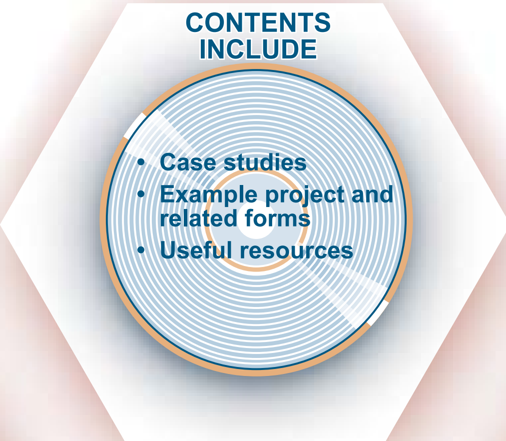
Understanding Procurement for Sampling and Analytical Services Under a Triad Approach



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Understanding Procurement for Sampling and Analytical Services Under a Triad Approach

U.S. Environmental Protection Agency
Office of Solid Waste and Emergency Response
Brownfields and Land Revitalization Technology Support Center
Washington, DC 20460

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Case study information provided in this document was verified by site contacts as of early 2004.

This document can be obtained from EPA's Brownfields and Land Revitalization Technology Support Center at *http://www.brownfieldstsc.org*. A limited number of hard copies of this document are available free of charge by mail from EPA's National Service Center for Environmental Publications at the following address (please allow 4 to 6 weeks for delivery):

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ACRONYMS AND ABBREVIATIONS

AA	Atomic absorption
bgs	Below ground surface
BOA	Basic ordering agreement
BTSC	Brownfields and Land Revitalization Technology Support Center
CICA	Competition in Contracting Act
COC	Chemical of concern
Cr	Chromium
CSM	Conceptual site model
DCAA	Defense Contract Audit Agency
DDT	Dichlorodiphenyldichloroethane
DNAPL	Dense nonaqueous-phase liquid
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ERRS	Emergency and Rapid Response Services contract
ERT	Environmental Response Team
ESAT	Environmental Services Assistance Team contract
FAR	Federal Acquisition Regulations
FDEP	Florida Department of Environmental Protection
FedBizOpps	Federal Business Opportunities web procurement portal
FIELDS	FIeld EnvironmentaL Decision Support
FSP	Field sampling plan
GC/MS	Gas chromatography/mass spectrometry
GIS	Geographic information system
GPS	Geopositional satellite
GSA	General Services Administration
HazCat	Hazard categorization
IA	Immunoassay
ICP	Inductively coupled plasma
ID/IQ	Indefinite delivery/indefinite quantity
IGCE	Independent government cost estimate
LIF	Laser-induced fluorescence
mg/kg	Milligram per kilogram
MIP	Membrane interface probe
MIPR	Military interdepartmental purchase request
MSA	Master services agreement
MTCA	Model Toxics Control Act
NJDEP	New Jersey Department of Environmental Protection
O&M	Operation and maintenance
Ohio EPA	Ohio Environmental Protection Agency
ORD	Office of Research and Development
OSC	On-Scene Coordinator
OSRTI	Office of Superfund Remediation and Technology Innovation
PAH	Polycyclic aromatic hydrocarbon
PBC	Performance-based contracting
PCB	Polychlorinated biphenyl
PCP	Pentachlorophenol
POL	Petroleum, oil, and lubricants
ppm	Part per million

ACRONYMS AND ABBREVIATIONS (continued)

PRP	Potentially responsible party
QA	Quality assurance
QAPP	Quality assurance project plan
QC	Quality control
RA	Remedial action
RAMP	Remedial action management plan
RCRA	Resource Conservation and Recovery Act
RD	Remedial design
redox	Reduction-oxidation
RFP	Request for proposal
RI	Remedial investigation
SADA	Spatial Analysis Decision Assistance
SCAPS	Site characterization and analysis penetrometer system
SIFU	Site Investigation Field Unit
SOQ	Statement of qualifications
SOW	Statement of work
SVOC	Semivolatile organic compound
TCA	Trichloroethane
TCE	Trichloroethene
TPH	Total petroleum hydrocarbons
USACE	U.S. Army Corps of Engineers
VCP	Voluntary cleanup program
VOC	Volatile organic compound
XRF	X-ray fluorescence

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TABLES

FIGURES

1.0 INTRODUCTION

The use of innovative technologies and approaches to streamline site investigations and cleanup of hazardous waste sites is continuing to expand, providing opportunities for better, more cost-effective solutions to environmental problems compared to traditional approaches. One such approach is the Triad – an innovative approach that uses systematic project planning, dynamic work strategies, and real-time measurement technologies to reduce uncertainty and improve decision-making while reducing overall project costs and timeframes. The overarching goal of the Triad approach (see box) is to actively manage decision uncertainty. The confidence and effectiveness of project decision-making are improved by:

- Identifying and managing decision uncertainties (those unknowns that stand in the way of making confident decisions) and data uncertainties (sources of variation in data when decisions are based on data)
- Incorporating advanced science and technologies to support "better, faster, and cheaper" projects

The Triad Approach – Overview
The Triad is an approach to environmental decision-making that is grounded in the management of decision uncertainty. This approach is used to manage decisions based on environmental data and addresses sampling, analytical, and relational uncertainties associated with those data. The most cost-effective way to accomplish uncertainty management is by using modern technologies and strategies to rapidly and efficiently build a conceptual site model tailored to support site-specific risk and remedial decision-making needs. These concepts are captured in the three elements of the Triad, which are systematic project planning, dynamic work strategies, and real-time measurement technologies. Refer to www.triadcentral.org for additional information.

Triad practitioners are developing a growing collection of information about the technical implementation of the Triad. However, only limited information is available regarding the procurement of sampling and analytical services under a Triad framework. Specifically, the dynamic nature of this approach requires that Triad-specific procurement issues be addressed, namely providing the flexibility and adaptability during project implementation that are crucial to the success of the Triad and to allow for the thorough, up-front planning required by the approach. The U.S. Environmental Protection Agency (EPA), through its Brownfields and Land Revitalization Technology Support Center (BTSC – see box below), has prepared this document to highlight methods and strategies that have been successfully used to procure services under a Triad framework. The document includes examples and lessons learned from actual Triad projects implemented in the federal, state, local, and private sector arenas.

Document Purpose and Scope

The purpose of this document is to provide project managers, technology service providers, regulators, and other interested parties with information and examples that may be useful in developing and implementing Triad-specific procurement approaches. The information is based on the actual experiences of federal, state, local, and private sector parties in working within their procurement systems to implement Triad projects. The document is intended for a wide audience, including federal, state, and local government agencies as well as the private sector, and includes examples from each. This document is not intended to be a comprehensive guide to procurement and in no way revises or supersedes any official procurement regulations or requirements. Rather, it is intended to provide an overview of strategies and approaches that have been used to procure services under a Triad framework.

In this document, the procurement processes are discussed in general terms that are intended to be broadly applicable to a wide audience. It is important to note that each procuring entity has its own specific regulations and requirements and that the terms used in an actual procurement will be specific to that entity. Furthermore, the specific requirements of an actual procurement will be determined on a case-by-case basis subject to the regulations and requirements of the procurement entity – including the Federal Acquisition Regulations (FAR) for the federal government (www.arnet.gov/far) – and the applicable requirements of states, local governments, and the private sector.

About the Brownfields and Land Revitalization Technology Support Center
EPA established the BTSC (www.brownfieldstsc.org) to ensure that decision-makers are aware of the full range of technologies available for conducting site assessments and cleanups and can make informed decisions about their sites. The center can help decision-makers evaluate strategies to streamline the site assessment and cleanup process, identify and review information about complex technology options, evaluate contractor capabilities and recommendations, explain complex technologies to communities, and plan technology demonstrations. The center is coordinated through EPA's Office of Superfund Remediation and Technology Innovation (OSRTI) and offers access to experts in EPA's Office of Research and Development (ORD) and other federal agencies such as the U.S. Department of Defense (DoD) and Department of Energy (DOE). Localities can submit requests for assistance through their EPA Regional Brownfields Coordinators, online; or by calling (877) 838-7220 toll free. For more information about the BTSC, contact Dan Powell of EPA at (703) 603-7196 or powell.dan@epa.gov. Publications developed through the BTSC include:

- "Road Map to Understanding Innovative Technology Options for Brownfields Investigation and Cleanup, Third Edition"
- "Assessing Contractor Capabilities for Streamlined Site Investigations"
- "Directory of Technical Assistance for Land Revitalization"
- "Brownfields Technology Primer: Requesting and Evaluating Proposals That Encourage Innovative Technologies for Investigation and Cleanup"
- "Brownfields Technology Primer: Using the Triad Approach to Streamline Brownfields Site Assessment and Cleanup"
- "Brownfields Technology Primer: Selecting and Using Phytoremediation for Site Cleanup"

Overview of Programs for the Triad

The Triad approach has been used or is well suited for implementation at all types of contaminated sites, including the examples provided below and other site types such as sites with underground storage tanks.

- **Brownfields:** The Triad is well suited for use in assessing and cleaning up Brownfields sites by a wide range of property owners, including state and local governments. Under EPA's Brownfields program, property owners can apply for funding from the Brownfields Site Assessment or Cleanup Revolving Loan Fund program when they plan to use innovative technologies and strategies such as the Triad. For more information, visit EPA's Brownfields Web site at www.epa.gov/brownfields.

- **Superfund:** EPA's OSRTI is promoting the use of the Triad approach at Superfund sites. The approach can be used during all portions of the Superfund remedial action, from remedial investigation (RI) through remedial design (RD), remedial action (RA), and operation and maintenance (O&M). With the appropriate level of quality control (QC) and documentation, data of the quality necessary to support most decisions can be generated in the field. For more information, visit the EPA Superfund Web site for dynamic field activities at www.epa.gov/superfund/programs/dfa.

  In addition, the Triad can be used for Superfund removal actions. Because of the need to move quickly and mitigate immediate threats to human health and the environment during removal actions, innovative approaches such as the Triad are well suited for these types of actions. EPA's Environmental Response Team (ERT) has been a leader in developing data and information tools to assist project managers with removal actions and expedited approaches to support these actions, including the Triad. For more information, visit the ERT software support Web site at www.ertsupport.org/.

- **Resource Conservation and Recovery Act (RCRA) Corrective Action:** Innovative sampling and analysis strategies such as the Triad work well at RCRA sites undergoing corrective action and can be applied from the site assessment process through design and implementation of corrective measures. For more information, visit the RCRA corrective action Web site at www.epa.gov/epaoswer/hazwaste/ca/index.htm.

- **State-Lead Programs:** Many state-lead programs are integrating innovative approaches into environmental cleanups. State voluntary cleanup programs (VCP) and state Superfund programs are pioneering the use of the Triad approach. They offer mobile laboratory services to local governments, and in some cases to potentially responsible parties (PRP), in order to expedite site characterization and allow decision-making on a real-time basis. For example, the State of Florida's Dry Cleaner Remediation Program offers assistance to site owners for the cleanup of dry cleaning sites using direct-push technologies and field-based measurement systems coupled with a pollution prevention program.

- **Private Sector:** The private sector has been a leader in implementing innovative sampling and analytical strategies such as the Triad on a broad range of projects. These efforts have included use of field-based site characterization technologies and dynamic work strategies to decrease uncertainty while reducing overall project costs.

