RI01643DF

DRAFT FINAL WORK PLAN AMENDMENT No. 3

TECHNICAL ASSISTANCE

CENTREDALE MANOR RESTORATION PROJECT SITE NORTH PROVIDENCE, RHODE ISLAND

RESPONSE ACTION CONTRACT (RAC), REGION I

For
U.S. Environmental Protection Agency

By
Tetra Tech NUS, Inc.

EPA Contract No. 68-W6-0045
EPA Work Assignment No. 043-ANLA-016P
TtNUS Project No. N0400

May 2001

TETRA TECH NUS, INC.

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Stephen S. Parker
Project Manager

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Program Manager

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FIGURE

1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) Region I requested that Tetra Tech NUS, Inc. (TtNUS) continue to provide Technical Assistance (TA) support for the Centredale Manor Restoration Project Site located in North Providence, Rhode Island under Contract No. 68-W6-0045, Work Assignment No. 043-ANLA-016P.

This Work Plan Amendment (No. 3) describes the scope of work and proposed schedule for providing additional technical support activities required for the source area and groundwater investigation at the site. This Work Plan Amendment was developed based on EPA Work Assignment Form (WAF), Revision No. 8 (dated March 2001), the associated Statement of Work and results of phone conversations between the EPA WAM and TtNUS project manager.

The WAF Rev. 8 describes preparation of Revision 2 of the site QAPP for addition of surface geophysics tasks. The need for the development of QAPP Revision 2 originated from comments from EPA technical staff. Many comments focused on the manner for execution of the source area investigation. Specifically, the comments focused on performing surface geophysics first, then proceeding with the subsurface investigations. Tetra Tech NUS, Inc. recognized that such an approach would require revision of many of the other field tasks to make the most effective use of the data collected. Therefore, the revision to the QAPP (completed in March 2001) describes a new sequence of events and revises the magnitude of several of the field tasks. These changes are described in this Work Plan Amendment.

Items that have changed include the number of samples collected, drilling footage, etc. These items differ from the original basis of cost for the source area investigation. To accurately reflect the anticipated effort that will be performed under the new QAPP, changes to Task 2 (field investigations) and Task 3 (laboratory analysis) are presented in this Work Plan Amendment. The associated cost estimate has been revised as well to reflect the associated changes in costs.

1.1 Work Assignment Objective

The objective of this work assignment is to perform a source area investigation, including the conduct of a soil and groundwater investigation for the Centredale Manor and Brook Village properties at 2074 Smith Street in North Providence, Rhode Island. The major components of this investigation are described in Work Plan Amendment No. 2 for this work assignment (November 2000). Work Plan Amendment No. 3 includes:

- revision 2 to the Quality Assurance Project Plan to direct collection of data under a different sequence of events
- addition of two subcontract efforts (surface geophysics and DPT piezometer installation
- revision of the source and cost of the mobilization effort
- revision of the Phase 1 and 2 soil exploration
- revision to the Phase 1 and 2 groundwater evaluations
- extension of the water level monitoring effort
- addition of surface geophysics

1.2 Work Plan Organization

This Draft Work Plan Amendment contains six sections: the Introduction is presented in Section 1.0; Section 2.0 identifies the site description and the environmental contamination problems; Section 3.0 presents the scope of work; Section 4.0 presents the detailed task descriptions; Section 5.0 presents a proposed project management approach and projected schedule; and Section 6.0 identifies the equipment and consumable supplies necessary to perform the activities identified in this Draft Work Plan Amendment No. 3.

