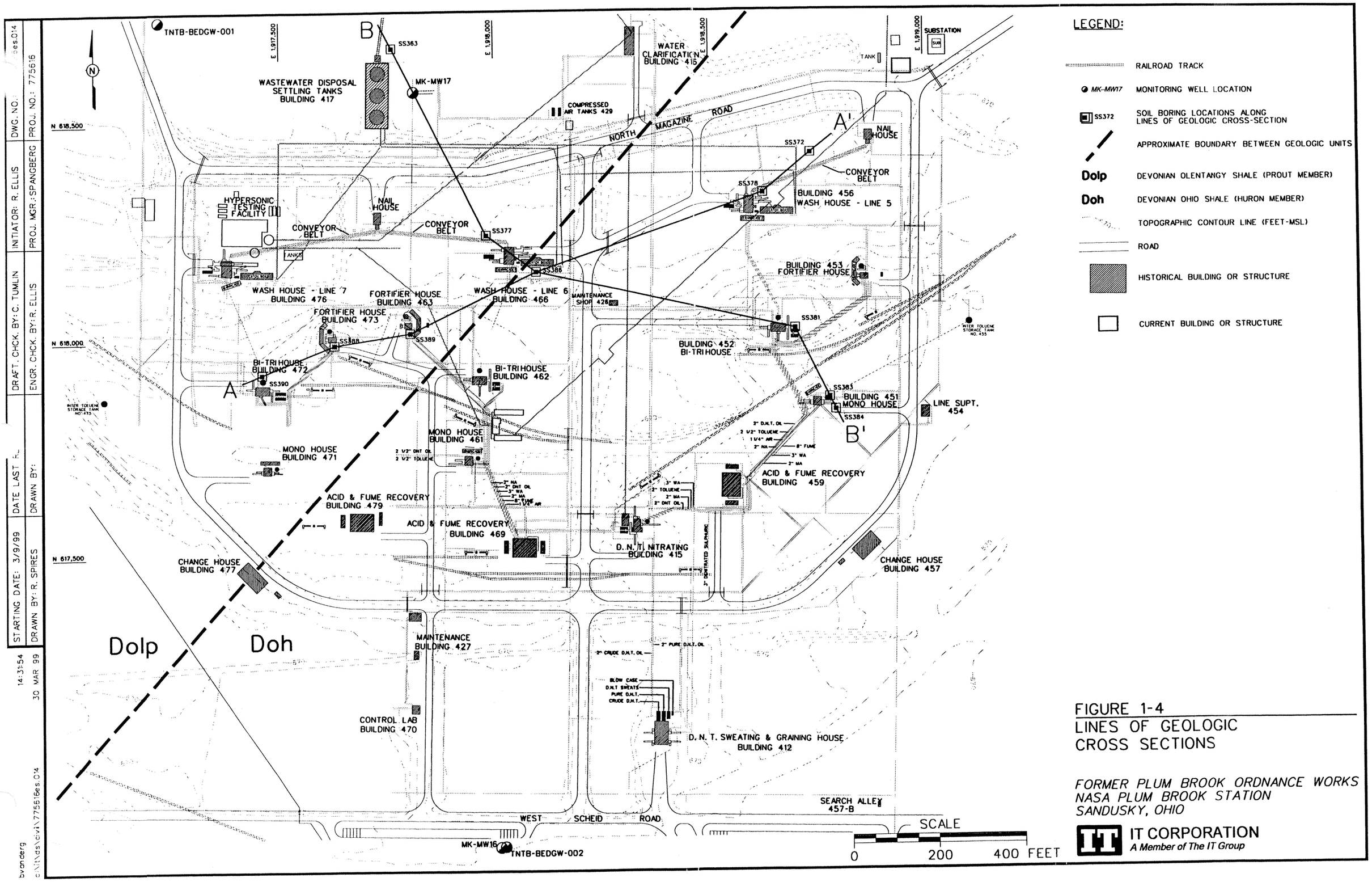

FIGURE 1-4
LINES OF GEOLOGIC CROSS SECTIONS

FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: R. ELLIS | DWG. NO. | DATE LAST R.
ENGR. CHCK. BY: R. ELLIS | PROJ. MGR.: SPANGBERG | PROJ. NO.: 775616 | DRAWN BY:
STARTING DATE: 3/9/99 | DRAWN BY: R. SPIRES
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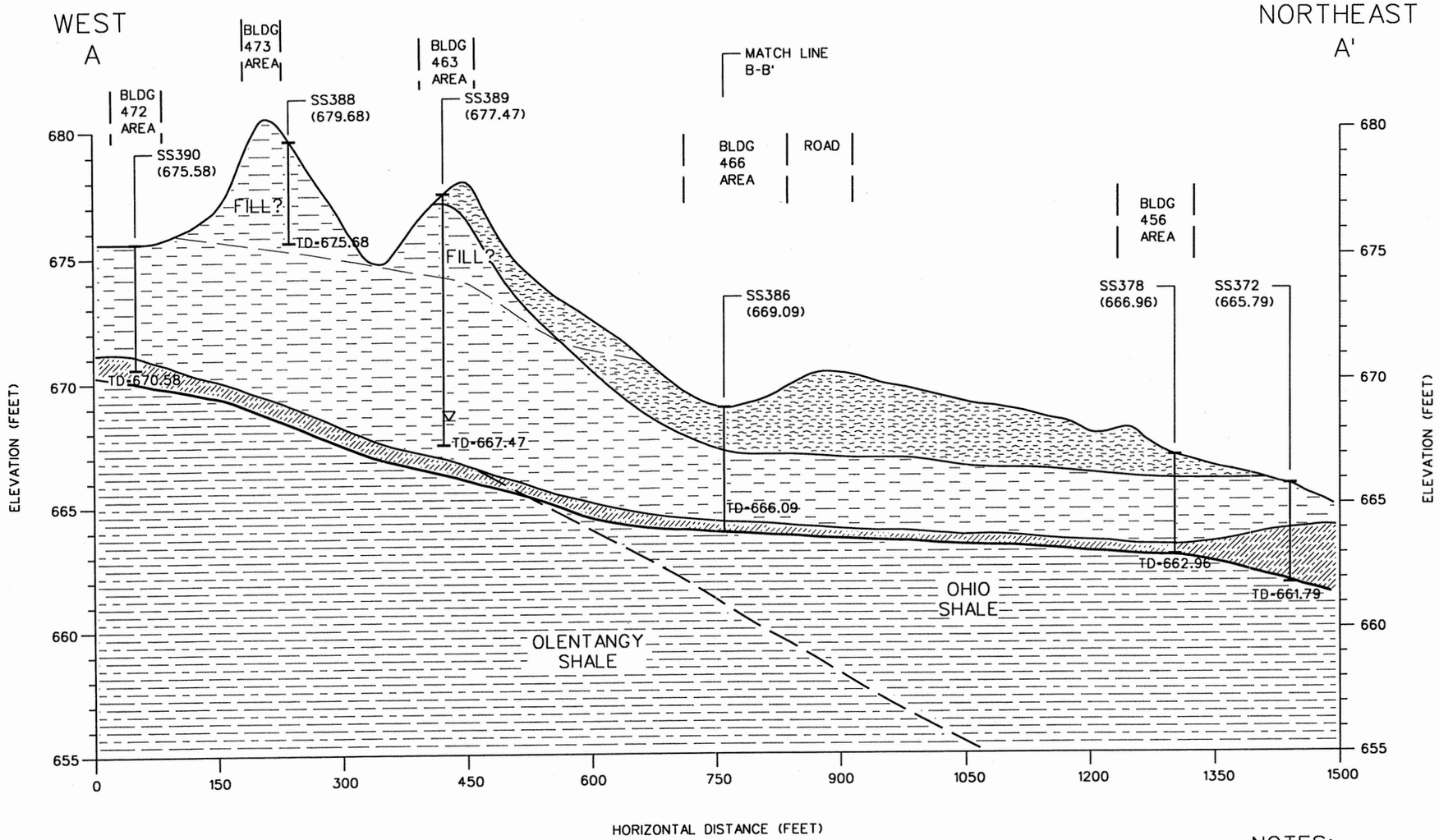

LEGEND:

	SHALE	APPROXIMATE BOUNDARY BETWEEN BEDROCK GEOLOGIC UNITS
	WEATHERED SHALE	APPROXIMATE GROUNDWATER ELEVATION DURING DRILLING
	SILTY CLAY	SS386 — BORING LOCATION NAME
	SILT	(660.89) — GROUND SURFACE ELEVATION
		TD-559.36 — ELEVATION OF TOTAL DEPTH OF BOREHOLE

HORIZONTAL SCALE:

0 150 300 FEET

VERTICAL SCALE:

0 5 10 FEET

NOTES:

ALL ELEVATIONS ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM (1988)

FIGURE 1-5
GEOLOGIC CROSS-SECTION A-A'

FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
A Member of The IT Group

STARTING DATE: 3/3/99	DATE LAST REV.:	DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: R. ELLIS	DWG. NO.: 75616es.012
DRAWN BY: R. SPIRES	DRAWN BY:	ENGR. CHCK. BY: R. ELLIS	PROJ. MGR.: SPANGBERG	PROJ. NO.: 775616

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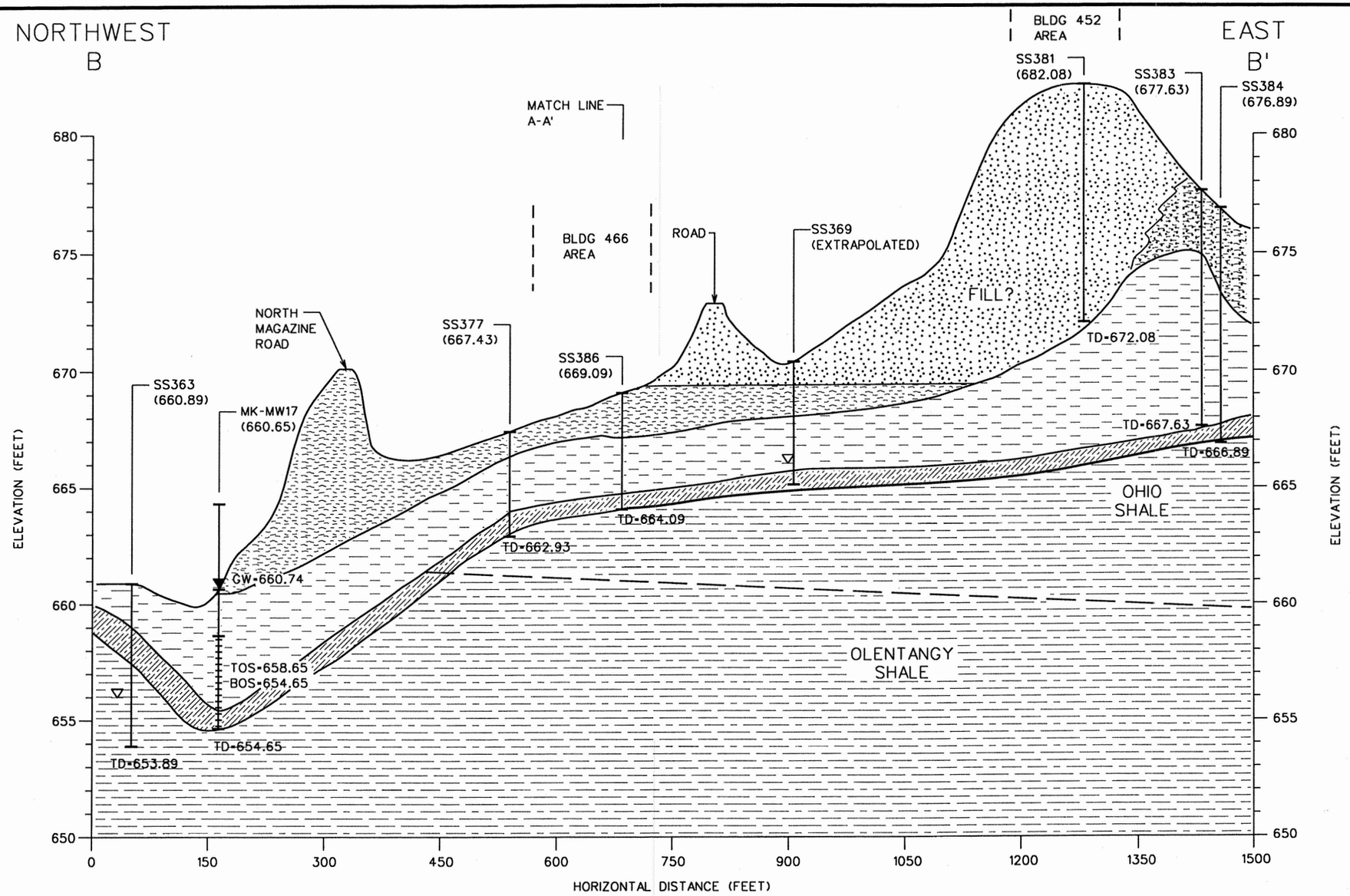

CROSS SECTION B-B'

LEGEND:

SHALE	SILT
WEATHERED SHALE	SANDY SILT
SILTY CLAY	SAND

▼ GW-660.74	GROUNDWATER ELEVATION (MAY 5, 1998)
▽	APPROXIMATE GROUNDWATER ELEVATION DURING DRILLING
SS363	BORING LOCATION NAME
(660.89)	GROUND SURFACE ELEVATION
TD-559.36	ELEVATION OF TOTAL DEPTH OF BOREHOLE
TOS	TOP OF SCREEN ELEVATION
BOS	BOTTOM OF SCREEN ELEVATION

NOTES:

ALL ELEVATIONS ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM (1988)

HORIZONTAL SCALE:

0 150 300 FEET

VERTICAL SCALE:

0 5 10 FEET

FIGURE 1-6
GEOLOGIC CROSS-SECTION B-B'

FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
A Member of The IT Group

STARTING DATE: 3/3/99 | DATE LAST REV.: | DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: R. ELLIS | DWG. NO.:...\775616es.011
DRAWN BY: R. SPIRES | DRAWN BY: | ENGR. CHCK. BY: R. ELLIS | PROJ. MGR.: SPANGBERG | PROJ. NO.: 775616

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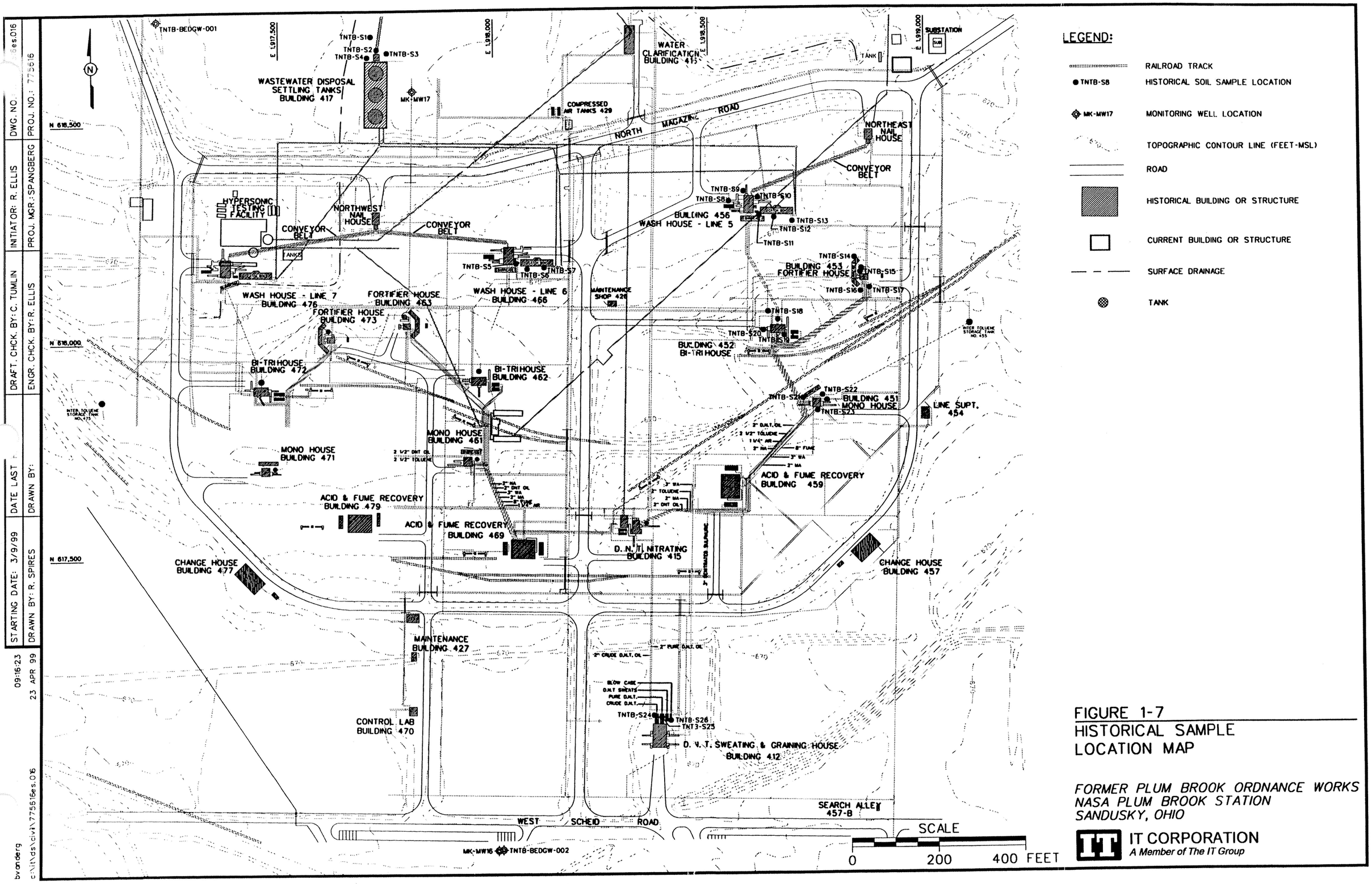

FIGURE 1-7
HISTORICAL SAMPLE LOCATION MAP

FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
A Member of The IT Group

DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: R. ELLIS | DWG. NO. | DATE LAST
ENGR. CHCK. BY: R. ELLIS | PROJ. MGR.: SPANGBERG | PROJ. NO.: 775616 | DRAWN BY:
STARTING DATE: 3/9/99
DRAWN BY: R. SPIRES
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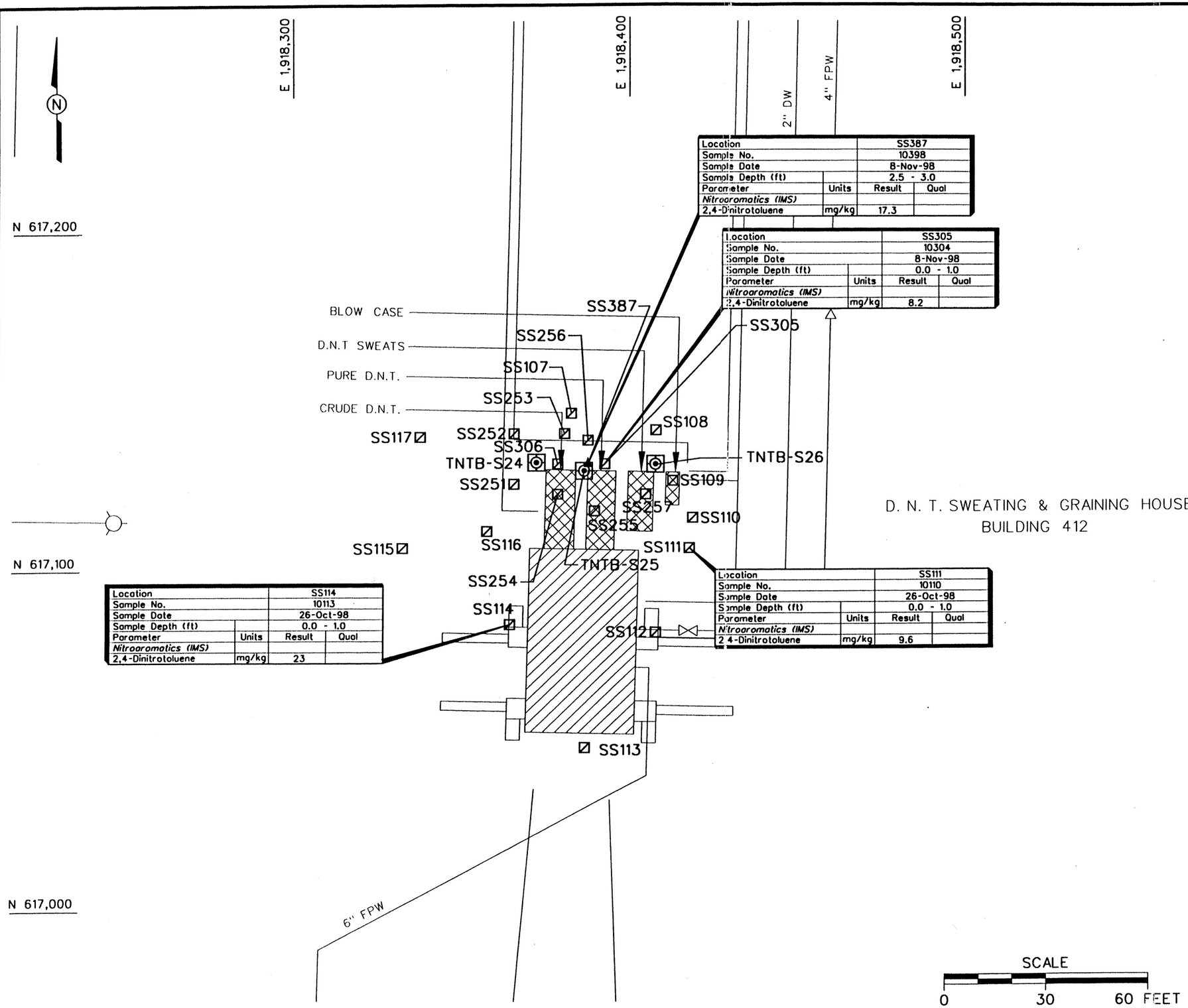

Location		SS387	
Sample No.		10398	
Sample Date		8-Nov-98	
Sample Depth (ft)		2.5 - 3.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4-Dinitrotoluene	mg/kg	17.3	

Location		SS305	
Sample No.		10304	
Sample Date		8-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4-Dinitrotoluene	mg/kg	8.2	

Location		SS114	
Sample No.		10113	
Sample Date		26-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4-Dinitrotoluene	mg/kg	23	

Location		SS111	
Sample No.		10110	
Sample Date		26-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4-Dinitrotoluene	mg/kg	9.6	

LEGEND:

- SS011 — SCREENING SURFACE SOIL SAMPLING LOCATION
- SS395 — SUBSURFACE SCREENING SOIL SAMPLING LOCATION
- TNTB-S6 — HISTORICAL SOIL BORING LOCATION WITH EXPLOSIVES DETECTION
- FIRE HYDRANTS
- POTABLE WATER VALVE

NOTES:

1. NITROAROMATICS (IMS) - IMS SCREENING RESULTS

FIGURE 4-1
BUILDING 412 SWEATING AND GRAINING HOUSE SAMPLE LOCATIONS AND ANALYTICAL RESULTS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
A Member of The IT Group

STARTING DATE: 03/15/99 | DATE LAST REV.: | DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: GUNDERSON | DWG. NO.: ...\775616es.018
DRAWN BY: B.VANDERGRIFF | DRAWN BY: | ENGR. CHCK. BY: S. MUFFLER | PROJ. MGR.: SPANGBERG | PROJ. NO.: 775616

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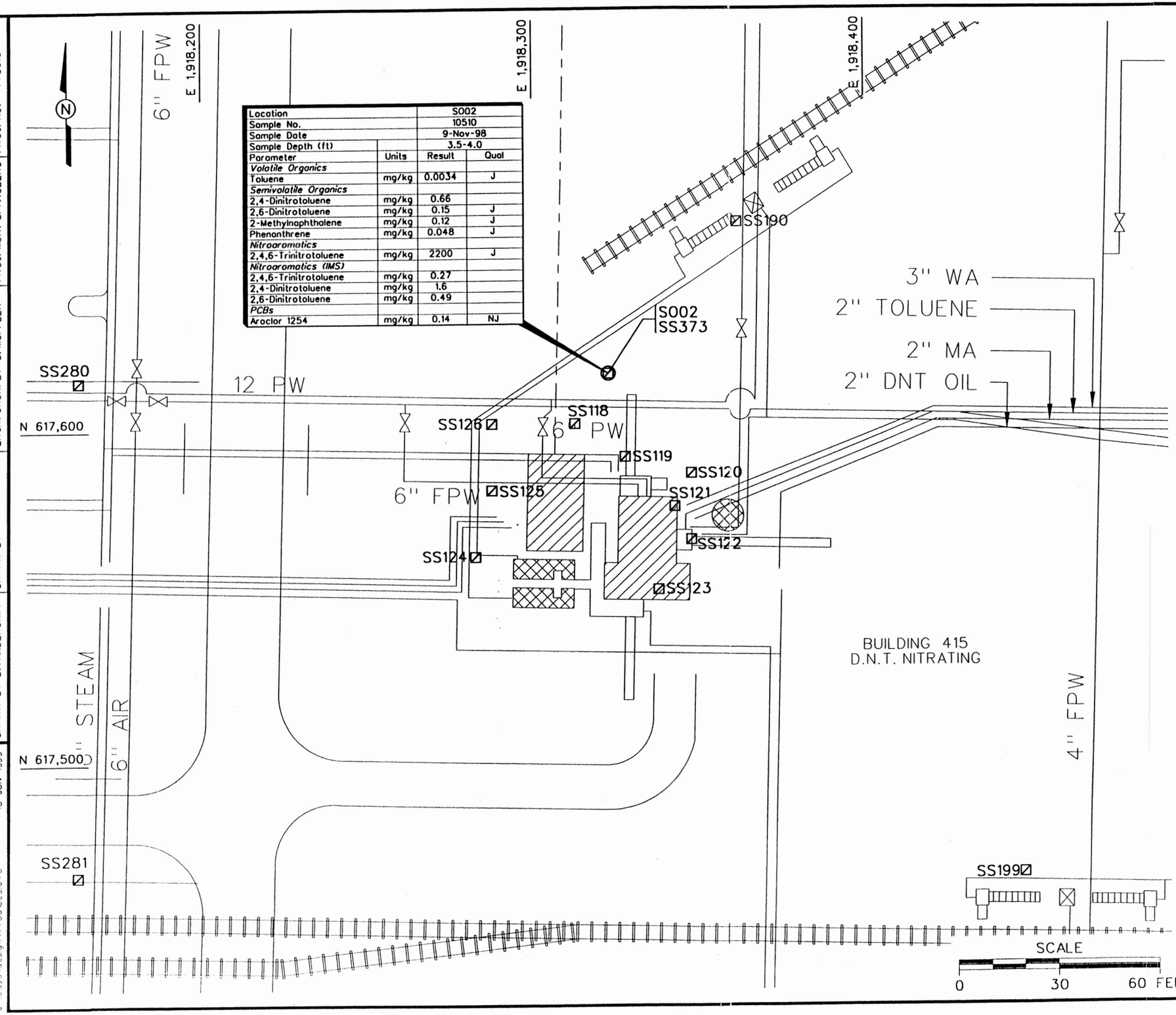
Location		S002	
Sample No.		10510	
Sample Date		9-Nov-98	
Sample Depth (ft)		3.5-4.0	
Parameter	Units	Result	Qual
Volatile Organics			
Toluene	mg/kg	0.0034	J
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	0.66	
2,6-Dinitrotoluene	mg/kg	0.15	J
2-Methylnaphthalene	mg/kg	0.12	J
Phenanthrene	mg/kg	0.048	J
Nitroaromatics			
2,4,6-Trinitrotoluene	mg/kg	2200	J
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.27	
2,4-Dinitrotoluene	mg/kg	1.6	
2,6-Dinitrotoluene	mg/kg	0.49	
PCBs			
Aroclor 1254	mg/kg	0.14	NJ



LEGEND:

- SS011 — SUBSURFACE SCREENING SOIL SAMPLING LOCATION
- S034 — SURFACE/SUBSURFACE SOIL SAMPLE CONFIRMATION LOCATION
- RAILROAD TRACK
- POTABLE WATER VALVE
- EXPANSION JOINT IN STEAM LINE
- TANK
- FORMER WASTEWATER FLUME LINE (UNDERGROUND)

FIGURE 4-2
BUILDING 415
D.N.T. NITRATING SAMPLE LOCATIONS AND ANALYTICAL RESULTS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
A Member of The IT Group

STARTING DATE: 03/31/99 | DATE LAST REV.: | DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: GUNDERSON | DWG. NO.: ...\775616es.040
DRAWN BY: B.VANDERGRIFF | DRAWN BY: | ENGR. CHCK. BY: S. MUFFLER | PROJ. MGR.: SPANGBERG | PROJ. NO.: 775616

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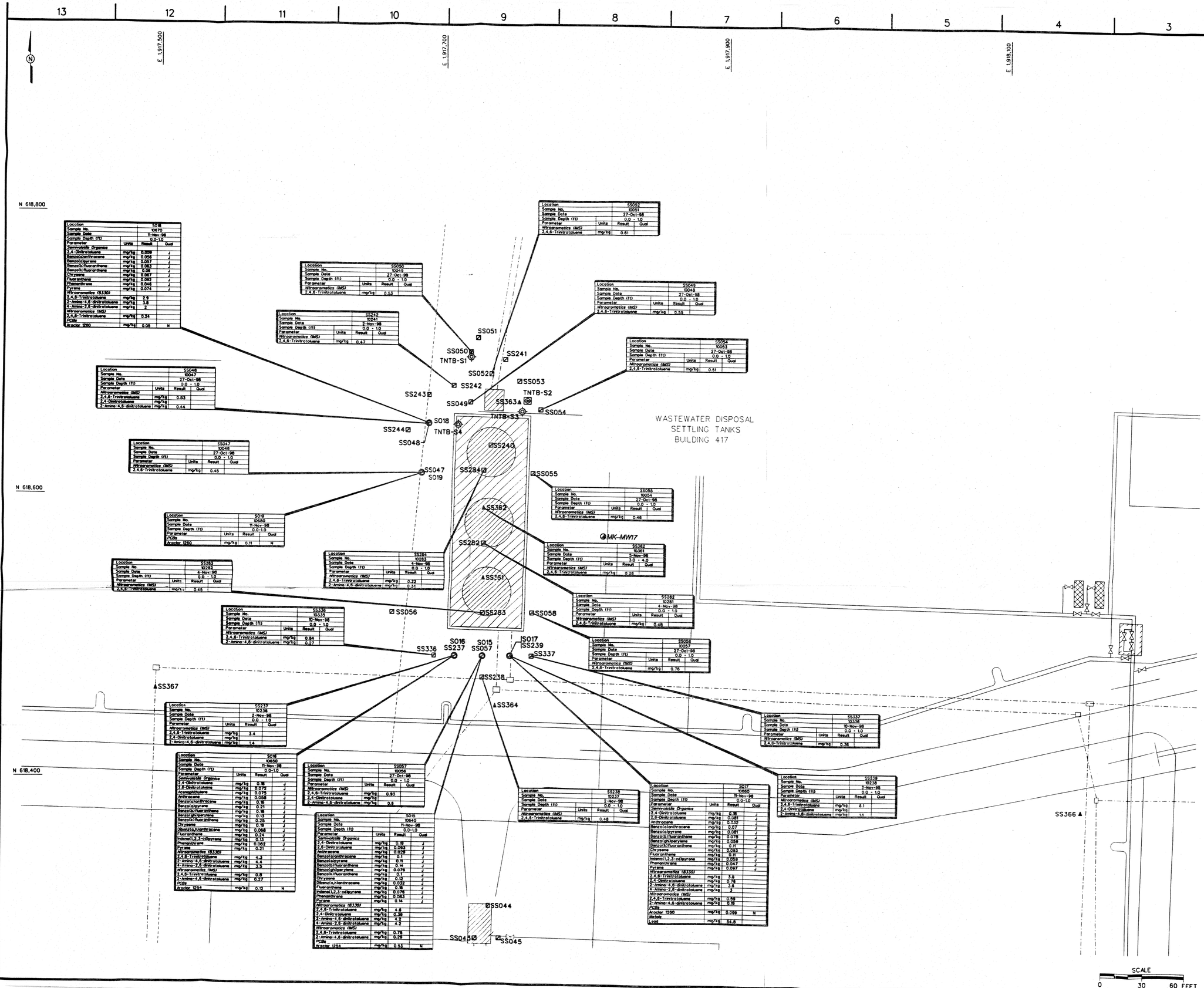


LEGEND:

SS011	SCREENING SURFACE SOIL SAMPLING LOCATION
SS395	SUBSURFACE SCREENING SOIL SAMPLING LOCATION
S040	SURFACE/SUBSURFACE SOIL SAMPLING CONFIRMATION LOCATION
TNTB-S6	HISTORICAL SOIL BORING LOCATION WITH EXPLOSIVES DETECTION
TNTB-S3	HISTORICAL SOIL BORING LOCATIONS
MK-MW17	MONITORING WELL LOCATION
	FORMER WASTEWATER FLUME LINE (UNDERGROUND)
	DRAINAGE CULVERT
	POTABLE WATER VALVE
	EXPANSION JOINT IN STEAM LINE
	DRAINAGE DITCH

NOTES

1. NITROAROMATICS (8a5) - 8a5 SCREENING RESULTS
2. NITROAROMATICS (8330) - METHOD 8330 RESULTS

NO	DATE	REVISION	BY	CHK'D	DSGN ENGR	ENGR	PROJ MGR	APPR

STARTING DATE 03/18/99 | INITIATOR M. GUNDERSON | CHK'D MUFFLER | DRAWN VANDERGRIFF | CHK'D C. TUMLIN | PROJECT MNGR M. SPANGBERG

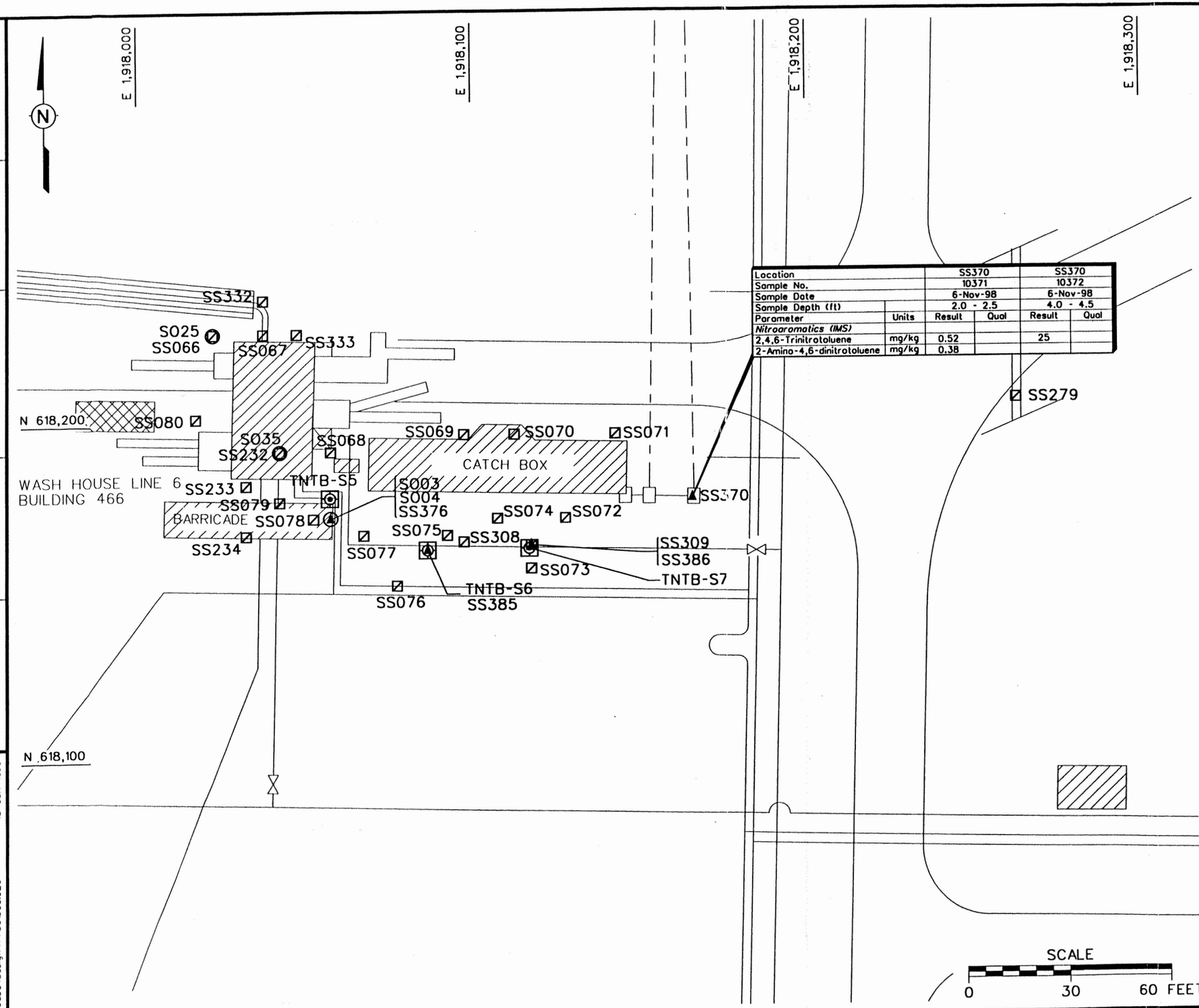
IT CORPORATION
A Member of The IT Group
KNOXVILLE, TENNESSEE

FIGURE 4-3
BUILDING 417 WASTEWATER SETTLING TANKS SAMPLE LOCATIONS AND ANALYTICAL RESULTS

PLUMB ROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

AREA	JOB NO.	DRAWING NO.	REV
	775616	775616ES.019	

15 JUN 1999



Location		SS370		SS370	
Sample No.		10371		10372	
Sample Date		6-Nov-98		6-Nov-98	
Sample Depth (ft)		2.0 - 2.5		4.0 - 4.5	
Parameter	Units	Result	Qual	Result	Qual
Nitroaromatics (IMS)					
2,4,6-Trinitrotoluene	mg/kg	0.52		25	
2-Amino-4,6-dinitrotoluene	mg/kg	0.38			

LEGEND:

- SS017 — SCREENING SURFACE SOIL SAMPLING LOCATION
- SS390 — SUBSURFACE SCREENING SOIL SAMPLING LOCATION
- SO40 — SURFACE/SUBSURFACE SOIL SAMPLING CONFIRMATION LOCATION
- TNTB-S7 — HISTORICAL SOIL BORING LOCATION WITH EXPLOSIVES DETECTION
- POTABLE WATER VALVE
- DRAINAGE CULVERT
- EXPANSION JOINT IN STEAM LINE
- FORMER WASTEWATER FLUME LINE (UNDERGROUND)

NOTES:

1. NITROAROMATICS (IMS) - IMS SCREENING RESULTS.
2. FIGURE IS INTENDED TO ONLY SHOW ANALYTICAL RESULTS FOR SS370, A SUBSURFACE SOIL SAMPLE LOCATION COLLECTED TO INVESTIGATE THE UNDERGROUND WASTEWATER PIPELINE. ALL OTHER SAMPLE LOCATIONS SHOWN FOR INFORMATION PURPOSES ONLY. ANALYTICAL RESULTS FOR OTHER SAMPLE LOCATIONS ARE SHOWN IN FIGURE 4-14.

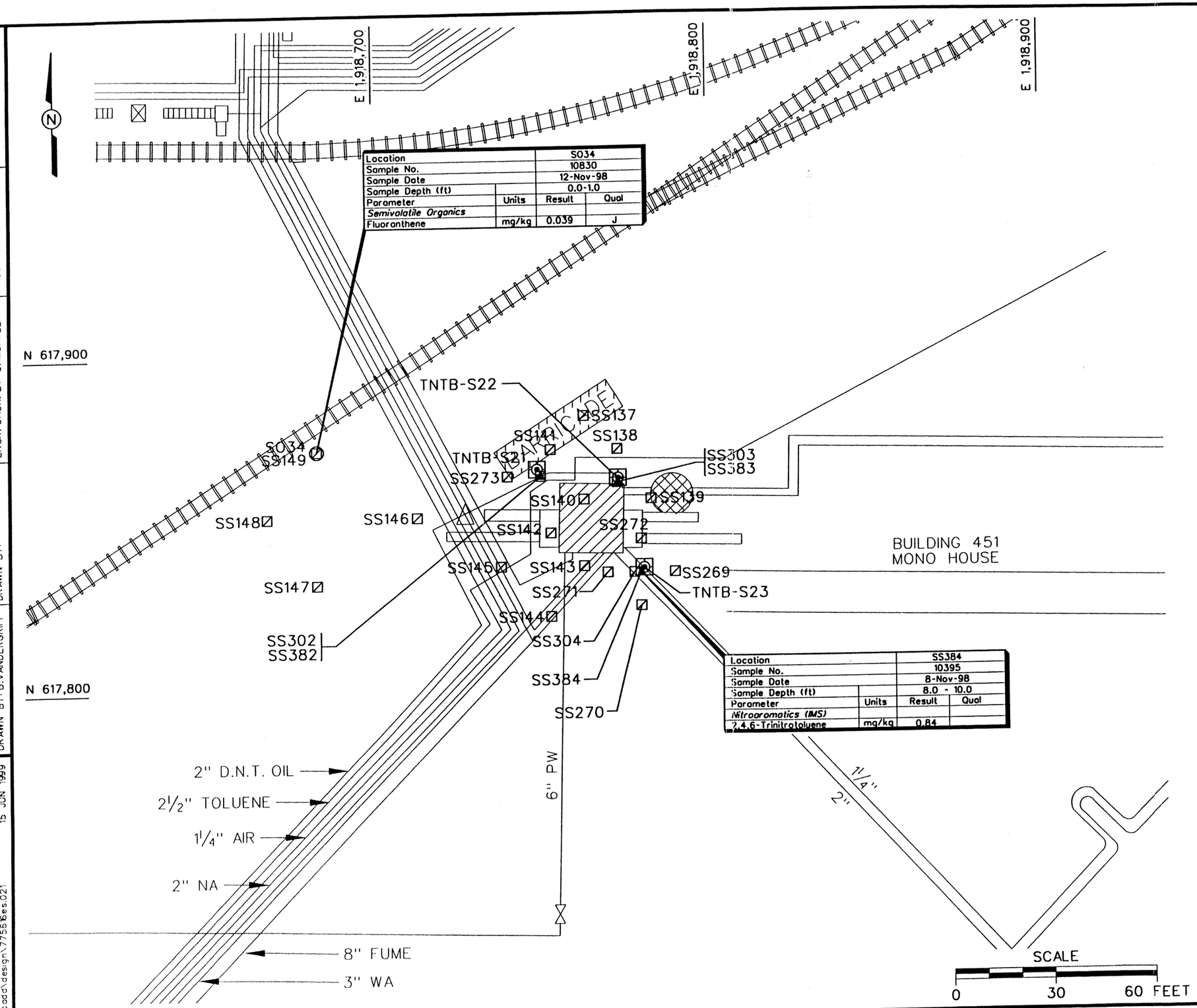
SCALE
0 30 60 FEET

FIGURE 4-4
WASTEWATER PIPELINE SAMPLE LOCATIONS AND ANALYTICAL RESULTS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
A Member of The IT Group

DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: GUNDERSON | DWG. NO.: ...\775616es.020
ENGR. CHCK. BY: S. MUFFLER | PROJ. MGR.: SPANGBERG | PROJ. NO.: 775616
STARTING DATE: 03/23/99 | DATE LAST REV.:
DRAWN BY: B. VANDERGRIFF | DRAWN BY:
10:24:29 15 JUN 1999
bvanderg
c:\cadd\design\775616es.020



Location		S034	
Sample No.		10830	
Sample Date		12-Nov-98	
Sample Depth (ft)		0.0-1.0	
Parameter	Units	Result	Qual
Semivolatile Organics			
Fluoranthene	mg/kg	0.039	J

Location		SS384	
Sample No.		10395	
Sample Date		8-Nov-98	
Sample Depth (ft)		8.0 - 10.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.84	

LEGEND:

- SS011 — SCREENING SURFACE SOIL SAMPLING LOCATION
- SS395 — SUBSURFACE SCREENING SOIL SAMPLING LOCATION
- S034 — SURFACE/SUBSURFACE SOIL SAMPLE CONFIRMATION LOCATION
- TNTB-S6 — HISTORICAL SOIL BORING LOCATION WITH EXPLOSIVES DETECTION
- RAILROAD TRACK
- POTABLE WATER VALVE
- EXPANSION JOINT IN STEAM LINE
- TANK

NOTES:

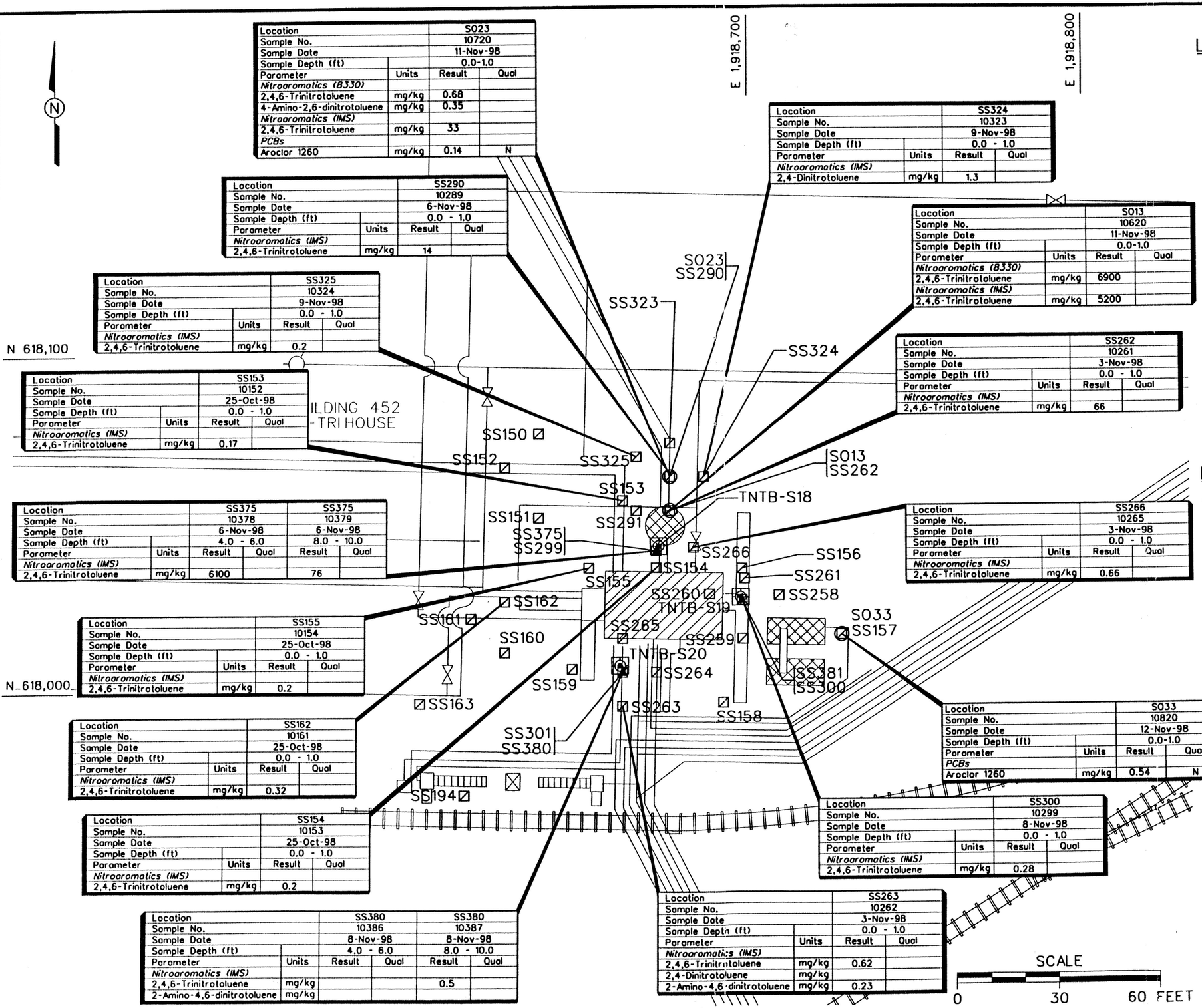
1. NITROAROMATICS (IMS) - IMS SCREENING RESULTS
2. NITROAROMATICS (8330) - METHOD 8330 RESULTS

FIGURE 4-5
BUILDING 451 MONO HOUSE SAMPLE LOCATIONS AND ANALYTICAL RESULTS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
A Member of The IT Group

STARTING DATE: 03/19/99 | DATE LAST REV.:
DRAWN BY: B.VANDERGRIFF | DRAWN BY:
DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: GUNDERSON | DWG. NO.: ...\775616es.021
ENGR. CHCK. BY: S. MUFFLER | PROJ. MGR.: SPANGBERG | PROJ. NO.: 775616
10:25:44 15 JUN 1999
bvanderg
c:\cadd\design\775616es.021



Location		S023	
Sample No.		10720	
Sample Date		11-Nov-98	
Sample Depth (ft)		0.0-1.0	
Parameter	Units	Result	Qual
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	0.68	
4-Amino-2,6-dinitrotoluene	mg/kg	0.35	
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	33	
PCBs			
Aroclor 1260	mg/kg	0.14	N

Location		SS290	
Sample No.		10289	
Sample Date		6-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	14	

Location		SS325	
Sample No.		10324	
Sample Date		9-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.2	

Location		SS153	
Sample No.		10152	
Sample Date		25-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.17	

Location		SS375		SS375	
Sample No.		10378		10379	
Sample Date		6-Nov-98		6-Nov-98	
Sample Depth (ft)		4.0 - 6.0		8.0 - 10.0	
Parameter	Units	Result	Qual	Result	Qual
Nitroaromatics (IMS)					
2,4,6-Trinitrotoluene	mg/kg	6100		76	

Location		SS155	
Sample No.		10154	
Sample Date		25-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.2	

Location		SS162	
Sample No.		10161	
Sample Date		25-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.32	

Location		SS154	
Sample No.		10153	
Sample Date		25-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.2	

Location		SS380		SS380	
Sample No.		10386		10387	
Sample Date		8-Nov-98		8-Nov-98	
Sample Depth (ft)		4.0 - 6.0		8.0 - 10.0	
Parameter	Units	Result	Qual	Result	Qual
Nitroaromatics (IMS)					
2,4,6-Trinitrotoluene	mg/kg			0.5	
2-Amino-4,6-dinitrotoluene	mg/kg				

Location		SS324	
Sample No.		10323	
Sample Date		9-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4-Dinitrotoluene	mg/kg	1.3	

Location		S013	
Sample No.		10620	
Sample Date		11-Nov-98	
Sample Depth (ft)		0.0-1.0	
Parameter	Units	Result	Qual
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	6900	
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	5200	

Location		SS262	
Sample No.		10261	
Sample Date		3-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	66	

Location		SS266	
Sample No.		10265	
Sample Date		3-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.66	

Location		S033	
Sample No.		10820	
Sample Date		12-Nov-98	
Sample Depth (ft)		0.0-1.0	
Parameter	Units	Result	Qual
PCBs			
Aroclor 1260	mg/kg	0.54	N

Location		SS300	
Sample No.		10299	
Sample Date		8-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.28	

Location		SS263	
Sample No.		10262	
Sample Date		3-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.62	
2,4-Dinitrotoluene	mg/kg		
2-Amino-4,6-dinitrotoluene	mg/kg	0.23	

LEGEND:

- ⊠SS011 — SCREENING SURFACE SOIL SAMPLING LOCATION
- ▲SS395 — SUBSURFACE SCREENING SOIL SAMPLING LOCATION
- ○S034 — SURFACE/SUBSURFACE SOIL SAMPLE CONFIRMATION LOCATION
- TNTB-S6 — HISTORICAL SOIL BORING LOCATION WITH EXPLOSIVES DETECTION
- RAILROAD TRACK
- FIRE HYDRANTS
- POTABLE WATER VALVE
- EXPANSION JOINT IN STEAM LINE
- TANK

NOTES

1. NITROAROMATICS (IMS) - IMS SCREENING RESULTS
2. NITORAROMATICS (8330) - METHOD 8330 RESULTS

SCALE

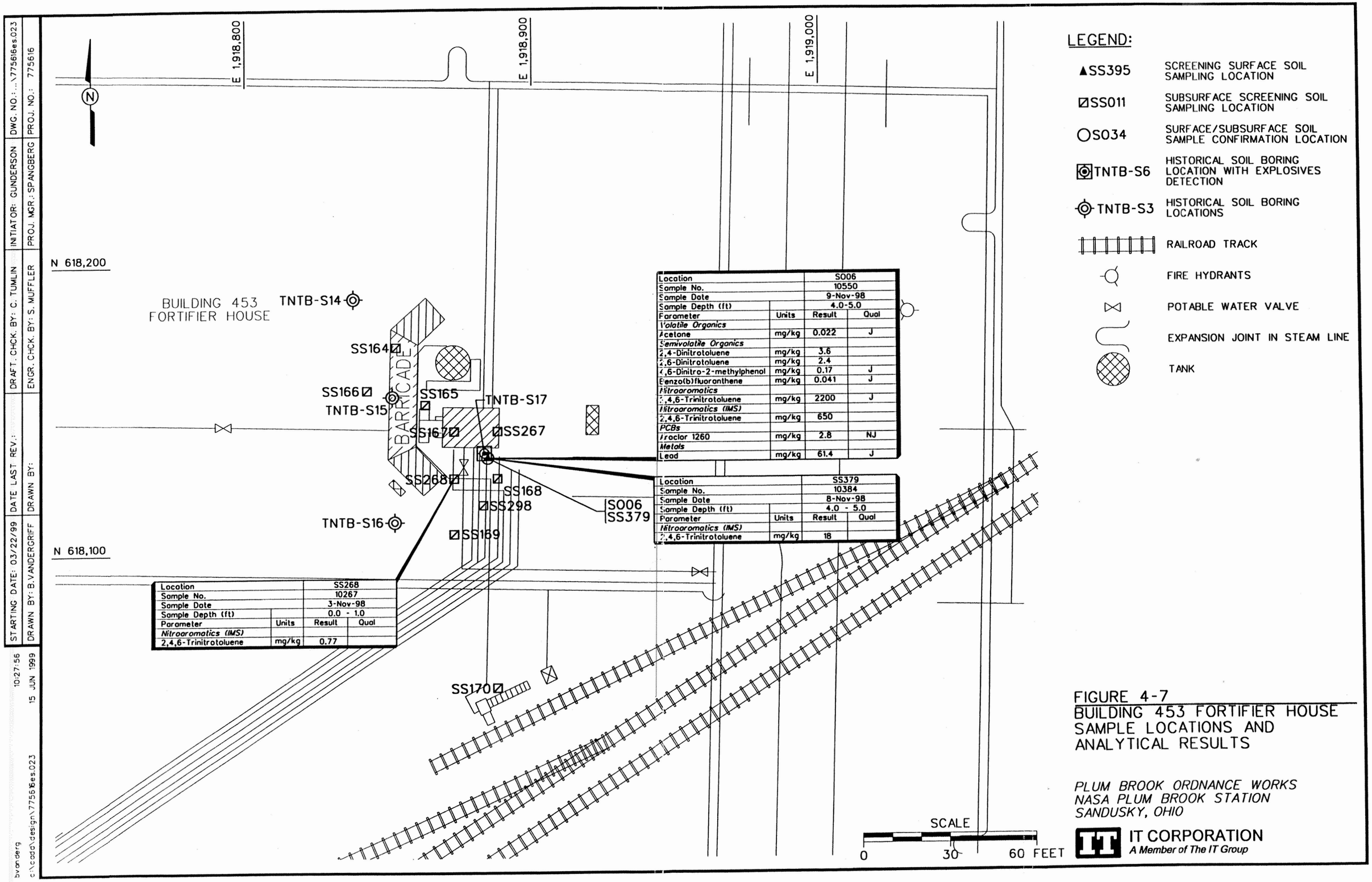
0 30 60 FEET

FIGURE 4-6
BUILDING 452 BI-TRIHOUSE SAMPLE LOCATIONS AND ANALYTICAL RESULTS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
A Member of The IT Group

DWG. NO.: ...\775616es.022 | PROJ. NO.: 775616
INITIATOR: GUNDERSON | PROJ. MGR.: SPANGBERG
DRAFT. CHCK. BY: C. TUMLIN | ENGR. CHCK. BY: S. MUFFLER
DATE LAST REV.: | DRAWN BY:
STARTING DATE: 03/15/99 | DRAWN BY: B.VANDERGRIFF
10:26:52 15 JUN 1999
c:\cadd\design\775616es.022 by vanderg



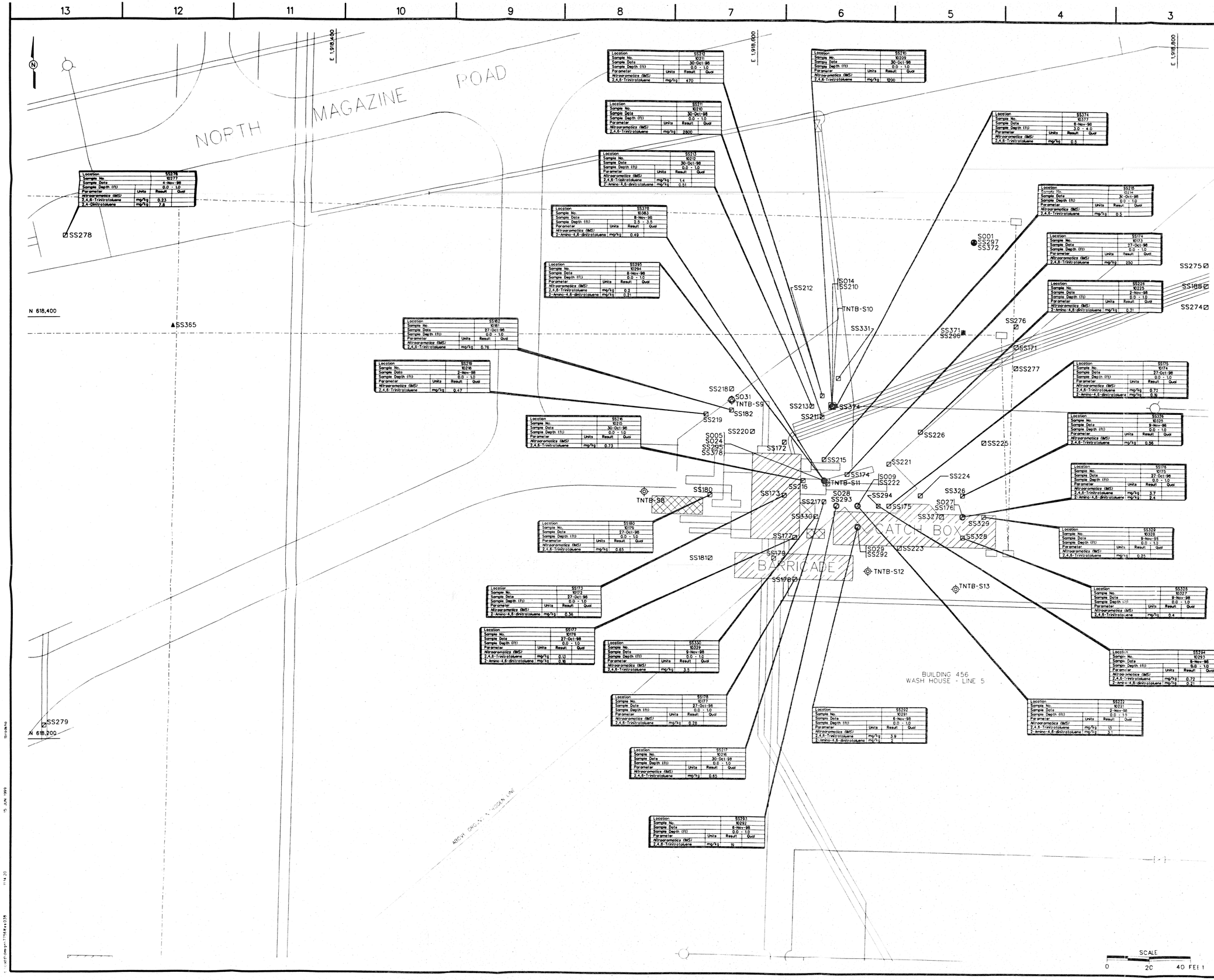
Location		S006	
Sample No.		10550	
Sample Date		9-Nov-98	
Sample Depth (ft)		4.0-5.0	
Parameter	Units	Result	Qual
Volatile Organics			
Acetone	mg/kg	0.022	J
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	3.6	
2,6-Dinitrotoluene	mg/kg	2.4	
4,6-Dinitro-2-methylphenol	mg/kg	0.17	J
Benzo(b)fluoranthene	mg/kg	0.041	J
Nitroaromatics			
2,4,6-Trinitrotoluene	mg/kg	2200	J
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	650	
PCBs			
Aroclor 1260	mg/kg	2.8	NJ
Metals			
Lead	mg/kg	61.4	J

Location		SS379	
Sample No.		10384	
Sample Date		8-Nov-98	
Sample Depth (ft)		4.0 - 5.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	18	

Location		SS268	
Sample No.		10267	
Sample Date		3-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.77	

FIGURE 4-7
BUILDING 453 FORTIFIER HOUSE
SAMPLE LOCATIONS AND
ANALYTICAL RESULTS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO



Location	SS278
Sample No.	10277
Sample Date	4-Nov-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	0.23
2,4-Dinitrotoluene mg/kg	7.8

Location	SS372
Sample No.	10211
Sample Date	30-Oct-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	470

Location	SS211
Sample No.	10210
Sample Date	30-Oct-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	2800

Location	SS213
Sample No.	10212
Sample Date	30-Oct-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	1.4
2-Amino-4,6-dinitrotoluene mg/kg	0.51

Location	SS378
Sample No.	10383
Sample Date	8-Nov-98
Sample Depth (ft)	2.5 - 3.5
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2-Amino-4,6-dinitrotoluene mg/kg	0.49

Location	SS295
Sample No.	10294
Sample Date	8-Nov-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	0.2
2-Amino-4,6-dinitrotoluene mg/kg	0.21

Location	SS182
Sample No.	10181
Sample Date	27-Oct-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	0.78

Location	SS219
Sample No.	10218
Sample Date	2-Nov-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	0.47

Location	SS216
Sample No.	10215
Sample Date	30-Oct-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	0.73

Location	SS180
Sample No.	10176
Sample Date	27-Oct-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	0.65

Location	SS173
Sample No.	10172
Sample Date	27-Oct-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2-Amino-4,6-dinitrotoluene mg/kg	0.36

Location	SS177
Sample No.	10176
Sample Date	27-Oct-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	0.13
2-Amino-4,6-dinitrotoluene mg/kg	0.18

Location	SS330
Sample No.	10329
Sample Date	9-Nov-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	3.5

Location	SS178
Sample No.	10177
Sample Date	27-Oct-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	0.28

Location	SS217
Sample No.	10216
Sample Date	30-Oct-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	0.65

Location	SS293
Sample No.	10292
Sample Date	8-Nov-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	16

Location	SS219
Sample No.	10218
Sample Date	2-Nov-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	0.47

Location	SS374
Sample No.	10377
Sample Date	8-Nov-98
Sample Depth (ft)	0.0 - 4.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	0.5

Location	SS215
Sample No.	10214
Sample Date	30-Oct-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	0.5

Location	SS174
Sample No.	10173
Sample Date	27-Oct-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	250

Location	SS226
Sample No.	10225
Sample Date	2-Nov-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2-Amino-4,6-dinitrotoluene mg/kg	0.31

Location	SS175
Sample No.	10174
Sample Date	27-Oct-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	0.72
2-Amino-4,6-dinitrotoluene mg/kg	0.16

Location	SS326
Sample No.	10325
Sample Date	9-Nov-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	0.56

Location	SS176
Sample No.	10175
Sample Date	27-Oct-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	3.7
2-Amino-4,6-dinitrotoluene mg/kg	2.4

Location	SS329
Sample No.	10328
Sample Date	9-Nov-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	0.25

Location	SS328
Sample No.	10327
Sample Date	9-Nov-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	0.4

Location	SS294
Sample No.	10293
Sample Date	8-Nov-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	0.72
2-Amino-4,6-dinitrotoluene mg/kg	0.21

Location	SS292
Sample No.	10291
Sample Date	8-Nov-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	3.9
2-Amino-4,6-dinitrotoluene mg/kg	2

Location	SS223
Sample No.	10221
Sample Date	2-Nov-98
Sample Depth (ft)	0.0 - 1.0
Parameter / Units	Result / Qual
Nitroaromatics (MS)	
2,4,6-Trinitrotoluene mg/kg	13
2-Amino-4,6-dinitrotoluene mg/kg	3.1

LEGEND:

- ⊠SS011 — SCREENING SURFACE SOIL SAMPLING LOCATION
- ▲SS395 — SUBSURFACE SCREENING SOIL SAMPLING LOCATION
- ○SO34 — SURFACE/SUBSURFACE SOIL SAMPLE CONFIRMATION LOCATION
- TNTB-S6 — HISTORICAL SOIL BORING LOCATION WITH EXPLOSIVES DETECTION
- TNTB-S3 — HISTORICAL SOIL BORING LOCATIONS
- FORMER WASTEWATER FLUME LINE (UNDERGROUND)
- RAILROAD TRACK
- FIREHYDRANTS
- POTABLE WATER VALVE
- EXPANSION JOINT IN STEAM LINE

NOTES:

1. NITROAROMATICS (IMS) - IMS SCREENING RESULTS

NO	DATE	REVISION	BY	CHKD	DSGN ENGR	ENGR	PROJ MGR	APPR

STARTING DATE	INITIATOR	CHKD	DRAWN	CHKD	PROJECT
03/22/99	M GUNDERSON	MUFFLER	VANDERGRIFF/C TUMLIN		MNGR M SPANGBERG

IT CORPORATION
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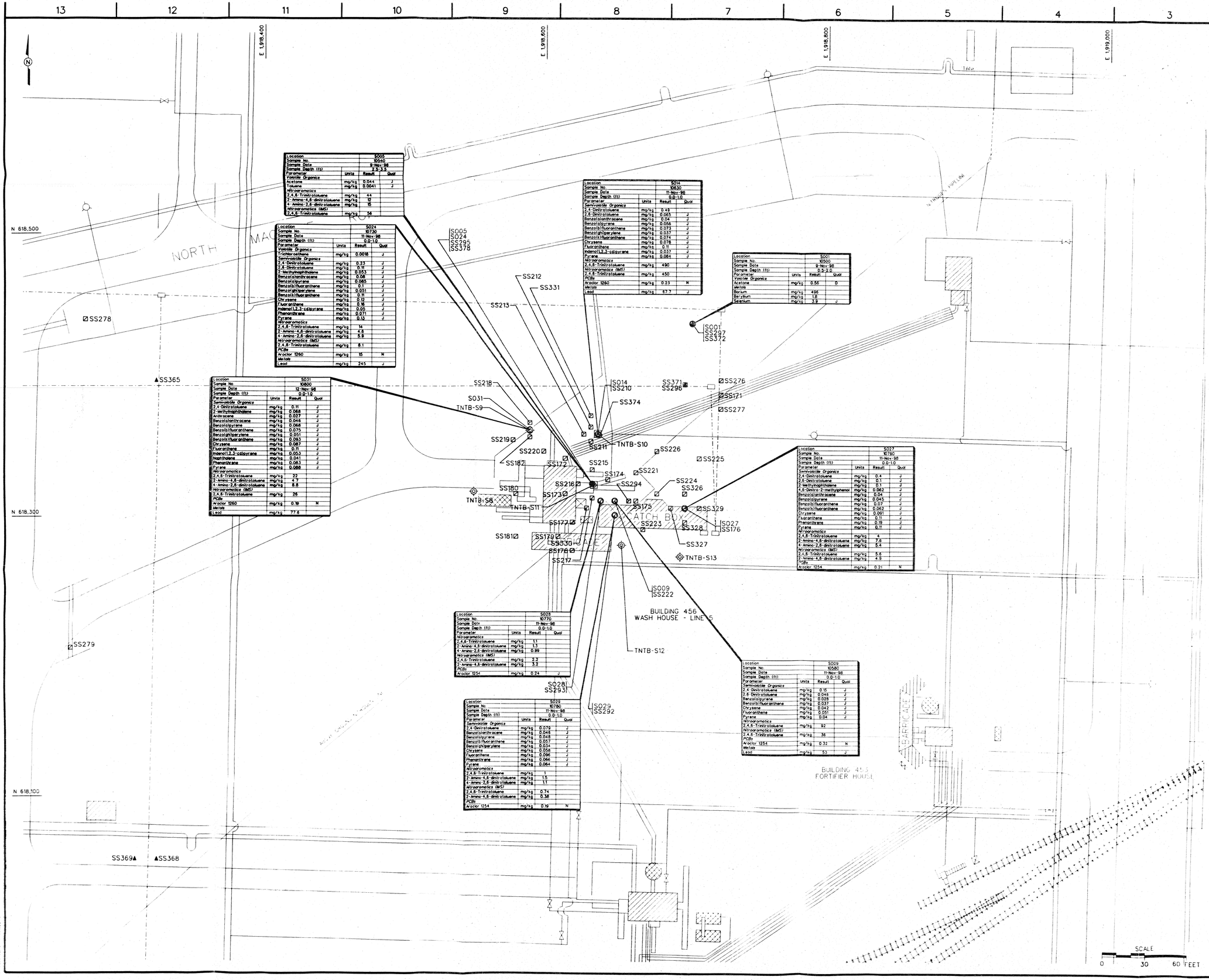
KNOXVILLE, TENNESSEE

FIGURE 4-8a
BUILDING 456 WASH HOUSE SAMPLE LOCATIONS AND ANALYTICAL RESULTS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

AREA	JOB NO.	DRAWING NO.	REV
	775616	775616ES.038	

SCALE
0 20 40 FEET



Location		S005	
Sample No.		10540	
Sample Date		9-Nov-98	
Sample Depth (ft)		2.5-3.5	
Parameter	Units	Result	Qual
Volatile Organics			
Acetone	mg/kg	0.044	J
Toluene	mg/kg	0.0041	J
Nitroaromatics			
2,4,6-Trinitrotoluene	mg/kg	44	
2-Amino-4,6-dinitrotoluene	mg/kg	12	
4-Amino-2,6-dinitrotoluene	mg/kg	15	
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	56	

Location		S024	
Sample No.		10730	
Sample Date		11-Nov-98	
Sample Depth (ft)		0.0-1.0	
Parameter	Units	Result	Qual
Volatile Organics			
Trichloroethene	mg/kg	0.0016	J
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	0.23	J
2,6-Dinitrotoluene	mg/kg	0.11	J
2-Methylnaphthalene	mg/kg	0.053	J
Benzo(a)anthracene	mg/kg	0.08	J
Benzo(a)pyrene	mg/kg	0.065	J
Benzo(b)fluoranthene	mg/kg	0.1	J
Benzo(ghi)perylene	mg/kg	0.051	J
Benzo(k)fluoranthene	mg/kg	0.11	J
Chrysene	mg/kg	0.12	J
Fluoranthene	mg/kg	0.16	J
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	J
Phenanthrene	mg/kg	0.071	J
Pyrene	mg/kg	0.13	J
Nitroaromatics			
2,4,6-Trinitrotoluene	mg/kg	14	
2-Amino-4,6-dinitrotoluene	mg/kg	4.6	
4-Amino-2,6-dinitrotoluene	mg/kg	5.9	
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	8.1	
PCBs			
Aroclor 1260	mg/kg	15	N
Metals			
Lead	mg/kg	245	J

Location		S031	
Sample No.		10800	
Sample Date		12-Nov-98	
Sample Depth (ft)		0.0-1.0	
Parameter	Units	Result	Qual
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	0.11	J
2-Methylnaphthalene	mg/kg	0.068	J
Anthracene	mg/kg	0.037	J
Benzo(a)anthracene	mg/kg	0.046	J
Benzo(a)pyrene	mg/kg	0.068	J
Benzo(b)fluoranthene	mg/kg	0.075	J
Benzo(ghi)perylene	mg/kg	0.051	J
Benzo(k)fluoranthene	mg/kg	0.063	J
Chrysene	mg/kg	0.087	J
Fluoranthene	mg/kg	0.11	J
Indeno(1,2,3-cd)pyrene	mg/kg	0.053	J
Naphthalene	mg/kg	0.041	J
Phenanthrene	mg/kg	0.063	J
Pyrene	mg/kg	0.088	J
Nitroaromatics			
2,4,6-Trinitrotoluene	mg/kg	22	
2-Amino-4,6-dinitrotoluene	mg/kg	4.7	
4-Amino-2,6-dinitrotoluene	mg/kg	8.8	
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	26	
PCBs			
Aroclor 1260	mg/kg	0.19	N
Metals			
Lead	mg/kg	77.6	

Location		S014	
Sample No.		10630	
Sample Date		11-Nov-98	
Sample Depth (ft)		0.0-1.0	
Parameter	Units	Result	Qual
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	0.49	
2,6-Dinitrotoluene	mg/kg	0.065	J
Benzo(a)anthracene	mg/kg	0.04	J
Benzo(a)pyrene	mg/kg	0.056	J
Benzo(b)fluoranthene	mg/kg	0.073	J
Benzo(ghi)perylene	mg/kg	0.037	J
Benzo(k)fluoranthene	mg/kg	0.074	J
Chrysene	mg/kg	0.078	J
Fluoranthene	mg/kg	0.11	J
Indeno(1,2,3-cd)pyrene	mg/kg	0.037	J
Pyrene	mg/kg	0.084	J
Nitroaromatics			
2,4,6-Trinitrotoluene	mg/kg	490	J
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	450	
PCBs			
Aroclor 1260	mg/kg	0.23	N
Metals			
Lead	mg/kg	67.7	J

Location		S001	
Sample No.		10500	
Sample Date		9-Nov-98	
Sample Depth (ft)		0.5-2.0	
Parameter	Units	Result	Qual
Volatile Organics			
Acetone	mg/kg	0.56	D
Metals			
Boron	mg/kg	496	
Beryllium	mg/kg	1.8	
Selenium	mg/kg	3.9	J

Location		S027	
Sample No.		10760	
Sample Date		11-Nov-98	
Sample Depth (ft)		0.0-1.0	
Parameter	Units	Result	Qual
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	0.4	J
2,6-Dinitrotoluene	mg/kg	0.1	J
2-Methylnaphthalene	mg/kg	0.1	J
4,6-Dinitro-2-methylphenol	mg/kg	0.062	J
Benzo(a)anthracene	mg/kg	0.04	J
Benzo(a)pyrene	mg/kg	0.045	J
Benzo(b)fluoranthene	mg/kg	0.07	J
Benzo(k)fluoranthene	mg/kg	0.062	J
Chrysene	mg/kg	0.091	J
Fluoranthene	mg/kg	0.11	J
Phenanthrene	mg/kg	0.19	J
Pyrene	mg/kg	0.11	J
Nitroaromatics			
2,4,6-Trinitrotoluene	mg/kg	4	
2-Amino-4,6-dinitrotoluene	mg/kg	7.6	
4-Amino-2,6-dinitrotoluene	mg/kg	5.4	
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	5.6	
2-Amino-4,6-dinitrotoluene	mg/kg	4.9	
PCBs			
Aroclor 1254	mg/kg	0.21	N

Location		S028	
Sample No.		10770	
Sample Date		11-Nov-98	
Sample Depth (ft)		0.0-1.0	
Parameter	Units	Result	Qual
Nitroaromatics			
2,4,6-Trinitrotoluene	mg/kg	1.1	
2-Amino-4,6-dinitrotoluene	mg/kg	1.3	
4-Amino-2,6-dinitrotoluene	mg/kg	0.99	
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	2.2	
2-Amino-4,6-dinitrotoluene	mg/kg	3.2	
PCBs			
Aroclor 1254	mg/kg	0.24	J

Location		S029	
Sample No.		10780	
Sample Date		11-Nov-98	
Sample Depth (ft)		0.0-1.0	
Parameter	Units	Result	Qual
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	0.079	J
Benzo(a)anthracene	mg/kg	0.044	J
Benzo(a)pyrene	mg/kg	0.048	J
Benzo(b)fluoranthene	mg/kg	0.057	J
Benzo(ghi)perylene	mg/kg	0.034	J
Chrysene	mg/kg	0.058	J
Fluoranthene	mg/kg	0.096	J
Phenanthrene	mg/kg	0.066	J
Pyrene	mg/kg	0.064	J
Nitroaromatics			
2,4,6-Trinitrotoluene	mg/kg	1	
2-Amino-4,6-dinitrotoluene	mg/kg	1.5	
4-Amino-2,6-dinitrotoluene	mg/kg	1.1	
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	0.74	
2-Amino-4,6-dinitrotoluene	mg/kg	0.38	
PCBs			
Aroclor 1254	mg/kg	0.19	N

Location		S009	
Sample No.		10580	
Sample Date		11-Nov-98	
Sample Depth (ft)		0.0-1.0	
Parameter	Units	Result	Qual
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	0.15	J
2,6-Dinitrotoluene	mg/kg	0.046	J
Benzo(a)pyrene	mg/kg	0.028	J
Benzo(b)fluoranthene	mg/kg	0.037	J
Chrysene	mg/kg	0.042	J
Fluoranthene	mg/kg	0.051	J
Pyrene	mg/kg	0.04	J
Nitroaromatics			
2,4,6-Trinitrotoluene	mg/kg	92	
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	38	
PCBs			
Aroclor 1254	mg/kg	0.32	N
Metals			
Lead	mg/kg	53	J

LEGEND:

- SS011 — SCREENING SURFACE SOIL SAMPLING LOCATION
- SS395 — SUBSURFACE SCREENING SOIL SAMPLING LOCATION
- S034 — SURFACE/SUBSURFACE SOIL SAMPLE CONFIRMATION LOCATION
- TNTB-S6 — HISTORICAL SOIL BORING LOCATION WITH EXPLOSIVES DETECTION
- TNTB-S3 — HISTORICAL SOIL BORING LOCATIONS
- FORMER WASTEWATER FLUME LINE (UNDERGROUND)
- RAILROAD TRACK
- DRAINAGE CULVERT
- FIREHYDRANTS
- POTABLE WATER VALVE
- EXPANSION JOINT IN STEAM LINE
- TANK

NOTES:

1. NITROAROMATIC (IMS) - IMS SCREENING RESULTS
2. NITROAROMATICS (8330) - METHOD 8330 RESULTS

NO.	DATE	REVISION	BY	CHK'D	DSGN ENGR	ENGR	PROJ MGR	APP'D

STARTING DATE	INITIATOR	CHK'D	DRAWN	CHK'D	PROJECT
03-Jan-99	M GUNTHER	MOFFSER	VANDERPAT	TUMLIN	MNGR M SPANGLER

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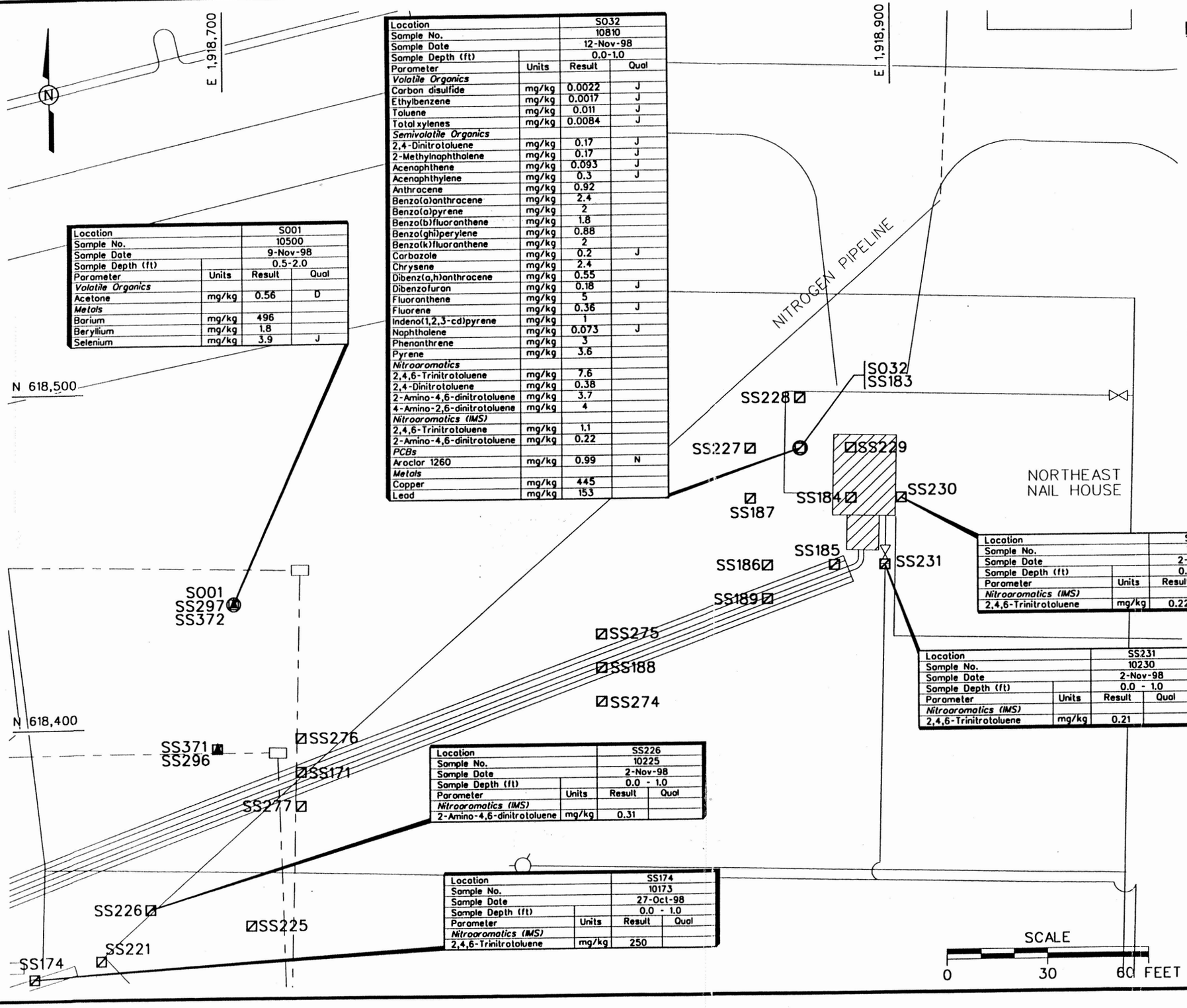
FIGURE 4-8b
BUILDING 456 WASH HOUSE SAMPLE LOCATIONS AND ANALYTICAL RESULTS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

AREA	JOB NO.	DRAWING NO.	REV.
	775616	775616ES.024	



Location		S032	
Sample No.		10810	
Sample Date		12-Nov-98	
Sample Depth (ft)		0.0-1.0	
Parameter	Units	Result	Qual
Volatile Organics			
Carbon disulfide	mg/kg	0.0022	J
Ethylbenzene	mg/kg	0.0017	J
Toluene	mg/kg	0.011	J
Total xylenes	mg/kg	0.0084	J
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	0.17	J
2-Methylnaphthalene	mg/kg	0.17	J
Acenaphthene	mg/kg	0.093	J
Acenaphthylene	mg/kg	0.3	J
Anthracene	mg/kg	0.92	
Benzo(a)anthracene	mg/kg	2.4	
Benzo(a)pyrene	mg/kg	2	
Benzo(b)fluoranthene	mg/kg	1.8	
Benzo(ghi)perylene	mg/kg	0.88	
Benzo(k)fluoranthene	mg/kg	2	
Carbazole	mg/kg	0.2	J
Chrysene	mg/kg	2.4	
Dibenz(a,h)anthracene	mg/kg	0.55	
Dibenzofuran	mg/kg	0.18	J
Fluoranthene	mg/kg	5	
Fluorene	mg/kg	0.36	J
Indeno(1,2,3-cd)pyrene	mg/kg	1	
Naphthalene	mg/kg	0.073	J
Phenanthrene	mg/kg	3	
Pyrene	mg/kg	3.6	
Nitroaromatics			
2,4,6-Trinitrotoluene	mg/kg	7.6	
2,4-Dinitrotoluene	mg/kg	0.38	
2-Amino-4,6-dinitrotoluene	mg/kg	3.7	
4-Amino-2,6-dinitrotoluene	mg/kg	4	
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	1.1	
2-Amino-4,6-dinitrotoluene	mg/kg	0.22	
PCBs			
Aroclor 1260	mg/kg	0.99	N
Metals			
Copper	mg/kg	445	
Lead	mg/kg	153	

Location		S001	
Sample No.		10500	
Sample Date		9-Nov-98	
Sample Depth (ft)		0.5-2.0	
Parameter	Units	Result	Qual
Volatile Organics			
Acetone	mg/kg	0.56	D
Metals			
Barium	mg/kg	496	
Beryllium	mg/kg	1.8	
Selenium	mg/kg	3.9	J

Location		SS230	
Sample No.		10229	
Sample Date		2-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.22	

Location		SS231	
Sample No.		10230	
Sample Date		2-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.21	

Location		SS226	
Sample No.		10225	
Sample Date		2-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2-Amino-4,6-dinitrotoluene	mg/kg	0.31	

Location		SS174	
Sample No.		10173	
Sample Date		27-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	250	

LEGEND:

- SS011 — SCREENING SURFACE SOIL SAMPLING LOCATION
- SS395 — SUBSURFACE SCREENING SOIL SAMPLING LOCATION
- S034 — SURFACE/SUBSURFACE SOIL SAMPLE CONFIRMATION LOCATION
- FIRE HYDRANTS
- POTABLE WATER VALVE
- FORMER WASTEWATER FLUME LINE (UNDERGROUND)

NOTES

1. NITROAROMATICS (IMS) - IMS SCREENING RESULTS

FIGURE 4-9
NORTHEAST NAIL HOUSE
SAMPLE LOCATIONS AND
ANALYTICAL RESULTS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
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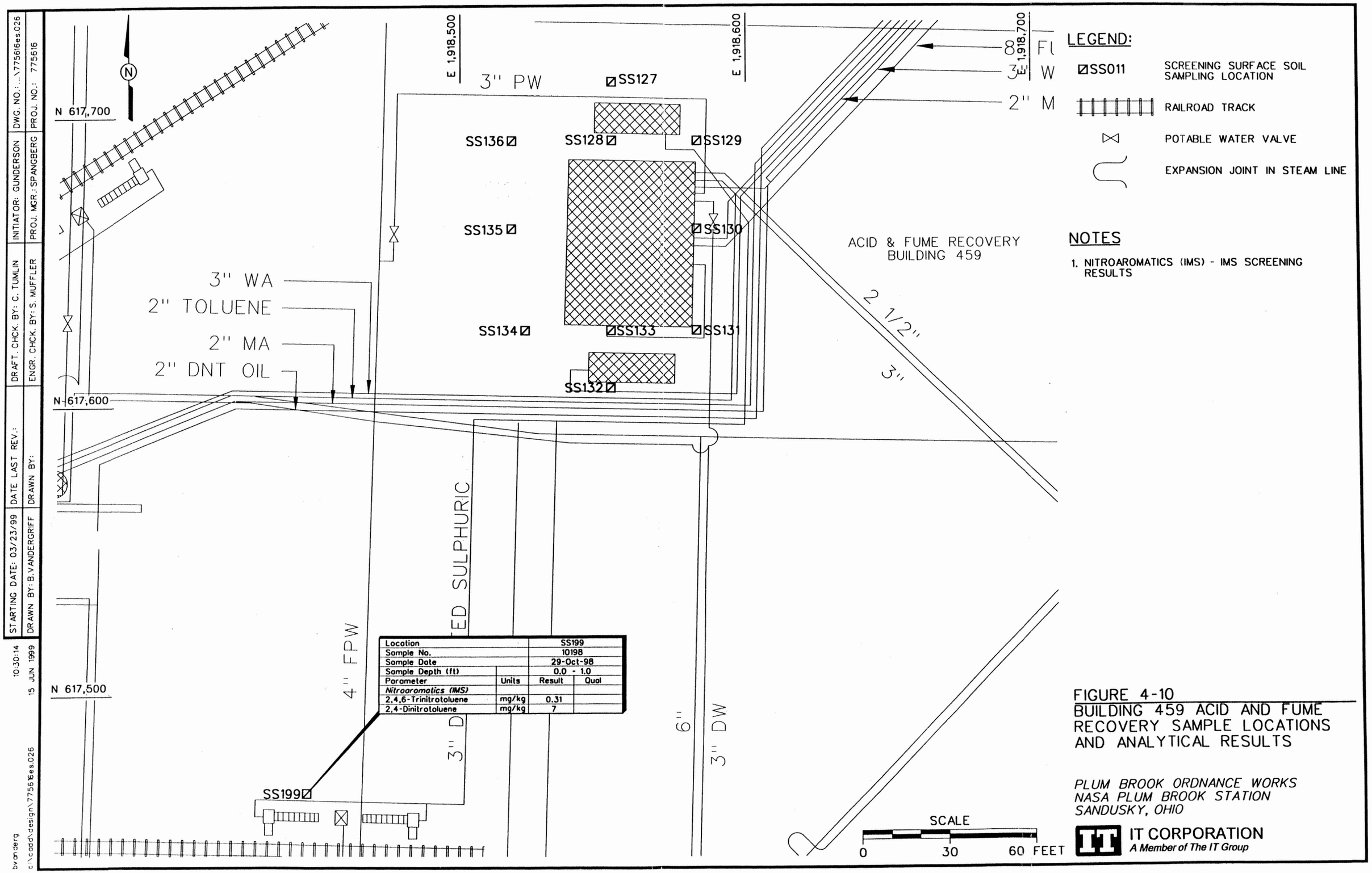
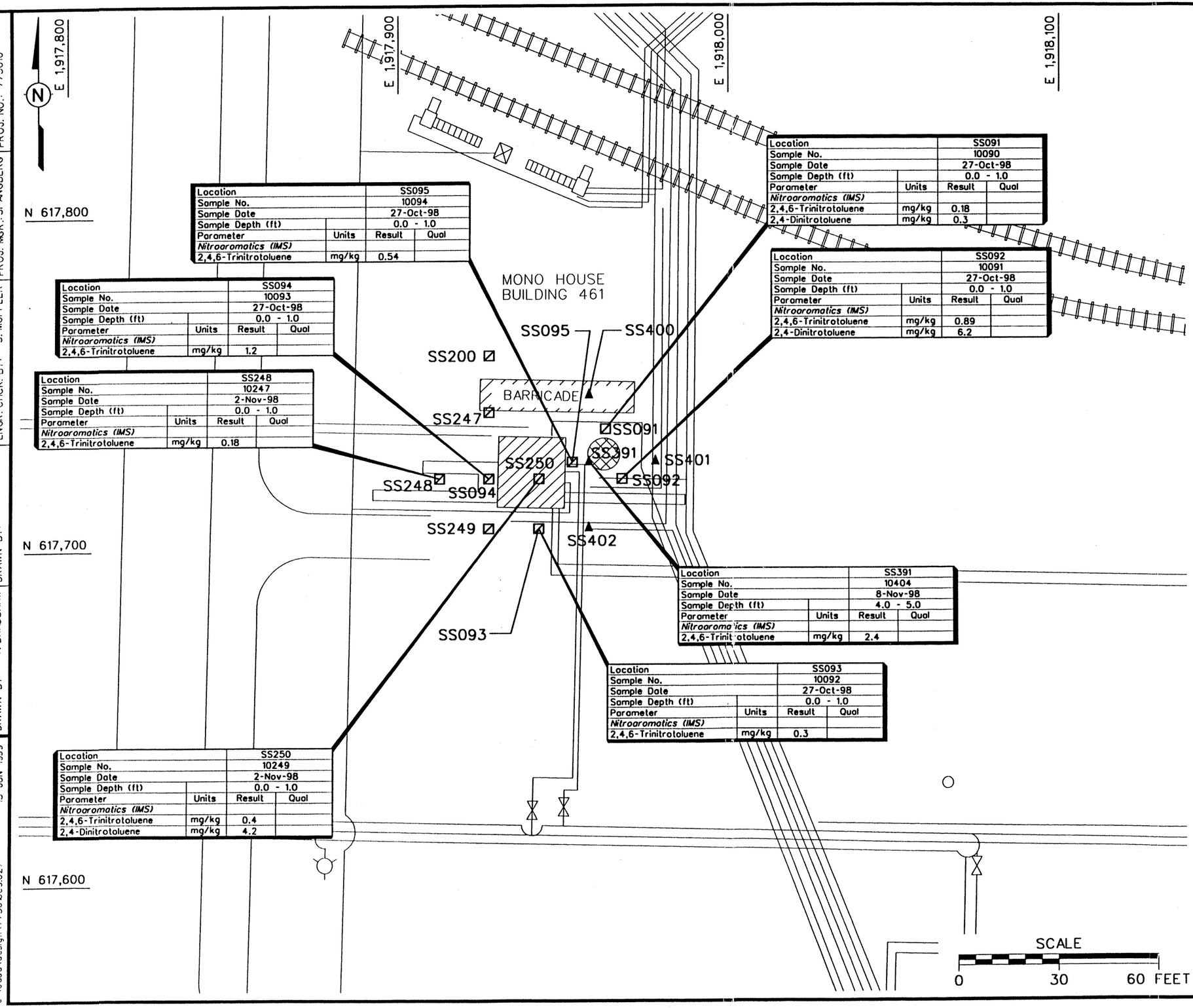
DWG. NO.: ...\775616es.025 | PROJ. NO.: 775616
INITIATOR: GUNDERSON | PROJ. MGR.: SPANGBERG
DRAFT. CHCK. BY: C. TUMLIN | ENGR. CHCK. BY: S. MUFFLER
DATE LAST REV.: | DRAWN BY:
STARTING DATE: 03/23/99 | DRAWN BY: B.VANDERGRIFF
10:29:04 15 JUN 1999
bvanderg c:\cadd\design\775616es.025



Location		SS199	
Sample No.		10198	
Sample Date		29-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.31	
2,4-Dinitrotoluene	mg/kg	7	

FIGURE 4-10
BUILDING 459 ACID AND FUME RECOVERY SAMPLE LOCATIONS AND ANALYTICAL RESULTS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO



Location		SS095	
Sample No.		10094	
Sample Date		27-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.54	

Location		SS094	
Sample No.		10093	
Sample Date		27-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	1.2	

Location		SS248	
Sample No.		10247	
Sample Date		2-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.18	

Location		SS091	
Sample No.		10090	
Sample Date		27-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.18	
2,4-Dinitrotoluene	mg/kg	0.3	

Location		SS092	
Sample No.		10091	
Sample Date		27-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.89	
2,4-Dinitrotoluene	mg/kg	6.2	

Location		SS391	
Sample No.		10404	
Sample Date		8-Nov-98	
Sample Depth (ft)		4.0 - 5.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	2.4	

Location		SS093	
Sample No.		10092	
Sample Date		27-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.3	

Location		SS250	
Sample No.		10249	
Sample Date		2-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.4	
2,4-Dinitrotoluene	mg/kg	4.2	

LEGEND:

- SS017 — SCREENING SURFACE SOIL SAMPLING LOCATION
- SS390 — SUBSURFACE SCREENING SOIL SAMPLING LOCATION
- RAILROAD TRACK
- POTABLE WATER VALVE
- FIRE HYDRANTS
- TANK
- DRAINAGE DITCH

NOTES:

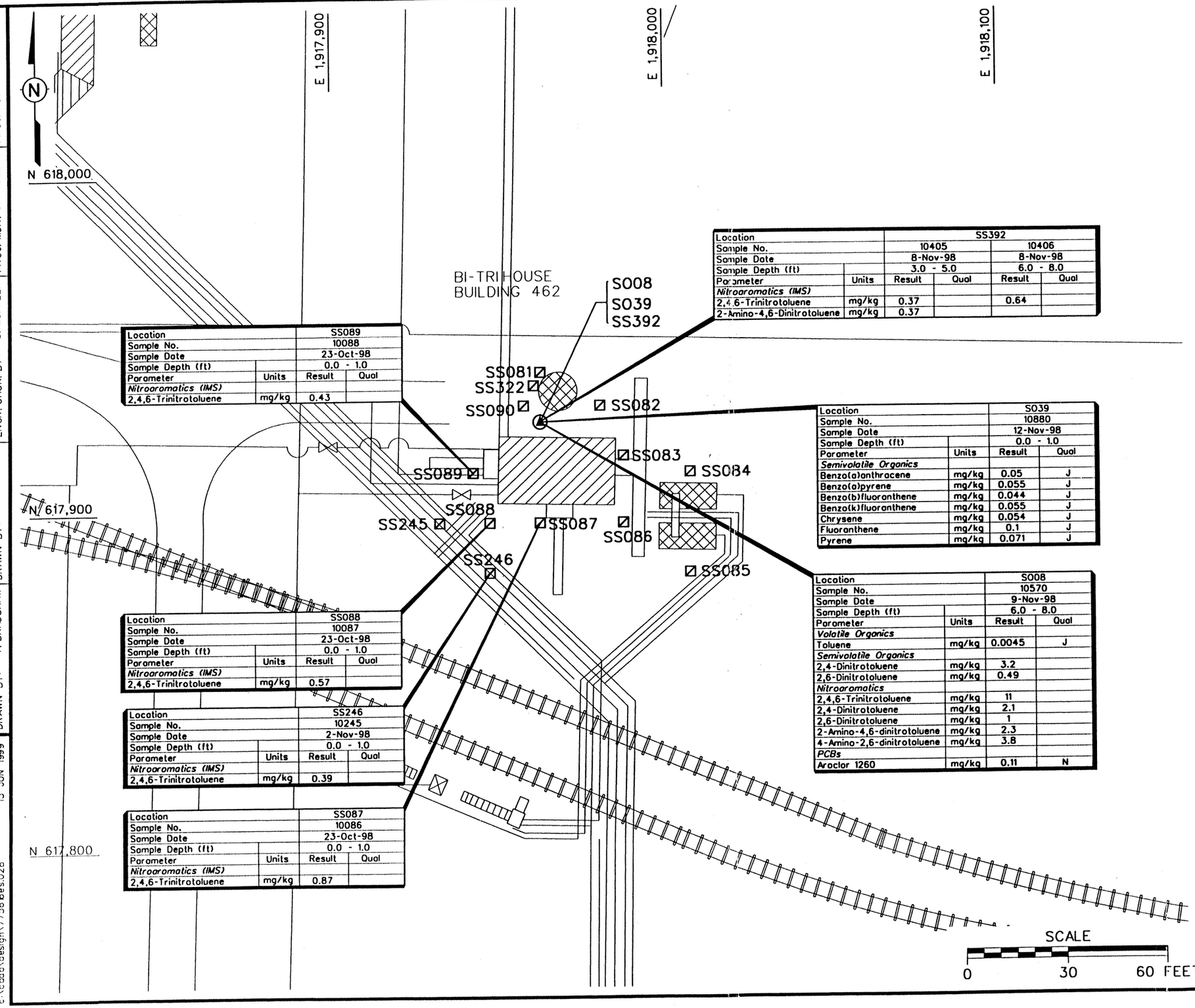
1. NITROAROMATICS (IMS) - IMS SCREENING RESULTS.