Document Organization

Section 2 of this document discusses approaches and strategies that have been successfully used to procure sampling and analytical services under a Triad approach. Section 3 presents six examples of recent procurement experiences under a Triad framework from federal, state, local, and private sector projects. Additional detailed information is provided in related Web sites (referred to in this document as attachments). These are described in Table 1-1, and include the following:

A Triad Overview
B Overview of Field-Based Measurement Technologies
C Pertinent Resources
D Glossary
E McCormick and Baxter Site Information
F Wenatchee Tree Fruit Site Information
G Florida Department of Environmental Protection Program Information
H Ohio Environmental Protection Agency (Ohio EPA) Program Information
I Assunpink Creek, Trenton, New Jersey, Project Information
J Lake Success Business Park (DuPont) Project Information

Table 1-1. Additional Information Related to Procurement in Attachments

Attachment	Description	Location
A – Triad Overview	Provides an overview of the key concepts, requirements, and benefits of the Triad approach, including a brief summary of the Triad approach.	http://www.triadcentral.org/over/index.cfm
B – Overview of Field-Based Measurement Technologies	Provides a summary of information about selected sampling technologies such as direct push technologies and techniques, and field-based measurement technologies that can be used under a Triad approach.	http://www.triadcentral.org/tech/index.cfm
C – Pertinent Resources	Provides information on references and resources about procurement and innovative technologies related to the Triad approach.	http://www.triadcentral.org/ref/index.cfm
D – Glossary	Provides descriptions of key terms used in this document.	http://www.triadcentral.org/gloss/index.cfm
E – McCormick and Baxter Site Information	Includes the scope of work used to procure sonic drilling services for this site.	http://www.brownfieldstsc.org/procurement_ex.cfm
F – Wenatchee Tree Fruit Site Information	Includes two versions of a case study (one by EPA and one by the U.S. Army Corps of Engineers [USACE]) about the site investigation and cleanup. Also included are the field sampling plan (FSP), quality assurance project plan (QAPP), and remedial action management plan (RAMP) for the site.	http://www.brownfieldstsc.org/procurement_ex.cfm
G – Florida Department of Environmental Protection Program Information	Includes materials used to solicit contractors for the Dry Cleaner Remediation Program, including example rate categories.	http://www.brownfieldstsc.org/procurement_ex.cfm

Table 1-1. Additional Information Related to Procurement in Attachments (continued)

Attachment	Description	Location
H – Ohio EPA Program Information	Provides background information about the Site Investigation Field Unit (SIFU) program as well as materials about one site investigated by the SIFU.	http://www.brownfieldstsc.org/procurement_ex.cfm
I – Assunpink Creek, Trenton, New Jersey, Project Information	Includes the request for proposal (RFP) used by the City of Trenton to procure Triad investigation services for the site as well as the dynamic work plan used to guide the investigation.	http://www.brownfieldstsc.org/procurement_ex.cfm
J – Lake Success Business Park (DuPont) Project Information	Includes a case study about the use of X-ray fluorescence (XRF) field analyses at the site.	http://www.brownfieldstsc.org/procurement_ex.cfm

2.0 APPROACHES AND STRATEGIES FOR PROCURING SAMPLING AND ANALYTICAL SERVICES UNDER A TRIAD APPROACH

There are many avenues for success in procuring services under a Triad approach. Keys to success include understanding the Triad-specific needs of the procurement, working with the procurement officials from the start to identify the best procurement method for the specific project, and understanding that flexibility and adaptability are crucial to successful implementation of the Triad. This section provides information about successful procurement approaches and strategies that have been used by a wide range of entities, including federal, state, and local agencies as well as the private sector. The approaches and strategies are based on experiences and lessons learned in procurement efforts, and the discussion includes information about potential procurement barriers and key considerations. It is important to note that the information presented in this section is not official guidance and does not revise or supersede any official government or other procurement regulations or requirements (see box about additional information on performance-based contracting to be provided at a later date).

Performance-Based Contracting
Recently, performance-based contracting (PBC, also known as performance-based service contracting) has seen an increase in use for procurement of sampling and analytical services. PBC is a procurement strategy that structures all aspects of an acquisition around the purpose of the work to be performed as opposed to the manner in which the contractor must perform the work or the processes that must be used. This strategy leverages the ingenuity of industry while providing the government with access to the best commercial products, services, and processes. Use of PBC strategies reduces acquisition cycle time and costs because contractors are not compelled to meet detailed, design-type specifications that inhibit creativity and efficiency. Use of the Triad approach is generally consistent with PBC concepts. EPA is planning a separate publication as a supplement to this report that will address the interrelationships between PBC and Triad.

2.1 TRIAD-SPECIFIC CONSIDERATIONS

As discussed in Section 1.0, the Triad involves three main components: (1) systematic project planning, (2) dynamic work strategies, and (3) real-time measurement technologies. The Triad involves a change in paradigm for site characterization and cleanup – moving from a traditional, step-by-step approach that involves standard processes, often with multiple mobilizations, to an innovative, dynamic approach that is flexible and adaptable and that minimizes the number of mobilizations. The dynamic approach allows decisions and strategies to be refined in the field in response to data generated using real-time measurement technologies. This approach encourages innovation within the context of sound planning to improve decision-making, reduce mobilizations, and reduce overall project costs and timelines. Most procurement methods (discussed in more detail below) are intended to accommodate the more traditional approach to site characterization and cleanup under which projects are designed to be performed in specific steps, with the elements associated with each step (such as sampling locations, number of samples, and analytical methods) relatively well defined.

The traditional approach generally requires a separate procurement or work plan for each step. Under the Triad approach, the services for an entire project or the major components of the project may be obtained under one procurement or work plan. The following Triad-specific considerations are important to successfully procuring services under a Triad framework:

- The three components of the Triad approach – systematic project planning, dynamic work strategies, and real-time measurement technologies
- Unit costs
- Flexibility

Three Components of the Triad Approach

The three components of the Triad approach are summarized below and are described in detail at www.triadcentral.org.

- **Systematic Project Planning** includes development and maintenance of a conceptual site model (CSM) that defines project goals and decisions to be made, identifies the type and quality of data to be collected, and determines how the data should be collected. Development of a systematic plan involves discussions with appropriate parties such as regulators, site representatives, and members of the local community. These discussions are important to the development of a well-defined, systematic plan and associated planning documents that are accepted by all involved. The CSM describes the likely conditions at the site based on existing information, identifies the uncertainties associated with the site, and provides the basis for designing data collection programs to reduce the uncertainties. The CSM can be used to provide an upper estimate of potential costs based on a contingency analysis of the uncertainties and can be used to help define the most appropriate contract mechanism for the project. Systematic planning maximizes the use of existing data and information to identify critical decisions and related data gaps. It is also used to identify logically related activities that in turn can be used to identify unit costs for activities within a given task. The planning process involves developing strategies and decision trees that are used to implement the statement of work (SOW) in the field and is essential to the Triad approach. As such, in any work plan or SOW, it is important to provide the scope, budget, and resources needed to conduct systematic project planning.

- **Dynamic Work Strategies** include the logical progression of activities that will be used to achieve project goals. Work planning documents written in a dynamic or flexible mode guide the course of the project and are adapted in real time (for example, while the work crew is still in the field) as new information becomes available. This process allows the preliminary CSM to be tested and refined in order to support the desired level of decision confidence in real time, saving time and money while supporting resolution of uncertainties and QC more effectively than work plans written in a static mode. (EPA's Emergency and Rapid Response Services [ERRS] contracts generally operate on the principle that if and when a contractor arrives on site to perform work and finds that conditions have changed, the contractor, through coordination with the On-Scene Coordinator [OSC], can make a change as to how the site is addressed.) Dynamic investigations using direct-push methods and associated innovative technologies, which are common with the Triad, have tended to work best when a variety of detailed optional tasks are built into a contract. Depending on the project scope and the size of a task, unit costs can be developed based on hourly rates, daily rates, half-daily rates, or the number of feet or holes drilled. If units of time (hourly/daily/half-daily) are used, minimum performance requirements (for example, assumed daily efforts in terms of number of feet drilled, holes installed, or samples collected) can be built into daily rates based on a well-defined scope and/or site knowledge. Additional unit costs for sample collection, materials, standby time, minimum daily charges, and overtime may need to be addressed. Minimum quantities should be estimated for each unit cost and option.

- **Real-Time Measurement Technologies** include sampling and analytical services that allow decisions to be made on a real-time basis while the work crew is still in the field. Real-time measurement involves field-based technologies that can provide real-time or near real-time delineation of site geology, hydrogeology, and contaminant distributions. For example, direct-push technology has become a preferred platform for housing in situ analytical data collection and sampling tools. (See Attachment B for further information about field-based technologies.) Real-time measurements can be performed by mobile laboratories as well as fixed laboratories that have quick turnaround times. In all cases, the level of quality assurance and quality control (QA/QC) required for the measurement technologies (as defined in the systematic plan) needs to be considered in the SOW along with the limitations of the technologies and contingency plans to address these limitations. For example, when higher levels of QA/QC are needed, the sample throughput is usually reduced, which can increase per sample costs. Use of real-time measurement technologies also includes use of appropriate decision support tools to manage sampling and analytical data at the site. Examples of decision support tools used for Triad projects include FIeld EnvironmentaL Decision Support (FIELDS) and Spatial Analysis Decision Assistance (SADA). Further information about these tools is available in "Using the Triad Approach to Streamline Brownfields Site Assessment and Cleanup" (EPA 542-B-03-002, June 2003), which is available through www.brownfieldstsc.org.

Unit Costs

In a Triad procurement, a "unit" is defined as a discrete activity that can be used as a basis for estimating and tracking costs for a project. Unit costs for services and equipment are site-specific and need to be customized to meet the specific needs of the project. For example, a unit cost for a particular type of field analysis could incorporate the daily rate for the equipment, personnel time, and mobilization costs and might specify a minimum number of samples to be analyzed in order to qualify for billing at a predetermined rate. Activities that will be repeated during the course of a project are well suited for unit costs. For example, a unit cost for instrumentation that provides a continuous view of the subsurface could be developed based on a daily or weekly rate. Alternatively, if a particular geologic setting is not well understood and flexibility is needed to further define site conditions, a unit cost based on linear footage may be more suitable. A planning process that allows decision-makers to understand the specific services and equipment to be provided and the associated "units" is essential for a successful procurement.

Examples of activities that are well suited for unit costs include the following:

- Direct-push and drilling programs (rates based on a unit-time with a stated minimum footage, as discussed in the box below)
- Leasing of geophysical technologies (units based on hourly or daily rates, per acre rates, or per foot rates)
- Portable analytical methods such as Hach ferrous iron test kits and the Photovac Snapshot Gas Chromatograph for air or vapor monitoring (rate based on number of samples analyzed)
- Contracting of field analytical services (rate based on number of hours of operation)
- Mobile gas chromatography (GC) laboratories (rates generally cover all equipment, consumables, data reporting, and QA/QC and are based on number and type of samples)

New Mexico Department of Transportation – Unit Cost Approach for Direct-Push Work
The New Mexico State Highway and Transportation Department District 1 Headquarters site in Deming, New Mexico, was contaminated with 1,1,1-trichloroethane (TCA) that had been disposed of in a septic system. This was a state-lead site with a prime contractor serving as project manager and two subcontractors supporting the investigation. Borehole investigations were performed by a geophysical subcontractor using direct-push technology. The direct-push work was priced at a daily rate, not including mobilization and demobilization costs. The direct-push costs included the daily rate, overtime hours if required, per diem, and unit prices for a number of consumables. The project was conducted under a time and materials contract with a not-to-exceed value. Through use of unit rates for consumables and a preprinted form for tracking materials used at each location, the costs per borehole could be closely monitored. The unit rates allowed the project manager to readily tabulate how the actual costs compared with the budget on a daily basis.

Flexibility

Because the complete scope for dynamic site investigation and cleanup projects cannot always be fully anticipated, contracts and agreements between technology contractors and project teams should address criteria for scope modification so that investigations can be quickly adapted in response to field conditions and data. Development of options and unit rates based on the anticipated data needs of a project will increase the flexibility of a procurement as well as the efficiency of the project. Successful projects involve:

- Clear decision criteria for ceasing or continuing to collect data (in the form of decision trees or investigation flow charts)
- Clear methods and lines of communication to facilitate rapid decision-making
- Clear understanding of the cost implications of scope changes and of how optional tasks will be triggered and managed
- Real-time meetings to discuss unanticipated situations or problems encountered

- Coordination between contractors and vendors on a real-time basis to ensure the availability of resources
- A rationale for "ranges" of samples to be collected and analyzed
- Clear decisions based on how sampling locations may be determined and revised in the field

2.2 OVERVIEW OF PROCUREMENT APPROACHES FOR TRIAD SERVICES

Procuring services for a project under a Triad framework depends on a number of factors, including the complexity of the project, end use considerations for the site, budget and schedule requirements, whether an existing contract vehicle is available or a new contact is needed, and the specific procurement requirements and regulations, which will vary depending on whether the procurement is performed by a federal or nonfederal government agency or by the private sector.

This section provides information about approaches and strategies that have been successfully used to procure services under the Triad (see Section 3 for example case studies). It is important to note that the specific type of contract used and its terms and conditions will depend on the specific requirements of the project, the specific entity procuring the services, and the governing procurement regulations and requirements.

As discussed in Section 1, this document is intended to provide a broad overview of procurement approaches based on actual experiences under the Triad approach. As such, the terminology used in the document is intended to be generally applicable across the federal, state, local, and private sectors. Therefore, the terminology is not specific to a particular procurement entity or body of regulations (for example, the FAR) and is intended to provide only an overview of ideas and methods for procuring Triad services in a broad arena.

Overview of Contract Types for the Triad

Triad services have generally been procured under fixed-price and cost-reimbursable types of contracts. The decision about the type of contract to be used will be project-specific, depending on a number of factors such as how well defined the scope and schedule of the project are, the type of contingencies expected, and requirements specific to the procuring entity. In general, cost-reimbursable contracts are used when there is greater uncertainty regarding the scope of the project. Under this type of contract, the contractor is reimbursed based on actual costs at a negotiated rate and fee. Fixed-price contracts are generally used when there is less uncertainty regarding the scope of the project. Under a fixed-price contract, the contractor is paid a set amount to complete a specific scope of work based on an agreed-upon price. As such, for Triad-type projects, smaller projects with lower costs and fewer scope uncertainties tend to lend themselves to fixed-price contracts, and relatively large projects with greater scope uncertainties tend to lend themselves to cost-reimbursable contracts. There are several variations on these types of contracts. Fixed-price contracts may be nonnegotiable, such as in firm-fixed-price contracts, or may include incentives, such as in fixed-price-incentive contracts. Cost-reimbursable contracts include cost-plus-fixed-fee, cost-plus-award-fee, and cost-plus-incentive-fee contracts, with the terms for payment of the fee defined by the contract.