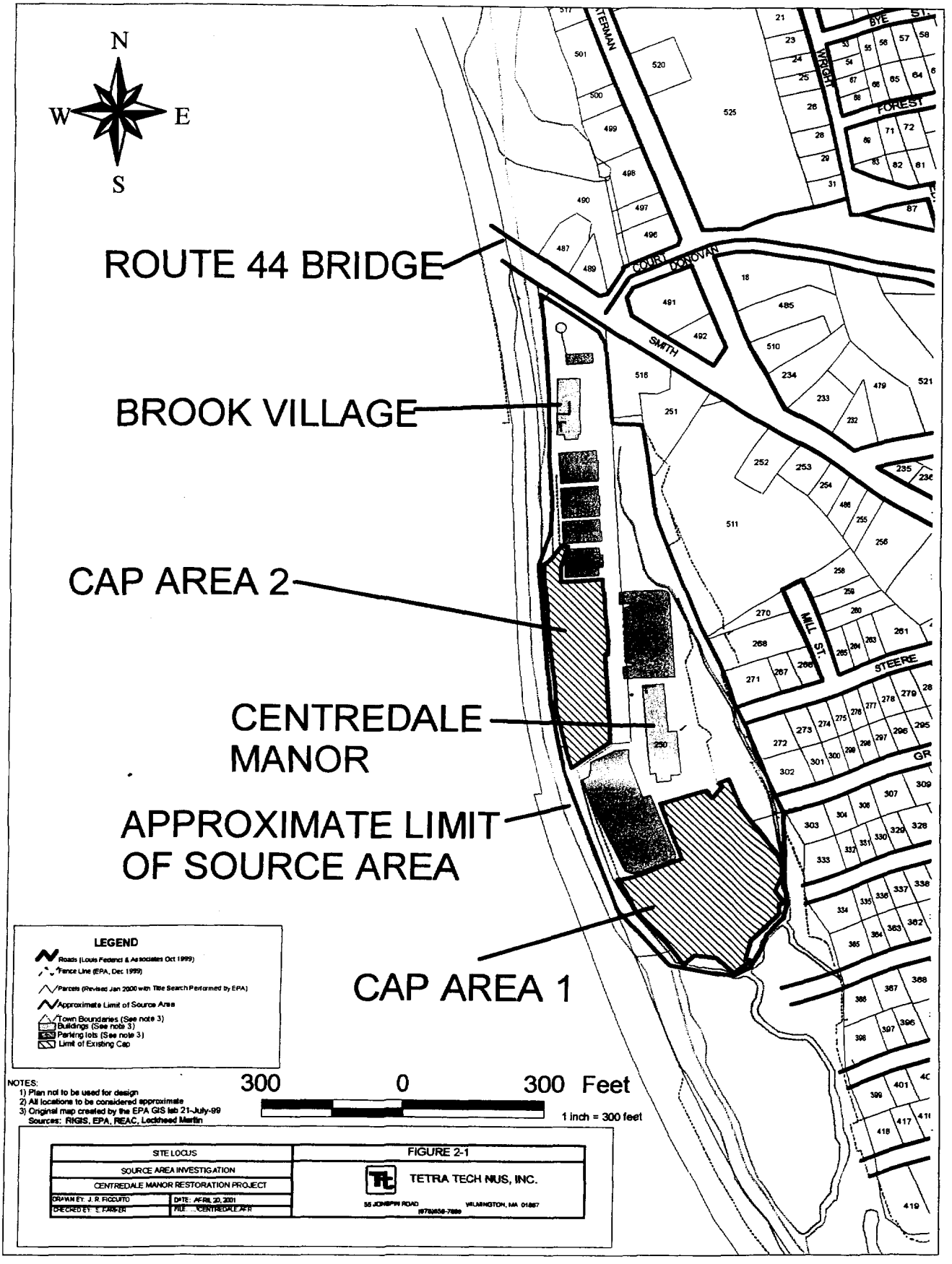
2.0 SITE DESCRIPTION

The Draft Final Work Plan for Technical Assistance (TtNUS, October 1999) presents a description and history of the site pertinent to this work assignment. As that work plan describes, the Centredale Manor and Brook Village properties are the former location of a chemical company and a drum reclamation company that operated between the 1940s and 1970s. Historic records indicate chemicals and chemical wastes were disposed of on the property and released into the Woonasquatucket River during this period. Figure 2-1 presents the source area of the Centredale Manor Restoration Project Site. Some information pertinent to the development of the source area investigation as described in Work Plan Amendment No. 2 has been recalled as described in the paragraphs that follow.

The source area investigation commenced in November 2000 with the preparation and submittal of the Quality Assurance Project Plan (QAPP) Revision 0. That QAPP called for installation of six piezometers to be used for groundwater sampling and water level monitoring. Revision 1 to the QAPP was prepared under the existing SOW to address comments to Section 5. However, following technical review of the QAPP, the need for additional piezometers as well as surface water stations for long term water level monitoring was noted. Additionally, it was requested by EPA that surface geophysics be used to better define the bedrock than only using the limited borings that were scoped.

Previous geophysical investigations identified anomalies and a possible paleochannel under the Brook Village and Centredale Manor properties. This geophysical data will be built on with additional geophysics information to attempt to define this paleochannel, attempt to identify any confining layers, and to attempt to delineate the bedrock surface.

In order to maximize the use of the surface geophysics data and groundwater flow data, the sequence of field work tasks including installation and sampling of borings and wells was revised. Additionally, since piezometers would be installed with direct push methods, soil samples and groundwater samples would not be collected from these piezometers. These revisions to the field work and sampling program were described in the QAPP Revision 2 (March 2001).


N
W
E
S
ROUTE 44 BRIDGE
BROOK VILLAGE
CAP AREA 2
CENTREDALE MANOR
APPROXIMATE LIMIT OF SOURCE AREA
CAP AREA 1
LEGEND
Roads (Louis Fedanzi & Associates Oct 1999)
Fence Line (EPA, Dec 1999)
Parcels (Revised Jan 2000 with Title Search Performed by EPA)
Approximate Limit of Source Area
Town Boundaries (See note 3)
Buildings (See note 3)
Parking lots (See note 3)
Limit of Existing Cap
NOTES:
1) Plan not to be used for design
2) All locations to be considered approximate
3) Original map created by the EPA GIS lab 21-July-99
Sources: RIGIS, EPA, REAC, Lockheed Martin
300 0 300 Feet
1 inch = 300 feet
SITE LOCUS
SOURCE AREA INVESTIGATION
CENTREDALE MANOR RESTORATION PROJECT
DRAWN BY: J. R. RICCIUTO
DATE: APRIL 20, 2001
CHECKED BY: E. FARRER
FILE: ...\CENTREDALE.AFR
FIGURE 2-1
TETRA TECH NUS, INC.
55 JONSPIN ROAD WILMINGTON, MA 01887
(978)658-7899

3.0 SCOPE OF WORK

The Scope for Work Plan Amendment No. 3 includes additional data gathering efforts in accordance with the source area investigation described in Work Plan Amendment 2. The following tasks are included:

- Prepare a Revision 2 to the Quality Assurance Project Plan (QAPP) to accommodate additional data to be collected and to reflect a revised approach for conduct of the source area investigation.