FIGURE 4-11
BUILDING 461 MONO HOUSE
SAMPLE LOCATIONS AND
ANALYTICAL RESULTS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
A Member of The IT Group

DWG. NO.:...\775616es.027 | PROJ. NO.: 775616
INITIATOR: GUNDERSON | PROJ. MGR.: SPANGBERG
DRAFT. CHCK. BY: C. TUMLIN | ENGR. CHCK. BY: S. MUFFLER
DATE LAST REV.: | DRAWN BY:
STARTING DATE: 03/23/99 | DRAWN BY: T. BRADSHAW
10:31:24 15 JUN 1999
bvanderg
c:\cadd\design\775616es.027



Location		SS392			
Sample No.		10405		10406	
Sample Date		8-Nov-98		8-Nov-98	
Sample Depth (ft)		3.0 - 5.0		6.0 - 8.0	
Parameter	Units	Result	Qual	Result	Qual
Nitroaromatics (IMS)					
2,4,6-Trinitrotoluene	mg/kg	0.37		0.64	
2-Amino-4,6-Dinitrotoluene	mg/kg	0.37			

Location		SS089	
Sample No.		10088	
Sample Date		23-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.43	

Location		S039	
Sample No.		10880	
Sample Date		12-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Semivolatile Organics			
Benzo(a)anthracene	mg/kg	0.05	J
Benzo(a)pyrene	mg/kg	0.055	J
Benzo(b)fluoranthene	mg/kg	0.044	J
Benzo(k)fluoranthene	mg/kg	0.055	J
Chrysene	mg/kg	0.054	J
Fluoranthene	mg/kg	0.1	J
Pyrene	mg/kg	0.071	J

Location		S008	
Sample No.		10570	
Sample Date		9-Nov-98	
Sample Depth (ft)		6.0 - 8.0	
Parameter	Units	Result	Qual
Volatile Organics			
Toluene	mg/kg	0.0045	J
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	3.2	
2,6-Dinitrotoluene	mg/kg	0.49	
Nitroaromatics			
2,4,6-Trinitrotoluene	mg/kg	11	
2,4-Dinitrotoluene	mg/kg	2.1	
2,6-Dinitrotoluene	mg/kg	1	
2-Amino-4,6-dinitrotoluene	mg/kg	2.3	
4-Amino-2,6-dinitrotoluene	mg/kg	3.8	
PCBs			
Aroclor 1260	mg/kg	0.11	N

Location		SS088	
Sample No.		10087	
Sample Date		23-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.57	

Location		SS246	
Sample No.		10245	
Sample Date		2-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.39	

Location		SS087	
Sample No.		10086	
Sample Date		23-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.87	

LEGEND:

- SS017 — SCREENING SURFACE SOIL SAMPLING LOCATION
- SS390 — SUBSURFACE SCREENING SOIL SAMPLING LOCATION
- S040 — SURFACE/SUBSURFACE SOIL SAMPLING CONFIRMATION LOCATION
- RAILROAD TRACK
- POTABLE WATER VALVE
- TANK

NOTES:

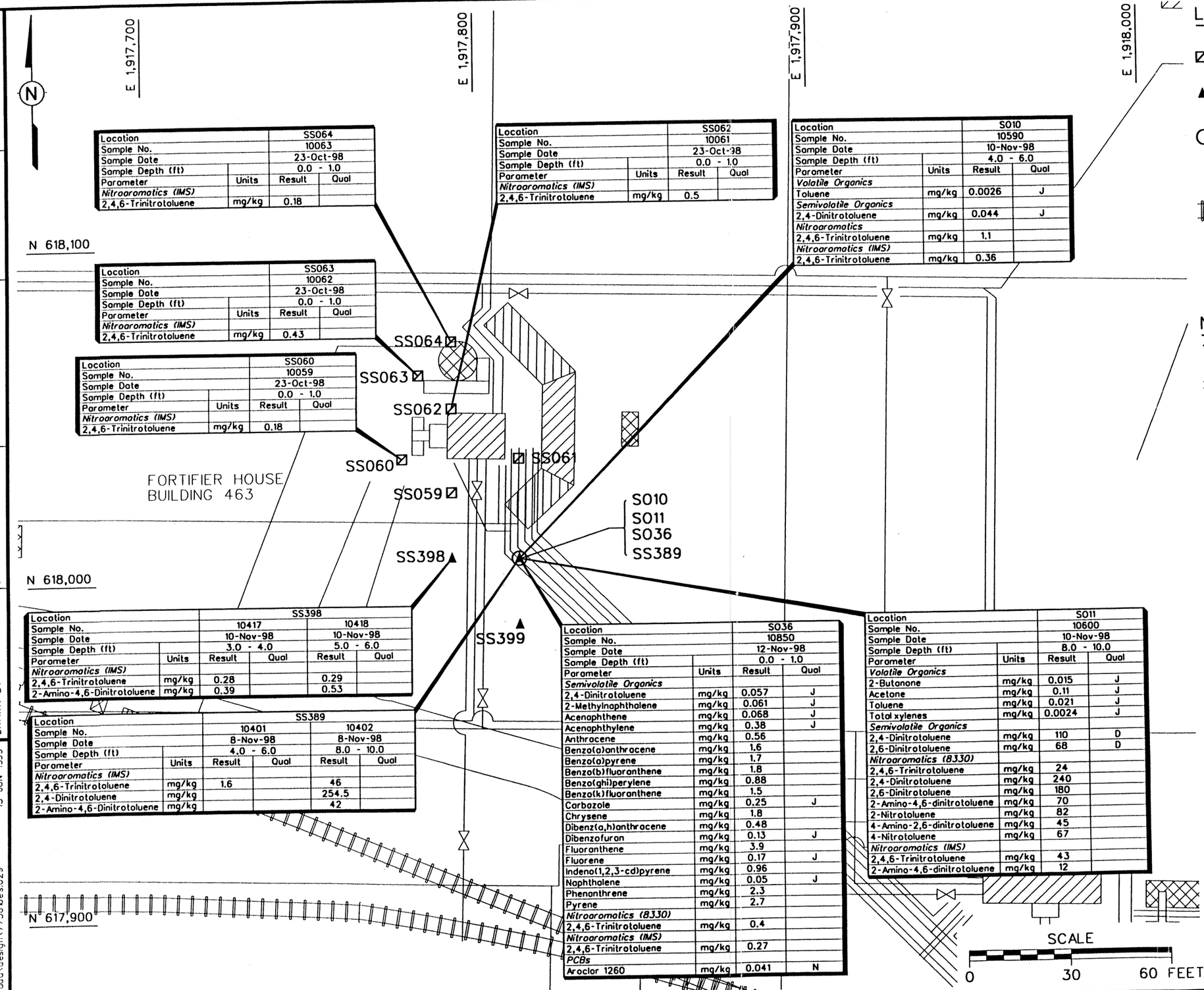
1. NITROAROMATICS (IMS) - IMS SCREENING RESULTS.

FIGURE 4-12
BUILDING 462 BI-TRI HOUSE
SAMPLE LOCATIONS AND
ANALYTICAL RESULTS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
A Member of The IT Group

DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: GUNDERSON | DWG. NO.: ...\775616es028
ENGR. CHCK. BY: S. MUFFLER | PROJ. MGR.: SPANGBERG | PROJ. NO.: 775616
STARTING DATE: 03/23/99 | DATE LAST REV.:
DRAWN BY: T. BRADSHAW | DRAWN BY:
10:33:24 15 JUN 1999
bvanderg
c:\cadd\design\775616es.028



Location		SS064	
Sample No.		10063	
Sample Date		23-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.18	

Location		SS063	
Sample No.		10062	
Sample Date		23-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.43	

Location		SS060	
Sample No.		10059	
Sample Date		23-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.18	

Location		SS062	
Sample No.		10061	
Sample Date		23-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.5	

Location		SO10	
Sample No.		10590	
Sample Date		10-Nov-98	
Sample Depth (ft)		4.0 - 6.0	
Parameter	Units	Result	Qual
Volatile Organics			
Toluene	mg/kg	0.0026	J
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	0.044	J
Nitroaromatics			
2,4,6-Trinitrotoluene	mg/kg	1.1	
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.36	

Location		SS398			
Sample No.		10417		10418	
Sample Date		10-Nov-98		10-Nov-98	
Sample Depth (ft)		3.0 - 4.0		5.0 - 6.0	
Parameter	Units	Result	Qual	Result	Qual
Nitroaromatics (IMS)					
2,4,6-Trinitrotoluene	mg/kg	0.28		0.29	
2-Amino-4,6-Dinitrotoluene	mg/kg	0.39		0.53	

Location		SS389			
Sample No.		10401		10402	
Sample Date		8-Nov-98		8-Nov-98	
Sample Depth (ft)		4.0 - 6.0		8.0 - 10.0	
Parameter	Units	Result	Qual	Result	Qual
Nitroaromatics (IMS)					
2,4,6-Trinitrotoluene	mg/kg	1.6		46	
2,4-Dinitrotoluene	mg/kg			254.5	
2-Amino-4,6-Dinitrotoluene	mg/kg			42	

Location		SO36	
Sample No.		10850	
Sample Date		12-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	0.057	J
2-Methylnaphthalene	mg/kg	0.061	J
Acenaphthene	mg/kg	0.068	J
Acenaphthylene	mg/kg	0.38	J
Anthracene	mg/kg	0.56	
Benzo(a)anthracene	mg/kg	1.6	
Benzo(a)pyrene	mg/kg	1.7	
Benzo(b)fluoranthene	mg/kg	1.8	
Benzo(ghi)perylene	mg/kg	0.88	
Benzo(k)fluoranthene	mg/kg	1.5	
Carbazole	mg/kg	0.25	J
Chrysene	mg/kg	1.8	
Dibenz(a,h)anthracene	mg/kg	0.48	
Dibenzofuran	mg/kg	0.13	J
Fluoranthene	mg/kg	3.9	
Fluorene	mg/kg	0.17	J
Indeno(1,2,3-cd)pyrene	mg/kg	0.96	
Naphthalene	mg/kg	0.05	J
Phenanthrene	mg/kg	2.3	
Pyrene	mg/kg	2.7	
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	0.4	
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.27	
PCBs			
Aroclor 1260	mg/kg	0.041	N

Location		SO11	
Sample No.		10600	
Sample Date		10-Nov-98	
Sample Depth (ft)		8.0 - 10.0	
Parameter	Units	Result	Qual
Volatile Organics			
2-Butanone	mg/kg	0.015	J
Acetone	mg/kg	0.11	J
Toluene	mg/kg	0.021	J
Total xylenes	mg/kg	0.0024	J
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	110	D
2,6-Dinitrotoluene	mg/kg	68	D
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	24	
2,4-Dinitrotoluene	mg/kg	240	
2,6-Dinitrotoluene	mg/kg	180	
2-Amino-4,6-dinitrotoluene	mg/kg	70	
2-Nitrotoluene	mg/kg	82	
4-Amino-2,6-dinitrotoluene	mg/kg	45	
4-Nitrotoluene	mg/kg	67	
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	43	
2-Amino-4,6-dinitrotoluene	mg/kg	12	

LEGEND:

- SS017 — SCREENING SURFACE SOIL SAMPLING LOCATION
- SS390 — SUBSURFACE SCREENING SOIL SAMPLING LOCATION
- SO40 — SURFACE/SUBSURFACE SOIL SAMPLING CONFIRMATION LOCATION
- POTABLE WATER VALVE
- RAILROAD TRACK
- TANK

NOTES:

1. NITROAROMATICS (IMS) - IMS SCREENING RESULTS.
2. NITROAROMATICS (8330) - METHOD 8330 RESULTS.

FIGURE 4-13
BUILDING 463 FORTIFIER HOUSE SAMPLE LOCATIONS AND ANALYTICAL RESULTS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
A Member of The IT Group

DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: GUNDERSON | DWG. NO.: ...\775616es.029
ENGR. CHCK. BY: S. MUFFLER | PROJ. MGR.: SPANGBERG | PROJ. NO.: 775616
DATE LAST REV.: | STARTING DATE: 03/23/99
DRAWN BY: | DRAWN BY: T. BRADSHAW
10:34:28 15 JUN 1999
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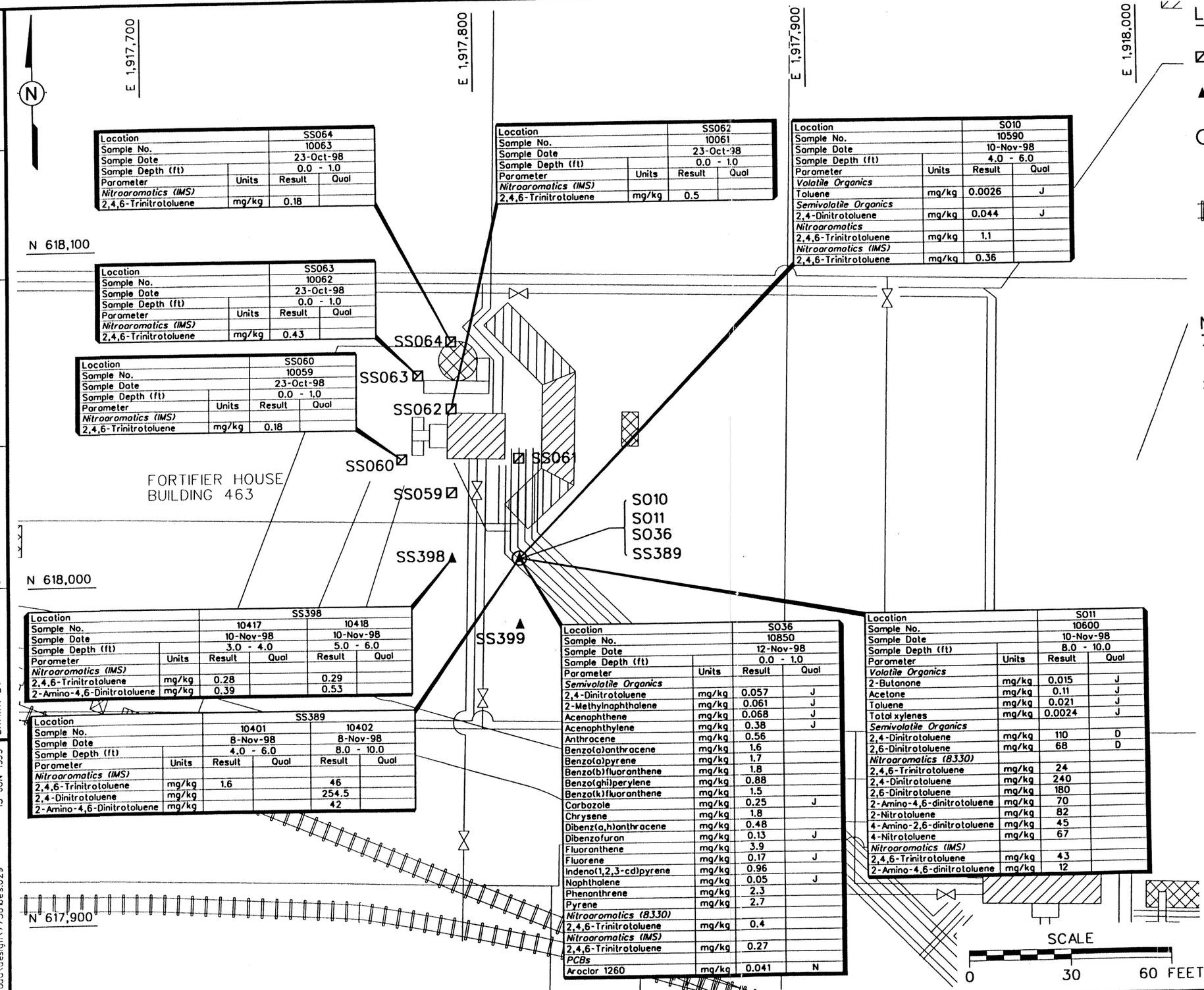

Location		SS064	
Sample No.		10063	
Sample Date		23-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.18	

Location		SS063	
Sample No.		10062	
Sample Date		23-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.43	

Location		SS060	
Sample No.		10059	
Sample Date		23-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.18	

Location		SS062	
Sample No.		10061	
Sample Date		23-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.5	

Location		SO10	
Sample No.		10590	
Sample Date		10-Nov-98	
Sample Depth (ft)		4.0 - 6.0	
Parameter	Units	Result	Qual
Volatile Organics			
Toluene	mg/kg	0.0026	J
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	0.044	J
Nitroaromatics			
2,4,6-Trinitrotoluene	mg/kg	1.1	
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.36	

Location		SS398			
Sample No.		10417		10418	
Sample Date		10-Nov-98		10-Nov-98	
Sample Depth (ft)		3.0 - 4.0		5.0 - 6.0	
Parameter	Units	Result	Qual	Result	Qual
Nitroaromatics (IMS)					
2,4,6-Trinitrotoluene	mg/kg	0.28		0.29	
2-Amino-4,6-Dinitrotoluene	mg/kg	0.39		0.53	

Location		SS389			
Sample No.		10401		10402	
Sample Date		8-Nov-98		8-Nov-98	
Sample Depth (ft)		4.0 - 6.0		8.0 - 10.0	
Parameter	Units	Result	Qual	Result	Qual
Nitroaromatics (IMS)					
2,4,6-Trinitrotoluene	mg/kg	1.6		46	
2,4-Dinitrotoluene	mg/kg			254.5	
2-Amino-4,6-Dinitrotoluene	mg/kg			42	

Location		SO36	
Sample No.		10850	
Sample Date		12-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	0.057	J
2-Methylnaphthalene	mg/kg	0.061	J
Acenaphthene	mg/kg	0.068	J
Acenaphthylene	mg/kg	0.38	J
Anthracene	mg/kg	0.56	
Benzo(a)anthracene	mg/kg	1.6	
Benzo(a)pyrene	mg/kg	1.7	
Benzo(b)fluoranthene	mg/kg	1.8	
Benzo(ghi)perylene	mg/kg	0.88	
Benzo(k)fluoranthene	mg/kg	1.5	
Carbazole	mg/kg	0.25	J
Chrysene	mg/kg	1.8	
Dibenz(a,h)anthracene	mg/kg	0.48	
Dibenzofuran	mg/kg	0.13	J
Fluoranthene	mg/kg	3.9	
Fluorene	mg/kg	0.17	J
Indeno(1,2,3-cd)pyrene	mg/kg	0.96	
Naphthalene	mg/kg	0.05	J
Phenanthrene	mg/kg	2.3	
Pyrene	mg/kg	2.7	
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	0.4	
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.27	
PCBs			
Aroclor 1260	mg/kg	0.041	N

Location		SO11	
Sample No.		10600	
Sample Date		10-Nov-98	
Sample Depth (ft)		8.0 - 10.0	
Parameter	Units	Result	Qual
Volatile Organics			
2-Butanone	mg/kg	0.015	J
Acetone	mg/kg	0.11	J
Toluene	mg/kg	0.021	J
Total xylenes	mg/kg	0.0024	J
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	110	D
2,6-Dinitrotoluene	mg/kg	68	D
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	24	
2,4-Dinitrotoluene	mg/kg	240	
2,6-Dinitrotoluene	mg/kg	180	
2-Amino-4,6-dinitrotoluene	mg/kg	70	
2-Nitrotoluene	mg/kg	82	
4-Amino-2,6-dinitrotoluene	mg/kg	45	
4-Nitrotoluene	mg/kg	67	
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	43	
2-Amino-4,6-dinitrotoluene	mg/kg	12	

LEGEND:

- SS017 — SCREENING SURFACE SOIL SAMPLING LOCATION
- SS390 — SUBSURFACE SCREENING SOIL SAMPLING LOCATION
- SO40 — SURFACE/SUBSURFACE SOIL SAMPLING CONFIRMATION LOCATION
- POTABLE WATER VALVE
- RAILROAD TRACK
- TANK

NOTES:

1. NITROAROMATICS (IMS) - IMS SCREENING RESULTS.
2. NITROAROMATICS (8330) - METHOD 8330 RESULTS.

FIGURE 4-13
BUILDING 463 FORTIFIER HOUSE SAMPLE LOCATIONS AND ANALYTICAL RESULTS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
A Member of The IT Group

DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: GUNDERSON | DWG. NO.: ...\775616es.029
ENGR. CHCK. BY: S. MUFFLER | PROJ. MGR.: SPANGBERG | PROJ. NO.: 775616
DATE LAST REV.: | STARTING DATE: 03/23/99
DRAWN BY: | DRAWN BY: T. BRADSHAW
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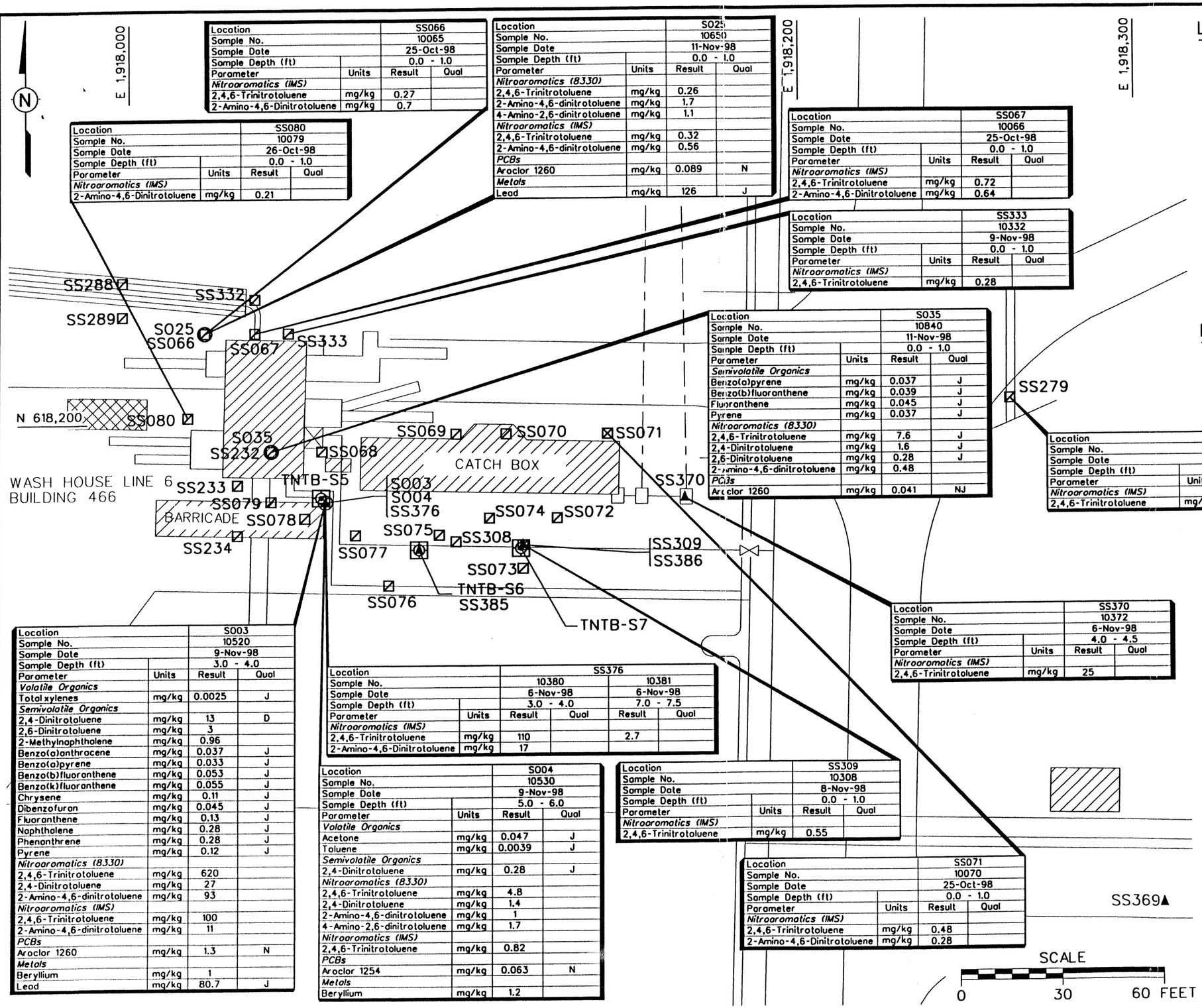

Location		SS066	
Sample No.		10065	
Sample Date		25-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.27	
2-Amino-4,6-Dinitrotoluene	mg/kg	0.7	

Location		SS080	
Sample No.		10079	
Sample Date		26-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2-Amino-4,6-Dinitrotoluene	mg/kg	0.21	

Location		S025	
Sample No.		10651	
Sample Date		11-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	0.26	
2-Amino-4,6-dinitrotoluene	mg/kg	1.7	
4-Amino-2,6-dinitrotoluene	mg/kg	1.1	
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.32	
2-Amino-4,6-dinitrotoluene	mg/kg	0.56	
PCBs			
Aroclor 1260	mg/kg	0.089	N
Metals			
Lead	mg/kg	126	J

Location		SS067	
Sample No.		10066	
Sample Date		25-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.72	
2-Amino-4,6-Dinitrotoluene	mg/kg	0.64	

Location		SS333	
Sample No.		10332	
Sample Date		9-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.28	

Location		S035	
Sample No.		10840	
Sample Date		11-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Semivolatile Organics			
Benzo(a)pyrene	mg/kg	0.037	J
Benzo(b)fluoranthene	mg/kg	0.039	J
Fluoranthene	mg/kg	0.045	J
Pyrene	mg/kg	0.037	J
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	7.6	J
2,4-Dinitrotoluene	mg/kg	1.6	J
2,6-Dinitrotoluene	mg/kg	0.28	J
2-Amino-4,6-dinitrotoluene	mg/kg	0.48	
PCBs			
Aroclor 1260	mg/kg	0.041	NJ

Location		SS279	
Sample No.		10278	
Sample Date		4-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.21	

Location		SS370	
Sample No.		10372	
Sample Date		6-Nov-98	
Sample Depth (ft)		4.0 - 4.5	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	25	

Location		S003	
Sample No.		10520	
Sample Date		9-Nov-98	
Sample Depth (ft)		3.0 - 4.0	
Parameter	Units	Result	Qual
Volatile Organics			
Total xylenes	mg/kg	0.0025	J
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	13	D
2,6-Dinitrotoluene	mg/kg	3	
2-Methylnaphthalene	mg/kg	0.96	
Benzo(a)anthracene	mg/kg	0.037	J
Benzo(a)pyrene	mg/kg	0.033	J
Benzo(b)fluoranthene	mg/kg	0.053	J
Benzo(k)fluoranthene	mg/kg	0.055	J
Chrysene	mg/kg	0.11	J
Dibenzofuran	mg/kg	0.045	J
Fluoranthene	mg/kg	0.13	J
Naphthalene	mg/kg	0.28	J
Phenanthrene	mg/kg	0.28	J
Pyrene	mg/kg	0.12	J
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	620	
2,4-Dinitrotoluene	mg/kg	27	
2-Amino-4,6-dinitrotoluene	mg/kg	93	
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	100	
2-Amino-4,6-dinitrotoluene	mg/kg	11	
PCBs			
Aroclor 1260	mg/kg	1.3	N
Metals			
Beryllium	mg/kg	1	
Lead	mg/kg	80.7	J

Location		SS376			
Sample No.		10380		10381	
Sample Date		6-Nov-98		6-Nov-98	
Sample Depth (ft)		3.0 - 4.0		7.0 - 7.5	
Parameter	Units	Result	Qual	Result	Qual
Nitroaromatics (IMS)					
2,4,6-Trinitrotoluene	mg/kg	110		2.7	
2-Amino-4,6-Dinitrotoluene	mg/kg	17			

Location		S004	
Sample No.		10530	
Sample Date		9-Nov-98	
Sample Depth (ft)		5.0 - 6.0	
Parameter	Units	Result	Qual
Volatile Organics			
Acetone	mg/kg	0.047	J
Toluene	mg/kg	0.0039	J
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	0.28	J
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	4.8	
2,4-Dinitrotoluene	mg/kg	1.4	
2-Amino-4,6-dinitrotoluene	mg/kg	1	
4-Amino-2,6-dinitrotoluene	mg/kg	1.7	
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.82	
PCBs			
Aroclor 1254	mg/kg	0.063	N
Metals			
Beryllium	mg/kg	1.2	

Location		SS309	
Sample No.		10308	
Sample Date		8-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.55	

Location		SS071	
Sample No.		10070	
Sample Date		25-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.48	
2-Amino-4,6-Dinitrotoluene	mg/kg	0.28	

LEGEND:

- SS017 — SCREENING SURFACE SOIL SAMPLING LOCATION
- SS390 — SUBSURFACE SCREENING SOIL SAMPLING LOCATION
- S040 — SURFACE/SUBSURFACE SOIL SAMPLING CONFIRMATION LOCATION
- POTABLE WATER VALVE
- DRAINAGE CULVERT
- FORMER WASTEWATER FLUME LINE (UNDERGROUND)

NOTES:

1. NITROAROMATICS (IMS) - IMS SCREENING RESULTS.
2. NITROAROMATICS (8330) - METHOD 8830 RESULTS.

FIGURE 4-14
BUILDING 466
WASH HOUSE SAMPLE LOCATIONS AND ANALYTICAL RESULTS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
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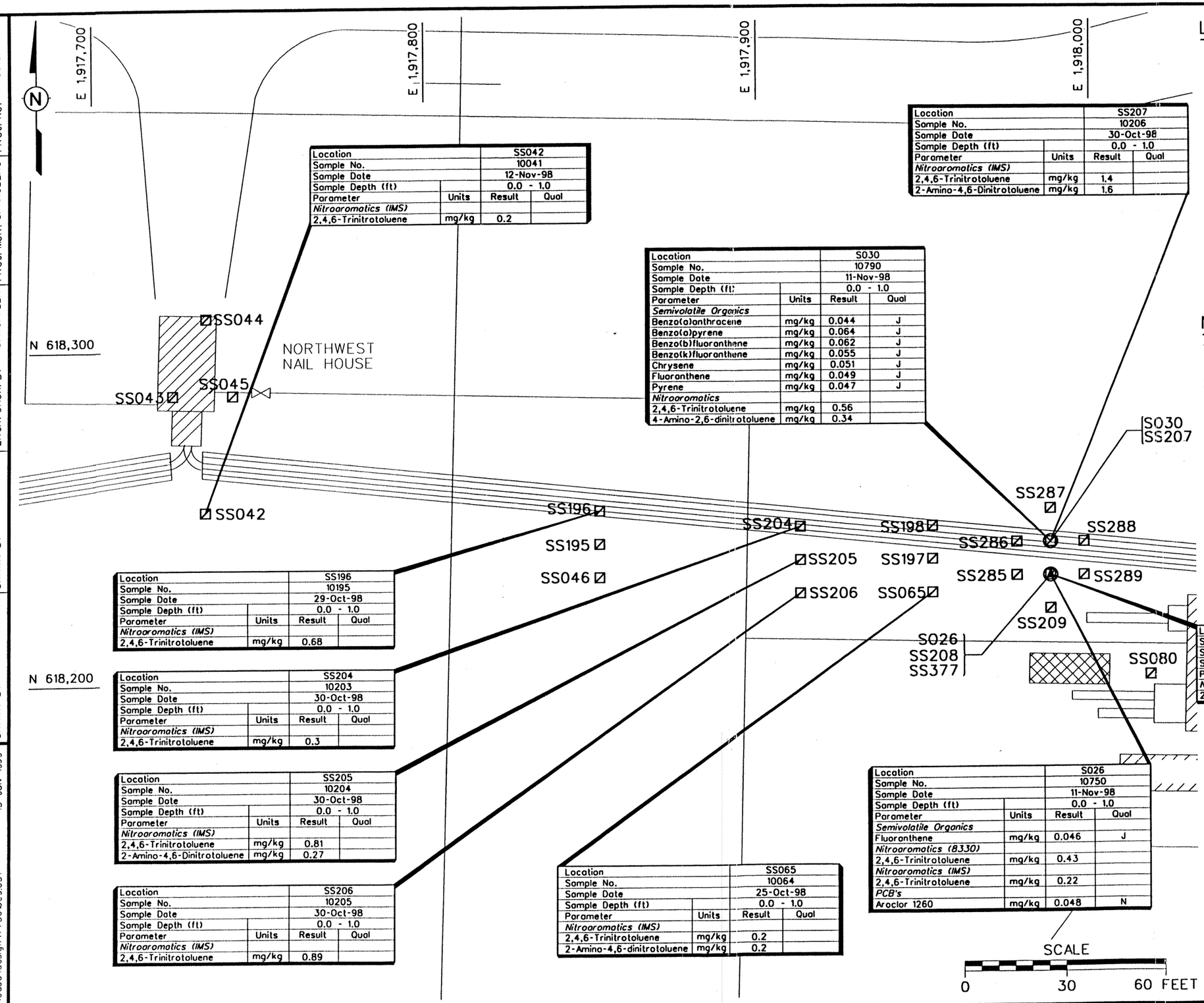
STARTING DATE: 03/22/99 | DATE LAST REV.: | DRAFT. CHCK. BY: C. TUMLIN | ENGR. CHCK. BY: S. MUFFLER | INITIATOR: GUNDERSON | PROJ. MGR.: SPANGBERG | DWG. NO.: ...\775616es.030 | PROJ. NO.: 775616
DRAWN BY: T. BRADSHAW | DRAWN BY:
10:37:19 15 JUN 1999
c:\cadd\design\775616es.030 by anderg



Location		SS042	
Sample No.		10041	
Sample Date		12-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.2	

Location		SS207	
Sample No.		10206	
Sample Date		30-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	1.4	
2-Amino-4,6-Dinitrotoluene	mg/kg	1.6	

Location		S030	
Sample No.		10790	
Sample Date		11-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Semivolatile Organics			
Benzo(a)anthracene	mg/kg	0.044	J
Benzo(a)pyrene	mg/kg	0.064	J
Benzo(b)fluoranthene	mg/kg	0.062	J
Benzo(k)fluoranthene	mg/kg	0.055	J
Chrysene	mg/kg	0.051	J
Fluoranthene	mg/kg	0.049	J
Pyrene	mg/kg	0.047	J
Nitroaromatics			
2,4,6-Trinitrotoluene	mg/kg	0.56	
4-Amino-2,6-dinitrotoluene	mg/kg	0.34	

Location		SS196	
Sample No.		10195	
Sample Date		29-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.68	

Location		SS204	
Sample No.		10203	
Sample Date		30-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.3	

Location		SS205	
Sample No.		10204	
Sample Date		30-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.81	
2-Amino-4,6-Dinitrotoluene	mg/kg	0.27	

Location		SS206	
Sample No.		10205	
Sample Date		30-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.89	

Location		SS065	
Sample No.		10064	
Sample Date		25-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.2	
2-Amino-4,6-dinitrotoluene	mg/kg	0.2	

Location		S026	
Sample No.		10750	
Sample Date		11-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Semivolatile Organics			
Fluoranthene	mg/kg	0.046	J
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	0.43	
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.22	
PCB's			
Aroclor 1260	mg/kg	0.048	N

Location		SS208	
Sample No.		10207	
Sample Date		30-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	23	

LEGEND:

⊠ SS017	SCREENING SURFACE SOIL SAMPLING LOCATION
▲ SS390	SUBSURFACE SCREENING SOIL SAMPLING LOCATION
○ S040	SURFACE/SUBSURFACE SOIL SAMPLING CONFIRMATION LOCATION
⋈	POTABLE WATER VALVE

NOTES:

1. NITROAROMATICS (IMS) - IMS SCREENING RESULTS.
2. NITROAROMATICS (8330) - METHOD 8330 RESULTS.

SCALE

0 30 60 FEET

FIGURE 4-15
NORTHWEST NAIL HOUSE SAMPLE LOCATIONS AND ANALYTICAL RESULTS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
A Member of The IT Group

STARTING DATE: 03/22/99 | DATE LAST REV.: | DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: GUNDERSON | DWG. NO.: ...\775616es.031
DRAWN BY: T. BRADSHAW | DRAWN BY: | ENGR. CHCK. BY: S. MUFFLER | PROJ. MGR.: SPANGBERG | PROJ. NO.: 775616
10:38:55 15 JUN 1999
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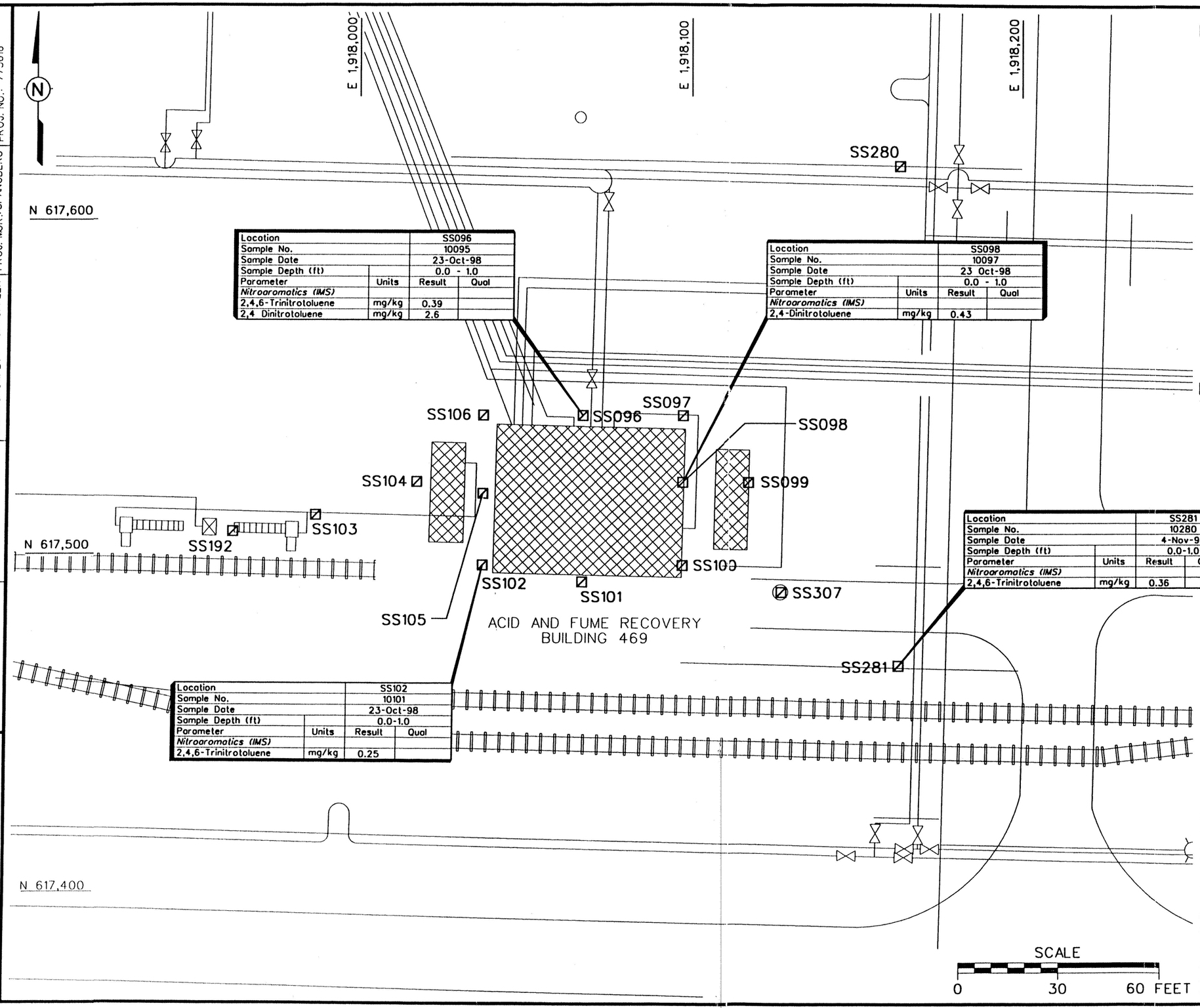

Location		SS096	
Sample No.		10095	
Sample Date		23-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.39	
2,4 Dinitrotoluene	mg/kg	2.6	

Location		SS098	
Sample No.		10097	
Sample Date		23 Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4-Dinitrotoluene	mg/kg	0.43	

Location		SS281	
Sample No.		10280	
Sample Date		4-Nov-98	
Sample Depth (ft)		0.0-1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.36	

Location		SS102	
Sample No.		10101	
Sample Date		23-Oct-98	
Sample Depth (ft)		0.0-1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.25	

LEGEND:

- SS011 — SURFACE SCREENING SOIL SAMPLING LOCATION
- RAILROAD TRACK
- POTABLE WATER VALVE
- EXPANSION JOINT IN STEAM LINE
- DRAINAGE DITCH
- MANHOLE

NOTES:

1. NITROAROMATICS (IMS) - IMS SCREENING RESULTS

SCALE
0 30 60 FEET

FIGURE 4-16
BUILDING 469
ACID AND FUME RECOVERY
SAMPLE LOCATIONS AND
ANALYTICAL RESULTS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
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DWG. NO.: ...\775616es.032
PROJ. NO.: 775616
INITIATOR: GUNDERSON
PROJ. MGR.: SPANGBERG
DRAFT. CHCK. BY: C. TUMLIN
ENGR. CHCK. BY: S. MUFFLER
DATE LAST REV.:
DRAWN BY:
STARTING DATE: 03/22/99
DRAWN BY: T. BRADSHAW
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15 JUN 1999
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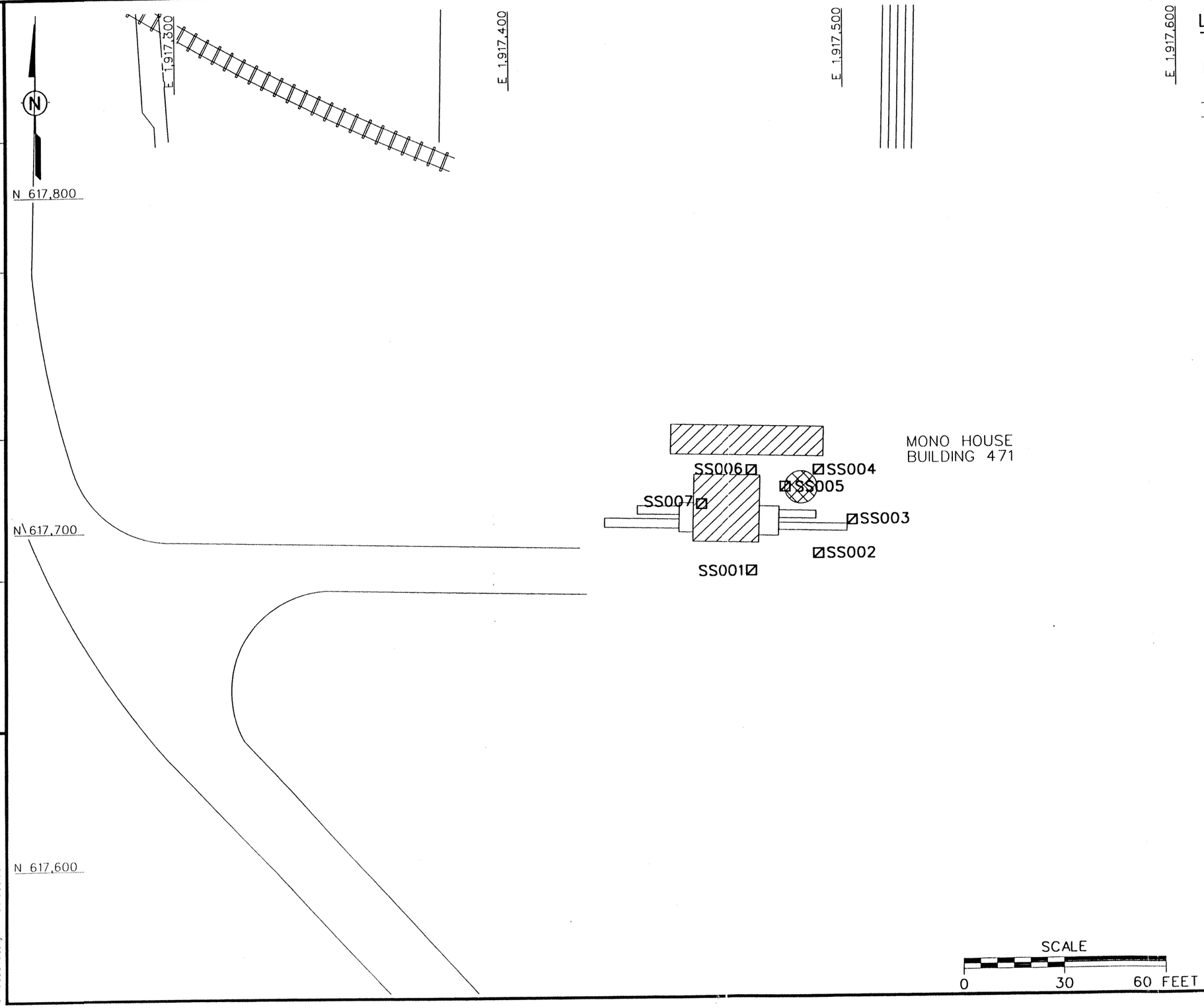

LEGEND:

SS039	SUBSURFACE SCREENING SOIL SAMPLING LOCATION
	RAILROAD
	TANK

FIGURE 4-17
BUILDING 471 MONO HOUSE
SAMPLE LOCATIONS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
A Member of The IT Group

DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: GUNDERSON	DWG. NO.: ...\775616es037	
ENGR. CHCK. BY: S. MUFFLER	PROJ. MGR. SPANGBERG	PROJ. NO.: 775616	
STARTING DATE: 04/23/99	DATE LAST REV.:		
DRAWN BY: B. VANDERGRIFF	DRAWN BY:		

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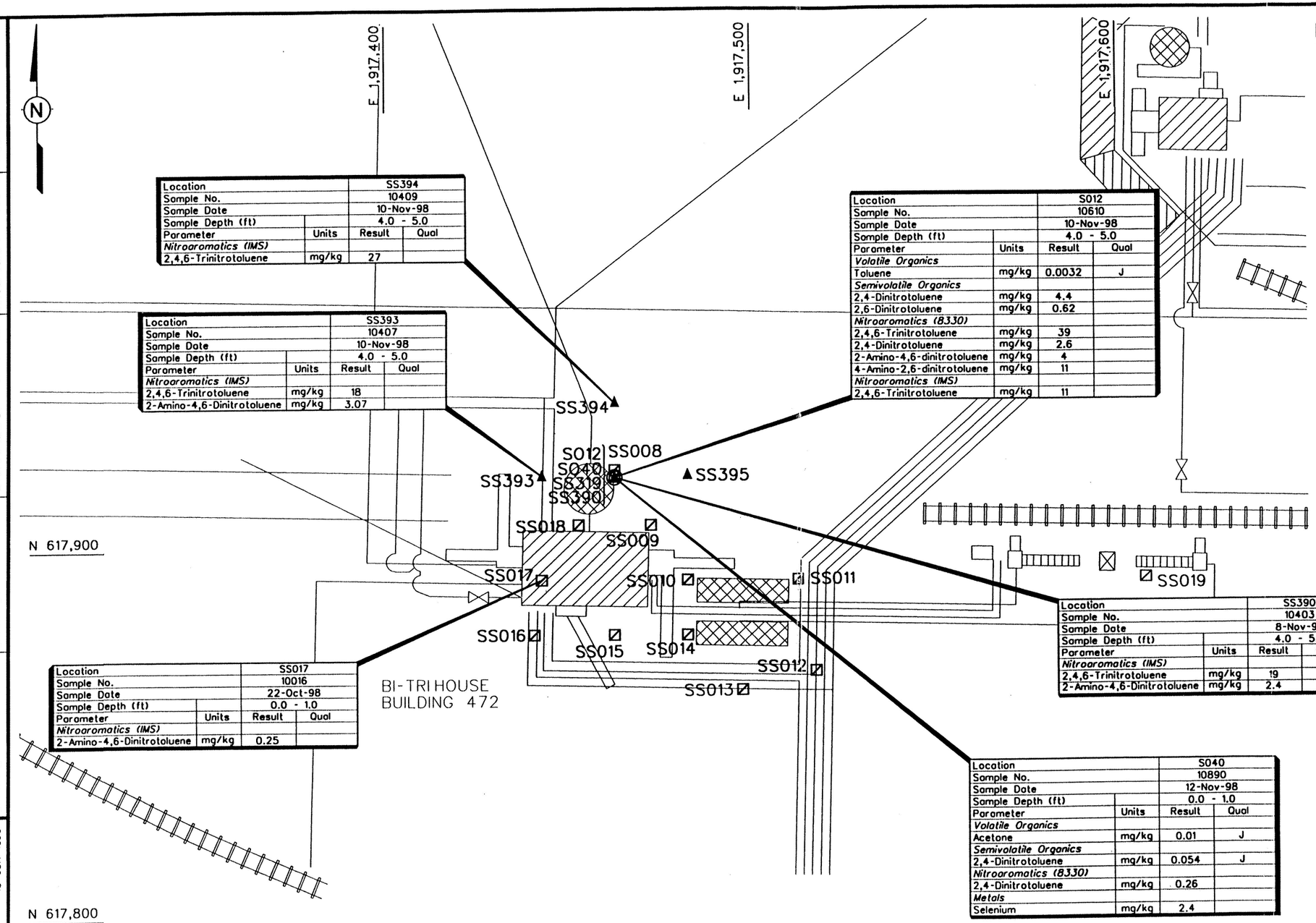

Location		SS394	
Sample No.		10409	
Sample Date		10-Nov-98	
Sample Depth (ft)		4.0 - 5.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	27	

Location		SS393	
Sample No.		10407	
Sample Date		10-Nov-98	
Sample Depth (ft)		4.0 - 5.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	18	
2-Amino-4,6-Dinitrotoluene	mg/kg	3.07	

Location		S012	
Sample No.		10610	
Sample Date		10-Nov-98	
Sample Depth (ft)		4.0 - 5.0	
Parameter	Units	Result	Qual
Volatile Organics			
Toluene	mg/kg	0.0032	J
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	4.4	
2,6-Dinitrotoluene	mg/kg	0.62	
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	39	
2,4-Dinitrotoluene	mg/kg	2.6	
2-Amino-4,6-dinitrotoluene	mg/kg	4	
4-Amino-2,6-dinitrotoluene	mg/kg	11	
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	11	

Location		SS390	
Sample No.		10403	
Sample Date		8-Nov-98	
Sample Depth (ft)		4.0 - 5.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	19	
2-Amino-4,6-Dinitrotoluene	mg/kg	2.4	

Location		SS017	
Sample No.		10016	
Sample Date		22-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2-Amino-4,6-Dinitrotoluene	mg/kg	0.25	

Location		S040	
Sample No.		10890	
Sample Date		12-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Volatile Organics			
Acetone	mg/kg	0.01	J
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	0.054	J
Nitroaromatics (8330)			
2,4-Dinitrotoluene	mg/kg	0.26	
Metals			
Selenium	mg/kg	2.4	

LEGEND:

- ☒ SS017 — SCREENING SURFACE SOIL SAMPLING LOCATION
- ▲ SS390 — SUBSURFACE SCREENING SOIL SAMPLING LOCATION
- ○ S040 — SURFACE/SUBSURFACE SOIL SAMPLING CONFIRMATION LOCATION
- RAILROAD TRACK
- POTABLE WATER VALVE
- TANK

NOTES:

1. NITROAROMATICS (IMS) - IMS SCREENING RESULTS.

SCALE

0 30 60 FEET

FIGURE 4-18
BUILDING 472 BI-TRI HOUSE SAMPLE LOCATIONS AND ANALYTICAL RESULTS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
A Member of The IT Group

STARTING DATE: 03/22/99 | DATE LAST REV.: | DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: GUNDERSON | DWG. NO.: ...\775616es033
DRAWN BY: T. BRADSHAW | DRAWN BY: | ENGR. CHCK. BY: S. MUFFLER | PROJ. MGR.: SPANGBERG | PROJ. NO.: 775616

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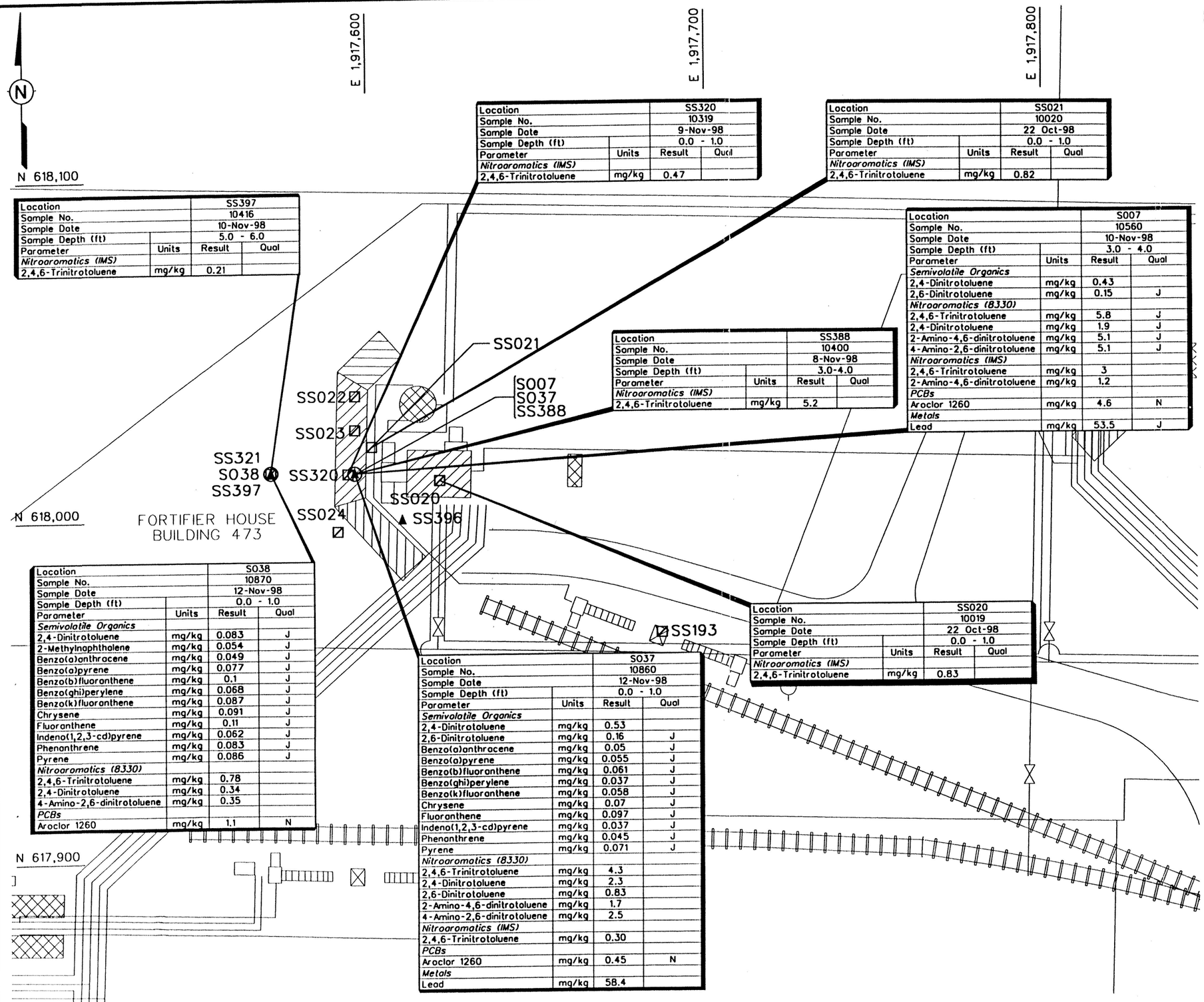

Location		SS320	
Sample No.		10319	
Sample Date		9-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.47	

Location		SS021	
Sample No.		10020	
Sample Date		22 Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.82	

Location		SS397	
Sample No.		10416	
Sample Date		10-Nov-98	
Sample Depth (ft)		5.0 - 6.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.21	

Location		S007	
Sample No.		10560	
Sample Date		10-Nov-98	
Sample Depth (ft)		3.0 - 4.0	
Parameter	Units	Result	Qual
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	0.43	
2,6-Dinitrotoluene	mg/kg	0.15	J
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	5.8	J
2,4-Dinitrotoluene	mg/kg	1.9	J
2-Amino-4,6-dinitrotoluene	mg/kg	5.1	J
4-Amino-2,6-dinitrotoluene	mg/kg	5.1	J
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	3	
2-Amino-4,6-dinitrotoluene	mg/kg	1.2	
PCBs			
Aroclor 1260	mg/kg	4.6	N
Metals			
Lead	mg/kg	53.5	J

Location		SS388	
Sample No.		10400	
Sample Date		8-Nov-98	
Sample Depth (ft)		3.0-4.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	5.2	

Location		S038	
Sample No.		10870	
Sample Date		12-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	0.083	J
2-Methylnaphthalene	mg/kg	0.054	J
Benzo(a)anthracene	mg/kg	0.049	J
Benzo(a)pyrene	mg/kg	0.077	J
Benzo(b)fluoranthene	mg/kg	0.1	J
Benzo(ghi)perylene	mg/kg	0.068	J
Benzo(k)fluoranthene	mg/kg	0.087	J
Chrysene	mg/kg	0.091	J
Fluoranthene	mg/kg	0.11	J
Indeno(1,2,3-cd)pyrene	mg/kg	0.062	J
Phenanthrene	mg/kg	0.083	J
Pyrene	mg/kg	0.086	J
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	0.78	
2,4-Dinitrotoluene	mg/kg	0.34	
4-Amino-2,6-dinitrotoluene	mg/kg	0.35	
PCBs			
Aroclor 1260	mg/kg	1.1	N

Location		SS020	
Sample No.		10019	
Sample Date		22 Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.83	

Location		S037	
Sample No.		10860	
Sample Date		12-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	0.53	
2,6-Dinitrotoluene	mg/kg	0.16	J
Benzo(a)anthracene	mg/kg	0.05	J
Benzo(a)pyrene	mg/kg	0.055	J
Benzo(b)fluoranthene	mg/kg	0.061	J
Benzo(ghi)perylene	mg/kg	0.037	J
Benzo(k)fluoranthene	mg/kg	0.058	J
Chrysene	mg/kg	0.07	J
Fluoranthene	mg/kg	0.097	J
Indeno(1,2,3-cd)pyrene	mg/kg	0.037	J
Phenanthrene	mg/kg	0.045	J
Pyrene	mg/kg	0.071	J
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	4.3	
2,4-Dinitrotoluene	mg/kg	2.3	
2,6-Dinitrotoluene	mg/kg	0.83	
2-Amino-4,6-dinitrotoluene	mg/kg	1.7	
4-Amino-2,6-dinitrotoluene	mg/kg	2.5	
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.30	
PCBs			
Aroclor 1260	mg/kg	0.45	N
Metals			
Lead	mg/kg	58.4	

LEGEND:

- SS011 — SCREENING SURFACE SOIL SAMPLING LOCATION
- SS395 — SUBSURFACE SCREENING SOIL SAMPLING LOCATION
- S040 — SURFACE/SUBSURFACE SOIL SAMPLING CONFIRMATION LOCATION
- RAILROAD TRACK
- FIRE HYDRANTS
- POTABLE WATER VALVE
- TANK

NOTES:

1. NITROAROMATICS (IMS) - IMS SCREENING RESULTS.
2. NITROAROMATICS (8330) - METHOD 8330 RESULTS.

SCALE

0 30 60 FEET

FIGURE 4-19
BUILDING 473 FORTIFIER HOUSE SAMPLE LOCATIONS AND ANALYTICAL RESULTS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
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DWG. NO.: ...\775616es.034 | PROJ. NO.: 775616
INITIATOR: GUNDERSON | PROJ. MGR.: SPANGBERG
DRAFT. CHCK. BY: C. TUMLIN | ENGR. CHCK. BY: S. MUFFLER
DATE LAST REV.: | DRAWN BY:
STARTING DATE: 03/19/99 | DRAWN BY: T. BRADSHAW
10:45:15 15 JUN 1999
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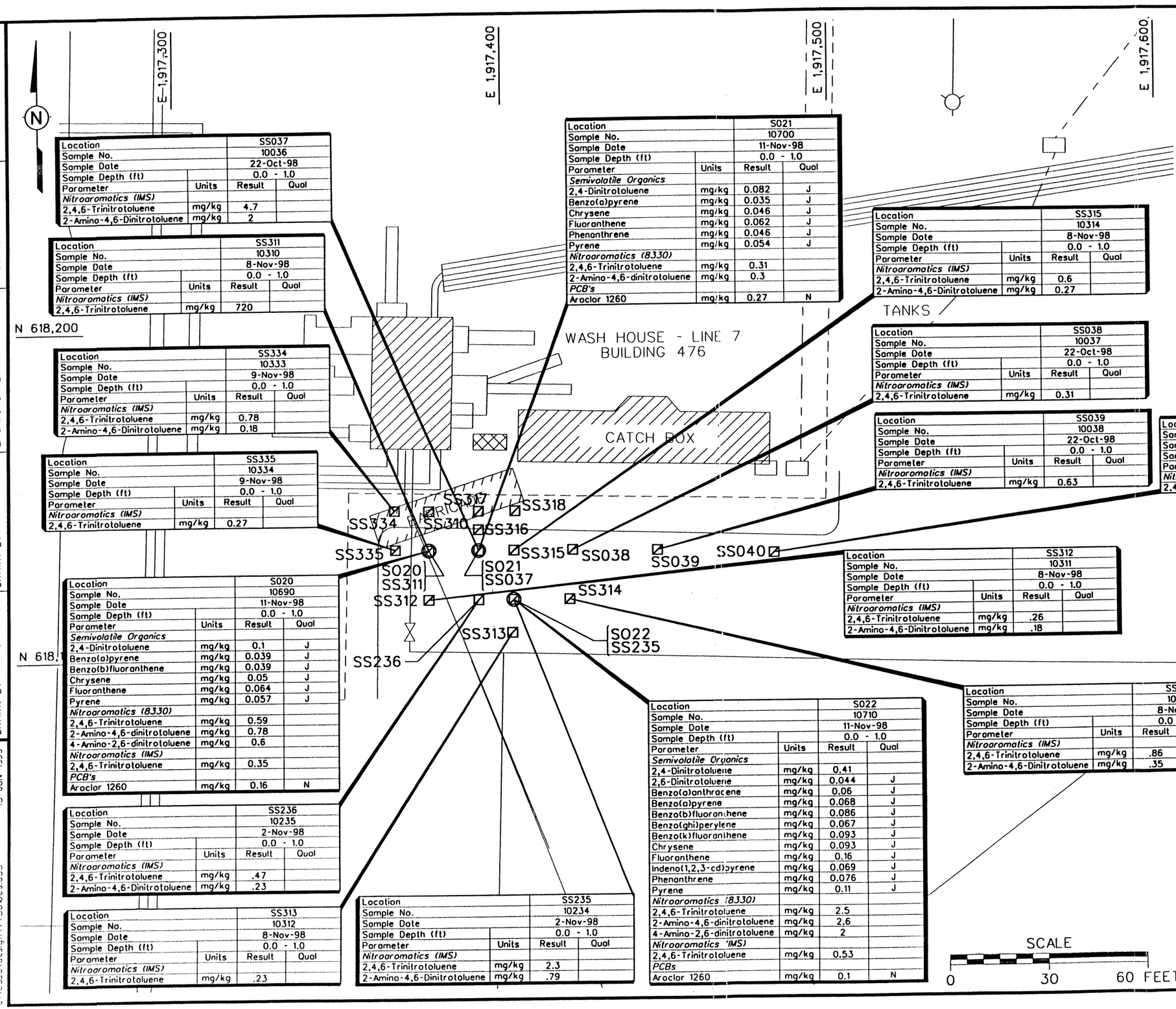

Location		SS037	
Sample No.		10036	
Sample Date		22-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	4.7	
2-Amino-4,6-Dinitrotoluene	mg/kg	2	

Location		SS311	
Sample No.		10310	
Sample Date		8-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	720	

Location		SS334	
Sample No.		10333	
Sample Date		9-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.78	
2-Amino-4,6-Dinitrotoluene	mg/kg	0.18	

Location		SS335	
Sample No.		10334	
Sample Date		9-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.27	

Location		S020	
Sample No.		10690	
Sample Date		11-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	0.1	J
Benzo(a)pyrene	mg/kg	0.039	J
Benzo(b)fluoranthene	mg/kg	0.039	J
Chrysene	mg/kg	0.05	J
Fluoranthene	mg/kg	0.064	J
Pyrene	mg/kg	0.057	J
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	0.59	
2-Amino-4,6-dinitrotoluene	mg/kg	0.78	
4-Amino-2,6-dinitrotoluene	mg/kg	0.6	
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.35	
PCB's			
Aroclor 1260	mg/kg	0.16	N

Location		SS236	
Sample No.		10235	
Sample Date		2-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	.47	
2-Amino-4,6-Dinitrotoluene	mg/kg	.23	

Location		SS313	
Sample No.		10312	
Sample Date		8-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	.23	

Location		S021	
Sample No.		10700	
Sample Date		11-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	0.082	J
Benzo(a)pyrene	mg/kg	0.035	J
Chrysene	mg/kg	0.046	J
Fluoranthene	mg/kg	0.062	J
Phenanthrene	mg/kg	0.046	J
Pyrene	mg/kg	0.054	J
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	0.31	
2-Amino-4,6-dinitrotoluene	mg/kg	0.3	
PCB's			
Aroclor 1260	mg/kg	0.27	N

Location		SS235	
Sample No.		10234	
Sample Date		2-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	2.3	
2-Amino-4,6-Dinitrotoluene	mg/kg	.79	

Location		S022	
Sample No.		10710	
Sample Date		11-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Semivolatile Organics			
2,4-Dinitrotoluene	mg/kg	0.41	
2,6-Dinitrotoluene	mg/kg	0.044	J
Benzo(a)anthracene	mg/kg	0.06	J
Benzo(a)pyrene	mg/kg	0.068	J
Benzo(b)fluoranthene	mg/kg	0.086	J
Benzo(ghi)perylene	mg/kg	0.067	J
Benzo(k)fluoranthene	mg/kg	0.093	J
Chrysene	mg/kg	0.093	J
Fluoranthene	mg/kg	0.16	J
Indeno(1,2,3-cd)pyrene	mg/kg	0.069	J
Phenanthrene	mg/kg	0.076	J
Pyrene	mg/kg	0.11	J
Nitroaromatics (8330)			
2,4,6-Trinitrotoluene	mg/kg	2.5	
2-Amino-4,6-dinitrotoluene	mg/kg	2.6	
4-Amino-2,6-dinitrotoluene	mg/kg	2	
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.53	
PCBs			
Aroclor 1260	mg/kg	0.1	N

Location		SS315	
Sample No.		10314	
Sample Date		8-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.6	
2-Amino-4,6-Dinitrotoluene	mg/kg	0.27	

Location		SS038	
Sample No.		10037	
Sample Date		22-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.31	

Location		SS039	
Sample No.		10038	
Sample Date		22-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.63	

Location		SS040	
Sample No.		10039	
Sample Date		22-Oct-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	0.39	

Location		SS312	
Sample No.		10311	
Sample Date		8-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	.26	
2-Amino-4,6-Dinitrotoluene	mg/kg	.18	

Location		SS314	
Sample No.		10313	
Sample Date		8-Nov-98	
Sample Depth (ft)		0.0 - 1.0	
Parameter	Units	Result	Qual
Nitroaromatics (IMS)			
2,4,6-Trinitrotoluene	mg/kg	.86	
2-Amino-4,6-Dinitrotoluene	mg/kg	.35	

LEGEND:

- SS039 — SURFACE SCREENING SOIL SAMPLING LOCATION
- S022 — SURFACE/SUBSURFACE SOIL SAMPLING CONFIRMATION LOCATION
- FIRE HYDRANTS
- POTABLE WATER VALVE
- DRAINAGE DITCH
- APPROXIMATE EXTENT OF ASPHALT PAVEMENT
- FORMER WASTEWATER FLUME LINE (UNDERGROUND)

NOTES:

1. NITROAROMATICS (IMS) - IMS SCREENING RESULTS.
2. NITROAROMATICS (8330) - METHOD 8330 RESULTS.

SCALE

0 30 60 FEET

FIGURE 4-20
BUILDING 476 WASH HOUSE SAMPLE LOCATIONS AND ANALYTICAL RESULTS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
A Member of The IT Group

STARTING DATE: 03/18/99 | DATE LAST REV.: | DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: GUNDERSON | DWG. NO.: ...\775616es.035
DRAWN BY: T. BRADSHAW | DRAWN BY: | ENGR. CHCK. BY: S. MUFFLER | PROJ. MGR.: SPANGBERG | PROJ. NO.: 775616

10:46:11 15 JUN 1999
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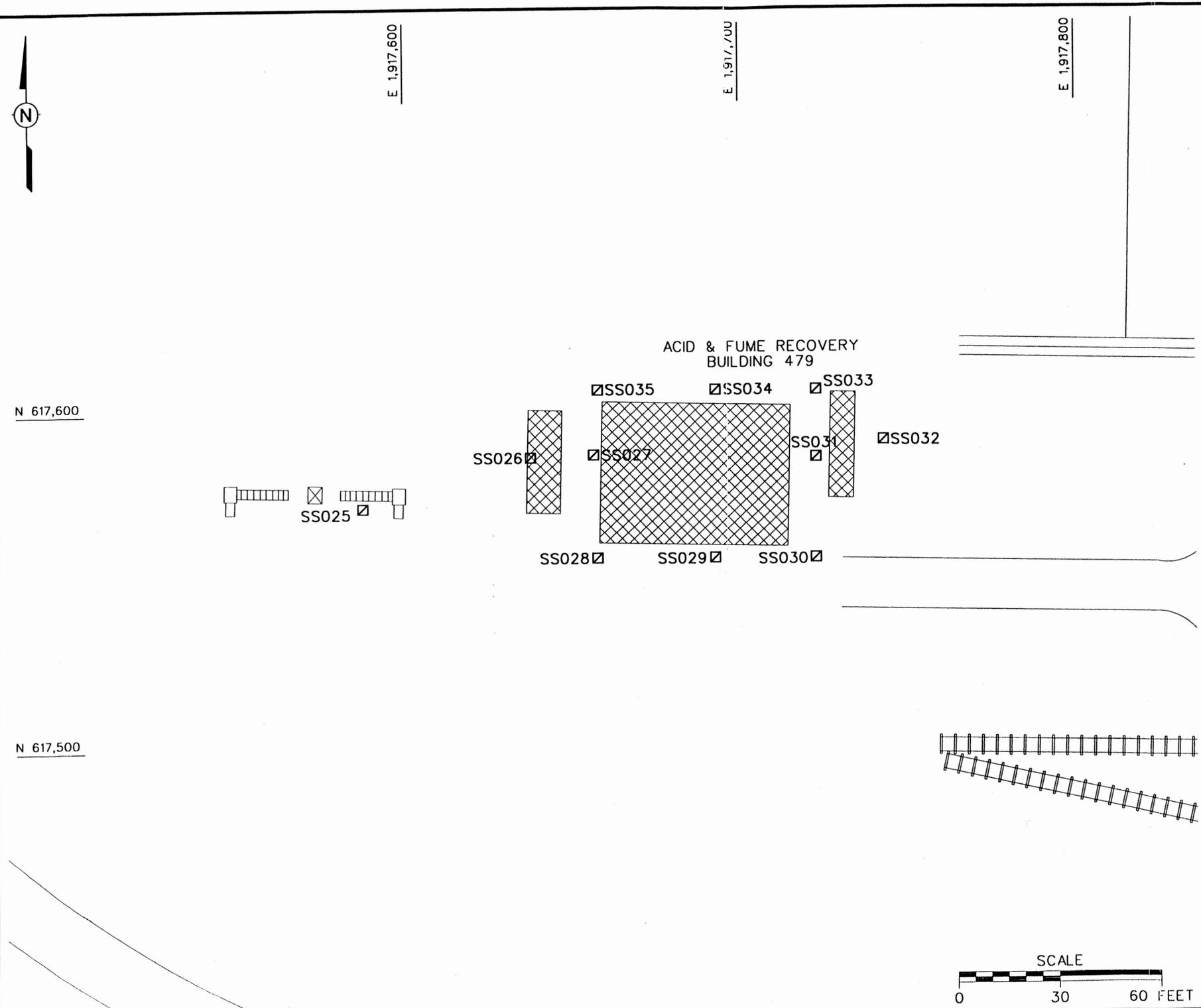

LEGEND:

SS011 SUBSURFACE SCREENING SOIL SAMPLING LOCATION

RAILROAD TRACK

FIGURE 4-21
BUILDING 479
ACID AND FUME RECOVERY
SAMPLE LOCATIONS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
A Member of The IT Group

STARTING DATE: 03/18/99	DATE LAST REV.:	DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: GUNDERSON	DWG. NO.: ...\775616es.036
DRAWN BY: T. BRADSHAW	DRAWN BY:	ENGR. CHCK. BY: S. MUFFLER	PROJ. MGR.: SPANGBERG	PROJ. NO.: 775616

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bvanderg
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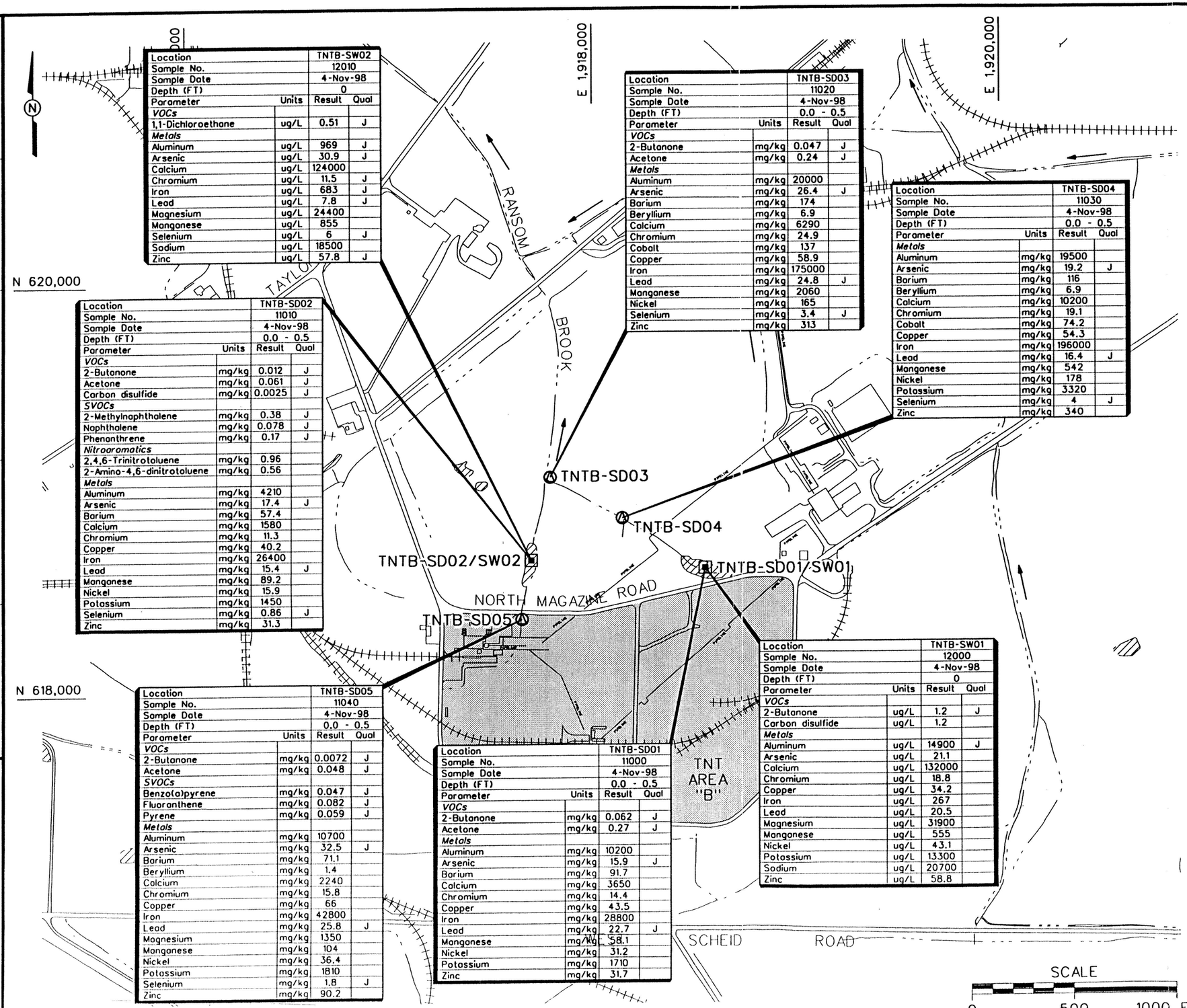

Location		TNTB-SW02	
Sample No.		12010	
Sample Date		4-Nov-98	
Depth (FT)		0	
Parameter	Units	Result	Qual
VOCs			
1,1-Dichloroethane	ug/L	0.51	J
Metals			
Aluminum	ug/L	969	J
Arsenic	ug/L	30.9	J
Calcium	ug/L	124000	
Chromium	ug/L	11.5	J
Iron	ug/L	683	J
Lead	ug/L	7.8	J
Magnesium	ug/L	24400	
Manganese	ug/L	855	
Selenium	ug/L	6	J
Sodium	ug/L	18500	
Zinc	ug/L	57.8	J

Location		TNTB-SD02	
Sample No.		11010	
Sample Date		4-Nov-98	
Depth (FT)		0.0 - 0.5	
Parameter	Units	Result	Qual
VOCs			
2-Butanone	mg/kg	0.012	J
Acetone	mg/kg	0.061	J
Carbon disulfide	mg/kg	0.0025	J
SVOCs			
2-Methylnaphthalene	mg/kg	0.38	J
Naphthalene	mg/kg	0.078	J
Phenanthrene	mg/kg	0.17	J
Nitroaromatics			
2,4,6-Trinitrotoluene	mg/kg	0.96	
2-Amino-4,6-dinitrotoluene	mg/kg	0.56	
Metals			
Aluminum	mg/kg	4210	
Arsenic	mg/kg	17.4	J
Barium	mg/kg	57.4	
Calcium	mg/kg	1580	
Chromium	mg/kg	11.3	
Copper	mg/kg	40.2	
Iron	mg/kg	26400	
Lead	mg/kg	15.4	J
Manganese	mg/kg	89.2	
Nickel	mg/kg	15.9	
Potassium	mg/kg	1450	
Selenium	mg/kg	0.86	J
Zinc	mg/kg	31.3	

Location		TNTB-SD05	
Sample No.		11040	
Sample Date		4-Nov-98	
Depth (FT)		0.0 - 0.5	
Parameter	Units	Result	Qual
VOCs			
2-Butanone	mg/kg	0.0072	J
Acetone	mg/kg	0.048	J
SVOCs			
Benzo(a)pyrene	mg/kg	0.047	J
Fluoranthene	mg/kg	0.082	J
Pyrene	mg/kg	0.059	J
Metals			
Aluminum	mg/kg	10700	
Arsenic	mg/kg	32.5	J
Barium	mg/kg	71.1	
Beryllium	mg/kg	1.4	
Calcium	mg/kg	2240	
Chromium	mg/kg	15.8	
Copper	mg/kg	66	
Iron	mg/kg	42800	
Lead	mg/kg	25.8	J
Magnesium	mg/kg	1350	
Manganese	mg/kg	104	
Nickel	mg/kg	36.4	
Potassium	mg/kg	1810	
Selenium	mg/kg	1.8	J
Zinc	mg/kg	90.2	

Location		TNTB-SD01	
Sample No.		11000	
Sample Date		4-Nov-98	
Depth (FT)		0.0 - 0.5	
Parameter	Units	Result	Qual
VOCs			
2-Butanone	mg/kg	0.062	J
Acetone	mg/kg	0.27	J
Metals			
Aluminum	mg/kg	10200	
Arsenic	mg/kg	15.9	J
Barium	mg/kg	91.7	
Calcium	mg/kg	3650	
Chromium	mg/kg	14.4	
Copper	mg/kg	43.5	
Iron	mg/kg	28800	
Lead	mg/kg	22.7	J
Manganese	mg/kg	58.1	
Nickel	mg/kg	31.2	
Potassium	mg/kg	1710	
Zinc	mg/kg	31.7	

Location		TNTB-SD03	
Sample No.		11020	
Sample Date		4-Nov-98	
Depth (FT)		0.0 - 0.5	
Parameter	Units	Result	Qual
VOCs			
2-Butanone	mg/kg	0.047	J
Acetone	mg/kg	0.24	J
Metals			
Aluminum	mg/kg	20000	
Arsenic	mg/kg	26.4	J
Barium	mg/kg	174	
Beryllium	mg/kg	6.9	
Calcium	mg/kg	6290	
Chromium	mg/kg	24.9	
Cobalt	mg/kg	137	
Copper	mg/kg	58.9	
Iron	mg/kg	175000	
Lead	mg/kg	24.8	J
Manganese	mg/kg	2060	
Nickel	mg/kg	165	
Selenium	mg/kg	3.4	J
Zinc	mg/kg	313	

Location		TNTB-SD04	
Sample No.		11030	
Sample Date		4-Nov-98	
Depth (FT)		0.0 - 0.5	
Parameter	Units	Result	Qual
Metals			
Aluminum	mg/kg	19500	
Arsenic	mg/kg	19.2	J
Barium	mg/kg	116	
Beryllium	mg/kg	6.9	
Calcium	mg/kg	10200	
Chromium	mg/kg	19.1	
Cobalt	mg/kg	74.2	
Copper	mg/kg	54.3	
Iron	mg/kg	196000	
Lead	mg/kg	16.4	J
Manganese	mg/kg	542	
Nickel	mg/kg	178	
Potassium	mg/kg	3320	
Selenium	mg/kg	4	J
Zinc	mg/kg	340	

Location		TNTB-SW01	
Sample No.		12000	
Sample Date		4-Nov-98	
Depth (FT)		0	
Parameter	Units	Result	Qual
VOCs			
2-Butanone	ug/L	1.2	J
Carbon disulfide	ug/L	1.2	
Metals			
Aluminum	ug/L	14900	J
Arsenic	ug/L	21.1	
Calcium	ug/L	132000	
Chromium	ug/L	18.8	
Copper	ug/L	34.2	
Iron	ug/L	267	
Lead	ug/L	20.5	
Magnesium	ug/L	31900	
Manganese	ug/L	555	
Nickel	ug/L	43.1	
Potassium	ug/L	13300	
Sodium	ug/L	20700	
Zinc	ug/L	58.8	

LEGEND:

- BUILDINGS
- RAILROAD
- SURFACE DRAINAGE
- SURFACE WATER
- SURFACE WATER/SEDIMENT SAMPLING LOCATIONS
- SEDIMENT SAMPLING LOCATION
- SURFACE WATER FLOW DIRECTION

FIGURE 4-22
SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS AND ANALYTICAL RESULTS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

IT CORPORATION
A Member of The IT Group

DWG. NO.: ...\775616es.039 | INITIATOR: GUNDERSON | DRAFT. CHCK. BY: C. TUMLIN | DATE LAST REV.: | STARTING DATE: 03/23/99
PROJ. NO.: 775616 | PROJ. MGR.: SPANGBERG | ENGR. CHCK. BY: M. GUNDERSON | DRAWN BY: | DRAWN BY: B. VANDERGRIFF
15 JUN 1999 10:49:51
c:\cad\design\775616es.039 by: spangberg

APPENDIX A

SITE PHOTOGRAPHS

PHOTOGRAPH [illegible]. [illegible] BUILDING. VIEW FACING EAST. HISTORICAL DOCKS TNTB-524, TNTB-525, AND TNTB-526 ARE SHOWN. [illegible] CORPORATION, [illegible] 1996.

