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Welcome to this ITRC Training Class

Quality Considerations for Multiple Aspects of Munitions Response Sites

Sponsored by: Interstate Technology and Regulatory Council (www.itrcweb.org)

Presenter 1: Welcome, and thank you for joining us today as we present the ITRC 'Quality Considerations for Multiple Aspects of Munitions Response Sites' training. My name is Joshua

Presenter 2: ...and my name is Katherine and we will be your guides today as we walk you through key concepts for planning and implementing a quality munitions response project. More details are provided in the guidance document that we introduce later in this training.

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Presenter 1: But first, a word from our sponsor. The Interstate Technology and Regulatory Council or ITRC is a state-led coalition of (*click*) regulators, industry experts, citizen stakeholders, academia and federal partners that work to achieve regulatory acceptance of environmental technologies and innovative approaches.

Presenter 2: ITRC brings together a diverse mix of environmental experts and stakeholders to broaden and deepen technical knowledge and advance the regulatory acceptance of environmental technologies. For further information, visit ITRC's website (*click*) using the URL on this slide.

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Our Goal - High Quality Munitions Response Projects

ITRC QCMR-1, Chapter 1

Presenter 1: (*click*) Between 2016 and 2018 the ITRC unexploded ordnance team developed the Quality Considerations for Multiple Aspects of Munitions Response Sites, or QCMR-1. The ITRC published this document in April of 2018. The team developed this training and companion guidance document to help you achieve high quality munitions response projects. Now let’s get started.

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Our Goal - High Quality Munitions Response Projects

- Quality is not an accident
- Planned and managed throughout project life-cycle
- Process Quality Management System

  - Documented policies, procedures, records, and responsibilities

ITRC QCMR-1, Chapter 1

Figure Source: pixabay.com

Presenter 2: *(click)* Quality is not an accident. Quality has to be (*click*) planned and managed throughout the entire life-cycle of a project. To properly plan for quality, we recommend a process quality management systems approach.

A process quality management system *(click)* is a collection of documented (*click*) policies, procedures, records, and associated responsibilities organized into a structured system of processes.

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Our Goal - High Quality Munitions Response Projects

- Process Quality Management
  - Establish quality requirements
  - Identify processes
  - Control of documents, records, and non-conforming products
  - QC activities
  - Corrective actions
  - Audits and documented procedures

- Defensible project decisions
- Efficient and cost-effective projects

ITRC QCMR-1, Chapter 1

Figure Source: pixabay.com

Presenter 2: Process quality management requires *(click)* establishing quality requirements, *(click)* identifying processes, *(click)* control of documents and records, control of non-conforming products, *(click)* quality control activities, *(click)* corrective actions, and *(click)* audits and documented procedures.

(click) All of which ensures defensible decisions, compliance with the plan, regulations and *(click)*, delivery of products and services in the most cost-and resource-efficient manner.

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Training Overview

- **Quality Overview**
- Project Example
  - Planning
  - Implementation and Monitoring
  - Verification/Validation and Data Usability
- Final Thoughts

Presenter 1: The training consists of the following. First, Katherine and I present an overview of basic quality concepts, and then apply these concepts to an example munitions response project. Then we wrap up with some final thoughts.

7 **ITRC Quality Considerations for Multiple Aspects of Munitions Response Sites (QCMR-1, 2018)**

- Defines Quality
- Evidence-based decision making
- Systematic Planning Process
- Data Quality Objectives (DQOs)
- Conceptual Site Model (CSM)

ITRC QCMR-1, Chapter 1

Presenter 1: In the guidance document we define quality (*click*) and present and support evidence-based decision *(click)* making.

Presenter 2: Evidence-based decision making uses relevant information to make it clear why a specific choice is being made. Better evidence will help increase the likelihood of meeting project decision goals.

Presenter 1: We discuss systematic planning (*click*). Specifically, the EPA Data Quality Objectives, or DQO, systematic planning process (*click*). And the development and use of an evolving conceptual site model (*click*), or CSM throughout the lifecycle of the project.

Presenter 2: We will introduce each of these document topics to you in this training. In addition, you'll notice on the bottom left corner of the slides *(click)* that there are references to document chapters. These chapters provide additional detail and resources on the content of the slides. In addition, a list of acronyms and a glossary of terms are provided within the guidance document and are references for this presentation.

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What is Quality?

- Friends want to have a high quality meal together, how do they define high quality?
  - a) **Seven course meal at a 5 star restaurant**
  - b) **Bar burger and steak fries at the local Irish Pub**
  - c) **Home cooked frozen lasagna**
  - d) **Depends**

Figure Source: pixabay.com

Presenter 1: Before we go any further, let's first define quality in the context of an everyday example. Some friends want to go out and have a great meal together *(click)*. How do they define great? A seven course meal *(click),* a bar burger and steak fries at the local Irish Pub *(click)*, home cooked frozen lasagna (*click*), or it depends *(click)*. (*3 second pause for audience to think about the answer*)

Presenter 2: Well I know what I like, but if you selected answer D *(click)*, you are correct. Because each friend may have a different opinion, the friends have to discuss in advance and decide what a quality meal looks like.

Presenter 1: That's right, it depends. Here it depends on the purpose of the meal and what the group decides together. This illustrates a fundamental concept about quality. Everyone has their own perception of quality. Therefore, quality has to be defined and agreed to by all those involved. Now let's talk about the fundamentals of quality.

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Quality Fundamentals

- Quality is Conformance to Requirements
  - Data Quality Objectives
  - Measurement Performance Criteria
  - Measurement Quality Objectives
- Quality Assurance/Quality Control
- Validation/Verification

ITRC QCMR-1, Chapter 2, ISO 9000

Figure Source: pixabay.com

Presenter 1: The international standard or ISO 9000 defines quality (*click*) 'as the degree to which a set of inherent characteristics or attributes of the object satisfies a set of requirements'. To put it simply, (*click*) quality is conformance to requirements. If a product conforms to a set of requirements, it is then by definition a quality product.

In a quality management system, quality requirements are established through a systematic planning process. The process used by the Department of Defense and presented in this training to establish data quality requirements is the EPA's DQO (*click*) planning process.

Presenter 2: Other requirements such as Measurement Performance Criteria *(click)* and Measurement Quality Objectives *(click)* are specified to ensure the processes achieve DQOs.

Quality Assurance (*click*) and Quality Control activities are identified and conducted to monitor these requirements.

DQOs, performance criteria, and measurements are documented to support data validation (*click*), verification, and usability of the data. We will discuss these quality fundamentals in more detail later in this training.