- Install and provide water level monitoring of an additional 18 piezometers using direct push techniques to provide a complete network of groundwater monitoring points that can be used for long term groundwater level monitoring to establish a conceptual groundwater flow model

- Install and provide water level monitoring of three surface water stations to support the groundwater flow model and establish a relationship of groundwater levels to the surface water levels in the river and raceway.

- Perform surface geophysics including ground penetrating radar, seismic refraction, 2D resistivity and square array azimuthal resistivity in order to define a paleochannel under the source area, any confining layers within the subsurface soils, and the surface of the bedrock underlying the site.

The new data that is collected as described above, as well as data collected in November 2000 will preclude the need for certain efforts previously scoped in Work Plan Amendment 2. Therefore, the following efforts are deleted from the scope of work:

- Installation of six shallow piezometers with continuous soil sampling for chemical analysis to a depth of approximately 20 feet below ground surface.

- Collection and analysis of groundwater samples from the six piezometers described above.

- Collection and analysis of soil samples from on-site borings below 10 feet below ground surface, which has been confirmed as depth of fill at the site.

In order to most effectively use the data that is to be collected as described in both this Work Plan Amendment and Work Plan Amendment No. 2, the field work tasks have been rearranged so that the data collected during one effort can be used to scope and augment the data collected in the next. These changes from Work Plan Amendment No. 2 are briefly outlined below.

- Install and sample source area borings and wells as a part of Phase 1 investigations

- Install and sample perimeter wells as a part of Phase 2 investigations

- Collect high water table data in March and April 2001, and collect low water table data in July 2001.

4.0 TASK PLAN DESCRIPTION

This section provides the details of the tasks to be performed by TtNUS to meet the requirements of the EPA Statement of Work (SOW) appended to WAF Rev. 8 and as discussed with the EPA RPM.

This section describes additional work required for the source area investigation that is not described in Work Plan Amendment No. 2. Changes are made to tasks 1, 2, and 3 as described in this section.

4.1 Task 0100 - Project Planning and Support

This task encompasses all necessary activities to plan, execute, and manage the tasks specified in the EPA Statement of Work and amendments.

Explanation of Variances: There is a variance of 458 hours expected for existing work under this task. This variance accommodates completion of QAPP Revision 2 (279 hours), two additional subcontract procurements (82 hours), as well as preparation of this work plan amendment (97 hours). The estimate for new work under this subtask is 50 hours for incorporating the use of surface geophysics into the QAPP and supporting documents.

There are three subtasks that are impacted from the variances described above. The effort for each is described in the following subsections.

4.1.1 Subtask 0115 - Develop Work Plan Amendment 3

TtNUS will prepare and submit a Draft Work Plan Amendment No. 3 and if required, a Draft Final Work Plan Amendment. The Draft Work Plan Amendment No. 3 includes a description of project tasks, the procedures to accomplish them, and a proposed project schedule. Specifically, the Work Plan will include the following:

- A detailed identification of project elements and associated tasks (and subtasks) that conform to the Work Breakdown Structure (WBS) tasks and sequence

specified in the SOW, modified by WAF Revision 8, as well as a re-scoping and re-costing of Tasks 2 and 3 as described elsewhere in this amendment.

- TtNUS' technical approach to perform each task modified by this Work Plan Amendment, including a description of each task, the assumptions used, the information needed for each task, any information to be produced during and at the conclusion of each task, and a description of the work products that will be submitted to EPA.

- A schedule providing specific dates (or assumed if this information is unavailable) for completion of each required activity and submission of each deliverable required by this SOW.

A Cost Estimate will be prepared as a separate document, including the estimated cost to complete the work by Level of Effort (by P levels) and dollar cost for each task of the WBS.

TtNUS will prepare a Draft Final Work Plan after receipt of EPA comments. This Draft Final version will incorporate comments on the draft version as directed by EPA and will reflect revisions as agreed to at the negotiations meeting.

4.1.2 Subtask 0121 - Revision 2 to the Quality Assurance Project Plan (QAPP)

This subtask includes preparing the site management documents using the most recent version of the equivalent plans for the site prepared by TtNUS under this and other work assignments, as well as those prepared by IT Corp, R.F. Weston, and others.

Efforts expended under this subtask included development of the draft Quality Assurance Project Plan for Source Area Investigation (November 2000), as well as Revision 1 (December 2000) and Revision 2 (March 2001). The QAPP incorporates a Field Sampling Plan (FSP), a Data Management Plan, and the quality assurance/quality control (QA/QC) parameters.

