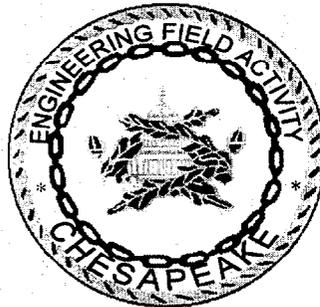


**Design Quality Assurance
Project Plan**
for
**Remedial Action Design at
Site 12 Town Gut Landfill
Site 41 Scrap Yard
Site 42 Olsen Road Landfill**

Indian Head Division
Naval Surface Warfare Center
Indian Head, Maryland



Engineering Field Activity Chesapeake
Naval Facilities Engineering Command

Contract Number N62472-90-D-1298

Contract Task Order 0245

March 2001



TETRA TECH NUS, INC.

**DESIGN QUALITY ASSURANCE PROJECT PLAN
FOR
REMEDIAL ACTION DESIGN AT
SITE 12 TOWN GUT LANDFILL
SITE 41 SCRAP YARD
SITE 42 OLSEN ROAD LANDFILL**

**INDIAN HEAD DIVISION
NAVAL SURFACE WARFARE CENTER
INDIAN HEAD, MARYLAND**

**COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT**

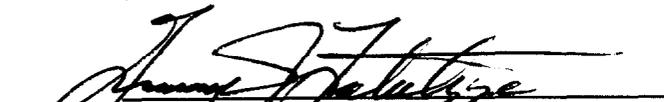
**Submitted to:
Engineering Field Activity Chesapeake
Environmental Branch Code 18
Naval Facilities Engineering Command
Washington Navy Yard, Building 212
Washington, D.C. 20374-2121**

**Submitted by:
Tetra Tech NUS, Inc.
661 Andersen Drive
Pittsburgh, Pennsylvania 15220-2745**

**CONTRACT NUMBER N62472-90-D-1298
CONTRACT TASK ORDER 0245**

March 2001

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ACRONYMS

B&RE	Brown and Root Environmental
CLEAN	Comprehensive Long-Term Environmental Action Navy
CTO	Contract Task Order
DQAPP	Design Quality Assurance Project Plan
EPA	United States Environmental Protection Agency
FS	Feasibility Study
IAS	Initial Assessment Study
IHDIV-NSWC	Indian Head Division Naval Surface Warfare Center
NACIP	Navy Assessment and Control of Installation Pollutants
NEESA	Naval Energy and Environment Support Activity
PA	Preliminary Assessment
PCB	Polychlorinated Biphenyls
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
RPM	Remedial Project Manager
SI	Site Inspection
Site 12	Scrap Yard
Site 42	Olsen Road Landfill
SOPs	Standard Operating Procedures
TtNUS	Tetra Tech NUS, Inc.

1.0 INTRODUCTION

This Design Quality Assurance Project Plan (DQAPP) was prepared as part of Contract Task Order (CTO) No. 0245, under Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract Number N62472-90-D-1298. This DQAPP will be used by Tetra Tech NUS, Inc. (TtNUS), formerly Brown and Root Environmental (B&RE), during the performance of the engineering and design services associated with the remedial action at the Town Gut Landfill (Site 12), the Scrap Yard (Site 41), and the Olsen Road Landfill (Site 42) located at the Indian Head Division Naval Surface Warfare Center (IHDIV-NSWC) in Indian Head, Maryland.

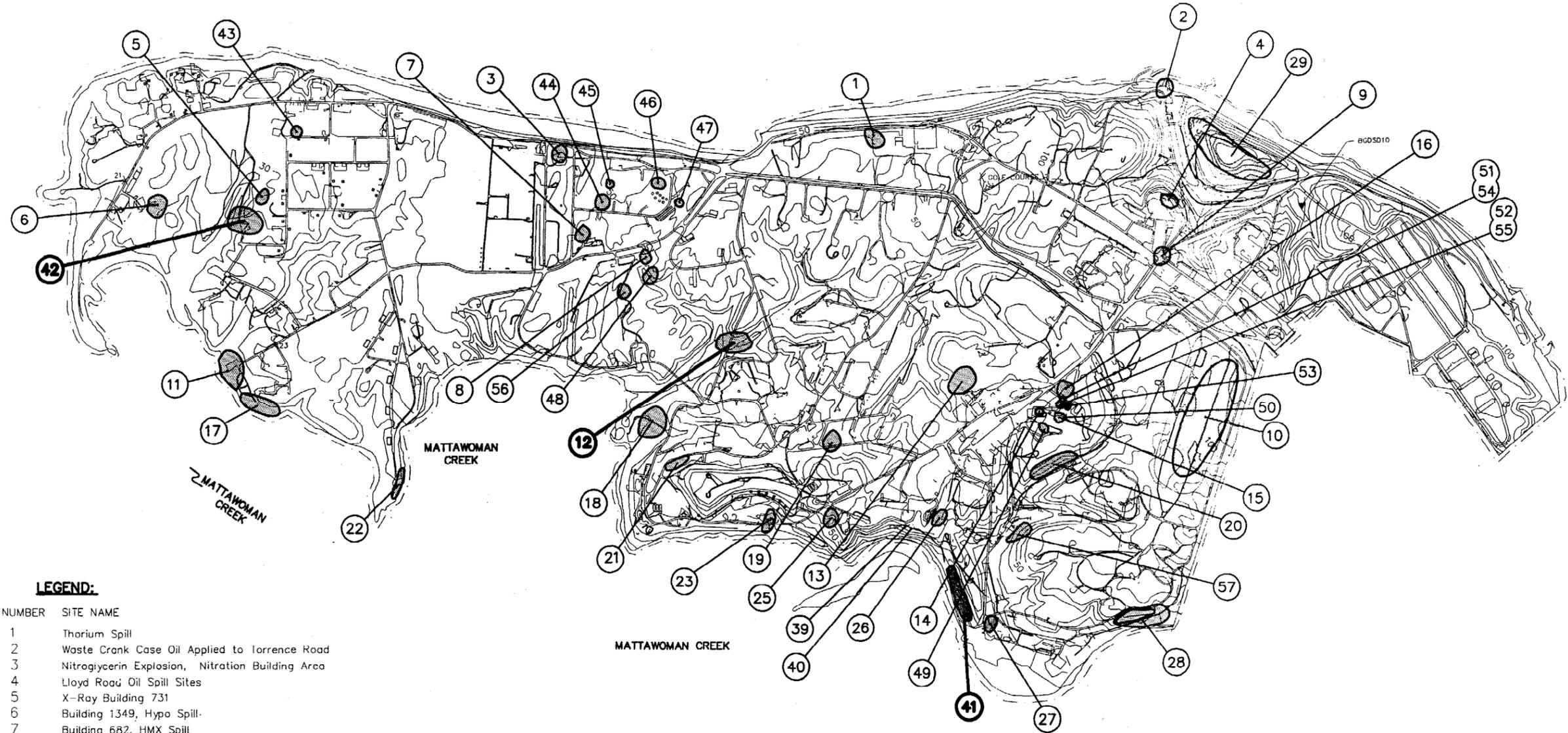
1.1 BACKGROUND

The IHDIV-NSWC is located in northwestern Charles County, Maryland, approximately 25 miles southwest of Washington, DC. The IHDIV-NSWC is a military facility consisting of the main area on the Cornwallis Neck Peninsula and the Annex on Stump Neck. The main area is bounded by the Potomac River to the northwest, west, and south, Mattawoman Creek to the south and east, and the town of Indian Head to the northeast (see Figure 1-1). Stump Neck Annex is located across Mattawoman Creek. The Stump Neck Annex is not contiguous with the main area, has a separate United States Environmental Protection Agency (EPA) identification number, and is operated by a tenant. The main area of the facility contains approximately 2,500 acres, while slightly less than 1,000 additional acres are located across Mattawoman Creek at the Stump Neck Annex.

In May 1993, the Naval Energy and Environment Support Activity (NEESA) submitted an Initial Assessment Study (IAS) which evaluated the various sites at the IHDIV-NSWC to determine if a potential threat to human health or the environment existed. Site 12 was one of five sites identified as exhibiting a potential threat. Site 12 was one of three sites included in a Navy Assessment and Control of Installation Pollutants (NACIP) Confirmation Study performed and subsequently published in September 1985 by CH2M Hill. Removal Actions were consequently conducted at Sites 5 and 8. Site 12 required further investigation.

A supplemental Preliminary Assessment (PA) Report was prepared by NEESA in January 1992. The report evaluated 17 additional sites including Sites 41 and 42. All but two sites (Sites 51 and 52) were recommended for further investigation. Sites 41 and 42 were among the sites recommended for further work. As a follow-up to the supplemental PA, a Site Inspection (SI) of the sites was conducted in two phases. Phase I focused on Site 42. Phase II focused on the remainder of the sites, including Site 41. Based on the results of the SI, all the sites were recommended for further study.

