44 Shelter Rock Road
Danbury, CT 06810
Tele:(203) 796-5000

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25 Years of Excellence

July 27, 1999

Refer to ES- 1690

Mr. David Locey
Project Manager
New York State Department of Environmental Conservation, Region 9
270 Michigan Avenue
Buffalo, New York 14203-2999

Subject: Operation and Maintenance Manual (January 1998)
Union Road Site, Erie County, Cheektowaga, NY
Inactive Hazardous Waste Disposal Site No. 915128

Ref: Letter dated March 18, 1999 from David Locey (NYSDEC) to Mark Cambra (NES).

Dear Mr. Locey:

As requested in Item 4 of the referenced letter, enclosed please find two (2) copies of Sections K, L, M, and N of Volume III of the Operation and Maintenance Manual for the subject site. Please replace the original sections of this document, as appropriate.

In regard to Items 1, 2, and 3, NES is working with our client's legal counsel on the most appropriate method of addressing each item.

If you have any questions regarding this report, please call me at 203-796-5305.

Sincerely,

SCIENTECH NES, INC.

Mark Cambra

Mark Cambra, P.E.
Project Manager
Union Road Remediation Project

Enclosures: Sections K, L, M, and N of Volume III of the Operation and Maintenance Manual

cc: S. Mittal: Project Manager, NYSDEC, Central Office
M. Rivara: Project Manager, Bureau of Environmental Exposure Investigation
M. Doster: Regional Director, NYSDEC, Region 9
M. Cioff
L. Lackner
J. Periconi
R. McPeak

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OPERATIONS AND MAINTENANCE PLAN

VOLUME III -- SITE SPECIFIC STANDARD OPERATING PROCEDURES (SOPS)

UNION ROAD SITE
333 LOSSON ROAD
CHEEKTOWAGA, NEW YORK 14227
SITE REGISTRY NO. 915128

PREPARED FOR:

AMERICAN PREMIER UNDERWRITERS, INC.
(FORMERLY THE PENN CENTRAL CORPORATION)
ONE EAST FOURTH STREET
CINCINNATI, OHIO 45202

PREPARED BY:

NES, INC.

NES, Inc. 44 Shelter Rock Road, Danbury, CT 06810

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Fax: (203) 792-3168

OPERATIONS AND MAINTENANCE PLAN
UNION ROAD SITE, 333 LOSSON ROAD
CHEEKTOWAGA, NEW YORK 14227
SITE REGISTRY NO. 915128

VOLUME III -- SITE SPECIFIC STANDARD OPERATING PROCEDURES (SOPS)

OPERATIONS AND MAINTENANCE PLAN

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ONE EAST FOURTH STREET
CINCINNATI, OHIO 45202

PREPARED BY:

NES, INC.

DOCUMENT AUTHORIZATION FORM

Operations and Maintenance Plan
Volume III -- Site Specific Standard
Operating Procedures (SOPs)

Union Road Site, 333 Losson Road
Cheektowaga, New York
Site Registry No. 915128

Prepared for:
American Premier Underwriters, Inc.
(Formerly The Penn Central Corporation)
One East Fourth Street
Cincinnati, Ohio 45202

Prepared by:

NES, Inc.
44 Shelter Rock Road, Danbury, CT 06810

Authorizations:

James M. Pietrzak — 1/6/98

James M. Pietrzak, P.E. — **Date**
Senior Environmental Engineer
Environmental Engineering and Remediation

Mark Cambra — 1/8/98

Mark Cambra, P.E. — **Date**
Section Manager
Environmental Engineering and Remediation

Robert E. McPeak — 1/9/98

Robert E. McPeak, Jr., P.E. — **Date**
Senior Department Manager
Environmental Engineering and Remediation

OPERATIONS AND MAINTENANCE PLAN VOLUME III
SITE SPECIFIC STANDARD OPERATING PROCEDURES (SOPS)

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X. Union Road Final Remedial Action Work Plan, Dated June 18, 1993.	--
Y. Union Road Remedial Design Report (100% Submission).	82A8461
Z. Final Technical Specifications (100% Submission)	82A8462
AA. Final Engineering Report.	82A8463

A. SITE SPECIFIC QA/QC PLAN FOR OPERATION, MAINTENANCE, AND MONITORING ACTIVITIES

13. QUALITY ASSURANCE PROGRAM PLAN

13.1 SCOPE

This Quality Assurance Program Plan (QAPP) describes the organization, document approval, and Construction Quality Assurance (CQA) aspects for the construction and implementation phases of the Union Road Project.

This QAPP has been produced to assist site personnel, contractors and other project personnel, and is in no way to preclude the construction specifications or work plan set forth for this site.

This QAPP defines the policies and practices employed by NES to facilitate the proper installation and maintenance of all design procedures set forth in the Remedial Design Work Plan and approved by the NYSDEC. All work performed by contractors and their agents of American Premier Underwriters, Inc. are subject to the provisions and guidelines set forth herein. All submittals, reports, data tables, correspondence, calculations and drawings generated by NES for the implementation phase of this project shall be reviewed in accordance with these procedures.

Parts of this section has been modeled after the USEPA, Office of Solid Waste and Emergency Response technical guidance document Construction Quality for Hazardous Waste Land Disposal Facilities.

13.2 RESPONSIBILITY AND AUTHORITY

13.2.1 Organizations Involved in CQA

The project organizational structure is outlined in Section 3.2.2 along with personnel qualifications and responsibilities.

13.2.1.1 Permitting Agency - NYSDEC

It is the responsibility of the NYSDEC, Division of Hazardous Waste Remediation to review the *Remedial Design Report* (including this QAPP) and *Technical Specifications* for compliance with New York State regulations. The NYSDEC has the responsibility and authority to review and accept or reject any design revisions or requests for variance that are submitted by APU or NES after approval of the *Remedial Design Report* and *Technical Specifications*. The NYSDEC also has the responsibility and authority to review all CQA documentation during or after facility construction to confirm that the approved CQA plan was followed and that the facility was constructed as specified in the design (USEPA, 1986).

The review of the *Remedial Design Report* and *Technical Specifications* by the NYSDEC does not relieve the Facility Operator of the responsibility for compliance with all applicable Federal, State and local regulations.

13.2.1.2 Facility Operator - APU

APU is ultimately responsible for the design, construction, and operation of the landfill facility. The direct implementation of these criteria will be carried out by NES as the Site Inspector/Engineer and General Contractor. This responsibility includes complying with the requirements of the NYSDEC, by the submission of CQA documentation, that the facility was constructed as specified in the design.

13.2.1.3 Site Inspector/Engineer - NES

The primary responsibility of NES as the Site Inspector/Engineer is to construct the landfill facility to fulfill the operational and performance requirements of the NYSDEC. Additionally, NES is responsible for implementing corrective measures when CQA personnel detect deviation from the approved design or specifications.

13.2.1.4 CQA Personnel - NES Site Inspector

The Site Inspector/Engineer has the responsibility for all aspects of QAPP implementation in the field. The Site Inspector/Engineer reports directly to the NES Project Manager who has the ultimate responsibility for quality management and the implementation of the QAPP.

General responsibilities of the Site Inspector/Engineer are outlined in Section 3.2.2; specific responsibilities include (USEPA, 1986):

- Scheduling and coordinating inspection activities;
- Confirming that regular calibration of testing equipment is properly conducted and recorded;
- Confirming that the test data are accurately recorded and maintained;
- Verifying that the raw data are properly recorded, validated, reduced, summarized and interpreted.
- Providing reports on inspection results including:
  - Review and interpretation of all data sheets and reports;
  - Identification of work in need of special testing or inspection; and
  - Rejection of defective work and verification that corrective measures are implemented.
- Performing independent site inspection of the work in progress to assess compliance with the facility design and specifications; and
- Verifying that the equipment used in testing meets the test requirements and that the test are conducted according to standardized procedures.

13.2.1.5 General Contractor - NES

It is the responsibility of the General contractor to construct the landfill facility in strict accordance with the design and specifications (USEPA, 1986).

13.2.2 Personnel Qualifications

Other individuals involved in the project have been outlined in Section 3.2.2, which includes the overall organizational structure, requirements for fulfilling the position and responsibilities and authorities.

13.2.3 Project Meetings

Periodic meetings held before and during the life of the construction project will enhance communication between all personnel and agencies involved in the project. Technical Specification Section 01200 PROJECT MEETINGS outlines the specific types of meetings and procedures for establishing meeting schedules and locations. The two specific types of meetings outlined in the Technical Specifications are detailed below.

13.2.3.1 Preconstruction Meeting

The Preconstruction Meeting will be held within twenty (20) days after the effective date of the Contract Agreement. Specific agenda items are outlined in the Technical Specifications. In general, the Preconstruction Meeting is held to:

- establish communication lines, responsibility and organization of the construction phase;
- review construction schedules and contract documents; and
- institute procedures for approval of shop drawings and field decisions.

13.2.3.2 Project Meetings

Project Meetings will be held twice per month and be attended by representatives of the NYSDEC, the Site Superintendent, the Site Inspector/Engineer, the Health and Safety Officer and any subcontractors or material suppliers as requested by the Site Inspector/Engineer. In general, Progress Meetings will be held to discuss work progress, project schedules and any changes that may affect the design or schedule.

13.2.3.3 Progress Meetings

Progress Meetings will be held daily prior to the commencement of work. Attendees shall include the Site Superintendent, the Site Inspector/Engineer and the Health and Safety Officer. Progress Meetings will be held to (USEPA, 1986):

- review the previous and present day's activities;
- identify the subcontractor's personnel and equipment assignments for the day; and
- discuss any potential construction problems.

13.3 GENERAL INSPECTION GUIDELINES

13.3.1 Equipment Calibration

Field equipment to be used at the site will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the manufacturers' specifications. Copies of the calibration and operation instructions from the manufacturer will be kept with the instrument when it is used at the site. It is the Site Inspector/Engineer's responsibility to be familiar with these instructions.

Equipment to be used in the field during field sampling will be examined daily to certify that it is in good operating condition. This includes checking the manufacturers operating manual to ensure that all maintenance requirements are being observed. Preventative maintenance will be conducted for equipment to ensure the accuracy of measurement systems. Key spare parts for each apparatus will be available.

13.3.2 Sampling

All laboratories to be used for analysis of chemical samples shall be certified and approved to conduct environmental analyses by the New York State Department of Health (NYSDOH) under the Environmental Laboratory Program (ELAP). All chemical analyses will be conducted in accordance with NYSDEC's Analytical Services Protocol (ASP).

All field sampling, handling, storage and delivery shall be performed in accordance with appropriate NYSDEC protocols and NES Standard Operating Procedures.

13.4 INSPECTION ACTIVITIES

This section addresses the inspection activities necessary to ensure that the facility has been constructed to meet or exceed all design criteria, plans, and specifications. The most vital inspection activity is continuous visual observation of the installation/construction process. Visual observation will dictate frequency and location of additional inspection activities such as physical testing. All inspection activities, including visual observations, shall be properly documented as specified in Section 13.5 DOCUMENTATION.

The following subsections outline the major components of the landfill design. Each section notes the applicable Technical Specification section, regulation and Standard Operating Procedure and outlines the general inspection and testing procedures. Testing frequencies and references are listed in the Technical Specifications.

13.4.1 Excavation of Contaminated Material

02221 Excavating, Trenching and Backfilling

Contaminated soil and sediments is to be excavated from the Marsh Area, Slate Bottom Creek, and Deer Lik Creek for consolidation into the landfill. Verification that all contaminated material has been removed is a critical inspection activity for this construction phase. Verification will include:

- Visual inspection of the Slate Bottom Creek and Deer Lik Creek excavation to ensure removal of all contaminated materials encountered; and
- Soil sampling on a 50 foot grid to guarantee removal of all contaminated material within the Marsh Area outside the capping limits according to the following site soil cleanup criteria (see RI report Section 4):
  - Total Petroleum Hydrocarbons (TPH) $\leq$ 100 mg/kg
  - Lead $\leq$ 250 mg/kg

  For samples above the preceeding criteria, an area half the distance to the next sample and one foot in depth will be excavated, resampled and reanalyzed.

13.4.2 Foundation

02015 Adjustment of Existing Structures
02221 Excavating, Trenching and Backfilling
02242 Stabilization of Unsuitable Material

Unsuitable foundation materials are to be excavated to reach competent suitable material specified for the landfill foundation. Inspection activities will include:

- Visual observations of soil material and measurements to ensure adequate removal of unsuitable foundation material as specified in the design;
- Visual observation of soil compaction to detect soft areas or inadequate compaction; and
- Soil tests to guarantee adequate compaction of foundation material including:
  - Particle Size Distribution
  - Maximum Density
  - Compaction Tests
  - Strength Test
  - Percent of Organics

13.4.3 Slurry Wall

02454 Slurry Trench Cutoff Wall

The slurry wall is designed to contain the landfill material and leachate by tying into the existing clay layer. A trench will be excavated to provide adequate width and depth for keying the slurry wall into acceptable underlying material. The soil properties of the slurry wall are critical to its efficacy, and accordingly, adequate soil testing must be performed. Inspection activities will include:

- Visual observation of the underlying material to ensure the slurry wall is keyed a minimum of 3 feet into acceptable material;
- Measurement of excavation dimensions; and
- Soil tests on a per unit volume to ensure specified properties are met including:
  - Bentonite swelling capability
  - Permeability test
  - Colloidal content
  - pH
  - Viscosity
  - Unit Weight
  - Percent Bentonite content
  - Filtrate loss test
  - Slump test

13.4.4 Gas Collection/Migration Layer

02440 Gas Collection/Migration System

The first layer placed on top of the select fill foundation material is the gas collection/migration layer, designed to prevent the accumulation of gases beneath the cap. The gas collection/migration layer consists of a sand layer with PVC gas collection piping covered by a geotextile fabric. Inspection activities include:

- Inspection of manufacturers specification sheets and certificates for geotextile fabrics;
- Visual observation of sand compaction to detect soft areas or inadequate compaction; and
- Soil tests on a per unit volume to guarantee adequate soil properties including:
  - Particle Size Distribution
  - Maximum Density
  - Permeability
  - Compaction Tests

13.4.5 Low Permeability Soil Barrier

02452 Clay Liner

The low permeability soil barrier provides a base for the flexible membrane barrier subcomponent of the final cover system and provides long-term minimization of liquid infiltration. It serves as a secondary barrier to infiltration in case the flexible membrane barrier fails (USEPA, 1986). The low permeability soil barrier is placed on top of the gas collection/migration system with a geotextile membrane separating the two layers to prevent transportation of fines into the gas collection/migration system.

- Visual observation of clay placement and compaction to detect soft areas or inadequate compaction; and
- Soil tests on a per unit volume to guarantee adequate soil properties including:
  - Particle Size Distribution
  - Liquid Limit, Plastic Limit Plasticity Index
  - Compaction Tests
  - Permeability of the clay liner
  - Specific Gravity of Soils
  - Shrinkage factor of Soils
  - Maximum Density
  - Strength Test

13.4.6 Flexible Membrane Liner (FML)

02450 High Density Polyethylene (HDPE) Liner

The FML is designed to prevent infiltration of precipitation and minimize transfer of water and liquids through the cover and into the landfill material. The FML is installed over the natural clay liner and seamed to eliminate the possibility for liquid infiltration. The underlying layer must be smooth and free of objects that could compromise the integrity or efficacy of the FML.

Testing procedures and requirements are outlined in Table 1 of Technical Specification Section 02450 and include:

- Thickness
- Lowest Ind. Reading
- Density
- Melt Flow Index (Max.)
- Carbon Black:
- Content
- Dispersion
- Tensile Properties
- Tear Resistance
- Resistance To Soil Burial Percent Change In Original Value
- Tensile Strength At Break
- Puncture Resistance
- Dimensional Stability (Max.)

Seaming:

- Shear Strength
- Peel Adhesion (Fusion)
- Peel Adhesion (Extrusion)

13.4.7 Drainage Layer

02710 Subdrainage Systems

The drainage layer is located above the FML and designed to prevent the accumulation of water on the surface of the HDPE liner and direct any recharge to the drainage channels. The sand layer is placed directly over the FML and therefore attention should be given to the initial placement of the sand material so as to avoid damaging the HDPE liner. Geotextile fabric is placed on top of the sand layer. Inspection activities include:

- Visual observation of sand placement and compaction to detect soft areas or inadequate compaction; and
- Soil tests on a per unit volume to guarantee adequate soil properties including:
  - Particle Size Distribution
  - Maximum Density
  - Permeability
  - Compaction Tests
- Filter fabric (geotextile fabric) for use in subdrainage systems shall meet the requirements of Technical Specifications Section 02710 Table 1.

13.4.8 Subsoil and Topsoil Layer

02221 Excavating, Trenching and Backfilling, Subsection 2.01.B
02483 Turf Establishment and Surface Restoration

The subsoil and topsoil layers are the uppermost components of the landfill designed to protect the underlying layers from environmental damage. These layers are placed over a geotextile fabric and the subdrainage system. Inspection activities include:

- Visual observation of the placement procedure to ensure uniform thickness;
- Inspection of manufacturers specifications and certifications;
- Visual observation of compaction to detect soft areas or inadequate compaction; and
- Soil tests on a per unit volume to guarantee adequate soil properties including:
  - pH
  - Percent of Organics
  - Sieve Size

13.4.9 Stream Work

02275 Bank and Channel Protection

Stream work includes the excavation of material from the stream banks and placement of Gabion Baskets and Reno Mattresses for stream protection and stabilization. Depth of excavation is minimal (6 to 12 inches) and should be observed to prevent over excavation. Inspection activities include:

- Visual observation and measurement of excavation limits;

- Visual observation of the installation of Gabion Baskets and Reno Mattresses to ensure proper placement as specified in the design; and
- Inspection of manufactures specifications and certifications.

13.4.10 Well Installation/Decommissioning

02050 Monitoring Well Abandonment
02170 Well Drilling and Installation
Well Decommissioning Procedures tentatively adopted by the NYSDEC, September 1, 1993
SOP-017-017 NES Standard Operating Procedure for Construction, Development, and Abandonment of Monitoring Wells in Unconsolidated Formations

The decommissioning process shall include the proper backfilling and sealing of monitoring wells proposed for decommissioning to prevent the infiltration of surface water or the migration of contamination between aquifers. Installation of wells is for the purpose of dewatering site areas after landfill construction and/or ground water monitoring. The Site Inspector/Engineer should inspect all submittals required by the contractors in the Technical Specifications including:

- Signed certificates from the suppliers of materials and manufactured items;
- Daily drilling reports summarizing activities and the drilling conditions; and
- Documentation of Health and Safety training and medical monitoring.

A copy of SOP-017-017 NES Standard Operating Procedure for Construction, Development, and Abandonment of Monitoring Wells in Unconsolidated Formations is included at the end of this section.

13.5 DOCUMENTATION

13.5.1 Daily Work Logs

The Site Inspector/Engineer shall maintain Daily Work Logs as a detailed record of site work progress. A sample Daily Work Log sheet appears at the end of this section. Pertinent items appearing on the report include:

1. Daily Work Log No.: unique identifying number (preceded by 2023-DWL-) for each Daily Work Log for cross-referencing and document control.
2. Date/Time/Weather.
3. Visitors: a listing of personnel and their firms on site not part of the regular work force.
4. Work Performed: a general accounting of the major tasks executed for the day and the location and subcontractor performing the work.
5. Equipment/Personnel Used: major equipment items and personnel utilized to perform the day's work.

6. Material Delivered/Disposed: materials brought on site for fill or construction or materials sent off site for disposal and any certifications required by the Technical Specifications.

7. Materials Accepted/Rejected: materials accepted or rejected for fill or construction and the corresponding Inspection Report Number.

8. Air Monitoring: results of any air monitoring performed in accordance with the site Health and Safety Plan.

9. NES Site Inspector/Engineer Signature.

10. Additional Comments.

13.5.2 Field Inspection Reports

The Field Inspection Reports are designed to aid the Site Inspector/Engineer in inspecting and testing materials brought to the site. Due to the varied nature of different testing/inspection procedures for different products, the Field Inspection Reports will not cover all aspects of every test/inspection procedure and should be supplemented with actual test data sheets, photographs, sketches, etc., to properly document the material acceptance/rejection. Pertinent information includes:

1. Field Inspection Report No.: unique identifying number (preceded by 2023-FIR-) for each Field Inspection Report for cross-referencing and document control.

2. Field Work/Material Inspected and Observations: work items inspected for the day, the location and a summary of the observations.

3. Tests Performed: listing of tests performed including the standard test method, Technical Specification reference section, test result and specification requirement.

4. Conclusions: acceptance/rejection of material and any observation conclusions.

5. NES Site Inspector/Engineer Signature.

A sample Field Inspection Report is included at the end of this section.

13.5.3 Block Evaluation Reports

A Block Evaluation Report will be used to summarize a group of Field Inspection Reports pertaining to the same design component; i.e., once a section of the construction phase has been completed (e.g., the Gas Collection/Migration Layer) all Field Inspection Reports pertaining to that phase will be collated and summarized in one Block Evaluation Report. Block Evaluation Reports include the following information:

1. Block Evaluation Report No.: unique identifying number (preceded by 2023-BER-) for each Block Evaluation Report for cross-referencing and document control.

2. Design Component Description: a brief description or title of the design component or construction phase summarized in the Block Evaluation Report.

3. Field Inspection Report Nos.: a list of the Field Inspection Reports summarized in the Block Evaluation Report.
4. Quality Characteristics Inspected: a brief description of the design specifications being evaluated with reference to the Technical Specifications or design reference.
5. Inspection Summary: summary of test/inspection results and average and standard deviation (if applicable) of the test results.
6. Conclusions: summary of compliance/noncompliance items, design component and additional comments.
7. NES Site Inspector/Engineer Signature.

A sample Block Evaluation Report is included at the end of this section.

13.6 REPORTS

The status of remedial work and the documentation of work will be provided in monthly reports submitted to the NYSDEC and other specified entities.

13.6.1 Monthly Reports

Written monthly progress reports will be submitted to the NYSDEC during the construction phases of the project. The monthly reports will describe the remedial actions that have been conducted toward the achievement of compliance with the Order of Consent during the previous month. The monthly reports will include all sampling results and tests received or generated in the previous month, including quality assurance/quality control information. The monthly reports will also identify all work plans, reports, and other deliverables required that were completed and submitted during the previous month.

The monthly reports will also describe all actions, including but not limited to data collection and implementation of work plans, that are scheduled for the next month and provide other information relating to the progress of work at the Site. Information regarding the percent complete, unresolved delays encountered or anticipated that may affect the future schedule for the implementation of obligations of the Order of Consent, as well as efforts made to mitigate those delays to any work plan that has been proposed to the NYSDEC or that the NYSDEC has approved. The monthly report will also describe all activities undertaken in support of the Citizen Participation Plan during the previous month and those to be undertaken in the next month.

These monthly reports will be submitted to the NYSDEC by the tenth day of every month following the effective date of this order.

Copies of the monthly reports will be submitted as follows:

1. One copy to the Director, Division of Hazardous Waste Remediation NYSDEC, 50 Wolf Road, Albany, NY 12233-7010

2. One copy to the Director, Bureau of Environmental Exposure Investigation, NYS Department of Health, 2 University Place, Albany NY 12203

3. Field Inspection Report Nos.: a list of the Field Inspection Reports summarized in the Block Evaluation Report.
4. Quality Characteristics Inspected: a brief description of the design specifications being evaluated with reference to the Technical Specifications or design reference.
5. Inspection Summary: summary of test/inspection results and average and standard deviation (if applicable) of the test results.
6. Conclusions: summary of compliance/noncompliance items, design component and additional comments.
7. NES Site Inspector/Engineer Signature.

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2. One copy to the Director, Bureau of Environmental Exposure Investigation, NYS Department of Health, 2 University Place, Albany NY 12203

3. Two copies to the Regional Director, NYSDEC Region 9, 270 Michigan Avenue, Buffalo, NY 14203

4. One copy to James J. Periconi, Esq., Periconi & Rothberg, P.C., 230 Park Avenue Suite 615, New York, NY 10169

5. One copy to Michael L. Cioffi, Esq., Assistant General Counsel, American Premier Underwriters, Inc. (formally The Penn Central Corporation), 1400 Provident Tower, One East Fourth Street, Cincinnati, OH 45202

In addition to the above:

1. One copy will be kept on file at NES, Inc., 44 Shelter Rock Road, Danbury, CT 06810, in care of Mark Cambra.

2. Two copies will also be kept on file at the NES, Inc. construction office at the Site for use by NES and NYSDEC..

13.7 APPROVAL OF FIELD GENERATED DOCUMENTS

Field generated documents must have an accelerated approval vehicle that will allow rapid turn-around time for comments, corrections and approvals. This vehicle is designed to avoid delays in work due to extensive review procedures while maintaining the necessary quality assurance and control procedures. Field generated documents include shop drawings, specifications, calculations, change order, vendor submittal, analytical data, and certifications.

13.7.1 Responsibility

The NYSDEC Site Representative will have the authority and responsibility of giving final approval to all site generated documentation. The NYSDEC Site Representative approval will bear the same weight as an approval from the Regional NYSDEC Office or Project Manager.

The NES Project Manager has the final approval authority for NES. The NES Project Manager has the responsibility of ensuring that all field generated documents are submitted and utilized without errors, all procedures outlined herein have been followed, and all approved documents are routed appropriately.

The Site Inspector/Engineer is responsible for the initiation, procurement, initial review and approval of all field documents. The Site Inspector/Engineer will act as liaison between the subcontractor and NES site personnel in all technical documentation matters. The Site Inspector/Engineer is also responsible for ensuring that all field documents are implemented and incorporated into the field work as approved.

The Subcontractor must provide the documentation as well as changes and updates as specified by the Site Inspector/Engineer.

13.7.2 Procedure

1. The Subcontractor or the Site Inspector/Engineer shall initiate the procedure when it is deemed necessary to modify or deviate from approved specifications and/or drawings.

2. The Subcontractor and the Site Inspector/Engineer shall mutually decide on the documentation and/or drawings necessary for field approval.

3. The Site Inspector/Engineer shall generate a Field Document Approval Form (attached) and record the Document Approval Number in the master log maintained by the Project Manager.

4. The Subcontractor shall submit the necessary documentation to the Site Inspector/Engineer.

5. The Site Inspector/Engineer shall review the documentation and confer with the Subcontractor to regenerate drawings and documents to reflect the changes, if any.

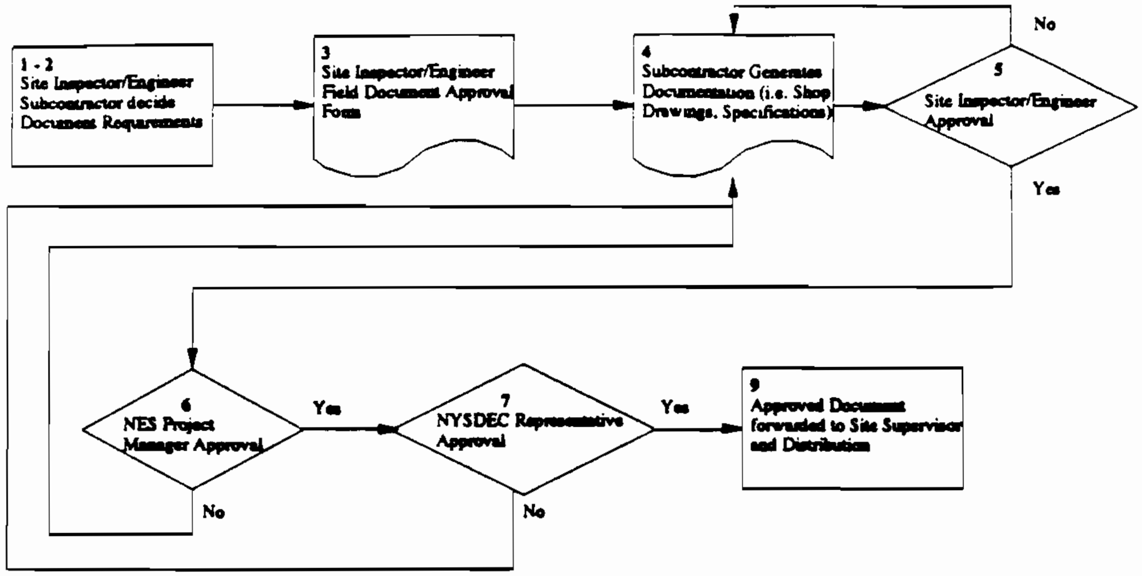
6. Once the Site Inspector/Engineer is satisfied as to the content and accuracy of the documents, they will be forwarded to the NES Project Manager for review and approval.

7. Upon approval from the NES Project Manager, the package will be forwarded to the NYSDEC Project Manager for review and approval.

8. If any individual within the approval chain requires modifications or corrections to the documentation, they will send the package back to the Site Inspector/Engineer to perform the necessary modifications and consult with the Subcontractor.

9. Final approved documents shall be maintained as part of the project file. A copy of all approved documents will be routed to the Site Supervisor, NYSDEC Regional Office and NES Document Control.

The approval process is depicted below:



Under no circumstances should information be altered after final signature. If it becomes necessary for processed documents to be revised, the new pages must be formally reviewed and approved (as described above). If a document becomes a controlled document, procedures mandated by the NES Document Control Procedure shall also be followed for controlling and revising the document.

13.7.3 Contractor Submittals

Submittals required by the Technical Specifications from subcontractors and manufacturers are outlined in Table 13-1 below. These submittals shall be reviewed by the Site Inspector/Engineer and or the Project Manager and approved or returned if found deficient or noncompliant. If the submittal pertains to field work or materials, the submittal shall be incorporated into a Field Inspection Report as described above.

Table 13-1: Listing of Submittals per Contract Documents

Tech Spec	Title	Submittal
00020	Invitation to Bid	· Contractor's Bid Form
00040	Contractor's Qualification Statement	· Qualification's Statement
00100	Instructions to Bidders	· Contractor's Qualification Statement · Bid Bond Form · Agreement
00300	Bid Form	· Contractor's Bid Form Items

Tech Spec	Title	Submittal
00500	Agreement	· Agreement Between Project Manager and Contractor
00600	Bonding and Insurance Requirements	· Executed Purchase Order · Performance Bond · Labor and materials Bond · Insurance Certificate
00700	General Conditions	· Monthly Progress Reports · Evidence of Permits and Licenses · Schedule of Values · Estimated Progress Schedule
00800	Special Conditions	· Contractor Review
01065	Health and Safety Requirements	· Review and Sign Off of Site Health and Safety Plan · Checklist for Contractors · Emergency Contact Data Sheets
01152	Application for Payment	· Informal · Formal
01153	Change Order Procedure	· Change Order Form
01200	Project Meetings	· Agenda Items List · Minutes of Meetings
01300	Submittals	Applies to Submittals of All Sections · Shop and Working Drawings · Manufacturer's Certificate · Transmittal Letters
01310	Construction Schedules	· Progress Schedule
01370	Schedule of Values	· Proposed Schedule of Values
01390	Subcontractor's Listing	· List of Subcontractors
01590	Temporary Field Office	· Shop Drawings
01630	Substitutions & Product Options	· Written Application for Approval
01700	Contract Close-Out	· Record Documents · Operation and Maintenance Data · Warranties and Bonds · Keys and Keying Schedule · Spare Parts And Materials Extra Stock · Certificates of Inspection · Certificates of insurance for Products and Completed Items · Evidence of Payment and release of liens · Listing of Subcontractors, Service Organizations, and Principal Vendors · Final Application for Payment · Final Change Order

Tech Spec	Title	Submittal
		• Certificate of Substantial Completion • Contractor's Affidavit • Contractor's of Release
01720	Project Record Documents	• Record Documents
02050	Monitoring Well Abandonment	• Test Results • Product Specifications • Certified Test Results and Certificates of Compliance • Certification Statement
02100	Abandonment	• Method for Sealing Piping
02110	Clearing and Grubbing	• Listing of Location(s) for Disposal
02140	Dewatering	• Test Results • Certified Copies of Permits
02211	Rock Removal	• Proposed Delineation of Locations • Placement and Covering Methods
02221	Excavating, Trenching and Backfilling	• Laboratory Test Results and Soil Certifications • Moisture Density Curves • Soil Sample(s) • Laboratory Testing Program
02270	Erosion Control Systems	• Samples • Test Results • Moisture Density Curves • Written Work Plan • Revisions to Pollution Controls • Shop Drawings of Materials to be Supplied
02275	Bank and Channel Protection	• Testing Results • Manufacturer's Listing and Affidavit
02450	HDPE Liner	• Manufacturer's Listing and Affidavit • Samples • Shop Drawings Including Layout • Certifications of Compliance • Installation, Erection Data, and Scheduling • Maintenance and Repair Requirements • Guarantees and Warranties • Proposed Plan for Control of Vegetation and Fungi Growth • Name of Manufacturer and Installer • Written Instruction and Procedures for Storage, Handling, Installation, Seaming, and Testing • Repair Instructions • List of Installation Equipment Weight and Bearing Pressures • Certified Test Results • Listing of Installation Personnel • Layout Drawings

Tech Spec	Title	Submittal
02452	Clay Layer	• Material Certifications • Test Results • Moisture Density Curves • Samples • Laboratory Testing Procedure • Clay Liner Report and Installation Proposal
02454	Slurry Trench Cutoff Wall	• Contractor and Laboratory Qualifications Statement • Manufacturer Information • Certificates of Compliance • Installation, Erection Data, and Scheduling • Proposed Work Plan • Manufacturer's Guarantee
02483	Turf Establishment and Surface Restoration	• Certifications of Compliance from Suppliers and Vendors • Representative Samples • Tilling, Topsoil Placement, and Seeding Schedules • Source of Topsoil Material • Laboratory Test Results Report • Manufacturers Shop Drawings
02485	Planting	• Samples of Loam Borrow, Fertilizer, Planting, Mulch, and Plant Materials • Handbook of Maintenance Instructions • Soil Analysis Test Results
02670	Well Drilling and Installation	• Certificates from Suppliers • Driller's Certifications • Daily Reports and Drilling Logs • Health and Safety Documentation • Cleaning Certification • Shop Drawings of Materials to be Supplied
02710	Subdrainage Systems	• Aggregate Materials Samples • Sampling Test Results • Moisture Density Curves
02831	Chain-Link Fences, Gates, and Warning Signs	• Certified Copies of Reports and Tests • Shop Drawings of Fencing Materials and Warning Signs • Manufacturer Guarantees
02850	Access Road	• Gradation Test Results • Manufacturer's Data Sheets
11306	Packaged Submersible Pump Station	• Duplex Control Panel Log Unit • Stress Calculations • Certified Pump Curves • Manufacturer's Shop Drawings • O&M Manuals • Anti-Floatation Calculations
11310	Dewatering Submersible well Pump Station	• Duplex Control Panel Log Unit • Stress Calculations • Certified Pump Curves

Tech Spec	Title	Submittal
	Pump Station	· Certified Pump Curves · Manufacturer's Shop Drawings
13000	Prefabricated, Pre-Engineered Concrete Storage Building	· Manufacturer's Shop Drawings · Structural Calculations
16001	Mechanical and Electrical Requirements	· Manufacturer's Shop Drawings and Warrantees
16050	General Electrical and Telecommunication Requirements	· Manufacturer's Shop Drawings and Warrantees

13.7.4 Storage of Records

NES shall maintain records for all project documents, all documentation generated in their design, and all correspondence relevant to the project. Controlled documents shall be maintained in dual storage facilities; one copy will be maintained by NES Environmental Engineering and Remediation Department and one copy will be maintained by NES Document Control. Other project documentation will be maintained in a central filing system within the NES Environmental Engineering and Remediation Department. Records may be originals or reproduced copies.

13.8 AUDITS

The auditing procedure provides a comprehensive system of planned and documented internal audits to verify compliance with all aspects of the Quality Assurance Program. Audits

13.8.1 Internal Audits

NES internal audits shall be conducted as early in the life of the project as practical and on regular intervals established by the Project Manager. Frequency of auditing may be increased for specific areas or for the project as a whole to ensure adherence to the Quality Control Program.

13.8.2 External Audits

Audits may be requested by APU or NYSDEC to review project documentation and assure quality project management. NES will make all project files available for review upon request.

13.9 REFERENCES

USEPA 1986. Office of Solid Waste and Emergency Response, Construction Quality Assurance for Hazardous Waste Land Disposal Facilities, OSWER Report No. EPA/530-SW-86-031, OSWER Policy Directive No. 9472003, October 1986, National Technical Information Service, Springfield, VA.

13.10 SAMPLE FORMS AND REPORTS

- Daily Work Log
- Field Inspection Report
- Block Evaluation Report
- Field Generated Document Approval Form

Union Road Site, Cheektowaga, New York
NYSDEC Registry No. 9-15-128

NES, Inc.

Work Log No. 2023-DWL-

DAILY WORK LOG

Page ___ of ___

Date: __/__/__ Work Began: __:__ Ended __:__ Weather: ____________

Visitors	Representing	Time In	Time Out

Work Performed	Location/Contractor

Equipment Used	Personnel

Materials Delivered / Disposed Certifications	Quantity

Materials Accepted / Rejected	Inspection Report No.

Air Monitoring: Location	Results

NES Site Inspector/Engineer

NES, Inc.

Work Log No. 2023-DWL-

DAILY WORK LOG

Page ___ of ___

(continued)

Date: / /

Additional Comments:

Union Road Site, Cheektowaga, New York
NYSDEC Registry No. 9-15-128

NES, Inc.

Field Inspection Report No. 2023-FIR-

Date: / /

FIELD INSPECTION REPORT

Page ___ of ___

Field Work/Material Inspected	Location

Observations

Tests Performed			
Standard Method	Tech Spec No.	Test Result	Spec Value

Conclusions

NES Site Inspector/Engineer

B. STANDARD OPERATING PROCEDURES (SOP) FOR VARIOUS ON-SITE OPERATIONS, MAINTENANCE AND MONITORING ACTIVITIES

SITE SPECIFIC STANDARD OPERATING PROCEDURE (SOP) FOR VARIOUS ON-SITE OPERATIONS, MAINTENANCE AND MONITORING ACTIVITIES

UNION ROAD SITE
333 LOSSON ROAD
CHEEKTOWAGA, NY 14227

SITE SPECIFIC STANDARD OPERATING PROCEDURES (SOP) FOR VARIOUS ON-SITE OPERATIONS, MAINTENANCE AND MONITORING ACTIVITIES

UNION ROAD SITE
333 LOSSON ROAD
CHEEKTOWAGA, NY 14227

TABLE OF CONTENTS

SITE SPECIFIC STANDARD OPERATING PROCEDURE (SOP) FOR VARIOUS ON-SITE OPERATIONS, MAINTENANCE, AND MONITORING ACTIVITIES

UNION ROAD SITE, 333 LOSSON ROAD CHEEKTOWAGA, NY 14227

MONITORING, TESTING AND RECORDS

Records of all monitoring data collected during the operation and maintenance activities, including information and records of all data used to comply with NYSDEC requirements, will be maintained following completion of all remedial activities until NYSDEC approves records disposal. As-built records, data utilized for five year review reporting, historical groundwater data, all groundwater quality and surface elevation information obtained during the post-closure care period will be maintained and archived for a period of time not to be less than thirty (30) years.

Prior to disposal of archived information before or after this period, the Project Engineer will notify the NYSDEC. The information and data will be discarded or submitted to the NYSDEC at their request. Records of monitoring information will include:

- Inspection Logs
- Photographs
- Analytical Data, including:
  - ⇒ Analytical technique utilized;
  - ⇒ Date, exact place and time of sampling or measurement;
  - ⇒ Date analysis was performed;
  - ⇒ Name of individual and firm who performed analysis;
  - ⇒ QA and QC data; and,
  - ⇒ Results of analyses.

<u>Groundwater Monitoring Plan</u>

<u>Elements of the Monitoring Plan</u>

The groundwater monitoring plan during remedial activities included the following key elements:

- installation of additional monitoring wells outside the slurry wall;
- installation of monitoring wells inside the slurry wall;
- collection of groundwater samples for laboratory analysis; and,
- collection of groundwater elevation measurements.

Sheet SP-5 illustrates the groundwater recovery and monitoring well network. At each corner of the cap, monitoring wells were installed outside the slurry wall; these wells are identified as MW-10S-M-D, MW-11S-M, MW-12S-M-D, MW-13S-M-D, and MW-14S. Well clusters were constructed at each of these locations so monitoring can be conducted in each of the three hydrogeological units beneath the site (the shallow zone, the till zone and the bedrock zone). Specific depths for these wells were determined in the field based on observations during drilling.

Five shallow monitoring wells (identified as MW-15, 16, 17, 18 and 19) were installed inside of the slurry wall, opposite to the well clusters installed outside of the wall. The comparison of these wells on either side of the slurry wall will permit evaluation of the hydraulic gradient across the wall. An additional three shallow monitoring wells (identified as MW-20, 21, and 22) were installed in interior areas of the cap in order to better define the hydraulic gradient beneath the cap.

A single shallow monitoring well, MW-23S, was installed adjacent to the outfall of the new marsh. The purpose of this well is to enable the ground water elevation in the marsh to be measured so that the impact of this surface water feature on groundwater flow patterns can be evaluated.

Groundwater elevation monitoring is to be conducted monthly for the first six months following completion of installation of the slurry wall and cap (the project), quarterly thereafter for the first two years, and annually (during the dry weather season) from three to five years. Groundwater elevations will be measured in all the monitoring wells discussed above. This information will be used to generate groundwater flow maps, evaluate hydraulic gradients and to determine the appropriate dewatering pumping schedules. A groundwater elevation monitoring schedule after the first two years will be developed and submitted to the NYSDEC for review.

Groundwater sampling will be conducted on a quarterly basis for the first year and on a semi-annual basis (twice per year) for the second year following completion of the project. Samples will be collected from monitoring wells outside of the slurry wall. The first quarterly sampling event will be conducted within two (2) months after completion of the project. Beginning in year three, monitoring is proposed to be conducted on an annual basis. Groundwater samples will be analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals and total petroleum hydrocarbons (method 418.1) via NYSDEC Analytical Services Protocol.

The proposed sampling frequency, sampling parameters, and/or sampling of specific wells shall only be modified based on the results of the previous sampling events with written permission from the NYSDEC.

Basis of Design

The monitoring well network was based on the following design criteria:

- To permit monitoring of the three hydrogeologic units beneath the site;
- To permit monitoring of groundwater both upgradient and downgradient of the landfill;
- To permit monitoring of the effect of the proposed new wetland to be created on groundwater flow patterns;
- To permit monitoring of the hydraulic head across the slurry wall; and,
- To permit evaluation of groundwater quality over time so that the effectiveness of the remedial action can be assessed.

Installation of monitoring well clusters satisfies the first criteria. To satisfy the second criteria, the groundwater monitoring well network is designed to provide upgradient (MW-13 S-M-D, MW-13 S-M-D, and MW-14 S-M-D) and downgradient (MW-11 S-M-D and MW-12 S-M-D) monitoring points. To satisfy the third criteria, a single, shallow monitoring well (MW-23 S) was installed adjacent to the outfall of the new marsh to be created to enable the ground water elevation in the marsh to be measured. To satisfy the fourth criteria, monitoring well clusters MW-10, 11, 12, 13 and 14 are located just outside the slurry wall; just inside the slurry wall in each of these locations are monitoring wells MW- 15, 16, 17, 18 and 19. The relationship of these wells on either side of the slurry wall will permit evaluation of the hydraulic gradient across the wall.

Historical groundwater sampling data are tabulated in Table 12-1 of the Remedial Design Report, Section 12. In order to satisfy the fifth criteria, future monitoring data will be tabulated in a similar manner so that time trends can be evaluated.

On-Site Treatment Plant Performance Monitoring

Dewatering activities include discharge to the Erie County Sewer Authority system (as Agent for the Buffalo Sewer Authority). The permit requirements and NYSDEC monitoring requirements will be adhered to during dewatering activities. Site specific permit conditions have been identified in the permit.

SITE MAINTENANCE

Maintenance following the remedial construction involves periodic site inspections of fencing and gates, the pumping system, as well as, the cap and slurry wall systems. Vegetative planting and turf established requires periodic maintenance, such as pruning, mowing, and replacement, as necessary.

All facilities must be properly operated and maintained, including but not limited to systems of treatment and control and related appurtenances that were installed and are being utilized to achieve compliance with the conditions of the Order of Consent. Proper operation and maintenance include effective performance, adequate funding, adequate operation staffing and training, as well as adequate laboratory and process controls, including quality assurance procedures.

The submittals noted in each Section of the Contract Documents, particularly the Technical Specifications for Remedial Activities, will be incorporated into the Operation and Maintenance Plan -- Volume II.

Operation and Maintenance Considerations

Dewatering

After remedial operations and construction of the landfill, there may be a need to dewater areas within the cap and wall. On-call access and availability of dewatering pumps and hoses will be required, if necessary.

The discharge of groundwater to the sanitary sewer will require operation and maintenance of all pumping equipment, piping, and electrical services used. The requirements of the Buffalo Sewer Authority will be adhered to and incorporated in the Operation and Maintenance Plan (Volume I, revised copy to be submitted upon completion of remedial activities) and the Contract Documents. Coordination with local power authorities will also be required, as necessary.

No downspouts, gutters, area drains, sump pumps, highway or roadway drainage systems will be connected to the sewer system. During wet weather conditions as determined by negotiation with the Buffalo Sewer Authority, discharge of groundwater will temporarily cease and resume only upon subsidence of storm related flows in the sewer system. The control mechanism affecting a temporary cessation will be one of or a combination of the following: remote pump control or automatic and manual pump shut down.

Slurry Wall

Loading pressures, erosion, and hydraulic head are potential problems for premature slurry wall breakdown. Pervious zones within the slurry wall may occur during construction, possibly due to the improper mixing of the backfill. Failure to excavate properly may cause wall inefficiencies including underseepage. Maintenance needs will be determined during the monitoring stages of the project.

Landfill Cap

The maintenance of the landfill cap will include vegetative cover maintenance such as periodic mowing, fertilization and watering to guarantee the service life of the landfill cap. Erosion and sediment control measures to be utilized are to be maintained.

Revegetation

The extent of soil excavation and revegetation operations will involve quality control issues, as well as continued maintenance of revegetated areas. All revegetated areas will be monitored for possible erosion or loss of vegetation.

Gabion Baskets and Reno Mattresses

The Gabion Basket and Reno Mattress constructed on stream banks and in channels must be periodically inspected and a determination made as to the condition of the channels installed. This will include inspections following major storm events that may have damaged channel areas.

Monitoring Wells

Monitoring wells located throughout the site will remain visible and accessible. Maintenance will include the trimming of vegetation, the maintenance of locks, well covers, and locking caps. This will insure the continued use of these wells for monitoring purposes. Pumps will be used to place groundwater into a piping system to the sanitary system on-site.

Erosion and Sediment Controls

All erosion and sedimentation controls to be placed into service during the remedial construction phase of the project will require periodic upkeep and replacement for a brief time following construction until placement of soils is completed and vegetation is established.

Inspections and Repair

The purpose of an inspection is to reveal any deterioration to the remedial activities undertaken. Potential problem areas to be evaluated include, at a minimum, periodic inspections of the following:

- Gates and Fences
- Warning Signs
- Vegetative Cover (Monthly and After Severe Storms)
- Groundwater Monitoring Wells
- Pumping and Distribution Equipment
- Wetland Area
- Creek Areas to be Checked for Damage to Gabion Baskets and Reno Mattresses and Exposed Tar-Like Materials

Fencing will be repaired when inspections indicate any physical discontinuity in fencing material. Fence posts and foundations will be repaired, or replaced if necessary, when inspections indicate weakness that may cause a portion of the structure to fail. Gates and locks will be maintained to ensure that they deter unauthorized entry.

Warning signs will be repaired when inspections indicate that they are no longer secured in place. Trees and shrubs will be trimmed to ensure the visibility of warning signs.

The monitoring well network will be inspected to evaluate excessive siltation and the integrity of well risers, casing, and surface and annular seals. Pumping and distribution equipment will be repaired if an inspection determines that equipment is not operating properly.

Stream Cleaning and Erosion Control by the Town of Cheektowaga

The Town of Cheektowaga, NY will undertake stream channel cleaning and erosion control operations within Deer Lik Creek and Slate Bottom Creek following storm events or as regularly scheduled maintenance. With proper communication with the Town, it is anticipated that this work will not be undertaken during the active construction phase of the project within the stream channel. If an emergency situation arises, cooperation and coordination with the Town will be necessary and provided.

Following remedial activities and during the Operation and Maintenance phase of the project, coordination between the Town of Cheektowaga, NY, the Project Engineer, and the PRP shall be required for the Town to undertake stream channel clearing and erosion control operations within Deer Lik Creek and Slate Bottom Creek.

The Town of Cheektowaga, NY shall be requested to notify the PRP and the Project Engineer in writing at least ten (10) working days prior to proposed cleanup and erosion control operations. During emergency situations, a telephone call to the PRP and the Project Engineer from the Town of Cheektowaga, NY shall be required to establish protocols and enhance coordination. If required to by the Town and the PRP, a letter of agreement shall be formulated and approved by all parties involved regarding coordination and cooperation between all parties during planned and emergency cleaning and erosion control.

Damage to reno mattresses and exposure of contaminated materials during cleaning operations is of a prime concern to the NYSDEC, the PRP and the Project Engineer. The Project Engineer anticipates coordinated contingency planning to avoid damage and unexpected releases, both during construction and throughout the Operation and Maintenance Period. The Town of Cheektowaga, NY shall be kept abreast of remedial activities and NES will coordinate between NES and the Town as needed on these issues throughout the proposed operation and maintenance period.

Equipment Operations

Pumping equipment installed during the remedial operations will be placed in on-site monitoring well facilities. Pumps and electrical services must be maintained in proper working order according to manufacturers' specifications and appropriate maintenance procedures.

Safety Issues

All operation and maintenance personnel must be familiar with the Site Health and Safety Plan. The document should remain on-site during all maintenance operations. Site security will be a key issue once the remedial construction phase of the work is completed. The residential community must be kept off-certain restricted access areas to insure continued operation of constructed systems.

Inspections and Maintenance

Inspection Schedule

Site inspections are to be conducted weekly on remedial activities during construction. Following completion of the remedial action, the site will be inspected monthly for one year following acceptance by the NYSDEC and at least once a year thereafter (for the first five years) to ensure remedial actions are remaining effective. The inspection schedule may be changed at the time of the five year review with proper justification and approval from the NYSDEC.

The yearly inspections of the site shall be modified, if deemed necessary, after the first five years. The Five Year Report will contain a proposed modification to this inspection schedule, if appropriate. Justification for the change of inspection frequency shall be required. Any changed on inspection frequency from that stated shall require NYSDEC approval.

Maintenance Schedules

Maintenance schedule shall follow manufactures' recommendations for equipment such as pumps and controls.

Turf Establishment

Maintaining turf for soil protection or other uses is necessary to keep the system functioning. Proper maintenance prevents the damage of vegetative cover. Less cost is involved in maintenance than repairs after extended damage. Maintenance will occur on a regular basis that is to be consistent with soil and climatic conditions, as well as favorable vegetative growth. Maintenance will involve mowing, fertilizing, pest control, weed control, liming if needed, reseeding, fire controls, and timely repairs. Mowing shall be undertaken at a frequency of at least twice per year and shall be scheduled dependent on weather conditions, condition of vegetation, and availability of equipment. It also requires the protection of vegetation from traffic and unintended uses, as well as special attention to critical areas (slopes, wet areas, etc.). Vegetative cover will require a certain degree of management or the intended function of the cover is upset.

Unimproved areas will receive limited fertilizer applications to produce enough growth to prevent undue erosion. Lime will be applied to maintain the desired level of soil reaction. For unimproved areas pH will be maintained at lower level than optimum. Weeds and brush will be tolerated. Pest and disease control requirements for this unimproved area will be kept under reasonable control. On this unimproved area, vegetation will be allowed to grow tall. Vegetative species to be utilized in this area were selected for their attributes, low maintenance, and conservation capabilities, and for erosion and sediment controls.

Erosion and sediment controls are to be maintained and inspected throughout the remedial operations and include hay bale and silt fence repair or replacement, bank stabilization and stream channel revegetation, temporary turf establishment, vegetative screening, and all other controls as established in the Erosion and Control Plan.

Pumping, Piping, and Monitoring Wells

Maintenance and inspection items include well casing and caps, well locks, pumping equipment including electrical system and controls, pipe materials and valves, as well as the sewer connection.

Slurry Wall

Maintenance and inspection items include stability inspections, observations of groundwater and movement behind the wall, and surface water and erosion problems.

Potential Problem	Possible Inspection Method	Possible Maintenance Item
Instability of Wall Base	Measure Subsurface Horizontal Movement	Additional Backfill and Compaction.
Ground Movement Behind Wall	• Visual Survey • Measure Subsurface Horizontal Movement • Extensometers and Piezometers • Survey • Measurement of Subsurface Settlement	Additional Backfill and Compaction.
Groundwater	Observation Wells Piezometer Sampling Wells	Subdrainage System Installation.
Surface Water	Surface Sampling Erosion Controls.	Surface Drainage Modification and Erosion Controls.

Landfill Cap

Inspection areas and maintenance response for the installed landfill cap include:

Inspection Areas	Maintenance Response
Unhealthy Vegetative Growth	Apply fertilizer, reseed, and/or irrigate.
Excessive Vegetative Growth	Mow vegetation. Prevent excessive and large root growth
Large Vegetative and Root Growth	Prevent excessive and large root growth
Surface Erosion	Apply mulch to areas affected and reseed. Direct runoff away from damaged areas.

Inspection Areas	Maintenance Response
Washouts	Add compacted backfill.
Sediment and Erosion Controls	Repair and replace.
Burrowing Rodents	Consult professional exterminator. Backfill burrows.

Gabion Baskets and Reno Mattresses

Maintenance and inspection items for the gabion baskets and the Reno mattresses installed include the following:

- Adherence to Installation Procedures
- Condition of Wire Mesh and Lacing Wire
- Corrosion
- Diaphragms
- Fasteners
- Location and Placement
- Sliding and Overturning
- Stability

Trouble Shooting Guide to Pumping and Electrical Systems Operation

This section contains troubleshooting guides for correcting malfunctions and emergency response procedure guides for a variety of operating problems and possible emergency conditions which could occur during operation and maintenance activities. A trouble shooting guide for all functioning operations such as the pumping equipment, electrical systems, erosion and sediment controls, and the slurry wall with vegetative cap will be utilized to quickly address problem situations. The purpose of the guides is to properly identify the symptoms defining the problem.
Once a problem has been identified, certain analysis and/or inspections must be performed before making a decision as to which corrective measures should be used. In some cases, the data-gathering process may be a single visual observation; in other cases, additional testing may be required. The resulting information will be used to determine which corrective action should be implemented. Operation and Maintenance Plan Volume II -- Manufacturer's Catalog Manuals, shall provide a listing of spare parts on-hand and manufacturer's technical support telephone numbers for reference.

Pumping and Piping Systems

Typical operational problems include, (1) pumps not starting, (2) reduced rate of discharge, (3) high power requirements, and (4) noisy pump and/or piping.

The following list of these problems includes most of the causes of failure or reduced operating efficiency.

Pump(s) Are Not Operating

- Water table conditions
- Rating of fuses or breakers not correct, causing them to burn out
- Switch contact corroded or shorted
- Terminal connections loose or broken
- Motor shorted or burned out
- Wiring hook-up or service not correct
- Wiring short circuited
- No fuel or power supply

Reduced Rate of Discharge or No Discharge

- Speed of motor too low
- Improper wiring
- Defective motor
- Discharge head too high
- Suction lift higher than anticipated
- Impeller clogged
- Discharge Line clogged
- Valves partially or entirely closed
- Impeller damaged or not working

High Power Requirements

- Clogged pump
- Bent pump shaft
- Impeller rubbing
- Lower than anticipated operating head

Noisy Pump and/or Piping

- Inlet clogged
- Inlet not submerged
- Foreign object in pump
- Foundation insecure, vibration
- Mechanical defects in pump
- Discharge valving partially closed
- Cavitation

Table 1 provides troubleshooting information may be in assistance in identifying and correcting problems.

Table 1. Trouble Shooting Guide to Pumping and Piping Systems

<table>
<tr><th>Problem</th><th>Numbered Cause for Correction</th><th>Numbered Correction to Resolve Cause</th></tr>
<tr><td>Pump Will Not Run</td><td>1. Poor electrical connection, blown fuse, tripped breaker or other interruption of power; improper power supply.
2. Motor or switch inoperative
2a. Float movement restricted
2b. Defective switch
2c. Defective motor
3. Insufficient liquid level</td><td rowspan="7">1. Check all electrical connections for security Have electrician measure current in motor leads Remove power, allow pump too cool, then recheck current
2a Reposition pump and clean intake. Provide for adequate clearance for floats.
2b. Disconnect level control. Using low range ohmmeter connect to level leads.
2c. Replace motor.
3 Make sure liquid levels are at least equal to suggested turn-on point
4. Recheck all sizing calculations to determine pump size.
5. Check discharge line for restrictions, including ice.
6. Remove and examine valves for proper installation and freedom of operation
7. Open valve.
8. Check impeller for freedom of operation, security, and condition. Clean impeller cavity and any inlet of any obstruction.
9. Loosen union to allow trapped air to escape Clean vent holes.
10. Check rotation. If power supply is three phase reverse any two of the three power supply leads to insure proper rotation
11. Repair fixtures to eliminate leaking
12. Check pump temperature limits and fluid temperature
13. Replace portion of discharge pipe as necessary.</td></tr>
<tr><td>Pump Will Not Turn Off</td><td>2a. Float switch movement restricted
2b Switch will not de-activate pump or is defective
4. Pump not properly sized
9. Pump may be air locked</td></tr>
<tr><td>Pump Hums But Doesn't Run</td><td>1. Incorrect voltage
8. Impeller jammed, worn or damaged</td></tr>
<tr><td>Pump Delivers Insufficient Capacity</td><td>1. Incorrect voltage
4. Pump not properly sized
5. Discharge restricted
6. Check valving incorrectly installed
7. Shut off valving closed
8. Impeller jammed
9. Pump may be air locked
10. Pump running backwards</td></tr>
<tr><td>Pump Cycles Too Frequently</td><td>6. Check valve not installed correctly
11. Fixtures are leaking</td></tr>
<tr><td>Pump Turns Off And On Independent Of Switch</td><td>1. Improper wiring or power supply
4. Discharge head less than minimum
8. Impeller jammed or rubbing
12. Excessive water temperature</td></tr>
<tr><td>Pump Operates Noisily Or Vibrates</td><td>2c. Worn bearings, motor shaft bent
8. Debris in impeller cavity or broken impeller
10. Pump running backwards
11. Replace Filters
13. Piping attachments too rigid or too loose.</td></tr>
</table>

Control Systems

Typical emergency procedures for control system problems should be developed for maintenance personnel. Personnel should review and understand the control system. Emergency procedures include the following:

A. Once a problem is noted, power should be turned off and locked out during equipment checking by a qualified electrical and control person or manufacturer's representative
B. Set up a Contingency Plan if pumps are shut down for extended periods.
C. Determine if power input is available to each control section. Determine if a control section is to be replaced or repaired.