TtNUS has developed the original and two revisions to the Quality Assurance Project Plan (QAPP) to direct and control the chemical data acquisition, the field investigation activities, and

hydrogeologic evaluations. Revision 0 of the QAPP was prepared to describe field investigations as proposed in Work Plan Amendment No. 2. Revision 1 of the QAPP was prepared to address general comments from the EPA on the history of the site and problem formulation. Revision 2 of the QAPP was prepared to address technical comments from the EPA on sequencing of tasks and to incorporate additional data acquisition efforts (including surface geophysics) not described in Work Plan Amendment No. 2 or the QAPP Revision 0.

The QAPP and revisions have been prepared in accordance with EPA QA/R-5 (latest draft) and the Region I, EPA New England's Compendium of Quality Assurance Project Plan Guidance (October 1999). The QAPP describes the project objectives and organization, functional activities, and QA/QC protocols that will be used to achieve the desired Data Quality Objectives (DQOs). The DQOs shall, at a minimum, reflect the use of analytical methods for identifying contamination and addressing contamination consistent with the levels for remedial action objectives identified in the National Contingency Plan.

4.1.3 Subtask 0140 — Subcontract Procurement and Support

This subtask includes activities required to procure, administer, monitor, and close-out up to two additional subcontracts:

- Direct push technology (DPT) piezometer installation without soil sampling
- Surface Geophysical Survey

Technical specifications will be developed based on EPA requirements and TtNUS standard operating procedures. Field oversight and monitoring of subcontractor performance will be conducted under appropriate field tasks.

Technical specifications and subcontract procurement for the DAS analyses will be performed under the DAS work assignment.

One pre-bid meeting is anticipated for the surface geophysical survey subcontract. TtNUS will evaluate the performance of subcontractors based on the technical specifications, cost, and the overall contract terms and conditions.

4.2 Task 0200 - Environmental Sampling

The objective of this task is to collect environmental data from the source area augmenting existing data to determine groundwater flow and contaminant loading into the Woonasquatucket River system. Technical detail on the collection of data under this task is presented in the QAPP Revision 2, dated March 2001.

Explanation of Variances: A variance of 463 hours is expected for existing work. This variance will accommodate resequencing of field tasks, instrumentation of additional piezometers, H&S monitoring during sampling, and coordination and oversight of additional land survey. The breakdown of these variances are as follows:

- Subtask 0221 - 1 hour (actual from January 2001)
- Subtask 0222 - 432 hours
- Subtask 0231 - (14) hours (positive variance)
- Subtask 0232 - 32 hours
- Subtask 0241 - 12 hours (actual from October 2000)

The estimate for new work described in WAF Rev. 8 is 230 hours to manage and oversee a geophysics subcontractor and to evaluate surface geophysics data collected.

Most of the subtasks for field investigations are impacted from the variances described above, and therefore, costs for Task 2 have been revised. The approach for completion of these subtasks is also different from that described in Work Plan Amendment No. 2. In the sections that follow, changes to work previously proposed under Work Plan Amendment No. 2 are presented. The eliminated efforts and the added efforts are both described for each affected subtask.

4.2.1 Subtask 0211 — Mobilization/Demobilization

This subtask involves providing the necessary personnel, equipment, and materials for mobilization and demobilization from the study area to conduct the field investigation. Included in this subtask are identifying and obtaining/returning field equipment, supplies, etc. It is

anticipated that the hydrogeologic investigation of the source area will be conducted in two phases, requiring two separate subcontract mobilization/demobilization efforts.

Adjusted pool subcontract dollars and equipment dollars are shown for this subtask on the attached cost estimate for acquisition and maintenance of a field office trailer on site. These costs reflect keeping the trailer for a period of 12 months (August 2000 through July 2001), along with associated utilities (phone and electricity). These costs have been shifted from the "Pool Subcontract category" to the ODC "Other" category. A slight increase is noted because actual vendor rates are reflected in this cost estimate, rather than anticipated rates. LOE for this subtask has not been changed.

4.2.2 Subtasks 0221 and 0222 - Subsurface Soil Exploration

Soil explorations at the source area shall be conducted through a series of soil borings at locations selected as described in the QAPP Revision 2. The paragraphs below describe the changes from the approach described in Work Plan Amendment No. 2. Adjusted equipment, labor, pool subcontract, and travel costs are shown on the attached cost estimate to reflect actual costs incurred under subtask 0221, and anticipated costs under 0222, based on changes described below.

Subsurface Soil Exploration Phase 1 (Subtask 0221):

- ORIGINALLY PLANNED: Installation of five shallow borings into the former raceway, three of which are finished as shallow overburden wells. Samples collected for soil classification and laboratory analysis at 1-foot intervals. This effort was previously scoped under this subtask.

- DELETED FROM THE SUBTASK: Installation of four perimeter borings finished as well clusters of two wells to define soil and bedrock conditions around the perimeter of the Source Area. Samples will be collected for soil classification and description. These borings and wells are now scoped under Phase 2 (Subtask 0222).

- DELETED FROM THE SUBTASK: Installation of eight overburden borings installed at locations on the river bank or pond banks where contaminants are anticipated to be discharged, and finished as wells. Continuous samples collected for laboratory analysis at 1-foot intervals to a depth of 10 feet, which is confirmed to be the extent of fill in these areas. These borings and wells are now scoped under Phase 2 (Subtask 0222).

