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ENVITCO POPT QA PLAN

Envitco's Project-Specific QA/QC Plan
for the
FDF POPT Demonstration
of
Joule-Heated Vitrification

1754

Contract No. 98WO002240

FINAL POPT QA PLAN

September 18, 1998

Envitco Project 98703

- A - Conforms to the Subcontract Requirements
 - B - Minor Comment Incorporate and Resubmit
 - C - Revise and Resubmit
- Signature: [Signature] Date: 9/23/98

Project Manager – David M. Bennert

Principal Investigator – Robert A. Wilson

QA Management Representative – Douglas H. Davis

[Signature]

Robert A. Wilson

Douglas H. Davis

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Attachment 2 – Envitco FDF POPT Audit and Major Inspection Plan

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Attachment 5 – Envitco Quality Assurance Procedures (Provided with Draft B Submittal)

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1.0 INTRODUCTION

Envitco's Quality Management System (QMS) provides the quality oversight, management, and procedural detail and guidelines to ensure compliance with the quality requirements of the POPT project for FDF. Envitco's QMS provides an ISO 9001-compliant document hierarchy consisting of:

- A Quality Assurance Manual,
- Quality Assurance Procedures, plus
- Quality Assurance Instructions.

Envitco's QMS fully encompasses the eight (8) FDF-specified components of the POPT Quality Assurance Plan as detailed by Contract Number 98WO002240, Section C.3.2.2, and Appendix B. These are:

- Management Plan for the POPT QA System
- Training and Qualification for the POPT QA System
- Quality Improvement (Nonconformance Reporting and Resolution)
- Documents and Records Procedures for the POPT QA System
- Work Process Procedures for the POPT QA System
- Design
- Procurement Procedures for the POPT QA System
- Inspection and Testing Procedures for the POPT QA System

Attachment 1, "*Envitco POPT QA Plan Matrix*", provides a correlation between the eight (8) FDF-specified components of the QA Plan and the corporate Envitco Quality Management System.

2.0 QA COORDINATION DURING EXECUTION OF PROOF-OF-PRINCIPLE TESTING

Envitco will be executing the POPT Program with the participation of three (3) principle subcontractors. These subcontractors and their areas of responsibility are:

- Toledo Engineering Company (TECO), providing engineering and pre-conceptual design for the full-scale treatment process
- Clemson Environmental Technologies Laboratory (CETL), providing physical facilities, auxiliary equipment for the melter, technicians for bench and pilot testing, facility preparations, and general operations

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- Cogema Engineering / SGN, providing engineering oversight for the pre-conceptual design of the full-scale vitrification facility, especially nuclearization and radon control.
- Trigon Engineering Consultants, Inc. will provide offgas sampling services to the program. This includes Methods 1-8 and Method 29.
- Oxford Laboratories, Inc. will conduct the chemical analysis of the offgas samples as taken by Trigon. Oxford has been selected due to their experience in conducting the analytical methods required of the EPA sample analysis procedures, and has a working history with Trigon.

SGN/Cogema Engineering will operate under their own NQA 1 QA/QC plan. SGN's plan is of equal viability to Envitco's so that proper procedures and documentation will be carried out to provide quality data to FDF.

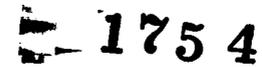
The Quality Assurance Program of CETL has been reviewed in light of the requirements of the POPT. Areas of the QA Program that were functional and sufficient will be conducted by CETL. Areas that were deemed insufficient will be managed and implemented by Envitco as described herein.

TECO does not have in place a documented QA/QC program comparable to Envitco. For this reason, Envitco will manage and implement the QA requirements applied to TECO's tasks. This includes the implementation of several QAIs and QAPs within the TECO system, as well as provisions for Envitco to conduct the necessary QA/QC on activities and deliverables.

Trigon will operate under their own QA/QC plan. Envitco has utilized the services of Trigon for prior demonstrations, including the Hanford LLW Melter demonstration.

Oxford Laboratories is an EPA-certified laboratory and will conduct the analyses under their own QA/QC plan.