Electrical Systems

Typical emergency procedures for electrical systems are to be developed for maintenance personnel. These personnel should review and understand the electrical system in use at the site. Main power panels, power schematics, grounding schematics, transfer switch and emergency generator information should be reviewed, if applicable. Electrical Contractor -- White Electric, Irving, New York, Tom White, 716-549-3618.

Emergency procedures include the following:

A. Determine scope and if electric utility company can provide assistance.
B. Once a problem is noted, power should be turned off and locked out during electrical system repair work by a qualified electrician.
C. Refer to Contingency Plan for extended shut-downs.
D. During extended street power failures, a standby generator, if used, will require periodic refueling.

<u>Preventive Maintenance Checklists</u>

Following review of manufacturer's recommendations and the completion of all remedial activities, preventative maintenance checklists will be utilized by personnel to document maintenance work undertaken. During both remedial activities and future maintenance, the following items will be considered in scheduling.

Erosion and Sediment Controls

A checklist to be utilized would involve review of the following items:

- Permanent Dikes
- Temporary Swales
- Straw Bale Dikes and Silt Fence
- Provisions for Protecting Cut and Fill Slopes
- Site Grading
- Seeding Specifications
- Storm Drainage

Erosion and Sediment Control Inspection Form
Union Road Site, Cheektowaga, NY

Date: ________________ **Inspector:** ______________________________ **Weather Condition** ________________________

Control	Location	Condition Comment	Recommended Measures
Permanent Dikes			
Temporary Swales			
Straw Bale Dikes and Silt Fence			
Provisions for Protecting Cut and Fill Slopes			
Site Grading			
Seeding Specifications			
Storm Drainage			

Pumping, Piping, and Monitoring Wells

A checklist to be utilized would involve review of the following items:

- Well and Casing Condition
- Locks and ID Condition
- Pump Running Test
- Electrical System Check
- Water Table Condition
- Piping and Valve Condition
- Alarm and Dial-Out Systems
- Floats and Controls

Pumping, Piping, and Monitoring Well Inspection Form
Union Road Site, Cheektowaga, NY

Date: ________________ **Inspector:** ________________________ **Weather Condition** __________________________

Item	Location	Condition Comment	Recommended Measures
Well and Casing Condition			
Locks and ID Condition			
Pump Running Test			
Electrical System Check			
Water Table Condition			
Piping and Valve Condition			
Alarm and Dial-Out Systems			
Floats and Controls			

Slurry Wall

A checklist to be utilized would involve review of the following items:

- Evidence of Erosion
- Breach of Wall
- Evidence of Stress and Strain Forces
- Evidence of contamination in wells outside slurry wall

Slurry Wall Inspection Form
Union Road Site, Cheektowaga, NY

Date: ______________ **Inspector:** ________________________________ **Weather Condition** ____________________________

Item	Location	Condition Comment	Recommended Measures
Evidence of Erosion			
Breach of Wall			
Evidence of Stress and Strain Forces			

Landfill Cap

A checklist to be utilized would involve review of the following items:

- Soil Placement
- Vegetative Growth (Excessive or Unhealthy)
- Surface Erosion

Landfill Cap Inspection Form
Union Road Site, Cheektowaga, NY

Date: ________________ **Inspector:** ____________________________ **Weather Condition** ___________________________

Item	Location	Condition Comment	Recommended Measures
Soil Placement			
Burrowing Rodents			
Vegetative Growth (Excessive or Unhealthy)			
Surface Erosion			

Gabion Baskets and Reno Mattresses

A checklist to be utilized would involve review of the following items:

- Location and Placement
- Adherence to Installation Procedures
- Sliding and Overturning
- Stability
- Condition of Wire Mesh and Lacing Wire
- Corrosion
- Fasteners
- Diaphragms

Gabion Basket and Reno Mattress Inspection Form
Union Road Site, Cheektowaga, NY

Date: ______________ **Inspector:** _________________________ **Weather Condition** ____________________________________

Item	Location	Condition Comment	Recommended Measures
Location and Placement			
Adherence to Installation Procedures			
Sliding and Overturning			
Stability			
Condition of Wire Mesh and Lacing Wire			
Corrosion			
Fasteners			
Diaphragms			

C. SITE SPECIFIC HEALTH & SAFETY PLAN

4. HEALTH AND SAFETY PLAN

Prepared By:	Review By:	Approved By:
Richard D. Moss	Robert Weireter	~~Davis~~ E. Frederiksen, CIH
NES Health and Safety Officer	Manager, Geosciences and Technical Services	
Date: 3/23/95	Date: 3.23.95	Date: 3-21-95

This Health and Safety Plan has been reviewed and approved by Mr. Frederiksen, CIH. A copy of his CIH certificate is included as Attachment 4 - A.

4.1 SCOPE OF WORK

The remedial plan involves the following major activities:

- placement of gabion baskets and reno mattresses within Slate Bottom and Deer Lik Creeks;
- installation of a slurry wall;
- construction of a landfill cap;
- excavation of contaminated material within the Roundhouse area; and
- topsoil placement and seeding.

Secondary site activities include:

- portions of the site will be cleared and grubbed;
- the wetland and tar pit areas will be dewatered;
- specific areas will be excavated to meet fill requirements; and
- a sanitary sewer connection will be installed for water discharge.

Support activities will include:

- construction of a new site entrance road from Losson Road;
- construction of a temporary site access road;
- staging of field offices and related equipment;
- construction of anti-tracking decontamination areas for heavy equipment,
- installation of a chain-link fence enclosure for equipment maintenance and storage; and
- installation of an above ground fuel tank and dispenser.

4.2 SITE HISTORY

The Site is a New York State Superfund Site (Registry No. 9-15-128) which is located in the Town of Cheektowaga, Erie County, New York. Approximately 8 to 10 miles east of the site is the City of Buffalo. The property lies between Losson and French Roads and is situated approximately 1,000 feet south of Losson Road and about one mile east of the intersection of Losson with Union Road (Route 277).

The Site was the former location of a large railroad facility. This facility, operated for approximately 40 years from about 1915 to 1955, was formerly used as a railroad classification yard and maintenance facility. The property has been undeveloped since railroad operations ceased.

4.3 PHYSICAL DESCRIPTION

The area has generally flat topography with a gentle slope ranging from 1 to 3 percent. The soils are classified as Niagara which are composed of silty, gravelly and stone-free, lake-laid sediments. A portion of the perimeter of the site and the marsh area adjacent to the tar pit lies within the 100 year flood plain of Slate Bottom Creek. An open waste lagoon, or tar pit, is located within the site.

Residential areas are adjacent to the site in all directions. Located within one mile of the site on Losson, Union, and French Roads are commercial buildings, while a park owned by the Town of Cheektowaga is situated about 1/2 mile northeast of the site.

4.4 HEALTH AND SAFETY PERSONNEL

Name	Responsibility
Mark Cambra	Project Manager
John Falbo	Site Superintendent/ Site Inspector
Tom Weisbeck	Site Health and Safety Officer
Rich Moss	NES Safety Officer
Tom Weisbeck	Site Security Officer

Resumes'are included in Attachment 4-B.

The Site Health and Safety Officer (HSO) and Site Superintendent are responsible for ensuring that the policies and procedures detailed in this plan are implemented. This includes compliance to the Community Health and Safety Plan, which is detailed as Section 4.8 in this Site Health and Safety Plan (HASP). Overall project responsibilities of these individuals are discussed in Section 3.0.

Site workers are responsible for reporting suspected overexposures or other suspected unsafe or unhealthy conditions. This program is largely dependent on individual site worker participation and open communication.

Subcontractors will be permitted to provide a Health and Safety Plan (HASP) for their employees covering any exposure to hazardous materials and complete all work in accordance with that plan. The subcontractor must use the NES HASP as minimum guidelines in developing its own plan or the subcontractor will use the NES HASP. However, the subcontractor shall hold NES harmless from, and indemnify it against, all liability in the event of any injury. NES will review and approve the subcontractor's health and safety plan prior to conducting any site work, and reviewed at any time thereafter.

4.5 EMERGENCY INFORMATION

The following information shall be posted near all Site telephones.

NAME	LOCATION	NUMBER
Fire Medical	3223 Union Road 3223 Union Road	911
Police	3223 Union Road	(716)683-6100
Hospital Corner Walden and Harlem Aves (See Attached Map, Attachment 4 - C)	St. Joseph's Hospital 2605 Harlem Road Cheektowaga, NY.	(716) 891-2450
Poison Control Center	Children's Hospital (Buffalo)	(716) 878-7654

Site Location of Emergency Supplies

First Aid Supplies	NES Site Office
Eye Wash Station	NES Site Office
Spill Response Kit	Refueling Truck and NES Site Office
MSDS Chemical Information	NES Site Office

Agency Notifications

Organization	Name	Number
NYSDEC - Region 9 Office	David Locey	(716) 851-7220
NYSDEC - Albany Office	Shive Mittal	(518) 457-0315
Cheektowaga Emergency Services	Routine number	(716) 685-1238
NYSDOH - Buffalo Office	Cameron O'Connor	(716) 847-4500
Erie County Department of Health	John Kociela, Director	(716) 858-7677
Cheektowaga Disaster Service Coordinator	Earl Loder	(716) 686-3465 (office) (716) 896-8091 (home)
County Highway Department, Lancaster Facility	George Micolof, District Engineer	(716) 683-4272

Other Emergency Notification Numbers

Organization	Name	Number
National Emergency Response Center		(800) 424-8802
Chemtrec		(800) 424-9300
Call Before You Dig	Within NY State Out of State	(800) 962-7962 (716) 893-1133
Electrical Service Emergency	Niagara Mohawk	(800) 962-7962
NES Safety Officer	Rich Moss	(203) 796-5234
NES Project Manager	Mark Cambra	(203) 796-5305
Site Health and Safety Officer	Tom Weisbeck	
NES Site Superintendent	John Falbo	
NES Personnel Office	Bonnie Ianuzzi	(203) 796-5263
NES Personnel Fax		(203) 796-2459

4.6 SITE CONTROL AND SECURITY

Site control and security encompasses every aspect of NES operations and are intended to meet several objectives:

- prevent the public from inadvertently entering the Site, which contains numerous physical and chemical hazards;
- protect adjacent private properties from inadvertent incursion during remediation activities;
- ensure that those visiting or working on the site are properly instructed and equipped to recognize and address site hazards;
- prevent unauthorized vehicular traffic, which would pose a hazard to workers, vehicle occupants, property, and can possibly act to cross-contaminate public roads; and
- ensure the security of Contractor's and Sub-contractor's property and equipment.

4.6.1 General Rules and Procedures

All Site Workers will sign-in when initially entering the Site during the workday, and sign-out when leaving. A Daily Sign-In Sheet has been established (included as Attachment 4-D) for this purpose and is included as an attachment to the HASP. This log is not intended as a record of employment attendance, but only as a means of determining the presence of individuals on the site for security reasons.

Site Workers are to enter and exit the Site ONLY through the main entrance. NES employees or subcontractors are NOT permitted on any property adjacent to the Site unless expressly and directly instructed by the Site Superintendent.

The project Site is large and is potentially accessible to trespassers in several areas. It is important that Site Workers immediately notify the Site Superintendent or Site Health and Safety Officer, who are responsible for implementing the appropriate action.

4.6.2 Site Worker Documentation

The Site Health and Safety Officer will retain a Site personnel file for all Site Workers. This file will retain, at a minimum, the following information. Additional medical information will also be retained as detailed in Section 4.7.6 Medical Surveillance:

- Proof of the appropriate Class 2 or Commercial Drivers License for drivers operating a construction vehicle off-site (e.g. heavy trucks being returned or delivered to the site).
- Proof of drivers license endorsement for Excavation Equipment and Backhoe Operation for all operators of such equipment onsite.
- The Site Health and Safety Officer(s) and Site Supervisor(s) will maintain current National Safety Council, Red Cross, or American Heart Association First Aid and CPR certifications.

4.6.3 Site Specific Training

Site Workers shall have received and provided documentation for the following OSHA Health and Safety and Site-Specific training:

- Training to OSHA 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response", to the level required for the tasks assigned.
  - Site Workers will document 40 hours of training and work onsite for 3 days under supervision to meet OSHA 29 CFR 1910.120(e)(3)(i) General Site Worker criteria. Site Workers will also meet annual 8 hour refresher training requirements under 29 CFR 1910.120(e)(8).
  - The Site Supervisor and the Site Health and Safety Officer shall each document 40 hour and supervised training in accordance with OSHA 29 CFR 1910.120(e)(3)(i) and an additional 8 hours of Supervisor training in accordance with OSHA CFR 1910.120(e)(4). Site Supervisors shall also meet annual refresher training requirements under 29 CFR 1910.120(e)(8).
- Training in accordance with OSHA 29 CFR 1910.134, "Respiratory Protection", for the proper selection, use, and maintenance of the respiratory protective devices to be implemented on this project. Training is to correspond with the NES Health and Safety Plan, 82A8120 Respiratory Protection, and this Health and Safety Plan.
- Training in accordance with the site-specific Hazard Communication Program in compliance with OSHA 1910.1200 and NES 82A8115.

Upon initial employment at the Site and prior to work activity, employees will be provided thorough, documented instruction regarding all aspects of this Health and Safety Plan, with emphasis upon:

- Site contaminants and indications of an over-exposure to Site contaminants;
- Locations of Site control zones and restrictions;
- Locations of safety equipment;
- Personal protective equipment required;
- Emergency procedures;
- General safe work practices, Site restrictions, and Site policies and procedures.

Weekly safety meetings will be conducted with all Site employees and representatives of sub-contractors. Tentatively, these 15-20 minute meetings are scheduled for Monday morning. Topics will include:

- Review of hazards associated with new work activity or phases of the project, such as new excavations or equipment.
- Compliance issues, such as temporarily restricted areas.
- General safety training where deficiencies are evident.

4.6.4 Visitors

All visitors and agency representatives must report directly to the NES Field Office upon entering the Site. Visitors are not permitted on the Site unless accompanied by authorized site personnel.

All visitors and Agency representatives will sign-in and out on a standard visitor log administered by the Site Health and Safety Officer The Site Health and Safety Officer will assign to visitors and agency representatives all necessary personal protective equipment and review with them site policies and procedures. Visitors and Agency representatives will comply with the NES HASP while on the premises.

4.6.5 Vehicle Operations

Privately owned vehicles (POV) are not permitted beyond the entrance parking area, which is reserved for site personnel and visitors. Only authorized NES vehicles are permitted beyond the parking area. The speed limit for POV on the site is 10 MPH. Excessive speed or careless operation of a vehicle anywhere on the site are grounds for disciplinary action. POV maintenance, such as changing oil, is permitted on the site in authorized locations.

Subcontractor vehicles will be permitted beyond the employee parking area only with the permission of the Site Superintendent or Site Health and Safety Officer. The unauthorized movement of subcontractor or vendor vehicles onto site work areas will not be tolerated.

Heavy equipment and backhoes are not permitted in the entrance parking area except upon initial arrival and prior to demobilization. Full decontamination of the equipment is required prior to placement in the entrance parking area.

When heavy equipment is used in a contaminated area, it will be fully decontaminated before being moved to a clean zone, such as the refueling station or heavy equipment staging area.

4.6.6 Restrictive Areas

Only authorized personnel, properly equipped and trained per this HASP, are permitted into the work areas. Site Workers and Visitors are only permitted in the exclusion zones while using the "buddy system". Exclusion zone perimeters may be modified during the course of the project and will remain restricted. Other areas may be restricted due to traffic, environmental concerns, or due to physical hazards. Following are the areas affected, the nature of the restriction, and purpose.

Site Area	Description	Restriction	Purpose
Roundhouse Area	West of parking area and access road to property line	Authorized individuals only	Minimize exposure to arsenic contamination in soil Prevent cross-contamination. Site management
Waste Disposal Area	Fenced area SW of parking area.	Authorized individuals only	High contamination level Equipment operation
Tar Pit Area	Within Disposal Area	Authorized under Site Supervision only	High contamination level Engulfment hazard

Slate Bottom Creek	Slate Bottom Creek runs along east and south sides of Site.	Authorized individuals only	Water hazard Slip/fall hazard
Slate Bottom Creek culvert.	Concrete waterway on the south side of the property	Authorized individuals only	Water hazard Slip/fall hazard Low illumination
Anti-tracking Pads	Five locations on access roads	To be avoided by pedestrians	Prevent cross-contamination
Deer Lik Creek East Bank	Deer Lik Creek, East Bank along property line	Authorized under Site Supervision only	Proximity to residential area Site management requirement
Slate Bottom Creek South Bank	Slate Bottom Creek South bank along property line	Authorized under Site Supervision only	Proximity to residential area Site management requirement.

4.6.7 Signage and Placarding Requirements

Signage and placarding requirements will vary as the project progresses. However, as a guide for initial mobilization, the following minimum signage and placarding will be required.

SIGN	ALERT LEVEL	APPLICATION	MATERIAL
Restricted Area. Authorized Personnel Only	Warning	Entrance gate Entrance to work areas	Aluminum
No Trespassing	Danger	Perimeter 100' increments	Steel
Speed Limit 10 MPH	Caution	Entrance gate Site roads	Aluminum
All Visitors Must Register at Office	Notice	Entrance gate Parking area	Aluminum
Hard Hat Area	Warning	Entrance to work area	Aluminum
Lead Work Area. Poison. No Smoking or Eating.	Warning	Entrance to work area	Aluminum
Arsenic Work Area. Poison. No Smoking or Eating.	Warning	Entrance to work area	Aluminum
Fuel Storage. No Smoking.	Danger	Fuel storage area gate	Aluminum
Vehicles Prohibited Beyond This Point	Warning	Entrance to work areas	Aluminum
Do Not Enter	Danger	Tar Pit & excavated pits	Aluminum
Diesel NFPA 704 Placard	-	Diesel fuel truck tank	Aluminum
Hydraulic Fluid NFPA 704 Placard	-	Hydraulic oil storage area	Aluminum
Hazardous Material Storage Area Restricted Entry	Caution	HAZMAT storage areas	Aluminum
Report All Injuries at Once	Notice	NES field office	Aluminum

4.7 SITE WORKER PROTECTION

4.7.1 Hazard Assessment and Abatement

The following substances are known to be present in the soil, marsh sediment, creek sediment, or within the waste disposal area. The mechanism for toxic exposure for all known site hazardous substances is through inhalation.

			OSHA Airborne Exposure Limits		
Substances	Max Soil Level (ppm) [a]	Location and Containment	Action Level $\mu g/m^3$	PEL $\mu g/m^3$	Ceiling $\mu g/m^3$
Lead (Inorganic)	810	Deer Lik Creek	30	50	NE
Lead (Inorganic)	96,600	Tar Pit Area	30	50	NE
Lead (Inorganic)	233,000	Waste Disposal Area	30	50	NE
Arsenic	33	Roundhouse Area	5	10	NE
Respirable Dust	NA	All	3000	5000	NE
Hydrogen Sulfide	NA	Monitoring Wells	NE	NE	28.4 mg/m^3
TPH	29,000	Marsh sediment	200 ppm [b]	NE	300 ppm [b]

[a] Based on the Remediation Investigation site characterization

b OSHA limits not established. Shown are the self-imposed Site Worker exposure limits based on the potential TPH fractions that may be present.

NE = Not Established

NA = Not Available

PEL = Permissible Exposure Limit

The action level listed above represents the maximum worker exposure limit permitted without respiratory protection. If the action level is encountered, the source of the emissions will be immediately identified and operations suspended or suitable engineering controls implemented to curtail emissions.

4.7.1.1 Lead Exposure

Based on site history and environmental sampling analysis, the primary hazard concern to workers is lead exposure. Lead contaminated dust or powder may be present on heavy equipment, tools, etc. Lead (Pb) can be absorbed by workers, during the remediation process, through inhalation or ingestion. NES will comply with OSHA 29 CFR 1926.62 which establishes a PEL of 50 $\mu g/m^3$ for workers in the construction industry.

Lead can cause serious *acute* (short term) health problems when directly inhaled at levels above the PEL. The severe health effects of acute lead poisoning are damage to the nervous system, which may include wrist or foot drop, tremors, and convulsions or seizures. Common symptoms of occupational acute lead poisoning include:

- loss of appetite
- nausea
- vomiting
- stomach cramps
- constipation
- insomnia
- fatigue
- headache and joint aches

Workers should be alert to any of these symptoms, which are reason to immediately vacate the area and seek medical attention.

Lead poses chronic, or long-term health affects which will not be immediately apparent if an over-exposure occurs. Chronic affects include hypertension, anemia, and central nervous system impairment. Skin absorption is considered a much less important source for chronic health affects. However, acute effects such as eye irritation may occur with high levels of direct contact. Lead exposure, even in low levels, significantly affects central nervous system development in infants and young children. Vulnerable receptors within the community also include pregnant women or those with existing high levels of PbB (lead blood levels).

4.7.1.2 Arsenic Exposure

Based on site history and environmental sampling analysis, inorganic arsenic, contained in soil, represents an inhalation hazard to individuals working in the Roundhouse area. Arsenic contaminated dust may be present on heavy equipment, tools, and implements used in this area. Arsenic detected in the Roundhouse area is as inorganic metal compounds, with no specific detection of trivalent forms, such as arsenic trioxide.

Arsenic is a toxic metal that can be absorbed by workers, primarily through inhalation of arsenic contaminated dust. It is important that all workers be familiar with the potential effects of arsenic compound intake, the most significant effect being the carcinogenic effect from chronic exposure. Excessive chronic exposure, although unlikely in this project setting, may induce symptoms in three phases:

First Phase	Second Phase	Third Phase
General weakness	Conjunctivitis	Peripheral neuritis
Nausea	Respiratory irritation	
Loss of appetite		
Diarrhea		

Acute, excessive exposure to arsenic is generally seen with ingestion rather than inhalation. Constriction of the throat, followed by epigastic pain and vomiting may occur.

Workers should be alert to any of these symptoms, which are reason to immediately vacate the area and seek medical attention.

4.7.1.3 Petroleum Hydrocarbon Exposure

Petroleum hydrocarbons, present as soil contamination, free product, and as tar-like composites within the waste disposal area, can pose significant flammability, toxicity, and mechanical hazards. Lighter fractions, although largely depleted through volatization and microbial action, may be present in isolated pockets. Potential anaerobic biodegradation at lower depths within the tar pit would result in methane pockets that can be released during excavation or sampling activities.

Site workers shall limit direct contact to petroleum hydrocarbon contamination to levels as low as reasonably achievable. The use of Tyvek coveralls with Level D personal protective equipment will be required in the waste disposal area exclusion zone. The action level for Level C operations will be 200 ppm airborne concentration. The ceiling level will be 300 ppm.

High concentrations of mist or vapor may cause respiratory tract irritation, headache, dizziness, nausea, and vomiting. Prolonged skin contact may cause irritation or dermatitis. Ingestion may cause nausea, vomiting, and esophogeal irritation, edema, with possible central nervous system depression.

Although flammable airborne concentrations are not anticipated in the exclusion zones, the action level will be 10% of the lower explosive limit (LEL). Since a mixture of petroleum hydrocarbons is present, and the vapor constituents cannot be readily identified, an LEL of 1% volume to volume in air will be assumed. Therefore, a 1000 ppm VOC concentration (10% of the assumed LEL) will be considered a potentially flammable atmosphere. The calibrant gas will be methane. The action level will require that all exclusion zone work be suspended and the exclusion zone evacuated.

The mechanical hazards posed by petroleum hydrocarbons are serious. The tar pit deposits, as noted under section 4.7.1.5 pose an engulfment and asphyxiation hazard. Site workers must not enter or attempt to traverse the tar pit. Also, safety boots covered with petroleum hydrocarbons must be decontaminated immediately as this threatens the site workers footing, is a common cause of fall injuries, and may deposit a slippery film on the steps and rungs of heavy equipment.

4.7.1.4 Hydrogen Sulfide Exposure

Drilling of the deep monitoring wells, scheduled for later phases of the project, may tap pockets of hydrogen sulfide in concentrations associated with natural hydrocarbon formations. Hydrogen sulfide is a highly toxic colorless gas with a strong odor of rotten eggs.

During the drilling of monitoring wells continuous H_2S monitoring will be conducted. The OSHA ceiling limit is 20 ppm. An action level of 10 ppm (14.2 mg/m^3), will dictate suspension of drilling and Level C protection with fullface respirators and H_2S filter cartridges. The monitoring well will be capped at that point.

Hydrogen sulfide rapidly depresses the sense of smell, which can not therefore be relied upon to warn of continuous exposure. Symptoms of exposure also include eye and respiratory irritation, headache, fatigue, apnea, and coma.

4.7.1.5 Physical Hazards

The Site presents numerous physical hazards, such as steep terrain, engulfment areas, and a waterway. Serious hazards, which can pose an imminent danger to Site Workers, include:

Hazards	Locations	Engineering Controls
Uneven terrain can cause slips and falls.	Roundhouse area due to subsurface structures and pits. Along Slate Bottom Creek due to steep banks and rip rap.	Safety shoes required on the site. Site roads & paths maintained for Site worker access. Restrict access to high hazard areas. Barricades and caution tape deployed.
Engulfment by soil, mud, or debris can cause serious injury, asphyxiation, or death.	Tar Pit Excavated areas and trenches Soil and debris stockpiles.	Areas posted and barricade fencing deployed.

Fall hazards exist whenever excavations are 4 feet or greater in depth.	Tar Pit and all excavated areas.	Areas posted and barricade fencing deployed per OSHA 1926.265. Fall protection, including full-body harnesses used by Site Workers per OSHA 1926 Subpart M.
Site vehicular traffic.	Throughout the Site.	Limit vehicle speeds to 10 MPH. Site access roads maintained. NO TAILGATE OR TRUCK BED RIDERS Use of headlights during low visibility conditions.
Construction equipment.	Dependent on work plan phase.	Hard hats to be used in work areas. Operator safe work practices enforced. Eye protection during vehicle maintenance.
Insects such as ticks, mosquitoes, and fleas pose a health risk which includes transmission of Lyme disease and Rocky Mountain Spotted Fever.	Present throughout Site during warm months.	Insect repellent (maximum 25% Deet) for ticks, fleas, and mosquitoes will be provided to Site Workers on a seasonal basis. Clearing and grubbing will reduce the hazard.
Poisonous insect bites such as from bees and wasps pose extremely serious hazard of allergic reaction, including anaphylaxis.	Throughout the Site.	Site Workers informed of nest locations. Nests that pose a clear hazard in work areas will be removed.

Hazards	Locations	Engineering Controls
Snakes are common on the Site, with the possible presence of Copperhead and Timber Rattlesnakes which are poisonous, as well as numerous non-poisonous species such as Black Snakes.	Throughout the Site.	Safety boots required in work areas. Short pants prohibited in work areas. Snake-bite kit included with first aid supplies.
Wild animals pose a hazard of rabies infection secondary to a bite. Raccoons, skunks, bats, and rats are potential vectors.	Throughout the Site.	Site Workers instructed to avoid confrontation and notify HSO immediately.
Poisonous plants such as poison ivy and sumac pose a hazard of severe rash, dermititis, and infection.	Throughout the Site.	Site Workers informed of appearance and locations on Site. Short pants prohibited in work areas.

4.7.1.6 Fast Moving Water

Site Workers may need to enter Deer Lik Creek and Slate Bottom Creek during their task assignments, primarily during the installation of the gabion baskets and reno mattresses. Site Workers may also be in or near these waterways during support tasks such as land surveying and water sampling. Under unusual, but potential depth and velocity conditions, these waterways can pose a significant hazard. The following precautions shall be taken:

Maximum Waterway Depth	Water Velocity	Site Worker Precautions
Below 2 ft.	Up to 5 fps	No special equipment. Use caution.
Below 2 ft.	Over 5 fps.	Life preserver must be worn.
2 ft. to 3 ft.	Up to 5 fps	Life preserver must be worn. Capture line deployed downstream.
2 ft. to 3 ft.	Over 5 fps	No Entry Permitted
Above 3 feet.	All conditions.	No Entry Permitted

Site Workers must always work in pairs (the "buddy system") in the Site work areas, and in particular while working in or near the waterways. Capture lines, when required, are deployed across the waterway, perpendicular to the bank. Lines are anchored on both banks with screw-type earth anchors. Lines are to be 3/4" with at least 1 orange flotation container per 4 feet. All life preservers shall be US Coast Guard approved.

A stream gauge will be used prior to the start of each work shift involving waterway entry, to determine the maximum water depth. A mechanical flowmeter will be deployed for measuring water velocity.

4.7.1.7 Fire / Explosion

Although the threat of brush fire is particularly high during the warm, dry months, it can occur as soon as the ground is free of snow and ice. Ignition sources can include vehicles, discarded smoking material, uncontrolled burning on an adjacent property, etc.

Community exposures include:

- Residences along Losson Road
- Residences along Hillpine Road
- Idlywoods Apartments
- LeHavre Drive
- Whitney Place

Onsite property exposures include:

- Overhead power transmission lines.
- NES and Agency field offices.
- Construction and refueling vehicles.
- Private vehicles in parking area.

The following engineering controls and procedures will be taken to reduce the possibility of fire or explosion:

- Smoking is prohibited beyond the parking area.
- All dirt trails and access roads are to be kept clear of brush and debris. Trails and roads are natural fire breaks and may be required for emergency vehicles.
- All vehicles in the work area will be equipped with fire extinguishers with a minimum rating of 3A:40B:C.

- All portable fuel containers will meet OSHA 29 CFR 1910.106, NFPA 30, UL listing, and FM approval.
- A fire extinguisher with a minimum 3A:40B:C will be staged within 50 feet of all portable generators, compressors, pumps, and welding activities on the Site.
- The Site Supervisor or Site Health and Safety Officer will be equipped with both Site radio communications and cellular telephone to ensure prompt notification to Municipal Emergency Services.
- Water trucks used for dust suppression will be equipped with hoses and small booster pumps.

4.7.1.8 Lifting Hazards

Care must be taken when loading and unloading equipment or supplies from elevated platforms, such as rack trucks and shipping containers. Workers must also exercise appropriate caution in moving drums and poly rolls. The Site Superintendent is responsible for ensuring that an adequate number of workers are assigned to each lifting task. Ergonomic support belts, intended to reduce the possibility of back injury secondary to lifting, will be provided as PPE on an optional basis. Employees are not required to lift any object under circumstances that they believe would be potentially injurious, due for example to a physical restriction, the object's weight, dimensions, or ability of a container to retain contents during the lifting process.

4.7.1.9 Environmental Hazards

Hyperthermia

Conditions in the work area during the summer months can be expected to occasionally exceed 90° F during the day, accompanied by high humidity. The ambient wet bulb globe temperature (WBGT) may be above 90 F° at certain times. **These ambient conditions are greatly exacerbated by the protective equipment, particularly Tyvek coveralls, hard hats, and gloves worn by the workers.**

These dangerous environmental conditions can have rapid deleterious affects on a worker's ability to safely perform basic tasks and avoid obvious hazards. It is essential that proper precautions, outlined below be consistently followed.

Heat related problems include **heat cramps, heat exhaustion, and heat stroke.** Refer to the NES Health and Safety Plan, Worker Protection and Safety Work Practices (82A8118) for a detailed explanation of the symptoms and first aid for each condition. This document is included with the Site Health and Safety Plan. **All workers MUST be familiarized with this information.**

Heat exhaustion is the result of fluid loss and metabolic stress as the individual attempts to maintain body temperature under extreme ambient temperature and humidity. Work activity can cause disorientation, nausea, vomiting, and blurred vision. When the signs and symptoms of heat exhaustion are encountered, the worker must cease activities, leave the area for an air-conditioned or cooler environment, and be provided with fluids and appropriate first aid treatment.

Heat stroke is a life-threatening condition resulting from the inability of the individual to regulate their core body temperature under high ambient temperature/humidity conditions. Heat stroke victims will be have hot, dry skin without perspiration. The victim will be disoriented, short of breath, extremely weak, experience nausea, and very possibly loss consciousness.

Preventive measures, when conditions warrant, include establishing a designated rest area near each work area. This refuge area should offer a cooler environment, with water or a suitable "sport-ade" liquid available at all times. The Site Superintendent is responsible for providing a sanitary drinking facility. Workers are permitted to cease work activities and rest in a cooler refuge area any time that they deem necessary due to the effects of heat stress.

Rest/work cycles of as high as 20/40 minutes shall be instituted by the Site Superintendent if WBGT conditions exceed 90 °F. Lower rest/work cycles may be applicable per NES policy 82A8118.

Noise

Site workers exposed to noise at or above 85 dB on an 8 hour time-weighted average are to wear hearing protection (ear plugs or muffs). Engineering controls to limit high noise exposure, such as varying personnel assignments, should be instituted when feasible. Refer to the NES Health and Safety Plan, Worker Protection and Safe Work Practices, NES Document 82A8118 for compliance information.

Project locations and situations which may impose excessive noise exposure include:

Site Location	Source	Expected dB Level	Engineering Controls
All work areas	Clearing and Grubbing	110+	Ear plugs NRR 30+
Disposal area	Dewatering	90-110	Ear plugs NRR 30+
All work areas	Earthmoving Equipment Drilling Equipment	90-110	Ear plugs NRR 30+

Hazardous Energy Sources (Electrical, Pneumatic, Steam, etc.)

Temporary electrical wiring used in areas on or near water accumulation poses a serious electrical hazard. Electrical appliances and portable site lighting must use ground fault circuit interrupters (GFCI), in addition to other National Electrical Code and local requirements for electrical equipment grounding.

Prior to maintenance or repair work on equipment, all electrical, hydraulic, pneumatic or steam pressurized sources of energy must be OFF or fully disconnected in accordance with NES Lockout/Tagout Procedure. Refer to NES Document 82A8124, Control of Hazardous Energy Sources for compliance information.

Work assignments which may impose an electrical or controlled energy hazard include:

Site Location	Equipment	Energy Hazards
All areas	Excavation equipment Power washing Drilling equipment Portable lighting Compressors Portable pumps	Electrical Mechanical Hydraulic

4.7.2 Personal Protective Equipment (PPE)

Based on an evaluation of potential hazards, the following levels of personal protection have been designated for the applicable work areas or tasks.

Hazardous Materials Status	Site Location	Work Assignments	PPE Level
Exclusion Zones	Tar pit and waste disposal area	All activities	C* or D
	Roundhouse area	Excavation	D
	Specified creek bottom locations	Excavation	D
Decontamination Zones	Personnel decontamination stations at Anti-tracking pads in Site work areas.	Decontamination and PPE disposal	D
Clean Zone	Parking area. Field offices. Specified maintenance & staging area.	General support tasks	D w/o hardhat

* Level C requirements are not expected, although pre-planning and training will provide for complete Level C capability.

Specific personal protective equipment for each level of protection is as follows. Site workers are always given the option to upgrade personal protective equipment (PPE). Downgrading of PPE is permissible only under the expressed direction of the Site Health and Safety Officer.

Level	Protective Equipment
A:	Not applicable
B:	Not applicable
C:	Tyvek coveralls with hood and taped anklets/wrists Latex gloves Rubber overboots Full face air purifying respirator (APR) with HEPA/VOC filter canister*. Radio communication with NES field office Optional: Powered APR respirator

D	Hard Hat Leather work gloves Steel-Toe Boots (Rubber boots or overboots in specified areas) Impact eye protection Full-body harness and fall protection system for specified activities Splash protection required for specified activities USCG approved life preserver for specified activities Tyvek coveralls in all exclusion zones Face shield with hard hat for specified tasks Integral hearing protectors with hard hat for specified tasks Radio communication with NES field office Shorts acceptable only UNDER Tyvek coveralls
Not Permitted	Tank Tops or Shorts

* Respirator canisters determined by type of chemical hazard. All canisters will have HEPA filters.

4.7.3 Personal Monitoring

Site workers will be monitored for exposure to airborne lead and arsenic in each work area at the discretion of the Site HSO. The MSA Escort personal sampling pump, or approved equivalent, will be used. At least 25% of workers, with tasks representative of highest expected exposure, will be monitored for this purpose. Personal air samples will be obtained on an 8 hour TWA exposure basis.

The Site Health and Safety Officer will ensure adequate sample collection, with at least 6 hours of collection time at 2 lpm, due to the limited pump size (720 liters or 0.72 m^3 for baseline results on 38mm acetate filter) and absence of supplementary background air monitoring in the immediate work area.

All sample results must be confirmed by the Site Health and Safety Officer and Project Manager prior to downgrading PPE.

If monitoring results indicate airborne lead levels above 30 $\mu g/m^3$ on an 8 hour time-weighted average, workers will be required to use respiratory protection while engineering controls are implemented to reduce this exposure level. The respirator will be an APR with HEPA filters, providing protection to 5,000 $\mu g/m^3$. The NES Health and Safety Plan (82A8121) "Respiratory Protection Program" will apply regarding selection, usage maintenance, and field training.

All lead samples will be forwarded to a NVLAP accredited and NYSDOH approved laboratory for analysis. Samples will be collected for analysis in accordance with EPA reference method N7082.

4.7.4 Environmental Monitoring

The following environmental monitoring instruments shall be used on Site at the specified intervals, and available for emergency requirements.

Direct Reading Instruments	Quantity	Frequency	Monitoring Application
Combustible Gas Indicator	1	As required	Emergency Use Only
Colorimetric Tubes/Pump	1	As required	Emergency Use Only
Photoionization Detector	1	As required	Suspected VOC.
Personal Multi-Gas Meter	1	As required	Emergency Use Only H_2S During Well Drilling
Petroleum Analyzer (PHA)	1	As indicated	Routine Analysis
Sound Level Meter	1	As indicated	During excavations and drilling operations.
Dust/Particulate Meter (Miniram)	3	Continuous	Work Areas

Indirect Reading Instruments	Quantity	Frequency	Monitoring Application
Sampling Pumps (PSP) 0.5 - 3 lpm	6	Continuous *	During specific excavation activities and conditions for personal and site perimeter.

* Note: The sampling pumps shall be calibrated for flow before use.

Weather Monitoring Instruments	Quantity	Frequency	Monitoring Application
WBGT Monitor	1	Hourly	During high temperature/humidity conditions.
Wind Sock (Visual Use Only)	1	Continuous	Quick field reference for wind direction.
Logging Wind Direction Indicator	1	Continuous	Cross-reference air sample locations with wind direction data.
Logging Anemometer	1	15 min.	Cross-reference air sample data with wind speed data.
Stream Depth Gauge	2	4 hours	During activities in a waterway.
Stream Velocity Gauge	1	Continuous	During activities in a waterway.
Other: Thermometer, Barometer, Hygrometer	1	Continuous	Used with WBGT monitor for possible environmental stress on Site Workers.

4.7.4.1 Airborne Monitoring Network

Airborne area monitoring for Site Worker protection is not planned. Personal air sampling, as described in Section 4.7.3, addresses the need to determine potential exposure levels and confirm PPE requirements.

Air sampling and analysis is planned as a means of identifying potential fugitive inorganic lead and arsenic emissions that may transgress the Site perimeter. Refer to the Community Health and Safety Plan, section 4.8 of the HASP for a detailed description.

4.7.5 Decontamination

All Work Areas are to be considered contaminated exclusion zones. Personnel and equipment leaving the work area shall be thoroughly decontaminated in adjacent "warm zone" areas that are free from dust accumulation.

4.7.5.1 Equipment Decontamination

Equipment and vehicles leaving potentially contaminated areas will pass over one or more of the anti-tracking pads. These areas are comprised of NYSDOT #3 gravel to a depth of at least 4 inches, overlaying a filter fabric sheet to retain contaminated soil. The anti-tracking pads are at least 50 feet in length and 15 feet wide. These pads are intended to remove potentially contaminated soil from tires and wheels.

Locations of the anti-tracking pads are indicated on the proposed site grading plan SP-4. These positions were established to ensure that the parking area is kept free from cross-contamination:

- Access road to Site from Losson Road.
- Entrance to parking area from work areas.
- Entrance to Roundhouse area. *
- Entrance to Waste Disposal and Tar Pit area. *
- Entrance to Slate Bottom Creek work area. *

* Vehicles cannot enter or exit without traveling across pads at these locations. These locations will have personal decontamination stations for Site Workers leaving the exclusion zones.

Construction equipment will be thoroughly decontaminated using a power washer prior to being moved to the parking area for loading. In addition, all construction equipment will undergo gross decontamination with power washer at least weekly and as necessary to prevent dust generation.

4.7.5.2 Personnel Decontamination

Designated Work Areas are to be considered contaminated *exclusion zones*. Personnel and equipment leaving the Work Area will be *thoroughly* decontaminated in an adjacent "contamination reduction zone" (CRZ) that is free from dust accumulation. Decontamination procedures will comply with requirements of OSHA 29 CFR 1910.120 and 1926.62.

There are two designated CRZ areas, located adjacent to the anti-tracking pads at the entrance to the Roundhouse area and the Waste Disposal area. Polyethylene covering will prevent soil contamination. Runoff will be contained to the anti-tracking pad. These CRZ areas will be directly accessible from the exclusion zone. Minimum Level D personal decontamination procedures shall apply. Modifications for this project, in accordance with the OSHA Lead Standard 29 CFR 1926.62, shall apply. Each area will be equipped with the following:

- Pressure sprayer for wetting down PPE, scrub brush
- Lined drums for disposal of coveralls and boots, decon "step-in" tub for scrubbing down
- Poly sheeting for equipment drop and decontamination wash

Minimum Procedures for Level D Decontamination

Station 1:	Equipment Drop*	Deposit equipment used on site (e.g. tools, monitoring instruments) on plastic tarp or in containers with liners.
Station 2:	Coverall, boot, and gloves cleaning	Wet outer boots, gloves, and coveralls with water from sprayer and brush. Only brush wetted surfaces.
Station 3:	Outer boot and glove removal	Remove outer boots and gloves. Deposit in container with plastic liner or polybag.
Station 4:	Boots, gloves, and outer garment removal	Coverall removed and deposited in container lined with plastic.
Station 5:	Field Wash	Hands and face to be cleaned at the field office facility. Shower as soon as possible.

* All equipment, such as shovels, will be washed and scrubbed before leaving the CRZ. This equipment should be left in the work area if it is to be used on the following day.

4.7.6 Worker Medical Surveillance

NES intends to take all appropriate measures to ensure the health and safety of employees at risk of exposure to potentially harmful conditions during the course of this project. To this end, the medical surveillance program is designed to meet several objectives:

- this program encourages the early detection of deleterious occupational health conditions, particularly acute airborne lead and arsenic exposure, so that harmful long-term effects can be avoided or minimized;

- this program permits NES to validate the effectiveness of engineering controls, work practices, and personal protective equipment in safeguarding the health of employees having task assignments during the project;

- a medical surveillance program is promulgated by federal law. OSHA 29 CFR 1910.120(f) HAZWOPER, 1926.62 Lead Standard, and 1910.1018 Arsenic Standard require that employees participate in a medical surveillance program if they have work assignments that pose a risk of exposure to hazardous substances, in this case inorganic lead and arsenic as the primary hazards.

Medical surveillance is an ongoing process that begins prior to the start of the employee's job assignment. The medical surveillance program will include the following examinations:

- Pre-assignment medical examination.
- Periodic medical examinations.

- Post-exposure examinations.
- Exit or termination medical examination.
- Emergency medical examination and treatment.

NES will utilize Board Certified physicians specializing in Occupational Medicine. The primary Medical Advisor is listed below. An alternate Medical Advisor may be assigned by the NES Safety Officer.

Corporate Health Care
95 Locust Ave.
Danbury, Ct. 06810
(Strook Tower - Danbury Hospital)
(203) 797-7811

All employee medical information is confidential. The results of examinations conducted under this program are available only to the employee, NES, the medical advisor, and those authorized by the employee. Records may be made available to OSHA or the New York Department of Labor upon written request.

In summary, medical procedures applicable to this program, conducted by the Medical Advisor or their designee, will include the following:

Baseline history, which consists of an interview to discuss past medical history, relevant family medical history, personal data, and occupational history.

Physical examination, which includes vital signs (pulse, blood pressure, respiration rate), general appearance, height, and weight, and other evaluation components based on the patient's medical history, age, and predisposition's.

Eye examination which includes tests that measure refraction, depth perception, and color vision. These tests shall be administered by a qualified technician or the physician. Vision quality is essential to safety, the accurate reading of instruments and labels, and the avoidance of physical hazards.

Spirometry examination is a pulmonary function test. Measurement will include forced expiratory volume in 1 second (FEV_1), forced vital capacity (FVC), and FEV_1 to FVC ratio. Interpretation of the results will account for age, height, and other factors. Other measurements may include FEF (forced expiratory flow), TLC (total lung capacity), and RV (residual volume).

Blood tests will be used as a diagnostic tool for assessing lead and arsenic exposure. Blood lead levels (PbB) and zinc protoporphyrin levels will be taken. In compliance with 29 CFR 1910.1025, these tests will be conducted on the following schedule:

- every 6 months for all employees exposed at or above the lead action level (30 ug/m^3) or arsenic action level (5$\mu g/m^3$).
- every two months for employees who previously tested PbB levels at or above 40 μg/100g of whole blood. This frequency is applied until two consecutive tests are below 40 μg /100g.

- every month during treatment for removal of elevated PbB.
- medical requirements for employees with elevated arsenic blood levels are to be determined by the NES medical advisor.

Employees who have incurred a direct toxic substance exposure, exceeding the OSHA specified STEL (short term exposure limit), per 29 CFR 1910.1000 tables Z1,2, or 3, or 10% of the IDLH concentration (NIOSH), shall be given immediate medical attention. *The appropriate course of action will depend largely on the nature of the toxic affect, whether acute or chronic, and if a physical injury, such a burn or fracture, is associated with the incident.*

The employee will be apprised of the medical test results, ramifications of the exposure incident, and the recommended medical course of action within 5 days after receipt of the results. A conference with the Medical Advisor should be offered to the employee. All communication regarding the incident, recommendations, and NES policy shall be documented. Also, recommendations offered to the employee by the Medical Advisor shall be obtained by NES and retained in the employee's medical file.

Medical records are retained for the employee's period of employment plus 30 years (per OSHA 29 CFR 1910.20). This includes all examination results, exposure history reports, injury reports, etc. Exposure history reports, received on a monthly basis by the NES Safety Officer, will be retained in the employee's medical file.

4.7.5 Emergency Procedures

The Site Health and Safety Officer shall be notified of any onsite emergencies and be responsible for ensuring that the appropriate actions are taken.

Personal Injury in an Exclusion Zone

1. The designated emergency signal shall be sounded, (Air Horn 2 Blasts).
   The Site Health and Safety Officer and Site Supervisor will be notified by radio.
2. The Exclusion Zone may be evacuated on direction of the Site Superintendent or HSO depending on the nature of the incident.
   The evacuee refuge area is the parking lot. Upon evacuation, all workers and site visitors are to assemble by the NES field office.
3. The Site Health and Safety Officer or Site Superintendent will evaluate the nature of the injury(s) and determine the extent of decontamination necessary prior to movement to the Support Zone.
4. Emergency Services will be notified and appropriate onsite first aid rendered.
5. If the victim is ambulatory and the mechanism of injury and condition of the victim clearly indicates that immobilization is unnecessary, the victim may be moved to the parking area by vehicle. This action is to be taken only at the discretion of the Site Health and Safety Officer.
6. The Site Health and Safety Officer will ensure that a Site Worker meets Emergency Services at the NES Site Office to direct them to the accident location.

Personal Injury in the Support Zone

1. The designated emergency signal shall be sounded, (Air Horn 2 Blasts).

The Site Health and Safety Officer and Site Supervisor will be notified by radio.

2. The Site may be evacuated on direction of the Site Superintendent, Site Health and Safety Officer, or on instruction from the Fire Department, depending on the nature of the incident. The immediate evacuee refuge area will be the parking lot. Upon evacuation, all workers and site visitors are to assemble by the NES field office.
3. If the victim is ambulatory without causing discomfort and the mechanism of injury and condition of the victim clearly indicates that immobilization is unnecessary, the victim may be moved to the parking area by vehicle. This action will be taken only at the discretion of the Site Health and Safety Officer and acquiescence of the victim.
4. Emergency Services will be notified and appropriate onsite first aid rendered.
5. The Site Health and Safety Officer will ensure that a Site Worker meets Emergency Services at the NES Site Office to direct them to the accident location.

Fire / Explosion

1. The designated emergency signal will be sounded. (Air Horn 3 Blasts). The Site Health and Safety Officer and Site Superintendent will be notified immediately by radio.
2. The Fire Department and Emergency Services shall be notified immediately either from the NES field office or via cellular telephone from the work area.
3. All construction equipment will be shut-down at the earliest safe opportunity.
4. All Site Workers will egress to the designated refuge area in the vicinity of the NES field office. The Site will be evacuated on direction of the Site HSO, Site Supervisor, or Fire Department. The Site entrance and access to the site work areas MUST be kept clear for responding emergency services vehicles.
5. Limited, incipient fires can be addressed with fire extinguishers when the Site Worker(s) have been specifically trained in fire extinguisher use.

Personal Protective Equipment Failure

1. Any Site Worker experiencing or suspecting an overexposure shall immediately egress to the support zone with the Site Worker "buddy".
2. Both Site Workers shall decontaminate per Site Safety Plan requirements.
3. The Site Health and Safety Officer shall be notified immediately. It may be necessary to suspend Exclusion Zone activities if the failure is due to chemical contamination.
4. Personnel are not permitted to reenter the Exclusion Zone without direct permission of the Site Health and Safety Officer.

4.8 COMMUNITY HEALTH AND SAFETY PLAN

In accordance with SARA Title III, Emergency Planning and Community Right-To-Know Act, it is incumbent upon the remediation contractor to institute air monitoring, engineering controls, and site policies and procedures to prevent a hazardous materials release from the site. Contingency planning detailed in this section provides for the early recognition of fugitive toxic emissions released within the site and having the potential to carry beyond the site perimeter. Contingency planning also includes the emergency procedures and community notification applicable to a hazardous materials release.

4.8.1 Potential Offsite Impacts

Residential neighborhoods that directly border the Union Road site on Hillpine Road, Losson Road, and Idlywoods Apartments are directly susceptible to fugitive emissions that can deposit lead or arsenic contaminated dust or soil, on or within buildings.

Prevailing southerly winds, particularly if southeasterly, will pose the largest potential of fugitive dust exposure to the Hillpine and Losson residences during the warm months, when open windows and ventilation fans promote dust capture.

Prevailing northwesterly winds, during the late fall and winter, pose the largest potential of dust exposure to the Idlywood Apartments, albeit little activity is scheduled during this time.

Lead surface water contamination within Slate Bottom and Deer Lik Creeks can be transported downstream. Sensitive receptors downstream include the Public, wildlife, and property.

4.8.1.1 Inorganic Lead and Arsenic

As indicated in Section 4.7.1.1, the primary hazard posed by the Site is inorganic lead. Potential arsenic exposure during remediation of the Roundhouse area is a secondary hazard. The Community Health and Safety Plan addresses several potential mechanisms that can transport contaminated particulates beyond the site perimeter:

- contaminated dust can be projected by wind erosion;
- vehicles leaving the site can transfer material to public roads;
- contaminated sediment from the marsh or tar pit areas can enter Slate Bottom and Deer Lik Creeks; and
- site workers with contaminated clothing can transfer material to local establishments or households.

On July 1, 1987, USEPA revised the ambient air quality standard for particulate matter less than 10 microns in diameter, which includes fugitive dust generated during remediation activities, whether contaminated or not. The primary standard limit is 150 $\mu g/m^3$ over a 24 hour averaging time and 50 $\mu g/m^3$ over an annual averaging time. This level was established based upon predicted respiratory tract deposition of the particulates and potential health effects of direct exposure.

NES will utilize engineering controls and continuous monitoring to ensure that fugitive dust emissions at the site perimeter do not exceed 150 $\mu g/m^3$ (as per NYSDEC TAGM4031). Indirect air sample monitoring at the site perimeter, positioned to be within the dust plume, will enable a determination of airborne inorganic lead and arsenic levels with the total fugitive dust emissions.

4.8.1.2 Noise

Noise levels generated by site activities are not expected to exceed 85 decibels on an 8 hour time-weighted average, the occupational exposure limit per OSHA 29 CFR 1910.95, at the site perimeter. However, short periods of nuisance levels (estimated 90 - 110 dB) may be expected during certain activities. To minimize the impact of nuisance noise, such operations will be conducted only during weekday business hours.

4.8.2 Engineering Controls

Every consideration shall be given first to the effective use of engineering controls, such as water spray, calcium chloride, and erosion control measures to prevent the uncontrolled, unplanned release of airborne fugitive.

The program for suppressing fugitive dust and particulate matter will be an integral aspect of the remediation activities. It is the responsibility of the Site Health and Safety Officer and Site Supervisor to ensure that the following engineering controls are implemented on an ongoing basis:

- Exposed road surfaces within the site will be treated as appropriate with calcium chloride pellets in accordance with accepted New York State Department of Transportation levels. This material, which is hydroscopic, aids in maintaining a higher surface soil moisture content and adheres to surface dust particles. Water will be applied to all Site roads as necessary to prevent surface soil drying.

- Vehicle speeds will be restricted to 10 mph. Excavation equipment will he restricted to the work areas and designated maintenance areas to avoid cross contamination of the parking area. Vehicles leaving the work areas will travel over the anti-tracking pads prior to moving to the parking area.

- Excavation equipment used in contaminated areas will be power washed to remove dust and compacted soil prior to removal from the work area. The excavation and transport of dry soil within the site perimeter may require that the soil surface be wetted or properly tarped.

- Under low humidity and high drying conditions, excavation faces and grading will be wetted where appropriate. Exposure of soil piles and grading, regardless of contamination level, will be minimized.

- If dust suppression techniques being utilized do not lower airborne particulate to a level of 150 $\mu g/m^3$ with no visible dust at the site perimeter, work activities in that area will be suspended.

4.8.3 Air Monitoring Program

The objective of the air monitoring program is to immediately identify conditions onsite which represent a potential fugitive emission of particulates beyond the Site perimeter. Airborne lead and arsenic levels will not be directly detectable with available measuring equipment at the time of emission. However, a conservative total airborne particulate limit (150 $\mu g/m^3$, 24 hour time weighted average) as defined by NYSDEC TAGM 4031 can be measured on a continuous real-time basis, and is indicative by inference of potential, or worst case, fugitive lead emissions.

By simultaneously measuring total airborne particulate concentrations on a continuous realtime basis and by conducting air sampling for both lead and arsenic concentration, an accurate, though delayed (6 to 12 hours) measurement of fugitive lead or arsenic emissions will be obtained.

Under worst case conditions, soil with the highest known lead content will be exposed to sufficient wind erosion to be carried offsite. The highest lead contamination level within 6 feet of the surface, identified in the waste disposal area, was 233,000 ppm. Assuming airborne dust generated by this soil retained similar concentrations, a total particulate level of 150 μg/m³ would generate up to 35 μg/m³ lead, which exceeds the OSHA action level for lead of 30 μg/m³. Actual lead levels would be verified through air sample analysis. Due to the relative density of inorganic lead or arsenic within the soil and dust plume, actual contaminant emissions can be expected to be significantly lower.

The air monitoring program will consist of the following stations:

- One meteorological station will be located at the NES Field Office. Wind direction and strength will be monitored and logged continuously. The data will be correlated to all airborne samples. Seasonal windrose information will be available as a guide for sampling station siting. A windsock will be mounted at the NES Field Office for visual reference.

- Three (3) portable PDM-3 Miniram particulate monitoring stations (Minirams), with tripods, (or approved equivalents) will be deployed at each work area. Two Minirams will be placed downwind of active remediation activities and one Miniram will be placed 180 degrees (upwind) of active remediation activities. This device provides real-time particulate levels including datalogging, with a low range limit of 100 μg/m³, which is 50 μg/m³ below the stop-work criteria. The Miniram units will be the only means of obtaining actual particulate level concentrations during remediation activities, and will therefore provide the criteria for suspending work activities or initiating emergency controls to reduce dust emissions. Note that dust levels considered unacceptable may not be visually detectable. Instrument siting and monitoring frequency criteria include:

  - Placement of the two downwind Minirams will be at 10-30 degree separation as taken from the suspected release location.
  - Placement will be as close as possible to the site perimeter except that the location will be moved towards the release location as necessary to verify that the plume has not risen above the station at the perimeter.
  - The third Miniram will be placed 180 degrees (upwind) of the initial placement to obtain a control baseline sample of air entering the Site.
  - Real-time wind direction (Site meteorological station and windsock) and weather forecasts obtained by the National Weather Service office will direct initial placement of the portable monitoring stations at the site perimeter during remedial activities.

- MSA Escort portable sampling pumps, or approved equivalents, will be used for measuring actual ambient air lead and arsenic levels. Samples will consist of 540 liters minimum volume (6 hours @ 1.5 lpm) collected on standard MCE 37 mm acetate filters with 0.8 μm pore size media. Gemini Dual-Sampler attachment, or approved equivalents, will permit separate collection of lead and arsenic samples. Use of low volume sampling pumps permit battery operation and portability, as well as weather resistance and reliability under harsh conditions. Units will be deployed in weatherproof housings on semi-portable mounts 6 to 8 feet above ground level. Siting and monitoring frequency criteria will include:

  - Unit(s) semi-permanently mounted at a location directly downwind of the work activity site based on seasonal wind direction and strength data. Generally, the wind vector of highest frequency, as depicted on the windrose chart, will be the initial station placement.

- Unit(s) will be placed at 60 degrees separation from the initial station as calculated from the emission location(s).
- Unit(s) will be deployed as required to obtain samples directly downwind of the emission location, and will be available in the event of a sudden, permanent wind shift.
- Samples will be collected daily during remedial activities and sent for laboratory analysis on an overnight delivery basis for next day results.

- Air sample analysis will be conducted by an AIHA and NVLAP accredited, NYSDOH approved laboratory using atomic absorption spectroscopy (AAS) in accordance with EPA reference method N7105 for lead, and EPA reference method N7900 for arsenic. All air samples will be analyzed for lead and arsenic.

- Deep monitoring well drilling will be conducted under continuous H_2S monitoring using the multi-gas meter equipped for H_2S measurement. These measurements will be taken at the well surface to indicate a worst case release concentration. Emergency notification (per 4.8.5) will be initiated at 10 ppm (NIOSH ceiling) at the well opening.

