N00164.AR.000311
NSWC CRANE
5090.3a

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

December 18, 1997

DRP-8J

REPLY TO THE ATTENTION OF:

Mr. Paul Freed
Environmental Protection Dept.
Naval Surface Warfare Center
300 Highway 361
Code 095
Crane, IN 47522

RE: Notice of Deficiency
Ground Water Plans
Naval Surface Warfare Center
Crane, IN

Dear Mr. Freed:

The United States Environmental Protection Agency (U.S. EPA) has performed a preliminary review of the Draft Field Sampling Plan and the Draft Quality Assurance Project Plan for the RCRA Subpart X Units. Enclosed are our review comments so far. A detailed review could not be completed because of major issues concerning lab methods and Standard Operating Procedures. The U.S. EPA technical staff still need to complete the detailed review of these documents once these concerns have been met. Comments on the Ground Water Monitoring Plan shall follow in a separate letter.

We anticipate meeting with you to discuss these issues on December 30th. Please be aware that until these plans are complete and approvable, the U.S. EPA can not make a draft permit decision concerning the Subpart X Units. Therefore it is critical to try and expedite these corrections. If you have any questions regarding this matter, please contact me at (312) 886-6146.

Sincerely,

Carol Witt-Smith
Corrective Action Expert
WMB, IL/IN/MI Section

Recycled/Recyclable-Printed with Vegetable Oil Based Inks on 100% Recycled Paper (40% Postconsumer)

ATTACHMENTS: QAP Comments
Field Sampling Plan Comments

cc: Ralph Basinski, B&R
Patricia Brown-Derocher, TechLaw
Al Debus, WMB
Jerry Kujawa, ORC
Michelle Timmerman, IDEM
Tom Linson, IDEM

Notice of Deficiency
Draft Quality Assurance Plan
for RCRA Ground Water Monitoring
Naval Surface Warfare Center
Crane, IN

A. Laboratory Information Needed

Following is a list of information/materials that should be provided by U.S. Navy in support of their contracted laboratory, Lauck's for the groundwater investigation.. Such method performance data will establish the feasibility of utilizing methods proposed (yet presently unvalidated) for certain compounds listed in Table 1-3 of the QAPP:

1. A listing of all laboratory standards matching the compounds in Table 1-3 which are not presently incorporated into or accounted for in existing methods;

2. Results of a method detection limit study(ies) for all unvalidated target analytes identified in Table 1-3;

3. Matrix spike recovery and matrix spike duplicate recovery data for all compounds of interest that are presently unaddressed, respectively, by the Lauck's laboratory methods identified in Table 1-3;

4. Initial calibration records for each of the compounds for which a method detection limit must be determined;

5. Printouts resulting from a 5 point initial calibration of instrumentation used in the analysis of the target analytes identified in the previous comment demonstrating characteristic and quantifiable mass spectral or chromatographic peaks;

6. A discussion of sample preparation and/or sample concentration techniques to generate the matrix spike recovery and initial calibration data mentioned above;

7. An indication of what the accuracy and precision acceptance limits would be for each of the compounds indicated in Table 1-3 for which methods validated by Lauck's do not presently exist;

8. Retention time windows, surrogates and internal standards (as appropriate) should be assigned to each of the compounds of concern on a method specific basis;

9. Any data indicating that interferences or coelution difficulties will not be experienced during routine analysis of groundwater samples should be presented;

10. An indication substantiating the feasibility of reporting limits listed in Table 1-3 for each of the analytes for which Lauck's analytical methods are presently not demonstrated. (It should be understood that the reporting limit values may exceed calculated method detection limit values.

B. QAP Specific Comments

1. Cover Page, add a line for the U.S. Navy Representative to sign the document. Also, add lines for all the contracted laboratory representatives to sign.

2. Page 1-1, Par. 2

   Add "corrective action" prior to "investigative."

3. Page 1-2, Sentence 1

   Add ",including the endangered species Indiana Bat," after "habitats."

4. Page 1-2, Section 1.1.1, Par. 2

   In the second sentence make the commas, semi-colons and add "and" prior to "to."

5. Page 1-9, Section 1.1.2, Par.2

   Add "Corrective Action" prior to "investigative."

6. Page 1-14, Figure 1-2

   Change "Demolition Ground" to Demolition Range (DR)" and make the writing darker.

7. Page 1-15, Section 1.2.2, Last Par.

   Add a Figure of the DR, showing the Navy and Army range locations.

8. Page 1-18, Section 1.2.1.2

   Change the last two sentences to be exact to the operations. Burning on the ground, then in steel pans with synthetic liners, and now in? Clarify this with Paul Freed and Jim Hunsicker.

9. Page 1-19, 5th Sentence

   Is the statement that UXO is found on the DR true?

10. Page 1-21, Section 1.3.3, ABG

    Add "Closed" in front of "surface."

11. Page 1-21, Section 1.3.3, ORR

    Make sure Paul Freed and Jim Hunsicker expand the description of the current operations sentence.

12. Page 1-22, Section 1.3.3, DR

    After the second sentence text needs to be added concerning the two range areas and the use of the DR for emergency responses.

    In sentence 5, add "NPDES regulated" prior to "sedimentation."

    In the second to last sentence, what do you mean by "from an isolated area"? Do you mean on top of the range?

13. Page 1-22, Section 1.4.1

    In sentence 1, change "each of the units" to "the DR." Change "at the ABG, ORR, and DR." to ". And the delineation and containment of releases of hazardous constituents at the ABG, and ORR."

14. Page 1-23, Sentence 1

    Make ground water two words. Change "APG" to "ABG."

15. Page 1-23, Section 1.4.2.1

    In sentence 1, delete "and" and add ", and water level measurements" after "turbidity."

    In sentence 3, delete "and water level measurements." Change "to determine ground water flow and direction at each unit" to "and flow rate and direction will be determined at each unit annually." This must be consistent with the regulation.

16. Page 1-32

Par. 1, Last sentence, delete "of" and insert "Appendix IX." Delete "recommended" and insert "requested to the U.S. EPA."

Par. 2, last sentence, make ground water two words. Add at the end "and TCE and its degradation products."

Par. 3,last sentence, where is Appendix A, table A-1?

Par. 4, first sentence, change "in" to "of" and change "(5 years)" to "(lifetime of the unit)."

17. Page 1-33, Section 1.4.3

Par. 1, sentence 1, at the end add "(at ABG and ORR) or have occurred at (DR)." In the next sentence, add "program" after "monitoring."

There needs to be clear objectives paragraphs explaining that this program is for the purposes of permitting (i.e., meeting 40 CFR Part 264 requirements) , complying with Corrective Action (RCRA Section 3004(u) and (v)), and closure requirements. This really is not clearly stated in the text.

18. Page 1-39, Figure 1-8

The ground water program is for the operating life and any closure and post-closure periods of the unit. The schedule should reflect this. 5 years is not enough. Also, ORR monitoring should be quarterly as we previously discussed, and reduced only when U.S. EPA approves a reduction modification request. Annual monitoring needs to be shown for every year. It does not stop ever. Some parameters may be reduced but the regulatory requirements must be met.

19. Tables 3-1, 3-2, 3-15, 3-16, etc.

All constituents need approved methods and labs to be determined prior to issuance of the permit decision. This is a problem with explosives and methane.

20. Page 4-1

Clarify "attendant."

21. Page 5-3, Section 5.3

Both Photographs and Negatives need to be retained.

Delete "pertinent" and add "associated with this ground water program" after "files."

All QAP related data for validation purposes must be retained.

Add at the end "Shall be maintained in the Administrative Record at NSWC, and available for inspection by the regulatory agencies." NSWC must retain copies on-site. Brown and Root may be maintaining the contract but the owner/operator has to retain files.

22. Page 6-1, Section 6.2, Par. 3

How will the issue about locating certified standards be resolved?

23. Page 7-1, Section 7.0

The Methane lab must be determined and included.

24. Page 7-1, Section 7.1

Move "and water level measurements" behind "turbidity."

25. Table 7-1

Modified methods and Methods TBD must be approved by the U.S. EPA.

It is not clear if TCE and its degradation constituents for the quarterly monitoring will be the same method as Appendix IX listed. It is not clear if you understand it is both and Appendix IX and quarterly requirements depending on the unit.

Under footnote 7, "Parts" is misspelled.

26. Page 9-1, Section 9.1.1

Add "water level (ft., in)."

27. Page 9-3, Section 9.2.2

Add after "All" "(100%)."

28. Table 1-1

There is no documentation to show that all the previous Appendix IX sampling was looked at to make sure the quarterly sampling parameters is complete. Was this done? If not, those Appendix IX constituents that did show up must be included. Also, there should be a clear description somewhere that discusses degradation products that are being monitored for.

29. Tables 1-1, 3-1, 1-3, 3-15, and 3-2

Attached are the comments directly on the copies of the Tables since they are complicated to spell out correctly. The contractor and U.S. EPA need to discuss these changes directly.

C. Draft Comments based upon review of the Laucks laboratory SOPs and Triangle Laboratories (Method 8290) in conjunction with oversight activities at the Naval Surface Warfare Center Crane Division.

The scope of these comments is based on a review of the laboratory analytical SOPs associated with sample analysis activities.

1. General Comment

Several methods refer to a control chart list for QC method limits. A current version of this control chart list is not available for review in the SOP's. There is not a clear indication in the laboratory SOP's that the following items are clearly defined by the laboratory for inorganic methods:

a. Verification that IDL values will be within project specified reporting limits
b. That QC limits and frequencies are within project specified limits.

The following table indicates the associated analytical method proposed in the QAPP for each appendix IX compound.

Analyte Name	Appendix IX Suggested Method	QAPP Method	Compound listed in Lab SOP
Acenaphthene	8270	8270	
Acenaphthylene	8270	8270	
Acetone	8240	8260	
Acetophenone	8270	8270	N
Acetonitrile	8015	8015B	
2-Acetylaminofluorene	8270	8270	N
Acrolein	8240	8260	N
Acrylonitrile	8240	8260	N
Aldrin	8080/8270	8081	
Allyl Chloride	8240	8260	N
4-Aminobiphenyl	8270	8270	N
Aniline	8270	8270	
Anthracene	8270	8270	
Antimony	6010	6020	
Aramite	8270	8270	N
Arsenic	6010	6020	
Barium	6010	6020	
Benzene	8240	8260	
Benzo[a]anthracene	8270	8270	
Benzo[b]fluoranthene	8270	8270	
Benzo[b]fluoranthene	8270	8270	
Benzo[g,h,i]perylene	8270	8270	
Benzo[a]pyrene	8270	8270	
Benzyl Alcohol	8270	8270	
Beryllium	6010	6020	
alpha-BHC	8080	8081	
beta-BHC	8080	8081	
delta-BHC	8080	8081	
gamma-BHC, Lindane	8080	8081	
Bis(2-chloroethyl) ether	8270	8270	
Bis(2-chloroethoxy)methane	8270	8270	

2-2'-Dichlorodiisopropyl ether	8270	Not in QAPP	N
Bis(2-ethylhexyl) phthalate	8270	8270	
Bromodichloromethane	8240	8260	
Bromoform	8240	8260	
4-Bromophenyl phenyl ether	8270	8270	
Butyl benzyl phthalate	8270	8270	
Cadmium	6010	6020	
Carbon disulfide	8240	8260	
Carbon tetrachloride	8240	8260	
Chlordane(alpha, gamma)	8080	8081	
p-Chloroaniline	8270	8270	
Chlorobenzene	8240	8260	
Chlorobenzilate	8270	8270	N
p-Chloro-m-cresol	8270	8270	
Cloroethane	8240	8260	
Chloroform	8240	8260	
2-Chloronaphthalene	8270	8270	
2-Chlorophenol	8270	8270	
4-Chlorphenyl phenyl ether	8270	8270	
Chloroprene	8240	8260	N
Chromium	6010	6020	
Chrysene	8270	8270	
Cobalt	6010	6020	
Copper	6010	6020	
m-Cresol	8270	8270	N
o-Cresol	8270	8270	
p-Cresol	8270	8270	
Cyanide	9010	9012	
2,4-D	8150	8151A	
4-4'-DDD	8080	8081	
4,4'-DDE	8080	8081	
4,4'-DDT	8080	8081	
Diallate	8270	8270	N
Dibenzo[a,h]anthracene	8270	8270	
Debenzofuran	8270	8270	