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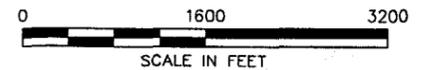


LEGEND:

SITE NUMBER SITE NAME

- | | | | |
|--|--|---|---|
| 1 Thorium Spill | 19 Catch Basins at Chip Collection Houses | 30-38 Stump Neck Annex (SEE FIGURE 3-2) | 49 Chemical Disposal Area |
| 2 Waste Crank Case Oil Applied to Torrence Road | 20 Single-base Powder Facilities | 39 Organic Plant Outfall | 50 Building 103, Crawl Space |
| 3 Nitroglycerin Explosion, Nitration Building Area | 21 Branson Road Landfill | 40 Palladium Catalyst in Sediments | 51 Building 101, Dry Wall |
| 4 Lloyd Road Oil Spill Sites | 22 NG Slums Burning Site | 41 Scrap Yard | 52 Building 102, Dry Wall |
| 5 X-Ray Building 731 | 23 Hydraulic Oil Spill Discharges From Extrusion Plant | 42 Olsen Road Landfill | 53 Mercury Contamination of the Sewage System |
| 6 Building 1349, Hypo Spill | 24 Abandoned Drain Lines | 43 Toluene Disposal Site | 54 Building 101 |
| 7 Building 682, HMX Spill | 25 Hypo Discharge X-Ray Building No. 2 | 44 Soak Out Area | 55 Building 102 |
| 8 Building 766, Mercury Deposits | 26 Thermal Destructor 2 | 45 Abandoned Drums | 56 IW87 - Lead Contamination |
| 9 Patterson Avenue, Oil Spill | 27 Thermal Destructor 1 | 46 Cadmium Sandblast Grit | 57 TCE Building 292 Area |
| 10 Single-base Propellant Grains Spill | 28 Original Burning Ground | 47 Mercuric Nitrate Disposal Area | |
| 11 Coffee Road Landfill | 29 The Valley | 48 Nitroglycerine Plant Disposal Area | |

- APPROXIMATE SITE LOCATION
- INTERMITTENT STREAM
- NAVAL RESERVE BOUNDARY
- CONTOUR INTERVAL 10 FEET
- FLOW DIRECTION



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES	DRAWN BY	DATE	Tetra Tech NUS, Inc.	CONTRACT NO.	OWNER NO.
							KW	3/30/99		7129	
							CHECKED BY	DATE	SITE LOCATION MAP INDIAN HEAD NSWC INDIAN HEAD, MARYLAND	APPROVED BY	DATE
							GTL	3/9/01		GTL	3/9/01
							COST/SCHED-AREA			APPROVED BY	DATE
							SCALE			DRAWING NO.	REV.
							AS NOTED			FIGURE 1-1	0

FORM CADD NO. SOUTH_BH.DGN - REV 0 - 02/11/97

In May 1997, B&RE developed a site-specific work plan that examined historical data and detailed the additional environmental samples and analytical methods needed to better define conditions at each of the sixteen sites. Sites 12, 41 and 42 were among the sites in that work plan. In October 1997, TtNUS performed the additional field sampling described in the site-specific work plan for Sites 12, 41 and 42. The results of the field investigation, as well as the subsequent human health and ecological risk assessments, were published in a Remedial Investigation report dated July 1999.

In September 1999, TtNUS developed a Pre-Feasibility Study Field Investigation Work Plan that included Site 12, Site 41, and Site 42. The overall objective of the work plan was to assemble sufficient data regarding the horizontal extent of the areas requiring remediation to support the development of the Feasibility Study (FS) Report published by TtNUS in January 2001.

The FS Report evaluated five remedial alternatives for Site 12. The selected remedial alternative provided for establishing a 2-foot minimum soil cover over the buried waste material with land use controls (e.g., groundwater monitoring and land use restrictions) to mitigate potential risks to human health and the environment. For Site 41, the FS Report included a preferred alternative calling for cleaning concrete surfaces and removing contaminating soil in combination with land use controls.

Site 42 was included in a draft FS published by TtNUS in February 2000. At this writing, sediment toxicity tests are being performed by others to more precisely delineate the extent of silver contamination in sediments. Following completion of those studies, a final FS Report will be prepared. The draft FS anticipates that the remedial action for Site 42 will include a combination of covering or capping the landfill, possibly removing contaminated sediments, and monitoring groundwater. However, preliminary results from the sediment toxicity tests indicate that silver is not causing toxicity in the sediments. If that conclusion is confirmed by published test results, sediment removal will not be included as part of the Site 42 remedial action.

1.1.1 Facility Operations

The primary mission of IHDIV-NSWC is as follows.

- Provide services in energetics for all warfare centers through engineering, fleet and operational support, manufacturing technology, limited production, and industrial base support.
- Provide research, development, testing, and evaluation of energetic materials, ordnance devices and components, and other related ordnance engineering standards, including chemicals, propellants, and their propulsion systems, explosives, pyrotechnics, warheads, and simulators.

- Provide support to all warfare centers, military departments, and the ordnance industry for special weapons, explosive safety, and ordnance environmental issues.
- Execute other responsibilities assigned by the Commander of the Activity.

1.1.2 Town Gut Landfill (Site 12)

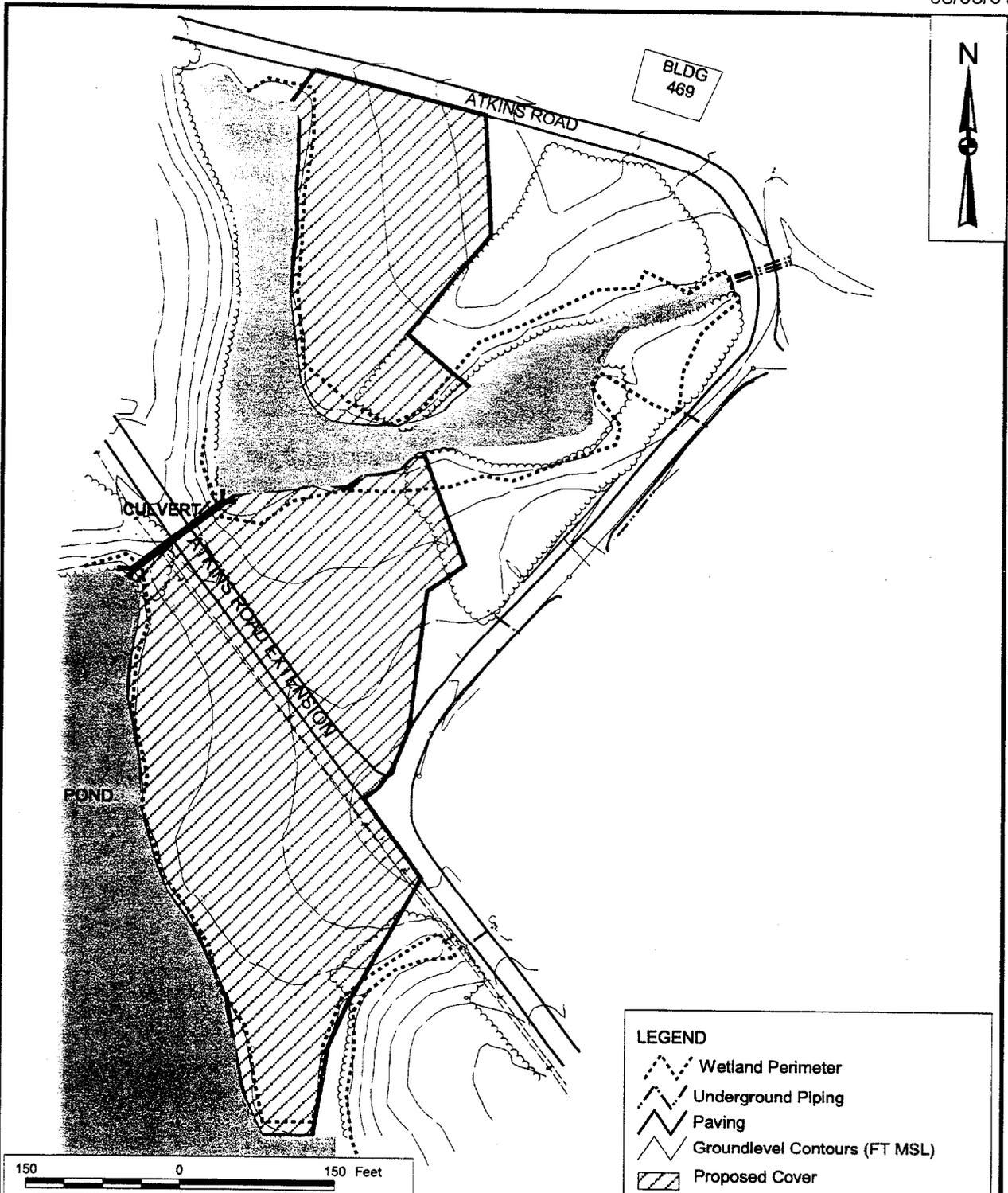
Site 12 is located on the southwest side of the IHDIV-NSWC. The site is approximately 4.3 acres in size and is divided roughly into three areas as shown on Figure 1-2. The northern area is bounded on the north and east by Atkins Road, and by ponds along the perimeter to the south and west. The central section is bounded by a pond to the north, Atkins Road to the east and southeast, and by Atkins Road Extension to the southwest and west. The southernmost section is bounded on the north and east by Atkins Road Extension, and on the south and west by a pond. Runoff from the site drains into the adjacent ponds which outlets toward the south through a pipe located under Noble Road and into Mattawoman Creek (both located south of the site).

Based on visual observations, historical maps and aerial photography, the landfill appears to have been built with construction debris and other fill material by working from original ground in a westerly direction and filling in an existing pond and topographically low area. The fill appears to be approximately 10 to 15 feet above the original ground. Construction debris and rubble is visible along the edge of the landfill adjacent to the pond.

This site was operated by INDIV-NSWC for disposal of landscaping waste, fill material, and rubble. Operations began circa 1968 and terminated in June 1980. Reportedly, material from off IHDIV-NSWC was deposited at this site until 1972. The site contains landscaping wastes, tree stumps, and demolition debris. NEESA team interviews indicated that trash may have been discarded at the site since operations began, although estimates of quantities deposited were not available. Some of the items reportedly disposed at the Town Gut Landfill include paint and varnishes, demolition waste, and chemical wastes. Assorted debris and construction rubble is visible along the edge of the landfill adjacent to the pond.

