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NSWC WHITE OAK
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Section: 06.02
Site 20903-5640 (White Oak)
Doc. #: 0004

00155

Design Quality Assurance Plan
for
Remedial Action Design at Operable Unit 2 (Sites 1 and 2)

Former
Naval Surface Warfare Center
White Oak
Silver Spring, Maryland

Engineering Field Activity Chesapeake
Naval Facilities Engineering Command

Contract Number N62472-90-D-1298

Contract Task Order 0273

November 2000

TETRA TECH NUS, INC.

Section: 06.02
Site 20903-5640 (White Oak)
Doc. #: 0004

110006/P

DESIGN QUALITY ASSURANCE PLAN FOR REMEDIAL ACTION DESIGN AT OPERABLE UNIT 2 (SITES 1 AND 2)

FORMER
NAVAL SURFACE WARFARE CENTER - WHITE OAK
SILVER SPRING, 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:
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600 Clark Avenue, Suite 3
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CONTRACT NUMBER N62472-90-D-1298
CONTRACT TASK ORDER 0273

November 2000

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1.0 INTRODUCTION

This Design Quality Assurance Plan (DQAP) was prepared as part of Contract Task Order (CTO) No. 273, under Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract Number N62472-90-D-1298. This DQAP will be used by Tetra Tech, NUS, Inc. (TtNUS) during the performance of the engineering and design services associated with the remedial action at Operable Unit 2 (Sites 1 and 2) located at the former Naval Surface Warfare Center – White Oak (NSWC-White Oak) in Silver Spring, Maryland.

1.1 BACKGROUND

NSWC-White Oak was originally established in 1944 as the Naval Ordnance Laboratory (NOL), with a mission to carry out research on military guns and explosives. It is located approximately 5 miles north of Washington, D.C., off New Hampshire Avenue in Silver Spring, Maryland (See Figure 1-1). Throughout the years, the mission was expanded to include research involving torpedoes, mines, and projectiles. In September 1974, NOL combined with the Naval Weapons Laboratory, Dahlgren, Virginia, to become the Naval Surface Weapons Center, which was renamed the Naval Surface Warfare Center, Dahlgren Division, in 1988. Since that time, it functioned as the principal Navy Research, Development, Test, and Evaluation Center for surface warfare weapon systems, ordnance technology, strategic systems, and underwater weapons systems.

1.1.1 Facility Operations

NSWC-White Oak covered approximately 712 acres and was located in both Prince George's and Montgomery Counties. NSWC-White Oak was identified as a Base Realignment and Closure (BRAC) facility and was closed in 1997, with the property transferred to the General Services Administration (GSA) and to the U.S. Army. Approximately 662 acres were transferred to the GSA in the fall of 1997. Of this total area, approximately 617 acres, or 87 percent, is within Montgomery County. The remaining area in the southeastern portion of the facility was transferred to the U.S. Army in February 1998. NSWC-White Oak is bordered by the Adelphi Laboratory Center (ALC) and the United States Naval Reserve (USNR) Training Center along with a mixture of residential, park, industrial, and commercial properties. GSA is currently investigating plans with the U.S. Food and Drug Administration (FDA) for the reuse and development of the NSWC-White Oak property. The property transferred to the U.S. Army will be used in conjunction with ongoing activities at the adjacent ALC.

Prior to its closure, the Navy investigated environmental sites at NSWC-White Oak that were in the Installation Restoration Program (IRP) under CERCLA and the remaining sites were investigated under