Contracts can be further defined by their schedule and quantity requirements. Within the government, contracts include: (1) definite-quantity contracts, which specify the quantity of supplies or services to be delivered within a fixed time period; (2) requirements contracts, which provide for filling defined purchase requirements for supplies or services during a contract period by placing orders; and (3) indefinite-quantity contracts, also known as task order or delivery order contracts, which provide for obtaining an indefinite quantity, within stated limits, of supplies or services within a fixed period. Government indefinite delivery/indefinite quantity (ID/IQ) contracts are especially well suited for procuring Triad services. ID/IQ contracts give the buyer flexibility in both the quantity of services to be procured and the scheduling of those services while controlling overall budgets and schedules through the specific terms and conditions identified in each task or delivery order.

As discussed above, the dynamic nature of the Triad requires contract flexibility (in order to allow for a dynamic work strategy and real-time decision-making), while contract integrity is maintained and the specific requirements and applicable regulations of the procuring entity are met. Therefore, a key to success in determining whether a given contract vehicle is suitable for procuring services under the Triad for a specific project is to involve the contracting staff in identifying the best contracting avenue. For example, within the federal government, the Contracting Officer can be a valuable asset in identifying innovative aspects of a contract mechanism and can provide specific information about how a contract vehicle could be used for procuring services under the Triad. The Contracting Officer should be actively involved in the planning process and in identifying the most appropriate procurement strategy. The Navy's Alpha Contracting program (see text box) illustrates the advantages of working as a team to identify the best contracting solution for a specific project requirement.

Example of Federal Agency Process for Identifying Contracting Solutions – Alpha Contracting
Alpha Contracting streamlines the acquisition process for the Navy and reduces the cycle time for contracts. It emphasizes conducting actions concurrently and maintaining a close relationship between an integrated government team and contractors. For example, under Alpha Contracting, the government and contractors may work together to develop a solicitation package that meets the government's needs while addressing contractor questions or concerns. Similarly, as the contractors complete portions of their technical and cost proposals, an integrated government team, including representatives of the program office, the contracting office, the contract administration office, and the Defense Contract Audit Agency (DCAA), may review the proposals and attempt to resolve issues that the team identifies. When the completed proposals are then formally submitted to the Contracting Officer, much of their content may have already been negotiated. This approach is likely to result in an optimized program with an achievable scope, improved performance and quality, and avoidance of non-value-added requirements as well as a lower overall cost than what was originally contemplated.
Source: http://www.abm.rda.hq.navy.mil/navyaos/content/view/full/132

Using a Two-Part Approach to Procuring Triad Services

Another way to procure services under a Triad framework is to use a two-part approach in which the up-front planning is procured as a separate activity from the field implementation services. For example, a local government agency may be planning to redevelop a Brownfields site in the community but lack the technical staff needed to prepare a detailed, systematic plan. In this case, the local government may choose to obtain the services of one organization to prepare a systematic plan and another organization to implement the plan, including the dynamic work strategies and real-time measurement technologies. Segmenting work in this way may involve use of a federal agency such as USACE to help develop the systematic plan followed by a local contractor that would implement the plan. This type of approach was used at the Wenatchee Tree Fruit site discussed in Section 3 of this document. When there is an existing contract mechanism available, an example of the two-part approach would be to segment the work as two separate task orders or delivery orders. The planning phase would be conducted and then, based on the plan developed, the field implementation portion would be performed as a separate task. This approach provides the flexibility to have the same contractor perform both parts of the work if it possesses the full range of technical expertise needed (if allowed by the governing procurement regulations) or to tap into two contractors with appropriate expertise using different vehicles.

The two-part approach to procuring Triad services provides the buyer with several advantages, including: (1) the ability to procure the technical expertise needed to develop a plan of sufficient technical detail for the SOW in order to procure field services, and (2) the ability to increase competition for the work by allowing a broader universe of contractors to bid on the field work component. A two-part approach also addresses cases where different contractors have different skills. For example, a contractor may be qualified to conduct the field work but not possess the expertise needed to perform the planning component of the work. Likewise, a contractor may be qualified to do the planning but not to conduct the field work. In such cases, the buyer can first target firms with expertise in systematic planning and can then use the resulting SOW in soliciting firms with expertise in the field aspects of an investigation.

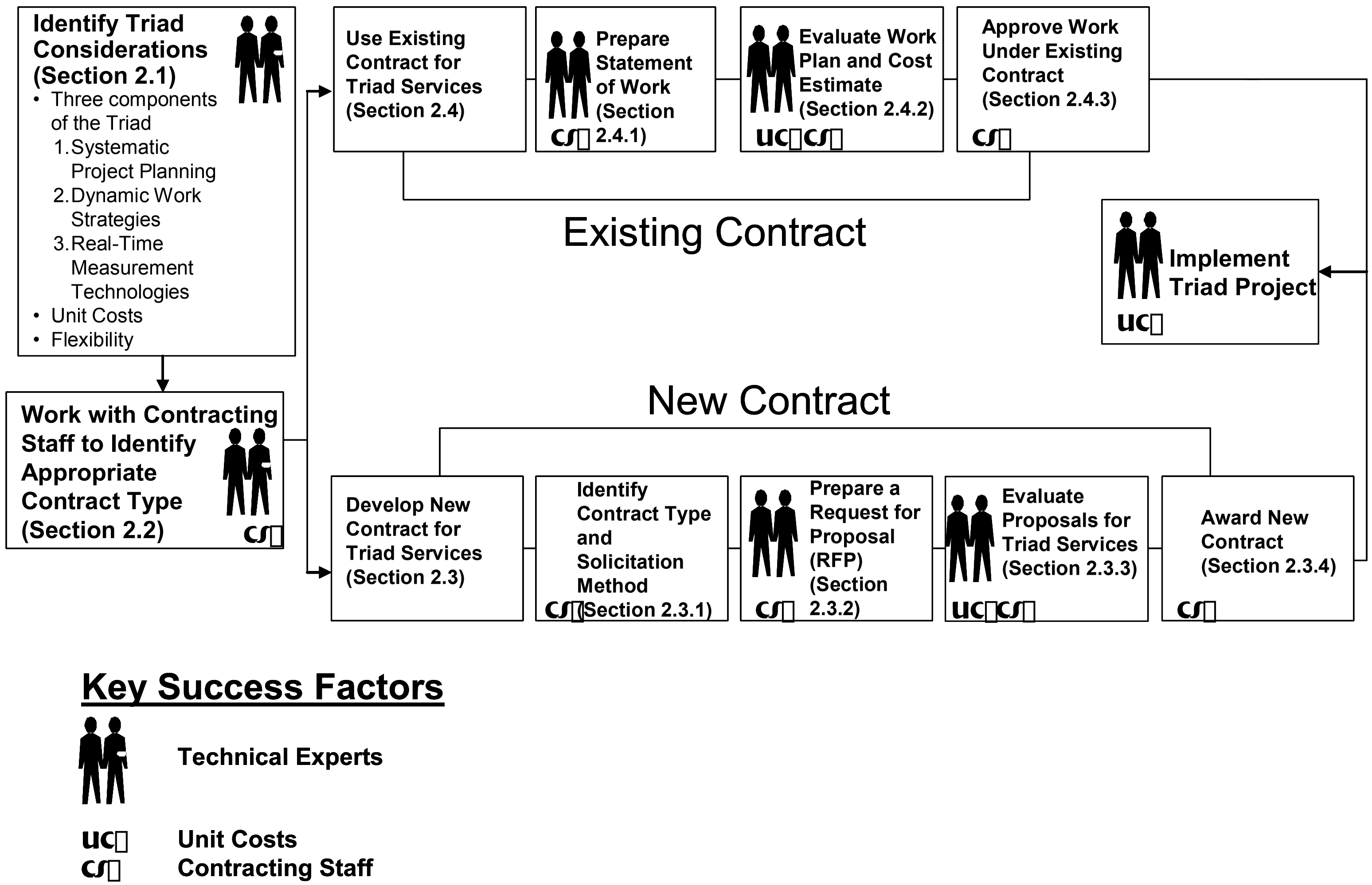
Using Fixed-Unit Costs

It is important that a buyer design the SOW or contract to ensure cost-effective procurement and project implementation. One way to accomplish this is to group activities at the task level so that bidders can provide fixed-unit costs (in contracting, sometimes referred to as firm-fixed price charged on a per unit basis). This approach can be used within both fixed-price and cost-reimbursable types of contracts (refer to example in Section 3.1.1). Providing specific base bid and optional tasks and requesting fixed-unit costs for logically related tasks allow the buyer to allocate funds appropriately. Requesting fixed-unit costs for logically related activities or tasks also allows decision-makers to identify where cost savings can be realized. Knowing what the tasks are, the buyer can estimate expenditures throughout the life of the project.

As the project is implemented, fixed-unit costs for optional activities allow decision-makers to control costs because they will pay only for the activities conducted. A fixed-unit cost contract based on options allows the buyer and contractor to share the risk of project implementation while providing an incentive for the contractor to achieve the task goals efficiently.

Sections 2.3 and 2.4 discuss strategies for procuring services under a Triad framework for new and existing contracts, respectively. Figure 2-1 illustrates the basic procurement processes under a Triad approach. For the purposes of this document, the term "buyer" is used as a generic term for the procuring entity, and the term "contractor" is used as a generic term for the entity providing services, consumables, or equipment. For an actual procurement, the specific terms will be dictated by the procuring entity.

Figure 2-1. Triad Services – Procurement Under Existing and New Contracts



Involving the Contracting Officer in Systematic Planning

The Contracting Officer is a crucial member of the project team that develops the systematic project plan. Once the Contracting Officer gains an understanding of project requirements, he or she can help identify capabilities within existing contract vehicles as well as contract terms and conditions to support use of the Triad approach. The Contracting Officer also can help design work plans that meet contract requirements and can identify potential problems early to help avoid delays in gaining work plan approval.

Special Procurement Considerations for EPA- and USACE-Lead Projects

EPA- and USACE-lead projects sometimes involve specialized types of procurement for selected equipment or services or acquisition of equipment or services without a formal procurement. For example, EPA and USACE can gain access to the DoD site characterization and analysis penetrometer system (SCAPS) unit without the need for a separate procurement. The SCAPS is a direct-push unit that is fitted with various tools such as a laser-induced fluorescence (LIF) sensor to identify the presence of petroleum, oil, and lubricants (POL). At the McCormick and Baxter Superfund site in Stockton, California, the SCAPS unit was used to obtain soil samples, support interpretation of LIF results, and install small-gauge wells for groundwater sampling. The services of the DoD SCAPS unit were obtained for this site using a military interdepartmental purchase request (MIPR) and an interagency agreement through the USACE Tulsa District. This project also is an example of USACE performing systematic planning separate from procurement of field services.

Selected laboratory services also can be obtained by EPA or USACE without the need for a separate procurement. For example, for the McCormick and Baxter site, laboratory services were obtained from a combination of the EPA Region 9 laboratory, the EPA Kerr Laboratory, and several private sector laboratories. USACE could access the services of the EPA Region 9 laboratory with no project-specific contracting requirements because the project was supported by EPA. The EPA laboratories and their associated capabilities were accessed through an EPA Environmental Services Assistance Team (ESAT) contract. For the McCormick and Baxter site, use of the government laboratories gave the project team flexibility in requesting laboratory method modifications and accelerated the characterization process; additional information about the site is provided in Section 3. This type of procurement option may be relevant to state and local sites for which state and federal laboratories are available to provide assistance.

2.3 PROCURING TRIAD SERVICES USING A NEW CONTRACT

When a new contract must be developed to obtain Triad services, the specific contract type selected and the specific requirements and regulations for the procuring entity will dictate how the procurement is accomplished. This section provides a general overview of how Triad services have been procured under new contract vehicles. New contracts are often used by state and local governments to secure services on a site-specific or project-specific basis when they do not have broader environmental support service contracts in place. It is important to note that this section does not focus on any one type of contract mechanism or procurement entity; rather, it illustrates some of the general aspects of procurement under a Triad approach using a new contract. In the case of a new contract, the buyer needs to identify the type of contract to be used for the procurement (fixed-price, cost-reimbursable, or a variation) based on project-specific considerations, including Triad-specific elements (see Section 2.1). The contracting staff within the procuring organization can assist with identification of the type of contract mechanism that best meets the needs of the buyer. With a new contract, an RFP is generally developed by a team that includes the technical buyer, contracting staff, and technical experts and is then used to solicit contractor proposals for the project. The team then evaluates the proposals and selects a contractor for the project.

In some cases, the buyer may have a pre-approved list of contractors for certain types of solicitations. For example, in the private sector, a company may have a list of preferred contractors and may have established master services agreements (MSA) with specific contractors. In the case of the government, an agency may have established basic ordering agreements (BOA) with various contractors to obtain specific types of services. Often MSAs and BOAs have pre-established terms and conditions that help streamline procurement. In such cases, a contractor will need to have been pre-qualified in order to bid on certain types of projects.