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2.1 Applicable QA Requirements

The following QA Procedures and Instructions have been identified as applicable to the work being conducted in fulfillment of the POPT contract:

QUALITY ASSURANCE PROCEDURES

QAP 4.2.2	Graded Quality Assurance Application
QAP 4.3.1	Contract Review
QAP 4.4.1	Design Control
QAP 4.5.1	Document Preparation, Approval and Control
QAP 4.6.1	Purchasing
QAP 4.10.1	Test Performance and Control
QAP 4.11.1	Control of Measuring and Testing Equipment
QAP 4.12.1	Inspection, Test and Verification of Operating Status
QAP 4.13.1	Control of Nonconformances
QAP 4.14.1	Corrective and Preventive Action Requests
QAP 4.14.2	Stop Work Notices
QAP 4.18.1	Training

QUALITY ASSURANCE INSTRUCTIONS

QAI 4.5.001	Document Identification System
QAI 4.5.002	Filing and Storage of Quality Records
QAI 4.5.005	Maintenance of Long-Term Document Index
QAI 4.5.006	Maintenance of Long-Term Controlled Document Index
QAI 4.6.001	Approved Suppliers List
QAI 4.18.001	Job Descriptions
QAI 4.18.002	Envitco Training Matrix
QAI 4.18.003	Employee Training Matrix

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3.0 COMPONENTS OF THE PROJECT-SPECIFIC POPT QUALITY ASSURANCE PLAN

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3.1 Envitco's Graded Approach to Quality

Envitco's QMS applies a graded approach to quality based on assignment of a "QA Impact Level" with four (4) Levels, A through D. The level is assigned using seven (7) criteria as discussed in QAP 4.2.2 – *Graded Quality Assurance Application*.

Envitco has reviewed the requirements of the project in terms of two (2) primary tasks: a) POPT demonstration program, and b) pre-conceptual design information for the full-scale treatment facility. Based on the specific project requirements, Envitco has determined that both tasks of the program are an Impact Level C. The application of the QA system has been graded to meet that level, as defined by the selection and application of the QAP and QAI identified in Section 2.1 above.

3.2 Management Plan for the POPT Quality Assurance System

Figure 3.2-1, *Organization of Envitco: Subcontract Structure* presents the general organizational chart of Envitco and the relationship between Envitco and its subcontractors as it applies to the FDF POPT program.

Figure 3.2-2, *FDF POPT Project Organization: Functional Relationships* presents the subcontractors involved and their roles in the POPT project.

Figure 3.2-3, "*Organization of Envitco: FDF POPT Project*" presents specific responsible individuals and their corresponding roles.

Interface with FDF is through the Project Manager (D. Bennert), the QA Management Representative (D. Davis) and the Sales Manager (I.M. Williams).

The Project Manager has authorized the Principal Investigator (R. Wilson) to conduct direct communications with the Contract Technical Representative.

The position of reviewer has been included in the Project Specific structure. This Reviewer has been included to allow the Envitco QA Management Representative the ability to participate in the Glass Recipe Development and other activities during the POPT. The Reviewer will provide QA oversight to those activities where the QAMR is providing a direct participating role in the POPT activities. The Reviewer will also provide an independent assessment of the test program (test plan, demonstration, and results), and will report to the Project Manager and QA Management Representative. The use of a reviewer is in response to Lessons Learned on previous demonstration programs.

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The review function will address both specific activities as well as global program processes and results. The activities that will involve Doug Davis acting in a technical, participatory role include:

- a) surrogate validation (~September 21 – October 2, 1998)
- b) treatment recipe development (~September 21, 1998 – February 10, 1999)
- c) demonstration operations (~November 15 – December 20, 1998)

(NOTE: The schedule of the activities presents a range when these subtasks will be occurring, and does not imply a full-time effort over this range.)

These activities will be conducted by Envitco, with assistance from C. Wilson (Independent Contractor) and CETL technical staff.

Wilson and Davis will work cooperatively on the surrogate validation and treatment recipe development program. The independent review function will be applied specifically to these tasks through a review of the data and analysis, and through direct communications with Wilson and Davis.

Dr. Thomas J. Overcamp will serve as the independent reviewer for the POPT. Dr. Overcamp will provide input to the Project Manager and the QAMR (Davis) on any findings or discrepancies in the data or analysis, but expressly has instructions to report problems directly to Envitco's President, Scott Slater, in case of unresolved issues.