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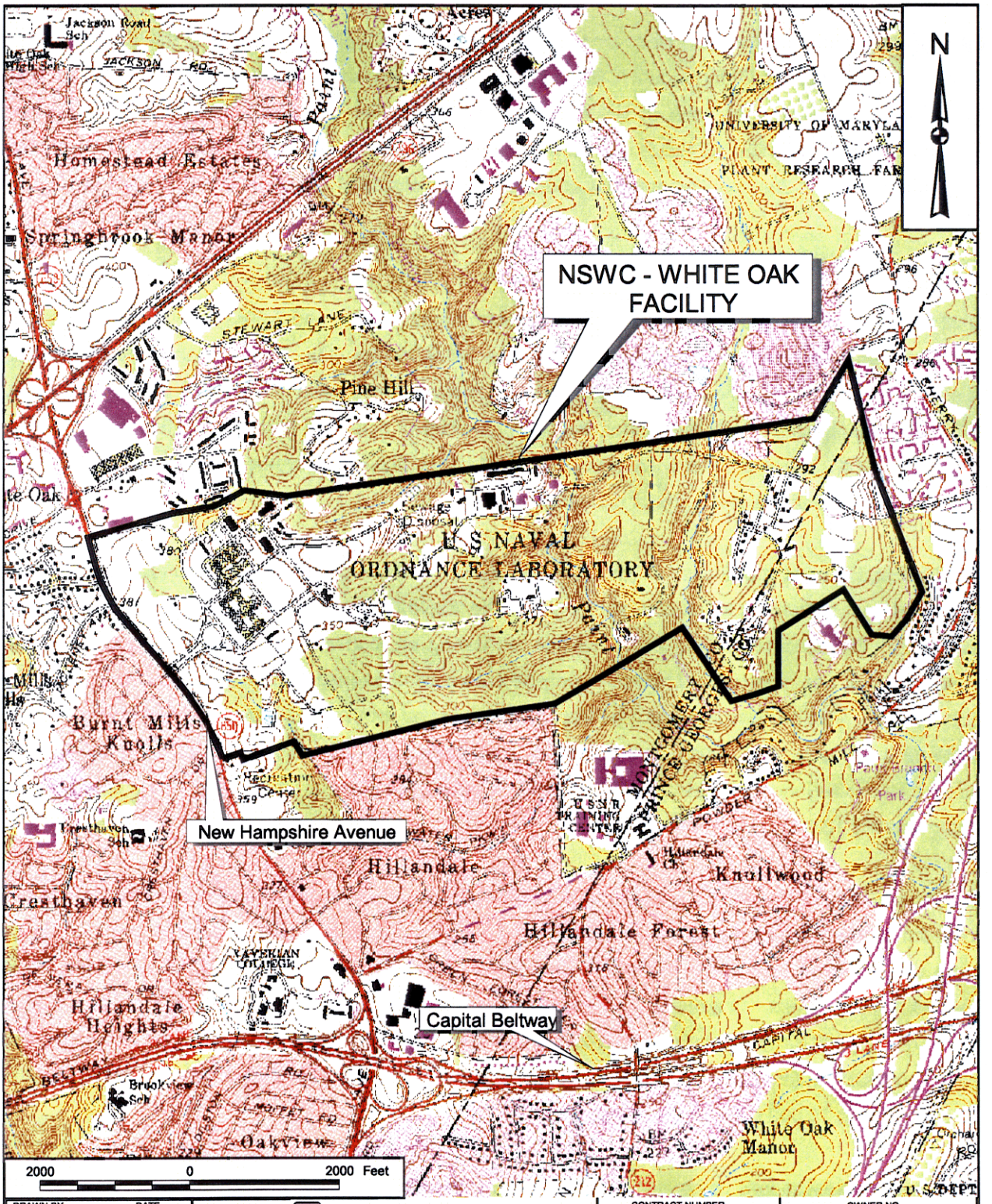

DRAWN BY	DATE	Tetra Tech NUS, Inc.	CONTRACT NUMBER	OWNER NO.
M. Spangenberg	10/10/00		7687	0298
CHECKED BY	DATE	SITE VICINITY MAP FORMER NSWC - WHITE OAK SILVER SPRING, MARYLAND	APPROVED BY	DATE
CAR	11/22/00		SN	11/22/00
COST/SCHEDULE-AREA			APPROVED BY	DATE
			—	—
SCALE			DRAWING NO.	REV
AS NOTED			FIGURE 1 - 1	0

P:\GIS\WHITEOAK\OU2_CMS.APR\SITE VICINITY MAP-PROPOSE AND PLAN MGS 10/10/00

the Resource Conservation and Recovery Act (RCRA). Subsequent to its closure, the EPA issued a Unilateral Administrative Order under RCRA 7003 on July 3, 1998 that required the Navy to investigate all of remaining environmental sites at NSWC-White Oak under RCRA. Even though BRAC sites are typically investigated under CERCLA, the Navy is currently following a hybrid RCRA/CERCLA approach for investigating and documenting activities at environmental sites at the former NSWC-White Oak.

1.1.2 Operable Unit 2 (Sites 1 and 2)

OU2 includes the soil, sediment, and waste material from both Sites 1 and 2 (i.e., the Parking Lot Landfill and Apple Orchard Landfill, respectively) at the former NSWC-White Oak. The location of these two sites is shown on Figure 1-2. These two landfills were originally identified and investigated as separate sites, but due to their proximity with each other, the similar periods of operation for both, and the similar wastes disposed in both, they are being considered as a single OU. The groundwater and surface water OUs at these sites will be addressed in a later document.

The Parking Lot Landfill was used as an open disposal site and landfill between 1948 and 1953. The site is located east of Building 101A and is adjacent to the Apple Orchard Landfill and Site 32. The wastes supposedly disposed within this landfill include lubricating oil, battery acid, metal plating wastes, and metal scrap. It was reported that approximately 60 automobile batteries were disposed at the site over its operating life. The site was used as a parking lot and is paved with asphalt; however, visible wastes from the landfill including tires, glass, and old metal equipment have been observed on the southern and eastern slopes beyond the edge of the parking lot. The landfill covers approximately 1 acre and contains approximately 10,000 cubic yards of waste.