PHOTOGRAPH [illegible]. BUILDING [illegible] HOUSE. VIEW FACING WEST WITH THE [illegible] TRAVEL FACILITY [illegible] BACKGROUND. HISTORICAL DOCKS TNTB-522 AND TNTB-523 ARE SHOWN. [illegible] CORPORATION, [illegible] 1996.

PHOTOGRAPH A-3. BUILDING 456, WASH HOUSE. VIEW FACING SOUTHWEST. THE ABOVEGROUND NITROGEN LINE IS ON THE LEFT. THE NITROGEN DEWAR TANKS (LEFT) AND HYPERSONIC TUNNEL FACILITY (RIGHT) ARE VISIBLE IN BACKGROUND. PHOTOGRAPH TAKEN BY IT CORPORATION, NOVEMBER 13, 1998.

PHOTOGRAPH A-4. NORTHEAST NAIL HOUSE. VIEW FACING SOUTH-SOUTHWEST. CONCRETE PRESENT IN THE CENTER OF THE PHOTOGRAPH IS THE REMNANT OF LOADING DOCK AREA ON NORTH SIDE OF THE NAIL HOUSE. NITROGEN DEWAR TANKS AND NITROGEN LINE ARE VISIBLE ON THE RIGHT SIDE OF PHOTOGRAPH IN THE BACKGROUND. PHOTOGRAPH TAKEN BY IT CORPORATION, NOVEMBER 13, 1998.

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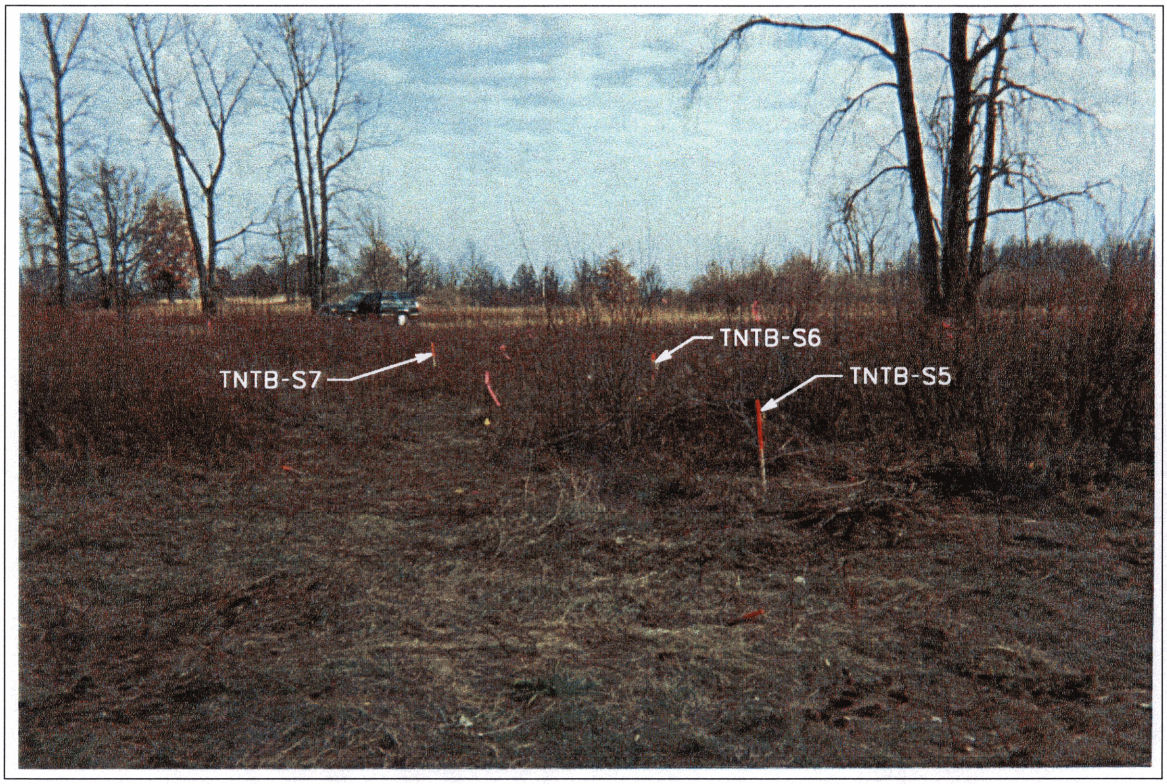
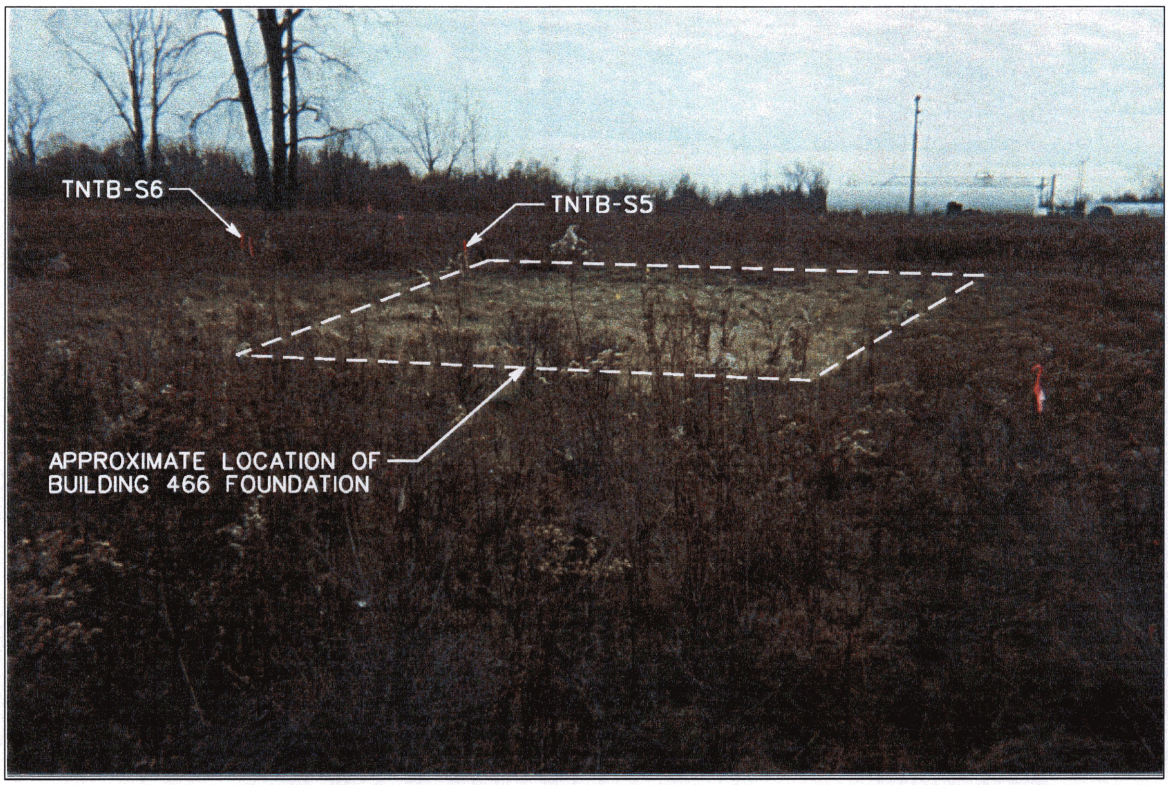


PHOTOGRAPH A-5. BUILDING 466, WASH HOUSE. VIEW FACING EAST-SOUTHEAST. HISTORICAL BORINGS TNTB-S5, TNTB-S6, AND TNTB-S7 ARE SHOWN AT STAKED LOCATIONS. PHOTOGRAPH TAKEN BY IT CORPORATION, NOVEMBER 13, 1998.



PHOTOGRAPH A-6. BUILDING 466, WASH HOUSE. VIEW FACING SOUTHEAST. GRASSY AREA IN THE CENTER OF THE PHOTOGRAPH REPRESENTS THE FORMER BUILDING FOUNDATION LOCATION. HISTORICAL BORING TNTB-S5 AND TNTB-S6 SHOWN AT STAKED LOCATIONS. PHOTOGRAPH TAKEN BY IT CORPORATION, NOVEMBER 13, 1998.

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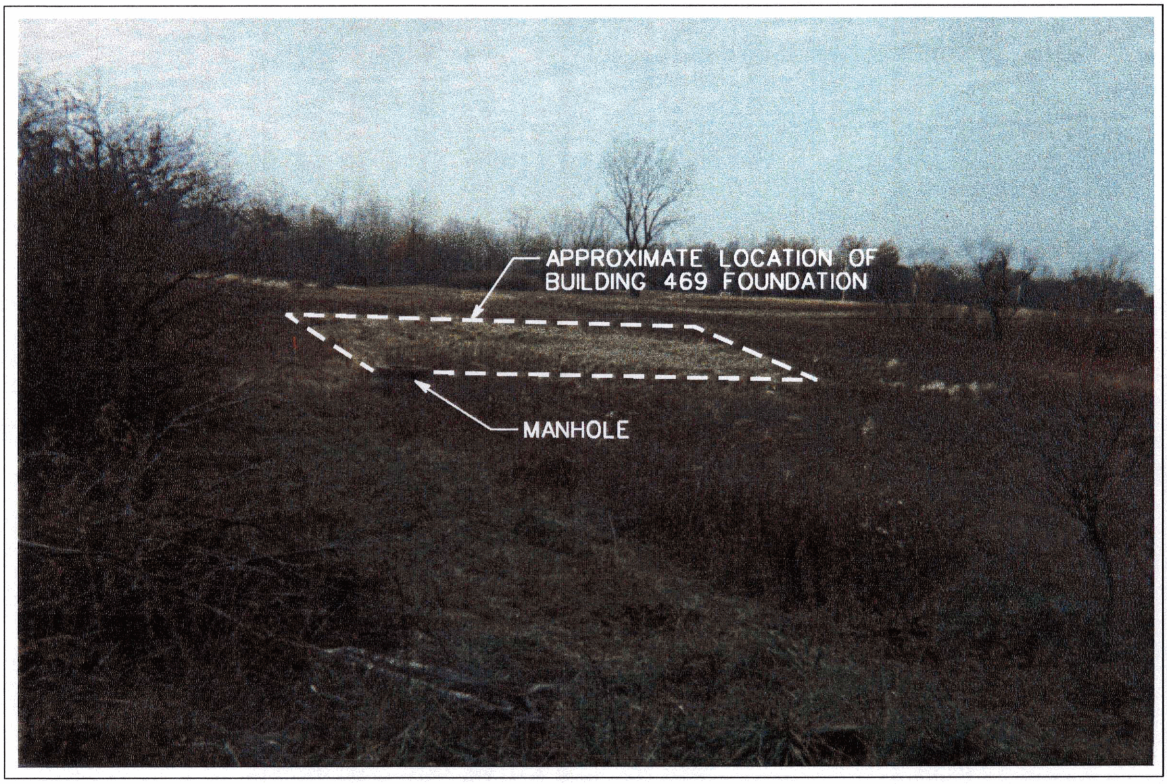
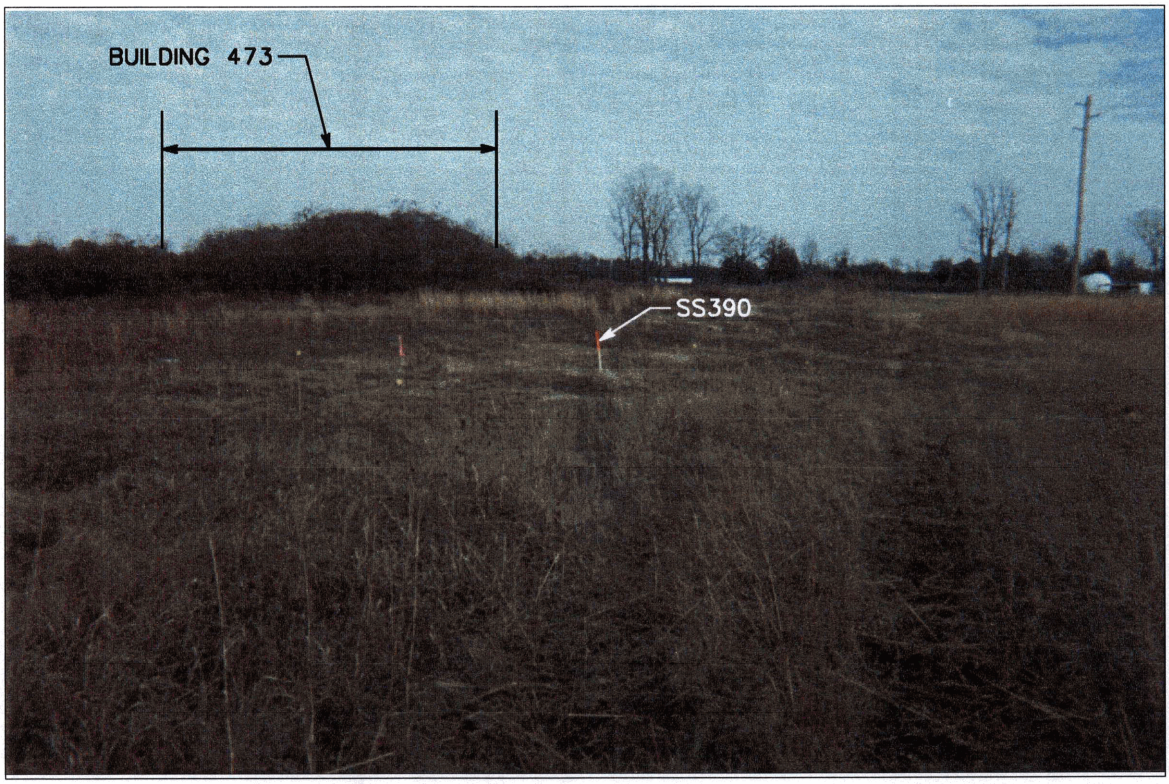


PHOTOGRAPH A-7. BUILDING 469, ACID AND FUME RECOVER BUILDING. VIEW FACING WEST-NORTHWEST. GRASSY AREA IN THE CENTER OF THE PHOTOGRAPH REPRESENTS THE FORMER LOCATION OF THE BUILDING FOUNDATION. CONCRETE MANHOLE IN LEFT CENTER OF PHOTOGRAPH IS THE LOCATION OF SEDIMENT SAMPLE SS307. PHOTOGRAPH TAKEN BY IT CORPORATION, NOVEMBER 13, 1998.



PHOTOGRAPH A-8. BUILDING 472 BI-TRI HOUSE (FOREGROUND) AND BUILDING 473 FORTIFIER HOUSE (BACKGROUND). BORING SS390, DRILLED AT BUILDING 472, SHOWN AT THE STAKED LOCATION IN THE FOREGROUND. LOCATION OF BUILDING 473 SEEN IN THE BACKGROUND AT HIGH BRUSHY AREA. PHOTOGRAPH TAKEN BY IT CORPORATION, NOVEMBER 13, 1998.

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PHOTOGRAPH A-9. BUILDING 476, WASH HOUSE. VIEW FACING EAST. SAMPLE SS311 SHOWN AT THE STAKED LOCATION TO THE RIGHT OF THE DRAINAGE DITCH. HYPERSONIC TUNNEL FACILITY VISIBLE ON THE LEFT. PHOTOGRAPH TAKEN BY IT CORPORATION, NOVEMBER 13, 1998.

PHOTOGRAPH A-10. NORTHWEST NAIL HOUSE. VIEW FACING SOUTH. CONCRETE FOUNDATION AT THE END OF THE ASPHALT DRIVEWAY IS THE LOADING DOCK AREA FOR THE NAIL HOUSE. PIPELINES ASSOCIATED WITH THE HYPERSONIC TUNNEL FACILITY ARE VISIBLE IN THE BACKGROUND. PHOTOGRAPH TAKEN BY IT CORPORATION, NOVEMBER 13, 1998.

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APPENDIX B

HTRW DRILL LOGS

HTRW DRILLING LOG

DISTRICT: USACE - Nashville		HOLE NUMBER: ~~DP-01B~~ CJH 11/5/98 SS 361
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR:	SHEET 1 OF SHEETS
3. PROJECT: PBOW	4. LOCATION: TNT B	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 2'	8. HOLE LOCATION: C-35, 2-10	
	9. SURFACE ELEVATION:	
	10. DATE STARTED: 11/5/98	11. DATE COMPLETED: 11/5/98
12. OVERBURDEN THICKNESS: 4.5'	15. DEPTH GROUNDWATER ENCOUNTERED:	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 4.5'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

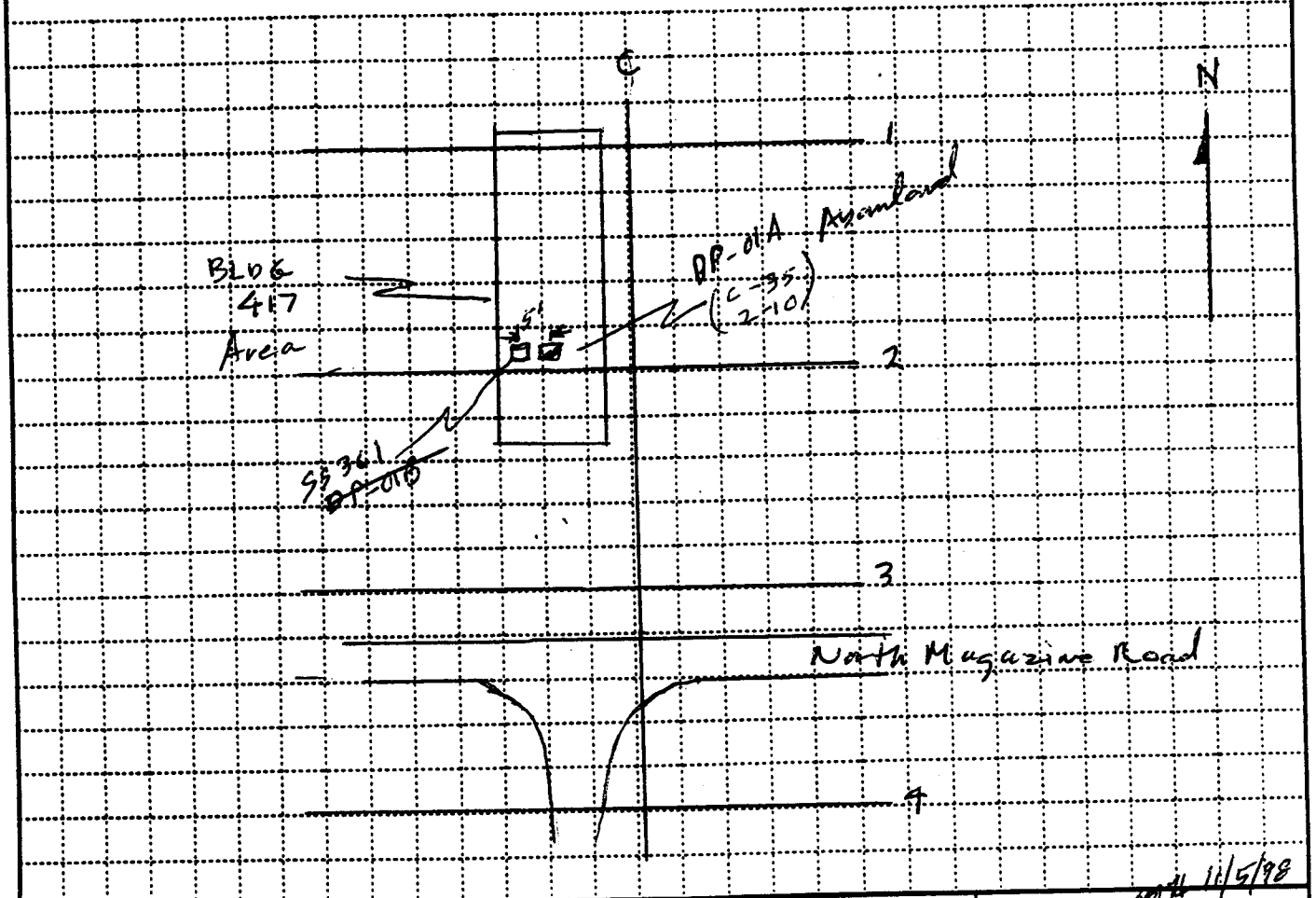
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	—	—	Charles T. Hagagenge

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale.



PROJECT	HOLE NO.
PBOW	SS 361 ~~DP-01~~ CJH 11/5/98

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

CJH 11/5/98

HTRW DRILLING LOG

SS 361

HOLE NUMBER ~~DP-01B~~

PROJECT PBOW

INSPECTOR Charles G. Hagegeorge

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals	REMARKS (g)
	0	Grass & Top Soil	HNu 0		USCS		Time Start 10:50 End 11:00
	1						
	2	Lt tan-Brown Silty Clay Shaley low plasticity Dry			CL	Direct Push #1	
	3	Dk Brown-Black silty clay, low-medium plasticity rootlets Dry			CL		
	4		0	361-SS ~~205~~ 1030-3-4		Direct Push #2	Sample collected above refusal 10:50
		Refusal at 4'6" Concrete					
	5						
	6						
	7						
	8						
	9						
	10						

PROJECT PBOW

HOLE NO. ~~DP-01B~~ CJH SS 361 11/5/98

HTRW DRILLING LOG

DISTRICT: USACE - Nashville		HOLE NUMBER: ~~DP-02~~ 55362
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo-Environmental	SHEET 1 OF 2 SHEETS
3. PROJECT: PBOW	4. LOCATION: TNT B	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 2"	8. HOLE LOCATION: C-35, 2-60	
	9. SURFACE ELEVATION:	
	10. DATE STARTED: 11/5/98	11. DATE COMPLETED: 11/5/98
12. OVERBURDEN THICKNESS: 6.0'	15. DEPTH GROUNDWATER ENCOUNTERED: 4-6' GW?	
13. DEPTH DRILLED INTO ROCK: Refusal Concrete 6.0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 6.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

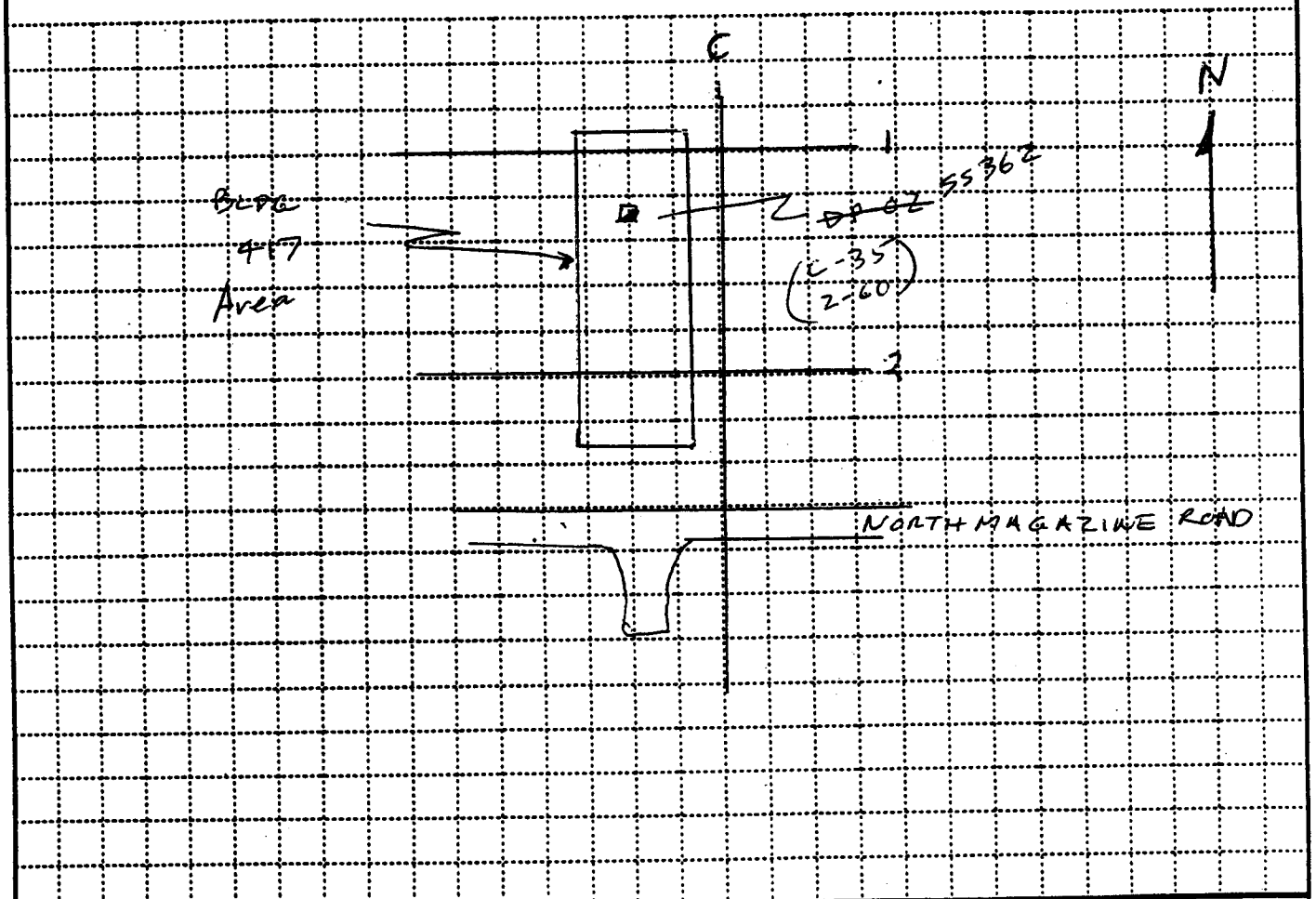
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	—	—	Charles A. Haggerty

LOCATION SKETCH/COMMENTS

SCALE:



PROJECT: PBOW

HOLE NO. ~~DP-02~~ 55362

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER (2) 11/5/98 55362 ~~DP-02~~

PROJECT PBOW

INSPECTOR Charles G. Hagegeorge

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	SAMPLING INTERVAL	REMARKS (g)
	0	Grass and Topsoil 0-0.5'	HNU 0		USCS		TIME
		0.5'-2.0' Dark brown, silty clay low plasticity, shale fragments, dry, some rootlets.			CL		START 11:40 END 12:15
	1						
	2				Recov 2.5'	Push 1 Rec 2.5'	
	3						
	4	4.0-6.0' Dark brown, silty clay low plasticity, shale fragments, wet.	0		CL		
	5				Recov 0.8'	Push 2 Rec 0.8'	
				CSJL 11/5/98 362-~~55266~~			Sample collected above refusal 11:45
	6	Refusal 6' Concrete		10361-(3-4)			
	7						
	8						
	9						
	10						

PROJECT PBOW

HOLE NO. ~~DP-02~~ 55362 CSJL 11/5/98

HTRW DRILLING LOG

DISTRICT: USACE- Nashville SS363	HOLE NUMBER: ~~DP03~~	
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo-Environmental CJH 11/5/98	SHEET 1 OF 2 SHEETS
3. PROJECT: PBOW	4. LOCATION: TNT B	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 2"	8. HOLE LOCATION: C-10, I-35 (N 618668, E 1917759)	
	9. SURFACE ELEVATION: 660.89	
	10. DATE STARTED: 11/5/98	11. DATE COMPLETED: 11/5/98
12. OVERBURDEN THICKNESS: 1.5 ft.	15. DEPTH GROUNDWATER ENCOUNTERED: 1.5 ft. of water above shale GW?	
13. DEPTH DRILLED INTO ROCK: 4.5 ft.	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 6 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

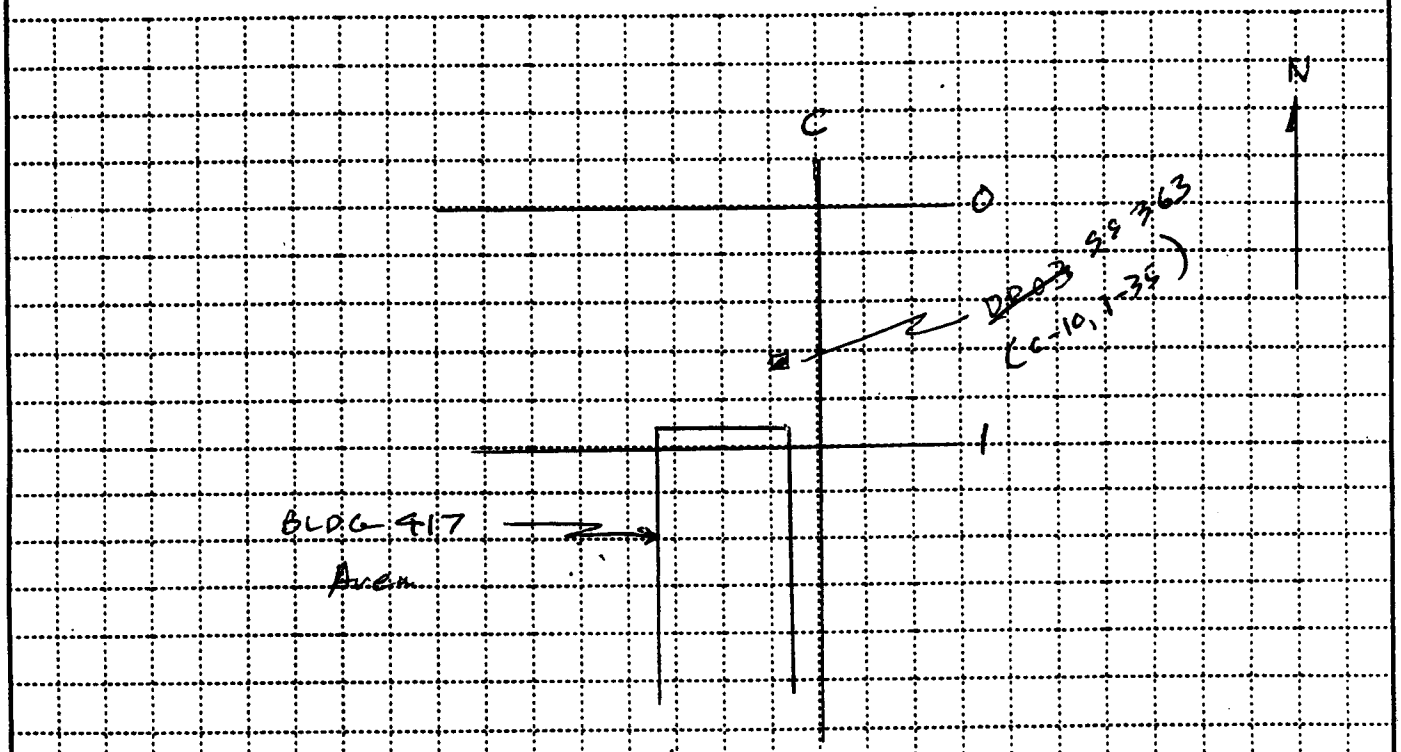
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	—	—	Charles D. Bagegeige

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT: PBOW	HOLE NO. SS363 CJH 11/5/98 ~~DP03~~

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

CJH 11/5/98

HTRW DRILLING LOG

HOLE NUMBER SS 363 ~~DP-03~~

PROJECT PBOW

INSPECTOR CGH.

SHEET 2 OF SHEETS 2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	~~FIELD SCREENING RESULTS (d)~~	GEOTECH SAMPLE OR CORE BOX NO. (e)	~~ANALYTICAL SAMPLE NO.~~ (f)	~~SAMPLING INTERVAL~~	REMARKS (g)
	0	0-0.5' Topsoil	~~HNu~~ 0		USCS		Time Start 1320 End 1355
	1	Lt-med brown sandy, silty clay, low ~~plasticity~~, dry, ~~some rounded rk fragments~~ stet ~~Shale~~		No sample collected shale. Clay sampled in surface soil borings	CL		
	2	Lt-med ~~brown~~, sandy, silty clay, low ~~plasticity~~, dry Wet at ~~bottom~~. Shale.			Shale	Push 1 Rec 2.5'	Water ~~at 3-4'~~ above shale at approx 1.5 ft. depth
	3	Shale - ~~Blk~~ gray to black Thin bedded					
	4		0				
	5					Push 2 Rec 1.5'	
	6	Refusal - shale at 6.0					
	7						
	8						
	9						
	10						

PROJECT PBOW

HOLE NO. SS 363 ~~DP-03~~

CJH. 11/5/98

HTRW DRILLING LOG

DISTRICT: USACE-Nashville	SS 364	HOLE NUMBER: ~~DP03~~
1. COMPANY NAME: IT Corp.	2. DRILL SUBCONTRACTOR: Geo-Environmental	SHEET 1 OF 2
3. PROJECT: PBOW	4. LOCATION: TNT B	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 2"	8. HOLE LOCATION: C-25, 3-20	
	9. SURFACE ELEVATION	
	10. DATE STARTED: 11/5/98	11. DATE COMPLETED: 11/5/98
12. OVERBURDEN THICKNESS: 1.5 ft	15. DEPTH GROUNDWATER ENCOUNTERED: Water in or above shale at approx 4.0 ft.	
13. DEPTH DRILLED INTO ROCK: 5.5 ft	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 7.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

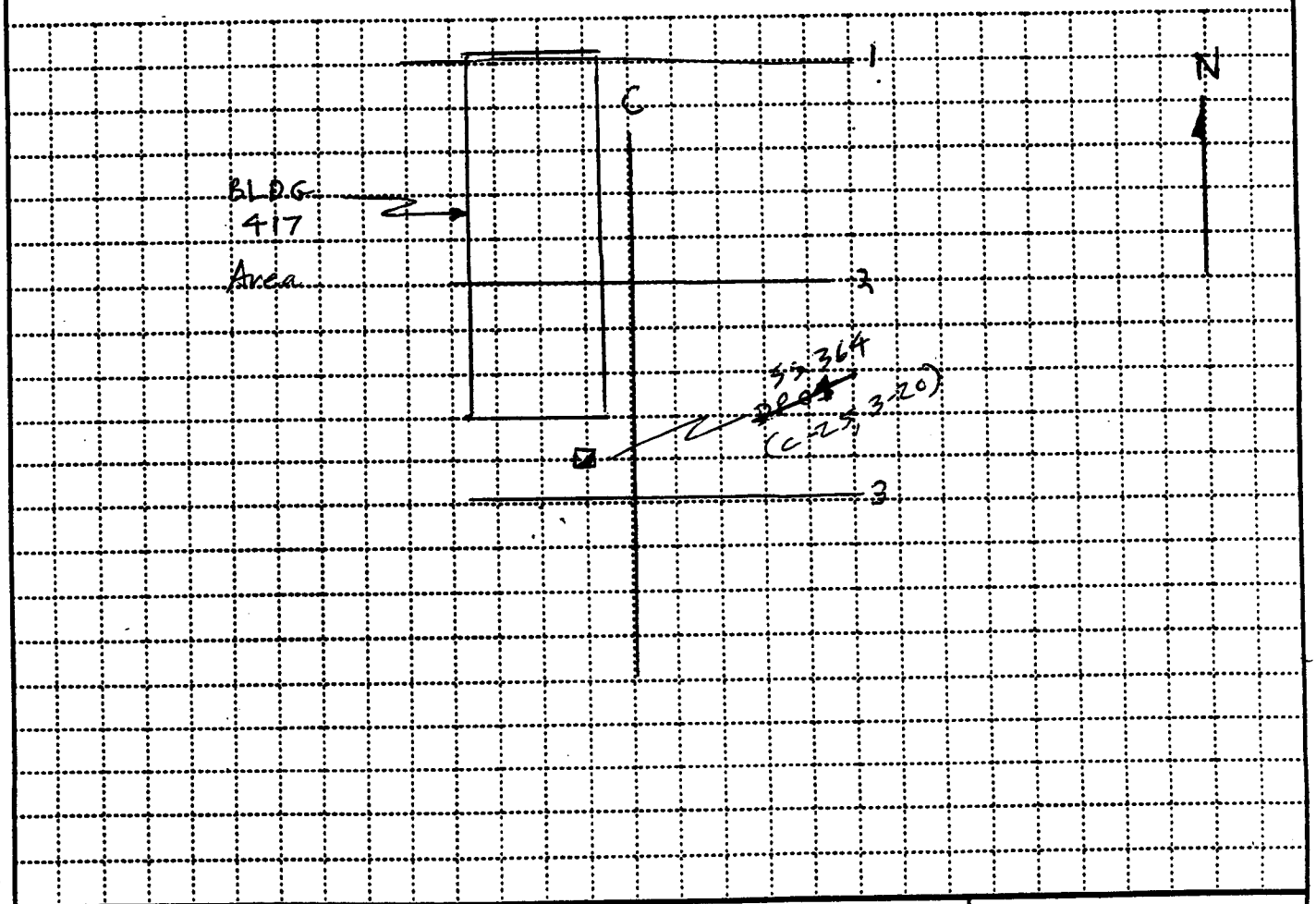
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA%

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	—	—	Charles J. Hagogenge

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT: PBOW

HOLE NO. SS364 ~~DP03~~

ENG FORM 5056-R, AUG 94

CJH 11/5/98

(Proponent: CECW-EG)

PJH 11/5/98

HTRW DRILLING LOG

SS364

HOLE NUMBER ~~DP-04~~

PROJECT PBOW

INSPECTOR Charles G. Hagegeorge

SHEET 2 OF 2 SHEETS

ELEV. (ft)	DEPTH (ft)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (g)	GEOTECH SAMPLE OR CORE BOX NO. (g)	ANALYTICAL SAMPLE NO. (f)	SAMPLING INTERVAL	REMARKS (g)
	0	0-0.5 ft Top Soil & Grass	HNU 0		USCS		TIME START 1330 END 1340
	1	0.5-1.5 ft. Weathered shale lt-med. brown		No samples collected.	Shale		
	2	1.5-3.5 ft. Weathered shale becoming dark brown. In places some clay, tan No plasticity, hard, dry.				Push 1 Rec. 3.0'	
	3						
	4	Shale, dark gray to black thin bedded to laminated 3.5-7.0 ft.	0				Water at 4.0 ft.
	5					Push 2	
	6					Rec 0.5'	
	7	Refusal 7.0' shale.					
	8						
	9						
	10						

PROJECT PBOW

HOLE NO. ~~DP-04~~ SS364

11/5/98 PJH

HTRW DRILLING LOG

DISTRICT: USACE - Nashville		HOLE NUMBER: ~~DP05~~ SS365 (11/5/98)
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo - Environmental	SHEET 1 OF 2 SHEETS
3. PROJECT: PBOW	4. LOCATION: TNT B	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 2"	8. HOLE LOCATION: E-40, 3+36	
	9. SURFACE ELEVATION	
	10. DATE STARTED: 11/3/98	11. DATE COMPLETED: 11/3/98
12. OVERBURDEN THICKNESS: 4.5	15. DEPTH GROUNDWATER ENCOUNTERED: None	
13. DEPTH DRILLED INTO ROCK: 1.0	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 5.5	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

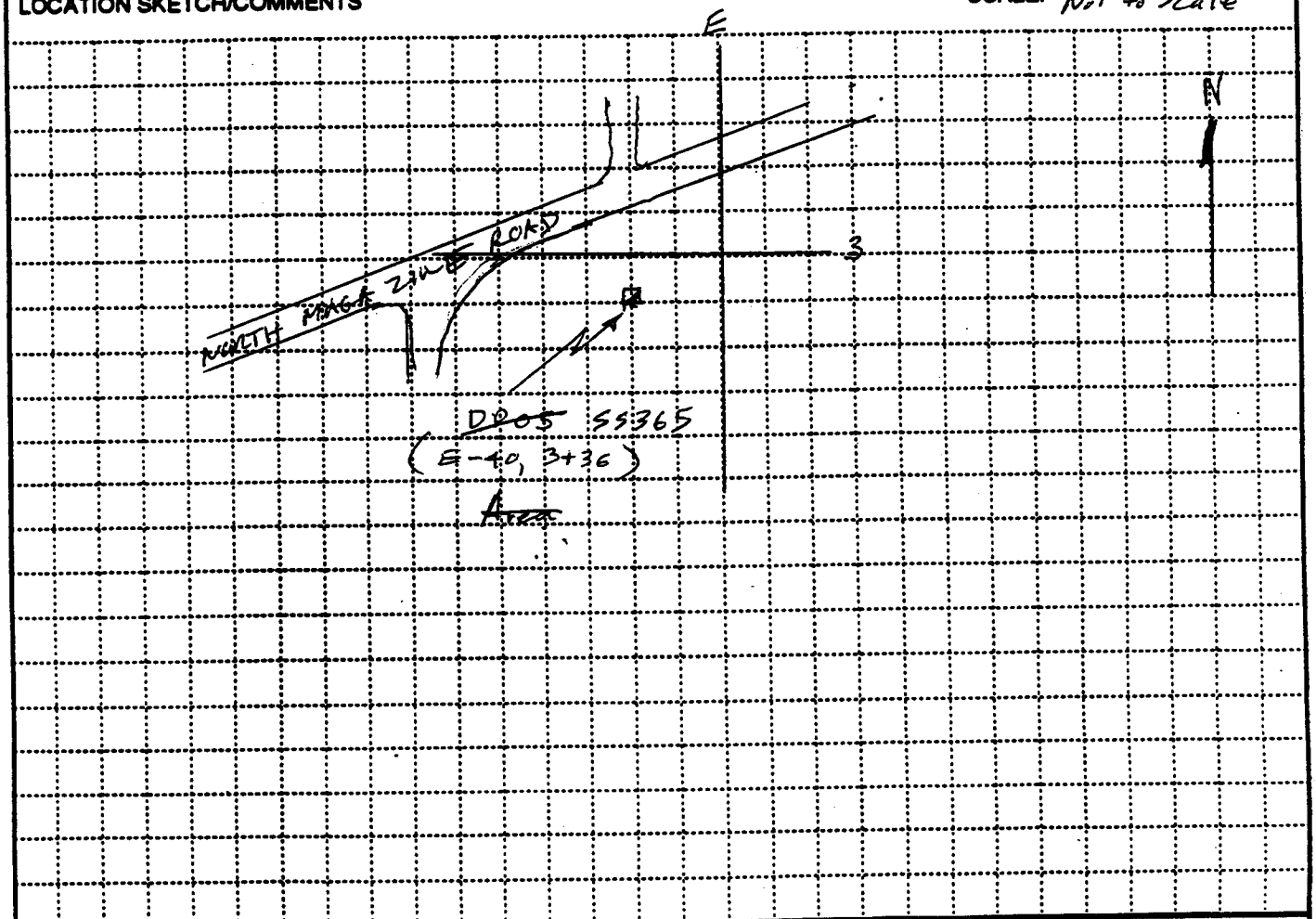
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
/	Bentonite	—	—	Charles D. Hargesheimer

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	SS365 ~~DP05~~

ENG FORM 5056-R, AUG 94 11/5/98 (Proponent: CECW-EG)

11/5/98

HTRW DRILLING LOG

HOLE NUMBER SS365 ~~DP05~~

PROJECT PBOW

INSPECTOR

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	GRAPHIC SAMPLE NO. (f)	SAMPLING INTERVAL	REMARKS (g)
	0	0-0.5' Top Soil & grass root lets	HNU 0	sample	USCS		Time Start 1400 End 1420
	1	0.5-2.5' Silty Clay, no-low plasticity, hard, ~~lt~~ lt brn, dry			CL	Push 1 Rec 3'	
	2						
	3	2.5-4.0' Silty Clay, med to dark brown, low plasticity, firm, dry					
	4	4.0-4.5' Silty Clay Dk brown, soft low-medium plasticity, moist ~~fissile~~.	0	SS 365 ~~387~~ 10364- (4-4.5)		Push 2 Rec 1.0'	Collected sample above shale 1420
	5	Shale 4.5-5.5' dk gray, fissile, weathered.			Shale		
		5.5' Refusal shale					
	6						
	7						
	8						
	9						
	10						

PROJECT PBOW

HOLE NO. SS365 ~~DP05~~

CDH 11/5/98

HTRW DRILLING LOG

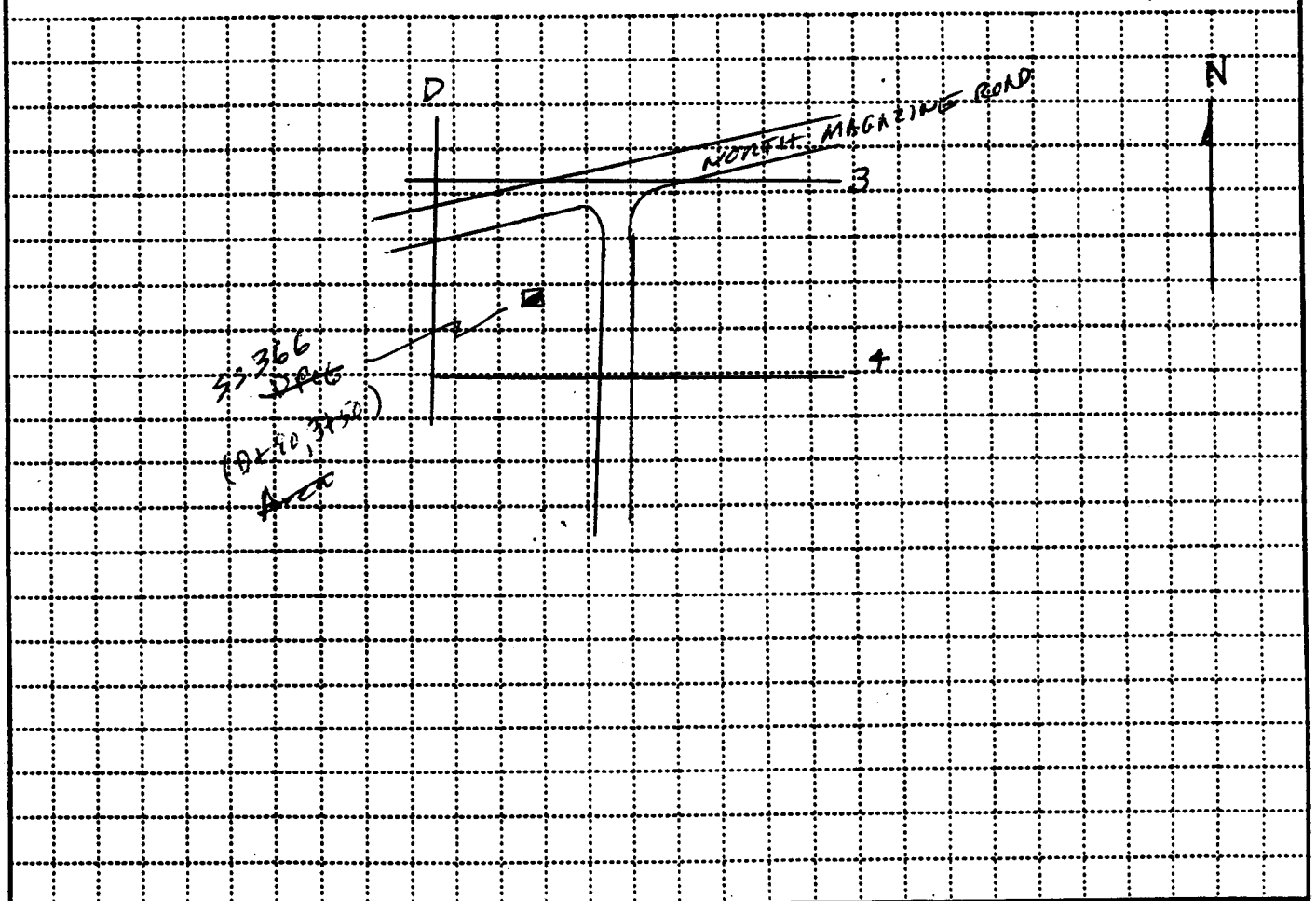
DISTRICT USACE-Nashville SS 366	HOLE NUMBER ~~DP06~~	
1. COMPANY NAME ~~The~~ IT Corp	2. DRILL SUBCONTRACTOR Geo-Environmental	SHEET 1 OF SHEETS 2
3. PROJECT PBOW	4. LOCATION TNT	
5. NAME OF DRILLER Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT 4' x 2"	8. HOLE LOCATION D+90, 3+50	
	9. SURFACE ELEVATION	
	10. DATE STARTED 11/5/98	11. DATE COMPLETED 11/5/98
12. OVERBURDEN THICKNESS 4.0'	15. DEPTH GROUNDWATER ENCOUNTERED	
13. DEPTH DRILLED INTO ROCK 1.5'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED NA	
14. TOTAL DEPTH OF HOLE 5.5'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	—	—	Charles D. Hargrove Not to Scale

LOCATION SKETCH/COMMENTS SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	SS 366 ~~DP06~~

ENG FORM 5056-R, AUG 94 CGH 11/5/98 (Proponent: CECW-EG)

CGH 11/5/98

HTRW DRILLING LOG

HOLE NUMBER SS366 ~~DP06~~

PROJECT PBOW | INSPECTOR Charles G. Hagegeorge | SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	SAMPLE NO. (f)	SAMPLE INTERVAL	REMARKS (g)
	0	0.05' Top Soil	HNU		USCS		Time
		0.5-1.0' Silty Clay, Dark Brown, hard, low plasticity, dry	0				Start 1445 End 1500
	1	1.0-1.5' Silty Clay, Lt Brown, firm, low plasticity, dry					
		1.5-2.0' Silty Clay, Dark Brown hard, low plasticity, dry				Push 1	
	2	2.0- Silty Clay, Lt Brown to tan, firm, low plasticity dry, Rootlets			CL	Rec. 3.5'	
	3			SS 366-~~288~~ 10365-(3-4)			Collected sample 1440
	4	4.0-5.5 Weathered Shale Clay same as above in places Shale, dark gray, fissile	0		Shale	Push 2 Rec 2.5'	
	5	5.5' Refusal In shale					
	6						
	7						
	8						
	9						
	10						

PROJECT PBOW | HOLE NO. SS366 ~~DP06~~ 11/5/98

HTRW DRILLING LOG

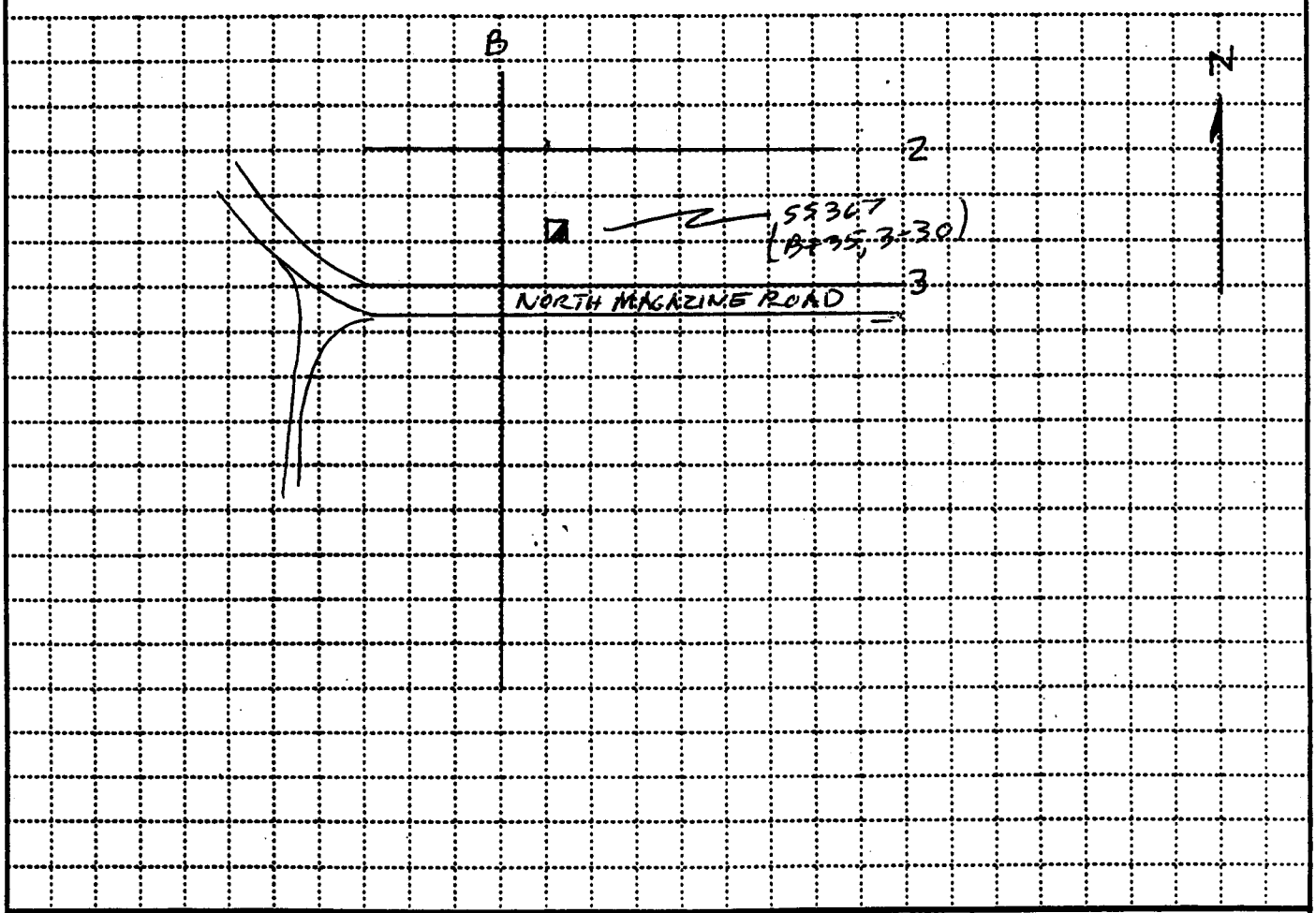
DISTRICT: USACE-Nashville 11/5/98 SS367	HOLE NUMBER: ~~DP-07~~	
1. COMPANY NAME: ~~THE~~ IT ~~GROUP~~ Corp	2. DRILL SUBCONTRACTOR: Geo-Environmental	SHEET 1 OF 2 SHEETS
3. PROJECT: PLUM BROOK ORDNANCE WORKS	4. LOCATION: ~~SANDUSKY, OHIO~~ TNTB	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4'x2'	8. HOLE LOCATION: B+35, 3-30	
	9. SURFACE ELEVATION	
	10. DATE STARTED: 11/5/98	11. DATE COMPLETED: 11/5/98
12. OVERBURDEN THICKNESS: 0.5' Top Soil	15. DEPTH GROUNDWATER ENCOUNTERED: None	
13. DEPTH DRILLED INTO ROCK: 3.5'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 4.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	—	—	Charles D. Hagegeorge

LOCATION SKETCH/COMMENTS SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	SS367 ~~DP07~~

ENG FORM 5056-R, AUG 94 11/5/98 (Proponent: CECW-EG)

11/5/98

HTRW DRILLING LOG

HOLE NUMBER SS367 DP07

PROJECT PBOW

INSPECTOR Charles G. Hagegeorge

SHEET 2 OF SHEETS 2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	SAMPLING INTERVAL	REMARKS (g)
	0	0-0.5' Top Soil	HNu		USCS		Time
		0.5-4.0' Shale, Dark Gray to Black, Weathers to a dark brown, laminated. dry.	0	No sample collected	Shale	Push 1 Rec 3.5'	Start 1520 End 1530
	1						
	2						
	3						
	4	4.0 TD in Shale					
	5						
	6						
	7						
	8						
	9						
	10						

PROJECT PBOW

HOLE NO. DP07 SS367 11/5/98

HTRW DRILLING LOG

DISTRICT: USACE-Nashville		HOLE NUMBER: SS368
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo-Environmental	SHEET 1 OF 2 SHEETS
3. PROJECT: PBOW	4. LOCATION: TNT B	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 2'	8. HOLE LOCATION: E-40, 7-25	
	9. SURFACE ELEVATION: NA	
	10. DATE STARTED: 11/6/98	11. DATE COMPLETED: 11/6/98
12. OVERBURDEN THICKNESS: 7'	15. DEPTH GROUNDWATER ENCOUNTERED: 6' Hit Water (Gw?)	
13. DEPTH DRILLED INTO ROCK: 1'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 8'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

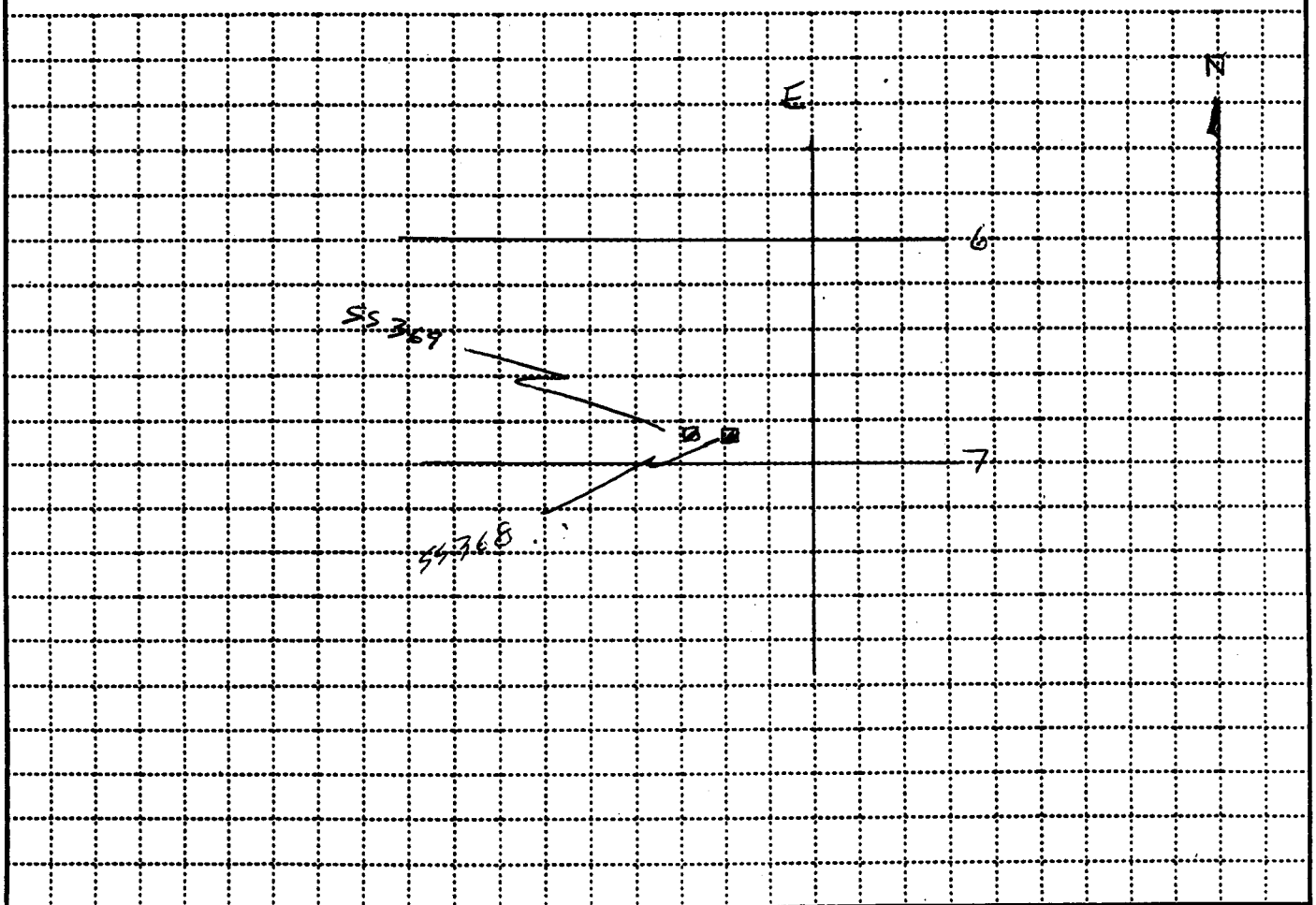
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA%

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	bentonite Grout	—	—	Charles D. Hargesheimer

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale.



PROJECT: PBOW	HOLE NO.: SS368

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: SS 368

PROJECT: PBOW

INSPECTOR: Charles G. Hagegeage

SHEET: 2 of 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	~~GEOTECH SAMPLE NO.~~ (f)	SAMPLING INTERVAL (g)	REMARKS (h)
	0	0-0.5' Top Soil & Grass	HNU	Sample No	USCS		TIME START 8:20 END 8:40
		0.5-1.0 Silty Clay, yellow brown, hard, no plasticity, dry	0		CL		
	1	1.0-2.0 Clayey Silt, dark gray, soft, no plasticity, dry			ML	Push 1	
	2	2.0-6.0 Clayey Sand, Lt. brown, fine grained, wet, medium dense.			SC	Rec 3.5'	
	3			SS 368-10367-(3-4)			Collected 8:30
	4		0				
	5					Push 2	
	6	6.0-7.0 Silty sand, dark gray, fine grained, wet, medium dense to loose.		SS 368-10368-(6-7)	SM		Collected 8:35
	7	7.0-8.0' Weathered shale, dark gray			Shale		
	8	Refusal Shale 8.0'					
	9						
	10						

PROJECT: PBOW

HOLE NO.: SS 368

HTRW DRILLING LOG

DISTRICT: USACE - Nashville		HOLE NUMBER: SS369
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo-Environmental	SHEET 1 OF 2
3. PROJECT: PBOW	4. LOCATION: TNTB	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 2"	8. HOLE LOCATION: E-55, 7-25	
	9. SURFACE ELEVATION: NA	
	10. DATE STARTED: 11/6/98	11. DATE COMPLETED: 11/6/98
12. OVERBURDEN THICKNESS: 7.5'	15. DEPTH GROUNDWATER ENCOUNTERED: 7.0' Water above shale	
13. DEPTH DRILLED INTO ROCK: .5'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 8.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

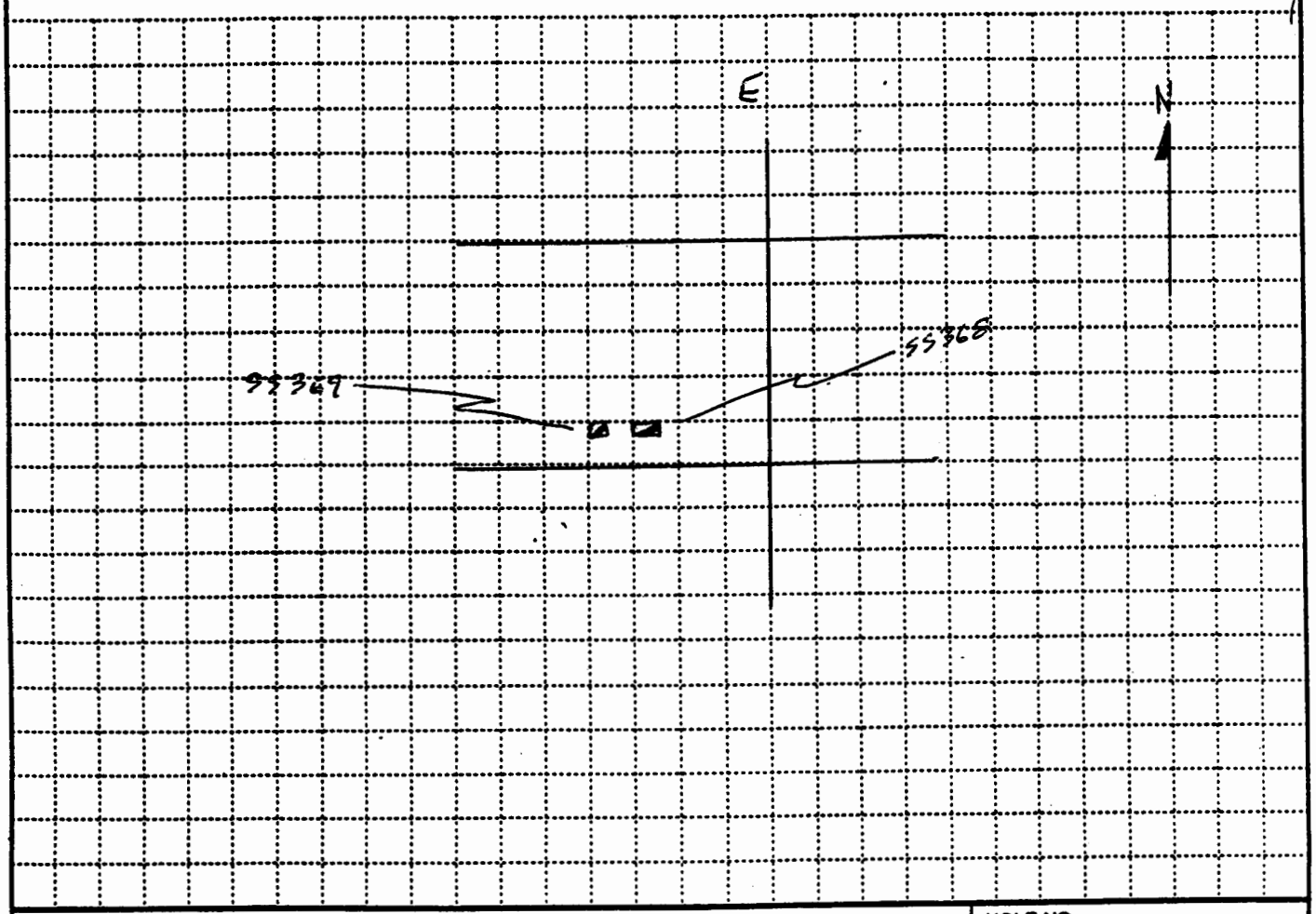
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite Grout	—	—	Charles D. Hagegeorge

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	SS369

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: SS369

PROJECT: PBOW

INSPECTOR: Charles G. Hagegeorge

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	~~SEALED SAMPLE OR CORE BOX NO.~~ (e)	ANALYTICAL SAMPLE NO. (f)	SAMPLE INTERVAL	REMARKS (g)
	0	0-0.5' Top soil & grass	HNU	Sample No	USCS		Time
		0.5-1' Clay, light brown, hard, No plasticity, dry, laminated	0		CL		Start 9:00 End 9:15
	1	1.0-2.0 Silty Sand, gray-dark gray, fine grained, medium dense to loose, dry			SM	Push 1	
	2	2.0-4.5' Clayey Silty Sand, Light brown ~~soft~~ fine grained, medium dense to loose, dry		SS 369-10369-(2-4.5)	SM	Rec. 3.5'	Collected sample 9:05
	3						
	4		0				
		4.5-6.0' Silty Clay, Light brown to ~~almost~~ light gray, firm, medium plasticity, dry.			CL	Push 2 Rec. 4.0'	
	5						
	6	6.0-7.5' Silty Clay, light gray, soft, medium plasticity, wet at bottom		SS 369-10370-(7-7.5)			Collected sample 9:10
	7						
		7.5-8.0' Shale, dark gray, thin bedded			Shale		
	8	Refusal-Top shale 8.0'					
	9						
	10						

PROJECT: PBOW

HOLE NO. SS369

HTRW DRILLING LOG

DISTRICT	USACE-Nashville
HOLE NUMBER	SS 370
1. COMPANY NAME	IT Corp.
2. DRILL SUBCONTRACTOR	Geo-Environmental
SHEET / SHEETS	1 OF 2
3. PROJECT	PBOW
4. LOCATION	TNT B
5. NAME OF DRILLER	Jack Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4'x2"
8. HOLE LOCATION	D+95, 6-40
9. SURFACE ELEVATION	NA
10. DATE STARTED	11/6/98
11. DATE COMPLETED	11/6/98
12. OVERBURDEN THICKNESS	4.5'
13. DEPTH DRILLED INTO ROCK	1.5'
14. TOTAL DEPTH OF HOLE	6.0'
15. DEPTH GROUNDWATER ENCOUNTERED	NONE
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

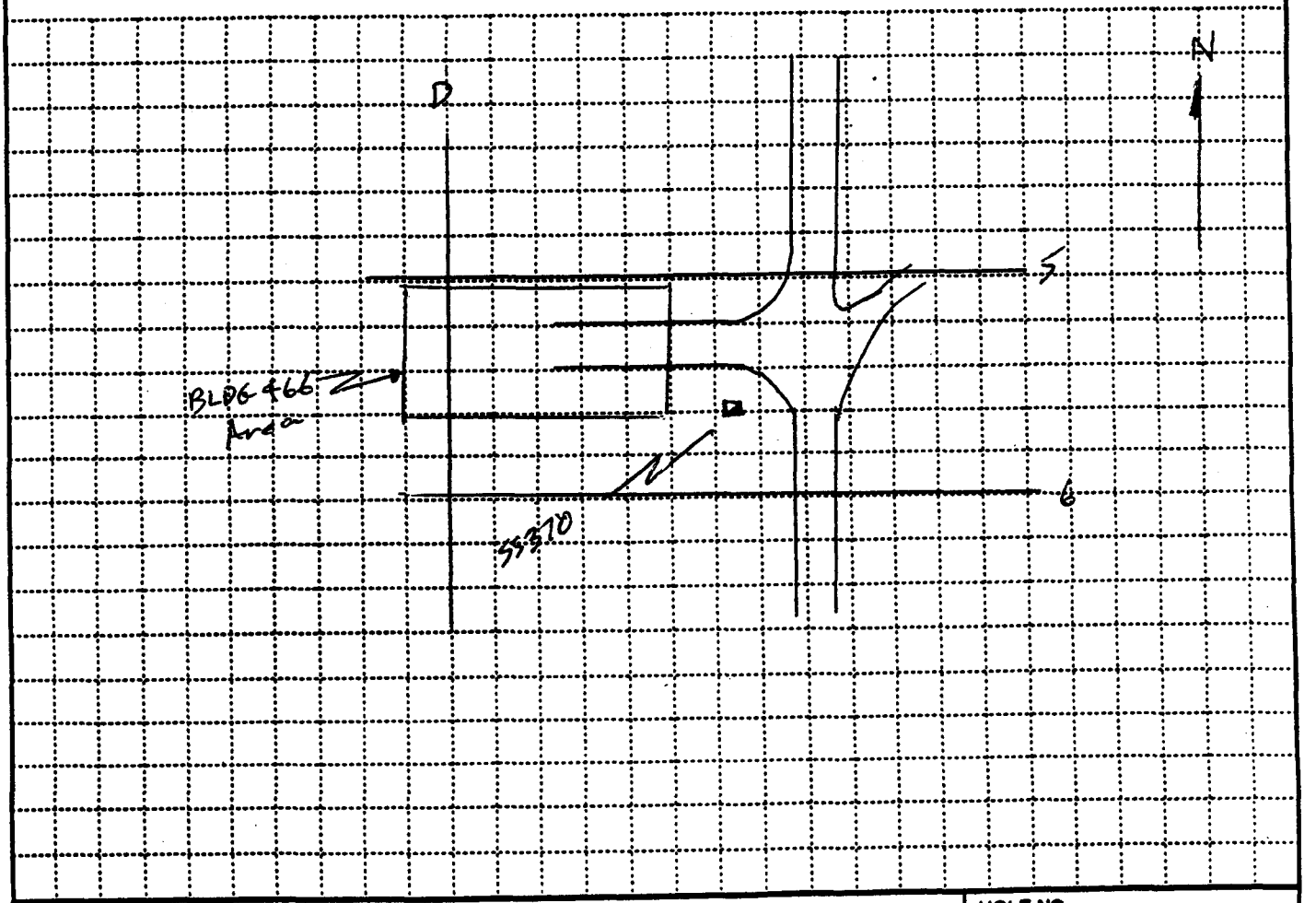
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite Grout	—	—	Charles J. Haggeorgi

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	SS 370

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: SS370

PROJECT: PBOW

INSPECTOR: Charles G. Hagegeorge

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	SAMPLING INTERVAL	REMARKS (g)
	0	0.5' Top Soil & grass	HNu	Sample Nos	USCS		Time Start 9:40 End 10:05
	1	0.5-2.5' Clayey Silt, Light brown, soft, no plasticity, dry	0		ML		
	2	2.5'-2.5' Silty Clay, dark gray, firm, no plasticity, dry		SS370-10371 (2-2.5)	CL	Push 1 Rec 3.5'	Collected 9:50
	3	2.5'-4.0' Clayey Silt, light brown, soft, no plasticity, dry			ML		
	4	4.0-4.5' Silty Clay, dark gray, firm no plasticity, dry	0		CL		
	5	4.5-6.0' Shale, light gray, thin bedded to laminated, dry		SS370-10372 (4.0-4.5)	Shale	Push 2 Rec 2.0'	Collected 9:55
	6	Refusal - In shale 6.0'					
	7						
	8						
	9						
	10						

PROJECT: PBOW

HOLE NO. SS370

HTRW DRILLING LOG

DISTRICT: USACE-Nashville		HOLE NUMBER: SS 371
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo-Environmental	SHEET 1 OF 2 SHEETS
3. PROJECT: PBOW	4. LOCATION: TNT B	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 2"	8. HOLE LOCATION: E+35, 3+38	
	9. SURFACE ELEVATION: NA	
	10. DATE STARTED: 11/6/98	11. DATE COMPLETED: 11/6/98
12. OVERBURDEN THICKNESS: 2.5'	15. DEPTH GROUNDWATER ENCOUNTERED: None	
13. DEPTH DRILLED INTO ROCK: 1.0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 3.5'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

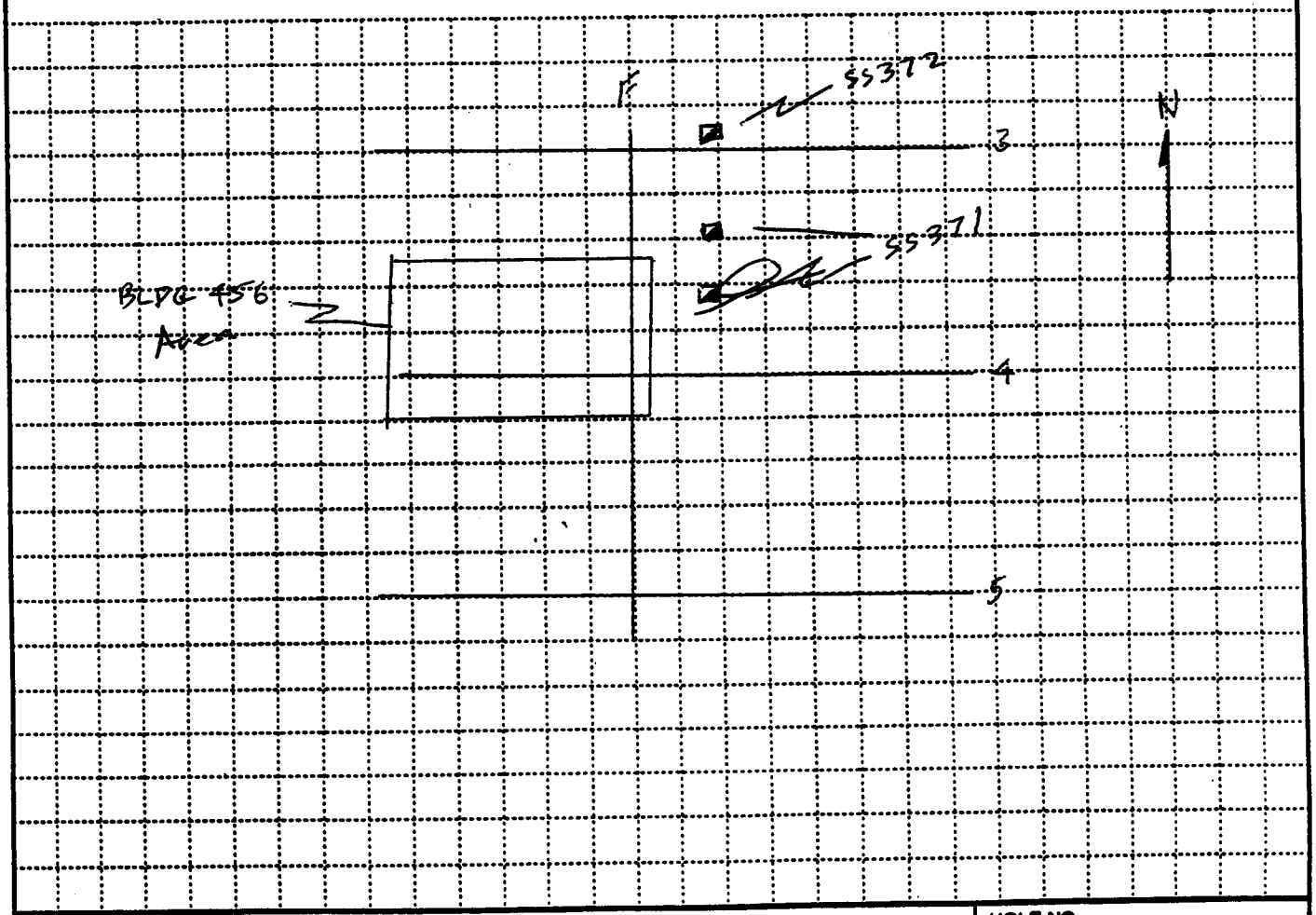
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite Grout	—	—	Charles D. Haggerty

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	SS 371

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER SS 371

PROJECT PBOW

INSPECTOR Charles G. Hogeegeorge

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH. SAMPLE OR CORE BOX NO. (e)	STRATIGRAPHIC SAMPLE NO. (f)	SAMPLING INTERVAL	REMARKS (g)
	0	0-0.5' Top soil & grass	HNU	Sample No.	USCS		Time
		0.5-2 Silty Clay, organic, soft, no plasticity, dry	0				Start 10:20 End 10:40
	1				CL	Push 1 Rec. 3.0'	
	2			SS 371- 1037- (2-2.5)			Collected 10:30
		2.5-3.5' Shale. Light brown, laminated					
	3				Shale		
		Refusal 3.5' Shale.					
	4						
	5						
	6						
	7						
	8						
	9						
	10						

PROJECT PBOW

HOLE NO. SS371

HTRW DRILLING LOG

DISTRICT: USACE-Nashville		HOLE NUMBER: SS372
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo-Environmental	SHEET 1 OF 2 SHEETS
3. PROJECT: PBOW	4. LOCATION: TNT B	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 2"	8. HOLE LOCATION: F+40, 3-5 (N618438, E1918703)	
	9. SURFACE ELEVATION: NA (665.79)	
	10. DATE STARTED: 11/6/98	11. DATE COMPLETED: 11/6/98
12. OVERBURDEN THICKNESS: 2.0'	15. DEPTH GROUNDWATER ENCOUNTERED: None	
13. DEPTH DRILLED INTO ROCK: 2.0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 4.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

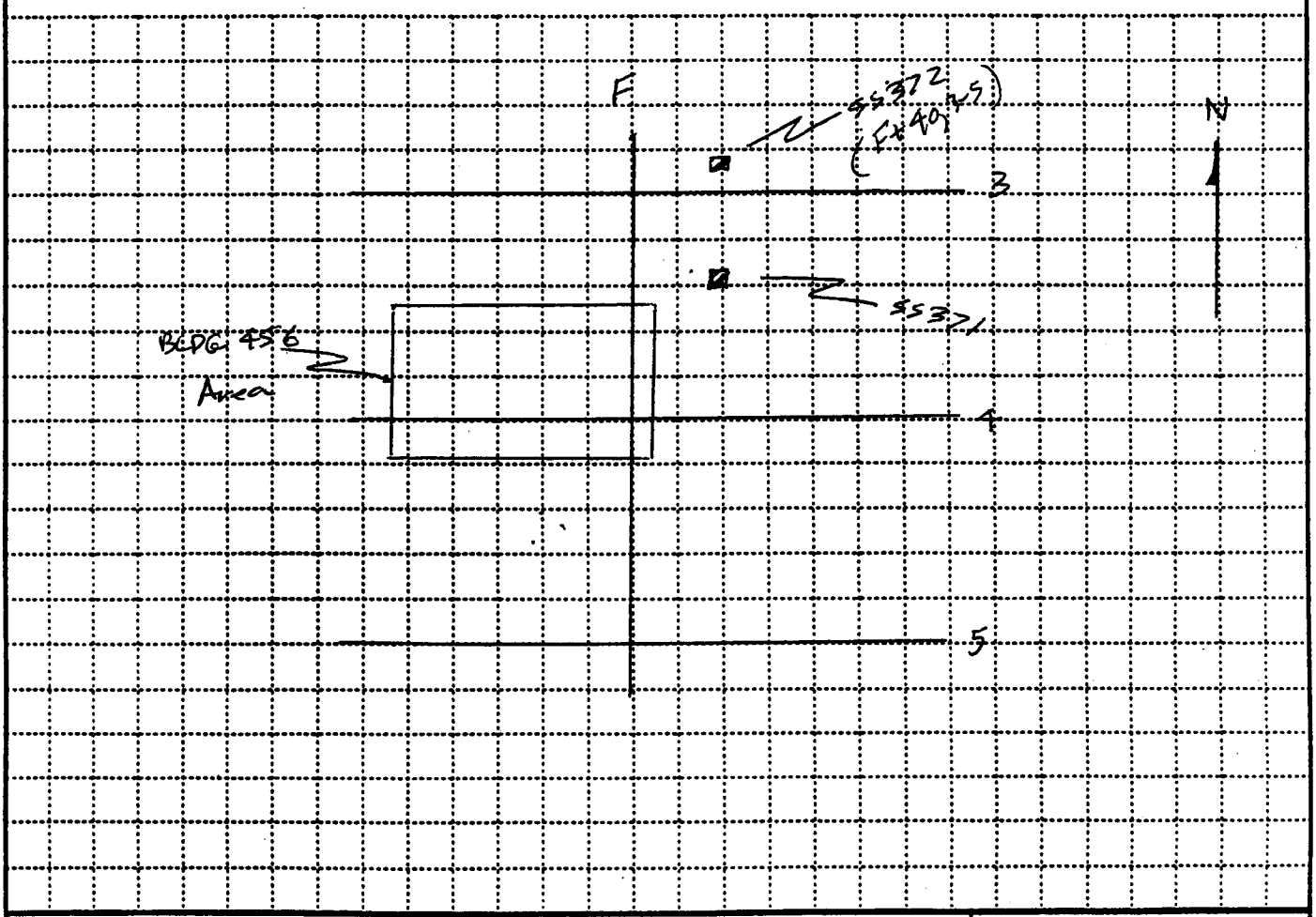
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite Grout	—	—	Charles D. Hagegeorge

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	SS372

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER SS372

PROJECT PBOW

INSPECTOR Charles G. Hagegeorge

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	SAMPLE INTERVAL	REMARKS (g)
	0	0-0.5' Top soil & grass	HN_U	Sample No.	USCS		Time
		0.5-2.0' Silty Clay, yellow brown, firm, dry, no plasticity, iron staining. organic splotches.	0				Start 10:30 End 10:40
	1				CL		
				SS372-10374-(1.5-2.0)		Push 1	Collected 10:35
	2	2.0-4.0' Weathered shale Lt brown to gray, dry. laminated				Rec. 3.5'	
	3				Shale		Confirmation Samples 11/9/98 @ 1240 #10500 & 10505 1.5-2.0'
	4	Refusal 4.0' In shale					
	5						
	6						
	7						
	8						
	9						
	10						

PROJECT PBOW

HOLE NO. SS372

HTRW DRILLING LOG

DISTRICT	USACE-Nashville
HOLE NUMBER	SS 373
1. COMPANY NAME	IT Corp
2. DRILL SUBCONTRACTOR	Geo-Environmental
SHEET / OF SHEETS	1 / 2
3. PROJECT	PBOW
4. LOCATION	TWT B
5. NAME OF DRILLER	Jack Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4"x2"
8. HOLE LOCATION	~~E-35, 11+10~~ E-40, 11+15
9. SURFACE ELEVATION	NA
10. DATE STARTED	11/6/98
11. DATE COMPLETED	11/6/98
12. OVERBURDEN THICKNESS	8.0'
15. DEPTH GROUNDWATER ENCOUNTERED	7.5' Water above shale
13. DEPTH DRILLED INTO ROCK	1.0'
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	9.0'
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

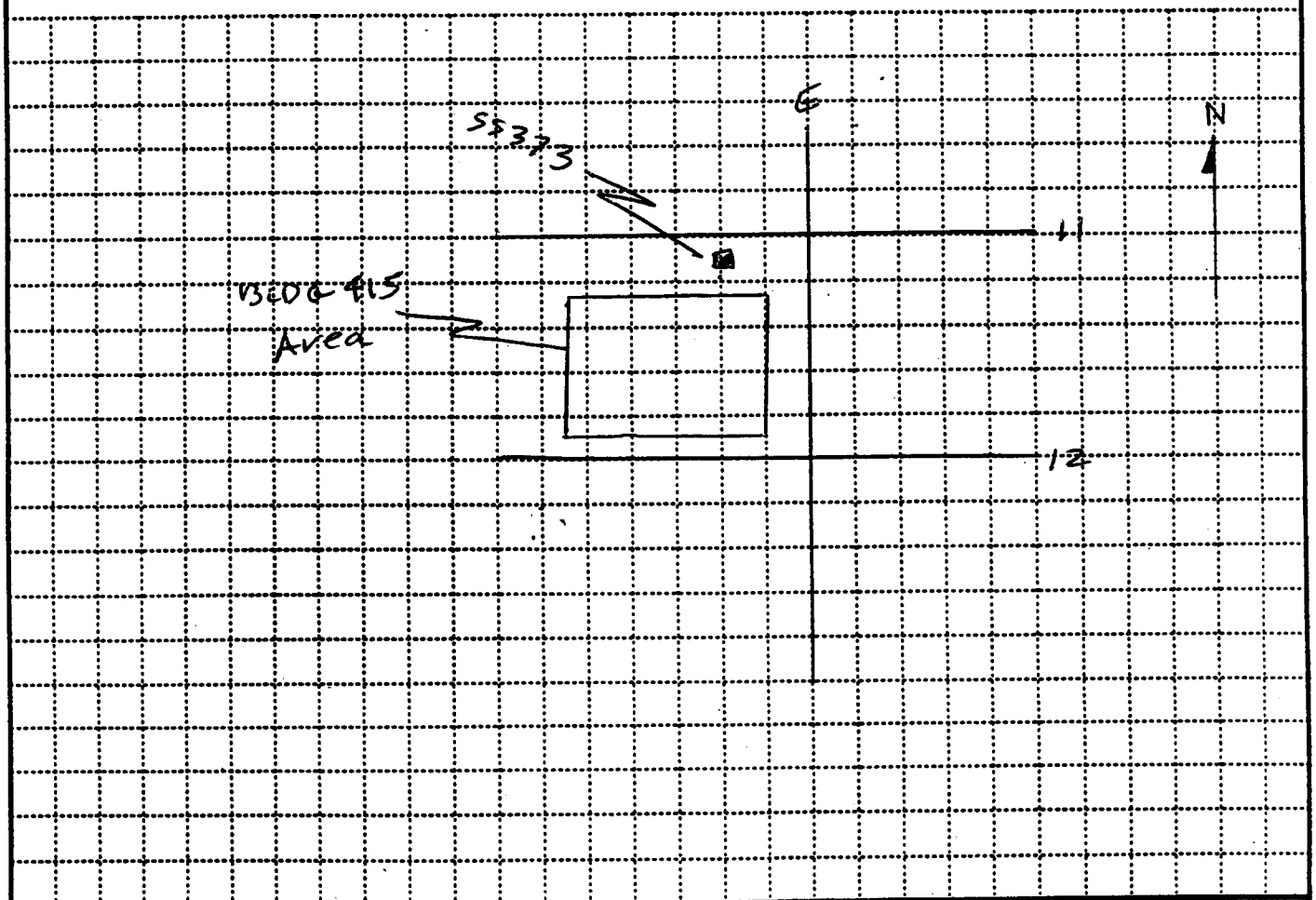
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite Grout	—	—	Charles D. Haggerty

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	SS373

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: SS 373

PROJECT: PBOW

INSPECTOR: Charles G. Hagegeorge

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	UNIFIED SOIL CLASSIFICATION SYMBOL (f)	SAMPLE INTERVAL	REMARKS (g)
	0	0-0.5' Top soil & grass	HN_V	Sample No.	USCS		Time Start 10:45 End 11:15
	1	0.5-3.5 Silty Clay, Light gray, No plasticity, dry, hard laminated			CL	Push 1 Rec 4'	
	2						
	3						
	4	3.5-4.0' ~~Dark gray~~ Silty Clay, dark gray, hard, No plasticity dry	0	SS373-10375-(3.5-4.0)			Collected 11:00
	5	4.0-6.0' Silty Clay, Lt gray - Lt brown, firm, no plasticity, dry,				Push 2 Rec 4'	Confirmation Samples 11/9/98 @ 1500 #10510 & 10515 3.5-4.0'
	6	6.0-7.5' Silty Clay, Lt brown, firm, no plasticity, dry, becoming iron stained near bottom					
	7						
	8	7.5-8.0' Clayey silt, gray, soft, No plasticity, wet	0	SS373-10376 (7.5-8.0)	ML		Collected 11:10 Water above shale
		Shale, dark gray, laminated					
	9	Refusal In shale 9.0'					
	10						

PROJECT: PBOW

HOLE NO. SS373

HTRW DRILLING LOG

DISTRICT: USACE-Nashville		HOLE NUMBER: SS374
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo-Environmental	SHEET 1 OF 2 SHEETS
3. PROJECT: PBOW	4. LOCATION: TNT B	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 2"	8. HOLE LOCATION: F-25, 3+73	
	9. SURFACE ELEVATION: NA	
	10. DATE STARTED: 11/6/98	11. DATE COMPLETED: 11/6/98
12. OVERBURDEN THICKNESS: 4.0'	15. DEPTH GROUNDWATER ENCOUNTERED: None	
13. DEPTH DRILLED INTO ROCK: 1.0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 5.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

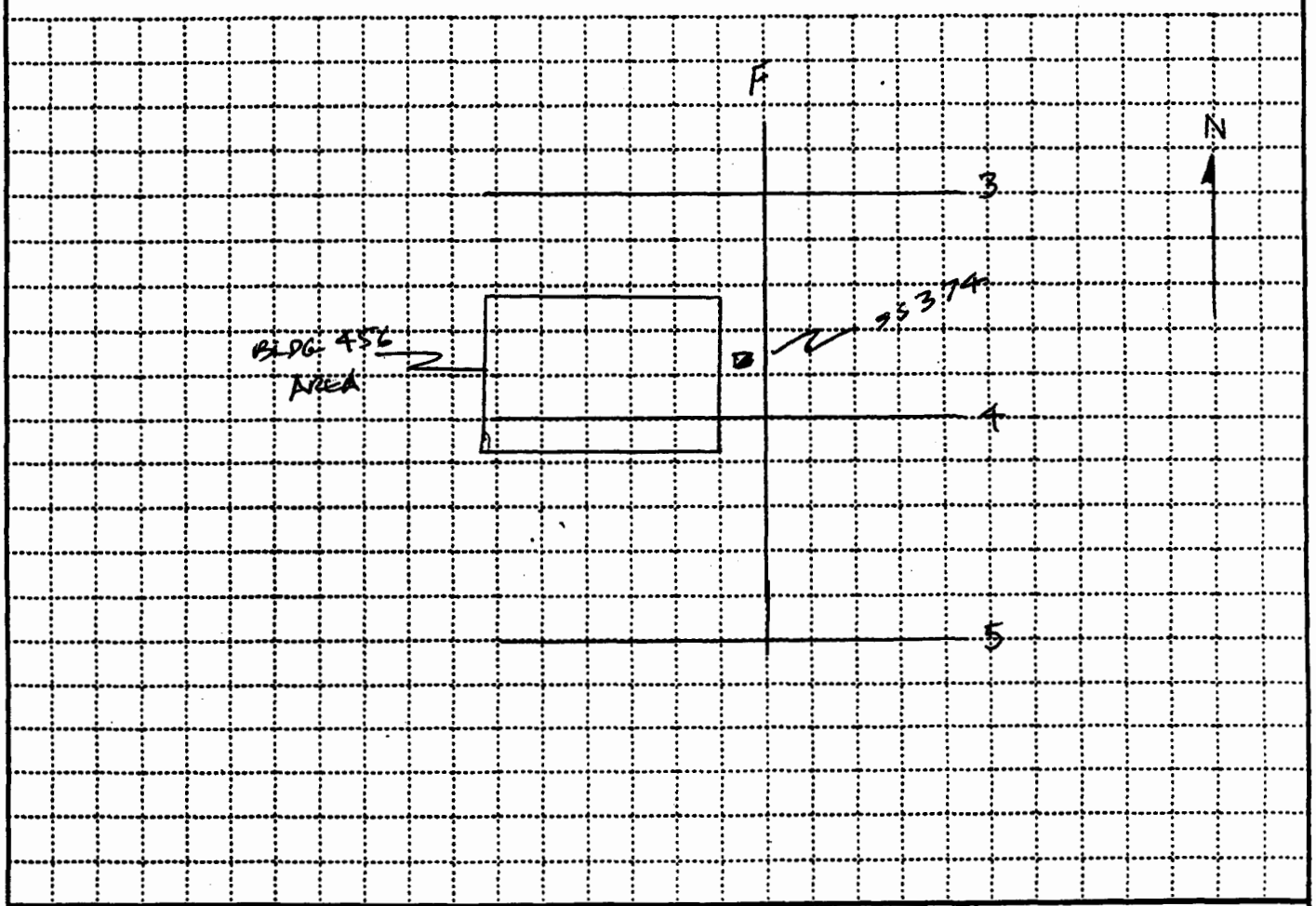
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite Grout	—	—	Charles D. Haggerty

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	SS374

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER SS374

PROJECT PBOW | INSPECTOR Charles G. Hagegeorge | SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	SAMPLING INTERVAL	REMARKS (g)
	0	0-0.5'	HNU	Sample No.	US CS		Time
	1	0.5'-1.5' Silt, Light brown, soft, no plasticity, dry	0		ML		Start ~~1100~~ 1255 End 1300
	2	1.5-3.0' Silty clay, brown, firm, no plasticity, dry some interbedded shale			CL	Push 1 Rec. 3'	
	3	3.0-4.0 Silty Clay, black, hard, no plasticity, dry	0	SS374-10377 (34)			Collected sample 12:55
	4	4.0-5.0 Shale, dark gray to black, thin bedded.			Shale		
	5	Refusal In Shale 5.0'					
	6						
	7						
	8						
	9						
	10						

PROJECT PBOW | HOLE NO. SS374

HTRW DRILLING LOG

DISTRICT: USACE-Nashville		HOLE NUMBER: SS 375
1. COMPANY NAME: IT Corp.	2. DRILL SUBCONTRACTOR: Geo-Environmental	SHEET 1 OF SHEETS 2
3. PROJECT: PBOW	4. LOCATION: TNT B	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 2"	8. HOLE LOCATION: (N618043 E918674) F+10, 7-10 (approx 3' SW SB18)	
	9. SURFACE ELEVATION: NA (682.64)	
	10. DATE STARTED: 11/6/98	11. DATE COMPLETED: 11/6/98
12. OVERBURDEN THICKNESS: 10.0'	15. DEPTH GROUNDWATER ENCOUNTERED:	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 10.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

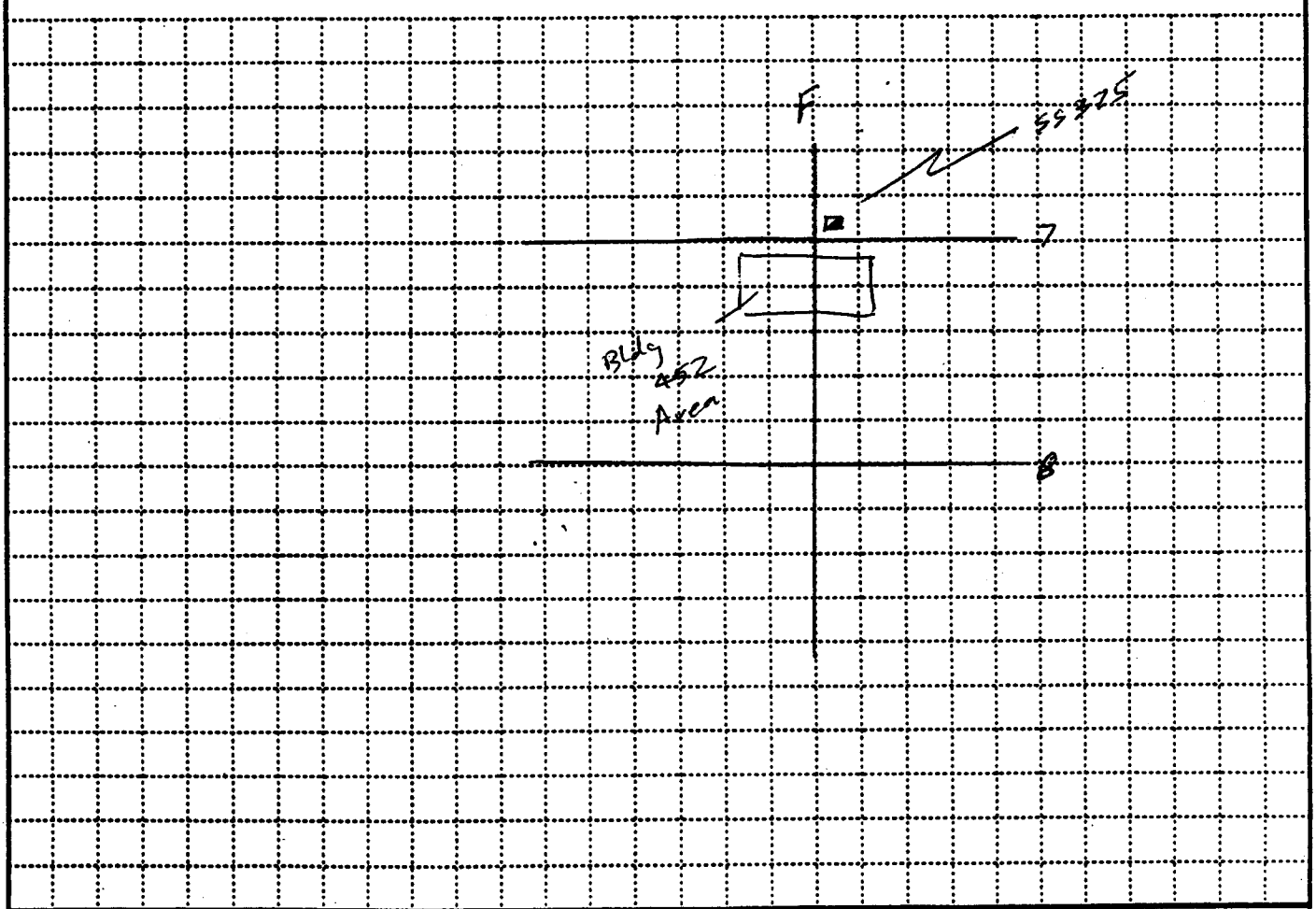
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite Grout	—	—	Charles J. Haggeorge

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	SS 375

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER SS375

PROJECT PBOW | INSPECTOR Charles G Hagegeorge | SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	SAMPLING INTERVAL	REMARKS (g)
	0	0-0.5'	HNu	Sample No.	USCS		Time
		0.5' 1.5' Silty Sand, brown, ~~silt, no plas~~ fine grained, dry. loose	0		SM		Start 1:10 End 1:35
	1						
		1.5- Silty Sand, red brown, fine grained, medium density dry.				Push 1 Rec 2'	
	2						
	3						
	4		0	SS 375 10378 4-6			Collected sample 1:20
	5						
	6					Push 2 Rec 3.5'	
	7						
	8		0	SS 375 10379 8-10			Collected sample 1:30
	9					Push 3 Rec. 2.0'	
	10	Refusal 10.0 ft shale					

PROJECT PBOW | HOLE NO. SS375

Cont.