2.3.1 Identifying a Contract Type and Solicitation Method

As discussed above, there are two basic types of contracts – fixed-price and cost-reimbursable – that have been used to procure Triad services. General considerations in selecting the contract type include:

- Project size and complexity
- Type and level of uncertainty about the scope of the project
- Specific characteristics and requirements of the project
- Special considerations for the project

The procurement process is usually competitive. In a competitive bid scenario, the RFP is sent to multiple contractors and the winning contractor is selected based on a set of evaluation factors for contract award. Occasionally a sole source contract will be awarded directly to a specific contractor. The determination of whether a contract is bid on a competitive basis or awarded on a sole source basis is made by the procurement entity in accordance with applicable requirements and regulations. For government agencies, the use of sole source contracts is generally limited and requires extensive justification (for example, FAR Part 6 delineates the exact requirements for implementing a sole source contract). The ability to award a sole source government contract may be limited by the value of the contract. The text box below provides an overview of the competitive bidding and sole source selection requirements of the federal government; in addition, the box provides information about use of an independent government cost estimate (IGCE) and use of preferential programs such as set-asides.

Overview of Federal Government's Competitive Bidding and Sole Source Selection Requirements
Competitive Bidding System: The Competition in Contracting Act (CICA) of 1984 established "full and open competition" as the primary goal of federal government procurement. CICA also revised the protest procedures and discouraged sole source procurement by requiring procurements that use methods other than full and open competition to be justified and approved. FAR Part 6 sets forth the competition requirements for federal contracts. By receiving offers from multiple contractors, the buyer can compare and contrast proposed technical designs and assess the reasonableness of costs. Competitive procurement may also provide for discussions or negotiations with bidders found to be within the competitive range. Competitive procurement concludes with the award of the contract to the bidder whose proposal is most advantageous considering the price and the other evaluation factors included in the solicitation. The procedure is contained in FAR Parts 6 and 15.

Sole Source Selection Procedure: Under government contracts, sole source procurement procedures can generally be used if there is only one source known to be able to perform a contract or if a single source is uniquely qualified for contract award as discussed in the FAR. For example, a contractor might have highly specialized skills, or a vendor might have unique equipment and staff required to collect the data needed. The basis for a sole source selection must be documented and, depending on the specifics of the work, must be published on the Federal Business Opportunities (FedBizOpps) web procurement portal (www.fedbizopps.gov). Further information about FAR requirements is available at http://www.arnet.gov/far/.

Independent Government Cost Estimates
For many procurements, there is a need to develop an IGCE. For many federal procurements, the organization that is soliciting services must prepare an IGCE before issuing a solicitation. The IGCE is used by the contracting department in its evaluation of proposals to help make the contract award decision and in performing cost negotiations.

Preferential Treatment in Contracting
For some contracts, the organization that is soliciting services will consider whether there is an opportunity to reserve some or all of a contract for a small or disadvantaged business. For example, the federal government maintains rigorous goals and procedures for identifying these types of contracting opportunities (sometimes referred to as set-asides). In the past, preferential treatment has been provided for businesses whose size is below specified criteria (for example, in terms of annual revenue or number of employees) or whose ownership is associated with specified disadvantaged segments, such as woman-owned, veteran-owned, or service-disabled veteran-owned.

2.3.2 Preparing a Request for Proposal Under the Triad

An RFP typically includes a SOW, instructions for preparing the proposal, a schedule, and terms and conditions. For Triad services, the RFP should define site-specific conditions and should reflect the specific qualifications required to perform the project, including experience with the technologies of interest, familiarity with the appropriate regulatory authority, past performance on similar projects, capabilities in data management and analysis, and overall contract management and cost control capabilities. Most RFPs request that bidders provide recent references for projects with similar scopes and budgets.

Types of Information Contained in the RFP

Components typically found in RFPs for Triad services are presented below.

Purpose: Contains a concise statement of the work that the contractor is being asked to perform. An example of a purpose statement for an RFP is as follows:

> The City of Pleasantville is soliciting proposals to select a qualified consulting firm to complete the base bid items described in the attached SOW within the scheduled time. The contractor should also demonstrate the capability to perform the optional activities described in the attached SOW within the scheduled time.

Background and Project Information: Provides relevant site information that bidders can use to develop their technical approaches and cost estimates. The level of detail provided will vary by project; however, for the Triad, it is important to provide detailed background information, including information about uncertainties, the decisions to be supported by the work, and the quality requirements for the decisions.

Statement of Work: Provides a description of the work to be performed, including detailed information, a schedule, and deliverables for each task. Sometimes this description will include activities related to the quality required for environmental data. The requirements in the SOW are used as the basis for comparing the responsiveness and technical adequacy of the proposals received.

Cost Instructions: Present information about how the proposed costs should be submitted. For the Triad, this presentation should include information about costing the base tasks and the optional tasks, including contingencies. As discussed above, unit costs are especially useful for the Triad. Examples of cost categories for Triad-based projects include equipment, consumables, and personnel costs. The level of detail called for in the cost proposal will depend on a number of factors, including the complexity of the project and the specific requirements of the procuring entity.

Evaluation Factors: Include criteria that will be used to evaluate proposals. Although the evaluation factors should be specific to the project and the procurement, the general types of factors presented below often appear in Triad-related RFPs. These factors may be assigned a score (points for each category) or a relative weight (based on which factors are more important).

- *Corporate experience* – the contractor's experience related to the SOW as well as experience in using the Triad, applying innovative approaches and technologies, and performing similar projects. Recent experience (within the past 3 to 5 years) is generally requested along with references. Other factors include the contractor's familiarity with applicable regulations and experience in working with stakeholders (decision-makers who will be involved with the site and in the Triad process).

- *Qualifications of key personnel, including subcontractor staff* – the qualifications of the contractor's and subcontractors' proposed key staff, such as the project manager, technical leads, and other technical personnel assigned to the project. The information submitted should include their titles, roles, responsibilities, and availability for the project as well as information (for example, résumés) that demonstrates their experience and qualifications. For more complex projects, an organizational chart showing the responsibilities and lines of authority for the project personnel should be requested.

- *Technical approach, including project plans* – information used to evaluate the contractor's understanding of the project, including a description of how the Triad approach will be implemented at the site. In general, the information should include a description of the proposed methodology for each task as well as milestones and schedules for completing each task.

- *Oral presentations* – verbal presentations of a contractor's qualifications and other information related to the SOW. It is becoming more common to require contractors to make oral presentations in conjunction with submitting written proposals. For example, written proposals may be screened based on such key elements as corporate or personnel experience. Bidders that qualify would then make oral presentations to the selection officials. Oral presentations can provide a more interactive framework and can expedite the contractor selection process. Before the oral presentations are delivered, selection officials often prepare a list of questions to ask each contractor in order to ensure that contractors are consistently evaluated. The document "Assessing Contractor Capabilities for Streamlined Site Investigations" (EPA 542-R-99-009) provides a series of potential questions for selection officials to ask when interviewing contractors about work related to field-based technologies and streamlined approaches. To help ensure that all bidders are treated equally during the procurement process, it is important that the questions to be asked during the oral presentations not be provided by the procuring entity before the presentations and that, to the extent possible, the questions or categories of questions be standardized among contractors. In the case of the federal government, there are stringent requirements for conducting and evaluating oral presentations, including guidelines for the format of the presentations. The specific procedures for oral presentations, including whether they are included in the proposal evaluation process, will vary by bid and by procuring entity.

- *Cost proposal* – the contractor's proposed costs, presented using the components and format required in the project-specific RFP.

- *Insurance coverage* – the information required to verify that the contractor has an adequate insurance program in place for successful performance of the project.

Terms and Conditions: Include the project-specific terms and conditions that will apply to the contractor. Examples of terms and conditions for Triad services include the following:

- *Conflict of interest* – the RFP might specify that the contractor should not create any situation designed to influence project activities or decisions in ways that could lead to corporate or personal gain for the contractor or that could give an improper advantage to third parties in their dealings with the site owner or operator.

- *Compliance with relevant laws and regulations* – the RFP should clearly identify the laws and regulations that apply to the project.

- *Termination of contract* – the RFP should clearly identify conditions that will result in termination of the contract.

- *Validity of the costs in the proposal* – the RFP should specify the time period for which the proposed costs are to remain valid from the date of proposal submittal.

Promoting the Use of Innovative Approaches and Technologies in the Procurement Process

Table 2-1 provides a list of questions that would help the buyer evaluate a bidder's experience and qualifications regarding use of innovative sampling and analytical services and technologies. Buyers that include these types of questions in their RFPs will be better positioned to understand how a bidder may be able to streamline its site investigation and cleanup process.

Table 2-1. Examples of Questions to Include in an RFP for Triad Services

- What recommendations are being proposed to streamline the site investigation process?
- What approaches or strategies are being proposed to accelerate the schedule without sacrificing quality?
- What innovative technologies, instruments, and other equipment are being proposed to implement a streamlined site investigation?
- What projects has your firm successfully implemented that involved innovative approaches?
- How could field mobilizations be minimized while ensuring that adequate data are collected to define contamination and to support cleanup and redevelopment goals?
- What types of economy-of-scale strategies are being proposed?
- Under what circumstances would using a mobile laboratory be considered?
- What types of statistical methods or modeling programs are being proposed for sampling location selection or for CSM development?
- How will sampling, analytical, and risk-related uncertainties be managed?
- What techniques are being proposed to gain broad area information?
- What noninvasive techniques are being recommended to gain more information about the site?
- What relevant expertise does the proposed project team have?
- How will individual experts on the project team contribute to the decision-making process?

In addition, several states are looking at new ways to promote use of innovative approaches and technologies at the local level. For example, the States of Delaware and Ohio have purchased equipment for providing field-based sampling and analytical services and have trained personnel who operate the equipment. The box below provides further information about these efforts in Delaware, and additional information about the State of Ohio's program is provided in Section 3.

State of Delaware – Use of Trained Personnel and State-Owned Equipment
The State of Delaware has procured field-based sampling and analytical equipment for conducting site characterizations. As part of the Superfund oversight program, PRPs may use the state's equipment and personnel to conduct field-based measurements using XRF, immunoassay (IA), or GC equipment and to provide field laboratory services on a daily rate. In general, the analytical results provided by the state mobile laboratory are used to guide where samples should be collected for analysis by a fixed laboratory. The state also uses contractors to supplement its technical staff. The state procures the services of contractors by requesting and evaluating a statement of qualifications followed by a cost proposal. Contractors bid on a hypothetical scope of work using agreed-upon unit rates. By offering innovative services in the form of field-based laboratory support to PRPs in the state Superfund program and VCP, the state promotes cooperation between stakeholders and the regulatory community. Under an EPA grant, the state has increased its capabilities to support investigations using field-based technologies. Further information about the State of Delaware's efforts is available at http://www.dnrec.state.de.us/dnrec2000/Divisions/AWM/sirb/. (Source: Personal communication with Qazi Salahuddin, DNREC, May 12, 2005).

2.3.3 Evaluating Proposals for Triad Services

Proposals are evaluated based on the specific evaluation criteria included in the RFP. The following discussion summarizes the types of evaluation criteria that are typically used in a procurement under a Triad framework.

Technical Approach: The technical approach is evaluated to assess the reasonableness of the overall approach proposed by the contractor to implement the project according to the requirements of the RFP. Technical expertise will be needed to evaluate a proposal involving innovative technologies and the Triad, including expertise in the proposed technologies, the proposed sampling and QA plans, and site-specific conditions such as hydrogeologic conditions. Because innovative technologies are not as widely used as more traditional approaches, a contractor that proposes use of innovative technologies should be able to explain why its proposed approach is feasible and should specify the potential advantages for the site. Similarly, the contractor should demonstrate a thorough knowledge of potential limitations associated with the proposed technologies and should describe contingency plans for adjusting the approach as necessary. Such knowledge is crucial for presenting plans to regulators and for addressing their concerns about potential limitations of proposed methods. For example, real-time measurement technologies such as the membrane interface probe (MIP) and LIF detectors can provide pinpoint accuracy for designing an RA. However, these tools cannot currently provide the level of documentation or the quantitative results used to support most risk assessments (see Attachment B, Overview of Field-Based Measurement Technologies, for additional information about these technologies). The technical approach should include a description of the site-specific QA/QC procedures to be used, which are crucial in applying innovative technologies. Different instruments and site conditions will require different levels and types of QA/QC. Some projects may require that the contractor demonstrate the applicability of the proposed methods. Other projects may require the contractor to use a QC program or a program that adjusts the numbers and types of QC samples collected to match the identified data gaps. The technical approach should identify specific tasks for developing a CSM. The technical approach should also link the identified sampling and analysis approach to the data required to support site-specific decisions.

Project Plans: Proposals that include use of a dynamic work strategy should describe the contractor's proposed plan for ensuring effective communication and facilitating on-site decision-making among stakeholders. The plan should describe (1) the procedures for managing and interpreting field data (on a daily basis or even more quickly); (2) stakeholder roles and responsibilities for making decisions about the need to obtain additional field data; and (3) communication of the decisions in a timely manner to the site owner and to regulatory staff, if required. Software and data presentation formats should be included and reviewed for completeness and clarity. Project plans should address the hydrogeologic conditions at the site, borehole and drilling methods, soil and water samples, and the capabilities and limitations of the technologies to be used, including analytical issues. Each technology has advantages and limitations that need to be weighed against (1) the data required to support project decision-making and (2) potential analytical interferences in site-specific samples. Table 2-2 provides examples of elements in a project plan for using a Triad approach.