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History of Munitions Response Sites

- Decades of production and use of military munitions for training
- Former ranges and munitions operating facilities still require a munitions response
- Identifies and responds to munitions-related hazards

ITRC QCMR-1, Chapter 1

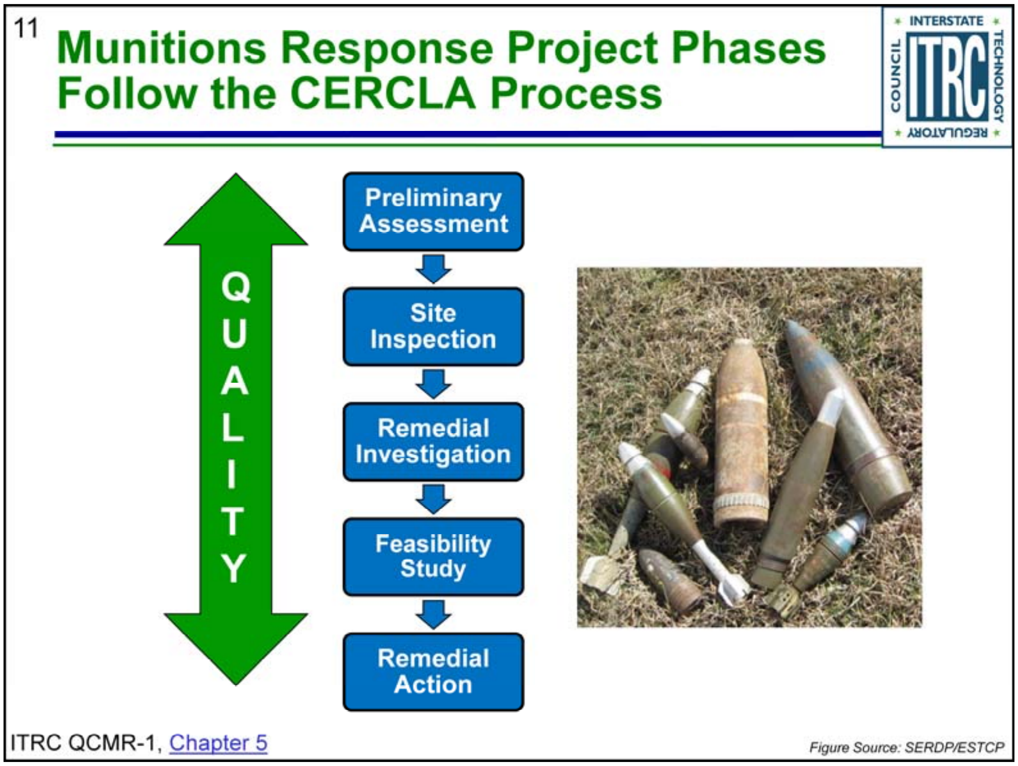
Figure Source: Air Force (top), DoD (bottom)

Presenter 1: Why do we do this, why is quality so important? *(click)* For decades, the U.S. Department of Defense has produced and used military munitions for live-fire testing and training to prepare the military for combat operations.

As a result, unexploded ordnance and discarded military munitions may be present at *(click)* former ranges and former munitions operating facilities that are now open to the public.

Presenter 2: A munitions response *(click)* identifies and responds to environmental and explosive safety hazards posed by these munitions or munitions constituents. Because the potential harm from coming into contact with unexploded ordnance can be severe, investigations and clean-up of these properties must meet the highest quality standards possible.

Please note however, that this training nor the document address munitions constituents or explosive safety. And we are only speaking to land-based projects and not the underwater environment, although some of the steps discussed here could be applicable underwater.



Presenter 1: Now, let's give you some background information on what a munitions response entails. A munitions response is (*click*) a complex and multi-phased process. The munitions response phases described in this document are the same phases established under the Comprehensive Environmental Response, Compensation, and Liability Act, more commonly know as CERCLA.

More information regarding each phase as it applies to a munitions response is available in the guidance document.

Presenter 2: Quality must be considered at every step of the process *(click)*. If you don't plan and implement quality processes from start to finish, you may end up redoing the work, or worse, in making a bad decision. Both are potentially costly.

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Evidence-Based Decisions

- Uses relevant information
- Multiple lines of evidence
- Values of the stakeholders
- Convergence of evidence to meet decision goals

ITRC QCMR-1, Chapter 3

Figure Source: pixabay.com

Presenter 1: Evidence-based decision making uses relevant information (*click*) to make it clear why a specific decision is being made.

The project team integrates the best information from multiple lines of evidence *(click)* with the expertise of the investigators and the values of the stakeholders *(click)* to make these decisions.

The convergence (*click*) of high quality multiple lines of evidence will help increase the likelihood of meeting decision goals.

To ensure high quality lines of evidence, we recommend implementing a systematic planning process.

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Systematic Planning

- Planning aligns with data use and available resources
- DQO Planning Process
- Conceptual Site Model

ITRC QCMR-1, Chapter 3

Figure Source: pixabay.com

Presenter 1: Systematic planning (*click*) is a common-sense approach (*click*) designed to ensure that the level of detail in planning is aligned with the intended use of the data and available resources. The preferred systematic planning approach is the (*click*) EPA's DQO Planning Process, which requires the (*click*) development and use of an evolving CSM.

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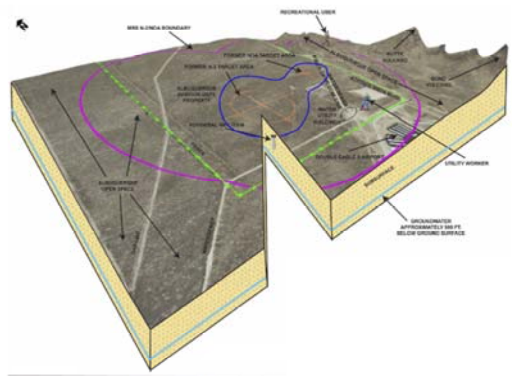
Conceptual Site Model

- Summarizes site characteristics, conditions, and features
- Text, tables, figures, flow diagrams, maps, and pictures
- Confirmed and updated as needed



ITRC QCMR-1, Chapter 3. QAPP Worksheet 10

Figure Source: USACE

Presenter 1: The CSM is an iterative “living” representation of the site that provides a simplified and concise summary (*click*) of relevant known and assumed site characteristics, conditions, and features.

Presenter 2: A CSM can be presented in multiple ways *(click)* including text description, tables, figures, flow diagrams, maps, and pictures. The CSM conveys what is currently known about the site, and *(click)* should be confirmed or updated as new data are collected at each project phase as needed.

The CSM is agreed to by the project team and it is documented in Worksheet 10. The CSM is a critical element of the DQO planning process.

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Data Quality Objectives

- U.S.EPA DQO Process
  - Series of 7 steps
  - Logical structured format
  - Manages uncertainty
- DQOs
  - Study objectives
  - Define type of data
  - Specify levels of decision errors

ITRC QCMR-1, Chapter 3

Figure Source: pixabay.com

Presenter 1: The EPA DQO process (*click*) consists of seven steps (*click*) and is a logical structured format (*click*) for setting well-defined, achievable objectives and developing a cost-effective, technically sound plan to acquire data. It balances the data user's tolerance for uncertainty (*click*) with the available resources for obtaining data.

Presenter 2: DQOs are qualitative and quantitative statements that (*click*) clarify study objectives, (*click*) define the appropriate type of data, and (*click*) specify the tolerable levels of potential decision errors.