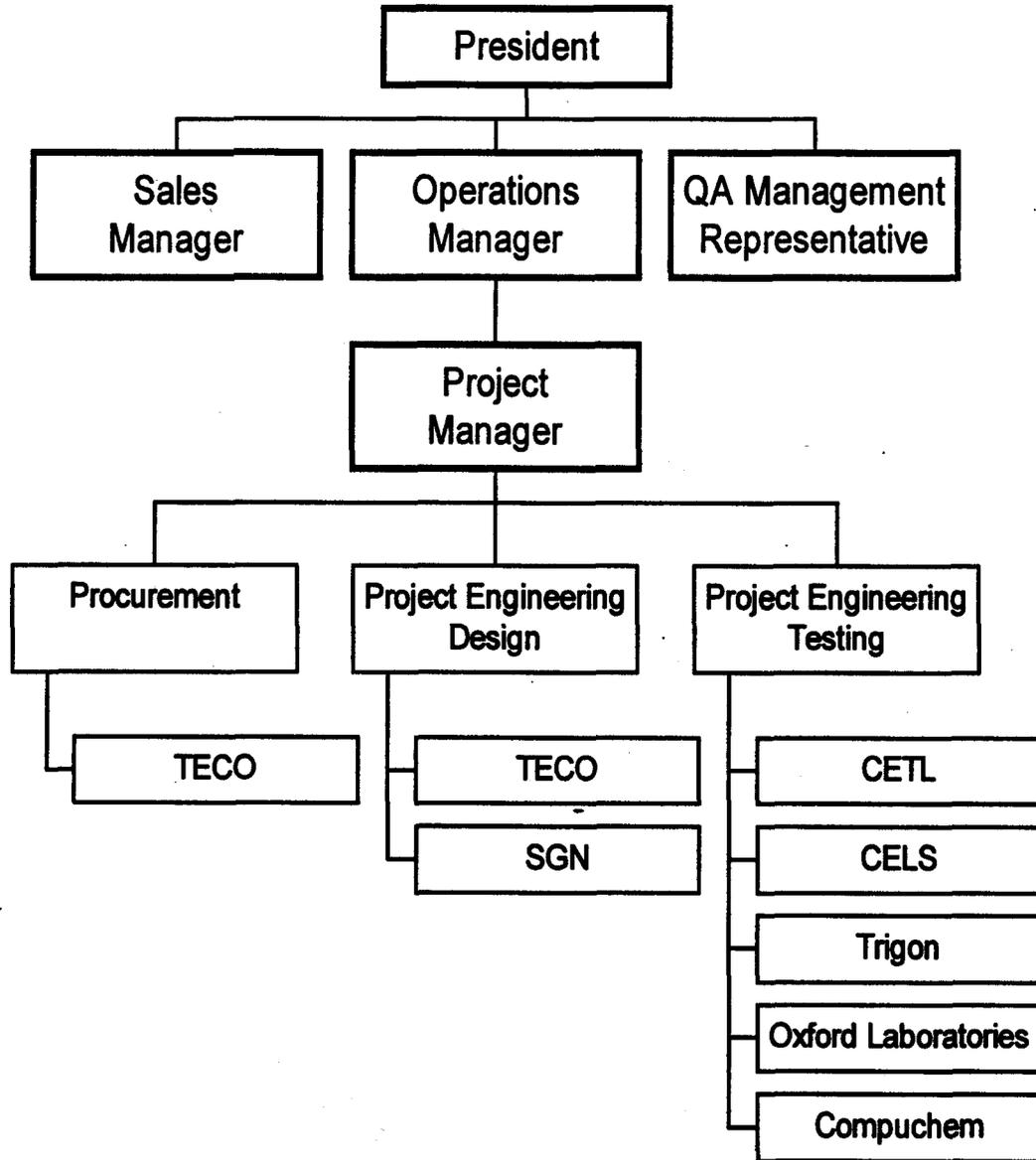
During the demonstration operations, the independent review will be conducted in a global manner. Dr. Overcamp will provide review of the test plan, test program, data and analysis. Dr. Overcamp will also review the testing program through observations of the activities conducted by the operations staff during the demonstration.

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Figure 3.2 – 1: Organization of Envitco