The Apple Orchard Landfill is an abandoned landfill located on the south side of the Perimeter Road in the northwestern end of the former NSWC-White Oak property. The landfill reportedly operated as an open disposal area and landfill from 1948 until 1982. The landfill is a single unit that is composed of several disposal areas. In addition to domestic refuse, wastes reportedly disposed at the site included oils containing PCBs, solvents, paint residue, acids and miscellaneous compounds. An estimated 500 gallons of PCB-contaminated oils were deposited at the site prior to 1970. It has been estimated that the landfill contains 75,000 cubic yards of waste/fill.

The primary investigations completed at the sites are summarized below.

- Site Screening Report for Sites 1, 5, 6, 12, 13, 28, 29, 31, 32, 33, and EBS AOC 100
- Engineering Evaluation/Cost Analysis (EE/CA) for Site 1
- RCRA Facility Investigation (RFI) Report for Sites 2, 3, 4, 7, 8, 9, and Paint Branch
- Corrective Measures Study (CMS) for OU2

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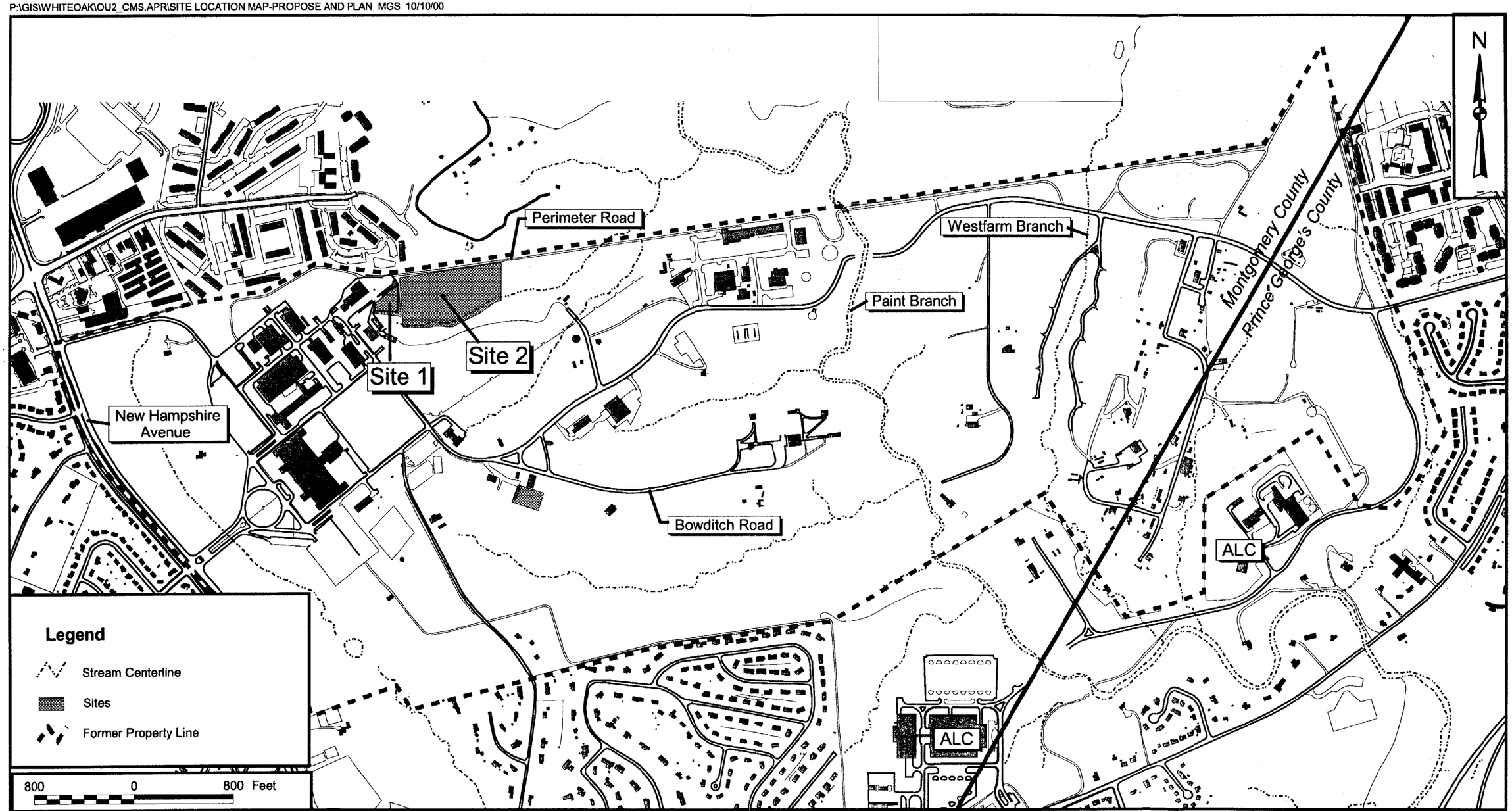


NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY M. Spangenberg	DATE 10/10/00	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7687 / OWNER NUMBER 0298
CHECKED BY CAR	DATE 11/22/00	SITE LOCATION MAP OPERABLE UNIT 2 FORMER NSWC - WHITE OAK SILVER SPRINGS, MARYLAND	APPROVED BY SN / DATE 11/22/00
COST/SCHEDULE-AREA			APPROVED BY — / DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 1 - 2 / REV 0

00155D022

The recommended alternative for OU2 soil, sediment, and waste material is to consolidate and cap it with a multimedia cap meeting the Federal and state requirements for landfill closure (i.e., 40 CFR 258, 40 CFR 264, COMAR 26.04.07, and COMAR 26.13.05). Another component of the alternative is offsite treatment and disposal of hot spots. The final component of the alternative is institutional controls. The controls include land use restrictions, fencing, and monitoring.

1.2 PURPOSE AND OBJECTIVE

The DQAP 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 design team, as well as reviews by independent in-house quality assurance/quality control (QA/QC) 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 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. SOP's
- 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

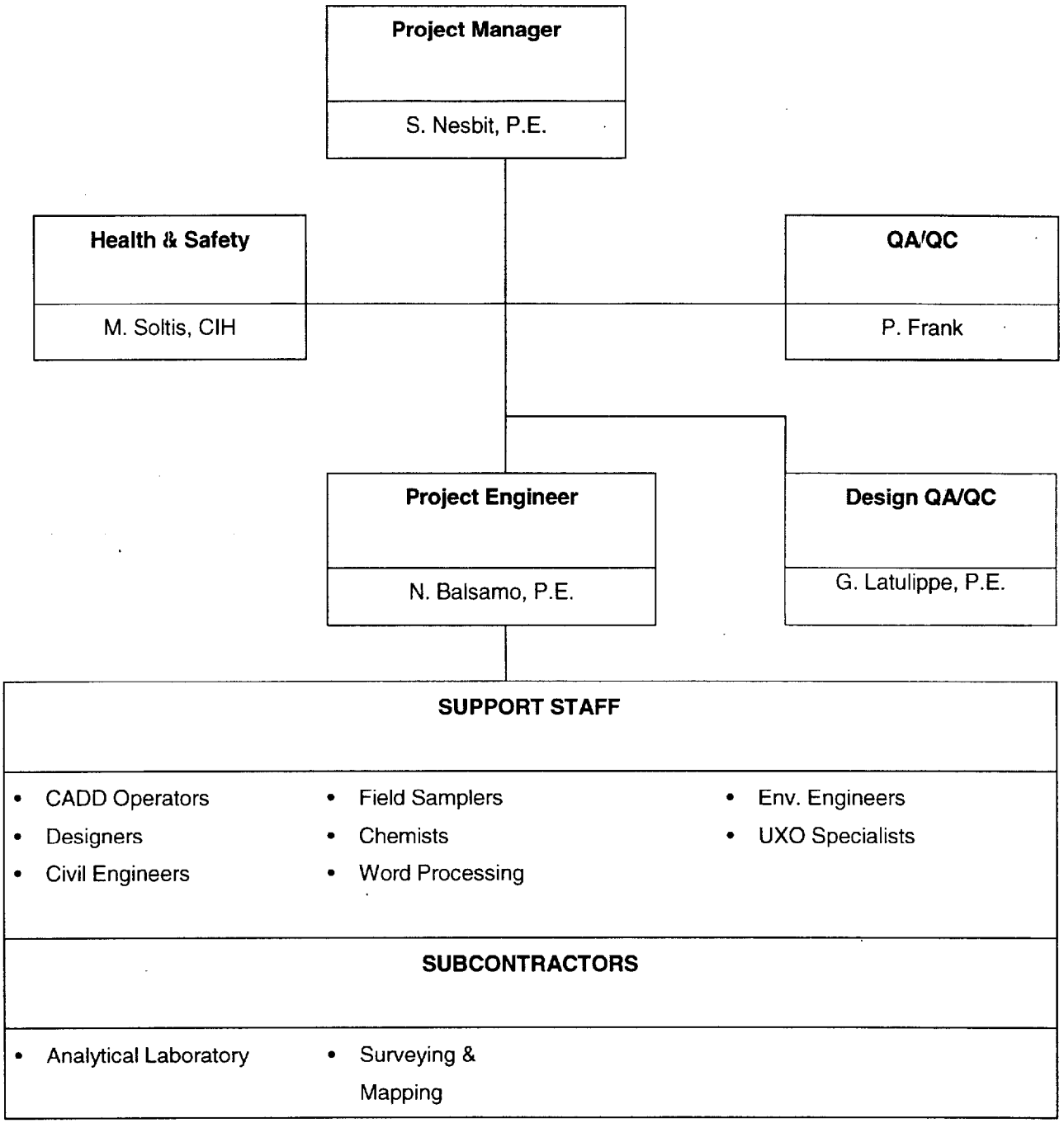
The Project Manager assigned to this CTO is Mr. Scott Nesbit, P.E. He is located in the TtNUS Pittsburgh office and can be reached at (412) 921-7134 by telephone and at (412) 921-4040 by telecopy. Mr. Nesbit has more than 14 years of design and environmental engineering experience.