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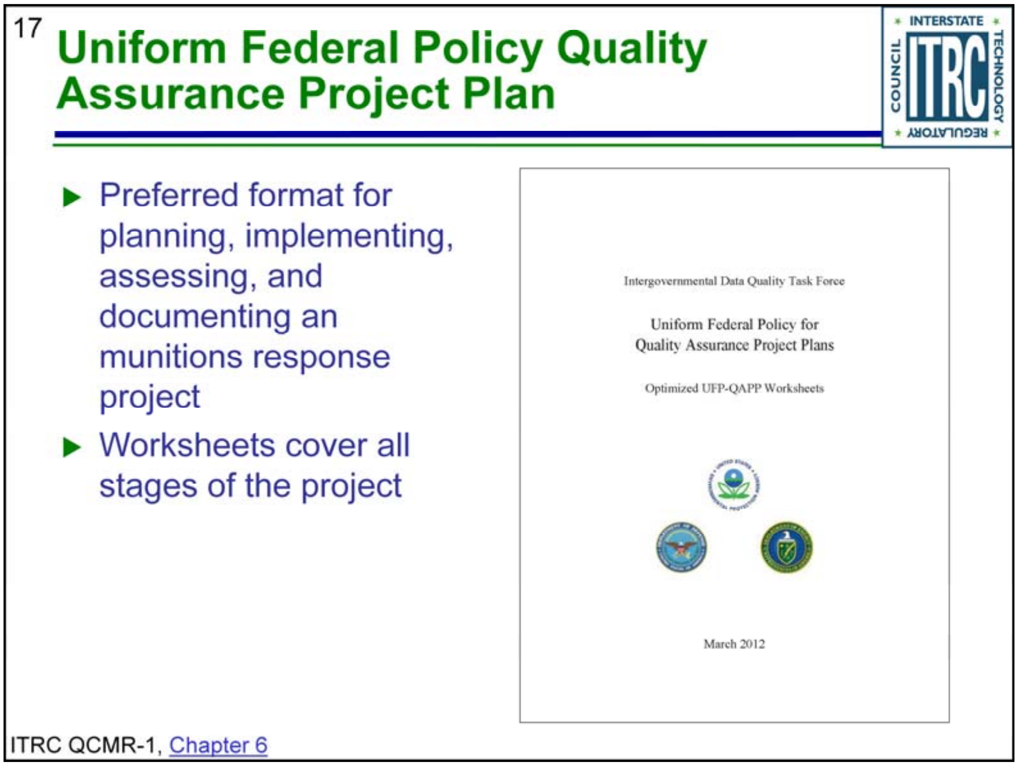
7 Steps - Data Quality Objectives Process

- **Step 1:** State Problem
- **Step 2:** Identify Goals of Study
- **Step 3:** Identify Information Inputs
- **Step 4:** Define Boundaries of Study
- **Step 5:** Develop Analytical Approach
- **Step 6:** Specify Performance or Acceptance Criteria
- **Step 7:** Develop Plan for Obtaining Data

ITRC QCMR-1, Chapter 5

Presenter 1: This slide presents the seven steps and we will walk through these shortly for our example site.



Presenter 1: Now that we have talked about the DQO planning process, let's talk about how it is implemented and documented. The Uniform Federal Policy Quality Assurance Project Plan, known as the UFP-QAPP is the preferred format (click) for documenting systematic planning activities including the DQO planning process.

It guides the team through the planning process and contains worksheet templates designed to simplify QAPP preparation. Worksheets (*click*) cover all stages of the project. Generally, the UFP-QAPP is prepared by the Munitions Response Contractor for the lead Department of Defense agency and then reviewed by the lead regulatory agency and other project team stakeholders.

We will reference worksheet numbers from the optimized UFP-QAPP during the presentation and they will be noted in the bottom left corner (*click*) of the slides where the guidance document chapter references are mentioned.

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MR-QAPP Toolkit

- Intergovernmental Data Quality Task Force
- Template specific to munitions response projects (MR-QAPP)
- Toolkit links within ITRC guidance document
- MR-QAPP worksheet format same as existing optimized UFP-QAPP
- Minimize rework, speed up projects, and reduce cost by defining requirements up front

ITRC QCMR-1, Chapter 6

Presenter 2: The (*click*) Intergovernmental Data Quality Task Force has developed an *(click)* overall munitions response QAPP, known as the MR-QAPP toolkit. (*click*) Links to the toolkit are included within the ITRC guidance document.

(*click*) The MR-QAPP worksheet format is the same as the existing optimized UFP-QAPP. The format may be familiar to you from other environmental projects. Use of the MR-QAPP is recommended (*click*) and will minimize rework, speed up projects, and reduce cost by defining requirements up front.

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When do you need DQOs?

a) Only for big projects
b) Anytime you collect data
c) Only for munitions response projects

Figure Source: pixabay.com

Presenter 1: And now before we wrap up the quality overview, here is a question for the audience. When do you need DQOs? Is it only for big projects *(click)*, anytime you collect data *(click)*, or only for munitions response projects *(click)*? (*3 second pause for audience to think about the answer*)

Presenter 2: Whenever you collect data to resolve a problem or answer a question you should use the DQO process, so the answer to this question is B. *(click)*.

Presenter 1: If you have not planned your data collection activities using the DQO process, you are likely to collect unusable data.

Presenter 1: Now lets apply these quality concepts to a munitions response project example. We will break the example project into planning, implementation and monitoring, and verification and validation of the data and data usability.

Let’s take a look at planning beginning as always, with the CSM.

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Example Site Project Planning

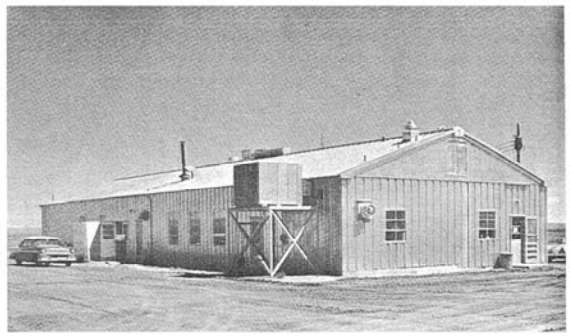
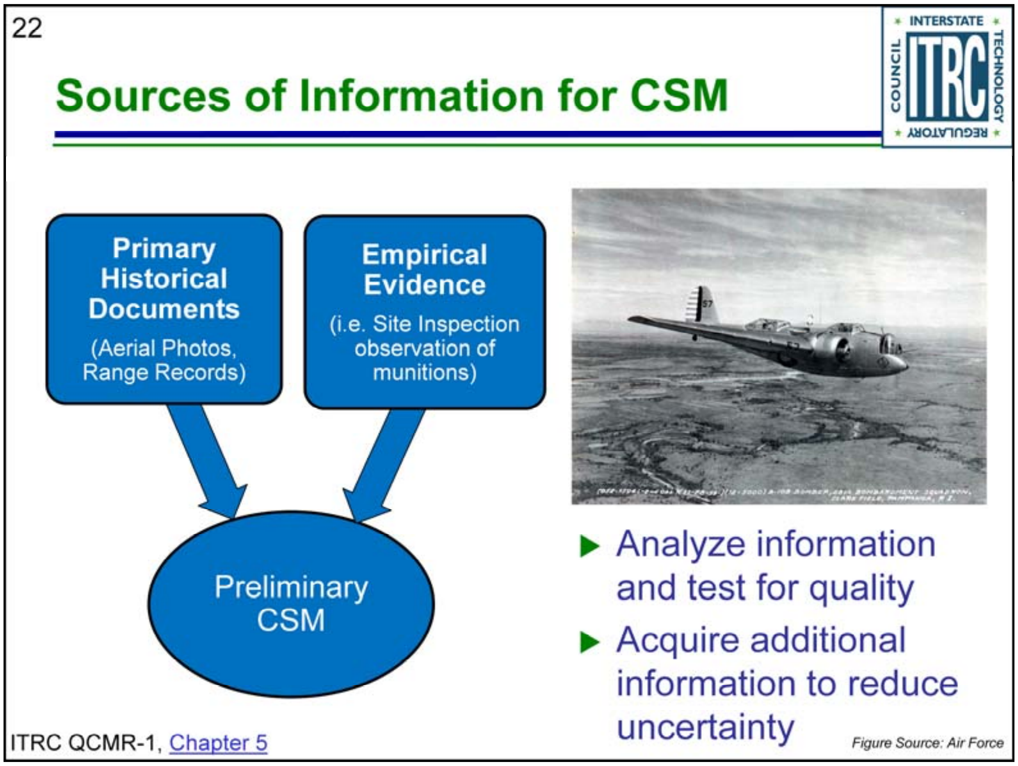


Figure Sources: Air Force (left), USACE (right)

Presenter 1: The project at our example case study site is transitioning from the Site Inspection phase to a Remedial Investigation.