1.1.3 Scrap Yard (Site 41)

Site 41 is located in the southeastern section of the facility along the shore of Mattawoman Creek (see Figure 1-3). The site is approximately 700' long by 100' wide. The area is generally flat and surface runoff is toward the south in the direction of Mattawoman Creek. The majority of the area is paved with concrete.



DRAWN BY J. BELLONE	DATE 1/10/00	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7129	OWNER NO. ---
CHECKED BY ---	DATE ---		APPROVED BY ---	DATE ---
COST/SCHEDULE-AREA ---	DATE ---	SITE MAP SITE 12 - TOWN GUT LANDFILL IH DIV-NSWC, INDIAN HEAD, MARYLAND	APPROVED BY ---	DATE ---
SCALE AS NOTED	DATE ---		DRAWING NO. FIGURE 1-2	REV 0

PIGISWSWC_INDIAN_HEAD\7129_PRESENTATION.APR\SITE 12 - SITE MAP JCB 3/6/01

This active scrap yard is used to store metal materials and scraps, including empty storage drums, and old office furniture. The scrap materials eventually are sold to be recycled and/or reused. In the past, transformers and spent batteries were stored at the scrap yard. The northwest end of the scrap yard was once a coal storage area.

From the 1960s to 1988, electrical transformers were stored at the northwest end of the scrap yard before offsite disposal. During a 1981 inspection, seventeen transformers were identified as either Polychlorinated biphenyls (PCB)-contaminated or as PCB-containing. These transformers were believed to have leaked, potentially contaminating this area. In addition, lead batteries also have been stored in the scrap yard and may have released lead to the surface soils. No batteries or transformers were identified in the western portion of the scrap yard during subsequent investigations, however large stains were observed in the area that formerly contained the transformers.

1.1.4 Olsen Road Landfill (Site 42)

Olsen Road Landfill is in the southwestern section of IHDIV-NSWC and covers approximately 1.5 acres southwest of Olsen Road as shown in Figure 1-4. From approximately 1982 to 1987 the area of Olsen Road Landfill was reportedly used as an unauthorized solid waste disposal area. Various solid wastes from IHDIV-NSWC were dumped at the site. Disposal of hazardous wastes at the landfill cannot be confirmed or denied by activity records or personnel.

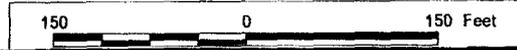
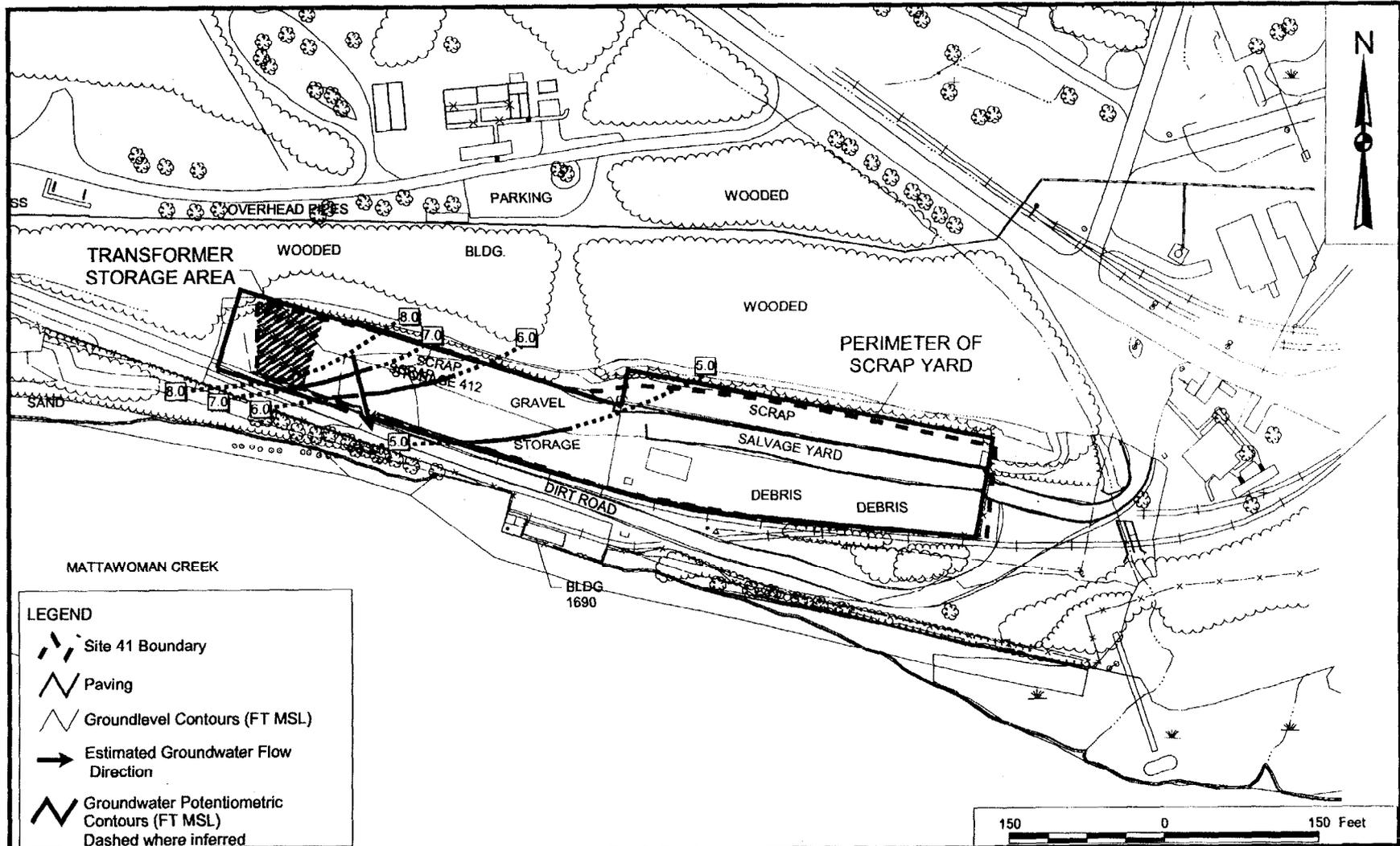
Prior to construction of the mixing, assembly, and cure facility and paving of the area surrounding it, the landfill was bisected by a dirt road extension of Olsen Road. The southern half of the site slopes to the south with visible debris of construction rubble (asphalt and concrete), wooden pallets, branches, and unlabeled cans and drums along the edges. Drainage swales border the western and southern edges of the site. A drainage pipe outfall with a swale runs along the eastern side of the site.

The drainage swale along the western edge of the site drains to the southwestern corner of the site, and subsequently into a pond at the southeastern corner of the site. The drainage pipe outfall and accompanying swale also drain into the pond in the southeastern corner. The southeastern pond drains south into the Mattawoman Creek. Based on water level measurements, the shallow groundwater flow is to the south/southeast.

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1-9

CTO 0245



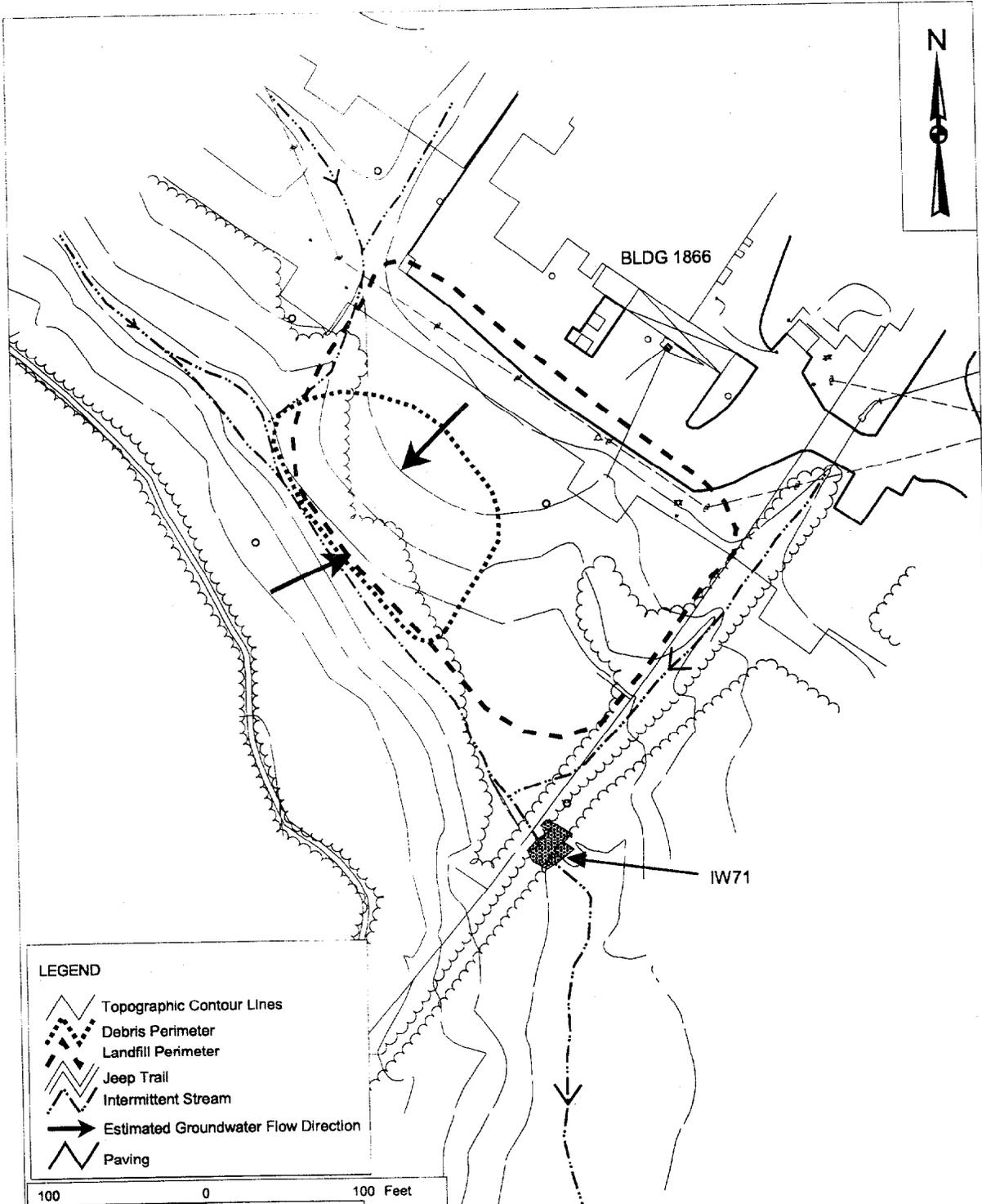
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SCALE AS NOTED	