Dibromochloromethane	8240	8260	
1,2-Dibromo-3-chloropropane	8240/8270	8260	
1,2-Dibromoethane	8240	8260	
Di-n-butyl phthalate	8270	8270	
o-Dichlorobenzene	8270	8270	
m-Dichlorobenzene	8270	8270	
p-Dichlorobenzene	8270	8270	
3,3'-Dichlorobenzidine	8270	8270	
trans-1,4-Dichloro2-butene	8240	8260	
Dichlordifluoromethane	8240	8260	
1,1'-Dichloroethane	8240	8260	
1,1-Dichloroethylene	8240	8260	
trans-1,2-Dichloroethylene	8240	8260	
2,4-Dichlorophenol	8270	8270	
2,6-Dichlorophenol	8270	8270	N
1,2-Dichloropropane	8240	8260	
cis-1,3-Dichloropropene	8240	8260	
trans-1,3-Dichloropropene	8240	8260	
Dieldrin	8270/8080	8081	
Diethyl phthalate	8270	8270	
O,O-Diethyl O-2-pyrazinyl phosphorothioate	8270	8270	N
Dimethoate	8270	8270	N
p-(Dimethylamino)azobenzene	8270	8270	N
7,12-Dimethylbenz[a] anthracene	8270	8270	
3,3'-Dimethylbenzidine	8270	8270	N
alpha, alpha-Dimethylphen ethylamine	8270	8270	N
2,4'Demethylphenol	8270	8270	
Dimethyl phthalate	8270	8270	
m-Dinitrobenzene	8270	8330	
4,6-Dinitro-o-cresol	8270	8270	N
2,4-Dinitrolphenol	8270	8270	
2-4-Dinitrotoluene	8270	8330	
2,6-Dinitrotoluene	8270	8330	

Dinoseb	8270/8150	8151A	
Di-n-octyl phthalate	8270	8270	
1,4-Dioxane	8015	8015B	N
Diphenylamine	8270	8270	N
Disulfoton	8270	8270B	N
Endosulfan I	8080	8081	
Endosulfan II	8080	8081	
Endosulfan sulfate	8080	8081	
Endrin	8080	8081	
Endrin Aldehyde	8080	8081	
Ethyl benzene	8240	8260	
Ethyl methacrylate	8015/8240/8270	8260	N
Ethyl methanesulfonate	8270	8270	N
Famphur	8270	8270B	N
Fluoranthene	8270	8270	
Fluorene	8270	8270	
Heptachlor	8270	8081	
Heptachlor epoxide	8270	8081	
Hexachlorbenzene	8270	8270	
Hexachlorobutadiene	8270	8270	
Hexachlorocyclopentadiene	8270	8270	
Hexachloroethane	8270	8270	
Hexachlorophene	8270	Not In QAPP	N
Hexachloropropene	8270	8270	N
2-Hexanone	8240	8260	
Indeno[1,2,3]pyrene	8270	8270	
Isobutyl alcohol	8015	8015B	
Isodrin	8270	8270	N
Isophorone	8270	8270	
Isosafrole	8270	8270	N
Kepone	8270	8081	N
Lead	6010	6020	
Mercury	7470	7470	
Methacrylonitrile	8240	8260	
Methapyrilene	8270	8270	N

Methoxychlor	8080/8270	8081	
Bromomethane	8240	8260	
Chloromethane	8240	8260	
3-Methylchloanthrene	8270	8270	N
Methylene Chloride	8240	8260	
2-Butanone Methyl Ethyl Ketone	8240	8260	
Methyl Iodide	8240	8260	
Methyl methacrylate	8240	8260	N
Methyl methanesulfonate	8270	8270	N
2-Methylnaphthalene	8270	8270	
Methyl parathion	8270	8270B	N
4-Methyl-2-pentanone	8015/8240	8260	
Naphthalene	8270	8270	
1,4-Naphthoquione	8270	8270	N
1-Naphthylamine	8270	8270	N
2-Naphthylamine	8270	8270	N
Nickel	6010	6020	
o-Nitroaniline	8270	8270	
m-Nitroaniline	8270	8270	
p-Nitroaniline	8270	8270	N
Nitrobenzene	8270	8330	
o-Nitrophenol	8270	8270	
p-Nitrophenol	8270	8270	
4-Nitroquinoline-1-oxide	8270	8270	N
N-Nitrosodi-n-butylamine	8270	8270	N
N-Nitrosodiethylamine	8270	8270	N
N-Nitrosodimethylamine	8270	8270	
N-Nitrosodipropylamine	8270	8270	
N-Nitrosodiphenylamine	8270	8270	
N-Nitrosomethyethylamine	8270	8270	N
N-Nitrosomorphaline	8270	8270	N
N-Nitrosopiperidene	8270	8270	N
N-Nitrosopyrrolidine	8270	8270	N
5-Nitro-o-toluidine	8270	8270	N

Parathion	8270	Not in QAPP (1)	N
Aroclor-1016	8080	8081	
Aroclor-1221	8080	8081	
Aroclor-1232	8080	8081	
Aroclor-1242	8080	8081	
Aroclor-1248	8080	8081	
Aroclor-1254	8080	8081	
Aroclor-1260	8080	8081	
PCDD	8280	8290	
PCDF	8280	8290	
Pentachlorobenzene	8270	8270	N
Pentachloroethane	8240/8270	8270	N
Pentachlornitrobenzene	8270	8270	N
Pentachlorophenol	8270	8270	
Phenacetin	8270	8270	N
Phenanthrene	8270	8270	
Phenol	8270	8270	
p-Phenylenediamine	8270	8270	N
Phorate	8270	Not in QAPP	N
2-Picoline	8270	8270	N
Pronamide	8270	8270	N
Propionitrile	8015/8240	8015B	
Pyrene	8270	8270	
Pyridine	8270	8270	
Safrole	8270	8270	N
Selenium	6010	6020	
Silver	6010	6020	
Silvex	8150	8270B	
Styrene	8240	8260	
Sulfide	9030	9056	
2,4,5-T	8150	8270B	
2,3,7,8-TCDD	8280	8290	
1,2,4,5-Tetrachlorobenzene	8270	8270	N
1,1,2,2-Tetrachloroethane	8240	8260	
1,1,1,2-Tetrachloroethane	8240	8260	

Tetrachloroethylene	8240	8260	
2,3,4,6-Tetrachlorophenol	8270	8270	N
Tetraethyl dithiopyrophosphate	8270	8270	N
Thallium	6010	6020	
Tin	6010	6020	
Toluene	8240	8260	
o-Toluidine	8270	8270	N
Toxaphene	8080	8081	
1,2,4-Trichlorobenzene	8270	8270	
1,1,1-Trichloroethane	8240	8260	
1,1,2-Trichloroethane	8240	8260	
Trichloroethylene	8240	8260	
Trichlorofluoromethane	8240	8260	
2,4,5-Trichlorophenol	8270	8270	
2,4,6-Trichlorophenol	8270	8270	
1,2,3-Trichloropropane	8240	8260	
O,O,O-Triethyl phosphorothioate	8270	8270	N
sym- Trinitrobenzene	8270	8330	
Vanadium	6010	6020	
Vinyl acetate	8240	8260	
Vinyl Chloride	8240	8260	
Xylene(total)	8240	8260	
Zinc	6010	6020	

(1) QAPP lists Ethyl Parathion

The following Table indicates all compounds in the QAPP that are not addressed in Appendix IX that are indicated for analysis.

Analyte	Method	Analyte in SOP (y/n)
Ethyl Parathion	8270B	N
1,2,3-Trichlorobenzene	8260	
1,3-Dichloropropane	8260	
2,2-Dichloropropane	8260	
Bromochlorobenzene	8260	
cis-1,2-Dichloroethene	8260	
Dibromomethane	8260	
Bis(2-chloroisopropyl)ether	8270	
2,4,6-Trinitrotoluene	8330	
HMX	8330	
2-Nitrotoluene	8330	
3-Nitrotoluene	8330	
4-Nitrotoluene	8330	
4-Amino-2,6-dinitrotoluene	8330	
2-Amino-4,6-dinitrotoluene	8330	
Tetryl	8330	
RDX	8330	
Nitroglycerin	8330	N
PETN	8330	N
2,4-Diamino-6-nitrotoluene	8330	N
2,6-Diamino-4-nitrotoluene	8330	N
2,2',6,6'-Tetranitro-4,4'--azoxytoluene	8330	N
3,5-Dinitroaniline	8330	N
TNX	8330	N
MNX	8330	N
Picric Acid	Lauks HPLC	
Picramic Acid	Lauks HPLC	
Nitrocellulose	Modified Army Corps of Engineers	

2.SOP Specific Comments

a. SOP No. LTL-8019

General	SOP does not indicate that corrective action be documented in a laboratory notebook or run log. Method detection limits are not addressed.
Section II Part 3.1	The laboratory SOP indicates that working surrogate standards are made by taking 10 uL aliquots of the stock solution 20 ng/uL and diluting with 10mLs of methanol to yield a working concentration of 20 ug/mL. This actually would produce a working concentration of 20 ng./mL.
Section II Part 3.2	This section of the SOP appears to be incomplete. The concentration of the initial stock solution is not indicated and this section does not indicate how the working concentration is obtained.
Section II Part 3.3	This section does not indicate the amount of surrogate added to the calibration standards.
Section VI Part 3	The percent difference calculation deviates from the typical and method 8000 procedure. The percent difference can be calculated from either the initial calibration midpoint value or the average of all initial calibration standards. However, the calculation should use only one of the terms in the percent difference calculation. The laboratory indicates that the midpoint and average values are used in the same calculation. CFi and ACi should be the same.

b. **SOP LTL -8260**

Section II Part II	This section of the SOP does not address labeling of standards and proper documentation in the standard prep logbooks to verify traceability. Refer to Section II Part 3 of SOP LTL-8019 for proper labeling and documentation.
General	SOP does not indicate that corrective action be documented in a laboratory notebook or run log.

Specific analyte quantitation ions and reference internal standards are not specified in the SOP.

c. SOP #: 8081

Analysis of Organochlorine Pesticides and PCBs by Method 8080/8081

General — The SOP does not address corrective action for when sample results are outside the linear calibration range (dilutions).

The SOP does not adequately address compound quantitation and identification for the multicompound analytes (PCBs). Such as the number of peaks used, pattern recognition etc.

The laboratory MDLs or reporting limits are not reported in this SOP.

Section 2.2 — Standards preparation SOP's should either refer the user to the Preparation, Storage, Shelf Life and Traceability Documentation of Standards and Reference Materials SOP or cover standards preparation documentation and labeling within this SOP.

Section 4.12.1.1 — The %D calculation deviates from the method. According to section 7.5.2 of method 8081 the continuing calibration factor should be compared to the initial calibration not the ICV standard as specified in this SOP.