Presenter 1: We will first walk through developing the CSM. Several types of information are necessary to build the CSM. At the Site Inspection phase, the type of information available usually consists of *(click)* historical documents or reports*, (click)* site observations from current visit reports, and possibly some limited sampling data. As the project team develops and matures the CSM, multiple lines of evidence should merge *(click)* and support one another to paint a more defined picture of the site.

Presenter 2: To ensure confidence in the decisions made based on the CSM, the information (*click*) used to produce the CSM should be carefully analyzed and tested for quality. For example, if the quality of historical information is poor, unknown, or not confirmed through other lines of evidence, the decisions made using this information should be suspect.

(*click*) Additional information or data should be acquired to reduce uncertainty in the decisions. After developing and assessing the preliminary CSM, the project team identifies uncertainties about the site and key questions that have to be resolved during the Remedial Investigation.

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Conceptual Site Model

- **Site Model:** Aerial bombing target
- **Sources:** Various sizes of practice bombs
- **Site Description:** Relatively flat, forested
- **Land Use & Receptors/Pathways:** Timber harvesting, onsite workers/ recreational users

ITRC QCMR-1, Chapter 3

Figure Source: pixabay.com

Presenter 1: So what do we know about the example site? In 1926, the Army Air Corps *(click)* constructed and used an aerial bombing target to train pilots. So far, only *(click)* practice bombs have been found at the site.

The site is *(click)* relatively flat and forested with pine trees. Right now, the land is used *(click)* for timber and recreation such as hiking, biking, and camping.

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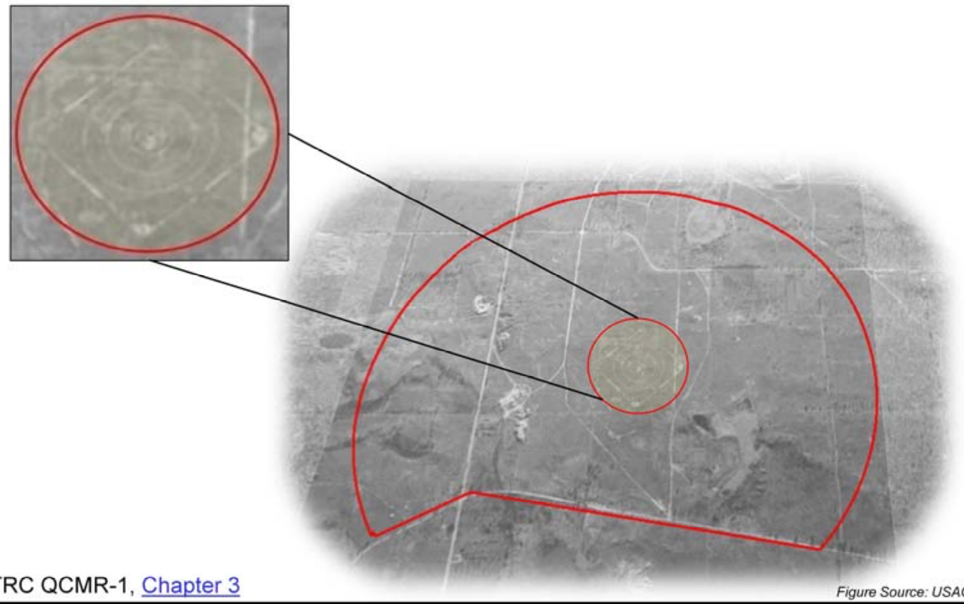
Historical Aerial Photography



ITRC QCMR-1, Chapter 3

Figure Source: USACE

Presenter 1: Primary historical documents like photos and expert visual observations represent the highest quality of evidence. Here (*click*) we see historical aerial photographs of the example site. During a site visit, munitions debris was also observed on the surface.

The bombing target circles including the "bulls eye" *(click)* are clearly visible in the photos. With these photos and observed munitions debris, the project team is very confident in the location and configuration of the target area at this munitions response site.

Presenter 2: Once the team develops the preliminary CSM and identifies data gaps, they implement the DQO planning process to identify the right type, quantity and quality of data required to resolve the data gaps.

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Step 1: Problem Statement

- Define the problem
  - Present concerns
  - Identify regulatory issues and action levels
  - Review site history
  - Identify data gaps

Problem
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Goals
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Boundaries
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Approach
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Criteria
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Plan

ITRC QCMR-1, Chapter 5

Figure Sources: Air Force

Presenter 1: The first DQO step is to (*click*) clearly define the problem. The members of the project team (*click*) present their concerns, (*click*) identify regulatory issues and action levels, (*click*) review the site history, and (*click*) identify data gaps. The project team then develops a concise description of the problem.

Presenter 2: From our example site CSM, there is evidence to suggest unexploded ordnance may be present at the site due to former use *(click)* from 1926 to 1947 as a bombing target.

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Step 1: Problem Statement

- Unexploded ordnance remaining onsite may pose an explosive hazard risk

Problem
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Boundaries
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Approach
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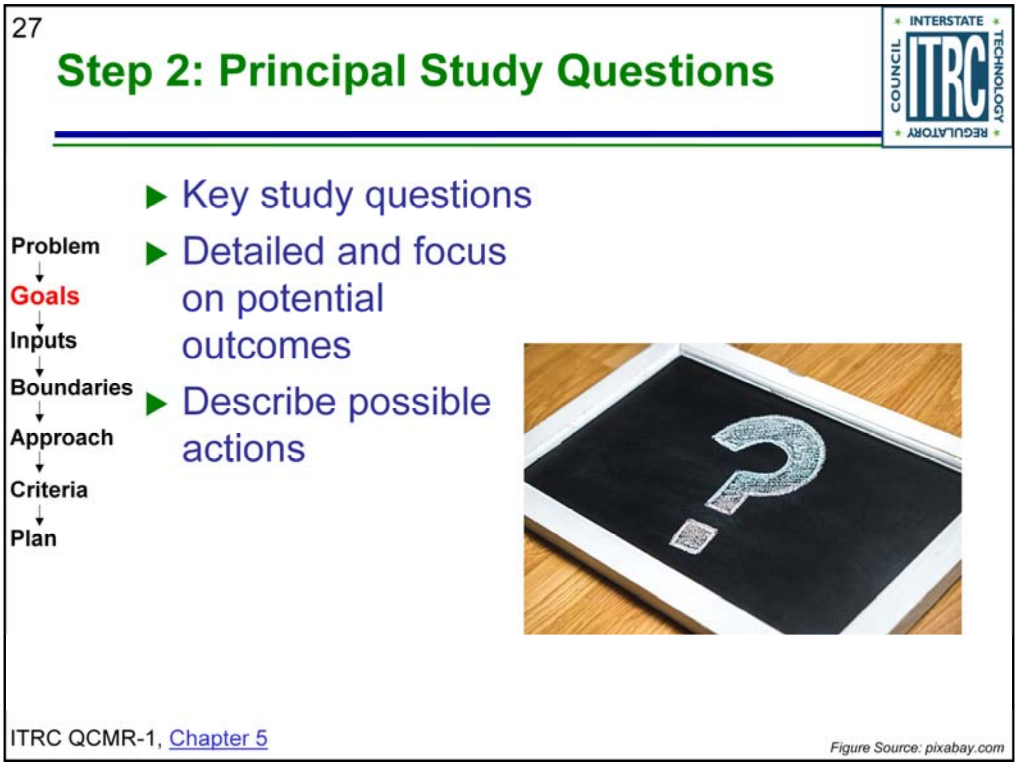
Plan