The organization chart for this project is shown on Figure 2-1. As shown in that figure, Mr. Nesbit 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 George Latulippe, P.E. Mr. Latulippe is a registered professional engineer and has more than 28 years experience on civil and environmental engineering projects. Mr. Latulippe 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.

FIGURE 2-1

PROJECT ORGANIZATION CHART



- 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 14.2, Design Verification Work Plan and Subtask 16.3, Field Sampling.

- Project Engineer. The Project Engineer will be Nina Balsamo, P.E. Ms. Balsamo 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. Ms. Balsamo will be the technical lead for all work associated with this project.

2.3 SUBCONTRACTORS

Surveying and analytical laboratory 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 for each of these subcontractors, 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 Implementation Plan (TtNUS, August 2000). The proposed project will be performed in a logical progression through completion of the following tasks and subtasks.

Task 14 - Engineering Services

- Subtask 14.1 - Design Quality Assurance Plan
- Subtask 14.2 - Design Verification Work Plan
- Subtask 14.3 - Erosion and Sediment Control Plan
- Subtask 14.4 - Stream Restoration Plan
- Subtask 14.5 - Storm Water Management Plan
- Subtask 14.6 - Meetings

Task 15 - Design Services

- Subtask 15.1 - 35% Design Submission
- Subtask 15.2 - 65% Design Submission
- Subtask 15.3 - 100% Design Submission
- Subtask 15.4 - Final Design Submission

Task 16 - Post-Construction Award Services

- Subtask 16.1 - Work Plan Review
- Subtask 16.2 - Consultation Services
- Subtask 16.3 - Field Sampling
- Subtask 16.4 - Confirmation Sampling Plan
- Subtask 16.5 - Post Removal Action Report

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 drawings will be prepared in accordance with TtNUS SOP DE-3.0, Design Drawings. All project deliverables will undergo review in accordance with TtNUS SOP DE-4.0, Review of Technical Documents. Design calculations will be performed and reviewed as detailed in TtNUS SOP DE-12.0, Design Calculations. Copies of these SOP's 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.

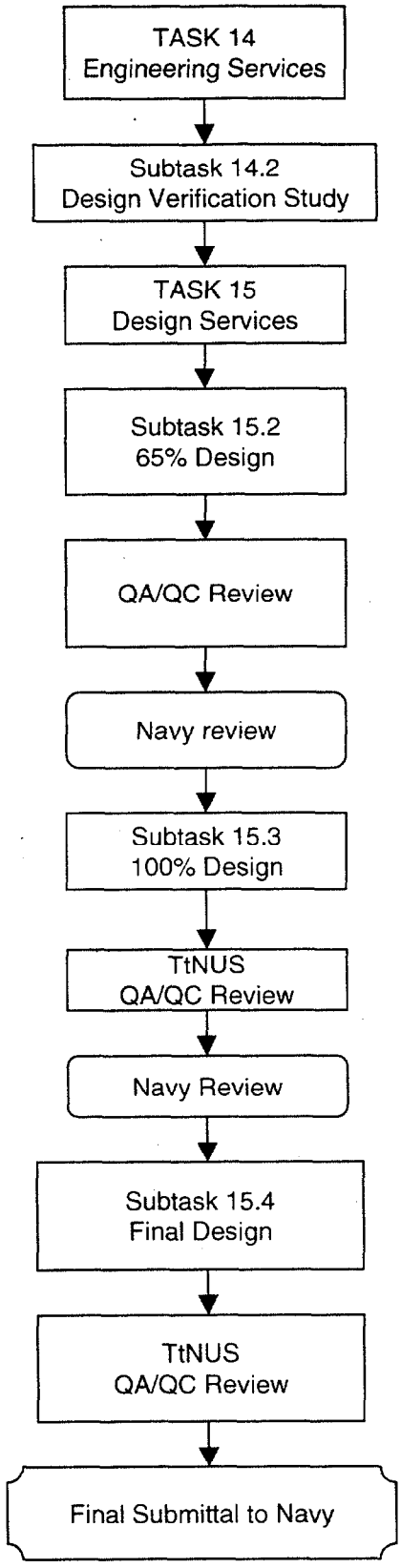
The TtNUS Project Manager will maintain close communications with both the Navy Design Manager and Remedial Project Manager (RPM) and the TtNUS project team during the design phase. Direction and comments received from the Navy will be addressed as the design is developed.