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Subcontract Structure

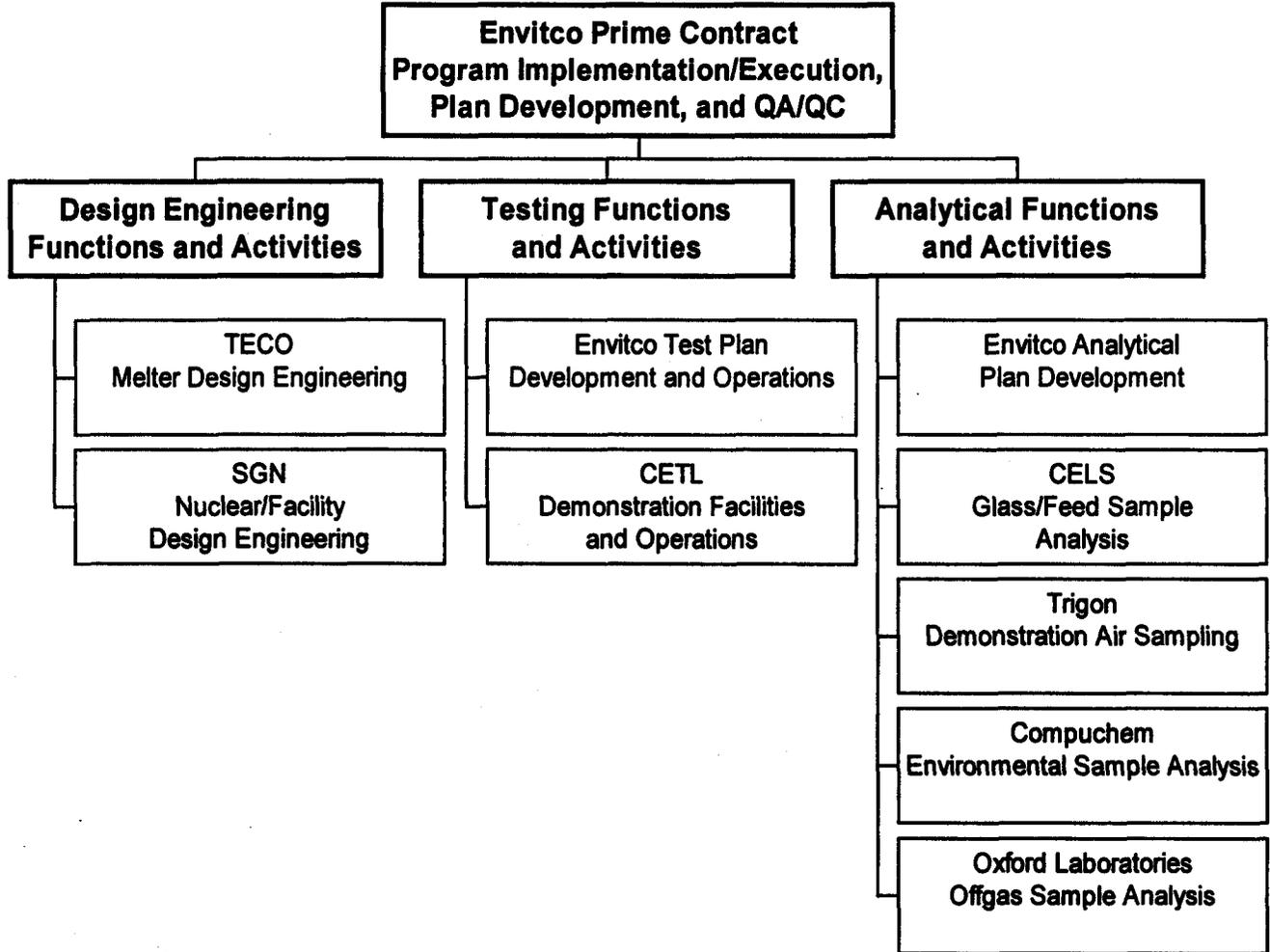


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Figure 3.2 – 2: FDF POPT Project Organization

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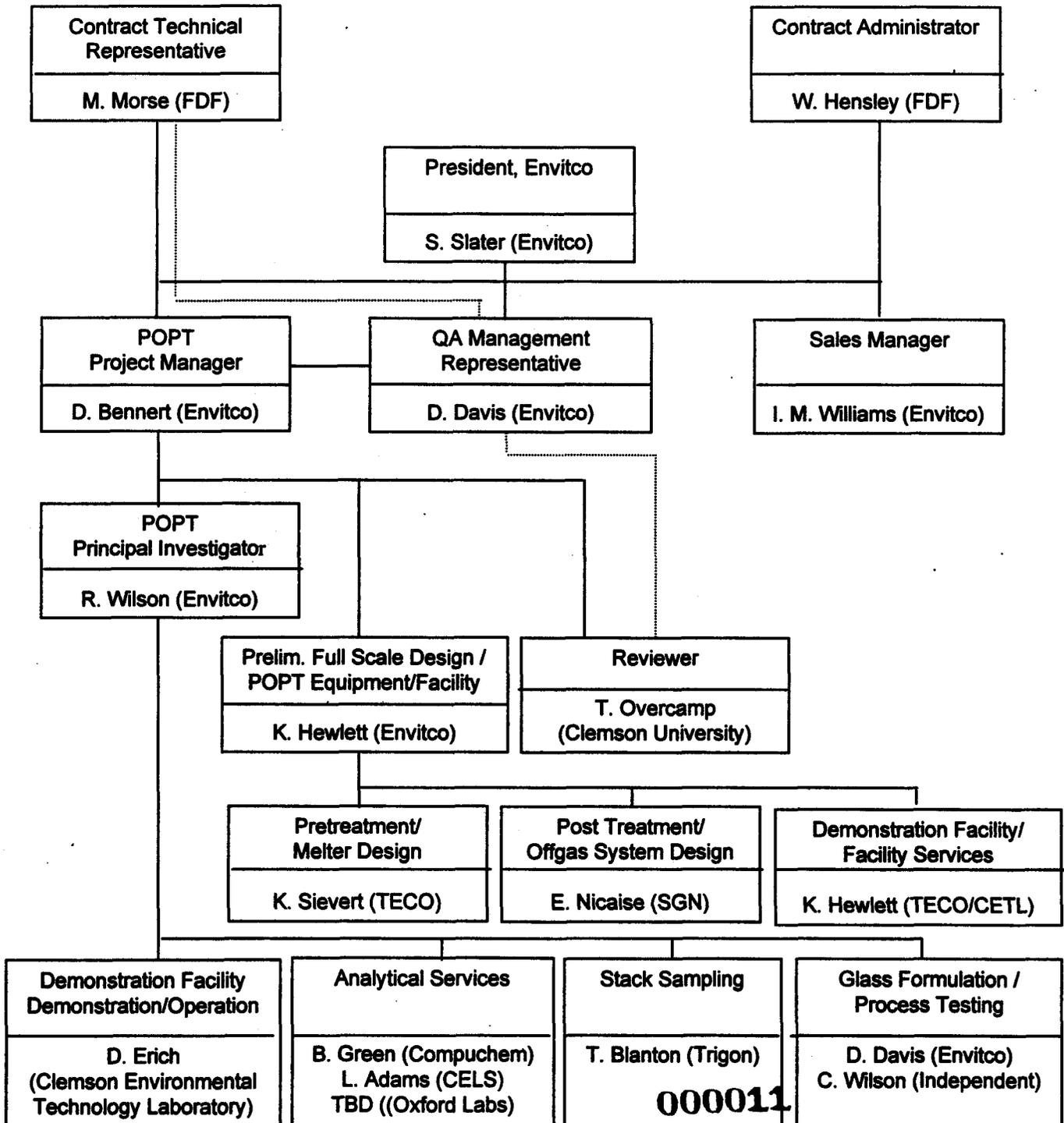
Functional Relationships