ITRC QCMR-1, Chapter 5

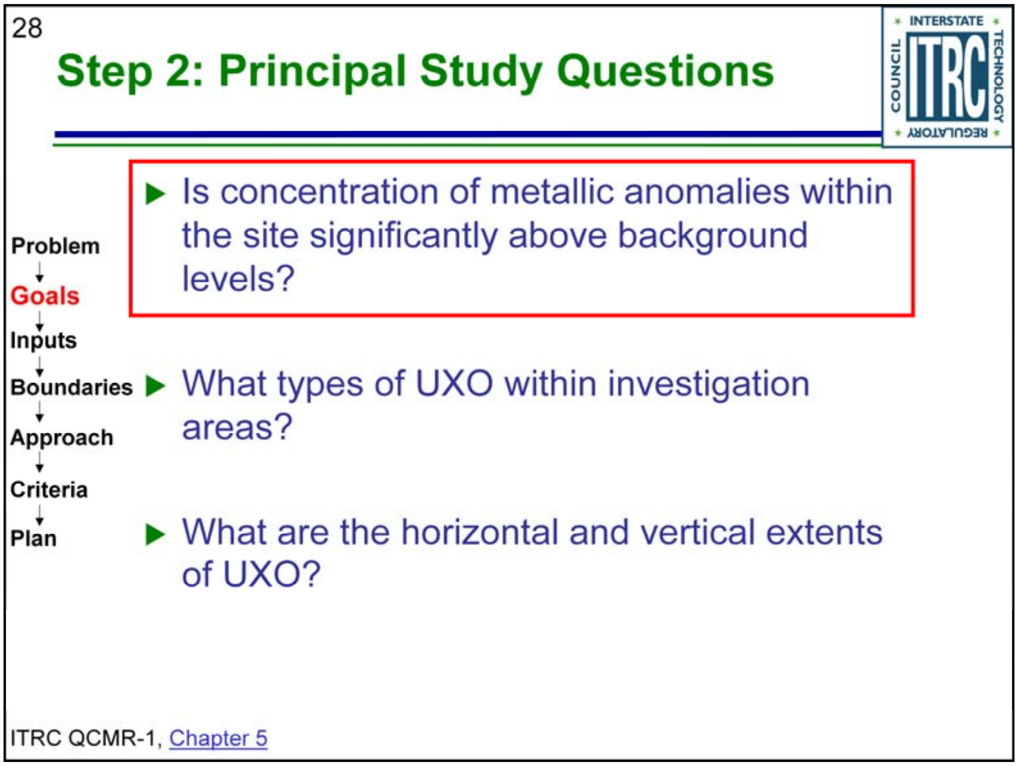
Figure Sources: DoD (right)

Presenter 1: Therefore, our problem statement *(click)* is that unexploded ordnance remaining on the site may pose an explosive hazard risk to current and anticipated users of the property. In the case of example site, people could come into contact with unexploded ordnance (*click*) through timber harvesting or recreational activities.



Presenter 1: During Step 2 of the DQO process, the project team identifies (*click*) key study questions the project will attempt to resolve. Key study questions should be (*click*) detailed and focus on potential outcomes. Typically during the Remedial Investigation phase, key questions are resolved by environmental measurements.

The project team should also (*click*) describe all the possible actions that might be taken once the key questions are resolved. Consideration should be given to the option of taking no action.



Presenter 1: This slide includes some example Remedial Investigation study questions.

Presenter 2: The *(click)* red box highlights the question that this training will focus on ‘Is the concentration of metallic anomalies within the site significantly above background levels?’

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Step 2: Principal Study Questions

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Goals
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Boundaries
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Approach
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Criteria
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Plan

- Possible actions for the question:
  - If the concentration of anomalies is significantly above background, identify the area as a High Density Area
  - If the concentration of anomalies is significantly below background, identify the area as a Low Density Area

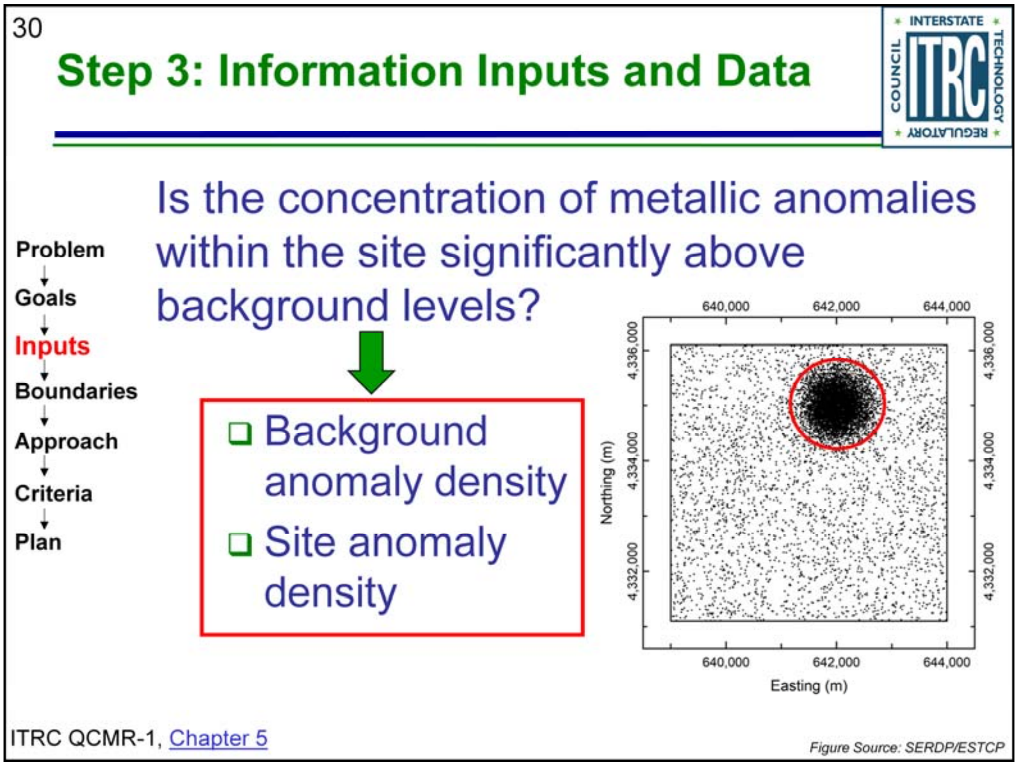
ITRC QCMR-1, Chapter 5

Presenter 1: Possible actions for this study question once resolved could be:

(click) If the concentration of anomalies is significantly above background, identify the area as a High Density Area.

Or, (click) if the concentration of anomalies is significantly below background, identify the area as a Low Density Area.

Detailed definitions of these terms describing the density areas are included in the MR-QAPP toolkit that we talked about earlier in the training.



Presenter 1: Now that we have our principal study question and identified our alternatives, we move on to Step 3.