Personnel Experience: Various factors are crucially important when selecting personnel for projects using the Triad approach. These factors include the experience of each key staff member in using innovative strategies under the site conditions presented in the RFP and the availability of personnel in the full range of specialized technical disciplines needed to support use of appropriate technologies. The contractor should have access to a multidisciplinary team that can address all aspects of the project. In general, teams should include staff with expertise in chemistry, geochemistry, geology, hydrogeology, biology, toxicology, civil engineering, and soil sciences. Depending on the site-specific conditions and proposed options for remediation, other expertise may be required. For example, specialized expertise may be required to conduct environmental and public health risk assessments, operate models, or carry out complicated statistical analyses.

Table 2-2. Examples of Elements of a Project Plan for Using a Triad Approach

Element: Hydrogeologic Conditions

Relevance: The hydrogeologic conditions at a site control the migration of contaminants. Once the site geology has been defined, predictions of the direction of migration become more reliable. Higher detection rates can be achieved by selecting sampling locations where the pattern of migration indicates that contamination is present. Hydrologic information typically is obtained from regional maps of groundwater flow or from potentiometric surface maps. Pore information obtained using cone penetrometer testing or Geoprobe technologies can be used to assemble detailed information about flow patterns at a particular site.

Examples of Information to be Included in the Project Plan:

- Data or other considerations that will influence the contractor’s selection of borehole or sampling locations other than upgradient or downgradient locations
- Statistical methods or modeling programs the contractor will use to assist in selecting sampling locations
- Geophysical methods the contractor will use to gain a better understanding of the geology at the site
- Geophysical methods the contractor will use to evaluate the locations of subsurface utilities or underground structures
- Geologic information that will influence the contractor’s selection of sampling locations
- The proposed method for evaluating detailed groundwater flow patterns at the site
- The proposed method of using the flow pattern information in selecting sampling locations
- The contractor’s capability to obtain information about patterns of groundwater flow by means other than use of published potentiometric surface maps

Element: Borehole and Drilling Methods

Relevance: Soil depth profiles may be obtained quickly (within minutes to hours) with innovative direct-push techniques that provide geologic information continuously as the sensor penetrates the subsurface. The sensor can be withdrawn while grouting material is exuded so that the borehole is sealed and no well remains to be maintained. The information obtained can be used to prepare a complete record of the site.

Examples of Information to be Included in the Project Plan:

- Factors that influence the contractor’s decision to use direct-push methods rather than standard drilling procedures
- The contractor’s rationale for evaluation of the number of samples required
- Information about how subsurface soil depth profiles will be used in evaluating the soil samples that are to be collected
- The method to be used to collect soil samples for analysis

Element: Soil and Water Samples

Relevance: The results produced by field-based site characterization technologies range from qualitative (contaminant results provided in terms of presence or absence or as greater or less than some concentration level, such as “the concentration of polychlorinated biphenyls [PCB] in soil is greater than 1 milligram per kilogram [mg/kg]”) to semiquantitative (contaminant results provided in terms of “mass of contaminant per mass of sample” in the form of wide concentration ranges, such as “the concentration of PCBs in soil is between 10 and 50 mg/kg”) to quantitative (contaminant results provided in terms of “mass of contaminant per mass of sample” as continuous data, such as “the concentration of PCBs in soil is 39 mg/kg”). Depending on the technology, reported values may be for single target analytes (such as trichloroethene [TCE]) or for a class of similar analytes that share some common property (such as chlorinated volatile organic compounds [VOC]).

Examples of Information to be Included in the Project Plan:

- Field analytical methods for identification of volatile contaminants such as benzene or TCE, certain semivolatile contaminants, or metals
- The factors that govern selection of field test kits for the project
- The method of evaluating the locations and number of samples
- When and how field methods, QA/QC procedures, and the sampling approach will be modified as more is learned about the site
- The strategy or justification for the mix of field analytical methods and laboratory analyses to be used

Several factors affect the specific technical disciplines that are needed to support a project. The types of contaminants and the instruments used at the site may require a chemist who has specialized experience in analysis for the contaminants, or the physical characteristics of the site may require a geologist with an in-depth understanding of local geology or hydrogeology. Similarly, QC protocols may need to be designed by an analytical chemist who can assess whether the analytical methods will produce data of a quality adequate to support the decisions to be made; the chemist should also have experience in using the methods in the field (as opposed to laboratory experience only). Likewise, implementation of a technology might require a data management specialist with an understanding of modeling software. In addition, environmental scientists or engineers may need to be on site to interpret the data as they are generated.

As an example, personnel who have the appropriate background in geochemistry can help predict the mobility of contaminants. If metals were released at a site, the mobility would depend on the speciation of the metals, which in turn would depend on the reduction-oxidation (redox) potential at the site. For example, metals such as chromium (Cr, which is commonly used in industry) exist in various states; however, Cr is most mobile in the Cr-VI state. Therefore, personnel with a background in redox chemistry can help assess whether Cr will migrate to groundwater or be reduced to Cr-III, as is the case where petroleum products are present, and can suggest when sample analysis for Cr-VI would be warranted. For many tasks, a Triad investigation will require senior experts to lead the decision-making in the field and to communicate findings to those team members who are not in the field.

Corporate Experience: Depending on the specifications for the project, contractors should demonstrate their experience in selecting and using specialized field equipment, designing remediation plans, remediating sites in similar settings, proactively identifying problems that might affect the project, and determining how to resolve them. The use of dynamic work strategies includes an element of uncertainty. The selected contractor may encounter problems that require creative thinking, use of uncertainty management tools, and special expertise to resolve the problems and keep the project moving forward. Contractors that can demonstrate prior corporate experience in working under dynamic conditions would be better suited to perform such a project.

Quality Assurance and Quality Control Procedures: The selected contractor should understand the importance of following sound QA/QC procedures in completing the work. In general terms, QA is an integrated system of management activities carried out to ensure that the work performed and the products provided are of the type and quality needed and expected. QC is the system of technical activities performed to measure and control quality in order to ensure that data meet the needs of users. Prescriptive, “one size fits all” QC programs generally are not adequate when field-based technologies are applied. QC programs should be adaptable and flexible so that supplementary review procedures can be added in response to unforeseen conditions. Errors can occur in the field or laboratory in characterizing and monitoring sites; therefore, QA/QC procedures should be built into all key activities. Contractors need to be prepared to implement QA/QC procedures for all aspects of a project, including planning, sample collection, laboratory analysis, data review, and data assessment. Additional types and quantities of QC samples will likely be required as more is learned about a site. The adequacy of QA/QC reviews and check samples may also be determined in part by the needs of the regulatory authority and the need to make defensible decisions.

The project-specific QA/QC procedures should ensure that federal, state, and local QA/QC requirements are met. Depending on the site-specific situation, the types of decisions to be made about the site, and the entity that will make those decisions, it may be necessary that data be defensible on a regulatory basis, a scientific basis, or both. In addition, when using the Triad approach, contractors should understand how site-specific and technology-specific QA/QC programs are developed and modified as a project progresses to ensure the accuracy, precision, comparability, and completeness of the data generated.

Furthermore, provisions should be made to audit data throughout the project rather than at the end, after all the analyses have been completed. By auditing data throughout the project, potential site-specific problems with an analytical method can be quickly identified and addressed, thus avoiding the need to reanalyze samples.

Streamlined investigation and monitoring strategies rely heavily on comprehensive, up-front planning for collection of data that will support the decisions to be made about the site as well as data needed to support defensible decisions, including QC data. The planning process includes the development of the CSM and the systematic plan. Contractors need to demonstrate relevant experience in the planning process, and they need to explain how they will maintain and use QC data as they implement the site assessment work plan. Because site characteristics, decisions to be made, and data quality needs vary from site to site, the contractors’ QA/QC qualifications should be evaluated based on the site-specific requirements covered in the RFP (see box below for further information about the capabilities and limitations of field-based technologies).

> **Understanding Capabilities and Limitations of Field-Based Site Characterization Technologies**
> Field-based site characterization technologies produce data that can target the principal sources of uncertainty at a site. The type of data generated by a field-based technology depends on the degree of sophistication of the technology and the QA/QC measures implemented while using the technology. An understanding of the analyte or analytes (specific chemicals or contaminants) targeted by the technology and the principles and analytical interferences related to use of the technology is essential to selecting and implementing the correct technology for a site. For example, IA test kits designed for PCB analysis usually are calibrated with a specific Aroclor (the trade name for PCB mixtures), but the kits will respond with varying degrees of sensitivity to other PCB mixtures. Cross-reactivity in test kits can be an advantage. When broad screening for the presence or absence of a group of contaminants is desired, it can be accomplished with a high sampling density, cost-effectively managing the principal source of uncertainty (sampling) that controls the reliability of most site decisions. In this example, the contractor can use QA/QC information to demonstrate that data are of known and documented quality.

Contractor Insurance: There is potential risk at any contaminated site. A site investigation and remediation project could disturb contaminants and cause pollution damage. Several types of insurance coverage and products are available and appropriate for protection against potential damages and liabilities associated with characterization and remediation of contaminated sites. Some coverage may be standard requirements in any contract issued by a Brownfields community, private company, or other entity. Other specialized coverage may be required for a site or project. Typically, entities that issue contracts take prime responsibility for identifying insurance needs for a project because they could be ultimately responsible for damages from both the environmental and business viewpoints. For Brownfields sites, banks and other lending institutions will specify the insurance coverage that should be in place to protect the loans. Before any contract is signed, it is important that all parties understand the potential risks and be assured that all appropriate insurance coverage is in place.

Table 2-3 lists information about four types of environmental insurance products that generally are considered for site investigation and cleanup contractors. The types of insurance necessary and the limits of coverage vary from site to site. Factors such as the potential types of contaminants present, the proximity to groundwater, the degree to which the site has been properly characterized, and the proximity to active businesses and population centers should be considered in evaluating the types and levels of insurance necessary. Questions about the availability and selection of insurance products for a specific site should be directed to insurance companies and underwriters that specialize in environmental insurance. The insurance company should provide a certificate of insurance to the procuring entity on behalf of the contractor. Further information about environmental insurance policies for Brownfields sites is available at www.epa.gov/brownfields/insurebf.htm.

Table 2-3. Insurance Coverage Considerations for Contractors

Type of Coverage	Key Features of Coverage
Pollution Liability	Covers third-party claims for bodily injury, property damage, and cleanup costs both off site and on site. Also covers newly discovered contaminants, natural resource damage claims, diminution of property values, business interruption due to contamination, regulatory re-openers, waste transportation, and project delays.
Cost Cap	Covers cost overruns for remediation expenses, changes in regulatory standards and laws, and costs associated with newly discovered contaminants or additional known pollutants. Based on cost estimates for completing an approved RA plan. Often requires a self-insured retention threshold that the insured must pay before coverage is applied.
Secured Lender	Pays for a covered loan upon loan default where pollution conditions exist. Policies can pay for loan balances, cleanup costs, legal defense, contract damages, bodily injury, property damage, and business interruption.
Finite Risk	Transfers financial liabilities from the insured to an insurance carrier. Insured pays the insurer the entire present value of the projected cleanup cost when the insurance is obtained. Insurance carrier takes on the financial responsibilities for the cleanup.

Environmental insurance issues should be considered during the procurement and planning process. Collection of data that are required to meet insurance policy requirements or that may affect insurance costs should be incorporated into the technical approach. By reducing areas of uncertainty for a site, the Triad can provide insurers with better information about the site, thus providing an opportunity to decrease insurance costs or attachment points.

Cost Proposal: The cost proposal for a project involving innovative technologies should follow the requirements specified in the RFP and is usually evaluated on the basis of overall cost or overall value. Unit pricing is generally used for potentially high-volume or unpredictable components of a project, such as clearing, backfilling, installation of wells, and treatment of contaminated media. Prices proposed as a lump sum or as fixed-unit prices can be evaluated based on the criteria identified in the RFP and by comparing the prices submitted by competing bidders.

2.3.4 Awarding a New Contract

Based on the results of the proposal evaluation, a contractor is awarded a contract by the procuring entity. The basis for the award is tied to the evaluation criteria, and the procuring entity notifies the winner as well as the contractors that were not awarded the contract. The exact requirements for notification vary among procuring entities.

2.4 PROCURING TRIAD SERVICES USING AN EXISTING CONTRACT

When an existing contract is used, the specific contract type, requirements, and procuring entity will dictate the process for how the procurement is accomplished. The following sections provide a general overview of how Triad services have been procured under existing contract vehicles. It is important to note that this discussion does not reflect any one contract mechanism or procurement entity. Rather, it illustrates some of the general aspects of procurement under a Triad approach for federal and nonfederal projects.