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Figure 3.2 – 3: Organization of Envitco

FDF POPT Project



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3.3 Training and Qualification for the POPT Quality Assurance System

The Envitco POPT Project Manager (D. Bennert) will identify project-specific training requirements of both Envitco and subcontractor personnel operating under Envitco's QA System during the POPT. The training requirements for the POPT operations will be identified to address the tasks specified in the Test Plan, which is currently under development, and will be available for inspection by FDF prior to the Treatment Recipe Development and the 72-hour demonstration portions of the POPT.

Training requirements for Envitco, CETL and TECO are identified in accordance with QAP 4.18.1, *Training*, and documented on the FDF POPT Training Matrix per QAI 4.18.002. Envitco will train and/or confirm training of those individuals prior to the POPT. Formal job descriptions addressing the activities tasked for the Fernald POPT are covered in QAI 4.18.001, and will be applied to personnel that will be brought in to assist in the demonstration program.

Envitco employee training records are maintained in accordance with QAI 4.18.003-*Training Record*. Envitco's subcontractors will also maintain training and qualification records for their personnel.

3.4 Quality Improvement (Nonconformance Identification and Resolution)

QAP 4.13.1 – *Control of Nonconformances* provides protocols to identify, document, and disposition nonconforming materials and parts. QAP 4.14.1 - *Corrective and Preventive Action* provides protocols to ensure a program of corrective action for major nonconformities. For identified nonconformities, either an NCR or a CPAR will be filed which may be initiated by any Envitco employee or agent. Follow-up is mandated until corrective action is complete and implemented, ensuring that conditions adversely affecting quality are resolved. QAP 4.14.2 - *Stop Work Notice* defines protocols of Stop Work Notices, the most severe procedure to prevent continuation of a nonconformity.

The requirements of Control of Non-Conformances (QAP 4.13.1), Corrective and Preventive Action (QAP 4.14.1) and Stop Work Notice (QAP 4.14.2) will flow down to CETL and TECO through implementation of the Envitco procedures. Envitco will train CETL and TECO personnel to confirm compliance.

FDF will be notified of any POPT-related NCR's generated during the program.

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QAP 4.10.1 - *Inspection and Testing* defines how we develop test criteria, inspection methods, and conduct inspections to identify nonconformances. **1754**

Inspection and testing requirements are documented through a) the Test Plan for the POPT, b) the Bill of Material as part of the procurement process, and c) the Approved Supplier List. Purchasing and the Approved Supplier List are addressed in Section 3.8 of this document.

CETL will be procuring commercial grade consumables in support of the POPT. No additional requirements for these procurements will be dictated by Envitco. CETL will procure in accordance with South Carolina State Procurement Codes as applied by Clemson University.

