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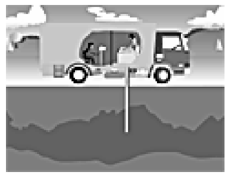
ITRC's Internet-based Training Program

An Overview of The Triad Approach: A New Paradigm for Environmental Project Management



Technical and Regulatory Guidance for the Triad Approach: A New Paradigm for Environmental Project Management

This training is co-sponsored by the EPA Office of Superfund Remediation and Technology Innovation

The Triad approach can be thought of as an initiative to update the environmental restoration process by providing a better union of scientific and societal factors involved in the resolution of contamination issues. It does so by emphasizing better investigation preparation (systematic project planning), greater flexibility in field work (dynamic work strategies), and advocacy of real-time measurement technologies, including field-generated data. The central concept that joins all of these ideas is the need to understand and manage uncertainties that affect decision making. The Triad approach relies on technological, scientific, and process advances that offer the potential for improvements in both quality and cost savings. The cost-saving potential is considered to be significant but is only now being documented by case studies.

This ITRC training course introduces the Triad concept and highlights how this process can increase the effectiveness and quality of environmental investigations. Key terms are defined, and the advantages and disadvantages are discussed. The concepts embodied in the three legs of the Triad approach—systematic project planning, dynamic work strategies, and real-time measurement technologies—are discussed. Some case studies are discussed, including the savings of time and money attributed to using the Triad approach. This training explains the relationship of the Triad to previous regulatory guidance and offers a discussion of issues that may affect stakeholders. An example is given of a state's efforts to formally adopt the Triad approach into its existing regulatory program. The training concludes by directing trainees to additional resources for further study. The ITRC guidance document Technical and Regulatory Guidance for the Triad Approach: A New Paradigm for Environmental Project Management (SCM-1, 2003) developed by the ITRC Sampling, Monitoring and Characterization Team, serves as the basis for this training course.

ITRC (Interstate Technology and Regulatory Council) www.itrcweb.org

Training Co-Sponsored by: EPA Office of Superfund Remediation and Technology Innovation (www.clu-in.org)

ITRC Course Moderator: Mary Yelken (myelken@earthlink.net)

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ITRC (www.itrcweb.org) – Shaping the Future of Regulatory Acceptance

- Network
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Host Organization

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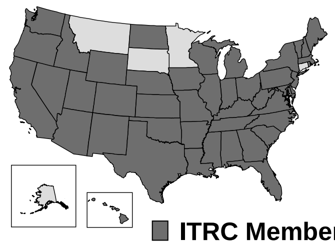

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The Interstate Technology and Regulatory Council (ITRC) is a state-led coalition of regulators, industry experts, citizen stakeholders, academia and federal partners that work to achieve regulatory acceptance of environmental technologies and innovative approaches. ITRC consists of 45 states (and the District of Columbia) that work to break down barriers and reduce compliance costs, making it easier to use new technologies and helping states maximize resources. ITRC brings together a diverse mix of environmental experts and stakeholders from both the public and private sectors to broaden and deepen technical knowledge and advance the regulatory acceptance of environmental technologies. Together, we're building the environmental community's ability to expedite quality decision making while protecting human health and the environment. With our network approaching 7,500 people from all aspects of the environmental community, ITRC is a unique catalyst for dialogue between regulators and the regulated community.

For a state to be a member of ITRC their environmental agency must designate a State Point of Contact. To find out who your State POC is check out the "contacts" section at www.itrcweb.org. Also, click on "membership" to learn how you can become a member of an ITRC Technical Team.

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ITRC Course Topics Planned for 2006

Popular courses from 2005

- Alternative Landfill Covers
- Constructed Treatment Wetlands
- Environmental Management at Operational Outdoor Small Arms Ranges
- DNAPL Performance Assessment
- Mitigation Wetlands
- Perchlorate Overview
- Permeable Reactive Barriers: Lessons Learn and New Direction
- Radiation Risk Assessment
- Radiation Site Cleanup
- Remediation Process Optimization
- Site Investigation and Remediation for Munitions Response Projects
- Triad Approach
- What's New With In Situ Chemical Oxidation

New in 2006

- Characterization, Design, Construction and Monitoring of Bioreactor Landfills
- Direct-Push Wells for Long-term Monitoring
- Ending Post Closure Care at Landfills
- Planning and Promoting of Ecological Re-use of Remediated Sites
- Rads Real-time Data Collection
- Remediation Process Optimization Advanced Training
- More in development…….

Training dates/details at www.itrcweb.org

Training archives at http://cluin.org/live/archive.cfm

More details and schedules are available from www.itrcweb.org under "Internet-based Training."

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The Triad Approach: A New Paradigm for Environmental Project Management

Logistical Reminders

- Phone line audience
  - ✓ Keep phone on mute
  - ✓ *6 to mute, *7 to un-mute to ask question during designated periods
  - ✓ Do NOT put call on hold
- Simulcast audience
  - ✓ Use ? at the top of each slide to submit questions
- Course time = 2 ¼ hours

Presentation Overview

- Triad Overview
- Detailed Triad Materials
- Questions & Answers
- Other Regulatory Guidance and Stakeholder and Tribal Issues
- Case Study Highlights
- State Implementation of Triad
- Links to Additional Resources
- Your Feedback
- Questions & Answers

No associated notes.

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Meet the ITRC Instructors

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Stuart J. Nagourney is Team Leader of ITRCs Sampling, Characterization, and Monitoring Team. He is a Research Scientist with the New Jersey Department of Environment Protection in the Office of Quality Assurance. Mr. Nagourney has been Manager of Analytical Laboratories for the Argus Division of Witco Corporation and Bureau Chief for Inorganic and Radiological Services for the NJDEP in addition to holding staff position in state and federal government agencies. He holds a B.S. in Chemistry from Brooklyn College and a M.S. in Inorganic and Physical Chemistry from Indiana University, Bloomington. Mr. Nagourney is an adjunct Professor of Chemistry at The College of New Jersey, serves on several national committees reviewing analytical test methods and provides peer review for numerous chemistry journals. Mr. Nagourney's responsibilities in the area of quality assurance and technology implementation Include auditing of certified environmental testing laboratories, review of DEP programs for adherence to quality principles, implementation of ISO certification, development of new reference materials to insure test method validity and development of staff training courses.

George Hall has degrees in science and engineering. He received a B.S. degree in Geology from Arkansas Tech University in 1975, and an M.S. Degree in Civil Engineering from Oklahoma State University in 1983. He holds professional licensure as both a geologist and engineer. Mr. Hall was employed by the Army Corps of Engineers from 1975 – 1997. During this time he worked in a variety of engineering and science positions involving geology, engineering geology, hydrogeology, geotechnical engineering, and environmental investigations and remediation. He held the position of Innovative Technology Advocate for the Tulsa District during the period of 1995 – 1997. He has taught graduate classes in hydrogeology as an adjunct professor for the University of Tulsa. In 1998 he formed Hall Consulting, P.L.L.C., and offers independent consulting services in the fields of science and engineering.

Katherine Owens has been an advocate for public participation in hazardous waste remediation activities at the Idaho National Laboratory (INL) since 1991. Since 1996, she has provided business/project management and public communication services through her consulting firm Paragon Professional Associates located in Idaho Falls, Idaho. Previously, Katherine worked for five years at the Idaho Water Resources Research Institute at the University of Idaho as a project manager overseeing water related research projects directly and indirectly involved with INL activities. Prior to that work, she spent five years at the INL as a project manager of Regulatory, Tribal, and Public Involvement for the U. S. Department of Energy (DOE) Buried Waste Integrated Demonstration Program then for the U.S. DOE Mixed Waste Focus Area. She was instrumental in the development and implementation of the Tribal, Regulatory, and Stakeholder Involvement Plans for both programs. Katherine is active on several ITRC teams. She joined the ITRC Sampling, Characterization, and Monitoring team in 2001 and is an instructor on their Triad training course. She joined the ITRC's Risk Assessment Resources team in 2003. Katherine earned a bachelor's degree in corporate training from Idaho State University in Pocatello, Idaho in 1992 and a master's degree in environmental studies from the University of Idaho in Idaho Falls, Idaho in 1997.

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Triad Overview

Stuart J. Nagourney

No associated notes.

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What You Will Learn……

- Understanding of the Triad approach
- Importance of the systematic planning element
- Potential for both time and cost savings
- Regulatory issues to consider prior to utilization of the Triad approach
- Potential stakeholder issues and concerns
- An approach that was used to formally implement the Triad approach within a state

No associated notes.