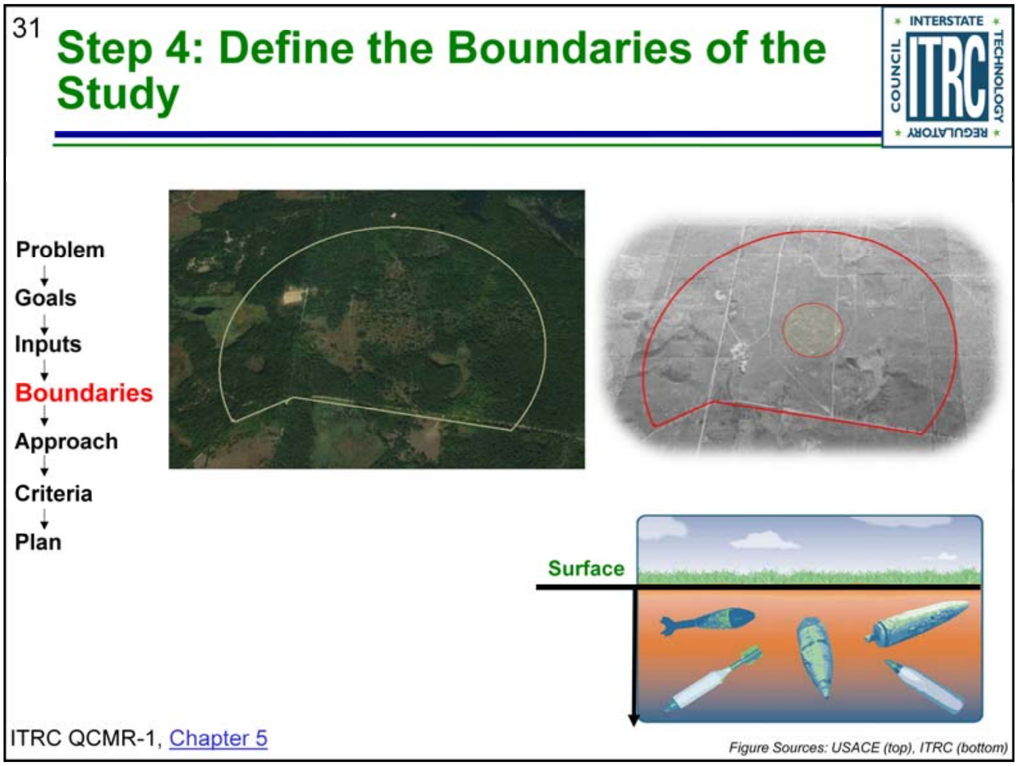
During Step 3, the project team makes a list of the information or data required to answer the questions to make the decisions identified in Step 2.

The project team should also determine in general how the data may be acquired.

Presenter 2: At our example site (*click*), the project team confirmed they needed the densities of buried metallic anomalies for both background and the site to answer the question *(click)*.

For munitions response projects, geophysical sensors are used to detect buried metallic anomalies, which we will talk about in more detail later in this training. With this type of data, the team will be able to estimate site and background densities and answer the question.

For example, the difference between the background anomaly density (*click*) and the site (*click*) anomaly density is clearly evident in this geophysical map.



Presenter 1: Next, we need to define the site boundaries in Step 4 *(click)*.

In this step, the project team specifies the spatial boundaries the data must represent to support the decision. The specified area is often referred to as the decision unit.

Here the decision unit should include both horizontal and (*click*) vertical components of the study area. Initially the team will use the bombing circles (*click*) to define the horizontal extent of the investigation area.

The project team may also use the bombing circles to identify areas where high anomaly densities are expected. The depth of the decision unit will be based on the type of munitions expected and possibly how the land will be used.

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Step 5: Analytical Approach

- **Decision Statement:**
  - **Parameter of Interest**
  - **Action Level**
  - **Decision Unit**
  - **Alternative Actions**

Problem ↓ **Goals** ↓ **Inputs** ↓ **Boundaries** ↓ **Approach** ↓ **Criteria** ↓ **Plan**

If the anomaly density within the site is significantly greater than background anomaly density, **then** identify the area as a High Density Area; **else** identify the area as a Low Density Area

ITRC QCMR-1, Chapter 5

Presenter 1: Let's move on to Step 5, the project team takes outputs from Steps 1 through 4 and produces the (*click*) parameter of interest, (*click*) action level, (*click*) decision unit, and (*click*) alternatives to form "if….then"…else" decision statements.

Presenter 2: The decision statement for this project is (*click*) "if the anomaly density within the munitions response site Decision Unit is significantly greater than the background anomaly density, then the site will be designated as a High Density Area and evaluated for further investigation, or the site may be identified as a Low Density Area."

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What should be defined in Step 5?

Step 5: Develop the Analytical Approach

a) Detailed plan for collecting data

b) Parameter of interest and action level

Figure Source: pixabay.com

Presenter 1: Before we move on, Step 5, the analytical approach, is often interpreted incorrectly. What should be defined in Step 5? A detailed plan for collecting data (*click*) or parameter of interest and action level (*click*). (*3 second pause for audience to think about the answer*)

Presenter 2: The answer is B, *(click)* the parameter to be measured, the decision unit, and action level for making decisions stated in terms of decision statements.

Presenter 1: Yes, you are right. Some teams define the data collection plan here, but that should be detailed in Step 7 that we will discuss later.

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Step 6: Specify Performance or Acceptance Criteria

- Uncertainty or error in any measurement
- Define tolerable limits on uncertainty
- Team derives performance criteria for data

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ITRC QCMR-1, [Chapter 5]

Figure Source: pixabay.com

Presenter 1: In Step 6, the team takes into account that there is (*click*) uncertainty or error in any measurement, and as a result, there is the possibility of making the wrong decision.

Therefore, the project team assesses the consequences of making a wrong decision and (*click*) establishes tolerable limits on decision error.

The limits on decision errors are then used to establish (*click*) measurement performance criteria for the data collection design.

This is hard work, the team needs to determine how uncertainty (click) or error in data affects the decision we make and how much error we can tolerate so as not to make a bad decision.

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Step 6: Specify Performance or Acceptance Criteria

- Reducing decision errors requires expenditure of more resources
- Controlling decision error probabilities to small values may be unnecessary
- Consider consequences of error

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Criteria
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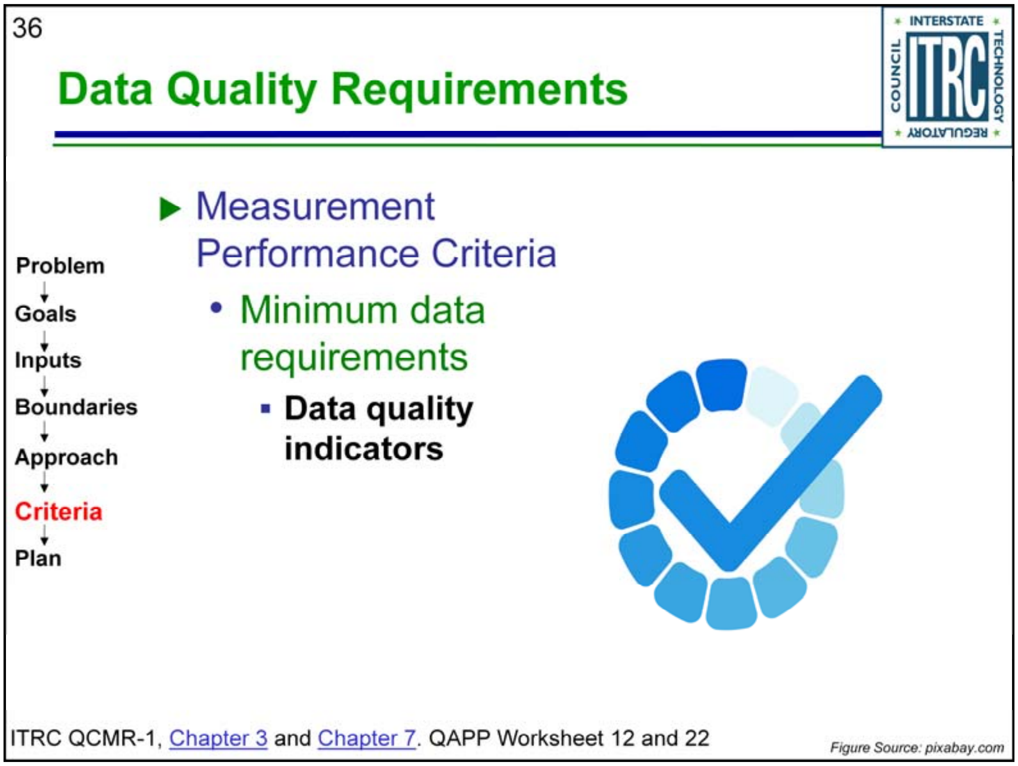
ITRC QCMR-1, Chapter 5