Inspection and testing requirements for TECO procurements will be generated by Envitco.

3.5 Documents and Records Procedures for the POPT QA System

The Project Manager is responsible for the control of project documents and records. QAP 4.5.1 - *Document Preparation, Approval, and Control* provides mechanisms to ensure that data and documents will be properly identified and controlled for later reference. QAI 4.5.001- *Document Identification System* provides a unique document number with searchable components, allowing easy retrieval from the hard copy file using an electronic database. QAI 4.5.005 - *Maintenance of a Document Index*, QAI 4.5.006 - *Maintenance of a Controlled Document Index*, and QAI 4.5.002 - *Filing and Storage of Quality Records* provide the protocols for control of the Quality Records of the POPT project.

TECO's Documents and Records Management will be conducted in accordance with their existing systems. Envitco will manage the design activities and, as such, will conduct design review activities, including documentation and records associated with the review. Envitco will maintain a copy of all TECO quality records under QAI 4.5.001, 4.5.005, and 4.5.002.

CETL will not be required to carry out records management, with the exception of the use of laboratory notebooks that will be utilized during the POPT program. Envitco will implement control of the notebooks through the existing CETL Standard Operating Procedure SOP 025, *Issuing and Archiving of Research Notebooks*. The research notebooks will be a quality record of the POPT and be controlled by Envitco through the procedures noted above. Controls will also be established for data collection on log sheets and other media.

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As defined in this document, Envitco will require CETL and TECO to perform certain quality-related activities utilizing Envitco QA Instructions or Procedures for certain quality-related activities. The procedures and instructions for the POPT will be compiled from Envitco QAI, CETL VITSOP's and newly generated procedures identified through the Test Plan, and managed in accordance with QAI 4.5 006, Maintenance of Controlled Document Index. The selected procedures and instructions (other than those specifically defined and assigned herein) will be identified in the Test Plan.

3.6 Work Process Procedures for the POPT Quality Assurance System

The individual Work Processes to be performed for Envitco's POPT will be detailed in the Test Plan. The Test Plan is currently under development, and will be available for inspection by FDF prior to the start of the Treatment Recipe Development and the 72-hour demonstration. QAPs and QAIs that are governing the activities of the POPT will be identified at that time.

Reference is made to Section 5.2 of Envitco's POPT Work Plan where the Standard Operating Procedures developed by CETL are identified. If required for the POPT by the Test Plan, these documents will be adapted (as necessary) and integrated into the Controlled Document system through QAI 4.5.006.

POPT QA Instructions and Procedures will be compiled from Envitco QAI, CETL VITSOP's, and newly generated procedures identified through the Test Plan.

3.7 Design

Section 4.1 of the QAM and QAP 4.4.1 – *Design Control* provide for protocols for the design process. The number and depth of reviews and verification procedures will vary based on the Graded QA Impact Level assigned as discussed in QAP 4.2.2 – *Graded Quality Assurance Application*.

The design function will be an integration of Envitco, TECO and SGN work. Envitco will manage the design work.

TECO design activities are reviewed by Envitco weekly through the formal Design Review Meetings. The Design Review Meetings take two (2) forms, addressing a) the design concept and approach, technical issues and system analysis, and b) print review addressing design details, construction details, and 'form, fit and function' of the construction and fabrication details. This approach is applied to all TECO design activities and is documented through Meeting Minutes. Additional meetings will be held

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at the request of Envitco or TECO to address questions or concerns related to the design.

SGN design activities will be managed through their own QA System, though Envitco will conduct formal review of the SGN design deliverables prior to development of the final report.

CETL will not be providing any design data to the POPT.

3.8 Procurement Procedures for the POPT Quality Assurance System

The Envitco Quality Management System provides for the control of procurement for the POPT project through two (2) distinct elements in our Quality Management System. Procurement activities are covered under QAM 4.3/QAP 4.3.1 - Contract Review, and QAM 4.6/QAP 4.6.1 – Purchasing.

Our Quality Management System defines selection of suppliers, as described in QAI 4.6.002- *Supplier Selection and Rating Performance*. Envitco maintains an Approved Supplier Listing as specified by our Quality Assurance Work Instructions QAI 4.6.001.

Procurements will be processed through TECO's procurement services, though all procurement specifications, inspection requirements and other QA requirements are defined and entered by Envitco. This data appears on the Purchase Order as a condition or specification of the order.