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Current United States Site Remediation Status and Policies

- More than 100,000 sites require remediation
- State and federal regulations control process
- Inflexible project plans only use fixed laboratory methods
- Cleanups often require multiple mobilizations
- Final decision can take > 10 years
- Cost of remediation is very high

No associated notes.

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Problems with Traditional Remediation Model

- Interested parties cannot agree on decision points
- Data only acceptable if produced by regulator-approved methods in fixed-based laboratories; this implies "definitive data" with little or no uncertainty. THIS IS NOT TRUE!
- Budget limits number of samples; this limits spatial definition of pollution
- Quality of site decisions are compromised by limited amount of information

The "data" here refers to analytical chemistry data for pollutant/contaminant concentrations in the environmental media encountered with cleanup of hazardous waste sites.

The current data quality model functions as if the following assumptions were true:

•"Data quality" is determined by the documentation and accuracy of the laboratory analytical method procedures

•Analytical accuracy for environmental samples can be ensured by using one-size-fits-all regulator-approved methods

•QC checks using ideal matrices (reagent water, clean sand) are representative of method performance for real-world samples

•Laboratory QA is substitutable for project QA (i.e., if method performance is in control, project decisions are trustworthy)

•After the selection, performance, and interpretation of analytical methods has been "standardized," analytical chemistry expertise is no longer needed either at the project or lab level since all potential variables that could affect the usefulness of data have already been accounted for

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A Better Remediation Model

- Focus on activities to minimize data uncertainty
- Anything that compromises data representativeness compromises data quality
- "Data" representativeness = sampling representativeness + analytical representativeness
- Project-specific planning: matches scale(s) of data generation with scale(s) of decision making

A scientifically sound model for environmental data quality is based on managing all uncertainties that could significantly impact the ability of data to defensibly support project decision making. In contrast to the first generation data quality model, a second generation data quality model will avoid assuming that

•Standard methods guarantee analytical representativeness; and that

•Analytical representativeness guarantees data representativeness.

The following premises are at the foundation of a second generation data quality model:

•"Data quality" is determined according to data's ability to support correct conclusions and decision making

•Anything that compromises data representativeness compromises data quality

•"Data" representativeness consists of <u>both</u> sampling representativeness and analytical representativeness

> •Sampling representativeness is a multifaceted concept that includes sample support (both initial sampling and subsampling), sampling design, and sample preservation
>
> •Analytical representativeness is a function of selecting target analytes appropriate to the decision to be made, selecting analytical methods applicable to those target analytes, and interpreting the analytical results correctly recognizing the likelihood and impact of non-specific analytical responses or interferences.

•The purpose of project-specific planning is to match the scale(s) of data generation with the scale(s) of decision making.

•Scientifically sound project decision making requires technical expertise to manage sampling and analytical uncertainties

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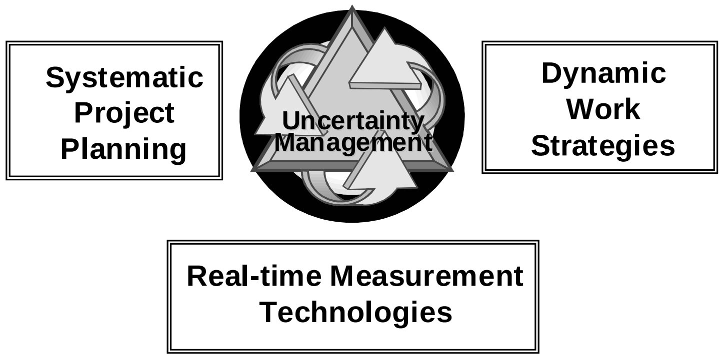
Solution: Triad

The Triad Approach



No associated notes.

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Triad: Systematic Project Planning

- **Systematic Project Planning** identifies key objectives and decision points through use of a conceptual site model (CSM)

C-17 DQO Working Meeting

Overall objective of Triad is to minimize uncertainty in both data and decisions.

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Triad: Dynamic Work Strategies

- **Dynamic Work Strategies** give experts working in the field the flexibility to make decisions and change direction based upon information as it is acquired

Overall objective of Triad is to minimize uncertainty in both data and decisions

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Triad: Real-time Measurements

- **Real-time Measurement Technologies** acquire and use data in near or real-time to support site decisions

Passive diffusion bag sampling

GeoProbe and MIP

Overall objective of Triad is to minimize uncertainty in both data and decisions

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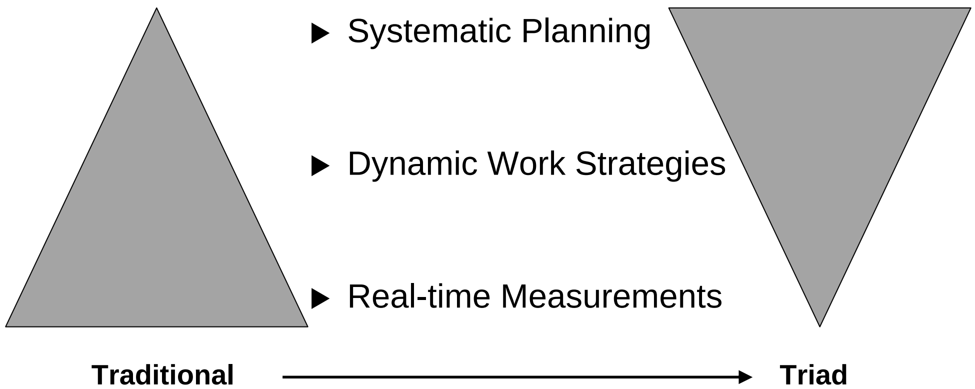
Resource Allocation: Traditional vs. Triad



No associated notes.

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Conceptual Site Model (CSM)

- ▶ The primary product of the Triad approach is an accurate CSM
- ▶ Correct decisions depend on an accurate CSM
- ▶ The CSM includes
  - Physical site setting
  - Regional environmental setting
  - Land use description
  - Contaminant regime and site investigations
  - Potential risks and potential receptors

Some remediation guidance (e.g., Superfund) have been recommending a dynamic CSM approach for years and some project teams use them now to very good effect. Triad wants to make the use of the CSM even more wide-spread, and, in those cases where its use is a fairly static, one or two-time "develop and update" process, to teach people how to use it in a dynamic process of repeated development, including in the field.

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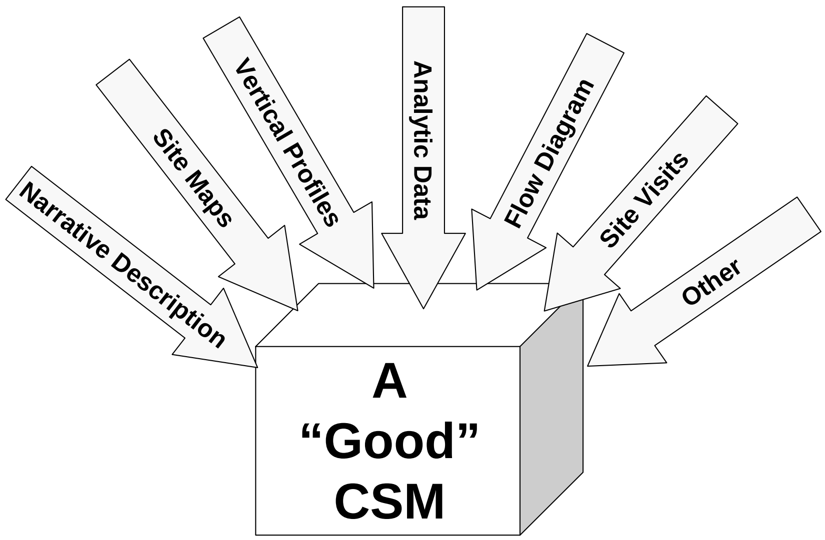
Conceptual Site Model



No associated notes.

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Where Has Triad Been Successfully Implemented?

- Large DOE sites with extensive range of pollutants including metals, organics, and radiologic waste
- Military installations requiring expedited decision making
- Industrial and research centers with unknown contaminants
- Smaller brownfields sites including dry cleaners and gasoline stations where contaminants are known

No associated notes.

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Triad and NORISC

- NORISC = Network Oriented Assessment of Insitu Screening of Contaminated Sites
- Consortium of European Union academia and government agencies to remediate hazardous waste sites
- Technical goals similar to Triad, but emphasize use of Decision Support Software (DSS)
- Early involvement of stakeholders key

No associated notes.