HTRW DRILLING LOG

DISTRICT	USACE-Nashville
HOLE NUMBER	SS 376
SHEET / SHEETS	1 OF 2
1. COMPANY NAME	IT Corp
2. DRILL SUBCONTRACTOR	Geo-Environmental
3. PROJECT	PBOW
4. LOCATION	TNT B
5. NAME OF DRILLER	Jack Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	
8. HOLE LOCATION	D-5, 5+60
9. SURFACE ELEVATION	NA
10. DATE STARTED	11/6/98
11. DATE COMPLETED	11/6/98
12. OVERBURDEN THICKNESS	7.5
13. DEPTH DRILLED INTO ROCK	0
14. TOTAL DEPTH OF HOLE	7.5
15. DEPTH GROUNDWATER ENCOUNTERED	7.0 water above refusal
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

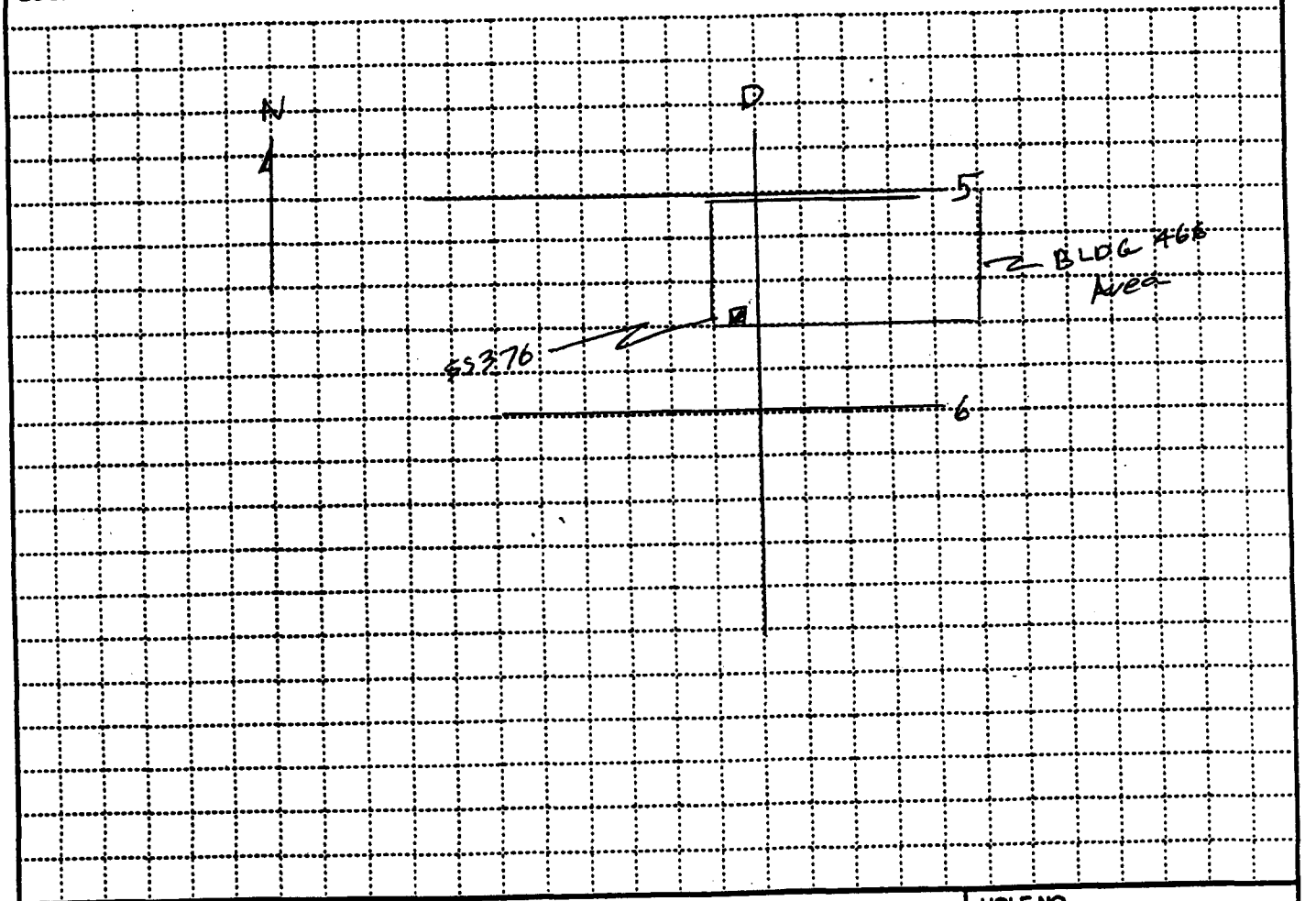
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite Grout	—	—	Charles D. Haggerty

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	SS 376

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: SS 376

PROJECT: PBOW

INSPECTOR: Charles G Hagegeorge

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	~~Sample No.~~ USCS	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	REMARKS (g)
	0	0.05' Top Soil & Grass	HNU		Sample No		Time Start 1:50 End 3:00
		0.5-1.0' Silt, lt brown, soft, No plasticity, dry		ML			
	1	1.0-2.5', Organic, shelly laminated.		OL		Push 1 Rec. 3.0'	
	2						
	3	2.5-4.0' Sand & gravel, dark gray, loose, fine to coarse gravel, poorly sorted, dry	0	GC	SS 376-10380 (3.0-4.0)		Sampled collected 2:30 Confirmation Samples 11/9/98 @ 1545 #10520 & 10525 3.0-4.0'
	4	4.0-7.0' Clay, gray to dark gray, firm, No plasticity, dry					
	5			CL		Push 2	
	6		0		SS 376 10381 - (7.0-7.5)	Rec 3.0'	Confirmation Samples 11/9/98 @ 1600 #10530 & 10535 5.0-6.0'
	7	7.0-7.5' Clayey Sand & Gravel fine to coarse, loose, poorly sorted, wet.		GC			Sample collected 2:45
		Refusal Rock (type?)					
	8						
	9						
	10						

PROJECT: PBOW

HOLE NO. SS 376

HTRW DRILLING LOG

DISTRICT	USACE-Nashville
HOLE NUMBER	SS 377
SHEET / SHEETS	1 OF 2
1. COMPANY NAME	IT Corp
2. DRILL SUBCONTRACTOR	Geo-Environmental
3. PROJECT	PBOW
4. LOCATION	TNT B
5. NAME OF DRILLER	Jack Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4' x 2"
8. HOLE LOCATION	D-75, 5+0
9. SURFACE ELEVATION	NA
10. DATE STARTED	11/6/98
11. DATE COMPLETED	11/6/98
12. OVERBURDEN THICKNESS	3.5'
13. DEPTH DRILLED INTO ROCK	1.0'
14. TOTAL DEPTH OF HOLE	4.5'
15. DEPTH GROUNDWATER ENCOUNTERED	None
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

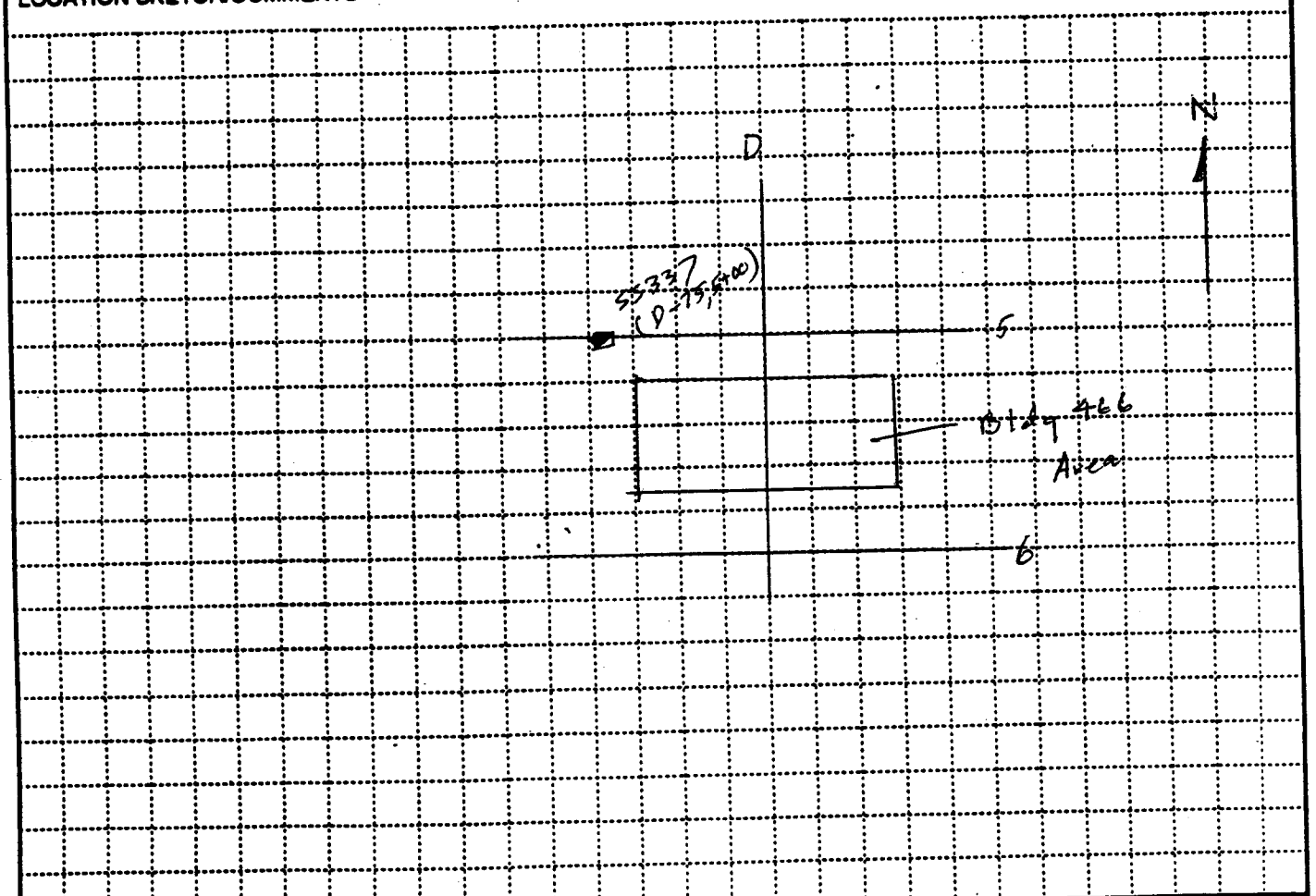
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite Grout	—	—	Charles J. Hoppegeorge

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	SS 377

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER SS 377

PROJECT PBOW

INSPECTOR

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	USCS	REMARKS (g)
	0	0.0-1.0' Top soil & grass	HNU	Sample No.	Sampling Interval		Time Start 3:00 End 3:30
	1	1.0-3.5 Silty Clay, Brown-gray, mottled, iron staining, hard no plasticity, dry	0		Rsh 1 Rsh 4.0'	CL	
	2						
	3		0	SS377-10382 (3-3.5)		Collected sample 3:20	
		3.5-4.5' Weathered shale, black, thin bedded				shale	
	4					shale	
		Refusal 4.5' in shale					
	5						
	6						
	7						
	8						
	9						
	10						

PROJECT PBOW

HOLE NO. SS377

HTRW DRILLING LOG

DISTRICT: USACE - Nashville		HOLE NUMBER: SS378
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo-Environmental	SHEET 1 OF 2 SHEETS
3. PROJECT: PBOW	4. LOCATION: TNT B	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 2"	8. HOLE LOCATION: SB11 (D&m) (N618323, E1918633) F-31, F+8	
	9. SURFACE ELEVATION: NA (666.96)	
	10. DATE STARTED: 11/8/98	11. DATE COMPLETED: 11/8/98
12. OVERBURDEN THICKNESS: 3.5'	15. DEPTH GROUNDWATER ENCOUNTERED: None	
13. DEPTH DRILLED INTO ROCK: 0.5'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 4.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

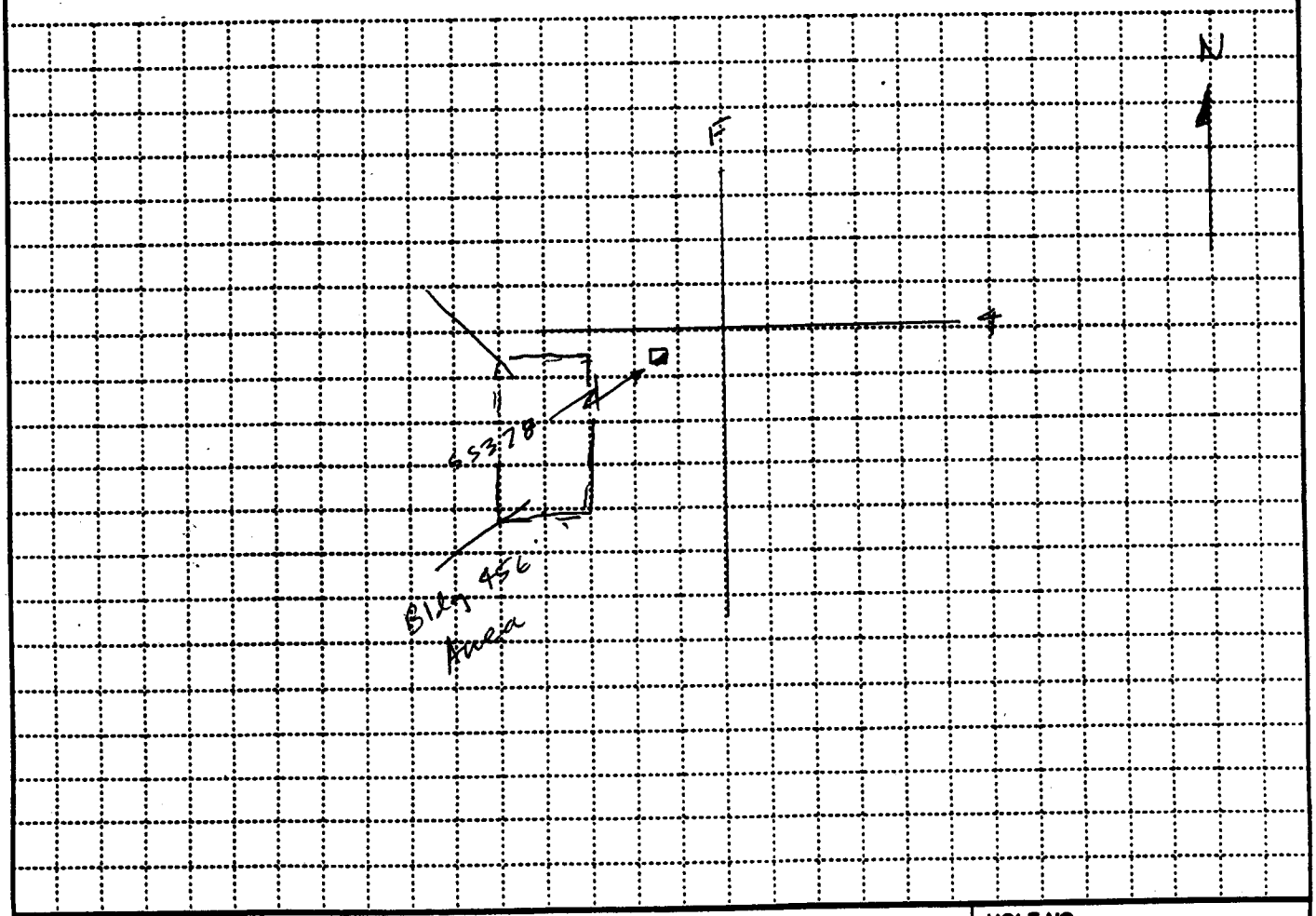
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite Cement	—	—	Charles D. Hoppenberg

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	SS378

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: SS378

PROJECT: PBOW

INSPECTOR: Charles G. Hagegeorge

SHEET 2 OF 2 SHEETS

ELEV. (0)	DEPTH (0)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	Sample Interval	REMARKS (G)
	0	0-0.5' Top soil & grass	HN_v	Sample No.	USCS		Time
		0.5-1.0' Clayey Silt, black, soft, no plasticity, dry			ML		Start 8:20 End 8:40
	1	1.0-2.5' Silty Clay, mottled brown with organic mat. firm, no plasticity, dry			CL	Push 1 Rec	
	2						
	3	2.5-3.5' Silty Clay, mottled yellow and brown, firm, low plasticity, dry	0	SS378 10383 (2.5-3.5)			Collected sample 8:35
		3.5-4.0' weathered shale laminated, weathers brown			Shale		Confirmation Samples 11/9/98 @ 1425 # 10540 & 10545 2.3-3.5'
	4	Refusal 4.0' in weathered shale, laminated, weathers brown					
	5						
	6						
	7						
	8						
	9						
	10						

PROJECT: PBOW

HOLE NO.: SS378

HTRW DRILLING LOG

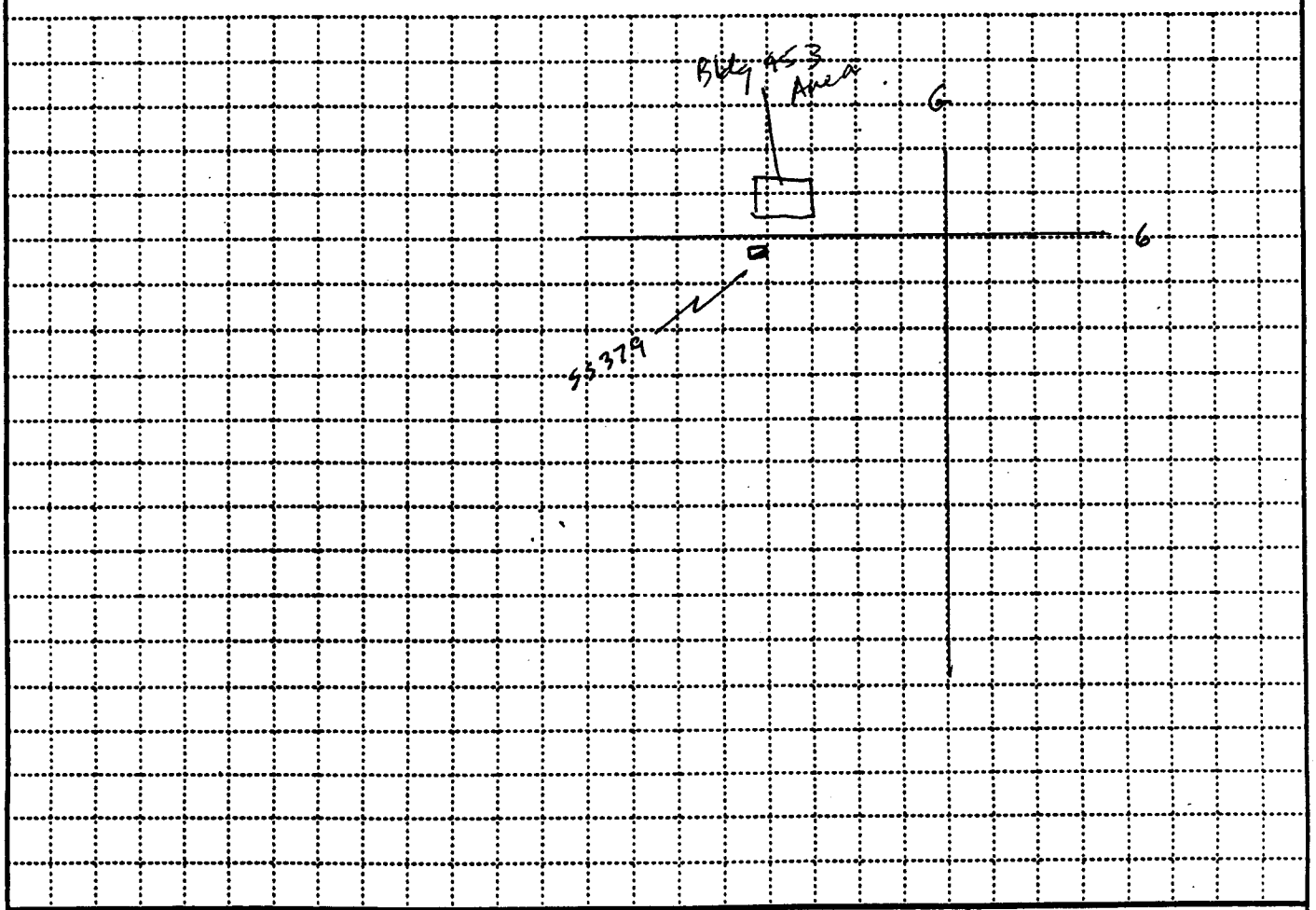
DISTRICT: USACE-Nashville		HOLE NUMBER: SS379
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo-Environmental	SHEET 1 OF 2 SHEETS
3. PROJECT: PBOW	4. LOCATION: TNT B	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4" x 2"	8. HOLE LOCATION: (N618135, E1918883) A/SB17 G-82, 6+3	
	9. SURFACE ELEVATION: NA (676.1)	
	10. DATE STARTED: 11/8/98	11. DATE COMPLETED: 11/8/98
12. OVERBURDEN THICKNESS: 8.5'	15. DEPTH GROUNDWATER ENCOUNTERED: None	
13. DEPTH DRILLED INTO ROCK: 1.5'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 10.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite Grout	—	—	Charles D. Hagegeorge

LOCATION SKETCH/COMMENTS — SCALE: Not to Scale



PROJECT: PBOW	HOLE NO. SS379

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: SS 379

PROJECT: PBOW

INSPECTOR: Charles G. Hagescage

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	SCATCH SAMPLE OR SAMPLE NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sample Tubes	REMARKS (g)
	0	0.0-0.5' Top soil & grass	HNU 0	Sample No.	USCS		Time
	1	0.5-1.5' Silt, yellow brown soft, no plasticity, dry.			ML		Start 8:50 End 9:05
	2	1.5-2.0' Silty, yellow brown, soft, no plasticity, dry				Push 1 Rec 3.0'	
	3	2.0 - 5.5' Silt, yellow brown soft - no plasticity, dry					
	4		0	SS379 10384 4.0-5.0'			Collected sample 9:00
	5						Confirmation Samples 11/9/98 @ 1345 4.0-5.0' #10550 & 10553 #10551 (FD) #10552 (FS)
	6	5.5-7.5' Weathered shale, laminated, weathers yellow brown, dry			Shale	Push 2 Rec. 4.0'	
	7						
	8	7.5-8.5' Silty Clay, yellow brown - brown, low plasticity dry	0	SS379 10385 (7.5-8.5)	CL		Collected sample 9:05
	9	8.5'-10.0' Shale, dark gray weathers to yellow brown, thin bedded, dry			shale	Push 3 Rec. 2.5'	
	10	Refusal at 10.0'					

PROJECT: PBOW

HOLE NO. SS 379

HTRW DRILLING LOG

DISTRICT: USACE-Nashville		HOLE NUMBER: SS380
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo-Environmental	SHEET 1 OF 2 SHEETS
3. PROJECT: PBOW	4. LOCATION: TNT B	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4'x2"	8. HOLE LOCATION: (N 618008, E 1918627) At SB-20 F+00, 7+26	
	9. SURFACE ELEVATION: NA (681.69)	
	10. DATE STARTED: 11/8/98	11. DATE COMPLETED: 11/8/98
12. OVERBURDEN THICKNESS: 10.0	15. DEPTH GROUNDWATER ENCOUNTERED: None	
13. DEPTH DRILLED INTO ROCK: 0	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 10.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

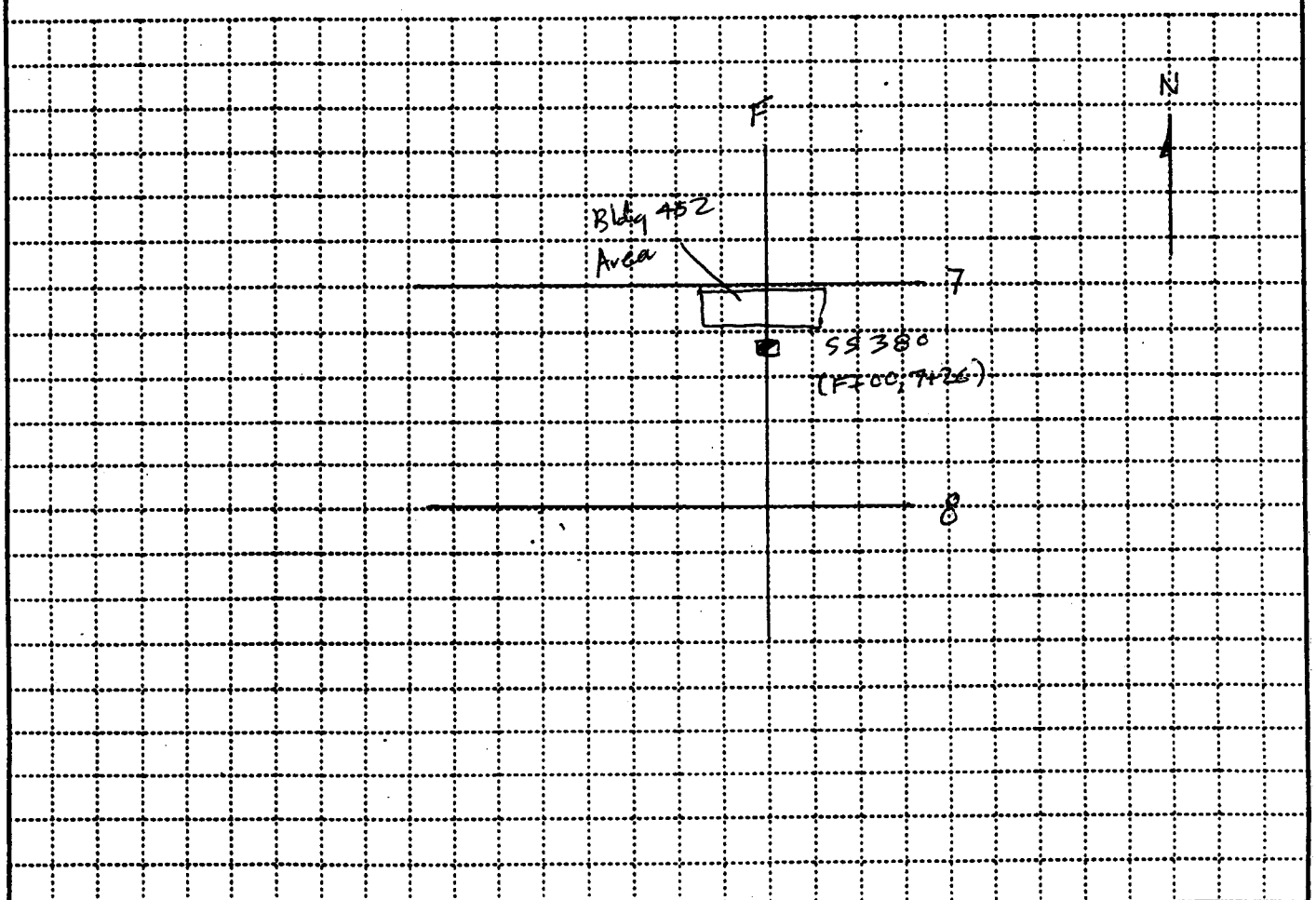
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite Grout	—	—	Charles T. Hagegeorge

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT: PBOW	HOLE NO. SS380

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: SS 380

PROJECT: PBOW

INSPECTOR: Charles G. Hagegeorge

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	CORE OR SAMPLE NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sample Interval	REMARKS (g)
	0	0-0.5' Top soil & grass	HNU	Sample No.	USCS		Time
		0.5 - Sand, yellow brown, v. fine grained, loose dry	0		SP		Start 9.25 End 9:45
	1					Push 1 ~~4.0~~ Rec 3.0'	
	2						
	3						
	4		0	SS 380 10386 (4.0-6.0)		Push 2 Rec 4.0'	Sample collected 9:35
	5						
	6						
	7						
	8		0	SS 380 10387 8.0-10.0'		Push 3 Rec 2.0'	Sample collected 9:40
	9						
	10	Total Depth 10.0' in					

PROJECT: PBOW

HOLE NO. SS 380

HTRW DRILLING LOG

DISTRICT	USACE-Nashville
HOLE NUMBER	SS 381
1. COMPANY NAME	IT Corp
2. DRILL SUBCONTRACTOR	Geo-Environmental
SHEET / SHEETS	1 OF 2
3. PROJECT	PBOW
4. LOCATION	TNT B
5. NAME OF DRILLER	Jack Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4 1/2 x 2"
8. HOLE LOCATION	(N618028, E1918698) At SB 19 F+36, 7+12
9. SURFACE ELEVATION	NA (682.08)
10. DATE STARTED	11/8/98
11. DATE COMPLETED	11/8/98
12. OVERBURDEN THICKNESS	10.0'
13. DEPTH DRILLED INTO ROCK	0
14. TOTAL DEPTH OF HOLE	10.0'
15. DEPTH GROUNDWATER ENCOUNTERED	None
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

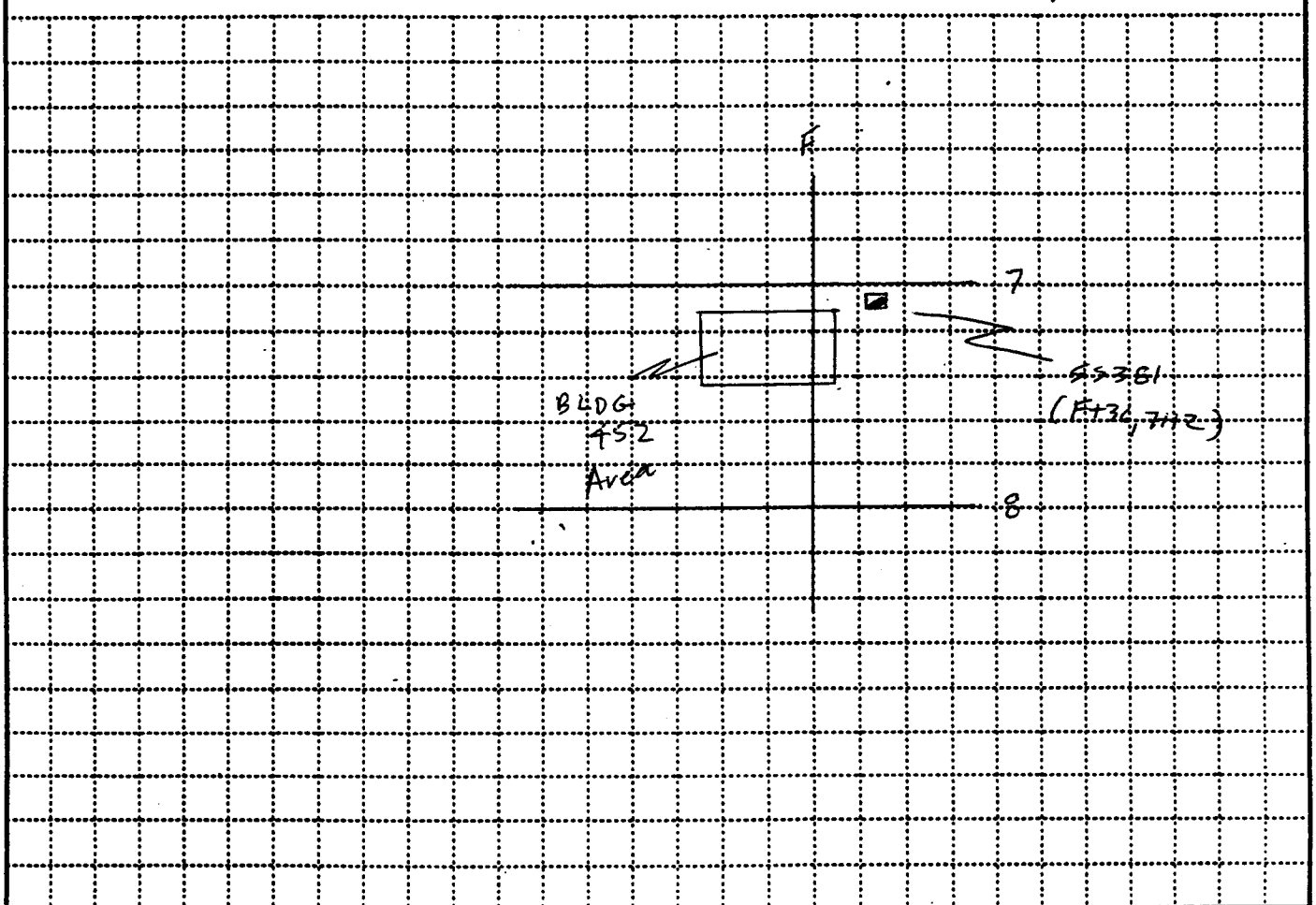
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		—	—	Charles D. Hazegrove

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT	PBOW
HOLE NO.	SS 381

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: SS 381

PROJECT: PBOW

INSPECTOR: Charles G. Hugegeorge

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sample Interval	REMARKS (g)
	0	0-0.5' Top soil & grass	HN_U	Sample No.	USCS		Time
			0				
		0.5-10.0' Sand, yellow-brown - brown, v. fine grained, loose, dry.			SP		Start 9:50
							End 10:05
	1						
						Push 1	
	2					Rec. 2.5'	
	3						
	4		0				
							Collected sample 9:55
	5			SS381 10388 4-6			
						Push 2	
	6					Rec 3.0'	
	7						
	8		0	SS381 10389 8-10			Collected sample 10:00
	9						
	10	Total Depth 10.0'					

PROJECT: PBOW

HOLE NO. SS381

HTRW DRILLING LOG

DISTRICT: USACE-Nashville		HOLE NUMBER: SS 382
1. COMPANY NAME: IT Corp.	2. DRILL SUBCONTRACTOR: Geo-Environmental	SHEET 1 OF SHEETS 2
3. PROJECT: PBOW	4. LOCATION: TNT B	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' X 2"	8. HOLE LOCATION: (N617866, E912749) At SB21 F+87, 9-32	
	9. SURFACE ELEVATION: NA (678.06)	
	10. DATE STARTED: 11/8/98	11. DATE COMPLETED: 11/8/98
12. OVERBURDEN THICKNESS: 10.0'	15. DEPTH GROUNDWATER ENCOUNTERED: None	
13. DEPTH DRILLED INTO ROCK: 0	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 10.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

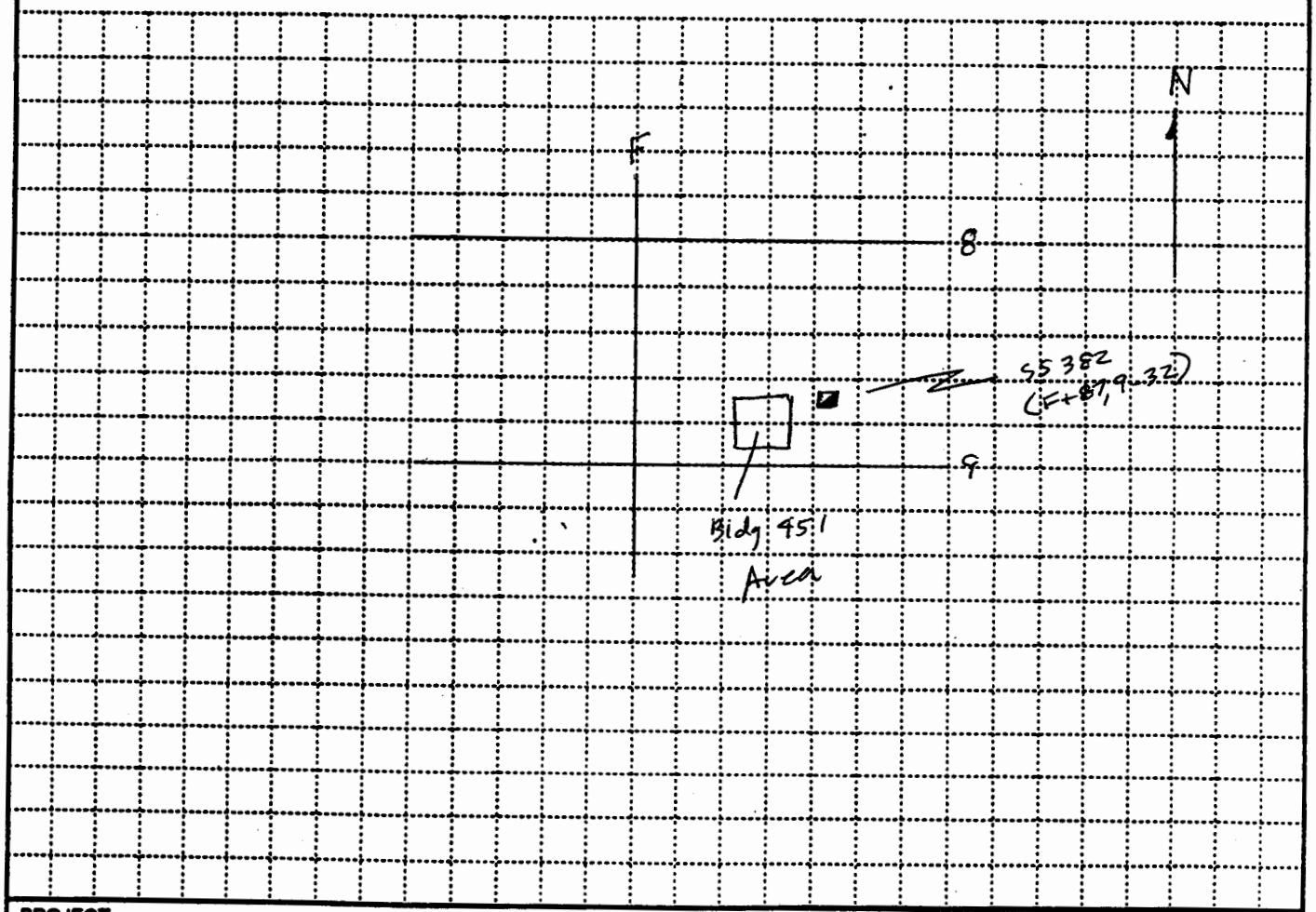
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	—	—	Charles D. Hagegeorge

LOCATION SKETCH/COMMENTS Grout

SCALE: Not to Scale



PROJECT: PBOW	HOLE NO. SS382

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: SS382

PROJECT: PBOW

INSPECTOR: Charles A. Hagegeage

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH. SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sample Interval	REMARKS (g)
	0	0-0.5'	HNu 0	Sample No.	USCS		Time
		0.5-1.0' Sand, Lt brown-yellow brown, very fine grained loose, dry			SP		Start 10:10 End 10:35
	1	Concrete 1.0-2.0'			Concrete	Push 1 Rec 3.5'	
	2	2.0-3.0' Sand, Light brown to yellow brown, very fine grained, loose dry			SP		
	3	3.0-7.5 Silty Clay, brown mottled yellow orange, firm low plasticity, dry			CL		
	4		0	SS382 10390 4-6			Collected sample 10:30
	5						
	6					Push 2 Rec 3.0'	
	7						
		7.5 - Clay, gray, soft med-high plasticity, moist			CH		
	8		0	SS382 10391 8-10			Collected sample 10:35
	9					Push 3 Rec. 2.0	
	10	Total Depth 10.0'					

PROJECT: PBOW

HOLE NO. SS382

HTRW DRILLING LOG

DISTRICT	USACE-Nashville
HOLE NUMBER	SS383
SHEET / OF SHEETS	1 OF 2
1. COMPANY NAME	IT Corp
2. DRILL SUBCONTRACTOR	Geo-Environmental
3. PROJECT	PBOW
4. LOCATION	TNT B
5. NAME OF DRILLER	Jack Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	
8. HOLE LOCATION	(N617867, E1918771) At SB22 F+110, 9-30
9. SURFACE ELEVATION	NA
10. DATE STARTED	11/8/98
11. DATE COMPLETED	11/8/98
12. OVERBURDEN THICKNESS	10.0'
13. DEPTH DRILLED INTO ROCK	0
14. TOTAL DEPTH OF HOLE	10.0'
15. DEPTH GROUNDWATER ENCOUNTERED	
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

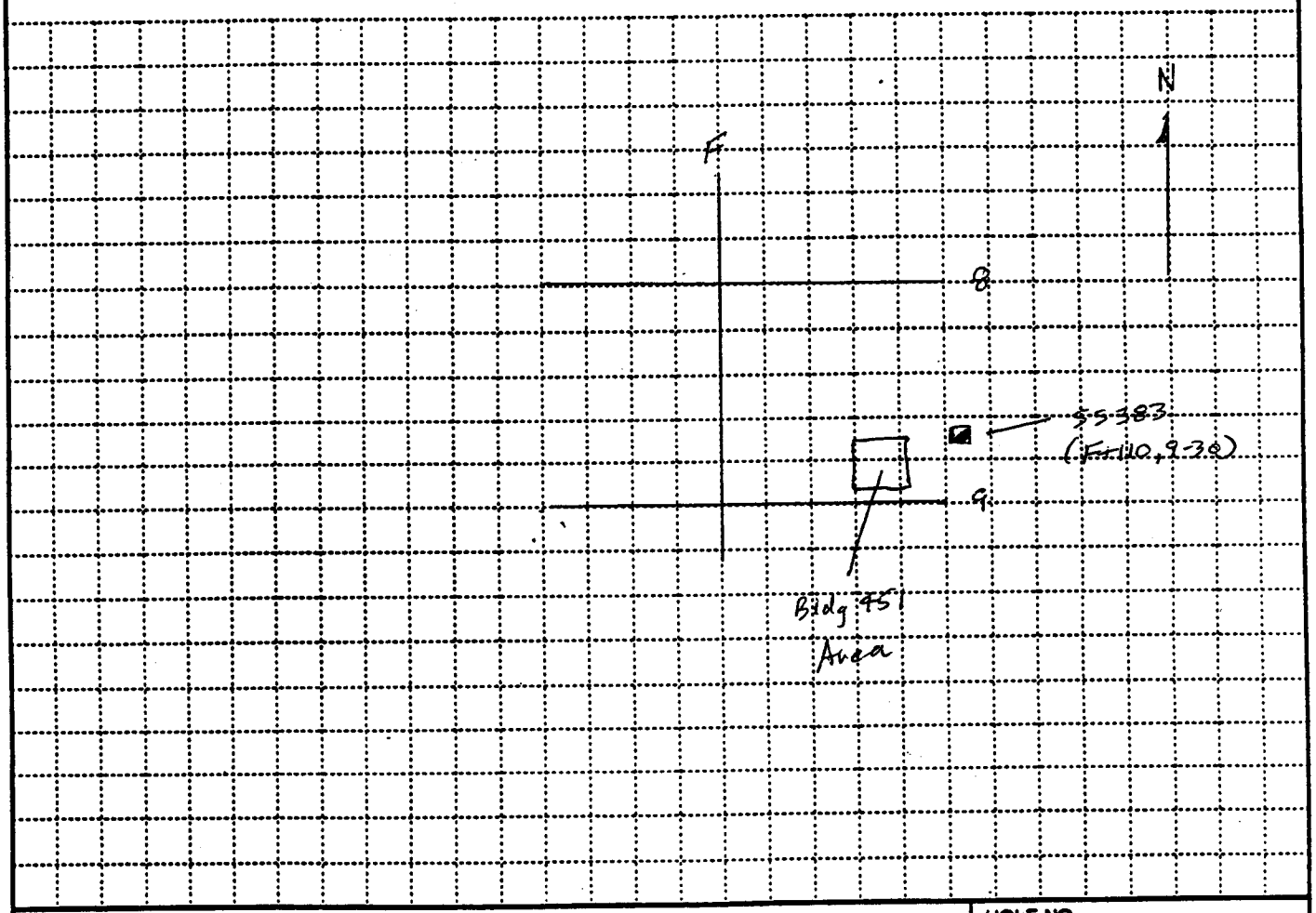
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	—	—	Charles S. Hagegeorge

LOCATION SKETCH/COMMENTS Grout

SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	SS383

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER SS383

SHEET 2 OF 2 SHEETS

PROJECT PBOW

INSPECTOR Charles G. Hengeveange

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sample Interval	REMARKS (g)
	0	0-0.5' Top soil & grass	HNU 0	Sample Nec	USCS		Time Start 10:45 End 11:00
	1	0.5-2.5' Sandy, Silty, brown, v. fine, loose, dry			ML		
	2					Push 1 rec 3.5'	
	3	2.5- Silty Clay, brown, firm, low plasticity, dry shale fragments		SS383 10392 (4-6)	CL		Collected sample 10:50
	4		0				
	5					Push 2 rec 4.0'	
	6						
	7						
	8		0	SS383 10393 (8-10)		Push 3 rec. 2.0'	Collected sample ~~8-10 Bis~~ 10:55
	9						
	10	Total Depth 10.0					

PROJECT PBOW

HOLE NO. SS383

HTRW DRILLING LOG

DISTRICT	USACE-Nashville
HOLE NUMBER	SS384
1. COMPANY NAME	IT Corp
2. DRILL SUBCONTRACTOR	Geo-Environmental
SHEET / SHEETS	1 OF 2
3. PROJECT	PBOW
4. LOCATION	TNT B
5. NAME OF DRILLER	Jack Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4" x 2"
8. HOLE LOCATION	(N 617836, E 1918781) At SB23 F+117, 9-3
9. SURFACE ELEVATION	NA (676.89)
10. DATE STARTED	11/8/98
11. DATE COMPLETED	11/8/98
12. OVERBURDEN THICKNESS	8'
13. DEPTH DRILLED INTO ROCK	0
14. TOTAL DEPTH OF HOLE	8'
15. DEPTH GROUNDWATER ENCOUNTERED	None
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

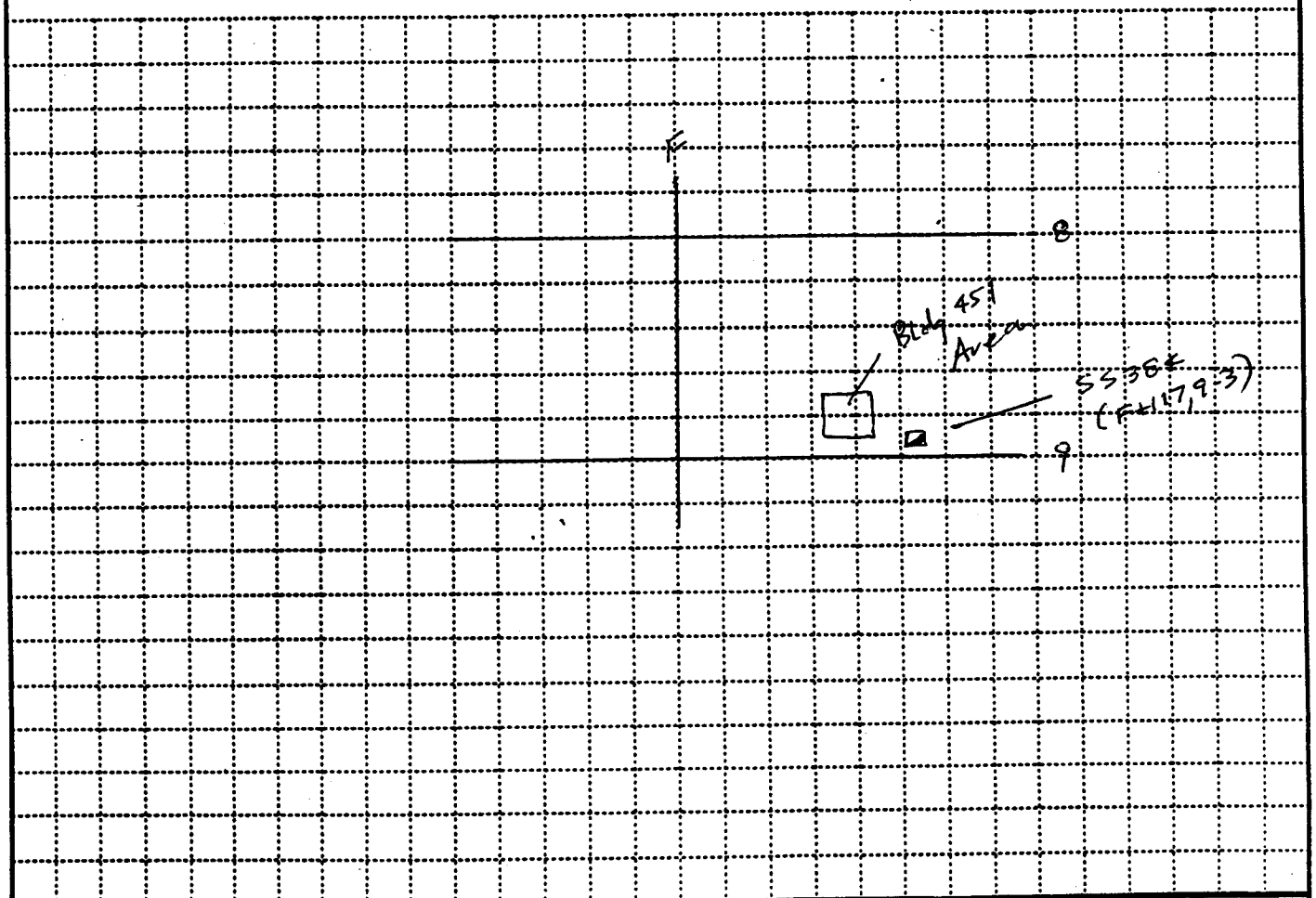
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite Grout	—	—	Charles D. Haggerty

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	SS384

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: SS384

PROJECT: PBOW

INSPECTOR: Charles G. Hagegeorge

SHEET 2 OF 2 SHEETS

ELEV. (0)	DEPTH (0)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (9)	CONTROL SAMPLE OR CORE BOX NO. (10)	ANALYTICAL SAMPLE NO. (11)	Sample Interval	REMARKS (12)
	0	0-0.5' Top Soil & Grass	HNU 0	Sample No	USCS		Time
		0.5-3.0' Silt, brown, ~~loose~~ soft, no plasticity, dry			ML	Push 1 Rec. 3.0'	Start 11:15 End 11:30
	1						
	2						
	3	3.0-9.0' Silty Clay, Lt brown to brown, firm, low plastic, dry			CL		
	4		0	SS384 10384 4-6			Sample collected 11:30
	5						
	6					Push 2 Rec. 3.0'	
	7						
	8		0	SS384 10395 8-10		Push 3 Rec.	Sample collected 11:35
	9	9.0-10.0' Shale, weathered gray			Shale		
	10	Total Depth 10.0'					

PROJECT: PBOW

HOLE NO. SS384

HTRW DRILLING LOG

DISTRICT: USACE-Nashville		HOLE NUMBER: SS385
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo-Environmental	SHEET 1 OF SHEETS 2
3. PROJECT: PBOW	4. LOCATION: TNT B	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4'x2"	8. HOLE LOCATION: (N618162, E1918087) H SB-6 D+15 6-35	
	9. SURFACE ELEVATION: NA (668.98)	
	10. DATE STARTED: 11/8/98	11. DATE COMPLETED: 11/8/98
12. OVERBURDEN THICKNESS: 4.5'	15. DEPTH GROUNDWATER ENCOUNTERED: None	
13. DEPTH DRILLED INTO ROCK: 0.5'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 5.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

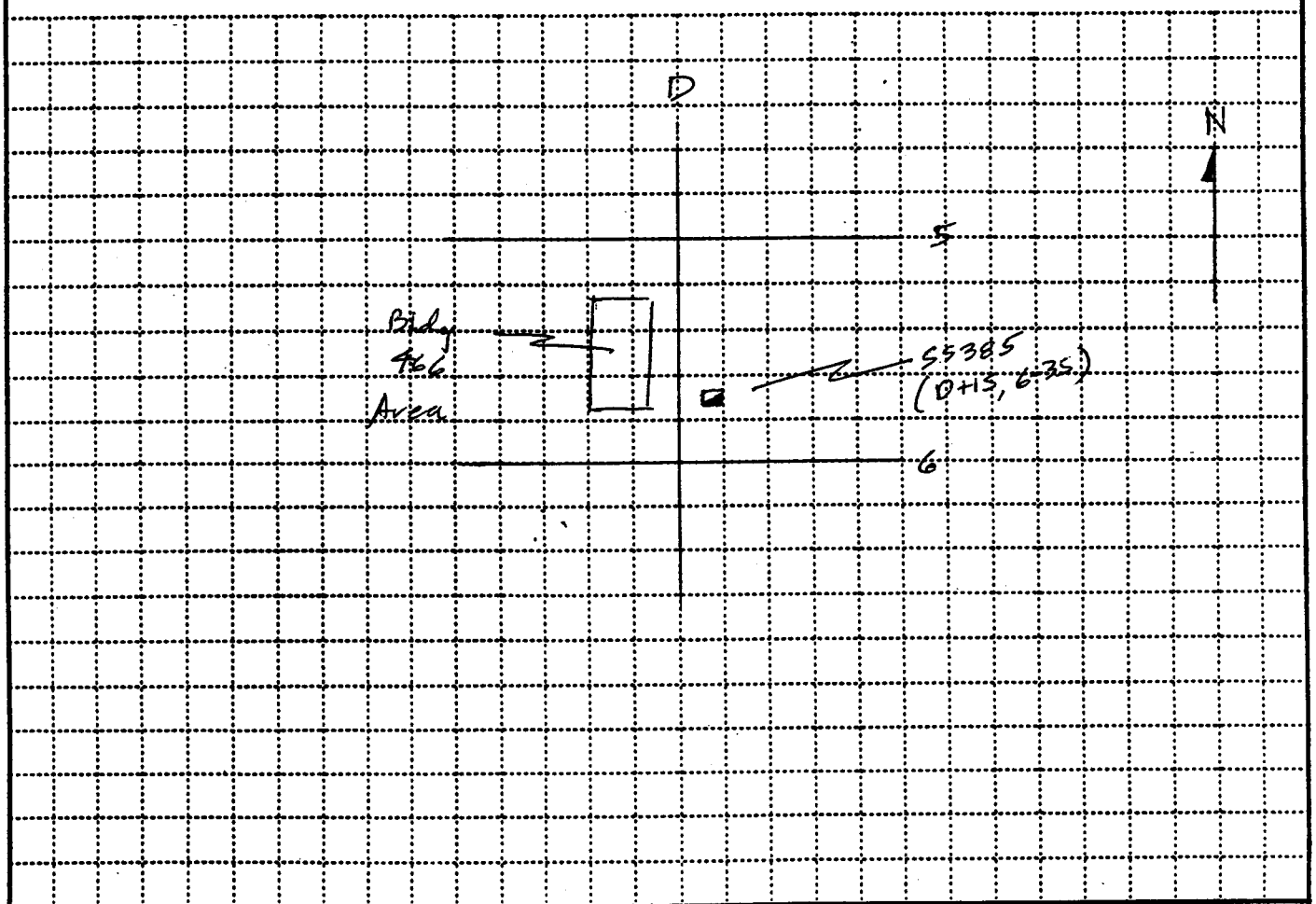
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite Grout	—	—	Charles D. Hagegeorge

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	SS385

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: SS 385

PROJECT: PBOW

INSPECTOR: Charles G. Hagegeage

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	OBSERVED SAMPLE OR CORE BOX NO. (e)	SAMPLE NO. (f)	Interval Sample	REMARKS (g)
	0	0-0.5' Top Soil & Grass	HN_0	Sample No.	USCS		
	1	0.5-2.5 Silt, brown, soft, no plasticity, dry	(			Push 1 Rec 3.0'	
	2						
	3	2.5-3.5 Silty Clay, dark gray, hard, low plasticity dry	0	SS385 10396 2.5-3.5			Sampled 1:20
	4	3.5-4.5 Silty Clay, brown hard, low plasticity dry				Push 2 Rec. 1.0'	
		4.5-5.0 Shale, weathered Black Thin Bedded			Shale		
	5	Refusal 5.0' in Shale					
	6						
	7						
	8						
	9						
	10						

PROJECT: PBOW

HOLE NO. SS385

HTRW DRILLING LOG

DISTRICT: USACE - Nashville		HOLE NUMBER: SS386
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo-Environmental	SHEET 1 OF 2 SHEETS
3. PROJECT: PBOW	4. LOCATION: TNT B	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 2"	8. HOLE LOCATION: At SB7 (N 618163, E 918117) D+55, 5+60	
	9. SURFACE ELEVATION: NA (669.09)	
	10. DATE STARTED: 11/8/98	11. DATE COMPLETED: 11/8/98
12. OVERBURDEN THICKNESS: 4.5'	15. DEPTH GROUNDWATER ENCOUNTERED: None	
13. DEPTH DRILLED INTO ROCK: 0.5'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 5.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

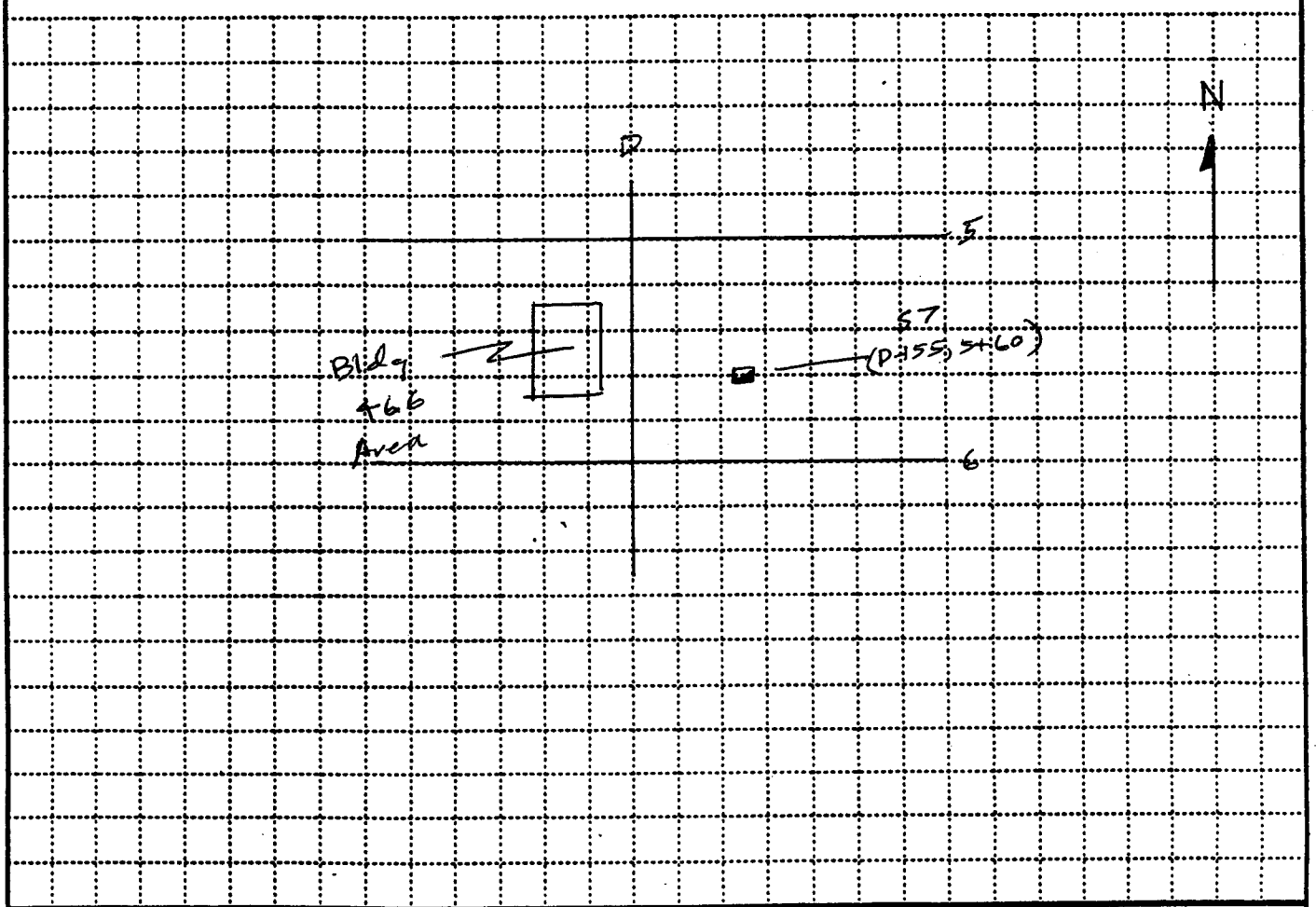
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	—	—	Charles H. Hoggegenge

LOCATION SKETCH/COMMENTS Grate

SCALE: Not to Scale



PROJECT: PBOW	HOLE NO. SS386

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER SS 386

PROJECT PBOW | INSPECTOR Charles G. Hagegeage | SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	PID/FID SCREENING RESULTS (d)	~~DEG-FROM-SAMPLE OR-CORE-BOX-NO.~~ (e)	ANALYTICAL SAMPLE NO. (f)	Sample Entered	REMARKS (g)
	0	0-0.5' Top Soil & Grass	HNU	Sample No.	USCS		Time
		0.5-~~4.5~~ 2.0 ~~Silty Clay~~ Silt, brown soft, no plasticity, dry	0		ML		Start 1:30 End 1:40
	1					Push 1 Rec 3.5'	
	2	2.0-4.0 Silty Clay, brown firm, low plasticity, dry			CL		
	3						
	4	4.0-4.5 Silty Clay - Dk gray - dk brown, hard, low plasticity, dry	0	SS 385 10397 (4.5-5.0)	CL	Push 2 Rec 1.0'	Collected sample 1:35
		4.5-5.0' Shale, dark gray, weathered			Shale		
	5	Refusal 5.0' in shale					
	6						
	7						
	8						
	9						
	10						

PROJECT PBOW | HOLE NO. SS 386

HTRW DRILLING LOG

DISTRICT: USACE-Nashville		HOLE NUMBER: SS 387
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo-Environmental	SHEET 1 OF SHEETS 2
3. PROJECT: PBOW	4. LOCATION: TNT B	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4'x2"	8. HOLE LOCATION: At SB25 (N617130, E1918387) E+25, 16+00	
	9. SURFACE ELEVATION: NA (671.96)	
	10. DATE STARTED: 11/8/98	11. DATE COMPLETED: 11/8/98
12. OVERBURDEN THICKNESS: 5.0'	15. DEPTH GROUNDWATER ENCOUNTERED: None	
13. DEPTH DRILLED INTO ROCK: 0	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 5.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

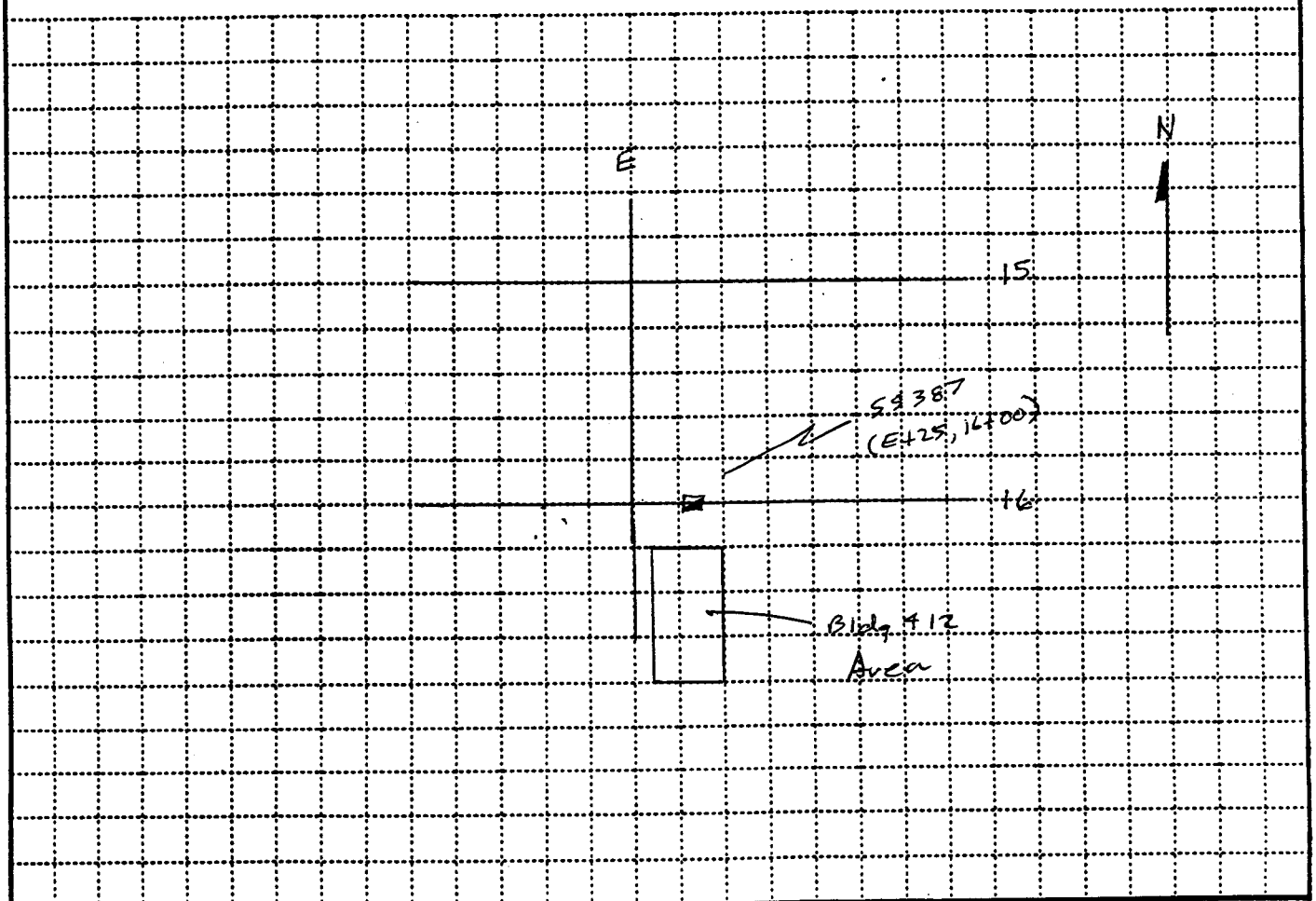
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite Grout	—	—	Charles D. Haggerty

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT: PBOW	HOLE NO. SS 387

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER SS387

PROJECT PBOW

INSPECTOR Charles G. Hagegeorge

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD-SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sample Extent	REMARKS (g)
	0	0-0.5 Top Soil	HNU 0	Sample No.	USCS		Time Start 1:55 End 2:05
	1	0.5-2.5' Clayey Silt, Lt brown, Soft, no plasticity, dry. pieces of brick			ML	Push 1 Rec 3.0'	
	2						
	3	2.5- Silty Clay, Gray, firm, low plasticity, dry		SS387 10398 (2.5-3.0)	CL		Collected sample 2:00
	4		0			Push 2 2.0'	
	5	plasticity increased to medium.		SS387 10399 (5.0-6.0)			Collected sample 2:05
	6	Refusal 6.0' in shale					
	7						
	8						
	9						
	10						

PROJECT PBOW

HOLE NO. SS387

HTRW DRILLING LOG

DISTRICT: USACE-Nashville		HOLE NUMBER: SS388
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo-Environmental	SHEET 1 OF SHEETS 2
3. PROJECT: PBOW	4. LOCATION: TNT B	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 2"	8. HOLE LOCATION: (N618006, E1917627) C-145, 7+18	
	9. SURFACE ELEVATION: NA (679.68)	
	10. DATE STARTED: 11/8/98	11. DATE COMPLETED: 11/8/98
12. OVERBURDEN THICKNESS: 4'+	15. DEPTH GROUNDWATER ENCOUNTERED: None	
13. DEPTH DRILLED INTO ROCK: 0	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 4.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

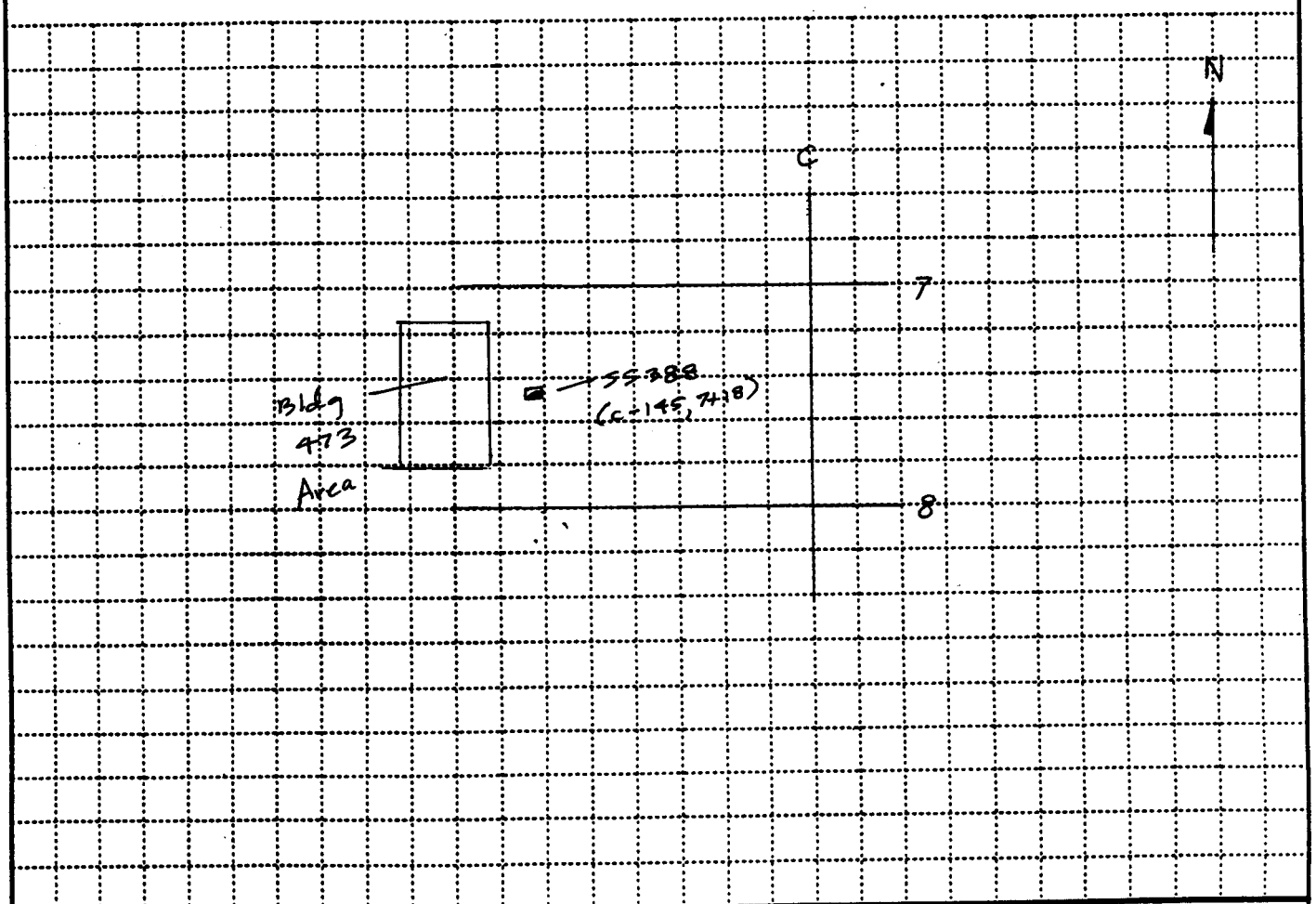
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	—	—	Charles T. Haggerty

LOCATION SKETCH/COMMENTS Grid

SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	SS388

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: SS388

PROJECT: PBOW

INSPECTOR: Charles G. Hagegeage

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	DEPTH SAMPLE OR CORE BOX NO. (e)	SAMPLE NO. (f)	Sample Intervl	REMARKS (g)
	0	Top Soil 0-0.5'	HNU	Sample No.	USCS		Time
		0.5-4.0 Clayey silt, dark brown, soft, noplasticity, dry. pieces of dark gray shale at bottom of interval.			ML		Start 2:40 End 2:50
	1					Push 1	
						Rec 2.0'	
	2						
	3		0		SS388 10400 (3-4)		Collected sample 2:50 Confirmation Samples 11/10/98 @ 0900 #10560 & 10565 3.0-4.0
	4	Refusal 4.0 ft. Concrete					
	5						
	6						
	7						
	8						
	9						
	10						

HTRW DRILLING LOG

DISTRICT: USACE - Nashville		HOLE NUMBER: SS389
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo-Environmental	SHEET 1 OF 2 SHEETS
3. PROJECT: PBOW	4. LOCATION: TNT B	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4" x 2"	8. HOLE LOCATION: C+50, 7+25 (N618019, E1917814)	
	9. SURFACE ELEVATION: NA (677.47)	
	10. DATE STARTED: 11/8/98	11. DATE COMPLETED: 11/8/98
12. OVERBURDEN THICKNESS: 10'+	15. DEPTH GROUNDWATER ENCOUNTERED: None	
13. DEPTH DRILLED INTO ROCK: 0	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 10'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

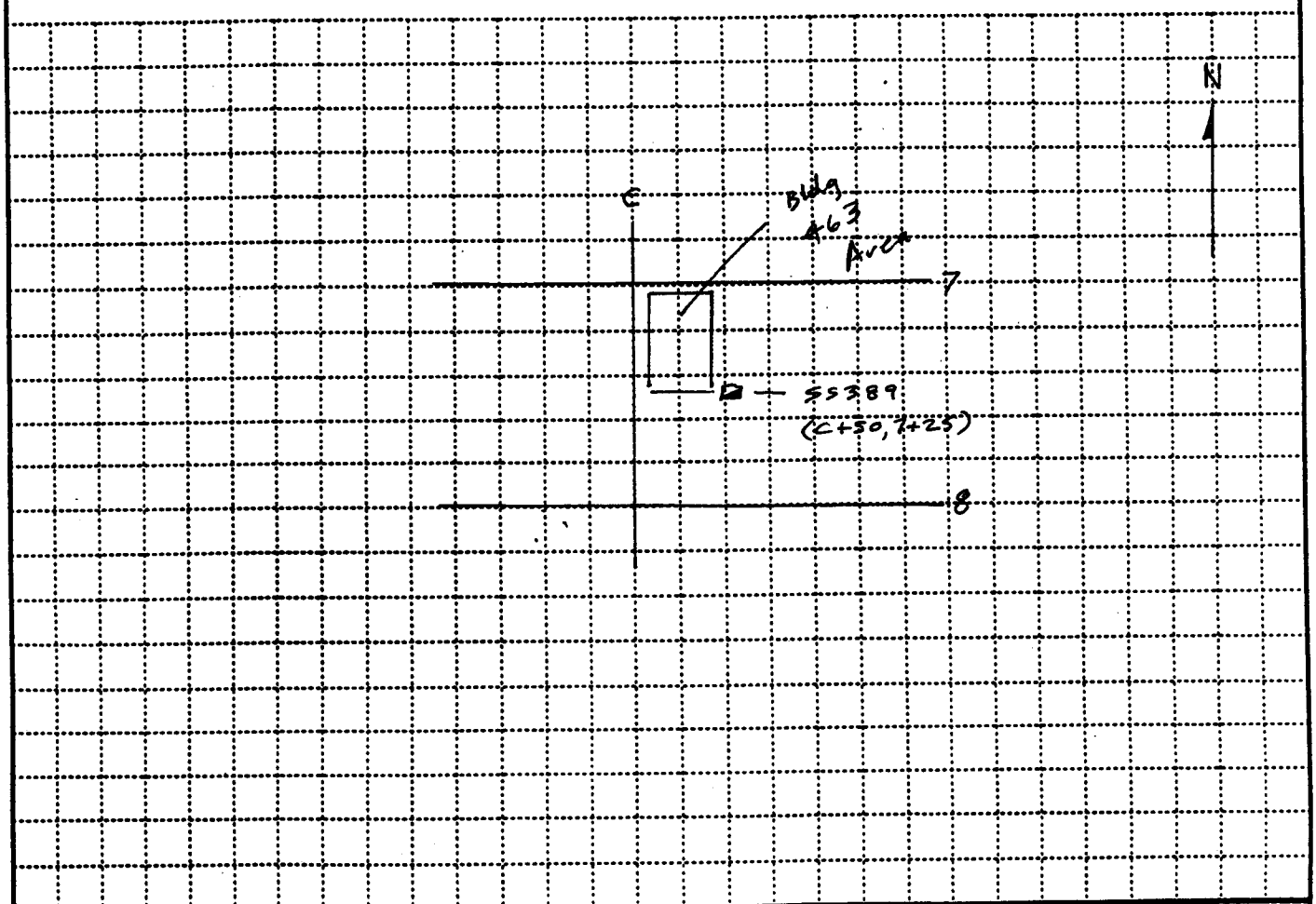
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	—	—	Charles T. Hagegeorge