Section 4.12.2.1 — The SOP states that CCV Calibration Factors can be outside QC limits as long as the associated samples are non detected for that analyte out of control. This section should state that this is acceptable policy as long as there was an increase in response. (See SOP LTL-8330, Section VI, part 3.2)

Section 4.15.1.1 — The matrix spike percent recovery calculation is incorrect. The difference in the spiked sample and the unspiked sample should be over the true value (spiked amount) rather than the spiked sample result.

$$\%R = \frac{\text{Spiked sample result (MS) - unspiked sample result}}{\text{Spiking amount}}$$

d. SOP # LTL-8151

Analysis of Chlorinated Herbicides by Method 8151A

General	The SOP does not address corrective action for when sample results are outside the linear calibration range (dilutions).
	The Standard Solution Concentration table from Appendix 1 does not indicate the surrogate concentrations in each calibration standard.
	The laboratory MDLs or reporting limits are not reported in this SOP.
Section 2.2	The SOP should either refer the user to the Preparation, Storage, Shelf Life and Traceability Documentation of Standards and Reference Materials SOP or cover standards preparation, documentation and labeling within this SOP.
Section 4.9.1.1	The %D calculation deviates from the method. According to method 8081, the continuing calibration factor should be compared to the initial calibration not the ICV standard as specified in this SOP.
Section 4.9.2.1	The SOP indicates that CCV Calibration Factors can be outside QC limits as long as the associated samples are non detected for that analyte out of control. This section should state that this is acceptable policy as long as there was an increase in response. (See SOP LTL-8330, Section VI, part 3.2)
Section 4.12.1.1	The matrix spike percent recovery calculation is incorrect. The difference in the spiked sample and the unspiked sample should be over the true value (spiked amount) rather than the spiked sample result.

$$\frac{\text{Spiked sample result (MS) - unspiked sample result}}{\text{Spiking amount}}$$

e. SOP #:8274

Determination of Semivolatile Organic Compounds by Method SW 8270B

Section VI — Internal standard criteria and corrective action are not addressed in Section VI of the method. The table in appendix VIII includes internal standard information.

General — The laboratory MDLs or reporting limits are not reported in this SOP.

Specific analyte quantitation ions and reference internal standards are not specified in the SOP.

The QAPP indicates analyses by 8270 and 8270B with two distinct analyte lists for each method variation. However, the laboratory SOP contains only one distinct compound list that does not contain any of the compounds from the 8270B compound list in the QAPP.

f. SOP #: LTL-8330

Determination of Nitroaromatics and Nitramines by Method SW 8330

General — The SOP does not cover dilution of sample extracts when concentrations exceed the linear calibration range.

Section I, Part 1 — The SOP section about interferences indicates that certain compounds can not be positively confirmed on the confirmation column because the laboratory cannot separate certain isomeric pairs on the confirmation column.

Section II,Part 2 — The standards section of the SOP does not address proper labeling of standards and documentation of all standard preparation information in the standards logbooks. This SOP does not refer the user to the Preparation, Storage, Shelf Life and Traceability Documentation of Standards and Reference Materials SOP.

g. SOP #: LTL-8302

HPLC Ordnance 8330 Data Review

Part 12 and 13 The (Form1 and Form 10) review does not address verification or review of retention times and windows.

h. SOP #: LTL-0035

HPLC Determination of Picric and Picramic Acids

General Standards preparation is not adequately addressed. The SOP does not indicate how standards are prepared, if stocks or neat standards are used, and concentrations of stocks, intermediate and working standards are not provided. Additionally, the SOP does not cover labeling, tracking and traceablity, and standard storage.

Second column confirmation does not appear to be performed by the laboratory for this analysis as compound confirmation is not addressed in this SOP.

Corrective action and documentation of action taken for spikes and surrogates are not covered in this SOP. The SOP also does not specify when reanalyses or sample dilutions are required.

Operating procedures and chromatographic conditions are not covered in this SOP.

The MDL and reporting limits were not specified. (The MDL standard was listed at 0.1 ug/mL.)

I. SOP #: LTL -3000

Extraction Method for Base, Acids and Neutral compounds in Water (3520B)

No problems found.

j. SOP #: LTL -3077

Extraction Method for Ordnance compounds in Water

No problems found.

k. SOP #: LTL -3200

Extraction Method for Organochlorine Pesticides in Water (8080/8081 by 3510)

No problems found.

l. SOP #: LTL -3210

Extraction Method for Polychlorinated Biphenyls in Water (8080/8081 by 3510)

No problems found.

m. SOP #: LTL -3550

Extraction Method for Picric and Picramic Acids in Water

No problems found.

n. P #: LTL-1013

Preparation, Storage, Shelf Life and Traceability Documentation of Standards and Reference Materials

No problems found.

o. P #:LTL-1019

Controlling, Maintaining, and Monitoring Laboratory Logbooks

No problems found.

p. Triangle Laboratories Inc. SOP # DHR182

PCDDs and PCDFs by HRGC/HRMS - Method 8290

Section IV, Standards,	Part C is incomplete. The last sentence of the section should read- ... "documenting the chromatographic resolution". See Section 5.7 of method SW 8290.

Section V Part 2c. This section of the SOP refers to section 4.4 which does not appear to exist. The missing information refereed to which is not covered in this SOP is the column resolution criteria for 2,3,7,8 -TCDD and retention time window criteria listed in Section 8.2 of method 8290. (Note according to the CLP method the resolution criteria for 2,3,7,8 -TCDD only applies on a SP-2331 column. For a DB-5 column used by the lab GC resolution is demonstrated by the separation of the recovery standard and internal standard.)

General Sections referred to throughout the SOP are incorrect It appears that sections were renumbered during a revision but the SOP was not corrected to reflect these changes.

According to the SOP quality control requirements and corrective action guidance are covered in the work area guideline 8290 QC Sample Requirements- Dioxin Analyses and not in this SOP.

Section V The RRF(m) (RRF for the internal standards) equation in Section V, page 6 is incorrectly shown. The equation should be as follows:

$$RRF(m)=\frac{Ais \times Qrs}{Qis \times Ars}$$

The equation reported in the SOP is the same equation as the equation for the target analytes.

The %RSD and %D listed on page 12 (compound identification section) should be moved to the appropriate calibration section.

q. Triangle Laboratories Inc. SOP #: DSP103

Extraction of PCDDs and PCDFs in Water Samples - Method 8290

General This SOP only covers the actual extraction procedure. Concentration of the extract and cleanup procedures are covered in additional SOPs.

Sample storage and holding times are not covered in this SOP or in the analysis SOP.

r. SOP LX-6020

Metals Analysis Using Inductively Coupled Plasma- Mass Spectrometry SW 846 Method 6020

General the laboratory SOP does not specify criteria for the following quality control criteria established in the method:

I. Analysis and monitoring of internal standard intensity in the samples must be with 30 and 120 percent of the intensity of the internal standard in the initial calibration standard.(Method section 8.3) Appendix II does provide internal standard recovery criteria. However, no information is provided regarding the composition of the internal standard.

II. Monitoring of interferant sources that are not on the project analyte list (Method section 8.4)

III. Analysis of interference check samples. (Method section 8.9) The laboratory has indicated that the manufacturer recommends that samples should not be analyzed above the high standard level. As a result, the laboratory does not perform interference check samples.

IV. Dilution of samples that exceed the linear range of the instrument

Section 4.1 The requirements for establishing the method detection limit study does not indicate that the replicate samples should be spiked to a level between 3-5 times the anticipated IDL. The SOP indicates that the spike level should be near the anticipated MDL (the IDL definition at the beginning of the SOP does indicate that the detection limit study should consist of samples spiked at 2-5 times the estimated IDL).

Section 4.2 The method acceptance criteria for the calibration is based on the recovery of an independent mid-point calibration standard. The laboratory SOP indicates that the acceptance criteria is based on the correlation coefficient of the standard curve.

The method only requires a calibration curve that consists of a blank and a minimum of one standard. The laboratory SOP specifies a curve of a blank and 3 standards.

Section 4.7 The laboratory SOP indicates that matrix spikes are added prior to digestion. The method indicates that spikes are to be added after digestion.

The method indicates that a control limit of 75 to 125 percent will be used for the spike analysis. The laboratory SOP indicates that control chart limits will be used.

Section 4.8 The method indicates that a duplicate RPD of 20 percent is applied to analyte values greater than 100 times the IDL. The laboratory SOP indicates that control chart limits will be used.

The laboratory SOP indicates that an MS/MSD may be substituted for a matrix duplicate under some circumstances. The method makes no provision for this substitution.

Section 5.1 The method specified mass resolution criteria for the instrument tune is less than 0.9 amu. However, the laboratory SOP indicates an acceptance criteria of less than 1 amu.

The laboratory SOP indicates that the mass calibration and resolution check will be performed every two weeks or when operating conditions change. The method specifies that the mass calibration and resolution check is required each time the instrument is operated.

s. SOP LTL-7102

Method Protocols for the Analysis of Metals by ICP Using SW 846 Method 6010A

General The laboratory SOP does not specify criteria for the following quality control criteria established in the method:

I. Dilution of samples that exceed the linear range of the instrument.

Section 4.1 The requirements for establishing the method detection limit study does not indicate that the replicate samples should be spiked to a level between 3-5 times the anticipated IDL. The SOP indicates that the spike level should be near the anticipated MDL (the IDL definition at the beginning of the SOP does indicate that the detection limit study should consist of samples spiked at 2-5 times the estimated IDL).

There is no indication regarding the frequency at which the IDL study must be performed.

Section 4.2 The method only indicates that a minimum of one blank and one standard are required to establish a calibration curve. Section 4.2 indicates the curve will consist of a minimum of a blank and three standards. This requirement in Section 4.2 also contradicts with Section 5, bullet number 1, which indicates that calibration must occur with a minimum of a blank and four standards.

Section 4.4 The method specifies that ICB corrective action is required when the blank exceeds the Instrument Detection Limit by more than three times. The laboratory SOP indicates that corrective action is prompted when the blank exceeds the reporting limit. In addition, the prescribed corrective action in the laboratory SOP is different than the corrective action specified in the method.

Section 4.5 The method specifies that CCB corrective action is required when the blank exceeds the Instrument Detection Limit by more than three times. The laboratory SOP indicates that corrective action is prompted when the blank exceeds the reporting limit. In addition, the prescribed corrective action in the laboratory SOP is different than the corrective action specified in the method.

Section 4.8 The SOP does not indicate that the LCS matrix should be representative of the sample media associated with the LCS.

Section 4.9 The method specified laboratory control limit for matrix spike recovery is 25 percent. The laboratory SOP indicates a recovery limit of 20 percent.

Section 4.10 The duplicate acceptance criteria established in the SOP of 20 percent does not account for duplicate results near the detection limit. For example, the method specifies that the RPD criteria only applies if the sample values are greater than 10 times the IDL.

Section 5 The method includes significant instructions regarding operating conditions for plasma optimization and specifications for operations with organic solvents. These instructions are not included or referenced in the laboratory SOP.

t. SOP LTL-77501

Operation of the PE FIMS 400 for the Analysis of Hg

General The laboratory refers all quality control limits to a Control Limits Catalog. However, the laboratory does not indicate how these limits are derived and if there are any provisions for maximum criteria that would prompt corrective action.

Section 1.3.10 The definition for IDL does not include an indication of how many spiked samples are required or how the IDL is derived.

Section 4.2.1 Methods 7470 and 7471 indicate the use of a standard at 2 ug/l. However, the laboratory SOP indicates that the standard is at 2.5 ug/l.

Sec 5.2.10 Method 7470 indicates that 5 ml of stannous sulfate should be added 30 seconds after the reduction of excess permanganate. The Laboratory SOP does not address this step.

Section 5.3.3 Method 7471 indicates that 5 ml of reagent water should also be added to the sample. The Laboratory SOP does not address this step.

Section 5.3.4 The method specifically cautions that the sample heating should occur under a hood due to the likely production of Cl_2 gas. The laboratory does not indicate that the procedure should be performed under an operable hood.

Sec 5.3.10 Method 7471 indicates that 5 ml of stannous sulfate should be added 30 seconds after the final addition of 50 ml of reagent water. The Laboratory SOP does not address this step.

u. SOP LTL-9104

Preparation and Analysis of Total and Amenable Cyanide according to EPA Methods 335.1, 335.3, and SW 846 method 9012.

Section 2.2 The laboratory SOP indicates that the Pyridine-barbituic acid color reagent should be diluted to 1 liter. However, method 9012 indicates that the final dilution volume is 250 milliliters.