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Applicability/Advantages of Triad

Advantages

- Lower life-cycle costs
- Better investigation quality
- Faster investigation, restoration, and redevelopment
- Greater confidence in data and decisions
- Improved communication with stakeholders
- More effective cleanups

Disadvantages

- Higher up-front costs
- Change in approach to data quality
- Negative bias towards field-generated data
- Lack of tools to manage decision uncertainty
- Need to train all parties

The Triad Approach Is Broadly Applicable

The Triad approach is a conceptual framework developed by synthesizing various strategic improvements to environmental investigation planning, execution, and evaluation. It is applicable across all types of environmental programs.

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Life-cycle Costs Must Be Considered

- Planning is generally more time consuming and costly with Triad projects
- Analytical cost varies; it may be equal to, less than, or greater than a conventional project
- Field measurement technologies are generally less costly on a per unit basis, but more samples are analyzed
- Reduced mobilizations avoid repeated planning, field execution, and analytical cost
- Accurate characterization reduces the uncertainty in site remediation, often leading to significantly reduced volumes requiring remediation
- **Bottom Line: Significant cost savings occur with Triad projects on a life-cycle basis**

Triad's major advantage – Life-cycle Cost Savings

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Key Triad Issues and Concerns

- Will more leaders of federal and state regulatory agencies endorse and advocate the use of Triad?
- Can more state and federal regulators be convinced to change traditional practice to include more aspects of Triad?
- Can sufficient numbers of practitioners be trained to make Triad cost-effective and practical?
- Can site owners and insurers become convinced that decisions from a Triad project have sufficient certainty and are legally defensible?

No associated notes.

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Detailed Triad Materials

George Hall

No associated notes.

24

Triad: Systematic Project Planning

- Ask the right questions “e.g., why am I doing this?”
- Collaborate with stakeholders to define project goals (including regulators)
- Form multi-disciplinary decision and core technical teams
- Provide on-site technical team with technical flexibility
- Involve statistical or judgement based sampling design
- Assumes iterative approach
- Overall objective is to minimize uncertainty

Systematic Project Planning Is the Key

The dynamic work strategy and real-time measurement technology components of the Triad approach may not be applicable to some sites. However, systematic project planning to establish clear objectives is essential for all environmental restoration projects.

Project Initiation (provide the answers to who, what, why)

Assemble Project Team

Define Project Objectives

Identify Key Decision Makers

Define Decisions to Be Made

Develop Initial Conceptual Site Model (CSM)

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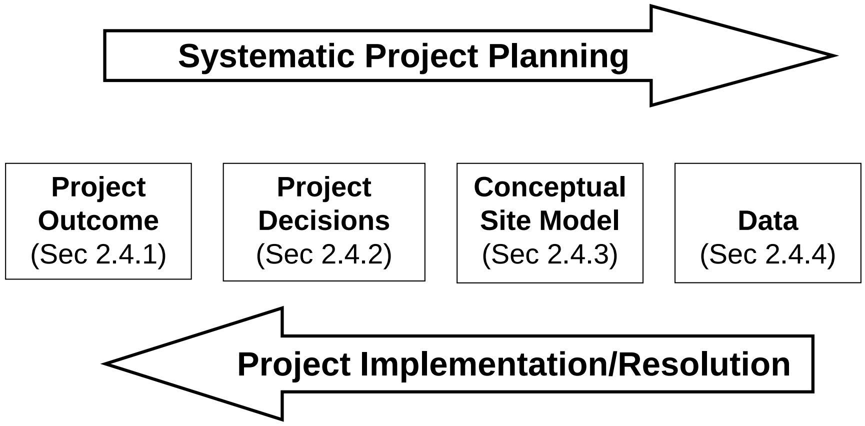
Planning vs. Implementation



(The thought process flow reverses from the Systematic Planning stage to the Implementation Stage)

Decision Strategies Are Determined During Systematic Project Planning

Decision strategies are determined with the input of stakeholders and the approval of regulators. If too little information is available to know which decision strategy would be best, the factors driving the selection of one strategy over another (e.g., selecting a cleanup strategy rather than a containment option) are determined. These factors can be arrayed into a matrix or decision tree, which is resolved as the needed information is gathered during implementation of the dynamic work strategy.

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Static Work Plans (SWPs) vs. Dynamic Work Plans (DWPs)

- SWPs assign sampling locations before mobilization and rarely change them in the field
  - DWPs develop sampling strategies but are prepared to change based on results of field measurements to address sampling uncertainty
- SWPs make few field measurements
  - DWPs are built around field measurement technologies
- SWPs consider the conceptual site model (CSM) during planning, modify it after completion of field work
  - DWPs consider the CSM as constantly changing during the project
- SWPs decisions are made in the office before field work
  - DWPs anticipate and plan for decisions to be made in real time to address uncertainties in the evolving CSM

No associated notes.

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Triad: Real-time Measurement Technologies

- Employ field analytical methods (FAM) to delineate site
- FAMs quicker and cheaper than lab-based measurements
- FAMs are a supplement to, not a replacement for, conventional laboratory measurements
- Must understand precision and accuracy of FAMs
- Process information in the field; speed up decision making

Field Program

Sampling and Analysis to Fill Data Gaps

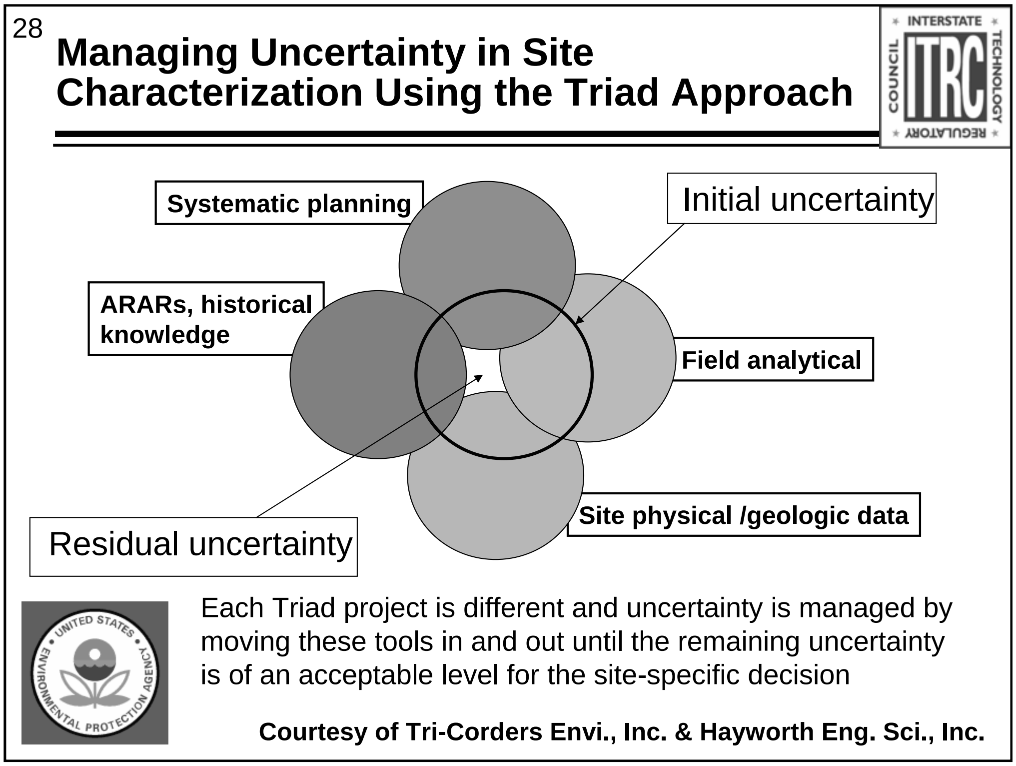
Data Validation, Verification, and Assessment

Some people equate field analytical methods with high detection limits, but field methods are available now for many contaminants with a wide range of detection limits.

Laboratory methods may be transportable via a mobile lab.

New field methods are being developed, some with low detection limits.

Sometimes, low detection limits are not needed to have sufficient certainty for particular decision.



This slide was provided courtesy of Tri-Corders Env., Inc. and Hayworth Eng. Sci., Inc

Central Concept = Uncertainty Management

The Triad approach explicitly focuses on the identification and management of sources of decision uncertainty that could lead to decision errors. The Triad explicitly manages the largest source of data uncertainty, which is data variability caused by the heterogeneity of chemical contaminants and the impacted environmental matrices.