The following items have been either a) specified by FDF with particular quality standards identified in the contract, or b) determined by Envitco to require oversight due to their impact on data quality. These items are:

- 1) **Surrogate Raw Materials:** Specifications are provided to the vendor in accordance with the specifications in the POPT contract. Quality will be confirmed through Certificates of Analysis.
- 2) **Offgas Sampling:** Offgas sampling will be contracted to Trigon, who has conducted work for Envitco in the past and is identified as an Approved Supplier.
- 3) **Chemical Analysis:** Data that will be reported will be contracted to FDF approved laboratories or CELS-Corning Laboratory Services. Specifications for the analyses will be developed jointly with the laboratory and will be specified in the Purchase Order as a condition of purchase.

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- 4) **Thermocouples and Instrumentation:** All devices that are purchased to generate reportable data for the demonstration, or provide a fundamental controlling function to the system will be purchased with certifications. Thermocouples will be purchased with certified wire sets or calibrations (as with other devices). This will be defined further in the test plan.
- 5) **Melter Refurbishment Components:** The refractory for refurbishment of the melter in preparation for the demonstration will require inspection in accordance with the specifications defined in the Purchase Order.

3.9 Inspection and Testing Procedures for POPT Quality Assurance System**3.9.1 General**

Overall guidance is drawn from the QAM Section on Purchasing and the corresponding QAP-4.6.1 – *Purchasing*. Also utilized are QAP 4.10.1 – *Test Performance and Control*; QAP 4.11.1 – *Control of Measuring and Test Equipment*, and QAP 4.12.1- *Inspection, Test, and Operating Status*.

Inspection and test plans will be detailed in the Test Plan, and will address:

- Characteristics to be measured or evaluated;
- The acceptance criteria and allowable tolerances for inspections;
- The method of testing;
- Precision and accuracy required for measurements;
- Calibration requirements; and
- Equipment list requiring calibration and level of calibration.

Specifications will be developed jointly with the suppliers of analytical and testing services (Trigon, CELS-Corning Laboratory Services, Compuchem) to identify the calibration and data requirements necessary to ensure data accuracy. Trigon will perform the offgas sampling in accordance with EPA standards, which include the specifications for calibrations and verification of results. The suppliers will operate within their existing QA systems, though specifications will be identified in the Purchase Orders for each vendor to supply sufficient, appropriate information that demonstrates the QA control for their activities.

Inspection Plans for surrogate compounds will be limited to the verification of Certificate of Analysis (COA) data against the compound specifications

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ordered, and the specifications of the contract. FDF will provide review and approval of the compound COA data.

As noted above, instrumentation that requires Envitco oversight due to its impact on data quality is limited to thermocouples, electronic pressure transducers, and electronic flow meters. The specific devices (specific to data collection point) will be identified in the Test Plan, and the range and accuracy requirements established. New devices will be purchased with calibrations or certifications. Existing devices will be checked for calibration validity, and recalibrated as necessary.

3.9.2 Schedule of POPT QA Activities**3.9.2.1 Introduction**

QA Activities that will be carried out specific to the POPT demonstration include:

- Project-Specific Audits
- Project-Specific Inspections and Testing

3.9.2.2 Project-Specific Audits

QA assistance in controlling the POPT project and assuring its level of quality is rendered through selected Project-Specific Audits. The schedule of Project-Specific Audits has been established to confirm some of the more critical activities being carried out as part of the POPT project. The Project-Specific Audits will be conducted by the QA staff.

The activity categories used are those presented in Schedule 13.0-1 of the Envitco Work Plan for the POPT.

**3.9.2.2.1 *Pre-Performance Activities Phase –
6/4/98 – 9/11/98***

Audited functions for this initial phase of the POPT work will be:

- QAP 4.6.1- *Purchasing*

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6/4/98 – 2/19/99**1754**

Work performed during this phase of the project includes surrogate preparation and validation, slurry development, and glass formula development. Audited functions of the Treatment Recipe Development activities will be:

- QAP 4.5.1 - *Document and Data Control*
- QAP 4.10.1- *Inspection and Testing*

3.9.2.2.3 72-Hour Demonstration of Process Phase
11/2/98 – 2/8/99

For the work conducted during the 72-Hour Demonstration Phase, audited areas will be:

- QAP 4.11.1 - *Control of Inspection, Measuring and Test Equipment*
- QAP 4.14.1 - *Corrective and Preventive Action*

3.9.2.2.4 Design of Full-Scale Remediation Facility
10/19/98 – 3/12/99

Key components of this activity and associated audit functions planned will be:

- Pre-Conceptual Process Design
– QAP 4.4.1 - *Design - Function Validation*

3.9.2.3 Project-Specific Inspections and Testing

QA assistance in controlling the POPT project is rendered by designation of inspection points in the project work. Some of these inspection points and testing sequences are specifically called out in the POPT Project Work Plan. Specific inspections related to procurements are defined in the Test Plan and Purchase Orders.