Section 2.3 The standard concentrations in the method are specified at 0. 10, 20, 50 100, 150, and 200 ug/l. However, the laboratory SOP indicates concentrations of 0, 10, 50, 100, 250, and 500 ug/l.

Section 5.3 The cyanide distillation process in the laboratory SOP differs from the method as follows:

I. The SOP indicates use of a 50 ml sample aliquot while the method specifies 500 ml.

II. The SOP indicates the addition of 5 ml of sulfuric acid while the method specifies 50 ml of sulfuric acid.

III. The SOP indicates a distillation time of 90 minutes while the method specifies a reflux time of 1 hour.

v. SOP LTL-9110

Determination of Anions by Ion Chromatography by Method 300.0A or 9056

General The laboratory SOP does not address the use or documentation of retention times in evaluating standards, check samples, or samples.

Section 1.3 The definition for IDL does not adequately identify the steps necessary to establish an IDL or to indicate the frequency at which the IDL must be re-established.

Section 4.5 The method specifies that the CCV recovery criteria is 95-105%. However, the laboratory SOP indicates a recovery criteria of 90-110% (85-115% for chloride).

Section 4.9 Method 9056 specifies a duplicate analysis rate of 1 in 10 samples. The laboratory specifies a duplicate analysis rate of 1 in 20 samples.

w. SOP LTL-9115

Determination of Total Organic Carbon in Water Samples Based on SW 846 9060

General The laboratory SOP does not provide any sample preparation information, including sample homogenization and adjusting the pH to less than 2.

The method specifies quadruplicate analysis. However, the SOP does not mention the number of analyses required per sample.

Section 4.1.1 The MDL should be established with spiked samples 3-5 times the anticipated MDL. The SOP indicates the spikes should be near the MDL.

Section 4.2 The laboratory SOP indicates that the initial calibration is performed using a single standard. However, the method indicates that a series of standards that encompass the expected concentration range of the samples should be performed.

x. **SOP LTL-9119**

Total Organic Halides by SW 846 Method 9020B

General The laboratory SOP does not indicate the addition of sulfite to reduce residual chlorine in the sample.

Section 4.2 The laboratory SOP does not provide any acceptance criteria for the calibration blank.

Section 4.5 The method specifies that a minimum of two method blanks should be analyzed. The SOP only indicates that one blank in 20 samples should be analyzed.

y. SOP LTL-1002

Document Tracking and Control

General The procedure should outline minimum SOP requirements that would ensure that each SOP is sufficiently detailed to adequately document the activity. The SOP should include responsibilities of applicable staff, equipment and supplies, definition of terms, safety, quality control, and documentation requirements.

Clarify the circumstances under which a deficiency or enhancement identified in an SOP prompts an immediate revision and when an issue can be addressed in the routine annual revision.

Section 2.2.4 The structure and function of the database used to track revisions of SOPs should be clearly identified. The SOP should clearly state the fields that must be completed. The SOP should also clearly indicate what reports are generated for tracking purposes and indicate the content of each report.

Section 2.2.5 The SOP indicates that the header information on each page **should** be included. The header information **must** be on each page to adequately track SOP revisions.

Section 2.2.6 The individuals responsible for reviewing and approving new SOPs and SOP revisions should be clearly identified to ensure a consistency of review.

Section 2.2.13 The SOP should specifically address the practice of copying and posting portions of SOPs near relevant instrumentation. The SOP should indicate that supervisors will specifically ensure that posted materials are updated when revisions are issued.

z. SOP LTL-1003

Chain of Custody and Documentation Procedures

General There is no requirement that the custody logs are reviewed by supervisory personnel for completeness and accuracy and the frequency of such review. In addition, there is not a place on the form for the supervisory personnel to document their review.

Section 4.2.1 The SOP should indicate the method in which the main walk in cooler and the VOA sample storage refrigerators are secured. (i.e. pad-lock or card entry to room)

Appendix A. The design of the Secure Storage Custody Log does not appear to facilitate more than one custody transaction per sample. A single sample number may appear on multiple log pages or on the same log page multiple times, which would make custody tracking difficult. A form presented in landscape format with multiple log-in and log-out entries per sample number line would facilitate clear internal custody tracking.

DRAFT

TABLE 1-1

SUMMARY OF RCRA GROUNDWATER MONITORING REQ
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
PAGE 1 OF 5

Type of RCRA Program Sampling/Objective	Analytical Program (All Wells)				Frequency of Sampl
	Parameter Type	Target Constituents	Objective	Limit of Detection	
AMMUNITION BURNING GROUNDS					
Type: RCRA Compliance monitoring and CMI and closure Objectives: • Monitor GW for compliance with GW protection standards outlined in RCRA permit (upgradient and downgradient wells). (at Point of Compliance) • Monitor existing GW contaminant distribution (compliance wells).	Field	• Dissolved oxygen • pH • Specific conductivity • Temperature • Turbidity	Determine if the well water is equivalent to formation water (i.e., stability). Evaluate general water quality.	NA	Quarterly: • Dissolved oxygen • pH • Specific conductivity • Temperature • Turbidity • Explosives[2][3] • Metals[2] (total and dissolved) • Cyanide • Nitrate • Sulfate • Total phosphorus • TOC • TOX
		• Pumping tests[1] • Water level measurements	Determine groundwater flow rate and direction.	NA	
	Laboratory	• Explosives[2][3] • Metals[2] (total and dissolved) • Cyanide	Monitor waste constituents and reaction products that indicate the presence of hazardous constituents in GW potentially attributable to operations.	Reporting limit low enough to meet criteria for the protection of human health and the environment[4].	
		• VOCs[2] (including TCE and degradation products[5]) • SVOCs[2] • Pesticides/PCBs[2] • Herbicides[2] • Dioxins/Furans[2]	Monitor additional Appendix IX hazardous constituents to see if they have entered GW.	Reporting limit low enough to meet criteria for the protection of human health and the environment[4].	Annual: • VOCs[2] (including TCE and degradation products[5]) • SVOCs[2][6] • Pesticides/PCBs[2][6] • Herbicides[2][6] • Dioxins/Furans[2][6] • Pumping tests[1] • Water level measurements
		• Nitrate • Sulfate • Total phosphorus • Chloride	Monitor karst geologic conditions and provide indication of the presence of hazardous constituents.	Reporting limit low enough to meet criteria for the protection of human health and the environment[4].	
		• TOC • TOX	Monitor indicator parameters for hazardous constituents.	NA	

Flow Rate and Direction

Quarterly 3yr or upon Sem
Semi-ann
Quarterly 3 yr Semi annual

089711P

TABLE 1-1

RY OF RCRA GROUNDWATER MONITORING REQUIREMENTS
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
PAGE 1 OF 5

n (All Wells)		Frequency of Sampling	Monitoring Points		
Objective	Limit of Detection		Location	Objective	Evaluations to be Performed
if the well water ent to formation , stability). general water	NA	Quarterly: • Dissolved oxygen • pH • Specific conductivity • Temperature • Turbidity • Explosives[2][3] • Metals[2] (total and dissolved) • Cyanide • Nitrate • Sulfate • Total phosphorus • TOC • TOX Annual: • VOCs[2] (including TCE and degradation products[5]) • SVOCs[2][6] • Pesticides/PCBs[2][6] • Herbicides[2][6] • Dioxins/Furans[2][6] • Pumping tests[1] • Water level measurements	Compliance: • Beech Creek 03C[redacted]; [redacted]30[redacted] • Beaver Bend 03C[redacted]	Monitor contaminant distribution.	Monitor movement of GW contaminant distribution to determine if contamination has moved beyond the compliance points.
ground water flow irection.	NA		Upgradient: • Beech Creek 03C17 Downgradient: • Beech Creek 03[redacted]04; [redacted]; 03[redacted]46; [redacted]20; 03[redacted]26; [redacted]27; 03[redacted]P2; 03[redacted]P2; 03[redacted]P2 • Springs A and C	Monitor quality of water in each interconnected aquifer underlying the unit. Monitor quality of background water in each aquifer that has not been affected by operations of the unit. Monitor quality of water in each aquifer that may have been affected by operations of the unit. Provide information for corrective actions.	Determine if statistically significant evidence of contamination exists by the comparison of downgradient concentrations to upgradient concentrations in each aquifer.
aste constituents ion products that e presence of constituents in tially attributable ons.	Reporting limit low enough to meet criteria for the protection of human health and the environment[4].				
dditional Appendix ious constituents to y have entered	Reporting limit low enough to meet criteria for the protection of human health and the environment[4].				
arst g ic s and provide of the presence of s constituents.	Reporting limit low enough to meet criteria for the protection of human health and the environment[4].				
ndicator rs for hazardous nts.	NA				

Full Suite Ba Pg Mn.

Are springs off-site?

ref. to well map Fig. 1-5

3yrs

Cl2.

App. IX Phosphate the same?

Flow Rate and Direction

check well #'s again

Quarterly 3 yrs.
or upon soil removal
Semi-ann after soil rem.
Quarterly & Semiannual statistical to background

TABLE 1-1

IMARY OF RCRA GROUNDWATER MONITORING REQUIREMENTS
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
PAGE 2 OF 5

ref. a well map Fig 1-5

ogram (All Wells)		Frequency of Sampling	Monitoring Points		
Objective	Limit of Detection		Location	Objective	Evaluations to be Performed
rmine if the well water uivalent to formation r (i.e., stability). uate efficiency of lorination of TCE.	NA	Quarterly (2 years): • Dissolved oxygen • pH • Redox potential • Specific conductance • Explosives[2][7] (including degradation products) • TCE and degradation products[5] • Total iron • Dissolved calcium, iron, magnesium, and manganese • Chloride • Methane • Nitrate/Nitrite • Sulfate • TOC	Natural attenuation: • Alluvium ~~03B02~~, 03B04 • Beech Creek 03C04; ~~03B10~~; ~~03B11~~; ~~03B12~~; 03C25 • Beaver Bend ~~03B03~~ • Springs A and C • Little Sulfur Creek (near ~~Spring~~ C and Base boundary)	Demonstrate natural attenuation. of TCE only ? TCE + explosives ?	Determine if GW is being naturally attenuated by the direct comparison of concentrations to historical concentrations.
itor waste constituents reaction products that ate the presence of rdous constituents in potentially attributable erations.	Reporting limit low enough to meet criteria for the protection of human health and the environment[4].				
uate efficiency of lorination of TCE. itor indicator meters used to uate microbial litions.	Reporting limit low enough to meet criteria for the protection of human health and the environment[4] or NA.				

check well #'s

DRAFT

TABLE 1-1

SUMMARY OF RCRA GROUNDWATER MONITORING REQUIREMENTS
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA

Type of RCRA Program Sampling/Objective	Analytical Program (All Wells)				Frequency of Sampling
	Parameter Type	Target Constituents	Objective	Limit of Detection	
AMMUNITION BURNING GROUNDS (CONTINUED)					
Objective: • Monitor natural attenuation of existing GW contamination.	Field:	• Dissolved oxygen • pH • Redox potential • Specific conductance	Determine if the well water is equivalent to formation water (i.e., stability). Evaluate efficiency of dechlorination of TCE.	NA	Quarterly (2 years): • Dissolved oxygen • pH • Redox potential • Specific conductance • Explosives[2][7] (including degradation products) • TCE and degradation products[5] • Total iron • Dissolved calcium, iron, magnesium, and manganese • Chloride • Methane • Nitrate/Nitrite • Sulfate • TOC
	Laboratory	• Explosives[2][7] (including degradation products) • VOCs[2] (TCE and degradation products[5])	Monitor waste constituents and reaction products that indicate the presence of hazardous constituents in GW potentially attributable to operations.	Reporting limit low enough to meet criteria for the protection of human health and the environment[4].	
		• Total iron • Dissolved calcium, magnesium, and manganese • Chloride • Methane • Nitrate/Nitrite • Sulfate • TOC	Evaluate efficiency of dechlorination of TCE. Monitor indicator parameters used to evaluate microbial conditions.	Reporting limit low enough to meet criteria for the protection of human health and the environment[4] or NA.	