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Triad: Examples of Real-time Measurement Technologies

- Analytical
  - Immunoassay
  - GC
  - DSITMS
  - GC/MS
  - XRF
  - In-situ probes
  - Open-path spectroscopy
  - Use nearby laboratory for fast turn-around
  - Data storage and management tools
- Geophysical
  - Electrical and electromagnetic
  - Borehole techniques
  - Seismic
- Geological
  - Direct-push
  - Cone pentrometer

Field Methods Alone Do Not Make a Triad Project

Just as using a dynamic work strategy alone does not equate to using the Triad approach, neither does the sole use of field methods. Systematic project planning to select the right analytical methods and to develop proper QC protocols is essential to Triad's goal of managing uncertainty.

Avoid Requirements for Fixed Percentages of Split Samples

Arbitrary percentages of QC samples, such as "10% split sample confirmation" nearly always fail to provide convincing evidence to "confirm" that field data are reliable. Split sample evidence is usually equivocal. Split samples are not a substitute for in-field method QC to demonstrate the method is working properly. Split samples should be selected on the basis of the analytical information these samples provide to enable interpretation of nonspecific analyses, and to provide the low reporting limits and analyte-specific data needed for risk assessment or to demonstrate regulatory closure compliance.

30 **Triad Approach Requires a Tool Box of Site Assessment Tools**

No associated notes.

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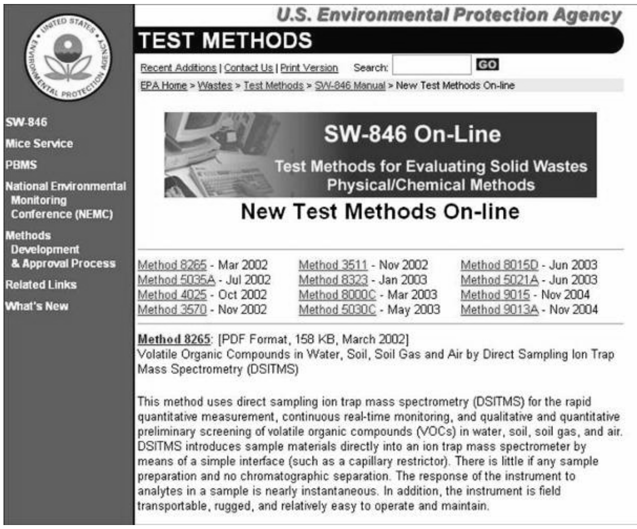
DSITMS Approved by US EPA SW 846 Method 8265


U.S. Environmental Protection Agency

TEST METHODS

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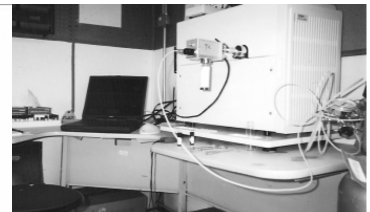
New Test Methods On-line

Method 8265 - Mar 2002	Method 3511 - Nov 2002	Method 8015D - Jun 2003
Method 5035A - Jul 2002	Method 8323 - Jan 2003	Method 5021A - Jun 2003
Method 4025 - Oct 2002	Method 8000C - Mar 2003	Method 9015 - Nov 2004
Method 3570 - Nov 2002	Method 5030C - May 2003	Method 9013A - Nov 2004

Method 8265: [PDF Format, 158 KB, March 2002]
Volatile Organic Compounds in Water, Soil, Soil Gas and Air by Direct Sampling Ion Trap Mass Spectrometry (DSITMS)

This method uses direct sampling ion trap mass spectrometry (DSITMS) for the rapid quantitative measurement, continuous real-time monitoring, and qualitative and quantitative preliminary screening of volatile organic compounds (VOCs) in water, soil, soil gas, and air. DSITMS introduces sample materials directly into an ion trap mass spectrometer by means of a simple interface (such as a capillary restrictor). There is little if any sample preparation and no chromatographic separation. The response of the instrument to analytes in a sample is nearly instantaneous. In addition, the instrument is field transportable, rugged, and relatively easy to operate and maintain.



http://www.epa.gov/epaoswer/hazwaste/test/index.htm

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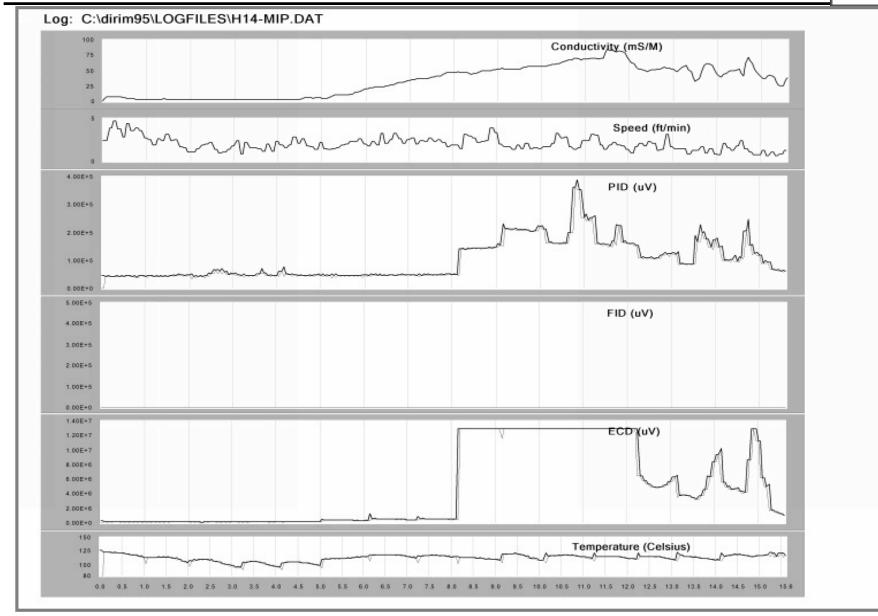
MIP Log with Soil Conductivity, FID, PID and ECD Vint Hill Farm Station, VA



No associated notes.

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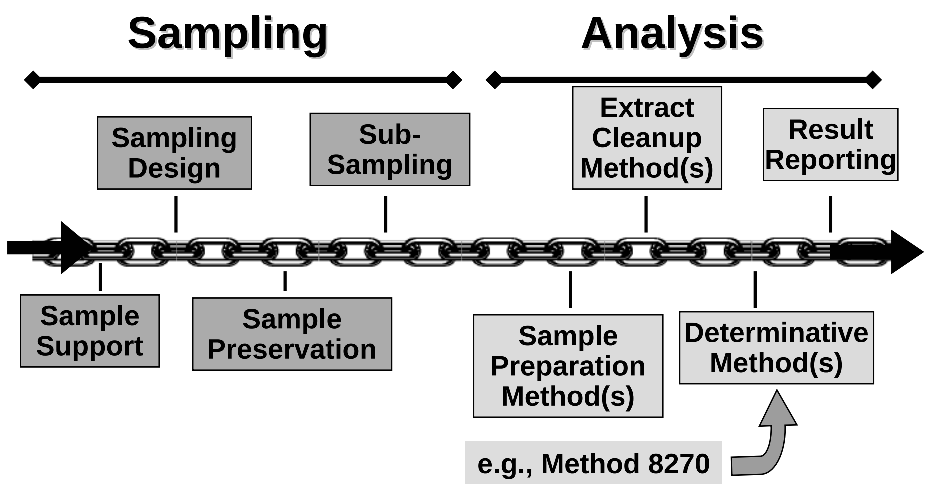
The Data Quality “Chain”



It is risky to simply assume that generic procedures are representative for project specific decisions!

No associated notes.