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The data from these inspections and tests will demonstrate the fulfillment of Envitco's and/or the product or process requirements.

3.9.2.3.1 Inspections During Pre-Performance Activities
Purchased Components or Services

surrogate compounds	approximately September 14, 1998
Refractories	approximately October 8, 1998
control/power upgrades	approximately October 14, 1998
CETL facility preparations	Monthly
TECO design activities	Weekly

3.9.2.3.2 Inspections During Performance Activities
Lab-Scale Development

Hold point-surrogate validation	approximately September 28, 1998
Hold point-batch sheet verification	approximately October 8, 1998
Hold point- recipe performance verification	approximately October 14, 1998

Melter Optimization – Pre-Demonstration

Hold point-established steady-state	approximately December 7, 1998
Hold point-readiness confirmation	approximately December 1, 1998
Verification of calibrations	approximately November 30, 1998

Seventy-two (72) Hour POPT Demonstration Melter Run

- Active QA reviews will be conducted during the demonstration run to verify correct application of instructions
- Active QA reviews will be conducted during the demonstration run to verify correct use of log sheets, glass and offgas sampling
- Operational data will be reviewed to confirm testing status

Final Report Inspection Activities

- Evaluation of the report deliverables against contract requirement
- Confirmation of Design Reviews of full-scale process development

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**Attachment 1
 Envitco Proof-of-Principle Test Quality Assurance Plan
 QA PLAN MATRIX**

Test Plan Components from Envitco Proposal	Envitco QAM	Envitco QAP	Envitco QAI/Forms	FDF POPT Project-specific QAI's, QA Plan, Forms, Figures, etc.
E.2.1 Graded Approach to Quality	3.0 Graded Approach			Section 3.1
E.2.2 Management Plan	4.1 Management Responsibility	4.1 Management Meetings QAP 4.18.1	Review Meeting/Agenda QAI 4.1.001 – form	Section 3.2 Envitco POPT Organization Figures 3.2-1 & 3.2.2
E.2.3 Training and Qualifications	4.18 Training	4.18 Training	QAI 4.18.001 Job Descriptions QAI 4.18.002 Training Matrix QAI 4.18.003 Training Record	Section 3.3 QAI 4.18.003 Training Records
E.2.4 Quality Improvement (Nonconformance)	4.1 Management Responsibility 4.10 Inspection and Testing 4.13 Control of Nonconforming Product 4.14 Corrective and Preventive Action 4.14.2 Stop Work Notice	4.1 Management Responsibility 4.10 Inspection and Testing 4.13 Control of Nonconforming Product 4.14 Corrective and Preventive Action 4.14.2 Stop Work Notice		Section 3.4

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**Attachment 1
Envitco Proof-of-Principle Test Quality Assurance Plan
QA PLAN MATRIX**

Test Plan Components from Envitco Proposal	Envitco QAM	Envitco QAP	Envitco QAI/Forms	FDF POPT Project-specific QAI's, QA Plan, Forms, Figures, etc.
E.2.5 Documents	4.5 Document and Data Control	4.5 Document and Data Control	QAI 4.5.001 Document Control Matrix QAI 4.5.002 QAI Development QAI 4.5.003 Document and Record Numbering System	Section 3.5 QAI 4.5.003.
E.2.5 Records	4.16 Control of Quality Records	4.16 Control of Quality Records	4.5.007 Records Master List	Section 3.5 QAI 4.5.003
E.2.6 Work Process Procedures	4.9 Process Control 4.8 Product Identification and Traceability 4.15 Handling, Storage, Packaging, Preservation and Delivery	4.9 Process Control 4.15 Handling, Storage, Packaging, Preservation and Delivery	4.15.001 Level A-D Requirements	Section 3.6 Specified Instructions are under Development
E.2.7 Design	4.4 Design	4.4 Design		Section 3.7

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**Attachment 1
 Envitco Proof-of-Principle Test Quality Assurance Plan
 QA PLAN MATRIX**

Test Plan Components from Envitco Proposal	Envitco QAM	Envitco QAP	Envitco QAI/Forms	FDF POPT Project-specific QAI's, QA Plan, Forms, Figures, etc.
E.2.8 Procurement	4.3 Contract Review 4.6 Purchasing	4.3 Contract Review 4.6 Purchasing	QAI 4.6.001 Approved Supplier List (ASL) QAI 4.6.002 Supplier Selection and Rating/Performance	Section 3.8
E.2.9 Inspection and Testing	4.10 Inspection and Testing 4.11 Control of Inspection, Measuring and Test Equipment 4.12 Inspection and Test Status	4.10 Inspection and Testing 4.11 Control of Inspection, Measuring and Test Equipment 4.12 Inspection and Test Status		Section 3.9

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