- Deep monitoring well drilling operations will be conducted under continuous H_2S monitoring using the multi-gas meter equipped for H_2S measurement. These measurements will be taken at the well surface to indicated a worst case release concentration. Emergency notification (per 4.8.5) will be inititated at 10 ppm (NIOSH ceiling) at the well opening.

4.8.4 Water Monitoring Plan

Work activity in the tar pit area is potentially a source of emission for inorganic lead, arsenic, and total petroleum hydrocarbons into Slate Bottom Creek. Therefore, weekly surface water analysis will be conducted during work activities in the tar pit and marsh areas, and during activities directly in Slate Bottom and Deer Lik Creeks. Baseline samples will also be taken prior to the start of work in these areas. Samples will be taken at the following locations at each time:

- Upstream of the tar pit discharge into Deer Lik Creek.
- In Slate Bottom Creek, upstream of the confluence with Deer Lik Creek.
- At the wetland area discharge.
- At the entrance to the Slate Bottom Creek culvert.
- At the exit from the Slate Bottom Creek culvert.

Samples will be filtered in the field and analyzed for total lead and dissolved lead per EPA reference method 239.2 and for TPH by EPA reference method 418.1, by a NYSDOH approved laboratory. Results will be available within 48 hours of sampling.

4.8.5 Emergency Notification

A discussion regarding the coordination of emergency notification and procedures was conducted with Earl Loder, Emergency Service Coordinator for the Town of Cheektowaga. Prior to Site mobilization, a meeting will be held with local fire officials (Bellevue Department), County

Hazardous Materials Response Team, the Department of Emergency Services, NYSDEC, and NYDOH representatives. The procedures and criteria for emergency notification involving a hazardous materials release or other site emergency that can affect the surrounding community will be reviewed in detail. The Site Emergency Action Procedures agreed to by the responding emergency services agencies will be incorporated into the Site Health and Safety Plan in this Section.

Site emergencies that can impact on Community Health and Safety include:

- Brush fire, particularly under high wind, dry conditions.
- Vehicle, or structure fire involving hazardous chemicals.
- Fugitive emissions of lead and/or arsenic contaminated dust.
- Fugitive emissions of hydrogen sulfide gas.
- Release of lead and/or arsenic contamination into Slate Bottom Creek.
- Diesel fuel release into Deer Lik or Slate Bottom Creeks or storm water system.

In the event of any of these emergency situations, all Community notifications will be made through the Town of Cheektowaga Fire Department, who will be the initial, immediate contact for NES Site personnel.

Attachment 4 - A

Mr. Frederiksen's CIH Certificate

The

American Board of Industrial Hygiene

ABIH

AMERICAN BOARD OF INDUSTRIAL HYGIENE

organized to improve the practice of Industrial Hygiene
proclaims that

Davis E. Frederiksen

having met all requirements through
education, experience, and examination,
is hereby certified in the

COMPREHENSIVE PRACTICE
of
INDUSTRIAL HYGIENE

and has the right to use the title and designations

CERTIFIED INDUSTRIAL HYGIENIST

CIH

Dec. 12, 1986
date

Chairman ABIH
Vernon E. Rose, Dr. P.H., CIH

3388
certificate number

David M. Trayer
Secretary ABIH
David M. Trayer, CIH

Attachment 4 -B

Resumes' of Key Personnel

MARK CAMBRA, P.E.

EDUCATION

M.S., Environmental Engineering, University of New Haven
B.S., Civil Engineering, University of Connecticut
Health and Safety Training for Hazardous Waste Site Operations (40 hours and 8 hour refreshers)

PROFESSIONAL CERTIFICATIONS AND AFFILIATIONS:

Licensed Professional Engineer, State of Connecticut
National Honorary Civil Engineering Fraternity (Chi Epsilon)
National Engineering Honor Society (Tau Beta Pi)
American Society of Civil Engineers (ASCE)

QUALIFICATIONS & RELEVANT EXPERIENCE

Mr. Cambra is the Section Manager, Environmental Engineering, in the Department of Environmental Engineering and Remediation. His responsibilities in this position include technical and administrative oversight of management, design, and implementation of remediation and engineering projects.

Mr. Cambra has over six years of office and field experience in various types of environmental, civil and remediation project design and implementation. His experience includes projects involving underground storage tank removal and subsequent remediation, solid waste landfill assessment and closure, RCRA hazardous waste landfill closure, and contaminated soil and ground water remediation.

Since joining NES, Mr. Cambra has been involved with several projects which have included:

- Project management for removal of underground storage tanks at an active manufacturing facility in Connecticut. Specific activities included preparation of work scope for subcontractor, field oversight, approval of subcontractor invoices, and submission of reports to the CTDEP.

- Project management for remediation and demolition of radiological and chemical contamination at an abandoned nuclear testing facility in Pawling, New York. Specific project activities included removal of underground storage tanks, excavation of contaminated soil, radiological characterization and decontamination, building demolition, abandonment of 500 feet deep water wells, asbestos abatement, lead-based paint abatement and site restoration.

- Project Engineer for the design of a $14 million dollar inactive hazardous waste landfill closure project located in Cheektowaga, New York. Specific activities included design of slurry wall, landfill cap, dewatering system, gabion basket stream improvement system (including culvert wingwall), and completion of U.S. Army Corps and local sewer authority permit applications.

- Technical review of a number 6 fuel oil recovery and remediation system involving an innovative drainage system to increase the flow of product and reduce the amount of aggregrate contamination located in Pawtucket, Rhode Island.

- Project Engineer for design and installation of a free product recovery system at a 100 acre active petroleum distribution terminal located in Linden, New Jersey.

- Preparation and negotiations of the contract between NES and subcontractors concerning a building modification and HVAC system design and installation at an active manufacturing facility in Waco, Texas.

- Feasibility study analysis and evaluation of new proposed remediation guidelines regarding a hazardous waste site remediation located in Houston, Texas, contaminated with lead battery chips.

Prior to joining NES, Mr. Cambra's experience included the following:

BIRD ENVIRONMENTAL, INC. (formerly YWC, Inc.)

1991 to 1993 Senior Project Engineer

Mr. Cambra was responsible for numerous RCRA hazardous waste facility closures, groundwater characterization and remediation projects, industrial wastewater treatability studies and designs, soil contamination assessment and remediation, underground storage tank removals, and groundwater assessment and treatment projects. His duties in this capacity included:

- Managing groundwater and soil contamination projects;
- Managing underground storage tank removal projects;
- Performing site audits, assessments, and characterizations;

- Preparing work plans, closure and post-closure plans, groundwater monitoring and site assessment reports;
- Preparing plans, specifications, and bid packages; and
- Coordinating and soliciting soil contractors.

YWC, INC.

1988 to 1991 Project Engineer

Worked on several RCRA hazardous waste facility closures, groundwater characterization and remediation/treatment projects. His responsibilities included the following:

- Managing and inspecting remediation and construction projects consisting of verification sampling, submittal review, field measurement verification, and communication with agencies;
- Designing various RCRA closures utilizing the AutoCad graphics program; and
- Preparing specification/bid packages and cost and material estimates.

RICHARD D. MOSS

EDUCATION

Currently enrolled in Masters Program in Occupational Health Management at the University of New Haven
B.A. Economics, Colgate University
M.B.A. Administration, University of Connecticut

QUALIFICATION & RELEVANT EXPERIENCE

Mr. Moss joined the Integrated Environmental Services Division of NES in August 1993 to support our health and safety activities. In this position, he is responsible for the supervision of NES' Health & Safety Program. Mr. Moss brings with him over eight years of experience in project management and a successful track record in designing focused, coordinated programs. Mr. Moss also has extensive engineering research and reporting experience.

Mr. Moss has experience in developing compliance programs to OSHA standards. He has developed training programs and has considerable "hands-on" HAZMAT remediation work in accordance with OSHA 29 CFR 1910.120. Mr. Moss is an EMT-1, American Heart Association CPR Instructor, and Certified State Fire Instructor in Connecticut.

Mr. Moss has managed the health and safety and industrial hygiene requirements for numerous NES hazardous materials remediation projects, and has oversight responsibility for all NES field activities involving hazardous materials. Since joining NES, projects and responsibilities have included:

- Health and Safety Officer for the Chevron Nuclear Lake radiological decommissioning project, with responsibility for the site health and safety program, asbestos and lead abatement program, site safety management, and project regulatory compliance.

- Health and Safety Officer for the Marathon Corporation cadmium remediation project with responsibilities for development and implementation of the health and safety program, industrial hygiene, and medical surveillance. This project involved the abatement of cadmium and nickel dust throughout a 200,000 square foot operating manufacturing facility.

- Development of the NES Corporate Health and Safety Program, which addresses both office and field health and safety policies, medical surveillance program, training requirements, regulatory compliance, and ongoing management assessment.

- Health and Safety Officer for the Union Road NYSDEC Superfund Project with responsibility for the Site Health and Safety Program, Community Health and Safety Plan, regulatory compliance, training requirements, and medical surveillance program.

- Project coordinator for the asbestos and lead assessment program as part of the University of Washington Training Reactor Decommissioning Project.

- Health and Safety Officer for the Tiverton Bioremediation Project, responsible for health and safety oversight, training, medical surveillance program, and regulatory compliance on this 106 acre remediation project.

- Development and implementation of the Site Health and Safety Plan involving an extensive RCRA lead abatement project for a major NES client.

Mr. Moss is also a regular contributor to The Interpreter on health and safety issues, and is the lead instructor for the NES 40 hr HAZWOPER course, in addition to other OSHA training courses.

Prior to joining NES, MR. Moss' professional experience included the following:

AET

1991 to 1993 Site Technician

Involved with emergency spill response and hazardous materials remediation.

SOS TECHNOLOGIES

1991 to 1993 Marketing/Training Consultant

Developed OSHA compliance programs for several major corporations covering over 3000 employees. Conducted health and safety training for corporate clients.

HONEYWELL, INC.

1986 to 1989 Project Specialist

Successful track record in designing focused, coordinated technical product programs with Engineering, Manufacturing, Finance, and Field Sales. Extensive market and engineering research and reporting experience involving technical products for fluid control applications. Member of the emergency response team.

CRANE COMPANY

1984 to 1986 Project Manager, Engineered Products

WHEATLEY INC.

1982 to 1984 Product Manager, Specialty Products

Responsible for fluid control products for chemical process, fossil energy, nuclear energy, and US Navy Nuclear applications.

CERTIFICATIONS

EMT-1, CPR Instructor, Advanced PHTLS
CT Fire Service Instructor I Certification
NFPA Firefighter III Certification
OSHA 40 hr HAZWOPER training
OSHA Hazmat Operation Level Certification

MARTIN D. LUNN

EDUCATION

Enrolled in M.S. program, Occupational Health Management/Industrial Hygiene, University of New Haven
B.S., Biology, University of Connecticut

QUALIFICATIONS & RELEVANT EXPERIENCE

Mr. Lunn is an OSHA Compliance Specialist in the Environmental Compliance Department. His responsibilities in this position include:

- Field health and safety oversight for remediation and construction projects;
- Conducting OSHA compliance audits;
- Establishing health and safety programs;
- Developing site safety plans and providing site supervision; and
- Preparing and conducting training programs.

Since joining NES, Mr. Lunn's experience has included the following:

- Site Health and Safety Officer for a multi-year bioremediation project at a 106 acre site in Rhode Island. Specific responsibilities have included daily health and safety inspections and monitoring, providing site-specific training to site workers, implementation of community health and safety monitoring, maintenance of site health and safety records and documentation, and maintenance of health and safety equipment. Key health and safety issues at the site include extensive excavation, screening rocks out of soil, transportation of soil throughout the site, construction of biobeds for performance of bioremediation, removal of retaining walls and earthern dikes, air monitoring, and traffic control. These issues are handled in a manner to protect residential neighborhoods, a public beach and a major navigable waterway which are adjacent to the site.

- Comprehensive OSHA compliance audits for manufacturing firms, involving air monitoring, hazardous waste sampling, and health and safety program review.

Prior to joining NES, Mr. Lunn's experience included the following:

ENVIRONMENTAL SCIENCES CORPORATION

1992 to 1993 Environmental Hygienist

In this capacity, Mr. Lunn was responsible for the following:

- Performing environmental and industrial sampling in connection with hazardous waste remediation projects;
- Preparing collected samples for analysis by means of extraction, digestion, or distillation;
- Updating and oversight of the corporate respiratory protection program;
- Conducting training classes for field personnel on proper field sampling techniques, chemical hygiene, and fire safety; and
- Developing and marketing services offered by the field department.

HALLIWELL ENGINEERING ASSOCIATES

1990 to 1992 Construction Manager/Field Engineer

Mr. Lunn represented building owners on large scale asbestos abatement and renovation projects. These projects ranged in value from $1 million to in excess of $5 million. Duties included the following:

- Assuring contractor compliance with contract documents, industry standards, as well as all applicable government regulations, including the Toxic Substance Control Act, Resource Conservation and Recovery Act, and the Comprehensive Environmental Response, Compensation, and Liability Act.
- Managing all aspects of project industrial hygiene, including sample quantities, location, and sampling duration; and
- Ensuring that solid/hazardous waste generated during construction was disposed of properly.

He also was an active participant in the design team for asbestos abatement projects in occupied and unoccupied high-rise office buildings, industrial sites, and resort complexes, and developed corporate Worker Right-to-Know/Hazardous Communication programs.

ENVIROMED SERVICES

1989 to 1990 Project Manager/Industrial Hygienist

As a Project Manager, Mr. Lunn managed on-site project monitors and air sampling technicians for a wide range of asbestos abatement projects. As Industrial Hygienist, he performed environmental and personal air sampling, sample analysis, and interpreted collected data for clients; conducted quality control inspections during all project phases; and mediated issues that developed between building owner and contractor.

U.S. Army Reserve

1984 to 1992

Received Honorable Discharge in May 1992. Attained rank of First Lieutenant.

PROFESSIONAL CERTIFICATIONS AND AFFILIATIONS:

Hazardous Materials Management Site and Safety, 1992
Hazardous Materials Management Emergency Response, 1992
Asbestos in Buildings: Abatement Supervision, 1991
NIOSH 582 Asbestos Air Sampling and Microscopial Analysis, 1989

JOHN M. FALBO
11036 Snyder Road
Springville, New York 14141
(716) 592-5294

OBJECTIVE: Seeking a challenging and responsible Supervisory position in the Construction Hazardous Waste field, in an assignment that offers the opportunities to advance based on individual contribution and initiative.

PROFILE: Excellent problem-solver, efficient, self-motivated, well-organized. Experienced primarily in area of landfill construction and closure both hazardous and non hazardous. OSHA 40 hour trained.

PROFESSIONAL EXPERIENCE:

URS Consultants, Inc., Buffalo, New York — **Senior Inspector** — 1993 - present

- Resident inspector for NYSDEC for the FMC Dublin Rd., Medina, NY Superfund Project. Providing oversite to assure regulatory compliance during remediation of a hazardous pesticide waste landfill. Project consisted of construction of a 2 acre double composite cell. Stabilization of 40,000 cy of waste, construction of a permanent onsite waste water treatment plant.

- Resident inspector at Pfhol Bros. Hazardous Waste Landfill, Phase II, Buffalo, NY. Project involved hazardous waste drum excavation, shredding and offsite disposal. Performed oversite inspection for the NYSDEC assuring regulatory compliance..

- Resident inspector on a local municipal landfill during impervious clay wall construction. Duties included oversight of wall construction, in-place density testing, Shelby tube sampling, surveying activities and coordination of daily activities with the landfill owners.

OHM Corporation, Buffalo, New York — **Supervisor II** — 1993

- Site Supervisor for the construction of a support area for a thermal dissorbtion demonstration project for a Niagara Mohawk Corporation in Utica, NY. Project included the construction of a contractors trailer area; hazardous waste processing area including HDPE containment, underdrain collection and pumping system; construction of 1.5 acre wastewater pre- and post-treatment ponds; and the excavation and processing of 4,000 tons of on-site waste. Other duties included scheduling of project, personnel, subcontractors, procurement of equipment, determining project cost and material quantities, ongoing negotiation with contracting customer.

- Operations Supervisor on a facility decon operation for Alcoa Aluminum Corp. in Mesina, N.Y. Duties included over-site of daily operations, assignment of personnel tasks, short and long term project scheduling and coordination of waste disposal.

URS Consultants, Inc., Buffalo, New York — **Senior Inspector** — 1991 - 1993

- Sr. Resident Inspector for Interim Remediation on NYSDEC Pfohl Bros. Project in Buffalo, NY. Responsible for inspection/administration of project to include: monitoring contractor's site construction, drum & soil removal to determine unit quantities, waste sampling activities, cost monitoring, scheduling, preparation of daily reports, review of change orders and submittals.

- Sr. Inspector assigned to EPA Helen Kramer Landfill closure project for Corps. of Engineers in New Jersey, #4 on the National Priority List. Responsible for the inspection and technical assistance during stabilization of 30,000 cy of subsoil, placement of 22,000 cy of roller compacted concrete retaining wall, installation of 2000 LF of sheet piling and gabion baskets for erosion control.

Malcolm Pirnie, Inc., Orchard Park, NY — **Construction Inspector** — 1988 - 1991

- Resident Inspector for closure of 27-acre Western, NY industrial hazardous waste landfill. Responsibilities: inspection, in-place soil density testing, collection of Shelby samples, monitoring construction costs/pay requests, and preparation of inspection report for company and NYSDEC.

- Resident Inspector/construction administration for closure of WWTP Ash Landfill in Lackawanna, NY, monitoring and inspection of excavation/installation of leachate collection system; installation of 45,000 sf of high-density polyethylene cap; and preparation of daily [illegible]

JOHN M. FALBO

- Resident Inspector for removal and disposal of 7,500-gallon toluene underground storage tank (UST) system including tank, piping, and associated appurtenances. Responsibilities: overall monitoring of removal of UST system, testing/sampling of surrounding soils prior to off-site disposal.

- Excavation and removal of Level "B" hazardous waste drum site for specialty organic chemical manufacturer in Connecticut. Responsible for construction inspection/administration of project including monitoring of contractor's drum/waste, soil excavation activities to determine unit quantities, waste sampling and analytical activities; construction cost monitoring, scheduling; preparation of daily reports, change orders and approvals; project coordination with Owner/Contractor; and served as field liaison with DEP officials.

- Resident Inspector for RCRA-type closure of six-acre waste landfill in CT used for disposal of organic chemicals, misc. plastic resins and sludges. Duties: inspection of excavation of 850-foot long, 4-ft wide, 18-ft deep trench using tight wall sheet pilings; placing and fusion welding of HDPE leachate collection pipe; and installation of a pump station including pumps, welded stainless steel pipe, flow meters, totalizers and applicable float switch and electric controls.

- Resident inspection/construction administration for the Phase II and III sections of 25-acre Sanitary Landfill in Bath, NY. Duties: inspection of excavation for landfill basin and construction of liner system to include a ground water drainage system, clay liner, leachate detection and leachate collection systems, and installation of 800,000 sf of high-density polyethylene liner.

- Resident Inspector/Construction Administrator for 15-acre landfill closure and leachate collection system in Ishua, NY. Responsibilities: in-place soil density testing with nuclear moisture-density gauge, in-situ permeability tests and collection of Shelby samples; ground water monitoring well sampling and level indicating; and preparation of reports.

CECOS Environmental, Inc., Buffalo, New York **Chemical Technician** 1987 - 1988

- Responsible for processing of hazardous waste material for treatment and/or disposal; demolition and clean-up of toxic and hazardous waste sites; asbestos abatement and containment; chemical sampling and cataloging; underground storage tank testing for tightness; tank entry above and below ground for cleaning and inspection; tank excavation, decontamination and disposal; sludge dewatering using mobil filter press

Niagara Electrical & Technical Products **Quality Control Inspection Foreman** 1984 - 1987

- Product performance testing; receiving inspection; data records keeping;
- Use of Statistical Performance Charts, blue prints, engineering specifications and calibrated equipment.

Harrison Radiator Division of General Motors **Inspection** 1969 - 1979

United States Air Force **Supervision, Inspection, Weapons Loading** 1969 - 1973

TECHNICAL TRAINING & CERTIFICATES:

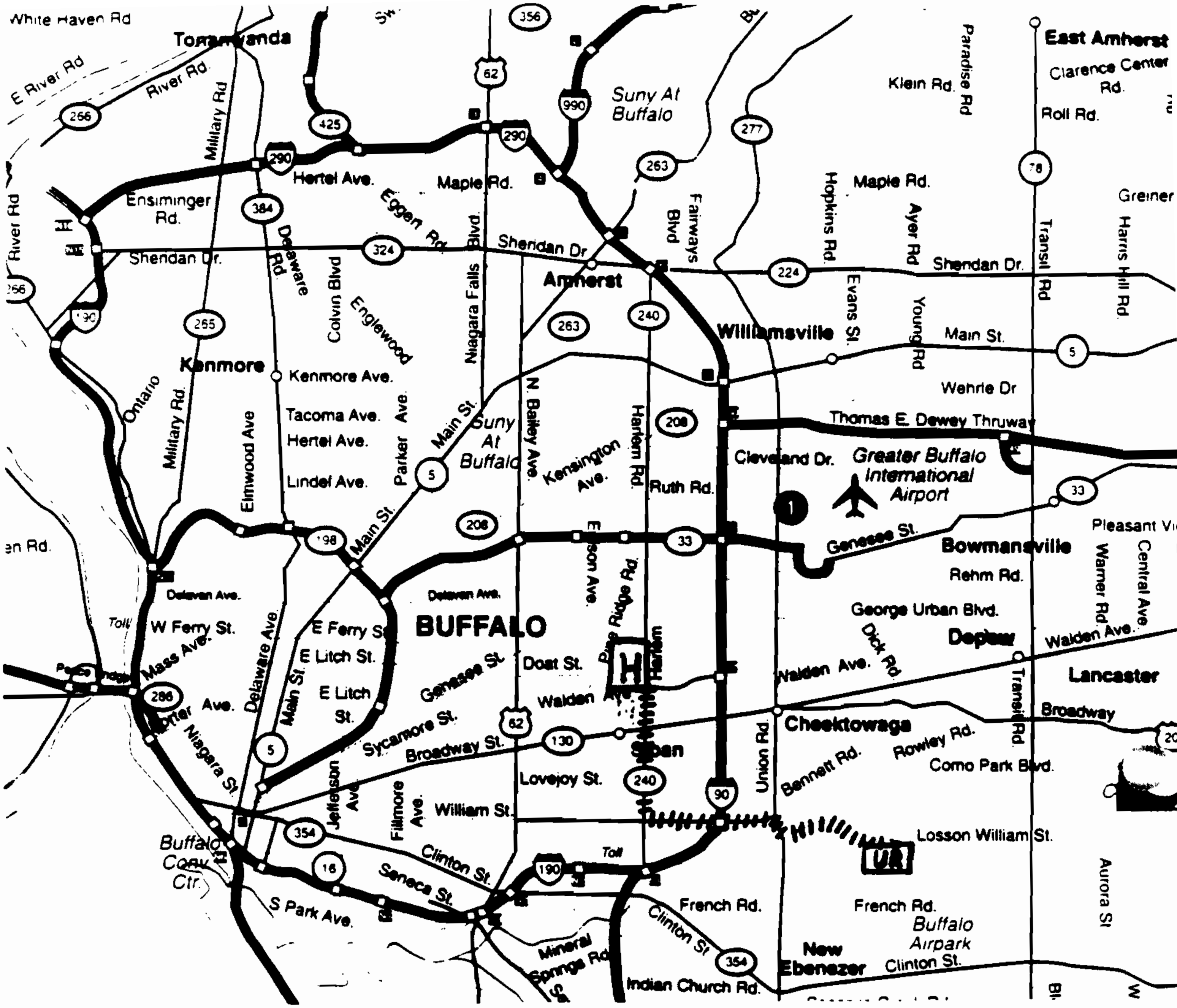
- RCRA Health & Safety Training - Hazardous Waste Sites - 40 hours
- Trained and proficient in use of respirators, in line air, SCBA and encapsulated suits.
- Certified Nuclear Moisture-Density Gauge Operator
- Statistical process control QA/QC - Eastern University of Michigan
- NICET Certified Level I - Geomembranes & Geotextiles
- Continuing education in Construction Technologies - Erie County Community College - 1994

PERSONAL DATA: Married, three children, excellent health (5'8 - 165 lbs)

REFERENCES FURNISHED UPON REQUEST

Attachment 4 -C

Map illustrating Directions to Nearest Hospital
(Corner Walden and Harlem Aves)



Directions to St. Josephs's Hospital From Union Road Site:

Left onto Losson Road
Right onto Union Road
Left onto William Street
Right onto Harlem Road (Route 240)
Left onto Walden Ave.
Follow signs to Emergency Room entrance.

Telephone: 891-2450

Attachment 4 -D

Daily Sign-In Sheet

DAILY SIGN-IN SHEET

Page ___ of ___

Date:___/_____/___

Visitors	Representing	Time In	Time Out

D. EMERGENCY CONTINGENCY PLAN

14. CONTINGENCY PLAN FOR REMEDIAL CONSTRUCTION ACTIVITIES

The primary intent of the Contingency Plan is to accomplish the approved remediation goals and to insure compatibility between the NYSDEC, Owner, PRP, Project Engineer, and local authorities to resolve any failures and/or problems of the remedial design system components.

The Contingency Plan stipulates responses to a variety of situations that may occur at the Union Road Site. The Contingency Plan supplements the site Health and Safety Plan and the site Operation and Maintenance Plan. The site Health and Safety Plan will control emergency response, site specific monitoring, and environmental safety issues.

The Contingency Plan for remedial construction activities identifies measures to insure the protection of the environment and site personnel, and will generally address health and safety issues if there are unexpected site conditions. The Contingency Plan items include the alternative operations and methods intended to be used as back-up to remedial design and for construction activities conducted. The Contingency Plan is to be implemented if any element of the remedial design fails to achieve any of its objectives or otherwise fails to protect the environment. A Contingency Plan situation matrix is provided to summarize Plan items and will be used as a general reference for field use and emergency response.

14.1 REMEDIAL CONSTRUCTION ACTIVITIES

14.1.1 Clearing and Grubbing Operations

This work will consist of clearing, grubbing, removing, and disposing of all trees, brush, stumps, fences, debris, and other miscellaneous materials. No burning will be permitted on or off the site. No tree stumps, tree trunks, or other debris will be buried within the site area without grinding and approval by the Project Engineer.

The Contractor is to comply with the requirements of preservation of property and restoration of disturbed areas outside site property boundaries. Clearing and grubbing operations will be conducted to maintain a minimal amount of exposed cleared area at one time.

14.1.2 Erosion, Sedimentation, and Dust Control

The work to be conducted will consist of both temporary and permanent control measures during the life of the construction and remedial period. Both temporary and permanent type erosion controls will be coordinated with all other remedial actions to the extent practicable. The goal is to guarantee an economical, effective, and continuous erosion control throughout the remedial construction and post construction period.

If there is a conflict between the specification requirements and pollution control laws, rules, or regulations of other State, Federal, or local agencies, the more restrictive laws, rules, or regulations will apply.

Dust control measures will be conducted as required during construction activities. Equipment and materials utilized to control dust will be kept on-site for use as required. During the progress of the work, the Contractor will conduct all operations and maintain the work area to minimize the creation and dispersion of dust. If determined by the Project Engineer, water and/or calcium chloride will be applied for more effective dust control. (See Health and Safety Plan for additional discussion regarding dust control.)

14.1.3 Reference Materials

Copies of all pertinent equipment and material shop drawings and a copy of as-built drawings will be maintained on-site. A copy of the site Health and Safety Plan, as well as all pertinent correspondence, including the NYSDEC Order of Consent, will also be maintained on-site for review and use.

14.1.4 Channel Integrity

Stream bank sediment bars, snags, stumps, debris, trees, branches, brush, and other debris disturb the smoothness of flow. These materials should be removed from the channels prior to and following the placement of gabions and mattresses in the channel.

The integrity of gabions and mattresses placed in the stream channel will include periodic inspection, particularly following major rainfall events. Fallen trees, limbs, branches and other debris accumulating in work areas will require removal to provide channel capacity.

Continued maintenance of the completed stream bank erosion controls is essential to avoid damage in the future. Control measures, once installed, are not automatically permanent and must be maintained.

The Operation and Maintenance Manual also discusses channel integrity.

14.1.5 Roadway Systems, On and Off Site

The use of on-site roadway systems will require routine maintenance during the active construction phases of the project. This would include erosion and sediment controls, dust control, and possibly snowplowing so access to critical areas can be achieved.

Pollution control truck mats will be placed at locations where truck and vehicle traffic leaves the site and continue onto local and State roads. This will insure the reduction of the amount of material on wheels and undercarriages that may potentially leave the site.

14.1.6 Slurry Wall

The slurry wall will be utilized to contain contaminants. Routine inspections, damage control, and contingency planning are required. (See Operation and Maintenance Plan for additional information.)

14.1.7 Monitoring of Soil Cover Re-vegetation

Soil cover revegetation work will require monitoring and maintenance until both soils and vegetation are stabilized. Mowing and additional erosion and sediment controls will be required as determined by NES/IES and the technical specifications for turf establishment.

14.1.8 Utilities and Power Sources, Emergency Power

Before any excavation and land modification activities, the Contractor will contact the New York "Call Before You Dig" protective organization to mark out and locate all facilities and utilities on or near the site. This "Call Before You Dig" [(800)962-7962 or (716)893-1133] notification must remain intact during all pre- and post- construction activities. New York State's Industrial Code 53 requires that the underground protective organization be called at least two working days (but not more than 10 working days) before the start to drill, dig, excavate, blast, drive pipe or posts. When called, the following information will be provided:

Name:	Union Road Site
Address:	Losson Road near Hillpine Road East of Union Road (Route 277) @ former Central, NYS, & Conrail Railroad Track Crossing and Roundhouse area, Town of Cheektowaga, Erie County, NY
Work to be Undertaken:	Clearing and Grubbing, Installation of Channel Rip-Rap, Excavation, Backfilling, Environmental Remediation Activities, and Drilling

Rewiring and/or re-networking of the site power source activities during emergency situations will be discussed with the power company. Alternate standby generator options will, in all cases, be available upon short notice.

14.1.9 Vegetative Screening

Any proposed modification to the existing vegetation that may be necessary to produce a vegetative screen around the landfill cap upon completion of all remedial activities will require monitoring during installation and maintenance during the project. Locally available vegetative species requiring little or no maintenance will be utilized and will be readily available if a replacement is required. Vegetative screening will be used to provide a border between the landfill cap area and the local residential neighborhood.

14.1.10 Weather Conditions/Dewatering

Site weather conditions may be cold and snowy in the winter and moderately warm in the summer. Precipitation is well distributed during the year and is adequate for most crops. From late fall through winter, snow storms are frequent and the average snowfall is heavy. Normal ingress and egress to the site will be maintained during active construction winter snow events. Snow plowing of site roadways will be undertaken as required.

The entire site is subject to flooding during major rainfall events. Caution will be taken concerning the storage of materials and equipment to minimize the risk of flood damage.

Dewatering during excavation work and monitoring well discharging to the sanitary sewer, which will require the use of dewatering pumping methods, could be hampered during storm events. Equipment necessary for dewatering activities such as pumps, hoses, and miscellaneous piping will be utilized. Emergency power systems and emergency procedures will be used as required for possibly extended periods of time.

14.1.11 Buried Drums of Unknown/Known Materials

The uncovering of buried drums containing unknown materials may require the subcontracting of an emergency response firm, possibly laboratory facilities, or disposal facilities. The subcontractor will be used to assist in the removal and disposal of these materials. The site Health and Safety Plan will address the minimum safety requirements for this type of situation.

14.1.12 Discovery of Free Product and Unknown/Known Liquids and Sludges

The discovery of free product or other unknown liquids on-site may also require the use of an emergency response firm, laboratory facilities, disposal facilities, or excavation contractors to assist in the removal and dispose of the liquids or materials found. Hazard determination procedures are provided in the site Health and Safety Plan for Remedial Construction Activities.

Several **laboratory facilities** available in the area to evaluate chemical constituents include:

- ACTS Testing Labs Inc., 3916 Broadway, Cheektowaga, NY, (716)684-3300
  Soils and Hazardous Waste Analysis, Drinking Water Analysis, Waste Water Analysis

- General Testing Corporation, 435 Lawrence Bell Drive, Amherst, NY, (716)634-0454
  Air Analysis, Hazardous Waste Analysis, Groundwater Monitoring, Soil Analysis

- Ecology and Environment, Inc., Lancaster, NY, (716)684-8060
  Sampling of Contaminated Soil/Waste, Groundwater, Air Emissions

Several **emergency response firms** are as follows:

- Environmental Services Group NY, 177 Wales Ave., Tonawanda, NY, (716)695-6720
  Contaminated Soil, Waste Oil, Bulk and Containerized Liquids and Solids

- Santarosa Group of Companies, 2470 Allen Ave., Niagara Falls, NY 14303 (716)285-9101
  Construction Site Cleanup, Hazardous Waste Transport (24 Hours), Contaminated Soils

Several waste disposal facilities are the following:

- CECOS Inter., Inc., P.O. Box 340 L.P.O., Niagara Falls, NY 14304, (716)282-2676
  Heavy Metal Wastes, Landfill Leachates, Groundwater, Aqueous Slurries, Acid/Caustic Solutions, Contact: Nicholas Morreale

- BFI Waste Systems, 2321 Kenmore, Ave., Kenmore, NY, (716)693-5185

- Laidlaw Environmental , Inc., 4255 Research Pkwy., Inc., Clarence, NY 14031, (716)634-6794, **Hazardous Waste Disposal**

Several waste transport firms include:

- **Frank's Vacuum Truck Service, Inc. 4500 Royal Ave., Niagara Falls, NY 14303,** (716)284-2132, **Bulk, Liquids, Bulk Solids, Containerized Solids, Vacuum Truck Services**

- The Environmental Service Group (NY), Inc., PO Box 242, Tonawanda, NY, 14150, (716)695-6720, **Bulk Loads, Contaminated Liquids and Solids**

Several excavation contractor firms include:

Environmental Service Group (NY), Inc., 177 Wales Ave. Tonawanda, NY
(716) 695-6720 Remedial Action Contractor, OSHA Trained

- **Clean Harbors Inc. 338 Harris Hill Road, Suite 110, Williamsville, NY 14221**
  (716) 885-0723, Incident Response

14.1.13 Emergency Response and Public Protection

Pre-planning is essential to effectively address emergency situations. The Site Health and Safety Plan will be utilized to address the following:

- **Personnel**
- **Site**
- **Medical/first aid**
- **Equipment**
- **Emergency response procedures**
- **Documentation**
- **Reporting**

The Contingency Plan is compatible with the spill response, fire, emergency response, and disaster plans of local, State, and Federal agencies, as well as, the Site Health and Safety Plan (Section 4.0). The Contingency Plan is to be reviewed on a periodic basis to better respond to new or changing site conditions or received information. The Contingency Plan, in conjunction with the Site Health and Safety Plan, should be discussed with site personnel at appropriate intervals during the performance of the work.

The site field and office authorities, as well as local authorities responsible for emergency response, will coordinate to respond to unanticipated site conditions and emergency situations in a timely fashion. All personnel involved must be familiar with the site Health and Safety Plan, as well as the chain of command, control, and communication systems in place for the site. The Site Superintendent and Site Health and Safety Officer will be familiar with the incident command system and the procedures for working with responding agencies during a site emergency.

During any emergencies, the health and safety of on-site personnel and the general public has the highest priority. To help insure that site health and safety concerns are under control, a site health and safety meeting will be held before the initiation of any site activity and weekly during remedial construction activities. Several site control procedures will be implemented to reduce site worker and general public exposure to hazards. These procedures include the establishment of work zones, strict enforcement of decontamination procedures, establishment of site security measures, set up and use of a workable communication network, site staff training, and the use of engineering controls. (See the site Health and Safety Plan for further information)

14.1.14 Emergency Contingency Plan

The emergency contingency plan for this project is detailed in the site Health and Safety Plan (see Section 4). Emergency contingency planning as detailed in the Health and Safety Plan will include the response to emergency situations and potential notification to the appropriate public officials and agencies. Specific emergency and community notification procedures for the general public are included in the Site Health and Safety Plan. Emergency response procedures will be tailored specifically for nearby residential communities

Table 14-1 Contingency Plan – Telephone Contacts for Emergency Notifications

(Refer to Site Health and Safety Plan for Initial Response Procedures)

The following information shall be posted near all Site telephones.

NAME	LOCATION	NUMBER
Fire Medical	3223 Union Road 3223 Union Road	911
Police, Emergency	3223 Union Road	911
Police	3223 Union Road	(716) 683-6100
Hospital Corner Walden and Harlem Avenues (See Attached Map)	St. Joseph's Hospital 2605 Harlem Road Cheektowaga, NY.	(716) 891-2450
Poison Control Center	Children's Hospital (Buffalo)	(716) 878-7654

Site Location of Emergency Supplies

First Aid Supplies	NES/IES Site Office
Eye Wash Station	NES/IES Site Office
Spill Response Kit	Refueling Truck
MSDS Chemical Information	NES/IES Site Office

Agency Notifications

Organization	Name	Number
NYSDEC – Region 9 Office	David Locey	(716) 851-7220
NYSDEC – Albany Office	Shive Mittal	(518) 457-0315
Cheektowaga Emergency Services	Routine number	(716) 685-1238
NYSDOH – Buffalo Office	Cameron O'Connor	(716) 847-4500
Erie County Department of Health	John Kociela, Director	(716) 858-7677
Cheektowaga Disaster Service Coordinator	Earl Loder	(716) 686-3465 (office) (716) 896-8091 (home)
County Highway Department, Lancaster Facility	George Micolof, District Engineer	(716) 683-4272

Other Emergency Notification Numbers

Organization	Name	Number
National Emergency Response Center		(800) 424-8802
Chemtrec		(800) 424-9300
Call Before You Dig	Within NY State Out of State	(800) 962-7962 (716) 893-1133
Electrical Service Emergency	Niagara Mohawk	(800) 962-7962
NES/IES Safety Officer	Rich Moss	(203) 796-5234
NES/IES Project Manager	Mark Cambra	(203) 796-5305
Site Health and Safety Officer	Tom Weisbeck	
NES/IES Site Superintendent	John Falbo	
NES/IES Personnel Office	Bonnie Ianuzzi	(203) 796-5263
NES/IES Personnel Fax		(203) 796-2459

14.2 REVIEW OF CONSTRUCTION OPERATION METHODS AND SPECIFICATIONS

Proposed construction activities and the methods to be utilized to achieve project goals (including the specifications) will be periodically reviewed and updated during the course of design and construction. Modifications will then be incorporated into Contingency as well as Health and Safety Planning.

14.3 MAJOR FAILURE/PROBLEMS MATRIX

Table 14-2 provides an easy reference listing of major failures and problems as discussed that should be anticipated during both construction activities and remedial operations. This tabulation is a supplement to requirements of the site Health and Safety Plan and the guidance provided in the Operation and Maintenance Plan.

Table 14.2 Contingency Plan – Summary of Anticipated Major Failure/Problems and Proposed Solutions

Anticipated Major Failure/Problems	Proposed Solution(s)
Brush Fires	The site field and office authorities and local response agencies will coordinate respond to emergency situations. All personnel involved must be familiar with the site Health and Safety Plan, as well as the chain of command, control, and communication systems in place for the site. (See Section 4).
Buried Drums of Unknown Materials	The uncovering of buried drums containing unknown materials will require characterization and possibly the subcontracting of an emergency response firm. This subcontractor may be used to provide for the removal, transport, and disposal of these materials. The Site Health and Safety Plan will address the minimum safety requirements for this type of situation (Refer to Health and Safety Plan). Work in this area will be stopped until the material is identified and appropriate actions are taken.
Cap Failure	Investigate cause, repair. (See procedures as discussed in site Operation and Maintenance Plan.)
Clearing and Grubbing Operations:	This work will consist of clearing, grubbing, removing, and disposing of all trees, brush, stumps, fences, debris, and other miscellaneous materials. No burning will be permitted on or off the site. No tree stumps, tree trunks, or other debris will be buried within the site area without grinding and approval by the Project Engineer. The Contractor is to comply with the requirements for the preservation of property and restoration of disturbed areas outside site property boundaries. Clearing and grubbing operations will be conducted to maintain a minimal amount of exposed cleared area at one time. Areas exposed for over fifteen calendar days will require temporary seeding. (See Clearing and Grubbing Plan)

Anticipated Major Failure/Problems	Proposed Solution(s)
Causes of Emergencies	See Site Safety and Health Plan for responses to the following: · Minor accidents · Chemical Exposure · Medical Problems · Protective Equipment Failure · Physical Injury
Channel Integrity (Gabions and Mattresses)	Stream bank sediment bars, snags, stumps, debris, trees, branches, brush, and other debris disturb the smoothness of flow. These materials should be removed from the channels prior to and following work until project closure. These operations will be coordinated with the Town of Cheektowaga. The integrity of gabions and mattresses placed in the stream channel will include periodic inspection, particularly following major rainfall events. Fallen trees, limbs, branches and other debris accumulating in work areas will require removal to maintain channel capacities. Continued maintenance of the completed stream bank erosion controls is essential to avoid damage in the future. Control measures, once installed, are not automatically permanent and must be maintained.
Damage to Fencing	Investigate cause, repair (See Operation and Maintenance Plan, Section 12)
Discovery of Free Product and Unknown Liquids	The discovery of free product or other unknown liquids on-site may also require the use of an emergency response firm to remove and dispose of the liquids found. Hazard determination procedures are provided in the Site Health and Safety Plan.
Discovery of Railroad Tanker/Fueling Car(s) or Tanks	Notify emergency authorities, excavate top of car or tank; continuously monitor atmosphere; open covers; sample contents; remove liquid and sludges; pressure wash interior; remove liquid and properly dispose of materials; excavate car and remove: decontaminate; and scrap metal. A crane and/or large excavator may be required.
Discovery of Railroad Wheels/Cars.	Excavate, remove, decontaminate, and scrap. Crane/large excavator may be required

Anticipated Major Failure/Problems	Proposed Solution(s)
Emergency Contingency Plan	The emergency contingency plan for this project is contained in this Section and the Operation and Maintenance Plan and the Site Health and Safety Plan documents. (See Section 12 and Section 4, respectively) Emergency contingency planning as detailed in the Health and Safety Plan includes the submittal of emergency information and notification of the following agencies and contacts at a minimum: · NYSDEC -- Region 9 Office, (716)852-7220 · NYSDOH -- Buffalo Office, Cameron O'Connor, (716)847-4500 · Erie County Department of Health, John Kociela, (716)858-7677 · Cheektowaga Disaster Service Coordinator, Earl Loder, (716)686-3465 Specific emergency and community notification procedures for the site and general public are included in the Community Health and Safety Plan (See Section 4). Emergency response procedures will be tailored specifically for nearby residential communities.
Emergency Response and Public Protection	The site field and office authorities and local response agencies will coordinate response to emergency situations. All personnel involved must be familiar with the site Health and Safety Plan, as well as the chain of command, control, and communication systems in place for the site. (See Section 4) The on-site health and safety responsibilities to direct response activities will consider the health and safety of on-site personnel and the general public as the highest priority. To help insure that site health and safety concerns are under control, a site meeting should be held prior to the initiation of any site activity and weekly during remedial construction activities. Several site control procedures will be implemented to reduce site worker and general public exposure to hazards. These procedures include the establishment of work zones, strict enforcement of decontamination procedures, the establishment of site security measures, the set up and use of a workable communication network, site staff training, and the use of engineering controls.

Anticipated Major Failure/Problems	Proposed Solution(s)
Erosion, Sedimentation, and Dust Control	The work to be conducted will consist of both temporary and permanent control measures during the life of the construction and remedial period. Both temporary and permanent type erosion controls will be coordinated with other remedial actions to the extent practicable. The goal is an economical, effective, and continuous erosion control throughout the remedial construction and post construction period. If there is a conflict between the specification requirements and pollution control laws, rules, or regulations of other State, Federal, or local agencies, the most restrictive law, rules, or regulations will apply. Dust control measures will be conducted during construction activities. Equipment and materials utilized to control dust will be kept on-sit for use as required. During the progress of the Work, operations will be conducted and maintained in areas of activity to minimize the creation and dispersion of dust. If determined by the Project Engineer, the use of water and/or calcium chloride for more effective dust control will be required.
Monitoring of Soil Cover Re-vegetation	The landfill cover, revegetation work will require monitoring and maintenance until both soils and vegetation are stabilized. Mowing and additional erosion and sediment controls will be required as determined by NES/IES and the technical specifications for turf establishment.
Failure of Pumps	Repair, replace, provide additional equipment, use of another well, revisions to treatment system. (Refer to Operation and Maintenance Plan, Section 12.6.2 Pumping and Piping Systems)
Roadway Systems, On and Off Site	The use of on-site roadway systems will require routine maintenance during the active construction phases of the project. This would include erosion and sediment controls, dust control and possibly snowplowing so access to critical areas can be achieved. Pollution control truck mats will be placed at locations where truck and vehicle traffic leaves the site and continue onto local and State roads. This will insure the reduction of the amount of material on wheels and undercarriages that may potentially leave the site.
Slurry Wall	The slurry wall will be utilized to contain contaminants. Routine inspections, damage control, and contingency planning are required. (See Site Operation and Management Plan)
Slurry Wall Failure	Moisture control, repairs, additional synthetics (See Operation and Maintenance Plan, Section 12.7.2)
Utilities and Power Sources, Emergency Power	At least 2 days (but not more than 10 days) prior to any excavation and land modification activities the Contractor will contact the New York "Call Before You Dig" (800)982-7962 or (716)893-1133,

Anticipated Major Failure/Problems	Proposed Solution(s)
	protective organization to mark out and locate all facilities and utilities on or near the site. This "Call Before You Dig" notification must remain intact during all pre- and post- construction activities. Rewiring and/or re-networking of the site power source activities during emergency situations will be discussed with the power company. Alternate standby generator options will, in all cases, be available upon short notice.
Vegetative Screening	Any proposed modification to the existing vegetation that may be necessary to produce a vegetative screen around the landfill cap upon completion of all remedial activities will require monitoring during installation and maintenance during the project. Locally available vegetative species requiring little or no maintenance will be utilized and will be readily available if required. Vegetative screening will be used to provide a border between the landfill cap area and the local residential neighborhood.
Weather Conditions and Dewatering	Site weather conditions will be cold and snowy in the winter and moderately warm in the summer. Precipitation is well distributed during the year and is adequate for most crops. From late fall through winter, snow storms are frequent and the average snowfall is heavy. Normal ingress and egress to the site will be maintained during active construction winter snow events. Snow plowing of site roadways will be undertaken as required. The entire site is subject to flooding during major rainfall events. Caution will be taken concerning the storage of materials and equipment to minimize the risk of flood damage. Dewatering during excavation work and monitoring well discharging to the sanitary sewer, which will require the use of dewatering pumping methods, could be hampered during storm events. Equipment necessary for dewatering activities such as pumps, hoses, and miscellaneous piping will be utilized. Emergency power systems and emergency procedures will be used as required for possibly extended periods of time.
Wetlands Vegetation Failure	Investigate cause, repair (See Operation and Maintenance Plan).

14.4 TROUBLE SHOOTING GUIDE TO REMEDIAL ACTIVITIES

14.4.1 Erosion and Sediment Controls

The following erosion and sediment installation control practices are recommended for this project:

- Reduce runoff velocities, install sediment controls, and implement erosion control plan;
- Perform all planting and tilling operations on or nearly on the contour (perpendicular to stormwater flow);
- Use crop residues incorporated into the topsoil with tilling;
- Good topsoiling and tilling operations, weed control practices, and seedbed preparation;
- Establish permanent vegetation in waterways and easily eroded areas; and
- Stabilize waterways with suitable gabion or mattress installation.

14.4.2 Slurry Wall

The continued maintenance of the slurry wall system installed will involve periodic visual inspection of the perimeter of the wall. The potential causes for premature slurry wall deterioration and the associated maintenance techniques are as follows:

Potential Cause for Premature Wall Breakdown	Maintenance Method
Loading Pressure	· Traffic Control · Redistribution of Load
Erosion	· Re-vegetation · Capping
Hydraulic Head	· Groundwater Pumping
Exposure/Cracking	· Capping

Also involved is inspection of vegetative cover and the condition of the vegetative screening. Erosion problems, subsidence, or other changes in grade are to be evaluated.

Potential problems and monitoring parameters to be used as a guide for the slurry wall system are as follows:

Potential Problem	Parameter	Possible Monitoring Method
Instability of the Wall Base	Horizontal Movement of the Ground	Measure Subsurface Horizontal Movement
Ground Movement Behind Wall	Horizontal Movement of Ground	· Visual Survey · Measure Subsurface Horizontal Movement · Extensometers/Piezometers
	Vertical Movement of Ground	· Survey · Measurement of Subsurface Settlement
Groundwater	Groundwater Level	Observation Wells
	Pore Pressure	Piezometer
	Chemistry	Sampling Wells
Surface Water	Chemistry	Surface Sampling

Slurry wall failures are due to the following:

- Chemical reaction processes between the wall and contaminants.
- Stress/Strain forces causing structural failure.
- Improper design and/or construction method.
- Erosion exposure or drying cracks.

Possible restorative methods for various wall failure problems are summarized as follows:

Wall Failure Mechanism	Resulting Problem	Possible Restorative Methods
Chemical Reaction Between Containment and Wall	Breach of Wall	· Re-Excavation and Re-Backfill · Second Slurry Wall Installation
Stress And Strain Forces	Cracking or Lesions	· Grouting · Re-Excavation and Re-Backfill
Improper Design and Installation Practices	Low Wall Permeability	· Re-Excavation and Re-Backfill
	Inadequate Key-In	· Grout Key-In
Exposure from Erosion	Cracking, Washing Out	· Re-Capping

14.4.3 Security

This maintenance includes gates, fences, and warning signs. Potential problems and a response are noted in the trouble shooting guide for site security as follows:

Potential Problems	Response
Gates and Fences	
Vandalized	Repair or replace gate or fencing that has been vandalized. Site Supervisor will be notified.
Rusty Hinges and Damaged Locks	Hinges and locks must be oiled or replaced as necessary.
Unsecured Fencing	Fencing fabric must be reattached

14.4.4 Topsoiling Operations, Vegetative Cover, and Landfill Cap

Proper topsoiling operations, along with the continued maintenance of vegetative cover and the landfill cap, are discussed in the Contingency Plan and further detailed in the Technical Specifications. This maintenance includes watering, mowing, and possible reseeding contingencies. Responsibility by the installation subcontractor for revegetating areas, until vegetation and modified areas have stabilized, will insure maintenance operations.

Potential problems and a response to the problem are noted in the troubleshooting guide for the vegetative cover as follows:

Potential Problems	Response
Vegetative Cover	
Unhealthy Growth	Apply fertilizer, reseed, and/or irrigate.
Excessive Growth	Mow vegetation. Prevent excessive/large root growth
Large vegetative/root growth	Prevent excessive/large root growth
Surface Erosion	Apply mulch to areas affected and reseed. Direct runoff away from damaged areas.
Burrowing Rodents	Consult professional exterminator. Backfill burrows.

14.4.5 Groundwater Monitoring Wells

The troubleshooting guide for on-site monitor wells include the following:

Potential Problem	Response
Well Vandalized	Repair or replace as necessary. Report incident to appropriate personnel.
Well Casing No Longer Vertical	Inspect well casing and seals to determine extent of damage. Remove and replace well as necessary.
Damaged Lock	Replace lock and provide new keys to appropriate personnel.
Well Discovered Unlocked	Lock well and report incident to facility operator.
Well ID Not Visible or Legible on Casing	Remove old ID and replace with a legible one.

E. SITE SPECIFIC CITIZEN PARTICIPATION PLAN

CITIZEN PARTICIPATION PLAN
for
UNION ROAD SITE

(DESIGN AND CONSTRUCTION PHASE)

Site Code 9-15-128

TOWN OF CHEEKTOWAGA
ERIE COUNTY, NEW YORK

OCTOBER 1994

PREPARED BY:

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
LANGDON MARSH, Commissioner

DIVISION OF HAZARDOUS WASTE REMEDIATION
MICHAEL J. O'TOOLE JR., P.E., Director

CONTENTS

1.0 Introduction

The New York State Department of Environmental Conservation (DEC), in partnership with the New York State Departments of Health (DOH) and Law (DOL), is responsible for ensuring that hazardous waste sites across the state are investigated and, if necessary, remediated. The Union Road Site (Site No. 9-15-128) is currently listed in the Registry of Inactive Hazardous Waste Disposal Sites as Class "2" site. A classification of "2" indicates a significant threat to the public health or the environment. Studies have confirmed the presence of hazardous wastes and action is required. Therefore, as the DEC investigates and remediates the Union Road site, the DEC will conduct a Citizen Participation program.

The Citizen Participation Plan (CPP) is aimed at increasing public understanding of the remedial process. The citizen participation program also opens up two-way communication between the public and the State. This communication provides the DEC with an opportunity to:

- obtain site information from the public that will enable the State to better develop a comprehensive remedial plan.
- answer your questions and learn your concerns regarding the site and the remedial process.

Under New York State's Hazardous Waste Site Remedial Program, the process begins with the discovery of a potential hazardous waste site and follows a path through investigation, enforcement, remedial action selection, design, construction, and monitoring. To keep the public informed about activities at the site the State:

- has established a local Document Repository which will contain all pertinent documents relating to the investigation and remediation of the site.
- will develop and mail a series of Fact Sheets discussing investigations, studies, plans and other issues involving the site.
- will hold public availability sessions, if needed, to meet with interested parties to discuss plans, concerns or questions about the site.
- will conduct public meetings, when necessary.

The Potentially Responsible Parties (PRPs) for the Union Road site include Witben Realty and Penn Central Corporation (PCC). Witben Realty is the current owner of the site; Universal Marion Corp. is the parent company of Witben. The site was formerly owned and operated by the New York Central Rail Road (NYCRR) and was taken over by PCC after NYCRR went bankrupt. Idlywood Associates owns part of the Slate Bottom Creek which will need remediation.

2.0 Site Background

2.1 Site Location

The Union Road Site is located in Erie County, New York. The site is approximately eight miles east of the City of Buffalo in the Town of Cheektowaga, on property about one mile east of Union Road, between Losson and French Roads (See Figure 1). The access to the site is via a dirt road from Losson Road.

2.2 Site History

The Union Road Site was the former location of a large railroad facility which comprised a classification yard, maintenance facilities, and a waste disposal area. The site is approximately 70 acres in size. The portions of the site which are of concern include: (a) The tar-pit/lagoon measuring 80 feet by 140 feet, (b) Landfill containing waste south of the tar-pit, (c) Marsh area north of the tar-pit, (d) Roundhouse area, and (e) Portions of Slate Bottom and Deer Lik Creeks. The tar-pit and marsh area lie within a depression measuring approximately 100 yards in length and 40 yards in width. The depth of this depression is approximately 20 feet below the elevation of surrounding surface. Topography of the Site is generally flat. Runoff from the site drains generally southeastward through marsh to Deer Lik Creek which in turn flows into Slate Bottom Creek. Residential areas exist essentially adjacent to the site to the north and west, and within 1/8 mile to the east and south (See Figure 2).

The site was used from early 1900 to about 1955 by NYCRR. The roundhouse, several maintenance and storage buildings, tanks, and numerous sheds were constructed on and in the vicinity of the site. The tar-pit is believed to be a man-made depression into which the now defunct NYCRR deposited waste oil, lubricants, tars, sludges and equipment cleaning solutions from rail car and locomotive servicing and repairs. A railroad spur that extended from the main tracks and terminated at the depression allowed for the transfer of the waste from the maintenance facility to the disposal area and the tar-pit. Railroad roundhouses served as primary maintenance areas for railroad operations. The roundhouse served as locations where locomotive furnaces were cleaned of coal ash, engine crankcase oil and piston oil were removed and changed. The railroad yard operated until mid-1950's when all the structures and tracks were dismantled. Foundations and the sub-structure of the round house exists below grade in the northern portion of the site.

2.3 Remedial Status

The site was first brought to the attention of the Erie County Department of Environment and Planning (DEP) during 1982. The samples collected from tar-pit by DEP during December, 1982 and again during April, 1983 indicated the presence of asphalt like material and lubrication oil. During July 1983-May 1984, RECRA Research, Inc. (RECRA), a consultant hired by Universal Marion/Witben Realty, performed a technical evaluation of the site. The samples collected by RECRA Research, Inc. in August, 1983 showed that the tar-like material contained high metal content including lead (up to 121,000 ppm-parts per million), copper (9,780 ppm), mercury (10.4 ppm), antimony (150 ppm) and chromium (24 ppm). Elevated levels of contaminants at the site indicated the need of additional investigation. Therefore, DEC and United States Environmental Protection Agency (EPA) was involved. In May 1986, a Phase I Investigation of the site was done by RECRA for DEC. During 1987, an analysis of a tar-pit sample performed by EPA showed that it meets the legal definition of a hazardous waste; in this case, for high lead (130 mg/l) contents. The snow fence erected by the Town was replaced by a high visibility fence by EPA during 1988. A Remedial Investigation/Feasibility Study (RI/FS) of the site was conducted by DEC under the State

Superfund Program after the PRPs declined to participate in the RI/FS process. The RI was conducted between December 1988 and November 1990 to define the nature and extent of contamination.

The RI performed at the site indicated elevated levels of Polynuclear Aromatic Hydrocarbons (PAHs), petroleum hydrocarbons (PHCs), and heavy metals in tar-pit, site soils, and groundwater.

The FS evaluated a number of alternatives in detail for the remediation of the site and identified a preferred alternative. The RI/FS for the Union Road site was completed by September 1991. The remedial alternatives were discussed in a public meeting held by the New York State Department of Environmental Conservation (NYSDEC) on January 23, 1992 in Buffalo.

As a result of the findings of the RI/FS, a chain link fence was installed around the site and exposed tar-like materials from the banks of the Slate Bottom Creek were removed and stored within the fenced area.

In addition to the work performed by the DEC at the site, the DOH has conducted a blood lead screening. Survey forms were sent by the DOH in August 1990 to apartments in Idylwoods Apartment Complex and homes in Losson Green Estates and on Pebble Creek Drive, all located adjacent to the site. It was requested that a form be completed and returned if there were children 16 years of age or under in the household who had played in the area of the site or Slate Bottom Creek. Blood lead screening for these children was offered on October 10, 1990, and twenty-nine individuals were tested. No one tested had a lead level considered to be elevated at that time under Federal Guidelines. Results were sent to individuals tested and to the personal physicians of those tested.