Figure Source: pixabay.com

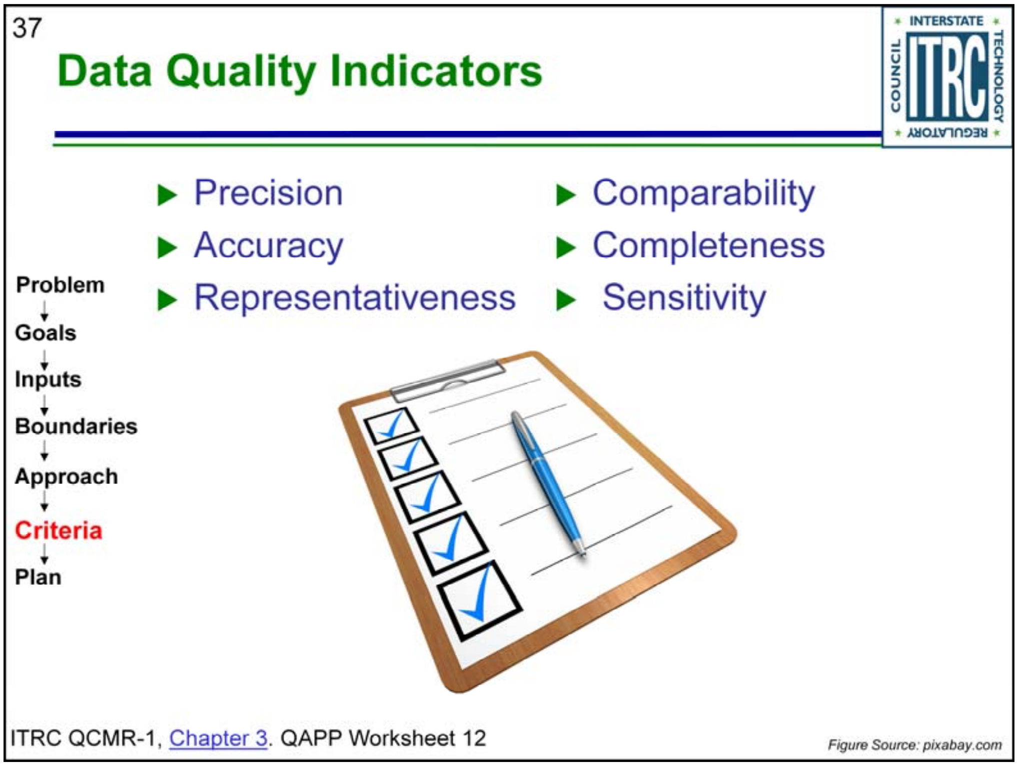
Presenter 2: One thing is certain, however, that (*click*) reducing decision errors requires the expenditure of more resources. Drastically (*click*) controlling decision error probabilities to extremely small values may be unnecessary for making a reasonable decision.

If the consequences of a decision error (*click*) are minor, a reasonable decision might be made based on lower quality data. On the other hand, if the consequences of a decision error are severe, sampling and measurement uncertainty should be controlled as much as reasonably possible.



Presenter 1: Now we need to establish minimum data quality requirements necessary to meet the DQOs. Data quality requirements are framed it terms of (*click*) Measurement Performance Criteria and Measurement Quality Objectives.

Measurement Performance Criteria are the (*click*) minimum performance specifications that the data collection process must meet to ensure the data satisfies the DQOs. Measurement Performance Criteria are stated in terms of (*click*) data quality indicators.



Presenter 1: Data quality indicators are precision, accuracy, representativeness, comparability, completeness, and sensitivity, more commonly known as PARCCS. For each indicator, the team sets criterion based on the desired level of data uncertainty specified in the DQO.

As mentioned earlier, the team needs to strike a balance between cost and quality when establishing data quality indicator requirements. For example, the greater the required precision the higher the cost. There must be a balance struck between the desired precision, the cost to acquire that level of precision in the data, and the DQO.

In the UFP-QAPP, data quality indicators are documented in Worksheet 12.

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Data Quality Requirements

Problem
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Goals
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Inputs
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Boundaries
↓
Approach
↓
Criteria
↓
Plan

- Measurement Quality Objectives
  - Minimum equipment requirements

ITRC QCMR-1, Chapter 3 and Chapter 7. QAPP Worksheet 12 and 22

Figure Source: pixabay.com

Presenter 2: Measurement Quality Objectives are (*click*) minimum performance requirements for equipment testing, inspection, and quality control for data collection processes.

Both Measurement Performance Criteria and Measurement Quality Objectives provide QC inspection points and requirements for inspecting data collection processes and data.

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Step 7: Develop the Detailed Plan for Obtaining Data

- Complete first six steps first
- Complete every step before data collection
- Optimize plan to obtain data
- Establish Measurement Performance Criteria

Problem
↓
Goals
↓
Inputs
↓
Boundaries
↓
Approach
↓
Criteria
↓
Plan

- Decides to sample representative portion of the site
- Collect geophysical data along transects

ITRC QCMR-1, Chapter 5. QAPP Worksheet 17

Figure Source: pixabay.com

Presenter 1: The first six steps (*click*) should be completed before the plan to obtain the required data is developed, and (*click*) every step should be completed before data collection begins.

During Step 7, (*click*) the project team optimizes the plan to obtain the required data and (*click*) establishes the measurement performance criteria so the resulting data will meet all the established constraints in the most cost-effective manner.

Presenter 2: Here at our example site, the project team (*click*) decides they only need to sample a representative portion of the site to answer the study question. The team has decided to estimate background and munition response site anomaly density by (*click*) collecting geophysical data along transects.

The DQO process is considered complete with the approval of an optimal design for sampling and analysis to support making a decision.

The detailed data collection design is documented in Worksheet 17.

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Transect Design

Problem
↓
Goals
↓
Inputs
↓
Boundaries
↓
Approach
↓
Criteria
↓
Plan

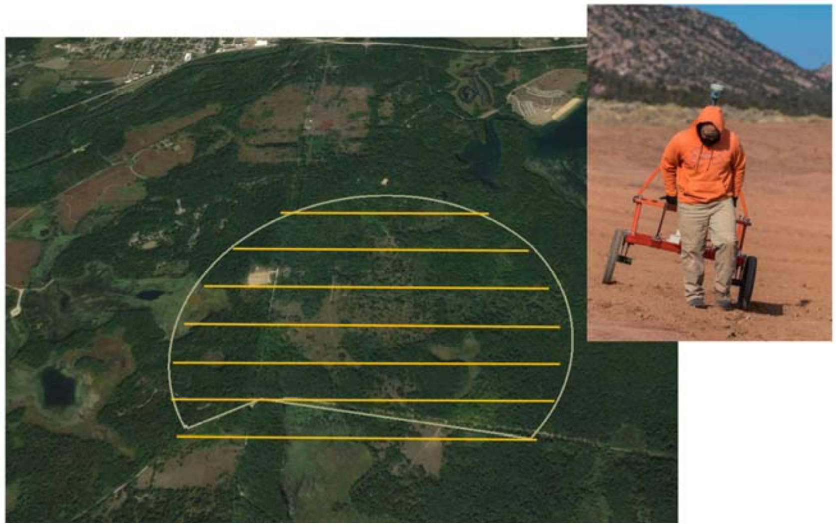

Figure Source: USACE

Presenter 1: Transects are approximately evenly spaced data collection paths *(click)* and the data are interpolated to provide an estimate of the anomaly density over the entire site.