- ADDED TO THE SUBTASK: Installation of four shallow borings located in areas presumed to be hydraulically downgradient of geophysical anomalies found in 1999, finished as shallow overburden wells. Continuous soil samples collected for laboratory analysis. These borings and wells were formerly scoped under Phase 2.

- DELETED FROM THE PROJECT: Installation of six borings finished as monitoring wells, with continuous soil sampling at 0.5 foot intervals. This deletion provides a reduction in subcontract dollars for this subtask.

- ADDED TO THE PROJECT: Installation of twenty Direct Push Technology (DPT) piezometers spread across the source area to monitor the seasonal water table elevation (no soil sampling or evaluation through installation of these piezometers).

Explanation of Variance (LOE): Because the sequence of investigation tasks was revised, efforts for Phase 1 (Subtask 0221) and Phase 2 (Subtask 0222) as proposed under Work Plan Amendment 2 were reversed. An estimate of 520 LOE was originally provided for the work proposed as Phase 2 but this was conducted as Phase 1, and 674 hours were actually incurred (an increase of 154 hours). This increase in LOE was due to additional piezometer installation and development, weather conditions encountered, and added personnel needed for health and safety monitoring. Because the Phase 1 LOE was applied to Subtask 0221, the Labor Breakdown table provided in the Detailed Cost Estimate reflects an increase of the original estimate from 673 to 674 hours for Subtask 0221.

Explanation of Variance (Dollars):There is an overall reduction in dollars for this subtask due to the deletion of the more expensive borings and monitoring wells and associated sampling.

Subsurface Soil Exploration Phase 2 (Subtask 0222):

- ADDED TO THE SUBTASK: Installation of four perimeter borings finished as well clusters of two wells to study soil and bedrock conditions around the perimeter of the Source Area. Samples will be collected for soil classification and description. These borings and wells were previously scoped under Phase I (Subtask 0221).

- ADDED TO THE SUBTASK: Installation of eight overburden borings installed at locations on the river bank or pond banks where contaminants are anticipated to be discharged, and finished as wells. Continuous samples collected for laboratory analysis at 1-foot intervals to a depth of 10 feet, which is confirmed to be the extent of fill in these areas. These borings and wells were previously scoped under Phase I (Subtask 0221).

- DELETED FROM THE SUBTASK: Installation of four shallow borings located in areas presumed to be hydraulically downgradient of geophysical anomalies found in 1999, finished as shallow overburden wells. Continuous soil samples collected for laboratory analysis. These boring and wells are now scoped under Phase 1 (Subtask 0221).

Explanation of Variance (LOE): As stated above, the sequence of investigation tasks was revised, and efforts for Phase 1 (Subtask 0221) and Phase 2 (Subtask 0222) proposed under Work Plan Amendment No. 2 were reversed. An estimate of 673 LOE was originally provided for the work now anticipated to be conducted as Phase 2, however, an additional 278 hours are needed to accommodate more complex drilling activities now anticipated. This increase in LOE is based on the need to telescope casing below fill layers, change out water between strata, manage separate containers of IDW, and to provide additional personnel for health and safety monitoring during installation of on-site borings. Subtask 0222 in the Labor Breakdown table provided in the Detailed Cost Estimate reflects this increase of 278 LOE plus the increase of 154 LOE incurred during conduct of Phase 1 for a total of 432 LOE. The sum of the two are presented as Subtask 0222 because Phase 1 efforts were charged to Subtask 0221.

Explanation of Variance (Dollars): There is similarly a dollar variance for this task due to the shift of the bulk of the boring/well installation effort to from Subtask 0221 to this subtask.

Technical Approach:

In general, borings will be installed with drive and wash drilling techniques, with the exception of the DPT piezometers and bedrock boring efforts. Drive and wash drilling uses three or four inch ID casing, driven into the borehole, which is washed out using injected water. Samples are collected ahead of the casing foot such that introduced water does not flush contaminants out of the soil. Drilling efforts include advancing the boring, collecting samples with 2 or 3 inch OD split-barrel samplers, constructing wells in the boreholes and development of the well prior to groundwater sample collection. Details on these efforts are presented in the QAPP.

DPT piezometers are installed using a pneumatic hammer to drive an expendable point down into the subsurface materials to a target depth. The hammer rods are withdrawn from the hole, leaving the point behind, and a one-inch ID PVC piezometer is placed into the open hole. The remaining annular space around the screened interval is filled with washed sand, and the space around the casing is filled with bentonite to the extent possible. Since the exact depth to the water table cannot be determined using this methodology, five foot screens are used and water depth is approximated from nearby wells and surface water bodies.

Bedrock drilling is performed using NX or equivalent core barrels and diamond bit cutting heads. Core runs of 10 feet are made then extracted from the hole and placed in core boxes for bedrock quality evaluation. All bedrock wells for this project are estimated to be 30 feet in depth, below approximately 50 feet of overburden.

All subsurface explorations will be performed by a drilling contractor, overseen by a TtNUS geologist or engineer. Subsurface drilling that involves extensive sample collection and shipment to analytical laboratories will require additional personnel to collect, handle, screen, pack and ship these samples under appropriate EPA chain of custody and associated paperwork.