3.3 INDEPENDENT DESIGN REVIEWS

TtNUS will perform independent QA/QC reviews at key milestones during the design project. The independent QA/QC reviews will be performed by the assigned design QA/QC personnel at critical phases of the project (65 percent, 100 percent, and construction document phases). The purpose of the independent reviews is to provide "third party" comments on the project drawings and specifications. The independent reviewer 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. By utilizing an independent reviewer, a thorough and unbiased review will be achieved. The independent QA/QC reviews will be performed and the review comments addressed in the design document prior to submission to the Navy.

All comments received on submittals will be responded to in a formal Response to Comments Report format and submitted with the next formal submittal.

FIGURE 3-1
OU2 DESIGN PROCESS



4.0 PROJECT DOCUMENTATION

TtNUS 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, TtNUS will provide "marked-up" review sets of the 100 percent design review, if requested by the Navy.

APPENDIX A

STANDARD OPERATING PROCEDURES

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3-1 STANDARD DESIGN DRAWING TITLE BLOCK AND REVISION COLUMNS 7

1.0 PURPOSE

This procedure specifies the requirements to be met in the preparation, review, approval, distribution, and record control of Design Drawings.

2.0 SCOPE

This procedure applies to all formal Design Drawings prepared by the Northeast Region of Brown & Root Environmental.

This procedure does not necessarily apply to informal engineering sketches which are typically used for studies and design concepts.

3.0 GLOSSARY

As-Built Drawing: A Design Drawing reflecting existing field conditions after the completion of all construction activities.

CADD: Computer Assisted Design & Drafting.

Final Design Drawings: Final Design Drawings, also referred to as 100% Design Drawings, are drawings that have incorporated Client's comments or changes and are approved for construction or implementation.

Pre-Final Design Drawings: Pre-Final Design Drawings, also referred to as 90% Design Drawings, are drawings which are fully complete but are subject to Client's comments or changes.

Reviewers: Reviewers shall include the Lead Engineer or Lead Scientist responsible for technical input to the Design Drawing(s) being reviewed as well as other qualified engineers or scientists designated by the Project Manager and whose area(s) of expertise shall closely match the technical content of the Design Drawing being reviewed. As required, one or more of the Reviewers shall be professionally licensed.

4.0 RESPONSIBILITIES

The Design Engineering Manager shall be responsible for coordinating the preparation of all Design Drawings prepared by Brown & Root Environmental at a particular office location.

The Project Manager shall be responsible for scheduling the preparation of project-specific Design Drawings with the Design Engineering Manager and for ensuring that these Design Drawings meet all of the project requirements.

The Lead Engineer and Lead Scientist for a project shall be responsible for providing the necessary technical input in their respective discipline for the preparation of the project-related Design Drawings.

The CADD Designer/Operator shall be responsible for the preparation of Design Drawings.

Review of a particular Design Drawing shall be the responsibility of the Reviewers designated by the Project Manager.

5.0 PROCEDURES

5.1 Preparation

5.1.1 Standard Sizes

Standard sizes for Design Drawings shall be:

- B-Size: 11" x 17"
- C-Size: 18" x 24"
- D-Size: 24" x 36"
- E-Size: 30" x 42"
- F-Size: 36" x 42"

For sketches, 8 1/2" x 11" size may be used.

5.1.2 Designation

Except when required otherwise by the Client, Design Drawings shall be sequentially numbered as follows:

Designation Number: 0000 - 1A22

Where:

- 0000: Four-digit Brown & Root project number
- 1: Single-digit drawing technical type identification number (1: Title Sheet, 2: Site Plan & Arrangement, 3: Civil, 4: Architectural/Structural, 5: Process & Mechanical, and 6: Electrical)
- A: Single-letter drawing size designator as per above list
- 22: Two- or three-digit sequential drawing number for each technical type (i.e., 01, 02, 03, etc.)

Examples:

- For project number 5082, 24" x 36" General Arrangement Drawings shall be identified as: 5082 - 2D01, 5082 - 2D02, etc.

- For project number 1792, 18" x 24" Foundation Drawings shall be identified as 1792 - 3C01, 1792 - 3C02, etc.

When required, Client-provided designation shall be used for Design Drawings.