On March 9, 1992, the Record of Decision (ROD) for the Union Road Site was signed by the Department. The ROD sets forth the selected remedial action plan developed in accordance with applicable regulations. The decision was based on the DEC's administrative record for the Union Road Site and upon public input to the proposed remedial action plan presented by the DEC.

<u>The major elements of the selected remedy are:</u>

- Installation of a soil-bentonite (SB) slurry wall surrounding the disposal area and the tar-pit of the site. The slurry wall will act as a groundwater cutoff wall, preventing contaminated groundwater from escaping to the Slate Bottom Creek.

- Installation of an engineered multi-layered cap over the disposal area. The cap will minimize the infiltration of surface water, thereby reducing contamination of groundwater.

- Pumping of groundwater from the site. The groundwater will be pretreated (if necessary) before discharge to the Buffalo Sewer Authority (BSA) sewer system.

- Provide clean soil cover over the contaminated surficial soils in the roundhouse area.

- Lining the Deer Lik and Slate Bottom Creeks in the vicinity of the site.

- Additional controls which will include the fencing of the site, deed restrictions and monitoring.

Immediately after signing the ROD on March 9,1992 DEC started negotiations with the PRPs to complete the Remedial Design (RD) and Remedial Action (RA). The negotiations resulted in signing an Order on Consent between Penn Central Corporation and DEC on March 28, 1994.

3.0 Project Description

3.1 Project Objective

The objective of the project is to remediate the site by conducting a Remedial Investigation/ Feasibility Study (RI/FS); selecting the final remedy through a Record of Decision (ROD); and completing the design and construction of the selected remedy. The ROD was signed March 9, 1992. The Remedial Design is currently in progress.

3.2 Identification of Key Decision Points

The remediation process includes these tasks:

- The consent order is signed and Remedial Design starts.
- DEC approves Remedial Design and construction starts.
- Remediation is complete and site monitoring commences.

3.3 Remedial Design

Based on the information provided in the ROD, a Remedial Design (RD) is prepared. The RD includes submission of an RD work plan, plans and specifications, the operation and maintenance plan, and other supporting documents. The Remedial Design work plan was finalized during June 1993. The preparation of the RD is currently in progress.

3.4 Remedial Construction and Start-up

During this phase of the work, a construction contractor is selected and field work is started. All permits, approvals, and access agreements are obtained. Oversight and inspection of the construction is conducted in accordance with the approved plan. Post-remedial operation and maintenance plan is issued and start-up occurs.

3.5 Schedule of Remedial Program

The Order On Consent for the remediation of the site was signed on March 28, 1994 between NYSDEC and Penn Central Corporation. The preliminary Project Schedule given in the June 1993 RD work plan was revised during April 1994 and is attached as Figure 3.

3.6 Project Contact Personnel

The following individuals are available to answer your questions:

NYSDEC Central Office Contact:
Mr. Shive R. Mittal, P.E.
Project Manager
NYS Department of Environmental Conservation
Division of Hazardous Waste Remediation
Room 222
50 Wolf Road
Albany, New York 12233-7010
(518) 457-0315

NYSDEC Regional Office Contact:
Mr. David Locey
Regional Project Engineer
or
Ms. Patricia L. Nelson
Citizen Participation Specialist
NYS Department of Environmental Conservation
270 Michigan Avenue
Buffalo, New York 14203-2999
(716) 851-7220

NYSDOH Contacts:
Ms. Meaghan Boice Green
NYSDOH Health Liaison Program
2 University Place
Albany, New York 12203
(800) 458-1158 Ext. 402

Mr. Michael F. Rivara
NYSDOH Environmental Health Specialist
2 University Place
Albany, New York 12203-3399
(800) 458-1158 Ext. 309

The DEC maintains a toll free number, (800) 342-9296, from which the public may obtain information regarding a site by leaving their name and phone number and a short message. Messages will be answered as soon as possible.

4.0 Citizen Participation Activities.

4.1 Overview

This section describes the specific Citizen Participation (CP) activities planned to be carried out during the Union Road site remedial program. These activities will be developed in phases as the remedial program progresses. The plan may be modified, at the Department's discretion, to reflect the changing status of the site, public interest in the site, or to fulfill the legal requirements or agency policy. Below are listed the major elements of the Union Road site remedial program and the citizen participation activities that are currently planned for each element.

4.2 Citizen Participation Site Assessment

The CP Site Assessment projects the type and amount of activities which will be needed to accomplish the goals of the program. Various factors were considered in the development of the contact lists, document repositories, and CP activities planned for each element of the remedial process. The factors considered for the Union Road site were:

- o proximity of the site to the residential areas in the Town of Cheektowaga.
- o the site is next to the Slate Bottom Creek.
- o open tar-pit

4.3 Contact List

DEC has established a site mailing list (See Attachment). This mailing list will be updated by DEC following each public meeting, and as additional interested citizens are identified. The contact list for the site contains:

- o All property and/or business owners near the site;
- o Groups and individuals interested in the site;
- o Government Agencies, including:
  - (1) Elected officials,
  - (2) Municipality's Clerk,
  - (3) Appropriate emergency and law enforcement agencies,
  - (4) Appropriate Department contact personnel,
  - (5) Others as required;
- o Document Repositories (See 4.4);
- o Media contacts.

As needed, the contact list will be updated to reflect the changing status or interest in the site.

4.4 Document Repositories

Document repositories are established at the following locations, to make site documents easily accessible for the public to read and review. During the remedial process, various documents will be placed in these repositories as they become available. The Department encourages you to use these repositories and review site documents prior to attending public meetings whenever possible. The document repositories for this site are:

Cheektowaga South Branch Library
2660 William Street
Cheektowaga, NY 14227

(By appointment only)
NYSDEC's Region 9 Office
270 Michigan Avenue
Buffalo, NY 14203
phone (716) 851-7220

(By appointment only)
NYSDEC's Central Office
Division of Hazardous Waste Remediation
50 Wolf Road
Albany, New York 12233-7010
phone (518) 457-0315

As the various documents become available during the remedial process they will automatically be placed in the Document Repositories. These documents may include:

- o Phase I Report;

- o Final draft work plans;
- o Remedial Investigation Report;
- o Feasibility Study Report;
- o Remedial Design Document;
- o All responsiveness summaries;
- o Fact sheets/newsletters, etc.;
- o Citizen Participation Plan;
- o Health and Safety Plans;
- o Testing, sampling, and monitoring data;
- o Remedial plans and specifications for construction;
- o Consent Orders;
- o Quality Assurance/Quality Control Plans.

4.5 Completed CP Activities

Concurrent with the investigations performed at the site, there has been significant community involvement and input into the project. A public meeting was conducted by DEC in the Town of Cheektowaga, New York, on February 15, 1989 to discuss the RI Work Plan and respond to questions from the community. A second public meeting was held by DEC in Cheektowaga on December 6, 1989 to discuss the results of the RI. At both meetings, representatives from NYSDOH were present to respond to questions from the community. A site specific Citizen Participation Plan (CPP) was developed and released to the public in October 1988. As a part of the plan, a public contact list was developed and used to disseminate fact sheets, meeting announcements and other information. A local information repository was established at Cheektowaga South Branch Library. Pertinent documents were placed in the repository. Fact sheets and responsiveness summary sheets were issued to the public during January 1989, November 1989, January 1990, December 1990, January 1992 and March 1992 to announce the availability of the documents in the repositories and to update the public on the remedial activities at the site.

Methods used to encourage public participation included announcements in local newspapers, announcements on local television stations, and mailing notices and fact sheets to the public contact list. The RI/FS reports, the Proposed Plan, and other pertinent documents were placed into the repository. A formal public meeting was held on January 23, 1992 to present the Proposed Plan and seek public comment. A public comment period was held from January 16, 1992 to February 18, 1992. A responsiveness summary has been prepared containing NYSDEC's responses to comments received during the public meeting, and comment period and attached to ROD.

4.6 Planned CP Activities

At a minimum, a fact sheet will be mailed to the contact list every 6 to 8 months, by DEC, depending upon type of activities, length of project, and public interest. The following Citizen Participation activities are planned during the various phases:

During Remedial Design Phase:

- o provide copies of the work plan(s) to all document repositories;

- develop and mail a fact sheet, upon completion of the draft design of the remediation, briefly describing the remedial process to date, summarize major elements of the remediation to be employed, and solicit comments regarding the design.

After Award of Construction Contract:

- provide copies of final design documents to all document repositories.

During Construction Phase:

- hold a public meeting before the start of construction work. A fact sheet will be mailed to the contact list before the meeting to provide the interested parties with information on the actual construction project, project schedule, contracts, availability of the design documents etc.

- mail periodic fact sheets to the contact list to inform the public about the project status, any anticipated delays, public meetings and/or public availability sessions and describe construction activities.

After Completion of Construction:

- Once construction is completed, the DEC will develop and mail a Fact Sheet to the contact list. The Fact Sheet will:
  - announce completion of remedial construction;
  - identify appropriate agency contacts;
  - canvass the public regarding their interest in a public meeting;
  - outline the future Operations, Maintenance and Monitoring program for the site.

5.0 Glossary of Terms and Major Program Elements

5.1 Commonly Used Citizen Participation Terms

Availability Session - Scheduled gathering of the Department staff and the public in a setting less formal than a public meeting. Encourages "one-to-one" discussions in which the public meets with Department staff on an individual or small group basis to discuss particular questions or concerns.

Citizen Participation - A process to inform and involve the interested/affected public in the decision-making process during identification, assessment and remediation of hazardous waste sites. This process helps to assure that the best decisions are made from environmental, human health, economic, social and political perspectives.

Citizen Participation Plan - A document that describes the site-specific citizen participation activities that will take place to complement the "technical" (remedial) activities. It also provides site background and rationale for the selected citizen participation program for the site. A plan may be updated or altered as public interest or the technical aspects of the program change.

Citizen Participation Specialist - A Department staff member within the Division of Hazardous Waste Remediation who provides guidance, evaluation and assistance to help the Project Manager carry out his/her site-specific Citizen Participation program.

Contact List - Names, addresses and/or telephone numbers of individuals, groups, organizations and media interested and/or affected by a particular hazardous waste site. Compiled and updated by the Department. Interest in the site, stage of remediation and other factors guide how comprehensive the list becomes. Used to assist the Department to inform and involve the interested/affected public.

Document Repository - Typically a regional DEC office and a public building, such as a library, near a particular site, at which documents related to remedial and citizen participation activities at the site are available for public review. Provides access to documents at times and a location convenient to the public. Environmental Management Councils (EMCs), Conservation Advisory Committees (CACs) as well as active local groups often can serve as supplemental document repositories.

Information Sheet - A written discussion of a site's remedial process, or some part of site, prepared by the Department for the public in easily understandable language. May be prepared for the "general" public or a particular segment. Uses may include, for example: discussion of an element of the remedial program, opportunities for public involvement, availability of a report or other information, or announcement of a public meeting. May be mailed to all or part of the interested public, distributed at meetings and availability sessions or sent on an "as requested" basis.

Project Manager - A Department staff member within the Division of Hazardous Waste Remediation (usually an engineer, geologist or hydrogeologist) responsible for the day-to-day administration of activities, and ultimate disposition of, one or more hazardous waste sites. The Project Manager works with the Citizen Participation staff, as well as Department fiscal and legal staff and the New York State Department of Health (NYSDOH) staff to accomplish site-related goals and objectives.

Public - The universe of individuals, groups and organizations: (a) affected (or potentially affected) by an inactive hazardous waste site and/or its remedial program; (b) interested in the site and/or its remediation; (c) having information about the site and its history.

Public Meeting - A scheduled gathering of the Department staff and the public to give and receive information, ask questions and discuss concerns. May take one of the following forms: large-group meeting called by the Department; participation by the Department at a meeting sponsored by another organization such as a town board or Department of Health; working group or workshop; public availability session

Public Notice - A written or verbal informational technique for telling people about an important part of a site's remedial program coming up soon (examples: announcement that the report for the RI/FS is publicly available; a public meeting has been scheduled).

The public notice may be formal, such as a paid legal advertisement in a newspaper circulated widely in the geographic area of the site

Public notices may also be more informal (examples: paid newspaper advertisement; telephone calls to key citizen leaders; targeted mailings).

Responsiveness Summary - A formal or informal written or verbal summary and response by the Department to public questions and comments. Prepared during or after important elements in a site's remedial program. The responsiveness summary may list and respond to each questions, or summarize and respond to questions in categories.

Toll-Free "800" Telephone Information Number - Provides cost-free access to the DEC or NYSDOH to members of the public who have questions, concerns or information about a particular hazardous waste site. Calls are taken and recorded 24 hours a day and a Department Albany-based staff member contacts the caller as soon as possible (usually the same day).

NYSDEC's Toll Free Number: 800-342-9296
NYSDOH's Toll Free Number: 800-458-1158
ext. 309 = NYSDOH Technical staff
ext. 402 = NYSDOH Health Liaison Program.

5.2 Significant Elements and Terms of the Remedial Program

NOTE: The first eight definitions represent major elements of the remedial process. They are presented in the order in which they occur, rather than in alphabetical order, to provide a context to aid in their definition.

Site Placed on Registry of Inactive Hazardous Waste Sites - Each inactive site known or suspected of containing hazardous waste must be included in the Registry. Therefore, all sites which state or county environmental or public health agencies identify as known or suspected to have received hazardous waste should be listed in the Registry as they are identified. Whenever possible, the Department carries out an initial evaluation at the site before listing.

Preliminary Site Assessment (PSA) - The first investigation of a site where hazardous waste has or may have been disposed of illegally or improperly is known as a PSA. The goal of the PSA is to determine whether a site meets the state's definition of a hazardous waste site by confirming the presence of hazardous waste and determining if the site poses a significant threat to public health or the environment. The PSA is a three-step process that includes:

- **Records Search:** a through background review and record check into past use and disposal activity at the site;
- **Sampling/Surveys:** sampling of exposed wastes, drums, surrounding soil and surface water, and performing geophysical and soil gas surveys, and
- **Groundwater monitoring:** installing monitoring wells and analyzing water samples to check for subsurface contamination.

Remedial Investigation (RI) - A process to determine the nature and extent of contamination by collecting data and analyzing the site. It includes sampling and monitoring, as necessary, and includes the gathering of sufficient information to determine the necessary for, and proposed extent of, a remedial program for the site.

Feasibility Study (FS) - A process for developing, evaluating and selecting remedial actions, using data gathered during the remedial investigation to: define the objectives of the remedial program for the site and broadly develop remedial action alternatives; perform an initial screening of these alternatives; and perform a detailed analysis of a limited number of alternatives which remain after the initial screening stage.

Remedial Design - Once a remedial action has been selected, technical drawings and specifications for remedial construction at a site are developed, as specified in the final RI/FS report. Design documents are used to bid and construct the chosen remedial actions. Remedial design is prepared by consulting engineers with experience in inactive hazardous waste disposal site remedial actions.

Construction - DEC selects contractors and supervises construction work to carry out the designed remedial alternative. Construction may be as straightforward as excavation of contaminated soil with disposal at a permitted hazardous waste facility. On the other hand, it may involve drum sampling and identification, complete encapsulation, leachate collection, storage and treatment, groundwater management, or other technologies. Construction costs may vary from several thousand dollars to many millions of dollars, depending on the size of the site, the soil, groundwater and other conditions, and the nature of the wastes.

Monitoring/Maintenance - Denotes post-closure activities to insure continued effectiveness of the remedial actions. Typical monitoring/maintenance activities include quarterly inspection by an engineering technician; measurement of level of water in monitoring wells; or collection of ground water and surface water samples and analysis for factors showing the condition of water, presence of toxic substances, or other indicators of possible pollution from the site. Monitoring/maintenance may be required indefinitely at many sites.

Consent Order - A legal and enforceable negotiated agreement between the Department and responsible parties where responsible parties agree to undertake investigation and cleanup or pay for the costs of investigation and cleanup work at a site. The order includes a description of the remedial actions to be undertaken at the site and a schedule for implementation.

Contract - A legal document signed by a contractor and the Department to carry out specific site remediation activities.

Contractor - A person or firm hired to furnish materials or perform services, especially in construction projects.

Delisting - Removal of a site from the state Registry based on a study which shows the site does not contain hazardous wastes.

Potentially Responsible Party (PRP) Lead Site - A hazardous waste site at which those legally liable for the site have accepted responsibility for investigating problems at the site, and for developing and implementing the site's remedial program. PRP's include: those who owned the site during the time wastes were placed, current owners, past and present operators of the site, and those who generated the wastes placed at the site. Remedial programs developed and implemented by PRP's generally result from an enforcement action taken by the State and the costs of the remedial program are generally borne by the PRP.

Ranking System - The United States Environmental Protection Agency (USEPA) uses a hazard ranking system (HRS) to assign numerical scores to each hazardous waste site. The scores express the relative risk or danger from the site.

Responsible Parties - Individuals, companies (e.g. site owners, operators, transporters or generators of hazardous waste) responsible for or contributing to the contamination problems at a hazardous waste site. PRP is a potentially responsible party.

Site Classification - The Department assigns sites to classifications established by state law, as follows:

- Classification 1 A site causing or presenting an imminent danger of causing irreversible or irreparable damage to the public health or environment -- immediate action required.

- Classification 2 A site posing a significant threat to the public health or environment -- action required.

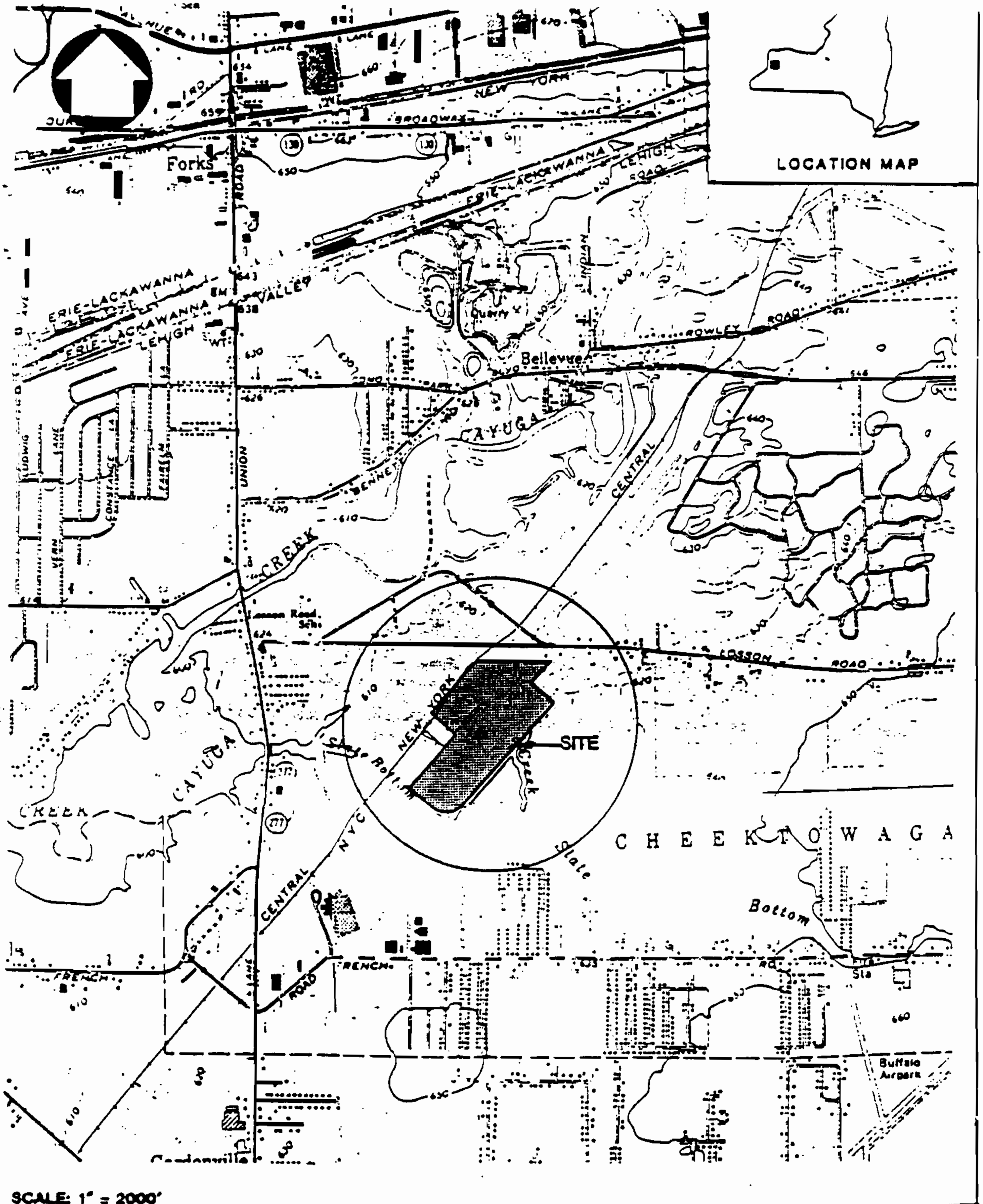
- Classification 2a A temporary classification for a site known or suspected to contain hazardous waste. Most likely the site will require a Phase I and Phase II investigation to obtain more information. Based on the results, the site then would be reclassified or removed from the state Registry if found not to contain hazardous wastes.

- Classification 3 A site which has hazardous waste confirmed, but not a significant threat to the public health or environment - action may be deferred.

- Classification 4 A site which has been properly closed -- requires continued management.

- Classification 5 A site which has been properly closed, with no evidence of present or potential adverse impact -- no further action required.

State-Lead Site An hazardous waste site at which the Department has responsibility for investigating problems at the site and for developing and implementing the site's remedial program. The Department uses money available from the State Superfund and the Environmental Quality Bond Act of 1986 to pay for these activities. The Department has direct control and responsibility for the remedial program.

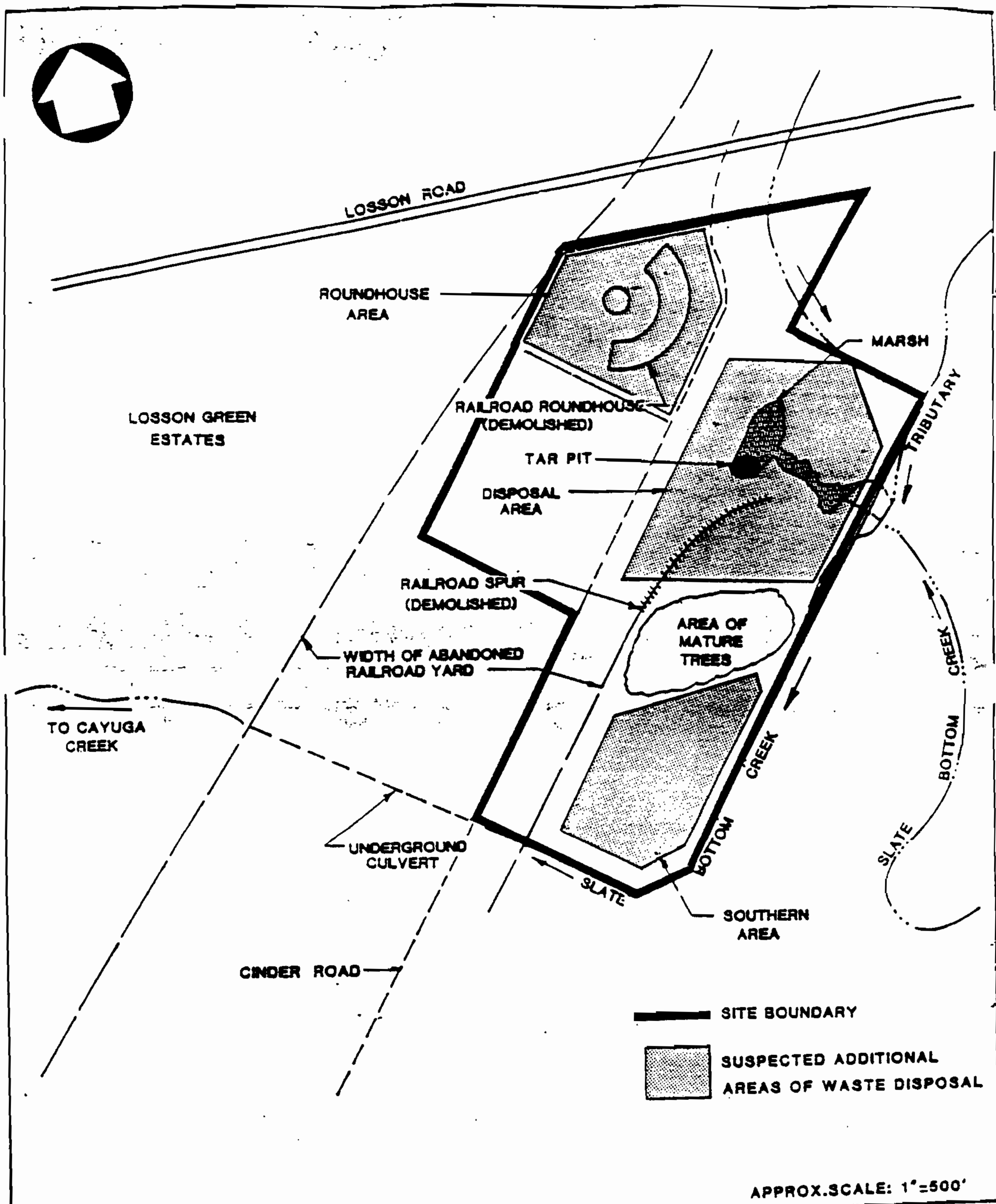


UNION ROAD SITE

LOCATION MAP

Figure 1 - Site location map

Dvirka and Bartilucci

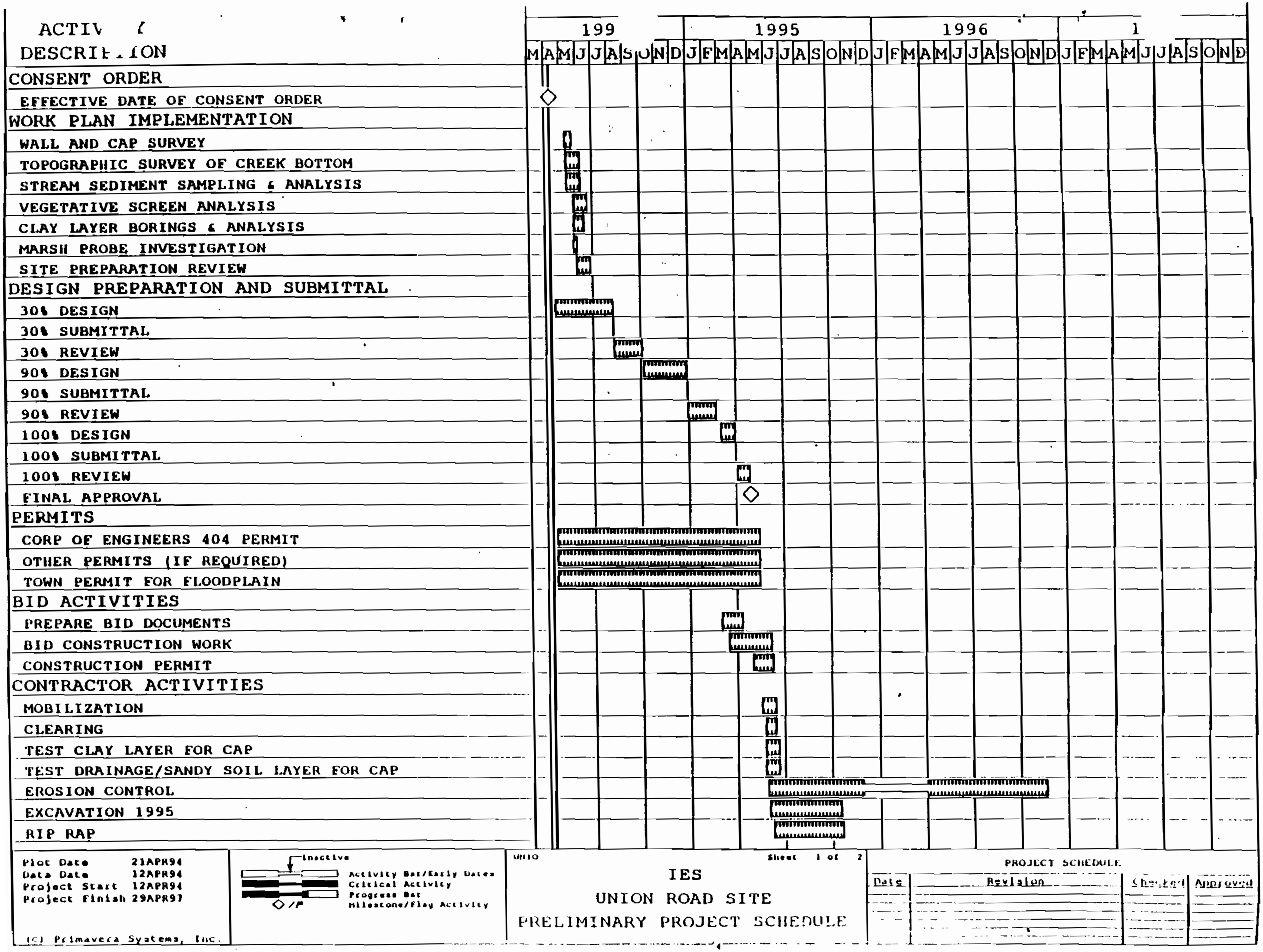


UNION ROAD SITE

DEFINITION OF SITE / STUDY AREA BOUNDARY

Dvirka and Bartilucci

Figure 2 - Site map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CONSENT ORDER
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WORK PLAN IMPLEMENTATION
WALL AND CAP SURVEY
TOPOGRAPHIC SURVEY OF CREEK BOTTOM
STREAM SEDIMENT SAMPLING & ANALYSIS
VEGETATIVE SCREEN ANALYSIS
CLAY LAYER BORINGS & ANALYSIS
MARSH PROBE INVESTIGATION
SITE PREPARATION REVIEW
DESIGN PREPARATION AND SUBMITTAL
30% DESIGN
30% SUBMITTAL
30% REVIEW
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90% REVIEW
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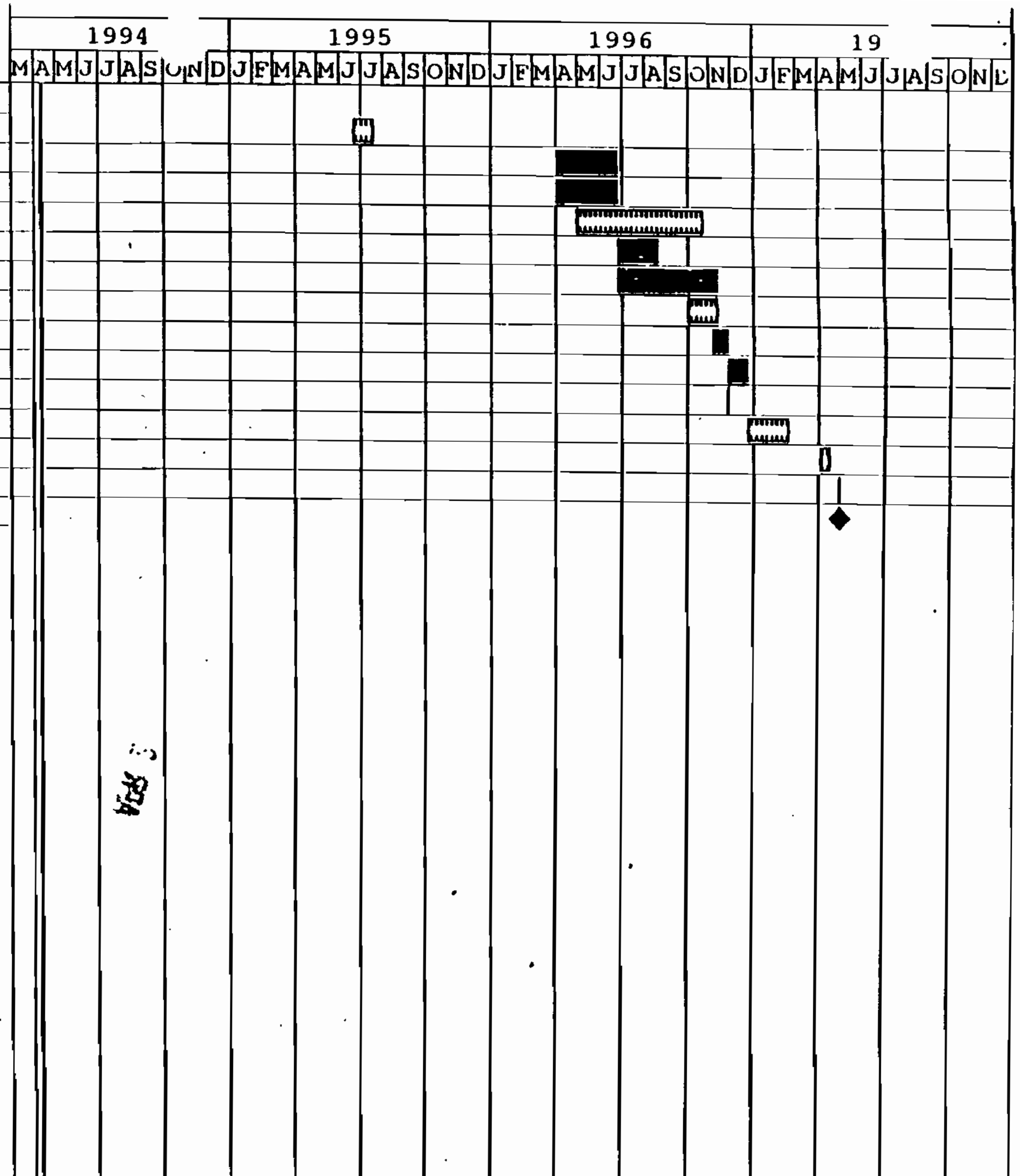
FINAL APPROVAL
PERMITS
CORP OF ENGINEERS 404 PERMIT
OTHER PERMITS (IF REQUIRED)
TOWN PERMIT FOR FLOODPLAIN
BID ACTIVITIES
PREPARE BID DOCUMENTS
BID CONSTRUCTION WORK
CONSTRUCTION PERMIT
CONTRACTOR ACTIVITIES
MOBILIZATION
CLEARING
TEST CLAY LAYER FOR CAP
TEST DRAINAGE/SANDY SOIL LAYER FOR CAP
EROSION CONTROL
EXCAVATION 1995
RIP RAP
Plot Date 21APR94
Data Date 12APR94
Project Start 12APR94
Project Finish 29APR97
(c) Primavera Systems, Inc.
Inactive
Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Flag Activity
UNIO
Sheet 1 of 2
IES
UNION ROAD SITE
PRELIMINARY PROJECT SCHEDULE
PROJECT SCHEDULE
Date
Revision
Checked
Approved

Figure 3

ACTIVI
DESCRIPT..ON

CONTRACTOR ACTIVITIES

- ROUNDHOUSE REVEGETATION
- DEWATERING
- EXCAVATION 1996
- BACKFILL
- BARRIER WALL
- CAP
- SITE GRADE
- CAP SEEDING
- FINAL CERTIFICATION/IMPLEMENTN OF O&M
- DEMOBILIZATION
- PREPARE AS-BUILTS, O&M PLAN, FINAL REPORT
- VEGETATIVE SCREEN AROUND LANDFILL
- SUBMITTAL OF AS BUILTS, O&M PLAN, FINAL REPORT
- AS BUILT APPROVAL BY NYSDEC



Plot Date	21APR94
Data Date	12APR94
Project Start	12APR94
Project Finish	29APR97

(c) Primavera Systems, Inc.

Inactive
Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Flag Activity

UNIO

Sheet 2 of 2

IES
UNION ROAD SITE
PRELIMINARY PROJECT SCHEDULE

PROJECT SCHEDULE

Date	Revision	Checked	Approved

F. NES QUALITY ASSURANCE MANUAL

QUALITY ASSURANCE MANUAL

DOCUMENT NO. 80A9086

REVISION 8

APPROVALS:

2/18/94

President, NES, Inc.

02-18-94

Quality Assurance Manager

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Copy No.

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REVISION LOG

Revision	Date	Description	Approval
1	9/15/86	Revised sections 2,6,7,16,17,18, and Appendices B and C. Reference CRA No. 6198.	M. E. Alling
2	11/3/86	Revised sections 2, 3, and Appendix C. Reference CRA No. 6331.	M. E. Alling
3	3/23/87	Revised section 2, 3, 5, 7, 9, 11, 12, 16 Appendices A.l, B, C, and Glossary. Reference CRA No. 6448.	M. E. Alling
4	10/28/88	Revised sections 1, 3, 4, 5, 6, 7, 9, 10, 12, 13, 15, 17, 18, Appendices A.l, B and C. Reference CRA No. 7084.	B. G. Ashby
5	12/06/89	Revised sections 1, 2, 9 and and Appendices A.l, A.2, B and C. Reference CRA No. 7476.	B. G. Ashby
6	1/14/91	Revised Scope of Manual, sections 2, 5, 6, 7, 9, 11, 12, 13, 15, Appendices A.1, B, C and Glossary. Refer to CRA 7840 and 7840A.	B. G. Ashby
7	3/16/92	Revised sections 1, 4 and 12 and Appendices A.1 and B. Refer to CRA 8304.	B. G. Ashby
8	02/18/94	Changed Nuclear Energy Services to NES, Inc. throughout, revised policy statement for applicability to additional standards, added Environmental Services to scope, revised Appendix A.1 to current organization and made minor editorial changes. Refer to CRA 8806.	B. G. Ashby B.G.A.

STATEMENT OF POLICY

This Quality Assurance Manual defines the Quality Assurance Program implemented by NES, Inc. in performing activities described in this Manual. Each NES employee is responsible to perform work in strict accordance with the requirements of this Quality Assurance Program.

The Quality Assurance Program is in compliance with Title 10 of the Code of Federal Regulations, Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants"; ANSI/ASME Standard N45.2,"Quality Assurance Program Requirements for Nuclear Facilities"; and ANSI/ASME NQA-1, "Quality Assurance Program Requirements for Nuclear Power Plants." Other quality requirements such as DOE 5700.6C, "Quality Assurance" and ANSI/ASQC E4, "Quality Systems Requirements for Environmental Programs" will be merged with this manual through preparation of a Quality Assurance Program Plan in accordance with Section 2.

This program is applicable to the design, procurement, manufacture, inspection, testing, installation and inservice inspection of nuclear components, including the furnishing of inservice inspection, consulting engineering and quality assurance services associated therewith. Specific implementing Quality Assurance Program Plans and administrative procedures assist in implementing this Manual.

The responsibility for verification that this Quality Assurance Program is being properly implemented rests with the Quality Assurance Manager.

W J Manion

William J. Manion, President
NES, Inc.

SCOPE OF MANUAL

NES, Inc. performs the following work using the Quality Assurance Program described in this Quality Assurance Manual:

1. Inservice inspection including preservice inspection and inservice testing.
2. Engineering services including design of permanent and temporary plant equipment, systems and structures.
3. Plant modification, maintenance, and installation activities, including those involving special processes.
4. Quality Assurance services, including nondestructive testing, inspection, records management, auditing, and training and certification of inspection personnel.
5. Waste Management activities including radioactive waste cleanup, transportation and disposal activities.
6. Environmental services including consulting, engineering, auditing, site characterization and remediation services.

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1. ORGANIZATION

1.1 SCOPE

This section describes the NES organization and the responsibility of personnel performing activities affecting quality. Where responsibilities are assigned, sufficient authority is provided to assure satisfactory accomplishment of the assignment.

1.2 ORGANIZATION STRUCTURE

The organization of NES is presented in the organization charts, Appendices A.1 and A.2.

NES is organized to support service line management. Services include engineered products, engineering services, quality assurance services, inspection services, waste management, staff augmentation services, plant betterment and environmental services. Overall administrative responsibility for each project is assigned to a Project Manager. Technical responsibility for each project is assigned to Task Engineers and/or Site Supervisors. Department and Group Managers are responsible to provide overall technical direction to project personnel. These personnel report through various administrative management positions as shown in the appendices to a Service Line Vice President or General Manager. 3

Senior management is responsible for all subordinate activities affecting quality. This in no way relieves subordinate personnel of assigned quality assurance functions. All personnel performing activities affecting quality have direct access to such levels of management as may be necessary to perform the assigned functions.

Quality Assurance activities within NES are the responsibility of the Quality Assurance Manager, who reports directly to the President. Quality Assurance personnel have sufficient authority and organizational freedom to identify quality problems, to initiate, recommend or provide solutions, to verify the implementation of solutions, and to control further processing of nonconforming items or unsatisfactory conditions until proper actions are accomplished.

When major problems or differences of opinion on quality matters cannot be resolved within the line organizations, these problems are brought to the attention of the President for final resolution. Such resolutions meet client, code or regulatory requirements.

1.3 ORGANIZATION RESPONSIBILITIES

1.3.1 President of NES

The President is responsible for maintaining the overall organizational structure necessary for an effective Quality Assurance Program and for establishing NES quality policy through approval of this Quality Assurance Manual.

1.3.2 Quality Assurance Manager

The Quality Assurance Manager is responsible for the formulation, implementation, effectiveness and maintenance of the Quality Assurance Program in part through approval of this Quality Assurance Manual. He regularly reviews the status and adequacy of the Program through audits and through annual evaluations of QA Program effectiveness with senior management. The Quality Assurance Manager, or his representative, has the authority to stop work when indicated by significant quality problems.

The Quality Assurance Manager exercises this authority through issue of a formal Stop Work Order to responsible line or senior management, who upon receipt of the order, formally stop work activities as defined.

Reporting to the President of NES, the Quality Assurance Manager has direct access to responsible management where appropriate action can be taken. The Quality Assurance Manager is sufficiently independent of the pressures of cost and schedule to assure proper implementation of the Quality Assurance Program. He is responsible to assure that verification of conformance to established requirements is accomplished by individuals and groups who do not have direct responsibility for performing the work being verified. Alternatively, such verification is performed by individuals or groups trained and qualified in QA concepts and practices and independent of the organization responsible for performing the work.

1.3.3 Service Line Vice Presidents and General Managers

These individuals are responsible for projects within their organizations and provide adequate resources of personnel to manage and implement support activities.

1.3.4 Director; Group Manager; Department Manager

These individuals are responsible for management of service line activities, for overall contract management of these activities in conformance with requirements of this Quality Assurance Manual, for schedular, technical and budgetary performance within their service line. As applicable, they approve Quality Assurance Program Plans. They provide adequate resources in terms of personnel to manage and implement support activities.

1.3.5 Project Manager

The Project Manager is assigned by the Service Line Vice President or General Manager and is directly responsible for planning, controlling and coordinating work associated with the assigned project, including assuring quality activities conform to NES and customer requirements. 8

The Project Manager is the liaison between the customer and NES. He is the sole authority for making or modifying project commitments to the customer and is the focal point for internal support functions required for the assigned project.

The Project Manager prepares the required project Quality Assurance Program Plan. He prepares and maintains project schedules and provides comprehensive project status and progress reports as requested by NES management to assure complete responsiveness to customer requirements.

1.3.6 Task Engineer

The Task Engineer is responsible to the Project Manager for satisfactory accomplishment of the project task workscope. He is directly responsible to the applicable Service Line Vice President, Director or Department Manager for performance of this work. The Task Engineer keeps the Project Manager and Department Manager informed as to the status of task performance.

1.3.7 Site Supervisor

The Site Supervisor receives technical and administrative support from, and reports to, the Project Manager. Alternatively, the Project Manager is located at the jobsite and serves as the Site Supervisor.

The Site Supervisor is responsible for the day–to–day operation of site activities in accordance with the quality standards set forth in this Manual. He directs site personnel in the performance of their duties and verifies the proper performance of quality related functions in coordination with Quality Assurance.

1.3.8 Document Control Supervisor

The Document Control Supervisor is responsible for the release and distribution of work controlling documents in accordance with document control procedures to assure that they are of the latest approved revision and to assure that the documents are available for distribution to the point of use.

The Document Control Supervisor is also responsible for the collection, storage and maintenance of quality assurance records retained by NES.

1.3.9 Administrative Manager

Administrative control of purchases is provided by the Administrative Manager. Technical and quality requirements of the purchase are established and approved by responsible NES personnel. The Administrative Manager provides data on available sources of supply and keeps current on available products. The Administrative Manager places safety related orders only with those vendors qualified for supply of such items or services.

1.4 DELEGATION

The performance of an activity assigned by this Manual may be delegated by the responsible individual to any qualified person; however, the responsibility for that activity remains as described in this Manual.

1.5 RESPONSIBILITY MATRIX

Appendix B lists a summary of primary responsibilities for the preparation and approval of quality documentation.

2. QUALITY ASSURANCE PROGRAM

2.1 SCOPE

This section describes the method by which NES establishes for each project a documented Quality Assurance (QA) Program meeting the requirements of 10CFR50, Appendix B, ANSI N45.2, NQA–1 or other quality requirements (e.g., DOE 5700.6C and ANSI/ASQC E4).

2.2 GENERAL REQUIREMENTS

This Manual establishes a basic Quality Assurance Program for NES and upon which NES builds a Quality Assurance Program unique to each project. The Quality Assurance Manager and Service Line Management participate early in the QA Program definition stage of the project to determine and identify the extent to which Quality Assurance controls are to be applied to work activities. The Quality Assurance Program is controlled and documented by written policies, procedures and instructions and is carried out for the life of the contract.

The Quality Assurance Program provides adequate control over activities affecting the quality of items and services to an extent consistent with their importance to safety, reliability and performance. Activities affecting quality are performed under controlled conditions and where necessary to achieve quality objectives, the use of special equipment, environmental conditions, skills or processes are provided. Personnel assigned to the project are indoctrinated and trained as necessary to achieve and maintain suitable job proficiency. During the performance of the work the status and adequacy of the program are regularly assessed. Upon completion of the project and acceptance of the work by the customer, designated quality assurance records generated during performance of the project are made available to the customer or retained by NES, as required, as evidence of the quality of the work.

2.3 SPECIFIC REQUIREMENTS

2.3.1 Project Scope

NES projects are implemented through direction provided by a specific, written Quality Assurance Program Plan (QAPP), this Quality Assurance Manual and implementing procedures. Alternatively, NES may perform work entirely under the control of the customer's Quality Assurance Program .

2.3.2 Quality Assurance Program Plan

The Project Manager prepares and obtains approval of a QAPP in accordance with NES Procedure 80A9031, Quality Assurance Program Plan Preparation. The QAPP includes specific details that are not included in this Manual and any contractual Quality Assurance requirements that are unique to the project.

A typical Quality Assurance Program Plan addresses the following topics:

1. Project–unique Quality Assurance requirements, including exceptions and additions to existing quality procedures.

2. Communication guidelines including required customer approvals for home office and field initiated changes.

3. Design criteria and design bases, as applicable.

4. Document distribution requirements, including identification of special document requirements.

5. Identification of any mandatory inspection or hold points and decisions regarding inspections to be conducted, i.e. source versus receipt.

6. A list of documents or categories of documents that are considered records for a particular project and a designation of those records to be stored by NES, those records to be turned over to the customer, and the retention period for those records maintained by NES.

7. Specific project audit schedule (a calendar schedule may be issued separately).

8. Identification of key project management personnel, normally the Project Manager and authorized customer representative.

The project QAPP is issued as soon after project initiation as feasible. The specific target date for issuance on each project is established by the NES Project Manager.

2.3.3 Quality Assurance Implementing Procedures

Procedures are prepared as required by this Manual to implement the Quality Assurance requirements. Procedures are prepared by qualified individuals with expertise in the area of procedure content and in accordance with the format established in NES Procedure 80A9024, Procedure Format. Quality Assurance implementing procedures are reviewed and approved as required by the Responsibility Matrix of Appendix B.

2.3.4 QA Program Assessment by Company Management

Company Management annually reviews/assesses the status and adequacy of the QA Program. This review/assessment is the responsibility of a team appointed by the President. The review/assessment determines required corrective action and provides direction for upgrading the Quality Assurance Program to meet changing conditions and requirements. The results of these assessments are documented and filed by Quality Assurance.

2.4 INDOCTRINATION AND TRAINING

2.4.1 Quality Assurance Personnel

Personnel performing Quality Assurance and Quality Control functions are trained, qualified and certified in accordance with written implementing procedures. Quality Assurance personnel include those performing audits, inspections or quality assurance reviews of procedures or documents under the direction of the Quality Assurance Manager. The Quality Assurance Manager may delegate the performance of certain Quality Assurance/Quality Control functions to personnel with service line organizations, such as inspection services or quality assurance services organizations, including the training, qualification and certification of individuals within the organization. Such activities are described in implementing procedures approved by the Quality Assurance Manager. The activities are subject to audit by the Quality Assurance Manager.

2.4.2 General Indoctrination and Training

Personnel whose duties affect quality of nuclear power plants have adequate qualifications to assure satisfactory performance of their assigned tasks. Service line personnel, whose activities affect quality, participate in indoctrination and training programs to become familiar with the purpose and intent of regulations, codes, standards, procedures and this Manual. These programs familiarize personnel with the Quality Assurance function as it relates to their work and its application at NES.

The Quality Assurance Manager is responsible for providing indoctrination to quality program requirements, deficiency reporting, examples of quality problems and quality evaluations in accordance with Procedure 80A9078, QA General Indoctrination.

Department Managers are responsible for assuring personnel under their direction attend the quality indoctrination and are sufficiently trained for their assignment.

2.4.3 Personnel Certification

Personnel requiring certification prior to performing quality functions are certified as meeting the requirements of the applicable personnel qualification procedure, such as for auditing, nondestructive examination or inspection.

2.5 QA MANUAL REVISIONS

Revisions to this QA Manual will be processed in accordance with NES Procedure 80A9003, Document Control. Minor revisions will be highlighted with a triangle and the revision level in the right hand column. A bar from the triangle may be added to indicate a paragraph change. If a section is completely rewritten, a triangle and the revision level shall be placed to the right of the title. 8

At each revision, the title page will be signed by the President and QA Manager and the revision level updated. Each revised Section will be indicated by updating the revision level of the first page of the section and on the Table of Contents. The cover page and the Table of Contents will indicate the current revision level. Manual sections will be revised and distributed independent of other sections. Unrevised sections will remain at the same revision level until changes are required.

3. DESIGN CONTROL

3.1 SCOPE

This section describes the measures in effect to assure that applicable design requirements, such as design bases, regulatory requirements, codes and standards are correctly translated into specifications, drawings, procedures or instructions in a manner to assure the quality of the design activity.

NES performs design of permanent plant components, systems, and structures, measuring, test and examination equipment including fixtures and calibration blocks; and other safety–related but non–permanent items. NES also performs engineering analyses of safety–related and important–to–safety items and services.

3.2 GENERAL REQUIREMENTS

3.2.1 Design Control Planning

Planning of the project design activities is performed by the Project Manager and Department Managers, as applicable.

Project design control is provided in accordance with the Quality Assurance Program Plan which is prepared in accordance with NES Procedure 80A9031, Quality Assurance Program Plan Preparation.

Design control measures are applied to the following items as applicable:

1. Engineering analyses (e.g., nuclear, structural, thermal – hydraulic)
2. Compatibility of materials
3. Accessibility for inspection, maintenance and repair.
4. Associated computer codes.
5. Delineation of acceptance criteria for inspections, examinations and tests.

3.2.2 Design Documents

The Project Manager defines the design documents (e.g., reports, procedures, drawings, specifications) to be prepared for the project.

The designated Task Engineers are responsible for preparing these documents .

Project design documents are listed on the project Master Document List. Approval of project design documents is in accordance with the approval matrix shown in Appendix B of this Manual.

Project design documents that become work controlling documents (specifications, procedures and drawings) are controlled as outlined in Section 6 of this Manual.

3.2.3 Engineering Analyses and Verification

Engineering analyses are performed using hand and/or computer calculation methods. All calculations are checked by an independent and qualified reviewer, although the reviewer may be from the same organization that performed the original analyses. The verification activity consists of, as a minimum, review of the design, checking of the calculations or analyses, and assessing the results against design objectives defined in the clients purchase order or the design specification. Additional design verification activity may be necessary dependent on the scope, complexity and importance to safety of the design. Where tests are used as a verification method, test controls of Section 11 of this Manual apply.

Where engineering analysis consists of exercise of prudent engineering judgment, key decisions are appropriately documented.

Design analysis calculations and key engineering decisions are documented under the responsibility of the Task Engineer.

3.2.4 Design Interface

In the event that design interfaces exist either within NES or between NES and others, design coordination activities and interface controls are established in a Quality Assurance Program Plan. The Plan establishes procedures for the review, approval, release, distribution, and revision of documents involving design interfaces and for design review meetings.

3.2.5 Design Errors

Errors discovered in approved design documents or methods (such as in computer codes) are suitably evaluated and documented, and actions are taken to assure that the design is not adversely impacted. Appropriate action is taken to correct design deficiencies so identified.

3.3 SPECIFIC REQUIREMENTS

3.3.1 Permanent Plant Components, Systems and Structures

3.3.1.1 Design Criteria

Design criteria are prepared by the Task Engineer and are incorporated in the Quality Assurance Program Plan. If issued as a separate project document, such as a formal design specification, the design criteria are reviewed and approved as shown in Appendix B.

The design criteria include such items as design bases and regulatory requirements specified by the customer, performance objectives, functional requirements, material requirements, environmental and interface requirements, and quality requirements, as applicable.

3.3.1.2 Engineering Analysis

Engineering analysis is documented in calculation notebooks prepared and maintained in accordance with NES Procedure 80A9004, Engineering Calculation Notebook Control.

3.3.1.3 Computer Codes

Computer codes used in the design process are verified prior to issuance of the design report. Code verification (including reverification following code modification) is performed in accordance with NES Procedure 80A9010, Computer Code Documentation Control Procedure.

3.3.1.4 Design Review

Project design reviews are held to evaluate the progress or results of design activities in engineering services activities, to assure that all aspects of the design have been properly considered, and to assure coordination among the responsible designers, Quality Assurance and the fabricator, if applicable. These reviews are planned and documented in accordance with the project Quality Assurance Program Plan which is prepared in accordance with NES Procedure 80A9031, Quality Assurance Program Plan Preparation. 3

1. The Project Manager specifies the number of internal design review meetings to be held for each formal design project in the project QAPP. There are three types of design review meetings as outlined below from which the Project Manager chooses dependent on the scope of the design activity.

   A. Design Initiation Meeting

      The objective of this meeting is to review in detail the design basis, objectives, functional requirements, proposed design, client requirements and interfaces, inputs, and overall design criteria. This meeting assures that key NES personnel are familiar with project scope and requirements.

   B. Mid-Design Meeting

      The objective of this meeting is to review design progress and to identify and resolve design problems.

   C. Final Design Meeting

      The objective of this meeting is to review the final design for compliance with customer requirements and project design criteria, and to discuss fabrication plans.

The Project Manager is responsible for calling and chairing the meetings and issuing the minutes which contain commitments and clearly defined due dates.

3.3.1.5 Inspections and Tests

Necessary tests or inspections required to prove the design adequacy are performed in accordance with Sections 10 and 11 of this Manual.

3.3.2 Measuring and Test Equipment Design

3.3.2.1 Calibration Blocks Design

Calibration blocks are subject to design controls as described below:

1. Design Criteria

   Criteria for calibration block design is identified in a calculation notebook controlled in accordance with 3.3.1.2. above.

2. Engineering Analysis

   Engineering analyses are documented by the use of a calculation notebook controlled in accordance with 3.3.1.2. above.

3. Design Review

   Formal design review meetings are not required for calibration block design activities. The design review is accomplished through verification of calculation notebooks as specified in 3.2.3 and 3.3.1.2. above.

3.3.2.2 Other Measuring and Test Equipment Design

Design control measures applied to development of measuring and test equipment are affected by provision of a suitable design specification(s) and through formal testing of completed equipment in accordance with Section 11 of this Manual. Testing includes satisfying calibration requirements per the provisions of Section 11 of this Manual. Other design control provisions are not applicable.

1. Design Specification

   A design specification is prepared by the Task Engineer and approved as shown in Appendix B. The design specification identifies essential parameters of the specified equipment, including those which must be demonstrated by functional testing.

2. Test Procedure

A formal test procedure is prepared by the Task Engineer and approved as shown in Appendix B prior to functional testing of the equipment and in accordance with Section 11 of this Manual.

The test procedure includes, directly or by reference, such functional test requirements and acceptance criteria as are necessary to demonstrate that the equipment meets all criteria identified in the design specification, and applicable requirements for calibration of the equipment.

3. Test Report

The results of the functional test of the equipment are documented by the Task Engineer and approved as shown in Appendix B.

3.3.3 Design Changes

Changes to approved design criteria, reference parameters, design methods, models, material property data or assumptions are documented and justified in the appropriate design calculation notebook by the Task Engineer and approved by the same individuals originally required per Appendix B.

Changes to approved final design documents under the control of the Document Control system are subject to the same controls as the original document. Revisions to final design documents are initiated and processed as described in Section 6 of this Manual.

3.3.4 Records

The Project Manager retains design documents for completed projects in accordance with customer requirements and applicable QAPPs.

4. PROCUREMENT DOCUMENT CONTROL

4.1 SCOPE

This section defines responsibilities and sets forth the measures that are followed to ensure that the necessary quality requirements are included or referenced in documents used to procure materials, equipment, and services. The procedures outlined herein are applicable to procurement of materials, equipment, and services that can affect quality of the final product. Three categories of procurement are established:

Category 1 – Items or services of a complex or critical nature affecting nuclear plant safety where quality assurance program implementation is required.

Category 2 – Items or services of a commercial grade or of a simple nature affecting nuclear plant safety but where normal commercial practice provides adequate quality without imposition of quality assurance program requirements.

Category 3 – Other items and services, including non–safety items and services .

4.2 GENERAL REQUIREMENTS

Procurement activities are performed in accordance with NES Procedure 80A9007, Procurement Control. 8

4.2.1 Procurement Documents

The following documents are used in the process of procuring materials, equipment, or services, and are reviewed and approved as denoted in the Responsibility Matrix (Appendix B):

1. Purchase Requisition

   The Purchase Requisition lists requirements necessary to prepare a Purchase Order, including technical reference and applicable revisions; it may also list recommended or preferred vendors. The originator of the Purchase Requisition is responsible for obtaining approvals.

2. Request for Proposal (RFP)

   The Request for Proposal contains an adequate description of the items, including (by statement or reference) the latest revision of all applicable drawings and specifications, other quality assurance requirements as stated in paragraph 7.3.2, and any other information necessary for potential vendors to evaluate the RFP with respect to price, delivery and technical content.

3. Purchase Order (PO)

   The Purchase Order represents the final document that places the order with the selected vendor according to information as specified on the Purchase Requisition. Purchase Orders are placed by the Purchasing Agent with only those vendors appearing on the Approved Vendor List for Category 1 items or services, or with other vendors for Category 2 and 3 procurements.