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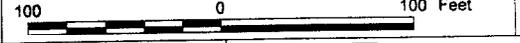
SITE MAP
SITE 41 - SCRAP YARD
IHDIV- NSWC, INDIAN HEAD, MARYLAND

CONTRACT NUMBER 7129	OWNER NUMBER
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO. FIGURE 1-3	REV 0

Rev. 1
03/06/01



LEGEND	
	Topographic Contour Lines
	Debris Perimeter
	Landfill Perimeter
	Jeep Trail
	Intermittent Stream
	Estimated Groundwater Flow Direction
	Paving



DRAWN BY J. BELLONE CHECKED BY COST/SCHEDULE-AREA SCALE AS NOTED	DATE 1/7/00 DATE DATE DATE	Tetra Tech NUS, Inc. SITE MAP SITE 42 - OLSEN ROAD LANDFILL IHDIV-NSWC, INDIAN HEAD, MARYLAND	CONTRACT NUMBER 7129 APPROVED BY APPROVED BY DRAWING No. FIGURE 1-4	OWNER No. — DATE DATE REV 0
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P:\GIS\NSWC_INDIAN_HEAD\7129_FS\APR 1/29/00 MGS SITE 42 - OLSON ROAD LANDFILL LAYOUT

1.2 PURPOSE AND OBJECTIVE

The DQAPP presents procedures that will be implemented to ensure that the project drawings, specifications, cost estimates, and design documents have been fully reviewed, checked, and coordinated with all disciplines involved in the design process. These procedures include an ongoing quality assurance (QA) process during development of the project, TtNUS project reviews, and Navy reviews. TtNUS project reviews will include internal design reviews performed by a senior member of the personnel. Procedures utilized by members of the design team for technical document review, as well as performance and review of design calculations, are outlined in the TtNUS Standard Operating Procedures (SOPs) provided in Appendix A.

To enable consistent and thorough Quality Assurance / Quality Control (QA/QC) reviews, checklists are provided for review of drawings and specifications as well as to provide adequate documentation of the reviews to the Navy. These checklists are included in Appendix B of this report.

1.3 DESIGN QUALITY ASSURANCE PLAN ORGANIZATION

This Design Quality Assurance Plan consists of the following five sections:

- Section 1.0 Introduction
- Section 2.0 Management Approach
- Section 3.0 Design Quality Assurance Program
- Section 4.0 Project Documentation
- Appendix A Tetra Tech NUS, Inc. SOPs
- Appendix B Review Checklists

Section 1.0 is this brief introduction, and Section 2.0 provides a description of the management approach, key personnel, and potential subcontractors. Section 3.0 presents the design quality assurance process, including the design review requirements. Section 4.0 identifies project documentation for verification that the quality assurance process is followed. Appendix A presents TtNUS SOPs. Appendix B presents specific checklists that will be used to document the review process.

2.0 MANAGEMENT APPROACH

TtNUS will provide both program and project management support to this project

2.1 CLEAN PROGRAM MANAGEMENT

TtNUS program management staff who are involved with the overall performance of CTO assignments include:

- John Trepanowski - Program Manager (610) 491-9688
- Garth Glenn - Deputy Program Manager (610) 491-9688
- Margaret Price - Contracting Officer (610) 491-9688
- Paul Frank - Quality Assurance Manager (412) 921-8950
- Matthew Soltis - Health and Safety Manager (412) 921-8912

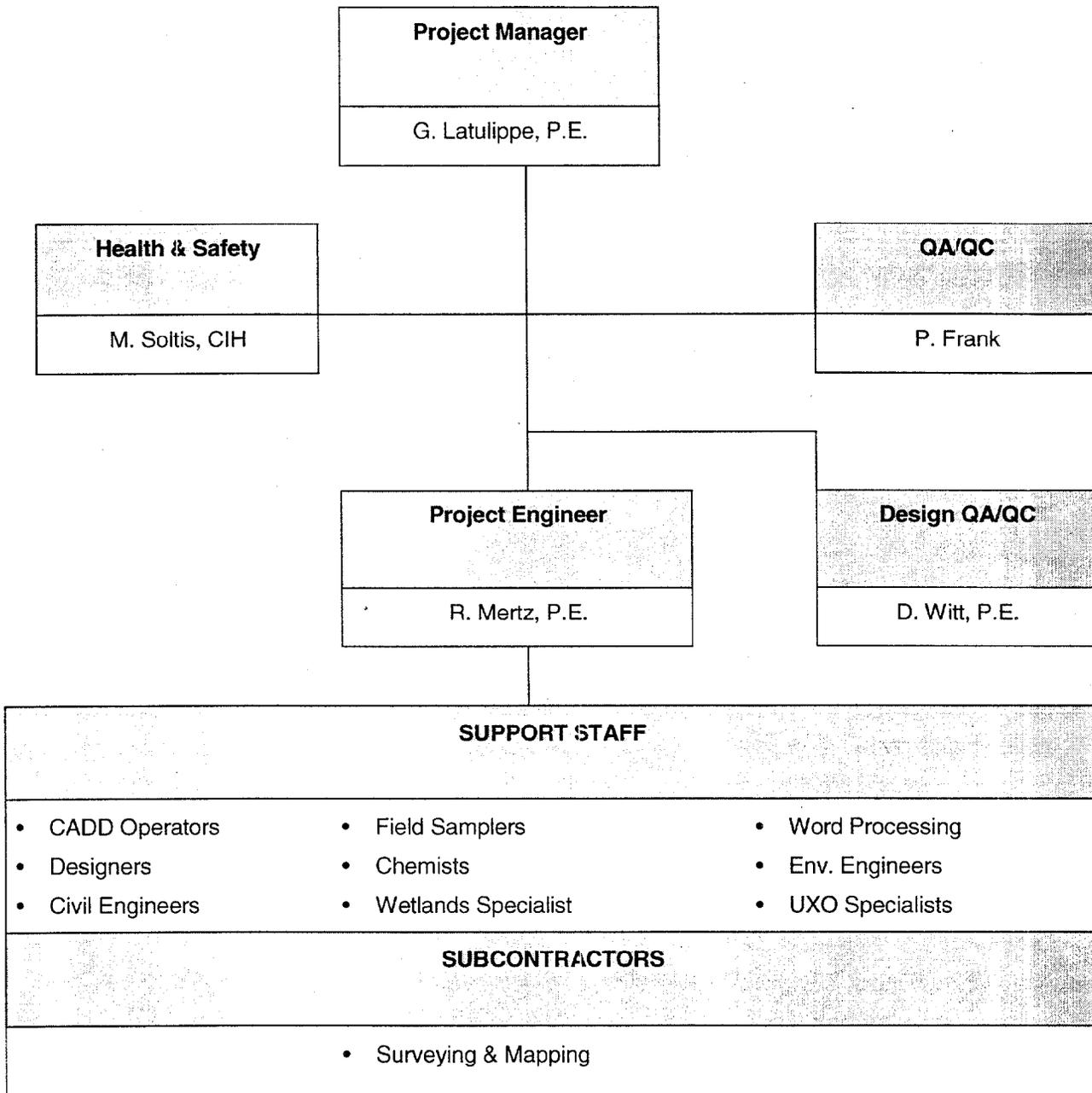
2.2 PROJECT ORGANIZATION

The Project Manager assigned to this CTO is Mr. George Latulippe, P.E. He is located in the TtNUS Pittsburgh office and can be reached at (412) 921-8684 by telephone and at (412) 921-4040 by telecopy. Mr. Latulippe has more than 28 years of design and environmental engineering experience.

The organization chart for this project is shown on Figure 2-1. As shown in that figure, Mr. Latulippe will be assisted on this project by the necessary engineer and technical personnel to perform this project. The organization chart only presents project-specific personnel; CLEAN Program management staff previously described will oversee the overall project and provide program management and QA/QC support. Responsibilities of the key project personnel are discussed below.

- Design QA/QC Specialist. The Design QA/QC Specialist will be Mr. Dan Witt, P.E. Mr. Witt is a registered professional engineer and has more than 13 years experience on civil and environmental engineering projects. Mr. Witt will perform independent QA/QC reviews of the project at the 65 percent design, 100 percent design, and construction document phases. He will be independent of the design team and will perform his reviews prior to submission of documents to the Navy.
- Analytical QA/QC Specialist. The Analytical QA/QC Specialist will be Mr. Joe Samchuck. Mr. Samchuck will oversee the review of all laboratory data generated during the performance of this assignment. Analytical work will be performed under Subtask 2030, Post Remedial Verification Sampling.