DRAFT

All NG

TABLE 1-1

SUMMARY OF RCRA GROUNDWATER MONITORING REQUIREMENTS
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
PAGE 3 OF 5

Type of RCRA Program Sampling/Objective	Analytical Program (All Wells)				Frequency of Sampling
	Parameter Type	Target Constituents	Objective	Limit of Detection	
OLD RIFLE RANGE					
Type: RCRA Compliance / monitoring and CMI Objectives: • Monitor GW for compliance with GW protection standards outlined in RCRA permit (upgradient and downgradient wells).	Field	• Dissolved oxygen • pH • Specific conductivity • Temperature • Turbidity	Determine if the well water is equivalent to formation water (i.e., stability). Evaluate general water quality.	NA	Semi-annual: • Dissolved oxygen • pH • Specific conductivity • Temperature • Turbidity • Explosives[2][6] • Ammonia • Metals[2] (total and dissolved) • Cyanide • TOC • TOX Annual: • VOCs[2][6] • SVOCs[2][6] • Pesticides/PCBs[2][6] • Herbicides[2][6] • Dioxins/Furans[2][6] • Pumping tests[1] • Water level measurements
		• Pumping tests[1] • Water level measurements	Determine groundwater flow rate and direction.	NA	
	Laboratory	• Explosives[2][6] • Ammonia • Metals[2] (total and dissolved) • Cyanide	Monitor waste constituents and reaction products that indicate the presence of hazardous constituents in GW potentially attributable to operations.	Reporting limit low enough to meet criteria for the protection of human health and the environment[4].	
		• VOCs[2] • SVOCs[2] • Pesticides/PCBs[2] • Herbicides[2] • Dioxins/Furans[2]	Monitor additional Appendix IX hazardous constituents to see if they have entered GW.	Reporting limit low enough to meet criteria for the protection of human health and the environment[4].	
		• TOC • TOX	Monitor indicator parameters for hazardous constituents.	NA	

* Flow rate and Direction

TABLE 1-1

MMARY OF RCRA GROUNDWATER MONITORING REQUIREMENTS
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
PAGE 3 OF 5

ogram (All Wells)		Frequency of Sampling	Monitoring Points		
Objective	Limit of Detection		Location	Objective	Evaluations to be Performed
ermine if the well water quivalent to formation er (i.e., stability). luate general water lity.	NA	Semi-annual: • Dissolved oxygen • pH • Specific conductivity • Temperature • Turbidity • Explosives[2] • Ammonia • Metals[2] (total and dissolved) • Cyanide • TOC • TOX	Upgradient: • Big Clifty Upper 06G14P2 • Big Clifty/Beech Creek ~~[illegible]~~ Downgradient: • Big Clifty Upper 06~~G11P2~~; ~~06G13P2~~; 06G16P2 • Big Clifty/Beech Creek ~~[illegible]~~; ~~06G42~~; ~~[illegible]~~; ~~06G44~~; ~~[illegible]~~; ~~06G15~~; ~~[illegible]~~	Monitor quality of water in each interconnected aquifer underlying the unit. Monitor quality of background water in each aquifer that has not been affected by operations of the unit. Monitor quality of water in each aquifer that may require corrective actions.	Determine if statistically significant evidence of contamination exists by the comparison of downgradient concentrations to upgradient concentrations in each aquifer.
ermine groundwater flow and direction.	NA				
nitor waste constituents reaction products that cate the presence of ardous constituents in f potentially attributable perations.	Reporting limit low enough to meet criteria for the protection of human health and the environment[4].				
nitor additional Appendix hazardous constituents to if they have entered l.	Reporting limit low enough to meet criteria for the protection of human health and the environment[4].	Annual: • VOCs[2][6] • SVOCs[2][6] • Pesticides/PCBs[2][6] • Herbicides[2][6] • Dioxins/Furans[2][6] • ~~Pumping tests[1]~~ • Water level measurements			
nitor indicator ameters for hazardous stituents.	NA				

check quarterly

check well #'s

ref to well map Fig 1-6

Appendix

+ Flow rate and Direction

TABLE 1-1

IMARY OF RCRA GROUNDWATER MONITORING REQUIREMENTS
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
PAGE 4 OF 5

get well map Fig 1-7

ogram (All Wells)		Frequency of Sampling	Monitoring Points		
Objective	Limit of Detection		Location	Objective	Evaluations to be Performed
ermine if the well water quivalent to formation er (i.e., stability). luate general water lity.	NA	Semi-annual: • Dissolved oxygen • pH • Specific conductivity • Temperature • Turbidity • Explosives[2][3] • Metals[2] (total and dissolved) • Cyanide • TOC • TOX Annual: • Pumping tests[1] • Water level measurements + Flow rate	Upgradient: • Pennsylvanian 06C08P2 • Big Clifty/Beech Creek 06C08 Downgradient: • Golconda/Haney LS ~~06C05P2; 06C04~~P2 • Pennsylvanian ~~06C06~~P2 • Lower Penn/Beech ~~Creek 06C06~~ • Big Clifty/Beech Creek ~~06C02; 06C03; 06C04; 06C05~~ • Beech Creek LS ~~06C07~~	Monitor quality of water in each interconnected aquifer underlying the unit. Monitor quality of background water in each aquifer that has not been affected by operations of the unit. Monitor quality of GW in each aquifer that has been affected by operations of the unit.	Determine if statistically significant evidence of contamination exists by the comparison of downgradient concentrations to upgradient concentrations in each aquifer.
ermine groundwater flow and direction.	NA				
nitor waste constituents reaction products that cate the presence of ardous constituents in potentially attributable operations.	Reporting limit low enough to meet criteria for the protection of human health and the environment[4].				
nitor indicator ameters for hazardous nstituents.	NA				

and Direction
see Subpart F.

Semi annual state to be proceed

DRAFT

TABLE 1-1

SUMMARY OF RCRA GROUNDWATER MONITORING REQUIREMENTS
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA

Type of RCRA Program Sampling/Objective	Analytical Program (All Wells)				Frequency of Sampling	
	Parameter Type	Target Constituents	Objective	Limit of Detection		
DEMOLITION RANGE						
Type: RCRA Detection monitoring and Objectives: • Monitor indicator parameters that provide reliable indications of the presence of hazardous constituents (upgradient and downgradient wells).	Field	• Dissolved oxygen • pH • Specific conductivity • Temperature • Turbidity	Determine if the well water is equivalent to formation water (i.e., stability). Evaluate general water quality.	NA	Semi-annual: • Dissolved oxygen • pH • Specific conductivity • Temperature • Turbidity • Explosives[2][3] • Metals[2] (total and dissolved) • Cyanide • TOC • TOX Annual: • Pumping tests[1] • Water level measurements Flow rate and Direction see Subpart	U • • D • • • • • •
		• Pumping tests[1] • Water level measurements	Determine groundwater flow rate and direction.	NA		
	Laboratory	• Explosives[2][3] • Metals[2] (total and dissolved) • Cyanide	Monitor waste constituents and reaction products that indicate the presence of hazardous constituents in GW potentially attributable to operations.	Reporting limit low enough to meet criteria for the protection of human health and the environment[4].		
		• TOC • TOX	Monitor indicator parameters for hazardous constituents.	NA		

TABLE 1-1

MMARY OF RCRA GROUNDWATER MONITORING REQUIREMENTS
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
PAGE 5 OF 5

ogram (All Wells)		Frequency of Sampling	Monitoring Points		
Objective	Limit of Detection		Location	Objective	Evaluations to be Performed
ermine if the well water quivalent to formation er (i.e., stability). luate general water lity.	NA	*Quarterly*[9]: • Dissolved oxygen • pH • Specific conductivity • Temperature • Turbidity • Explosives[2][3] • Metals[2] (total and dissolved) • VOCs[2] • SVOCs[2] • Pesticides/PCBs[2] • Herbicides[2] • Dioxins/Furans[2] • Nitrate • Sulfate • *Total phosphorus* • water level measurements	*TBD*[10]	*Monitor quality of water in* each interconnected aquifer underlying the unit. Monitor quality of background water in each aquifer that has not been affected by operations of the unit. Monitor quality of water in each aquifer that may have been affected by operations of the unit.	*Determine if statistically* significant evidence of contamination exists by the comparison of downgradient concentrations to upgradient concentrations in each aquifer. Determine the extent of the GW contaminant distribution.
itor waste constituents reaction products that cate the presence of ardous constituents in potentially attributable perations.	Reporting limit low enough to meet criteria for the protection of human health and the environment[4].				
itor additional Appendix azardous constituents to if they have entered l.	Reporting limit low enough to meet criteria for the protection of human health and the environment[4].				
nitor karst geologic iditions and provide ication of the presence of ardous constituents.	Reporting limit low enough to meet criteria for the protection of human health and the environment[4].				

ref to wellmap

ium Contaminant Levels	RFI	RCRA Facility Investigation	TOC	Total organic carbon
plicable	SVOCs	Semivolatile organic compounds	TOX	Total organic halides
lorinated biphenyls	TBD	To be determined	VOCs	Volatile organic compounds
inary Remediation Goals	TCE	Trichloroethene	CMI	Corrective Measures Implementation

ear provided that good data is obtained.

health and ecological receptors, U.S. EPA Region IX PRGs for tap water; U.S. EPA EcoTox Thresholds; Safe Drinking Water Act MCLs; IDEM health-based

complete list reviewed here.

observed.

4'-azoxytoluene, 3,5-dinitroaniline, 1,3,5-trinitroso-1,3,5-hexahydrotriazine, 1-nitroso-3,5-dinitro-1,3,5-hexahydrotriazine, and picric acid.

lts of the quarterly monitoring.

DRAFT

TABLE 1-1

SUMMARY OF RCRA GROUNDWATER MONITORING REQUIRE
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA

Type of RCRA Program Sampling/Objective	Analytical Program (All Wells)				Frequency of Sampling	
	Parameter Type	Target Constituents	Objective	Limit of Detection		
OLD JEEP TRAIL						
Type: RFI Characterization Objectives: • Monitor GW for the presence of hazardous constituents and determine concentrations if present (upgradient and downgradient wells). • Delineate the extent of the GW contaminant distribution (upgradient and downgradient wells).	Field	• Dissolved oxygen • pH • Specific conductivity • Temperature • Turbidity	Determine if the well water is equivalent to formation water (i.e., stability). Evaluate general water quality.	NA	Quarterly[9]: • Dissolved oxygen • pH • Specific conductivity • Temperature • Turbidity • Explosives[2][3] • Metals[2] (total and dissolved) • VOCs[2] • SVOCs[2] • Pesticides/PCBs[2] • Herbicides[2] • Dioxins/Furans[2] • Nitrate • Sulfate • Total phosphorus • water level measurements	TE
	Laboratory waste driven	• Explosives[2][3] • Metals[2] (total and dissolved) • Cyanide • VOCs, TCE & deg. prod. • ~~SVOCs~~	Monitor waste constituents and reaction products that indicate the presence of hazardous constituents in GW potentially attributable to operations.	Reporting limit low enough to meet criteria for the protection of human health and the environment[4].		
		• VOCs[2] • SVOCs[2] • Pesticides/PCBs[2] • Herbicides[2] • Dioxins/Furans[2]	Monitor additional Appendix IX hazardous constituents to see if they have entered GW.	Reporting limit low enough to meet criteria for the protection of human health and the environment[4].		
		• Nitrate • Sulfate • Total phosphorus	Monitor karst geologic conditions and provide indication of the presence of hazardous constituents.	Reporting limit low enough to meet criteria for the protection of human health and the environment[4].		