4.2.3 Subtasks 0231 and 0232 - Groundwater Evaluations

Groundwater monitoring wells will be installed in borings installed as described in Section 4.2.2 of this work plan amendment. Samples will be collected at the end of each phase of well installations using low-flow sampling methods as described in the QAPP Revision 2. Adjusted equipment, labor, and travel costs are shown on the attached cost estimate to reflect actual costs incurred under Subtask 0231, and anticipated costs under Subtask 0232, based on changes described below.

Groundwater Evaluation Phase 1 (Subtask 0231):

- ORIGINALLY PLANNED: Samples collected from three shallow overburden wells in the former raceway, based on the observations from boring installation. These samples were previously scoped under this subtask, so there are no cost changes associated with this effort.

- ADDED TO THE SUBTASK: Samples collected from four source area shallow wells to determine quality of the groundwater adjacent to areas where fill has been noted in past studies. These samples were previously scoped under Phase 2 (Subtask 0232) so the subtask addition provides no overall cost changes to the project.

- DELETED FROM THE SUBTASK: Collection of samples from four well clusters of two wells around the perimeter of the site to evaluate groundwater quality at different vertical locations within the overburden and bedrock aquifers. These are now scoped under Phase 2 (Subtask 0232) so the subtask deletion provides no overall cost changes to the project.

- DELETED FROM THE SUBTASK: Collection of samples from eight discharge area shallow wells to determine quality of groundwater entering the pond and river. These are now scoped under Phase 2 (Subtask 0232) so the subtask deletion provides no overall cost changes to the project.

- DELETED FROM THE PROJECT: Installation of recording transducers in six selected monitoring wells for a period of four weeks.

- ADDED TO THE PROJECT: Installation of recording transducers in 21 selected monitoring wells and piezometers and in three surface water monitoring positions for a period of eight weeks. Surface water monitoring positions to be built for this purpose.

- ADDED TO THE PROJECT: Because horizontal gradient of the water table is being evaluated under Phase I (in April 2001), and vertical gradient of the water table is being evaluated under Phase 2 (July 2001), an additional land survey effort will be required to measure vertical and horizontal positions of wells installed under each of these phases of work.

Explanation of Variance: There is an overall increase of dollars for this subtask due to the additional equipment rental and extended rental period. The added survey effort also contributes to the increase in dollars. There is a decrease in travel and sample shipments due to the lower than anticipated sample collection effort. There is a slight decrease in LOE (14 hours), because although LOE for sample collections are reduced, additional LOE was required for installation and maintenance of the additional recording transducers.

Groundwater Evaluation Phase 2 (Subtask 0232):

- DELETED FROM THE SUBTASK: Samples collected from four source area shallow wells to determine quality of the groundwater adjacent to areas where fill has been noted in past studies. These are now scoped under Phase I (Subtask 0231) so the subtask deletion provides no overall cost changes to the project.

- ADDED TO THE SUBTASK: Collection of samples from four well clusters of two wells around the perimeter of the site to evaluate groundwater quality at different vertical locations within the overburden and bedrock aquifers. These were previously scoped under Phase I (Subtask 0231) so the subtask addition provides no overall cost changes to the project.

- ADDED TO THE SUBTASK: Collection of samples from eight discharge area shallow wells to determine quality of groundwater entering the pond and river. These were previously scoped under Phase I (Subtask 0231) so the subtask addition provides no overall cost changes to the project.

- DELETED FROM THE PROJECT: Installation of recording transducers in six selected monitoring wells for a period of four weeks.

- ADDED TO THE PROJECT: Installation of recording transducers in 21 selected monitoring wells and in three surface water monitoring positions for a period of four weeks. Surface water monitoring positions built under Task 0231 will be used for this purpose.

Explanation of Variance: There is an overall increase of dollars for this subtask due to the additional equipment rental (recording transducers). There is also an anticipated increase in LOE, travel, and sample shipments due to the additional sample collections, previously scoped under subtask 0231.

4.2.4 Subtask 0241 — Sediment Sampling, Manton and Dyerville Areas

This task includes collection of sediment samples from the underwater areas of the river downstream of Lymansville dam. This subtask was completed in November 2000. Variances in labor and ODCs shown on the attached cost estimate are a result of actual costs versus those proposed under Work Plan Amendment No. 2.

At completion of this subtask 13 stations were sampled, in addition to two "background" locations (in the pond in line with the Assapumpsett Brook, in Johnston), and associated QC samples. This is a slight reduction from that originally anticipated: 16 stations (plus two background plus QC) would be sampled. The field crew collected sediment samples, prepared chains of custody, packaged and shipped samples to the analytical laboratory for DAS analysis of required analytical parameters (described in Task 0300). All sediment samples were collected from aquatic sediments, as defined in the Technical Memorandum for Woonasquatucket River Sediment Investigations (TtNUS, June 2000).

4.2.5 Subtask 0250 - Air Monitoring and Sampling

Air samples will be collected from inside the Centredale Manor building in spring or summer of 2001. Five samples will be collected for analysis of volatile organic compounds using summa canisters. In addition, five samples will be collected for analysis of dioxins and PCBs using particulate filters and low flow air pumps.

During the collection of air samples, wipe samples from horizontal surfaces in the building for PCBs and dioxins will be collected.