5.1.3 Voiding

When a Design Drawing is voided, the notation "**VOIDED**" shall be made in bold face across that drawing's tracing. The designation number of a voided Design Drawing shall not be reused. Design Drawings may, however, be totally redrawn using the same designation number if revision continuity is maintained. When a Design Drawing is extensively redrawn, the notation "**REVISED**" shall be made above the title block in addition to the change in revision indicator required by a normal drawing modification.

5.1.4 Quality

The line and lettering quality of Design Drawings shall be such that they may be reduced for reproduction in report sizes, and that they may be microfilmed to meet aperture card quality requirements as specified by Clients.

5.1.5 Scale

The scale of Site Plans shall be indicated by a bar scale. The scale of other Design Drawings, including Arrangement, Civil, Structural, and Mechanical, shall be indicated by a numerical scale designation in the title block. Special scales as may apply to details or sections of a particular Design Drawing shall be indicated on the drawing sheet immediately underneath the title of the detail or section.

- CAUTION -

All reduced-size Design Drawings shall be identified as such by a bold notation: **"REDUCED COPY - NOT TO SCALE"** on the drawing sheet.

5.1.6 Status Notation

The status of a Design Drawing being issued shall be indicated by a notation above the title block of the drawing sheet. Status notations shall include: **"PRELIMINARY"** or **"DRAFT," "CLIENT APPROVAL," "PREFINAL," "FINAL," "APPROVED FOR CONSTRUCTION"** (AFC), and **"AS BUILT"** as directed by the Project Manager. As required, Client-provided status notations may also be used.

5.1.7 Holds

A Design Drawing may be issued as AFC without having all parts of this drawing completed. In this case, hold areas shall be identified on the drawing sheet by encircling in a bubble fashion the part(s) which are not yet ready for construction.

5.2 Review

Design Drawings shall be reviewed in accordance with Standard Operating Procedure DE-4.0: Review Of Technical Documents.

5.3 Approval and Sign-off

Prior to initial issue for internal review (Rev. A), Design Drawings shall be initialed in the title block by the Project Manager and the appropriate Lead Engineer or Scientist and CADD Designer/Operator.

Following initial internal review and upon issue for Client's approval (Rev. B), Design Drawings shall be signed and dated in the title block by the Design Engineering Manager, the Project Manager, and the appropriate Lead Engineer or Scientist. In addition, the Design Engineering Manager shall initial and date the revision columns as may be required to document the internal approval of drawing revisions.

Also at that time, if required, the Design Drawings shall be stamped, signed, and dated by the appropriate licensed Reviewer.

Following Client's (and Third Party's as applicable) approval and upon issue for construction (Rev. 0), the same sign-offs as described above for the Client's approval issue shall be repeated.

Following issue for construction, subsequent revisions of the Design Drawings (Rev. 1, Rev. 2, etc.) shall be subject to the same sign-offs as the Client' s approval and construction issues.

5.4 Revisions

5.4.1 Revision Identification

Revisions to a Design Drawing shall be identified by encircling the revised part(s) of the drawing in a bubble fashion. Identification of a revision shall be particular to the issue of a Design Drawing for which this revision was made and shall not be carried to the next issue.

5.4.2 Revision Designator

Each revision issue of a Design Drawing shall be identified by a revision designator shall be shown in the lower right-hand corner of the title block of this drawing. Prior to issue for construction, the revision designator shall be sequential alphabetical (i.e., Rev. A, Rev. B, Rev. C, etc.). Starting with the issue for construction, the revision designator shall be sequential numerical (i.e., Rev. 0, Rev. 1, Rev. 2, etc.).

5.4.3 Revision Columns

Four (4) revision columns shall be provided next to the title block of each Design Drawing. From left to right these columns shall be to indicate the date on which the revision was made, to show the revision designator, to briefly describe the nature of the revision, and for initialing by the Design Engineering Manager. The information shown in the revision columns shall be carried from issued to issue.

5.4.4 Revision Review

Each revised Design Drawing shall be internally reviewed in accordance with Standard Operating Procedure DE-4.0: Review Of Technical Documents prior to issue. Revision review shall be performed by the same Reviewers as reviewed the Design Drawings before revision.

If a particular revision results in relatively insignificant changes to a Design Drawing, the revision review process may be waived at the option of the Project Manager. In this case, the Design Engineering Manager shall simply date and sign the revision column.

5.5 Client-specific Requirements

Clients sometimes impose Design Drawing formats and designation to be compatible with their drawing system. In those cases, the requirements listed in Sections 5.1 through 5.4 above shall be modified by the Project Manager on a project-specific basis to comply with the Client's requirements.