34

Data Is Generated on Samples

Perfect Analytical Chemistry + **Non-Representative Sample**

↓

"BAD" DATA

Distinguish:
Analytical Quality from Data Quality

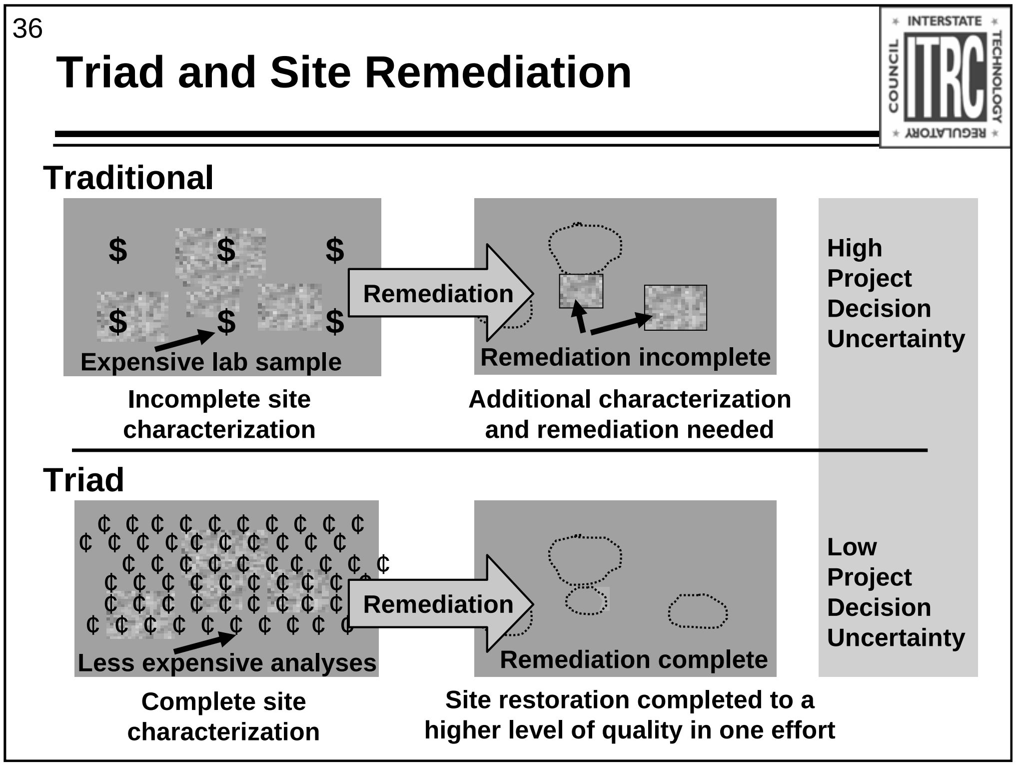
No associated notes.

Oversimplified Data Quality Model

Methods	=	Data	=	Decisions
Screening Methods	→	Screening Data	→	Uncertain Decisions
"Definitive" Methods	→	"Definitive" Data	→	Certain Decisions

Distinguish:
Analytical Methods from Data from Decisions

No associated notes.



High Density Sampling vs. Analytical Perfection

Decision errors about risk and remediation are an unavoidable consequence of traditional work strategies that rely on fixed laboratory analyses. Since such analyses are expensive, relatively few samples can be analyzed compared to the number needed to accurately characterize heterogeneous contaminant distributions.

High analytical quality data points are seldom needed to refine the CSM. High analytical quality analyses are useless without a reliable CSM that demonstrates the representativeness of those data points.

The Triad Approach Is Efficient

The Triad approach offers the potential for significant **cost savings.** Cost savings up to 50% have been observed. The cost savings potential increases with site complexity.

Time savings can also be significant. Systematic project planning establishes clear project goals and the associated decision logic so that a dynamic work strategy can reduce the number of field mobilizations.

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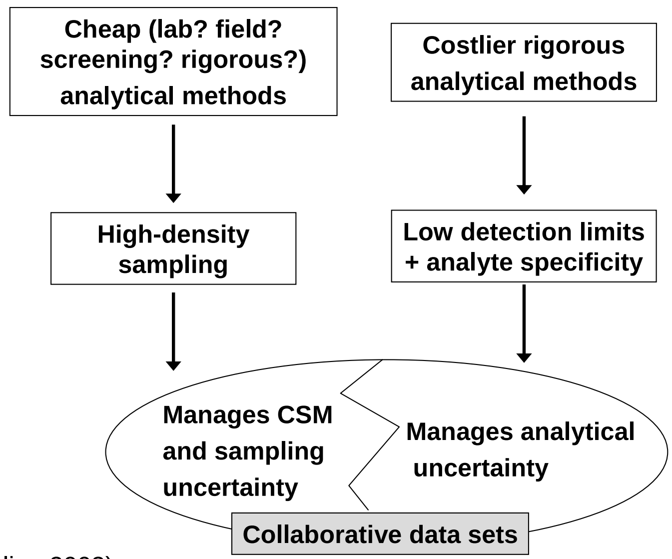
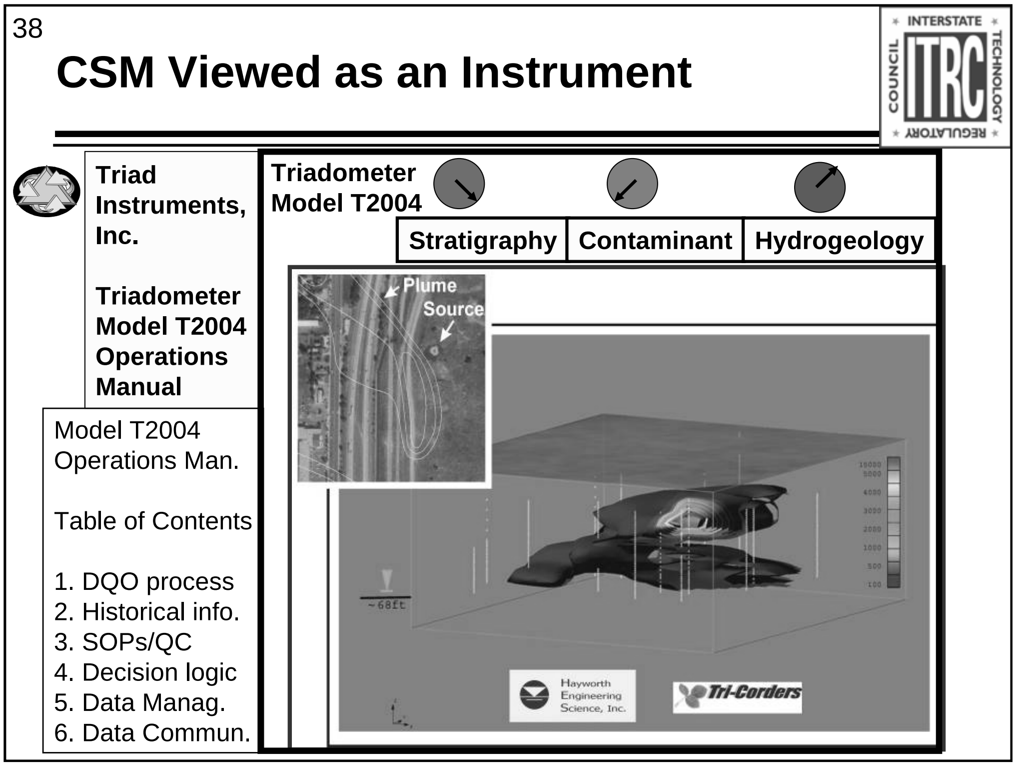
Collaborative Data Sets Increase Data Quality in Heterogeneous Matrices



(Crumbling 2003)

The increased impetus the Triad places on field analysis should not imply that laboratory analysis is of lesser importance. Data derived from fixed laboratories continue to play an important role in analysis of contaminants not currently amenable to field analysis and to evaluate the effectiveness of analytical data obtained in the field. Samples split between the field and fixed laboratory are required when comparison analysis is needed to help interpret results from nonspecific or biased analytical methods



The CSM creates the setting within which the analytical contaminant data are evaluated and understood. The CSM consists of chemical, physical, and biological data that are organized into text, graphics, tables, or some other useful representation (or "model") able to support site decision making. Different decisions may require different representations of the CSM. For example, decisions about groundwater contamination migration or cleanup need a CSM that emphasizes hydrogeology and contaminant concentrations and fate information; whereas decisions about contaminant exposure require a CSM that focuses on identifying all potential receptors and exposure pathways.

Heterogeneity Is Addressed in the CSM

The CSM is the primary tool used to:

· predict the degree of contaminant heterogeneity and the nature of spatial patterning and migration pathways;

· verify whether those predictions were accurate;

· assess whether heterogeneity impacts the performance of statistical sampling plans;

· understand "data representativeness;" and integrate knowledge of heterogeneity and spatial patterning into decisions about exposure pathways, selecting remedies, designing treatment systems, and long-term monitoring strategies

Better Quality Control

Triad systematic planning revolves around the identification and management of things that can cause decision errors. This is the essence of quality control.