FIGURE 2-1
PROJECT ORGANIZATION CHART



- Project Engineer. The Project Engineer will be Robert Mertz, P.E. Mr. Mertz is a registered professional engineer and has more than 15 years of experience on civil and environmental projects involving solid waste management. Specific experience includes engineering, design and construction management of solid and hazardous waste management facilities. Mr. Mertz will be the technical lead for all work associated with this project.

2.3 SUBCONTRACTORS

Surveying subcontractors will be used to implement the proposed scope of work. The subcontractors will be procured to best meet the requirements of this project. Competitive bids will be obtained, and the lowest priced of the qualified, responsive, responsible bidders will be selected.

3.0 DESIGN QUALITY ASSURANCE PROGRAM

3.1 DESIGN PROCESS

TtNUS will implement the project in accordance with the letter titled "Confirmation of Negotiation of Cost Impact Letter No. 68" and dated January 26, 2000. The proposed project will be performed in a logical progression through completion of the following tasks and subtasks.

Task 18 - Site 12 Engineering Services

- Subtask 1810 – Design Quality Assurance Plan (includes Sites 41 and 42)
- Subtask 1820 – Draft Design Plans & Reports
- Subtask 1830 – Final Design Plans & Report
- Subtask 1840 – Design Conferences and Meetings
- Subtask 1850 – Pre-Design Investigations

Task 19 - Site 12 Design Services

- Subtask 1910 – 65% Design
- Subtask 1920 – 100% Design
- Subtask 1930 – Final Design

Task 20 - Site 12 Post-Construction Award Services

- Subtask 2060 – Services During Construction

Task 21 – Site 41 Engineering Services

- Subtask 2120 – Draft Design Plans & Reports
- Subtask 2130 – Final Design Plans & Reports
- Subtask 2140 – Design Conferences and Meetings

Task 22 – Site 41 Design Services

- Subtask 2210 – 65% Design
- Subtask 2220 – 100% Design
- Subtask 2230 – Final Design

Task 23 – Site 41 Post Construction Award Services

- Subtask 2360 – Services During Construction

Task 24 – Site 42 Engineering Services

- Subtask 2420 – Draft Design Plans & Reports
- Subtask 2430 – Final Design Plans & Reports
- Subtask 2440 – Design Conferences and Meetings
- Subtask 2450 – Pre-Design Investigations

Task 25 – Site 42 Design Services

- Subtask 2510 – 65% Design
- Subtask 2520 – 100% Design
- Subtask 2530 – Final Design

Task 26 – Site 41 Post Construction Award Services

- Subtask 2660 – Services During Construction

The QA/QC will be incorporated into the design process through application of standardized design and review procedures, as described below.

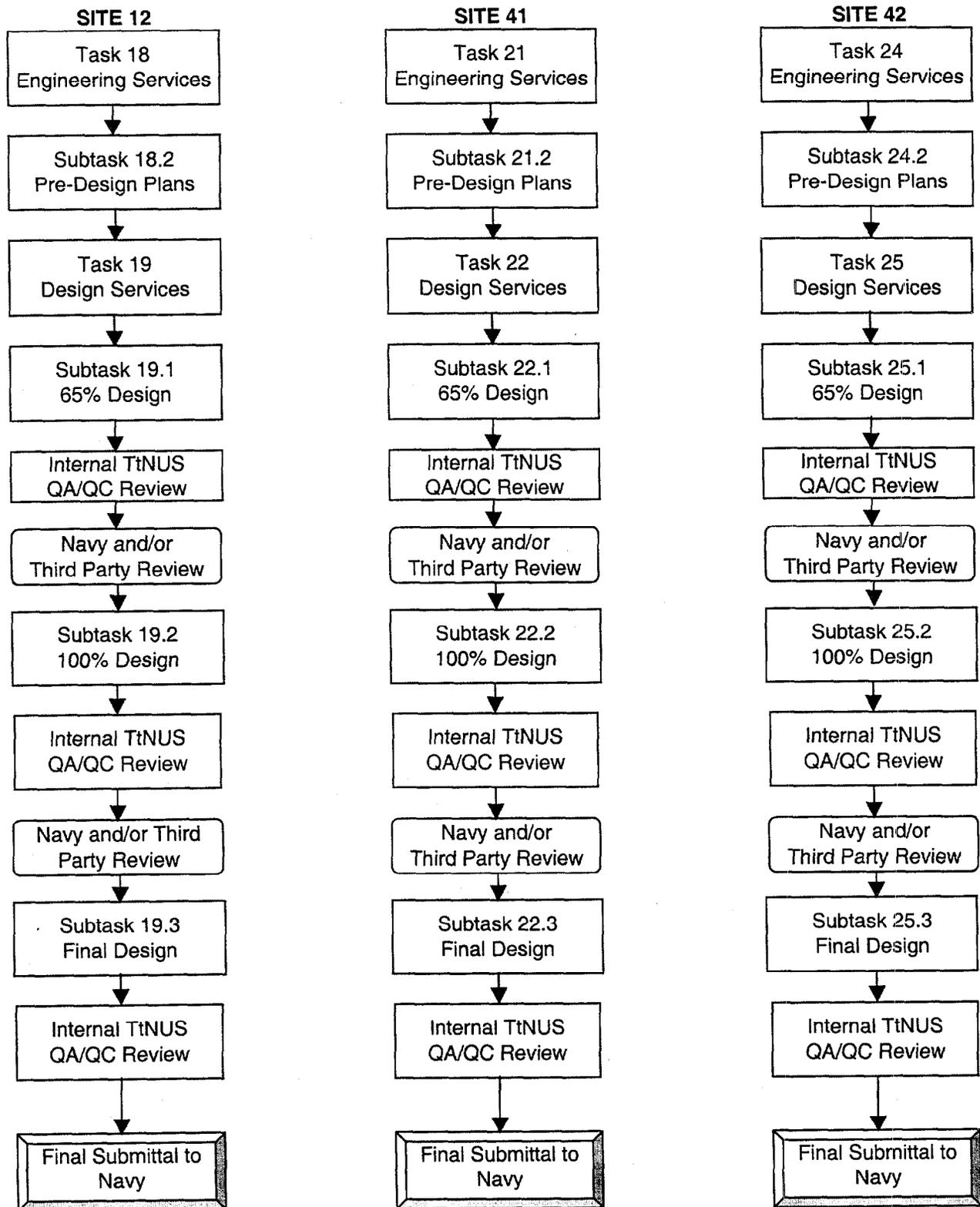
3.2 DESIGN PROCEDURES

The overall design process for the project is provided on Figure 3-1. Design calculations will be performed and reviewed as detailed in TtNUS SOP DE-12.0, Design Calculations. All project deliverables will undergo review in accordance with TtNUS SOP DE-4.0, Review of Technical Documents. Copies of these SOPs are provided in Appendix A. Completion of Technical document reviews will be recorded on Forms D-1 and RR-1 which are included in Appendix B.

The TtNUS Project Manager will maintain close communications with both the Navy Design Manager and Remedial Project Manager (RPM) and the TtNUS project team during the design phase. Direction and comments received from the Navy will be addressed as the design is developed.

Figure 3-1

Design Process



3.3 DESIGN REVIEWS

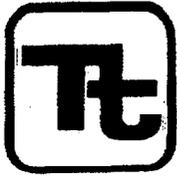
TiNUS will perform internal independent QA/QC reviews at key milestones during the design project. These QA/QC reviews will be performed by the assigned design QA/QC personnel at critical phases of the project (65 percent, 100 percent, and final construction document phases). The purpose of the internal independent reviews is to provide comments on the project drawings and specifications from qualified personnel not previously involved in (i.e., independent from) the design process. The reviewers will utilize both checklists (D-1 and RR-1) attached in Appendix B, and will perform reviews of the design documents for content, and accuracy. The internal independent QA/QC reviews will be performed and the review comments addressed in the design document prior to submission to the Navy.

4.0 PROJECT DOCUMENTATION

TiNUS will perform internal QA/QC reviews. These reviews will be documented through the use of the checklists in Appendix B, and documentation will be maintained in the project design file. Documentation of the 100 percent design review will be provided to the Navy, upon request. In addition, TiNUS will provide "marked-up" review sets of the 100 percent design review, if requested by the Navy.

APPENDIX A

STANDARD OPERATING PROCEDURES



STANDARD OPERATING PROCEDURES

TETRA TECH NUS, INC.

Number

DE-12.0

Page

1 of 9

Effective Date

03/00

Revision

3

Applicability

Tetra Tech NUS, Inc.

Prepared

Design Engineering

Approved

D. Senovich *[Signature]*

Subject

DESIGN CALCULATIONS

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Subject DESIGN CALCULATIONS	Number DE-12.0	Page 2 of 9
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1.0 PURPOSE

The purpose of this procedure is to provide the requirements for the preparation, checking, approval, revision, filing, and record retention of Design Calculations.

2.0 SCOPE

This procedure is applicable to all Design Calculations prepared by Tetra Tech NUS, Inc.

3.0 GLOSSARY

Author: The person primarily responsible for the preparation of one of more Technical Documents. For Design Calculations, the Author shall, in most cases, be one of the Engineers or Scientists assigned to the project.

Design Calculations: A set of mathematical calculations performed to determine engineering design criteria, including size, configuration, and operational parameters.