AWQC	Ambient Water Quality Criteria	MCLs	Maximum Contaminant Levels	RFI	RCRA Facility Investigation
DQLs	Data Quality Levels	NA	Not applicable	SVOCs	Semivolatile organic compounds
GW	Ground water	PCBs	Polychlorinated biphenyls	TBD	To be determined
IDEM	Indiana Department of Environmental Management	PRGs	Preliminary Remediation Goals	TCE	Trichloroethene

not in Table 1-2 should be Table 1-3?

1 If data is not available, pumping tests are to be performed during the first year provided that good data is obtained.
2 See Table 1-2 for the list of specific chemicals and analytical methods.
3 Analyte list does not include picramic acid and picric acid.
4 Human health- and ecological-based criteria consist of U.S. EPA DQLs for human health and ecological receptors, U.S. EPA Region IX PRGs for tap water; U.S. EP criteria; and Federal AWQC.
5 Primary degradation products for trichloroethene include dichloroethenes and vinyl chloride.
6 Analyses will be performed once during the first year of monitoring, unless detections are observed.
7 Analyte list includes 2,4-diamino-6-nitrotoluene, 2,6-diamino-4-nitrotoluene, 2,2',6,6-tetranitro-4,4'-azoxytoluene, 3,5-dinitroaniline, 1,3,5-trinitroso-1,3,5-hexahydrotria
8 Analyte list includes picramic acid and picric acid.
9 Four quarters of sampling to be conducted with additional sampling to be conducted based on the results of the quarterly monitoring.
10 Monitoring well network to be determined following additional investigative activities.

TABLE 3-1

QUALITY CONTROL LIMITS[1]
MATRIX SPIKE/MATRIX SPIKE DUPLICATE SAMPLES AND SURROGATE SPIKES
EXPLOSIVES ANALYSES
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
PAGE 1 OF 2

Chemical	Accuracy (%R)	Precision (RPD)
EXPLOSIVES BY SW-846 METHOD 8330		
1,3,5-Trinitrobenzene	44-142	30
1,3-Dinitrobenzene	32-122	30
2,4,6-Trinitrotoluene	59-114	30
2,4-Dinitrotoluene	42-110	30
2,6-Dinitrotoluene	38-106	30
HMX	10-96	30
2-Nitrotoluene	30-99	30
3-Nitrotoluene	28-105	30
4-Nitrotoluene	31-100	30
4-Amino-2,6-dinitrotoluene	58-117	30
2-Amino-4,6-dinitrotoluene	58-117	30
Tetryl	27-109	30
Nitrobenzene	31-99	30
RDX	47-125	30
Nitroglycerin	30-150[2]	50
PETN	30-150[2]	50
2,4-Diamino-6-nitrotoluene[3]	TBD[4]	TBD
2,6-Diamino-4-nitrotoluene[3]	TBD	TBD
2,2',6,6'-Tetranitro-4,4'-azoxytoluene[3]	TBD	TBD
3,5-Dinitroaniline[3]	TBD	TBD
TNX[3]	TBD	TBD
MNX[3]	TBD	TBD
1,2-Dinitrobenzene (surrogate)	60-140	NA[5]
EXPLOSIVES BY LAUCKS HPLC METHOD		
Picric acid	48-152[6]	50
Picramic acid	60-128[6]	26
2,4-Dinitrophenol (surrogate)	58-121	NA
EXPLOSIVES BY MODIFIED ARMY CORPS METHOD		
Nitrocellulose	30-150[7]	50

1 In-house QC limits provided by Laucks Testing Laboratories, Inc.

2 Laucks will perform the preparative extraction for these analytes in the same manner as the remaining analytes but will analyze for them using a 214 wavelength (similar to SW-846 Method 8332) rather than a wavelength of 254. Statistical QC limits will be developed once 20 data points are obtained. The default limits presented will be used until that time.

TABLE 3-2

QUALITY CONTROL LIMITS[1]
LABORATORY CONTROL SAMPLES
EXPLOSIVES ANALYSES
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
PAGE 1 OF 2

Chemical	Accuracy (%R)
EXPLOSIVES BY SW-846 METHOD 8330	
1,3,5-Trinitrobenzene	52-125
1,3-Dinitrobenzene	53-122
2,4,6-Trinitrotoluene	51-134
2,4-Dinitrotoluene	55-129
2,6-Dinitrotoluene	49-132
HMX	29-135
2-Nitrotoluene	41-140
3-Nitrotoluene	40-145
4-Nitrotoluene	39-142
4-Amino-2,6-dinitrotoluene	60-125
2-Amino-4,6-dinitrotoluene	61-125
Methyl-2,4,6-Trinitrophenylnitramine	33-138
Nitrobenzene	40-134
RDX	44-125
Nitroglycerin	30-150[2]
PETN	30-150[2]
2,4-Diamino-6-nitrotoluene[3]	TBD[4]
2,6-Diamino-4-nitrotoluene[3]	TBD
2,2',6,6'-Tetranitro-4,4'-azoxytoluene[3]	TBD
3,5-Dinitroaniline[3]	TBD
TNX[3]	TBD
MNX[3]	TBD
EXPLOSIVES BY LAUCKS HPLC METHOD	
Picric acid	40-160[5]
Picramic acid	40-160[5]
EXPLOSIVES BY MODIFIED ARMY CORPS METHOD	
Nitrocellulose	30-150[6]

1 In-house QC limits provided by Laucks Testing Laboratories, Inc.
2 Laucks will perform the preparative extraction for these analytes in the same manner as the remaining analytes but will analyze for them using a 214 wavelength (similar to SW-846 Method 8332) rather than a wavelength of 254. Statistical QC limits will be developed once 20 data points are obtained. The default limits presented will be used until that time. } al Dave
3 These compounds will only be included in matrix spike analyses associated with samples from the ABG collected to evaluate natural attenuation.

TABLE 3-15

QUALITY CONTROL LIMITS[1]
MATRIX SPIKE AND LABORATORY DUPLICATE SAMPLES
MISCELLANEOUS PARAMETERS
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA

Chemical	Accuracy (%R)	Precision (RPD)
MISCELLANEOUS PARAMETERS		
Ammonia (EPA 350.1)	53-120	10
Chloride (SW-846 Method 9056)	73-121	11
Cyanide (SW-846 Method 9012)	64-135	11
Methane (RSK SOP-147)	NA[2]	NA
Nitrate (SW-846 Method 9056)	90-110	20
Nitrite (SW-846 Method 9056)	70-130	30
Sulfate (SW-846 Method 9056)	88-115	20
Total Organic Carbon (SW-846 Method 9060)	70-119	11
Total Organic Halides (SW-846 Method 9020B)	60-134	24
Total Phosphorus (EPA Method 365.2)	54-129	27

1. In-house QC limits provided by Laucks Testing Laboratories, Inc.
2. Not available. A laboratory has not yet been selected for this parameter. QC limits will become available when a laboratory has been selected.

TABLE 3-16

QUALITY CONTROL LIMITS[1]
LABORATORY CONTROL SAMPLES
MISCELLANEOUS PARAMETERS
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA

Chemical	Accuracy (%R)
MISCELLANEOUS PARAMETERS	
Ammonia (EPA Method 350.1)	75-125
Chloride (SW-846 Method 9056)	90-110
Cyanide (SW-846 Method 9012)	75-125
Methane (RSK SOP-147)	NA[2]
Nitrate (SW-846 Method 9056)	90-110
Nitrite (SW-846 Method 9056)	90-110
Sulfate (SW-846 Method 9056)	80-120
Total Organic Carbon (SW-846 Method 9060)	80-120
Total Organic Halides (SW-846 Method 9020B)	75-125
Total Phosphorus (EPA Method 365.2)	75-125

1 In-house QC limits provided by Laucks Testing Laboratories, Inc.
2 Not available. A laboratory has not yet been selected for this parameter. QC limits will become available when a laboratory has been selected.

TABLE 7-1

SUMMARY OF ORGANIC AND INORGANIC ANALYTICAL PROCEDURES
GROUND WATER SAMPLES
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
PAGE 1 OF 2

Analytical Parameter	Preparation Method	Analytical Method	Preparation/Analytical SOP(s)[1]
Explosives	SW-846[2] 8330	SW-846 8330	LTL-3077 / LTL-8330
Nitrocellulose	Modified Army Corps Method[3]	Modified Army Corps Method	LTL-9132 / LTL 9125
Picric acid and Picramic acid	Laucks HPLC Method	Laucks HPLC Method	LTL-3550 / LTL-8303
Appendix IX Metals (except mercury) - total	SW-846 3010A or SW-846 3015	SW-846 6020	LTL-7009 or LTL-7010 / LTL-7202
Appendix IX Metals (except mercury) - dissolved	—[4]	SW-846 6020	LTL-7202
Mercury - total & dissolved	SW-846 7470A	SW-846 7470A	LTL-7501
Iron - total	SW-846 3010A or SW-846 3015	SW-846 6010B	LTL-7009 or LTL-7010 / LTL-7102
Calcium, Magnesium, and Manganese - dissolved	—	SW-846 6010B	LTL-7102
Appendix IX Volatile Organic Compounds	SW-846 5030	SW-846 8260A (with 25 mL purge)	LTL-8260 (low-level option)
1,4-Dioxane, Acetonitrile, Isobutyl alcohol, and Propionitrile	SW-846 5030	SW-846 8015B	LTL-8019
Appendix IX Semivolatile Organic Compounds and Organophosphorus Pesticides	SW-846 3520B	SW-846 8270B	LTL-3000 / LTL-8274
Appendix IX Organochlorine Pesticides and PCBs	SW-846 3510B	SW-846 8081	LTL-3200, LTL-3210 / LTL-8081
Appendix IX Herbicides	SW-846 8151A	SW-846 8151A	LTL-8151
Dioxins/Furans	SW-846 8290	SW-846 8290	DSP103 / DHR182
Ammonia	—	EPA[5] 350.1	LTL-9109
Chloride	—	SW-846 9056	LTL-9110
Cyanide	—	SW-846 9012	LTL-9104
Methane	RSK SOP-175[6]	RSK SOP-147[7]	TBD[8]
Nitrate	—	SW-846 9056	LTL-9110

all Dave

all of TCE, deg. Same sep but same methodology?

TABLE 7-1

SUMMARY OF ORGANIC AND INORGANIC ANALYTICAL PROCEDURES
GROUND WATER SAMPLES
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
PAGE 2 OF 2

Analytical Parameter	Preparation Method	Analytical Method	Preparation/Analytical SOP(s) [1]
Nitrite	—	SW-846 9056	LTL-9110
Sulfate	—	SW-846 9056	LTL-9110
Total Organic Halides	—	SW-846 9020B	LTL-9119
Total Phosphorus	—	EPA 365.2	LTL-9108

1 Laboratory SOPs are included in Appendix B.
2 U.S. EPA, 1986a. Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods. SW-846, 3rd Ed. And subsequent updates.
3 Indiana Army Ammunition Plant Contamination Survey. "Nitrocellulose in Water". Aqualab, Inc., 1983.
4 No preparation method is required for this parameter.
5 U.S. EPA, 1983. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020.
6 U.S. EPA Robert S. Kerr Environmental Research Laboratory, 1994. Standard Operating Procedure RSK SOP-175, "Sample Preparation and Calculations for Dissolved Gas Analysis in Water Samples using GC Headspace Equilibrium Technique", Revision 0.
7 U.S. EPA Robert S. Kerr Environmental Research Laboratory, 1993. Standard Operating Procedure RSK SOP-147, "Gas Chromatographic Analysis of Gaseous Samples for Par-Per-Million Levels of Nitrous Oxide, Methane, Ethane, and Ethene", Revision 0.
8 To be determined. An analytical laboratory has not yet been selected for this parameter.