4.2.2 Contents of Purchase Order

Dependent on the requirements of the item or service being purchased, the Purchase Orders contain the following:

1. An adequate description of the items ordered including reference to the applicable drawings and/or specifications.
2. Copies of the applicable revisions of applicable drawings and/or specifications.
3. Copies of the applicable revisions of applicable Quality Assurance specifications or requirements for vendor QA Program implementation.
4. Requirements for the selected vendor to impose the NES Quality Assurance requirements on sub–tier vendors.
5. Requirements for NES and client access to the vendor's facility for surveillance and/or inspection for Category 1 and 2 procurements.
6. For Category 1 procurements, requirements for Quality Assurance Program evaluation, inspection and where specified, approval by NES.

7. As applicable, provisions that evaluation audits by NES do not constitute acceptance nor in any way relieve the vendor of his contractual obligation or responsibility to furnish end products that meet all contractual requirements.

8. A definition of the records to be prepared, maintained, submitted or made available for review and approval.

9. Instructions on record retention and disposition.

10. For Category 1 and 2 procurements, requirements for submittal of certifications and/or test and inspection records prior to or with delivery of the item(s) or service.

11. Requirements for reporting of defects and noncompliances per 10CFR21, as applicable.

4.2.3 <u>Purchase Order Changes</u>

Changes to the Purchase Order are processed in the same manner as the original Purchase Order.

4.2.4 <u>Procurement Records</u>

Purchase Order records are maintained by the Purchasing Agent.

4.3 SPECIFIC REQUIREMENTS

Procurement document requirements for the defined procurement categories are specified in the following subsections.

4.3.1 <u>Category 1 – Items and Services Affecting Nuclear Power Plant Safety</u>

Category 1 purchases are defined as those of a critical or complex nature that affect plant safety. Category 1 items and services are defined in NES Procedure 80A9007, Procurement Control. Category requirements include:

1. Preparation of a formal procurement specification detailing the quality and technical requirements, and referencing applicable drawings, documents, etc.

2. Preparation of a Purchase Requisition and approval by the Project Manager or Department Manager.

3. Preparation of a Purchase Order (or Request for Proposal when deemed necessary) containing a transcription of technical and quality requirements from the approved Purchase Requisition.

4. Placement of the Purchase Order only with vendors on the Approved Vendor List developed in accordance with Section 7 of this Manual.

5. Review of the Purchase Order in accordance with NES Procedure 80A9038, Quality Assurance Review of Purchase Orders, and approval of the Purchase Order by the Quality Assurance Manager for compliance with quality requirements, prior to release of the order.

4.3.2 Category 2 – Items and Services Requiring Vendor Certifications

Category 2 items and services are defined as those items where quality attributes can be satisfied by material or other certifications provided by the vendor. Category 2 requirements include:

1. Definition of procurement requirements, including the necessary certifications in the Purchase Requisition and subsequently in the Purchase Order.

2. Approval of the Purchase Requisition by the Project Manager or Department Manager.

3. Review and approval of the Purchase Order by the Quality Assurance Manager to assure proper category assignment and inclusion of applicable quality documentation requirements.

4.3.3 Category 3 – Non–Safety Related Items and Services

Category 3 items and services are defined as not safety related. Requirements for Category 3 procurement are found in NES Procedure 80A9007, Procurement Control.

5. INSTRUCTIONS, PROCEDURES AND DRAWINGS

5.1 SCOPE

This section describes the measures used by NES to assure that activities affecting quality are prescribed by documented instructions, procedures or drawings of a type appropriate to the circumstances and to assure that such activities are accomplished in accordance with those requirements.

5.2 GENERAL REQUIREMENT

NES communicates requirements for work affecting quality through this Quality Assurance Manual, specifications, drawings, procedures, Quality Assurance Program Plans, Inservice Inspection Program Plans and Inservice Testing Program Plans. These documents are reviewed and approved in accordance with the Responsibility Matrix of Appendix B. Through this review and approval activity, NES assures that the documents contain appropriate qualitative and quantitative acceptance criteria thus defining quality work.

Quantitative criteria such as dimensions, tolerances, and operating limits and qualitative criteria such as workmanship standards are specified as necessary to define satisfactory work performance and quality compliance.

5.3 SPECIFIC REQUIREMENTS

The following documents are prepared to affect communication of project requirements, as applicable to the type of project:

5.3.1 Specifications

Specifications define requirements for an item not included on the item drawing. Specifications include one or more of the following: applicable documents and drawings, manufacturing requirements, inspection and test requirements, acceptance criteria, handling and shipping requirements, and administrative requirements. Specifications are developed, reviewed and approved as specified in Sections 3 and 4 of this Manual. Specifications for items to be fabricated through the

Engineered Products Service Line are developed in accordance with NES Procedure 80A9059, Procedure for the Preparation of Project Fabrication Specification.

5.3.2 Drawings

Drawings show dimensions, acceptance criteria, tolerances, materials and other requirements of the design necessary to fabricate, assemble and inspect the item or to locate and examine items. Applicable specifications are listed on the drawing, where appropriate. Drawings are developed, reviewed and approved as specified in Section 3 of this Manual.

5.3.3 Procedures

Procedures define requirements to accomplish a specific sequence of operations, examinations or tests. Procedures include one or more of the following: applicable codes, documents and drawings, detailed sequence of operations, examinations or tests, special process requirements, acceptance criteria, inspection requirements and administrative requirements. Quality Assurance procedures define routine activities to accomplish quality objectives and are prepared in accordance with the NES Procedure 80A9024, Procedure Format. Applicable Quality Assurance Program Implementing procedures to be used with this Manual are listed in Appendix C.

5.3.4 Quality Assurance Program Plan (QAPP)

QAPPs define information necessary to supplement this Manual and the applicable QA implementing procedures for a specific project. The Plan includes the detailed requirements outlined in, and is developed and approved as described in, Section 2 of this Manual.

5.3.5 ISI and IST Program Plans

ISI and IST Program Plans contain examination or test sequences and schedules, detailed examination and testing procedures, appropriate Code classes for each component of the nuclear power plant, diagrams and system drawings delineating the identification and extent of areas subject to examination, definitions of personnel and equipment qualifications, access provisions, report and record formats.

calibration block details, program schedules, and any specific exceptions to applicable Regulatory Guides, Codes and NRC Bulletins.

5.3.6 Work Travelers or Process Control Sheets

In those instances where the importance and complexity of an activity requires the preparation and implementation of a traveler or process control sheet, such documents are used to control operations, inspections and documentation.

5.3.6.1 Travelers or Process Control Sheets Contain:

a) Identification of the systems, structures, components or activities, including necessary reference to other process control sheets.

b) Issue and revision records and necessary approvals.

c) Identification of procedures used in the performance of the activity, such as WPSs, cleaning, or NDE procedures.

d) Material (item) identification.

e) Records of operations performed including necessary inspections and acceptances.

f) Records of inspections, tests and examinations including Hold Points.

g) Records of nonconformances and dispositions, including references to Nonconformance Reports and signoff of reinspections/retests.

h) Identification of or reference special processes to be performed in conjunction with these activities.

i) Requirements for or reference to traceability or identification and marking requirements.

j) Requirements for or reference to inspection, examination and test provisions including accept/reject criteria and Hold Points.

k) Special requirements such as for special handling equipment, for radiation protection provisions for workers, for preservation or protection of items and other requirements necessary to provide a quality activity.

5.3.6.2 Travelers or Process Control Sheets are controlled in accordance with a Procedure(s) developed for the project. This Procedure(s) contains applicable requirements for development, approval, release and distribution of the document to assure communication of latest approved requirements to users of the document. As such, travelers and process control sheets are not subject to the requirements of Section 6 of this Manual.

5.3.7 Revisions

Revisions to the documents described in paragraphs 5.3.1 through 5.3.5 are subject to the same review approval and document control measures as the original.

6. DOCUMENT CONTROL

6.1 SCOPE

This section sets forth the measures in effect to assure that controlled documents including changes thereto are reviewed and approved for release and distributed to and used at the place of work. Documents subject to the provision of this section include:

1. NES Quality Assurance Manual
2. Design and Fabrication Specifications
3. Procedures
4. Design Drawings
5. Quality Assurance Program Plans
6. ISI and IST Program Plans
7. Master Document Lists
8. Design Reports
9. Revisions to the above

Calculations, audit reports, documents related to design computer codes and Nonconformance Reports are controlled as stated in Sections 3, 7, 15 or 18, as applicable.

6.2 GENERAL REQUIREMENTS

6.2.1 Review and Approval

The review and approval responsibilities of personnel involved in the development of controlled documents are identified in Appendix B, Responsibility Matrix. Detailed requirements related to the means of development of controlled documents are identified in the applicable section(s) of this Manual.

Individuals in each Service Line have Approval Authority (AA) for technical documents as listed in Appendix B. The organization chart, Appendix A.1 indicates these personnel by an A–A. Any individual above the designated AA level may also approve such documents.

6.2.2 Project Controlled Documents

Documents that are to be controlled for a specific project are listed in the project Master Document List.

6.2.3 Customer Approval

For a specific project any special requirements for document control (e.g., customer approval for release) are identified in the project Quality Assurance Program Plan.

6.2.4 Procedure

Controlled documents are processed and/or revised in accordance with NES Procedure 80A9003, NES Document Control.

6.3 SPECIFIC REQUIREMENTS

6.3.1 Controlled Distribution

The Document Control Supervisor is responsible for document control activities within NES and maintains a controlled distribution list identifying assigned holders of controlled document copies. The Document Control Supervisor is responsible for the issuance of controlled documents and revisions.

6.3.2 Document Transmittal and Recall

Transmittal of controlled documents and revisions is accomplished utilizing a transmittal form requiring receipt acknowledgment by each recipient.

Receipt acknowledgments on revised documents include the statement that the recipient attests to the latest revision having been received and the obsolete document having been either marked "obsolete" or destroyed. Transmittals are non–permanent records and may be destroyed for obsolete revisions of documents.

For external distribution of project–related documents, the Project Manager is responsible for forwarding the document and transmittal form to the assigned individual.

6.3.3 Externally Generated Documents (EGD)

Externally generated documents containing design input used in engineering services projects are controlled by the Project Manager who receives the documents and maintains a log of externally generated documents. Design input derived from EGD is controlled in accordance with Section 3 of this Manual.

7. CONTROL OF PURCHASED MATERIAL, EQUIPMENT AND SERVICES

7.1 SCOPE

This section describes the measures in effect at NES to assure that purchased materials, equipment and services conform to the procurement documents. These measures include source evaluation and selection, inspection at the source, inspection upon delivery and review of objective evidence furnished by the vendor.

Requirements are defined in accordance with the procurement categories of Section 4 of this Manual.

7.2 GENERAL REQUIREMENTS

7.2.1 Approved Vendor List

An Approved Vendor List is maintained by the Quality Assurance Manager listing those vendors qualified to supply Category 1 items or services to NES. The Purchasing Manager orders Category 1 items or services only from those vendors appearing on the Approved Vendor List.

7.2.2 Selection of Sources

For inclusion on the Approved Vendor List, an evaluation is required for selection of sources that is based on either historical quality performance data, source surveys or audits, or source qualification program. This evaluation is conducted in accordance with NES Procedure 80A9030, Vendor Evaluation and Selection.

7.2.3 Audits

During supply of the item or service, audits are performed consistent with the importance to safety, complexity, or quality of the item or service.

7.2.4 Source Inspection

Verification of vendors' activities during performance of the work is planned and performed with required Quality Assurance personnel participation in accordance with written procedures to assure conformance to Purchase Order requirements. Shipping releases are used to control material release from a vendor's facility where required.

7.2.5 Receiving Inspection

Receiving inspection is performed to assure that items are properly identified and correspond to the purchase document and the receiving documentation; that items and acceptance records satisfy the inspection instructions prior to use; that specified records are available at the point of use of the item.

Nondestructive examination consumable materials will be receipt inspected in accordance with NES Procedure 80A9033, Inservice Inspection Program Receiving Inspection Procedure.

7.2.6 Commercial Grade Items

For commercial grade items verification requirements are established in the project Quality Assurance Program Plan or Implementing Procedures to provide "Adequate Assurance" the items satisfactorily meet design criteria.

7.3 SPECIFIC REQUIREMENTS

7.3.1 Vendor Evaluation and Selection

Vendors are selected on past performance or by a preliminary evaluation by the Purchasing Manager, Quality Assurance Manager, Project Manager and/or other cognizant NES personnel. The preliminary evaluation determines whether the vendor has the basic capability and willingness to conform to the requirements of NES and the customer, including compliance with 10CFR21, as applicable.

Dependent upon the workscope, a vendor's Quality Assurance Program may be reviewed to determine acceptability and a survey may be performed of the vendor's facility.

A Purchase Order for Category 1 procurement is awarded only to vendors meeting one of the following criteria:

1. A thorough source evaluation including a capability verification performed by qualified and certified audit personnel to evaluate the vendor's quality system and organization. Surveys are performed in accordance with written checklists approved by the Quality Assurance Manager. The auditor may request technical assistance from service line personnel to assist in determining the vendor's capability in areas such as facilities, equipment, personnel, and technical expertise.

2. Inclusion on the customer's qualified supplier list for the scope of supply.

Acceptable vendors and their capability limits are documented on the Approved Vendor List (AVL). Remaining on the AVL is dependent upon the vendor's ability to continually perform and supply quality items and services, and upon the results of periodic audits.

7.3.2 Vendor Requirements for Category 1 Procurement

Vendors are required to maintain a documented Quality Assurance Program consistent with the complexity and quality requirements of the items or service to be supplied.

Vendors provide objective evidence that items delivered to NES or the customer meet all quality requirements.

Vendors submit documents, such as procedures, drawings, instructions, and nonconformance reports as required by purchasing documents to the Project Manager for processing in accordance with 80A9008 Supplier Submittal Control.

If required on the Purchase Order or referenced documents, vendors successfully complete a qualification program prior to producing the production items for NES.

7.3.3 Audits for Category 1 Procurements

During performance of a contract, audits of the vendor are performed by the Quality Assurance Manager or his designee consistent with the importance, complexity, and quantity of purchased item(s). These audits serve to assure the required quality of the item(s) and provide objective evidence that the vendor is meeting quality requirements of the Purchase Order and paragraph 7.3.2 of this Manual. The planned vendor audits and schedule are included in the Project Quality Assurance Program Plan, or on the NES audit schedule as described in Section 18. All audits are performed in accordance with the NES Procedure 80A9022, Quality Assurance Audit Procedure. Lead Auditors are qualified in accordance with the NES Procedure 80A9026, Qualification and Certification of Quality Assurance Program Audit Personnel.

7.3.4 Source Inspections

Source inspections are performed by a qualified NES Inspector whenever it is necessary to assure the required quality of the item (i.e., when the quality of the item cannot be adequately verified by review of test reports, receipt inspection or other means).

Hold points for source inspections are established by the Project Manager with input from the Task Engineer and specified in the Project Quality Assurance Program Plan or Fabrication Specification.

The NES Inspector performs source inspection in accordance with the requirements of the project QAPP, the project drawings, specifications and procedures, as applicable. If the source inspection is complex (e.g., requires special instrumentation, special techniques, etc.) the NES Inspector is provided with a written Inspection Plan. The Plan is prepared in accordance with NES Procedure 80A9034, Inspection and Surveillance Planning and Reporting, and is approved by the Project Manager and the Quality Assurance Manager. 3

After performing the source inspection, the NES Inspector immediately notifies the NES Project Manager of the inspection results. The NES Project Manager is responsible for a decision, in consort with the Task Engineer, whether to release the vendor for continuing production.

The NES Inspector prepares an Inspection Report within 5 working days in accordance with the requirements of the Project QAPP or the Project Inspection Plan.

The report is submitted to the Project Manager for approval and to the Quality Assurance Manager for review.

If the Inspection Report indicates full compliance with the Project requirements, the Project Manager approves the report and prescribes further action, e.g., "Release for Shipment". If the Inspection Report indicates noncompliance, the Project Manager provides for a Nonconformance Report to be initiated by NES. Subsequent action is in accordance with the Nonconformance Report processing procedure (see Section 15).

7.3.5 Receipt Inspection

Vendor–supplied items are subjected to inspection upon receipt by NES as specified in Section 10 of this Manual. Items accepted and released are identified as to their inspection status prior to removal to a controlled storage area or releasing them for installation or further work.

When items are accepted based on a certificate of conformance, the basis for the validity of the certificates is established.

7.3.6 Spare and Replacement Part Procurement

Procurement controls for spare and replacement parts for structures, systems and components are such that the quality is equal to or greater than the quality of the original item, or as required to preclude repetition of defects.

8. IDENTIFICATION OF MATERIALS, PARTS, AND COMPONENTS

8.1 SCOPE

This section describes the controls to assure that materials, parts and components including partially fabricated items are identified and controlled and the identification, where required by code, specification or industry standard, is maintained on the item or on records traceable to the item throughout installation or use. These measures are designed to prevent the use of incorrect or defective items.

Identification and control of measuring and test equipment including NDE equipment is subject to the controls of Section 12 of this Manual. Identification and control of nonconforming items is described in Section 15 of this Manual.

8.2 GENERAL REQUIREMENTS

8.2.1 Permanent Plant Identification and Control

The Project Manager or Site Supervisor assures that permanent plant items to be installed in the facility are identified and controlled. Procedures governing identification and control of permanent plant items are prepared to project requirements by the Project Manager and implemented by the Department Manager or Site Supervisor as applicable .

8.3 SPECIFIC REQUIREMENTS

8.3.1 Identification Requirements

Identification of materials and parts important to the function of structures, systems and components within the scope of this Manual are traceable to appropriate documentation such as drawings, specifications, purchase orders, manufacturing and inspection documents, nonconformance reports and physical and chemical test reports. Physical identification is used to the maximum extent possible, but where such identification is impractical or insufficient, other appropriate means are used. Identification may be on the item or on records traceable to the item .

insufficient, other appropriate means are used. Identification may be on the item or on records traceable to the item .

8.3.2 Identification Marking

When identification marking is required, the marking is clear, unambiguous and indelible. The method of marking is such as not to affect the function of the item and is chosen to prevent subsequent obliteration or masking if on–piece marking is essential. Identification marking is transferred to each piece as items are subdivided.

8.3.3 Material Traceability

When required by customer requirements, codes or standards, unique material traceability to specific inspection and test records is provided.

8.3.4 Vendor Controls

As applicable, comparable requirements for identification and control of vendor supplied items are imposed in procurement documents prepared in accordance with Section 4.

8.3.5 Verification of Identification

Correct identification of items is verified and documented upon receipt from vendors or prior to shipment to customers, as applicable.

9. CONTROL OF SPECIAL PROCESSES

9.1 SCOPE

This Section describes the controls that are applied to nondestructive examination, welding, heat treatment and chemical cleaning to assure that such processes are performed by qualified personnel using procedures meeting the applicable code, specification, industry standard and customer requirements. Special processes beyond those listed, or for those not covered by existing codes or standards, or where item quality requirements exceed those of established codes or standards, are defined in procedures. Such procedures describe qualification of personnel and equipment.

9.2 GENERAL REQUIREMENTS

9.2.1 Special processes are those processes where direct inspection is impossible or disadvantageous. Special processes performed by NES include nondestructive testing, welding, heat treatment and chemical cleaning.

9.2.2 Special processes are performed in accordance with procedures prepared and approved in accordance with Appendix B.

9.2.3 Special processes are performed under controlled conditions using qualified procedures and personnel.

9.2.4 Documentation of the qualification of personnel and procedures is maintained in accordance with applicable codes, standards, and procedures. Qualification data is filed and kept current.

9.3 SPECIFIC REQUIREMENTS

9.3.1 Nondestructive Examination

1. Nondestructive Examination Procedures

Generic and project–specific NDE procedures are prepared, reviewed and approved in accordance with Appendix B. Field changes to approved NDE procedures are field issued provided Level III approval is obtained, as described in applicable procedures. Addenda modify generic procedures to client specific requirements and are reviewed and approved the same as the original.

Qualification of NDE procedures is as described in NES Procedure 80A9084, Nondestructive Examination Procedure Qualification. 8

Nondestructive examination procedures contain:

a. The specific application of the procedure as to the type of examination and the components, piping and materials to be examined.

b. Reference to the codes, standards, specifications, drawings or procedures applicable to the specific examination.

c. Procedure and personnel certification requirements.

d. Examination accept/reject criteria, as applicable.

e. Examination documentation requirements.

f. Disposition instructions for data taken with equipment found to be out of calibration.

Data generated from the use of Nondestructive Examination Procedures will be processed in accordance with NES Procedure 80A9023, Inservice Inspection Data Control Procedure.

2. Nondestructive Examination Personnel

Nondestructive examination is performed by personnel trained, qualified and certified in accordance with NES Procedure 80A9068, Procedure for Certifying Nondestructive Examination Personnel for liquid penetrant, magnetic particle, radiographic, ultrasonic, eddy current examinations and leak testing. This procedure meets the requirements of the American Society for Nondestructive Testing's recommended practice SNT-TC-1A and applicable requirements of the ASME Boiler and Pressure Vessel Code Section XI.

Visual examination is performed by personnel trained, qualified and certified in accordance with NES Procedure 80A9069, Certification of Visual Examination Personnel, or 80A9037, Qualification and Training of Quality Assurance and Quality Control Specialists. Procedure 80A9069 meets the requirements of ASME Boiler and Pressure Vessel Code Section XI and applicable requirements of SNT–TC–1A and ANSI N 45.2.6. Procedure 80A9037 meets the requirements of ANSI N 45.2.6 and NQA–1.

Level III nondestructive examination personnel are qualified through prior experience, training and examination. Examinations include basic, method, specific and practical portions and meet the guidelines of the 1984, 1980 and the 1975 Editions of SNT–TC–1A. Later editions may be applied by contract. Level III personnel may certify other Level III personnel and do certify Level I and II personnel.

Project prepared Quality Assurance Program Plans define any personnel certification requirements beyond those defined above.

9.3.2 Welding

1. Welding Procedures

Welding Procedure Specifications (WPSs) are prepared, qualified and approved under the responsibility of the Project Manager in accordance with NES Procedure 80A9011, Welding Procedure Control. This Procedure includes specific requirements for the qualification of WPSs to codes and specifications applicable to the work.

Welding Procedure Specifications include applicable data such as:

a) Welding processes employed

b) Joint design including backing use

c) Base metal to be joined

d) Thicknesses qualified

e) Filler metals to be used

f) Positions qualified

g) Welding progressions to be used

h) Preheat and interpass temperatures

i) Post weld heat treatment times and temperatures

j) Shielding and backing gas flows and composition

k) Electrical characteristics including polarity, transfer modes, and electrode wire feed rates

l) Technique parameters including weave widths, gas cup sizes, back gouging, oscillation, etc.

m) Other essential and nonessential variables

Procedure Qualification Records (PQRs) are prepared as required in support of WPS qualification to document qualification parameters and specimen test results.

2. Welder and Welding Operator Qualifications

Welders and welding operators are qualified under the responsibility of the Project Manager in accordance with NES Procedure 80A9012, Welder and Welding Operator Control. This Procedure defines the applicable requirements for:

a) Qualification processes

b) Thickness limitations

c) Backing use

d) Welding progressions

e) Welding positions

f) Electrical characteristics

g) Other welders and welding operator essential and nonessential variables

h) Test requirements for welded specimens

i) Requalification including maintenance of qualification

Welder or welding operation qualification records are prepared and maintained to document the qualification and testing of welders and operators in accordance with applicable code and specification requirements.

3. Control of Filler Metals

Welding filler materials (including fluxes, inserts, and electrodes) are controlled in accordance with NES Procedure 80A9013, General Welding Control, to assure that materials used are in accordance with WPS requirements, and where required by code or specification requirements, to assure that material traceability is provided to the point of use of the material. Procedure 80A9013 includes applicable requirements for:

a) Controlled storage and issue of filler materials

b) Storage conditions including special environmental controls to protect materials susceptible to damage due to moisture or temperature.

c) Responsibility for filler material protection and issuance

d) Limitations on issue of material subject to moisture damage

e) Return of unused material

f) Where required for control, accounting of quantities of materials issued and returned

4. Welding Records

Welding documentation is included in work travelers or process control sheets described in Section 5 of this Manual. Welding documentation includes applicable data such as:

a) Welder(s) or welding operator(s) employed

b) WPS numbers for WPSs used

c) Weld joint data such as pipe diameters, thicknesses, weld reinforcement, or sizes

d) Backing data

e) Base metals joined

f) Initial signoffs and dates for preparation and approval

g) Hold point signoffs and dates for inspections performed

h) Weld(s) identification including system or component identification

i) Reference to Nonconformance Reports written on unacceptable welding practices or activities

j) Other data necessary to document satisfactory accomplishment of welding

9.3.3 Post Weld Heat Treatment (PWHT)

Post weld heat treatment activities are controlled under the responsibility of the Project Manager to Procedures prepared in accordance with Project requirements. These Procedures include applicable requirements for:

a) Control equipment

b) Identification of PWHT parameters including heating rates, holding times and temperatures, cooldown rates, and provisions for accumulated heat treatment limitations

c) Personnel qualification requirements

d) Methods of temperature measurement including thermocouple placement and location

e) Methods of heat application and insulation

f) Review and acceptance of PWHT results

g) Special precautions such as for personnel protection and for avoidance of chimney effects

h) Inspection and monitoring of PWHT activities

i) Documentation requirements including requirements for time temperature recording chart validation and recording of inspection, and monitoring results

9.3.4 Vendor Controls

Requirements for vendor special processes are specified in procurement documents developed in accordance with Section 4 of the Manual. Controls of vendor supplied special processes are such as to produce an equivalent level of quality assurance as is specified above.

9.3.5 Requalification

When questions arise as to the validity of the qualification of special process procedures, personnel or equipment, appropriate measures are taken to assure validity including requalification. These requirements apply to both NES and vendor activities.

10. INSPECTION

10.1 SCOPE

This section describes the controls applied to assure that activities affecting quality are subject to inspection consistent with the necessity to verify quality through inspection.

10.2 GENERAL REQUIREMENTS

1. Inspection is provided for each work operation where necessary to verify quality. Inspections are performed by personnel qualified in accordance with NES Procedure 80A9037, Qualification and Training of Quality Assurance and Quality Control Specialists. Inspections are assigned to others than those who performed the activity inspected. Such persons do not report directly to the immediate supervisors responsible for the work inspected .

2. If inspection of processed items is impossible or disadvantageous, indirect control by monitoring of processing methods, equipment and personnel is provided. Both inspection and process monitoring are provided when necessary .

3. Where sampling is used to verify a group of items or activities, the sampling is based on recognized standards as defined in NES Procedure 80A9050, Statistical Evaluation, and provides adequate justification of sample size and selection processes.

4. Mandatory hold points are established on vendor activities in the NES Purchase Order where necessary to establish NES witness or inspection of vendor work activities. Work does not proceed beyond a designated hold point until formal release is provided by NES.

10.3 SPECIFIC REQUIREMENTS

10.3.1 Source Inspection

1. Source inspection for Category 1 procurements is performed in accordance with a written source Inspection Plan prepared in accordance with NES Procedure 80A9034, Inspection and Surveillance Planning and Reporting, and approved as defined in Appendix B. The Inspection Plan is implemented by appropriately trained and qualified personnel. Inspection Plans identify the following, as applicable. 8

   A. Inspector qualification

   B. Identification of the item to be inspected

   C. Instrument calibration requirements

   D. Reference design documents

   E. Accept/reject criteria

   F. Hold points

   G. Documentation and reporting requirements

2. NES and customer hold points are specified in the Quality Assurance Program Plan for the project, or in the appropriate NES specification or purchase order. Hold points are established at each point where it is necessary to perform an objective evaluation of hardware or documentation prior to proceeding with further activity. Processing of items does not proceed beyond a specified hold point until approval is obtained from the Project Manager in the case of project releases or from the customer in the case of customer releases.

10.3.2 Receiving Inspection

Procurement Category 1 and 2 items are received and inspected to assure complete compliance with the procurement documents.

1. Category 1

Items are inspected to verify compliance with procurement specifications as required by Section 4 of this Manual. Inspections are performed by appropriately trained personnel in accordance with plans and procedures, such as defined in NES Procedure 80A9034, Inspection and Surveillance Planning and Reporting.

Inspection or test procedures and reports are maintained by the Project Manager.

2. Category 2

Items are inspected by appropriately qualified personnel to verify compliance with the certification requirements of the Purchase Order. Inspection records, consisting of accepted certifications and a copy of the Purchase Order (noting satisfactory inspection), are maintained by the Department Manager or Project Manager.

3. Additional Inspections

Source and/or Receipt Inspection as described in this Manual constitute the inspections needed to verify product or service acceptance. If additional inspections are deemed necessary by the Project Manager or Quality Assurance Manager, they are performed in accordance with a specific written inspection plan.

4. Nonconformances

Items determined to be nonconforming during inspection are reported in accordance with Section 15 of this Manual.

11. TEST CONTROL

11.1 SCOPE

This section describes the controls implemented by NES to assure that testing is performed where required to demonstrate that items will perform satisfactorily in service, and that test programs are prescribed by written procedures containing or referencing acceptance criteria of applicable design documents.

11.2 GENERAL REQUIREMENTS

1. NES test programs are described in Functional Test Procedures or Test Plans prepared and approved as described in Appendix B. Where a vendor is responsible for performance of testing, NES specifications describe the necessary controls, test parameters and acceptance limits for the program. The Project Manager is responsible for the scope and content of the test program .

2. Test programs cover all required tests including, as appropriate, prototype qualification tests, proof tests, and operational tests to demonstrate satisfactory functioning or performance of items.

3. Test procedures include prerequisites for assuring proper test, requirements for adequate instrumentation and requirements for administration of the test including necessary surveillance by NES and customer personnel. Prerequisites for test include such items as calibrated instruments, appropriate equipment, trained personnel, condition of test equipment, condition of the item to be tested, suitable environmental conditions, and provisions for data collection, as appropriate.

4. Test results are documented by cognizant test personnel and evaluated by the Project Manager to assure that test requirements have been satisfied.

11.3 SPECIFIC REQUIREMENTS

11.3.1 Test Procedures or Plans

Test procedures or plans include, as applicable:

1. Scope of the test.

2. The requirements and acceptance limits.

3. Test prerequisites and conditions for the test including calibrated instrumentation, adequate test equipment and instrumentation including their accuracy requirements, completeness of the item tested, suitable and controlled environmental conditions, provisions for data collection and storage.

4. Test sequence including any mandatory hold points for witness by vendor, customer or NES including NES Quality Assurance personnel.

5. Acceptance and rejection criteria.

6. Methods for documenting or recording test results and data.

11.3.2 Conduct of Test

Tests are conducted in accordance with Test Procedures or Plans under the responsibility of the Task Engineer. Test team members are qualified through participation in similar tests, however, at least one member of the test team will be certified in accordance with Procedure 80A9037, Qualification and Training of Quality Assurance and Quality Controls Specialists. 3

11.3.3 Test Reports

Test reports prepared and approved in accordance with Appendix B contain, as a minimum:

1. Actual test procedures.

2. Completed data sheets or inspection records.

3. Reference to pertinent laboratory notebooks or test records.

4. Accuracy and calibration status of measuring and test equipment used.

5. Dates of key test events.

6. Identification of individuals involved in test, including persons responsible for performance and verification of tests.

7. Actions regarding deficiencies, if any.

8. An evaluation of the test data against the acceptance criteria and a statement as to the acceptance of the overall test.

9. Required NES/customer approvals.

Distribution of test reports includes the customer and the Project Manager.

11.3.4 <u>Vendor Test Control</u>

Test program requirements are incorporated in the appropriate NES specifications which are approved by the Department Manager and the Project Manager. Test procedures are prepared for each test identified in the NES specifications and/or Purchase Order. These procedures are reviewed and approved by the Project Manager and the Quality Assurance Manager. The assigned Task Engineer prepares the test procedures for those tests performed by NES at the vendor's facility, customer's site or at NES. 8

The test procedures include, as a minimum, the items identified in paragraph 11.3.1 above.

A test report is prepared and approved in accordance with the Responsibility Matrix, Appendix B. The Project Manager distributes test reports.

Test reports contain, as a minimum, the items identified in paragraph 11.3.3 above.

12. CONTROL OF MEASURING AND TEST EQUIPMENT

12.1 SCOPE

This section describes the controls employed to assure that measuring and testing equipment used in activities affecting quality is of the proper type, range and accuracy for the measurement or test and to assure that such equipment is controlled, calibrated and adjusted at prescribed intervals or times so as to establish valid relationships to nationally recognized standards.

These controls are not intended to imply a need for special calibration and control measures on rulers, tapes, levels and such other devices, if normal commercial practices provide adequate accuracy of the device.

12.2 GENERAL REQUIREMENTS

12.2.1 Procedures

Written procedures used for control of measuring and test equipment are prepared as described in Section 5 of this Manual.

12.3 SPECIFIC REQUIREMENTS

1. The Department Manager, Project Manager or Site Supervisor is responsible to assure that controls of measuring and test equipment are fully implemented and in accordance with procedures described in paragraph 12.2.1.

2. Measuring and test equipment used to determine product conformance is controlled and calibrated and is permanently marked with a distinctive serial number for traceability and identification.

3. Measuring and test equipment calibration interval requirements are based upon the type of equipment, the stability characteristics, the required accuracy, purpose of use, degree of usage, NES experience, and other conditions affecting measurement control. The equipment is labeled with a calibration sticker or label to indicate the

calibration and due dates and the identification of the individual who performed the calibration. Calibration records show accomplishment, as–found condition and identification of the standard used for each calibration.

4. Calibration is performed under suitable environmental conditions. Calibration of measuring and test equipment is performed using standards that are traceable to National Standards, where such standards exist, or other suitable standards, such as State Weights and Measures Standards. Where no National Standards exist, the basis for calibration is documented. Certification documents are maintained on file for Master Standards that are used for calibration. Calibration standards have an accuracy four times as great as the accuracy of the equipment being calibrated except where limited by the state of the art, in which case, the basis for calibration is documented.

5. Tolerances for calibration are in accordance with the equipment manufacturer's instructions, NES experience, government standards and the state of the art. Where such information is not available, the basis for calibration tolerances is documented.

6. Measuring and test equipment found to be out of tolerance are recalibrated, repaired or replaced, as applicable. When measuring and test equipment is found to be out of tolerance, the equipment is tagged or segregated and a Nonconformance Report is prepared. An initial evaluation is made and documented by the Department Manager or Project Manager of the validity of previous inspections, examinations or tests and of the acceptability of items previously inspected or tested with equipment found to be out of calibration. Corrective actions are documented on the Nonconformance Report prepared in accordance with Section 15 of the Manual.

7. Measuring and test equipment is kept in safe storage and issued from an area(s) designated by the Department Manager/Project Manager or Site Supervisor. Equipment usage is recorded on the Inspection or Data Report.

   A system of recording measuring and test equipment usage data is established and maintained to provide use traceability for measuring and test equipment. The system includes a method of identification to document equipment usage to applicable control checklist, data sheet or other specific identification.

8. Users of controlled measuring and test equipment are instructed in the use of the equipment and instructed to immediately return for calibration any equipment that is dropped, damaged or suspected to be out of calibration.

9. Calibration standards and equipment sent to others for calibration requires certification stating that the calibration standard(s) used is traceable to National Standards or other suitable standards.

10. Calibration controls of specific equipment is provided in NES Procedures as follows:

- 80A9067, Control of Mechanical Measuring Equipment 8
- 80A9053, Ultrasonic Instrument Linearity Verification
- 80A9054, Calibration of Magnetic Particle Examination Equipment
- 80A9055, Calibration of Thermometers
- 80A9056, MacBeth Quantalog Densitometer Calibration Procedure

14. INSPECTION, TEST AND OPERATING STATUS

14.1 SCOPE

This section sets forth the requirements for the identification of inspection, test and operating status to assure that inspections and tests are performed and that the acceptability of items requiring inspection and test is known throughout manufacturing, installation and operation.

14.2 GENERAL REQUIREMENTS

1. The inspection and test status of items is maintained through the use of status indicators such as physical marking on items or on records traceable to items, or physical location controls such as segregation. Status is controlled to assure that only items passing required inspections or tests are used, installed or operated. Nonconforming items are clearly identified as nonconforming as required in Section 15.

2. Procedures prepared to control inspection, test and operating status include:

   A. Controls on status indicators.

   B. Authority for application and removal of status indicators.

   C. Measures to prevent inadvertent operation of items.

14.3 SPECIFIC REQUIREMENTS

14.3.1 Nondestructive Examination Equipment

Initial operating status of nondestructive examination equipment is established and indicated on test records. Subsequent operating calibration activities are performed to maintain the operating status of the equipment and these activities are documented on either operating calibration records or on records of calibration controlled per Section 12 of this Manual.

Calibration block acceptance is indicated by use of an "Inspection Log", which is used to document the status of calibration block adequacy during inspection and test.

14.3.2 Consumable Materials

The inspection status of consumable material is indicated (signature, date, accept/reject) on a copy of the Purchase Order.

14.3.3 Construction/Modification/Installation Activities

The inspection or test status of items under construction, modification, or installation is indicated through the use of travelers or process control sheets as described in Section 5 of this Manual. These work packages provide instructions and references for performing key activities and planned inspection points including attestation to acceptability or references to Nonconformance Reports issued in accordance with Section 15 of this Manual.

14.3.4 Vendor Controls

The Project Manager imposes requirements for vendor controls of inspection, test and operating status in procurement documents. These documents require vendors to provide an effective system for identifying and documenting the inspection and test status of items during manufacture, inspection and test.

This program precludes the possibility of any item inadvertently bypassing a required manufacturing process, inspection or test and includes the applicable requirements of paragraph 14.2.1.

15. NONCONFORMING ITEMS

15.1 SCOPE

This section describes the controls applied to control items, services or activities that do not conform to previously established requirements and that render the quality of an item, service or activity unacceptable or indeterminate.

15.2 GENERAL REQUIREMENTS

1. Any NES employee may identify and document nonconformances through the use of a Nonconformance Report. Audit personnel may identify nonconformances found during audits in accordance with Section 18 of this Manual.

2. Procedures are available in accordance with Appendix C of this Manual describing the controls applied to nonconforming items or activities. Procedures require nonconformance identification, segregation, disposition and notification to affected organizations. Nonconforming items are reviewed and accepted, rejected, repaired or resolved in accordance with these procedures. In addition, procedures include:

   A. Responsibility and authority for disposition of nonconforming items.

   B. Requirements that repaired or reworked items be reinspected in accordance with these procedures.

   C. Requirements for controlling further processing of nonconforming items.

   D. Documentation requirements for items dispositioned "use–as–is" or "repair" to assure customer acceptance.

   E. Requirements for documenting the "as–built" condition of resolved or repaired items.

15.3 SPECIFIC REQUIREMENTS

15.3.1 Nonconformance Processing

1. Identified nonconformances are reported on a Nonconformance Report. Nonconformances identified by NES are documented and processed in accordance with NES Procedure 80A9082, Company Nonconformance Control.

2. Nonconformances identified by a supplier are documented and processed in accordance with the NES Procedure 80A9008, Supplier Submittal Control.

3. Nonconforming items are clearly identified and segregated and are not further processed, delivered or installed until the nonconformance is dispositioned. Segregation is used where practical. Whether segregated or not, the item is clearly identified as nonconforming.

4. Nonconformance Reports are forwarded to the Department Manager to determine the disposition. The nonconformance may be dispositioned "rework", "repair", "use–as–is", or "replace".

5. The Project Manager reviews the disposition and signifies his concurrence and approval by signing the report, and forwards the Nonconformance Report to the Quality Assurance Manager for review and approval.

6. The Nonconformance Report must be approved by the Quality Assurance Manager before the items are finally dispositioned. If the Quality Assurance Manager indicates that 10CFR21 applies, action is taken in accordance with NES Procedure 80A9036, Compliance with 10CFR21. 9

7. Quality Assurance verifies the implementation of dispositions where required and signs the Nonconformance Report to indicate satisfactory completion of verification.

8. Completed Nonconformance Reports are maintained by the Quality Assurance Manager. Copies are maintained by the Project Manager and placed in the project file.

15.3.2 Customer–Initiated Nonconformance Reports

Should a customer originate a Nonconformance Report, the Project Manager initiates an NES Supplier Nonconformance Report to provide control during processing. The report is processed as outlined in this Section. Final dispositions, verifications, and corrective action are forwarded to the customer by the Project Manager. 8

15.3.3 Vendor Controls

NES procurement and qualification activities provide requirements for vendor control of nonconforming items. Such requirements include:

1. Control of the identification, documentation and segregation of nonconforming items to preclude further processing, delivery or installation pending notification of affected individuals and/or organizations, review of the nonconformances, and approval of disposition.

2. Documentation identifying the item, the inspection requirements that the item does not meet, the nonconformance, and the disposition of the nonconformance and providing for signature approval of the disposition.

3. Identification of the individuals and/or organizations, including NES as customer, who have the responsibility and authority to approve dispositions, depending on the nature of the nonconformance and the proposed disposition.

4. Segregation of nonconforming items by controlled physical separation of such items from acceptable items or by tagging, when physical separation is impractical, to preclude the use of the nonconforming item.

5. Reinspection or re–examination of repaired and reworked items in accordance with initial criteria unless test results or other conditions indicate the need for new criteria and the documentation of the reinspection or re–examination and results.

6. Control of the repair and/or rework of nonconforming items.

7. Reporting nonconformances to NES.

8. Making the documentation of nonconformances disposition ("use as is" or "repair") part of the quality record of the items.

   Note: Completed copies of Supplier Nonconformance Reports written by NES to document and disposition a supplier's noncompliance are forwarded to that supplier.

15.3.4 Corrective Action

Nonconformance Reports include a brief statement of cause, corrective action, and action to prevent recurrence of the nonconforming condition.

The Quality Assurance Manager reviews and evaluates nonconformances to determine the need for initiating any additional corrective action as outlined in Section 16 of this Manual.

16. CORRECTIVE ACTION

16.1 SCOPE

This section describes the controls in effect to assure that conditions adverse to quality such as failures, malfunctions, deficiencies, deviations, and defective material and equipment are promptly identified and corrected. In the case of significant conditions adverse to quality, the cause of the condition is identified and corrected to preclude repetition.

16.2 GENERAL REQUIREMENTS

The Quality Assurance Manager identifies and documents the existence of conditions adverse to quality through audits, review of Nonconformance Reports and through trend analysis. He assures that the requirements of this Section are fulfilled and documented through corrective action, and furnishes to the President a report of results of trending.

The Quality Assurance Manager (and NES Management, if appropriate) extends these requirements to vendors supplying items or services to NES.

16.3 SPECIFIC REQUIREMENTS

1. The Quality Assurance Manager reviews on a regular basis NCRs and Audit Finding Reports (AFRs) after they have been closed out to determine whether further corrective action is or is not necessary. The Quality Assurance Manager submits a trend analysis to the President on an annual basis.

2. Significant or recurring nonconformances are identified by the Quality Assurance Manager by initiating a Corrective Action Request (CAR, Exhibit 16.1) to determine the cause and eliminate the recurrence of these nonconformances. The Project Manager, QA Department personnel, or other NES Managers may also identify such a condition to the Quality Assurance Manager causing initiation of the same action. The Quality Assurance Manager identifies the department responsible to participate in investigation and determination of the cause.

3. The Group Managers, Project Managers and other NES Managers, as appropriate to the conditions, participate in the investigation and make available other required personnel to determine the cause and develop appropriate corrective action.

4. After approval by the Quality Assurance Manager of the corrective action, the appropriate manager initiates required corrective action and reports its implementation and results within the time allotted. The allotted time is appropriate to the condition.

5. The Quality Assurance Manager verifies completion of required corrective action and attainment of desired results and prepares and furnishes a complete report of corrective action to the President.

6. If the condition is identified with material or services furnished by a vendor, the Quality Assurance Manager requests action on the vendor's part consistent with the above requirements. If the subcontractor fails to comply with these requirements, he is removed from the Approved Vendor List.

EXHIBIT 16.1

CORRECTIVE ACTION REQUEST

NUCLEAR ENERGY SERVICES, INC.
44 Shelter Rock Road
Danbury, CT 06810

Audit No: ____________
Project No: ____________
CAR No: ____________

Requirement:

Finding:

Recommended Action (optional):

Originator ____ Date ____ Acknowledged by ____ Date ____

Potential 10 CFR 21 Yes ☐ No ☐ ____ Evaluated by ____ Date ____

Response Due: ____ Date ____ Cause Code ____

Cause:

Remedial Action:

Preventive Action:

Signature ____ Date ____ Scheduled Completion Date ____

Response Accepted: Yes ☐ No ☐ Action: ____________

Evaluated By: ____________ Date ____________
Verified By: ____________ Date ____________
CAR Closed: ____________ Closed By: ____________ Date ____________

17. QUALITY ASSURANCE RECORDS

17.1 SCOPE

This section describes the controls that are in effect for the collection, storage and maintenance of quality assurance records. Sufficient records are prepared as work is performed to furnish documentary evidence of the quality of items and activities affecting quality. Documents are considered records only when stamped, initialed or signed and dated by authorized personnel. Records may be originals or reproduced copies.

17.2 GENERAL REQUIREMENTS

Quality Assurance records are prepared consistent with code, customer and regulatory requirements for the work. Records include the results of reviews, inspections, tests, audits, monitoring of work performance, material analyses, equipment logs and other documents which provide objective evidence of the quality of items and activities. Records also include the qualifications of personnel, equipment and processes, as appropriate. Inspection and test records include the date of inspection or test, the identity of the inspector or data recorder, the type of observation, the results, the acceptability, and those actions taken in connection with any deficiency noted. Records are identifiable, legible and retrievable.

Records are collected, stored and maintained in accordance with NES Procedure 80A9099, Identification, Storage and Retention of Quality Assurance Records.

17.3 SPECIFIC REQUIREMENTS

17.3.1 Inprocess Record Keeping

During the course of project work, the Project Manager or Site Supervisor controls project–specific quality assurance records in a manner that provides ready identification, protection and retrieval. Unique customer requirements for record collection, maintenance and storage are included in the QAPP, as applicable.

17.3.2 Records Maintenance

Quality Records will be maintained in dual storage facilities. One copy will be maintained by the responsible department or placed in storage within the same building. A second copy will be placed in storage in a separate building.

The Records will be protected to prevent damage from moisture, temperature and pressure. They will be firmly attached in binders or placed in folders or envelopes and stored in steel files.

The Records will be in locked rooms, locked files or locked building when unattended .

17.3.3 Records Correction

Corrections to records include the identity of the person making the correction and the date of the correction. The correction is made so as not to conceal or obliterate original data.

17.3.4 Safekeeping

Procedures, personnel certifications and nonconformances are stored in the home office, with copies kept at the applicable site, if required by the project. Where dual storage is required to prevent loss of records, such maintenance is provided in the home office. 3

18. AUDITS

18.1 SCOPE

This section describes the auditing program in effect to assure the effectiveness of and adherence to the NES Quality Assurance Program. This program provides a comprehensive system of planned and documented internal audits to verify compliance with all aspects of the Quality Assurance Program.

18.2 GENERAL REQUIREMENTS

Audits are conducted as early in the life of an activity as practical, on intervals consistent with the schedule for accomplishing the activity, and commensurate with the status and importance of the activity.

Audits are performed in accordance with NES Procedure 80A9022, Quality Assurance Audit Procedure, by qualified personnel certified in accordance with NES Procedure 80A9026, Qualification and Certification of Quality Assurance Program Audit Personnel. Auditors do not have direct responsibility for areas audited. Audit results are documented by audit personnel and are reviewed by management having responsibility for the area audited. Responsible management takes action to correct revealed deficiencies.

18.3 SPECIFIC REQUIREMENTS

18.3.1 Internal Auditing

1. The internal audit program is planned and implemented by the Quality Assurance Manager, in accordance with NES Procedure 80A9022. Audits are formally scheduled so that each section of the Manual is audited at least once within the calendar year. Project audits are scheduled based on requirements of the QAPP. Problem areas that may develop are audited at increased frequencies as considered necessary to assure control. Internal auditing frequencies are increased when necessary to assure effectiveness and implementation of significant changes to the QA Program. The Quality Assurance Manager issues the audit schedule to appropriate levels of management.

2. Audits are conducted by audit teams headed by a Lead Auditor who coordinates the audit efforts and makes audit assignments to the team members. Personnel other than Quality Assurance Department personnel may be utilized as team members to provide technical expertise .

3. Audits are performed by Quality Assurance personnel on an unscheduled basis with checklists when conditions adverse to quality are considered to exist that require review by audit. The Quality Assurance Manager reviews these audit reports and determines if there is a need to immediately schedule a reaudit of the activity.

4. Personnel performing audits are qualified to evaluate the area being audited and do not have direct responsibilities in the areas being audited. Prior to each audit, the Lead Auditor meets with the audit team, reviews findings of previous audit(s), makes audit assignments and coordinates the preparation of checklists for conduct of the audit. Audit checklists are reviewed by the Lead Auditor to assure that the requirements of applicable documents and pertinent requirements have been included. Audit checklists shall be approved by the Quality Assurance Manager.

5. Management of activities to be audited shall be notified a reasonable amount of time in advance of the scheduled audit by copy of an audit plan except as noted in 3. above. Audits proceed in accordance with prepared plans and checklists. These plans may be varied by the Lead Auditor, for example, if the audit reveals the need for additional audit coverage or if less coverage is warranted due to inactivity in the audit area. Objective evidence is examined for compliance with QA Program requirements. During the audit, team members complete their checklists and note their findings. Based on these findings, the Lead Auditor coordinates the preparation of the Audit Report and Audit Finding Reports, as applicable. The audit report is forwarded to the Quality Assurance Manager by the Lead Auditor. The Quality Assurance Manager discusses the Audit Finding Reports with the Lead Auditor and retains the audit checklists used by the team .

6. Assuring completion of corrective action and follow–up on audit findings is the responsibility of the Quality Assurance Manager. To accomplish these actions, the following steps are taken:

   A. The Quality Assurance Manager issues the Audit Finding Reports (AFRs) to the cognizant supervisor(s) of the area(s) audited. By copy of this report, the cognizant supervisor determines the cause, proposes both remedial and preventive corrective action and obtains concurrence of this corrective action from the Quality Assurance Manager and cognizant management within thirty days. The cognizant supervisor initiates corrective action. Copies of the audit report are forwarded to the customer and responsible NES management.

   B. Monthly, Quality Assurance reviews the outstanding AFRs and corrective action responses and, when applicable, closes the corresponding AFRs indicating satisfactory completion of corrective action. The method used to verify satisfactory completion of corrective action is entered on the AFR. AFRs that cannot be closed receive further follow–up and corrective action, as appropriate; e.g., performance of a follow–up audit or requesting additional action. Open AFRs are kept in an active file until resolved.

   C. Monthly, the Quality Assurance Manager, based on the results of the review, issues the Audit Finding Summary Report showing completed corrective actions and any open AFRs to responsible management and the President.

   D. A copy of the closed AFR is sent to responsible management.

   E. Quarterly, the Audit Finding Summary Report includes the results of trend analysis and notes significant trends, should any exist. These trends shall serve as a basis for management assessments of the QA Program and may provide a basis for additional audits or other management action.

7. Follow–up actions, including reaudit of deficient areas, are taken when necessary.

18.3.2 External Auditing

1. External audits are conducted as required on vendors to assure compliance with quality requirements. The planning and implementation of these audits is described in NES Procedure 80A9022, Quality Assurance Audit Procedure, and is the responsibility of the Quality Assurance Manager. External audits are formally scheduled and performed as required by the applicable QAPP or every 18 months for those vendors who are actively performing work for NES. Other vendors are audited triennially. 3

2. These audits are conducted to satisfy one or more of the following requirements:

   A. To assure adequate implementation of the vendor's Quality Assurance Program, following award of contract and initiation of work.

   B. To evaluate significant changes in the vendor's Quality Assurance Program and implementation of these changes.

   C. To identify possible nonconformances in the vendor's Quality Assurance Program.

   D. To assure effective control of nonconformances by the vendor, including documentation of nonconformances, design review, authorization of dispositions, inspection of repairs and corrective action to prevent recurrence.

   E. To assure that the vendor is maintaining an adequate quality program that meets customer and NES requirements.

3. The audit team and Lead Auditor concept is used as in paragraph 18.3.1.2. The Lead Auditor prepares an audit checklist, reviews the items on the checklist and findings of previous audit(s) with the team, and makes audit assignments prior to the audit. Audit checklists relate to the product and system or organization to be audited. The Quality Assurance Manager reviews and approves the audit checklist prior to the audit.

4. Based on the audit results, the team prepares the preliminary results while at the vendor's facility. At the close of the audit, findings are discussed with the vendor to ensure their accuracy. Any corrective actions immediately needed are discussed and implementation requested by the Lead Auditor.

5. The Quality Assurance Manager reviews the audit findings with the Lead Auditor upon completion of the audit. The Quality Assurance Manager is responsible for obtaining any needed corrective actions and is assisted in this regard by the Purchasing Manager, Project Manager, Service Line Vice President or General Manager as appropriate. 8

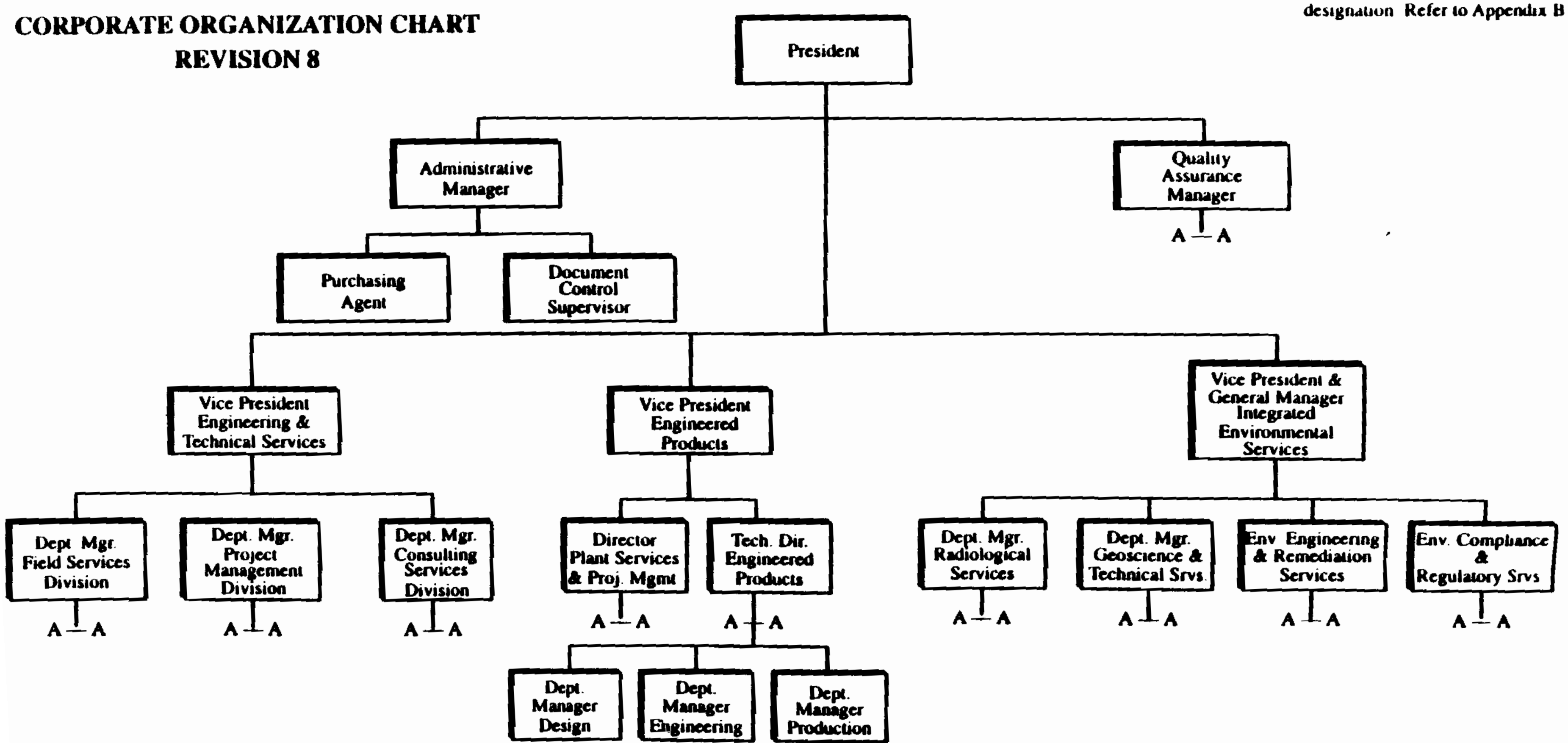
6. The Quality Assurance Manager issues the formal audit report to the vendor and other responsible NES management. The audit report is forwarded to the vendor by the Quality Assurance Manager requesting corrective action response(s), as stated in the report, within thirty (30) days. Follow-up and verification of corrective action is performed within sixty (60) days of the audits. A final audit report is issued by the Quality Assurance Manager within ninety (90) days of the audit, noting corrective actions taken and any open items. Copies of the final report are forwarded to the vendor, Project Manager, and responsible NES Management. AFRs are distributed as they are closed.

7. Reaudits are performed at the discretion of the Quality Assurance Manager and Quality Assurance maintains complete audit report files.