QAPP Revision 2 identifies the need for additional QC samples not previously scoped, as well as additional equipment (pumps) for air sample collection. This results in a slight overall increase in equipment dollars for this subtask.

4.2.6 Subtasks 0270 and 0271 –Geophysical Studies

Work Plan Amendment 2 described the performance of down-hole geophysics under Subtask 0270 to identify bedrock fractures and orientation within the open bedrock boreholes. These efforts do not change from those anticipated in Work Plan Amendment No. 2, so there are no changes to this subtask.

WAF Rev. 8 requests the performance of surface geophysics to attempt to identify a possible paleochannel, depth of fill, presence of confining layers, the surface of bedrock, and bedrock fracture orientation. This will be performed under a new subtask 0271. This effort will be accomplished through a series of geophysical investigative methods including seismic refraction, square array azmithual resistivity, ground penetrating radar, and 2 dimensional resistivity. This additional task results in an increase in LOE and dollars to the project.

Technical efforts for Subtask 0271 are described in the paragraphs that follow.

Seismic Refraction Investigation

The objective of the Seismic Refraction Investigation is to determine the depth to bedrock within the source area and the areas adjacent to the source areas. To meet this objective a series of seismic lines will be run at an orientation that is both parallel and perpendicular to the orientation of the suspected bedrock valley.

Seismic refraction produces and interprets elastic waves traveling through subsurface materials. These waves travel through different materials at different velocities. The more dense materials allow elastic waves to travel at higher velocity. Bedrock has a much higher density than overburden and therefore allows a higher velocity. When the elastic waves cross a geologic boundary such as the contact between bedrock and overburden, the velocity wave is propagated or changed. This change causes the waves to be refracted. With a series of geophones set up in a line with the energy source located at one end, elastic waves generated at the surface and refracted by a high velocity layer will reach the more distant geophones before the wave moving through the lower velocity layer. This difference in arrival times is recorded on a seismograph. The data from the seismograph is evaluated to determine the depth to bedrock based on the wave velocity in each of the layers.

Bedrock depths identified through seismic refraction should be ground-truthed or confirmed with borings at multiple locations. This will assure accuracy of the investigation, and allow for correction if needed. Bedrock borings are anticipated as a part of Phase 2 geologic investigations, and these can be used for confirmation. Locations of the proposed lines are presented in Section 6 of QAPP Revision 2 (March 2001) for the site. A total of 4,500 feet of seismic lines are anticipated.

Square Array Azimuthal Resistivity

After the seismic refraction investigation is complete the location and number of Square Array Azimuthal Resistivity test stations will be selected. This will be done since the slope of the bedrock surface can have an influence of the Square Array Azimuthal Resistivity results. A resistivity sounding will be conducted to determine the spacing of the electrodes. The proposed locations for the Square Array Azimuthal Resistivity surveys are presented on

Figure 6-2 of the QAPP Revision 2. The actual locations and number of test stations will be determined in the field based on the initial test results.

An initial array will be set up based on the seismic refraction results and the resistivity sounding. The spacing of the electrodes will be selected so that the resistivity investigations will penetrate into the bedrock. The resistivity soundings will be conducted using Alpha, Beta, and Gamma configurations. The electrodes will then be moved so that the square is rotated in 15-degree increments and the Alpha, Beta and Gamma configurations will be used for each rotated square.

After the first square array is completed a second square array will be completed in the same manner as the first array using the same center point but with larger electrode spacing. The larger electrode spacing will provide deeper penetration into the bedrock. The deeper penetration also evaluates a larger volume of rock.

At this time it is estimated that eight Square Array Azimuthal Resistivity test stations be conducted at the Centredale Manor Site. The actual number and location of the test stations will be determined in the field after a review of the Seismic Refraction investigation.

Only one Square Array Azimuthal Resistivity test station can be completed per day in the paved parking areas. The decrease in production is due to the need to drill pilot holes for the electrodes through the asphalt.

Ground Penetrating Radar

Ground Penetrating Radar (GPR) has been used at the site by Weston in 1999 to show possible locations of buried debris and depth of fill. The work performed by Weston may be augmented with additional GPR using lower frequency antennas in an effort to try to characterize subsurface materials and possibly detect the bedrock surface. GPR will be performed on the same series of lines as described in the sections above that will run both parallel and perpendicular to the orientation of the suspected bedrock valley. It is anticipated that GPR will be performed on the same lines as those proposed for seismic refraction described above, for a total of 4500 feet.

Two Dimensional Resistivity

Resistivity methods measure the resistance to flow of electricity through the subsurface materials. Typically Direct Current (DC) is injected into the subsurface using electrodes called current electrodes. The current stimulates a response is a second set of electrodes called potential electrodes. This potential is measured using a voltmeter and the resistivity can be calculated from the geometry and spacing of the electrodes, the current injected, and the voltage response at the potential electrodes.

The resistivity of the subsurface materials is a function of the type of materials and the nature of these materials. 2D resistivity is used in conjunction with GPR to characterize subsurface earth materials and possibly the overburden bedrock interface.

4.3 Task 0300 - Sample Analysis

Environmental samples will be analyzed in accordance with the DQOs presented in the QAPP Revision 2. QA/QC during sample analysis will be consistent with the precision, accuracy, representativeness, completeness, and comparability required by the specified category of data quality.