TABLE 1-3

ANALYTICAL METHODS AND LIMITS OF DETECTION
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
PAGE 1 OF 8

Chemical	Laboratory MDL/IDL[1] (ug/L)	Laboratory PQL[1] (ug/L)	Project Target PQL[2] (ug/L)
EXPLOSIVES (SW-846 METHOD 8330, UNLESS OTHERWISE NOTED)			
* 1,3,5-Trinitrobenzene 0.03-0.17	0.29	0.8 0.2-0.8	1.8
* 1,3-Dinitrobenzene 0.03-0.18	0.25	0.9 0.2-0.9	2.36
* 2,4,6-Trinitrotoluene (TNT) 0.04-0.18	0.39	1.0* 0.4-0.9	0.4 ← 2.2 Human RS DQL
* 2,4-Dinitrotoluene 0.03-0.23	0.31	1.2 0.4-1.2	60.8 ← Human AWQC 0.11
2,6-Dinitrotoluene 0.06-0.42	0.24	2.0 0.3-2	37
* Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) 0.05-0.28	0.26	2.0 0.5-1	1800
* 2-Nitrotoluene 0.05-0.39	0.33	2.0 0.4-2	2.2
* 3-Nitrotoluene 0.04-0.39	0.46	2.0 1-2	370
* 4-Nitrotoluene 0.04-0.39	0.55	2.0 1.3-2	370
* 4-Amino-2,6-dinitrotoluene 0.05-0.4	0.26	1.6 0.65-2	--
* 2-Amino-4,6-dinitrotoluene 0.04-0.2	0.23	0.9 0.65-1	--
Methyl-2,4,6-trinitrophenylnitramine (Tetryl) 0.05-0.25	0.29	1.2 0.2-1.2	370
Nitrobenzene 0.03-0.3	0.50	1.5 0.2-1.5	15.2
* Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) 0.05-0.2	0.28	0.8* 0.5-1	0.61
Nitroglycerin 0.44-7	TBD[6]	TBD[6] 2.5-35	--
Pentaerythritol tetranitrate (PETN) 0.52-7	TBD[6]	TBD[6] 2.5-35	--
2,4-Diamino-6-nitrotoluene	TBD	TBD	--
2,6-Diamino-4-nitrotoluene	TBD	TBD	--
2,2',6,6'-Tetranitro-4,4'-azoxytoluene	TBD	TBD	--
3,5-Dinitroaniline	TBD	TBD	--
1,3,5-Trinitroso-1,3,5-hexahydrotriazine (TNX)	TBD	TBD	--
1-Nitroso-3,5-dinitro-1,3,5-hexahydrotriazine (MNX)	TBD	TBD	--
EXPLOSIVES BY LAUCKS HPLC METHOD			
Picric acid (HPLC Method) TBD	0.06[4]	0.6 TBD	--
Picramic acid (HPLC Method) TBD	0.30[4]	0.9 TBD	--
EXPLOSIVES BY MODIFIED ARMY CORPS METHOD			
Nitrocellulose (Modified Army Corps Method) TBD	TBD[3][4]	TBD[4] TBD	--[5]
APPENDIX IX METALS (SW-846 METHOD 6020 ICP/MS, UNLESS OTHERWISE NOTED)			
Antimony 0.575-3.11	1.0	1.0 10-15	6
Arsenic 0.0475-2.7	1.0	1.0 2.5-10	2
Barium 0.34-0.475	0.5	1.0 1-50	3.9 ← check
Beryllium 0.05-0.71	0.5	1.0 1.25-2	4
Cadmium 0.325-0.52	0.5	1.0 1.25-1.5	1.1
Chromium (total) 0.5-1.2	0.5	5.0 2.5-3	10
Cobalt 0.175-0.92	0.5	3.0 2-12.5	3
Copper 0.825	0.5	2.0 6.25	11
Lead 0.2-0.325	0.5	1.0 0.75-5	2.5
Mercury (SW-846 Method 7470A) 0.048-0.2	0.06	0.2 0.1-0.2	1.3
Nickel 0.275-1.8	0.5	10 5-10	100
Selenium 0.625-2.7	1.0	1.0 1.25-10	5
Silver 0.175-0.51	0.5	3.0 2-2.5	4.1
Thallium 0.625-4.5	0.5	1.0 2.5-20	2
Vanadium 0.7-0.175	0.5	2.0 2-12.5	19
Zinc 0.175-4.9	5.0	10 12.5-20	100

Not asked for before

Not decided yet lowest possible

Mercury .4 lower poss

check table

TABLE 1-3

ANALYTICAL METHODS AND LIMITS OF DETECTION
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
PAGE 2 OF 8

Chemical		Laboratory MDL/IDL[1] (ug/L)	Laboratory PQL[1] (ug/L)	Project Target PQL[2] (ug/L)	
ADDITIONAL METALS (SW-846 METHOD 6010B ICP)					
Calcium		25	1000	--	
Iron		5	100	300	
Magnesium		35	1000	--	
Manganese		1	15	50	
APPENDIX IX VOLATILE ORGANIC COMPOUNDS (SW-846 METHOD 8260A WITH 25 ML PURGE, UNLESS OTHERWISE NOTED)					
1,1,1-Trichloroethane	0.124 -0.13	0.13	0.5 0.5-1	88	✓
1,1,1,2-Tetrachloroethane	0.14 -0.22	0.14	0.5 0.5-1	5	✓ ok
1,1,2,2-Tetrachloroethane	0.064-0.22	0.23	0.5 0.5-1	5	✓
1,1,2-Trichloroethane	0.15-0.58	0.15	0.5 0.5-1	5	✓
1,2,3-Trichloropropane	0.088-0.25	0.25	0.5 0.5-1	12.11	✓
1,2,3-Trichlorobenzene	0.3 -0.75	0.30	0.5 0.5-1	--	✓
1,1-Dichloroethane	0.076-0.16	0.16	0.5 0.5-1	47	✓
1,1-Dichloroethene	0.138-0.17	0.17	0.5 0.5-1	0.5	✓
1,1-Dichloropropylene	0.19 -0.21	0.21	0.5 0.5-1	--	✓
1,2-Dibromo-3-chloropropane	0.076-0.5	0.54	1[7] 1-20	1	✓
1,2-Dibromoethane	0.082-0.09	0.09	0.5 0.5-1	1	✓
1,2-Dichloroethane	0.082-0.1	0.11	0.5 0.5-1	1	✓
1,2-Dichloropropane	0.048-0.14	0.14	0.5 0.5-1	380	✓
1,3-Dichloropropane	0.11-0.46	0.11	0.5 0.5-1	--	✓
1,4-Dioxane (SW-846 Method 8015B)	0.266	TBD[4]	TBD[4] 2	2	✓ or lower
2,2-Dichloropropane *	0.11-0.22	0.11	0.5 0.5-1	--	✓
2-Butanone	0.198-0.69	0.70	3 2-3	917.72	✓
2-Chloro-1,3-butadiene (chloroprene)	0.39	0.40	3 3	14	✓
2-Hexanone	0.186-0.5	0.50	3 2-3	--	✓
4-Methyl-2-pentanone	0.102-0.59	0.59	3 2-3	1520	✓
Acetone	0.762-2.9	2.9	5 2-5	610	✓
[redacted]	TBD	2.0	10 TBD	220	✓
Acrolein	0.558-4.5	4.6	10* 4-10	4	✓ or lower
Acrylonitrile	0.512-1.2	1.3	3 2-10	3.7	✓
Allyl chloride (3-chloro-1-propene)	0.22	0.22	10 10	1800	✓
Benzene	0.066-0.08	0.08	0.5 0.5-1	5	✓
Bromochloromethane	0.17-0.18	0.17	0.5 0.5-1	--	✓
Bromodichloromethane	0.064-0.13	0.13	0.5 0.5-1	100	✓
Bromoform	0.076-0.14	0.15	0.5 0.5-1	8.5	✓
Bromomethane	0.37-0.412	0.37	0.5 0.5-2	8.7	✓
Carbon disulfide	0.11-0.2	0.20	0.5 0.05-1	21	✓
Carbon tetrachloride	0.1-0.12	0.10	0.3* 0.05-1	0.17	✓
Chlorobenzene	0.11-0.194	0.12	0.5 0.05-1	10	✓
Chloroethane	0.122-0.18	0.19	0.5 0.5-2	710	✓
Chloroform	0.096-0.17	0.17	0.3* 0.05-1	0.16	✓
Chloromethane	0.15-0.158	0.15	0.5 0.5-2	1.5	✓
cis-1,2-Dichloroethene	0.14-0.34	0.14	0.5 0.5-1	61	✓
cis-1,3-Dichloropropene	0.048-0.15	0.15	0.3* 0.05-1	0.081	✓

Not added for previous

Move Dan check #1s

TABLE 1-3

ANALYTICAL METHODS AND LIMITS OF DETECTION
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
PAGE 3 OF 8

Chemical		Laboratory MDL/IDL[1] (ug/L)	Laboratory PQL[1] (ug/L)	Project Target PQL[2] (ug/L)
Dibromochloromethane	0.09 - 0.11	0.12	0.5 0.05-1	1
Dibromomethane	0.064-0.22	0.22	0.5 0.05-1	370
Dichlorodifluoromethane	0.066-0.2	0.20	0.5 0.05-1	390
Ethylbenzene	0.048-0.1	0.11	0.5 0.05-1	17.2
Ethyl methacrylate	1.358	0.31	1 2	550
Isobutyl alcohol (SW-846 Method 8015B)	TBD	5.6	10 TBD	11000
Methacrylonitrile	0.15	0.15	0.5 5	1
Methylene chloride	1.022-1.77	1.7	3 1-5	4.3
Methyl iodide	0.28	0.28	0.5 0.5	–
Methyl methacrylate	0.29	0.29	2 2	2800
Propionitrile (SW-846 Method 8015B)	TBD	2.2	10 TBD	6080
Styrene	0.08	0.08	0.5 0.5-1	56
Tetrachloroethene	0.108-0.12	0.12	0.5 0.5-1	1.1
Toluene	0.13-0.262	0.13	0.5 0.5-1	253
trans-1,2-Dichloroethene	0.066-0.16	0.17	0.5 0.5-1	100
trans-1,3-Dichloropropene	0.058-0.1	0.11	0.5 0.5-1	0.5
trans-1,4-Dichloro-2-butene	0.33	0.34	10 10	10
Trichloroethene	0.082-0.15	0.15	0.5 0.5	1.6
Trichlorofluoromethane	0.13-0.176	0.13	0.5 0.5-1	1300
Vinyl acetate	0.048-0.21	0.21	0.5 0.5-2	248.03
Vinyl chloride	0.094-0.22	0.22	0.5 0.5-2	2
m,p-Xylenes	3 total 0.13-0.142	0.13	0.5 0.5-1	1.8
o-Xylene		0.10	0.5	1.8
APPENDIX IX SEMIVOLATILE ORGANIC COMPOUNDS (SW-846 METHOD 8270B)				
1,2,4,5-Tetrachlorobenzene	1-3	2.7	10 10-12	10
1,2,4-Trichlorobenzene	0.46-1.92	0.80	2 1-10	70
1,2-Dichlorobenzene	0.56-1.04	0.77	2 1-10	14
1,3-Dichlorobenzene	0.53-1.58	0.76	2 1-10	71
1,4-Dichlorobenzene	0.6-1.57	0.86	2 1-10	5
1,4-Naphthoquinone	1-5.05	3.7	10 10-20	10
1,4-Phenylenediamine	7.21-20	25	100 10-200	6900
1-Naphthylamine	1.62-3	18	36* 10-12	10
2,3,4,6-Tetrachlorophenol	0.42-2	12	25* 10	14.06
2,4,5-Trichlorophenol	0.76-1.5	1.5	3 2-10	63
2,4,6-Trichlorophenol	0.75-1.2	1.2	3* 2-10	2
2,4-Dichlorophenol	0.63-2	1.3	3 2-10	18
2,4-Dimethylphenol	0.62-2.25	0.63	2 1-10	166.9
2,4-Dinitrophenol	0.39-5	0.12	10 10-50	10
2,6-Dichlorophenol	0.6-3.1	5.4	5 2-10	–
2-Acetylaminofluorene	1.38-3	4.2	12 10-20	14.86
2-Chloronaphthalene	0.38-2.99	0.60	2* 1-10	1
2-Chlorophenol	0.662-1.39	1.4	3* 2-10	2
2-Methylnaphthalene	0.63-1.74	0.64	3 1-10	9.15
2-Methylphenol[8]	0.7-2	0.70	2 1-10	1520
2-Naphthylamine	1.32-4	5.2	16 10-16	–