[redacted] [redacted]

NES QUALITY ASSURANCE MANUAL
APPENDIX A.1
CORPORATE ORGANIZATION CHART
REVISION 8

A — A Document Approval Authority is granted to individuals above this designation. Refer to Appendix B



Inventory Optimization
Computerized Standard Nomenclature
Q-List and Safety Enginneering
Bill of Materials (BOM)
Procurement Enginering
System Engineering Support Services
Quality Audit and Inspection Services

Plugs & Seals
Fuel Handling Equipment
RX & Steam Generator
Servicing Equi[illegible]
Inspection Equip[illegible]
Shields & Special Tools

Comprehensive Radiological & Geoscience Consulting
Environmental Engineering
Environmental Auditing
Regulatory Compliance
Project Management

NES QUALITY ASSURANCE MANUAL
APPENDIX A.1
CORPORATE ORGANIZATION CHART
REVISION 8

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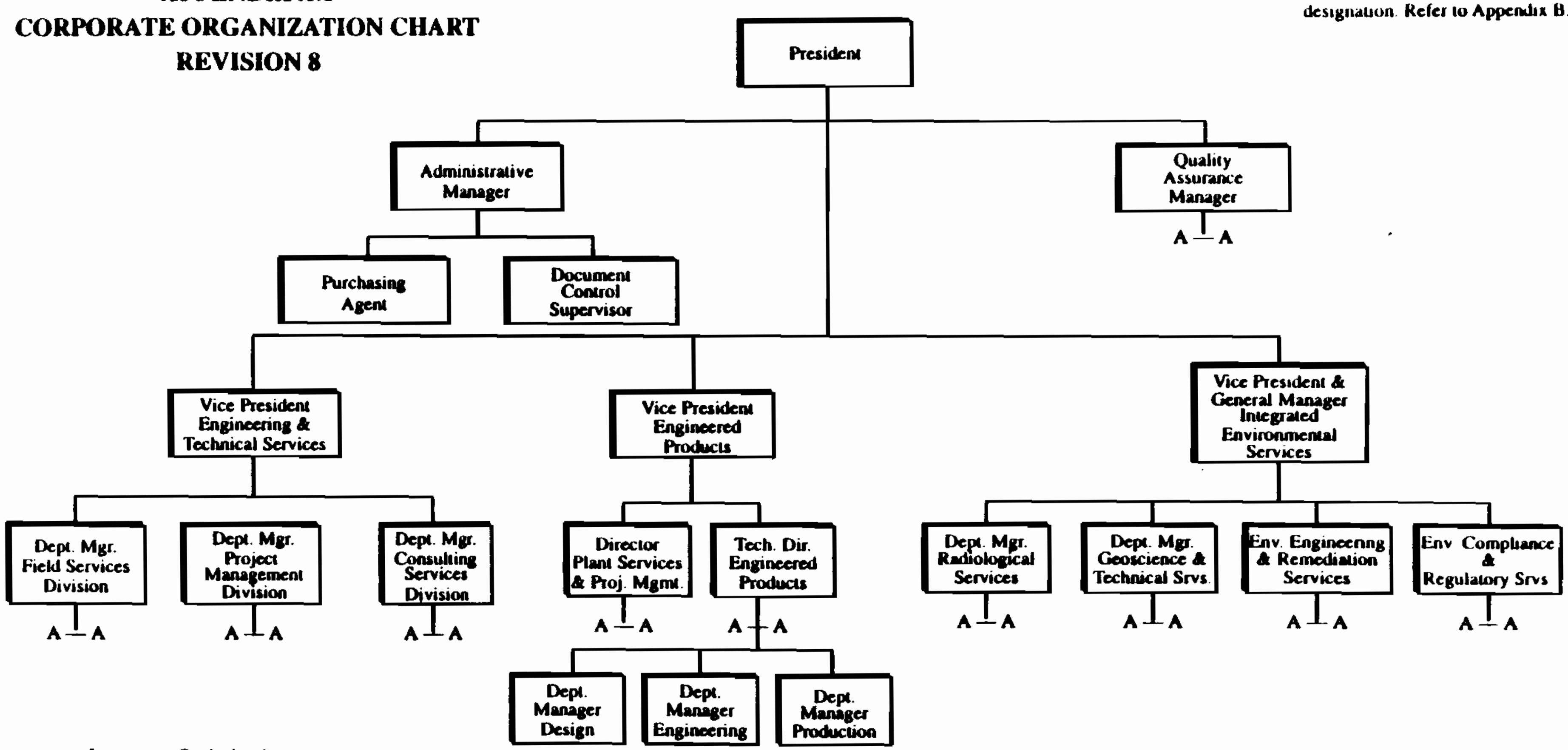

Inventory Optimization
Computerized Standard Nomenclature
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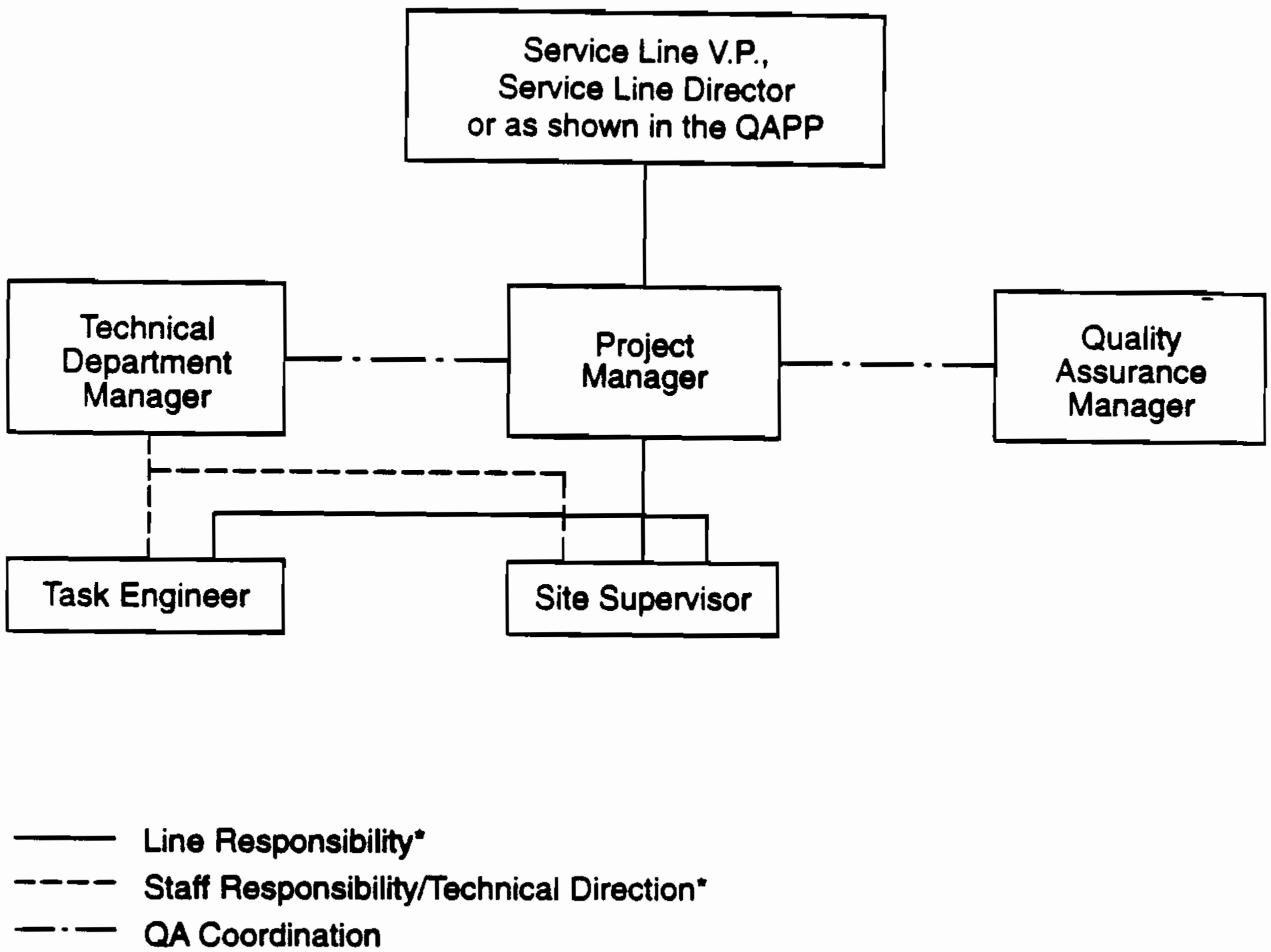
System Engineering Support Services
Quality Audit and Inspection Services
Litigation Support Services
Consulting and Expert Witness Services

Plugs & Seals
Fuel Handling Equipment
RX & Steam Generator
Servicing Equipment
Inspection Equipment
Shields & Special Tools
Microfilming Radiographs
Maintenance/Installation
Records Management
ISI Program & Procedures
Inservice Inspection
Nondestructive Examination

Comprehensive Radiological & Geoscience Consulting
Environmental Engineering
Environmental Auditing
Regulatory Compliance
Project Management
Site Characterization
Remediation
Decontamination & Decommissioning



* Staff and line responsibilities may be reversed on certain projects between the Project Manager and the Technical Department Manager, but Technical Direction is retained in every case by the Technical Department Manager.

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NES QUALITY ASSURANCE MANUAL
APPENDIX B
RESPONSIBILITY MATRIX
REVISION 8

FUNCTION/DOCUMENT	PREPARED BY	APPROVED BY	COMMENTS
QA Program			
QA Manual	QAM	PRES, QAM	
QA Program Plan	PM	SLVP, QAM	
Implementing Procedures	AE	QAM, PRES	
Personnel Qualification	AE	QAM, PRES, L3	
Design/Engineering (1)			
Design Spec.	TE	PM, AA	
Design Dwg.	TE	PM, AA	
Calc. Notebook	TE	QI, PM	
Inservice Inspection (1)			
Program Plans	TE	PM, AA	
Generic NDE Procedures	TE	AA, L3	
Project NDE Procedures	TE	PM, AA, L3	
NDE Procedure Field Changes	SS	L3, PM	
Procedure Addenda	AE		Approvals are the same as the original document.
Misc. Procedures (1)	TE	PM, AA	
e.g. Functional Test Special Process Material Handling Shipping & Storing Installation Other			
Procurement, Cat. 1 & 2			
Requisition	AE	PM, AA	
Purchase Orders	PA	QAM	
Specification	TE	PM, AA	
Vendor NCRS	VENDOR	PM, AA, QAM	
Vendor Submittals	VENDOR	PM, AA	
e.g. Procedure Reports Documentation			

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APPENDIX B
RESPONSIBILITY MATRIX
(Continued)

FUNCTION/DOCUMENT	PREPARED BY	APPROVED BY	COMMENTS
Reports e.g. Design/Analysis Test ISI Other Project	TE	PM, AA	
Data (2) e.g. Test Results Inspection Results Exam Results Source Insp. Reports	See Comment	See Comment	Prepared and approved in accordance with the controlling procedure.
QA Records/Documents			
Nonconformance Report	AE	QAM	PM or AA provides disposition
Corrective Action Requests	QAM	QAM	SLVP, AA or vendor provides disposition
Audit Reports	LA	QAM	
Audit Finding Reports	LA	QAM	AA, QAM or vendor provides disposition
Audit Checklists	LA	QAM	
Trend Analysis	QAM	N/A	
Approved Vendor List	QE	QAM	
QA Indoctrination	QAM	N/A	
Inspection Plans	TE	PM, QAM	

LEGEND:

AA – Authorized Approver (3)
AE – Any Employee
INSP – Inspector
LA – Lead Auditor
L3 – Level III
PA – Purchasing Agent (Administrative Manager)
PM – Project Manager
PRES – President
QAM – Quality Assurance Manager
QE – Quality Assurance Engineer
QI – Qualified Individual
SLVP – Service Line Vice President or General Manager
SS – Site Supervisor
TE – Task Engineer

NOTES:

(1) Revisions including ECNs and FCs are approved the same as the original except NDE FCs see above
(2) Data is a written record of a specific test, examination or inspection
(3) AA, those persons shown above A–A on Appendix A.1

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NES QUALITY ASSURANCE MANUAL
APPENDIX C
IMPLEMENTING PROCEDURE INDEX
REVISION 8

NUMBER	TITLE	SECTION REFERENCE
80A9003	NES DOCUMENT CONTROL	6
80A9004	ENGINEERING CALCULATION NOTEBOOK CONTROL	3
80A9007	PROCUREMENT CONTROL	4
80A9008	SUPPLIER SUBMITTAL CONTROL	7 & 15
80A9010	COMPUTER CODE DOCUMENTATION CONTROL PROCEDURE	3
80A9011	WELDING PROCEDURE CONTROL	9
80A9012	WELDER AND WELDING OPERATOR CONTROL	9
80A9013	GENERAL WELDING CONTROL	9
80A9022	QUALITY ASSURANCE AUDIT PROCEDURE	7 & 18
80A9023	INSERVICE INSPECTION DATA CONTROL PROCEDURE	9
80A9024	PROCEDURE FORMAT	2 & 5
80A9026	QUALIFICATION AND CERTIFICATION OF QUALITY ASSURANCE PROGRAM AUDIT PERSONNEL	7 & 18
80A9030	VENDOR EVALUATION AND SELECTION	7
80A9031	QUALITY ASSURANCE PROGRAM PLAN PREPARATION	2 & 3
80A9033	INSERVICE INSPECTION PROGRAM RECEIVING INSPECTION PROCEDURE	7
80A9034	INSPECTION AND SURVEILLANCE PLANNING AND REPORTING	7 & 10
80A9036	COMPLIANCE WITH 10CFR21	15
80A9037	QUALIFICATION AND TRAINING OF QUALITY ASSURANCE AND QUALITY CONTROL SPECIALISTS	10

APPENDIX C
IMPLEMENTING PROCEDURE INDEX
REVISION 8
(Continued)

NUMBER	TITLE	SECTION REFERENCE
80A9038	QUALITY ASSURANCE REVIEW OF PURCHASE ORDERS	4
80A9050	STATISTICAL EVALUATION	10
80A9053	ULTRASONIC INSTRUMENT LINEARITY VERIFICATION	12
80A9054	CALIBRATION OF MAGNETIC PARTICLE EXAMINATION EQUIPMENT	12
80A9055	CALIBRATION OF THERMOMETERS	12
80A9056	MACBETH QUANTALOG DENSITOMETER CALIBRATION PROCEDURE	12
80A9059	PROCEDURE FOR THE PREPARATION OF PROJECT FABRICATION SPECIFICATION	5
80A9067	CONTROL OF MECHANICAL MEASURING EQUIPMENT	12
80A9068	PROCEDURE FOR CERTIFYING NONDESTRUCTIVE EXAMINATION PERSONNEL	9
80A9069	CERTIFICATION OF VISUAL EXAMINATION PERSONNEL	9
80A9078	QA GENERAL INDOCTRINATION	2
80A9082	COMPANY NONCONFORMANCE CONTROL	15
80A9084	NONDESTRUCTIVE EXAMINATION PROCEDURE QUALIFICATION	9
80A9099	IDENTIFICATION, STORAGE AND RETENTION OF QUALITY ASSURANCE RECORDS	17

GLOSSARY

Accept–As–Is	See "Use–As–Is"
AFR	Audit Finding Report (refer to Section 18)
Approval	An act of endorsing or adding positive authorization or both.
As–Built Data	Documented data that describes the condition actually achieved in a product. Includes revised or marked–up drawings and specifications.
Audit	A planned and documented activity performed to determine by investigation, examination, and evaluation of objective evidence the adequacy of and adherence to established procedures, instructions, drawings, and other applicable documents, and the effectiveness of implementation. An audit should not be confused with surveillance or inspection activities performed for the sole purpose of process control or product acceptance.
Calibration	Comparison of a device (such as an instrument) with an appropriate standard of known and higher accuracy or closer tolerance in order to eliminate by adjustment or document any variation in the accuracy of the device being compared.
Certificate of Compliance (C of C)	A written statement, signed by a qualified party, attesting that items or services are in accordance with specified requirements and accompanied by additional information to substantiate the statement.
Certified Test Report (CMTR)	A written and signed document, approved by a qualified party, that contains sufficient data and information to verify the actual properties of items and the actual results of all required tests.
CAR	Corrective Action Request (refer to Section 16)

GLOSSARY (Continued)

Certificate of Conformance	A written statement, signed by a qualified party, certifying that items or services comply with specific requirements.
Certification	The act of determining, verifying, and attesting in writing to the qualifications of personnel, processes, procedures, or items in accordance with applicable requirements.
Characteristic	Any property or attribute of an item, process, or service that is distinct, describable, and measurable.
Close–out (Clear)	Documentation to show that the designated requirement has been met.
Commercial Grade Item	An item that is: • Not subject to design or specification requirements that are unique to nuclear facilities. • Used in applications other than nuclear facilities. • Ordered from the manufacturer/supplier on the basis of specifications set forth in the manufacturer's published product description (e.g., catalog).
Corrective Action	Measures taken to rectify conditions adverse to quality and, where necessary, to preclude repetition.
CRA	Change Request and Authorization (refer to Procedure 80A9003) – method of revising documents to next revision level.
Defect	Any nonconformance, deviation, or deficiency of an item or activity from specified requirements.
Design	Technical management processes which commence with identification of design input and which lead to and include the issuance of design output documents.
Design Check	Review of design to assure complete and correct interpretation of design input and the completeness and accuracy of drafting effort.

GLOSSARY (Continued)

Design Review	A deliberately critical examination and evaluation ensuring that designs clearly, accurately, and completely describe technical requirements of the item in sufficient detail for the appropriate design phase.
Deviation	Written authorization to depart from a requirement for a specified number of items or a specified period of time.
Disposition	The action required to close–out a nonconformance report.
Documentation	Any written or pictorial information describing, defining, specifying reporting, or certifying activities, requirements, procedures, or results.
Drawing Check	Review of drawings by drafting room personnel, other than the assigned drafting technician, to assure conformance with drafting practices and specified requirements.
ECN	Engineering Change Notice – method to change drawings expediently (refer to Procedure 80A9003)
Examination	An element of inspection consisting of investigation of materials, components, supplies, or services to determine conformance to those specified requirements which can be determined by such investigation. Examination is usually nondestructive and includes simple physical manipulation, gauging, and measurement.
Field Change Notice	Method to change project procedures expediently (refer to Procedure 80A9003)
Inspection	Examination or measurement to verify whether an item or activity conforms to specified requirements.
Inspector	A qualified inspector employed by NES whose duties include the verification of quality related activities.
Item	Any level of unit assembly, including assembly, component, part, structure, subassembly, subsystem, system, or material.

GLOSSARY (Continued)

Measuring and Test Equipment (M&TE)	Devices or systems used to calibrate, measure, gage, test, or inspect in order to control or to acquire data to verify conformance to specified requirements.
Nonconformance	The condition of a characteristic, documentation, or procedure which renders the quality of an item or activity unacceptable or indeterminate.
Nonconformance Report (NCR)	A form used to document a nonconformance, its disposition, and its close–out.
Objective Evidence	Any documented statement of fact, other information, or record, either quantitative or qualitative, pertaining to the quality of an item or service based on observations, measurements, or tests which can be verified.
Overcheck	An additional check to the usual activity, such as additional nondestructive examination by a supervisor after the normal examination by an assigned technician.
Procedure	A document that specifies or describes how an activity is to be performed.
Qualification (Personnel)	The characteristics or abilities gained through training or experience or both, as measured against established requirements such as standards or tests, that qualify an individual to perform a required function.
Quality Assurance (QA)	All those planned and systematic actions necessary to provide adequate confidence that a structure, system, or component will perform satisfactorily in service.
Quality Assurance Program Plan (QAPP)	The limited program established in accordance with the documented requirements for a specific project.
Quality Assurance Record	A record which furnishes documentary evidence of the required and obtained quality of items or activities affecting quality. A document is considered a quality assurance record when the document has been completed.

GLOSSARY (Continued)

Quality Control	Those quality assurance actions which provide a means to control and measure the characteristics of an item, process, or facility to established requirements.
Repair	The process of restoring a nonconforming characteristic to a condition such that the capability of an item to function reliably and safety is unimpaired even though that item still does not conform to the original requirement.
Report	Document that gives information for record purposes.
Review	A deliberately critical examination of planning, design, construction, and/or operation of a facility, component, item, or service.
Rework	The process by which a nonconforming item is made to conform to prior specified requirements by completion, remachining, reassembling, or other corrective means.
Special Process	A process, the results of which are highly dependent on the control of the process and the skill of the operators and in which determination of the desired quality cannot be made readily by means of inspecting the product which results from the process.
Surveillance	Monitoring or observation to verify whether an item or activity conforms to specified requirements.
Testing	The determination or verification of the capability of an item to meet specified requirements by subjecting the item to a set of physical, chemical, environmental, or operating conditions.
Traceability	The ability to trace the history, application, or location of an item and like items or activities by means of recorded identification.

GLOSSARY (Continued)

Use–As–Is	A disposition which may be imposed for a nonconformance when it can be established that it will not result in an adverse condition and that the item under consideration will continue to meet all engineering functional requirements including performance, maintainability, and safety.
Verification	An act of conforming, substantiating, and assuring that an activity or condition has been implemented in conformance with specified requirements.

G. NES DOCUMENT CONTROL

NES, Inc.

DOCUMENT NO. 80A9003 REV. 15

NES DOCUMENT CONTROL

UNCONTROLLED COPY

Project Application	Copy No.	Assigned To
Implementing		

APPROVALS					
TITLE / DEPT. – SIGNATURE – DATE					
REV NO	PREPARED BY	QA MANAGER	PRESIDENT		
12					
13					
14					
15	Ben G. Ashby	[signature] 05-03-94	[signature] 5/3/94		
16					
17					
18					
19					
20					
21					
22					
23					

NES, Inc. REVISION LOG

DOCUMENT NO. 80A9003

REV NO.	DATE	PAGE NO.	DESCRIPTION	APPROVAL
1	11/75		CRA No. 95	GDO
			General Revisions on Most Pages, Retyped.	
2	1/76		CRA No. 121 –	GDO
3			CRA No. 587 Extensive Revision to format and forms	GDO
4	7/16/79		CRA 939	
5	2/15/84		CRA No. 3916 Paragraphs affected:	
			2, 3, 4.1.1, 4.1.8, 4.4.4, 5 (Note), 5.1, 5.2	
			6.1.1, 6.1.2, 6.2.1, 6.2.2, 7d, 8.1.h, 10.0	
6	9/13/84	14	CRA 4646 Paragraph affected 8.1.5	
7	6/12/86	10-	Add Section 4.7 (See CRA 6131)	
		11		
8	9/19/86	1	Change title	M. E. Alling
		11	Add Section 4.8	
		25	Add Figure 4.8	
			See CRA 6253	
9	6/30/88	All	General rewrite to accommodate computer records.	Ben G. Ashby
			See CRA 6887	
10	12/13/88		Editorial corrections to paragraph	Ben G. Ashby
			references and multiple use of MDL	
			Reference CRA 7121.	
11	10/4/89	11	Revise approvals for CRA's incorp. ECN's	Ben G. Ashby
		15	Deleted disk storage for previous revisions –	Ben G. Ashby
		19	To eliminate distribution of unneeded	
			procedures. CRA 7458	
12	3/4/91	7,8	Revised to describe an electronic DRC and	Ben G. Ashby
			quarterly MDL review. CRA 7967	
13	8/4/93	11	Clarify FC requirements. See CRA 8397.	Ben G. Ashby
14	10/05/93	6,9,13	Clarify follow–ups and editorial. See CRA 8726.	Ben G. Ashby
15	4/19/94	4,5 &6	Revise MDL processing to accommodate computer	[signature] 05-02-94
			generation. See CRA 8888.	

1. OBJECTIVE

The objective of this document is to describe the procedure to be followed to control NES documents.

2. GENERAL

This procedure provides direction for controlling documents such as drawings, specifications, reports, procedures, programs plans, Quality Assurance Program Plans, and the Quality Assurance Manual. This procedure provides several forms and logs to assure adequate control of documents. These forms and logs may be manual as described in this procedure, electronic or a combination of manual and electronic as long as the minimum information shown is provided. Also some additional information may be added to electronic records for sort and select purposes.

3. RESPONSIBILITIES

Several groups and/or individuals have responsibilities defined throughout this procedure. General responsibilities are as follows:

3.1 Document Control Department - The Document Control Department (Supervisor) is responsible for receiving, distributing, filing and generally controlling approved documents in accordance with this procedure.

3.2 Document Preparer - An individual assigned responsibility for initiating new documents or revisions to existing documents is responsible for preparing documents or revisions in accordance with this procedure, obtaining the necessary approvals and forwarding the approved documents to Document Control.

3.3 Document Approver - Approval authority for documents is shown in the NES Quality Assurance Manual. These approvers are responsible for assuring technical content of the document, inclusion of customer requirements, inclusion of quality requirements, inclusion of operation details and commitment of required company resources as applicable to their review and approval.

4. PROCEDURE

4.1 Identification – NES documents shall be identified by a number with the format shown below. The number shall be assigned by Document Control to a document following submittal of an approved Master Document List (see Section 4.2.1).

Document Size (A thru E)

XXY ZZZZ

Two (2) digit series number Assigned by Document Control

Sequentially assigned 4 digit number

Drawings, specifications or procedures reproduced in other technical documents without changes shall carry their original identification number.

4.2 DOCUMENT CONTROL FORMS

4.2.1 Master Document List – The Master Document List (MDL – Figure 4.1), establishes a block of numbers assigned to an activity for preparation of documents supporting that activity. The assigned numbers are applied to documents as they are generated by responsible individuals. The MDL is updated by Document Control to reflect current status of affected documents. Additions or deletions of documents are considered changes to the MDL requiring redistribution, however, changes in document revision status are not considered MDL changes requiring redistribution. Specific MDL controls are as follows:

1. The Project Manager will identify by title all documents required and prepare the MDL.

2. The MDL will be the first document for each group of related documents and will list drawings, specifications procedures or technical reports for an activity.

3. The first issue of the MDL shall be reviewed and approved by the Project Manager. This review and approval may be shown by entering the Project Manager's name and initialing the entry.

4. The approved first issue of MDLs shall be transmitted to Document Control for retention.

5. Based on the number of documents listed on a MDL, Document Control will issue a block of document numbers for the Project. The block size shall reflect the Project Manager's judgment on the amount of additional documents, if any, required to complete the project.

   NOTE: The block of numbers shall be recorded by Document Control in the Master Document List Log which shall indicate the project title, the date of entering the numbers, the MDL number and the block size.

6. The Project Manager shall assign a number to the MDL and each document listed.

7. Document Control shall issue the completed MDLs to the Project Manager.

   NOTE: The Project Manager will be responsible for distribution to responsible users.

8. Document Control will record the initial document approval and revision on the MDL, then change this information as documents are revised. These changes do not require redistribution of the MDL.

   The letters "CAD" shall be placed in the remarks column of the MDL to denote any drawings generated by computerized drafting.

   If the title or size of the document/drawing submitted for filing does not agree with the original information entered in the MDL, the Project Manager will be notified and either the document will be corrected or the MDL will be revised using a Change Request and Authorization form (CRA) to make the necessary changes.

9. The Project Manager is responsible for initiating revisions to MDLs as required. The Project Manager shall prepare a CRA which will describe each change and its justification.

   The CRA for MDLs will be reviewed and approved by the Project Manager, and executed by Document Control.

10. The MDL Revision Number shall be changed each time an approved CRA for the MDL is executed. The MDL Revision Number shall be recorded in the Remarks Column to identify each item affected by the Revision. The CRA number shall be recorded in the Latest CRA No. Column on the MDL.

11. Document Control shall distribute the revised MDL.

12. Document Control will review active MDLs semiannually for outstanding documents, contact Project Managers as required to obtain status and take appropriate action.

13. The Approval Date, Latest Rev. No., Latest Rev. Date and Latest CRA No. is for information only and may be changed by Document Control, or the Project Manager when convenient. The DRC is the record of document status.

4.2.2 Document Record Card - An electronic Document Record Card (DRC) provides the current status for each document. Specific DRC controls are:

1. An electronic DRC is entered for each document number issued. The following information is shown on the DRC for each document.

   - Document Number
   - Current Revision
   - Project Number
   - Document Title
   - Approval Date
   - Change Request Authorization Number
   - Other information for sort or select purposes and drawing status as determined by Document Control may be entered on this record.
   - Information regarding CAD drawings is entered in comments (memo field)

   Note: The above information may be shown as a hard copy Document Record Card for some inactive documents.

4.2.3 Change Request and Authorization - The Change Request and Authorization (CRA - Figure 4.2) is used to circulate proposed changes for review, comment and approval. Final document revisions should then be direct transcriptions of the CRA approved change. CRAs are processed as follows:

1. The CRA form shall be prepared by the person initiating the change and shall require approval by the responsible individuals identified in the applicable NES QA Manual and QAPP.

2. Document Control maintains a CRA log that provides a sequential number for CRAs and records the document number, type of document and responsible individual.

3. The CRA is stamped "Complete" and filed by Document Control after revision of the document.

4.2.4 Document Distribution Log - Document Control will maintain a log of "Controlled Document" holders and assure distribution of revised documents to "Holders of Record".

4.2.5 Document Control Print Order Form

1. The Print Order Form (POF - Figure 4.3) is prepared by a responsible NES employee to request initial printing and distribution of "Controlled Documents". Document Control will print and distribute the documents in accordance with the POF and update the distribution log for Controlled Document holders.

2. The POF may also be used to request "Uncontrolled Document" printing and distribution. Uncontrolled documents may also be distributed by verbal request or from reproduction of a Controlled Document.

3. Document Control shall process the POF and shall be responsible for document reproduction.

4. The submitted POF must clearly indicate the intended control. Document copies distributed by Document Control shall either be classified "Controlled" or "Uncontrolled".

"Controlled" - These document copies shall have controlled distribution with automatic recall and updating when revisions occur. Controlled copies will be clearly stamped "Controlled" using red ink. A controlled stamp other than red in color, will readily identify an uncontrolled document copy.

a. When controlled copies are to be distributed outside NES, the POF must indicate the individual and organization to which the document will be assigned.

b. A copy number and holder's name affixed to the title page shall be assigned to controlled copies of Quality Assurance Manuals, Quality Assurance Program Plans and associated NES Implementing Procedures only.

c. All holders of controlled copies shall be automatically supplied with updated document copies as changes occur. The DTC shall be used to distribute and recall revised documents.

d. If specifically requested by the client, an unstamped Controlled Document may be provided, typically for incorporation in the clients document control system. The DTC will clearly indicate that an unstamped Controlled Document has been provided.

Document copies obtained through any other means shall be "Uncontrolled" -When distributed by Document Control, these document copies shall only be considered up to date at the time of distribution. Uncontrolled document copies will be clearly stamped Uncontrolled, or may have black (copied) "Controlled" markings.

4.2.6 Document Transmittal Control Form - The Document Transmittal Control (DTC - Figure 4.4) Form is used to distribute and acknowledge receipt of "Controlled Documents" as follows:

1. Document Control will prepare a DTC for initial distribution of documents as shown on the POF and distribution of document revisions as shown on the distribution log.

2. Document Control will assign a unique sequential number to each DTC from a log. Document Control will also record the recipient and document number in the log.

3. Document Control will transmit documents directly for controlled distribution within the company.

4. Document Control will forward the DTC and documents to the responsible Project Manager who will make external controlled distribution.

5. Document Control will maintain an electronic record of the transmittal and update the data base when the acknowledged transmittal is returned.

6. Document Control will make a reasonable attempt to obtain acknowledged DTCs. A follow up will be conducted monthly to identify internally distributed DTCs that have been outstanding for more than thirty days and externally distributed DTCs that have been outstanding more than sixty days. In the event Document Control is unsuccessful in obtaining acknowledged DTCs they will bring the matter to the attention of the QA Manager who will provide further direction.

4.2.7 Engineering Change Notice Form

1. The Engineering Change Notice (ECN - Figure 4.5) is used to specify in-process changes in approved documents, to assure affected design personnel are cognizant of changes and it serves to inform holders of controlled documents that certain changes have been authorized by NES without the need to revise the actual document until a later time.

2. The ECN shall be prepared by any cognizant employee and approved by the responsible individuals identified in the NES QA Manual and/or applicable QAPP. The approved ECN shall be forwarded to Document Control.

3. ECN numbers shall be assigned sequentially and recorded in a master log maintained by Document Control. The ECN number, the project number, the number and revision of the document affected, and the name of the person requesting the ECN shall be recorded in the log.

4. Document Control will distribute controlled copies of the ECN to "Holders of Record" of the original document and file the original ECN .

5. The approved ECNs shall be considered part of the affected document and it will be each recipient's responsibility to attach their controlled copy of each ECN to the applicable document until such time that the document itself is revised and distributed.

6. The changes described in the ECN will be incorporated into the next or "as-built" revision, of the applicable document upon completion of the project. This shall be accomplished by means of a CRA, as described in Section 4.2.3 above. A CRA written solely to incorporate a previously approved ECN shall only require review and approval by the applicable project manager.

7. The approved ECNs shall be stamped "complete" by Document Control when the changes in the ECNs have been incorporated into a revision of the document.

4.2.8 Field Change Authorization - The Field Change Authorization (FCA - Figure 4.6) is used to make necessary changes to documents in the field. FCAs are processed as follows:

1. The FCA form shall be used to specify changes to NDE Procedures, PSI and ISI Program Plans (not including Quality Assurance Program Plans), Scan Plans, and other project procedures. Any field employee may initiate changes to these documents.

2. The field technician or supervisor shall complete the FCA form and shall obtain a number from Document Control through the Project Manager. FCA numbers shall be assigned sequentially by Document Control, by document number and shall be recorded in a master log maintained by Document Control. The field change number, project number, the number and revision of the document affected, and the name of the person requesting the field change shall be recorded in the log.

3. For NDE procedures, an NES Level III Examiner qualified in the discipline of the procedure being changed shall approve the FCA. In the event an appropriate Level III Examiner is not available at the same site, the originator shall obtain Level III approval by the most expedient means , (i.e., documented telephone conversation or telecopy) followed by approval in writing. Additional approvals shall be obtained as required by the QA Manual and project QAPP.

4. Approvals for Program Plans, Scan Plans, and other project procedures shall be as required by the QA Manual and project QAPP. These approvals shall be obtained by the most expedient means (i.e., documented telephone conversation or telecopy if required).

5. The field supervisor shall distribute copies of the approved FCA on site and forward the original to Document Control. Document Control will distribute controlled copies of the FCA to "Holders of Record" of the original document and file the original.

6. The approved FCA shall be considered part of the affected document and it will be each recipient's responsibility to attach the controlled copy of each Field Change to the applicable document until such time that the document itself is revised and distributed.

7. Field Changes are included in the applicable document at revision.

8. The approved FCA shall be stamped "complete" by Document Control when the changes in the FCA have been incorporated into a revision of the document.

4.2.9 <u>Addenda</u>

Addenda are added to procedures to enhance the base procedure by incorporating specific and unique client requirements. The Addenda Authorization (Figure 4.7) is used to obtain the required approvals.* Addenda will be distributed to all internal document holders and affected external document holders.

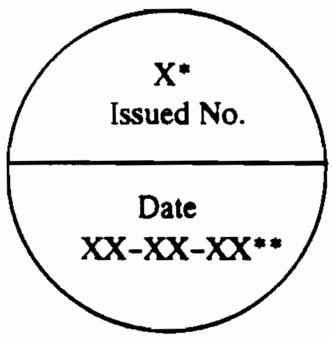
* Approvals of the Addenda shall be at least equal to the approvals of the base document and may include customer approval.

4.3 DRAWING STATUS

4.3.1 Preliminary Approval (Drawings Only)

Due to reviews prior to final approval, drawings shall require special status control during this cycle, as follows:

1. Prior to final approval (NES and/or customer), the status of drawings shall be indicated with the following stamp on the original.



* Status Issue Number/Letter (as applicable)

** Date of Completion

2. Before final approval, the status issue number/letter shall be used for identifying the status level of drawings during the review cycle (NES and/or customer). Each drawing issue that is changed from the prior issue shall be updated with the next succeeding number/letter and date.

3. After final approval, the issue stamp and number shall be removed and the revision number shall be used for identifying the status level.

4.4 DOCUMENT APPROVALS

4.4.1 NES Approvals

1. NES approval of a document shall be indicated by approval signatures in the document title-block assigned spaces. The NES personnel required to approve a document shall be denoted in the NES Quality Assurance Manual and/or the applicable Project Quality Assurance Program Plan.

2. Upon final approval by NES personnel the original document will be submitted to Document Control. This shall apply even if customer approval is still required.

For drawings generated by computerized drafting the floppy disc containing the drawing information shall be submitted to Document Control along with the approved reproducible hard copy which becomes the original document.

a. Each computer generated drawing shall have its own individual floppy disk.

b. The floppy disk shall be labeled with the following information:

   a. Drawing Number and Revision

   b. Project Number (if applicable)

4.4.2 Customer Approval

1. When the Project Quality Assurance Program Plan or customer's contract require customer approval after NES approval, the Project Manager shall forward document copies (not the original) to the customer for review and approval.

2. Customer approval may be as follows:

   Customer Approval Without Comment - The customer submits written approval without comment. The approval letter or other evidence of approval shall be retained by the Project Manager/Engineer in the project file. The document will retain the revision level in effect at the time the document is transmitted to the customer.

   Customer Approval With Comment - The customer submits written approval subject to the addition of their comments. The comments will be reviewed by the NES Project Manager/Engineer, and if found acceptable, a CRA (Section 4.2.3) shall be prepared to revise the document. The document will be updated to the next revision level.

4.5 Document Holds - During development of design and the preparation of documents, it is often necessary to show "HOLDS" where certain information is lacking. To the maximum extent possible, it is desirable that any HOLDS on documents be resolved and removed before the document is released for use. When this is not possible, due either to lack of design information or to client request, the following procedures will apply:

a. The HOLD portion of the document will be plainly encircled with an irregular line and assigned a number (i.e., HOLD 1, HOLD 2, etc.).

b. A note will be placed on the document, directly above the title block, listing the HOLDS and their expected removal dates. Upon removal, the HOLD designation will be erased from this listing and from the affected portion of the document. Any document revisions resulting from HOLD removals will be noted in the usual manner.

c. Documents with HOLDS, like those without them, shall also be reviewed and approved in accordance with Section 4.4.

d. As deemed necessary the Project Manager will prepare a document HOLDS list. The HOLDS list will show all existing HOLDS, their expected removal dates, and the NES personnel responsible for follow-up and removal. The HOLDS list will be distributed to the NES personnel responsible for follow-up and removal of the HOLDS.

4.6 Document Revisions – Revisions to approved documents may be required during the design and/or fabrication stages. Revisions to approved documents shall be processed as follows:

1. Changes made to documents after NES approval and customer approval (when applicable) shall be accomplished by the use of a CRA form. The CRA shall be processed as follows:

   a. A separate CRA shall be issued for each document undergoing changes.

   b. The current revision number of the document being revised shall be inserted in the "Present Revision No." space.

   c. The project affected (when applicable) shall be inserted in the "Projects Affected" space.

   d. The "Requested By" and "Date" spaces shall be completed.

   e. The "Present Requirements" box shall be completed by indicating the current document content which is to be revised.

   f. The "Change To" box shall be completed by indicating, in detail, the proposed changes to the present requirement.

g. The "Reason for Change" shall be completed by indicating the reason for changing the present requirement.

h. The approval signatures and dates of the responsible individuals identified in the NES QA Manual and/or QAPP, shall be obtained.

2. After the CRA is completed and approved, Document Control shall release the original document to the CRA originator, who will be responsible for revising the document.

   For drawings generated by computerized drafting, Document Control shall release the applicable floppy disk and the original document to the CRA originator, who will be responsible for revising both the original document and the drawing information on the floppy disk.

3. The revision number shall be increased each time a document has been changed from its previous revision. Minor revisions shall be highlighted in the document by the placement of a triangle (including revision number) and bar (to indicate the extent of the revision) adjacent to the revised area. Major revisions will be indicated with a triangle enclosed revision number adjacent the title.

4. The revised document shall be reviewed by the CRA originator, or other responsible individual, to ensure that the CRA change requirements have been incorporated into the original document. The CRA originator, or other responsible individual, who signed the CRA shall indicate his approval by initialing the approval block on the revision log. Customer approval, if required, shall be in accordance with the requirements of Section 4.4.2.

5. Drawings generated by computerized drafting can be revised in either of two ways.

   a. Minor revisions can be made directly on the hard copy original with the floppy disk being upgraded to reflect the change. No new hard copy original is to be printed out. The initialing of the approval block of the revision log will signify that the revision has been properly made on the original <u>and</u> that the floppy disk has also been upgraded to include the revisions.

   b. Major revisions can be made by changing the information on the floppy disk and printing out a new hard copy original. The names and dates in the approval box of the previous revision hard copy shall be printed on the new hard copy original. Initialing of the approval block of the revision log will signify that the revision has been properly made.

Upon approval of the revision, the hard copy original and the floppy disk shall be returned to Document Control. If the revision was made directly on the floppy disk (paragraph 5.b above) with a new hard copy original being produced, the hard copy original or a print of the previous revision is to be folded to 8 1/2 x 11 inches and returned to Document Control to be filed with the CRA which released the document for revision.

6. The CRA originator, or other responsible individuals shall obtain the final approval signatures on the document cover sheet for each revision. Upon final approval by NES personnel, revised original documents shall be returned to Document Control. Request for copies shall be made utilizing the POF. Documents that were previously issued as Controlled copies will automatically be redistributed in accordance with the Document Distribution Log.

7. After construction or fabrication is completed, revisions to original documents are made to record changes that occurred. These revisions are made from information collected during construction or fabrication and from field investigation. All changes to the original documents must reflect actual "as-built" conditions verified by inspection personnel and shall be processed on a CRA.

4.7 Standard Distribution - Some documents will automatically be distributed by Document Control as follows:

1. Quality Assurance Implementing Procedure - Unless otherwise directed and QA Manager concurrence is obtained, Document Control will assure that controlled copies of QA Implementing Procedures shown in Appendix C of the NES Quality Assurance Manual are distributed to each manager.

2. Project Quality Assurance Program Plan - Document Control will assure that Controlled copies of the Project Quality Assurance Program Plan shall automatically be assigned and distributed to the NES Quality Assurance Manager.

nes MASTER DOCUMENT LIST NO.__________ REV.______ DATE ______ SHEET ____ OF ____

Project Title __________________ PROJECT NO.______ TASK NO. ______

BLOCK SIZE ________ TO ______ PROJECT MANAGER APPROVAL ________

ITEM NO	DOCUMENT NO	APPROVAL DATE	LATEST REV NO	LATEST REV DATE	LATEST CRA NO	TITLE	REMARKS
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							

MASTER DOCUMENT LIST NO. ________

FIGURE 4.1
MASTER DOCUMENT LIST

CHANGE REQUEST AND AUTHORIZATION

CRA No. ________

Page _____ of _____

DOCUMENT and REVISION	APPLICABLE PROJECTS
DOCUMENT TITLE	
REQUESTED BY	DATE

APPROVALS

TITLE	SIGNATURE	DATE	DESIGN EVALUATION COMMENTS

PRESENT REQUIREMENT:

CHANGE TO:

PURPOSE:

FIGURE 4.2
CHANGE REQUEST AND AUTHORIZATION FORM

nes

PRINT ORDER

Requested By	Proj. No.	Task No.	Phone Ext.	Date of Order	Date Wanted

DOCUMENT NUMBER	NO. COPIES	PROCESS (CHECK ONE)				Cont-rolled	Uncont-rolled	SPECIAL INSTRUCTIONS/USAGE REQUIREMENTS
		OZALID	SEPIA	MYLAR	XEROX			

NOTE: IF NOT OTHERWISE SPECIFIED, PRINTS WILL BE STAMPED "FOR REFERENCE ONLY - NOT FOR DISTRIBUTION OUTSIDE OF NUCLEAR ENERGY SERVICES, INC."

☐ FOR INTERNAL DISTRIBUTION		☐ FOR EXTERNAL DISTRIBUTION	
TO:		TO:	
Signature	Date	Signature	Date

FIGURE 4.3

PRINT ORDER FORM

NES, Inc.
44 Shelter Rock Road
Danbury, Connecticut 06810
(203) 796-5000

DOCUMENT TRANSMITTAL CONTROL FORM NUMBER

DATE ______________ PROJECT/TASK: ______________________ Page _____ OF _____

ASSIGNED TO ________________________ TITLE ________________________

ORGANIZATION ____

____

THE ENCLOSED CONTROLLED DOCUMENT(S) ARE HEREWITH BEING TRANSMITTED FOR YOUR USE.

KINDLY RETURN A SIGNED COPY OF THIS TRANSMITTAL TO NES, ATTENTION OF: ______________________

IF TRANSMITTAL FORM IS NOT SIGNED AND RETURNED TO NES WITHIN 30 DAYS, YOUR CONTROLLED COPY WILL AUTOMATICALLY BECOME UNCONTROLLED.

I HEREBY ACKNOWLEDGE RECEIPT OF THE ABOVE DOCUMENT(S) AND HAVE DESTROYED OR MARKED OBSOLETE ALL PRIOR REVISIONS.

NAME: ______________________ TITLE: ______________ DATE: ______________

FIGURE 4.4
DOCUMENT TRANSMITTAL CONTROL FORM

ENGINEERING CHANGE NOTICE

Project No.	Project Title			ECN No. ______
Document No.	Rev.	ECN Requested By	Date	Sheet ____ of ____
Document Title:				

Present Requirement

Change To

Reason For Change

The changes described above will be incorporated into the final or "as–built" revision of the applicable document upon completion of the project. This notice serves to inform holders of controlled copies of the document that the above changes have been authorized by NES.

Required Approvals

Title	Signature	Date	Design Evaluation Comments

FIGURE 4.5
ENGINEERING CHANGE NOTICE FORM

nes

FIELD CHANGE AUTHORIZATION

Document Number: ____________ Revision: ________ Field Change Number: ____________

Document Title: ____

Originator: ______________________________ Date: ____________

Description of Field Change:

Reason for Change:

APPROVALS:

Title	Signature	Date

NDE PROCEDURES ONLY

Procedure requalification is is not (circle one) required.

Cognizant Level III Signature: ______________________________

Distribute to all Controlled Copy holders of affected document.

NOTE: A copy of this authorization shall be attached to the affected document until a subsequent revision incorporates the field change.

FIGURE 4.6
FIELD CHANGE AUTHORIZATION FORM

nes

Effective Date ______

ADDENDUM AUTHORIZATION

Document Title ______ Document No. ______

Addendum No. ______ Originator ______

For Site/Utility ______

Description of Addendum:

Reason for Change:

APPROVALS:

Title	Signature	Date

Approvals for the Addendum shall at least be equal to the approvals of the base document and may include customer sign off.

Distribute to all NES Controlled Copy holders of affected document and ______.

A copy of this authorization shall be attached to the affected document.

FIGURE 4.7
ADDENDUM AUTHORIZATION FORM

H. NES QUALITY ASSURANCE AUDIT PROCEDURE

NES, Inc.

QUALITY ASSURANCE AUDIT PROCEDURE

UNCONTROLLED COPY

Project Application	Copy No.	Assigned To
Implementing		

APPROVALS					
TITLE / DEPT. – SIGNATURE – DATE					
REV NO	PREPARED BY	QA MANAGER	PRESIDENT		
0					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11	[illegible] 02-01-94	[illegible] 02-01-94	[illegible] 2/1/94		

NES, Inc.

REVISION LOG

DOCUMENT NO. 80A9022

REV NO.	DATE	PAGE NO.	DESCRIPTION	APPROVAL
1	8/10/77		CRA 293	T. LaGuardia
2	3/9/79		CRA 754	G. Oberndorfer
3	7/16/79		CRA 940	G. Oberndorfer
4	5/4/81	5–10	CRA 1861	V. Potent
5	9/12/83	2–12	CRA 3631	W. Gall
6	10/18/83	9, 14	CRA 3717 – to include "30 day requirement	
			for responses and revise audit form.	
7		3–13	Delete Corrective Action Request (CAR)	M.E. Alling
			with Audit Nonconformance Report (ANCR)	
		14	Delete CAR form, replace with ANCR form	
			See CRA 4452	
8	7/23/84	1	Add ISI V.P. and Gen. Mgr. and Sr. V.P.	M.E. Alling
			Operations to approvals.	
		11	Change "....in separate project files..." to	
			"...a central file..."	
			See CRA 4498	
9	12/19/85	All	Complete rewrite. See CRA 5832	M.E. Alling
10	10/31/90	All	Complete Rewrite. See CRA 7819	Ben G. Ashby
11	01-27-94	3,9,10, 11,12	Update to more clearly define current practices.	[signature] 02-01-94
		& 14	See CRA 8794.	

QUALITY ASSURANCE AUDIT PROCEDURE

1. OBJECTIVE

The objective of this procedure is to establish the Quality Assurance (QA) audit program. The audit program includes scheduling, planning, preparation, performance, followup, and close out of audit activities.

2. GENERAL

This procedure applies to internal project and system audits and external vendor audits. The scope of each individual audit is defined in a written Audit Plan in accordance with this procedure.

3. RESPONSIBILITIES

The Quality Assurance Manager is responsible for the audit program including development of Audit Schedules, review of Audit Plans, approval of checklists, selection and qualification of Auditors and Lead Auditors, and approval of Audit Reports.

Audit personnel are responsible for audit preparation and performance, documentation of results, issuance of audit findings, and verification of corrective action. Audit personnel shall be independent of any direct responsibility for performance of the activities which they audit.

4. PROCEDURE

4.1 AUDIT SCHEDULING

4.1.1 The Quality Assurance Manager prepares and approves a written Audit Schedule for each calendar year. The schedule is distributed to the NES President, Service Line Vice Presidents and Managers whose activities are scheduled for audits. 11

4.1.2 In developing the vendor Audit Schedule, vendor audits are scheduled for one or more of the following conditions:

- When it is necessary to determine the capability of a subcontractor's QA program prior to awarding a contract or purchase order.

- When, after award of a contract, sufficient time has elapsed for implementation of the QA program, and it is appropriate to determine that the organization is adequately performing the functions as defined in the QA program description, codes, standards, and other contract documents.

- When significant changes are made in functional areas of the QA program such as significant reorganization or procedure revisions.

- When it is suspected that the quality of an item is in jeopardy due to deficiencies in the QA program.

- When a systematic, independent assessment of program effectiveness is considered necessary.

- When it is necessary to verify implementation of required corrective actions.

4.1.3 The schedule provides for a series of internal systems audits to evaluate compliance of the NES QA Program with each criterion of 10CFR50, Appendix B. Audits are scheduled so that each section of the NES QA Program is audited at least once during the calendar year. These systems audits will, in general, include evaluations of the system by a sampling of activities of ongoing projects.

4.1.4 The schedule also includes project audits to assure the adequacy of and conformance with the program. The determination of the need for a project audit is based on the scope, complexity, and safety importance of the work. For projects which require audits, the project Quality Assurance Program Plan (QAPP) includes a section on the required audits per NES Procedure 80A9031, Procedure for Preparation of Quality Assurance Program Plans. Audits of projects are scheduled as early in the life of the project as practicable to assure timely implementation of quality assurance requirements.

4.1.5 Vendor audits are also included on the Audit Schedule. These audits are scheduled as required by NES Procedure 80A9030, Vendor Evaluation and Selection and applicable Quality Assurance Program Plans.

4.1.6 The Audit Schedule is reissued as necessary to reflect revisions.

4.2 AUDIT PERSONNEL

4.2.1 Personnel Qualifications

The NES Quality Assurance Manager is responsible for selecting and assigning audit team members. Audit team leaders are certified as Lead Auditors in accordance with NES Procedure 80A9026, Qualification and Certification of Quality Assurance Program Audit Personnel.

The audit team may include auditors, auditors–in–training, and/or technical specialists/advisors. Audit team members have experience or training commensurate with the scope, complexity, or special nature of the activities to be audited.

4.2.2 Responsibilities

The team leader is responsible for the orientation of the audit team, coordination of the audit process, establishing the pace of the audit, assuring communications within the team and with the organization being audited, participation in the audit performance, and coordination of the preparation and issuance of the Audit Report.

The audit team members are responsible for performing their assigned functions during preparation, performance, reporting, and follow–up activities.

4.3 AUDIT PREPARATION

4.3.1 Audit Plan

A written Audit Plan (Exhibit 1) is generated for each audit. The plan identifies the audit scope, requirements, activities to be audited, organizations to be notified, applicable documents (QA Manual, procedures, QAPP, etc.), audit dates, and checklists to be developed.

4.3.2 Audit Checklists

A. Since types of audits differ, so do the types of checklists used for the conduct of each type of audit. In general, systems audits and vendor audits are conducted using checklists based on upper tier level documents such as 10CFR50, Appendix B; ANSI and ASME Standards; and QA Manuals. These types of audits and their checklists are designed to assure both the adequacy and effectiveness of the program being audited. Project audits are generally conducted using checklists based on lower-tier documents. These documents include QAPPs and implementing procedures. An evaluation is made during checklist preparation as to the adequacy of these procedures in respect to meeting the requirements of the applicable sections of the NES QA Program. The actual performance of the audit is primarily designed to determine the effectiveness of implementation of the program. However, program inadequacies discovered during checklist preparation or audit performance are thoroughly investigated.

B. Checklists are of sufficient depth to determine both the adequacy and effectiveness of the quality program elements being audited. Checklists also include follow-up on previously identified problems to assure effectiveness of past preventive actions.

4.3.3 Team Orientation

The team leader assures that the team is prepared prior to the audit by initiating the following, as required:

- Involving team members in the preparation of the Audit Plan and checklists.
- Providing applicable documents to the team members for information and review (including Audit Plan, checklists, procedures, prior audits, etc.).
- Holding preaudit orientation meetings/sessions to discuss the audit.
- Making audit assignments and establishing auditor responsibilities for the conduct of various phases of the audit.

4.3.4 Audit Notification

The audited organization is notified, in writing, by forwarding a copy of the Audit Plan, letter or memorandum prior to initiation of the audit. This notification is made reasonably in advance of the audit so that proper arrangements may be made for personnel availability, auditor work space, etc.

Unannounced internal audits may be performed at the discretion of the Quality Assurance Manager.

4.4 AUDIT PERFORMANCE

4.4.1 Preaudit Meeting

A preaudit meeting is held between the audit team and management of the audited organization. This meeting should confirm the audit scope, present the Audit Plan, discuss the audit sequence, establish channels of communications, and discuss plans for the post audit conference.

4.4.2 Performance of the Audit

A. Checklists are used in conducting the audit. The checklists are intended for use as a guide and should not restrict the audit investigation when evaluation of quality performance raises questions that are not specifically included in the checklist. Items may be added or deleted from the checklist by the auditor.

B. Objective evidence representing selected elements of the Quality Assurance Program is examined for compliance with Quality Assurance Program requirements. Evidence is reviewed to the depth necessary to determine whether or not requirements are being effectively implemented. To the extent possible objective evidence reviewed is recorded on or attached to the Audit Checklist.

C. Audit findings (nonconformances and/or program deficiencies) identified during the audit are discussed with the audited organization to obtain acknowledgement of the finding and to initiate audited organization investigation of cause and extent of corrective action.

D. Conditions requiring immediate corrective action are reported immediately to management of the audited organization.

E. Specific attention is given to the corrective action on program deficiencies identified during previous internal and external audits.

4.4.3 Post Audit Conference

At the conclusion of the audit process, a post audit meeting is held with management of the audited organization to discuss the results of the audit, present any audit findings, and clarify questions.

4.5 AUDIT REPORTING

An Audit Report is issued within thirty days of the post audit meeting. The report is signed by the Lead Auditor and approved by the Quality Assurance Manager. The report contains the following information:

- Audit Report number
- Date(s) of the audit
- Date of report issuance
- Type of audit and scope of work audited
- Project identification, if applicable
- Audit team members and title/function
- Individuals contacted (including identification of preaudit and post audit meeting attendees)
- Listing of requirements (codes, standards, specifications)
- Listing of checklists utilized
- Summary of audit results including a statement of the effectiveness of the QA Program elements audited.
- Summary of each Audit Finding Report (AFR)
- Distribution list: NES President, cognizant Vice President(s) Manager(s), Quality Assurance Manager, and other responsible individuals

4.6 AUDIT FINDING REPORT (AFR)

4.6.1 Audit findings (nonconformances and program deficiencies) are documented on AFR forms (Exhibit 2).

4.6.2 The originator clearly documents the specific requirement violated, describes the condition observed to be in violation of the above requirement, and identifies the responsible organization. The AFR indicates the Audit Report number to which it corresponds and a consecutive number commencing with 1. The originator signs and dates the AFR.

4.6.3 The Quality Assurance Manager or his designee reviews the AFR for significance and reporting requirements. He also assigns the response due date and signs and dates the form indicating his approval.

4.7 AUDIT FOLLOW UP

4.7.1 Audited Organization

Responses to AFRs are prepared by management of the audited organization (e.g., Project Managers/designees for internal Project Audits). The response includes explicit statements of:

- Cause
- Corrective action
- Action to prevent recurrence
- Scheduled completion dates (SCD) for corrective action and action to prevent recurrence
- The responsible individual signs and dates the AFR, attaches any objective evidence to support the corrective action, if practical, and forwards the response to the NES QA Manager.

4.7.2 Auditing Organization

A. Review of Responses

When the assigned Lead Auditor has reviewed the response to the AFR, he indicates its status as acceptable or unacceptable. If unacceptable, the AFR is returned to the audited organization with the reasons for rejecting the AFR response. If the audited organization and Lead Auditor cannot reach agreement on an acceptable response, they will consult the Quality Assurance Manager and/or responsible Managers to obtain an acceptable response.

The response will then be then be revised and resubmitted to the Quality Assurance Manager.

B. Verification Activities

The Lead Auditor reviews appropriate objective evidence to verify completion of corrective action and action to prevent recurrence. This review is documented in the appropriate space of the AFR. The Lead Auditor signs and dates the AFR indicating closure and files the AFR in accordance with NES Procedure 80A9099, Identification, Storage and Retention of Quality Assurance Records.

C. AFR Status Reports

The QA Manager issues a monthly report which includes status information of AFRs. This report is designed to be a management aid in providing timely response, corrective actions, follow-up and closeout of AFRs.

The report provides, as a minimum, the following information on Open Audit Findings:

- Audit Number
- Audit Finding Number
- Brief Description
- Responsible Organization or Individual
- Date of Issuance
- Date Response Due
- Date Response Accepted
- Proposed Corrective Action Completion Date

The report also identifies Audit Findings closed during the reporting period.

4.8 RECORDS

The Quality Assurance Manager maintains a file of Audit Reports. AFRs are held in an open file to facilitate follow-up activities.

Copies of Audit Plans, Audit Reports, and checklists are maintained in a central file by the Quality Assurance Manager. Copies of Audit Reports and closed AFRs are filed and maintained in accordance with NES Procedure 80A9099, Identification, Storage and Retention of Quality Assurance Records.

AUDIT PLAN

SUBJECT:

DATE:

REF. NO.

AUDIT NO.:

PROJECT MANAGER;

PROJECT NO.;

Organization(s) to be Notified:

Audit Requirement(s):

Scheduled Date(s) of Audit:

Audit Scope and Activities to be Audited:

Reference Documents and Checklists:

Document Number	Rev.	Document Title	Checklist Number

Audit Team:

Distribution:

cc:

EXHIBIT 1

NES, Inc.