2.4.1 Preparing a Statement of Work

When using an existing contract, the buyer prepares a description of the project scope and requirements that, depending on the contract, may be referred to by a number of terms, including SOW, task order, and delivery order. For this discussion, the project description is referred to as the SOW. The SOW is issued to the contractor, and the contractor prepares and submits a work plan and cost estimate in response. For Triad projects, it is important that the SOW and proposed work plan include the Triad-specific considerations described above, such as developing a systematic plan, using a dynamic work strategy, and using real-time measurement technologies, as well as all site- and project-specific requirements and all site- and decision-specific QA/QC requirements.

When preparing a SOW under the Triad, the buyer must present a sufficient breadth of activities to allow the contractor to properly implement the project. The SOW should clearly identify which tasks are considered necessary and which tasks are considered optional. The SOW should include:

- Development of a systematic project plan, including development and revision of the CSM
- Use of a dynamic work strategy
- Use of real-time measurement technologies, including field-based innovative technologies as appropriate, and application of QA/QC requirements to ensure that the data generated are of the quality needed to support decisions

One approach to developing a SOW under the Triad is to organize the SOW in separate sections that include a clear description of project requirements, a description of the work that is included in the base bid, and a description of the optional work that may be needed during the project. It is helpful to define the options as units, to clearly define each unit in terms of logically related tasks, and to require the contractor to link each unit to the decision that it will support.

Under the Triad, the performance objectives should be well defined without impacting flexibility or being overly prescriptive. That is, the buyer should define performance objectives (what is to be accomplished) but should give the contractor the flexibility to decide how to achieve the intended results in a manner that will potentially reduce costs and provide the best value (how it will be accomplished). Available illustrations, maps, diagrams, and tables should be included in the SOW to further describe the work or the related requirements. When a buyer is not technical, it is helpful to have others who are familiar with the site and the technical project requirements, such as technical experts and the project manager, be involved in developing the SOW.

In some cases, it may be advantageous to use government-wide agency contracts or multiple award schedules to procure services. The text box below provides additional information about these types of contract mechanisms.

Government-Wide Agency Contracts and Multiple Award Schedules
Recently, federal agencies have been using several types of government-wide agency contracts, including General Services Administration (GSA) multiple award schedules, to procure services. Under the GSA Schedules Program, GSA establishes long-term, government-wide contracts to provide access to over 6.8 million commercial supplies and services that can be ordered directly from GSA Schedule contractors. For example, under GSA's Environmental Services Schedule 899, federal agencies can obtain services under various Special Item Numbers, including **Environmental Planning Services & Documentation Services** (899-1), which includes environmental assessments and other environmentally related studies and consultations, and **Remediation Services** (899-8), which includes excavation, removal, transportation, storage, treatment, and disposal of hazardous waste; preparation, characterization, field investigation, conservation, and closure of sites; wetland restoration; emergency response; underground storage tank and aboveground storage tank removal; air monitoring; soil vapor extraction, stabilization/solidification, bioventing, carbon absorption, reactive walls, containment, monitoring, and waste reduction at hazardous waste sites; and ordnance removal and support. Further information on such services is available at http://www.gsa.gov/Portal/gsa/ep/channelView.do?pageTypeId=8211&channelPage=/ep/channel/gsaOverview.jsp&channelId=-12989.

2.4.2 Evaluating the Work Plan and Cost Estimate

The work plan and cost estimate submitted by the contractor in response to the SOW are evaluated by the buyer based on the specific requirements of the SOW. Under a Triad framework, it is important to place special emphasis on the Triad-specific considerations of the SOW. The evaluation of a work plan and cost estimate under an existing contract will follow steps similar to those detailed above for new contracts.

2.4.3 Approving the Work Under an Existing Contract

Based on the results of the work plan and cost estimate evaluation, the work is approved by the contracting authority, and the contractor is notified that work can proceed. The exact requirements for formal approval and issuing a notification to proceed are dictated by the terms and conditions of the existing contract.

3.0 EXAMPLES OF RECENT PROCUREMENT EXPERIENCES

This section presents six case study examples of specific sites and programs for which site investigation and cleanup services have been procured under a Triad framework. As shown in Table 3-1, these examples include federal, state, local, and private sector projects; cover a variety of contaminants, media, and site types; and include use of various real-time measurement technologies. The examples offer insights into the following types of activities related to federal and nonfederal procurement strategies:

- Using fixed-unit costs
- Performing systematic planning separately from field activities
- Prequalifying technology and service providers
- Demonstrating flexibility in providing services to support a dynamic investigation
- Establishing personnel qualifications
- Using in-house capabilities for site investigation
- Employing area-wide approaches to site investigation

The attachments cited in this section are available on related Web sites, as discussed in Table 1-1 and shown at the end of this report.

Table 3-1. Summary of Recent Procurement Experiences – Selected Sites and Programs

Site/Program Name, Location, Organization Conducting Procurement	Contaminants; Media; Site Type	Real-Time Measurement Technologies	Procurement Information	Comments
McCormick and Baxter Superfund Site, Stockton, CA USACE Field Work **(Section 3.1.1)**	DNAPLs (creosote and PCP); Soil and Groundwater; Wood Treatment Facility	Sonic drilling (to a depth of 250 feet bgs)	Services were procured using fixed-unit costs and performance of systematic planning separate from field activities; services involved advancing a baseline set of two boreholes and four progressively more complex options for boreholes and monitoring wells.	The investigation was geared toward potential use of in situ thermal treatment technologies for cleanup.

Table 3-1. Summary of Recent Procurement Experiences – Selected Sites and Programs (continued)

Site/Program Name, Location, Organization Conducting Procurement	Contaminants; Media; Site Type	Real-Time Measurement Technologies	Procurement Information	Comments
Wenatchee Tree Fruit Research and Extension Center, Wenatchee, WA USACE Field Work **(Section 3.1.2)**	Pesticides (organochlorine and organo-phosphorus); Soil; Research Facility	IA test kits	USACE used a two-step process of first undertaking systematic planning and then using a BOA with a small business to obtain IA test services.	Use of a dynamic approach based on the systematic plan was shown to save about 50 percent of the cost for performing site assessment and cleanup.
Florida Department of Environmental Protection (FDEP), Dry Cleaning Solvent Cleanup Program, FL State Lead – Florida **(Section 3.2.1)**	Chlorinated Solvents; Soil and Groundwater; Dry Cleaners	Various, including direct-push sampling, field GC, and colorimetric test kits	FDEP developed a short list of qualified contractors (partially based on oral presentations); as of August 2002, FDEP had identified 11 firms for contract award. Awards are made based on this short list of qualified contractors.	Results for one site showed increased certainty in targeting hot spots, less use of off-site sampling (only in source areas), and increased sampling density and site coverage.
Former Starkey Junkyard Site, Uhrichsville, OH State Lead – Ohio **(Section 3.2.2)**	VOCs, SVOCs, TPH, PCBs, and Metals; Soil and Sediment; Auto Salvage Yard	Direct-push sampling (Geoprobe), mobile laboratory (field GC, XRF, IA test kits, and HazCat kits), and sediment sampling	Systematic planning was performed separately from procurement of sampling and analytical services; Ohio EPA provided field sampling and analysis capabilities.	Ohio EPA, through its SIFU, provides field equipment and trained personnel to communities for use in obtaining real-time results, supporting targeted sampling, and delineating hot spots or areas of concern.

Table 3-1. Summary of Recent Procurement Experiences – Selected Sites and Programs (continued)

Site/Program Name, Location, Organization Conducting Procurement	Contaminants; Media; Site Type	Real-Time Measurement Technologies	Procurement Information	Comments
Assunpink Creek Greenway Project, Trenton, NJ City of Trenton Brownfields Assessment Grant **(Section 3.3.1)**	PAHs, PCBs, TPH, and Heavy Metals; Soil and Groundwater; Wire Manufacturer and Rail Yard	Direct-push sampling, IA test kits, XRF, and field GC/MS	Services were procured through an open RFP. Required activities included preparation of a dynamic work plan that identified decision rules and the technical approach.	The City of Trenton used an area-wide approach to investigate several parcels bordering the creek. The site is to be redeveloped as a recreational area and greenway.
Lake Success Business Park (DuPont), CT Private – DuPont **(Section 3.4.1)**	Heavy Metals (lead); Soil; Small Arms Manufacturing and Storage	XRF	Services were procured under an existing contract with a full-service firm.	A cost evaluation showed savings because XRF was used instead of conventional analysis at an off-site laboratory.

Notes:

bgs	Below ground surface
DNAPL	Dense nonaqueous-phase liquid
GC/MS	Gas chromatography/mass spectrometry
HazCat	Hazard categorization
PAH	Polycyclic aromatic hydrocarbon
PCP	Pentachlorophenol
SVOC	Semivolatile organic compound
TPH	Total petroleum hydrocarbons

3.1 FEDERAL CASE STUDIES

This section presents case studies for projects in California and Washington that involved USACE. These projects incorporated (1) fixed-unit costs, and (2) a procurement in which systematic planning was to be conducted separately from field activities. One example involved site characterization, and the other involved a removal action.

3.1.1 Sonic Drilling Services for the McCormick and Baxter Superfund Site DNAPL Investigation

3.1.1.a Background

The McCormick and Baxter (M&B) wood preserving company operated on a 29-acre site in Stockton, California, from 1942 until 1990. M&B chemically treated wood products in pressure cylinders with various preservation solutions containing creosote, PCP, arsenic, copper, chromium, and zinc. Solvents or carriers for these preservatives reportedly included petroleum-based fuels such as fuel oil, kerosene, diesel, butane, and ether. The chemicals of concern (COC) identified for the M&B site are PCP, PAHs, arsenic, and dioxins and furans. PCP and PAHs were potentially present as DNAPL. The subsurface strata most likely to be encountered at the site are alluvial fan and fluvial deposits, including silt, silty clay, clayey silt, silty sand, sand, and coarse-grained sands and gravels. The objectives of the DNAPL investigation were to identify the nature and extent of the DNAPL contamination and to define geologic conditions that would affect the implementability of in situ thermal treatment technologies. The site was added to the Superfund National Priorities List in October 1992. EPA was the lead agency for the fund-lead cleanup, and USACE was responsible for conducting the site characterization.

Sonic drilling, as discussed below, was conducted from July - August 2000. Six borings were completed and two wells were installed.

3.1.1.b Procurement Information – McCormick and Baxter Superfund Site

USACE developed a SOW to obtain sonic drilling services for investigating DNAPLs at the site, as shown in Attachment E. The SOW requested that a contractor furnish services, materials, equipment, supplies, and personnel necessary to advance two or more primary sonic drilling borings at the site. In addition, the SOW provided USACE with the flexibility to order one to four additional services (options) based on the findings during the DNAPL investigation. USACE required that bidders estimate costs for the primary borings and the four options based on unit costs for specific services. The primary borings consisted of a minimum of two borings drilled and continuously cored from the ground surface to an approximate depth of 250 feet bgs. The borings were to be continuously logged and sampled, and up to two 4-inch-diameter monitoring wells were to be installed. Unit costs for these activities were based on the:

- Number of hours for drill rig rental
- Number of feet of borehole advancement and abandonment
- Number of hours for well development

Options were provided for additional borings to be advanced on site and in a nearby slough, and one option involved renting a barge for the work in the slough. The unit costs for these activities had a structure similar to that of the unit costs for the primary borings. The SOW language describing provision of the optional services and cost estimates is included in Attachment E.

The SOW also established requirements for the personnel who would provide the drilling services and the equipment to be used. For example, the selected contractor was to provide at least one experienced operator and two helpers. The operator needed to have a minimum of 5 years of experience operating the equipment provided, including a rotary-sonic drill rig. A second helper was required because of the potential for off-site drilling and implementation of dust control measures. The equipment was to include the rotary-sonic drill rig, two water tanks, and a water truck as well as the rental barge and all other necessary equipment if the associated option was authorized. Attachment B provides additional information about field-based measurement technologies.

By segmenting the work into discrete tasks or options, USACE could manage project contingencies within the overall SOW. This approach also helped to minimize the number of mobilizations to the site.

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Sources of Additional Information:

USACE. "McCormick and Baxter Superfund Site – Sonic Drilling Scope of Work." CESPK-ED-E-8. March 2000.

3.1.2 Immunoassay Testing for Pesticides at the Wenatchee Tree Fruit Research and Extension Center Site

3.1.2.a Background

The Wenatchee Tree Fruit Research and Extension Center (WTFREC) site is an agricultural research center in Wenatchee, Washington. A portion of the site was used as a pesticide disposal research area from 1966 until the early 1980s, resulting in soil contaminated with organochlorine, organophosphorus, and other pesticides. USACE, in cooperation with EPA and the site owner, wished to clean up the site for residential reuse. Attachment F provides further information about this site, including case studies about the site investigation and cleanup process, the RAMP, and the FSP. The cleanup was performed under the regulatory oversight of the State of Washington Department of Ecology VCP, and USACE led the site investigation, including procurement of investigation services.