LOCATION SKETCH/COMMENTS Grout

SCALE: Not to Scale



PROJECT: PBOW	HOLE NO. SS389

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: SS 389

PROJECT: PBOW

INSPECTOR: Charles G. Hangeorge

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (g)	GEOTECH SAMPLE OR CORE BOX NO. (h)	MANUFACTURE SAMPLE NO. (i)	Sample Interval	REMARKS (g)
	0	0-0.5 Top Soil & Grass	HNU 0	Sample Int.	USCS		Time Start 3:10 End 3:25
		0.5-1.0' silt, brown, soft -medium soft, no plasticity, dry			ML		
	1	1.0- Silty Clay, brown, firm-hard, low plasticity dry.			CL	Push 1 Rec. 4.0'	
	2						
	3						
	4		0	SS 389 10401 (4-6)			Collected sample 3:26 Confirmation Samples 11/10/98 @ 0830 # 10590 & 10595 4.0-6.0'
	5						
	6					Push 2 Rec 4.0'	
	7						
	8		0				
	9	wet at 9.0'		SS 389 10402 (8-10)		Push 3 Rec.	Collected sample 3:25 Confirmation Samples 11/10/98 @ 0945 # 10600 & 10605 8.0-10.0'
	10	Total Depth 10.0'					

PROJECT: PBOW

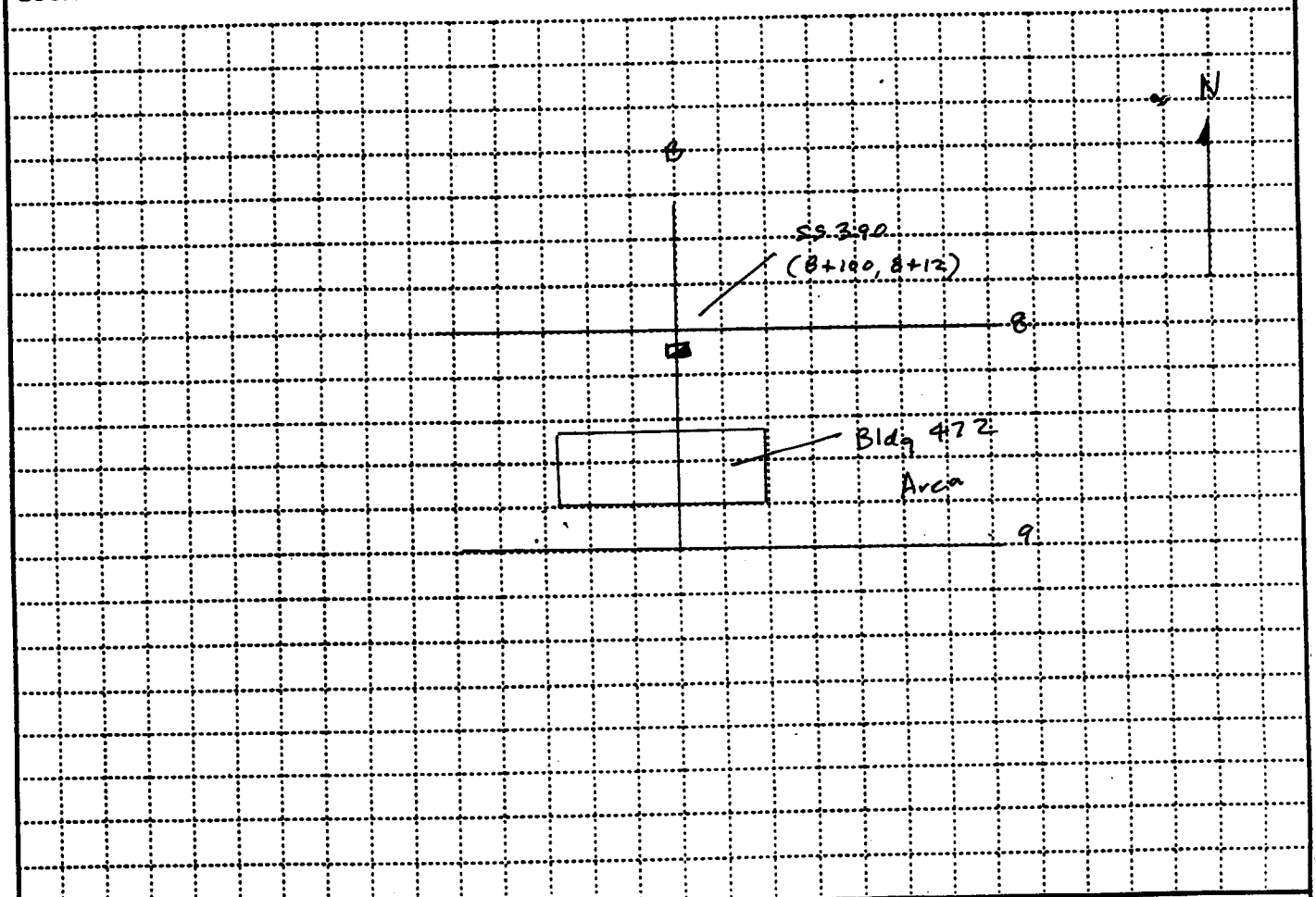
HOLE NO. SS 389

HTRW DRILLING LOG

DISTRICT	USACE - Nashville
HOLE NUMBER	SS390
SHEET / SHEETS	1 OF 2
1. COMPANY NAME	ET Corp
2. DRILL SUBCONTRACTOR	Geo-Environmental
3. PROJECT	PBOW
4. LOCATION	TNT B
5. NAME OF DRILLER	Jack Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4' x 2'
8. HOLE LOCATION	B+00, 8+12 (N 617921, E 1917464)
9. SURFACE ELEVATION	NA (675.58)
10. DATE STARTED	11/8/98
11. DATE COMPLETED	11/8/98
12. OVERBURDEN THICKNESS	0
13. DEPTH DRILLED INTO ROCK	5'
14. TOTAL DEPTH OF HOLE	5'
15. DEPTH GROUNDWATER ENCOUNTERED	None
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA
18. GEOTECHNICAL SAMPLES	NA
DISTURBED	—
UNDISTURBED	—
19. TOTAL NUMBER OF CORE BOXES	NA
20. SAMPLES FOR CHEMICAL ANALYSIS	NA
VOC	—
METALS	—
OTHER (SPECIFY)	—
OTHER (SPECIFY)	—
OTHER (SPECIFY)	—
21. TOTAL CORE RECOVERY	NA %
22. DISPOSITION OF HOLE	
BACKFILLED	
MONITORING WELL	—
OTHER (SPECIFY)	—
23. SIGNATURE OF INSPECTOR	Charles D. Hagegeorge

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT	PBOW
HOLE NO.	SS390

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER 55390

SHEET 2 OF 2 SHEETS

PROJECT PBOW

INSPECTOR C.G. Hoogeveen

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	CORETECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sample Interval	REMARKS (g)
	0	0-0.5' Top Soil & Grass	HNu 0	Sample No.	USCS		Time
		0.5'-5.0 Weathered. fragments of shale throughout interval Bottom 1.0' becoming more of a silty Clay, yellow brown, soft, low plasticity, dry.					Start 3:40 End 3:45
	1				shale	Push 1	
	2					Rec 3.0'	Transitional Contact
					CL		
	3						
	4		0	55390 10403 (4-5)		Push 2 1.0'	Collected sample 3:45 Confirmation Samples 11/10/98 @ 0955 #10610 #10615 4.0-5.0'
	5	Refusal at 5.0' in weathered shale					
	6						
	7						
	8						
	9						
	10						

PROJECT PBOW

HOLE NO. 55390

HTRW DRILLING LOG

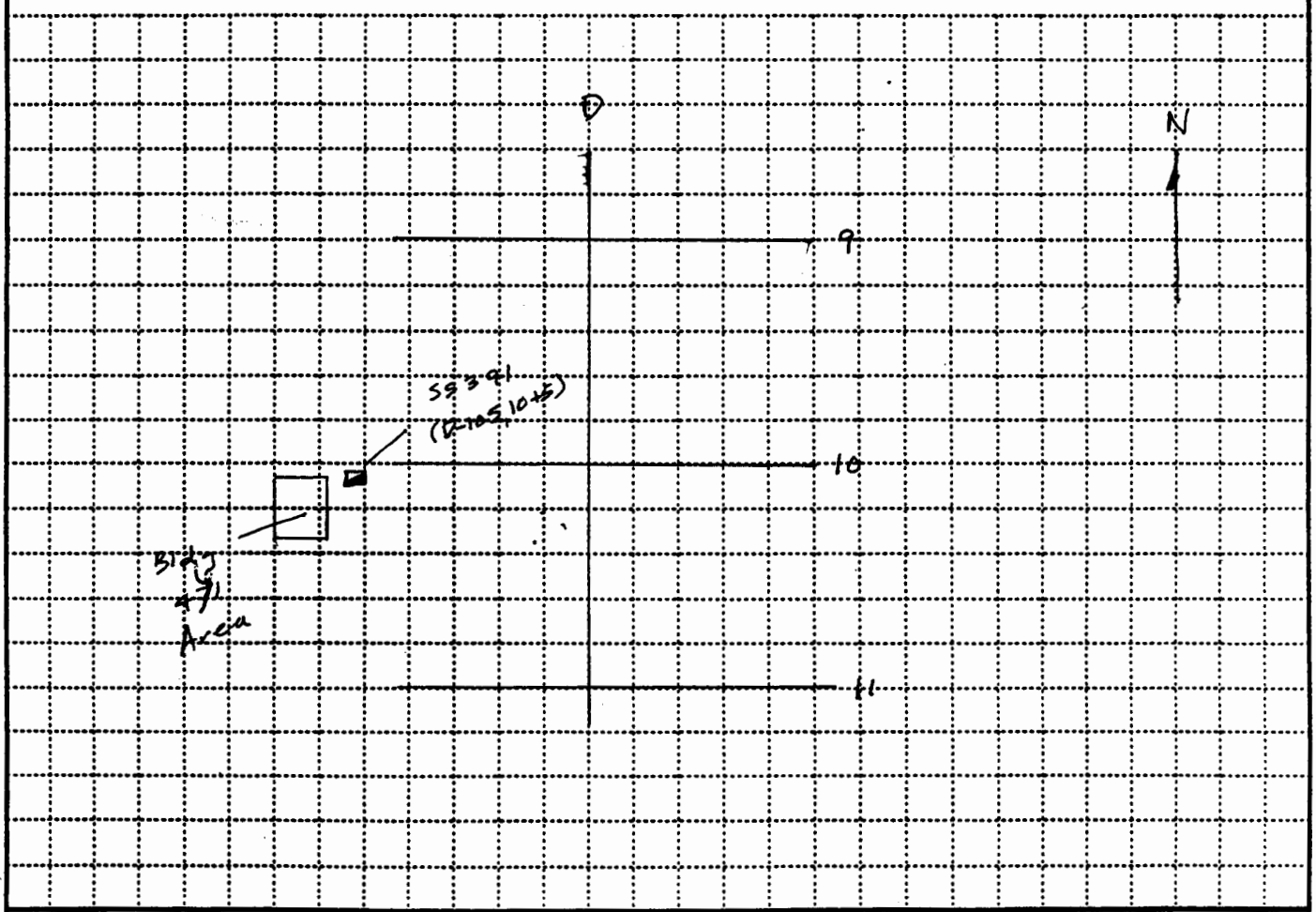
DISTRICT: USACE-Nashville		HOLE NUMBER: SS 391
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo-Environmental	SHEET 1 OF 2 SHEETS
3. PROJECT: PBOW	4. LOCATION: TNT B	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 2"	8. HOLE LOCATION: D-105, 10+5 (N617725, E1917957)	
	9. SURFACE ELEVATION: NA (676.88)	
	10. DATE STARTED: 11/ /98	11. DATE COMPLETED: 11/ /98
12. OVERBURDEN THICKNESS: 5'+	15. DEPTH GROUNDWATER ENCOUNTERED: None	
13. DEPTH DRILLED INTO ROCK: 0	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 5'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
NA	—	—	—	—	—	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite Grout	—	—	Charles R. Haggerty

LOCATION SKETCH/COMMENTS — SCALE: Not to Scale



PROJECT: PBOW	HOLE NO.: SS 391

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: SS391

PROJECT: PBOW

INSPECTOR: C. G. Hagegeorge

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	~~FIELD SCREENING RESULTS (d)~~ HNU	~~CHEMICAL SAMPLE OR CORE BOX NO. (e)~~ Sample No.	~~ANALYTICAL SAMPLE NO. (f)~~ USCS	Sample Interval	REMARKS (g)
	0	0-0.5' Top Soil & Grass	0				Time Start 4:05 End 4:15
		0.5'-5.0 Silty Sand, brown med-dense, dry			SM	Push 1 Rec. 2.5'	
	1						
	2						
	3						
	4		0	SS391 10404 (4-5)		Push 2 Rec 1.0'	~~Collected sa~~ Collected sample 4:10
	5	Refusal 5.0' Shale?					
	6						
	7						
	8						
	9						
	10						

PROJECT: PBOW

HOLE NO. SS391

HTRW DRILLING LOG

DISTRICT: USACE-Nashville		HOLE NUMBER: SS 392
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo-Environmental	SHEET 1 OF 2 SHEETS
3. PROJECT: PBOW	4. LOCATION: TNT B	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4'x2"	8. HOLE LOCATION: D-100, 8+5 (N617934, E1917968)	
	9. SURFACE ELEVATION: NA (675.82)	
	10. DATE STARTED: 11/8/98	11. DATE COMPLETED: 11/8/98
12. OVERBURDEN THICKNESS: 8.0'	15. DEPTH GROUNDWATER ENCOUNTERED: None	
13. DEPTH DRILLED INTO ROCK: 0	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 8.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

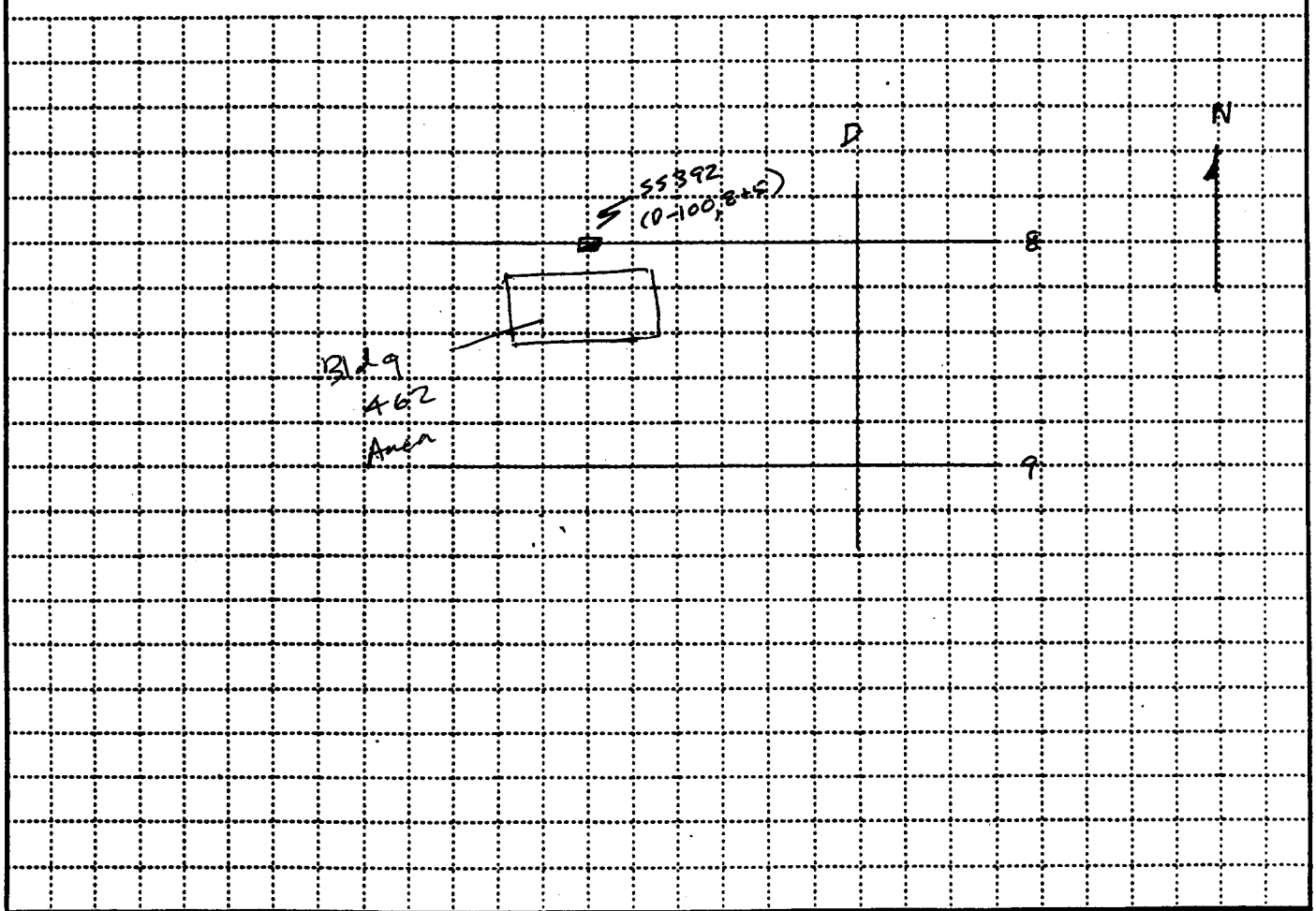
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	—	—	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	—	—	—	—	—	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	—	—	Charles D. Hargegrove

LOCATION SKETCH/COMMENTS Grout

SCALE: Not to Scale



PROJECT: PBOW	HOLE NO. SS 392

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER SS 392

PROJECT PBOW | INSPECTOR C. G. Haygeage | SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH. SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sample Interval	REMARKS (g)
	0	0-0.5' Top Soil & Grass	HNu	Sample No.	USCS		Time Start 4:30 End 4:40
	1	0.5-3.0' Silt, brown, soft, no plasticity, dry					
	2					Push 1 Rec 4.0'	
	3	3.0-5.0' Silty Clay, brown, firm, low plasticity, dry	0	SS 392 10405 3-5			Collected sample 4:35
	4						
	5	5.0-8.0 Silty Clay, dark gray firm - hard, low plasticity, dry.				Push 2	
	6		0	SS 392 10406 6-8		Rec 4.0'	Collected sample 4:40
	7						Confirmation Samples 11/9/98 @ 1630 #10570 & 10575 6.0-8.0'
	8	Refusal 8.0' in Shale					
	9						
	10						

PROJECT PBOW | HOLE NO. SS 392

APPENDIX C

LAND SURVEY DATA

TABLE C-1

Summary of Soil Sample Locations (1998)
TNT Area B - RI Report
Former Plum Brook Ordnance Works
Sandusky, Ohio

Sample ID	Easting (ft)	Northing (ft)	E-W Axis Gridline	E-W Grid Offset	N-S Axis Node	N-S Grid Offset	Depth (ft)		Associated Bldg. No.	Comments
SO01	1,918,702.9	618,436.8	F	+40	3	-5	0.5	2	417-PL	
SO02	1,918,322.9	617,616.8	E	-40	11	+15	3.5	4	417-PL	
SO03	1,918,057.9	618,171.8	D	-5	5	+60	3	4	466	
SO04	1,918,057.9	618,171.8	D	-5	5	+60	5	6	466	
SO05	1,918,631.9	618,323.8	F	-31	4	+8	2.5	3.5	456	
SO06	1,918,880.9	618,128.8	G	-82	6	+3	4	5	453	Also Dup, Split
SO07	1,917,617.9	618,013.8	C	-145	7	+18	3	4	473	
SO08	1,917,962.9	617,926.8	D	-100	8	+5	6	8	462	
SO09	1,918,647.9	618,311.8	F	-15	4	+20	0	1	456	
SO10	1,917,812.9	618,006.8	C	+50	7	+25	4	6	463	
SO11	1,917,812.9	618,006.8	C	+50	7	+25	8	10	463	
SO12	1,917,462.9	617,919.8	B	+0	8	+12	4	5	472	
SO13	1,918,676.9	618,053.8	F	+14	7	-22	0	1	452	
SO14	1,918,635.9	618,358.8	F	-27	3	+73	0	1	456	Also Dup, Split
SO15	1,917,727.9	618,486.8	C	-35	2	+45	0	1	417	Also MS, MSD
SO16	1,917,707.9	618,486.8	C	-55	2	+45	0	1	417	
SO17	1,917,747.9	618,486.8	C	-15	2	+45	0	1	417	
SO18	1,917,682.9	618,611.8	B	+220	1	+20	0	1	417	
SO19	1,917,687.9	618,611.8	B	+225	1	+20	0	1	417	
SO20	1,917,407.9	618,136.8	B	-55	6	-5	0	1	476	
SO21	1,917,417.9	618,136.8	B	-45	6	-5	0	1	476	
SO22	1,917,417.9	618,121.8	B	-45	6	+10	0	1	476	
SO23	1,918,676.9	618,063.8	F	+14	7	-32	0	1	452	
SO24	1,918,631.9	618,323.8	F	-31	4	+8	0	1	456	
SO25	1,918,022.9	618,226.8	D	-40	5	+5	0	1	466	Also MS, MSD
SO26	1,917,987.9	618,231.8	D	-75	5	+0	0	1	NWNH	Also Dup, Split
SO27	1,918,697.9	618,306.8	F	+35	4	+25	0	1	456	
SO28	1,918,637.9	618,311.8	F	-25	4	+20	0	1	456	
SO29	1,918,647.9	618,301.8	F	-15	4	+30	0	1	456	
SO30	1,917,987.9	618,241.8	D	-75	5	-10	0	1	NWNH	
SO31	1,918,587.9	618,361.8	F	-75	4	-30	0	1	456	
SO32	1,918,872.9	618,481.8	G	-90	2	+50	0	1	NENH	

TABLE C-1

Summary of Soil Sample Locations (1998)
TNT Area B - RI Report
Former Plum Brook Ordnance Works
Sandusky, Ohio

Sample ID	Easting (ft)	Northing (ft)	E-W Axis Gridline	E-W Grid Offset	N-S Axis Node	N-S Grid Offset	Depth (ft)		Associated Bldg. No.	Comments
SO33	1,918,727.9	618,016.8	F	+65	7	+15	0	1	452	
SO34	1,918,682.9	617,871.8	F	+20	9	-40	0	1	451	
SO35	1,918,042.9	618,191.8	D	-20	5	+40	0	1	466	Also Dup, Split
SO36	1,917,812.9	618,006.8	C	+50	7	+25	0	1	463	
SO37	1,917,617.9	618,013.8	C	-145	7	+18	0	1	473	
SO38	1,917,590.9	617,989.8	C	-172	7	+42	0	1	473	
SO39	1,917,962.9	617,926.8	D	-100	8	+5	0	1	462	
SO40	1,917,462.9	617,919.8	B	+0	8	+12	0	1	472	
SS001	1,917,472.9	617,686.8	B	+10	10	+45	0	1	471	
SS002	1,917,492.9	617,691.8	B	+30	10	+40	0	1	471	
SS003	1,917,502.9	617,701.8	B	+40	10	+30	0	1	471	
SS004	1,917,492.9	617,716.8	B	+30	10	+15	0	1	471	
SS005	1,917,482.9	617,711.8	B	+20	10	+20	0	1	471	
SS006	1,917,472.9	617,716.8	B	+10	10	+15	0	1	471	
SS007	1,917,457.9	617,706.8	B	-5	10	+25	0	1	471	
SS008	1,917,462.9	617,921.8	B	+0	8	+10	0	1	472	
SS009	1,917,472.9	617,906.8	B	+10	9	-75	0	1	472	
SS010	1,917,482.9	617,891.8	B	+20	9	-60	0	1	472	
SS011	1,917,512.9	617,891.8	B	+50	9	-60	0	1	472	
SS012	1,917,517.9	617,866.8	B	+55	9	-35	0	1	472	
SS013	1,917,497.9	617,861.8	B	+35	9	-30	0	1	472	
SS014	1,917,482.9	617,876.8	B	+20	9	-45	0	1	472	
SS015	1,917,462.9	617,876.8	B	+0	9	-45	0	1	472	
SS016	1,917,440.9	617,876.8	B	-22	9	-45	0	1	472	
SS017	1,917,442.9	617,891.8	B	-20	9	-60	0	1	472	
SS018	1,917,452.9	617,906.8	B	-10	9	-75	0	1	472	
SS019	1,917,607.9	617,891.8	B	+145	9	-60	0	1	472	Loading Dock
SS020	1,917,642.9	618,011.8	C	-120	7	+20	0	1	473	
SS021	1,917,622.9	618,021.8	C	-140	7	+10	0	1	473	
SS022	1,917,617.9	618,036.8	C	-145	7	-5	0	1	473	
SS023	1,917,617.9	618,026.8	C	-145	7	+5	0	1	473	
SS024	1,917,612.9	617,996.8	C	-150	7	+35	0	1	473	

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Sample ID	Easting (ft)	Northing (ft)	E-W Axis Gridline	E-W Grid Offset	N-S Axis Node	N-S Grid Offset	Depth (ft)		Associated Bldg. No.	Comments
SS025	1,917,587.9	617,571.8	C	-175	11	+60	0	1	479	
SS026	1,917,637.9	617,586.8	C	-125	11	+45	0	1	479	
SS027	1,917,657.9	617,586.8	C	-105	11	+45	0	1	479	
SS028	1,917,657.9	617,556.8	C	-105	11	+75	0	1	479	
SS029	1,917,692.9	617,556.8	C	-70	11	+75	0	1	479	
SS030	1,917,722.9	617,556.8	C	-40	11	+75	0	1	479	
SS031	1,917,722.9	617,586.8	C	-40	11	+45	0	1	479	
SS032	1,917,742.9	617,591.8	C	-20	11	+40	0	1	479	
SS033	1,917,722.9	617,606.8	C	-40	11	+25	0	1	479	
SS034	1,917,692.9	617,606.8	C	-70	11	+25	0	1	479	
SS035	1,917,657.9	617,606.8	C	-105	11	+25	0	1	479	
SS037	1,917,392.9	618,136.8	B	-70	6	-5	0	1	476	
SS038	1,917,417.9	618,136.8	B	-45	6	-5	0	1	476	
SS039	1,917,447.9	618,136.8	B	-15	6	-5	0	1	476	
SS040	1,917,482.9	618,136.8	B	+20	6	-5	0	1	476	
SS042	1,917,734.9	618,251.8	C	-28	5	-20	0	1	NWNH	
SS043	1,917,724.9	618,286.8	C	-38	4	+45	0	1	NWNH	
SS044	1,917,734.9	618,309.8	C	-28	4	+22	0	1	NWNH	
SS045	1,917,742.9	618,286.8	C	-20	4	+45	0	1	NWNH	
SS046	1,917,852.9	618,231.8	C	+90	5	+0	0	1	NWNH	
SS047	1,917,682.9	618,616.8	B	+220	1	+15	0	1	417	
SS048	1,917,687.9	618,651.8	B	+225	1	-20	0	1	417	
SS049	1,917,717.9	618,666.8	C	-45	1	-35	0	1	417	
SS050	1,917,717.9	618,701.8	C	-45	0	+30	0	1	417	
SS051	1,917,722.9	618,711.8	C	-40	0	+20	0	1	417	
SS052	1,917,732.9	618,686.8	C	-30	0	+45	0	1	417	
SS053	1,917,752.9	618,681.8	C	-10	0	+50	0	1	417	
SS054	1,917,767.9	618,661.8	C	+5	1	-30	0	1	417	
SS055	1,917,762.9	618,616.8	C	+0	1	+15	0	1	417	
SS056	1,917,662.9	618,516.8	B	+200	2	+15	0	1	417	
SS057	1,917,727.9	618,486.8	C	-35	2	+45	0	1	417	
SS058	1,917,762.9	618,516.8	C	+0	2	+15	0	1	417	

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Summary of Soil Sample Locations (1998)
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Sample ID	Easting (ft)	Northing (ft)	E-W Axis Gridline	E-W Grid Offset		N-S Axis Node	N-S Grid Offset	Depth (ft)		Associated Bldg. No.	Comments
SS059	1,917,792.9	618,026.8	C	+30		7	+5	0	1	463	
SS060	1,917,777.9	618,036.8	C	+15		7	-5	0	1	463	
SS061	1,917,812.9	618,036.8	C	+50		7	-5	0	1	463	
SS062	1,917,792.9	618,051.8	C	+30		7	-20	0	1	463	
SS063	1,917,782.9	618,061.8	C	+20		7	-30	0	1	463	
SS064	1,917,792.9	618,071.8	C	+30		7	-40	0	1	463	
SS065	1,917,952.9	618,226.8	D	-110		5	+5	0	1	NENH	
SS066	1,918,022.9	618,226.8	D	-40		5	+5	0	1	466	
SS067	1,918,037.9	618,226.8	D	-25		5	+5	0	1	466	
SS068	1,918,057.9	618,191.8	D	-5		5	+40	0	1	466	
SS069	1,918,097.9	618,196.8	D	+35		5	+35	0	1	466	
SS070	1,918,112.9	618,196.8	D	+50		5	+35	0	1	466	
SS071	1,918,142.9	618,196.8	D	+80		5	+35	0	1	466	
SS072	1,918,127.9	618,171.8	D	+65		5	+60	0	1	466	
SS073	1,918,117.9	618,156.8	D	+55		5	+75	0	1	466	
SS074	1,918,107.9	618,171.8	D	+45		5	+60	0	1	466	
SS075	1,918,092.9	618,166.8	D	+30		6	-35	0	1	466	
SS076	1,918,077.9	618,151.8	D	+15		5	+80	0	1	466	
SS077	1,918,067.9	618,166.8	D	+5		6	-35	0	1	466	
SS078	1,918,052.9	618,171.8	D	-10		6	-40	0	1	466	
SS079	1,918,042.9	618,176.8	D	-20		5	+55	0	1	466	
SS080	1,918,017.9	618,201.8	D	-45		5	+30	0	1	466	
SS081	1,917,962.9	617,941.8	D	-100		8	-10	0	1	462	
SS082	1,917,980.9	617,931.8	D	-82		8	+0	0	1	462	
SS083	1,917,987.9	617,916.8	D	-75		8	+15	0	1	462	
SS084	1,918,007.9	617,911.8	D	-55		8	+20	0	1	462	
SS085	1,918,007.9	617,881.8	D	-55		8	+50	0	1	462	
SS086	1,917,987.9	617,896.8	D	-75		8	+35	0	1	462	
SS087	1,917,962.9	617,896.8	D	-100		8	+35	0	1	462	
SS088	1,917,947.9	617,896.8	D	-115		8	+35	0	1	462	
SS089	1,917,942.9	617,911.8	D	-120		8	+20	0	1	462	
SS090	1,917,957.9	617,931.8	D	-105		8	+0	0	1	462	

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Sample ID	Easting (ft)	Northing (ft)	E-W Axis Gridline	E-W Grid Offset		N-S Axis Node	N-S Grid Offset	Depth (ft)		Associated Bldg. No.	Comments
SS091	1,917,962.9	617,736.8	D	-100		10	-5	0	1	461	
SS092	1,917,967.9	617,721.8	D	-95		10	+10	0	1	461	
SS093	1,917,942.9	617,706.8	D	-120		10	+25	0	1	461	
SS094	1,917,927.9	617,721.8	D	-135		10	+10	0	1	461	
SS095	1,917,952.9	617,726.8	D	-110		10	+5	0	1	461	
SS096	1,918,067.9	617,541.8	D	+5		12	-10	0	1	469	
SS097	1,918,097.9	617,541.8	D	+35		12	-10	0	1	469	
SS098	1,918,097.9	617,521.8	D	+35		12	+10	0	1	469	
SS099	1,918,117.9	617,521.8	D	+55		12	+10	0	1	469	
SS100	1,918,097.9	617,496.8	D	+35		12	+35	0	1	469	
SS101	1,918,067.9	617,491.8	D	+5		12	+40	0	1	469	
SS102	1,918,037.9	617,496.8	D	-25		12	+35	0	1	469	
SS103	1,917,987.9	617,511.8	D	-75		12	+20	0	1	469	
SS104	1,918,017.9	617,521.8	D	-45		12	+10	0	1	469	
SS105	1,918,037.9	617,721.8	D	-25		10	+10	0	1	469	
SS106	1,918,037.9	617,541.8	D	-25		12	-10	0	1	469	
SS107	1,918,382.9	617,146.8	E	+20		16	-15	0	1	412	
SS108	1,918,407.9	617,141.8	E	+45		16	-10	0	1	412	
SS109	1,918,412.9	617,126.8	E	+50		16	+5	0	1	412	
SS110	1,918,418.9	617,115.8	E	+56		16	+16	0	1	412	
SS111	1,918,417.9	617,106.8	E	+55		16	+25	0	1	412	
SS112	1,918,407.9	617,081.8	E	+45		16	+50	0	1	412	
SS113	1,918,377.9	617,061.8	E	+15		16	+70	0	1	412	
SS114	1,918,352.9	617,116.8	E	-10		16	+15	0	1	412	
SS115	1,918,332.9	617,106.8	E	-30		16	+25	0	1	412	
SS116	1,918,357.9	617,111.8	E	-5		16	+20	0	1	412	
SS117	1,918,337.9	617,139.8	E	-25		16	-8	0	1	412	
SS118	1,918,312.9	617,601.8	E	-50		11	+30	0	1	415	
SS119	1,918,327.9	617,591.8	E	-35		11	+40	0	1	415	
SS120	1,918,347.9	617,586.8	E	-15		11	+45	0	1	415	
SS121	1,918,342.9	617,576.8	E	-20		12	-45	0	1	415	
SS122	1,918,347.9	617,566.8	E	-15		12	-35	0	1	415	

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Sample ID	Easting (ft)	Northing (ft)	E-W Axis Gridline	E-W Grid Offset		N-S Axis Node	N-S Grid Offset	Depth (ft)		Associated Bldg. No.	Comments
SS123	1,918,337.9	617,551.8	E	-25		12	-20	0	1	415	
SS124	1,918,282.9	617,561.8	E	-80		12	-30	0	1	415	
SS125	1,918,287.9	617,581.8	E	-75		11	+50	0	1	415	
SS126	1,918,287.9	617,601.8	E	-75		11	+30	0	1	415	
SS127	1,918,552.9	617,711.8	F	-110		10	+20	0	1	459	
SS128	1,918,552.9	617,691.8	F	-110		10	+40	0	1	459	
SS129	1,918,582.9	617,691.8	F	-80		10	+40	0	1	459	
SS130	1,918,582.9	617,661.8	F	-80		11	-30	0	1	459	
SS131	1,918,582.9	617,626.8	F	-80		11	+5	0	1	459	
SS132	1,918,552.9	617,606.8	F	-110		11	+25	0	1	459	
SS133	1,918,552.9	617,626.8	F	-110		11	+5	0	1	459	
SS134	1,918,522.9	617,626.8	F	-140		11	+5	0	1	459	
SS135	1,918,517.9	617,661.8	F	-145		11	-30	0	1	459	
SS136	1,918,517.9	617,691.8	F	-145		10	+40	0	1	459	
SS137	1,918,762.9	617,881.8	F	+100		8	+50	0	1	451	
SS138	1,918,772.9	617,871.8	F	+110		9	-40	0	1	451	
SS139	1,918,782.9	617,856.8	F	+120		9	-25	0	1	451	
SS140	1,918,762.9	617,856.8	F	+100		9	-25	0	1	451	
SS141	1,918,752.9	617,871.8	F	+90		9	-40	0	1	451	
SS142	1,918,752.9	617,846.8	F	+90		9	-15	0	1	451	
SS143	1,918,762.9	617,836.8	F	+100		9	-5	0	1	451	
SS144	1,918,752.9	617,821.8	F	+90		9	+10	0	1	451	
SS145	1,918,737.9	617,836.8	F	+75		9	-5	0	1	451	
SS146	1,918,712.9	617,851.8	F	+50		9	-20	0	1	451	
SS147	1,918,682.9	617,831.8	F	+20		9	+0	0	1	451	
SS148	1,918,667.9	617,851.8	F	+5		9	-20	0	1	451	
SS149	1,918,682.9	617,871.8	F	+20		9	-40	0	1	451	
SS150	1,918,637.9	618,076.8	F	-25		7	-45	0	1	452	
SS151	1,918,637.9	618,051.8	F	-25		7	-20	0	1	452	
SS152	1,918,627.9	618,066.8	F	-35		7	-35	0	1	452	
SS153	1,918,662.9	618,056.8	F	+0		7	-25	0	1	452	
SS154	1,918,672.9	618,036.8	F	+10		7	-5	0	1	452	

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Sample ID	Easting (ft)	Northing (ft)	E-W Axis Gridline	E-W Grid Offset	N-S Axis Node	N-S Grid Offset	Depth (ft)		Associated Bldg. No.	Comments
SS155	1,918,652.9	618,036.8	F	-10	7	-5	0	1	452	
SS156	1,918,697.9	618,031.8	F	+35	7	+0	0	1	452	
SS157	1,918,727.9	618,016.8	F	+65	7	+15	0	1	452	
SS158	1,918,692.9	617,996.8	F	+30	7	+35	0	1	452	
SS159	1,918,647.9	618,006.8	F	-15	7	+25	0	1	452	
SS160	1,918,627.9	618,011.8	F	-35	7	+20	0	1	452	
SS161	1,918,617.9	618,021.8	F	-45	7	+10	0	1	452	
SS162	1,918,627.9	618,026.8	F	-35	7	+5	0	1	452	
SS163	1,918,602.9	617,996.8	F	-60	7	+35	0	1	452	
SS164	1,918,852.9	618,171.8	G	-110	6	-40	0	1	453	
SS165	1,918,862.9	618,151.8	G	-100	6	-20	0	1	453	
SS166	1,918,842.9	618,156.8	G	-120	6	-25	0	1	453	
SS167	1,918,872.9	618,136.8	G	-90	6	-5	0	1	453	
SS168	1,918,887.9	618,121.8	G	-75	6	+10	0	1	453	
SS169	1,918,872.9	618,106.8	G	-90	6	+25	0	1	453	
SS170	1,918,887.9	618,053.8	G	-75	6	+78	0	1	453	Loading Dock
SS171	1,918,722.9	618,386.8	F	+60	3	+45	0	1	456	NENH
SS172	1,918,612.9	618,341.8	F	-50	4	-10	0	1	456	
SS173	1,918,612.9	618,316.8	F	-50	4	+15	0	1	456	
SS174	1,918,642.9	618,326.8	F	-20	4	+5	0	1	456	
SS175	1,918,662.9	618,311.8	F	+0	4	+20	0	1	456	
SS176	1,918,697.9	618,306.8	F	+35	4	+25	0	1	456	
SS177	1,918,617.9	618,296.8	F	-45	4	+35	0	1	456	
SS178	1,918,617.9	618,276.8	F	-45	4	+55	0	1	456	
SS179	1,918,607.9	618,286.8	F	-55	4	+45	0	1	456	
SS180	1,918,577.9	618,316.8	F	-85	4	+15	0	1	456	
SS181	1,918,577.9	618,286.8	F	-85	4	+45	0	1	456	
SS182	1,918,587.9	618,356.8	F	-75	4	-25	0	1	456	
SS183	1,918,872.9	618,481.8	G	-90	2	+50	0	1	NENH	
SS184	1,918,887.9	618,466.8	G	-75	3	-35	0	1	NENH	
SS185	1,918,882.9	618,446.8	G	-80	3	-15	0	1	NENH	
SS186	1,918,862.9	618,446.8	G	-100	3	-15	0	1	NENH	

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Sample ID	Easting (ft)	Northing (ft)	E-W Axis Gridline	E-W Grid Offset		N-S Axis Node	N-S Grid Offset	Depth (ft)		Associated Bldg. No.	Comments
SS187	1,918,857.9	618,466.8	G	-105		3	-35	0	1	NENH	
SS188	1,918,812.9	618,416.8	G	-150		3	+15	0	1	NENH	
SS189	1,918,862.9	618,436.8	G	-100		3	-5	0	1	NENH	
SS190	1,918,361.9	617,661.8	E	-1		11	-30	0	1	415	
SS191	1,918,322.9	617,723.8	E	-40		10	+8	0	1	415	
SS192	1,917,962.9	617,506.8	D	-100		12	+25	0	1	469	Loading Dock
SS193	1,917,687.9	617,962.8	C	-75		8	-31	0	1	473	Loading Dock
SS194	1,918,615.9	617,969.8	F	-47		7	+62	0	1	452	Loading Dock
SS195	1,917,852.9	618,241.8	C	+90		5	-10	0	1	NWNH	
SS196	1,917,852.9	618,251.8	C	+90		5	-20	0	1	NWNH	
SS197	1,917,952.9	618,226.8	D	-110		5	+5	0	1	NENH	
SS198	1,917,952.9	618,246.8	D	-110		5	-15	0	1	NENH	
SS199	1,918,447.9	617,466.8	E	+85		13	-35	0	1	459	
SS200	1,917,927.9	617,758.8	D	-135		10	-27	0	1	461	
SS204	1,917,912.9	618,246.8	C	+150		5	-15	0	1	NWNH	
SS205	1,917,912.9	618,236.8	C	+150		5	-5	0	1	NWNH	
SS206	1,917,912.9	618,226.8	C	+150		5	+5	0	1	NWNH	
SS207	1,917,987.9	618,241.8	D	-75		5	-10	0	1	NWNH	
SS208	1,917,987.9	618,231.8	D	-75		5	+0	0	1	NWNH	
SS209	1,917,987.9	618,221.8	D	-75		5	+10	0	1	NWNH	
SS210	1,918,635.9	618,358.8	F	-27		3	+73	0	1	456	
SS211	1,918,630.9	618,353.8	F	-32		3	+78	0	1	456	
SS212	1,918,630.9	618,363.8	F	-32		3	+68	0	1	456	
SS213	1,918,625.9	618,358.8	F	-37		3	+73	0	1	456	
SS215	1,918,631.9	618,333.8	F	-31		3	+98	0	1	456	
SS216	1,918,621.9	618,323.8	F	-41		4	+8	0	1	456	
SS217	1,918,631.9	618,313.8	F	-31		4	+18	0	1	456	
SS218	1,918,587.9	618,366.8	F	-75		4	-35	0	1	456	
SS219	1,918,575.9	618,354.8	F	-87		4	-23	0	1	456	
SS220	1,918,597.9	618,346.8	F	-65		4	-15	0	1	456	
SS221	1,918,662.9	618,331.8	F	+0		4	+0	0	1	456	
SS222	1,918,647.9	618,311.8	F	-15		4	+20	0	1	456	

TABLE C-1

Summary of Soil Sample Locations (1998)
TNT Area B - RI Report
Former Plum Brook Ordnance Works
Sandusky, Ohio
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Sample ID	Easting (ft)	Northing (ft)	E-W Axis Gridline	E-W Grid Offset	N-S Axis Node	N-S Grid Offset	Depth (ft)		Associated Bldg. No.	Comments
SS223	1,918,667.9	618,291.8	F	+5	4	+40	0	1	456	
SS224	1,918,677.9	618,316.8	F	+15	4	+15	0	1	456	
SS225	1,918,707.9	618,341.8	F	+45	4	-10	0	1	456	
SS226	1,918,677.9	618,346.8	F	+15	4	-15	0	1	456	
SS227	1,918,857.9	618,481.8	G	-105	2	+50	0	1	NENH	
SS228	1,918,872.9	618,496.8	G	-90	2	+35	0	1	NENH	
SS229	1,918,887.9	618,481.8	G	-75	2	+50	0	1	NENH	
SS230	1,918,902.9	618,466.8	G	-60	2	+65	0	1	NENH	
SS231	1,918,897.9	618,446.8	G	-65	2	+85	0	1	NENH	
SS232	1,918,042.9	618,191.8	D	-20	5	+40	0	1	466	
SS233	1,918,032.9	618,181.8	D	-30	5	+50	0	1	466	
SS234	1,918,032.9	618,166.8	D	-30	5	+65	0	1	466	
SS235	1,917,417.9	618,121.8	B	-45	6	+10	0	1	476	
SS236	1,917,392.9	618,121.8	B	-70	6	+10	0	1	476	
SS237	1,917,707.9	618,486.8	C	-55	2	+45	0	1	417	
SS238	1,917,727.9	618,471.8	C	-35	2	+60	0	1	417	
SS239	1,917,747.9	618,486.8	C	-15	2	+45	0	1	417	
SS240	1,917,732.9	618,636.8	C	-30	1	-5	0	1	417	
SS241	1,917,742.9	618,696.8	C	-20	0	+35	0	1	417	
SS242	1,917,718.9	618,666.8	C	-44	1	-35	0	1	417	
SS243	1,917,687.9	618,671.8	B	+225	0	+60	0	1	417	
SS244	1,917,672.9	618,646.8	B	+210	1	-15	0	1	417	
SS245	1,917,932.9	617,896.8	D	-130	8	+35	0	1	462	
SS246	1,917,947.9	617,881.8	D	-115	8	+50	0	1	462	
SS247	1,917,927.9	617,741.8	D	-135	10	-10	0	1	461	
SS248	1,917,912.9	617,721.8	D	-150	10	+10	0	1	461	
SS249	1,917,927.9	617,706.8	D	-135	10	+25	0	1	461	
SS250	1,917,942.9	617,721.8	D	-120	10	+10	0	1	461	
SS251	1,918,365.9	617,125.8	E	+3	16	+6	0	1	412	
SS252	1,918,365.9	617,140.8	E	+3	16	-9	0	1	412	
SS253	1,918,380.9	617,140.8	E	+18	16	-9	0	1	412	
SS254	1,918,378.9	617,122.8	E	+16	16	+9	0	1	412	

TABLE C-1

Summary of Soil Sample Locations (1998)
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Sandusky, Ohio
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Sample ID	Easting (ft)	Northing (ft)	E-W Axis Gridline	E-W Grid Offset		N-S Axis Node	N-S Grid Offset	Depth (ft)		Associated Bldg. No.	Comments
SS255	1,918,389.9	617,117.8	E	+27		16	+14	0	1	412	
SS256	1,918,387.9	617,138.8	E	+25		16	-7	0	1	412	
SS257	1,918,404.9	617,122.8	E	+42		16	+9	0	1	412	
SS258	1,918,708.9	618,019.8	F	+46		7	+12	0	1	452	
SS259	1,918,698.9	618,009.8	F	+36		7	+22	0	1	452	
SS260	1,918,688.9	618,019.8	F	+26		7	+12	0	1	452	
SS261	1,918,698.9	618,029.8	F	+36		7	+2	0	1	452	
SS262	1,918,676.9	618,053.8	F	+14		7	-22	0	1	452	
SS263	1,918,662.9	617,995.8	F	+0		7	+36	0	1	452	
SS264	1,918,672.9	618,005.8	F	+10		7	+26	0	1	452	
SS265	1,918,662.9	618,015.8	F	+0		7	+16	0	1	452	
SS266	1,918,683.9	618,042.8	F	+21		7	-11	0	1	452	
SS267	1,918,887.9	618,136.8	G	-75		6	-5	0	1	453	
SS268	1,918,872.9	618,121.8	G	-90		6	+10	0	1	453	
SS269	1,918,789.9	617,834.8	F	+127		9	-3	0	1	451	
SS270	1,918,779.9	617,824.8	F	+117		9	+7	0	1	451	
SS271	1,918,769.9	617,834.8	F	+107		9	-3	0	1	451	
SS272	1,918,779.9	617,844.8	F	+117		9	-13	0	1	451	
SS273	1,918,739.9	617,863.8	F	+77		9	-32	0	1	451	
SS274	1,918,812.9	618,406.8	G	-150		3	+25	0	1	NENH	
SS275	1,918,812.9	618,426.8	G	-150		3	+5	0	1	NENH	
SS276	1,918,722.9	618,396.8	F	+60		3	+35	0	1	NENH	
SS277	1,918,722.9	618,376.8	F	+60		3	+55	0	1	NENH	
SS278	1,918,272.9	618,438.8	E	-90		3	-7	0	1	456	Ditch
SS279	1,918,262.9	618,218.8	E	-100		5	+13	0	1	466	
SS280	1,918,162.9	617,614.8	D	+100		11	+17	0	1	469	
SS281	1,918,162.9	617,466.8	D	+100		13	-35	0	1	469	Ditch
SS282	1,917,727.9	618,566.8	C	-35		2	-35	0	1	417	
SS283	1,917,727.9	618,516.8	C	-35		2	+15	0	1	417	
SS284	1,917,727.9	618,618.8	C	-35		2	-87	0	1	417	
SS285	1,917,977.9	618,231.8	D	-85		5	+0	0	1	NWNH	
SS286	1,917,977.9	618,241.8	D	-85		5	-10	0	1	NWNH	

TABLE C-1

Summary of Soil Sample Locations (1998)
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Sample ID	Easting (ft)	Northing (ft)	E-W Axis Gridline	E-W Grid Offset	N-S Axis Node	N-S Grid Offset	Depth (ft)		Associated Bldg. No.	Comments
SS287	1,917,987.9	618,251.8	D	-75	5	-20	0	1	NWNH	
SS288	1,917,997.9	618,241.8	D	-65	5	-10	0	1	NWNH	
SS289	1,917,997.9	618,231.8	D	-65	5	+0	0	1	NWNH	
SS290	1,918,676.9	618,058.8	F	+14	7	-27	0	1	452	
SS291	1,918,666.9	618,053.8	F	+4	7	-22	0	1	452	
SS292	1,918,647.9	618,301.8	F	-15	4	+30	0	1	456	
SS293	1,918,637.9	618,311.8	F	-25	4	+20	0	1	456	
SS294	1,918,657.9	618,311.8	F	-5	4	+20	0	1	456	
SS295	1,918,631.9	618,323.8	F	-31	4	+8	0	1	456	
SS296	1,918,697.9	618,393.8	F	+35	3	+38	0	1	417-PL	
SS297	1,918,702.9	618,436.8	F	+40	3	-5	0	1	417-PL	
SS298	1,918,882.9	618,116.8	G	-80	6	+15	0	1	453	
SS299	1,918,672.9	618,041.8	F	+10	7	-10	0	1	452	
SS300	1,918,698.9	618,019.8	F	+36	7	+12	0	1	452	
SS301	1,918,662.9	618,005.8	F	+0	7	+26	0	1	452	
SS302	1,918,749.9	617,863.8	F	+87	9	-32	0	1	451	
SS303	1,918,772.9	617,861.8	F	+110	9	-30	0	1	451	
SS304	1,918,777.9	617,834.8	F	+115	9	-3	0	1	451	
SS305	1,918,392.9	617,131.8	E	+30	16	+0	0	1	412	
SS306	1,918,378.9	617,131.8	E	+16	16	+0	0	1	412	
SS307	1,918,127.9	617,488.8	D	+65	12	+43	0	1	469	Manhole
SS308	1,918,097.9	618,164.8	D	+35	5	+67	0	1	466	
SS309	1,918,117.9	618,163.8	D	+55	5	+68	0	1	466	
SS310	1,917,407.9	618,148.8	B	-55	6	-17	0	1	476	
SS311	1,917,407.9	618,136.8	B	-55	6	-5	0	1	476	
SS312	1,917,402.9	618,121.8	B	-60	6	+10	0	1	476	
SS313	1,917,417.9	618,111.8	B	-45	6	+20	0	1	476	
SS314	1,917,427.9	618,121.8	B	-35	6	+10	0	1	476	
SS315	1,917,427.9	618,136.8	B	-35	6	-5	0	1	476	
SS316	1,917,417.9	618,126.8	B	-45	6	+5	0	1	476	
SS317	1,917,417.9	618,148.8	B	-45	6	-17	0	1	476	
SS318	1,917,427.9	618,148.8	B	-35	6	-17	0	1	476	

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Summary of Soil Sample Locations (1998)
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Sample ID	Easting (ft)	Northing (ft)	E-W Axis Gridline	E-W Grid Offset		N-S Axis Node	N-S Grid Offset	Depth (ft)		Associated Bldg. No.	Comments
SS319	1,918,157.9	617,971.8	D	+95		6	-40	0	1	417-PL	
SS320	1,917,615.9	618,013.8	C	-147		7	+18	0	1	473	
SS321	1,917,711.9	618,004.8	C	-51		7	+27	0	1	473	
SS322	1,917,960.9	617,937.8	D	-102		8	-6	0	1	462	
SS323	1,918,676.9	618,073.8	F	+14		7	-42	0	1	452	
SS324	1,918,686.9	618,063.8	F	+24		7	-32	0	1	452	
SS325	1,918,666.9	618,069.8	F	+4		7	-38	0	1	452	
SS326	1,918,697.9	618,316.8	F	+35		4	+15	0	1	456	
SS327	1,918,687.9	618,306.8	F	+25		4	+25	0	1	456	
SS328	1,918,697.9	618,296.8	F	+35		4	+35	0	1	456	
SS329	1,918,707.9	618,306.8	F	+45		4	+25	0	1	456	
SS330	1,918,627.9	618,306.8	F	-35		4	+25	0	1	456	
SS331	1,918,630.9	618,291.8	F	-32		4	+40	0	1	456	
SS332	1,918,037.9	618,236.8	D	-25		5	-5	0	1	466	
SS333	1,918,047.9	618,226.8	D	-15		5	+5	0	1	466	
SS334	1,917,997.9	618,136.8	B	-65		6	-5	0	1	476	
SS335	1,917,397.9	618,148.8	B	-65		6	-17	0	1	476	
SS336	1,917,692.9	618,486.8	C	-70		2	+45	0	1	417	
SS337	1,917,762.9	618,486.8	C	+0		2	+45	0	1	417	
SS361	1,917,727.9	618,541.8	C	-35		2	-10	3	4	417	
SS362	1,917,727.9	618,591.8	C	-35		2	-60	3	4	417	
SS363	1,917,752.9	618,666.8	C	-10		1	-35	NA	NA	417-PL	
SS364	1,917,737.9	618,451.8	C	-25		3	-20	NA	NA	417-PL	
SS365	1,918,322.9	618,395.8	E	-40		3	+36	4	4.5	417-PL	
SS366	1,918,152.9	618,381.8	D	+90		3	+50	3	4	417-PL	
SS367	1,917,497.9	618,461.8	B	+35		3	-30	NA	NA	417-PL	
SS368	1,918,322.9	618,056.8	E	-40		7	-25	3	4	417-PL	
SS368	1,918,322.9	618,056.8	E	-40		7	-25	6	7	417-PL	
SS369	1,918,307.9	618,056.8	E	-55		7	-25	2	4.5	417-PL	
SS369	1,918,307.9	618,056.8	E	-55		7	-25	7	7.5	417-PL	
SS370	1,918,457.9	618,171.8	D	+95		6	-40	2	2.5	417-PL	
SS370	1,918,457.9	618,171.8	D	+95		6	-40	4	4.5	417-PL	

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Summary of Soil Sample Locations (1998)
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Sample ID	Easting (ft)	Northing (ft)	E-W Axis Gridline	E-W Grid Offset	N-S Axis Node	N-S Grid Offset	Depth (ft)		Associated Bldg. No.	Comments
SS371	1,918,697.9	618,393.8	F	+35	3	+38	2	2.5	417-PL	
SS372	1,918,702.9	618,436.8	F	+40	3	-5	1.5	2	417-PL	
SS373	1,918,322.9	617,616.8	E	-40	11	+15	3.5	4	417-PL	
SS373	1,918,322.9	617,616.8	E	-40	11	+15	7.5	8	417-PL	
SS374	1,918,637.9	618,358.8	F	-25	3	+73	3	4	456	
SS375	1,918,672.9	618,041.8	F	+10	7	-10	4	6	452	
SS375	1,918,672.9	618,041.8	F	+10	7	-10	8	10	452	
SS376	1,918,057.9	618,171.8	D	-5	5	+60	3	4	466	
SS376	1,918,057.9	618,171.8	D	-5	5	+60	7	7.5	466	
SS377	1,917,987.9	618,231.8	D	-75	5	+0	3	3.5	NWNH	
SS378	1,918,631.9	618,323.8	F	-31	4	+8	2.5	3.5	456	
SS379	1,918,880.9	618,128.8	G	-82	6	+3	4	5	453	
SS379	1,918,880.9	618,128.8	G	-82	6	+3	7.5	8.5	453	
SS380	1,918,662.9	618,005.8	F	+0	7	+26	4	6	452	
SS380	1,918,662.9	618,005.8	F	+0	7	+26	8	10	452	
SS381	1,918,698.9	618,019.8	F	+36	7	+12	4	6	452	
SS381	1,918,698.9	618,019.8	F	+36	7	+12	8	10	452	
SS382	1,918,749.9	617,863.8	F	+87	9	-32	4	6	451	
SS382	1,918,749.9	617,863.8	F	+87	9	-32	8	10	451	
SS383	1,918,772.9	617,861.8	F	+110	9	-30	4	6	451	
SS383	1,918,772.9	617,861.8	F	+110	9	-30	8	10	451	
SS384	1,918,779.9	617,834.8	F	+117	9	-3	4	6	451	
SS384	1,918,779.9	617,834.8	F	+117	9	-3	8	10	451	
SS385	1,918,077.9	618,266.8	D	+15	6	-35	2.5	3.5	466	
SS386	1,918,117.9	618,071.8	D	+55	5	+60	4	4.5	466	
SS387	1,918,387.9	617,131.8	E	+25	16	+0	2.5	3	412	
SS387	1,918,387.9	617,131.8	E	+25	16	+0	5	6	412	
SS388	1,917,617.9	618,013.8	C	-145	7	+18	3	4	473	
SS389	1,917,812.9	618,006.8	C	+50	7	+25	4	6	463	
SS389	1,917,812.9	618,006.8	C	+50	7	+25	8	10	463	
SS390	1,917,462.9	617,919.8	B	+0	8	+12	4	5	472	
SS391	1,917,957.9	617,726.8	D	-105	10	+5	4	5	461	

TABLE C-1

Summary of Soil Sample Locations (1998)
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Former Plum Brook Ordnance Works
Sandusky, Ohio

Sample ID	Easting (ft)	Northing (ft)	E-W Axis Gridline	E-W Grid Offset		N-S Axis Node	N-S Grid Offset	Depth (ft)		Associated Bldg. No.	Comments
SS392	1,917,962.9	617,926.8	D	-100		8	+5	3	5	462	
SS392	1,917,962.9	617,926.8	D	-100		8	+5	6	8	462	
SS393	1,917,442.9	617,919.8	B	-20		8	+12	4	5	472	
SS393	1,917,442.9	617,919.8	B	-20		8	+12	8	9	472	
SS394	1,917,462.9	617,939.8	B	+0		8	-8	4	5	472	
SS394	1,917,462.9	617,939.8	B	+0		8	-8	8	9	472	
SS395	1,917,482.9	617,919.8	B	+20		8	+12	4	5	472	
SS395	1,917,482.9	617,919.8	B	+20		8	+12	8	9	472	
SS396	1,917,631.9	617,999.8	C	-131		7	+32	3	4	473	
SS396	1,917,631.9	617,999.8	C	-131		7	+32	8	10	473	
SS397	1,917,592.9	618,013.8	C	-170		7	+18	3	4	473	
SS397	1,917,592.9	618,013.8	C	-170		7	+18	5	6	473	
SS398	1,917,792.9	618,006.8	C	+30		7	+25	3	4	463	
SS398	1,917,792.9	618,006.8	C	+30		7	+25	5	6	463	
SS399	1,917,812.9	617,986.8	C	+50		7	+45	4	6	463	
SS399	1,917,812.9	617,986.8	C	+50		7	+45	8	10	463	
SS400	1,917,957.9	617,746.8	D	-105		10	-15	4	5	461	
SS400	1,917,957.9	617,746.8	D	-105		10	-15	8	9	461	
SS401	1,917,977.9	617,726.8	D	-85		10	+5	4	5	461	
SS401	1,917,977.9	617,726.8	D	-85		10	+5	8	10	461	
SS402	1,917,957.9	617,706.8	D	-105		10	+25	4	5	461	
SS402	1,917,957.9	617,706.8	D	-105		10	+25	8	10	461	

Notes:
Dup - Duplicate
MS - Matrix Spike
MSD - Matrix Spike Duplicate

TABLE C-2
Summary of Survey Data Locations (1998)
TNT Area B - RI Report
Former Plum Brook Ordnance Works
Sandusky, Ohio
(1 of 2)

Survey ID	Surveyed Northing	Surveyed Easting	Elevation (ft MSL)	Sample ID	Associated Sample Locations	Estimated Northing	Estimated Easting	Surveyed/Est. Difference
1089	618616.153	1918554.358	659.59	SW01	NA	NA	NA	NA
1090	618617.028	1918554.183	659.29	SD01	NA	NA	NA	NA
1106	618656.829	1917697.402	659.64	SW02	NA	NA	NA	NA
1107	618657.132	1917698.99	659.24	SD02	NA	NA	NA	NA
1109	619064.166	1917792.372	659.66	SD03	NA	NA	NA	NA
1110	618862.767	1918148.385	659.48	SD04	NA	NA	NA	NA
1098	618366.309	1917652.224	663.08	SD05	NA	NA	NA	NA
1104	618491.976	1918874.069	668.17	SP01	SO32, SS183	618482	1918873	10
1083	618361.375	1918588.018	666.72	SP02	TNTB-S9, SO31	618362	1918588	0
1078	618438.362	1918702.638	665.79	SP03	SS372	618437	1918703	2
1079	618358.981	1918635.784	665.92	SP04	TNTB-S10, SS337	NA	NA	NA
1080	618323.003	1918633.085	666.96	SP05	TNTB-S11, SO05, SO024, SS295	618324	1918632	1
1081	618312.289	1918647.917	667.08	SP06	SS222	618312	1918648	0
1082	618312.128	1918697.605	666.39	SP07	SO27, SS176	618307	1918698	5
1075	618134.966	1918883.284	676.1	SP08	TNTB-S17, SS379	618129	1918881	7
1069	618043.205	1918673.573	682.64	SP09	TNTB-S18, SS375	618042	1918673	2
1068	618027.936	1918698.045	682.08	SP10	TNTB-S19, SS381	618020	1918699	8
1070	618007.788	1918662.101	681.69	SP11	TNTB-S20, SS380	618006	1918663	2
1067	618017.173	1918729.382	681.69	SP12	SO33, SS157	618017	1918728	2
1071	617865.891	1918748.83	678.06	SP13	TNTB-S21, SS382	617864	1918750	2
1072	617867.032	1918771.449	677.63	SP14	TNTB-S22, SS383	617862	1918773	5
1073	617836.12	1918780.745	676.89	SP15	TNTB-S23, SS384	617835	1918780	2
1117	617725.171	1917957.479	676.88	SP16	SS391	617727	1917958	2
1116	617933.612	1917967.831	675.82	SP17	SS392	617927	1917963	8
1093	618177.97	1918057.696	668.95	SP18	TNTB-S5, SS376	618172	1918058	6
1092	618162.373	1918086.936	668.98	SP19	TNTB-S6, SS075	618167	1918093	7
1091	618162.81	1918117.29	669.09	SP20	TNTB-S7, SS386	618164	1918118	1
1095	618313.224	1917735.218	670.06	SP21	SS044	618310	1917735	3
1094	618234.061	1917987.252	667.43	SP22	SS208	618232	1917988	2
1115	618018.761	1917813.98	677.47	SP23	SS389	618007	1917813	12

TABLE C-2
Summary of Survey Data Locations (1998)
TNT Area B - RI Report
Former Plum Brook Ordnance Works
Sandusky, Ohio
(2 of 2)

Survey ID	Surveyed Northing	Surveyed Easting	Elevation (ft MSL)	Sample ID	Associated Sample Locations	Estimated Northing	Estimated Easting	Surveyed/Est. Difference
1114	618006.344	1917627.200	679.68	SP24	SS388	618014	1917618	12
1113	618141.217	1917411.396	667.5	SP25	SS311	618137	1917408	6
1112	617920.772	1917463.625	675.58	SP26	SS390	617920	1917463	1
1121	617718.612	1917474.037	677.83	SP27	SS0006	617717	1917473	2
1074	617872.242	1918684.951	675.12	SP28	SO34, SS149	617872	1918683	2
1100	618487.083	1917729.317	662.43	SP29	SS0057	618487	1917728	1
1101	618668.093	1917758.516	660.89	SP30	TNTB-S2	NA	NA	NA
1128	617129.71	1918386.725	671.96	SP31	TNTB-S25, SS387	617132	1918388	2
1120	617558.593	1917723.665	672.24	SP32	SS030	617557	1917723	2
1118	617482.209	1918094.915	669.65	SP33	ROAD INTERSECTION	NA	NA	NA
1124	617614.054	1918247.274	670.37	SP34	ROAD INTERSECTION	NA	NA	NA
1103	617627.987	1918523.404	669.95	SP35	ROAD INTERSECTION	NA	NA	NA
1119	617384.662	1917841.972	673.04	SP36	ROAD INTERSECTION	NA	NA	NA
1126	617376.368	1918207.868	673.94	SP37	ROAD INTERSECTION	NA	NA	NA
1077	618588.565	1919006.473	669.16	SP38	ROAD INTERSECTION	NA	NA	NA
1086	618461.087	1918233.891	670.26	SP39	ROAD INTERSECTION	NA	NA	NA
1105	618416.86	1917271.22	671.05	SP40	ROAD INTERSECTION	NA	NA	NA
1076	617824.029	1918987.779	675.29	SP46	ROAD INTERSECTION	NA	NA	NA
1102	617368.713	1918519.181	672.11	SP47	ROAD INTERSECTION	NA	NA	NA
1087	618519.764	1918487.212	669.27	SP48	ROAD INTERSECTION	NA	NA	NA
1088	618333.153	1918493.158	667.93	SP49	ROAD INTERSECTION	NA	NA	NA
1085	618216.095	1918227.201	670.81	SP50	ROAD INTERSECTION	NA	NA	NA
1125	617619.642	1918321.303	672.81	SP51	SS373	617617	1918323	3
Average Difference Between Surveyed Northings/Eastings and Field Estimated Northings/Eastings :								3.97

These values were scaled to the Ohio State Plane Coordinate System (North Zone)
A combined factor of 0.999927034 was used in this determination.
The coordinates are NAD 1983 datum expressed in feet.
Vertical datum is NGVD 1929.

APPENDIX D

DATA VALIDATION SUMMARY

Quanterra
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ANALYTICAL REPORT

PROJECT NO. 775616

Plum Brook - TNT Area B
SDG #: PB037

Maureen McMyler

IT Corporation - Knoxville

QUANTERRA INCORPORATED

Project Manager

December 21, 1998

Quanterra

PROJECT NARRATIVE
PB037

The results reported herein are applicable to the samples submitted for analysis only.

Sample Receipt

Sample 19002 was received for 8260A volatiles in an improper container. The sample was canceled by IT Corporation.

Quality Control

Semivolatiles

Surrogate and internal standard recoveries for samples 18010, 18020, 18030, and 18050 were outside control limits. However, re-extraction and re-analysis was not possible due to insufficient sample volume.

PCBs

The matrix spike duplicate recoveries for sample 12010 were not acceptable for Aroclor 1260. The laboratory control sample showed acceptable results indicating that the analysis was in control. The matrix spike duplicate results are, therefore, attributed to matrix effects.

Explosives

Surrogate recoveries for samples 12010 (MS/MSD) and 12011 were outside control limits due to obvious matrix interferences.

The matrix spike/matrix spike duplicate recoveries for sample 12010 were acceptable for all analytes except HMX, RDX, and 3-nitrotoluene due to matrix effects.

Some of the laboratory control sample results were outside control limits. However, laboratory control sample duplicate recoveries and all surrogate recoveries were acceptable for target analytes, indicating that the problem was confined to the laboratory control sample. Thus, the validity of the sample results is not adversely affected.

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Quanterra

PROJECT NARRATIVE
PB037

Metals

The matrix spike/matrix spike duplicate recoveries and/or RPDs for sample 12010 (total) were outside control limits for some analytes. However, the laboratory control sample showed acceptable results indicating that the analysis was in control. The matrix spike/matrix spike duplicate results are, therefore, attributed to matrix effects. In addition, results outside of limits do not necessarily reflect poor method performance due to high analyte concentrations in the sample relative to the spike level. The affected analytes are flagged appropriately on the matrix spike/matrix spike duplicate report.

COMMENTS:

Volatiles

Samples 18000 and 1810 were reported with elevated reporting limits for all analytes. Based on screening results, a dilution was necessary prior to analysis; the reporting limits were adjusted accordingly.

Samples 18030 and 1850 were reported with elevated reporting limits for all analytes due to the difficult sample matrix (foamy matrix). A dilution was necessary prior to analysis, and the reporting limits were adjusted accordingly.

The concentration of acetone in sample 18010 exceeded the calibration level of the instrument. The sample was analyzed at a dilution to bring the concentration of the compound into the instrument calibration range. The results for both analyses are reported in order to provide the lowest possible reporting limits.

PCBs

Samples 12000,12010, 12011,19000,19001 and 18050 were extracted with limited volume; the reporting limits were adjusted accordingly.

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PROJECT NARRATIVE
PB037

Explosives

Sample 12010, 12011, and 18040 was reported with elevated reporting limits for some analytes due to the difficult sample matrix.

Due to the high level of particulate matter in sample 18010, only 320 ml of the usual 500 ml could be extracted. The reporting limits were adjusted accordingly.

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ANALYTICAL REPORT

PROJECT NO. 775616

Plum Brook - TNT Area B
SDG #: PB038

Maureen McMyler

IT Corporation - Knoxville
312 Directors Drive
Knoxville, TN 37922

QUANTERRA INCORPORATED

Project Manager

December 21, 1998

Quanterra

PROJECT NARRATIVE
PB038

The results reported herein are applicable to the samples submitted for analysis only.

Sample Receipt

There were no problems with the condition of the samples received.

Quality Control

Volatiles

Internal standard recoveries for samples 10510 and 10610 were outside control limits. These samples were re-extracted and re-analyzed and the recoveries were also outside control limits. These results indicate that the internal standard results are due to matrix effects. Furthermore, all samples, except 10500, 10550, 10551 and 10560, had poor internal standard and/or surrogate recoveries. These samples were not re-analyzed due to similar matrix effects and previously reported sample results.

Internal standard recoveries for sample 11030 were outside QC limits. Since the associated matrix spike/matrix spike duplicate demonstrated similar internal standard recoveries, the results are attributed to sample matrix effects. In addition, the matrix spike/matrix spike duplicate recoveries for sample 11030 were acceptable for all analytes except toluene. The laboratory control sample showed acceptable results indicating that the analysis was in control. The matrix spike/matrix spike duplicate results are attributed to matrix effects.

The result for methylene chloride for method blank CNGLG101 was greater than the reporting limit, but less than 5 times the reporting limit. Methylene chloride is considered a common laboratory contaminant.

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Quanterra

PROJECT NARRATIVE
PB038

PCBs

Samples 10510, 10520, 10530, 10550, 10551, 10560 and 10570 appear to contain a weathered mixture of aroclors 1254 and 1260. The predominant aroclor result was reported, while the reporting limit of the subordinate aroclor was elevated (if necessary). In addition, samples 10520, 10551 and 10570 were reported with elevated reporting limits for aroclor 1221 due to sample matrix interferences. Sample 11010 was reported with elevated reporting limits for all analytes due to the difficult sample matrix. The lowest dilution that could be analyzed was performed and the reporting limits were adjusted accordingly.

Explosives

The surrogate recovery for sample 10560 was above control limits due to obvious matrix interferences.

Metals

The matrix spike/matrix spike duplicate recoveries for sample 11030 were outside control limits for some analytes. However, the laboratory control sample showed acceptable results indicating that the analysis was in control. The matrix spike/matrix spike duplicate results are, therefore, attributed to matrix effects. In addition, results outside of limits do not necessarily reflect poor method performance due to high analyte concentrations in the sample relative to the spike level. The affected analytes are flagged appropriately on the matrix spike/matrix spike duplicate report.

COMMENTS:

Volatiles

The concentrations of acetone in sample 10500 exceeded the calibration level of the instrument. The sample was analyzed at appropriate dilutions to bring the concentrations of the compound into the instrument calibration range. The results for both analyses are reported in order to provide the lowest possible reporting limits.

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PROJECT NARRATIVE
PB038

Semivolatiles

The concentrations of several compounds in samples 10520 and 10600 exceeded the calibration level of the instrument. The samples were analyzed at appropriate dilutions to bring the concentrations of the compounds into the instrument calibration range. The results for both analyses are reported in order to provide the lowest possible reporting limits.

Explosives

Samples 10520, 10550 and 10551 were reported with elevated reporting limits for 4-amino-2,6-DNT due to the presence high levels of TNT.

Sample 10600 was reported with an elevated reporting limit for 1,3,5-trinitrobenzene due to sample matrix interferences.

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ANALYTICAL REPORT

PROJECT NO. 775616

Plum Brook - TNT Area B
SDG #: PB041

Maureen McMyler

IT Corporation - Knoxville

312 Directors Drive
Knoxville, TN 37923

QUANTERRA INCORPORATED

Project Manager

January 5, 1999

PROJECT NARRATIVE
PB041

The results reported herein are applicable to the samples submitted for analysis only.

Sample Receipt

Sample 10620 was processed for explosives (SW 8330) analyses only due to confirmed high concentrations of TNT.

Quality Control

Volatiles

Internal standard and/or surrogate recoveries for all samples except 10720, 10820, and 10830 were outside normal QC limits. To prove matrix effect for remaining samples, representative samples 10660 and 10800 were rerun. Re-analysis of the sample resulted in similar results, indicating that a sample matrix effect is responsible for the internal standard criteria not being met. Both sets of data are reported.

Internal standard recoveries for sample 10640 were outside QC limits. Since the associated matrix spike/matrix spike duplicate demonstrated similar surrogate recoveries, the results are attributed to sample matrix effects.

Explosives

The matrix spike/matrix spike duplicate recoveries for sample 10640 were acceptable for all analytes except 2-amino-4,6-DNT and 2,6-DNT. The laboratory control sample showed acceptable results indicating that the analysis was in control. The matrix spike/matrix spike duplicate results are, therefore, attributed to matrix effects.

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PROJECT NARRATIVE
PB041

Metals

The matrix spike/matrix spike duplicate recoveries for sample 10640 were outside control limits for some analytes. However, the laboratory control sample showed acceptable results indicating that the analysis was in control. The matrix spike/matrix spike duplicate results are, therefore, attributed to matrix effects. In addition, results outside of limits do not necessarily reflect poor method performance due to high analyte concentrations in the sample relative to the spike level. The affected analytes are flagged appropriately on the matrix spike/matrix spike duplicate report.

The result for zinc in method blank CP35RB was greater than the reporting limit, but less than 2 times the reporting limit. Zinc is considered a common laboratory contaminant.

COMMENTS:

PCBs

Most samples appear to contain a weathered mixture of aroclors 1254 and 1260. The predominant aroclor result was reported, while the reporting limit of the subordinate aroclor was elevated (if necessary). In addition, sample 10720 was reported with elevated reporting limits for aroclor 1221 and samples 10700,10800 were reported with elevated reporting limits for aroclor 1016 due to matrix interferences.

Explosives

Several samples were reported with elevated reporting limits for one or more analytes due to sample matrix interferences. The affected analytes are flagged on the sample report.

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ANALYTICAL REPORT

PROJECT NO. 775616

Plum Brook - TNT Area B
SDG #: PB042

Maureen McMyler

IT Corporation - Knoxville

312 Directors Drive
Knoxville, TN 37923

QUANTERRA INCORPORATED

Project Manager

December 22, 1998

PROJECT NARRATIVE
PB042

The results reported herein are applicable to the samples submitted for analysis only.

Sample Receipt

There were no problems with the condition of the samples received.

Quality Control

Volatiles

Internal standard and/or surrogate recoveries for samples 10580, 10730, 10780 10631, 10760,and 10840 were outside normal QC limits. To prove matrix effect for samples, a representative sample 10730 was rerun. Reanalysis of the sample resulted in similar results, indicating that a sample matrix effect is responsible for the internal standard criteria not being met. Both sets of data are reported.

Internal standard recoveries for sample 10740 were outside QC limits. Since the matrix spike/matrix spike duplicate for this sample demonstrated similar surrogate recoveries, the results are attributed to sample matrix effects.

The result for methylene chloride for method blank CNGLG101 was greater than the reporting limit, but less than 5 times the reporting limit. Methylene chloride is considered a common laboratory contaminant.

Semivolatiles

Surrogate recoveries for sample 10770 were outside QC limits. Since the analysis of this sample at a dilution showed acceptable surrogate recoveries, the results are attributed to sample matrix effects.

Internal standard recoveries for sample 10770 were outside QC limits. However, the sample was reanalyzed at a dilution with acceptable results.

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PROJECT NARRATIVE
PB042

Semivolatiles (Continued)

The laboratory control sample, CNJ5Q102, results were outside control limits for 4-nitrophenol. However, matrix spike/matrix spike duplicate recoveries and all sample surrogate recoveries were acceptable, indicating that the problem was confined to the laboratory control sample. Thus, the validity of the sample results is not adversely affected.

Metals

The serial dilution of sample 10740 was outside control limits due to physical or chemical matrix interferences.

The matrix spike/matrix spike duplicate recoveries and RPDs for sample 10740 were outside control limits for some analytes. However, the laboratory control sample showed acceptable results indicating that the analysis was in control. The matrix spike/matrix spike duplicate results are, therefore, attributed to matrix effects. In addition, results outside of limits do not necessarily reflect poor method performance due to high analyte concentrations in the sample relative to the spike level. The affected analytes are flagged appropriately on the matrix spike/matrix spike duplicate report.

COMMENTS:

PCBs

All samples, with the exception of 10790, appear to contain a weathered mixture of aroclors 1254 and 1260. The predominant aroclor result was reported, while the reporting limit of the subordinate aroclor was elevated (if necessary). In addition, samples 10631 and 10760 were reported with elevated reporting limits for aroclor 1221 due to sample matrix interferences.

Explosives

Several samples were reported with elevated reporting limits for one or more analytes due to sample matrix interferences. The affected analytes are flagged on the sample report.

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Quanterra Incorporated, Knoxville Laboratory maintains the following certifications, approvals and accreditations: California ELAP Cert. #2100, Connecticut DPH Cert. #PH-0233, Florida DOH SDWA Cert. #87293, Florida DOH Environmental Water Cert. #E87177, Florida DEP CompQAP #880566, Georgia EPD by US EPA Region IV, Hawaii DOH, Kentucky DEP Lab ID #90101, Maryland DHMH Cert. #277, Massachusetts Cert. #M-TN009, New York DOH Lab #10781, North Carolina DEHNR Cert. #64, North Dakota DOHCL Cert. #R-134, Ohio EPA VAP #CL0059, Oklahoma DEQ ID #9415, South Carolina DHEC Lab ID #84001, Tennessee DOH Lab ID #02014, Tennessee DEC UST, Utah DOH Cust. ID QUAN#, Virginia DGS Lab ID #00165, Washington DOE Lab #C120, Wisconsin DNR Lab ID #998044300, AALA Cert. #486.01, US Army Corps of Engineers, Naval Facilities Engineering Service Center, and USDA Soil Permit #S-3929. This list of approvals is subject to change and does not imply that laboratory certification is available for all parameters reported in this environmental sample data report.

Curtis & Tompkins, Ltd.

Laboratory Number: **136439**
Client: **IT Corporation**
Location: **Plum Brook Ordnance WKS**
Project #: **775616**

Received Date: **11/06/98**

CASE NARRATIVE

This hardcopy data package contains sample and QC results for twelve water samples which were received on November 10, 1998.

Volatile Organic Compounds: High initial calibration %RSD was observed for acetone, vinyl chloride, methylene dichloride, and bromoform on instrument VOA_02 on November 5, due to laboratory contamination of the low-level standards. High continuing calibration %D was observed for vinyl chloride and bromoform on November 9; all compounds met the minimum response criterion and these compounds were not detected in any of these samples. No other analytical problems were encountered.

Semi-Volatile Organic Compounds: The blank spike relative percent difference (RPD) was outside acceptance limits for 4-nitrophenol. The blank spike and blank spike duplicate recoveries were acceptable. The RPD has been flagged.

The %D for the continuing calibration sample from 11/10/98 of 3,3'-dichlorobenzidine was above acceptance limits. This compound was not detected in any of the associated samples. No other analytical problem was encountered.

PCBs: The %D for the continuing calibration sample from 11/16/98 of arochlor 1221 was above acceptance limits. This compound was not detected in any of the associated samples. No other analytical problems were encountered.

Metals: No analytical problems were encountered.

Nitroaromatics: The analysis was performed by NEL Laboratories in Reno, Nevada. See the NEL case narrative.

NEL LABORATORIES
Reno • Las Vegas
Phoenix • Burbank

Reno Division
1030 Matley Lane • Reno, Nevada 89502
(702) 348-2522 • Fax: (702) 348-2546
1-800-368-5221

CLIENT: Curtis & Tompkins, LTD. Analytical Labs.
2323 Fifth St.
Berkeley, CA 94710
ATTN: Carol Wortham

PROJECT NAME: 136439
PROJECT #: NA

NEL ORDER ID: R9811036

Attached are the analytical results for samples in support of the above referenced project.

Samples submitted for this project were not sampled by NEL Laboratories. Samples were received by NEL in good condition, under chain of custody on 11/7/98.

Samples were analyzed as received.

Where applicable we have included the following quality control data:

Method blank - used to demonstrate absence of contamination or interferences in the analytical process.
Laboratory Control Spike (LCS) - used to demonstrate laboratory ability to perform the method within specifications by spiking representative analytes into a clean matrix.
Surrogates - compounds added to each sample to ensure that the method requirements are met for each individual sample.

Should you have any questions or comments, please feel free to contact our Client Services department at (702) 348-2522.

Eileen M Ferguson
Eileen M. Ferguson
Laboratory Manager

11/23/98
Date

CERTIFICATIONS:

	Reno	Las Vegas	S. California
Arizona	AZ0520	AZ0518	AZ0583
California	1707	2002	2264
US Army Corps of Engineers	Certified	Certified	Certified

	Reno	Las Vegas	S. California
Idaho	Certified	Certified	
Montana	Certified	Certified	
Nevada	NV033	NV052	CA084
Washington			Certified

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Curtis & Tompkins, Ltd.

Laboratory Number: **136499** Received Date: **11/07/98**
Client: ~~**Kleinfelder**~~ IT Corporation
Location: ~~**Defense Depot Ogden OU1**~~ MM 1/19/98
Project #: ~~**23-9000-53**~~

CASE NARRATIVE

This hardcopy data package contains sample and QC results for one soil and two water samples which were received on November 7, 1998.

Volatile Organic Compounds: No analytical problems were encountered.

Semi-Volatile Organic Compounds: The relative percent difference (RPD) for 4-nitrophenol on the blank spike duplicate was outside acceptance limits. The RPD has been flagged. No other analytical problems were encountered.

PCBs: The %D of the continuing calibration sample from 11/16/98 for arochlor 1221 was above acceptance limits. This compound was not detected in the associated samples. No other analytical problems were encountered.

Metals: The blank spike duplicate recovery for iron was above acceptance limits on 11/18/98. This element was not detected in the associated samples.

The RPD for aluminum, lead, nickel, and thallium from 11/18/98, beryllium, copper, manganese, and zinc from 11/16/98, and molybdenum from 11/23/98 of the matrix duplicate was outside acceptance limits. The blank spike duplicate RPD was acceptable for all elements. The RPD has been flagged.

The matrix spike for aluminum, antimony, cadmium, and zinc was outside acceptance limits. The blank spike was acceptable for all elements. The recoveries have been flagged. No other analytical problems were encountered.

General Chemistry: The matrix spike and matrix spike duplicate were outside acceptance limits for the total organic carbon analysis. The laboratory control sample was acceptable. The recoveries have been flagged. No other analytical problems were encountered.

Nitroaromatics: The analysis was performed by NEL Laboratories in Reno, Nevada. See the NEL case narrative.

NEL LABORATORIES
Reno • Las Vegas
Phoenix • Burbank

Reno Division
1030 Matley Lane • Reno, Nevada 89502
(702) 348-2522 • Fax: (702) 348-2546
1-800-368-5221

CLIENT: Curtis & Tompkins, LTD. Analytical Labs.
2323 Fifth St.
Berkeley, CA 94710

ATTN:

PROJECT NAME: 136499 NEL ORDER ID: R9811047
PROJECT #: NA

Attached are the analytical results for samples in support of the above referenced project.

Samples submitted for this project were not sampled by NEL Laboratories. Samples were received by NEL in good condition, under chain of custody on 11/11/98.

Samples were analyzed as received.

Where applicable we have included the following quality control data:

Method blank - used to demonstrate absence of contamination or interferences in the analytical process.
Laboratory Control Spike (LCS) - used to demonstrate laboratory ability to perform the method within specifications by spiking representative analytes into a clean matrix.
Surrogates - compounds added to each sample to ensure that the method requirements are met for each individual sample.

Should you have any questions or comments, please feel free to contact our Client Services department at (702) 348-2522.

Eileen M Ferguson
Eileen M. Ferguson
Laboratory Manager

11/23/98
Date

CERTIFICATIONS:

	Reno	Las Vegas	S. California
Arizona	AZ0520	AZ0518	AZ0583
California	1707	2002	2264
US Army Corps of Engineers	Certified	Certified	Certified

	Reno	Las Vegas	S. California
Idaho	Certified	Certified	
Montana	Certified	Certified	
Nevada	NV033	NV052	CA03
Washington			Certified

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Curtis & Tompkins, Ltd.

Laboratory Number: **136617**
Client: **IT Corporation**
Location: **Plum Brook Ordnance WKS**
Project #: **775616**

Received Date: **11/13/98**

CASE NARRATIVE

This hardcopy data package contains sample and QC results for four soil samples which were received on November 13, 1998.

Volatile Organic Compounds: High initial calibration %RSD was observed for methylene chloride on instrument VOA_03 on November 10, due to laboratory contamination of the low-level standards. No other analytical problems were encountered.

PCBs: No analytical problems were encountered.

Semi-Volatile Organic Compounds: No analytical problems were encountered.

Metals: The matrix spike recoveries for aluminum, antimony, calcium, iron, manganese, and zinc were outside acceptance limits. The laboratory control samle was acceptable for all elements. The recoveries have been flagged. No other analytical problems were encountered.

Explosives: The analysis was performed by NEL Laboratories in Reno, Nevada.

See the NEL case narrative.

NEL LABORATORIES
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Phoenix • Burbank

Reno Division
1030 Matley Lane • Reno, Nevada 89502
(702) 348-2522 • Fax: (702) 348-2546
1-800-368-5221

CLIENT: Curtis & Tompkins, LTD. Analytical Labs.
2323 Fifth St.
Berkeley, CA 94710

ATTN:

PROJECT NAME: 136617
PROJECT #: NA

NEL ORDER ID: R9811079

Attached are the analytical results for samples in support of the above referenced project.

Samples submitted for this project were not sampled by NEL Laboratories. Samples were received by NEL in good condition, under chain of custody on 11/17/98.

Samples were analyzed as received.

Where applicable we have included the following quality control data:

Method blank - used to demonstrate absence of contamination or interferences in the analytical process.
Laboratory Control Spike (LCS) - used to demonstrate laboratory ability to perform the method within specifications by spiking representative analytes into a clean matrix.
Surrogates - compounds added to each sample to ensure that the method requirements are met for each individual sample.

Should you have any questions or comments, please feel free to contact our Client Services department at (702) 348-2522.

Some QA results have been flagged as follows:

C - Sample concentration is at least 5 times greater than spike contribution. Spike recovery criteria do not apply
Jm - This concentration should be considered an estimate due to probable matrix effects.

Eileen M Ferguson
Eileen M. Ferguson
Laboratory Manager

12/4/98
Date

CERTIFICATIONS:

	Reno	Las Vegas	S. California
Arizona	AZ0520	AZ0518	AZ0583
California	1707	2002	2264
US Army Corps of Engineers	Certified	Certified	Certified

	Reno	Las Vegas	S. California
Idaho	Certified	Certified	
Montana	Certified	Certified	
Nevada	NV033	NV052	CA084

Eco-Tech Technologies, Inc.

February 5, 1999

Maureen Mc Myler
IT Corp. Inc.
312 Directors Drive
Knoxville, TN 37923

Re: Plum Brook Ordnance Data Validation

Dear Maureen:

Enclosed are the four soil and two water SDGs for the Plum Brook TNT Area B and Red Water sites. They were validated at 100% Level III according to the National Functional Guidelines. Blank contamination was noted with a "B" qualifier as per your instructions. I have also split the sample quantity summary certification by site according to the P. O. numbers shown on the sample cross reference sheets. Please call if you have any questions (910) 278-4653.

Sincerely,

Tom

Tom Kitchings

109 West Tennessee Avenue
Oak Ridge, TN 37830

(423) 220-0502
Fax: (423) 220-0509

Environmental Technologies, Inc.

Plum Brook Ordnance Works
Data Validation Summary
February , 1999

Data analyzed from water and soil samples collected in November, 1998, were 100% validated at Level III according to the EPA National Functional Guidelines for data review. Blank contamination was noted by a "B" qualifier as necessary. SDGs included PB037, PB038, PB039, PB040, PB041 and PB042.

Volatiles: Acetone and 2-butanone had low relative response factors in both the ICAL and CCAL. This resulted in "R/J" qualifiers being added to acetone in 38 samples and 2-butanone in 25 samples from the soil SDGs PB038, PB039, PB041 and PB042. Low sample internal standard (IS) area counts were common throughout the four soil SDGs with 52 samples having those compounds associated with the affected IS being qualified as "UJ/J".