NES, Inc.
44 Shelter Rock Road, Danbury, CT 06810

AUDIT FINDING REPORT

Audit No.: ____________
Project No.: ____________
AFR No.: ____________

Requirement: Responsible Organization:

Finding:

Recommended Action (optional):

Auditor	Date	Acknowledged by	Date

Potential 10 CFR 21 ☐ No ☐ Yes Upgrade to CAR ☐ No ☐ Yes

Evaluated by	Date

Response Due: ____________ ____________

Date	Cause Code

Cause:

Remedial Action:

Preventive Action:

Signature	Date	Scheduled Completion Date

Response Accepted: ☐ Yes ☐ No, Action: ____________

Evaluated by: ____________ Date: ____________

Verified by: ____________ Date: ____________

AFR Closed: ____________ Closed by: ____________ Date: ____________

EXHIBIT 2

I. IDENTIFICATION, STORAGE AND RETENTION OF QA RECORDS

IDENTIFICATION, STORAGE, AND RETENTION

OF QUALITY ASSURANCE RECORDS

UNCONTROLLED COPY

Project Application	Copy No	Assigned To
Implementing		

APPROVALS

TITLE / DEPT. - SIGNATURE - DATE

REV NO	PREPARED BY	Exec. Vice Pres. Operations	QA Manager		
0	W.S. Gall				
1					
2					
3					
4					
5					
6	[signature] 9/18/89	[signature] 9-18-89	[signature] For BGA 9/18		
7	[signature] 10/30/90	[signature] 10-31-90	[signature] 10-29-90		
8	Ben G. Ashby	[signature] 2-1-91	[signature] 02-01-91		
9					
10					
11					

nes NUCLEAR ENERGY SERVICES

REVISION LOG

DOCUMENT NO. 80A9099

REV NO.	DATE	PAGE NO.	DESCRIPTION	APPROVAL
1	6/22/84	all	Complete Rewrite CRA #4403	
2	9/23/86	all	Complete Rewrite CRA #6257	M. E. Alling
3	9/23/88	9&12	CRA #7046	B. D. Brown
4	2/3/89	all	General editorial revision and change	
			to permit microfilm or copies of drawing	
			revisions to be filed in dual storage.	
			Refer to CRA #7173.	
5	5/19/89	8	Delete Item j para. 5.5.5	
-		12	Delete NDE Procedure Qualification	
-		-	Reports Ref. CRA 7342	
6	9/18/89	all	Added Para. numbers	
		9	Para. 5.6.1 location of stroage facilities	
		10	Para. 6.1 Added Mezzanine Section	
			CRA 7440	
7	10/29/90	8	Para 5.5.3 Delete "for each service..."	
		10	Para 5.6.1 Delete last sentence of	
			last paragraph. CRA 7821	
8	01/28/91	6-10	5.3.6 deleted to permit filing personnel	[signature]
		& 12	certs alphabetically. Paragraphs	
			renumbered. 5.5.3 delted - personnel	
			certs. 5.5.4: added to address 10CFR21	
			records. 5.6.1 and 6.1 clarified.	
			Appendix A. See CRA 7919.	

1. OBJECTIVE

1.1 The objective of this procedure is to describe the method to be used by NES to control the collection, indexing, filing, storage, maintenance, and disposition of quality assurance records for nuclear power plants in accordance with the requirements of ANSI N45.2.9-1979 and ANSI N45.2-1977.

2. GENERAL

2.1 Documents that are considered to be quality assurance records are those which furnish documentary evidence of the quality of items and/or activities affecting quality. A document is considered to be a quality assurance record after it is completed and signed as required by applicable NES procedures. Documents that are to become quality assurance records must be legible, accurate, and completed as appropriate to the work accomplished.

3. DEFINITIONS

3.1 LIFETIME RECORDS

As defined in ANSI N45.2.9-1979, lifetime records are those which meet one or more of the following criteria:

a. Those which would be of significant value in demonstrating capability for safe operation.

b. Those which would be of significant value in maintaining, reworking, repairing, replacing, or modifying the item.

c. Those which would be of significant value in determining the cause of an accident or malfunction of an item.

d. Those which would provide required baseline for inservice inspection.

4. RESPONSIBILITIES

4.1 PROJECT MANAGER

Each Project Manager, with the concurrence of the client, is responsible for determining what project quality records are required to be retained in accordance with this procedure and for preparing a Project Quality Assurance Records List for those records.

4.2 QUALITY ASSURANCE MANAGER

The Quality Assurance Manager is responsible for determining which Quality Assurance Department and NES generic records are required to be retained in accordance with this procedure and for preparing a Generic Quality Assurance Records List for those records.

4.3 MANAGERS

The managers of projects, departments or service lines which produce records requiring retention in accordance with this procedure are responsible for properly transmitting those records to the Document Control Supervisor.

4.4 DOCUMENT CONTROL SUPERVISOR

The Document Control Supervisor is responsible for providing facilities which are adequate for the storage of quality records and for storing records in these facilities.

5. REQUIREMENTS

5.1 RECORDS LIST

5.1.1 Generic QA Records List

The Generic QA Records List is a list of documents or categories of documents which are originated by the NES QA Department and by other non-project activities at NES, which are considered records for retention in accordance with this procedure, and which specifies the retention period for the Nonpermanent records on that list. The Generic QA Records List is attached to this procedure as Appendix A.

5.1.2 Project QA Records List

The Project QA Records List is a list of documents or categories of documents which are to be considered records for a particular project and designates which of these records are to be stored by NES and which are to be turned over to the Client for retention. This list is prepared by the Project Manager at the earliest practicable time consistent with the schedule for accomplishing work activities. The Project QA Records List is submitted to the Client for approval. When approved the QA Records List becomes a part of the project Quality Assurance Program Plan (QAPP) and is approved by the Client when required by contract. The Project QA Records List defines and designates agreements and responsibilities for retention of applicable quality assurance records (i.e., is the record to be retained by NES or by the Client?).

5.2 MASTER RECORDS INDEX

5.2.1 The Master Records Index is a detailed listing of records which are stored in an NES records storage facility. It may be in the form of a list, a card file, a computer listing, or a combination of all three. The Document Control Supervisor is responsible for initiating and maintaining the Master Records Index of all record files in storage. This list provides the following:

a. Record identification.

b. Date of receipt or date of supplementation.

c. Location in the filing system.

d. Required retention period.

The Master Records Index lists each file of a record type appearing on a Project QA Records List or Generic QA Records List. The various items within a file need not be indexed (i.e., each individual's qualification folder must be on the Index, but an eye test in that folder need not appear on the list).

5.3 TRANSMITTAL

5.3.1 A transmittal form (Figure 1) is used to forward records to the Document Control Supervisor for storage. The responsible manager forwards one copy of records accompanied by a written transmittal to the Document Control Supervisor. The transmittal contains the following information:

a. An unambiguous identification of the record being transmitted.

1) Individual records are listed individually.

2) Serialized records may be listed either individually or by identifying the first and last item of a continuously serialized block of items.

b. Project records transmittals clearly identify the project (or project/task) with which they are to be filed.

c. Whether the record is a new file or an existing file (i.e., an eye test for a personnel certification already on file would be an existing file record).

d. That one copy is being forwarded.

e. The signature of the person transmitting the records. By signing the transmittal, the person transmitting the records is verifying and attesting that the records are legible, identified, in good condition, and complete.

f. The signature of the person receiving the records. By signing the transmittal, the person receiving the records is verifying and attesting that the copy of all records are legible, identified, in good condition, and complete.

g. If a record has already been placed in storage, and is to be revised, the revised copy is transmitted to the Document Control Supervisor with a note in the comments section of the transmittal to mark the existing record obsolete (void or superceded) and file it with the revised record.

5.3.2 Any individual regularly assigned to the Document Control Department may sign a transmittal receiving records for storage. The Document Control Supervisor uses the transmittal as the basis for updating the Master Records Index and maintains a copy of the transmittal as a working file for one year.

5.3.3 A written transmittal is used to change the location of a document in storage (e.g., to move an Inspection Record from one project file to another project file).

5.4 RETENTION PERIOD/CATEGORIES

5.4.1 All records to be retained by NES must have their retention period indicated on the applicable Project or Generic QA Records List. The basis for determining this period may be the project documents, the guidelines of ANSI or regulatory standards, or NES corporate policy. Any nonpermanent records must have a period of retention assigned to it. The designation of time for retention may be a fixed number of years after which the file may be disposed of or it may be defined as a number of years after a triggering event such as closeout of a specific project. The retention period for nonpermanent records is the period of time after which disposal or disposition of the record is permissible. Such disposal or disposition is not mandatory.

5.5 INDEX/FILING

5.5.1 Quality related project records to be retained by NES are individually listed on the Master Records Index and filed in the categories defined on the Project QA Records List. These records are filed by project and, if requested by the Project Manager, separated by task within the project.

5.5.2 Serialized items (e.g., Audit Reports) are shown individually on the Master Records Index. Numbered revisions to records are shown individually.

5.5.3 The logic for filing project records is determined by the Document Control Supervisor based on the Project QA Records List for that project and other instructions from the Project Manager.

5.5.4 Generic records are filed as follows:

a. Approved Vendors List - chronologically
b. Audit Reports - numerically
c. NES Nonconformance Reports - numerically
d. Trend Analysis Reports - chronologically
e. NES Corrective Action Requests and Audit Finding Reports - numerically
f. QA Indoctrination Session Records - chronologically
g. QA Management Assessment Reports - chronologically
h. Personnel Qualification (Certification) Records - individually and alphabetically by name
i. Generic procedures - numerically in individual files

j. Computer Program Qualification Records - numerically.

k. Purchase Orders - Numerically.

l. 10 CFR21 evaluations - Chronologically

5.5.5 The location of rolled documents, bound books, magnetic tapes, photographs, radiographs, and other records which cannot be practically filed in folders is indicated on the Master Records Index.

5.6 STORAGE

5.6.1 The NES office building is considered a storage area. In addition, there are two storage facilities. One facility is located in the NES building 3rd floor and the other in the Mezzanine section of the Building in the home office compound in Danbury. These buildings are located adjacent to each other with approximately 15 feet separation. However, due to type of construction, compartmentation and fire sprinkling system, the two (2) hour fire rating minimum is met. Both of these facilities have an indoor environment free from unusual dampness, temperature extremes, and rodent or insect infestation. These facilities are individually lockable. Also, the NES office building is continuously occupied during work hours. During non-working hours, the outside compound is patrolled by a guard service or the buildings are monitored electronically for unauthorized access. When not occupied by personnel who are authorized unescorted entry, the storage facilities are locked. The permanent distribution of keys to the storage cabinets and storage facilities is limited to those persons normally assigned to the Document Control department. Unescorted access to the storage facility is limited to:

a. Personnel regularly assigned to the Document Control department.

b. Personnel regularly assigned to the Quality Assurance department.

A list of personnel who are authorized unescorted access is posted at the entry to both facilities by the Document Control Supervisor and updated as required. Other personnel are permitted access to record storage facilities only when escorted by an NES employee who has been authorized such access.

Non-employees of NES are not authorized to remove records from a storage facility. This is not intended to limit their access to records within the facility or prohibit their receiving copies of records.

All records are stored in lockable steel cabinets. Items are not stored as loose sheets of paper but bound in folders (e.g., AVCO fasteners or staples) or notebooks. Rolled drawings and other odd-shaped records are stored in lockable steel cabinets, but need not be bound.

6. PROCEDURE

6.1 Managers responsible for forwarding records to the Document Control Supervisor, complete a transmittal form as specified in paragraph 5.3. The manager specifies the storage location of these records (i.e., mezzanine section or mezzanine and third floor storage).

The primary use location is considered a secure storage, and one copy is forwarded for duplicate storage in the mezzanine section. If the primary copy is inactive, then it may be forwarded to the third floor storage.

6.2 The manager assures that one copy of each record is attached to the transmittal and forwards the transmittal and record copies to the Document Control Supervisor.

6.3 The Document Control Supervisor reviews the records to assure that the transmittal is correct and records received agree with the transmittal. The transmittal is signed by the Document Control Supervisor and a copy forwarded to the originator.

6.4 The Document Control Supervisor logs the information from the transmittal onto the Master Records Index as required in paragraphs 5.2 and 5.5.

6.5 The records are filed in accordance with the Master Records Index and the transmittal form.

6.6 Any document that is within the control of Document Control may be transmitted to storage with the use of a print order form. Document Control would then automatically issue a controlled copy to storage.

6.7 Each revision of drawings is microfilmed or copied and placed in storage by Document Control.

7. STORAGE

7.1 Records received by the Document Control Supervisor are stored within seven calendar days of receipt.

7.2 Storage is in accordance with the requirements of this procedure.

7.3 Records which are discovered to be missing or damaged are replaced by the person that originally placed the record in storage. A report of each such incident is made by the Document Control Supervisor and kept as a working file for two years. The Quality Assurance Manager periodically reviews these reports and takes corrective action as necessary. If the record cannot be replaced, the matter is treated as a nonconformance.

7.4 Any indication of larceny, vandalism, or extensive damage to records is investigated by the Quality Assurance Manager and corrective action taken as necessary.

APPENDIX A

GENERIC QUALITY ASSURANCE RECORDS LIST

Quality Assurance Department Records	Retention Period (yrs)	Disposal Trigger Event
Approved Vendors List	3	Date of issue
Audit Reports and Audit Finding Reports	3	Date of issue
Audit Schedules	1	Date of issue
NES Nonconformance Reports	Lifetime	
Trend Analysis Reports	3	Date of issue
NES Corrective Action Requests	3	Date of issue
QA Indoctrination Records	3	Date of record
QA Management Assessment Reports	3	Date of issue
QA Implementing Procedures	3	Date of removal from active use
Purchase Orders		
Category 1	3	Date of issue
Category 2	3	Date of issue
10CFR21 Evaluations	Lifetime	Date of issue
NES-wide Records		
Personnel Qualification Record	3	Date of Termination
NDE Personnel (incl visual)		
Inspectors		
Auditors		
QA/QC Specialists		
Computer Program Qualification Records	Lifetime	Date of issue

nes
A UNIT OF Quillcorp

DUPLICATE STORAGE TRANSMITTAL FORM

Number: ______

Transmitted to: Document Control Department   Page ______ of ______

NES Project No.: ______   Department No.: ______

Attached for duplicate storage are the following documents and/or records.

Title	Quantity	Retention Period	Existing File	New File

SAMPLE ONLY
SIMILAR VERSIONS WHICH
REQUIRE THE SAME
INFORMATION ARE ACCEPTABLE

Comments and/or Special Instructions: ______

Transmitted by: ______ Date: ______
Receipt
Acknowledged by: ______ Date: ______

Document Control File

FIGURE 1

J. CORRECTING GROUND-WATER ELEVATION IN THE PRESENCE OF SEPARATE-PHASE PRODUCT

INFORMATION ONLY

NES, Inc.

Title: Standard Operating Procedure for Correcting Ground-Water Elevations for the Presence of Separate-Phase Product

Number: SOP-017-002

Date: March 11, 1993

Revision Number: 0

1.0 Purpose

When preparing data tables or maps, you must first correct ground-water elevation measurements for the presence of separate-phase product (i.e., oil, gasoline, etc.). Only corrected water-table elevations should be used to evaluate ground-water flow at a site. The procedure for performing the correction is described below.

2.0 Procedure

To determine the total hydraulic head (water-table elevation) in a monitoring well containing separate-phase product, the measured thickness of the hydrocarbon layer must be adjusted to an equivalent water thickness. This is accomplished by using the following formula:

$$CGWE = MGWE + (PT \times PD)$$

where:

MGWE is the water level measured in the well relative to a specified datum;
PT is the product thickness measured in the well;
PD is the density of the product in the well relative to ground-water; and
CGWE is the corrected ground-water elevation.

For example, if the hydrocarbon thickness measured in a well is 0.75 feet (ft), the relative density of the hydrocarbon is 0.80, and the measured ground-water elevation is 14.56 ft above mean sea level, then the corrected ground-water elevation is 15.16 ft above mean sea level. Notice that there are no units for density because the value is relative to the density of water. Water has a density of 1.00 at a temperature of 4° Celsius. However, be aware that the density of liquids, including hydrocarbons, will vary with temperature (density decreases with increasing temperature in most hydrocarbons).

The American Petroleum Institute (API) reports densities for petroleum products in their 1989 publication, A Guide to the Assessment and Remediation of Underground Petroleum Releases. Copies of the reference and the reported densities are attached. When you do not have specific density data on a type of product at a site, you can use the densities provided in the API report to perform water-table elevation corrections. Always cite the reference and density value used in a calculation as a footnote at the bottom of any data summary table generated for a report.

K. REVIEWING DATA TABLES

ENVIRONMENTAL SERVICES
STANDARD OPERATING PROCEDURE

REVIEWING DATA TABLES

Project Number: NES/Generic	Copy No.	Assigned To:

APPROVALS					
TITLE / DEPT. - SIGNATURE - DATE					
REV NO.	PREPARED BY	DOCUMENT REVIEW	PROJECT MANAGER	DEPARTMENT MANAGER	VICE PRESIDENT/ GENERAL MANAGER
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1.0 PURPOSE

Data tables are reviewed to confirm that the original data have been correctly handled and processed such that its further use on the project is acceptable. In addition, all presented reference material (e.g., soil cleanup levels) are checked to ensure that data are appropriately evaluated. Moreover, the spelling of chemical compounds, as well as other text in the table, must be proofed to prevent uncertainty with regard to reported results.

2.0 PROCEDURE

2.1 The Project Manager assigns one individual as the Data Processor and one as the Data Reviewer.

2.2 The Data Processor supplies the designated Data Reviewer with **copies** of both the data originals and the processed data, i.e., the data summary table in draft form. Originals (i.e., analytical reports received from the lab), should **not** be used (i.e., marked up) during the data review process. The Data Processor is also responsible for providing a copy of any reference material from which evaluation criteria (e.g., soil cleanup standards) were obtained.

2.3 The Data Reviewer marks the processed data copy (i.e., the draft data summary table) with a check mark in non-red ink for all items he/she approves. Items shall include all data, calculations, reference standards, compound names, notes and titles.

2.4 If the Reviewer disagrees with any item, for any reason, the he/she crosses through the item with a red marker and writes the recommended correction next to it.

2.5 The Reviewer manually initials and dates all pages of the material reviewed as follows: Chk'd by: JD, 7/3/98.

2.6 The Reviewer returns the data to the originator (the Data Processor) who reviews all recommended corrections. If disagreements result, the Data Processor confers with the Reviewer or, if necessary, the Project Manager until all differences are resolved.

2.7 The Data Processor corrects the processed data using the agreed-to changes. There should be no need to alter data items marked in non-red ink by the because these items are presumably correct. If previously approved data items are changed, the entire procedure must be repeated.

2.8 The Data Processor gives the newly revised data and the previously checked copies to the reviewer who compares them to assure all agreed-to corrections have been made.

2.9 When the Reviewer is satisfied, he/she initials and dates the final copy of the processed data. The information in the left header of all data tables which are placed in the final report must be completed as shown in the following example.

Prepared by:
Date:
Checked by:
Date:

Table 1
ACME Company
Turnpiketown, NJ
Well Purging Summary Table
February 23, 1993 Sampling Event
(Pre-Purge Data)

Monitoring Well Location	Well Permit Number	Date	Weather Conditions	PID Reading	Depth of Well **	Diameter of Well	Depth to Screen	Depth to Water	Estimated Volume of Well	Thickness of Free Product
MW-4	24-24967	2/23/93	Sunny mid 30s	0.00	41.20'	4"	19.2'	16.04'	18.38'	NPD
MW - 5	24-24968	2/23/93	"	3.70	47.30'	4"	18.9'	16.74'	19.94'	NPD
MW-6	24-29404	2/23/93	"	14.90	66.48'	2"	45'	21.54'	7.33'	NPD
MW-7	24-24969	2/23/93	"	28.10	42.40'	4"	16.6'	14.34'	18.31'	NPD
MW-9	24-27556-5	2/23/93	"	3.10	42.60'	4"	17'	17.2'	16.58'	NPD
EMW-15A	24-28143	2/23/93	"	1.90	33.75'	2"	12'	7.66'	4.26'	NPD
MW-8	24-30052	2/23/93	"	0.00	36.95'	4"	25'	27.36'	6.26'	NPD

NPD : No Product Detected
DTW : Depth to Water
TOC : Top of Inner Casing
* : Wells were either sampled within approximately two hours of purging or were allowed to recover if well was purged dry
below land surface.

2.10 Original checked and signed data tables must be retained with report originals, whether submitted to NES Document Control or not. Under no circumstances should processed data be altered after a document becomes controlled without following the procedures for revisions to controlled documents (NES Document No. 80A9003). If it is more advantageous to revise processed data without reissuing a controlled document, an errata sheet must be prepared, formally checked and issued as a separate document through the NES Document Control System.

L. SAMPLING A MONITORING WELL

NES, Inc.

ENVIRONMENTAL SERVICES
STANDARD OPERATING PROCEDURE

SAMPLING A MONITORING WELL

Project Number: NES/Generic	Copy No.	Assigned To:

APPROVALS					
TITLE / DEPT. - SIGNATURE - DATE					
	PREPARED BY	DOCUMENT REVIEW	PROJECT MANAGER	DEPARTMENT MANAGER	VICE PRESIDENT/ GENERAL MANAGER
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1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish the guidelines for the sampling of ground-water monitoring wells for total and dissolved constituents. As part of the SOP for the sampling of ground-water monitoring wells, sample collection equipment and devices must be considered, and equipment decontamination and pre-sampling procedures (e.g., measuring water levels, sounding wells, and purging wells) must be implemented. Sampling objectives must be firmly established in the work plan before considering the above.

The following SOP is stringent in that it is largely adapted from the New Jersey Department of Environmental Protection and Energy's (NJDEPE) *Field Sampling Procedures Manual, May 1992*. However, in determining well sampling procedures on a site-specific basis, state and Federal regulatory and agency requirements and guidance must be considered. Decontamination procedures must be in compliance with state and/or Federal protocols in order that regulatory agency scrutiny of the procedures and data collected do not result in non-acceptance (invalidation) of the work undertaken and data collected.

2.0 EQUIPMENT AND MATERIALS

2.1 In order to sample ground water from monitoring wells, specific equipment and materials are required. The equipment and materials list may include, but is not necessarily limited to, the following:

a. bailers (Teflon™ or stainless steel);
b. pumps (centrifugal, peristaltic, bladder, electric submersible, bilge, hand-operated diaphragm, etc.);
c. appropriate discharge hose;
d. appropriate discharge tubing (e.g., polypropylene, Teflon, etc.) if using a peristaltic pump;
e. appropriate compressed gas if using bladder -type or gas-displacement device;
f. portable generator and gasoline or alternate power supply if using an electric submersible pump;
g. non-absorbent cord (e.g., polypropylene, etc.);
h. plastic sheeting;
i. applicable field forms (e.g., groundwater sampling field worksheet, groundwater pumping field worksheet well inspection worksheet, etc.) and field notebook;
j. well location and site map;
k. stop watch, digital watch with second increments, or watch with a second hand;
l. well keys;
m. black pen and water-proof marker;
n. tools (e.g., pipe wrenches, screwdrivers, hammer, pliers, flashlight, pen knife, etc.);
o. appropriate health and safety equipment, as specified in the site health and safety plan (HASP);
p. pH meter(s) and buffers;
q. conductivity meter(s) and standards;
r. dissolved Oxygen (DO) meter;

s. thermometer(s);

t. extra batteries (for meters, thermometers, flashlight, etc.);

u. filtration apparatus, filters, pre-filters;

v. plastic ware (e.g., pre measured buckets, beakers, flasks, funnels);

w. disposable gloves; and

x. reference copies of site sampling and analysis plan (SAP) and HASP.

3.0 EQUIPMENT DECONTAMINATION

For each sampling event, all field measurement and sampling equipment that will enter a well must be cleaned (refer to NES Document No. 82A8496) prior to its entry into the well.

4.0 CALIBRATION OF FIELD ANALYSIS EQUIPMENT

Calibrate field analysis equipment (e.g., thermometers, pH, conductivity and dissolved oxygen meters, etc.) before use or as required in the manufacturer's manual for the instrument. Refer to the SOP for field analysis for measuring temperature, ph, dissolved oxygen and turbidity of water samples (NES Document No. 82A8497) and other applicable SOPs as appropriate. Document, initial and date the calibration procedures on the appropriate field form, and in the field notebook.

5.0 PROCEDURE

5.1 Purge the well prior to sampling (refer to NES Document No. 82A8498). The well should be pumped or bailed in accordance with the workplan.

5.2 If well has been pumped to near dryness, the well should be allowed to recover to a volume sufficient for sampling. In general, sampling should take place within two hours of purging; however, for wells with slow recharge, the two hour limit may be exceeded to allow for sufficient recovery of the water volume.

5.3 Record the physical appearance of the purge water (i.e., color, turbidity, odor, etc.) on the appropriate field form. Note any changes that occur during the purging.

5.4 If a bailer is used to collect the sample, then:

a. Flush the decontaminated bailer three times with distilled/deionized water.

b. Tie dedicated non-absorbent cord (polypropylene) to the bailer with a secure knot and then tie the free end of the bailer cord to the protective casing or, if possible, some nearby structure to prevent losing the bailer and cord down the well.

c. Lower the bailer slowly down the well and into the water column to minimize the disturbance of the water surface. If a bottom filled bailer is used, then do not submerge the top of the bailer; however, if a top filling bailer is used, then submerge the bailer several feet below the water surface.

5.5 If a pump is used to collect the sample, then use the same pump used to purge the well. If need be, reduce the discharge rate to facilitate filling sample containers and to avoid problems that can occur while filling sample containers. Alternately, the purge pump can be removed and a thoroughly decontaminated bailer can be used to collect the sample.

5.6 When sampling, remove the cap from each container, pour in the sample and replace and secure the cap immediately.

5.7 Fill each appropriate, pre-labeled sample container carefully and cautiously to prevent: 1) agitating or creating turbulence; 2) breaking the container; 3) entry of, or contact with, any other medium; and 4) spilling/splashing the sample and exposing the sampling team to contaminated water. Immediately place the filled sample container in an ice-filled (wet ice or blue pack) cooler for storage.

5.8 If VOCs are being tested for, then,"top off" containers and tightly seal with Teflon™-lined septums held in place by open-top screw caps to prevent volatilization. Ensure that there are no bubbles by turning the container upside down and tapping it gently.

5.9 Filter water samples collected for dissolved metals analysis prior to preservation to remove the suspended sediment from the sample (see NES Document No. 82A8499 for procedure). In the event that the regulatory agency wants unfiltered samples for metals analysis, a second set of filtered samples should also be collected. Because unfiltered samples indicate total metals (dissolved and suspended), they may not be representative of aquifer conditions because ground water does not transport sediment (except in some rare cases). Thus, the results for dissolved metals in ground water should be based on filtered samples, even if both filtered and unfiltered sets are presented in a report.

5.10 Add any necessary preservative(s) to the appropriate container (s) prior to, or after (preferred), the collection of the sample, unless the appropriate preservative(s) have already been added by the laboratory before shipment.

5.11 As required, record the start and end time for sampling and the sampling method (e.g., bailer or pump). Measure and record pH, dissolved oxygen, temperature, and specific conductivity, if required.

5.12 Complete all necessary field worksheets and chain-of-custody forms. Secure the cooler with sufficient packing tape and a custody seal.

M. MEASURING WATER LEVELS AND SOUNDING A WELL WITH A STEEL TAPE

ENVIRONMENTAL SERVICES
STANDARD OPERATING PROCEDURE

MEASURING WATER LEVELS AND SOUNDING A WELL WITH A STEEL TAPE

Project Number: NES/Generic	Copy No.	Assigned To:			
APPROVALS					
TITLE / DEPT. - SIGNATURE - DATE					
REV NO.	PREPARED BY	DOCUMENT REVIEW	PROJECT MANAGER	DEPARTMENT MANAGER	VICE PRESIDENT/ GENERAL MANAGER
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1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes the guidelines for utilizing a steel measuring tape in the field to determine the depth to water (DTW) or to measure the total depth of a well, below an established (i.e., surveyed) measuring point (MP). The DTW measurements can be used to construct ground-water elevation maps and determine the direction of ground-water flow. Determining the total depth of a well is necessary for calculating the total volume of water standing in the well. The total depth measurements can be used to determine if the wells are silting in (i.e., filling with sediment) or if the well has been damaged, and can also be used for identification purposes if several wells of different depths are in close proximity to one another.

The steel tape method of ground-water measurement is an accurate method of measure for static water conditions. Rapidly fluctuating ground water conditions, such as those encountered during a pump test or while purging a well, require an electronic water-level indicator. Note: the same device and method should be used during a round of measurements to ensure precision and consistency.

2.0 EQUIPMENT

Steel tape with brass (14 oz.) or stainless steel (16 oz.) weight, carpenters chalk, Alconox™ detergent or equivalent, distilled or deionized water, paper towels, black-ink pen and field book.

3.0 DECONTAMINATION

The steel tape must be cleaned before initial use and before each well measurement in the field to avoid cross contamination of the wells. At a minimum, the end weight and any portion of the tape that comes in contact with the fluid in the well is to be wiped with a dedicated paper towel and rinsed with distilled or deionized water. If free product is encountered in the well, then the tape should be cleaned by wiping the free liquid off with a paper towel, scrubbing with a non-phosphate, laboratory grade detergent and rinsing with copious amounts of distilled or deionized water.

4.0 PROCEDURE

4.1 If available, consult previous measurements for the well(s) to obtain an idea of the depth to ground water and the distance to the bottom of the well. Locate the well and remove the well cap. It may be necessary to wait for several minutes for the water level in the well to equilibrate if the well has an air-tight seal.

4.2 Attach the weight to the end of the tape. Make sure to account for the extra distance of the weight on the end of the tape. If taking a water-level measurement, apply carpenters chalk to the bottom few feet of the tape. Lower the tape down the well, making sure that the tape is not binding in the well. Resistance will be felt when the tape breaks the water surface. Hold the tape on an even foot increment mark and lower this point to the *marked measuring point on the PVC well casing*. If no mark exists on the PVC casing, take the measurement on the PVC casing and record where the measurement was taken The tape can then be removed from the well and the wet/dry interface point on the tape can be read. Subtracting the point at which the tape was held from the wet/dry interface point will give the DTW reading. Take a second measurement to be sure that this reading is accurate. Water levels can be accurately measured to the nearest 0.01 foot.

4.3 The "popper/plunker" of ground-water measurement may also be used. This method involves the use of a tape with a fairly large-diameter flat weight attached to the end of the tape. Record the distance from the end of the tape to the bottom of the weight, and add this distance to any measurement obtained. The idea is that a "popping" or "plunking" noise will be heard when the water surface is reached. The DTW measurement is read directly from the tape at the marked point on the PVC, and "plunk" the surface several times to get an accurate measurement

4.4 Record all DTW measurements in the field log book.

4.5 If the PVC well pipe is too far down the well to obtain a proper measurement, the measurement can be obtained from the top of the curb box (well cover). A ruler can be used to measure the distance from the measured point on the curb box to the PVC casing. The ruler and tape must always be held straight and perpendicular to land surface to ensure that accurate vertical measurements are collected. Record these distances in the log book.

4.6 The total depth of the well (TD) can be obtained by letting the weight drop to the bottom of the well and feeling for the point where the probe reaches the bottom. Record this measurement.

4.7 Subtracting the DTW from the TD will give the height of standing water in the well. The volume of standing water in the well can then be calculated by multiplying the height of standing water by the proper multiplication factor. The volume of standing water calculation is necessary to determine the correct volume of water to purge from the well prior to ground-water sampling. The SOP for purging a well (NES Document No. 82A8498) provides a detailed description for calculating well purge volumes.

4.8 At sites lacking historical data or where there is reason to suspect that water levels fluctuate due to nearby pumping, tidal effects or other causes, it is advisable to collect a second water-level measurement from the earliest (first) well measured during the round. Comparison of the two measurements will determine if water levels have changed significantly during the course of the measuring round.

4.9 Before leaving the site, check all recorded field measurements against previously existing data for inaccuracies. Discrepancies can indicate equipment or procedure problems during measurement collection. Re-measure those wells where an error is suspected.

4.10 Water-level elevations are calculated by subtracting the DTW from the established MP for that well. The water-level elevations can then be used to construct ground-water flow (contour) maps. Always check the ground-water flow maps against previous maps developed for the site or regional maps published for the area. The ground-water flow patterns shown in the current map should agree with historical and regional maps, unless hydrogeologic conditions at the site have changed significantly over time.

N. MEASURING WATER LEVELS AND SOUNDING A WELL WITH AN ELECTRONIC INDICATOR

ENVIRONMENTAL SERVICES
STANDARD OPERATING PROCEDURE

MEASURING WATER LEVELS AND SOUNDING A WELL WITH AN ELECTRONIC INDICATOR

Project Number: NES/Generic		Copy No.		Assigned To:	
APPROVALS					
TITLE / DEPT. - SIGNATURE - DATE					
REV NO.	PREPARED BY	DOCUMENT REVIEW	PROJECT MANAGER	DEPARTMENT MANAGER	VICE PRESIDENT/ GENERAL MANAGER
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1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes the guidelines for utilizing an electronic water-level indicator (WLI) in the field to accurately and uniformly determine the depth to water (DTW) below an established (surveyed) measuring point (MP). The information obtained by using a WLI can be utilized to construct ground-water elevation maps and determine the direction of ground-water flow.

2.0 EQUIPMENT

WLI, Alconox™ detergent or equivalent, distilled/deionized water, measuring tape or ruler, paper towels, black-ink pen and field log book are required.

3.0 DECONTAMINATION

The WLI must be cleaned before initial use and before each well measurement in the field to avoid cross contamination of the wells. At a minimum, the probe on the WLI is to be wiped with a dedicated paper towel and rinsed with distilled/deionized water. If free product such as oil is encountered in the well, then the WLI should be cleaned by wiping the probe with a paper towel, and scrubbing with a non-phosphate, laboratory grade detergent and rinsing with copious amounts of distilled/deionized water.

4.0 CALIBRATION

Before going into the field, the WLI should be checked to ensure that it is in proper working condition. Turn the unit "on" and check the batteries; immerse the probe in a bucket of potable water to be sure that the indication system (beepers, lights, or both) is working correctly. Use a steel tape to ensure the measuring increment marks are accurate and check the tape for kinks or stretching. Note: the same device and method should be used to complete a round of measurements to ensure precision and consistency.

5.0 PROCEDURE

5.1 If available, consult previous measurements for the well(s) to obtain an idea of the depth to ground water. Locate the well, and remove the well cap. It may be necessary to wait for several minutes for the water level in the well to equilibrate if the well is sealed air tight.

5.2 Turn the WLI on, and lower it (probe end first) into the well. Make sure that the tape hangs freely under its own weight and is not binding or twisting in the well. The detection system will be activated when the detection part of the probe crosses the air/water interface. This reading is the DTW. The DTW is read from a marked measuring point (MP), usually on the PVC casing of the well. If no mark exists on the PVC casing, take the measurement on the PVC and record where the measurement was taken (usually either the northernmost or highest point on the casing is selected). Take a second measurement to be sure that this reading is accurate. If the instrument is marked in one foot increments, grab the tape at the measurement point and measure the point from the nearest increment mark using a graduated ruler. Water levels must be accurately measured to the nearest 0.01 foot.

5.3 Record all DTW measurements in the field log book.

5.4 If the PVC casing is too far down the well to obtain a proper measurement, obtain a measurement from the top of the curb box (well cover), and use a ruler to measure the distance from the measured point on the curb box to the PVC casing. The ruler and tape must always be held straight and perpendicular to land surface to ensure that accurate vertical measurements are collected. Record these distances in the log book.

5.5 The total depth of the well (TD) can be obtained by slowly allowing the probe to drop to the bottom of the well and feeling for the point where the probe reaches the bottom. Care should be exercised to avoid damaging the probe during this procedure. Record this measurement.

5.6 Subtracting the DTW from the TD will give the height of standing water in the well. The volume of standing water in the well can then be calculated by multiplying the height of the standing water column by the proper multiplication factor. Calculating the volume of standing water in a well is necessary when purging the well prior to ground-water sampling. The SOP for purging a well (NES Document No. 82A8498) provides a detailed description for calculating well purge volumes.

5.7 At sites lacking historical data or where there is reason to suspect that water levels fluctuate due to nearby pumping, tidal effects or other causes, it is advisable to collect a second water-level measurement from the earliest (first) well measured during the round. Comparison of the two measurements will determine if water levels have changed significantly during the course of the measuring round.

5.8 Before leaving the site, check all recorded field measurements against previously existing data for inaccuracies. Discrepancies can indicate equipment or procedure problems during measurement collection. Re-measure those wells where an error is suspected.

5.9 Water-level elevations are calculated by subtracting the DTW from the established MP for that well. The water-level elevations can then be used to construct ground-water flow (contour) maps. Always check the ground-water flow maps against previous maps developed for the site or regional maps published for the area. The ground-water flow patterns shown in the current map should agree with historical and regional maps, unless hydrogeologic conditions at the site have changed significantly over time.

O. SAMPLE HANDLING

Title: Standard Operating Procedure for Sample Handling

Number: SOP-017-005

Date: October 26, 1993

Revision Number: 2

LIST OF REVISIONS

0. Issued final on April 22,1993
1. Changes include use of ice bath to flash cool samples before packing them into the cooler for shipment to the laboratory. Revision issued on July 22, 1993.
2. Corrected two typographical errors. Revision issued on October 26, 1993.

1.0 Purpose

The purpose of this Standard Operating Procedure (SOP) is to establish guidelines for sample handling that will aid in achieving consistent methods of data collection. This SOP is designed to ensure that once samples are collected, they are preserved, packed and delivered in a manner that will maintain the utmost sample integrity. While the following procedures are appropriate for most sampling events, applicable local, state and Federal sample handling protocols and guidelines must be reviewed and considered. If necessary, modifications to the SOP can be addressed on a site-specific basis. Any modification must be clearly stated in the work plan or field sampling plan prepared for the site; these documents will always take precedence over the SOP.

2.0 Considerations

2.1 Sample Containers

Prior to the sampling event, consideration must be given to the type and number of containers that will be used to store and transport the samples. The sample matrix, the analytical method, the laboratory's quality assurance/quality control (QA/QC) requirements, potentially present contaminants and local, state or Federal regulatory requirements factor into the selection of a sample container. Typically, the contracted laboratory will select and provide the appropriate number and type of sample containers based upon the analytical methods and scope of work requested. Prior to sampling, make sure that the laboratory is clear on the scope of work and the objectives of the project. When performing non-routine sampling, it is also recommended that the sampling crew request instructions from the laboratory regarding the volume of sample required (e.g., matrix spike analyses for soil require extra samples), the proper filling and preserving of sample containers and the type and number of containers supplied per analytical parameter.

As a general guide, the attached table provides a list of common analytical parameters with corresponding sample containers as specified by USEPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846 (EPA/530-SW-846.3-1). Sample container selection is usually based upon some combination of the following criteria:

a. Reactivity of Container Material with Sample

For sampling potentially hazardous material, glass is the recommended container type because it is chemically inert to most substances. Plastic containers are not recommended for most hazardous wastes because the potential exists for contaminants to adsorb to the surface of the plastic or for the plasticizer to leach into the sample. Metals species will adhere to the sides of glass containers in an aqueous matrix; therefore, plastic bottles (e.g., nalgene) must be used. If metals analyses are to be performed along with other analyses, then a separate plastic bottle must be used. In the case of a strong alkali waste or hydrofluoric solution, plastic containers may be more suitable because glass containers may be etched by these compounds and create adsorptive sites on the surface of the container.

b. Volume of the Container

The volume of sample to be collected will be dictated by the analytical method and the sample matrix. Individual laboratories may provide larger volume containers or request multiple containers for a sample to ensure sufficient sample for duplicates or other QA/QC checks. Wide mouth containers are recommended to facilitate transfer of the sample from the sampler into the container without spillage or sample disturbance. Aqueous samples analyzed for volatile organic compounds (VOCs) must be placed in 40-milliliter (ml) glass vials with polytetrafluoroethylene (PTFE) (e.g., Teflon™) septum. Non-aqueous samples for VOC analysis should be collected in the same type of vials or in wide mouth 4-ounce (oz.) jars. These jars should have PTFE-lined screw caps.

c. Color of Container

Whenever possible, amber glass containers should be used to prevent photodegradation of the sample, except when samples are being collected for metals analyses. If amber containers are not available, then containers holding the samples should be protected from light (i.e., placed in cooler with ice immediately after filling).

d. Container Closures

Container closures (i.e., caps and lids) must screw on and off the containers and form a leak-proof seal. Container caps must not be removed until the container is ready to be filled with the sample and the container cap must be replaced immediately after filling. Container caps should be constructed of a material that is inert with respect to the sampled material, such as PTFE. Alternately, the caps may be separated from the sample by a closure liner that is inert to the sample material. If soil or sediment samples are being collected, the threads of the container must be wiped clean with dedicated paper towels (or Kimwipes™) so the cap can be properly threaded.

e. Decontamination of Sample Containers

Sample containers should be laboratory pre-cleaned, preferably by the laboratory performing the analysis. (The cleaning procedure will be dictated by the specific analysis to be performed on the sample.) Sample containers should be examined upon receipt to ensure that each appears clean. Do not mistake any preservative that was already deposited in the sample container by the laboratory for unwanted residue. Sample bottles received from a laboratory should not be field cleaned. If there is any question regarding the integrity of the bottle, the laboratory should be contacted and the bottle(s) replaced.

f. Sample Bottle Storage and Transportation

Extreme care should always be taken to avoid contamination of the sample bottles. Sample shuttles or coolers and sample bottles must be stored and transported in clean environments. Sample bottles and clean sample equipment should never be stored near solvents, gasoline or other equipment that is a potential source of cross contamination. When under chain of custody, sample bottles should either be custody sealed in a cooler or shuttle that is secured inside a locked vehicle or other designated secure area, or in the presence of authorized personnel.

2.2 Sample Filtering

Aqueous samples collected for dissolved metals analyses may require filtering to remove suspended sediment from the sample. Filtering must be performed prior to preserving the sample. If the sample container received from the laboratory contains preservative, then an interim container must be used to transport the sample from the collection point to the filtering apparatus. To ensure that interim containers are contaminant free, they should be supplied by the laboratory.

2.3 Decontamination of Sampling Equipment

Refer to the SOP for the Decontamination of Field Equipment (SOP-017-008) for guidance on decontamination of re-usable sampling equipment.

2.4 Quality Assurance/Quality Control Samples

QA/QC samples are intended to provide control over the proper collection and subsequent review and interpretation of analytical data. Refer to the SOPs for Collection of Quality Control Samples (SOP-017-007) and Field Record Keeping (SOP-017-006) for detailed guidance concerning these procedures.

2.5 Sample Preservation Requirements

Certain analytical methods require that the sample be preserved in order to stabilize and maintain sample integrity. Many laboratories provide pre-preserved bottles as a matter of convenience and to help ensure that samples will be preserved immediately upon collection. Care must be exercised not to overfill sample bottles containing preservatives to prevent the sample and preservative from spilling, thereby diluting the preservative.

When samples are preserved in the field, special care must be taken. The transportation and handling of concentrated acids in the field requires additional preparation and adherence to appropriate preservation procedures. All preservation acids used in the field should be trace-metal or higher grade.

2.6 Sample Labels

Sample labels should be provided with the sample containers, but this should be verified with the laboratory. If desired, labels may be pre-printed by computer with blanks provided for variable information collected in the field. If necessary, masking tape may be used for labels in the field, but this practice should be avoided. Sample containers should always be labeled prior to filling to avoid problems associated with marking wet or dirty paper. Indelible ink markers should be used for labeling and labels should be covered with clear tape.

At a minimum, sample containers will be labeled with the following information:

site name;
IES project number;
initials of sampler;
sample identification code;
analytical method;
date and time of collection; and
preservative added (if applicable).

The sample identification code marked on each sample label will follow the coding system described below.

1. Sample type (medium) abbreviation will be as presented below.

ground water sample	=	GW
surface water sample	=	SW
sediment sample	=	SED
solid waste sample	=	WASTE
waste water sample	=	WW
chip sample	=	CHIP
wipe sample	=	WIPE
soil sample	=	SOIL
influent sample	=	INF
effluent sample	=	EFF
air sample	=	AIR
dust sample	=	DUST

2. Sample location abbreviation will use the identifier system established for the site. Examples of sample location abbreviations are presented below.

soil boring	=	"SB-" followed by the designated number of the boring
monitoring well	=	"MW-" followed by the designated number of the well
surface water	=	"SW-" followed by the designated number of the sampling location
surface soil	=	"SS-" followed by the designated number of the sampling location
sediment	=	"SD-" followed by the designated number of the sampling location
discharge outfall	=	"OF-" followed by the designated number of the outfall location
air	=	"AS-" followed by the designated number of the air station

3. Where applicable, depth intervals will be designated in feet or tenths of a foot (e.g., 0.5-1.0 ft).

4. Analytical parameter designations will be abbreviated as presented below.

volatile organic compound	=	VOC
semivolatile organic compound	=	SVOC
polychlorinated biphenyl	=	PCB
pesticide	=	PEST
metals	=	METAL
non-metallic inorganic	=	INO
geotechnical	=	GA

5. Quality control qualifiers will be abbreviated as presented below.

field replicate	=	R
trip or travel blank	=	TB
field or rinsate blank	=	FB
matrix spike and matrix spike duplicate	=	MS/MSD

For example, the designation "SOIL/SB-10/12-14/VOC" would indicate that the sample was a soil sample collected at Soil Boring SB-10, that it was collected at a depth interval of 12 to 14 feet below land surface, and it was selected to be analyzed for volatile organic compounds. A sample designated "GW/MW-10/R/SVOC" would indicate a replicate sample of ground water collected from Monitoring Well MW-10 and selected to be analyzed for semivolatile organic compounds.

Occasionally, the contracted laboratory supplies preprinted or bar-coded labels on the sample containers. These labels are acceptable; however, care must be exercised to ensure that coded-alike containers do not get confused with other similar containers. The sampler should initial and record the time and date on each container in a blank portion of the label or on a separately attached label.

2.7 Chain-of-Custody Forms

Sample shuttles are to be accompanied by a properly completed chain-of-custody form. The designation for each sample container placed in a shuttle will be listed on the chain-of-custody form. When transferring the possession of samples, the individuals relinquishing and receiving the shuttle will sign, date, and note the time on the form.

Typically, chain-of-custody forms are prepared in triplicate, with an original and two carbon copies. The original and one carbon copy accompany the sample shuttle, and the second carbon copy is retained by the sampler for the project files. Before separating, the carbon copies should be examined to ensure that all information is legible. Forms should be prepared using a hard, flat surface and black-ink ball-point pen. If necessary, retrace illegible information.

All shipments will be accompanied by a chain-of-custody record identifying the contents. If the samples are sent by common carrier, a bill of lading (airbill) must also be used. Bill of lading receipts must be retained as part of the permanent chain-of-custody documentation. Commercial carriers are not required to sign off on the custody form as long as the forms are sealed inside the sample cooler and the custody seal remains intact.

2.8 Sample Packing

All samples should be organized and the labels checked for accuracy. The caps should be checked for tightness. Any irregularities concerning the condition of the samples or containers should be noted on the chain-of-custody form. The bottles must be carefully packed to prevent breakage during transport. If there are any samples known or suspected to be highly contaminated, they should be packaged individually to prevent cross-contamination. Sufficient ice packs should be placed in the cooler to maintain the temperature at 4 degrees Celsius (°C) until delivery to the laboratory. (Consult the work plan to determine if a particular cooling agent is specified for preservation (e.g., the United States Environmental Protection Agency does not condone the use of blue packs because they claim that the samples will not hold at 4°C.) The chain of custody form should be properly completed, placed in a "zip-loc" bag and placed in the cooler. One copy must be maintained for the project file. The cooler should be sealed with strapping tape and a custody seal. The cooler drains should be taped shut to prevent leakage. The custody seal number should be noted in the field book or on the chain of custody form.

2.9 Sample Delivery

Samples should be delivered to the laboratory within 24 hours of collection. If samples are shipped prior to or on a weekend or holiday, the laboratory should be contacted to confirm that someone will be available to accept delivery. Check the work plan to determine whether a shorter delivery time is imperative.

3.0 Equipment and Materials

3.1 General Equipment

a. Sample bottles of proper size and type
b. Cooler with ice (wet or blue pack)
c. Field notebook, appropriate field form(s), chain of custody form(s), custody seals
d. Black pen and indelible marker
e. Packing tape and "zip-loc" bags
f. Overnight shipping forms and laboratory address
g. Health and Safety plan (HASP)
h. Work plan/scope of work
i. Pertinent SOP's for specified tasks and their respective equipment and materials
j. Container labels
k. Ice bath (cold water and ice in a small, leak-proof cooler)

3.2 Preservatives

Preservatives for specific samples/analytes, as specified by the laboratory. Preservatives must be stored in secure spill-proof glass containers with their content, concentration, and date of preparation and expiration clearly labeled.

3.3 Miscellaneous Equipment (if appropriate)

a. graduated pipettes
b. pipette bulbs
c. Litmus paper
d. glass stirring rods
e. filtering equipment

3.4 Personal Protective Equipment

a. protective goggles
b. disposable gloves
c. protective clothing (e.g., Tyvek™)
d. portable water supply for immediate flushing of spillage, if appropriate.
e. shovel and container for immediate containerization of spillage-impacted soil, if appropriate.

4.0 Procedure

4.1 Examine all bottles and verify that they are clean and of the proper type, number and volume capacity for the sampling to be conducted.

4.2 Label bottles carefully and clearly with the appropriate information as described in Section 2.6.

4.3 Collect samples in the proper manner (refer to the specific sampling SOP which addresses the sampling technique being performed).

4.4 Chemically preserve samples as required. Field preservation must be done immediately and should not be performed later than 30 minutes after sample collection.

4.5 Seal containers carefully.

4.6 Conduct QC sampling as required.

4.7 Seal each sample container in a "zip-loc" bag and immerse it in the ice bath for a minimum of 30 seconds to flash cool the sample from ambient temperature down to the internal temperature of the shipping cooler (approximately 4°C). Flash cooling must be performed immediately following sample collection and preservation. Samples must not be allowed to warm up prior to packing them into the laboratory cooler for shipping.

4.8 Arrange containers in front of assigned coolers. Organize and carefully pack all samples in cooler immediately after collection. Pack samples so that breakage will not occur. There must be a cushion of padding (e.g., bubble wrap or vermiculite) between each sample container and between the containers and the top, bottom and sides of the shuttle. Smaller containers, such as 40-ml vials, can be placed in "zip-lock" bags to protect them and keep them dry.

4.9 Complete and place the chain-of-custody form in the cooler after all samples have been collected. Maintain one copy for the project file. If the cooler is to be transferred several times prior to shipment to the laboratory, it may be easier to tape the chain of custody form to the exterior of the sealed cooler. When exceptionally hazardous samples are known or suspected to be present, this should be identified on the chain-of-custody record as a courtesy to the laboratory personnel. Any other irregularities should also be noted.

4.10 Add additional ice as necessary to ensure that it will last until receipt by the laboratory. Ice cubes are to be double packed in "zip-lock" bags to prevent leakage.

4.11 Seal the cooler with packing or strapping tape (make several complete revolutions) and a custody seal (cover with clear tape). Record the number of the custody seal in the field notebook and on the field form. If samples are shipped in the mail they should be properly labeled and comply with shipping regulations. Maintain the shipping bill along with the chain-of-custody form for the project files and call the laboratory the next day to confirm receipt.

4.12 Unless specified otherwise in the superseding site-specific work plan or field sampling plan, this SOP shall govern the manner in which sample handling is performed by IES personnel. However, if field conditions or other factors dictate the need, reasonable deviation from the SOP is acceptable. Any departure from the SOP must be documented in the site-specific field notebook or project file, along with an explanation as to why the deviation was necessary.

P. COLLECTION OF QUALITY CONTROL SAMPLES

Standard Operating Procedure for Collection Of Quality Control Samples

Number: SOP-017-007

Date: June 16, 1995

Revision Number: 0

1.0 Purpose

The purpose of this standard operating procedure is to establish guidelines for the collection of quality control (QC) samples and to explain the measures taken to ensure the integrity of each sample collected. The objective of any QC program is to ensure that the data generated are of known and reliable quality. The acceptance of sampling data by regulatory agencies and in litigation-support investigations can depend heavily on the proper QC program to justify the results presented.

The QC sampling requirements must be determined based upon the data quality objectives for the project. In some instances regulatory agencies, such as the USEPA, may specify or provide guidance concerning QC sampling on a project. All QC requirements should be clearly defined in the work plan developed for the project, including types of samples to be collected, sample collection methods and frequency of sampling.

2.0 Quality Control Samples

QC Samples are used to prove sampling activities and laboratory performance during an environmental investigation or routine monitoring at a site. Types of QC samples may include field blanks (a.k.a., equipment or rinseate blanks), trip blanks (a.k.a., travel blanks), replicates (a.k.a., duplicates or split samples), matrix spike/matrix spike duplicates and performance evaluation samples (a.k.a., fortifications). A discussion pertaining to each QC sample type is provided below.

2.1 Field Blanks

Description - A field equipment blank (field blank) is collected to check on the sampling equipment handling, preparation, storage and shipment procedures implemented in the field. A field blank is performed by exposing demonstrated analyte-free water (e.g., distilled/deionized water) to the sampling process (i.e., the water must pass through or over the actual sampling equipment). Preferably, the analyte free water should be provided by the laboratory performing the sample analysis. At a selected field location documented in the field book, the water is poured from the full set of bottles through the dedicated field sampling device that has been decontaminated for sample collection (e.g., auger flight, split-spoon sampler or bailer) and into the empty set of laboratory-supplied sample bottles. It is important that the blank be exposed to the entire sampling process, e.g., an equipment blank for metals should be filtered if the samples were also filtered. Field blanks are generally not required for potable well sampling events or when a sample is collected directly from a source into a sampling container without the aid of any tools. Field blanks are usually preserved in the same manner and analyzed for the same suite of parameters as the other samples collected during the sampling event. In some situations it may be advantageous to require equipment blanks for each type of sampling procedure (e.g., split-spoon, bailer, pump).

Field blanks may also be used to detect potential interference or cross contamination from ambient air during sampling events, especially if known sources of contamination are within close proximity or monitoring instruments indicate the presence of contamination above background levels. This field blank is a sample bottle that is filled and sealed with demonstrated analyte free water, and is opened in the field and exposed to the air at a location to check for potential atmospheric interferences. The blank is then resealed and shipped back to the laboratory for analysis.

Frequency - For short-duration sampling events, the rate of one field blank per day is usually sufficient. For sampling events lasting more than a few days, field blanks are generally performed at the rate of between 5% to 10% of the total number samples collected throughout the event.

2.2 Trip Blanks

Description - Trip blanks consist of a set of sample bottles filled at the laboratory with demonstrated analyte free water. These samples then accompany the bottles that are prepared at the laboratory into the field, and back to the laboratory along with the collected samples for analysis. **These bottles should never be opened in the field.** Trip blanks must return to the laboratory with the same set of bottles they accompanied to the field. Trip blanks are primarily used to check for "artificial" contamination of the sample by a test substance or other analyte.

Frequency - Typically, one trip blank per cooler containing VOC samples, or test substance of other analytes of interest, should accompany each day's samples.

2.3 Replicate Samples

Description - Replicate samples are collected to check on the reproducibility of results either within a laboratory or between laboratories. A replicate sample is called a split sample when it is collected with or turned over to a second party (e.g., regulatory agency, litigant's consulting firm) for an independent analysis.

With the exception of VOCs, obtaining replicate samples in a soil or sediment matrix requires homogenization of the sample aliquot prior to filling sample containers. **Samples taken for VOC analysis however must always be taken from discrete locations or intervals without mixing.** Homogenization of the sample for remaining parameters is necessary to generate two equally representative samples. Note that enough sample must be collected at one time in order to fill all the necessary containers. Samples should be thoroughly mixed using a decontaminated stainless-steel bowl and spoon. Once mixing is completed the sample should be divided in half and containers should be filled by scooping sample alternately from each half.

Replicates of aqueous samples for VOC analysis should be filled from the same bailer or other sampling device whenever possible and be the first set of containers filled. Aqueous replicate samples for other parameters are either obtained from the same sampling device or by alternately filling sample containers from the same sampling device for each parameter.

Frequency - Replicates for determining the reproducibility of laboratory results are commonly collected at a rate of 5% (one for every twenty samples collected). Split samples are at the discretion of the second party and may include every sample collected.

2.4 Performance Evaluation Samples

Description - In certain instances when a laboratory's quality assurance performance is in question, splitting samples may not prove as useful as providing blind performance evaluation (PE) samples to a laboratory since analytical performance and accuracy differs from laboratory to laboratory. Performance evaluation samples provide information on a laboratory's performance based upon analysis of that sample which contains parameters of a known and defined concentration. A PE sample can be used to pre-qualify a laboratory or if submitted blind with a sample lot, may be used to evaluate the quality of the analytical data. PE samples consist of pre-measured, pre-determined samples of known origin and concentration which are submitted for analysis along with a sample shipment from the field. Deviations from known concentration may indicate improper calibration or other laboratory errors that may have influenced the results reported for those samples collected in the field.

Frequency - Performance evaluation samples are usually required by the governing agency for a project. Therefore, the frequency of submitting these samples to the laboratory is commonly at the discretion of the agency.

2.5 Matrix Spike/Matrix Spike Duplicates

Description -Spikes of compounds (e.g., standard compound, test substance, etc.) may be added to samples in the laboratory to determine if the matrix is interfering with constituent identification or quantification, as well as a check for systematic errors and lack of sensitivity of analytical equipment. Samples for spikes are collected in the identical manner as for standard analysis and shipped to the laboratory for spiking. Matrix spike duplicate sample collection and laboratory spiking and analysis is done to check on the reproducibility of matrix spike results. Prior to sampling, check with the laboratory to determine if additional sample volumes are required for matrix spike/matrix spike duplicate (MS/MSD) samples.

Frequency - The rate for MS/MSDs is almost always one per sample delivery group. A sample delivery group can be defined as either:

- all field samples collected during a project;
- each set of twenty field samples collected during a project; or
- each fourteen calendar day period during which field samples for a project are received by the laboratory (said period beginning with the receipt of the first sample in the sample delivery group),which ever comes first.

3.0 PROCEDURE

3.1 Determine the type and number of QA/QC samples to be collected as specified in the work plan and implement the sampling as outlined above.

3.2 Ensure unbiased handling and analysis of performance evaluation, replicate and blank QC samples by concealing their identity by means of coding so that the analytical laboratory cannot determine which samples are included for QC purposes. Attempt to use a code that will not cause confusion if additional samples are collected in the future.

3.3 Label selected matrix spike samples so that the laboratory knows which samples are to be spiked. For projects when only a few samples are collected during a long interval of time, it may be advantageous not to select matrix spike samples until after the samples are received by the laboratory, thus limiting the number of MS/MSDs. In this instance, frequent communication must be maintained between the sampling crew and the laboratory to ensure that an appropriate number of MS/MSDs are analyzed.

3.4 Document the QC samples on the appropriate field forms and in the field notebook. On the chain of custody form, fortification, replicate and blank QC samples will be labeled using the codes discussed above and MS/MSDs will be identified as such.