The goal for the cleanup project was to identify, characterize, remove, and dispose of all pesticide-contaminated soil and debris present in the test plot area of the WTFREC. The action levels were determined to be the State of Washington Model Toxics Control Act (MTCA) Method B Cleanup Levels. USACE used a systematic plan with a dynamic work strategy guided by field analysis to integrate the site characterization and cleanup processes. Soil was characterized, excavated, and segregated based on IA test kit results for dichlorodiphenyldichloroethane (DDT) and cyclodiene pesticides such as dieldrin and endrin. For the project, USACE developed a detailed SOW that outlined the on-site decision-making plan and specified the on-site measurement technologies to be used. In addition, a decision flow diagram was developed to guide the contractor through the on-site decision-making process.

The USACE team developed site-specific action levels for the IA test kits based on a comparison with analytical results from a fixed laboratory. An initial demonstration of method applicability involving the IA method results and fixed laboratory results was completed before the SOW was finalized, and the demonstrate results were incorporated into the systematic plan. The IA data were used to identify areas to be excavated and to confirm that contaminated soil had been removed. The project was completed in accordance with MTCA Method B Cleanup Levels.

3.1.2.b Procurement Information – Wenatchee Tree Fruit Research and Extension Center Site

USACE procured a prime contractor for the project (Garry Struthers Associates, Inc.) using a preplaced, indefinite-quantity, delivery order contract in August 1997. The contract was awarded based on evaluation of competitive bids from prospective contractors. The work was done under delivery orders that used a combination of fixed-price and fixed-unit price payment schedules. The prime contractor prepared the RAMP and oversaw several subcontractors, including one subcontractor for transport and disposal of contaminated soil, one for soil sampling, and three for analytical work.

Characterization, cleanup, and closure were accomplished in a single 4-month field mobilization (September 1997 to January 1998). The project cost of $589,000 was about half the $1.2 million estimated for a more traditional site characterization and remediation scenario. That scenario would have required multiple rounds of field mobilization, sampling, sample shipment, laboratory analysis, and data assessment. The dynamic approach resulted in substantial savings in the areas of soil analysis and waste transport and disposal.

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Sources of Additional Information:

EPA. "Innovations in Site Characterization Case Study: Site Cleanup of the Wenatchee Tree Fruit Test Plot Site Using a Dynamic Work Plan." EPA-542-R-00-009. August 2000.

USACE. "Remedial Action Management Plan – Wenatchee Tree Fruit Research Center Test Plot Remediation." August 1997.

USACE. "Sampling and Analysis Plan, Field Sampling Plan – Part B." No Date.

USACE. "Quality Assurance Project Plan, Sampling and Analysis Plan – Part C." No Date.

USACE. "Cost and Performance Report – Expedited Characterization and Soil Remediation at the Test Plot Area, Wenatchee Tree Fruit Research Center." May 15, 2000.

3.2 STATE CASE STUDIES

This section presents two case studies, one for the State of Florida involving use of a preapproved set of contractors and one for the State of Ohio involving state ownership and operation of field investigation equipment.

3.2.1 Use of Short-Listed Contractors in State of Florida Dry Cleaner Remediation Program

3.2.1.a Background

In 1994, the Florida legislature created a program to address remediation of sites and drinking water supplies contaminated with dry cleaning solvents. The Dry Cleaner Remediation Program (sometimes referred to as the Solvent Cleanup Program) has been used by active and inactive dry cleaning facilities, dry cleaning wholesale supply facilities, and coin-operated dry cleaning facilities, with more than 1,400 sites made eligible for cleanup. The program includes a tax levied on dry cleaning services to accumulate the funds necessary to clean up spills at dry cleaner facilities with the potential to impair the quality of groundwater in Florida. The program provides characterization and remediation services and limited liability protection to dry cleaner owners and operators. The program operates on a budget of approximately $7.5 million per year. Program applicants are responsible for paying a project deductible that can range from $1,000 to $10,000 based on the date of application.

Private contractors perform the remediation and are managed by FDEP contract managers. FDEP assigns sites to contractors for assessment and cleanup based on the results of a ranking. Assignments are based in part on geographic areas to streamline equipment use and mobilization efforts. Florida provides cleanup procedures and guidelines for sites contaminated with dry cleaning solvents, including target cleanup levels for groundwater, surface water, and soil as well as natural attenuation default concentrations for groundwater. Goals for the site assessments are to minimize the number of site mobilizations, use existing data, minimize investigation-derived waste, and streamline reporting requirements. The program methodology relies on direct-push sampling and on-site mobile laboratories, microwells for monitoring groundwater quality, the ability to change the scope of an assessment while field work is ongoing, and collection of data needed for the RD during the site assessment.

3.2.1.b Procurement Information – State of Florida Dry Cleaner Remediation Program

Under the FDEP program (associated documentation is provided in Attachment G), FDEP “short lists” contractors based on statement of qualifications (SOQ) packages and then issues BOAs to a select group of contractors that will potentially perform site work. Based on contractor location and degree of use under the contract, FDEP assigns sites to one or more contractors. Projects are not competitively bid; only subcontracted activities whose costs can vary widely based on site conditions, such as drilling services, are bid out. Contractors’ standard rates are determined in their contracts with FDEP. The assigned contractor conducts an initial site visit that results in a preliminary evaluation of the site. Based on this evaluation, the contractor develops a detailed SOW and cost estimate. The contractor and FDEP then procure subcontractor quotes based on the anticipated scope of activities not specifically called out as unit costs in the basic contract.

The SOW for an FDEP project typically includes field preparation, mobilization and demobilization, well sampling, data evaluation, report preparation, remedial alternative evaluation, and management of investigation-derived waste. Based on the conditions encountered at a site, the scope of the field work may be expanded or reduced using the unit rates. Scope changes may be approved through Field Work Change Directives that allow approval of cost increases without project delays. Use of the established unit rates allows FDEP to avoid stopping work in progress in order to process change orders. FDEP formalizes approved Field Work Change Directives in contract change orders that are processed after field activities are completed.

FDEP approves contractors by reviewing SOQ packages and conducting interviews. Oral interview questions cover topics such as site assessment and remedy selection, construction and operation of active treatment systems, pay-for-performance, monitored natural attenuation, process and project management, and knowledge of state rules and regulations. In August 2002, FDEP identified 11 firms for contract award, including many of the larger environmental consulting firms operating in Florida.

FDEP maintains program consistency and project compliance with a systematic plan by:

- Providing its contractors with a well-structured set of guidelines and preprinted forms used to compile site information
- Assigning a central point of contact during the investigation, remediation, and review process

For investigation work, FDEP has a single state-certified hydrogeologist who reviews each work plan. A certified professional engineer reviews each RD before it is implemented; most designs developed under the program involve presumptive remedies or remedies proven to be effective under similar site conditions. The FDEP program may have up to 10 projects underway at any one time.

Because FDEP has worked with the same contractors over the last 3 years, the department has been able to develop a detailed unit cost structure that allows for flexibility while controlling costs. FDEP develops unit rates that can be combined into tasks and subtasks whose total costs can then be estimated on a fixed-price basis. As shown in Attachment G, labor rates are provided for more than 25 categories of labor and laboratory analyses for multiple types of analytes. The analytes (and analytical methods) include metals (inductively coupled plasma [ICP], flame atomic absorption [AA], furnace AA, gaseous hydride, and cold vapor), purgeables (GC and GC/MS), extractables, and leach testing parameters. Mobile laboratory rates are provided based on a minimum of 10 samples per day for a single GC and a chemist. Additional rates are available for equipment used for air sampling and monitoring, groundwater and surface water sampling, soil and sediment sampling, surface geophysical testing, and other activities; vehicle rental; and personal protective equipment.

3.2.1.c Specific Example Site – State of Florida Dry Cleaner Remediation Program

The Concord Custom Cleaners site in Tallahassee, Florida, is an inactive dry cleaner facility that operated from 1970 until 2001. Under a BOA with FDEP, LFR Levine-Fricke Inc. performed an initial site visit in September 2001. The contractor developed a plan that included use of direct-push equipment and an on-site mobile laboratory, as shown in Attachment G. The contractor then installed six small-diameter monitoring wells at the site using direct-push methods. A fixed laboratory analyzed groundwater collected from the monitoring wells.

3.2.1.d Specific Example Site – State of Florida Remediation

For the Calloway Drum Recycling (CDR) site in Auburndale, Florida, Ecology and Environment, Inc., developed a dynamic work strategy that included use of direct-push technology and the Color-Tec analytical method (a semiquantitative method that measures total chlorinated compounds). The contractor conducted the site assessment project in support of FDEP under a cooperative agreement with EPA Region 4. The CDR site was used as a drum recycling facility in the 1970s, and its soil and groundwater were suspected to be contaminated with petroleum hydrocarbons and chlorinated solvents, as shown in Attachment G. Although this site was not assessed under the dry cleaner program, many of the elements discussed above for use of the Triad approach were applied there.

The planning process for the site assessment at CDR involved documentation of the site history and previous site findings, potential migration pathways, data gaps, a flexible scope of work for field data collection, and site-specific data quality objectives. The contractor identified four primary focus areas for the CDR site. The contractor then investigated soil and groundwater using field-based analyses. Analysis for total VOCs in headspace using flame ionization and photoionization detectors was performed to identify suspected petroleum and other solvents in soil samples, and Color-Tec analysis was used to identify suspected chlorinated solvents in soil and groundwater samples. CDR site assessment results indicated increased certainty in targeting hot spots, less use of definitive sampling (only in source areas), and increased sampling density and site coverage compared with a traditional site assessment process.

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Sources of Additional Information:

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3.2.2 Use of In-House Field Capabilities for Ohio EPA Site Assessments

3.2.2.a Background

Ohio EPA provides support to its Brownfields and voluntary action sites through use of its own field staff and equipment. Ohio EPA uses its field capabilities to provide real-time results, support targeted sampling, and delineate hot spots or areas of concern. These capabilities are provided through Ohio EPA's SIFU. Since 1993, SIFU has conducted assessments at potential Superfund sites under an agreement with EPA. The types of services available from SIFU include soil and groundwater investigations (such as Geoprobe investigations), field screening for metals and organics, geographic information system (GIS) and geopositional satellite (GPS) services, contaminated sediment investigations, and ecological assessments. SIFU's mobile laboratory capabilities include field GC, XRF, IA test kit, and HazCat kit services.

Recently SIFU provided site sampling services for a Phase 2 voluntary action program investigation at the former Starkey Junkyard site in Uhrichsville, Ohio. The results of the investigation will be used as part of an application for cleanup funds from the Clean Ohio Fund. The Starkey Junkyard site was used for more than 60 years as an auto salvage yard. Numerous potential releases of automotive fluids and other materials were suspected at the site, and it contained used batteries, scrap metals, and burned tires. Contaminants of potential concern included VOCs, SVOCs, TPH, PCBs, and metals.

The Village of Uhrichsville is planning to reuse the site as a park and baseball field and requested a targeted Brownfields assessment from Ohio EPA. As part of the Brownfields assessment request, village staff met with SIFU personnel and certified professionals to develop a work plan and data quality objectives through a systematic planning process. The scoping meeting identified the decisions to be made, inputs to the decisions, the study boundaries, decision rules, limits on decision errors, and the design for a dynamic sampling and analysis program.

Field work included use of a Geoprobe to collect soil samples and an on-site mobile laboratory to screen samples for VOCs, PCBs, and metals. More than 2,000 samples were analyzed. Ohio EPA staff also performed an assessment of biological and water quality and conducted sediment sampling in a creek adjacent to the site. The field work revealed elevated concentrations of lead and arsenic as well as TPH (measured as diesel range organics) in soil and sediment.

3.2.2.b Procurement Information – Ohio EPA

Ohio EPA makes field capabilities available to communities for which the cost of assessment would otherwise be prohibitive. This service provides site decision-makers with the opportunity to perform systematic planning separately from procurement of sampling and analytical services. SIFU services can be provided for complete site assessments or as a supplement to other site assessment work performed by contractors. For example, at the Starkey Junkyard site in Uhrichsville, Ohio, SIFU performed all the site assessment activities. The sampling and analytical equipment used by SIFU is owned by Ohio EPA, including a mobile laboratory with field GC, XRF, and IA test kit capabilities; and the equipments was procured approximately 5 years ago using grant funds. Ohio EPA personnel perform the field sampling and analyses. Additional information about Ohio EPA's in-house field capabilities is provided in Attachment H.

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3.3 LOCAL GOVERNMENT CASE STUDY

This section presents a case study for the Assunpink Creek site in New Jersey that involved use of direct-push sampling and the Triad approach.

3.3.1 Direct-Push Sampling at the Assunpink Creek Greenway Project, Trenton, New Jersey

3.3.1.a Background

The Assunpink Creek Greenway Project is being performed to redevelop Brownfields properties along Assunpink Creek in Trenton, New Jersey, into a recreation area and greenway. The City of Trenton has a memorandum of agreement with the New Jersey Department of Environmental Protection (NJDEP) to include several of these properties in a VCP. Based on a preliminary assessment of contamination, it was decided to investigate areas of concern at two of the project sites, the Crescent Wire and Freight Yard sites, using a dynamic work strategy based on the Triad approach.