This task is reduced significantly from that previously scoped due to elimination of samples. Samples were eliminated from six borings and wells to be installed as part of Phase I drilling (Subtask 0221). Because these six wells were replaced with DPT piezometers, and because samples cannot be collected during or after this type of installation, the overall sample number decreased. Other samples were eliminated during the refinement of the sampling program documented in the QAPP Revision 2. Overall, the following samples were eliminated:

- 25 soil and 5 sediment samples for dioxin analysis
- 13 soil and 5 sediment samples for SVOC analysis
- 13 soil and 5 sediment samples for metals analysis
- 5 sediment samples for Grain size/TOC analysis
- 5 sediment samples for AVS/SEM analysis

- 64 soil samples for VOC analysis
- 15 groundwater samples for alk./sulf/TOC analysis

Also as part of completion of the QAPP, some QC samples were added:

- 3 Air samples for VOC analysis
- 3 Air samples for PCB analysis
- 4 Wipe samples for PCB analysis

The samples obtained from the field work described in Task 0200 will be analyzed under both the DAS and the CLP program: Aquatic sediments were analyzed under the DAS work assignment due to the anticipated concentrations of dioxin (greater than 1 ppb) and anticipated solids content below 30 percent). Soils and groundwater samples will be analyzed by CLP laboratories, with the exception of the dioxin analysis, and soil VOC analysis which will be performed by DAS laboratories.

The LOE for subcontracting the DAS analytical services is included under the DAS work assignment. No LOE will be incurred under this task. Only the costs for DAS analyses are included under this subtask.

Sediment samples will be analyzed for dioxins and hexachloroxanthene (HCX), PCBs, semivolatile organic compounds (SVOCs), pesticides, metals, acid-volatile sulfides and simultaneously extracted metals (AVS and SEM), total organic carbon (TOC), grain size distribution, percent moisture or percent solids.

Soil samples will be analyzed for dioxins and HCX, PCBs, SVOCs, pesticides, VOCs and metals. Groundwater samples will be analyzed for dioxins and HCX, PCBs, SVOCs, pesticides, VOCs total and dissolved metals, pH, Eh, dissolved oxygen, alkalinity, sulfide, and TOC. The compound hexachloroxanthene (HCX) will be identified as a Tentatively Identified Compound (TIC) during the dioxin analysis.

5.0 PROJECT MANAGEMENT

The overall TtNUS project management and control of the technical assistance support activities are presented in the approved Draft Final Work Plan for Technical Assistance (TtNUS, October 1999).

5.1 Project Organization

Mr. George Gardner, the Program Manager, is responsible for the overall management and implementation of the RAC I contract performed in US EPA Region 1. Mr. Stephen Parker will continue to serve as the project manager for Work Assignment 043-ANLA-O16P and has the primary responsibility for the implementation and execution of the Work Assignment including technical quality, oversight/review, control of costs and schedule, and implementation of appropriate quality assurance procedures during all phases. In general, the technical disciplines and technical staffing will be drawn from the TtNUS's Wilmington, Massachusetts, office. When specialized or additional support is required, personnel from other TtNUS offices may be used.

5.2 Quality Assurance and Data Management

All quality assurance and data management work shall be performed in accordance with the TtNUS RAC I QA Program Plan.

5.3 Project Schedule

The schedule begins concurrently with preparation of Work Plan Amendment No. 2 (July, 2000). The primary deliverable for this work assignment, which is the final Technical Memorandum for the Source Area Investigations is anticipated to be complete on December 31, 2001. This reflects no change to the schedule originally proposed under Work Plan Amendment No. 2.

5.4 Project Cost

The additional cost for the performance of the source area investigation as described in this Work Plan Amendment is presented in a separate document, the Detailed Costing Estimate.

The anticipated costs for the additional effort requested in WAF Rev. 8 are partially offset by exclusion of other field tasks that this effort replaces. The cost estimate for the source area investigation described in Work Plan Amendment No. 2 is $901,016. The detailed cost estimate associated with Work Plan Amendment No. 3 includes a completely revised cost for Tasks 2 and 3, as well as additional costs for Task 1. The overall change from these revisions is a net increase of $127,616 for a new total of $1,028,632 for the source area investigation, and $1,753,339 for the Work Assignment.

6.0 EQUIPMENT AND SUPPLIES

As described in Sections 1, 2 and 5 of this work plan amendment, the order of performance of tasks has been revised from that described in Work Plan Amendment No. 2. In order to most effectively use the data that is to be collected as described in both this Work Plan Amendment and Work Plan Amendment No. 2, the field work tasks have been rearranged so that the data collected during one effort can be used to scope and augment the data collected in the next. To assure cost-effective use of equipment and field time, Task 2 costs for equipment and supplies have been revised as noted in the Detailed Cost Estimate for Work Plan Amendment No. 3.

Additional non-expendable equipment is required for performance of long term groundwater monitoring at 24 separate locations as described in Section 4 of this work plan amendment. The original cost estimate provided in Work Plan Amendment No. 2 described the use of recording transducers at six locations. Since the number of locations has been increased, additional transducer rental is required. See also the Detailed Cost Estimate for other equipment details.