3.5 Seal samples in the appropriate cooler. Refer to IES SOP-017-005 for sampling handling and shipping procedures.

Q. FIELD RECORD KEEPING

Title: Standard Operating Procedure for Field Record Keeping

Number: SOP-017-006

Date: July 22, 1993

Revision Number: 0

1.0 Purpose

This standard operating procedure (SOP) establishes the procedures to be used for documenting and recording field activities. These activities include but are not limited to: site walk-throughs; geophysical testing; monitoring well installation; aquifer testing; air, water, ground water, soil, and waste sampling; waste removal; and installation, operation, and maintenance of remediation systems.

Field data is only as good as its documentation. Because memories fail and project personnel may change with time and task, thorough documentation is needed to accurately and permanently record observations made and information collected in the field. Standardization of field documentation helps ensure that all pertinent information is recorded in a readily recoverable and understandable format.

Field documentation becomes part of the legal record of site activities and as such the utmost care and consideration must be given to its generation and maintenance.

2.0 Materials

The following materials are needed for proper documentation of field activities:

- a bound, waterproof field notebook;
- black pens, indelible markers, and grease or wax pencils;
- all weather clip board and form holder;
- appropriate project and task specific forms (e.g., sample data sheets and boring logs);
- camera and film (optional);
- cassette recorder (optional); and
- video tape recorder (optional).

3.0 General Procedures and Responsibilities

3.1 The project manager (PM) identifies and procures all forms required for proper recording of field activities. Project specific needs, i.e., client and regulatory documentation requirements, must be considered. The required forms should be referenced and included in formal work plans, proposals or other documents. Examples of available IES forms are attached to the appropriate SOP regarding the performance of specific tasks.

3.2 The PM briefs the designated field team leader (FTL) on project documentation requirements for the task(s) at hand, gives the FTL the field notebook and provides one clean copy of each required form if not already available from the work plan.

3.3 The FTL is responsible for maintaining the field notebook during field activities and for bringing an adequate number of the appropriate forms to the field site.

3.4 The FTL retains or assigns documentation responsibilities to field team members (FTMs) as appropriate. The number of individuals recording field activities should be minimized.

3.5 Whenever an alteration to a field book or data form entry is required, the incorrect entry is to be struck out with only a single line followed by the initials of the recorder making the change (e.g., ~~79 ug/l~~). The revised information should be recorded next to the original data.

3.6 The FTL is responsible for collecting and reviewing all field documentation at the end of each day. If possible, deficiencies in the record should be corrected immediately and the cause of the deficiency addressed.

3.7 The FTL is responsible for photocopying field documentation daily. Copies should be maintained physically separate from the originals. If photocopying facilities are not available at the site, field office or hotel, the FTL should copy all field documentation immediately upon returning to the office.

3.8 Upon return to the office, the FTL relinquishes both the originals and one photocopy each of the field notebook and all other field documentation to the PM.

3.9 The PM maintains field documentation for the project. The field notebook and all other original documents are placed in a separate folder labeled "Field Notes - Originals" and copies are placed in a folder labeled "Field Notes - Working Copies." Field notes should be filed chronologically and, where appropriate, the file folder label should include the dates when the field work was performed. Original documents are kept and eventually archived with the site files. Working copies of field notes should be used for reference during data reduction and report writing.

4.0 Procedure for Maintaining the Field Notebook

4.1 The PM issues a field notebook for the project which includes the following information prominently displayed on the cover or first page: the project name; number; location; and the message "If found, please return to Integrated Environmental Services, 44 Shelter Rock Road, Danbury, CT 06810, Attention: <project manager> or call <project manager's phone number> -REWARD OFFERED." In addition, each page of the field notebook should be sequentially numbered. Under no circumstances should pages ever be removed from the field notebook.

4.2 The field notebook is brought to the site during every planned and scheduled site visit. If the notebook is not brought to the site, notes should be kept on another medium using the same format as the official field notebook; these notes must be transcribed into the official field notebook as soon as practicable, along with a notation that the transcription was made.

4.3 The field notebook is maintained and recorded in by one person (usually the FTL) for any given task or block of time. A change in custody is to be documented in the notebook and initialed by each individual.

4.4 A fresh page is used to begin each day's entries, with the day and date prominently recorded at the top followed by the weather conditions, e.g., Friday April 23, 1993 - overcast, expected high 50° F, chance of showers.

4.5 The next entry should include time of arrival at site, personnel present (IES, Client, Regulatory, and subcontractors), and general purpose of site visit. This should be followed by a brief description of site conditions noting changes from the last time IES was onsite.

4.6 Subsequent entries should be made in chronological order with times noted. The field notebook is a log of actions, occurrences, and activities at the site and as such should be written in the first person active voice and provide a description of who, what, where, why, when, and how. General types of information recorded in the field notebook include but are not limited to:

- arrival and departures of both IES and non-IES personnel and equipment;
- descriptions of both formal and informal meetings including identification of person or organization calling the meeting, purpose, location, time, attendees, topics discussed, and decisions made;
- all conversations with the client, the general public, and regulatory personnel;
- significant site/work related discussions between IES personnel and subcontractors, e.g., when decisions are made or orders given;
- telephone conversations with IES, client, regulatory, and subcontracted personnel;
- health and safety procedures including level of protection, monitoring of vital signs, frequency of air monitoring, and any change (i.e., downgrade or upgrade) in the level of protection for both IES and non-IES personnel;
- deviations from the health and safety plan;
- significant changes in weather from first arrival at the site, e.g., high winds, heavy precipitation, or temperature extremes;
- air monitoring results, e.g., photo-ionization detector readings;
- site reconnaissance information such as topography, geologic features, water bodies, cultural features, and areas of suspected contamination;
- task designation and work progress;
- observations of potential contamination, e.g., stressed vegetation, stained soil, sheen on surface or ground water, etc. (descriptions should be objective and use of pejorative and/or non-technical terms, e.g., smelly and slimy, avoided);
- liberal use of sketches, drawings, and maps including measured or approximate dimensions or distances to clarify, amplify and enhance verbal descriptions;
- sample description including unique identification number, location, matrix, sample device, odor, color, texture, response to field instruments, and sample containers filled (some information may be redundant when field sample data sheets or other forms are used; nonetheless, this information should be faithfully recorded in the field notebook);
- description of photographs taken;
- deviations from the work plan;
- delays, unusual situations, problems and accidents or injuries;
- equipment and instrument problems;
- decontamination and calibration procedures;
- peripheral activities which may impact field activities; and

- time of departure of IES personnel and a description of site conditions at the time of departure, e.g., non-IES personnel remaining on site, vehicles, equipment, wastes, and other materials left on site, site security, etc.

4.7 If simultaneous activities are occurring, the FTL must make provisions for recording of activities by personnel at the work face and subsequent transcription into the field notebook. When multiple tasks are performed at remote site locations for extended periods of time, the use of additional field notebooks may be allowed with PM approval.

4.8 The last daily entry should be followed by the FTL's signature.

5.0 Procedure for Chain-of-Custody Forms

Most contracted laboratories have their own Chain-of-Custody (COC) forms. If appropriate, use of the laboratory supplied COC forms are preferred because it reduces the chance of miscommunication between the samplers and the receiving laboratory. Otherwise, the FTL is responsible for obtaining appropriate blank COC forms from the PM for use during the sampling event.

5.1 Prior to initiation of field activities, the FTL is responsible for ensuring that an ample supply of COC forms are onsite to cover all of the scheduled sampling, including extra blank forms for contingency purposes.

5.2 The FTL reviews and familiarizes himself with the COC form and contacts the issuing laboratory for clarification of any questions concerning proper completion of the COC form.

5.3 Pre-completion of the COC form and sample bottle labels is limited to site generic information, e.g., site name and address, and IES project number.

5.4 The format of various COC forms will differ; however, the following information must be included on all COC forms accompanying IES samples: IES project number; IES project name; IES' name address and telephone number and contact person; unique sample identification numbers; sample matrix;, date and time samples were collected; volume, type, and quantity of sample containers; preservatives; and analyses requested. Reference methods must be specified when appropriate, e.g., VOCs+15 (via 624). Special instructions and considerations should be noted in the comment section, e.g., sample bottle not full, run TPH first.

5.5 The FTL or his/her designee completes the COC form as soon as practicable after collection of the samples. Note: sample bottle labels must be completed at the time of sample collection and prior to collection of the next sample.

5.6 If sample custody is directly relinquished, e.g., laboratory pickup at the project site, the FTL or his/her designee: 1) signs, dates, and notes the time of the transfer; 2) gives the COC to the receiver to sign, date, and note the time; 3) takes the COC back from the receiver and reviews for completeness rectifying any deficiencies; and 4) gives the completed COC back to the receiver, retaining the appropriate carbon copy for the project files. If the COC form does not have carbon copies, a photocopy or handwritten duplicate with appropriate signatures must be made (**no exceptions**).

5.7 If sample custody is indirectly relinquished, e.g., express mailed to the receiving laboratory, the FTL or his/her designee: 1) signs, dates, and notes the time of the transfer; 2) places the completed COC form into the sample shuttle retaining the appropriate carbon copy; 3) completes the express mail slip and retains the appropriate carbon copy; and 4) attaches the retained copies of the COC form and express mail slip together for the project file. If the COC form does not have carbon copies, a photocopy or handwritten duplicate with appropriate signatures must be made.

6.0 Procedure for Other Field Documentation Forms and Documents

Other task or project specific forms and documents may be required or appropriate for documentation of field activities, e.g., boring logs, monitoring well construction logs, air monitoring logs and sample data sheets. The FTL is responsible for ensuring that all forms are completed fully and properly.

6.1 Prior to initiation of field activities, the PM identifies, obtains, and provides the FTL with a copy of various documents, forms, and logs to be used.

6.2 The FTL reviews and familiarizes herself/himself with all forms and contacts the PM for clarification of any questions concerning proper completion of the forms.

6.3 The FTL brings adequate copies of the appropriate forms to the field site.

6.4 Pre-completion of forms is limited to site generic information, e.g., site name and address, and IES project number.

6.5 Although of varying purpose and layout, the following information must be included on all forms: project name and IES project number; date and time; and the name of the IES employee completing the form.

6.6 As a general rule, all lines, boxes, etc. must be filled out and all queries or prompts answered, i.e., there should be no blank spaces left on the form. If a particular item does not apply w :e NA in the space or otherwise mark appropriately. If you are unsure of how a particular query should be answered, consult other staff members or qualify your answer.

R. DECONTAMINATION OF FIELD EQUIPMENT

Title: Standard Operating Procedure for Decontamination of Field Equipment

Number: SOP-017-008

Date: March 31, 1993

Revision Number: 0

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish the guidelines for decontamination of all field equipment potentially exposed to contamination during drilling, and soil and water sampling. The objective of decontamination is to ensure that all drilling and soil-sampling and water-sampling equipment is decontaminated (i.e., free of potential contaminants): 1) prior to being brought onsite to avoid the introduction of potential contaminants to the site; 2) between drilling and sampling events and activities onsite to eliminate the potential for cross contamination between boreholes and wells; and 3) prior to the removal of equipment from the site to prevent the transportation of potentially contaminated equipment offsite.

The following SOP is stringent in that it is largely adapted from the New Jersey Department of Environmental Protection and Energy's (NJDEPE) *Field Sampling Procedures Manual, May 1992*. However, in determining decontamination procedures on a site-specific basis, state and Federal regulatory and agency requirements and guidance must be considered. Decontamination procedures must be in compliance with state and/or Federal protocols in order that regulatory agency scrutiny of the procedures and data collected do not result in non-acceptance (invalidation) of the work undertaken and data collected.

2.0 DECONTAMINATION OF HEAVY EQUIPMENT

Items such as drill rigs, well casing, auger flights, augers, rods, samplers, tools, backhoes and any piece of equipment that can potentially come in contact (directly or indirectly) with the sampling matrix should be decontaminated prior to usage during a site investigation. Drilling rigs and associated items mentioned previously should be properly decontaminated by the contractor before arrival on site. Heavy equipment can be steam cleaned or manually scrubbed.

2.1 Steam generators and power washers use potable water to provide a high pressure medium to remove visible debris. They are also efficient in terms of ease of handling and generate low volumes of wash solutions. Potential disadvantages include the need for a fixed or portable power source and water supply and they may not be practical for use on small pieces of equipment or for one day sampling events.

2.2 Manual scrubbing involves using a non-phosphate, laboratory-grade glassware detergent solution, followed by a thorough water rinse. This method can be as effective as a steam generator but is labor intensive and generates large volumes of wash and rinse solutions.

2.3 Drilling equipment utilized in the presence of thick sticky oils (e.g., PCBs) may need special decontamination procedures before actual steam cleaning or scrubbing.

2.4 The wash solutions may have to be contained, sampled and disposed of in a proper manner depending on the type of contaminants encountered and Federal, state and local procedures.

3.0 PROCEDURE FOR NON-AQUEOUS SAMPLING EQUIPMENT

3.1 All equipment should be decontaminated prior to beginning sampling.

3.2 A location for a decontamination station should be selected. It should be located away from any potential sources of cross contamination. The decontamination station must in no way contaminate an otherwise clean area. Decontamination should be performed over a container and the residual liquid material must be properly disposed.

3.3 Wear disposable gloves while cleaning equipment to avoid cross contamination and change gloves as needed.

3.4 Disassemble sampling devices and scrub with a brush in a non-phosphate, laboratory-grade detergent and tap water solution to remove visual or gross contamination.

3.5 Rinse with generous amounts of tap water.

3.6 Rinse with distilled or de-ionized water.

3.7 Place clean equipment on a clean plastic sheet to dry (e.g., polyethylene).

3.8 Reassemble the cleaned equipment as necessary.

3.9 If metal samples are to be collected, then an acid rinse (10% nitric acid) followed by a distilled and deionized water rinse is needed. If analysis of metals is required and carbon steel sampling devices are used instead of stainless steel, it may be necessary to reduce the nitric acid rinse from 10% to 1% to reduce the leaching of metals from the sampler to the sample. It is then necessary to use a 1% nitric acid rinse after the tap water rinse (step 3.5).

3.10 If analysis of organics will be conducted, then a rinse of acetone (pesticide grade) followed by a rinse with distilled and deionized water will be necessary.

4.0 PROCEDURE FOR AQUEOUS SAMPLING EQUIPMENT

Wherever possible, disposable bailers or laboratory-decontaminated stainless-steel bailers will be used for sampling. (The use of laboratory-cleaned, packaged and dedicated bailers for collecting groundwater samples is required in the State of New Jersey.) This is advantageous because bailer decontamination takes place in a controlled environment and reduces the risk of cross contamination of the wells to be sampled. However, if the need arises, the following steps will be taken to decontaminate aqueous sampling equipment:

4.1 laboratory grade glassware detergent plus tap water wash;
4.2 tap water rinse;
4.3 distilled and de-ionized water rinse;
4.4 10% nitric acid (trace metal or higher grade) rinse * diluted with distilled or de-ionized water;
4.5 distilled or de-ionized water rinse;
4.6 acetone (pesticide grade) rinse**;
4.7 distilled or de-ionized water rinse; and
4.8 air dry.

* Only if sample is analyzed for metals
** Only if sample is analyzed for organics

5.0 DECONTAMINATION OF SUBMERSIBLE PUMPS

Submersible pumps and wire leads must be cleaned and flushed prior to and between each use according to the following protocol.

5.1 Wash pump casing, hose and cable using an external laboratory-grade glassware detergent plus tap water;
5.2 tap water rinse;
5.3 flush 10-20 gallon of potable water through the pump*;
5.4 distilled or de-ionized water rinse;
5.5 for a two-inch diameter submersible pump, the recessed screw at the bottom of the pump must be removed and the cavity should be rinsed out with distilled or de-ionized water and then filled with distilled or de-ionized water **;
5.6 pump and wires should be placed on clean polyethylene sheeting.

* For submersible pumps smaller than four inches in diameter, the number of gallons to be flushed can be proportionately reduced (i.e., three inches -- 15 gallons, two inches -- 10 gallons).

**IES maintains two Grundfos™, two-inch diameter submersible pumps. The recessed screw mentioned in step 5.5 may not be pertinent to other brands or sizes of submersible pumps.

6.0 DECONTAMINATION FLUIDS

It may be necessary in some cases to forego chemical decontamination in the field and pursue non-chemical means (i.e., without using solvent rinses such as acetone, methanol or nitric acid). This may be preferable because it eliminates the chance of introducing potentially hazardous chemicals at the site which: 1) may be deleterious to the environment; 2) cause unnecessary exposure of the field personnel to hazardous substances; 3) confuse interpretation of chemical analytical data; and 4) require off site disposal of wash waters which otherwise could be discharged on-site. Any necessary agency approval must be obtained prior to using non-chemical decontamination methods in the field.

S. MEASURING THE THICKNESS OF FLOATING, SEPARATE-PHASE ORGANIC LIQUIDS

Standard Operating Procedure for Measuring the Thickness of Floating, Separate-Phase Organic Liquids

Number: SOP-017-009

Date: June 16, 1995

Revision Number: 0

1.0 Purpose

The purpose of this Standing Operating Procedure (SOP) is to establish guidelines for measuring the thickness of floating, separate-phase organic liquids in a well, tank or drum. Note that measuring the thickness of floating, separate-phase organic liquids usually requires special health and safety considerations, equipment and procedures.

The objectives for measuring separate-phase organic liquids may include the calculation of the "true" (non-free product depressed) elevation of the water table. Calculating the "true" elevation of the water table is described in IES SOP-017-002.

2.0 Considerations

The primary considerations when measuring the thickness of floating separate-phase liquids are health and safety, and proper equipment selection.

2.1 Health and Safety

All separate-phase products must be assumed to possess health and safety hazards equivalent to the most hazardous contaminant suspected to be at the site. For example, if fuel oil is being measured in wells where polychlorinated biphenyls (PCBs) are known (or suspected) to be present, then the potential for PCBs to be present in the fuel oil must be considered. When measuring the thickness of flammable materials it is imperative that all possible sources of ignition be eliminated. Minimum requirements include **(NO EXCEPTIONS)** no smoking or open flames, use of intrinsically safe downhole monitoring equipment, use of static free bailing cord (e.g., cotton rope), and use of properly vented and grounded product collection containers. When product collection containers will be stored at the site, the local fire code official must be consulted regarding product storage requirements (e.g., venting, grounding, labeling, permits, secondary containment, etc.). A comprehensive explanation of health and safety procedures should be outlined in the health and safety plan (HASP).

2.2 Equipment Selection

There are several methods which may be employed to measure the thickness of separate-phase product in a well, tank or drum. The actual method to be utilized should be outlined in the work plan. Considerations in selecting a method shall include: the type and consistency of the product; the level of accuracy desired; the expected depth and thickness of the product; and the diameter of the well or port.

Measurements of floating, separate-phase product thickness can be performed using 1) an electronic oil/water interface probe; 2) a graduated, clear acrylic bailer; 3) a weighted steel measuring tape (or graduated "stick") in conjunction with oil- and/or water-finding paste.

An oil/water interface probe is capable of providing rapid and accurate (± 0.01 foot) results under most field situations. However, viscous product or oil/water emulsions may interfere with performance by coating the probe/and or disguising the interface. In these situations, a clear, acrylic bailer may be used in wells, or oil- and water-finding pastes in a tank or drum.

A clear acrylic bailer may be used if simply the presence or absence of product or an approximate product thickness is desired. In certain situations (e.g., viscous product or product/water emulsions) a clear acrylic bailer may be the best available method. However, when product thicknesses are greater than approximately three feet, a bailer will be unable to provide approximate product thickness measurements. If the oil/water interface probe will not work, and the product thickness is too great to be measured by a bailer, then the best available technique may be oil- and water-finding paste.

A graduated "stick" or weighted steel tape in conjunction with oil and water paste may be appropriate for measuring residual water or product in a tank or drum. This method is not recommended for use in monitoring wells because of possible cross contamination from the paste itself. In certain situations where no other method can provide the necessary data, oil- and water finding-paste may be used on monitoring wells containing product. This method is less accurate than an oil/water interface probe, but frequently more accurate than a clear, acrylic bailer.

It should be noted that erroneous data may be collected by all three methods when measurements are collected through fill ports of tanks which are equipped with drop tubes. Whenever possible, thickness measurements should be collected from ports with unobstructed access to the tank contents. When

i. absorbent pads;

j. well location and site maps;

k. well keys;

l. disposable gloves;

m. black pen and indelible marker;

n. calculator;

o. tools (e.g., pipe wrench, screw drivers, pliers, flashlight, pen knife, etc.); and

p. buckets for decontamination.

6.1.2 Based on previous data, if any, ensure that non-product containing wells are either measured by means other than the probe or are measured prior to product-containing wells to reduce the possibility of cross contamination.

6.1.3 Remove the well cap or plug and clean the top of the well with a clean rag. Place the cap or plug on clean plastic on the ground to protect it from potential contamination.

6.1.4 Identify measuring point (MP) on well casing or other designated location.

6.1.5 Slowly lower the properly decontaminated probe to the product surface. A distinct tone or beep will indicate the level and presence of product. The Depth to Product (DTP) from the measuring point will be recorded in the field book and on appropriate field forms. Continue lowering the probe until the tone or beep indicates the presence of water. The oil/water interface is best measured by lowering the probe about six inches into the water and then raising it to the interface. The Depth to Water (DTW) from the measuring point will be recorded in the field book and on the appropriate field forms. The product thickness is the difference between the DTW and DTP.

6.1.6 Replace locking and/or protective caps on the well.

6.1.7 Thoroughly clean the probe and the portion of the tape which entered the product according to the field equipment decontamination SOP.

6.2 Clear Acrylic Bailer

6.2.1 Remove the well cap or plug and clean the top of the well with a clean rag. Place the cap or plug on clean plastic on the ground to protect it from potential contamination.

6.2.2 Slowly lower a clear, decontaminated bottom-filling bailer into the well until the bottom of the bailer contacts the fluid surface.

6.2.3 Using a reference point on the bailer line, slowly lower the bailer into the fluid a distance less than the bailer length so that at its deepest point the top of the bailer remains above the air/fluid contact.

6.2.4 Slowly raise the bailer out of the well.

6.2.5 The thickness of the floating free product shall be approximated by placing a tape measure along side the bailer. The data will be documented in the field notebook and on appropriate field forms.

6.2.6 Dispose of the product in an appropriate manner; product disposal should be specified in the work plan. This may include draining the product back into the well or tank, or containerization if the measurement is in conjunction with bailing for removal purposes.

6.2.7 Replace locking and/or protective caps on the well.

6.2.8 Discard the contaminated bailer and cord in the proper manner.

6.2.9 If free product is extensive or thicker than the height of the bailer, then an electronic interface probe may be used to measure product thickness, if a more exact measurement is required.

6.3 Oil/Water-Finding Paste (**Generally not recommended for monitoring wells sampled for water quality**)

6.3.1 Make sure all equipment is decontaminated and cleaned before use in accordance with the field equipment decontamination SOP (SOP-017-008).

6.3.2 Secure access to the tank or drum to be measured only after the contents are known and properly addressed in the HASP. Attempt to estimate the DTP and DTW so the entire stick or weighted steel tape does not have to be coated with oil and water paste.

6.3.3 Coat one side of the stick or steel tape with water-finding paste and the other side with oil-finding paste (if applicable). Depending upon information needs, lower the tape to just below the water interface or to the bottom of the tank or drum. Be sure to apply the paste along a sufficient length of the tape to traverse the oil layer.

6.3.4 If only DTP and DTW data is required, then the top of the tape is held at an even foot increment at the MP. This is called the "held" value, and is recorded as such. If the depth to the bottom of the tank is also required, then the held value cannot be specifically selected at an even foot increment.

6.3.5 The steel tape or graduated stick is removed and the "water cut" (the point at which the water-finding paste has changed color) and "product cut" (point at which the oil-finding paste changes color or the tape is no longer dry) levels are recorded. The difference between the "held" value and the "product cut" value is the DTP. The difference between the "held" value and the "water cut" value is the DTW. The difference between the "product cut" and the "water cut" is the product thickness. If the diameter of a horizontal tank is desired, then the difference between the "held" value (to the bottom of the tank) and the depth of the fill pipe is required.

6.3.6 All pertinent data will be recorded in the field notebook and on appropriate field forms.

6.3.7 Make sure all equipment is decontaminated before use in the tank or drum according to the IES field equipment decontamination SOP (SOP-017-008). All disposable materials must be discarded in a manner consistent with the work plan or site conditions.

T. PURGING A MONITORING WELL

Title: Standing Operating Procedure for Purging A Monitoring Well

Number: SOP-017-012

Date: February, 195

Revision Number: 1

List of Revisions

1. Corrected coefficient factors in Section 4.4 for calculating the amount of standing water in the well.
2. Modified Groundwater Sampling Field Worksheet by correcting coefficient factors for calculating the amount of standing water in the well.
3. Modified Groundwater Sampling Field Worksheet by identifying Steps One - Four, to make the sequence of calculations easier to follow.

1.0 Purpose

The purpose of this Standing Operating Procedure (SOP) is to standardize field methods for purging a well before sampling. **The objective of well purging is to remove the standing column of water from the well and to allow fresh water, which is representative of the aquifer surrounding the well, to enter.** Purging of a well can be performed in one of two ways. The more widely used method is to purge a specified number of casing volumes; **typical regulatory requirements call for purging three to five times the volume of water in the casing.** The other purging method involves pumping ground water from the well until specific indicator parameters (e.g., specific conductance, pH, temperature) stabilize. If the well recharge rate is slow, the well may have to be pumped dry prior to removing a specified number of well volumes or before indicator parameters stabilize.

When possible, field personnel will adhere to these guidelines to obtain consistency in sampling and purging procedures. **Many factors may change the well purging procedure and in those cases the purging of the wells will have to be site specific.** Moreover, state and Federal regulatory and agency requirements regarding purging methodology must be considered. For shallow or small diameter wells, bailers or centrifugal pumps can be used to purge the wells. For deep and large diameter wells a submersible pump is recommended.

2.0 Equipment and Materials

The following equipment may be needed to purge a monitoring well before sampling:

√ bailers;

√ non-absorbent cord (e.g. polypropylene, etc);

- √ pumps and related equipment (e.g. appropriate discharge hose and valves, extension cords, battery, portable generator with fuel, air compressor, bottled gas, flow meter);
- √ Teflon ™ tape, electrical tape;
- √ tape measure (stainless steel, steel, fiberglass) with 0.01-foot increments and chalk (e.g., blue carpenter's) or electronic water-level indicator;
- √ appropriate field forms (e.g., Groundwater Sampling Field Worksheet, Groundwater Pumping Field Worksheet, Well Inspection Form, etc.) and field notebook
- √ well location and site map;
- √ well keys;
- √ black pen and water-proof marker;
- √ tools (e.g., pipe wrenches, screwdrivers, hammer, pliers, flashlight, pen knife, etc.);
- √ appropriate health and safety equipment, as specified in the site health and safety plan (HASP);
- √ appropriate field measurement devices, if required (for example, pH meter(s) and buffers, conductivity meter(s) and standards, dissolved Oxygen (DO) meter, thermometer(s), extra batteries (meters, thermometers, flashlight);

3.0 Decontamination

Each piece of equipment that is used in the purging of a well shall be properly decontaminated prior to being used in a well and before exiting the site. Refer to the SOP for Decontamination of Field Equipment for decontamination methodology. Any disposable tubing, rope or other consumable equipment that is used shall either be permanently dedicated to a specific well or changed between purging of each well and properly disposed of after its usage.

4.0 Procedure

4.1 Prior to each well being purged, the depth to water (DTW) measurement is taken. Following the depth to water measurement the length of the column of standing water in the well is obtained by subtracting the DTW from the total depth in the well. Refer to the SOPs for Measuring Groundwater Levels for further details.

4.2 If historic site data indicate that explosive gases could be present and accumulate in the well, then a combustible gas indicator will be used to check vapor concentrations in wells at the site prior to beginning the purging procedure. Vapor concentrations in a well that exceed the 25 percent lower explosive limit (LEL) will require specific precautionary measures to allow purging a well without danger of explosion or fire (e.g., use of cotton cord bailers or lowering pump devices, non-electric powered pumps). These conditions will be addressed in the site health and safety plan (HASP).

4.3 Before purging begins, any measurements such as pH, dissolved oxygen, temperature and specific conductivity should be collected as required by the site-specific work plan.

4.4 **The volume of standing water in the well is calculated by multiplying the length of standing water by a coefficient which equates the diameter of the well to gallons per linear foot.**

2" diameter casing = 0.163 gallons/linear foot

4" diameter casing = 0.653 gallons/linear foot

Or use the following equation: $V=(0.163)\ (r^2)\ (h)$, where V is volume of water in gallons, r is the radius (equal to one-half of the diameter) of the well casing in inches, and h is the height of the water column in the well in feet.

4.5 If purging is performed by removing a certain number of casing volumes, then the specified volume is purged per the regulatory requirement.

4.6 If the recharge rate into the well is slow, the well may pump dry prior to removing the specified volume of water. **Slow reacting wells or wells with a history of going dry should be pumped at a maximum rate of 0.5 gallons per minute.** If the recovery rate is fairly rapid and time allows, then remove more than one casing volume; otherwise, the evacuation of one casing volume may suffice.

4.7 **Purging of the water should take place from the water at the top of the column so fresh water enters the well through the screen zone at the bottom of the well and replaces the stagnant water in the upper casing of the well.**

4.8 If purging by bailers, the water removed from the well can be measured by discharging the purge water into a container of known volume. If using a pump, the volume of water purged can be calculated by monitoring the rate of flow with a flow meter, and multiplying it by the time or by discharging into a drum.

4.9 **If a bailer is used to purge the well**, then:

a. Tie the non-absorbent cord (polypropylene) to the bailer with a secure knot and then tie the free end of the bailer cord to the protective casing or, if possible, some nearby structure to prevent losing the bailer and cord down the well.

b. Lower the bailer slowly down the well and into the water column to minimize the disturbance of the water surface; this will help to prevent the loss of VOCs from the water. If a bottom filled bailer is used, then do not submerge the top of the bailer, lower the bailer only deep enough to remove water from the top of the water column. However, if a top filling bailer is used, then submerge the bailer several feet below the water surface.

4.10 If purging is not executed by excavating a specified number of well volumes, then purging is performed by pumping or bailing the well until specific indicator parameters (e.g., specific conductance, pH, temperature) stabilize.

4.11 **Be careful and cautious to prevent contact of the bailer with any other medium (such as the ground) and to prevent spilling/splashing of the purge water and exposing the sampling team to potentially contaminated water**

4.12 All purge water should be containerized and/or disposed of in accordance with the work plan or site conditions.

4.13 After purging dissolved oxygen, temperature, specific conductance and pH or any other required parameter should be measured, if required.

4.14 **All data should be recorded in the field books**. Where applicable, the attached field sheets should be useful during well purging and sampling for recording measurements. One sheet must be completed per well.

NES, Inc.

GROUNDWATER SAMPLING FIELD WORKSHEET

Site Location: ______________________________

Project Manager: ______________________________

Well Number: __________

STEP ONE: TAKE INITIAL MEASUREMENTS

Well diameter (in.): ________

Depth to water (ft.): _______

Well Depth (ft.): __________

STEP TWO: PERFORM PURGING CALCULATIONS

Height of Water Column (ft.): ___________ (equal to Well Depth minus Depth to Water)

Volume of water in the well (gallons): ________________

Note: for a 2" diameter well, multiply Height of Water Column by 0.163
for a 4" diameter well, multiply Height of Water Column by 0.653
for a well of another diameter, use the following formula: $V = (0.163)(r^2)(h)$
where: V = volume of water (gallons); r = well radius (inches); and
h = height of the water column (ft)

Determine Volume of water to be purged from the well (gallons): _____________
(equal to Volume of water in the well times 3)

STEP THREE: PURGE THE WELL

Purging method: ____________________ Time purging began: __________________

Volume actually purged (gallons): ________ Time purging ended: __________________

Did the well purge dry? Yes __ No___

Was free product present in the well? Yes __ No __

STEP FOUR: SAMPLE THE WELL

Sampling method: ____________________ Time of sampling: __________________

Comments/Notes: ____

____

Worksheet Completed by: ______________________________ Date: ____________

U. COLLECTING SOIL SAMPLES

Title : Standard Operating Procedures For Collecting Soil Samples
Number: SOP-017-013
Date: January 21, 1994
Revision Number: 0

1.0 Purpose

This Standard Operating Procedure (SOP) establishes the procedures for collecting soil samples. These procedures are applicable to surface, subsurface, and stockpiled soil sample collection with split-spoon samplers, thin-walled tube samplers, hand augers, scoops and other sampling devices.

2.0 Considerations

Soil samples can be collected from the surface, shallow subsurface, or at depth interval. Commonly, surface sampling refers to the collection of samples at a 0-6 inch depth; the minimum and maximum depth of surface samples must be defined in the Sampling and Analysis Plan (SAP). Surface soil samples are usually collected with a stainless steel trowel or scoop. Subsurface samples may be collected with a split-spoon sampler, thin-walled tube sampler or directly from a boring device such as a bucket auger. Borings may be advanced by hand augering, power-assisted hand augering, pneumatic drill, or with a drill rig. In some situations, subsurface samples are collected via excavation with a back hoe or other heavy equipment. When samples are collected at depth, the water content should be noted since "soil sampling" is generally restricted to the unsaturated zone.

Soil samples can be collected in either a random (simple, stratified, or systematic) or biased manner. The SAP should not only specify sampling locations and depth, but should also indicate the type of sampling (random or biased) and the reason behind selection of the sampling points in order to allow sampling personnel to make field modifications to the SAP which are consistent with the purpose of the sampling.

Either grab or composite samples can be taken. A grab sample is a discrete aliquot that is representative of one specific sample site at a specific point in time. Because the entire sample is collected at one particular point and all at one time, a grab sample is representative of only those conditions. As a rule, when collecting samples at hazardous wastes sites, only grab sampling should be employed.

A composite sample is a non-discrete sample composed of more than one specific aliquot collected at various sampling points. Soil samples may be composited in the field or several samples may be submitted to the laboratory to be composited by weight. The method used is dependent on the regulatory requirements and should be approved and described in the work plan. While compositing samples may have some merit when performed for specific purposes, and under known conditions, the information obtained may not be particularly useful. A commonly used application of composite samples is characterizing stockpiled soils for treatment or waste disposal. To avoid off gassing of contaminants, care must be exercised when composite samples are to be analyzed for VOCs.

3.0 Equipment and Materials

The equipment and materials required for proper collection of soil samples will be project/site/phase/task specific and will depend upon the techniques and methodologies employed. Sample collection methods, materials, and Quality Assurance/Quality Control (QA/QC) requirements should be specified in the SAP. IES SOP-017-007 should be referenced regarding the collection of quality control samples. Equipment and materials required for proper collection of soil samples may include but is not necessarily limited to the following:

- A detailed SAP;
- Field notebook, maps, boring log, and field data sheets maps;
- Decontamination supplies including: non-phosphate laboratory grade detergent, buckets, brushes, potable water, distilled water, regulatory-required reagents, aluminum foil, and plastic sheeting, garbage bags - Refer to SOP-017-008.
- SAP specified sampling device(s), e.g., split-spoon sampler, thin-walled tube sampler, stainless steel hand auger, or stainless steel trowel;
- Stainless steel spoons, spatulas, scrapers, probes and other small tools;
- Stainless steel mixing bowl;
- Disposable sampling gloves (sterile non-powdered latex or vinyl examination gloves);
- Laboratory-supplied and cleaned sample containers;
- Sample labels, Chain-of-Custody/Analytical Request Forms, custody seals;
- Sample Shuttle/cooler with blue or wet ice;
- Zip-lock bags and packing material;
- Black pen and indelible marker;
- Tape measure;
- Paper Towels;
- Masking and packing tape;
- Overnight (express) mail forms.

4.0 Decontamination

All sampling equipment should be properly decontaminated prior to use and all reusable sampling equipment should be thoroughly decontaminated immediately after use (refer to SOP-017-008). Where possible, thoroughly pre-cleaned and aluminum foil-wrapped sampling equipment should be used and dedicated to individual sampling locations and depth intervals. In some cases the use of dedicated samplers may be impractical therefore, when collecting numerous surface soil samples (using trowels) or subsurface soil samples from boreholes (using split spoons), it may be necessary to decontaminate equipment in the field. Disposable items such as sampling gloves, aluminum foil, and plastic sheeting should be changed after each sample is collected and discarded in an appropriate manner.

5.0 Procedure

1) Determine the type and quantity of sampling equipment required. In cases where it is not known which type of sampling equipment will work best, several types of systems and devices should be on hand and available. Prior to collecting soil samples, ensure that all sampling equipment has been thoroughly cleaned according to SOP-017-008.

2) Determine the amount of soil, and the size and number of sample containers needed, prepare preservatives if required, and prepare decontamination equipment and materials if reusable sample equipment is to be used.

3) For subsurface samples, the boring must be advanced with thoroughly cleaned equipment to the top of the desired sampling interval. A pre-cleaned sampling device should then be advanced through the sampling horizon (after removal of the boring tool if required). When the sampling tool is also the boring device, e.g., bucket auger, the device should be withdrawn and cleaned prior to advancement through the sampling horizon or, preferably, another pre-cleaned device should be used to collect the sample.

4) Using disposable gloves and a pre-cleaned, stainless steel spatula or spoon, extract the soil sample from the sampler, and place the sample in a laboratory-supplied pre-cleaned sample container. This should be done as quickly as possible. This is especially important when sampling for volatile organic compounds (VOCs). Samples to be analyzed for VOCs must be collected prior to other constituents and handling should be kept to a minimum. Collect the sample towards the middle of the sampler because soil at the ends of the sampler may be slough, and therefore not representative of the depth interval being sampled.

5) Label the sample container with appropriate information such as: client name, site location, sample identification (location, depth, etc.) date and time of collection, and sampler's initials. If samples are extremely contaminated they should be placed in individual zip-lock bags and noted as such on the chain-of-custody form.

6) Using the remaining portion of the soil from the sampler, log the sample in detail by recording: color, odor, moisture, texture, density, consistency, organic content, layering, grain size, etc. Samples may be screened with portable instrumentation such as a PID or OVA. These results should also be recorded in the field notebook or on the appropriate field data forms

7) Immediately after collection the sample should be cooled to 4°C and placed in a cooler/sample shuttle. See SOP-017-005 and SOP-017-006 for proper sample handling and documentation.

8) Discard any gloves, foil, plastic, etc. in an appropriate manner that is consistent with site conditions.

9) All reusable sampling equipment must be thoroughly cleaned in accordance with SOP-017-008. Following the final decontamination, (at the conclusion of the sampling event after all samples have been taken) wrap the sampling equipment in aluminum foil for storage.

V. CONSTRUCTION, DEVELOPMENT, AND ABANDONMENT OF MONITORING WELLS IN UNCONSOLIDATED FORMATIONS

Title: Standard Operating Procedures for Construction, Development, and Abandonment of Monitoring Wells in Unconsolidated Formations

Number SOP-017-017

Date: February 28, 1994

Revision Number: 1

<u>LIST OF REVISIONS</u>

0. Issued final on February 16, 1994.
1. Typographical corrections - no substantive changes.

1.0 Purpose

This Standard Operating Procedure (SOP) establishes and standardizes the methods and procedures for construction of ground-water monitoring or observation wells in unconsolidated (e.g., gravel, sand, silt and clay) formations. Well development and well abandonment (closure) procedures are also addressed.

2.0 Considerations

The United States Environmental Protection Agency (USEPA), the United States Geological Survey (USGS), and state regulatory agency procedures will be reviewed and considered in conjunction with the experience of IES to determine appropriate site-specific well construction and abandonment procedures. Discussions will be held with appropriate agencies to resolve conflicting procedures and finalize well construction or abandonment methods. The well construction plan and, if necessary, abandonment will be detailed in the work plan.

Monitoring wells will be completed in unconsolidated formations for the purposes of measuring ground-water levels and collecting ground-water samples. Ground-water level data will be used to calculate ground-water elevations which will be used to construct water-level elevation and ground-water flow direction maps to illustrate head and flow relationships. Ground-water samples will be used to quantify water quality conditions.

Observation wells will be completed in unconsolidated formations for the purpose of collecting water level data from aquifer tests. Slug tests, step-drawdown tests, and constant-rate pumping tests (refer to the respective SOPs) may be conducted to qualitatively characterize flow system hydraulic parameters and/or intra-aquifer and inter-aquifer hydraulic connection.

2.0 Procedure For Well Construction

Prior to beginning field activities, the on-site geologists shall familiarize themselves with well installation and construction details provided in the work plan. The work plan shall specify the following: purpose and expected use of the wells; well locations and desired depths/screened intervals; acceptable drilling/boring methods; acceptable or required well casing type, e.g., PVC or stainless steel, and size (nominal diameter); screen length, diameter, type (material and fabrication method), and slot size; well pack type and size; grout type; seal type; cement mixture; type of surface completion, and acceptable development methods.

In general, unless otherwise specified in the work plan, wells will be a minimum of 2 inches nominal diameter to accommodate most water sampling and water level measuring devices. Larger diameter monitoring wells (4 inches, 6 inches or greater) may be needed to accommodate pumps, floats or sensors. All casings, fittings, and screens will be new material. The inside diameter of the well (screen and riser/blank/casing) shall be constant and not restricted by fittings or couplings. No PVC glues or resins shall be used.

Installation of each unconsolidated well will begin immediately after borehole completion and geophysical logging (if conducted). Once well installation has begun, no breaks in the process will be made until the well has been completed and secured against unauthorized access. In cases of unscheduled delays, such as personal injury, equipment breakdowns or sudden inclement weather, installation will be resumed as soon as practical. The geologist will record all monitoring well installation and construction details on a well construction diagram and in the field notebook (see SOP-017-006).

When conditions (total well depth, screen length, depth to water) allow, wells constructed in unconsolidated formations will be installed as described below. Conditions may require modification of specified material thicknesses and heights; extreme caution shall be used to ensure that such modifications do not compromise the integrity of the well.

1) The depth and diameter of the boring is measured and recorded and checked to see if it is in accordance with the work plan and is appropriate for the purpose of the well given field observations, e.g., depth to water and formation characteristics.

2) The appropriate length screen and casing are determined, assembled (fitted with bottom cap), and lowered into the borehole to the appropriate depth

3) The geologist calculates the volume per foot of annulus using the following formula;

$$\pi[(r_b)^2-(r_w)^2] = ft^3/\text{linear foot of annulus}$$

Where:

r_b = **Boring Radius(ft)**

r_w = **Well Radius (ft)**

This value should be referenced by the geologist to compare theoretical volumes of material (gravel sand, bentonite, grout, cement) required to construct the well with actual quantities of materials used. Large discrepancies between theoretical and actual quantities may indicate problems with the well, e.g., use of less material than calculated may indicate bridging of material in the annulus.

4) A gravel pack (quartz sand or pea gravel) will be filled in around the screen from one foot below the bottom of the screen to several feet above the screen (0.5 feet minimum) to filter out fines from the overlying bentonite seal and grout. The size of the uniformly graded gravel pack will be selected based on the grain size of the formation material in the screened interval and the slot size of the screen. Care shall be taken to avoid bridging of well pack materials in the annulus of the well; this may require the use of a tremie pipe.

5) A 1 foot to 3 foot layer of clean, fine grained silica sand may be placed above the selected gravel pack. Again, care shall be taken to avoid bridging of the pack materials in the annulus of the well; this may require the use of a tremie pipe.

6) Several feet (0.5 ft minimum) of bentonite powder or pellets will be placed on top of the sand or gravel layer to seal the top of the gravel packed screen zone. The bentonite should be introduced very slowly to prevent bridging.

7) The remainder of the annulus will be grouted to within a few feet of land surface. For very deep wells, i.e., greater than 100 ft, constructed of PVC, the grout should be emplaced in lifts to prevent damage to the casing from heat of curing and/or the weight of the grout.

8) The well will be surface completed in accordance with the work plan. Surface completion usually includes either a locking steel protective casing or a curb box set over the well and cemented in place. The cement at the surface is formed in a manner to prevent water from ponding at the top of the well or directly entering the well. In high traffic areas, bollards may be installed to prevent vehicular damage.

9) Each well will be properly identified with the appropriate information, e.g., local well number and state permit number (if applicable), as specified in the work plan and as required by applicable regulations. The top of the inner well casing will serve as the Measuring Point for ground-water level measurements. The measuring point will be surveyed to the nearest 0.01 foot relative to a common datum (e.g., mean sea level) by a professional, state licensed surveyor as defined in the work plan.

10) If required, well clusters will be constructed. A well cluster is defined as a group of two or more wells, located adjacent to or very near each other, which penetrate different depths of the aquifer or formation. Each well is screened at a different depth to obtain data defining the vertical distribution of water levels and quality in the aquifer or formation. In the event that a well cluster is drilled, then one large-diameter (e.g., 6 inch, 8 inch, 10 inch, etc.) borehole may be drilled and each well in the cluster will be individually cased within that one borehole; however, the preferred method is to drill individual boreholes for each well in the cluster.

11) A boring log/well construction diagram will be completed for each well. The boring log will include a description of the surface soils and subsurface materials encountered. The well diagram will show the screened interval and casing placement and materials used to fill the annular space between the well casing and borehole.

The following information, if applicable, will be included on the well log.

- Project Number;
- Date and Initials of Individual Documenting the well information;
- Date and Time of Construction;
- Well Location, Local Number and Permit Number;
- Borehole Diameter and Well Depth;
- Casing Material, Screen Material, Screen Slot Size and Length;
- Gravel Pack Type and Size (depths from___to___);
- Sand Pack Type and Size (depths from___to___);
- Bentonite Pellets (depths from___to___);
- Grout (depths from___to___);
- Ground Surface and Measuring Point Elevations;
- Well Height Above or Depth Below Land Surface;
- Depth where Groundwater was Encountered.

3.0 Well Development

A monitoring well must be properly developed before it can be used for water quality sampling, measuring water levels, or aquifer testing. Well development is the process of removing fine-grained materials (sands, silts and clays) from the formation around the screen, the well pack, and the well itself. Well development continues until the well responds to water level changes in the formation (i.e., a good hydraulic connection is established between the well and formation) and the well produces clear, sediment free water to the extent practical. The geologist should check for relative clarity by eye or with a turbidmeter to determine whether development is complete. The work plan should provide a standard to determine when development is complete. Well development procedures will be recorded on the well construction diagram and in the field notebook.

A variety of well development methods are available. The method used will depend upon: the drilling technique used; formation texture; size, types, and placement of well construction materials; and regulatory considerations. Acceptable development methods should be specified in the work plan. The following well development methods are commonly used:

- Bailing;
- Pumping (centrifugal, submersible, or air);
- Backwashing;
- Surging (mechanical);
- Jetting; and
- A combination of the above.

Dispersing agents, acids, disinfectants or other additives will not be used during development nor will they be introduced into the well at any other time unless specifically stipulated in the work plan. During development, water will be removed from the entire column of water standing in the well by periodically lowering and raising the pump intake or or depth of the bailer. Well development will include the rinsing of the interior well casing above the water column in the well using only water from that well.

4.0 Well Abandonment

Because wells interrupt the natural stratigraphy and are potential contaminant pathways, they must be properly abandoned when they no longer serve a purpose, or have questionable integrity due to damage, or when they interfere with construction or other site activities. Upon the completion of the investigation, a determination will be made whether to maintain the well or to close it (i.e., abandon and seal it). If the client and IES agree to abandon the well, then the state or other appropriate agency will be notified and a request will be presented for well abandonment. After obtaining required approvals, the appropriate well abandonment forms will be completed as required, and abandonment of the well will commence in accordance with local, state and/or Federal regulations.

For each abandoned well, the procedure will be documented on an appropriate field form and in the field notebook. Documentation may include, where appropriate, the following.

- Well designation;
- Location with respect to the replacement well, if replaced (e.g., 30 ft north and 40 ft west of monitoring well MW-1). A location sketch should be prepared;
- Open depth prior to grouting and any other relevant circumstances (e.g., formation collapse);
- Well casing left in the borehole by depth, size and composition;
- A copy of the geologic log;
- A revised diagram of the abandoned well using the well construction log form;
- Additional items left in hole by depth, description and composition (e.g., lost tools, bailers, etc.);
- A description and daily quantities of grout used to compensate for settlement;
- The date of grouting;
- The level of water prior to grouting and the date and time measured;
- The remaining casing, size and composition above or below ground surface reported in depths or heights from ground surface;
- Any other state or local well abandonment reporting requirements.

W. MEASURING TEMPERATURE, pH, SPECIFIC CONDUCTIVITY, DISSOLVED OXYGEN, AND TURBIDITY OF WATER SAMPLES

Title: Standard Operating Procedure for Measuring Temperature, pH, Specific Conductivity, Dissolved Oxygen, and Turbidity of Water Samples

Number: SOP-017-021

Date: May 18, 1993

Revision Number: 0

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes the guidelines for measuring pH, specific conductivity, temperature, dissolved oxygen (DO), and turbidity of water samples (including in-situ measurements) in the field. Temperature measuring devices in the field will consist of either a thermometer, or a pH, conductivity, and/or DO meter equipped with a temperature probe. The pH and specific conductance are measured in the field by using a pH meter and conductivity meter, both of which may be included in a single unit. A DO meter is usually a separate unit that measures the amount of dissolved oxygen in the water sample. All of the instruments used in the field should have an accompanying manufacturer's instrument manual that may be consulted for calibration, use, repair, maintenance, or trouble shooting of the instrument.

2.0 MEASURING WATER TEMPERATURE

Obtaining the temperature of a water sample is the first measurement to be taken in the field. The pH, specific conductivity, and dissolved oxygen measurements of the sample may require compensation based upon the temperature of the sample. The temperature probe should therefore be able to rapidly equilibrate, and should provide consistent and accurate readings. All temperature readings are to be recorded in degrees centigrade (^{o}C).

The measurement must be collected rapidly in the field to determine the temperature of the water sample under in-situ conditions. Temperature readings can also be used to determine if a sufficient quantity of water has been purged from the well prior to sampling by comparing the temperature of the standing water in the well to the temperature of the fresh formation water after purging. The determination can be made when the temperature readings from the aquifer water have stabilized.

2.1 CALIBRATION

Calibration of the thermometers and temperature meters will be performed prior to use in the field, and again upon returning to the office, and will be recorded in a calibration logbook.

At a minimum, the temperature measuring device should be checked against a second thermometer. If there is a discrepancy between the readings, then it should be noted in the field book or calibration log. The source of the discrepancy should be evaluated and pertinent observations noted in the field book or calibration log.

The following information is to be documented in the field book or calibration logbook:

a. date;
b. thermometer/meter identification;
c. calibration results relative to another thermometer; and
d. initials of the individuals performing the calibration check.

2.2 PROCEDURE

2.2.1 Place the water sample in a clean and suitable container; disposable glass containers or plastic beakers are recommended. The temperature should be measured immediately.

2.2.2 The thermometer should be rinsed in distilled water and then immersed in the sample until the temperature equilibrates, then record the temperature. Rinse the thermometer after each measurement.

2.2.3 For in-situ measurements, the probe of the temperature meter and downhole wires should be thoroughly rinsed in distilled and deionized water. The probe should then be lowered down the well and immersed until the temperature equilibrates. The temperature should be recorded and the probe retrieved and rinsed again in distilled and deionized water.

2.2.4 The data collected is to be recorded in the field book or sampling log form.

3.0 MEASURING pH

The pH measurement of a sample is used to determine the acidic or basic nature of the water system. This information can be used to assist in evaluating the mobility of contaminants.

The pH can also be used during purging of a well to determine when standing water has been replaced by water from the formation. The determination can be made when the readings have stabilized.

The pH of a sample should be obtained with a pH meter which will automatically obtain the reading. The meter should be able to compensate for temperature, either automatically or manually. The pH will be measured in standard units (SU) and recorded with or without the designation.

3.1 CALIBRATION

The calibration of a pH meter is to be performed prior to its use in the field. If the meter is being used for extended periods of time (i.e., more than four hours) during the day, it should be calibrated at a minimum of one more time during its operation.

Re-calibration of the instrument must also occur if: the pH of the samples being measured is significantly outside the previous calibration range; the procedure or conditions warrant frequent calibrations; or the instrument has moved from the study area or offsite.

Two calibrations bracketing the expected pH range of the samples as well as a pH 7.0 buffer calibration are to be made with standard buffer solutions. The common buffers utilized for calibration are 4.0, 7.0, and 10.0.

The information obtained during the instrument calibration should be recorded in a calibration logbook. This information should include:

a. date;
b. pH instrument identification;
c. calibration results using the pH standards; and
d. initials of the individual calibrating the instrument.

3.2 PROCEDURE

3.2.1 Refer to the manufacturer's requirements regarding a required warm-up period prior to use in the field, and requirements regarding proper use in the field. Carefully rinse the electrode with distilled and deionized water prior to, and after each measurement.

3.2.2 Place the sample to be measured into an appropriate container, and immediately take the temperature and pH measurements. The temperature of the sample should be measured and this should be compensated for on the instrument, if required. If this is not possible, the temperature should be recorded.

3.2.3 The measurements should be taken while the solution is being stirred and the pH reading equilibrates. The pH should be recorded in 0.1 increments in the field book or the field document, initialed and dated.

3.2.4 The pH meter should be kept in proper working order by periodically checking the levels of the electrode solution in the instrument's probe. The electrodes should be thoroughly rinsed with distilled water and stored properly according to the manufacturer's instructions. The electrodes should never be stored in distilled and deionized water or potable water.

4.0 MEASURING SPECIFIC CONDUCTANCE

The specific conductivity in a sample is the measurement of the total dissolved solids (TDS) in the ground water or surface water. The measurement of TDS can be used as a qualitative measurement of contamination and to assist in evaluating electrical resistivity and borehole physical data.

Specific conductance can also be used during purging of a well to determine when a sufficient volume of water has been removed from the well. This is accomplished by observing when the specific conductivity readings of samples taken during purging have stabilized.

The specific conductance is measured with a conductivity meter that compensates for temperature either automatically or manually. Conductivity measurements are displayed by the meter and recorded in the data as micro mhos per centimeter (umhos/cm) or must be converted to this unit.

4.1 CALIBRATION

The calibration of the instrument should be made in accordance with the manufacturer's manual, and should be performed prior to field use. The instrument should be re-calibrated if the measurements of the samples are significantly outside the range of the calibration standard range or if the meter is moved offsite. Adjust the temperature of the meter to match the temperature of the standard, if required.

Check past data for previous specific conductivity measurements and, if possible, choose a calibration standard which is near the expected conductivity value of the samples to be measured. Select the standard and adjust the span of the conductivity meter to match the value of the calibration standard.

Record the calibration data in the calibration logbook. Include the following:

a. date;
b. conductivity meter identification;
c. initials of the person performing the calibration; and
d. calibration results.

4.2 PROCEDURE

4.2.1 Obtain a sample of the water to be tested; immediately place the sample in an appropriate container, and take the temperature of the sample (see section 2.0). Adjust the temperature control of the conductivity meter to match the temperature of the sample. If there is no temperature adjustment, then note and record the temperature. Rinse the probe with distilled and deionized water and store the probe according to the manufacturer's specifications.

4.2.2 Immerse the probe into the water sample and allow the meter to equilibrate. The measurement is then read off the instrument display. The lowest appropriate scale factor on the instrument should be used to provide the most precise measurement. Note the reading and if it is appropriately expressed in umhos/cm.

4.2.3 For in-situ measurements, lower the probe to just below the air/water interface and allow the meter to equilibrate. Adjust the temperature control to match the temperature of the sample. Collect the measurement in umhos/cm and retrieve the probe.

4.2.4 Conductivity measurements are to be recorded in the field book, initialed, and dated. The specified conductivity is to be expressed in units of umhos/cm. The probe is then to be cleaned with distilled and deionized water and stored according to the manufacturer's specifications.

5.0 MEASURING DISSOLVED OXYGEN (DO)

The measurement of the amount of DO expresses the saturation of oxygen within that sample at that temperature. The amount of DO will be expressed in either percentage saturation or milligrams per liter (mg/l). The dissolved oxygen content can provide an indirect measurement of the amount of biological activity and contamination in the sample. Microorganisms utilize oxygen as they degrade (digest) contaminants.

5.1 CALIBRATION

Calibration methods may vary; therefore, the calibration of the DO meter should be accomplished following the individual instructions of the manufacturer. The calibration should be accomplished in the field, but the instrument should be checked prior to field use. Check the probe, the probe membrane, and the ability of the instrument to calibrate correctly prior to use in the field.

The calibration of the instrument is dependent on altitude, so the altitude of the site in question must be known. Check the altitude of the site on a USGS topographic map, which should be sufficiently accurate for calibration purposes. The instrument should be re-calibrated when moving the instrument between sites.

5.2 PROCEDURE

5.2.1 The meter should be operated according to the manufacturer's instructions. Many DO meters require that the probe be placed down the well. Care must be taken so that the water is not agitated or air is introduced to the sample. Many DO meters require that the probe be moving up and down at a rate of approximately one meter per foot through the medium to achieve an accurate reading.

5.2.2 Record the temperature and the DO reading in the field notebooks or field logs and initial and date the log. Clean the DO meter with distilled and deionized water and store it according to the manufacturer's instructions.

6.0 MEASURING TURBIDITY

The measurement of turbidity in a field sample is the measurement of the total suspended solids (TSS) within the sample. The turbidity is the measuring of the amount of light scattered by the sample. The turbidity is commonly measured in nephlometric turbidity units (NTU). These units are comparable to the former Formazin Turbidity Units (FTU) and the Jackson Turbidity Units (JTU). The unit should be operated according to the instructions of the manufacturer.

6.1 CALIBRATION

Formazin polymer is used as the turbidity reference standard to calibrate the unit in the field. Prior to use in the field, the unit should be checked for proper working order. The unit should be turned on and allowed a warm-up period if required by the manufacturer. The cuvette containing the standard should be placed in the meter and, if necessary, the meter shall be adjusted to the proper setting.

6.2 PROCEDURE

6.2.1 The meter should be operated according to the manufacturer's instructions. If using bailers to obtain a sample, do this slowly to avoid agitating any fine particles in the sampling media. Rinse out the cuvette using distilled and deionized water.

6.2.2 After pouring the sample into the supplied cuvette, wipe the outside of the container with a cloth or tissue to remove any water or debris.

6.2.3 Place the sample into the machine and record the reading. Avoid organic debris, rapidly settling coarse sediments, or fine air bubbles, as these will affect the readings of the meter. Debris and coarse sediments tend to give low readings, while fine air bubbles will tend to give elevated readings.

6.2.4 Record the turbidity measurement in the field book or sampling log, dispose of the sample in accordance with site conditions, and rinse out the cuvette using distilled and deionized water.