Human WQC 0.8

10

9 or less 9.15 wink

TABLE 1-3

ANALYTICAL METHODS AND LIMITS OF DETECTION
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
PAGE 4 OF 8

Chemical		Laboratory MDL/IDL[1] (ug/L)	Laboratory PQL[1] (ug/L)	Project Target PQL[2] (ug/L)
2-Nitroaniline	0.58-1.1	0.60	2 2-50	2.2
2-Nitrophenol	1.04-2	1.1	5 2-10	13.5
2-Picoline	0.97-4	9.2	20 10-10	3790
3,3'-Dichlorobenzidine	1.55-2	0.59	~~10 10-50~~	~~10~~
[redacted]	2-11.2	25	[redacted]	[redacted]
3-Methylcholanthrene	2-3	3.9	12 10-12	400
3-Methylphenol[6]	0.887-2	0.70	2 2-10	1800
3-Nitroaniline	0.54-7.73	0.54	2 2-50	--
4,6-Dinitro-2-methylphenol	0.31-5	0.31	~~10 10-50~~	~~10~~
4-Aminobiphenyl	1-3	3.4	12 10-20	--
4-Bromophenyl phenyl ether	0.31-2	0.31	~~2 2-10~~	~~2~~
4-Chloro-3-methylphenol	0.66-2	0.66	2 2-10	34.79
4-Chloroaniline	0.59-3.03	0.60	2 1-10	121.6
4-Chlorophenyl phenyl ether	0.23-2	0.24	~~4 1-10~~	~~4~~
4-Methylphenol	0.69-1	0.80	4 4-10	180
4-Nitroaniline	0.93-7.21	0.59	2 2-50	--
4-Nitrophenol	1.07-5	0.24	10 10-50	35
4-Nitroquinoline-1-oxide	5.05-10	11	100 50-100	--
5-Nitro-o-toluidine	2-4	8.0	16 10-16	--
7[redacted]	1-3	7.0	[redacted]	
Acenaphthene	0.31-1.49	0.32	1 1-10	23
Acenaphthylene	0.34-1.41	0.35	1 1-10	1
Acetophenone	0.59-5	3.3	20 10-20	687.89
[redacted]	0.4-2.64	0.52	[redacted]	[redacted]
[redacted]	1.37-3	4.0	[redacted]	10
Anthracene	0.31-1	0.31	1 1-10	5
[redacted]	0.23-1.06	0.24	[redacted]	[redacted]
[redacted]	0.25-2	0.25	[redacted]	[redacted]
[redacted]	0.55-2	0.56	[redacted]	[redacted]
[redacted]	0.51-2	0.55	[redacted]	[redacted]
[redacted]	0.21-3.5	0.21	[redacted]	[redacted]
Benzyl alcohol	0.62-3.28	0.62	1 1-20	281.24
Bis(2-chloroethoxy)methane	0.9-1.26	1.0	5 5-10	6400
Bis(2-chloroethyl)ether	0.52-1	0.58	1[7] 1-10	1
~~Bis(2-chloroisopropyl)ether~~	1.09-2	0.65	~~2 2-10~~	~~2~~
Bis(2-ethylhexyl)phthalate	0.45-3.03	0.46	2 1-10	4.8
Butyl benzyl phthalate	0.58-2	0.58	2 1-10	19
[redacted]	[redacted]	3.4	[redacted]	[redacted]
[redacted]	0.2-1.17	0.20	[redacted]	[redacted]
[redacted]	1.19-2	3.5	[redacted]	[redacted]
Di-n-butyl phthalate	0.28-3.97	0.28	2 1-10	3
Di-n-octyl phthalate	0.67-2.68	0.67	2 1-10	30
[redacted]	0.46-2.14	0.52	[redacted]	[redacted]
Dibenzofuran	0.29-2	0.29	1 1-10	13.52
Diethyl phthalate	0.28-2	0.28	2 1-10	220

Dimetho 1.0 PQL

TABLE 1-3

ANALYTICAL METHODS AND LIMITS OF DETECTION
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
PAGE 5 OF 8

Method # ? 8270B ?

Chemical		Laboratory MDL/IDL[1] (ug/L)	Laboratory PQL[1] (ug/L)	Project Target PQL[2] (ug/L)
Dimethoate	1-1.55	5.4	[redacted]	
p-(Dimethylamino)azobenzene	1-3	3.7	15 10-20	–
[redacted]	1-4	17	[redacted]	10
Dimethyl phthalate	0.28-2	0.29	2 2-10	73
Diphenylamine	0.18-2.67	3.6	2 1-10	10
Ethyl methane sulfonate	0.51-4	4.8	16 10-20	–
Fluoranthene	0.34-1.38	0.34	1 1-10	8.1
Fluorene	0.45-1.61	0.75	1 1-10	10
Hexachlorobenzene	0.3-1.66	0.30	[redacted]	or lower
Hexachlorobutadiene	0.53-2.41	0.63	[redacted]	
Hexachlorocyclopentadiene	0.72-7.32	0.05	[redacted]	
Hexachloroethane	0.71-2	0.71	2 2-10	4.8
Hexachloropropene	2-6	4.0	[redacted]	
Indeno(1,2,3-cd)pyrene	0.32-4.45	0.32	[redacted]	
Isodrin	0.49-2	3.4	[redacted]	
Isophorone	0.45-1	0.48	1 1-10	71
Isosafrole	0.82-5	2.9	20 10-20	–
Methapyrilene	1-7.89	17	40 10-20	–
Methyl methane sulfonate	0.61-4.0	4.1	16 10-20	–
n-Nitrosodi-n-butylamine	0.44-4.1	4.7	[redacted]	
n-Nitrosodiethylamine	0.71-6.3	3.3	[redacted]	
n-Nitrosodimethylamine	0.967-4.2	0.44	[redacted]	
[redacted]	0.57-2	0.57	[redacted]	
n-Nitrosodi-n-propylamine	0.39-2	0.39	[redacted]	
n-Nitrosomethyethylamine	0-6.2	3.6	[redacted]	
n-Nitrosomorpholine	0.39-5.4	5.3	[redacted]	ck?
n-Nitrosopiperidine	0.25-4.2	3.6	[redacted]	
n-Nitrosopyrrolidine	0.33-5.3	3.0	[redacted]	
Naphthalene	0.43-1.53	0.63	1 1-10	24
Pentachlorobenzene	0.95-4	4.7	[redacted]	
Pentachloroethane	TBD	4.8	10 TBD	14.39 (<10) check?
Pentachloronitrobenzene	0.57-3.6	3.8	[redacted]	
Pentachlorophenol	0.9-4.42	0.97	[redacted]	
Phenacetin	0.96-4.1	1.6	[redacted]	
Phenanthrene	0.2-1.85	0.31	[redacted]	
Phenol	0.565-1.5	1.5	5 2-10	100
Pronamide	0.74-3	3.3	12 10-12	160
Pyrene	0.4-1.4	0.43	[redacted]	
Pyridine	0.76-2	1.2	10 10-20	37
Safrole	0.8-5	2.7	20 10-20	40
Tetraethyl dithiopyrophosphate (Sulfotepp)	2-4.7	3.5	[redacted]	
Thionazin	0.47-2	4.0	100 10-20	–
o-Toluidine	0.38-8.2	5.2	15 10-32	–
O,O,O-Triethyl phosphorothioate	2-6.6	4.6	10 [redacted]	

TABLE 1-3

ANALYTICAL METHODS AND LIMITS OF DETECTION
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
PAGE 6 OF 8

Chemical	Laboratory MDL/IDL[1] (ug/L)	Laboratory PQL[1] (ug/L)	Project Target PQL[2] (ug/L)
APPENDIX IX ORGANOCHLORINE PESTICIDES and PCBs (SW-846 METHOD 8081) Ralph 8081A			
Aldrin – 0.003-0.0063	0.0029/0.0036	[redacted]	
Alpha-BHC – 0.001-0.003	0.0026/0.0024	[redacted]	
Alpha-chlordane 0.0011-0.003	0.0032/0.0056	[redacted]	
Beta-BHC 0.0019-0.002	0.0027/0.0032	0.03 0.01-0.05	0.037
4,4'-DDD – 0.006-0.009	0.0063/0.0081	0.05 0.01-0.05	0.05
4,4'-DDE – 0.001-0.005	0.0051/0.0069	[redacted]	
4,4'-DDT – 0.007-0.009	0.0067/0.0079	[redacted]	
Delta-BHC – 0.003	0.0032/0.0039	0.05 0.01-0.05	666.67
Dieldrin – 0.001-0.007	0.0074/0.0095	[redacted]	
Endosulfan I – 0.002-0.004	0.0036	0.05 0.01-0.05	0.051
Endosulfan II – 0.0019-0.008	0.0081/0.0098	0.05 0.01-0.05	0.051
Endosulfan sulfate – 0.003-0.007	0.0071/0.0086	0.05 0.01-0.05	0.05
Endrin – 0.007-0.0071	0.0073/0.0082	[redacted]	
Endrin aldehyde – 0.0048-0.007	0.0074/0.018	[redacted]	
Gamma-BHC (Lindane) – 0.001-0.002	0.0019/0.0028	0.05 0.01-0.05	0.052
Gamma-chlordane added. 0.0016-0.003	0.0027/0.0037	[redacted]	
Heptachlor 0.001-0.003	0.0026/0.0026	[redacted]	
Heptachlor epoxide 0.3	0.0031/0.0037	[redacted]	
[redacted] 0.016-0.04	TBD[4]	[redacted]	
[redacted] 0.35-0.4	0.0406/0.036	[redacted]	
[redacted] 0.043-0.094	0.70/1.1	[redacted]	
Aroclor-1016 0.084-0.12	0.080/0.094	[redacted]	0.5
Aroclor-1221 0.048-0.23	0.084/0.080	[redacted]	0.5
Aroclor-1232 0.1-0.37	0.21/0.23	[redacted]	
Aroclor-1242 0.038-0.11	0.33/0.37	[redacted]	
Aroclor-1248 0.11-0.14	0.11/0.061	[redacted]	
Aroclor-1254	0.11/0.11	[redacted]	
Aroclor-1260 0.036-0.095	0.095/0.083	[redacted]	
APPENDIX IX ORGANOPHOSPHORUS PESTICIDES (SW-846 METHOD 8270B) Ralph 8141A			
[redacted] 0.065	[redacted] 0.3	[redacted]	
Ethyl parathion 0.064	5.231 0.2	10	–
Famphur 0.077	2.604 0.5	10	–
[redacted] 0.046	4.982 0.2	[redacted]	
[redacted] 0.077	5.063 0.3	[redacted]	
APPENDIX IX HERBICIDES (SW-846 METHOD 8151A)			
2,4-D 0.011-0.08	0.076	0.2 0.3-1	70
2,4,5-T 0.0059-0.02	0.077	0.2 0.1-0.2	370
2,4,5-TP (Silvex) 0.011-0.02	0.017	0.2 0.1-0.2	50
Dinoseb 0.016-0.02	0.078	0.2 0.3-1	0.39
DIOXINS/FURANS (SW-846 METHOD 8290)			
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	6.1E-6	E-5	5E-6
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-PeCDD)	2.24E-5	5E-5	5E-6
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,6,7,8-HxCDD)	9.8E-6	5E-5	5E-6
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-HxCDD)	6.1E-6	5E-	5E-6

R5 DQL Human

Human AWQC 0.014

Initially Ralph's list chlordane

.5

R5 DQL Human Human AWQC 0.019

?

lower

5270B semivolatiles

Can it meet PQL's reduced cost

Ralph's List

4.5E-6 or lower