Quality control within the context of a dynamic work strategy is much more effective at catching mistakes than traditional work strategies relying on static work plans and fixed laboratory analyses. Results are immediately compared with the current CSM.

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How Do You Know When Enough (Data) Is Enough?

Using the Triad approach allows the decision to stop taking data to be made with confidence BEFORE you leave the site.

No associated notes.

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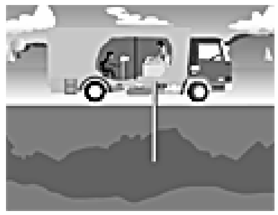
Questions & Answers



No associated notes.

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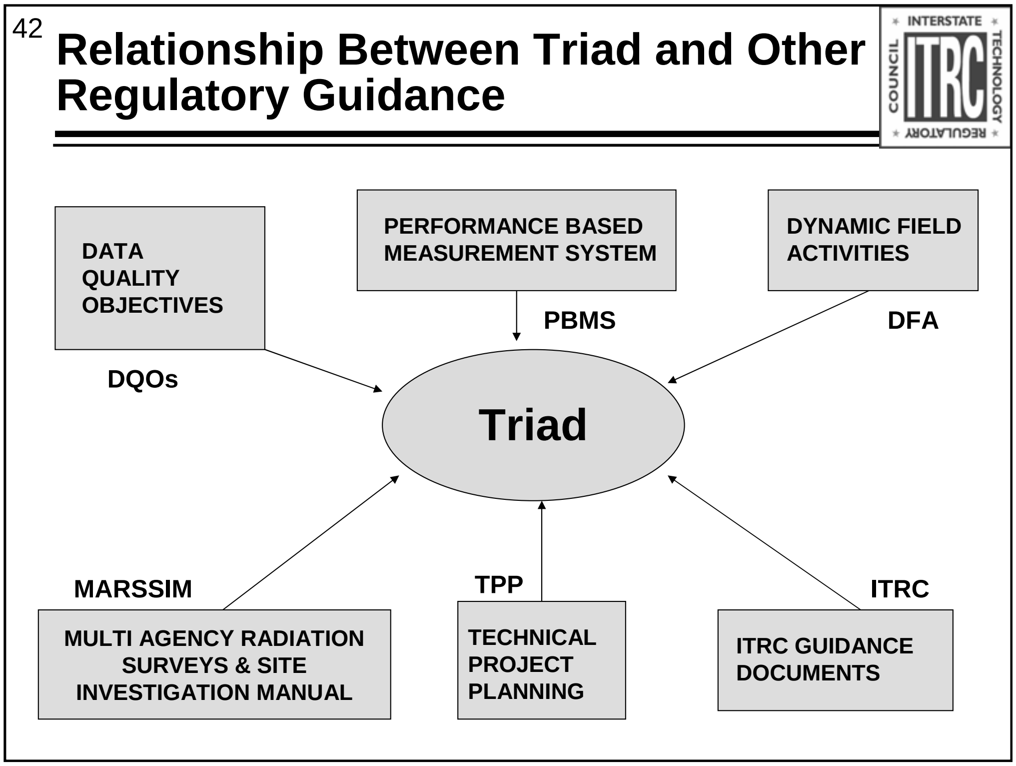
Other Regulatory Guidance and Stakeholder and Tribal Issues

Katherine J. Owens

No associated notes.



Triad concepts are not new. It is the integration of the concepts that is new. Triad should be seen as an extension of other regulatory guidance.

ITRC has been involved with “accelerated” efforts for site characterization since 1995 and has published several technical guidance documents on those technologies. These early efforts served as building blocks to help support today’s Triad approach.

These documents can be accessed via the ITRC Website (www.itrcweb.org).

Refer to Sections 3.1 – 3.7 of the Triad document, Relationships to Existing Guidance.

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Triad Is Consistent with any Guidance that Recognizes the Following:

- Decisions are based on scientific, economic, and social considerations
- Data must be representative of target populations
- Data quality must be based on sampling representativeness, not solely on laboratory analytical procedures
- Data collection must be tailored to specific decisions developed during the systematic planning process and design of the Conceptual Site Model
- Appropriate scientific/technical expertise must be involved throughout project planning and implementation

Reference: Section 3.0 in the Triad document, Relationships to Existing Guidance.

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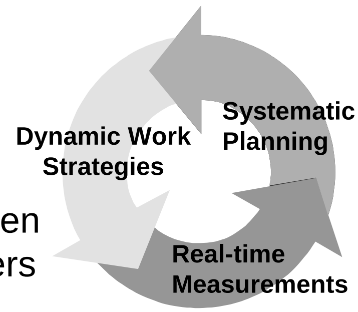
Triad and Stakeholders

- All Triad components are designed to involve stakeholder participation
- Stakeholders have a right to be involved in defining project outcomes
- On-going communication between the project team and stakeholders is key



The underlying premise and success of Triad depends on stakeholder participation and trust among the project team members. The most important component of Stakeholder involvement in Triad is during the systematic planning stage when defining project objectives for the development of the conceptual site model takes place. Since Triad is a dynamic process and subject to change based on real-time measurement data, it is important for ongoing communication with the stakeholders. This can be accomplished through periodic meetings, site visits, and status reports.

Current guidance from cleanup programs often supports this approach of involving stakeholders throughout the process.

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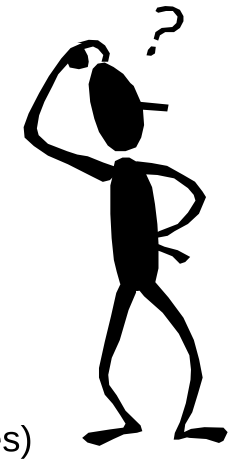
Who Is a Stakeholder?

Anyone with an interest in the outcome of the project…

- State regulator
- Landowner
- Problem holder
- Private citizen
- Business owner
- Consultant/contractor
- Other government agencies
(e.g. city, county, other federal agencies)

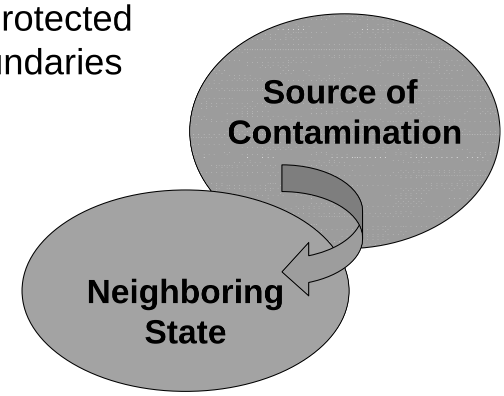


Refer to Section 7.0 of the Triad document, Stakeholder Concerns.

Historically, the term stakeholder usually is understood to mean the “public.” However, in Triad, a stakeholder is defined as anyone with an interest in the outcome of the project. It is contingent upon the Triad project team to determine other “affected” stakeholders that need to be brought into the process, including state regulators, representatives of tribal, federal, and municipal governments, landlords, business owners, adjacent property owners, etc. This can be accomplished via public meetings, posted announcements, and contacts with state or other environmental oversite agencies.

Potential Stakeholder Concerns

- Affected stakeholders are not limited to adjacent property owners
- Residents of neighboring states (countries) are not protected by geographical boundaries
  - Down wind
  - Down river
  - Aquifer



It is important to note that affected stakeholders are not necessarily limited to adjacent property owners. For instance, those who live downstream of a contaminated site may be affected even if they are not in the immediate vicinity of the site.

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Tribal Concerns

- Tribal members may have treaties that grant fishing, hunting, or other access to property outside of their present day reservations
- Tribal governments need to be involved early and often and participate in all phases of the project decision making

Tribes may have treaties or other pacts with the federal government that grant them fishing, hunting, or access rights in places that are not necessarily near their present-day reservations. In other words, non-adjacent tribes may have legal rights involving the contaminated site or other property affected by the contamination, even though they do not own the property or live adjacent to the site

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Regulatory Issues: Misconceptions about Triad

- “The Triad approach is equivalent to giving the contractor a blank check”
- “I do not have time to review data every day”
- “If the data produced by the field measurement technologies are not definitive, it is not useful (for decision making, for risk assessment….)”
- “Field measurements are made without (proper) QC”
- “How can we trust the contractors to make the correct decisions?”
- “We have been doing Triad for years already”

Because of the dynamic nature of Triad and the empowerment that is given to the core technical team for making on-site decisions, it is imperative that trust be established within the project team. This approach requires a fundamental change in philosophical and business practices and is quite possibly the most significant element of the Triad process. All parties involved enter into a partnership for defining project goals and objectives during the systematic planning process, the development of the conceptual site model, and selection of field analytical methods

It is important to remember that we are not asking regulators to close sites using field analytical data alone. In most cases, the high density data is used to select sampling locations for more definitive data. This process provides everyone with the level of data and analytical quality they need to feel comfortable making the tough decisions. Many practitioners HAVE been doing pieces of Triad for years and we applaud them! However, many also are missing out on one of the most critical aspects: managing uncertainty.