Checker: A qualified engineer or scientist other than the Author who shall independently check the Design Calculations. Equivalent to the Reviewer for other Technical Documents. The area(s) of expertise of the Checker shall closely match the nature and contents of the Design Calculation(s) to be reviewed. Checkers shall typically include the Manager and/or senior technical specialists within the Author's Technical Department.

4.0 RESPONSIBILITIES

The Project Manager shall be responsible for coordinating the preparation, internal checking, and Client checking and approval (as required) of the Design Calculations.

The Author(s) shall be responsible for preparing and, as required, revising the Design Calculations.

The Technical Department Manager(s) shall be responsible for providing technical guidance for the Design Calculations prepared within his or her Technical Department.

The Checker(s) designated by the Project Manager and the appropriate Technical Department Manager(s) shall be responsible for checking the Design Calculations and interfacing with the Author.

5.0 PROCEDURES

5.1 Preparation

Design calculations shall be performed on standard design calculation worksheets. Exhibit 12-1 shows the typical headings for the worksheets and Exhibit 12-2 provides the instructions for completing the headings, which shall be completed for each worksheet.

Each set of Design Calculations shall contain, at a minimum, the following essential elements:

- A summary statement of purpose and the objective of the calculations on the front worksheet.
- Known and assumed design parameters as defined in accordance with Design Engineering Procedure DE-1.0: Design Basis Document. Assumptions shall be justified by appropriate references

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to guidance documents, handbooks, textbooks, or similar independently published sources, unless obvious to a qualified independent Checker.

- Calculations laid out in an orderly manner, including methodology used. References for inputs and equations not in common usage shall be provided. Descriptions and units shall also be provided for all equation symbols.
- Graphical representations, such as flow charts and design sketches, to further describe and define, as necessary, the development of the calculations and design.
- Results or conclusions clearly stated so that impact on the overall project can be determined.

Where appropriate, copies of reference materials, such as conversation reporting forms, memos, sketches and vendor product information, shall be attached to the Design Calculations to form a complete stand-alone Design Calculation package.

In the case where calculations are performed electronically using computer software packages, a description of the calculation(s) used and the output table(s) shall be provided.

Each page shall be consecutively numbered starting with Page 1 for the front worksheet. All attachments shall be numbered. In the case of a non-paginated computer output, the total number of pages can be identified in a table of contents or on the front worksheet rather than numbering each page of the output.

5.2 Identification

Each set of Design Calculations shall be given an identification number before it is submitted for checking. The identification numbering system for Design Calculations shall be as follows:

Identification Number: 0000 - 1111 - AA-22 - Rev. X

Where:

- 0000: TtNUS project number,
- 1111: project task number (WBS code),
- AA: Technical Department identity (PE = Process Engineering, CE = Civil Engineering, DE = Design Engineering, ES = Earth Sciences, CT = Chemistry/Toxicology, etc.),
- 22: Design Calculations chronological order (01, 02, 03, etc.),
- X: revision designator, alphabetical (A, B, C, etc.) before submittal to Client and numerical (1, 2, 3, etc.) after Client approval.

5.3 Checking

Design Calculations must be checked internally before any resultant drawings and specifications are submitted for Client review and approval. Design Calculations may also be submitted to the Client for checking and approval, as required.

Checking of Design Calculations shall be performed in accordance with Standard Operating Procedure DE-4.0: Review of Technical Documents.

The Author shall submit the original set of Design Calculations to the Project Manager for assignment to the Checker(s).

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The Project Manager shall then arrange for the distribution of a copy (not the original) of the Design Calculation(s) to the assigned Checker(s).

The level of detailed review required during the checking process will vary depending upon the importance and complexity of the Design Calculations being checked. In general, the check shall consist of a review of the following:

- Method of analysis
- Input information
- Accuracy of results
- Reasonableness of results
- Attached reference material

The check may consist of reviewing the Design Calculations as presented or conducting an independent analysis by alternate methods. The method of verification shall be indicated on the front worksheet of the Design Calculations.

The Checker shall make comments directly on the copy of the Design Calculations (using a pen or pencil color other than black) and return this marked copy to the Author for correction of the original Design Calculations or resolution. The corrected original Design Calculations are then signed (front worksheet) and initialed (subsequent sheets) by the Checker.

When the method of checking consists of reviewing the Design Calculations as presented, the Checker shall use the copy of the Design Calculations and place a check mark near each verified value, formula, reference, assumption, etc., in the calculations. Incorrect items shall be marked with a single line through the value or text, and the correct value or text shall be entered onto the copy in a legible manner.

If the verification is by alternate analyses, the Checker's Design Calculations shall be attached to the Design Calculations being checked. The Checker need only initial the pages actually verified. The Checker's signature on the front worksheet attests to his or her agreement with the results as evidenced by the supplemental calculations.

5.4 Revisions

If changes are necessary, a revised set of Design Calculations shall be issued. A copy of the original Design Calculations shall be made and retained in the Project File as a record using the front worksheet with the original signatures.

The revised Design Calculations shall bear the same identification number as the original and have a new front worksheet.

The revised Design Calculations shall be prepared, checked, and approved in accordance with the same procedures as described for the original in Sections 5.1 and 5.3 above. The Author and Checker of a revised set of Design Calculations shall preferably, but not necessarily, be the same as those of the original Design Calculations.

The revised Design Calculations shall be filed with the original Design Calculations. The front worksheet of the original Design Calculations shall be marked to signify that a revision exists, i.e., "Superseded by Rev. X." In this manner, a complete record shall be maintained of how the original and revised Design Calculations evolved.

Should a set of Design Calculations no longer be required or no longer be applicable, it shall be marked "Void."

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5.5 Records

Design Calculations for a project shall be organized in a file(s) using a Design Calculations Index (Exhibit 12-3). Instructions for completing this index are provided in Exhibit 12-4.

The Design Calculations file(s) shall be kept by the Project Manager during the active phase of a project and placed with the project file after the project has been completed.

6.0 REFERENCES

- 6.1 Design Engineering Procedure DE-1.0: Design Basis Document.
- 6.2 Standard Operating Procedure DE-4.0: Review of Technical Documents.

7.0 ATTACHMENTS

- 7.1 Exhibit 12-1: Standard Design Calculation Worksheet
- 7.2 Exhibit 12-2: Instructions for Completing Design Calculation Worksheets
- 7.3 Exhibit 12-3: Design Calculations Index
- 7.4 Exhibit 12-4: Instructions for Completing Design Calculations Index

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EXHIBIT 12-1

STANDARD DESIGN CALCULATION WORKSHEET

TETRA TECH NUS, INC.		CALCULATION WORKSHEET		PAGE ____ OF ____ (1)	
CLIENT (2)			JOB NUMBER (3)		
SUBJECT (4)					
BASED ON (5)			DRAWING NUMBER (6)		
BY (7)		CHECKED BY (8)		APPROVED BY (9)	
DATE (10)					

SPECIMEN

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EXHIBIT 12-2

INSTRUCTIONS FOR COMPLETING DESIGN CALCULATION WORKSHEETS

1. Page numbers and total number of pages, including attachments. Front worksheet is page 1.
2. Enter Client's name.
3. TtNUS Project Number. For major contracts/programs, also enter the specific assignment number (e.g., Contract Task Order [CTO] Delivery Order [DO], etc.) Also enter the Design Calculations identification number as defined in Section 5.2.
4. Project name and title of Design Calculations.
5. When appropriate, reference the Design Basis Document associated with the work.
6. When appropriate, reference the number of the drawing or the report figure where the result of the Design Calculations is illustrated.
7. Initials of Author.
8. Checker's initials and date Design Calculations were checked.
9. Project Manager's initials.
10. Date Design Calculations were approved.

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EXHIBIT 12-4

INSTRUCTIONS FOR COMPLETING DESIGN CALCULATIONS INDEX

1. Client's name and project designation.
2. TtNUS project number.
3. Design Calculations identification number as defined in Section 5.2.
4. Date Design Calculations were placed in the project files.
5. Same title as appears on Design Calculations worksheets.
6. Same Author as appears on Design Calculations front worksheet.



TETRA TECH NUS, INC.

STANDARD OPERATING PROCEDURES

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Effective Date	06/99	Revision	1
Applicability	Tetra Tech NUS, Inc.		
Prepared	Design Engineering		
Approved	D. Senovich <i>DS</i>		

Subject
REVIEW OF TECHNICAL DOCUMENTS

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1.0 PURPOSE

This procedure specifies the requirements for internal review, Client review, and Third Party review of Technical Documents.

2.0 SCOPE

This procedure is applicable to the review of all Technical Documents prepared by Tetra Tech NUS, Inc.

3.0 GLOSSARY

Author: The person primarily responsible for the preparation of one or more Technical Documents.

Client Deliverable Document: A Technical Document that at some point during the project must be submitted to the Client for review and approval purposes.

Internal Technical Document: A Technical Document that must be prepared during the project but is not subject to formal Client review and approval.

Reviewer: A qualified engineer, scientist, or technician other than the Author. The area(s) of expertise of the Reviewer shall closely match the nature and contents of the Technical Document to be reviewed.

Technical Document: A document covering one or more technical aspects of a project. Technical Documents include, but are not limited to, logs, reports, computations, and drawings. For the purpose of review, Technical Documents are divided into two categories: Internal Technical Documents and Client Deliverable Documents.

Third Party: A reviewing entity other than Tetra Tech NUS, Inc. or the Client. In most cases, the Third Party is a regulatory agency but it could also be an independent firm retained by the Client for oversight purposes.