5.6 Records

The following documents shall be kept in the active project file:

- An original reproducible of the latest revision of each project Design Drawing
- The appropriate review documentation as specified in Standard Operating Procedure DE-4.0: Review of Technical Documents
- Record CADD disk(s) of all project Design Drawings

6.0 REFERENCES

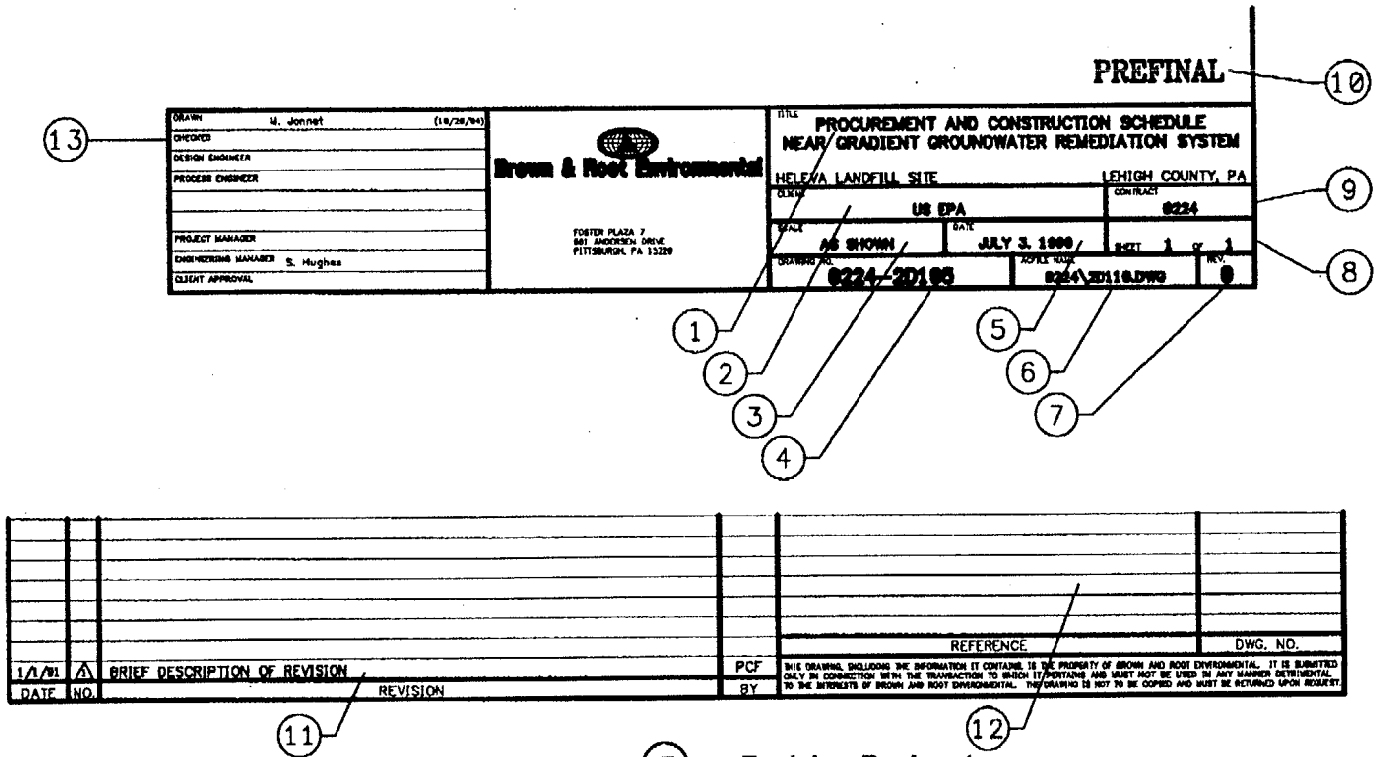
6.1 Standard Operating Procedure DE-4.0: Review Of Technical Documents

7.0 ATTACHMENTS

7.1 Exhibit 3-1: Standard Design Drawing Title Block and Revision Columns

EXHIBIT 3-1

STANDARD DESIGN DRAWING TITLE BLOCK AND REVISION COLUMSN (EXAMPLE)



1. Drawing Title
   Project Name/Description/Location
2. Client Name and Contract Number
3. Scale (see 5.1.5)
4. Drawing Number
5. Date of Issue
6. CADD File Name
7. Revision Designator
8. Sheet Number
9. Brown & Root Environmental Project Number
10. Status Notation
11. Revision Description and Approval
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13. Approvals

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4-3 TYPICAL DOCUMENT REVIEW LOG - FOLLOW-UP SHEET #2 10

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.

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.

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

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.

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:

- 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

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			

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			

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			

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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

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).

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."

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

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

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.

EXHIBIT 12-3

DESIGN CALCULATIONS INDEX

{PRIVATE }**Tetra Tech NUS, Inc.**

PROJECT NAME (1):			PROJECT NUM
CALCULATIONS No. (3)	FILING DATE (4)	SUBJECT (5)	AUTHOR (6)

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.

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: _____ Project No: _____

Reviewer: _____ Review Date: _____

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