Contamination in the method blank, equipment rinsate and trip blanks resulted in a number of compounds being qualified as "B" due to the 5X/10X rule. These compounds and the number of affected samples were: methylene chloride-60, acetone-19, toluene-6, chloroform-2, and bromomethane-2. Detected compounds in 16 samples were qualified as "J" due to high surrogate recoveries. Finally, a high percent difference (%D) in the associated CCAL resulted in three samples from SDG PB037 which had bromomethane being qualified as "UJ".

109 West Tennessee Avenue
Oak Ridge, TN 37830

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Semivolatiles: Bis - (2 ethyl hexyl) phthalate was present in the method blank associated with PB042. Ten samples were qualified as "B". Phenol qualified as "B" in twelve samples due to method blank and equipment rinsate contamination. A low surrogate recovery for one sample from SDG PB040 resulted in a reanalysis being performed. The reanalysis was acceptable but was done outside the holding time. All compounds were qualified as "UJ/J". Hexachlorocyclopentadiene had a high % D for the continuing calibration standard. Twelve samples were affected and the compound qualified as "UJ". PB042 had one sample with a high %D in the field duplicate analysis for 2,4-DNT. The result was qualified as "UJ/J".

Explosives: The results for the three samples in the PB037 were qualified as "UJ". Matrix interference was highly pronounced in these samples obscuring the compound peaks or causing a shift in the location of peaks. Two of the samples were reported with zero surrogate recovery. An inspection of chromatograms indicated that the surrogate was present but the peak was shifted well beyond the RT window. Use of the data is questionable.

One sample from PB038 had a high surrogate recovery and all detected compounds were qualified as "J" High %D's in the field duplicate analysis were noted in six samples from PB038 and PB042. Affected compounds, TNT; 2,4-DNT; and 2,6-DNT, were qualified as "J".

Pesticides/PCBs: SDGs PB038, PB041 and PB042 had reported concentrations of Aroclor 1254 or 1260 in 34 of the samples in those SDGs. The chromatographic patterns for these samples indicate that significant "weathering" had occurred, that is degradation of the earlier eluting peaks relative to the later occurring ones had taken place. This phenomenon resulted in an "N", or presumably present, qualifier being added to the reported concentration.

High %D's occurred in the field duplicate analysis for PB038 and PB042. The four affected samples had a "J" added to the already present "N". This is reported as "tentatively identified at an approximate concentration." The same qualifier was added to one sample in PB038 due to a high surrogate recovery.

Metals: Overall, the metals data were acceptable as reviewed and qualified. Most samples required some qualifications due to QC analysis results which were outside of acceptable criteria. QC criteria for which qualifications were required include: laboratory calibration blank contamination, matrix spike results, ICP serial dilution results and field duplicate analysis.

Vanadium in twelve samples from SDGs PB038, PB041 and PB042 was qualified as "B" due to contamination in associated laboratory calibration blanks. Likewise, thallium was qualified as "B" in seven samples in PB038 due to contamination in the associated calibration blank.

All six of the SDGs contained samples which were qualified as "UJ/J" due to high or low recoveries for the matrix spike results. Analytes requiring qualification were Al, As, Sb, Pb, Te, Cr, V, and calcium.

As, and Pb in twelve samples in SDG PB039 required a "J" qualification based on ICP-serial dilution QC results. Likewise, Al, Ba, Ca, Cu, Fe, Mg, Mn, Pb, and Zn were qualified as "J" in thirteen samples from PB042.

High %D's from the field duplicate analyses associated with PB037, PB040, and PB042 resulted in a number of compounds being qualified as "J". The compounds included Al, As, Ca, Cr, Pb, Se, Ba, Fe, Mg, Mn and Zn. A total of ten samples were affected.

Wet Chemistry/TOC and Hardness: Two of the eleven samples analyzed for TOC were qualified as "J" due to high %D's from the field duplicate analysis. The hardness results were acceptable as reported.

APPENDIX E

ANALYTICAL DATA REPORTS

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO01		TNTB-SO02		TNTB-SO03		TNTB-SO04		TNTB-SO05	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10500		10510		10520		10530		10540	
Sample Date:		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98	
Depth:		.5 - 2		3.5 - 4		3 - 4		5 - 6		2.5 - 3.5	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2-Butanone	ug/kg										
Acetone	ug/kg	560	D					47	J	44	J
Carbon disulfide	ug/kg										
Ethylbenzene	ug/kg										
Toluene	ug/kg			3.4	J			3.9	J	4.1	J
Total xylenes	ug/kg					2.5	J				
Trichloroethene	ug/kg										

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO06		TNTB-SO08		TNTB-SO10		TNTB-SO11		TNTB-SO12	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10550		10570		10590		10600		10610	
Sample Date:		09-NOV-98		09-NOV-98		10-NOV-98		10-NOV-98		10-NOV-98	
Depth:		4 - 5		6 - 8		4 - 6		8 - 10		4 - 5	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2-Butanone	ug/kg							15	J		
Acetone	ug/kg	22	J					110	J		
Carbon disulfide	ug/kg										
Ethylbenzene	ug/kg										
Toluene	ug/kg			4.5	J	2.6	J	21	J	3.2	J
Total xylenes	ug/kg							2.4	J		
Trichloroethene	ug/kg										

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO24		TNTB-SO32		TNTB-SO40	
Associated Site:		TNTB		TNTB		TNTB	
Sample No:		10730		10810		10890	
Sample Date:		11-NOV-98		12-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2-Butanone	ug/kg						
Acetone	ug/kg					10	J
Carbon disulfide	ug/kg			2.2	J		
Ethylbenzene	ug/kg			1.7	J		
Toluene	ug/kg			11	J		
Total xylenes	ug/kg			8.4	J		
Trichloroethene	ug/kg	1.8	J				

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO02		TNTB-SO03		TNTB-SO04		TNTB-SO06		TNTB-SO07	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10510		10520		10530		10550		10560	
Sample Date:		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98		10-NOV-98	
Depth:		3.5 - 4		3 - 4		5 - 6		4 - 5		3 - 4	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2,4-Dinitrotoluene	ug/kg	660		13000	D	280	J	3600		430	
2,6-Dinitrotoluene	ug/kg	150	J	3000				2400		150	J
2-Methylnaphthalene	ug/kg	120	J	960							
4,6-Dinitro-2-methylphenol	ug/kg							170	J		
Acenaphthene	ug/kg										
Acenaphthylene	ug/kg										
Anthracene	ug/kg										
Benzo(a)anthracene	ug/kg			37	J						
Benzo(a)pyrene	ug/kg			33	J						
Benzo(b)fluoranthene	ug/kg			53	J			41	J		
Benzo(ghi)perylene	ug/kg										
Benzo(k)fluoranthene	ug/kg			55	J						
Carbazole	ug/kg										
Chrysene	ug/kg			110	J						
Dibenz(a,h)anthracene	ug/kg										
Dibenzofuran	ug/kg			45	J						
Fluoranthene	ug/kg			130	J						
Fluorene	ug/kg										
Indeno(1,2,3-cd)pyrene	ug/kg										
Naphthalene	ug/kg			280	J						
Phenanthrene	ug/kg	48	J	280	J						
Pyrene	ug/kg			120	J						

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO08		TNTB-SO09		TNTB-SO10		TNTB-SO11		TNTB-SO12	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10570		10580		10590		10600		10610	
Sample Date:		09-NOV-98		11-NOV-98		10-NOV-98		10-NOV-98		10-NOV-98	
Depth:		6 - 8		0 - 1		4 - 6		8 - 10		4 - 5	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2,4-Dinitrotoluene	ug/kg	3200		150	J	44	J	110000	D	4400	
2,6-Dinitrotoluene	ug/kg	490		46	J			68000	D	620	
2-Methylnaphthalene	ug/kg										
4,6-Dinitro-2-methylphenol	ug/kg										
Acenaphthene	ug/kg										
Acenaphthylene	ug/kg										
Anthracene	ug/kg										
Benzo(a)anthracene	ug/kg										
Benzo(a)pyrene	ug/kg			28	J						
Benzo(b)fluoranthene	ug/kg			37	J						
Benzo(ghi)perylene	ug/kg										
Benzo(k)fluoranthene	ug/kg										
Carbazole	ug/kg										
Chrysene	ug/kg			42	J						
Dibenz(a,h)anthracene	ug/kg										
Dibenzofuran	ug/kg										
Fluoranthene	ug/kg			51	J						
Fluorene	ug/kg										
Indeno(1,2,3-cd)pyrene	ug/kg										
Naphthalene	ug/kg										
Phenanthrene	ug/kg										
Pyrene	ug/kg			40	J						

PLUM BROOK
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO14		TNTB-SO15		TNTB-SO16		TNTB-SO17		TNTB-SO18	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10630		10640		10650		10660		10670	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2,4-Dinitrotoluene	ug/kg	490		190	J	160	J	180	J	59	J
2,6-Dinitrotoluene	ug/kg	65	J	93	J	72	J	81	J		
2-Methylnaphthalene	ug/kg										
4,6-Dinitro-2-methylphenol	ug/kg										
Acenaphthene	ug/kg										
Acenaphthylene	ug/kg					75	J				
Anthracene	ug/kg			29	J	58	J	32	J		
Benzo(a)anthracene	ug/kg	40	J	100	J	160	J	70	J	56	J
Benzo(a)pyrene	ug/kg	56	J	110	J	210	J	81	J	57	J
Benzo(b)fluoranthene	ug/kg	73	J	140	J	180	J	78	J	63	J
Benzo(ghi)perylene	ug/kg	37	J	76	J	130	J	59	J		
Benzo(k)fluoranthene	ug/kg	74	J	100	J	250	J	110	J	60	J
Carbazole	ug/kg										
Chrysene	ug/kg	76	J	120	J	190	J	93	J	67	J
Dibenz(a,h)anthracene	ug/kg			32	J	68	J				
Dibenzofuran	ug/kg										
Fluoranthene	ug/kg	110	J	160	J	240	J	110	J	92	J
Fluorene	ug/kg										
Indeno(1,2,3-cd)pyrene	ug/kg	37	J	76	J	130	J	59	J		
Naphthalene	ug/kg										
Phenanthrene	ug/kg			83	J	82	J	47	J	46	J
Pyrene	ug/kg	84	J	140	J	210	J	97	J	74	J

PLUM BROOK
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO20		TNTB-SO21		TNTB-SO22		TNTB-SO24		TNTB-SO26	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10690		10700		10710		10730		10750	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2,4-Dinitrotoluene	ug/kg	100	J	82	J	410		230	J		
2,6-Dinitrotoluene	ug/kg					44	J	110	J		
2-Methylnaphthalene	ug/kg							53	J		
4,6-Dinitro-2-methylphenol	ug/kg										
Acenaphthene	ug/kg										
Acenaphthylene	ug/kg										
Anthracene	ug/kg										
Benzo(a)anthracene	ug/kg					60	J	80	J		
Benzo(a)pyrene	ug/kg	39	J	35	J	68	J	85	J		
Benzo(b)fluoranthene	ug/kg	39	J			86	J	100	J		
Benzo(ghi)perylene	ug/kg					67	J	51	J		
Benzo(k)fluoranthene	ug/kg					93	J	110	J		
Carbazole	ug/kg										
Chrysene	ug/kg	50	J	46	J	93	J	120	J		
Dibenz(a,h)anthracene	ug/kg										
Dibenzofuran	ug/kg										
Fluoranthene	ug/kg	64	J	62	J	160	J	160	J	46	J
Fluorene	ug/kg										
Indeno(1,2,3-cd)pyrene	ug/kg					69	J	50	J		
Naphthalene	ug/kg										
Phenanthrene	ug/kg			46	J	76	J	71	J		
Pyrene	ug/kg	57	J	54	J	110	J	130	J		

PLUM BROOK
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO27		TNTB-SO29		TNTB-SO30		TNTB-SO31		TNTB-SO32	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10760		10780		10790		10800		10810	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		12-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2,4-Dinitrotoluene	ug/kg	400	J	79	J			110	J	170	J
2,6-Dinitrotoluene	ug/kg	100	J								
2-Methylnaphthalene	ug/kg	100	J					68	J	170	J
4,6-Dinitro-2-methylphenol	ug/kg	62	J								
Acenaphthene	ug/kg									93	J
Acenaphthylene	ug/kg									300	J
Anthracene	ug/kg							27	J	920	
Benzo(a)anthracene	ug/kg	40	J	46	J	44	J	46	J	2400	
Benzo(a)pyrene	ug/kg	45	J	48	J	64	J	68	J	2000	
Benzo(b)fluoranthene	ug/kg	70	J	57	J	62	J	75	J	1800	
Benzo(ghi)perylene	ug/kg			34	J			51	J	880	
Benzo(k)fluoranthene	ug/kg	62	J			55	J	93	J	2000	
Carbazole	ug/kg									200	J
Chrysene	ug/kg	91	J	58	J	51	J	87	J	2400	
Dibenz(a,h)anthracene	ug/kg									550	
Dibenzofuran	ug/kg									180	J
Fluoranthene	ug/kg	110	J	96	J	49	J	110	J	5000	
Fluorene	ug/kg									360	J
Indeno(1,2,3-cd)pyrene	ug/kg							53	J	1000	
Naphthalene	ug/kg							41	J	73	J
Phenanthrene	ug/kg	190	J	66	J			83	J	3000	
Pyrene	ug/kg	110	J	64	J	47	J	88	J	3600	

PLUM BROOK
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO34		TNTB-SO35		TNTB-SO36		TNTB-SO37		TNTB-SO38	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10830		10840		10850		10860		10870	
Sample Date:		12-NOV-98		11-NOV-98		12-NOV-98		12-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2,4-Dinitrotoluene	ug/kg					57	J	530		83	J
2,6-Dinitrotoluene	ug/kg							160	J		
2-Methylnaphthalene	ug/kg					61	J			54	J
4,6-Dinitro-2-methylphenol	ug/kg										
Acenaphthene	ug/kg					68	J				
Acenaphthylene	ug/kg					380	J				
Anthracene	ug/kg					560					
Benzo(a)anthracene	ug/kg					1600		50	J	49	J
Benzo(a)pyrene	ug/kg			37	J	1700		55	J	77	J
Benzo(b)fluoranthene	ug/kg			39	J	1800		61	J	100	J
Benzo(ghi)perylene	ug/kg					880		37	J	68	J
Benzo(k)fluoranthene	ug/kg					1500		58	J	87	J
Carbazole	ug/kg					250	J				
Chrysene	ug/kg					1800		70	J	91	J
Dibenz(a,h)anthracene	ug/kg					480					
Dibenzofuran	ug/kg					130	J				
Fluoranthene	ug/kg	39	J	45	J	3900		97	J	110	J
Fluorene	ug/kg					170	J				
Indeno(1,2,3-cd)pyrene	ug/kg					960		37	J	62	J
Naphthalene	ug/kg					50	J				
Phenanthrene	ug/kg					2300		45	J	83	J
Pyrene	ug/kg			37	J	2700		71	J	86	J

PLUM BROOK
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO39		TNTB-SO40	
Associated Site:		TNTB		TNTB	
Sample No:		10880		10890	
Sample Date:		12-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr
2,4-Dinitrotoluene	ug/kg			54	J
2,6-Dinitrotoluene	ug/kg				
2-Methylnaphthalene	ug/kg				
4,6-Dinitro-2-methylphenol	ug/kg				
Acenaphthene	ug/kg				
Acenaphthylene	ug/kg				
Anthracene	ug/kg				
Benzo(a)anthracene	ug/kg	50	J		
Benzo(a)pyrene	ug/kg	55	J		
Benzo(b)fluoranthene	ug/kg	44	J		
Benzo(ghi)perylene	ug/kg				
Benzo(k)fluoranthene	ug/kg	55	J		
Carbazole	ug/kg				
Chrysene	ug/kg	54	J		
Dibenz(a,h)anthracene	ug/kg				
Dibenzofuran	ug/kg				
Fluoranthene	ug/kg	100	J		
Fluorene	ug/kg				
Indeno(1,2,3-cd)pyrene	ug/kg				
Naphthalene	ug/kg				
Phenanthrene	ug/kg				
Pyrene	ug/kg	71	J		

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO02		TNTB-SO03		TNTB-SO04		TNTB-SO06		TNTB-SO07	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10510		10520		10530		10550		10560	
Sample Date:		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98		10-NOV-98	
Depth:		3.5 - 4		3 - 4		5 - 6		4 - 5		3 - 4	
PCB3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1254	ug/kg	140	NJ			63	N				
Aroclor 1260	ug/kg			1300	N			2800	NJ	4600	N

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO08		TNTB-SO09		TNTB-SO14		TNTB-SO15		TNTB-SO16	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10570		10580		10630		10640		10650	
Sample Date:		09-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		6 - 8		0 - 1		0 - 1		0 - 1		0 - 1	
PCB3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1254	ug/kg			320	N			530	N	120	N
Aroclor 1260	ug/kg	110	N			230	N				

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO17		TNTB-SO18		TNTB-SO19		TNTB-SO20		TNTB-SO21	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10660		10670		10680		10690		10700	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
PCB3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1254	ug/kg										
Aroclor 1260	ug/kg	99	N	50	N	110	N	160	N	270	N

PLUM BROOK
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO22		TNTB-SO23		TNTB-SO24		TNTB-SO25		TNTB-SO26	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10710		10720		10730		10740		10750	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
PCB3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1254	ug/kg										
Aroclor 1260	ug/kg	100	N	140	N	15000	N	89	N	48	N

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO27		TNTB-SO28		TNTB-SO29		TNTB-SO31		TNTB-SO32	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10760		10770		10780		10800		10810	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		12-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
PCB3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1254	ug/kg	210	N	240	N	190	N				
Aroclor 1260	ug/kg							190	N	990	N

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO33		TNTB-SO35		TNTB-SO36		TNTB-SO37		TNTB-SO38	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10820		10840		10850		10860		10870	
Sample Date:		12-NOV-98		11-NOV-98		12-NOV-98		12-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
PCB3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1254	ug/kg										
Aroclor 1260	ug/kg	540	N	41	NJ	41	N	450	N	1100	N

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO01		TNTB-SO02		TNTB-SO03		TNTB-SO04		TNTB-SO05	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10500		10510		10520		10530		10540	
Sample Date:		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98	
Depth:		.5 - 2		3.5 - 4		3 - 4		5 - 6		2.5 - 3.5	
METALS3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	9350		5560		6120		8080		7600	
Arsenic	mg/kg	23.8	J	8.9	J	20.5	J	15.4	J	18.1	J
Barium	mg/kg	496		51.8		58.3		103		207	
Beryllium	mg/kg	1.8		0.57		0.84		1.0		1.2	
Cadmium	mg/kg										
Calcium	mg/kg	1670		4020		3370		3790		4060	
Chromium	mg/kg	17.4		9.0		24.9		13.6		13.6	
Cobalt	mg/kg	54.1		8.7		16.1		11.7		9.7	
Copper	mg/kg	58.9		27.3		46.0		39.3		60.1	
Iron	mg/kg	80000		14100		33000		27900		37600	
Lead	mg/kg	19.1	J	26.1	J	80.7	J	16.1	J	20.5	J
Magnesium	mg/kg	831		1730		2000		1290		1420	
Manganese	mg/kg	3110		116		241		169		340	
Mercury	mg/kg	0.043				0.054				0.080	
Nickel	mg/kg	48.5		21.9		46.4		37.2		55.5	
Potassium	mg/kg			752		1390		785		1150	
Selenium	mg/kg	3.9	J	0.90	J	2.0	J	1.7	J	2.2	J
Thallium	mg/kg										
Vanadium	mg/kg										
Zinc	mg/kg	42.8		57.0		285		97.8		99.1	

PLUM BROOK
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO06		TNTB-SO07		TNTB-SO08		TNTB-SO09		TNTB-SO10	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10550		10560		10570		10580		10590	
Sample Date:		09-NOV-98		10-NOV-98		09-NOV-98		11-NOV-98		10-NOV-98	
Depth:		4 - 5		3 - 4		6 - 8		0 - 1		4 - 6	
METALS3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	2990		4440		5060		5110	J	5210	
Arsenic	mg/kg	9.9	J	8.7	J	22.3	J	11.5		22.2	J
Barium	mg/kg	40.8		56.4		38.9		64.8	J	67.9	
Beryllium	mg/kg					0.88		0.63		0.73	
Cadmium	mg/kg			1.1				0.64			
Calcium	mg/kg	2140		3150		2080		2950	J	1070	
Chromium	mg/kg	6.2		6.9		11.3		20.3	J	9.8	
Cobalt	mg/kg					9.5		14.8		9.4	
Copper	mg/kg	19.7		16.9		66.7		28.9	J	46.1	
Iron	mg/kg	12500		13000		30800		20600	J	34000	
Lead	mg/kg	61.4	J	53.5	J	17.3	J	53.0	J	17.6	J
Magnesium	mg/kg	655		721		1260		1000	J	724	
Manganese	mg/kg	87.5		264		195		373	J	207	
Mercury	mg/kg					0.044		0.044		0.059	
Nickel	mg/kg	8.8		11.9		40.5		27.1		23.4	
Potassium	mg/kg	690		677		1200		843		1110	
Selenium	mg/kg	0.78	J	0.64	J	1.6	J	1.0		1.6	J
Thallium	mg/kg										
Vanadium	mg/kg										
Zinc	mg/kg	42.9		272		54.0		241	J	68.8	

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO11		TNTB-SO12		TNTB-SO14		TNTB-SO15		TNTB-SO16	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10600		10610		10630		10640		10650	
Sample Date:		10-NOV-98		10-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		8 - 10		4 - 5		0 - 1		0 - 1		0 - 1	
METALS3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	4650		5070		7150	J	5840		5000	
Arsenic	mg/kg	25.3	J	35.6	J	13.2		11.7		8.9	
Barium	mg/kg	85.1		64.9		112	J	51.8		36.4	
Beryllium	mg/kg	0.67		0.71		0.86					
Cadmium	mg/kg										
Calcium	mg/kg	8110		922		5610	J	3260		2620	
Chromium	mg/kg	10.2		11.3		12.5	J	11.3		8.3	
Cobalt	mg/kg	9.0		8.1		11.8		11.2		9.7	
Copper	mg/kg	40.4		46.7		47.8	J	32.0		24.4	
Iron	mg/kg	37900		40400		23600	J	20200		15100	
Lead	mg/kg	20.0	J	22.9	J	67.7	J	41.9		30.2	
Magnesium	mg/kg	1460		1020		1550	J	1760		909	
Manganese	mg/kg	460		136		378	J	150		152	
Mercury	mg/kg	0.059		0.081		0.082		0.080		0.073	
Nickel	mg/kg	25.4		27.4		31.3		26.9		19.8	
Potassium	mg/kg	1170		1300		1130		1220		898	
Selenium	mg/kg	1.8	J	1.8	J	1.3		1.6		1.0	
Thallium	mg/kg										
Vanadium	mg/kg										
Zinc	mg/kg	40.6		44.6		146	J	241	J	49.9	J

PLUM BROOK
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO17		TNTB-SO18		TNTB-SO19		TNTB-SO20		TNTB-SO21	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10660		10670		10680		10690		10700	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
METALS3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	5770		7170		8400		7290		6760	
Arsenic	mg/kg	11.1		12.3		8.8		18.1		15.8	
Barium	mg/kg	52.7		56.1		82.7		73.4		66.6	
Beryllium	mg/kg	0.61		0.77		0.82		0.73		0.78	
Cadmium	mg/kg										
Calcium	mg/kg	10900		3410		2790		3600		3370	
Chromium	mg/kg	12.4		11.8		11.8		13.0		13.4	
Cobalt	mg/kg	11.8		9.4		10		10.7		11.2	
Copper	mg/kg	37.7		35.6		40.8		36.2		35.1	
Iron	mg/kg	18800		22400		17800		25500		26100	
Lead	mg/kg	54.8		19.8		15.3		37.1		26.0	
Magnesium	mg/kg	2550		891		873		1300		1060	
Manganese	mg/kg	176		85.7		69.6		196		274	
Mercury	mg/kg	0.11		0.056		0.057		0.069		0.077	
Nickel	mg/kg	26.5		20.0		24.7		27.1		23.8	
Potassium	mg/kg	1090		1080		750		1170		1120	
Selenium	mg/kg	1.3		1.6		1.2		1.3		1.3	
Thallium	mg/kg										
Vanadium	mg/kg			11.1		13.0					
Zinc	mg/kg	82.5	J	31.1	J	25.2	J	52.7	J	61.4	J

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO22		TNTB-SO23		TNTB-SO24		TNTB-SO25		TNTB-SO26	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10710		10720		10730		10740		10750	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
METALS3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	6540		3050		3960	J	6300	J	5240	J
Arsenic	mg/kg	12.4		2.8		7.4		12.0		9.1	
Barium	mg/kg	69.0				47.6	J	76.8	J	39.6	J
Beryllium	mg/kg	0.75						0.80			
Cadmium	mg/kg										
Calcium	mg/kg	4000		14200		90900	J	21000	J	31000	J
Chromium	mg/kg	20.5		6.0		12.1	J	12.4	J	8.5	J
Cobalt	mg/kg	10.9				5.9		11.7		7.4	
Copper	mg/kg	38.6		8.3		34.3	J	43.9	J	23.5	J
Iron	mg/kg	21500		7790		13400	J	26600	J	15600	J
Lead	mg/kg	32.0		29.5		245	J	126	J	33.4	J
Magnesium	mg/kg	1160		1570		9190	J	2090	J	4170	J
Manganese	mg/kg	284		171		286	J	352	J	154	J
Mercury	mg/kg	0.062				0.13		0.069		0.049	
Nickel	mg/kg	23.6		8.0		13.9		32.6		17.9	
Potassium	mg/kg	1140				763		735		831	
Selenium	mg/kg	1.2						1.1		0.97	
Thallium	mg/kg										
Vanadium	mg/kg					11.6	J			8.7	
Zinc	mg/kg	116	J	79.1	J	156	J	170	J	53.3	J

PLUM BROOK
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO27		TNTB-SO28		TNTB-SO29		TNTB-SO30		TNTB-SO31	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10760		10770		10780		10790		10800	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
METALS3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	6570	J	4910	J	5530	J	5750	J	5740	
Arsenic	mg/kg	22.1		9.2		9.6		9.3		20.3	
Barium	mg/kg	100	J	76.5	J	73.3	J	46.2	J	74.5	
Beryllium	mg/kg	0.87				0.63				0.85	
Cadmium	mg/kg	0.63								1.3	
Calcium	mg/kg	3610	J	2860	J	3350	J	7030	J	4100	
Chromium	mg/kg	12.9	J	19.1	J	17.3	J	9.5	J	11.3	
Cobalt	mg/kg	15.5		15.9		10.7		8.4		14.9	
Copper	mg/kg	48.3	J	25.4	J	33.3	J	21.7	J	47.9	
Iron	mg/kg	32800	J	18900	J	19900	J	17900	J	19300	
Lead	mg/kg	30.5	J	40.5	J	35.6	J	36.6	J	77.6	
Magnesium	mg/kg	1130	J	1010	J	1050	J	1540	J	1020	
Manganese	mg/kg	311	J	504	J	330	J	116	J	357	
Mercury	mg/kg	0.061				0.048		0.045		0.083	
Nickel	mg/kg	42.6		23.6		24.5		19.4		56.3	
Potassium	mg/kg	1450		920		835		785		747	
Selenium	mg/kg	1.7		0.95		0.89		1.1		1.2	
Thallium	mg/kg	1.4									
Vanadium	mg/kg									8.2	
Zinc	mg/kg	91.8	J	164	J	164	J	63.7	J	235	J

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO32		TNTB-SO33		TNTB-SO34		TNTB-SO35		TNTB-SO36	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10810		10820		10830		10840		10850	
Sample Date:		12-NOV-98		12-NOV-98		12-NOV-98		11-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
METALS3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	5410		4180		3720		4680	J	5280	
Arsenic	mg/kg	8.0		1.7		4.0		8.5		15.8	
Barium	mg/kg	45.5		46.3		24.1		39.0	J	53.3	
Beryllium	mg/kg	0.69									
Cadmium	mg/kg	1.1									
Calcium	mg/kg	6020		1200		1830		1770	J	8480	
Chromium	mg/kg	10		6.4		6.6		8.9	J	10.7	
Cobalt	mg/kg	15.7						7.7		10.7	
Copper	mg/kg	445		7.6		6.9		19.9	J	28.5	
Iron	mg/kg	14500		7340		9030		14300	J	21000	
Lead	mg/kg	153		41.6		9.7		32.3	J	24.8	
Magnesium	mg/kg	1410		660		897		796	J	1850	
Manganese	mg/kg	203		235		185		202	J	291	
Mercury	mg/kg	0.047						0.042		0.053	
Nickel	mg/kg	40.7		9.1		11.4		14.0		17.1	
Potassium	mg/kg	907						765		1160	
Selenium	mg/kg	1.0						0.64		1.3	
Thallium	mg/kg										
Vanadium	mg/kg										
Zinc	mg/kg	282	J	46.1	J	33.7	J	42.7	J	50.1	J

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO37		TNTB-SO38		TNTB-SO39		TNTB-SO40	
Associated Site:		TNTB		TNTB		TNTB		TNTB	
Sample No:		10860		10870		10880		10890	
Sample Date:		12-NOV-98		12-NOV-98		12-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1	
METALS3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	6160		5720		4170		3170	
Arsenic	mg/kg	12.8		12.5		4.0		29.4	
Barium	mg/kg	90.8		77.0		43.4		60.2	
Beryllium	mg/kg	0.79		0.62					
Cadmium	mg/kg								
Calcium	mg/kg	4760		4640		1430		807	
Chromium	mg/kg	12.1		12.7		6.2		8.1	
Cobalt	mg/kg	10.0		8.8		5.9		6.2	
Copper	mg/kg	34.7		28.2		8.8		35.2	
Iron	mg/kg	19900		20200		9750		30500	
Lead	mg/kg	58.4		47.4		35.7		35.0	
Magnesium	mg/kg	1050		1220		741			
Manganese	mg/kg	205		240		219		24.0	
Mercury	mg/kg	0.085		0.065		0.038		0.056	
Nickel	mg/kg	23.2		20.9		12.3		6.5	
Potassium	mg/kg	1340		1450				1930	
Selenium	mg/kg	1.2		1.1		0.64		2.4	
Thallium	mg/kg							1.4	
Vanadium	mg/kg								
Zinc	mg/kg	75.5	J	75.9	J	27.1	J	17.7	J

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO02		TNTB-SO03		TNTB-SO04		TNTB-SO05		TNTB-SO06	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10510		10520		10530		10540		10550	
Sample Date:		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98	
Depth:		3.5 - 4		3 - 4		5 - 6		2.5 - 3.5		4 - 5	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2,4,6-Trinitrotoluene	mg/kg	0.27		620		4.8		44		2200	J
2,4-Dinitrotoluene	mg/kg	1.6		27		1.4					
2,6-Dinitrotoluene	mg/kg	0.49									
2-Amino-4,6-dinitrotoluene	mg/kg			93		1.0		12			
2-Nitrotoluene	mg/kg										
4-Amino-2,6-dinitrotoluene	mg/kg					1.7		15			
4-Nitrotoluene	mg/kg										

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO07		TNTB-SO08		TNTB-SO09		TNTB-SO10		TNTB-SO11	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10560		10570		10580		10590		10600	
Sample Date:		10-NOV-98		09-NOV-98		11-NOV-98		10-NOV-98		10-NOV-98	
Depth:		3 - 4		6 - 8		0 - 1		4 - 6		8 - 10	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2,4,6-Trinitrotoluene	mg/kg	5.8	J	11		92		1.1		24	
2,4-Dinitrotoluene	mg/kg	1.9	J	2.1						240	
2,6-Dinitrotoluene	mg/kg			1.0						180	
2-Amino-4,6-dinitrotoluene	mg/kg	5.1	J	2.3						70	
2-Nitrotoluene	mg/kg									82	
4-Amino-2,6-dinitrotoluene	mg/kg	5.1	J	3.8						45	
4-Nitrotoluene	mg/kg									67	

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO12		TNTB-SO13		TNTB-SO14		TNTB-SO15		TNTB-SO16	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10610		10620		10630		10640		10650	
Sample Date:		10-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		4 - 5		0 - 1		0 - 1		0 - 1		0 - 1	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2,4,6-Trinitrotoluene	mg/kg	39		6900		490	J	4.6		4.3	
2,4-Dinitrotoluene	mg/kg	2.6						0.39			
2,6-Dinitrotoluene	mg/kg										
2-Amino-4,6-dinitrotoluene	mg/kg	4.0						4.2		4.4	
2-Nitrotoluene	mg/kg										
4-Amino-2,6-dinitrotoluene	mg/kg	11						4.2		3.5	
4-Nitrotoluene	mg/kg										

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO17		TNTB-SO18		TNTB-SO20		TNTB-SO21		TNTB-SO22	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10660		10670		10690		10700		10710	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2,4,6-Trinitrotoluene	mg/kg	3.8		2.9		0.59		0.31		2.5	
2,4-Dinitrotoluene	mg/kg	0.76									
2,6-Dinitrotoluene	mg/kg										
2-Amino-4,6-dinitrotoluene	mg/kg	3.6		3.8		0.78		0.30		2.6	
2-Nitrotoluene	mg/kg										
4-Amino-2,6-dinitrotoluene	mg/kg	3.0		2.0		0.60				2.0	
4-Nitrotoluene	mg/kg										

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO23		TNTB-SO24		TNTB-SO25		TNTB-SO26		TNTB-SO27	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10720		10730		10740		10750		10760	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2,4,6-Trinitrotoluene	mg/kg	0.68		14		0.26		0.43		4.0	
2,4-Dinitrotoluene	mg/kg										
2,6-Dinitrotoluene	mg/kg										
2-Amino-4,6-dinitrotoluene	mg/kg			4.6		1.7				7.6	
2-Nitrotoluene	mg/kg										
4-Amino-2,6-dinitrotoluene	mg/kg	0.35		5.9		1.1				5.4	
4-Nitrotoluene	mg/kg										

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO28		TNTB-SO29		TNTB-SO30		TNTB-SO31		TNTB-SO32	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10770		10780		10790		10800		10810	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		12-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2,4,6-Trinitrotoluene	mg/kg	1.1		1.0		0.56		22		7.6	
2,4-Dinitrotoluene	mg/kg									0.38	
2,6-Dinitrotoluene	mg/kg										
2-Amino-4,6-dinitrotoluene	mg/kg	1.3		1.5				4.7		3.7	
2-Nitrotoluene	mg/kg										
4-Amino-2,6-dinitrotoluene	mg/kg	0.99		1.1		0.34		8.8		4.0	
4-Nitrotoluene	mg/kg										

PLUM BROOK

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SO35		TNTB-SO36		TNTB-SO37		TNTB-SO38		TNTB-SO40	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10840		10850		10860		10870		10890	
Sample Date:		11-NOV-98		12-NOV-98		12-NOV-98		12-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2,4,6-Trinitrotoluene	mg/kg	7.6	J	0.40		4.3		0.78			
2,4-Dinitrotoluene	mg/kg	1.6	J			2.3		0.34		0.26	
2,6-Dinitrotoluene	mg/kg	0.28	J			0.83					
2-Amino-4,6-dinitrotoluene	mg/kg	0.48				1.7					
2-Nitrotoluene	mg/kg										
4-Amino-2,6-dinitrotoluene	mg/kg					2.5		0.35			
4-Nitrotoluene	mg/kg										

PLUM BROOK
Soils (Surface and Deep)
Data Summary

Report Date: 02/24/99

Sample Location:		TNTB-SO01		TNTB-SO02		TNTB-SO03		TNTB-SO04		TNTB-SO05	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10500		10510		10520		10530		10540	
Sample Date:		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98	
Depth:		.5 - 2		3.5 - 4		3 - 4		5 - 6		2.5 - 3.5	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	ug/kg	5.9	U	5.6	U	5.7	U	6.7	U	6.4	U
1,1,2,2-Tetrachloroethane	ug/kg	5.9	U	5.6	UJ	5.7	UJ	6.7	UJ	6.4	UJ
1,1,2-Trichloroethane	ug/kg	5.9	U	5.6	U	5.7	U	6.7	U	6.4	UJ
1,1-Dichloroethane	ug/kg	5.9	U	5.6	U	5.7	U	6.7	U	6.4	U
1,1-Dichloroethene	ug/kg	5.9	U	5.6	U	5.7	U	6.7	U	6.4	U
1,2-Dichloroethane	ug/kg	5.9	U	5.6	U	5.7	U	6.7	U	6.4	UJ
1,2-Dichloroethene	ug/kg	5.9	U	5.6	U	5.7	U	6.7	U	6.4	UJ
1,2-Dichloropropane	ug/kg	5.9	U	5.6	U	5.7	U	6.7	U	6.4	UJ
2-Butanone	ug/kg	24	R	22	U	23	R	27	R	26	R
2-Hexanone	ug/kg	24	U	22	U	23	U	27	U	26	UJ
4-Methyl-2-pentanone	ug/kg	24	U	22	U	23	U	27	U	26	UJ
Acetone	ug/kg	560	D	22	U	23	R	47	J	44	J
Benzene	ug/kg	5.9	U	5.6	U	5.7	U	6.7	U	6.4	UJ
Bromodichloromethane	ug/kg	5.9	U	5.6	U	5.7	U	6.7	U	6.4	UJ
Bromoform	ug/kg	5.9	U	5.6	U	5.7	U	6.7	U	6.4	UJ
Bromomethane	ug/kg	12	U	11	U	11	U	13	U	13	U
Carbon disulfide	ug/kg	5.9	U	5.6	U	5.7	U	6.7	U	6.4	U
Carbon tetrachloride	ug/kg	5.9	U	5.6	U	5.7	U	6.7	U	6.4	UJ
Chlorobenzene	ug/kg	5.9	U	5.6	U	5.7	U	6.7	U	6.4	UJ
Chloroethane	ug/kg	12	U	11	U	11	U	13	U	13	U
Chloroform	ug/kg	5.9	U	5.6	U	5.7	U	6.7	U	6.4	U
Chloromethane	ug/kg	12	U	11	U	11	U	13	U	13	U
Dibromochloromethane	ug/kg	5.9	U	5.6	U	5.7	U	6.7	U	6.4	UJ
Ethylbenzene	ug/kg	5.9	U	5.6	U	5.7	U	6.7	U	6.4	UJ
Methylene chloride	ug/kg	3.8	B	5.1	B	3.6	B	6.7	B	6.2	B
Styrene	ug/kg	5.9	U	5.6	U	5.7	U	6.7	U	6.4	UJ
Tetrachloroethene	ug/kg	5.9	U	5.6	U	5.7	U	6.7	U	6.4	UJ
Toluene	ug/kg	5.9	U	3.4	J	1.4	B	3.9	J	4.1	J
Total xylenes	ug/kg	5.9	U	5.6	U	2.5	J	6.7	U	6.4	UJ
Trichloroethene	ug/kg	5.9	U	5.6	U	5.7	U	6.7	U	6.4	UJ

PLUM BROOK
Soils (Surface and Deep)
Data Summary

Report Date: 02/24/99

Sample Location:		TNTB-SO06		TNTB-SO07		TNTB-SO08		TNTB-SO09		TNTB-SO10	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10550		10560		10570		10580		10590	
Sample Date:		09-NOV-98		10-NOV-98		09-NOV-98		11-NOV-98		10-NOV-98	
Depth:		4 - 5		3 - 4		6 - 8		0 - 1		4 - 6	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	ug/kg	5.7	U	5.5	U	6.1	U	5.9	U	6.0	U
1,1,2,2-Tetrachloroethane	ug/kg	5.7	U	5.5	U	6.1	UJ	5.9	UJ	6.0	UJ
1,1,2-Trichloroethane	ug/kg	5.7	U	5.5	U	6.1	UJ	5.9	UJ	6.0	U
1,1-Dichloroethane	ug/kg	5.7	U	5.5	U	6.1	U	5.9	U	6.0	U
1,1-Dichloroethene	ug/kg	5.7	U	5.5	U	6.1	U	5.9	U	6.0	U
1,2-Dichloroethane	ug/kg	5.7	U	5.5	U	6.1	UJ	5.9	UJ	6.0	U
1,2-Dichloroethene	ug/kg	5.7	U	5.5	U	6.1	UJ	5.9	UJ	6.0	U
1,2-Dichloropropane	ug/kg	5.7	U	5.5	U	6.1	UJ	5.9	UJ	6.0	U
2-Butanone	ug/kg	23	R	22	R	25	R	24	U	24	R
2-Hexanone	ug/kg	23	U	22	U	25	UJ	24	UJ	24	U
4-Methyl-2-pentanone	ug/kg	23	U	22	U	25	UJ	24	UJ	24	U
Acetone	ug/kg	22	J	22	R	11	B	24	U	24	R
Benzene	ug/kg	5.7	U	5.5	U	6.1	UJ	5.9	UJ	6.0	U
Bromodichloromethane	ug/kg	5.7	U	5.5	U	6.1	UJ	5.9	UJ	6.0	U
Bromoform	ug/kg	5.7	U	5.5	U	6.1	UJ	5.9	UJ	6.0	U
Bromomethane	ug/kg	11	U	11	U	12	U	12	U	12	U
Carbon disulfide	ug/kg	5.7	U	5.5	U	6.1	U	5.9	U	6.0	U
Carbon tetrachloride	ug/kg	5.7	U	5.5	U	6.1	UJ	5.9	UJ	6.0	U
Chlorobenzene	ug/kg	5.7	U	5.5	U	6.1	UJ	5.9	UJ	6.0	U
Chloroethane	ug/kg	11	U	11	U	12	U	12	U	12	U
Chloroform	ug/kg	5.7	U	5.5	U	6.1	U	5.9	U	6.0	U
Chloromethane	ug/kg	11	U	11	U	12	U	12	U	12	U
Dibromochloromethane	ug/kg	5.7	U	5.5	U	6.1	UJ	5.9	UJ	6.0	U
Ethylbenzene	ug/kg	5.7	U	5.5	U	6.1	UJ	5.9	UJ	6.0	U
Methylene chloride	ug/kg	3.0	B	2.8	B	5.2	B	3.5	B	3.4	B
Styrene	ug/kg	5.7	U	5.5	U	6.1	UJ	5.9	UJ	6.0	U
Tetrachloroethene	ug/kg	5.7	U	5.5	U	6.1	UJ	5.9	UJ	6.0	U
Toluene	ug/kg	1.8	B	5.5	U	4.5	J	5.9	UJ	2.6	J
Total xylenes	ug/kg	5.7	U	5.5	U	6.1	UJ	5.9	UJ	6.0	U
Trichloroethene	ug/kg	5.7	U	5.5	U	6.1	UJ	5.9	UJ	6.0	U

PLUM BROOK
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Sample Location:		TNTB-SO11		TNTB-SO12		TNTB-SO14		TNTB-SO15		TNTB-SO16	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10600		10610		10630		10640		10650	
Sample Date:		10-NOV-98		10-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		8 - 10		4 - 5		0 - 1		0 - 1		0 - 1	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	ug/kg	6.3	U	6.2	U	6.3	U	6.2	UJ	6.1	U
1,1,2,2-Tetrachloroethane	ug/kg	6.3	UJ	6.2	UJ	6.3	U	6.2	UJ	6.1	UJ
1,1,2-Trichloroethane	ug/kg	6.3	UJ	6.2	U	6.3	U	6.2	UJ	6.1	UJ
1,1-Dichloroethane	ug/kg	6.3	U	6.2	U	6.3	U	6.2	UJ	6.1	U
1,1-Dichloroethene	ug/kg	6.3	U	6.2	U	6.3	U	6.2	UJ	6.1	U
1,2-Dichloroethane	ug/kg	6.3	UJ	6.2	U	6.3	U	6.2	UJ	6.1	UJ
1,2-Dichloroethene	ug/kg	6.3	UJ	6.2	U	6.3	U	6.2	UJ	6.1	UJ
1,2-Dichloropropane	ug/kg	6.3	UJ	6.2	U	6.3	U	6.2	UJ	6.1	UJ
2-Butanone	ug/kg	15	J	25	R	25	U	25	UJ	24	U
2-Hexanone	ug/kg	25	UJ	25	U	25	U	25	UJ	24	UJ
4-Methyl-2-pentanone	ug/kg	25	UJ	25	U	25	U	25	UJ	24	UJ
Acetone	ug/kg	110	J	25	R	25	U	25	R	24	U
Benzene	ug/kg	6.3	UJ	6.2	U	6.3	U	6.2	UJ	6.1	UJ
Bromodichloromethane	ug/kg	6.3	UJ	6.2	U	6.3	U	6.2	UJ	6.1	UJ
Bromoform	ug/kg	6.3	UJ	6.2	U	6.3	U	6.2	UJ	6.1	UJ
Bromomethane	ug/kg	13	U	12	U	13	U	12	UJ	12	U
Carbon disulfide	ug/kg	6.3	U	6.2	U	6.3	U	6.2	UJ	6.1	U
Carbon tetrachloride	ug/kg	6.3	UJ	6.2	U	6.3	U	6.2	UJ	6.1	UJ
Chlorobenzene	ug/kg	6.3	UJ	6.2	U	6.3	U	6.2	UJ	6.1	UJ
Chloroethane	ug/kg	13	U	12	U	13	U	12	UJ	12	U
Chloroform	ug/kg	6.3	U	6.2	U	6.3	U	6.2	UJ	6.1	U
Chloromethane	ug/kg	13	U	12	U	13	U	12	UJ	12	U
Dibromochloromethane	ug/kg	6.3	UJ	6.2	U	6.3	U	6.2	UJ	6.1	UJ
Ethylbenzene	ug/kg	6.3	UJ	6.2	U	6.3	U	6.2	UJ	6.1	UJ
Methylene chloride	ug/kg	6.8	B	6.6	B	2.5	B	3.6	B	3.1	B
Styrene	ug/kg	6.3	UJ	6.2	U	6.3	U	6.2	UJ	6.1	UJ
Tetrachloroethene	ug/kg	6.3	UJ	6.2	U	6.3	U	6.2	UJ	6.1	UJ
Toluene	ug/kg	21	J	3.2	J	6.3	U	6.2	UJ	6.1	UJ
Total xylenes	ug/kg	2.4	J	6.2	U	6.3	U	6.2	UJ	6.1	UJ
Trichloroethene	ug/kg	6.3	UJ	6.2	U	6.3	U	6.2	UJ	6.1	UJ

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Sample Location:		TNTB-SO17		TNTB-SO18		TNTB-SO19		TNTB-SO20		TNTB-SO21	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10660		10670		10680		10690		10700	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ
1,1,2,2-Tetrachloroethane	ug/kg	6.0	UJ	6.6	UJ	6.6	UJ	6.0	UJ	6.1	UJ
1,1,2-Trichloroethane	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ
1,1-Dichloroethane	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ
1,1-Dichloroethene	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ
1,2-Dichloroethane	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ
1,2-Dichloroethene	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ
1,2-Dichloropropane	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ
2-Butanone	ug/kg	24	R	26	UJ	26	UJ	24	U	24	UJ
2-Hexanone	ug/kg	24	U	26	UJ	26	UJ	24	U	24	UJ
4-Methyl-2-pentanone	ug/kg	24	U	26	UJ	26	UJ	24	U	24	UJ
Acetone	ug/kg	24	R	26	UJ	26	UJ	24	U	24	UJ
Benzene	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ
Bromodichloromethane	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ
Bromoform	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ
Bromomethane	ug/kg	12	U	13	UJ	13	UJ	12	U	12	UJ
Carbon disulfide	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ
Carbon tetrachloride	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ
Chlorobenzene	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ
Chloroethane	ug/kg	12	U	13	UJ	13	UJ	12	U	12	UJ
Chloroform	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ
Chloromethane	ug/kg	12	U	13	UJ	13	UJ	12	U	12	UJ
Dibromochloromethane	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ
Ethylbenzene	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ
Methylene chloride	ug/kg	6.1	B	3.9	B	4.2	B	3.2	B	3.8	B
Styrene	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ
Tetrachloroethene	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ
Toluene	ug/kg	6.0	U	2.8	B	6.6	UJ	6.0	U	6.1	UJ
Total xylenes	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ
Trichloroethene	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ

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Sample Location:		TNTB-SO22		TNTB-SO23		TNTB-SO24		TNTB-SO25		TNTB-SO26	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10710		10720		10730		10740		10750	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	ug/kg	6.1	U	5.4	U	5.8	U	6.1	U	6.1	U
1,1,2,2-Tetrachloroethane	ug/kg	6.1	UJ	5.4	U	5.8	UJ	6.1	UJ	6.1	U
1,1,2-Trichloroethane	ug/kg	6.1	U	5.4	U	5.8	U	6.1	UJ	6.1	U
1,1-Dichloroethane	ug/kg	6.1	U	5.4	U	5.8	U	6.1	U	6.1	U
1,1-Dichloroethene	ug/kg	6.1	U	5.4	U	5.8	U	6.1	U	6.1	U
1,2-Dichloroethane	ug/kg	6.1	U	5.4	U	5.8	U	6.1	UJ	6.1	U
1,2-Dichloroethene	ug/kg	6.1	U	5.4	U	5.8	U	6.1	UJ	6.1	U
1,2-Dichloropropane	ug/kg	6.1	U	5.4	U	5.8	U	6.1	UJ	6.1	U
2-Butanone	ug/kg	24	U	22	U	23	U	25	U	24	U
2-Hexanone	ug/kg	24	U	22	U	23	U	25	UJ	24	U
4-Methyl-2-pentanone	ug/kg	24	U	22	U	23	U	25	UJ	24	U
Acetone	ug/kg	24	R	22	R	23	U	25	U	24	U
Benzene	ug/kg	6.1	U	5.4	U	5.8	U	6.1	UJ	6.1	U
Bromodichloromethane	ug/kg	6.1	U	5.4	U	5.8	U	6.1	UJ	6.1	U
Bromoform	ug/kg	6.1	U	5.4	U	5.8	U	6.1	UJ	6.1	U
Bromomethane	ug/kg	12	U	11	U	12	U	12	U	12	U
Carbon disulfide	ug/kg	6.1	U	5.4	U	5.8	U	6.1	U	6.1	U
Carbon tetrachloride	ug/kg	6.1	U	5.4	U	5.8	U	6.1	UJ	6.1	U
Chlorobenzene	ug/kg	6.1	U	5.4	U	5.8	U	6.1	UJ	6.1	U
Chloroethane	ug/kg	12	U	11	U	12	U	12	U	12	U
Chloroform	ug/kg	6.1	U	5.4	U	5.8	U	6.1	U	6.1	U
Chloromethane	ug/kg	12	U	11	U	12	U	12	U	12	U
Dibromochloromethane	ug/kg	6.1	U	5.4	U	5.8	U	6.1	UJ	6.1	U
Ethylbenzene	ug/kg	6.1	U	5.4	U	5.8	U	6.1	UJ	6.1	U
Methylene chloride	ug/kg	3.2	B	3.3	B	5.7	B	4.4	B	3.1	B
Styrene	ug/kg	6.1	U	5.4	U	5.8	U	6.1	UJ	6.1	U
Tetrachloroethene	ug/kg	6.1	U	5.4	U	5.8	U	6.1	UJ	6.1	U
Toluene	ug/kg	6.1	U	5.4	U	1.8	B	2.1	B	6.1	U
Total xylenes	ug/kg	6.1	U	5.4	U	5.8	U	6.1	UJ	6.1	U
Trichloroethene	ug/kg	6.1	U	5.4	U	1.8	J	6.1	UJ	6.1	U

PLUM BROOK
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Sample Location:		TNTB-SO27		TNTB-SO28		TNTB-SO29		TNTB-SO30		TNTB-SO31	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10760		10770		10780		10790		10800	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	ug/kg	6.2	U	6.0	U	6.1	U	6.2	U	6.0	U
1,1,2,2-Tetrachloroethane	ug/kg	6.2	UJ	6.0	U	6.1	UJ	6.2	U	6.0	UJ
1,1,2-Trichloroethane	ug/kg	6.2	U	6.0	U	6.1	UJ	6.2	U	6.0	U
1,1-Dichloroethane	ug/kg	6.2	U	6.0	U	6.1	U	6.2	U	6.0	U
1,1-Dichloroethene	ug/kg	6.2	U	6.0	U	6.1	U	6.2	U	6.0	U
1,2-Dichloroethane	ug/kg	6.2	U	6.0	U	6.1	UJ	6.2	U	6.0	U
1,2-Dichloroethene	ug/kg	6.2	U	6.0	U	6.1	UJ	6.2	U	6.0	U
1,2-Dichloropropane	ug/kg	6.2	U	6.0	U	6.1	UJ	6.2	U	6.0	U
2-Butanone	ug/kg	25	U	24	U	24	U	25	U	24	R
2-Hexanone	ug/kg	25	U	24	U	24	UJ	25	U	24	U
4-Methyl-2-pentanone	ug/kg	25	U	24	U	24	UJ	25	U	24	U
Acetone	ug/kg	25	U	24	U	24	U	25	U	24	R
Benzene	ug/kg	6.2	U	6.0	U	6.1	UJ	6.2	U	6.0	U
Bromodichloromethane	ug/kg	6.2	U	6.0	U	6.1	UJ	6.2	U	6.0	U
Bromoform	ug/kg	6.2	U	6.0	U	6.1	UJ	6.2	U	6.0	U
Bromomethane	ug/kg	12	U	12	U	12	U	12	U	12	U
Carbon disulfide	ug/kg	6.2	U	6.0	U	6.1	U	6.2	U	6.0	U
Carbon tetrachloride	ug/kg	6.2	U	6.0	U	6.1	UJ	6.2	U	6.0	U
Chlorobenzene	ug/kg	6.2	U	6.0	U	6.1	UJ	6.2	U	6.0	U
Chloroethane	ug/kg	12	U	12	U	12	U	12	U	12	U
Chloroform	ug/kg	6.2	U	6.0	U	6.1	U	6.2	U	6.0	U
Chloromethane	ug/kg	12	U	12	U	12	U	12	U	12	U
Dibromochloromethane	ug/kg	6.2	U	6.0	U	6.1	UJ	6.2	U	6.0	U
Ethylbenzene	ug/kg	6.2	U	6.0	U	6.1	UJ	6.2	U	6.0	U
Methylene chloride	ug/kg	3.7	B	3.1	B	4.1	B	3.2	B	4.9	B
Styrene	ug/kg	6.2	U	6.0	U	6.1	UJ	6.2	U	6.0	U
Tetrachloroethene	ug/kg	6.2	U	6.0	U	6.1	UJ	6.2	U	6.0	U
Toluene	ug/kg	6.2	U	6.0	U	6.1	UJ	6.2	U	6.0	U
Total xylenes	ug/kg	6.2	U	6.0	U	6.1	UJ	6.2	U	6.0	U
Trichloroethene	ug/kg	6.2	U	6.0	U	6.1	UJ	6.2	U	6.0	U

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Sample Location:		TNTB-SO32		TNTB-SO33		TNTB-SO34		TNTB-SO35		TNTB-SO36	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10810		10820		10830		10840		10850	
Sample Date:		12-NOV-98		12-NOV-98		12-NOV-98		11-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	ug/kg	5.9	UJ	5.5	U	5.6	U	6.0	U	6.0	U
1,1,2,2-Tetrachloroethane	ug/kg	5.9	UJ	5.5	U	5.6	U	6.0	UJ	6.0	UJ
1,1,2-Trichloroethane	ug/kg	5.9	UJ	5.5	U	5.6	U	6.0	U	6.0	UJ
1,1-Dichloroethane	ug/kg	5.9	UJ	5.5	U	5.6	U	6.0	U	6.0	U
1,1-Dichloroethene	ug/kg	5.9	UJ	5.5	U	5.6	U	6.0	U	6.0	U
1,2-Dichloroethane	ug/kg	5.9	UJ	5.5	U	5.6	U	6.0	U	6.0	UJ
1,2-Dichloroethene	ug/kg	5.9	UJ	5.5	U	5.6	U	6.0	U	6.0	UJ
1,2-Dichloropropane	ug/kg	5.9	UJ	5.5	U	5.6	U	6.0	U	6.0	UJ
2-Butanone	ug/kg	23	UJ	22	U	22	U	24	U	24	U
2-Hexanone	ug/kg	23	UJ	22	U	22	U	24	U	24	UJ
4-Methyl-2-pentanone	ug/kg	23	UJ	22	U	22	U	24	U	24	UJ
Acetone	ug/kg	17	B	22	R	22	R	24	R	24	R
Benzene	ug/kg	5.9	UJ	5.5	U	5.6	U	6.0	U	6.0	UJ
Bromodichloromethane	ug/kg	5.9	UJ	5.5	U	5.6	U	6.0	U	6.0	UJ
Bromoform	ug/kg	5.9	UJ	5.5	U	5.6	U	6.0	U	6.0	UJ
Bromomethane	ug/kg	12	UJ	11	U	11	U	12	U	12	U
Carbon disulfide	ug/kg	2.2	J	5.5	U	5.6	U	6.0	U	6.0	U
Carbon tetrachloride	ug/kg	5.9	UJ	5.5	U	5.6	U	6.0	U	6.0	UJ
Chlorobenzene	ug/kg	5.9	UJ	5.5	U	5.6	U	6.0	U	6.0	UJ
Chloroethane	ug/kg	12	UJ	11	U	11	U	12	U	12	U
Chloroform	ug/kg	5.9	UJ	5.5	U	5.6	U	6.0	U	6.0	U
Chloromethane	ug/kg	12	UJ	11	U	11	U	12	U	12	U
Dibromochloromethane	ug/kg	5.9	UJ	5.5	U	5.6	U	6.0	U	6.0	UJ
Ethylbenzene	ug/kg	1.7	J	5.5	U	5.6	U	6.0	U	6.0	UJ
Methylene chloride	ug/kg	4.7	B	2.3	B	2.2	B	3.3	B	2.8	B
Styrene	ug/kg	5.9	UJ	5.5	U	5.6	U	6.0	U	6.0	UJ
Tetrachloroethene	ug/kg	5.9	UJ	5.5	U	5.6	U	6.0	U	6.0	UJ
Toluene	ug/kg	11	J	5.5	U	5.6	U	6.0	U	6.0	UJ
Total xylenes	ug/kg	8.4	J	5.5	U	5.6	U	6.0	U	6.0	UJ
Trichloroethene	ug/kg	5.9	UJ	5.5	U	5.6	U	6.0	U	6.0	UJ

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Sample Location:		TNTB-SO37		TNTB-SO38		TNTB-SO39		TNTB-SO40	
Associated Site:		TNTB		TNTB		TNTB		TNTB	
Sample No:		10860		10870		10880		10890	
Sample Date:		12-NOV-98		12-NOV-98		12-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	U
1,1,2,2-Tetrachloroethane	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	UJ
1,1,2-Trichloroethane	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	UJ
1,1-Dichloroethane	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	U
1,1-Dichloroethene	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	U
1,2-Dichloroethane	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	UJ
1,2-Dichloroethene	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	UJ
1,2-Dichloropropane	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	UJ
2-Butanone	ug/kg	25	UJ	24	UJ	23	UJ	24	U
2-Hexanone	ug/kg	25	UJ	24	UJ	23	UJ	24	UJ
4-Methyl-2-pentanone	ug/kg	25	UJ	24	UJ	23	UJ	24	UJ
Acetone	ug/kg	25	R	24	R	23	R	10	J
Benzene	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	UJ
Bromodichloromethane	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	UJ
Bromoform	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	UJ
Bromomethane	ug/kg	12	UJ	12	UJ	12	UJ	12	U
Carbon disulfide	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	U
Carbon tetrachloride	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	UJ
Chlorobenzene	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	UJ
Chloroethane	ug/kg	12	UJ	12	UJ	12	UJ	12	U
Chloroform	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	U
Chloromethane	ug/kg	12	UJ	12	UJ	12	UJ	12	U
Dibromochloromethane	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	UJ
Ethylbenzene	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	UJ
Methylene chloride	ug/kg	3.6	B	3.7	B	2.6	B	2.7	B
Styrene	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	UJ
Tetrachloroethene	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	UJ
Toluene	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	UJ
Total xylenes	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	UJ
Trichloroethene	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	UJ

PLUM BROOK
Soils (Surface and Deep)
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Sample Location:		TNTB-SO01		TNTB-SO02		TNTB-SO03		TNTB-SO04		TNTB-SO05	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10500		10510		10520		10530		10540	
Sample Date:		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98	
Depth:		.5 - 2		3.5 - 4		3 - 4		5 - 6		2.5 - 3.5	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl chloride	ug/kg	12	U	11	U	11	U	13	U	13	U
cis-1,3-Dichloropropene	ug/kg	5.9	U	5.6	U	5.7	U	6.7	U	6.4	UJ
trans-1,3-Dichloropropene	ug/kg	5.9	U	5.6	U	5.7	U	6.7	U	6.4	UJ

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Soils (Surface and Deep)

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Sample Location:		TNTB-SO06		TNTB-SO07		TNTB-SO08		TNTB-SO09		TNTB-SO10	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10550		10560		10570		10580		10590	
Sample Date:		09-NOV-98		10-NOV-98		09-NOV-98		11-NOV-98		10-NOV-98	
Depth:		4 - 5		3 - 4		6 - 8		0 - 1		4 - 6	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl chloride	ug/kg	11	U	11	U	12	U	12	U	12	U
cis-1,3-Dichloropropene	ug/kg	5.7	U	5.5	U	6.1	UJ	5.9	UJ	6.0	U
trans-1,3-Dichloropropene	ug/kg	5.7	U	5.5	U	6.1	UJ	5.9	UJ	6.0	U

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Soils (Surface and Deep)

Data Summary

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Sample Location:		TNTB-SO11		TNTB-SO12		TNTB-SO14		TNTB-SO15		TNTB-SO16	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10600		10610		10630		10640		10650	
Sample Date:		10-NOV-98		10-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		8 - 10		4 - 5		0 - 1		0 - 1		0 - 1	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl chloride	ug/kg	13	U	12	U	13	U	12	UJ	12	U
cis-1,3-Dichloropropene	ug/kg	6.3	UJ	6.2	U	6.3	U	6.2	UJ	6.1	UJ
trans-1,3-Dichloropropene	ug/kg	6.3	UJ	6.2	U	6.3	U	6.2	UJ	6.1	UJ

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Sample Location:		TNTB-SO17		TNTB-SO18		TNTB-SO19		TNTB-SO20		TNTB-SO21	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10660		10670		10680		10690		10700	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl chloride	ug/kg	12	U	13	UJ	13	UJ	12	U	12	UJ
cis-1,3-Dichloropropene	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ
trans-1,3-Dichloropropene	ug/kg	6.0	U	6.6	UJ	6.6	UJ	6.0	U	6.1	UJ

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Soils (Surface and Deep)

Data Summary

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Sample Location:		TNTB-SO22		TNTB-SO23		TNTB-SO24		TNTB-SO25		TNTB-SO26	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10710		10720		10730		10740		10750	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl chloride	ug/kg	12	U	11	U	12	U	12	U	12	U
cis-1,3-Dichloropropene	ug/kg	6.1	U	5.4	U	5.8	U	6.1	UJ	6.1	U
trans-1,3-Dichloropropene	ug/kg	6.1	U	5.4	U	5.8	U	6.1	UJ	6.1	U

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Sample Location:		TNTB-SO27		TNTB-SO28		TNTB-SO29		TNTB-SO30		TNTB-SO31	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10760		10770		10780		10790		10800	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl chloride	ug/kg	12	U	12	U	12	U	12	U	12	U
cis-1,3-Dichloropropene	ug/kg	6.2	U	6.0	U	6.1	UJ	6.2	U	6.0	U
trans-1,3-Dichloropropene	ug/kg	6.2	U	6.0	U	6.1	UJ	6.2	U	6.0	U

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Data Summary

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Sample Location:		TNTB-SO32		TNTB-SO33		TNTB-SO34		TNTB-SO35		TNTB-SO36	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10810		10820		10830		10840		10850	
Sample Date:		12-NOV-98		12-NOV-98		12-NOV-98		11-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl chloride	ug/kg	12	UJ	11	U	11	U	12	U	12	U
cis-1,3-Dichloropropene	ug/kg	5.9	UJ	5.5	U	5.6	U	6.0	U	6.0	UJ
trans-1,3-Dichloropropene	ug/kg	5.9	UJ	5.5	U	5.6	U	6.0	U	6.0	UJ

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Soils (Surface and Deep)

Data Summary

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Sample Location:		TNTB-SO37		TNTB-SO38		TNTB-SO39		TNTB-SO40	
Associated Site:		TNTB		TNTB		TNTB		TNTB	
Sample No:		10860		10870		10880		10890	
Sample Date:		12-NOV-98		12-NOV-98		12-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl chloride	ug/kg	12	UJ	12	UJ	12	UJ	12	U
cis-1,3-Dichloropropene	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	UJ
trans-1,3-Dichloropropene	ug/kg	6.2	UJ	6.1	UJ	5.8	UJ	5.9	UJ

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Soils (Surface and Deep)
Data Summary

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Sample Location:		TNTB-SO01		TNTB-SO02		TNTB-SO03		TNTB-SO04		TNTB-SO05	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10500		10510		10520		10530		10540	
Sample Date:		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98	
Depth:		.5 - 2		3.5 - 4		3 - 4		5 - 6		2.5 - 3.5	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	ug/kg	390	U	370	U	380	U	440	U	420	U
1,2-Dichlorobenzene	ug/kg	390	U	370	U	380	U	440	U	420	U
1,3-Dichlorobenzene	ug/kg	390	U	370	U	380	U	440	U	420	U
1,4-Dichlorobenzene	ug/kg	390	U	370	U	380	U	440	U	420	U
2,4,5-Trichlorophenol	ug/kg	390	U	370	U	380	U	440	U	420	U
2,4,6-Trichlorophenol	ug/kg	390	U	370	U	380	U	440	U	420	U
2,4-Dichlorophenol	ug/kg	390	U	370	U	380	U	440	U	420	U
2,4-Dimethylphenol	ug/kg	390	U	370	U	380	U	440	U	420	U
2,4-Dinitrophenol	ug/kg	1900	U	1800	U	1800	U	2100	U	2000	U
2,4-Dinitrotoluene	ug/kg	390	U	660		13000	D	280	J	420	U
2,6-Dinitrotoluene	ug/kg	390	U	150	J	3000		440	U	420	U
2-Chloronaphthalene	ug/kg	390	U	370	U	380	U	440	U	420	U
2-Chlorophenol	ug/kg	390	U	370	U	380	U	440	U	420	U
2-Methylnaphthalene	ug/kg	390	U	120	J	960		440	U	420	U
2-Methylphenol	ug/kg	390	U	370	U	380	U	440	U	420	U
2-Nitroaniline	ug/kg	1900	U	1800	U	1800	U	2100	U	2000	U
2-Nitrophenol	ug/kg	390	U	370	U	380	U	440	U	420	U
3,3'-Dichlorobenzidine	ug/kg	1900	U	1800	U	1800	U	2100	U	2000	U
3-Nitroaniline	ug/kg	1900	U	1800	U	1800	U	2100	U	2000	U
4,6-Dinitro-2-methylphenol	ug/kg	1900	U	1800	U	1800	U	2100	U	2000	U
4-Bromophenyl phenyl ether	ug/kg	390	U	370	U	380	U	440	U	420	U
4-Chloro-3-methylphenol	ug/kg	390	U	370	U	380	U	440	U	420	U
4-Chloroaniline	ug/kg	390	U	370	U	380	U	440	U	420	U
4-Chlorophenyl phenyl ether	ug/kg	390	U	370	U	380	U	440	U	420	U
4-Methylphenol	ug/kg	390	U	370	U	380	U	440	U	420	U
4-Nitroaniline	ug/kg	1900	U	1800	U	1800	U	2100	U	2000	U
4-Nitrophenol	ug/kg	1900	U	1800	U	1800	U	2100	U	2000	U
Acenaphthene	ug/kg	390	U	370	U	380	U	440	U	420	U
Acenaphthylene	ug/kg	390	U	370	U	380	U	440	U	420	U
Anthracene	ug/kg	390	U	370	U	380	U	440	U	420	U

PLUM BROOK
Soils (Surface and Deep)
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Sample Location:		TNTB-SO06		TNTB-SO07		TNTB-SO08		TNTB-SO09		TNTB-SO10	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10550		10560		10570		10580		10590	
Sample Date:		09-NOV-98		10-NOV-98		09-NOV-98		11-NOV-98		10-NOV-98	
Depth:		4 - 5		3 - 4		6 - 8		0 - 1		4 - 6	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	ug/kg	380	U	360	U	400	U	390	U	390	U
1,2-Dichlorobenzene	ug/kg	380	U	360	U	400	U	390	U	390	U
1,3-Dichlorobenzene	ug/kg	380	U	360	U	400	U	390	U	390	U
1,4-Dichlorobenzene	ug/kg	380	U	360	U	400	U	390	U	390	U
2,4,5-Trichlorophenol	ug/kg	380	U	360	U	400	U	390	U	390	U
2,4,6-Trichlorophenol	ug/kg	380	U	360	U	400	U	390	U	390	U
2,4-Dichlorophenol	ug/kg	380	U	360	U	400	U	390	U	390	U
2,4-Dimethylphenol	ug/kg	380	U	360	U	400	U	390	U	390	U
2,4-Dinitrophenol	ug/kg	1800	U	1800	U	2000	U	1900	U	1900	U
2,4-Dinitrotoluene	ug/kg	3600		430		3200		150	J	44	J
2,6-Dinitrotoluene	ug/kg	2400		150	J	490		46	J	390	U
2-Chloronaphthalene	ug/kg	380	U	360	U	400	U	390	U	390	U
2-Chlorophenol	ug/kg	380	U	360	U	400	U	390	U	390	U
2-Methylnaphthalene	ug/kg	380	U	360	U	400	U	390	U	390	U
2-Methylphenol	ug/kg	380	U	360	U	400	U	390	U	390	U
2-Nitroaniline	ug/kg	1800	U	1800	U	2000	U	1900	U	1900	U
2-Nitrophenol	ug/kg	380	U	360	U	400	U	390	U	390	U
3,3'-Dichlorobenzidine	ug/kg	1800	U	1800	U	2000	U	1900	U	1900	U
3-Nitroaniline	ug/kg	1800	U	1800	U	2000	U	1900	U	1900	U
4,6-Dinitro-2-methylphenol	ug/kg	170	J	1800	U	2000	U	1900	U	1900	U
4-Bromophenyl phenyl ether	ug/kg	380	U	360	U	400	U	390	U	390	U
4-Chloro-3-methylphenol	ug/kg	380	U	360	U	400	U	390	U	390	U
4-Chloroaniline	ug/kg	380	U	360	U	400	U	390	U	390	U
4-Chlorophenyl phenyl ether	ug/kg	380	U	360	U	400	U	390	U	390	U
4-Methylphenol	ug/kg	380	U	360	U	400	U	390	U	390	U
4-Nitroaniline	ug/kg	1800	U	1800	U	2000	U	1900	U	1900	U
4-Nitrophenol	ug/kg	1800	U	1800	U	2000	U	1900	U	1900	U
Acenaphthene	ug/kg	380	U	360	U	400	U	390	U	390	U
Acenaphthylene	ug/kg	380	U	360	U	400	U	390	U	390	U
Anthracene	ug/kg	380	U	360	U	400	U	390	U	390	U

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Sample Location:		TNTB-SO11		TNTB-SO12		TNTB-SO14		TNTB-SO15		TNTB-SO16	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10600		10610		10630		10640		10650	
Sample Date:		10-NOV-98		10-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		8 - 10		4 - 5		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	ug/kg	420	U	410	U	410	U	410	U	400	U
1,2-Dichlorobenzene	ug/kg	420	U	410	U	410	U	410	U	400	U
1,3-Dichlorobenzene	ug/kg	420	U	410	U	410	U	410	U	400	U
1,4-Dichlorobenzene	ug/kg	420	U	410	U	410	U	410	U	400	U
2,4,5-Trichlorophenol	ug/kg	420	U	410	U	410	U	410	U	400	U
2,4,6-Trichlorophenol	ug/kg	420	U	410	U	410	U	410	U	400	U
2,4-Dichlorophenol	ug/kg	420	U	410	U	410	U	410	U	400	U
2,4-Dimethylphenol	ug/kg	420	U	410	U	410	U	410	U	400	U
2,4-Dinitrophenol	ug/kg	2000	U	2000	U	2000	U	2000	U	1900	U
2,4-Dinitrotoluene	ug/kg	110000	D	4400		490		190	J	160	J
2,6-Dinitrotoluene	ug/kg	68000	D	620		65	J	93	J	72	J
2-Chloronaphthalene	ug/kg	420	U	410	U	410	U	410	U	400	U
2-Chlorophenol	ug/kg	420	U	410	U	410	U	410	U	400	U
2-Methylnaphthalene	ug/kg	420	U	410	U	410	U	410	U	400	U
2-Methylphenol	ug/kg	420	U	410	U	410	U	410	U	400	U
2-Nitroaniline	ug/kg	2000	U	2000	U	2000	U	2000	U	1900	U
2-Nitrophenol	ug/kg	420	U	410	U	410	U	410	U	400	U
3,3'-Dichlorobenzidine	ug/kg	2000	U	2000	U	2000	U	2000	U	1900	U
3-Nitroaniline	ug/kg	2000	U	2000	U	2000	U	2000	U	1900	U
4,6-Dinitro-2-methylphenol	ug/kg	2000	U	2000	U	2000	U	2000	U	1900	U
4-Bromophenyl phenyl ether	ug/kg	420	U	410	U	410	U	410	U	400	U
4-Chloro-3-methylphenol	ug/kg	420	U	410	U	410	U	410	U	400	U
4-Chloroaniline	ug/kg	420	U	410	U	410	U	410	U	400	U
4-Chlorophenyl phenyl ether	ug/kg	420	U	410	U	410	U	410	U	400	U
4-Methylphenol	ug/kg	420	U	410	U	410	U	410	U	400	U
4-Nitroaniline	ug/kg	2000	U	2000	U	2000	U	2000	U	1900	U
4-Nitrophenol	ug/kg	2000	U	2000	U	2000	U	2000	U	1900	U
Acenaphthene	ug/kg	420	U	410	U	410	U	410	U	400	U
Acenaphthylene	ug/kg	420	U	410	U	410	U	410	U	75	J
Anthracene	ug/kg	420	U	410	U	410	U	29	J	58	J

Sample Location:		TNTB-SO17		TNTB-SO18		TNTB-SO19		TNTB-SO20		TNTB-SO21	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10660		10670		10680		10690		10700	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	ug/kg	400	U	430	U	440	U	400	U	400	U
1,2-Dichlorobenzene	ug/kg	400	U	430	U	440	U	400	U	400	U
1,3-Dichlorobenzene	ug/kg	400	U	430	U	440	U	400	U	400	U
1,4-Dichlorobenzene	ug/kg	400	U	430	U	440	U	400	U	400	U
2,4,5-Trichlorophenol	ug/kg	400	U	430	U	440	U	400	U	400	U
2,4,6-Trichlorophenol	ug/kg	400	U	430	U	440	U	400	U	400	U
2,4-Dichlorophenol	ug/kg	400	U	430	U	440	U	400	U	400	U
2,4-Dimethylphenol	ug/kg	400	U	430	U	440	U	400	U	400	U
2,4-Dinitrophenol	ug/kg	1900	U	2100	U	2100	U	1900	U	2000	U
2,4-Dinitrotoluene	ug/kg	180	J	59	J	440	U	100	J	82	J
2,6-Dinitrotoluene	ug/kg	81	J	430	U	440	U	400	U	400	U
2-Chloronaphthalene	ug/kg	400	U	430	U	440	U	400	U	400	U
2-Chlorophenol	ug/kg	400	U	430	U	440	U	400	U	400	U
2-Methylnaphthalene	ug/kg	400	U	430	U	440	U	400	U	400	U
2-Methylphenol	ug/kg	400	U	430	U	440	U	400	U	400	U
2-Nitroaniline	ug/kg	1900	U	2100	U	2100	U	1900	U	2000	U
2-Nitrophenol	ug/kg	400	U	430	U	440	U	400	U	400	U
3,3'-Dichlorobenzidine	ug/kg	1900	U	2100	U	2100	U	1900	U	2000	U
3-Nitroaniline	ug/kg	1900	U	2100	U	2100	U	1900	U	2000	U
4,6-Dinitro-2-methylphenol	ug/kg	1900	U	2100	U	2100	U	1900	U	2000	U
4-Bromophenyl phenyl ether	ug/kg	400	U	430	U	440	U	400	U	400	U
4-Chloro-3-methylphenol	ug/kg	400	U	430	U	440	U	400	U	400	U
4-Chloroaniline	ug/kg	400	U	430	U	440	U	400	U	400	U
4-Chlorophenyl phenyl ether	ug/kg	400	U	430	U	440	U	400	U	400	U
4-Methylphenol	ug/kg	400	U	430	U	440	U	400	U	400	U
4-Nitroaniline	ug/kg	1900	U	2100	U	2100	U	1900	U	2000	U
4-Nitrophenol	ug/kg	1900	U	2100	U	2100	U	1900	U	2000	U
Acenaphthene	ug/kg	400	U	430	U	440	U	400	U	400	U
Acenaphthylene	ug/kg	400	U	430	U	440	U	400	U	400	U
Anthracene	ug/kg	32	J	430	U	440	U	400	U	400	U

PLUM BROOK
Soils (Surface and Deep)
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Sample Location:		TNTB-SO22		TNTB-SO23		TNTB-SO24		TNTB-SO25		TNTB-SO26	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10710		10720		10730		10740		10750	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	ug/kg	400	U	360	U	390	U	400	U	400	U
1,2-Dichlorobenzene	ug/kg	400	U	360	U	390	U	400	U	400	U
1,3-Dichlorobenzene	ug/kg	400	U	360	U	390	U	400	U	400	U
1,4-Dichlorobenzene	ug/kg	400	U	360	U	390	U	400	U	400	U
2,4,5-Trichlorophenol	ug/kg	400	U	360	U	390	U	400	U	400	U
2,4,6-Trichlorophenol	ug/kg	400	U	360	U	390	U	400	U	400	U
2,4-Dichlorophenol	ug/kg	400	U	360	U	390	U	400	U	400	U
2,4-Dimethylphenol	ug/kg	400	U	360	U	390	U	400	U	400	U
2,4-Dinitrophenol	ug/kg	2000	U	1700	U	1900	U	2000	U	1900	U
2,4-Dinitrotoluene	ug/kg	410		360	U	230	J	400	U	400	U
2,6-Dinitrotoluene	ug/kg	44	J	360	U	110	J	400	U	400	U
2-Chloronaphthalene	ug/kg	400	U	360	U	390	U	400	U	400	U
2-Chlorophenol	ug/kg	400	U	360	U	390	U	400	U	400	U
2-Methylnaphthalene	ug/kg	400	U	360	U	53	J	400	U	400	U
2-Methylphenol	ug/kg	400	U	360	U	390	U	400	U	400	U
2-Nitroaniline	ug/kg	2000	U	1700	U	1900	U	2000	U	1900	U
2-Nitrophenol	ug/kg	400	U	360	U	390	U	400	U	400	U
3,3'-Dichlorobenzidine	ug/kg	2000	U	1700	U	1900	U	2000	U	1900	U
3-Nitroaniline	ug/kg	2000	U	1700	U	1900	U	2000	U	1900	U
4,6-Dinitro-2-methylphenol	ug/kg	2000	U	1700	U	1900	U	2000	U	1900	U
4-Bromophenyl phenyl ether	ug/kg	400	U	360	U	390	U	400	U	400	U
4-Chloro-3-methylphenol	ug/kg	400	U	360	U	390	U	400	U	400	U
4-Chloroaniline	ug/kg	400	U	360	U	390	U	400	U	400	U
4-Chlorophenyl phenyl ether	ug/kg	400	U	360	U	390	U	400	U	400	U
4-Methylphenol	ug/kg	400	U	360	U	390	U	400	U	400	U
4-Nitroaniline	ug/kg	2000	U	1700	U	1900	U	2000	U	1900	U
4-Nitrophenol	ug/kg	2000	U	1700	U	1900	U	2000	U	1900	U
Acenaphthene	ug/kg	400	U	360	U	390	U	400	U	400	U
Acenaphthylene	ug/kg	400	U	360	U	390	U	400	U	400	U
Anthracene	ug/kg	400	U	360	U	390	U	400	U	400	U

Sample Location:		TNTB-SO27		TNTB-SO28		TNTB-SO29		TNTB-SO30		TNTB-SO31	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10760		10770		10780		10790		10800	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	ug/kg	410	U	2000	U	400	U	410	U	390	U
1,2-Dichlorobenzene	ug/kg	410	U	2000	U	400	U	410	U	390	U
1,3-Dichlorobenzene	ug/kg	410	U	2000	U	400	U	410	U	390	U
1,4-Dichlorobenzene	ug/kg	410	U	2000	U	400	U	410	U	390	U
2,4,5-Trichlorophenol	ug/kg	410	U	2000	U	400	U	410	U	390	U
2,4,6-Trichlorophenol	ug/kg	410	U	2000	U	400	U	410	U	390	U
2,4-Dichlorophenol	ug/kg	410	U	2000	U	400	U	410	U	390	U
2,4-Dimethylphenol	ug/kg	410	U	2000	U	400	U	410	U	390	U
2,4-Dinitrophenol	ug/kg	2000	U	9600	U	1900	U	2000	U	1900	U
2,4-Dinitrotoluene	ug/kg	400	J	2000	U	79	J	410	U	110	J
2,6-Dinitrotoluene	ug/kg	100	J	2000	U	400	U	410	U	390	U
2-Chloronaphthalene	ug/kg	410	U	2000	U	400	U	410	U	390	U
2-Chlorophenol	ug/kg	410	U	2000	U	400	U	410	U	390	U
2-Methylnaphthalene	ug/kg	100	J	2000	U	400	U	410	U	68	J
2-Methylphenol	ug/kg	410	U	2000	U	400	U	410	U	390	U
2-Nitroaniline	ug/kg	2000	U	9600	U	1900	U	2000	U	1900	U
2-Nitrophenol	ug/kg	410	U	2000	U	400	U	410	U	390	U
3,3'-Dichlorobenzidine	ug/kg	2000	U	9600	U	1900	U	2000	U	1900	U
3-Nitroaniline	ug/kg	2000	U	9600	U	1900	U	2000	U	1900	U
4,6-Dinitro-2-methylphenol	ug/kg	62	J	9600	U	1900	U	2000	U	1900	U
4-Bromophenyl phenyl ether	ug/kg	410	U	2000	U	400	U	410	U	390	U
4-Chloro-3-methylphenol	ug/kg	410	U	2000	U	400	U	410	U	390	U
4-Chloroaniline	ug/kg	410	U	2000	U	400	U	410	U	390	U
4-Chlorophenyl phenyl ether	ug/kg	410	U	2000	U	400	U	410	U	390	U
4-Methylphenol	ug/kg	410	U	2000	U	400	U	410	U	390	U
4-Nitroaniline	ug/kg	2000	U	9600	U	1900	U	2000	U	1900	U
4-Nitrophenol	ug/kg	2000	U	9600	U	1900	U	2000	U	1900	U
Acenaphthene	ug/kg	410	U	2000	U	400	U	410	U	390	U
Acenaphthylene	ug/kg	410	U	2000	U	400	U	410	U	390	U
Anthracene	ug/kg	410	U	2000	U	400	U	410	U	27	J

Sample Location:		TNTB-SO32		TNTB-SO33		TNTB-SO34		TNTB-SO35		TNTB-SO36	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10810		10820		10830		10840		10850	
Sample Date:		12-NOV-98		12-NOV-98		12-NOV-98		11-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	ug/kg	390	U	360	U	370	U	400	U	390	U
1,2-Dichlorobenzene	ug/kg	390	U	360	U	370	U	400	U	390	U
1,3-Dichlorobenzene	ug/kg	390	U	360	U	370	U	400	U	390	U
1,4-Dichlorobenzene	ug/kg	390	U	360	U	370	U	400	U	390	U
2,4,5-Trichlorophenol	ug/kg	390	U	360	U	370	U	400	U	390	U
2,4,6-Trichlorophenol	ug/kg	390	U	360	U	370	U	400	U	390	U
2,4-Dichlorophenol	ug/kg	390	U	360	U	370	U	400	U	390	U
2,4-Dimethylphenol	ug/kg	390	U	360	U	370	U	400	U	390	U
2,4-Dinitrophenol	ug/kg	1900	U	1800	U	1800	U	1900	U	1900	U
2,4-Dinitrotoluene	ug/kg	170	J	360	U	370	U	400	U	57	J
2,6-Dinitrotoluene	ug/kg	390	U	360	U	370	U	400	U	390	U
2-Chloronaphthalene	ug/kg	390	U	360	U	370	U	400	U	390	U
2-Chlorophenol	ug/kg	390	U	360	U	370	U	400	U	390	U
2-Methylnaphthalene	ug/kg	170	J	360	U	370	U	400	U	61	J
2-Methylphenol	ug/kg	390	U	360	U	370	U	400	U	390	U
2-Nitroaniline	ug/kg	1900	U	1800	U	1800	U	1900	U	1900	U
2-Nitrophenol	ug/kg	390	U	360	U	370	U	400	U	390	U
3,3'-Dichlorobenzidine	ug/kg	1900	U	1800	U	1800	U	1900	U	1900	U
3-Nitroaniline	ug/kg	1900	U	1800	U	1800	U	1900	U	1900	U
4,6-Dinitro-2-methylphenol	ug/kg	1900	U	1800	U	1800	U	1900	U	1900	U
4-Bromophenyl phenyl ether	ug/kg	390	U	360	U	370	U	400	U	390	U
4-Chloro-3-methylphenol	ug/kg	390	U	360	U	370	U	400	U	390	U
4-Chloroaniline	ug/kg	390	U	360	U	370	U	400	U	390	U
4-Chlorophenyl phenyl ether	ug/kg	390	U	360	U	370	U	400	U	390	U
4-Methylphenol	ug/kg	390	U	360	U	370	U	400	U	390	U
4-Nitroaniline	ug/kg	1900	U	1800	U	1800	U	1900	U	1900	U
4-Nitrophenol	ug/kg	1900	U	1800	U	1800	U	1900	U	1900	U
Acenaphthene	ug/kg	93	J	360	U	370	U	400	U	68	J
Acenaphthylene	ug/kg	300	J	360	U	370	U	400	U	380	J
Anthracene	ug/kg	920		360	U	370	U	400	U	560	

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Sample Location:		TNTB-SO37		TNTB-SO38		TNTB-SO39		TNTB-SO40	
Associated Site:		TNTB		TNTB		TNTB		TNTB	
Sample No:		10860		10870		10880		10890	
Sample Date:		12-NOV-98		12-NOV-98		12-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	ug/kg	410	U	400	U	380	U	390	U
1,2-Dichlorobenzene	ug/kg	410	U	400	U	380	U	390	U
1,3-Dichlorobenzene	ug/kg	410	U	400	U	380	U	390	U
1,4-Dichlorobenzene	ug/kg	410	U	400	U	380	U	390	U
2,4,5-Trichlorophenol	ug/kg	410	U	400	U	380	U	390	U
2,4,6-Trichlorophenol	ug/kg	410	U	400	U	380	U	390	U
2,4-Dichlorophenol	ug/kg	410	U	400	U	380	U	390	U
2,4-Dimethylphenol	ug/kg	410	U	400	U	380	U	390	U
2,4-Dinitrophenol	ug/kg	2000	U	1900	U	1800	U	1900	U
2,4-Dinitrotoluene	ug/kg	530		83	J	380	U	54	J
2,6-Dinitrotoluene	ug/kg	160	J	400	U	380	U	390	U
2-Chloronaphthalene	ug/kg	410	U	400	U	380	U	390	U
2-Chlorophenol	ug/kg	410	U	400	U	380	U	390	U
2-Methylnaphthalene	ug/kg	410	U	54	J	380	U	390	U
2-Methylphenol	ug/kg	410	U	400	U	380	U	390	U
2-Nitroaniline	ug/kg	2000	U	1900	U	1800	U	1900	U
2-Nitrophenol	ug/kg	410	U	400	U	380	U	390	U
3,3'-Dichlorobenzidine	ug/kg	2000	U	1900	U	1800	U	1900	U
3-Nitroaniline	ug/kg	2000	U	1900	U	1800	U	1900	U
4,6-Dinitro-2-methylphenol	ug/kg	2000	U	1900	U	1800	U	1900	U
4-Bromophenyl phenyl ether	ug/kg	410	U	400	U	380	U	390	U
4-Chloro-3-methylphenol	ug/kg	410	U	400	U	380	U	390	U
4-Chloroaniline	ug/kg	410	U	400	U	380	U	390	U
4-Chlorophenyl phenyl ether	ug/kg	410	U	400	U	380	U	390	U
4-Methylphenol	ug/kg	410	U	400	U	380	U	390	U
4-Nitroaniline	ug/kg	2000	U	1900	U	1800	U	1900	U
4-Nitrophenol	ug/kg	2000	U	1900	U	1800	U	1900	U
Acenaphthene	ug/kg	410	U	400	U	380	U	390	U
Acenaphthylene	ug/kg	410	U	400	U	380	U	390	U
Anthracene	ug/kg	410	U	400	U	380	U	390	U