4.0 RESPONSIBILITIES

The Project Manager shall be responsible for coordinating the review of all project-generated Technical Documents and interfacing with the Client (and Third Party, as applicable).

The Project (or Program) QA/QC Manager shall be responsible for oversight of the Technical Document review process.

Review of a particular Technical Document shall be the responsibility of the Reviewers designated by the Project Manager.

5.0 PROCEDURES

5.1 Approach

5.1.1 General

Every Technical Document, whether an Internal Technical Document or a Client Deliverable Document, shall undergo review.

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5.1.2 Internal Technical Documents

Internal Technical Documents shall undergo a single-tier internal review process.

5.1.3 Client Deliverable Documents

Client Deliverable Documents shall undergo a two- or three-tier review process (i.e., internal review and Client review, or internal review, Client review, and Third Party review), depending on whether the Client is the only recipient or a Third Party is also involved.

No Client Deliverable Document shall be submitted to the Client, even informally, before having completed initial internal review.

No Client Deliverable Document shall be submitted to a Third Party, even informally, before having been first reviewed and approved by the Client unless specifically requested by the Client.

Each tier of review shall result in the preparation of revised Client Deliverable Documents, and/or new Client Deliverable Documents (i.e., response to comments), and/or new Internal Technical Documents (i.e., additional computations), all of which shall in turn have to go through the review process.

5.2 Initial Internal Review

The Author and Project Manager shall jointly determine at what stage of development a Technical Document shall undergo initial internal review. For each Technical Document, the sequence of the initial internal review shall be as follows:

- The Author shall provide a first draft of the Technical Document to the designated Reviewer(s) and initiate the preparation of a Document Review Log.
- The Reviewer(s) shall review the draft Technical Document and enter comments on the document itself and/or in a separate comments memorandum. If comments are hand-written, special care shall be taken to keep them as legible as possible.
- The Reviewer(s) shall sign and date the marked-up draft Technical Document and/or comments memorandum and return these to the Project Manager.
- The Project Manager shall retain the original marked-up draft Technical Document and/or comments memorandum in the project file and forward a copy of these to the Author for resolution.
- The Author shall resolve the comments directly with the Reviewer(s). In cases where a mutually satisfactory resolution cannot be reached, the Project Manager and/or the appropriate Technical Department Manager shall be included in the resolution process.
- After the comments have been resolved, the Author shall revise the draft Technical Document and re-submit it to the Reviewer(s) for final concurrence.
- Once final concurrence has been achieved, the internal review process is completed and the draft Technical Document is submitted to the Project Manager.

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5.3 Client Review and Comments

Client review shall be considered as an extension of the internal review process.

Any comments that a Client may have on a Client Deliverable Document shall be received by the Project Manager, who shall pass them on to the Author for resolution.

If further clarification or information is required from the Client for comment resolution, the Author shall request this clarification or information from the Project Manager, who shall obtain it from the Client.

The resolution of Client's comments shall be accomplished in accordance to the following process:

- The Author shall prepare responses to the Client's comments. As required, the Author shall solicit input from the appropriate technical personnel to prepare responses to the Client's comments.
- As determined by the Project Manager, the responses shall be internally reviewed by the original Reviewer(s) of the initial draft Client Deliverable Document or other technical personnel, as appropriate.
- The responses shall be transmitted to the Client by the Project Manager.
- The Project Manager shall interface with the Client to obtain approval of the responses. As required, the Project Manager shall enroll the support of the Author and/or appropriate technical personnel when interfacing with the Client. Also as required, the responses shall be revised by the Author and re-submitted to the Client by the Project Manager.
- Upon Client's approval of the responses, the Project Manager shall direct the Author to revise the Client Deliverable Document.
- The Author shall revise the Client Deliverable Document. As required, the Author shall solicit input from the appropriate technical personnel to prepare this revision. The Author shall then provide the revised Client Deliverable Document to the Project Manager.
- As determined by the Project Manager, the revised Client Deliverable Document shall be internally reviewed by the original Reviewer(s) of the initial draft Client Deliverable Document or other technical personnel, as appropriate.
- The Project Manager shall submit the revised Client Deliverable Document to the Client and secure the Client's written approval of this document.

5.4 Third Party Review and Comments

Comments from a Third Party review of Client Deliverable Documents shall be received, either directly or through the Client (at the Client's option), by the Project Manager, who shall pass them to the Author for resolution. If further clarification or information is required for comment resolution, the Author shall request this clarification or information from the Project Manager, who shall obtain it either directly from the reviewing Third Party or through the Client, at the Client's option.

The sequence of resolution for Third Party comments shall be identical to that for the Client's comments, with the following additional steps: the Project Manager securing the Client's approvals for the responses

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to comments and the revised Client Deliverable Document before submitting these documents to the reviewing Third Party.

5.5 Follow-up Internal Review

Follow-up internal review shall be performed on new or revised Technical Documents resulting from the Client and Third Party review processes and/or from changes to the project scope. The follow-up internal review shall be performed by the original Reviewer(s) of the initial draft Technical Documents from which the new or revised Technical Documents were developed and/or other technical personnel, as may be appropriate

The sequence of follow-up internal review shall normally be identical to that of the initial internal review. However, at the option of the Project Manager, this sequence may be streamlined or waived if the Client's and Third Party's comments or project scope changes are clearly insignificant (i.e., minor editorial changes) and do not affect the adequacy of the Client Deliverable Document. Streamlining or waiving of the normal sequence of follow-up internal review shall be indicated by the Project Manager on the Document Review Log.

5.6 Revisions

5.6.1 Identification

Each revision of every project Technical Document shall be identified by a revision designator to indicate which stage of the review process this Technical Document is currently undergoing.

For Internal Technical Documents, the revision designator shall be alphabetical through the entire review process, starting with "Rev. A".

For Client Deliverable Documents, the revision designator shall be alphabetical, starting with "Rev. A", through the initial internal review and initial Client review until Client's approval is first obtained. For example, a Client Deliverable Document shall be first issued as "Rev. A" for internal review, then re-issued as "Rev. B" for initial submission to the Client, and further re-issued if necessary as "Rev. C", "Rev. D", etc., during Client review. Upon initial Client approval, the revision designator shall be switched from alphabetical to numerical and the approved Client Deliverable Document shall be re-issued as "Rev. 0". Subsequent revisions, as may be required by changes in project scope or Third Party review, shall be designated as "Rev. 1", "Rev. 2", etc.

A Technical Document shall retain its revision designator throughout each review and revision cycle. For example, a Client Deliverable Document shall be designated as "Rev. A" throughout the initial internal review and revision process and its revision designator shall not be changed to "Rev. B" until it has been fully revised and is formally issued for client approval. Any partially revised or informally distributed Client Deliverable Document shall retain its current revision designator and shall be identified as "PRELIMINARY" or "IN REVIEW" to depict its interim status. As further visual evidence that the Client Deliverable Document is being revised, the current revision designator shall be struck-out (e.g., ~~Rev. A~~). The "strike-out" shall be removed at the time the next revision of the Client Deliverable Document is formally issued.

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5.6.2 Sidelines

Revised Technical Documents shall feature sidelines to identify revised areas and a revision designator shall be shown next to the sideline to indicate during which issue this area was revised. When the same area of a Technical Document is revised more than once, only the latest revision designator shall be shown next to the sideline identifying the revised area. When a Client Deliverable Document is issued as "Rev. 0" following Client's approval, all sidelines and associated designators from previous revision issues shall be removed and the process shall begin again.

5.7 Records

5.7.1 Document Review Log

During the active life of the project, the Project Manager shall prepare, update, and retain in the project file a Document Review Log for each project Technical Document. After project completion, this Document Review Log shall remain as a permanent part of the archival project file. Typical Document Review Log sheets are attached to this SOP as Exhibits 4-1 through 4-3.

The Document Review Log shall identify internal Reviewers, Client's review parties, and Third Party reviewer(s), as appropriate. The Document Review Log shall also identify review process milestones, including:

- Dates of first draft issue ("Rev. A") and issue of subsequent revisions
- Dates of review for all appropriate parties (i.e., Reviewers, Client, Third Party)
- Date(s) of submittal of response to comments
- Date(s) of receipt of Client's (and Third Party's) approval.

In the event any of the Client's or Third Party's comments or approvals are submitted verbally, the conversation shall be properly recorded and dated on a conversation reporting form, and filed with the review log documentation.

5.7.2 Internal Review Records

During the active review phase of each Technical Document (i.e., Internal Technical Document or Client Deliverable Document), the Project Manager shall retain the following internal review records in the project file:

- First draft (Rev. A) and revised (e.g., Rev. B, Rev. C, Rev. 0, Rev. 1, etc.) Technical Documents
- Marked-up, dated, and signed Technical Documents from each Reviewer
- Reviewers' comments memoranda

At the conclusion of the active review phase, the above records shall be purged from the project file, except for the latest Technical Document revision.

5.7.3 Client and Third Party Review Records

During the active review phase of each Client Deliverable Document, the Project Manager shall retain the following Client and Third Party review records in the project file:

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- Client's and Third Party's (as applicable) comments
- Phone notes dealing with Client's and Third Party's (as applicable) comments
- Response to Client's and Third Party's (as applicable) comments
- Client's and Third Party's (as applicable) written approvals.

At the conclusion of the active review phase, the above records shall be retained in the project file and become a permanent part of the archival project file.

6.0 REFERENCES

None.

7.0 ATTACHMENTS

- 7.1 Exhibit 4-1: Typical Document Review Log - Cover Sheet
- 7.2 Exhibit 4-2: Typical Document Review Log - Follow-up Sheet #1
- 7.3 Exhibit 4-3: Typical Document Review Log - Follow-up Sheet #2

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**EXHIBIT 4-1
TYPICAL DOCUMENT REVIEW LOG
COVER SHEET**



Tetra Tech NUS, Inc.