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Regulator Involvement

- Triad projects differ significantly from conventional projects in how regulators are involved in planning and execution
- Triad projects often employ new and innovative technologies
- Most successful Triad projects have regulator involvement early and often
- Regulators should be true stakeholders in project success
- The members of the project decision team, including the regulators, must develop trust in each other

The major difference between Triad projects and conventional projects is the role of the regulator. In Triad, the regulator is an active participant in the project decision team and is involved in all three phases of the project. As such, the regulator becomes a true stakeholder in the project and is subject to a certain degree of risk in that the regulator is invested in the project's success or failure.

Trust among team members is essential for the success of Triad projects.

Regulatory Barriers

- Regulatory barriers…..real vs. perceived
- Triad is a process
- NO SPECIFIC REGULATORY BARRIERS have been identified that prohibit Triad
- Institutional barriers are the greatest challenge
- Acceptance of field analytical methods for on-site decision making

There are no set rules or mandates that prohibit Triad. Most regulatory barriers to Triad are institutional. Historically, regulators are guided in their oversight work by agency business practices created to enforce state law and regulations resulting in a very prescriptive approach to project oversight. Triad projects do not fit into the existing regulatory compliance paradigm due to the participatory role of the regulator on the project team. The success of a Triad project requires a true partnership of all team members fostering creative and innovative approaches to planning, work plan development, and application of field analytical methods.

Some State and Federal agencies are supportive of Triad.

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Potential Regulatory Concerns

- Organizational culture and business practice inertia
- Defending the quality of Field Analytical Methods (FAM) data
- Discriminating between analytical quality and data quality
- Legal defensibility of FAM data and Triad
- Certification of FAMs
- Conflicts with state law, policy, and/or guidance
- Lack of guidance for state regulators
- Defining action levels during project planning
- Associating uncertainty with specific decisions

Refer to Section 5.0 of the Triad Document; “Regulatory and Other Barriers”

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Overcoming Regulatory Concerns

Organizational and Business Practice Inertia	**Acceptance of Field Generated Data**	**Legal Defensibility of FAM Data**	**Conflicts with State Law and Policy**	**Lack of Written Guidance**
Establish training for regulators and practitioners	Expand lab accreditation/ certification programs to include FAMs	Refer to peer reviewed articles in professional journals	Document problems as they arise during Triad projects	Create guidance on how to practice Triad (New Jersey)
Educate senior management	Consider qualifying practitioners on selected FAMs	Refer to the Triad central Website Criteria:	Utilize experience gained in other states	Compile successful Triad implementation case studies
Create a cadre of trained staff in Triad projects	Strike a balance between regulation and project specific QC	Technique has been validated and tested	Change state law, policy, and guidance to remove barriers	**Associating Uncertainty to Specific Decisions**
Develop a state peer network of experienced Triad users	Remind staff of SW-846 accepted FAMs	Rates of potential error associated with the relevant testing are known	**Defining Action Levels During Planning**	Using decision support software (NORISC)
Draw upon experience of previous investigations to demonstrate time and cost savings	Utilize experience gained in other states to predict similar issues	Technology has been peer reviewed and accepted in science community	Publicize case studies where action levels were defined	Seek out professional judgment of experienced FAMs practitioners

No associated notes.

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Case Study Highlights

George Hall

No associated notes.

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Triad Case Studies

- Fernald Uranium Processing Facility, Ohio
  - $34 million saved
- Varsity Cleaners, Florida
  - $300 – 450 thousand saved, time savings
- Wenatchee Tree Fruit Study, Washington
  - +$500 thousand saved, time savings
- Assunpink Creek Brownsfields Site, New Jersey
  - Unquantified time and cost savings
- McGuire Air Force Base C-17 Hanger Site, New Jersey
  - $1.3 million saved, 18 – 24 months saved
- Pine Street Barge Canal, Vermont
  - $45 million saved, site reduced from 70 to 38 acres

No associated notes.

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McGuire Air Force Base, New Jersey C-17 Hanger Site Investigation

The problem

- Construction of a new hanger for C-17 aircraft delayed by recently discovered potential Cl solvent source
- Very limited groundwater sampling indicated up to 1% of solubility limit PCE
- Same data indicated limited distribution of shallow dissolved phase
- Apparent dechlorination underway at site
- Construction to begin in early June 2003

Former Building 2227

No associated notes.

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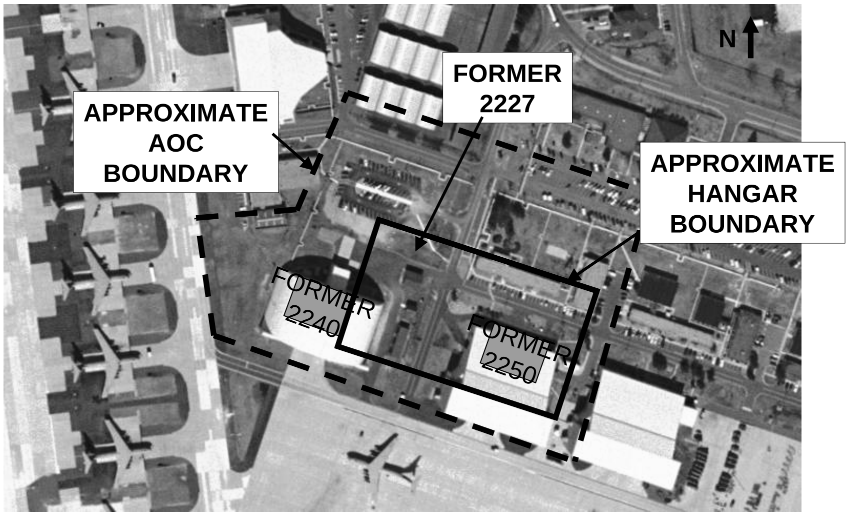
C-17 Remedial Investigation and Interim Remedial Action



Major Topics include:

- Brief History of the Boeing Michigan Aeronautical Research Center (BOMARC) site
- Transportation Options considered
- Transportation Solution worked out between Air Force/Army/Navy
- Key current/future BOMARC project milestones

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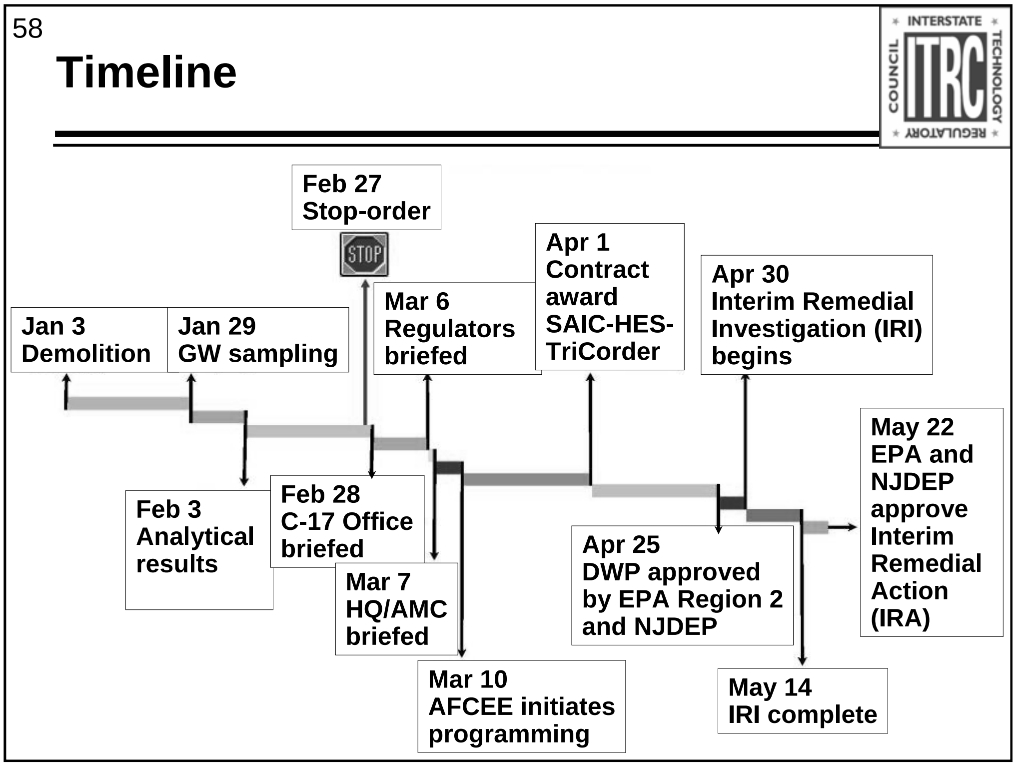
McGuire Air Force Base, New Jersey C-17 Hanger Site Investigation