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Sample Location:		TNTB-SO01		TNTB-SO02		TNTB-SO03		TNTB-SO04		TNTB-SO05	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10500		10510		10520		10530		10540	
Sample Date:		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98	
Depth:		.5 - 2		3.5 - 4		3 - 4		5 - 6		2.5 - 3.5	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	ug/kg	390	U	370	U	37	J	440	U	420	U
Benzo(a)pyrene	ug/kg	390	U	370	U	33	J	440	U	420	U
Benzo(b)fluoranthene	ug/kg	390	U	370	U	53	J	440	U	420	U
Benzo(ghi)perylene	ug/kg	390	U	370	U	380	U	440	U	420	U
Benzo(k)fluoranthene	ug/kg	390	U	370	U	55	J	440	U	420	U
Butyl benzyl phthalate	ug/kg	390	U	370	U	380	U	440	U	420	U
Carbazole	ug/kg	390	U	370	U	380	U	440	U	420	U
Chrysene	ug/kg	390	U	370	U	110	J	440	U	420	U
Dibenz(a,h)anthracene	ug/kg	390	U	370	U	380	U	440	U	420	U
Dibenzofuran	ug/kg	390	U	370	U	45	J	440	U	420	U
Diethyl phthalate	ug/kg	390	U	370	U	380	U	440	U	420	U
Dimethyl phthalate	ug/kg	390	U	370	U	380	U	440	U	420	U
Fluoranthene	ug/kg	390	U	370	U	130	J	440	U	420	U
Fluorene	ug/kg	390	U	370	U	380	U	440	U	420	U
Hexachlorobenzene	ug/kg	390	U	370	U	380	U	440	U	420	U
Hexachlorobutadiene	ug/kg	390	U	370	U	380	U	440	U	420	U
Hexachlorocyclopentadiene	ug/kg	1900	UJ	1800	UJ	1800	UJ	2100	UJ	2000	UJ
Hexachloroethane	ug/kg	390	U	370	U	380	U	440	U	420	U
Indeno(1,2,3-cd)pyrene	ug/kg	390	U	370	U	380	U	440	U	420	U
Isophorone	ug/kg	390	U	370	U	380	U	440	U	420	U
Naphthalene	ug/kg	390	U	370	U	280	J	440	U	420	U
Nitrobenzene	ug/kg	390	U	370	U	380	U	440	U	420	U
Pentachlorophenol	ug/kg	1900	U	1800	U	1800	U	2100	U	2000	U
Phenanthrene	ug/kg	390	U	48	J	280	J	440	U	420	U
Phenol	ug/kg	390	U	370	U	380	U	440	U	420	U
Pyrene	ug/kg	390	U	370	U	120	J	440	U	420	U
bis(2-Chloroethoxy)methane	ug/kg	390	U	370	U	380	U	440	U	420	U
bis(2-Chloroethyl)ether	ug/kg	390	U	370	U	380	U	440	U	420	U
bis(2-Chloroisopropyl)ether	ug/kg	390	U	370	U	380	U	440	U	420	U
bis(2-Ethylhexyl)phthalate	ug/kg	390	U	1400	B	920	B	440	U	360	B

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Sample Location:		TNTB-SO06		TNTB-SO07		TNTB-SO08		TNTB-SO09		TNTB-SO10	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10550		10560		10570		10580		10590	
Sample Date:		09-NOV-98		10-NOV-98		09-NOV-98		11-NOV-98		10-NOV-98	
Depth:		4 - 5		3 - 4		6 - 8		0 - 1		4 - 6	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	ug/kg	380	U	360	U	400	U	390	U	390	U
Benzo(a)pyrene	ug/kg	380	U	360	U	400	U	28	J	390	U
Benzo(b)fluoranthene	ug/kg	41	J	360	U	400	U	37	J	390	U
Benzo(ghi)perylene	ug/kg	380	U	360	U	400	U	390	U	390	U
Benzo(k)fluoranthene	ug/kg	380	U	360	U	400	U	390	U	390	U
Butyl benzyl phthalate	ug/kg	380	U	360	U	400	U	390	U	390	U
Carbazole	ug/kg	380	U	360	U	400	U	390	U	390	U
Chrysene	ug/kg	380	U	360	U	400	U	42	J	390	U
Dibenz(a,h)anthracene	ug/kg	380	U	360	U	400	U	390	U	390	U
Dibenzofuran	ug/kg	380	U	360	U	400	U	390	U	390	U
Diethyl phthalate	ug/kg	380	U	360	U	400	U	390	U	390	U
Dimethyl phthalate	ug/kg	380	U	360	U	400	U	390	U	390	U
Fluoranthene	ug/kg	380	U	360	U	400	U	51	J	390	U
Fluorene	ug/kg	380	U	360	U	400	U	390	U	390	U
Hexachlorobenzene	ug/kg	380	U	360	U	400	U	390	U	390	U
Hexachlorobutadiene	ug/kg	380	U	360	U	400	U	390	U	390	U
Hexachlorocyclopentadiene	ug/kg	1800	UJ	1800	U	2000	U	1900	U	1900	U
Hexachloroethane	ug/kg	380	U	360	U	400	U	390	U	390	U
Indeno(1,2,3-cd)pyrene	ug/kg	380	U	360	U	400	U	390	U	390	U
Isophorone	ug/kg	380	U	360	U	400	U	390	U	390	U
Naphthalene	ug/kg	380	U	360	U	400	U	390	U	390	U
Nitrobenzene	ug/kg	380	U	360	U	400	U	390	U	390	U
Pentachlorophenol	ug/kg	1800	U	1800	U	2000	U	1900	U	1900	U
Phenanthrene	ug/kg	380	U	360	U	400	U	390	U	390	U
Phenol	ug/kg	380	U	360	U	400	U	390	U	390	U
Pyrene	ug/kg	380	U	360	U	400	U	40	J	390	U
bis(2-Chloroethoxy)methane	ug/kg	380	U	360	U	400	U	390	U	390	U
bis(2-Chloroethyl)ether	ug/kg	380	U	360	U	400	U	390	U	390	U
bis(2-Chloroisopropyl)ether	ug/kg	380	U	360	U	400	U	390	U	390	U
bis(2-Ethylhexyl)phthalate	ug/kg	1100	B	88	B	1000	B	91	B	570	B

Sample Location:		TNTB-SO11		TNTB-SO12		TNTB-SO14		TNTB-SO15		TNTB-SO16	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10600		10610		10630		10640		10650	
Sample Date:		10-NOV-98		10-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		8 - 10		4 - 5		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	ug/kg	420	U	410	U	40	J	100	J	160	J
Benzo(a)pyrene	ug/kg	420	U	410	U	56	J	110	J	210	J
Benzo(b)fluoranthene	ug/kg	420	U	410	U	73	J	140	J	180	J
Benzo(ghi)perylene	ug/kg	420	U	410	U	37	J	76	J	130	J
Benzo(k)fluoranthene	ug/kg	420	U	410	U	74	J	100	J	250	J
Butyl benzyl phthalate	ug/kg	420	U	410	U	410	U	410	U	400	U
Carbazole	ug/kg	420	U	410	U	410	U	410	U	400	U
Chrysene	ug/kg	420	U	410	U	76	J	120	J	190	J
Dibenz(a,h)anthracene	ug/kg	420	U	410	U	410	U	32	J	68	J
Dibenzofuran	ug/kg	420	U	410	U	410	U	410	U	400	U
Diethyl phthalate	ug/kg	420	U	410	U	410	U	410	U	400	U
Dimethyl phthalate	ug/kg	420	U	410	U	410	U	410	U	400	U
Fluoranthene	ug/kg	420	U	410	U	110	J	160	J	240	J
Fluorene	ug/kg	420	U	410	U	410	U	410	U	400	U
Hexachlorobenzene	ug/kg	420	U	410	U	410	U	410	U	400	U
Hexachlorobutadiene	ug/kg	420	U	410	U	410	U	410	U	400	U
Hexachlorocyclopentadiene	ug/kg	2000	U	2000	U	2000	U	2000	U	1900	U
Hexachloroethane	ug/kg	420	U	410	U	410	U	410	U	400	U
Indeno(1,2,3-cd)pyrene	ug/kg	420	U	410	U	37	J	76	J	130	J
Isophorone	ug/kg	420	U	410	U	410	U	410	U	400	U
Naphthalene	ug/kg	420	U	410	U	410	U	410	U	400	U
Nitrobenzene	ug/kg	420	U	410	U	410	U	410	U	400	U
Pentachlorophenol	ug/kg	2000	U	2000	U	2000	U	2000	U	1900	U
Phenanthrene	ug/kg	420	U	410	U	410	U	83	J	82	J
Phenol	ug/kg	420	U	410	U	410	U	410	U	400	U
Pyrene	ug/kg	420	U	410	U	84	J	140	J	210	J
bis(2-Chloroethoxy)methane	ug/kg	420	U	410	U	410	U	410	U	400	U
bis(2-Chloroethyl)ether	ug/kg	420	U	410	U	410	U	410	U	400	U
bis(2-Chloroisopropyl)ether	ug/kg	420	U	410	U	410	U	410	U	400	U
bis(2-Ethylhexyl)phthalate	ug/kg	580	B	63	B	85	B	410	U	400	U

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Sample Location:		TNTB-SO17		TNTB-SO18		TNTB-SO19		TNTB-SO20		TNTB-SO21	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10660		10670		10680		10690		10700	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	ug/kg	70	J	56	J	440	U	400	U	400	U
Benzo(a)pyrene	ug/kg	81	J	57	J	440	U	39	J	35	J
Benzo(b)fluoranthene	ug/kg	78	J	63	J	440	U	39	J	400	U
Benzo(ghi)perylene	ug/kg	59	J	430	U	440	U	400	U	400	U
Benzo(k)fluoranthene	ug/kg	110	J	60	J	440	U	400	U	400	U
Butyl benzyl phthalate	ug/kg	400	U	430	U	440	U	400	U	400	U
Carbazole	ug/kg	400	U	430	U	440	U	400	U	400	U
Chrysene	ug/kg	93	J	67	J	440	U	50	J	46	J
Dibenz(a,h)anthracene	ug/kg	400	U	430	U	440	U	400	U	400	U
Dibenzofuran	ug/kg	400	U	430	U	440	U	400	U	400	U
Diethyl phthalate	ug/kg	400	U	430	U	440	U	400	U	400	U
Dimethyl phthalate	ug/kg	400	U	430	U	440	U	400	U	400	U
Fluoranthene	ug/kg	110	J	92	J	440	U	64	J	62	J
Fluorene	ug/kg	400	U	430	U	440	U	400	U	400	U
Hexachlorobenzene	ug/kg	400	U	430	U	440	U	400	U	400	U
Hexachlorobutadiene	ug/kg	400	U	430	U	440	U	400	U	400	U
Hexachlorocyclopentadiene	ug/kg	1900	U	2100	U	2100	U	1900	U	2000	U
Hexachloroethane	ug/kg	400	U	430	U	440	U	400	U	400	U
Indeno(1,2,3-cd)pyrene	ug/kg	59	J	430	U	440	U	400	U	400	U
Isophorone	ug/kg	400	U	430	U	440	U	400	U	400	U
Naphthalene	ug/kg	400	U	430	U	440	U	400	U	400	U
Nitrobenzene	ug/kg	400	U	430	U	440	U	400	U	400	U
Pentachlorophenol	ug/kg	1900	U	2100	U	2100	U	1900	U	2000	U
Phenanthrene	ug/kg	47	J	46	J	440	U	400	U	46	J
Phenol	ug/kg	400	U	430	U	440	U	400	U	65	B
Pyrene	ug/kg	97	J	74	J	440	U	57	J	54	J
bis(2-Chloroethoxy)methane	ug/kg	400	U	430	U	440	U	400	U	400	U
bis(2-Chloroethyl)ether	ug/kg	400	U	430	U	440	U	400	U	400	U
bis(2-Chloroisopropyl)ether	ug/kg	400	U	430	U	440	U	400	U	400	U
bis(2-Ethylhexyl)phthalate	ug/kg	400	U	430	U	440	U	400	U	400	U

Sample Location:		TNTB-SO22		TNTB-SO23		TNTB-SO24		TNTB-SO25		TNTB-SO26	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10710		10720		10730		10740		10750	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	ug/kg	60	J	360	U	80	J	400	U	400	U
Benzo(a)pyrene	ug/kg	68	J	360	U	85	J	400	U	400	U
Benzo(b)fluoranthene	ug/kg	86	J	360	U	100	J	400	U	400	U
Benzo(ghi)perylene	ug/kg	67	J	360	U	51	J	400	U	400	U
Benzo(k)fluoranthene	ug/kg	93	J	360	U	110	J	400	U	400	U
Butyl benzyl phthalate	ug/kg	400	U	360	U	390	U	400	U	400	U
Carbazole	ug/kg	400	U	360	U	390	U	400	U	400	U
Chrysene	ug/kg	93	J	360	U	120	J	400	U	400	U
Dibenz(a,h)anthracene	ug/kg	400	U	360	U	390	U	400	U	400	U
Dibenzofuran	ug/kg	400	U	360	U	390	U	400	U	400	U
Diethyl phthalate	ug/kg	400	U	360	U	390	U	400	U	400	U
Dimethyl phthalate	ug/kg	400	U	360	U	390	U	400	U	400	U
Fluoranthene	ug/kg	160	J	360	U	160	J	400	U	46	J
Fluorene	ug/kg	400	U	360	U	390	U	400	U	400	U
Hexachlorobenzene	ug/kg	400	U	360	U	390	U	400	U	400	U
Hexachlorobutadiene	ug/kg	400	U	360	U	390	U	400	U	400	U
Hexachlorocyclopentadiene	ug/kg	2000	U	1700	U	1900	U	2000	U	1900	UJ
Hexachloroethane	ug/kg	400	U	360	U	390	U	400	U	400	U
Indeno(1,2,3-cd)pyrene	ug/kg	69	J	360	U	50	J	400	U	400	U
Isophorone	ug/kg	400	U	360	U	390	U	400	U	400	U
Naphthalene	ug/kg	400	U	360	U	390	U	400	U	400	U
Nitrobenzene	ug/kg	400	U	360	U	390	U	400	U	400	U
Pentachlorophenol	ug/kg	2000	U	1700	U	1900	U	2000	U	1900	U
Phenanthrene	ug/kg	76	J	360	U	71	J	400	U	400	U
Phenol	ug/kg	400	U	360	U	390	U	400	U	400	U
Pyrene	ug/kg	110	J	360	U	130	J	400	U	400	U
bis(2-Chloroethoxy)methane	ug/kg	400	U	360	U	390	U	400	U	400	U
bis(2-Chloroethyl)ether	ug/kg	400	U	360	U	390	U	400	U	400	U
bis(2-Chloroisopropyl)ether	ug/kg	400	U	360	U	390	U	400	U	400	U
bis(2-Ethylhexyl)phthalate	ug/kg	400	U	360	U	87	B	73	B	400	U

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Sample Location:		TNTB-SO27		TNTB-SO28		TNTB-SO29		TNTB-SO30		TNTB-SO31	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10760		10770		10780		10790		10800	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	ug/kg	40	J	2000	U	46	J	44	J	46	J
Benzo(a)pyrene	ug/kg	45	J	2000	U	48	J	64	J	68	J
Benzo(b)fluoranthene	ug/kg	70	J	2000	U	57	J	62	J	75	J
Benzo(ghi)perylene	ug/kg	410	U	2000	U	34	J	410	U	51	J
Benzo(k)fluoranthene	ug/kg	62	J	2000	U	400	U	55	J	93	J
Butyl benzyl phthalate	ug/kg	410	U	2000	U	400	U	410	U	390	U
Carbazole	ug/kg	410	U	2000	U	400	U	410	U	390	U
Chrysene	ug/kg	91	J	2000	U	58	J	51	J	87	J
Dibenz(a,h)anthracene	ug/kg	410	U	2000	U	400	U	410	U	390	U
Dibenzofuran	ug/kg	410	U	2000	U	400	U	410	U	390	U
Diethyl phthalate	ug/kg	410	U	2000	U	400	U	410	U	390	U
Dimethyl phthalate	ug/kg	410	U	2000	U	400	U	410	U	390	U
Fluoranthene	ug/kg	110	J	2000	U	96	J	49	J	110	J
Fluorene	ug/kg	410	U	2000	U	400	U	410	U	390	U
Hexachlorobenzene	ug/kg	410	U	2000	U	400	U	410	U	390	U
Hexachlorobutadiene	ug/kg	410	U	2000	U	400	U	410	U	390	U
Hexachlorocyclopentadiene	ug/kg	2000	UJ	9600	U	1900	U	2000	U	1900	U
Hexachloroethane	ug/kg	410	U	2000	U	400	U	410	U	390	U
Indeno(1,2,3-cd)pyrene	ug/kg	410	U	2000	U	400	U	410	U	53	J
Isophorone	ug/kg	410	U	2000	U	400	U	410	U	390	U
Naphthalene	ug/kg	410	U	2000	U	400	U	410	U	41	J
Nitrobenzene	ug/kg	410	U	2000	U	400	U	410	U	390	U
Pentachlorophenol	ug/kg	2000	U	9600	U	1900	U	2000	U	1900	U
Phenanthrene	ug/kg	190	J	2000	U	66	J	410	U	83	J
Phenol	ug/kg	410	U	2000	U	400	U	410	U	390	U
Pyrene	ug/kg	110	J	2000	U	64	J	47	J	88	J
bis(2-Chloroethoxy)methane	ug/kg	410	U	2000	U	400	U	410	U	390	U
bis(2-Chloroethyl)ether	ug/kg	410	U	2000	U	400	U	410	U	390	U
bis(2-Chloroisopropyl)ether	ug/kg	410	U	2000	U	400	U	410	U	390	U
bis(2-Ethylhexyl)phthalate	ug/kg	92	B	2000	U	73	B	78	B	390	U

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Sample Location:		TNTB-SO32		TNTB-SO33		TNTB-SO34		TNTB-SO35		TNTB-SO36	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10810		10820		10830		10840		10850	
Sample Date:		12-NOV-98		12-NOV-98		12-NOV-98		11-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	ug/kg	2400		360	U	370	U	400	U	1600	
Benzo(a)pyrene	ug/kg	2000		360	U	370	U	37	J	1700	
Benzo(b)fluoranthene	ug/kg	1800		360	U	370	U	39	J	1800	
Benzo(ghi)perylene	ug/kg	880		360	U	370	U	400	U	880	
Benzo(k)fluoranthene	ug/kg	2000		360	U	370	U	400	U	1500	
Butyl benzyl phthalate	ug/kg	390	U	360	U	370	U	400	U	390	U
Carbazole	ug/kg	200	J	360	U	370	U	400	U	250	J
Chrysene	ug/kg	2400		360	U	370	U	400	U	1800	
Dibenz(a,h)anthracene	ug/kg	550		360	U	370	U	400	U	480	
Dibenzofuran	ug/kg	180	J	360	U	370	U	400	U	130	J
Diethyl phthalate	ug/kg	390	U	360	U	370	U	400	U	390	U
Dimethyl phthalate	ug/kg	390	U	360	U	370	U	400	U	390	U
Fluoranthene	ug/kg	5000		360	U	39	J	45	J	3900	
Fluorene	ug/kg	360	J	360	U	370	U	400	U	170	J
Hexachlorobenzene	ug/kg	390	U	360	U	370	U	400	U	390	U
Hexachlorobutadiene	ug/kg	390	U	360	U	370	U	400	U	390	U
Hexachlorocyclopentadiene	ug/kg	1900	U	1800	U	1800	U	1900	U	1900	U
Hexachloroethane	ug/kg	390	U	360	U	370	U	400	U	390	U
Indeno(1,2,3-cd)pyrene	ug/kg	1000		360	U	370	U	400	U	960	
Isophorone	ug/kg	390	U	360	U	370	U	400	U	390	U
Naphthalene	ug/kg	73	J	360	U	370	U	400	U	50	J
Nitrobenzene	ug/kg	390	U	360	U	370	U	400	U	390	U
Pentachlorophenol	ug/kg	1900	U	1800	U	1800	U	1900	U	1900	U
Phenanthrene	ug/kg	3000		360	U	370	U	400	U	2300	
Phenol	ug/kg	390	U	360	U	370	U	400	U	390	U
Pyrene	ug/kg	3600		360	U	370	U	37	J	2700	
bis(2-Chloroethoxy)methane	ug/kg	390	U	360	U	370	U	400	U	390	U
bis(2-Chloroethyl)ether	ug/kg	390	U	360	U	370	U	400	U	390	U
bis(2-Chloroisopropyl)ether	ug/kg	390	U	360	U	370	U	400	U	390	U
bis(2-Ethylhexyl)phthalate	ug/kg	390	U	360	U	370	U	77	B	740	B

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Sample Location:		TNTB-SO37		TNTB-SO38		TNTB-SO39		TNTB-SO40	
Associated Site:		TNTB		TNTB		TNTB		TNTB	
Sample No:		10860		10870		10880		10890	
Sample Date:		12-NOV-98		12-NOV-98		12-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	ug/kg	50	J	49	J	50	J	390	U
Benzo(a)pyrene	ug/kg	55	J	77	J	55	J	390	U
Benzo(b)fluoranthene	ug/kg	61	J	100	J	44	J	390	U
Benzo(ghi)perylene	ug/kg	37	J	68	J	380	U	390	U
Benzo(k)fluoranthene	ug/kg	58	J	87	J	55	J	390	U
Butyl benzyl phthalate	ug/kg	410	U	400	U	380	U	390	U
Carbazole	ug/kg	410	U	400	U	380	U	390	U
Chrysene	ug/kg	70	J	91	J	54	J	390	U
Dibenz(a,h)anthracene	ug/kg	410	U	400	U	380	U	390	U
Dibenzofuran	ug/kg	410	U	400	U	380	U	390	U
Diethyl phthalate	ug/kg	410	U	400	U	380	U	390	U
Dimethyl phthalate	ug/kg	410	U	400	U	380	U	390	U
Fluoranthene	ug/kg	97	J	110	J	100	J	390	U
Fluorene	ug/kg	410	U	400	U	380	U	390	U
Hexachlorobenzene	ug/kg	410	U	400	U	380	U	390	U
Hexachlorobutadiene	ug/kg	410	U	400	U	380	U	390	U
Hexachlorocyclopentadiene	ug/kg	2000	U	1900	U	1800	U	1900	U
Hexachloroethane	ug/kg	410	U	400	U	380	U	390	U
Indeno(1,2,3-cd)pyrene	ug/kg	37	J	62	J	380	U	390	U
Isophorone	ug/kg	410	U	400	U	380	U	390	U
Naphthalene	ug/kg	410	U	400	U	380	U	390	U
Nitrobenzene	ug/kg	410	U	400	U	380	U	390	U
Pentachlorophenol	ug/kg	2000	U	1900	U	1800	U	1900	U
Phenanthrene	ug/kg	45	J	83	J	380	U	390	U
Phenol	ug/kg	410	U	400	U	380	U	390	U
Pyrene	ug/kg	71	J	86	J	71	J	390	U
bis(2-Chloroethoxy)methane	ug/kg	410	U	400	U	380	U	390	U
bis(2-Chloroethyl)ether	ug/kg	410	U	400	U	380	U	390	U
bis(2-Chloroisopropyl)ether	ug/kg	410	U	400	U	380	U	390	U
bis(2-Ethylhexyl)phthalate	ug/kg	410	U	400	U	380	U	390	U

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Sample Location:		TNTB-SO01		TNTB-SO02		TNTB-SO03		TNTB-SO04		TNTB-SO05	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10500		10510		10520		10530		10540	
Sample Date:		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98	
Depth:		.5 - 2		3.5 - 4		3 - 4		5 - 6		2.5 - 3.5	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
di-n-Butyl phthalate	ug/kg	390	U	370	U	380	U	440	U	420	U
di-n-Octyl phthalate	ug/kg	390	U	370	U	380	U	440	U	420	U
n-Nitroso-di-n-propylamine	ug/kg	390	U	370	U	380	U	440	U	420	U
n-Nitrosodiphenylamine	ug/kg	390	U	370	U	380	U	440	U	420	U

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Sample Location:		TNTB-SO06		TNTB-SO07		TNTB-SO08		TNTB-SO09		TNTB-SO10	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10550		10560		10570		10580		10590	
Sample Date:		09-NOV-98		10-NOV-98		09-NOV-98		11-NOV-98		10-NOV-98	
Depth:		4 - 5		3 - 4		6 - 8		0 - 1		4 - 6	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
di-n-Butyl phthalate	ug/kg	380	U	360	U	400	U	390	U	390	U
di-n-Octyl phthalate	ug/kg	380	U	360	U	400	U	390	U	390	U
n-Nitroso-di-n-propylamine	ug/kg	380	U	360	U	400	U	390	U	390	U
n-Nitrosodiphenylamine	ug/kg	380	U	360	U	400	U	390	U	390	U

Sample Location:		TNTB-SO11		TNTB-SO12		TNTB-SO14		TNTB-SO15		TNTB-SO16	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10600		10610		10630		10640		10650	
Sample Date:		10-NOV-98		10-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		8 - 10		4 - 5		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
di-n-Butyl phthalate	ug/kg	420	U	410	U	410	U	410	U	400	U
di-n-Octyl phthalate	ug/kg	420	U	410	U	410	U	410	U	400	U
n-Nitroso-di-n-propylamine	ug/kg	420	U	410	U	410	U	410	U	400	U
n-Nitrosodiphenylamine	ug/kg	420	U	410	U	410	U	410	U	400	U

PLUM BROOK
Soils (Surface and Deep)
Data Summary

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Sample Location:		TNTB-SO17		TNTB-SO18		TNTB-SO19		TNTB-SO20		TNTB-SO21	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10660		10670		10680		10690		10700	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
di-n-Butyl phthalate	ug/kg	400	U	430	U	440	U	400	U	400	U
di-n-Octyl phthalate	ug/kg	400	U	430	U	440	U	400	U	400	U
n-Nitroso-di-n-propylamine	ug/kg	400	U	430	U	440	U	400	U	400	U
n-Nitrosodiphenylamine	ug/kg	400	U	430	U	440	U	400	U	400	U

Sample Location:		TNTB-SO22		TNTB-SO23		TNTB-SO24		TNTB-SO25		TNTB-SO26	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10710		10720		10730		10740		10750	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
di-n-Butyl phthalate	ug/kg	400	U	360	U	390	U	400	U	400	U
di-n-Octyl phthalate	ug/kg	400	U	360	U	390	U	400	U	400	U
n-Nitroso-di-n-propylamine	ug/kg	400	U	360	U	390	U	400	U	400	U
n-Nitrosodiphenylamine	ug/kg	400	U	360	U	390	U	400	U	400	U

PLUM BROOK
Soils (Surface and Deep)
Data Summary

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Sample Location:		TNTB-SO27		TNTB-SO28		TNTB-SO29		TNTB-SO30		TNTB-SO31	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10760		10770		10780		10790		10800	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
di-n-Butyl phthalate	ug/kg	410	U	2000	U	400	U	410	U	390	U
di-n-Octyl phthalate	ug/kg	410	U	2000	U	400	U	410	U	390	U
n-Nitroso-di-n-propylamine	ug/kg	410	U	2000	U	400	U	410	U	390	U
n-Nitrosodiphenylamine	ug/kg	410	U	2000	U	400	U	410	U	390	U

PLUM BROOK
Soils (Surface and Deep)
Data Summary

Report Date: 02/24/99

Sample Location:		TNTB-SO32		TNTB-SO33		TNTB-SO34		TNTB-SO35		TNTB-SO36	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10810		10820		10830		10840		10850	
Sample Date:		12-NOV-98		12-NOV-98		12-NOV-98		11-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
di-n-Butyl phthalate	ug/kg	390	U	360	U	370	U	400	U	390	U
di-n-Octyl phthalate	ug/kg	390	U	360	U	370	U	400	U	390	U
n-Nitroso-di-n-propylamine	ug/kg	390	U	360	U	370	U	400	U	390	U
n-Nitrosodiphenylamine	ug/kg	390	U	360	U	370	U	400	U	390	U

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Soils (Surface and Deep)

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Sample Location:		TNTB-SO37		TNTB-SO38		TNTB-SO39		TNTB-SO40	
Associated Site:		TNTB		TNTB		TNTB		TNTB	
Sample No:		10860		10870		10880		10890	
Sample Date:		12-NOV-98		12-NOV-98		12-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
di-n-Butyl phthalate	ug/kg	410	U	400	U	380	U	390	U
di-n-Octyl phthalate	ug/kg	410	U	400	U	380	U	390	U
n-Nitroso-di-n-propylamine	ug/kg	410	U	400	U	380	U	390	U
n-Nitrosodiphenylamine	ug/kg	410	U	400	U	380	U	390	U

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Soils (Surface and Deep)

Data Summary

Report Date: 02/24/99

Sample Location:		TNTB-SO01		TNTB-SO02		TNTB-SO03		TNTB-SO04		TNTB-SO05	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10500		10510		10520		10530		10540	
Sample Date:		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98	
Depth:		.5 - 2		3.5 - 4		3 - 4		5 - 6		2.5 - 3.5	
PCB3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016	ug/kg	39	U	74	U	190	U	44	U	42	U
Aroclor 1221	ug/kg	39	U	74	U	1300	U	44	U	42	U
Aroclor 1232	ug/kg	39	U	74	U	190	U	44	U	42	U
Aroclor 1242	ug/kg	39	U	74	U	190	U	44	U	42	U
Aroclor 1248	ug/kg	39	U	74	U	190	U	44	U	42	U
Aroclor 1254	ug/kg	39	U	140	NJ	1100	U	63	N	42	U
Aroclor 1260	ug/kg	39	U	93	U	1300	N	44	U	42	U

PLUM BROOK
Soils (Surface and Deep)
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Sample Location:		TNTB-SO06		TNTB-SO07		TNTB-SO08		TNTB-SO09		TNTB-SO10	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10550		10560		10570		10580		10590	
Sample Date:		09-NOV-98		10-NOV-98		09-NOV-98		11-NOV-98		10-NOV-98	
Depth:		4 - 5		3 - 4		6 - 8		0 - 1		4 - 6	
PCB3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016	ug/kg	380	U	720	U	40	U	39	U	39	U
Aroclor 1221	ug/kg	380	U	720	U	220	U	39	U	39	U
Aroclor 1232	ug/kg	380	U	720	U	40	U	39	U	39	U
Aroclor 1242	ug/kg	380	U	720	U	40	U	39	U	39	U
Aroclor 1248	ug/kg	380	U	720	U	40	U	39	U	39	U
Aroclor 1254	ug/kg	1400	U	2500	U	63	U	320	N	39	U
Aroclor 1260	ug/kg	2800	NJ	4600	N	110	N	240	U	39	U

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Soils (Surface and Deep)

Data Summary

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Sample Location:		TNTB-SO11		TNTB-SO12		TNTB-SO14		TNTB-SO15		TNTB-SO16	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10600		10610		10630		10640		10650	
Sample Date:		10-NOV-98		10-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		8 - 10		4 - 5		0 - 1		0 - 1		0 - 1	
PCB3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016	ug/kg	42	U	41	U	41	U	81	U	40	U
Aroclor 1221	ug/kg	42	U	41	U	41	U	81	U	40	U
Aroclor 1232	ug/kg	42	U	41	U	41	U	81	U	40	U
Aroclor 1242	ug/kg	42	U	41	U	41	U	81	U	40	U
Aroclor 1248	ug/kg	42	U	41	U	41	U	81	U	40	U
Aroclor 1254	ug/kg	42	U	41	U	210	U	530	N	120	N
Aroclor 1260	ug/kg	42	U	41	U	230	N	260	U	80	U

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Soils (Surface and Deep)

Data Summary

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Sample Location:		TNTB-SO17		TNTB-SO18		TNTB-SO19		TNTB-SO20		TNTB-SO21	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10660		10670		10680		10690		10700	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
PCB3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016	ug/kg	40	U	43	U	44	U	40	U	65	U
Aroclor 1221	ug/kg	40	U	43	U	44	U	40	U	40	U
Aroclor 1232	ug/kg	40	U	43	U	44	U	40	U	40	U
Aroclor 1242	ug/kg	40	U	43	U	44	U	40	U	40	U
Aroclor 1248	ug/kg	40	U	43	U	44	U	40	U	40	U
Aroclor 1254	ug/kg	48	U	45	U	75	U	150	U	250	U
Aroclor 1260	ug/kg	99	N	50	N	110	N	160	N	270	N

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Soils (Surface and Deep)

Data Summary

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Sample Location:		TNTB-SO22		TNTB-SO23		TNTB-SO24		TNTB-SO25		TNTB-SO26	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10710		10720		10730		10740		10750	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
PCB3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016	ug/kg	40	U	36	U	3900	U	40	U	40	U
Aroclor 1221	ug/kg	40	U	38	U	3900	U	40	U	40	U
Aroclor 1232	ug/kg	40	U	36	U	3900	U	40	U	40	U
Aroclor 1242	ug/kg	40	U	36	U	3900	U	40	U	40	U
Aroclor 1248	ug/kg	40	U	36	U	3900	U	40	U	40	U
Aroclor 1254	ug/kg	51	U	36	U	7200	U	40	U	40	U
Aroclor 1260	ug/kg	100	N	140	N	15000	N	89	N	48	N

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Soils (Surface and Deep)
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Sample Location:		TNTB-SO27		TNTB-SO28		TNTB-SO29		TNTB-SO30		TNTB-SO31	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10760		10770		10780		10790		10800	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
PCB3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016	ug/kg	41	U	40	U	40	U	41	U	46	U
Aroclor 1221	ug/kg	58	U	40	U	40	U	41	U	39	U
Aroclor 1232	ug/kg	41	U	40	U	40	U	41	U	39	U
Aroclor 1242	ug/kg	41	U	40	U	40	U	41	U	39	U
Aroclor 1248	ug/kg	41	U	40	U	40	U	41	U	39	U
Aroclor 1254	ug/kg	210	N	240	N	190	N	41	U	54	U
Aroclor 1260	ug/kg	96	U	160	U	120	U	41	U	190	N

Sample Location:		TNTB-SO32		TNTB-SO33		TNTB-SO34		TNTB-SO35		TNTB-SO36	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10810		10820		10830		10840		10850	
Sample Date:		12-NOV-98		12-NOV-98		12-NOV-98		11-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
PCB3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016	ug/kg	150	U	110	U	37	U	40	U	39	U
Aroclor 1221	ug/kg	150	U	110	U	37	U	40	U	39	U
Aroclor 1232	ug/kg	150	U	110	U	37	U	40	U	39	U
Aroclor 1242	ug/kg	150	U	110	U	37	U	40	U	39	U
Aroclor 1248	ug/kg	150	U	110	U	37	U	40	U	39	U
Aroclor 1254	ug/kg	250	U	110	U	37	U	40	U	39	U
Aroclor 1260	ug/kg	990	N	540	N	37	U	41	NJ	41	N

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Soils (Surface and Deep)
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Sample Location:		TNTB-SO37		TNTB-SO38		TNTB-SO39		TNTB-SO40	
Associated Site:		TNTB		TNTB		TNTB		TNTB	
Sample No:		10860		10870		10880		10890	
Sample Date:		12-NOV-98		12-NOV-98		12-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1	
PCB3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016	ug/kg	41	U	200	U	38	U	39	U
Aroclor 1221	ug/kg	41	U	200	U	38	U	39	U
Aroclor 1232	ug/kg	41	U	200	U	38	U	39	U
Aroclor 1242	ug/kg	41	U	200	U	38	U	39	U
Aroclor 1248	ug/kg	41	U	200	U	38	U	39	U
Aroclor 1254	ug/kg	130	U	280	U	38	U	39	U
Aroclor 1260	ug/kg	450	N	1100	N	38	U	39	U

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Soils (Surface and Deep)
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Sample Location:		TNTB-SO01		TNTB-SO02		TNTB-SO03		TNTB-SO04		TNTB-SO05	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10500		10510		10520		10530		10540	
Sample Date:		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98	
Depth:		.5 - 2		3.5 - 4		3 - 4		5 - 6		2.5 - 3.5	
METALS3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	9350		5560		6120		8080		7600	
Antimony	mg/kg	7.1	UJ	6.7	UJ	6.9	UJ	8.0	UJ	7.7	UJ
Arsenic	mg/kg	23.8	J	8.9	J	20.5	J	15.4	J	18.1	J
Barium	mg/kg	496		51.8		58.3		103		207	
Beryllium	mg/kg	1.8		0.57		0.84		1.0		1.2	
Cadmium	mg/kg	0.59	U	0.56	U	0.57	U	0.67	U	0.64	U
Calcium	mg/kg	1670		4020		3370		3790		4060	
Chromium	mg/kg	17.4		9.0		24.9		13.6		13.6	
Cobalt	mg/kg	54.1		8.7		16.1		11.7		9.7	
Copper	mg/kg	58.9		27.3		46.0		39.3		60.1	
Iron	mg/kg	80000		14100		33000		27900		37600	
Lead	mg/kg	19.1	J	26.1	J	80.7	J	16.1	J	20.5	J
Magnesium	mg/kg	831		1730		2000		1290		1420	
Manganese	mg/kg	3110		116		241		169		340	
Mercury	mg/kg	0.043		0.037	U	0.054		0.044	U	0.080	
Nickel	mg/kg	48.5		21.9		46.4		37.2		55.5	
Potassium	mg/kg	594	U	752		1390		785		1150	
Selenium	mg/kg	3.9	J	0.90	J	2.0	J	1.7	J	2.2	J
Silver	mg/kg	1.2	U	1.1	U	1.1	U	1.3	U	1.3	U
Sodium	mg/kg	594	U	559	U	571	U	668	U	639	U
Thallium	mg/kg	1.8	B	1.1	UJ	1.2	B	1.3	UJ	1.5	B
Vanadium	mg/kg	5.9	UJ	8.6	B	5.7	UJ	6.7	UJ	6.4	UJ
Zinc	mg/kg	42.8		57.0		285		97.8		99.1	

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Sample Location:		TNTB-SO06		TNTB-SO07		TNTB-SO08		TNTB-SO09		TNTB-SO10	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10550		10560		10570		10580		10590	
Sample Date:		09-NOV-98		10-NOV-98		09-NOV-98		11-NOV-98		10-NOV-98	
Depth:		4 - 5		3 - 4		6 - 8		0 - 1		4 - 6	
METALS3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	2990		4440		5060		5110	J	5210	
Antimony	mg/kg	6.9	UJ	6.6	UJ	7.4	UJ	7.1	UJ	7.2	UJ
Arsenic	mg/kg	9.9	J	8.7	J	22.3	J	11.5		22.2	J
Barium	mg/kg	40.8		56.4		38.9		64.8	J	67.9	
Beryllium	mg/kg	0.57	U	0.55	U	0.88		0.63		0.73	
Cadmium	mg/kg	0.57	U	1.1		0.61	U	0.64		0.60	U
Calcium	mg/kg	2140		3150		2080		2950	J	1070	
Chromium	mg/kg	6.2		6.9		11.3		20.3	J	9.8	
Cobalt	mg/kg	5.7	U	5.5	U	9.5		14.8		9.4	
Copper	mg/kg	19.7		16.9		66.7		28.9	J	46.1	
Iron	mg/kg	12500		13000		30800		20600	J	34000	
Lead	mg/kg	61.4	J	53.5	J	17.3	J	53.0	J	17.6	J
Magnesium	mg/kg	655		721		1260		1000	J	724	
Manganese	mg/kg	87.5		264		195		373	J	207	
Mercury	mg/kg	0.038	U	0.036	U	0.044		0.044		0.059	
Nickel	mg/kg	8.8		11.9		40.5		27.1		23.4	
Potassium	mg/kg	690		677		1200		843		1110	
Selenium	mg/kg	0.78	J	0.64	J	1.6	J	1.0		1.6	J
Silver	mg/kg	1.1	U	1.1	U	1.2	U	1.2	U	1.2	U
Sodium	mg/kg	573	U	548	U	613	U	592	U	597	U
Thallium	mg/kg	1.1	UJ	1.1	UJ	1.3	B	1.2	U	1.5	B
Vanadium	mg/kg	6.6	B	5.6	B	6.1	UJ	5.9	UJ	6.0	UJ
Zinc	mg/kg	42.9		272		54.0		241	J	68.8	

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Soils (Surface and Deep)
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Sample Location:		TNTB-SO11		TNTB-SO12		TNTB-SO14		TNTB-SO15		TNTB-SO16	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10600		10610		10630		10640		10650	
Sample Date:		10-NOV-98		10-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		8 - 10		4 - 5		0 - 1		0 - 1		0 - 1	
METALS3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	4650		5070		7150	J	5840		5000	
Antimony	mg/kg	7.5	UJ	7.4	UJ	7.5	UJ	7.4	UJ	7.3	UJ
Arsenic	mg/kg	25.3	J	35.6	J	13.2		11.7		8.9	
Barium	mg/kg	85.1		64.9		112	J	51.8		36.4	
Beryllium	mg/kg	0.67		0.71		0.86		0.62	U	0.61	U
Cadmium	mg/kg	0.63	U	0.62	U	0.63	U	0.62	U	0.61	U
Calcium	mg/kg	8110		922		5610	J	3260		2620	
Chromium	mg/kg	10.2		11.3		12.5	J	11.3		8.3	
Cobalt	mg/kg	9.0		8.1		11.8		11.2		9.7	
Copper	mg/kg	40.4		46.7		47.8	J	32.0		24.4	
Iron	mg/kg	37900		40400		23600	J	20200		15100	
Lead	mg/kg	20.0	J	22.9	J	67.7	J	41.9		30.2	
Magnesium	mg/kg	1460		1020		1550	J	1760		909	
Manganese	mg/kg	460		136		378	J	150		152	
Mercury	mg/kg	0.059		0.081		0.082		0.080		0.073	
Nickel	mg/kg	25.4		27.4		31.3		26.9		19.8	
Potassium	mg/kg	1170		1300		1130		1220		898	
Selenium	mg/kg	1.8	J	1.8	J	1.3		1.6		1.0	
Silver	mg/kg	1.3	U	1.2	U	1.3	U	1.2	U	1.2	U
Sodium	mg/kg	629	U	617	U	628	U	615	U	605	U
Thallium	mg/kg	1.4	B	1.8	B	1.3	U	1.2	U	1.2	U
Vanadium	mg/kg	6.3	UJ	6.2	UJ	6.8	B	6.2	U	6.1	U
Zinc	mg/kg	40.6		44.6		146	J	241	J	49.9	J

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Sample Location:		TNTB-SO17		TNTB-SO18		TNTB-SO19		TNTB-SO20		TNTB-SO21	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10660		10670		10680		10690		10700	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
METALS3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	5770		7170		8400		7290		6760	
Antimony	mg/kg	7.2	UJ	7.9	UJ	7.9	UJ	7.2	UJ	7.3	UJ
Arsenic	mg/kg	11.1		12.3		8.8		18.1		15.8	
Barium	mg/kg	52.7		56.1		82.7		73.4		66.6	
Beryllium	mg/kg	0.61		0.77		0.82		0.73		0.78	
Cadmium	mg/kg	0.60	U	0.66	U	0.66	U	0.60	U	0.61	U
Calcium	mg/kg	10900		3410		2790		3600		3370	
Chromium	mg/kg	12.4		11.8		11.8		13.0		13.4	
Cobalt	mg/kg	11.8		9.4		10		10.7		11.2	
Copper	mg/kg	37.7		35.6		40.8		36.2		35.1	
Iron	mg/kg	18800		22400		17800		25500		26100	
Lead	mg/kg	54.8		19.8		15.3		37.1		26.0	
Magnesium	mg/kg	2550		891		873		1300		1060	
Manganese	mg/kg	176		85.7		69.6		196		274	
Mercury	mg/kg	0.11		0.056		0.057		0.069		0.077	
Nickel	mg/kg	26.5		20.0		24.7		27.1		23.8	
Potassium	mg/kg	1090		1080		750		1170		1120	
Selenium	mg/kg	1.3		1.6		1.2		1.3		1.3	
Silver	mg/kg	1.2	U	1.3	U	1.3	U	1.2	U	1.2	U
Sodium	mg/kg	600	U	656	U	662	U	600	U	611	U
Thallium	mg/kg	1.2	U	1.3	U	1.3	U	1.2	U	1.2	U
Vanadium	mg/kg	6.0	U	11.1		13.0		6.0	U	6.1	U
Zinc	mg/kg	82.5	J	31.1	J	25.2	J	52.7	J	61.4	J

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Sample Location:		TNTB-SO22		TNTB-SO23		TNTB-SO24		TNTB-SO25		TNTB-SO26	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10710		10720		10730		10740		10750	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
METALS3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	6540		3050		3960	J	6300	J	5240	J
Antimony	mg/kg	7.3	UJ	6.5	UJ	35.0	UJ	7.4	UJ	7.3	UJ
Arsenic	mg/kg	12.4		2.8		7.4		12.0		9.1	
Barium	mg/kg	69.0		21.8	U	47.6	J	76.8	J	39.6	J
Beryllium	mg/kg	0.75		0.54	U	0.58	U	0.80		0.61	U
Cadmium	mg/kg	0.61	U	0.54	U	2.9	U	0.61	U	0.61	U
Calcium	mg/kg	4000		14200		90900	J	21000	J	31000	J
Chromium	mg/kg	20.5		6.0		12.1	J	12.4	J	8.5	J
Cobalt	mg/kg	10.9		5.4	U	5.9		11.7		7.4	
Copper	mg/kg	38.6		8.3		34.3	J	43.9	J	23.5	J
Iron	mg/kg	21500		7790		13400	J	26600	J	15600	J
Lead	mg/kg	32.0		29.5		245	J	126	J	33.4	J
Magnesium	mg/kg	1160		1570		9190	J	2090	J	4170	J
Manganese	mg/kg	284		171		286	J	352	J	154	J
Mercury	mg/kg	0.062		0.036	U	0.13		0.069		0.049	
Nickel	mg/kg	23.6		8.0		13.9		32.6		17.9	
Potassium	mg/kg	1140		544	U	763		735		831	
Selenium	mg/kg	1.2		0.54	U	0.58	U	1.1		0.97	
Silver	mg/kg	1.2	U	1.1	U	1.2	U	1.2	U	1.2	U
Sodium	mg/kg	612	U	544	U	584	U	613	U	608	U
Thallium	mg/kg	1.2	U	1.1	U	1.2	U	1.2	U	1.2	U
Vanadium	mg/kg	6.5	B	6.5	B	11.6	J	6.1	UJ	8.7	
Zinc	mg/kg	116	J	79.1	J	156	J	170	J	53.3	J

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Sample Location:		TNTB-SO27		TNTB-SO28		TNTB-SO29		TNTB-SO30		TNTB-SO31	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10760		10770		10780		10790		10800	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
METALS3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	6570	J	4910	J	5530	J	5750	J	5740	
Antimony	mg/kg	7.4	UJ	7.2	UJ	7.3	UJ	7.4	UJ	7.2	UJ
Arsenic	mg/kg	22.1		9.2		9.6		9.3		20.3	
Barium	mg/kg	100	J	76.5	J	73.3	J	46.2	J	74.5	
Beryllium	mg/kg	0.87		0.60	U	0.63		0.62	U	0.85	
Cadmium	mg/kg	0.63		0.60	U	0.61	U	0.62	U	1.3	
Calcium	mg/kg	3610	J	2860	J	3350	J	7030	J	4100	
Chromium	mg/kg	12.9	J	19.1	J	17.3	J	9.5	J	11.3	
Cobalt	mg/kg	15.5		15.9		10.7		8.4		14.9	
Copper	mg/kg	48.3	J	25.4	J	33.3	J	21.7	J	47.9	
Iron	mg/kg	32800	J	18900	J	19900	J	17900	J	19300	
Lead	mg/kg	30.5	J	40.5	J	35.6	J	36.6	J	77.6	
Magnesium	mg/kg	1130	J	1010	J	1050	J	1540	J	1020	
Manganese	mg/kg	311	J	504	J	330	J	116	J	357	
Mercury	mg/kg	0.061		0.040	U	0.048		0.045		0.083	
Nickel	mg/kg	42.6		23.6		24.5		19.4		56.3	
Potassium	mg/kg	1450		920		835		785		747	
Selenium	mg/kg	1.7		0.95		0.89		1.1		1.2	
Silver	mg/kg	1.2	U	1.2	U	1.2	U	1.2	U	1.2	U
Sodium	mg/kg	616	U	600	U	605	U	618	U	598	U
Thallium	mg/kg	1.4		1.2	U	1.2	U	1.2	U	1.2	U
Vanadium	mg/kg	6.2	UJ	6.0	UJ	6.1	UJ	6.2	UJ	8.2	
Zinc	mg/kg	91.8	J	164	J	164	J	63.7	J	235	J

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Sample Location:		TNTB-SO32		TNTB-SO33		TNTB-SO34		TNTB-SO35		TNTB-SO36	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10810		10820		10830		10840		10850	
Sample Date:		12-NOV-98		12-NOV-98		12-NOV-98		11-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
METALS3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	5410		4180		3720		4680	J	5280	
Antimony	mg/kg	7.0	UJ	6.6	UJ	6.7	UJ	7.2	UJ	7.2	UJ
Arsenic	mg/kg	8.0		1.7		4.0		8.5		15.8	
Barium	mg/kg	45.5		46.3		24.1		39.0	J	53.3	
Beryllium	mg/kg	0.69		0.55	U	0.56	U	0.60	U	0.60	U
Cadmium	mg/kg	1.1		0.55	U	0.56	U	0.60	U	0.60	U
Calcium	mg/kg	6020		1200		1830		1770	J	8480	
Chromium	mg/kg	10		6.4		6.6		8.9	J	10.7	
Cobalt	mg/kg	15.7		5.5	U	5.6	U	7.7		10.7	
Copper	mg/kg	445		7.6		6.9		19.9	J	28.5	
Iron	mg/kg	14500		7340		9030		14300	J	21000	
Lead	mg/kg	153		41.6		9.7		32.3	J	24.8	
Magnesium	mg/kg	1410		660		897		796	J	1850	
Manganese	mg/kg	203		235		185		202	J	291	
Mercury	mg/kg	0.047		0.036	U	0.037	U	0.042		0.053	
Nickel	mg/kg	40.7		9.1		11.4		14.0		17.1	
Potassium	mg/kg	907		551	U	560	U	765		1160	
Selenium	mg/kg	1.0		0.55	U	0.56	U	0.64		1.3	
Silver	mg/kg	1.2	U	1.1	U	1.1	U	1.2	U	1.2	U
Sodium	mg/kg	587	U	551	U	560	U	602	U	597	U
Thallium	mg/kg	1.2	U	1.1	U	1.1	U	1.2	U	1.2	U
Vanadium	mg/kg	5.9	U	5.5	B	6.8	B	6.0	B	6.0	U
Zinc	mg/kg	282	J	46.1	J	33.7	J	42.7	J	50.1	J

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Sample Location:		TNTB-SO37		TNTB-SO38		TNTB-SO39		TNTB-SO40	
Associated Site:		TNTB		TNTB		TNTB		TNTB	
Sample No:		10860		10870		10880		10890	
Sample Date:		12-NOV-98		12-NOV-98		12-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1	
METALS3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	6160		5720		4170		3170	
Antimony	mg/kg	7.4	UJ	7.3	UJ	6.9	UJ	7.1	UJ
Arsenic	mg/kg	12.8		12.5		4.0		29.4	
Barium	mg/kg	90.8		77.0		43.4		60.2	
Beryllium	mg/kg	0.79		0.62		0.58	U	0.59	U
Cadmium	mg/kg	0.62	U	0.61	U	0.58	U	0.59	U
Calcium	mg/kg	4760		4640		1430		807	
Chromium	mg/kg	12.1		12.7		6.2		8.1	
Cobalt	mg/kg	10.0		8.8		5.9		6.2	
Copper	mg/kg	34.7		28.2		8.8		35.2	
Iron	mg/kg	19900		20200		9750		30500	
Lead	mg/kg	58.4		47.4		35.7		35.0	
Magnesium	mg/kg	1050		1220		741		595	U
Manganese	mg/kg	205		240		219		24.0	
Mercury	mg/kg	0.085		0.065		0.038		0.056	
Nickel	mg/kg	23.2		20.9		12.3		6.5	
Potassium	mg/kg	1340		1450		577	U	1930	
Selenium	mg/kg	1.2		1.1		0.64		2.4	
Silver	mg/kg	1.2	U	1.2	U	1.2	U	1.2	U
Sodium	mg/kg	617	U	608	U	577	U	595	U
Thallium	mg/kg	1.2	U	1.2	U	1.2	U	1.4	
Vanadium	mg/kg	7.9	B	6.1	U	5.8	U	5.9	U
Zinc	mg/kg	75.5	J	75.9	J	27.1	J	17.7	J

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Sample Location:		TNTB-SO01		TNTB-SO02		TNTB-SO03		TNTB-SO04		TNTB-SO05	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10500		10510		10520		10530		10540	
Sample Date:		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98		09-NOV-98	
Depth:		.5 - 2		3.5 - 4		3 - 4		5 - 6		2.5 - 3.5	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	0.25	U	0.25	U	25	U	0.25	U	2.5	U
1,3-Dinitrobenzene	mg/kg	0.25	U	0.25	U	25	U	0.25	U	2.5	U
2,4,6-Trinitrotoluene	mg/kg	0.25	U	0.27		620		4.8		44	
2,4-Dinitrotoluene	mg/kg	0.25	U	1.6		27		1.4		2.5	U
2,6-Dinitrotoluene	mg/kg	0.25	U	0.49		25	U	0.25	U	2.5	U
2-Amino-4,6-dinitrotoluene	mg/kg	0.25	U	0.25	U	93		1.0		12	
2-Nitrotoluene	mg/kg	0.25	U	0.25	U	25	U	0.25	U	2.5	U
3-Nitrotoluene	mg/kg	0.25	U	0.25	U	25	U	0.25	U	2.5	U
4-Amino-2,6-dinitrotoluene	mg/kg	0.25	U	0.25	U	170	U	1.7		15	
4-Nitrotoluene	mg/kg	0.25	U	0.25	U	25	U	0.25	U	2.5	U
HMX	mg/kg	0.50	U	0.50	U	50	U	0.50	U	5.0	U
Nitrobenzene	mg/kg	0.25	U	0.25	U	25	U	0.25	U	2.5	U
RDX	mg/kg	0.50	U	0.50	U	50	U	0.50	U	5.0	U
Tetryl	mg/kg	0.65	U	0.65	U	65	U	0.65	U	6.5	U

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Sample Location:		TNTB-SO06		TNTB-SO07		TNTB-SO08		TNTB-SO09		TNTB-SO10	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10550		10560		10570		10580		10590	
Sample Date:		09-NOV-98		10-NOV-98		09-NOV-98		11-NOV-98		10-NOV-98	
Depth:		4 - 5		3 - 4		6 - 8		0 - 1		4 - 6	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	62	U	0.25	U	0.50	U	5.0	U	0.25	U
1,3-Dinitrobenzene	mg/kg	62	U	0.25	U	0.50	U	5.0	U	0.25	U
2,4,6-Trinitrotoluene	mg/kg	2200	J	5.8	J	11		92		1.1	
2,4-Dinitrotoluene	mg/kg	62	U	1.9	J	2.1		5.0	U	0.25	U
2,6-Dinitrotoluene	mg/kg	62	U	0.25	U	1.0		5.0	U	0.25	U
2-Amino-4,6-dinitrotoluene	mg/kg	62	U	5.1	J	2.3		5.0	U	0.25	U
2-Nitrotoluene	mg/kg	62	U	0.25	U	0.50	U	5.0	U	0.25	U
3-Nitrotoluene	mg/kg	62	U	0.25	U	0.50	U	5.0	U	0.25	U
4-Amino-2,6-dinitrotoluene	mg/kg	400	U	5.1	J	3.8		16	U	0.25	U
4-Nitrotoluene	mg/kg	62	U	0.25	U	0.50	U	5.0	U	0.25	U
HMX	mg/kg	120	U	0.50	U	1.0	U	10	U	0.50	U
Nitrobenzene	mg/kg	62	U	0.25	U	0.50	U	5.0	U	0.25	U
RDX	mg/kg	120	U	0.50	U	1.0	U	10	U	0.50	U
Tetryl	mg/kg	160	U	0.65	U	1.3	U	13	U	0.65	U

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Sample Location:		TNTB-SO11		TNTB-SO12		TNTB-SO13		TNTB-SO14		TNTB-SO15	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10600		10610		10620		10630		10640	
Sample Date:		10-NOV-98		10-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		8 - 10		4 - 5		0 - 1		0 - 1		0 - 1	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	18	U	2.5	U	250	U	25	U	0.25	U
1,3-Dinitrobenzene	mg/kg	12	U	2.5	U	250	U	25	U	0.25	U
2,4,6-Trinitrotoluene	mg/kg	24		39		6900		490	J	4.6	
2,4-Dinitrotoluene	mg/kg	240		2.6		250	U	25	U	0.39	
2,6-Dinitrotoluene	mg/kg	180		2.5	U	250	U	25	U	1.0	U
2-Amino-4,6-dinitrotoluene	mg/kg	70		4.0		250	U	25	U	4.2	
2-Nitrotoluene	mg/kg	82		2.5	U	250	U	25	U	0.25	U
3-Nitrotoluene	mg/kg	12	U	2.5	U	250	U	25	U	0.25	U
4-Amino-2,6-dinitrotoluene	mg/kg	45		11		2400	U	77	U	4.2	
4-Nitrotoluene	mg/kg	67		2.5	U	250	U	25	U	0.25	U
HMX	mg/kg	25	U	5.0	U	500	U	50	U	0.50	U
Nitrobenzene	mg/kg	12	U	2.5	U	250	U	25	U	0.25	U
RDX	mg/kg	25	U	5.0	U	500	U	50	U	0.50	U
Tetryl	mg/kg	32	U	6.5	U	650	U	65	U	0.65	U

PLUM BROOK
Soils (Surface and Deep)
Data Summary

Report Date: 02/24/99

Sample Location:		TNTB-SO16		TNTB-SO17		TNTB-SO18		TNTB-SO19		TNTB-SO20	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10650		10660		10670		10680		10690	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
1,3-Dinitrobenzene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
2,4,6-Trinitrotoluene	mg/kg	4.3		3.8		2.9		0.25	U	0.59	
2,4-Dinitrotoluene	mg/kg	0.25	U	0.76		0.25	U	0.25	U	0.25	U
2,6-Dinitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
2-Amino-4,6-dinitrotoluene	mg/kg	4.4		3.6		3.8		0.25	U	0.78	
2-Nitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
3-Nitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
4-Amino-2,6-dinitrotoluene	mg/kg	3.5		3.0		2.0		0.25	U	0.60	
4-Nitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
HMX	mg/kg	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Nitrobenzene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
RDX	mg/kg	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Tetryl	mg/kg	0.65	U	0.65	U	0.65	U	0.65	U	0.65	U

PLUM BROOK
Soils (Surface and Deep)
Data Summary

Report Date: 02/24/99

Sample Location:		TNTB-SO21		TNTB-SO22		TNTB-SO23		TNTB-SO24		TNTB-SO25	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10700		10710		10720		10730		10740	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	0.25	U	0.25	U	0.25	U	0.50	U	0.25	U
1,3-Dinitrobenzene	mg/kg	0.25	U	0.25	U	0.25	U	0.50	U	0.25	U
2,4,6-Trinitrotoluene	mg/kg	0.31		2.5		0.68		14		0.26	
2,4-Dinitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.50	U	0.25	U
2,6-Dinitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.50	U	0.25	U
2-Amino-4,6-dinitrotoluene	mg/kg	0.30		2.6		0.25	U	4.6		1.7	
2-Nitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.50	U	0.25	U
3-Nitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.50	U	0.25	U
4-Amino-2,6-dinitrotoluene	mg/kg	0.25	U	2.0		0.35		5.9		1.1	
4-Nitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.50	U	0.25	U
HMX	mg/kg	0.50	U	0.50	U	0.50	U	1.0	U	0.50	U
Nitrobenzene	mg/kg	0.25	U	0.25	U	0.25	U	0.50	U	0.25	U
RDX	mg/kg	0.50	U	0.50	U	0.50	U	1.0	U	0.50	U
Tetryl	mg/kg	0.65	U	0.65	U	0.65	U	1.3	U	0.65	U

PLUM BROOK
Soils (Surface and Deep)
Data Summary

Report Date: 02/24/99

Sample Location:		TNTB-SO26		TNTB-SO27		TNTB-SO28		TNTB-SO29		TNTB-SO30	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10750		10760		10770		10780		10790	
Sample Date:		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
1,3-Dinitrobenzene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
2,4,6-Trinitrotoluene	mg/kg	0.43		4.0		1.1		1.0		0.56	
2,4-Dinitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
2,6-Dinitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
2-Amino-4,6-dinitrotoluene	mg/kg	0.25	U	7.6		1.3		1.5		0.25	U
2-Nitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
3-Nitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
4-Amino-2,6-dinitrotoluene	mg/kg	0.25	U	5.4		0.99		1.1		0.34	
4-Nitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
HMX	mg/kg	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Nitrobenzene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
RDX	mg/kg	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Tetryl	mg/kg	0.65	U	0.65	U	0.65	U	0.65	U	0.65	U

PLUM BROOK
Soils (Surface and Deep)
Data Summary

Report Date: 02/24/99

Sample Location:		TNTB-SO31		TNTB-SO32		TNTB-SO33		TNTB-SO34		TNTB-SO35	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10800		10810		10820		10830		10840	
Sample Date:		12-NOV-98		12-NOV-98		12-NOV-98		12-NOV-98		11-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	1.2	U	0.25	U	0.25	U	0.25	U	0.25	U
1,3-Dinitrobenzene	mg/kg	1.2	U	0.25	U	0.25	U	0.25	U	0.25	U
2,4,6-Trinitrotoluene	mg/kg	22		7.6		0.25	U	0.25	U	7.6	J
2,4-Dinitrotoluene	mg/kg	1.2	U	0.38		0.25	U	0.25	U	1.6	J
2,6-Dinitrotoluene	mg/kg	1.2	U	0.25	U	0.25	U	0.25	U	0.28	J
2-Amino-4,6-dinitrotoluene	mg/kg	4.7		3.7		0.25	U	0.25	U	0.48	
2-Nitrotoluene	mg/kg	1.2	U	0.25	U	0.25	U	0.25	U	0.25	U
3-Nitrotoluene	mg/kg	1.2	U	0.25	U	0.25	U	0.25	U	0.25	U
4-Amino-2,6-dinitrotoluene	mg/kg	8.8		4.0		0.25	U	0.25	U	1.3	U
4-Nitrotoluene	mg/kg	1.2	U	0.25	U	0.25	U	0.25	U	0.25	U
HMX	mg/kg	2.5	U	0.50	U	0.50	U	0.50	U	0.50	U
Nitrobenzene	mg/kg	1.2	U	0.25	U	0.25	U	0.25	U	0.25	U
RDX	mg/kg	2.5	U	0.50	U	0.50	U	0.50	U	0.50	U
Tetryl	mg/kg	3.2	U	0.65	U	0.65	U	0.65	U	0.65	U

PLUM BROOK

Soils (Surface and Deep)

Data Summary

Report Date: 02/24/99

Sample Location:		TNTB-SO36		TNTB-SO37		TNTB-SO38		TNTB-SO39		TNTB-SO40	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		10850		10860		10870		10880		10890	
Sample Date:		12-NOV-98		12-NOV-98		12-NOV-98		12-NOV-98		12-NOV-98	
Depth:		0 - 1		0 - 1		0 - 1		0 - 1		0 - 1	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
1,3-Dinitrobenzene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
2,4,6-Trinitrotoluene	mg/kg	0.40		4.3		0.78		0.25	U	0.25	U
2,4-Dinitrotoluene	mg/kg	0.25	U	2.3		0.34		0.25	U	0.26	
2,6-Dinitrotoluene	mg/kg	0.25	U	0.83		0.25	U	0.25	U	0.25	U
2-Amino-4,6-dinitrotoluene	mg/kg	0.25	U	1.7		0.25	U	0.25	U	0.25	U
2-Nitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
3-Nitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
4-Amino-2,6-dinitrotoluene	mg/kg	0.25	U	2.5		0.35		0.25	U	0.25	U
4-Nitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
HMX	mg/kg	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Nitrobenzene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
RDX	mg/kg	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Tetryl	mg/kg	0.65	U	0.65	U	0.65	U	0.65	U	0.65	U

PLUM BROOK

Sediment

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SD01		TNTB-SD02		TNTB-SD03		TNTB-SD05	
Associated Site:		TNTB		TNTB		TNTB		TNTB	
Sample No:		11000		11010		11020		11040	
Sample Date:		04-NOV-98		04-NOV-98		04-NOV-98		04-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2-Butanone	ug/kg	62	J	12	J	47	J	7.2	J
Acetone	ug/kg	270	J	61	J	240	J	48	J
Carbon disulfide	ug/kg			2.5	J				

PLUM BROOK

Sediment

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SD01		TNTB-SD02		TNTB-SD03		TNTB-SD05	
Associated Site:		TNTB		TNTB		TNTB		TNTB	
Sample No:		11000		11010		11020		11040	
Sample Date:		04-NOV-98		04-NOV-98		04-NOV-98		04-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2-Butanone	ug/kg	62	J	12	J	47	J	7.2	J
Acetone	ug/kg	270	J	61	J	240	J	48	J
Carbon disulfide	ug/kg			2.5	J				

PLUM BROOK

Sediment

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SD02		TNTB-SD05	
Associated Site:		TNTB		TNTB	
Sample No:		11010		11040	
Sample Date:		04-NOV-98		04-NOV-98	
Depth:		0 - .5		0 - .5	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr
2-Methylnaphthalene	ug/kg	380	J		
Benzo(a)pyrene	ug/kg			47	J
Fluoranthene	ug/kg			82	J
Naphthalene	ug/kg	78	J		
Phenanthrene	ug/kg	170	J		
Pyrene	ug/kg			59	J

PLUM BROOK

Sediment

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SD01		TNTB-SD02		TNTB-SD03		TNTB-SD04		TNTB-SD05	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		11000		11010		11020		11030		11040	
Sample Date:		04-NOV-98		04-NOV-98		04-NOV-98		04-NOV-98		04-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5		0 - .5	
METALS3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	10200		4210		20000		19500		10700	
Arsenic	mg/kg	15.9	J	17.4	J	26.4	J	19.2	J	32.5	J
Barium	mg/kg	91.7		57.4		174		116		71.1	
Beryllium	mg/kg					6.9		6.9		1.4	
Calcium	mg/kg	3650		1580		6290		10200		2240	
Chromium	mg/kg	14.4		11.3		24.9		19.1		15.8	
Cobalt	mg/kg					137		74.2			
Copper	mg/kg	43.5		40.2		58.9		54.3		66.0	
Iron	mg/kg	28800		26400		175000		196000		42800	
Lead	mg/kg	22.7	J	15.4	J	24.8	J	16.4	J	25.8	J
Magnesium	mg/kg									1350	
Manganese	mg/kg	58.1		89.2		2060		542		104	
Nickel	mg/kg	31.2		15.9		165		178		36.4	
Potassium	mg/kg	1710		1450				3320		1810	
Selenium	mg/kg			0.86	J	3.4	J	4.0	J	1.8	J
Zinc	mg/kg	31.7		31.3		313		340		90.2	

PLUM BROOK

Sediment

Detected Hits Summary

Report Date: 02/25/99

Sample Location:		TNTB-SD02	
Associated Site:		TNTB	
Sample No:		11010	
Sample Date:		04-NOV-98	
Depth:		0 - .5	
EXPLOSIVES	Units	Result	Val Qlfr
2,4,6-Trinitrotoluene	mg/kg	0.96	
2-Amino-4,6-dinitrotoluene	mg/kg	0.56	

PLUM BROOK

Surface Water

Dtected Hits Summary

Report Date: 02/25/99

Sample Location:			TNTB-SW01		TNTB-SW02	
Associated Site:			TNTB		TNTB	
Sample No:			12000		12010	
Sample Date:			04-NOV-98		04-NOV-98	
VOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
1,1-Dichloroethane		ug/L	-	-	0.51	J
2-Butanone		ug/L	1.2	J	-	-
Carbon disulfide		ug/L	1.2		-	-

PLUM BROOK

Surface Water

Dtected Hits Summary

Report Date: 02/25/99

Sample Location:			TNTB-SW01		TNTB-SW02	
Associated Site:			TNTB		TNTB	
Sample No:			12000		12010	
Sample Date:			04-NOV-98		04-NOV-98	
SEMIVOLATILES3	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr

PLUM BROOK

Surface Water

Dtected Hits Summary

Report Date: 02/25/99

Sample Location:			TNTB-SW01		TNTB-SW02	
Associated Site:			TNTB		TNTB	
Sample No:			12000		12010	
Sample Date:			04-NOV-98		04-NOV-98	
PCB3	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr

PLUM BROOK

Surface Water

Dtected Hits Summary

Report Date: 02/25/99

Sample Location:			TNTB-SW01		TNTB-SW02	
Associated Site:			TNTB		TNTB	
Sample No:			12000		12010	
Sample Date:			04-NOV-98		04-NOV-98	
METALS3-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
Aluminum		ug/L	14900	J	969	J
Arsenic		ug/L	21.1		30.9	J
Calcium		ug/L	140000		126000	
Calcium	Y	ug/L	132000		124000	
Chromium		ug/L	18.8		11.5	J
Copper		ug/L	34.2		-	-
Iron		ug/L	35000		167000	J
Iron	Y	ug/L	267		683	J
Lead		ug/L	20.5		7.8	J
Magnesium		ug/L	34200		23900	J
Magnesium	Y	ug/L	31900		24400	
Manganese		ug/L	793		1440	J
Manganese	Y	ug/L	555		855	
Nickel		ug/L	43.1		-	-
Potassium		ug/L	16200		-	-
Potassium	Y	ug/L	13300		-	-
Selenium		ug/L	-	-	6.0	J
Sodium		ug/L	20600		17600	
Sodium	Y	ug/L	20700		18500	
Zinc		ug/L	58.8		57.8	J

PLUM BROOK

Surface Water

Dtected Hits Summary

Report Date: 02/25/99

Sample Location:			TNTB-SW01		TNTB-SW02	
Associated Site:			TNTB		TNTB	
Sample No:			12000		12010	
Sample Date:			04-NOV-98		04-NOV-98	
EXPLOSIVES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr

PLUM BROOK

Sediment

Data Summary

Report Date: 02/24/99

Sample Location:		TNTB-SD01		TNTB-SD02		TNTB-SD03		TNTB-SD04		TNTB-SD05	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		11000		11010		11020		11030		11040	
Sample Date:		04-NOV-98		04-NOV-98		04-NOV-98		04-NOV-98		04-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5		0 - .5	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	ug/kg	17	U	7.4	U	31	U	28	U	10	U
1,1,2,2-Tetrachloroethane	ug/kg	17	UJ	7.4	UJ	31	UJ	28	UJ	10	UJ
1,1,2-Trichloroethane	ug/kg	17	U	7.4	UJ	31	U	28	U	10	U
1,1-Dichloroethane	ug/kg	17	U	7.4	U	31	U	28	U	10	U
1,1-Dichloroethene	ug/kg	17	U	7.4	U	31	U	28	U	10	U
1,2-Dichloroethane	ug/kg	17	U	7.4	UJ	31	U	28	U	10	U
1,2-Dichloroethene	ug/kg	17	U	7.4	UJ	31	U	28	U	10	U
1,2-Dichloropropane	ug/kg	17	U	7.4	UJ	31	U	28	U	10	U
2-Butanone	ug/kg	62	J	12	J	47	J	110	U	7.2	J
2-Hexanone	ug/kg	66	U	30	UJ	120	U	110	U	40	U
4-Methyl-2-pentanone	ug/kg	66	U	30	UJ	120	U	110	U	40	U
Acetone	ug/kg	270	J	61	J	240	J	110	R	48	J
Benzene	ug/kg	17	U	7.4	UJ	31	U	28	U	10	U
Bromodichloromethane	ug/kg	17	U	7.4	UJ	31	U	28	U	10	U
Bromoform	ug/kg	17	U	7.4	UJ	31	U	28	U	10	U
Bromomethane	ug/kg	33	U	15	U	61	U	12	B	20	U
Carbon disulfide	ug/kg	17	U	2.5	J	31	U	28	U	10	U
Carbon tetrachloride	ug/kg	17	U	7.4	UJ	31	U	28	U	10	U
Chlorobenzene	ug/kg	17	U	7.4	UJ	31	U	28	U	10	U
Chloroethane	ug/kg	33	U	15	U	61	U	55	U	20	U
Chloroform	ug/kg	17	U	7.4	U	31	U	28	U	10	U
Chloromethane	ug/kg	33	U	15	U	61	U	55	U	20	U
Dibromochloromethane	ug/kg	17	U	7.4	UJ	31	U	28	U	10	U
Ethylbenzene	ug/kg	17	U	7.4	UJ	31	U	28	U	10	U
Methylene chloride	ug/kg	16	B	8.4	B	28	B	29	B	9.5	B
Styrene	ug/kg	17	U	7.4	UJ	31	U	28	U	10	U
Tetrachloroethene	ug/kg	17	U	7.4	UJ	31	U	28	U	10	U
Toluene	ug/kg	17	U	7.4	UJ	31	U	28	U	10	U
Total xylenes	ug/kg	17	U	7.4	UJ	31	U	28	U	10	U
Trichloroethene	ug/kg	17	U	7.4	UJ	31	U	28	U	10	U

PLUM BROOK

Sediment

Data Summary

Report Date: 02/24/99

Sample Location:		TNTB-SD01		TNTB-SD02		TNTB-SD03		TNTB-SD04		TNTB-SD05	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		11000		11010		11020		11030		11040	
Sample Date:		04-NOV-98		04-NOV-98		04-NOV-98		04-NOV-98		04-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5		0 - .5	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl chloride	ug/kg	33	U	15	U	61	U	55	U	20	U
cis-1,3-Dichloropropene	ug/kg	17	U	7.4	UJ	31	U	28	U	10	U
trans-1,3-Dichloropropene	ug/kg	17	U	7.4	UJ	31	U	28	U	10	U

PLUM BROOK
Sediment
Data Summary

Report Date: 02/24/99

Sample Location:		TNTB-SD01		TNTB-SD02		TNTB-SD03		TNTB-SD04		TNTB-SD05	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		11000		11010		11020		11030		11040	
Sample Date:		04-NOV-98		04-NOV-98		04-NOV-98		04-NOV-98		04-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5		0 - .5	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
1,2-Dichlorobenzene	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
1,3-Dichlorobenzene	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
1,4-Dichlorobenzene	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
2,4,5-Trichlorophenol	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
2,4,6-Trichlorophenol	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
2,4-Dichlorophenol	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
2,4-Dimethylphenol	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
2,4-Dinitrophenol	ug/kg	5300	U	2400	U	9800	U	8800	U	3200	U
2,4-Dinitrotoluene	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
2,6-Dinitrotoluene	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
2-Chloronaphthalene	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
2-Chlorophenol	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
2-Methylnaphthalene	ug/kg	1100	U	380	J	2000	U	1800	U	670	U
2-Methylphenol	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
2-Nitroaniline	ug/kg	5300	U	2400	U	9800	U	8800	U	3200	U
2-Nitrophenol	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
3,3'-Dichlorobenzidine	ug/kg	5300	U	2400	U	9800	U	8800	U	3200	U
3-Nitroaniline	ug/kg	5300	U	2400	U	9800	U	8800	U	3200	U
4,6-Dinitro-2-methylphenol	ug/kg	5300	U	2400	U	9800	U	8800	U	3200	U
4-Bromophenyl phenyl ether	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
4-Chloro-3-methylphenol	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
4-Chloroaniline	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
4-Chlorophenyl phenyl ether	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
4-Methylphenol	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
4-Nitroaniline	ug/kg	5300	U	2400	U	9800	U	8800	U	3200	U
4-Nitrophenol	ug/kg	5300	U	2400	U	9800	U	8800	U	3200	U
Acenaphthene	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
Acenaphthylene	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
Anthracene	ug/kg	1100	U	490	U	2000	U	1800	U	670	U

PLUM BROOK
Sediment
Data Summary

Report Date: 02/24/99

Sample Location:		TNTB-SD01		TNTB-SD02		TNTB-SD03		TNTB-SD04		TNTB-SD05	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		11000		11010		11020		11030		11040	
Sample Date:		04-NOV-98		04-NOV-98		04-NOV-98		04-NOV-98		04-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5		0 - .5	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
Benzo(a)pyrene	ug/kg	1100	U	490	U	2000	U	1800	U	47	J
Benzo(b)fluoranthene	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
Benzo(ghi)perylene	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
Benzo(k)fluoranthene	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
Butyl benzyl phthalate	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
Carbazole	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
Chrysene	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
Dibenz(a,h)anthracene	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
Dibenzofuran	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
Diethyl phthalate	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
Dimethyl phthalate	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
Fluoranthene	ug/kg	1100	U	490	U	2000	U	1800	U	82	J
Fluorene	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
Hexachlorobenzene	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
Hexachlorobutadiene	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
Hexachlorocyclopentadiene	ug/kg	5300	U	2400	U	9800	U	8800	UJ	3200	UJ
Hexachloroethane	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
Indeno(1,2,3-cd)pyrene	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
Isophorone	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
Naphthalene	ug/kg	1100	U	78	J	2000	U	1800	U	670	U
Nitrobenzene	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
Pentachlorophenol	ug/kg	5300	U	2400	U	9800	U	8800	U	3200	U
Phenanthrene	ug/kg	1100	U	170	J	2000	U	1800	U	670	U
Phenol	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
Pyrene	ug/kg	1100	U	490	U	2000	U	1800	U	59	J
bis(2-Chloroethoxy)methane	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
bis(2-Chloroethyl)ether	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
bis(2-Chloroisopropyl)ether	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
bis(2-Ethylhexyl)phthalate	ug/kg	1100	U	490	U	2000	U	1800	U	100	J

PLUM BROOK

Sediment

Data Summary

Report Date: 02/24/99

Sample Location:		TNTB-SD01		TNTB-SD02		TNTB-SD03		TNTB-SD04		TNTB-SD05	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		11000		11010		11020		11030		11040	
Sample Date:		04-NOV-98		04-NOV-98		04-NOV-98		04-NOV-98		04-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5		0 - .5	
SEMIVOLATILES3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
di-n-Butyl phthalate	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
di-n-Octyl phthalate	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
n-Nitroso-di-n-propylamine	ug/kg	1100	U	490	U	2000	U	1800	U	670	U
n-Nitrosodiphenylamine	ug/kg	1100	U	490	U	2000	U	1800	U	670	U

PLUM BROOK

Sediment

Data Summary

Report Date: 02/24/99

Sample Location:		TNTB-SD01		TNTB-SD02		TNTB-SD03		TNTB-SD04		TNTB-SD05	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		11000		11010		11020		11030		11040	
Sample Date:		04-NOV-98		04-NOV-98		04-NOV-98		04-NOV-98		04-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5		0 - .5	
PCB3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016	ug/kg	110	U	150	U	200	U	180	U	67	U
Aroclor 1221	ug/kg	110	U	150	U	200	U	180	U	67	U
Aroclor 1232	ug/kg	110	U	150	U	200	U	180	U	67	U
Aroclor 1242	ug/kg	110	U	150	U	200	U	180	U	67	U
Aroclor 1248	ug/kg	110	U	150	U	200	U	180	U	67	U
Aroclor 1254	ug/kg	110	U	150	U	200	U	180	U	67	U
Aroclor 1260	ug/kg	110	U	150	U	200	U	180	U	67	U

PLUM BROOK
Sediment
Data Summary

Report Date: 02/24/99

Sample Location:		TNTB-SD01		TNTB-SD02		TNTB-SD03		TNTB-SD04		TNTB-SD05	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		11000		11010		11020		11030		11040	
Sample Date:		04-NOV-98		04-NOV-98		04-NOV-98		04-NOV-98		04-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5		0 - .5	
METALS3	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	10200		4210		20000		19500		10700	
Antimony	mg/kg	19.8	UJ	8.9	UJ	36.8	UJ	33.1	UJ	12.1	UJ
Arsenic	mg/kg	15.9	J	17.4	J	26.4	J	19.2	J	32.5	J
Barium	mg/kg	91.7		57.4		174		116		71.1	
Beryllium	mg/kg	1.7	U	0.74	U	6.9		6.9		1.4	
Cadmium	mg/kg	1.7	U	0.74	U	3.1	U	2.8	U	1.0	U
Calcium	mg/kg	3650		1580		6290		10200		2240	
Chromium	mg/kg	14.4		11.3		24.9		19.1		15.8	
Cobalt	mg/kg	16.5	U	7.4	U	137		74.2		10.1	U
Copper	mg/kg	43.5		40.2		58.9		54.3		66.0	
Iron	mg/kg	28800		26400		175000		196000		42800	
Lead	mg/kg	22.7	J	15.4	J	24.8	J	16.4	J	25.8	J
Magnesium	mg/kg	1650	U	742	U	3070	U	2760	U	1350	
Manganese	mg/kg	58.1		89.2		2060		542		104	
Mercury	mg/kg	0.11	U	0.049	U	0.20	U	0.18	U	0.067	U
Nickel	mg/kg	31.2		15.9		165		178		36.4	
Potassium	mg/kg	1710		1450		3070	U	3320		1810	
Selenium	mg/kg	1.7	UJ	0.86	J	3.4	J	4.0	J	1.8	J
Silver	mg/kg	3.3	U	1.5	U	6.1	U	5.5	U	2.0	U
Sodium	mg/kg	1650	U	742	U	3070	U	2760	U	1010	U
Thallium	mg/kg	3.3	UJ	1.5	UJ	6.1	UJ	5.5	UJ	2.0	UJ
Vanadium	mg/kg	16.5	UJ	7.4	UJ	30.7	UJ	27.6	UJ	10.1	UJ
Zinc	mg/kg	31.7		31.3		313		340		90.2	

PLUM BROOK

Sediment

Data Summary

Report Date: 02/24/99

Sample Location:		TNTB-SD01		TNTB-SD02		TNTB-SD03		TNTB-SD04		TNTB-SD05	
Associated Site:		TNTB		TNTB		TNTB		TNTB		TNTB	
Sample No:		11000		11010		11020		11030		11040	
Sample Date:		04-NOV-98		04-NOV-98		04-NOV-98		04-NOV-98		04-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5		0 - .5	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
1,3-Dinitrobenzene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
2,4,6-Trinitrotoluene	mg/kg	0.25	U	0.96		0.25	U	0.25	U	0.25	U
2,4-Dinitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
2,6-Dinitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
2-Amino-4,6-dinitrotoluene	mg/kg	0.25	U	0.56		0.25	U	0.25	U	0.25	U
2-Nitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
3-Nitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
4-Amino-2,6-dinitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
4-Nitrotoluene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
HMX	mg/kg	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Nitrobenzene	mg/kg	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
RDX	mg/kg	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Tetryl	mg/kg	0.65	U	0.65	U	0.65	U	0.65	U	0.65	U

PLUM BROOK
Surface Water
Data Summary

Report Date: 02/24/99

Sample Location:			TNTB-SW01		TNTB-SW02	
Associated Site:			TNTB		TNTB	
Sample No:			12000		12010	
Sample Date:			04-NOV-98		04-NOV-98	
VOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane		ug/L	1.0	U	1.0	U
1,1,2,2-Tetrachloroethane		ug/L	1.0	U	1.0	U
1,1,2-Trichloroethane		ug/L	1.0	U	1.0	U
1,1-Dichloroethane		ug/L	1.0	U	0.51	J
1,1-Dichloroethene		ug/L	1.0	U	1.0	U
1,2-Dichloroethane		ug/L	1.0	U	1.0	U
1,2-Dichloroethene		ug/L	1.0	U	1.0	U
1,2-Dichloropropane		ug/L	1.0	U	1.0	U
2-Butanone		ug/L	1.2	J	5.0	R
2-Hexanone		ug/L	5.0	U	5.0	U
4-Methyl-2-pentanone		ug/L	5.0	U	5.0	U
Acetone		ug/L	13	B	4.7	B
Benzene		ug/L	1.0	U	1.0	U
Bromodichloromethane		ug/L	1.0	U	1.0	U
Bromoform		ug/L	1.0	U	1.0	U
Bromomethane		ug/L	2.0	UJ	2.0	UJ
Carbon disulfide		ug/L	1.2		1.0	U
Carbon tetrachloride		ug/L	1.0	U	1.0	U
Chlorobenzene		ug/L	1.0	U	1.0	U
Chloroethane		ug/L	2.0	U	2.0	U
Chloroform		ug/L	1.0	U	1.0	U
Chloromethane		ug/L	2.0	U	2.0	U
Dibromochloromethane		ug/L	1.0	U	1.0	U
Ethylbenzene		ug/L	1.0	U	1.0	U
Methylene chloride		ug/L	1.0	U	1.0	U
Styrene		ug/L	1.0	U	1.0	U
Tetrachloroethene		ug/L	1.0	U	1.0	U
Toluene		ug/L	3.4		0.47	B
Total xylenes		ug/L	1.0	U	1.0	U

PLUM BROOK
Surface Water
Data Summary

Report Date: 02/24/99

Sample Location:			TNTB-SW01		TNTB-SW02	
Associated Site:			TNTB		TNTB	
Sample No:			12000		12010	
Sample Date:			04-NOV-98		04-NOV-98	
VOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
Trichloroethene		ug/L	1.0	U	1.0	U
Vinyl chloride		ug/L	2.0	U	2.0	U
cis-1,3-Dichloropropene		ug/L	1.0	U	1.0	U
trans-1,3-Dichloropropene		ug/L	1.0	U	1.0	U

PLUM BROOK
Surface Water
Data Summary

Report Date: 02/24/99

Sample Location:			TNTB-SW01		TNTB-SW02	
Associated Site:			TNTB		TNTB	
Sample No:			12000		12010	
Sample Date:			04-NOV-98		04-NOV-98	
SEMIVOLATILES3	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene		ug/L	10	U	10	U
1,2-Dichlorobenzene		ug/L	10	U	10	U
1,3-Dichlorobenzene		ug/L	10	U	10	U
1,4-Dichlorobenzene		ug/L	10	U	10	U
2,4,5-Trichlorophenol		ug/L	10	U	10	U
2,4,6-Trichlorophenol		ug/L	10	U	10	U
2,4-Dichlorophenol		ug/L	10	U	10	U
2,4-Dimethylphenol		ug/L	10	U	10	U
2,4-Dinitrophenol		ug/L	50	U	50	U
2,4-Dinitrotoluene		ug/L	10	U	10	U
2,6-Dinitrotoluene		ug/L	10	U	10	U
2-Chloronaphthalene		ug/L	10	U	10	U
2-Chlorophenol		ug/L	10	U	10	U
2-Methylnaphthalene		ug/L	10	U	10	U
2-Methylphenol		ug/L	10	U	10	U
2-Nitroaniline		ug/L	50	U	50	U
2-Nitrophenol		ug/L	10	U	10	U
3,3'-Dichlorobenzidine		ug/L	50	U	50	U
3-Nitroaniline		ug/L	50	U	50	U
4,6-Dinitro-2-methylphenol		ug/L	50	U	50	U
4-Bromophenyl phenyl ether		ug/L	10	U	10	U
4-Chloro-3-methylphenol		ug/L	10	U	10	U
4-Chloroaniline		ug/L	10	U	10	U
4-Chlorophenyl phenyl ether		ug/L	10	U	10	U
4-Methylphenol		ug/L	10	U	10	U
4-Nitroaniline		ug/L	50	U	50	U
4-Nitrophenol		ug/L	50	U	50	U
Acenaphthene		ug/L	10	U	10	U
Acenaphthylene		ug/L	10	U	10	U

PLUM BROOK
Surface Water
Data Summary

Report Date: 02/24/99

Sample Location:			TNTB-SW01		TNTB-SW02	
Associated Site:			TNTB		TNTB	
Sample No:			12000		12010	
Sample Date:			04-NOV-98		04-NOV-98	
SEMIVOLATILES3	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
Anthracene		ug/L	10	U	10	U
Benzo(a)anthracene		ug/L	10	U	10	U
Benzo(a)pyrene		ug/L	10	U	10	U
Benzo(b)fluoranthene		ug/L	10	U	10	U
Benzo(ghi)perylene		ug/L	10	U	10	U
Benzo(k)fluoranthene		ug/L	10	U	10	U
Butyl benzyl phthalate		ug/L	10	U	10	U
Carbazole		ug/L	10	U	10	U
Chrysene		ug/L	10	U	10	U
Dibenz(a,h)anthracene		ug/L	10	U	10	U
Dibenzofuran		ug/L	10	U	10	U
Diethyl phthalate		ug/L	10	U	10	U
Dimethyl phthalate		ug/L	10	U	10	U
Fluoranthene		ug/L	10	U	10	U
Fluorene		ug/L	10	U	10	U
Hexachlorobenzene		ug/L	10	U	10	U
Hexachlorobutadiene		ug/L	10	U	10	U
Hexachlorocyclopentadiene		ug/L	50	U	50	U
Hexachloroethane		ug/L	10	U	10	U
Indeno(1,2,3-cd)pyrene		ug/L	10	U	10	U
Isophorone		ug/L	10	U	10	U
Naphthalene		ug/L	10	U	10	U
Nitrobenzene		ug/L	10	U	10	U
Pentachlorophenol		ug/L	50	U	50	U
Phenanthrene		ug/L	10	U	10	U
Phenol		ug/L	2.2	B	4.8	B
Pyrene		ug/L	10	U	10	U
bis(2-Chloroethoxy)methane		ug/L	10	U	10	U
bis(2-Chloroethyl)ether		ug/L	10	U	10	U

PLUM BROOK
Surface Water
Data Summary

Report Date: 02/24/99

Sample Location:			TNTB-SW01		TNTB-SW02	
Associated Site:			TNTB		TNTB	
Sample No:			12000		12010	
Sample Date:			04-NOV-98		04-NOV-98	
SEMIVOLATILES3	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
bis(2-Chloroisopropyl)ether		ug/L	10	U	10	U
bis(2-Ethylhexyl)phthalate		ug/L	10	U	10	U
di-n-Butyl phthalate		ug/L	10	U	10	U
di-n-Octyl phthalate		ug/L	10	U	10	U
n-Nitroso-di-n-propylamine		ug/L	10	U	10	U
n-Nitrosodiphenylamine		ug/L	10	U	10	U

PLUM BROOK
Surface Water
Data Summary

Report Date: 02/24/99

Sample Location:			TNTB-SW01		TNTB-SW02	
Associated Site:			TNTB		TNTB	
Sample No:			12000		12010	
Sample Date:			04-NOV-98		04-NOV-98	
PCB3	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016		ug/L	2.1	U	1.9	U
Aroclor 1221		ug/L	2.1	U	1.9	U
Aroclor 1232		ug/L	2.1	U	1.9	U
Aroclor 1242		ug/L	2.1	U	1.9	U
Aroclor 1248		ug/L	2.1	U	1.9	U
Aroclor 1254		ug/L	2.1	U	1.9	U
Aroclor 1260		ug/L	2.1	U	1.9	U

PLUM BROOK
Surface Water
Data Summary

Report Date: 02/24/99

Sample Location:			TNTB-SW01		TNTB-SW02	
Associated Site:			TNTB		TNTB	
Sample No:			12000		12010	
Sample Date:			04-NOV-98		04-NOV-98	
METALS3-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
Aluminum		ug/L	14900	J	969	J
Aluminum	Y	ug/L	200	U	200	U
Antimony		ug/L	60.0	U	60.0	U
Antimony	Y	ug/L	60.0	U	60.0	U
Arsenic		ug/L	21.1		30.9	J
Arsenic	Y	ug/L	10.0	U	10.0	U
Barium		ug/L	200	U	200	U
Barium	Y	ug/L	200	U	200	U
Beryllium		ug/L	5.0	U	5.0	U
Beryllium	Y	ug/L	5.0	U	5.0	U
Cadmium		ug/L	5.0	U	5.0	U
Cadmium	Y	ug/L	5.0	U	5.0	U
Calcium		ug/L	140000		126000	
Calcium	Y	ug/L	132000		124000	
Chromium		ug/L	18.8		11.5	J
Chromium	Y	ug/L	10.0	U	10.0	U
Cobalt		ug/L	50.0	U	50.0	U
Cobalt	Y	ug/L	50.0	U	50.0	U
Copper		ug/L	34.2		25.0	U
Copper	Y	ug/L	25.0	U	25.0	U
Iron		ug/L	35000		167000	J
Iron	Y	ug/L	267		683	J
Lead		ug/L	20.5		7.8	J
Lead	Y	ug/L	3.0	U	3.0	U
Magnesium		ug/L	34200		23900	J
Magnesium	Y	ug/L	31900		24400	
Manganese		ug/L	793		1440	J
Manganese	Y	ug/L	555		855	
Mercury		ug/L	0.20	U	0.20	U

PLUM BROOK
Surface Water
Data Summary

Report Date: 02/24/99

Sample Location:			TNTB-SW01		TNTB-SW02	
Associated Site:			TNTB		TNTB	
Sample No:			12000		12010	
Sample Date:			04-NOV-98		04-NOV-98	
METALS3-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
Mercury	Y	ug/L	0.20	U	0.20	U
Nickel		ug/L	43.1		40.0	U
Nickel	Y	ug/L	40.0	U	40.0	U
Potassium		ug/L	16200		5000	U
Potassium	Y	ug/L	13300		5000	U
Selenium		ug/L	5.0	U	6.0	J
Selenium	Y	ug/L	5.0	U	5.0	U
Silver		ug/L	10.0	U	10.0	U
Silver	Y	ug/L	10.0	U	10.0	U
Sodium		ug/L	20600		17600	
Sodium	Y	ug/L	20700		18500	
Thallium		ug/L	10.0	U	10.0	U
Thallium	Y	ug/L	10.0	U	10.0	U
Vanadium		ug/L	50.0	U	50.0	U
Vanadium	Y	ug/L	50.0	U	50.0	U
Zinc		ug/L	58.8		57.8	J
Zinc	Y	ug/L	20.0	U	20.0	U

PLUM BROOK
Surface Water
Data Summary

Report Date: 02/24/99

Sample Location:			TNTB-SW01		TNTB-SW02	
Associated Site:			TNTB		TNTB	
Sample No:			12000		12010	
Sample Date:			04-NOV-98		04-NOV-98	
EXPLOSIVES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene		ug/L	0.20	UJ	0.20	UJ
1,3-Dinitrobenzene		ug/L	0.20	UJ	0.20	UJ
2,4,6-Trinitrotoluene		ug/L	0.20	UJ	0.20	UJ
2,4-Dinitrotoluene		ug/L	0.20	UJ	0.20	UJ
2,6-Dinitrotoluene		ug/L	0.20	UJ	0.20	UJ
2-Amino-4,6-dinitrotoluene		ug/L	0.20	UJ	0.20	UJ
2-Nitrotoluene		ug/L	0.20	UJ	0.20	UJ
3-Nitrotoluene		ug/L	0.20	UJ	0.20	UJ
4-Amino-2,6-dinitrotoluene		ug/L	0.20	UJ	0.20	UJ
4-Nitrotoluene		ug/L	0.20	UJ	0.20	UJ
HMX		ug/L	0.50	UJ	0.50	UJ
Nitrobenzene		ug/L	0.20	UJ	0.51	UJ
RDX		ug/L	0.50	UJ	0.50	UJ
Tetryl		ug/L	0.20	UJ	0.20	UJ

APPENDIX F

DATA QUALITY EVALUATION

Appendix F

Data Quality Evaluation
Plum Brook Ordnance Works
TNT Area B Investigation

F1.0 Introduction

This appendix presents the results of the Quality Assurance/Quality Control (QA/QC) protocols implemented during the sampling and analysis portion of the investigation of TNT Area B. The quality indicators from every aspect of the data collection process have been reviewed, and an assessment of the data with regard to the project specific objectives is presented. The reliability of the sampling and fixed-base laboratory analytical procedures used during the investigations was demonstrated by implementing the project specific quality assurance procedures specified in the site-wide Sampling and Analysis Plan and Quality Assurance Project Plan (IT, 1996a) and its site-specific attachments (SSAP, IT 1998). Successful execution of these procedures provides strong supporting evidence for the acceptance of the fixed-base laboratory data as representative of the area under investigation. A complete evaluation of the procedures implemented in the investigations is summarized in this Data Quality Evaluation (DQE).