Sheet 1 of --

DOCUMENT REVIEW LOG

PROJECT/CLIENT NAME: _____
PROJECT NUMBER: _____
DOCUMENT TITLE: _____
DOCUMENT TYPE: _____
INTERNAL TECHNICAL DOCUMENT: _____ CLIENT DELIVERABLE DOCUMENT: _____

MILESTONES/REVIEWERS	REV. No.	DATES		COMMENTS
		START	END	
INITIAL INTERNAL REVIEW				
FIRST INTERNAL DRAFT ISSUE	A			
INITIAL INTERNAL REVIEW: Reviewer 1 Reviewer 2	A			
FINAL INTERNAL DRAFT ISSUE	B			
INITIAL CLIENT REVIEW				
INITIAL SUBMISSION TO CLIENT	B			
INITIAL CLIENT'S REVIEW	B			
CLIENT'S COMMENTS	B			
RESPONSE TO CLIENT COMMENTS & FOLLOW-UP REVIEW				
INTERNAL ISSUE OF RESPONSE TO COMMENTS	B			
INTERNAL REVIEW OF RESPONSE TO COMMENTS Reviewer 1 Reviewer 2	B			
CLIENT APPROVAL OF RESPONSE TO COMMENTS	B			
INTERNAL ISSUE OF REVISED DOCUMENT	B			
FOLLOW-UP INTERNAL REVIEW OF REVISED DOCUMENT: Reviewer 1 Reviewer 2	B			
ISSUE FOR PRELIMINARY CLIENT APPROVAL	C			
INITIAL CLIENT APPROVAL				
INITIAL CLIENT APPROVAL	C			
ISSUE OF CLIENT-APPROVED DOCUMENT	0			

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**EXHIBIT 4-2
TYPICAL DOCUMENT REVIEW LOG
FOLLOW-UP SHEET #1**



Tetra Tech NUS, Inc.

Sheet 2 of —

DOCUMENT REVIEW LOG

PROJECT/CLIENT NAME: _____
DOCUMENT TITLE: _____

MILESTONES/REVIEWERS	REV. No.	DATES		COMMENTS
		START	END	
INITIAL THIRD PARTY REVIEW (If Applicable)				
SUBMITTAL TO THIRD PARTY	0			
THIRD PARTY REVIEW:	0			
THIRD PARTY COMMENTS	0			
RESPONSE TO THIRD PARTY COMMENTS & FOLLOW-UP INTERNAL REVIEW (If Applicable)				
INTERNAL ISSUE OF RESPONSE TO COMMENTS	0			
INTERNAL REVIEW OF RESPONSE TO COMMENTS Reviewer 1 Reviewer 2	0			
CLIENT APPROVAL OF RESPONSE TO COMMENTS	0			
SUBMITTAL OF RESP. TO COMMENTS TO THIRD PARTY	0			
THIRD PARTY APPROVAL OF RESP. TO COMMENTS	0			
INTERNAL ISSUE OF REVISED DOCUMENT	0			
FOLLOW-UP INTERNAL REVIEW OF REVISED DOCUMENT: Reviewer 1 Reviewer 2	0			
ISSUE FOR THIRD PARTY APPROVAL	1			
THIRD PARTY APPROVAL (If Applicable) & FINAL CLIENT APPROVAL				
THIRD PARTY APPROVAL	1			
ISSUE FOR FINAL CLIENT APPROVAL	2			
FINAL CLIENT APPROVAL	2			
ISSUE OF FINAL CLIENT-APPROVED DOCUMENT	3			

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**EXHIBIT 4-3
TYPICAL DOCUMENT REVIEW LOG
FOLLOW-UP SHEET #2**



Tetra Tech NUS, Inc.

Sheet 3 of —

DOCUMENT REVIEW LOG

PROJECT/CLIENT NAME: _____
DOCUMENT TITLE: _____

MILESTONES/REVIEWERS	REV. No.	DATES		COMMENTS
		START	END	
FOLLOW-UP INTERNAL REVIEW OF SCOPE CHANGES				
FIRST INTERNAL ISSUE OF REVISED DOCUMENT	1			
FOLLOW-UP INTERNAL REVIEW OF REVISED DOCUMENT Reviewer 1 Reviewer 2	1			
FINAL INTERNAL ISSUE OF REVISED DOCUMENT	2			
CLIENT REVIEW OF REVISED DOCUMENT				
REVISED DOCUMENT SUBMISSION TO CLIENT	2			
CLIENT'S REVIEW	2			
CLIENT'S COMMENTS	2			
RESPONSE TO CLIENT COMMENTS & FOLLOW-UP INTERNAL REVIEW				
INTERNAL ISSUE OF RESPONSE TO COMMENTS	2			
INTERNAL REVIEW OF RESPONSE TO COMMENTS Reviewer 1 Reviewer 2	2			
CLIENT APPROVAL OF RESPONSE TO COMMENTS	2			
INTERNAL ISSUE OF REVISED DOCUMENT	2			
FOLLOW-UP INTERNAL REVIEW OF REVISED DOCUMENT: Reviewer 1 Reviewer 2	2			
REVISED DOCUMENT ISSUE FOR CLIENT APPROVAL	3			
CLIENT APPROVAL				
CLIENT APPROVAL OF REVISED DOCUMENT	3			
ISSUE OF APPROVED REVISED DOCUMENT	4			

APPENDIX B

REVIEW FORMS

D-1: GENERAL DESIGN REVIEW FORM

RR-1: RECORD OF DESIGN REVIEW FORM

**FORM D-1
GENERAL DESIGN REVIEW FORM**

Client/Site: _____ Project No: _____
 Project: _____ Review Date: _____
 Reviewer: _____
 Submission Level: _____
 Information Reviewed: _____

NO.	ITEM	STATUS/COMMENT
G1.	Do plans and specifications conform to scope of work and/or Navy standards?	
G2.	Is the Navy's prime contract identified in the documents or transmittal?	
G3.	Are the limits of the contractor's and Navy's responsibility clearly defined? a. Navy furnished - contractor installed equipment or materials b. Navy furnished - owner installed equipment or materials c. Contractor furnished - contractor installed equipment or materials d. Who furnishes and pays for electricity, water, etc.?	
G4.	Do numbers (elevations, dimensions, tests) in report agree with figures, tables and plans?	
G5.	Is Professional Engineer's seal required and provided?	
G6.	Have drawings and specifications been checked for "safety" in design?	
G7.	Have comments provided by Navy been incorporated or appropriate response provided as to why they are not included?	
S1.	Are specifications clearly non-proprietary unless authorized in writing to be otherwise? (i.e., at least two manufacturers and/or equal)	
S2.	Have all technical provisions of the specifications been checked against the drawings? Is the terminology used on the drawing and within the various specification sections consistent?	
S3.	Are the applicable codes and specifications utilized and referenced?	
S4.	Is the Table of Contents correct and does it conform to paragraphs in the text?	
S5.	If required, has the SPECSINTACT System been used in accordance with MIL-HDBK-1006/2A, Appendix E?	
S6.	Have the specifications been proofread after typing?	

FORM D-1
GENERAL DESIGN REVIEW FORM
PAGE TWO

NO.	ITEM	STATUS/COMMENT
D1.	Has index of drawings been carefully cross-checked with the title of each sheet?	
D2.	Does the title of the drawings correspond with the title of the specifications?	
D3.	Is the title block complete on each sheet?	
D4.	Has design between disciplines been coordinated?	
D5.	Do drawings contain proper scales and dimensions?	
D6.	Are related views and details properly referenced?	
D7.	Have all drawings and views been properly oriented by north arrow or section bubble?	
D8.	Have design decisions and calculations been filed? Design criteria should be included as well as all decisions and calculations. Each should be signed and dated by the designer and by the checker when appropriate. Each entry should be securely fastened in the folder as this is the principal project design file.	
D9.	Have drawings been checked against basic criteria and outline specifications? Have comments from previous reviews (Navy and Halliburton NUS) been addressed?	
D10.	If graphic scales are used, have they been indicated on all applicable drawings?	
D11.	Are the terminology and abbreviations consistent with the specifications and abbreviation list and/or standards (ANSI, etc.)?	
D12.	Are all drawings complete and understandable?	
D13.	Do drawings show underground utilities without conflicts?	
D14.	Verify that cross-referenced specification sections exists.	
D15.	Verify onsite plans that all existing and new work is clearly indicated.	
01	Other Comments:	

**FORM RR-1
CLEAN PROGRAM
RECORD OF DESIGN REVIEW**

(1) Organization/Discipline: _____
 Product Title/Report Number: _____
 _____ Author _____
 Project Number/Task Number: _____
 Product Revision Status: _____ Original _____ Draft _____ Revision No. _____

(2) Project Manager: _____
 Reviewer Assignment(s):
 (1) _____ (3) _____
 (2) _____ (4) _____
 Review Completion Due By: _____

(3) Review Comments: On Attachment _____ See Below _____

Reviewer (1): _____
 _____ Signature _____ Date _____

Reviewer (2): _____
 _____ Signature _____ Date _____

Reviewer (3): _____
 _____ Signature _____ Date _____

Reviewer (4): _____
 _____ Signature _____ Date _____

(4) Author Comment Resolution Completed: _____
 _____ Signature _____ Date _____

(5) Project Manager Review/Approval: _____
 _____ Signature _____ Date _____

Other Review/Approval If Required: _____
 _____ Signature _____ Date _____