The Approach: Use Triad to locate chlorinated solvent source and plume

- DQO process used to plan project
- Decision team
  - US Air Force
  - NJ DEP
  - US EPA Region 2
- Core technical team
  - US Air Force
  - NJ DEP
  - US EPA Region 2
  - Hayworth Engineering Sciences
  - Tri-Corders Environmental
  - SAIC
- Technology
  - CPT deployed MIP, soil and groundwater sampling tools
  - Geoprobe soil and groundwater sampling
  - Tri-Corders direct sampling ion trap mass spectrometer
  - Groundwater Modeling System for data management

No associated notes.



No associated notes.

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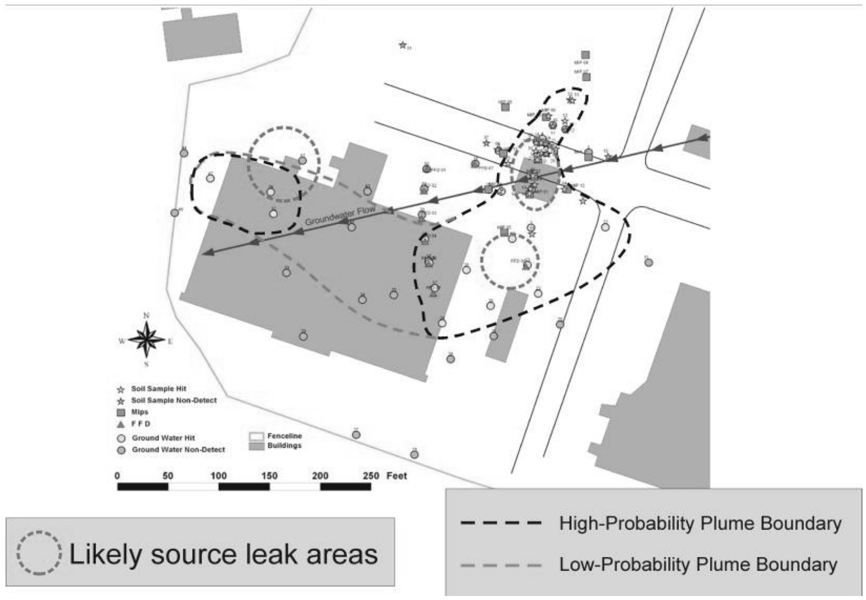
McGuire Air Force Base, C-17 Hanger Investigation Results



14 field days
15 MIP penetration
15 Geophysical CPT penetrations
>20 continuous soil core logged
Data collected using DSITMS and EPA Method 8265
33 soil sampling locations, 234 discrete soil analyses
45 groundwater sampling locations, 162 discrete groundwater analyses
244 QC analyses

Sampled at 108 plan view locations

Determined source had been removed when oil/water separator was removed

Completely mapped dissolved phase plume

Confirmed natural attenuation was occurring

Provided data for interim remedial action design

Completed planning, field work, and IRA design within seven weeks

IRA including well installation and soil removal completed within four months

IRA decisions made by regulators and site managers within six days of demobilization from the site

Hanger construction project back on schedule

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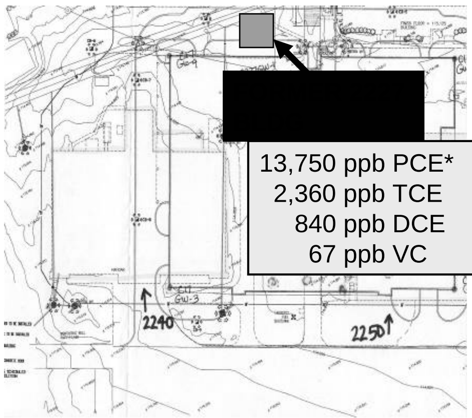
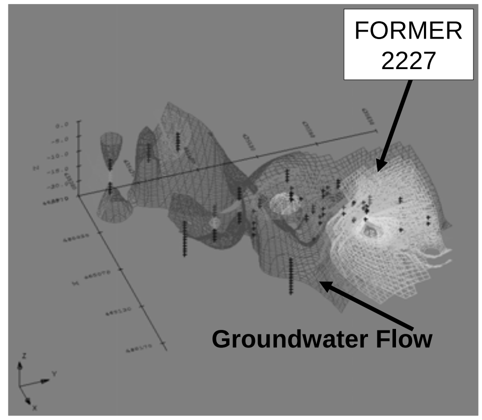
Conceptual Site Model Before and After





CSM Feb 2003, results of 5 groundwater samples collected 29 Jan 2003

CSM 15 May 2003, based on results of 15 MIP penetrations,15 Geophysical CPT penetrations, 234 discrete soil analyses, and 162 discrete groundwater analyses

No associated notes.

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State Implementation of Triad

Stuart J. Nagourney

No associated notes.

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New Jersey Triad Implementation Efforts

- New Jersey Technical Regulations (N.J.A.C. 7:26E) have always encouraged the use of FAMs for site delineation for “at risk” efforts
- ITRC Triad had New Jersey leadership (Team Leader and ITRC State Point of Contact)
- Triad was strongly endorsed by NJDEP management
- NJDEP staff developed and implemented a Triad implementation plan

No associated notes.

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New Jersey Triad Implementation Plan

- Received endorsement by NJDEP management
- Created an interdisciplinary project team
- Identified a subset of NJDEP staff and managers who would be interested in working on Triad projects
- With EPA and ACE, developed training for managers and staff (>300 staff trained)
- Wrote Triad implementation guide for NJDEP

No associated notes.

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New Jersey Triad Implementation FAM Certification

- NJDEP has a laboratory certification program for DW, WW, SHW and air matrices
- 4 categories of FAMs to be included
  - Immunoassay
  - GC
  - GC/MS
  - XRF
- Certification process will involve
  - Review of applicant qualifications
  - Review of applicant SOPs
  - On-site audits
- Goal is to blur distinction between data collected in the field from that obtained in a fixed laboratory

No associated notes.

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Triad; The Bottom Line

Significant Cost Savings 

Significant Time Savings 

No associated notes.

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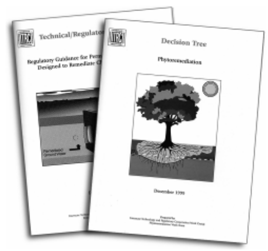
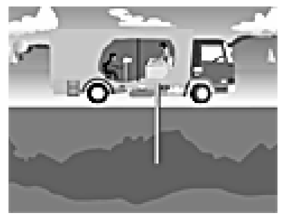
Thank You for Participating

- **Links to additional resources**
  - **http://www.clu-in.org/conf/itrc/triad/resource.cfm**
- **2nd question and answer session**





Links to additional resources:
http://www.clu-in.org/conf/itrc/triad/resource.cfm

Your feedback is important – please fill out the form at:
http://www.clu-in.org/conf/itrc/triad

The benefits that ITRC offers to state regulators and technology developers, vendors, and consultants include:

✓Helping regulators build their knowledge base and raise their confidence about new environmental technologies

✓Helping regulators save time and money when evaluating environmental technologies

✓Guiding technology developers in the collection of performance data to satisfy the requirements of multiple states

✓Helping technology vendors avoid the time and expense of conducting duplicative and costly demonstrations

✓Providing a reliable network among members of the environmental community to focus on innovative environmental technologies

How you can get involved with ITRC:

✓Join an ITRC Team – with just 10% of your time you can have a positive impact on the regulatory process and acceptance of innovative technologies and approaches

✓Sponsor ITRC's technical team and other activities

✓Be an official state member by appointing a POC (State Point of Contact) to the State Engagement Team

✓Use ITRC products and attend training courses

✓Submit proposals for new technical teams and projects