The DQE for the TNT Area B investigation is divided into two phases. The first phase includes the discussion of the overall field sampling effort and the field quality control (QC) activities employed. The resulting QC data are presented and compared to the procedures and goals established in the Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP), as well as the verification of the completeness, accuracy and representativeness of the field sampling. The second phase deals with the analytical program and the results of the QC activities employed. An overall comparison to data quality objectives (DQO) was performed as well as a complete data review. Also included is a discussion of the Ion Mobility Spectroscopy (IMS) field screening effort. A comparison of the screening data with fixed-base laboratory data is addressed. A complete discussion of the IMS screening data and associated QA/QC protocol implemented is presented in DP Consultants' *Quality Assurance Quality Control Report for On-Site Ion Mobility Spectroscopy Analysis* found in Attachment 1 of this appendix. All elements of data evaluation were compiled and used to determine the usability and overall applicability of the resulting data.

F2.0 Field Sampling Program

Field Quality Control Activities. To ensure the reliability of the field sampling procedures, and fixed-base lab analytical data, field QA/QC samples were collected or prepared for each medium sampled, each sample shipment and/or each sampling event. These QA/QC samples were used to address any sample variability and uncertainty in procedures. Since equipment rinsate and field blank samples were analyzed by the fixed-base laboratory, they were not analyzed by IMS. IMS duplicate and colorimetric split samples were analyzed from the same sample collection jar.

F2.1 Field Duplicates

The purpose of the field duplicate is to generate data used to evaluate the precision of the sample collection, handling and analysis procedures. Field duplicate samples were collected from the following locations: TNTB-SO06, TNTB-SO14, TNTB-SO26, TNTB-SO35, TNTB-SD04, and TNTB-SW02.

It can be difficult to collect true duplicate samples, especially for solid matrices that are inherently more heterogeneous than liquid matrices. Greater variations are seen in the precision data which are measured by calculating the relative percent difference (RPD) between the original sample results and its duplicate results. Higher RPDs are thought to reflect difficulties often encountered during the collection of duplicate samples or sample handling. Wide variations in soil results may be attributable to actual variations in concentrations rather than denoting problems with precision or sampling effectiveness.

All positive concentrations and the calculated RPD for the original sample and/or its duplicate are presented in Tables F-1 to F-5. The RPD results were calculated as follows:

$$RPD = \frac{A-B}{[(A+B)/2]} 100$$

where:

RPD = Relative percent difference
A = Original sample result
B = Duplicate sample result.

Table F-1

Field Duplicate Results
TNT Area B
Former Plum Brook Ordnance Works, Sandusky, Ohio
PBOW-98-SO-TNTB-SO06-10550 (4.0-5.0)

Parameter	10550 Original (µg/kg)	10551 Duplicate (µg/kg)	RPD %
Acetone	22 J	8.4 B	89
Aroclor 1260	2800 NJ	550 NJ	134
2,4-Dinitrotoluene (8270C)	3600	3400	6
2,6-Dinitrotoluene (8270C)	2400	1600	40
4,6-Dinitro-2-Methylphenol	170 J	240 J	34
Benzo(b)fluoranthene	41 J	370 U	NC
Chrysene	380 U	74 J	NC

Table F-1

Field Duplicate Results
TNT Area B
Former Plum Brook Ordnance Works, Sandusky, Ohio
PBOW-98-SO-TNTB-SO06-10550 (4.0-5.0)

Parameter	10550 Original (mg/kg)	10551 Duplicate (mg/kg)	RPD %
Aluminum	2990	3290	10
Arsenic	9.9 J	15.4 J	43
Barium	40.8	52.0	24
Calcium	2140	1830	16
Chromium	6.2	8.0	25
Copper	19.7	25.8	27
Iron	12500	22000	55
Lead	61.4 J	36.5 J	51
Magnesium	655	686	5
Manganese	87.5	111	24
Nickel	8.8	13.5	42
Potassium	690	662	4
Selenium	0.78 J	1.2 J	42
Zinc	42.9	50.5	16
2,4,6-Trinitrotoluene	2200 J	140 J	176
2-Amino-4,6-dinitrotoluene	62 U	11	NC
2,4-Dinitrotoluene (8330)	62 U	5.4 J	NC

U = Compound analyzed for but not detected; value given is quantitation limit.
J = Compound detected but value is estimated.
NC = Not calculable.
NJ = Compound detected but identification is tentative and value is estimated.

Table F-2

Field Duplicate Results
TNT Area B
Former Plum Brook Ordnance Works, Sandusky, Ohio
PBOW-98-SO-TNTB-SO14-10630 (0-0)

Parameter	10630 Original (ug/kg)	10631 Duplicate (ug/kg)	RPD %
Aroclor 1260	230 N	280 N	20
2,4-Dinitrotoluene (8270C)	490	210 J	80
2,6-Dinitrotoluene (8270C)	65 J	420 U	NC
Benzo(a)anthracene	40 J	420 U	NC
Benzo(a)pyrene	56 J	43 J	26
Benzo(b)fluoranthene	73 J	47 J	43
Benzo(ghi)perylene	37 J	420 U	NC
Benzo(k)fluoranthene	74 J	63 J	16
Chrysene	76 J	51 J	39
Fluoranthene	110 J	69 J	46
Indeno(1,2,3-cd)pyrene	37 J	420 U	NC
Pyrene	84 J	58 J	37

Table F-2

Field Duplicate Results
TNT Area B
Former Plum Brook Ordnance Works, Sandusky, Ohio
PBOW-98-SO-TNTB-SO14-10630 (0-0)

Parameter	10630 Original (mg/kg)	10631 Duplicate (mg/kg)	RPD %
Aluminum	7150 J	7540 J	5
Arsenic	13.2	13.7	4
Barium	112 J	122 J	9
Beryllium	0.86	0.87	1
Calcium	5610 J	6430 J	14
Chromium	12.5 J	12.9 J	3
Cobalt	11.8	17.6	39
Copper	47.8 J	77.9 J	48
Iron	23600 J	24800 J	5
Lead	67.7 J	75.4 J	11
Magnesium	1550 J	2050 J	28
Manganese	378 J	645	52
Mercury	0.082	0.084	2
Nickel	31.3	34.9	11
Potassium	1130	1210	7
Selenium	1.3	0.96	30
Zinc	146 J	148 J	1
2,4,6-Trinitrotoluene	490 J	320 J	42

U = Compound analyzed for but not detected; value given is quantitation limit.
J = Compound detected but value is estimated.
NC = Not calculable.

Table F-3

Field Duplicate Results
TNT Area B
Former Plum Brook Ordnance Works, Sandusky, Ohio
PBOW-98-SO-TNTB-SO26-10750 (0-0)

Parameter	10750 Original (ug/kg)	10751 Duplicate (ug/kg)	RPD %
Aroclor 1260	48 N	60 N	22
Acenaphthylene	400 U	81 J	NC
Anthracene	400 U	99 J	NC
Benzo(a)anthracene	400 U	340 J	NC
Benzo(a)pyrene	400 U	300 J	NC
Benzo(b)fluoranthene	400 U	230 J	NC
Benzo(ghi)perylene	400 U	120 J	NC
Benzo(k)fluoranthene	400 U	340 J	NC
Chrysene	400 U	330 J	NC
Dibenz(a,h) anthracene	400 U	79 J	NC
Fluoranthene	46 J	640	173
Indeno(1,2,3-cd)pyrene	400 U	140 J	NC
Phenanthrene	400 U	150 J	NC
Pyrene	400 U	470	NC

Table F-3

Field Duplicate Results
TNT Area B
Former Plum Brook Ordnance Works, Sandusky, Ohio
PBOW-98-SO-TNTB-SO26-10750 (0-0)

Parameter	10750 Original (mg/kg)	10751 Duplicate (mg/kg)	RPD %
Aluminum	5240 J	5070 J	3
Arsenic	9.1	8.6	6
Barium	39.6 J	35.8 J	10
Calcium	31000 J	69500 J	77
Chromium	8.5 J	7.8 J	9
Cobalt	7.4	6.9	7
Copper	23.5 J	20.6 J	13
Iron	15600 J	14300 J	9
Lead	33.4 J	28.6	15
Magnesium	4170 J	7320 J	55
Manganese	154 J	185 J	18
Mercury	0.049	0.048	2
Nickel	17.9	16.4	9
Potassium	831	812	2
Vanadium	8.7	11.5 J	28
Zinc	53.3 J	46.9 J	13
2,4,6-Trinitrotoluene	0.43	0.25 U	NC

U = Compound analyzed for but not detected; value given is quantitation limit.
J = Compound detected but value is estimated.
NC = Not calculable.

Table F-4

Field Duplicate Results
TNT Area B
Former Plum Brook Ordnance Works, Sandusky, Ohio
PBOW-98-SO-TNTB-SD04-11030 (0-0)

Parameter	11030 Original (mg/kg)	11031 Duplicate (mg/kg)	RPD %
Aluminum	19500	23000	16
Arsenic	19.2 J	23.9 J	22
Barium	116	126	8
Beryllium	6.9	8.2	17
Calcium	10200	10200	0
Chromium	19.1	21.3	11
Cobalt	74.2	58.3	24
Copper	54.3	59.3	9
Iron	196000	213000	8
Lead	16.4 J	19.3 J	16
Manganese	542	456	17
Nickel	178	183	3
Potassium	3320	3590	8
Selenium	4 J	4.4 J	10
Zinc	340	381	11

U = Compound analyzed for but not detected; value given is quantitation limit.
J = Compound detected but value is estimated.
NC = Not calculable.

Table F-5

Field Duplicate Results
TNT Area B
Former Plum Brook Ordnance Works, Sandusky, Ohio
PBOW-98-SO-TNTB-SW02-12010 (0-0)

Parameter	12010 Original (mg/kg)	12011 Duplicate (mg/kg)	RPD %
Aluminum (T)	969 J	4700 J	132
Arsenic (T)	30.9 J	138 J	127
Barium (T)	200 U	354 J	56
Calcium (T)	126000	134000	6
Calcium (D)	124000	124000	0
Chromium (T)	11.5 J	29.4 J	88
Copper (T)	25 U	59.4 J	82
Iron (T)	167000 J	428000 J	88
Iron (D)	683 J	168000 J	198
Lead (T)	7.8 J	31.2 J	120
Magnesium (T)	23900 J	24500 J	2
Magnesium (D)	24400	24900	2
Manganese (T)	1440 J	2340 J	48
Manganese (D)	855	872	2
Selenium (T)	6 J	11 J	59
Sodium (T)	17600	17400	1
Sodium (D)	18500	19200	4
Zinc (T)	57.8 J	223 J	118
1,1-Dichloroethane	.00051 J	.00043 J	17
Carbon Disulfide	.001 U	.00020 J	NC

U = Compound analyzed for but not detected; value given is quantitation limit
J = Compound detected but value is estimated
NC = Not calculable
T = Total
D = Dissolved

When concentrations are detected in only one of the two samples, "NC" is used to represent the RPD which is then "not calculable" for the parameter. There is no quantifiable result available from the "non-detect" sample to be used in the RPD calculation. When "estimated" (J qualified) concentrations are reported, there is a greater potential for increased variability between the primary and duplicate results as reflected in the RPD calculation.

Sample results with RPD values less than 50 are considered acceptable. Within each sampling area, there were results exceeding that value. Results from TNTB-SO06 outside acceptable limits were acetone (89 percent), 2,4,6-trinitrotoluene (62 percent), lead (51 percent), iron (59 percent), and Aroclor 1260 (134 percent). The organic compounds exceeding the RPD limit were estimated. Results from TNTB-SO14 demonstrated good precision with two exceptions: 2,4-Dinitrotoluene by SW8270C (80 percent) and manganese (52 percent). Four semivolatile compounds were detected in the original, but not in the duplicate. All the detected compounds were below the reporting limits. An RPD value could not be calculated. The samples collected from TNTB-SO26 demonstrated good precision for the metals except for calcium (71 percent) and magnesium (55 percent). The results for the organic compounds were not so precise. Twelve semivolatile compounds were detected in the duplicate, but not in the original. The RPD limit could not be determined. Eleven of the detected compounds were estimated and below the reporting limit. The samples from TNTB-SD04 demonstrated good precision overall. All metals detected had RPD values less than 25 percent. The results from the surface waters from TNTB-SW02 were highly variable for most of the total metals detected. The nutritional elements such as calcium, sodium, and magnesium were very precise for both dissolved and total metals.

F2.2 Equipment Rinse Blanks

Equipment rinses (ER) are used to assess the effectiveness of the equipment decontamination procedures employed and the potential of cross-contamination of environmental samples between sampling locations. The rinsates are collected by passing clean, analyte-free water through and over the sampling equipment after the decontamination procedures have been executed. One ER was collected for soils and one for surface and sediments. The blanks were analyzed for the same analytical parameters as the associated environmental samples collected.

The analytical results exhibited some low level concentrations of volatiles and one semivolatile. Organics acetone, chloroform, methylene chloride, toluene, and phenol were reported in the rinsates.

Careful review of all site related sample data suggested that the concentrations reported are not indicative of deficiencies in the decon process but rather laboratory process contamination or constituents detected or inherent in the water used in the final rinse. The ER data were used in the validation process by applying the "5X/10X Rule" and associated results were qualified accordingly.

F2.3 Field Blanks

Field blanks were prepared from clean water used in the decontamination procedures employed. Analysis of the blanks ensures that all water sources used during decon are free of parameters of interest. A field blank was collected from the final decontamination rinse water. Only one lot number of the deionized final rinse water was used; therefore, one (1) field blank was submitted for analysis and tested for the parameters analyzed in this investigation.

The non-potable, analyte-free water used in the final rinse of the sampling equipment exhibited low level concentrations of volatile and semivolatile compounds. The volatiles detected were acetone at 1.9 µg/L, chloroform at 0.97 µg/L, methylene chloride at 1.5 µg/L and toluene at 0.42 µg/L. Phenol (12 µg/L) and bis(2-ethylhexyl)phthalate (13 µg/L) were the only semivolatile organic compounds reported. Review of the associated field sample data suggest that these concentrations may be a result of laboratory process contamination. All compounds except chloroform were found in at least one method blank. The field blank data were used in the validation process by applying the "5X/10X Rule" and associated results were qualified accordingly.

F3.0 Analytical Program

The analytical program determined whether specific compounds were present in the samples collected from the areas investigated. Chemical analyses for this investigation consisted of two phases: field screening by IMS and fixed-base laboratory analyses. The fixed-base lab chemical analyses for the investigation were performed in accordance with the guidelines prescribed by the U.S. Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846), Physical/Chemical Methods, Third Edition, September 1986 and subsequent revisions. The field samples and associated QA/QC samples were analyzed for volatile organics, semivolatile organics, PCBs, metals, and nitroaromatic explosives using the methods presented in Table 3.1. No promulgated method exists for the analysis of soil by IMS. A standard

operating procedure (SOP) was submitted by the subcontractor, DP Consultants, at the beginning of the field effort. The SOP may be found in Attachment 1 to this appendix.

All analytical samples collected for the generation of definitive data were reported in EPA Level IV CLP-like data packages. A 100% Level III data validation was performed using EPA guidelines presented in the *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* and *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* dated February 1994. The criteria for blank evaluation were based on those detailed in *Region III Modifications to National Functional Guidelines for Organic Data Review* (September 1994) and *Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses* (April 1993). The regulatory compound/analyte list reported was the Target Compound List (TCL) for organics and the Target Analyte List (TAL) for inorganics. The data packages from the fixed-base laboratory have been reviewed for completeness and compliance to the approved final work plan (IT, 1996). All samples were submitted to the laboratory accompanied by a request for analysis/ chain of custody (RFA/COC) form. The RFA portion of the form provides project specific analytical specifications and quality control instructions to the laboratories. A formal chain-of-custody (COC) traceability record was included as part of the document ensuring documentation of custody for sample transportation, storage and eventual disposal by the laboratory. Copies of all custody documentation are included in the data packages submitted. All samples were received at the laboratory within the 4 +/- 2 degrees Celsius with custody seals intact.

The technical requirements for IMS were similar to those for a fixed-base laboratory. The subcontractor shall have and maintain an IMS unit capable of a multi-point calibration with explosive standards that include 2,4,6-trinitrotoluene (TNT), total dinitrotoluene (DNT), 1,3,5-trinitrobenzene (TNB), and total amino-DNT. To verify the effectiveness of the IMS, the subcontractor was required to analyze two composite samples per day using a non-immunoassay, wet chemistry field test. Verification was qualitative and semi-quantitative. At a minimum, the subcontractor was to provide calibration procedures, reporting limits, daily QA/QC sample analyses, and corrective actions. The calibration procedures included a compound list, concentrations of standards, acceptable recovery limits, and intervals between calibration checks. Daily QA/QC samples for the IMS would include method blanks, one pair of matrix spike and matrix spike duplicate samples, one blank spike or LCS, and one field duplicate.

F3.1 QA/QC Procedures

The project QA/QC program described in the SAP and QAPP was followed for the sample collection and fixed-base laboratory analysis of samples. The elements of this program are discussed in the sections that follow. The fixed-base laboratory analytical program consisted of EPA SW-846 methods with Level IV CLP-like deliverables for the generation of definitive data for the investigation. Deliverables included sample preparation information, calibration records, QC data such as method blanks, spikes, duplicates, surrogate recoveries, internal standards, and copies of the RFA and COC records. Chemical analyses for this project were performed following standardized protocols, which include specific requirements for how compounds are analyzed, identified and reported.

Each of the methods employed included specific QA/QC protocols that are used to support the validity of the sampling event and the resulting data. These QA/QC protocols are a critical part of the analytical method and were followed explicitly during sample analysis. Specific measures included detailed record keeping procedures, analysis of duplicate samples, instrument calibrations, and the analyses of blanks, surrogate and internal standards.

F3.1.1 Reporting Limits

Practical Quantitation Limits (PQL), the laboratories' statistically determined reporting limits, were presented in the QAPP for the Quanterra-Knoxville, TN laboratory. The analytical program executed required the use of SW-846 methods which specify the procedures for calculating the PQLs presented. Each laboratory is required to demonstrate method performance through method detection limit (MDL) studies for every analysis, media, and instrument. These studies are required to be laboratory specific so that individual laboratory variables such as equipment brands, reagent suppliers, chemist technique, etc., are all factored into the performance study. The PQL is statistically supported by the MDL established. The PQL calculation is designed to use the MDL, established using controlled matrices (i.e., distilled water), and adjusts the limit by a predetermined mathematical factor for the analysis of actual environmental sample matrices (i.e., soil, groundwater, etc.). For purposes of clarity and consistency with respect to definition and terminology, the term "reporting limit" has been substituted for PQL when referencing the limit of detection the laboratory reported for each sample and analytical parameter. This value has been corrected for all necessary dilution and interference factors based on the analytical data for each sample.

All laboratory results were reviewed with respect to the actual reporting limits achieved as compared to the limits presented in the SAP. Dilutions resulted in high reporting limits for

several organics and metals. Interference by high levels of 2,4,6-trinitrotoluene resulted in elevated reporting limits for 4-amino-2,6-dinitrotoluene. Interference and altered patterns of Aroclor 1260 and 1254 resulted in elevated limits for both of them. Matrix interference resulted in elevated limits for Aroclor 1221 and 1,3,5-trinitrobenzene. The high percentage of moisture in the sediment samples raised reporting limits. Data were reported on a dry-weight basis and reporting limits were adjusted accordingly.

The PQLs for IMS were predicted in the SOP supplied by DP Consultants. The results were reviewed with respect to actual reporting limits achieved. The actual PQLs for analytes TNT, 2-amino-4,6-dinitrotoluene, 4-amino-2,6-dinitrotoluene, and TNB was 0.18 mg/kg. The PQLs for 2,4-DNT and 2,6-DNT were 4 mg/kg. Dilutions resulted in higher reporting limits. Only results from the highest dilution were reported. Results were reported on a wet-weight basis.

F3.1.2 Holding Times

All laboratory results submitted for the Plum Brook investigation were reviewed with respect to laboratory adherence to analysis holding times. Maximum analytical holding times, as presented in Table 5-1 of the QAPP, were met by the laboratory.

F3.1.3 Method Blanks

Method blanks were analyzed with each analytical "batch" processed. The blanks were carried through the analytical procedure, step-by-step, including the addition of all solvents and other reagents required in the analytical process. The purpose of the blank is to ensure that no contaminants are introduced to the sample as a result of the analytical process, helping to eliminate the element of doubt as to the origin of reported concentrations.

The method blank results reported with the site investigation data were evaluated for high readings characteristic of background or process contamination. There were no significant concentrations detected in the designated blank samples that deem any analytical process out of control or require further corrective action. The compounds found in the method blanks include acetone, methylene chloride, toluene, bis(2-ethylhexyl)phthalate, and zinc. The concentrations reported for the method blanks submitted should be attributed to laboratory process contamination. Acetone, methylene chloride, and toluene are used as laboratory solvents. Methylene chloride is used in the preparation and extraction of samples for many analyses. Phthalate esters are thought to originate from the extraction portion of the semivolatiles analysis either through the safety gloves worn by the extraction technician or other theorized origins. All

analytes detected in the method blanks and associated samples were qualified (B) by the laboratory.

Most applicable method blank criteria were met for all parameters as specified by the method employed and the SAP. Both methylene chloride and zinc were detected at levels greater than their reporting limits in three method blanks. No corrective actions were taken by the laboratory. The data were qualified by validation where required. The detected hits analytical data presented in the site investigation report are blank corrected.

Analysis of a daily method blank was required by the IMS SOP. Although no blank data were tabulated, the QA/QC report (Attachment 2 of this appendix) did not indicate the presence of blank contamination.

F3.1.4 Laboratory Control Samples

Laboratory control samples (LCS) were used in the analytical program as a measure of accuracy without the influence of matrix on the analysis. The laboratory control sample is best described as a spiked laboratory blank measured and reported by calculating the percent recovery of the known spiked concentrations. An LCS was analyzed with every batch of samples processed and analyzed. The control limits applied were statistically derived by the laboratory as required by the method. The review of the LCS data associated with these site investigation data sets showed the data to be within the specified control limits demonstrating accuracy for most analytical processes employed. Twelve explosive compounds in the LCS associated with samples from TNB-SW01 and TNTB-SW02 were below the acceptable limits. Since the compounds were within limits in the LCS duplicate, the lab took no action. The associated sample results were qualified for other reasons. 4-Nitrophenol recovery exceeded the limits in one LCS. No data were qualified.

Analyses of a daily LCS was required by the IMS SOP. Data were reported as part of the colorimetric study. The QA/QC report discusses LCS data.

F3.1.5 Matrix Spike\Matrix Spike Duplicates

Matrix spikes are used to provide an indication of bias due to matrix effects and a measure of accuracy of associated results. Duplicate analyses, sometimes performed using a matrix spike duplicate in the case of organics analyses, provide a measure of precision in the analytical process. Four matrix spike/matrix spike duplicate (MS/MSD) pairs were analyzed for the TNT Area B site investigation. Samples 10640, 10740, 11030, and 12010 were collected and

submitted for an MS/MSD analysis. The observed percent recoveries of the spikes were used to determine accuracy for the analyses. Control limits used to evaluate these recoveries were determined statistically by the laboratory for organics. Relative percent difference (RPD) calculations are used to evaluate duplicate sample results for precision. The acceptance criteria for the precision data were statistically determined by the laboratory. Metals data exhibited variability in accuracy for several elements in all of the MS/MSD pairs. Antimony percent recoveries were consistently low in three of the four analyses. Percent recoveries for several other metals did not fall within the acceptable project range of 80-120 percent. They included aluminum, arsenic, calcium, chromium, cobalt, lead, manganese, nickel, selenium, thallium, vanadium, and zinc. Precision data were all within the control limits. Accuracy and precision were good for the organics, with a few exceptions. Recoveries for explosive compounds HMX, RDX, and 3-nitrotoluene were very high in 12010 MS/MSD samples. The problem was attributed to matrix effect. Associated data were qualified as estimated in the validation process for the affected elements where appropriate.

Analysis of a daily MS/MSD pair was required by the IMS SOP. Based on the tabulated MS/MSD data, these QA/QC samples were not analyzed daily, but at the discretion of the subcontractor. The results achieved were varied. Although there is an appearance of precision of the MS/MSD data, those results are misleading. RPD values are determined using the entire concentration detected. The results are not corrected to take into account the concentration in the original sample.

F3.1.6 Surrogate Standards

Surrogate standards were used in the fixed-base analytical program to monitor the percent recovery efficiencies of the sample preparation and analytical procedure on a sample-by-sample basis for organic constituents. The surrogate standards used were those required by the analytical method employed. Control limits for the surrogate recovery were determined statistically by the laboratory as required. Volatile analyses exhibited several anomalies in the surrogate standard recoveries that were attributed to matrix interferences based on recoveries for the affected analytes, the recoveries reported for the sample reanalyses, and difficulties with previous Plum Brook samples. One explosive and one PCB surrogate exceeded the acceptable range. Data were estimated in the validation process as a result of these variations, but all data were found to be acceptable as reported and qualified.

F3.1.6 Laboratory Duplicates

Duplicate samples were requested in the statement of work submitted to the subcontractor. They were not part of the original SOP. The lab analyzed duplicates to provide information on sample variability. Samples were analyzed on separate days. Duplicate analyses were requested to verify precision in the analytical process. A certain amount of variability is expected from soil samples due to difficulty in obtaining homogeneous samples. It should be noted that lab duplicates were obtained from the same sample container. Three compounds were tabulated. The results for TNT showed good precision. RPD values for five samples were greater than 120 percent, but most of the results were precise. Eleven RPD values were below 25 percent. The results for 2-amino-4,6-dinitrotoluene were more varied. Of the 14 samples with detected results in the original and duplicate, RPD values were less than 50 percent in 9. Five samples had RPD values ranging from 85 to 163 percent. Of the samples chosen for duplicates, the IMS detected 2,4-DNT in only five samples. The compound was detected in four of the duplicates. The results were varied with RPD values of 173, 16, 129, and 37 percent.

F4.0 Data Quality Objectives

DQOs are qualitative and quantitative criteria used to guide sample collection and analysis activities. The DQOs for the project were developed at the outset of the investigation to ensure that the data generated during the execution of the analytical program were of appropriate quality to support the anticipated end use of the data. DQOs describe the level of uncertainty that a decision-maker is willing to accept in results derived from the environmental data. This uncertainty is used to judge the quality of the measurement data, usually in terms of objectives, bias, representativeness, comparability and completeness. DQOs seek to ensure that the right type, amount and quality of data are collected to accomplish the objectives of the project.

The DQOs for this project are to produce scientifically valid data of known accuracy and precision, which are complete with respect to identified critical samples, comparable with similar data types and representative of the media sampled so as to be useful for the cited purposes.

In order to achieve these DQOs, criteria were established in the SAP by which these goals could be achieved. The investigation required that all fixed-base laboratory analyses be performed and resulting data reported as definitive data. A non-CLP, (SW-846) method was employed and Level IV (CLP-like) data packages were provided for evaluation of these samples. Definitive data criteria were chosen because compliance with the criteria specified within its guidelines

provides quantified concentrations with acceptable reliability for the purposes of the investigation. Most reported fixed-base laboratory analytical data met or exceeded the requirements of Level IV QC criteria.

The objective for the IMS analysis was to provide "real time" analysis of explosive indicator compounds. It was to be used as a tool to define the areas and extents of contamination. The USACE project chemist chose IMS because it was believed that IMS could achieve acceptable results in a cost effective manner. Ten percent of the IMS data points were to be used to correlate the screening results with definitive data produced by SW-846 Method 8330. Since use of IMS for the screening of explosives in soil is a new technology, an attempt was to made to set up a QA/QC program similar to those required by fixed-base laboratories to ensure some sort of reliability, accuracy and precision. To ensure the effectiveness of the IMS data, two samples were to be analyzed each day by colorimetric method SW-846 8515. Specific requirements are outlined in Table 7.1.1 of the SOP.

F5.0 Data Useability

The data review process as presented in this report, compares sample results to pre-established criteria to confirm that the data are of acceptable technical quality. Specific criteria were reviewed which verifies the achievement of all precision, accuracy, completeness, comparability and representativeness goals established to meet the project DQOs. To verify that these objectives were met, field measurements, sampling and handling procedures, laboratory analysis and reporting and all nonconformances and discrepancies in the data were examined to determine compliance with the appropriate and applicable procedures. The results of this review were presented in previous sections. All outliers or nonconformances were discussed where they occurred.

Precision data was obtained through the analysis and evaluation of duplicate QA samples. Accuracy was determined through the analysis and evaluation of method blanks, laboratory control samples, trip blanks and matrix spike samples. These QA samples were collected and/or analyzed at the frequency established in the SAP, verifying the completeness element of the goals along with the evaluation of holding times, and reporting limits.

Completeness is a measure of the amount of valid data that are obtained during a sampling event. Acetone and 2-butanone were rejected in several samples in SDGs PB038, PB041, and PB042

because of low relative response factors in initial and continuing calibration standards. It should be noted that the laboratory met the analytical requirements of SW-846 8260A.

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Comparability ensures that results for the sampling event can be compared with data from other past and/or future sampling programs. Comparability for this sampling event was achieved through the use of established and recognized techniques and accepted standard EPA methods. All samples collected and analyzed at the fixed-base lab were subjected to the same sampling, handling, preparation, analysis, reporting and validation criteria for the purpose of achieving comparability goals within the data set.

IMS data were compared to both colorimetric and definitive data. Figure 7 of the QA/QC Report submitted by DP Consultants is a summary of the comparison between IMS and colorimetric data (see attachment). Values considered are listed as '4X TNT Conc.'. These are the values obtained by following product instructions, and thus SW-846 Method 8515. According to product information, the minimum detection limit of the colorimetric kit is 0.7 ppm. Results obtained were as low 0.19 ppm. Overall, there was a correlation between the TNT results. Most detected hits by IMS were detected hits by the kit. There were several disagreements. There were 13 incidences of detects in the IMS that were not detected by the kit. Eight of those were substantially higher than the detection limit. Of the common detects, there is variability. RPD values range from less than 1 percent to 138 percent.

In the comparison between IMS and definitive data, there were 50 incidences of detects by the fixed-base laboratory and no detects by IMS. Twenty of the detected hits were at levels above the IMS reporting limit. Therefore, they should have been detected. The TNT data were valid in terms of detecting the presence or the absence of the compound. There was only one false negative and one false positive. Precision was highly variable. There was a trend for the IMS samples to have lower detected concentrations of TNT than those submitted to the fixed-base lab, even when the results were corrected for moisture. The results for 2-amino-4,6-dinitrotoluene were even more varied. The compound was detected by the fixed-base laboratory in 23 samples. Of those samples, IMS detected the compounds in 9. The RPD values ranged from 96 to 196 percent. Also, the compound was detected by IMS in 8 samples. The results were not confirmed by the fixed-base lab. No correlation could be drawn between the two methods for the other compounds. 2,4-DNT was detected in several confirmation samples, but not in IMS. The adjusted IMS detection limits were too high.

To verify sample representativeness, field data such as field activity daily logs (FADL), sample collection logs, and COC/RFA forms were reviewed. The overall results of the analyses as discussed in this evaluation suggest that representative samples were collected and analyzed with results being indicative of the media analyzed with the exception of the few anomalies noted. Organic chemicals were omitted from consideration if they were common laboratory contaminants or could be traced to some other source within the analytical investigation process. Overall, the investigation data do reflect expected site conditions.

All fixed-base laboratory analytical results for chemicals are reported using validation data qualifiers. The following are brief explanations of the qualifiers used.

B - The analyte was not detected substantially above the level found in laboratory or field blanks.

J - The analyte was positively identified, but the numerical value is estimated.

N - The analysis indicates the presence of an analyte for which there is evidence to make a tentative identification.

NJ - The analysis indicates the presence of an analyte for which there is evidence to make a tentative identification, but the numerical value is estimated.

U - The analyte was analyzed for, but was not detected above the sample PQL.

UJ - The analyte was analyzed for, but was not detected above the sample PQL. The PQL is approximate.

R - The sample results are rejected due to deficiencies in the ability to analyze the sample and meet quality control objectives.

The qualifiers used in the data summary and detected hits reports of the field screening data were changed from those assigned by DP Consultants to the commonly used qualifiers listed above, where appropriate.

F6.0 Conclusions

The goals and objectives for the Plum Brook TNT Area B Investigation were to provide information concerning environmental contamination that can be used in making management decisions for the necessity of further work at the site. Specifically , the objectives of the

investigation were as follows: define the nature and extent of source areas and determine whether contaminant distribution is consistent with DOD activities. To accomplish this goal, samples were collected and data were generated for the contaminants of potential concern. Evaluation of the data using the specific DQOs established for the project and the data validation process resulted in the determination that the data set from the fixed-base lab is valid and of sufficient quality to meet the objectives of the investigation. Although there were instances of matrix difficulties, there were no problems observed that would adversely affect the application of the data or the success of the overall investigation.

IMS has been used successfully in the sensing of chemical warfare agents, screening for explosive and narcotics residues, and monitoring for toxic vapors. Its potential for low detection limits, low cost, and ease of use makes it appealing for analytical use. Typically used for detecting substances in air, the IMS is capable of detecting explosives in soil. It is not widely used in that capacity. An attempt was made to impose strict laboratory QC requirements on a technology without historical analytical studies and no EPA-promulgated method. The inability of the IMS to meet the self-imposed QC criteria does not mean that the data is not useful. It clarifies the need for further technological development. A complete discussion of the QA/QC results is presented in the *Quality Assurance Quality Control Report* submitted by DP Consultants.

The data obtained from the IMS screening of explosives was useful in that it is of comparable quality to other screening data. It has the added advantage that it seems more valuable in identifying the presence, if not the accurate concentration, of explosive compounds other than TNT. There is a correlation between the IMS method and SW-846 8330 in the detection, but not concentration, of TNT. It is not clear if it is more useful than immunoassay or colorimetric tests that are designed to be used in the field by "nontechnical" personnel.

ATTACHMENT 1

IMS STANDARD OPERATING PROCEDURES

STANDARD OPERATING PROCEEDURE
FOR
EXPLOSIVES IN SOIL
SCREENING ANALYSIS
BY
ION MOBILITY SPECTROSCOPHY

PLUM BROOK ORDANCE WORKS
October 1998

Approved and Authorized By _____
Doug Perry Executive Officer
DP Consultants

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1. Scope and Application

1.1. The field screening analysis procedure that follows is designed to analyze for selected explosive compounds in soil. This procedure is designed to rapidly identify and quantify specified explosive compounds and their associated degradant and by-products in the low to sub parts per million range in soil.

1.2. This SOP is an initial defining of the approach to be used for the execution of the Ion Mobility analysis of specified explosives, degradants and by-products in soils. Due to the lack of historical and procedural background for this type of analysis program it may be necessary for the analyst to modify, based on his best professional judgment, portions of this SOP. These modifications will be made with the objective of achieving maximum precision, accuracy, and data quality that is obtainable by this procedural approach. Changes may also be made within the limitations of the data quality objective for the purpose of allowing the program to be executed in an efficient and expedient manner

1.3. The intent of this document is to provide objective and procedural guidance to all involved parties in the execution of this program. This document defines the initial type and acceptance criteria for the associated QA/QC analysis to be performed.

1.4. Spectral information for major explosives in common use will be stored in the database. However, in order to assure maximum efficiency and accuracy the IMS instruments operational parameters will be maximized for the analysis of Trinitrotoluene (TNT) Total Dinitrotoluenes (TDNT) (2,4-dinitrotoluene and 2,6-dinitrotoluene) Total Amino-Dinitrotoluenes (TAmDNT) (2, Amino-4, 6-Dinitrotoluene, and 4, Amino-2, 6-Dinitrotoluene) and Trinitrobenzene (TNB).

1.5. The response for the TDNTs is the defining factor for the practical quantation limit. Based upon the general acceptance of colorimetric procedures for achieving acceptable lower detection limits for this type of program, this SOP has been designed to generate equivalent detection limits and data quality.

2. Summary of Method

2.1. A defined weight of the soil sample is extracted by shaking/sonication in a mixture of hexane and acetone. The explosives are extracted into the solvent and a fixed volume of the extract is transferred to the IMS filter and the solvent is allowed to evaporate leaving a residue of explosives for introduction into the IMS unit.

2.2. The spiked filter is placed into the IMS's thermal desorber and the vaporized explosive compounds are introduced into the IMS's ionization and shutter chamber. The target compounds are ionized, passed through the shutters into the drift tube. The ions are separated based on physical and chemical characteristics as they migrate to the charged end of the drift tube. The charged ions are detected and measured by a Faraday plate when they reach the end of the drift tube.

2.3. Identification of the each compound is made based on the drift time of its specific and unique ion through the drift tube. Quantification is based on the use of the external standards calibration method using a 5-point calibration curve and the mass of ions contacting the Faraday plate over time.

2.4. Based on a 3g sample weight of soil and 30ml of extract the following concentration range is expected

Target Compound	Predicted PQL (ppm wet weight)	Predicted Concentration Range (ppm wet weight)
TNT	0.5	0.5-2.0
Total DNT	4.0	4.00-100
Total AmDNT	1.0	1.00-4.00
TNB	0.5	0.5-2.00

3. **Interference**

3.1. Because of its sensitivity and reliance on the formation of reactant ions the IMS is subject to ion suppression and detector swamping This interference may be the result of a large amount of non-targeted organics being present in the sample causing poor ionization or excessive consumption of the dopant ions.

3.2. Interference can also be the result of the presence of plastizers and other unwanted contaminants in the solvents and extraction jars.

4. **Safety**

4.1. All procedural operations will be carried out in a manner that protects the health and safety of all personnel.

4.2. The health and safety hazards of many of the chemicals used in this procedure have not been fully defined. Additional health and safety information can be found in the MSDS file provided in the laboratory

4.3. The following hazards are known:

- Carcinogens
  2,4-DNT, 2,6TNT, 2Am4,6-DNT, 4Am2,6-DNT
- Flammable
  Acetone, Hexane
- Explosive and propellant
  TNT, 2,4-DNT, 2.6-DNT

4.4. Exposure to chemicals will be maintained as low as reasonably achievable through ventilation and the opening and use of small volumes. Unless in use all containers will be kept closed.

4.5. Exposure to chemicals will be minimized by preparation of standards where possible, use of auto-dispensers, and the use of disposable glassware and containers where possible

4.6. All work will be stopped immediately in the event of a known hazard or if there is a potential situation that compromises the health and safety of all personnel. The situation will be immediately addressed and corrected and appropriate project management notified.

5. Equipment and Supplies

5.1. Ion Mobility Spectrometer
IMS unit equipped with:

- Self-contained thermal desorber
- NI_{63} ionization source
- Electronic introduction control shutters
- Heated high efficiency 6-inch drift tube.

5.2. Carrier Gas
Self-contained carrier gas system capable of purifying and providing organic free air doped with a consistent weight of chlorine ions

5.3. Data System
Computerized data system that interfaces with IMS unit capable of high-speed acquisition of IMS response signals and converting the signal amplitude versus time into plasmagrams and printing out the total K_0 values for the individual compound ions. Also capable of determining ion drift times relative to an internal signal and documenting individual compound desorption decay rate.

5.4. Reagents
Acetone pesticide grade free of plastizers and interfering compounds

Sodium Sulfate dried pesticide grade free of plastizers and interfering compounds

Hexane's pesticide grade free of plastizers and interfering compounds

Extraction solvent 50/50 mix of acetone and hexane

Acetone 4-8% water mix

5.5. Expendables

Clean 40-ml clear glass bottles; explosive and plastizer free with Teflon® lined screw caps

Glass Pasture transfer pipettes

Wooden tongue depressors

0.45µ nylon or Teflon® uniprep filters

5.6. Non-expendable equipment

Assortment of variable volume pipettors and tips allowing for the consistent transfer of desired volumes ranging from 0.001 to 1.00 ml

Teflon® IMS filters heat cleaned and checked

Multi-placed sonication unit and timer

Auto-pipettors capable of accurate delivery of 30mls of reagents

Assortment of glass volumetric flask

Assortment of glass beakers

Top loading analytical balance accurate to two places

5.7. Standards

5.7.1. Individual stock standard solutions will be purchased from a commercial supplier. From these stock solutions the following standard solutions will be prepared

- Individual standards for the development of IMS's calibration curve
- Mix of all target compounds for continuing calibration verification analysis
- Mix of target compounds for matrix spiking

5.7.2. All standard solutions will be stored either on ice in a cooler or in a refrigerator set aside specifically for standards

6. Sample Collection, Preservation and Storage

6.1. All samples collected and delivered to the on-site laboratory by 1500 hrs will be extracted on the day of receipt. Samples not delivered by 1500 hr will remain in the sampling teams' custody. These samples will be stored under sampling teams' custody at 4°C.

6.2. Initial analysis will be within 36 hour of extraction. The resulting extracts will be stored in the on-site laboratory. Due to the lack of refrigeration, the relatively low volatility of the extraction solvent, and short duration of the project the extracts will not be refrigerated.

6.3. Sample will be collected in clean amber glass jars with Teflon® lined tops. Sample will be extracted in clean jars with Teflon® lined caps. The analysis aliquot will be pulled directly from the extraction jar. The extract will be stored still in the extraction jar over the sample aliquot.

7. Quality Control

7.1. The tables below are a summary of the Quality Control program that is to be implemented

7.1.1.IMS Program

QC Type	Frequency	Acceptance Criteria	Corrective Action
Initial Calibration	Start of project and as need for precision and accuracy maintenance	R>0.985	Instrument maintenance preparation of new standards
CCV	Start of analysis day Mid-morning Mid-afternoon End of analysis day	3 of 4 reported compounds %R 100%±20% no target compound exceeding 100%±35%	Evaluate source of failure including preparation of new standard and development of new calibration curve
Instrument Blank	Start of analysis day Mid-morning Mid-afternoon End of analysis day	No quantification ions exceeding 65% of its PQL	Instrument maintenance and solvent and equipment contamination evaluation
LCS	Start of analysis day Mid-afternoon	3 of 4 reported compounds %R 100%± 35% no target compound exceeding 100%± 55%	Re-preparation of a second LCS stop all sample analysis until two successive LCS's are prepared and analyzed no sample extracted after the failing LCS will be analyzed all affected samples will be re-prepared, extracted and analyzed
MB	Start of analysis day Mid-afternoon	No quantification ions exceeding 65% of its PQL	Instrument maintenance and solvent and equipment contamination evaluation
MS/MSD	Two per day	None for information purposes only	Re-spike and analyze at the analyst desecration
Colorimetric test comparisom[1]	Two per day	RPD' s < 65%	Re-analyze and/or repeat the whole test

[1] An aliquot of the colorimetric analysis acetone extract will be extracted with hexane and the hexane extract used for the comparative IMS analysis

7.1.2. Colorimetric Program

QC Type	Frequency	Acceptance Criteria	Corrective Action
Initial Calibration	Start of project and as need for precision and accuracy maintenance	R>0.98	Instrument maintenance preparation of new standards
CCV	Start of each analysis day	%R 100%±20%	Evaluate source of failure including preparation of new standard and development of new calibration curve
Instrument Blank	With each group of samples	No spectrophotometer reading 65% of the PQL	Instrument maintenance and solvent and equipment contamination evaluation
LCS		%R 100%± 35%	Re-preparation of a second LCS stop all sample analysis until two successive LCS's are prepared and analyzed no sample extracted after the failing LCS will be analyzed all affected samples will be re-prepared, extracted and analyzed
MB	With each group of samples	No quantification ions exceeding 65% of its PQL	Instrument maintenance and solvent and equipment contamination evaluation
Duplicate Analysis	On all sample for colorimetric analysis	None for information purposes only	may be repeated at the analyst discretion

8. Procedure

8.1. IMS Analysis

8.1.1. Sample Extraction

8.1.1.1. Transfer into a 40ml bottle 3 grams (±0.1g) of the soil sample and record the weight on the sample preparation log. Add approximately 2g of sodium sulfate, along with 30ml of 50/50 acetone hexane extraction solution to the

weighed soil sample. Cap the extraction bottle shake wetting all surfaces and sonicate for a minimum of 3 min.

8.1.1.2. Removes the extraction bottle from the sonicator, shake vigorously and let the soil settle out by allowing the bottle to set undisturbed. Transfer 1-2ml of the extraction solvent to the rediprep filter reservoir and filter.

8.1.2. Instrumental Analysis

8.1.2.1. To clean Teflon® IMS filters transfer 10µl of the filtered extract being sure that all the solvent is on the filter. Allow a minimum of 5 minutes for the solvent to evaporate.

8.1.2.2. Place the Teflon® filter on the thermal desorption anvil sample side up and slide the anvil into position in the thermal desorption.

8.1.2.3. The IMS will automatically desorb and process the sample producing a plasmagram

8.1.2.4. Evaluate the plasmagram reviewing each ion desorption rate and the dopant desorption rate and peak intensity for indication of signal suppression.

8.1.2.5. Calculate concentration based on primary ion K_o values and the applicable calibration curve.

8.2. Colorimetric Analysis

8.2.1. The colorimetric analysis program will follow the procedure as the manufactures defined in the kits instructions with the following exceptions.

- Clean glass jars instead of the provided plastic bottles will be used for extraction
- Pesticide grade acetone will be used instead of commercial grade from local hardware store
- Two separate spectrophotometers will be used and calibrated one for TNT analysis and the second for 24DNT analysis

9. Data Analysis and Calculations

9.1. Identification of Target Compounds

9.1.1. The IMS software will automatically identify the ions of the target compounds based upon the relative drift time of the defined compound ions. The relative drift time will be referenced to the drift time of the dopant ion. Final identification will be made by the analyst based upon the presence of the primary ions and the secondary ions for the target compounds with the exception of the DNTs, which typically have only one ion.

9.1.2. The identification of the two target compounds for the colorimetric analysis is based on the color change that occurs after the addition of the manufacturer supplied hydroxyl reactant solution. The TNT color change is the fastest changing to a red color following Beers-Lambert law. Correction for background color in the extract will be made by performing a spectrophotometric measurement on an un-reacted aliquot of the extract and subtracting 4x that reading from the reading of the reacted extract.

9.1.3. The DNT color change is blue violet that occurs 15 to 20 minutes after the TNT color change and the TNT color has dissipated. The DNT color is measured at a different wavelength than TNT. The DNT color following Beers-Lambert law. Correction for background color in the extract will be made by performing a spectrophotometric measurement on an un-reacted aliquot of the extract and subtracting 4x that reading from the reading of the reacted extract.

9.1.4. If a lot of TNT and DNT is presence as a mix in a sample then the color changes may to some extent occur simultaneously potentially resulting in bias spectrophotomeric measurements. There is no viable corrective action, for this it is at the analyst discretion as to how to address the situation.

10. Calculations

10.1. IMS Compound Concentration (wet weight)

$$COMP_{conc} = \frac{TC_{conc} \text{ X } EX_{vol}}{Sp_{vol} \text{ X } SP_{wt} \text{ X } 1{,}000} \text{ X } D$$

Where

$COMP_{conc}$ = Concentration of target compound from IMS measurement as µg/g

TC_{conc} = Total weight of compound as ρg detected by the IMS based on calibration curve

EX_{vol} = Volume of hexane used for sample extraction in µl (30,000µl)

Sp_{vol} = Volume of hexane extract placed on the Teflon® filter in µl (10µl)

SP_{wt} = Sample weight (wet weight) in g

D = Dilution factor if sample was diluted

10.2. Colorimetric Compound Concentration (wet weight)

$$COMP_{conc} = \frac{(ASB_{dev} - 4XASB_{blk}) \text{ X } EX_{vol}}{\text{X } SP_{wt}} \text{ X } D$$

Where

$COMP_{conc}$ = Concentration of target compound from IMS measurement as µg/g

ASB_{dev} = Spectrophotometric measurement of color developed extract

ASB_{blk} = Spectrophotometric measurement of blank undeveloped extract

EX_{vol} = Volume of hexane used for sample extraction in ml

SP_{wt} = Sample weight (wet weight) in g

D = Dilution factor if sample was diluted

10.3. QC Calculations

10.3.1. Percent Recovery

$$\%R = \frac{Q_d}{Q_a} X100$$

Where

Q_d = Quantity determined by analysis

Q_a = Quantity added or expected to be determined by analysis

10.3.2. Relative Percent Difference

$$RPD = \frac{\overline{A-B}}{(A+B)/2} X100$$

Where

A = the value of the original analysis results

B = the value of the duplicate or comparative result

10.3.3. Matrix Spike Recovery

$$\%R_{ms} = \frac{C_{spk}-C_{org}}{EX_{spk}} X100$$

Where

$\%R_{ms}$ = Percent of spiked compound recovered by the analytical procedure

C_{spk} = Measured concentration of spiked sample

C_{org} = Measured concentration of unspiked sample

EX_{spk} = Expected concentration for amount of spike

11. Data Management

All raw data and activities in the on-site laboratory will be properly recorded and filed. At a minimum the documentation will include the following

- Sample Receipt Log
- Raw Analytical Data Sheets
- Instrument logs
- Plasmagrams
- Laboratory Daily Activity Log
- Analysis Results Reports in a Spreadsheet Format

The laboratory operator will keep all document and electronic data until the final report is completed and approved. Once report and data are approved all materials will be given to the contractor for his files and storage.

ATTACHMENT 2

QUALITY ASSURANCE/QUALITY CONTROL REPORT

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List of Acronyms

CCC	continuing calibration check
CRREL	Cold Regions Research and Engineering Laboratory
2-A-DNT	2-amion-4,6-DNT
4-A-DNT	4-amion-2,6-DNT
DNT	dinitrotoluene
HPLC	high-performance liquid chromatography
IMS	Ion Mobility Spectroscopy
LCS	laboratory control sample
MDL	method detection limit
MS/MSD	matrix spike/matrix spike duplicate
PBOW	Plum Brook Ordnance Works
ppm	parts per million
QA/QC	quality assurance/quality control
RBC	risk-based concentrations
SDI	Strigistic Diagnosics Inc.
SOP	standard operating procedure
TNB	trinitrobenzene
TNT	trinitrotoluene

Attachment 2

Quality Assurance/Quality Control Report
On-Site Ion Mobility Spectroscopy Analysis
Plum Brook Ordinance Works, Sandusky, Ohio
Area B Investigation October-November 1998

1.0 Introduction

The previous investigation TNT Area B Plum Brook Ordnance Works (PBOW) found areas of nitroaromatic explosives contamination but did not provide all of the needed information to define the limits of trinitrotoluene (TNT), its production by-products and breakdown contamination resulting from when the facility was used for TNT production. With the objective of being able to execute an efficient, informative and cost-affective investigation program to obtain needed information, Ion Mobility Spectroscopy (IMS) was selected as a means for on-site analysis. IMS was seen as a means of getting real-time, on-site analytical data for TNT, 2,4-dinitrotoluene (DNT), 2,6-DNT, 2-amino-4,6-DNT (2-A-DNT), 4-amino-2,6-DNT (4-A-DNT) and trinitrobenzene (TNB). The purpose and objectives of the on-site IMS at TNT Area B were to:

- Evaluate IMS as an alternative methodology for real-time, on-site analysis of TNT and selective nitroaromatic by-products.
- Determine the comparability of on-site IMS data to the more traditional on-site Method 5010 colorimeteric analysis for TNT.
- Provide the necessary data for reactive field selection of sample locations necessary for locating contamination areas and their knowledgeable delineation.
- Provide the data necessary for field selection of samples that best represent the areas of contamination and their diversity of concentrations and contaminants that exist at the site to be sent to a fixed-base laboratory for traditional SW-846 analysis.
- Provide a means to economically increase the statistical sampling population, thus enhancing the understanding of the magnitude, variability, and the extent of contamination of nitroaromatic compounds.

As with any new analytical program the IMS was not without its problems. The problems that directly affected the data are discussed in detail in the quality assurance/quality control (QA/QC)

discussion below. When evaluating each aspect of the QA/QC program individually it would appear some of the data may be indefinite in precision and accuracy. This would be especially true if the same norm used for SW-846 methods is applied. However, if the data is looked at as a whole, and the norm for a less rigorous field method is used, then it can be stated that the objectives previously defined have been met.

2.0 Quality Assurance/Quality Control

2.1 QA/QC Introduction

A QA/QC program was incorporated as an integral part of the IMS field analysis program at PBOW. The objective of the QA/QC program was to provide a means for the measurement and documentation of the level of confidence of the data generated by the IMS analysis. Because IMS is a new approach to the environmental field analysis of explosives, there does not exist any historical basis for the development of QA/QC objectives. At the start of the project a standard operating procedure (SOP) was written that defined the parameters of the QA/QC program in terms of types of QA/QC analysis to be performed and some initial tentative acceptance criteria that were to serve as decision guides. These QA/QC analysis parameters included:

- The development of calibration curves for each of the defined compounds
- Analysis of blanks
- Analysis of Standards of known concentrations
- Performance of a colorimetric TNT test on selected samples
- Analysis of matrix spikes/matrix spikes duplicates (MS/MSD)
- The analysis of selected samples off-site by full SW-846 high-performance liquid chromatography (HPLC) methods
- The analysis of duplicate samples was added in the field and was not included in the SOP.

2.2 QA/QC Discussion

Once on site, problems were encountered that affected the ability to meet all the acceptance criteria defined in the SOP, and the ability to simultaneously generate data at the rate necessary to keep the field operation running efficiently and effectively. These problems had their impact on the accuracy of some compounds, and the ability to quantify others.

One of the major factors affecting the decision to continue to analyze with the IMS program, despite the problems in meeting some of the QC criteria, was the fact that from the onset of the project, TNT was defined as being the primary compound that drove future decisions. With this in mind, the IMS operational parameter at the onset of the project was established so as to maximize the precision and accuracy of TNT. This accentuation of the operational parameters for TNT resulted in there being more than the desired variability for the DNTs and Amino-DNTs. The decision to continue with the IMS analysis was also affected by the fact that the alternative analysis program was the colorimetric analysis of TNT. The initial comparability of the IMS and TNT colorimetric data indicated that the two methods' data were comparable when experimental error and matrix affects were taken into consideration.

Problems also occurred resulting from the unexpected breakdown of the target compounds in the hexane and acetone extract. This breakdown affected some select samples and standards. The samples known to have been affected by the hexane/acetone breakdown were subsequently re-run. There was also the inability to calibrate and properly monitor for three of the compounds due to what is suspected to be interference of the preparation solvent with the ion formation of these compounds in the new standards. The 4-A-DNT, 2,6-DNT and TNB were all affected by this interference. During calibration all these compounds were tested with curves developed for 4-A-DNT and TNB, but the standard for 2,6-DNT had deteriorated to a point where a calibration curve was not obtainable. However, the 2,6-DNT standard did allow for the determination of its desorption profile and that the characteristic 2,6-DNT ions were being formed and detected.

Two decisive circumstance were the determinant factors that resulted in the continuance of the IMS analysis despite the standards problem. These factors were:

- In the TNT production process both 2,4-DNT and 2,6-DNT is formed simultaneously with the 2,4-DNT being the dominant compound formed (80 percent/20 percent). The IMS was responding to the continuing calibration check (CCC) standards for 2,4-DNT and there were never any samples that gave a positive response for 2,6-DNT. The same is true for 4-A-DNT in that in the breakdown of TNT both 2-A-DNT and 4-A-DNT are simultaneously generated with the 2-A-DNT being the predominate compound.

- Per the initial analytical program description and the SOP it was acceptable to report both the DNTs and Amino-DNTs as a total value not as individual compounds. As the IMS program evolved it became capable of analyzing for these four compounds individually. This new capability was incorporated into the Plum Brook program allowing for the quantification and reporting of the individual compounds of the pairs with the lowest risk-based concentrations (RBC).

All of these problems will be discussed thoroughly in the applicable section below.

2.3 IMS Calibration and Calibration Curves

Prior to the analysis of any samples, a 5-point calibration curve was established for each of the targeted compounds except 2,6-DNT. Figures 1 through 5 show the calibration curves and the supportive data for all the target compounds except 2,6-DNT.

The linear ranges of the IMS calibration curves are narrow. This narrowness of the linear range had two affects. The first affect was the lack of resolution of concentrations (i.e. the inability to consistently differentiate between two closely associated concentrations 0.05 versus 0.06). The second affect was the necessity to include a calibration point below the lowest reportable limit in the development of the regression formulas used in determining concentrations measured by the IMS.

Because of the IMS instrumentation variability it became necessary to analyze all compounds at each calibration concentration level in triplicate. The average maximum amplitude values for each of the three measurements was used in the development of the calibration curve and linear regression equation. Because of the necessity of having to run the standards in triplicate all samples were also run in triplicate and the average maximum amplitude was used to calculate the concentration of target compounds in the samples.

The initial standards that were brought into the field were made up in acetone only. Due to unknown factors, these standards broke down soon after arrival in the field. This made it necessary to obtain new standards from Supelco, instead of from the original source. All new standards stock solutions were initially made up in a 50/50 solution of hexane and acetone, the same as the solvent solution being used to extract the soils. However these also soon broke down despite refrigerated storage. Replacement standards were ordered, and stock solutions made up in acetone only. A fresh standard in 50/50 acetone and hexane was made up daily, prior to the start of each day's analysis. These standards remained stable for the duration of that day's analysis.

For some reason yet to be determined, the new standards for the 2,6-DNT, 4-A-DNT, and TNB from Supelco gave no response on the IMS. It did not mater whether they were in acetone only, or the acetone/hexane solution. There was however a response for these compounds to the original standards of unknown concentration. This did not affect any of the reported data because

no 4-A-DNT, 2,6-DNT, or TNB were detected at concentrations that prompted the IMS to give a response for the indicative ions. It is suspected that the acetonitirle used to make the Supelco solutions may have caused the problem.

The original calibration curve was used for the entire program, even though there were times that a loss of sensitivity was indicated by the continuing calibration check for 2-A-DNT and TNT.

2.4 IMS Continuing Calibration Checks

Tables 1-3 are a compound by compound summary of the three compounds (e.g. TNT, 2-A-DNT, 2,A-DNT) that were monitored with CCC standards.

Per the SOP, at a minimum CCCs were to be run at the start and end of each analysis day and also at mid-morning and mid-afternoon. A CCC was also analyzed at least once during each analysis day between the start and end of day's analysis. Initially, each individual compound was analyzed individually each time. Eventually, 2-A-DNT and TNT were combined to make one standard and 2,A-DNT were analyzed separately.

The CCC analysis program determined that there was an on-going problem with the IMS analysis that affected the precision and accuracy of the data. The extent and magnitude of this effect is not readily determinable, and varies from compound to compound and from day to day. Initially, it was thought that the problems were with the breakdown of the standards but, after a review, it was determined that active sites had developed within the IMS system. These active sites were causing the target compounds to be either absorbed within the system, or broken-down prior to ionization and entry into the drift tube. All compounds were affected in varying degrees by the active sight condition, but the analysis of 2-A-DNT was affected most.

2.4.1 TNT CCC

TNT was affected by the active site problem. Initially, the shocking of the system with high concentrations of TNT at the start of the day appeared to negate the problem and acceptable recoveries were obtained for the start-of-day CCCs. An evaluation of the recovery patterns for CCCs on individual days showed that:

1) The system shocking was only a short-term correction and the active site sometimes developed as the analysis day progressed. The extent of their development was dependent on the introduction of material with the samples that bound up the active site.

2) Two different active sites scenarios developed. One scenario was that the affect of the active sights increased as the day progressed, resulting in poorer recoveries for the CCC standards as the day progressed. The second scenario was to degrade to low recoveries of CCC standard followed by an improved recovery.

- The lowest TNT recovery for a CCC on days of reported results was 42 percent with a high of 156 percent.

- For days of reported results 82 percent of the start of day CCC; 70 percent of the interim CCC and 64 percent of the end of day CCC met or exceeded the 80 percent recovery criteria stated in the SOP.

- For days of reported results 18 percent of the start of day; 23 percent of the interim; and 36 percent of the closing CCCs recoveries fell between 80 percent and 50 percent.

- For days of reported results, 7 percent of the interim CCCs had a recovery between 40 percent and 50 percent.

- Based on evaluations of LCS's, Matrix spike recoveries, and colorimetric values, it does not appear that the TNT CCCs accurately reflect the operating condition of the IMS.

It must be realized that because of the small calibration range and the low concentrations within this narrow, low concentration calibration range, that a 40 percent or 50 percent recovery is not a significant amount (i.e. 0.05 to 0.15 parts per million [ppm]) of sensitivity loss. Therefore, within the context of the project objective and the decision concentration, the loss of accuracy had a minor impact, even when the dilution multipliers are taken into consideration. The 80 percent criteria stated in the SOP was met for the majority of the CCCs analyzed. For those few CCCs that did not meet the 80 percent criteria the data is still usable:

- Within the context of the projects objectives

- When compared to the variability of HPLC and colorimetric standards analysis within the same concentration ranges

- When compared to the variability resulting from the lack of sample homogeneity.

On day three of the colorimetric analysis there were CCC recoveries less than the expected 80 percent (i.e. 6 percent and 79 percent). However, the result for the colorimetric analysis is comparable with the IMS data, indicating that the IMS was operating with in acceptable limits. Also, the MS recoveries were well within acceptable limits.

Therefore, despite the variability and not meeting the 80 percent criteria stated in the SOP, the data provided the information necessary to locate areas of TNT contamination and the informed selection of representative samples for the more rigorous, fix-base laboratory HPLC analysis. The CCC recovery data is within tolerance when the full implications of the x versus 4x multiplier background correction for colorimeteric analysis is taken into consideration. (discussed below in Section 2.4)

2.4.2 2-A-DNT CCC

Table 3 is a summary of the CCC recoveries for 2-A-DNT.

The affect of the active sights was greater for the analysis of 2-A-DNT than it was for TNT. This active sight problem based on the CCC recoveries appears to be random and varying over a wide range and indicates a lack of accuracy and precision. However, based on the following facts it can be stated that if any 2-A-DNT of a decision level concentration was present in the sample aliquot analyzed it would have been detected, but may not necessarily have the actual concentrations reported. The accuracy of this statement is not readily determinable in light of the evidence of the CCCs not being an accurate reflection of instrument status for TNT and the lack a colorimetric analysis program as with the TNT to provide any supportive evidence either way.

- The system shocking with high concentrations of TNT and 2-A-DNT was not a very effective corrective action, and the active site sometimes developed as the analysis day progressed. The extent of active site development was dependent on the introduction of materials along with the samples that bound up the active site.

- Two different active site scenarios developed. One scenario was that the affect of the active sights increased as the day progressed, resulting in poorer recoveries for the CCC standards as the day progressed. The second scenario was to degrade to low recoveries of CCC standard followed by an improved recovery.

- For days of reported results the lowest recovery for a CCC was 6 percent with a high of 117 percent.

- For days of reported results 37 percent of the start of day CCCs; 36 percent of the interim CCCs; and 40 percent of the end of day CCCs; the 80 percent recovery criteria stated in the SOP was met or exceeded.

- For days of reported results 36 percent of the start of day CCCs; 43 percent of the interim CCCs; and 40 percent of the closing CCCs the recoveries fell between 80 percent and 50 percent.

- For days of reported results 19 percent of the start of the day CCCs; 21 percent of the interim CCCs; and 20 percent of the end of day CCCs the recoveries were less than 50 percent.

It must be realized that because of the small calibration range and the low concentrations within this calibration range, that a 40 percent or 50 percent recovery is not a significant amount (i.e., 0.05 to 15 ppm) of sensitivity loss. Therefore; within the context of the project objective and the decision concentration, the loss of accuracy did not have an un-surmountable impact, even when the dilution multipliers are taken into consideration. The 80 percent criteria stated in the SOP was met for the majority of the CCCs analyzed. For the portion of the CCCs that did not meet the 80 percent criteria the data is still usable:

- Within the context of the projects objectives
- When compared to the variability of HPLC and colorimetric standards analysis within the same concentration ranges
- When compared to the variability due to the samples lack of homogeneity
- The fact that the IMS instrument did have a non-linear response for a long range below the lowest reportable calibration curve concentration allows for the reporting of estimated values lower than normal
- That the traditional field colorimetric method used for making decisions about non-TNT explosives are not compound specific, and could give false positives resulting from the presence of any organo-nitrate or organo-amine compound
- Had the IMS not been used, and the proposed alternative TNT colorimetric procedure been used, no information regarding 2-A-DNT contamination would have been obtained

Therefore, despite the variability, and not meeting the 80 percent criteria stated in the SOP, the IMS data provided the information necessary to locate areas of 2-A-DNT contamination and the informed selection of representative samples for the more rigorous fix-base laboratory HPLC analysis.

2.4.3 2,4-DNT CCC

Table 3 is a summary of the CCC recoveries for 2,4-DNT.

The analysis of 2,4-DNT CCCs was not as consistent as it should have been. There were a few days when no 2,4-DNT CCCs were measured. This lack of daily measurement has been duly

noted on the report with a Q qualifier. 2,4-DNT was plagued with the largest amount of variability from measurement to measurement for a singular sample, but because of the high connection for the calibration range it was the one consistently measured compound that got good recoveries for the CCCs. Of the 2,4-DNT CCCs analyzed:

- 54 percent met the 80 percent to 120 percent SOP recovery criteria
- 15 percent had CCC recoveries less than 80 percent but were greater than 70 percent with no recoveries less than 70 percent.
- 31 percent had CCC recoveries exceeding 120 percent.

Per the CCCs, 2,4-DNT was not susceptible to the active site problems that TNT and 2-A-DNT had.

2.5 Comparison of IMS to Colorimetric for TNT Study

As part of the QA/QC program selected samples were analyzed for TNT by both the current IMS program protocols and by an accepted field colorimetric protocol. The objective of this aspect of the QA/QC program was to provide a real-time mechanism for the determination of the comparability of the IMS data for TNT with that of the more traditional EPA colorimetric method for in the field screening determination of TNT.

A commercially available colorimetric TNT field analysis kit was purchased from Strigistic Diagnostics Inc. (SDI). This kit was originally developed and formulated by Ensys Inc., and is based upon the development work and research of Dr. Tom Jenkins et al. of the U.S. Army Corps of Engineers Cold Regions Research and Engineering Laboratory (CRREL). The SDI kit differs from the protocol developed by CRREL in that it uses a NH-Amine complex as the hydroxyl source rather than potassium hydroxide as developed by CRREL. The substitution of this NH-Amine resulted in a faster, more consistent, and more stable development of the red color in the presence of TNT.

In order to eliminate variability introduced by sample heterogeneity, the same sample aliquots and extraction solvent were used for both the colorimetric and IMS analysis. The procedure was to follow the weighing and extraction criteria for the colorimetric method, and to take the aliquot for IMS analysis from the leftover solvent.

Originally, as part of the design of this aspect of the QA/QC program, the colorimetric program was also to determine the concentration of 2,4-DNT. However, due to some modifications to the NH-Amine complex, the quantification of 2,4-DNT was not achievable. The inability to quantify 2,4-DNT colorimetrically was due to the fact that the improvements in stability caused the developed TNT color to be persistent long enough to cause interference in the spectrophotometric measurement of the blue-violet color that develops in the presence of 2,4-DNT. Due to the continued slow development of the TNT color that occurs between the time of measurement for TNT and the development time for 2,4-DNT, it is not practical to subtract the absorbance of TNT to compensate for the overlapping of color. These problems resulted in a lack of quantification of the selected samples for 2,4-DNT. However, all samples were allowed to sit for the time necessary for 2,4-DNT color development and were then evaluated for the presence of 2,4-DNT.

For the colorimetric program there is a correction performed to compensate for the naturally occurring colors in the extract resulting from the extraction of humic materials with acetone. In the original protocol developed by CRREL, the absorbance resulting from the measurement of the filtered, undeveloped extract is multiplied by 2x and is subtracted from the measured absorbence for the developed extract. Per the procedure for the commercial colorimetric kit a 4x multiplier is used instead of the 2x multiplier for calculating the absorbance subtraction value. The use of the 4x multiplier provides a more confident assurance of fewer false positives than with the 2x multiplier. In order to provide a better picture of the comparability of the IMS to the colorimetric, all tables for this section show quantification results calculated using both the 2x and the 4x multipliers.

Tables 4 through 6 are individual days' analysis summaries for IMS and colorimetric analysis of the selected samples. Table 7 is a summary of all 3 days of the IMS versus colorimetric analysis of the selected samples. A total of 46 samples were selected for these comparatives study there were also 11 control samples and 10 spiked samples. Based on these 66 analyses the following observations can be made:

- For the 4x calculations, the average RPD is 47.4 percent with a standard deviation of 37.6 percent. The maximum RPD is 138 percent with a minimum RPD of 0.617 percent. An evaluation of the distribution of the data shows that for 74 percent of the positive reportable hits the IMS had a higher value than the corresponding colorimetric, and 26 percent of the colorimetric reportable hits had a higher value than the corresponding IMS value. This 26 percent indicates that when compared to the 4x colorimetric results as the standard that the IMS values would be biased high.

- For the 2x calculations, the average RPD is 35.7 percent with a standard deviation of 28.6 percent. The maximum RPD is 109 percent and a minimum RPD is 0.617 percent. An evaluation of the distribution of the data show that for 32 percent of the positive reportable hits the IMS has a higher value than the corresponding colorimetric and 68 percent of the colorimetric reportable hits had a higher value than the corresponding IMS value. This 68 percent indicates that when compared to the 2x colorimetric results as the standard that the IMS values are biased low. However, the closer values (i.e. 32/68 vs. 74/26) indicate that there is a better comparability between the 2x and the IMS with less biasing.

- There is better agreement between the IMS results and the 2x colorimetric results than between the IMS and 4x colorimetric results.

- The RPDs between duplicate samples and matrix spike duplicates reflect the same pattern of recovery and comparability as discussed above for the whole data set.

- For the SDI control and LCS the 2x data was more comparable to the actual IMS data than was the 4x data.

- A number of samples gave a green color development instead of the red color that develops in the presence of TNT, or the blue-violet color in the presence of 2,4-DNT. For these samples there was no consistent pattern of bias. However, because the IMS is not dependent on the development of color, the IMS results are real, where as the colorimetric values per proper protocol should be reported as non-detect. If a value were to be reported based upon the spectrophotometric measurement, then it is most likely that it would not be the actual concentration.

- The IMS was able to report TNT concentrations for a number of the samples that were reported as non-detects for both the 2x and 4x colorimetric calculations.

Table 8 is a summary of the QA/QC for the IMS/colorimetric comparison study. This summary shows that in both precision and accuracy the colorimetric and IMS methodologies are similar and comparable.

The cause and affect of the green color change on the ability to colorimetrically quantify TNT is unknown. Traditionally, per most protocols, the samples with the green color would be reported as non-detects or with, on rare occasion, some form of qualifier. In evaluating the data associated with the affected samples it can be stated that, based on the colorimetric test alone, if the samples with the green response were reported as non-detects per the IMS, 60 percent of the data would have been reported incorrectly. By the same token, had the green color sample been reported as positive, then the 4x results would have still been incorrect for 60 percent, while the 2x may have been right.

On one of the days when a majority of the colorimetric analysis was conducted, the recovery for the associated CCCs was poor. However, based on this data it appears that the poor CCC recovery did not accurately reflected the instrument's operating condition.
Per the results of the colorimetric study, it can be said that the IMS for TNT is equivalent, if not better.

2.6 Matrix Spike Analysis

There were two rounds of analysis involving the analysis of MSs. The first round involved the spiking of the samples for the colorimetric comparative study (Table 8). The second was a round of samples that were prepared and analyzed in the same manner as the samples for IMS analysis only (Table 9).

For the MSs associated with the colorimetric study the samples were spiked with TNT only. The average TNT spike recovery was 118 percent with a standard deviation of 59 percent for the IMS analysis. This was comparable to the colorimetric at 137 percent recovery and a standard deviation of 81 percent for the 4x and 142 percent recovery and a standard deviation of 80 percent for the 2x. It would appear that the IMS was generally better than the colorimetric for spike recovery with a better overall precision and accuracy.

The second round of spiking was not affiliated with another QA/QC analysis. The soil aliquots were spiked directly with both TNT and 2-A-DNT. The average recovery for the 2-A-DNT was 24 percent with a standard deviation of 13 percent. For TNT the average recovery of the spike was 58 percent with a standard deviation of 30 percent.

Per the SOP, there were no acceptance criteria. The matrix spiking and the need for re-spiking and repeating was at the analyst's discretion. Due to time constraints, there was no re-spiking or reanalysis. It is not clear at this time why there is the discrepancy between the two spiking programs.

2.7 Duplicate Analysis

The analysis of duplicate sample aliquots was not part of the QA/QC program as defined in the SOP. It was added in order to provide more information about the consistency of the IMS analysis and an additional dimension for the colorimetric comparison. The duplicate analysis broke down into to 5 distinct entities. These five entities being:

- The duplicate analysis of samples as part of the routine daily analysis Table 10

- The duplicate analysis of samples as part of and intense IMS specific QA/QC analysis evaluation Table 9

- The analysis of matrix spikes and matrix spike duplicates as part of and intense IMS specific QA/QC analysis evaluation Table 9

- The analysis of duplicates as part of the IMS colorimetric comparison program table

- The analysis of matrix spike and matrix spike duplicates as part of the IMS colorimetric comparison program Table 8.

Table 10 is a summary of samples that were analyzed in duplicate, and in some samples in triplicate, as part of the routine IMS analysis program. In all cases the duplicate analysis was run on a separate date from the original analysis. This gives an indication of day to day and project variability. From this analysis the following can be stated:

1. 2-A-DNT analysis

   - Three of the four samples with reportable un-qualified values had RPD values of less than 90 percent (an average of 49.9 percent and standard deviation of 28.4 percent). The fact that one sample exceeded the 90 percent RPD is consistent with TNT RPD and may be attributed to the sample in terms of heterogeneity. The variability can be considered as minimal (i.e. 0.41 versus 2.0) and within most normal analytical variability.

   - Seven of the eight samples with reportable qualified estimated had RPD values of less than 90 percent (an average of 21 percent and standard deviation of 18.5 percent). The fact that one sample exceeded the 90 percent RPD is consistent with TNT RPD and maybe attributed to the sample in terms of heterogeneity. The variability can be considered as minimal (i.e. 0.44 versus 2.6) and within most normal analytical variability.

   - The remaining 30 samples were consistent non-detects.

2) TNT

   - Twenty-one of the twenty-three samples with reportable un-qualified values had RPDs of less than 90 percent (an average of 31.2 percent and standard deviation 18.5 percent). The two samples exceeding the 90 percent RPD is consistent with 2-A-DNT RPD and maybe attributed to the sample in terms of heterogeneity.

   - Three of the seven samples with reportable estimated values had RPDs of less than 90 percent (an average of 38.2 percent and standard deviation 31.6 percent). The four samples exceeding the 90 percent RPD may be attributed to

the sample and in terms of heterogeneity and/or variability due to the increase in instrumental variability as a result of being at the marginal end of instrumental detection limits.

- There were four samples that, per the IMS, there was in one of the two duplicate analysis TNT present at a concentration that could not be reasonably reported (reported as less than 0.01E). The second analysis had TNT concentration large enough to be reported as an estimated value.

- The remaining seven samples were consistent non-detects.

3) 2,4-DNT

- Due to variability and standards all 2,4-DNT duplicate results were qualified.

- The five samples that had detectable 2,4-DNT showed more variability than the other two compounds. However there are not enough points to determine if there is a pattern, but due to the differences in the inconsistencies when compared on a sample by sample basis with the other two compounds it seems most likely the variability is instrumentally caused.

Table 9 is the duplicate analysis of samples as part of an intense IMS specific QA/QC analysis evaluation. All samples except two were selected because they were known to be contaminated. The selected samples were extracted and analyzed by IMS only on the same day as one batch. This gives an indication of the daily variability. From this data the following statements can be made:

1) 2-A-DNT

- All 12 samples with reportable 2-A-DNT concentrations had RPDs of less than 60 percent with an average RPD of 11.0 percent and a standard deviation of 14.2 percent.

- As can be predicted, the RPDs for the single day are less than the multiple day and the variability was also lesser.

- The two samples showed ND on both analyses.

2) TNT

- Ten of the twelve samples with reportable concentrations had RPD of less than 60 percent with an average RPD of 29.2 percent and a standard deviation of 18.3 percent

- That all of the RPDs greater than 60 percent were on one samples analyzed in quadruplicate with the wide variability occurring on all four comparisons indicating a lack of sample homogeneity.

- The one sample selected as having no contamination was non-detect on both analysis.

3) 2,4-DNT

- There was no reporting of DNT results for these selected samples.

Table 9 is the analysis of MS/MSD as part of an intense IMS specific QA/QC analysis evaluation. The selected samples were extracted and analyzed by IMS only on the same day as one batch. This gives an indication of the daily variability. From this data he following statements can be made:

1) 2-4-DNT

- For ten of the twelve MSDs there was an RPD of less than 60 percent with an average RPD of 18.3 percent and a standard deviation of 17.0 percent.

- The two MSDs with RPDs less than 60 percent are suspected of not having been spiked.

- The average, while lower, is comparable to the non-spiked RPDs indicating that the precision is consistent for both low and mid-to-high calibration range concentrations.

2) TNT

- All 12 MSDs had RPDs of less than 60 percent with an average RPD of 18.8 percent and a standard deviation of 11.7 percent.

- The average, while lower, is comparable to the non-spiked RPDs indicating that the precision is consistent for both low and mid-to-high calibration range concentrations.

3) 2,4-DNT

- No MSD analysis was performed for 2,A-DNT.

Table 8 is the analysis of duplicates as part of the IMS colorimetric comparison program. All this data was collected on a single day using the colorimetric extraction procedure. This procedure differed from the IMS in that it used 20 grams of soil and 50 milliliters of acetone extraction

solvent. Also included in this section of evaluation is the duplicate LCS that were analyzed as part of other IMS versus colorimetric analysis.

1) IMS TNT

- All five of the samples analyzed in duplicate had RPDs less than 62 percent with an average of 32.6 percent and a standard deviation 21.7 percent.
- Both of the duplicate LCSs had RPDs less than 60 percent with an average of 9.72 percent and a standard deviation of 8.78 percent.
- The use of a 20-gram soil aliquot did not appear to have an advantage over the use of a 3-gram soil aliquot for extraction. (i.e. 32.6 RPD versus 29.2) for samples with RPDs less than 60 percent. However, it does appear to have eliminated the occurrence of sample with RPDs less than percent.

2) 4x Colorimetric TNT

- For three of the five samples the RPDs were less than 60 percent with an average of 29 percent and a standard deviation of 5.0 percent.
- One sample had an RPD of 84 percent.
- One sample gave a false negative result for both analyses.
- The distribution the RPDs excluding the false negative is even indicating that there is little to no biasing of the results between the two types of analysis. However, the over all RPD values for the 4x colorimetric is higher indicating greater variability.

3) 2x Colorimetric TNT

- All 5 of the samples analyzed in duplicate had RPDs less than 60 percent with an average of 19.8 percent and a standard deviation of 11.4 percent.
- There were no false positives or negatives.
- Sixty percent of the 2x RPDs were less the IMS RPDs.
- The even distribution of the RPDs and close agreement of the values is an indication that there is little to no biasing of the results between the two types of analysis and their variability is equivalent.

Table 8 is the analysis of MS/MSDs as part of the IMS colorimetric comparison program. All this data was collected on a single day using the colorimetric extraction procedure. This

procedure differed from the IMS in that it used 20 grams of soil and 50 milliliters of acetone extraction solvent.

1) IMS TNT MSDs

- All five of the MSD samples analyzed had RPDs less than 60 percent with an average RPD of 17.4 percent and a standard deviation 11.5 percent.
- The higher concentrations base on the lower average RPD and standard deviation indicate that at greater concentrations the IMS has less variability.

2) 4x TNT MS

- Four of the five MS samples analyzed had RPDs less than 60 percent with an average RPD of 21.0 percent and a standard deviation 13.0 percent.
- One of the MS samples had an RPD of 71 percent. This along with the generally higher RPDs indicates that the 4x analysis has more variability than the IMS.

3) 2x TNT MS

- All five of the MS samples analyzed had RPDs less than 60 percent with an average RPD of 25.0 percent and a standard deviation 12.3 percent.
- This low and consistent with the IMS RPDs indicate a close comparability between the two methods.

2.8 MDL Study

Per the SOP a method detection limit study (MDL) was to be done at project start up. Due to problems at the start of the project no MDL study was done. However, some of the same information can be gleaned by using LCSs as the source of the values for calculating the MDL.

Based on eight LCS values, an MDL of 0.068 was calculated for 2-A-DNT, 0.048 for TNT and 0.67 for 2,4-DNT.

Perceivably these values are high and traditionally would negate the ability to report any estimated concentrations below these values. These MDL values are high when compared to the reported lower detection limit and estimated values because of the following three factors.

1. The data used to calculate the MDLs were from LCSs analyzed on several different day instead of the traditional analysis of one group of spiked blanks analyzed together on a singular day. Thus the introduction of day-to-day variability.

2. The narrow calibration range of the IMS instrument does not allow for much differentiation of detected concentration values within its linear range. (i.e. a lack of resolution between values with in the calibration range.

3. Traditionally MDLs are conducted on blank spikes at concentrations 3 to 7x the lowest value of the calibration curve at a range where instrumental variability is not as great as it is in the lower region of the curve. However, because of the narrow linear range of the IMS calibration curve it was not practical to analyze blank spikes at such concentrations; thus blank spike in a region where great variability occurred was analyzed and used for the MDL calculations. Traditionally these define the lower end of the values that can be reported as estimated; however, for this project because of the way the curve line dropped off the E or estimated values were extended.

2.9 Conclusions

One of the objectives of this project was to evaluate the IMS as to its capabilities for providing real-time, on-site analytical data for TNT its breakdown and by-products. Because, this was in essence an experimental program the objective of the QA/QC program was to provide a mechanism for documenting the quality of the data being generated not as a means of defining the levels of acceptable analytical operations.

The other objectives were to provide the on-site project management necessary information to:

- Make informed decisions in the field for the selection of sample locations necessary for locating contamination areas and their knowledgeable delineation.

- Make informed decisions in the field for the selection of samples that best represent the areas of contamination, their diversity of concentrations and contaminants existing at the site to be sent to a fixed-base laboratory for the more rigorous traditional SW-846 analysis.

- Economically increase the statistical sampling population thus enhancing the understanding of the magnitude, variability, and the extent of contamination of the different compounds.

In summary the QA/QC program as executed showed the following:

- The project and IMS were weak on the consistent measurement of standards and the use of standards as an indicator of the instruments operational status.

- The recoveries of LCSs and MSs, along with the consistency of the duplicate analysis indicate that there is consistency in the IMS operation and that if present

within the concentration range defined by the RBCs a target compound would be detected by the IMS analysis.

- There is a problem with the development of active sites that affect the analysis of TNT and 2-A-DNT, having a greater effect on 2-A-DNT.

- There is a problem with the consistent introduction of 2,A-DNT into the IMS.

- That solvents used in the preparation of standards need to be clearly defined.

- The use of acetone and hexane in combination as a standard preparation and extraction solvent causes the target compounds to breakdown after 24 hours.

- The precision and accuracy of the IMS is comparable if not better than the colorimetric program when a correction multiplier of 4x is used.

- The 4x colorimetric while not likely to give false positives can give some significant false negatives and is susceptible to an interference from an unknown compound that is present on TNT production facilities and causes a green color change.

- The precision and accuracy of the IMS is comparable if not equivalent to the colorimetric program when a correction multiplier of 2x is used.

- The 2x colorimetric while more likely than the 4x colorimetric to give false positives does not give significant false negatives and is susceptible to an interference from an unknown compound found on TNT production facilities that causes a green color change.

- The narrow linear range and poor resolution of the IMS calibration while allowing for the detection and reporting of low concentrations has a significant impact on the precision and accuracy of the IMS analysis program.