The Crescent Wire site was used for the manufacture of high-tension cables and wire. A preliminary CSM showed that there had been PCB and TPH impacts at the site and that these contaminants were present in overlying, unsaturated soils, forming a thin floating layer on the water table surface at a depth of 12 to 14 feet bgs. To help refine the CSM, a dynamic investigation approach was developed to identify which of four potential scenarios applied to the site. These scenarios included the possibilities that (1) the impacted area was confined to a small hot spot with limited migration potential, (2) the floating plume had migrated downgradient but not as far as the creek, (3) the floating layer had migrated to the creek, and (4) the source of the floating product was upgradient and off site.

The Freight Yard site was historically used as a railroad freight depot and includes a rail area, an area with a concrete building used to house electrical equipment (Block 305), a powerhouse, and loading platforms. Near-surface soils in the rail area have been impacted by historical site activities. A preliminary CSM showed that there were impacts from heavy metals (arsenic, lead, zinc, and copper) as well as PAHs, PCBs, and TPH. To help refine the CSM, a dynamic investigation approach was developed to address three potential scenarios: (1) the contamination was shallow, and there had been no migration; (2) the depth of contamination was moderate, and there had been limited migration but none to groundwater; and (3) contamination was fairly extensive and variable, and there was TPH migration close to the water table.

At Block 305 of the Freight Yard site, there is a relatively small, abandoned, concrete block building believed to have contained electrical equipment. Several rusting and degraded 55-gallon drums found adjacent to the building were removed. The objective for the dynamic investigation in this area was to delineate the lateral and vertical extent of soil impacts and to determine whether contamination in soil had the potential to impact groundwater. The COCs for this area included PAHs, TPH, and selected metals.

3.3.1.b Procurement Information – Assunpink Creek Greenway Project

The City of Trenton issued an RFP to obtain site investigation services for the sites, as shown in Attachment I. The RFP provided a general description of the project and the sites, discussed the planned reuse of the sites and the investigation objectives, provided decision guidance and results from previous investigations, included a request that bidders propose a dynamic approach (including use of field analytical methods), and provided technical specifications for 24 individual tasks. These tasks ranged from a baseline ecological evaluation to a geophysical survey to an investigation of PCB and oil impacts at the Crescent Wire site. The RFP also provided an overall project schedule and information about the basis for measurement and payment for each task. Generally payment was to be made after all work on a task was completed and a proper invoice was provided. Furthermore, the RFP provided a pricing form that identified, for each of the 24 tasks, the specific items to be included in the task, the estimated quantity for each item (for example, five PCB analyses), and the unit basis for the item (for example, lump sum, per sample, per day, per well, per drum, per boring, or per ton). Most tasks that involved sample collection and analysis were costed on a per sample basis. The RFP also addressed sites not intended to be assessed using the Triad approach.

The city retained two firms to conduct further investigations at the sites, including a lead environmental consulting firm and a subcontracted smaller firm specializing in field methods. The firms were selected based on their experience, including their work at similar sites, qualifications, proposed costs, responsiveness, and innovative approach. These firms developed the dynamic work strategy for the sites and proposed specific field analytical methods with criteria and QA/QC information for each COC (see Attachment I). For example, for the Crescent Wire site, they proposed IA test kits for both PCBs and TPH and XRF analysis for metals. For the rail area of the Freight Yard site, they proposed IA test kits for PCBs, field GC/MS analysis for both PAHs and TPH, and XRF analysis for metals.

The project provides an example of how a systematic plan based on a dynamic work strategy can be developed separately from and prior to the field investigation activities. The work plan included a preliminary CSM as well as possible scenarios needed to refine the CSM. For each of the sites, the work plan discussed the project objectives, COCs, decision rules, and technical approach. This approach included use of both field analytical methods and fixed laboratory analysis of confirmation samples.

In addition, the project illustrates how multiple sites can be bundled together for an area-wide investigation to achieve a streamlined approach and economies-of-scale. In this case, a single work plan was developed that addressed all the sites. Nondynamic tasks were completed first, followed by dynamic tasks. The investigation for the Crescent Wire site was performed in a single mobilization, as was the investigation for the Freight Yard site.

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Sources of Additional Information:

City of Trenton. "Request for Proposals – Greenway Sites." No Date.

Langan Engineering and Environmental Services, Inc., and S2C2 Inc. "Dynamic Workplan for Site Investigation and Remedial Investigation Activities – Assunpink Creek Greenways Project." Prepared for City of Trenton Department of Housing and Development. December 18, 2002.

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3.4 PRIVATE SECTOR CASE STUDY

This section presents a case study for the Lake Success Business Park site in Connecticut that involved use of real-time measurement technologies.

3.4.1 On-Site Lead Analysis at Lake Success Business Park (DuPont), Connecticut

3.4.1.a Background

Lake Success Business Park (LSBP) in Bridgeport, Connecticut, is a 422-acre site that was owned by Remington Arms Company until 1989 and was operated as a small arms and ammunition storage and manufacturing facility. The site is currently owned by a subsidiary of DuPont, which is developing the site into a business park. As a result of the arms storage and manufacturing activities, site soil is contaminated with lead and other metals. In the early 1990s, a RCRA facility investigation identified 51 areas of environmental concern, with lead as the primary contaminant in soil. EPA assigned two action levels for lead at the site: 500 parts per million (ppm) for areas within the boundaries of a buffer zone and 1,000 ppm for non-buffer zone areas. LSBP is an interim status RCRA facility with corrective action being performed by the site owner under an administrative consent order.

The site contractor used XRF analysis of soil samples to support site characterization and remedial decision-making, as shown in Attachment J. Decisions were made to delineate and confirm soil excavation boundaries. Ten percent of confirmation and post-excavation samples were analyzed by an off-site laboratory using EPA SW-846 Method 3050 (acid-soluble sample digestion) and Method 3050/6010 (ICP-atomic emission spectroscopy), and the results were compared with the XRF data.

The project team collected nearly 8,000 samples for XRF analysis. Of these, 793 sample pairs were evaluated using off-site laboratory analysis (as of fall 1999). Comparison results demonstrated 99.0 percent agreement with respect to the 1,000-ppm action level and 97.4 percent agreement with respect to the 500-ppm action level.

3.4.1.b Procurement Information – Lake Success Business Park

The XRF work at LSBP was performed by the URS Diamond Group (URS) under an existing contract with DuPont to provide site investigation services. To provide a cost estimate for the XRF analyses, URS first prepared a sheet of unit costs with estimated quantities. URS then compared the XRF costs with the unit and total estimated costs for conducting conventional metal analyses at an off-site laboratory.

For the project, URS purchased the XRF analyzer and conducted the analyses using field personnel. URS also decided to use aggressive sample preparation steps that included homogenizing, sieving, drying, and grinding. At the time (the late 1990s), these protocols and the associated instrumentation were considered to be requirements for XRF analyses. However, more recently, both the instrumentation and the understanding of the benefits of practices such as grinding have changed dramatically.

After the project was completed, a cost evaluation was conducted by EPA to compare the use of XRF analysis at the site with conventional laboratory analyses. EPA estimated that up to 50 percent savings were realized through the use of XRF analysis without compromising the reliability of project decision-making. EPA considered only the costs of analysis because field personnel were required to be on site for sampling under both scenarios. In addition to the analytical cost savings, the use of field analytical technologies saved time and labor by minimizing downtime and the number of mobilizations; the costs associated with the time and labor savings were not quantified in the cost evaluation.

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Source of Additional Information:

EPA. "Innovations in Site Characterization – Technology Evaluation: On-site Lead Analysis Using a Field Portable XRF Analyzer." Draft. August 2002.

4.0 CONCLUSIONS

The Triad approach has been successfully used in the federal, state, local, and private sector arenas to reduce uncertainty, improve decision-making, and reduce overall project costs and timelines. Flexibility and adaptability are key components of the Triad approach and have been viewed as challenges when services are procured under systems that have been designed for more traditional approaches. This document provides innovative strategies and approaches used by the federal and nonfederal sectors to successfully procure services under a Triad framework as well as relevant case study examples. Keys to success in such procurement efforts include:

- Involving technical experts and project managers who understand the Triad approach and the specific project requirements in the procurement process to ensure that the Triad considerations for the project are appropriately incorporated into the process. This is especially important if the buyer does not have a technical background.

- Involving the contracting staff in the planning process before the final procurement strategy is identified. Experienced contracting staff can identify the best contract mechanism and approach to provide for the flexibility and adaptability required under the Triad approach while maintaining appropriate controls over the contract and the project.

- Using unit costs to allow better estimating and tracking of project costs under the Triad approach. A unit cost under a Triad approach is defined as a discrete activity that can be used as a basis for estimating and tracking costs. Unit costs are site-specific and need to be customized to meet the specific needs of a project. Development of options and unit rates based on the anticipated data needs of a project will increase the flexibility of a procurement as well as project efficiency. A planning process that allows decision-makers to understand the specific services and equipment to be provided and the associated "units" is essential for a successful procurement.

- Clearly identifying the specific Triad considerations for a project, including the three primary components of the Triad approach (systematic project planning, dynamic work strategies, and real-time measurement technologies), fixed-unit costs, and flexibility. Project-specific definition of these considerations is important to ensure that sufficient time and resources are allocated for the thorough, up-front planning required by the Triad approach. Moreover, the performance criteria for a SOW or work plan must reflect these Triad considerations.

- Clearly identifying how flexibility will be incorporated into the project while maintaining control over overall project and contract objectives. This requires up-front planning to establish (1) clear decision criteria for data collection; (2) clear methods and lines of communication to facilitate rapid decision-making, including real-time meetings and effective coordination among decision-makers; (3) a clear understanding of the cost implications of scope changes and how optional tasks will be triggered and managed; (4) a rationale for "ranges" of samples to be collected and analyzed; and (5) clear decision rules for how sampling locations may be determined and revised in the field.

- Considering use of a two-part approach to procurement in which the up-front planning is procured as a separate activity from the field implementation services. A two-part approach can provide the buyer with several advantages. For example, if the buyer does not possess the necessary technical expertise, this approach gives the buyer the ability to procure the expertise needed to develop a systematic plan with sufficient technical detail for the SOW in order to procure the field services. In addition, this approach gives the buyer the ability to increase competition for the work by allowing a broader universe of contractors to bid on the field work component. A two-part approach is also useful in cases where different contractors have different skills and areas of expertise. This type of approach was used at the Wenatchee Tree Fruit site discussed in Section 3 of this document.

The use of the Triad approach provides opportunities for better, more cost-effective solutions to environmental problems compared to traditional approaches. By using systematic project planning, dynamic work strategies, and real-time measurement technologies, decision uncertainty can be actively managed, improving decision-making and reducing overall project costs and timeframes. The information presented in this document, including the six case studies presented in Section 3, illustrates how the federal, state, local, and private sectors have used innovative strategies and approaches to successfully procure services under a Triad framework.

Additional information about procurement of sampling and analytical services under a Triad approach can be obtained from the BTSC at www.brownfieldstsc.org. Additional information about EPA procurements can be obtained from the Office of Acquisition Management at www.epa.gov/oam/ or from the Contracting Officer for a specific procurement. The chart on the following page refers users to additional information available about procurement under a Triad approach.

Additional Information Related to Procurement in Attachments

Attachment	Description	Location
A – Triad Overview	Provides an overview of the key concepts, requirements, and benefits of the Triad approach, including a brief summary of the Triad approach.	http://www.triadcentral.org/over/index.cfm
B – Overview of Field-Based Measurement Technologies	Provides a summary of information about selected sampling technologies such as direct push technologies and techniques, and field-based measurement technologies that can be used under a Triad approach.	http://www.triadcentral.org/tech/index.cfm
C – Pertinent Resources	Provides information on references and resources about procurement and innovative technologies related to the Triad approach.	http://www.triadcentral.org/ref/index.cfm
D – Glossary	Provides descriptions of key terms used in this document.	http://www.triadcentral.org/gloss/index.cfm
E – McCormick and Baxter Site Information	Includes the scope of work used to procure sonic drilling services for this site.	http://www.brownfieldstsc.org/procurement_ex.cfm
F – Wenatchee Tree Fruit Site Information	Includes two versions of a case study (one by EPA and one by the USACE) about the site investigation and cleanup. Also included are the FSP, QAPP, and RAMP for the site.	http://www.brownfieldstsc.org/procurement_ex.cfm
G – Florida Department of Environmental Protection Program Information	Includes materials used to solicit contractors for the Dry Cleaner Remediation Program, including example rate categories.	http://www.brownfieldstsc.org/procurement_ex.cfm
H – Ohio EPA Program Information	Provides background information about the SIFU program as well as materials about one site investigated by the SIFU.	http://www.brownfieldstsc.org/procurement_ex.cfm
I – Assunpink Creek, Trenton, New Jersey, Project Information	Includes the RFP used by the City of Trenton to procure Triad investigation services for the site as well as the dynamic work plan used to guide the investigation.	http://www.brownfieldstsc.org/procurement_ex.cfm
J – Lake Success Business Park (DuPont) Project Information	Includes a case study about the use of XRF field analyses at the site.	http://www.brownfieldstsc.org/procurement_ex.cfm