Transects are often designed using Visual Sample Plan, known as VSP. It is a software tool that is widely used and accepted by regulatory agencies, as well as other available software tools to support this process. The example site transects are presented as the orange lines *(click)* in this slide.

Presenter 2: Data will be collected using a geophysical sensor (*click*) and GPS equipment along these paths. The data will be analyzed to identify high anomaly density areas within the site. To support the transect design, the team uses VSP to statistically calculate the number and width of transects required to detect a high anomaly density area based on the type and frequency of munitions used at a confidence level required by the DQO.

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Measurement Performance Criteria

DQO
MPC
DQI
MQO
Verif/ Valid
DUA

Definable Feature of Work	Data Quality Indicator(s)	Performance Criteria	Activity to Assess Measurement Performance
Transect	Completeness	Survey 100% of each transect path	Verification of conformance to MQOs for in-line spacing (WS 22)

ITRC QCMR-1, Chapter 3 and Chapter 7. QAPP Worksheet 12

Figure Source: USACE

Presenter 1: Now that we defined the sampling design, let's talk about the measurement performance criteria. This slide gives one example for the transect survey and Worksheet 12 *(click)* will list all of these for the project. We talked a few slides back about the completeness *(click)* data quality indicator *(click)*. This measurement performance criteria *(click)* states that planned transect paths are fully covered onsite during data collection with the geophysical sensor. A digital record is created using the geophysical sensor and GPS equipment.

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Measurement Quality Objective

CSM → DQO → MPC → DQI → **MQO** → Verif/ Valid → DUA

Measurement Performance Criteria - WS 12

Definable Feature of Work (DFW)	Data Quality Indicator(s)	Performance Criteria	Activity to Assess
Transect Survey	**Completeness**	Survey 100% of each transect path	Verification of conformance to MQOs for **in-line spacing** (WS 22)

Measurement Quality Objective - WS 22

MQO	DFW/ SOP	Frequency	Responsible Person/ Verified by	Acceptance Criteria	Corrective Action
In-line Measurement Spacing	**DGM Survey/ SOP-01**	Daily	Project Geophysicist/ QC Geophysicist	98% ≤ 0.25m between measurements	Perform root cause analysis and determine corrective action

ITRC QCMR-1, Chapter 3 and Chapter 7. QAPP Worksheets 12 and 22

Presenter 1: Now that we have established the performance criteria, we need to define how these are verified during data collection using measurement quality objectives. Don’t get caught up in the details of this slide, but I’m showing you a top level snap shot of how measurement performance criteria and measurement quality objectives are connected *(click)*. The measurement performance criteria in Worksheet 12 *(click)* need corresponding measurement quality objectives *(click)* in Worksheet 22 to achieve this performance *(click)*. For our example site, *(click)* to ensure the geophysical survey covers the planned transects *(click)*, the sensor needs to collect measurements at intervals within the *(click)* acceptance criteria.

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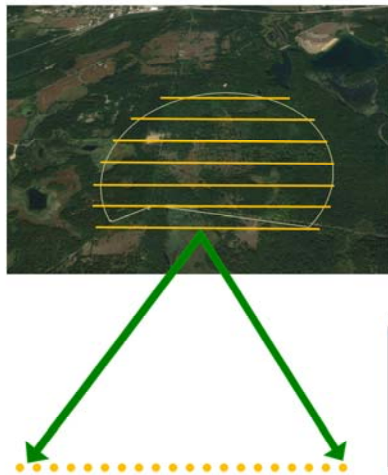
Measurement Quality Objective

CSM
↓
DQO
↓
MPC
↓
DQI
↓
MQO
↓
Verif/
Valid
↓
DUA



Measurement Performance Criteria

Measurement Quality Objective

Acceptance Criteria:
98% ≤ 0.25m between measurements

ITRC QCMR-1, Chapter 3 and Chapter 7. QAPP Worksheets 12 and 22

Figure Source: USACE

Presenter 1: This slide shows a visual schematic of the required data collection intervals we just defined in the measurement quality objective *(click).* The geophysical sensor will need to collect data at intervals that fall within the defined acceptance criteria. We will circle back to this example later when we talk about monitoring the field data collection.

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What defines performance requirements of field equipment?

a) Measurement Performance Criteria

b) Measurement Quality Objectives

Figure Source: pixabay.com

Presenter 1: Measurement performance criteria and measurement quality objectives are terms that sound very similar *(click)*. Let's discuss them one more time. Which one defines performance requirements of data collection methods including field equipment? (*3 second pause for audience to think about the answer*)

Presenter 2: The correct answer is B *(click),* measurement quality objectives. If you picked B, you have a good understanding of the difference between these terms.

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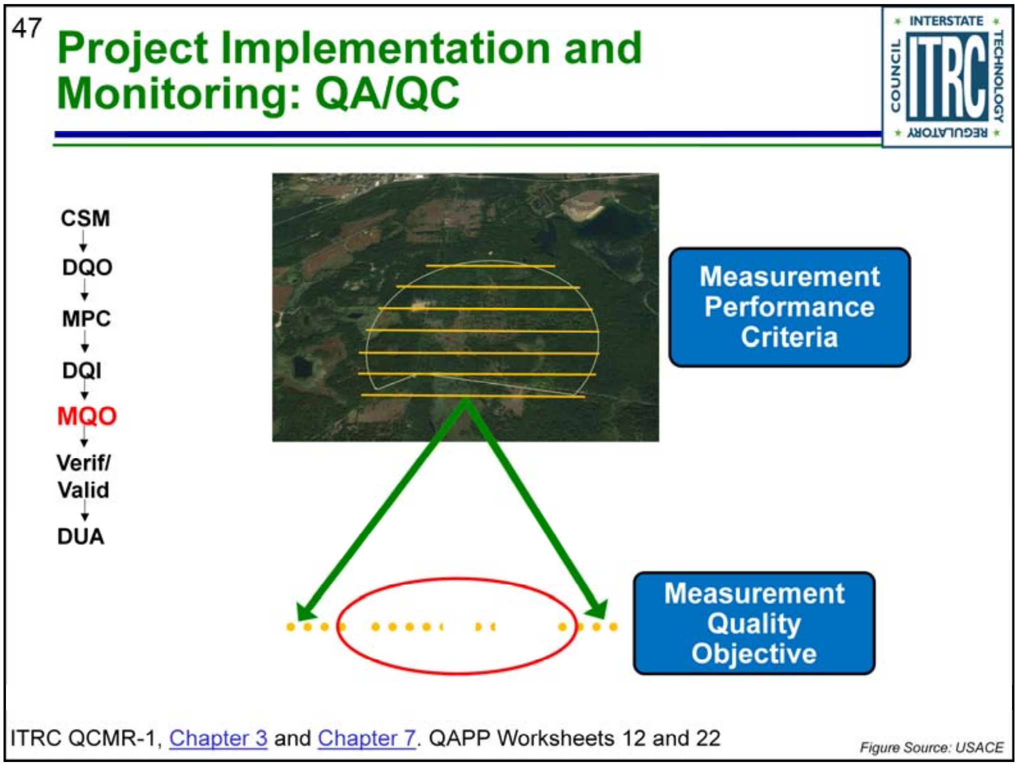
Congratulations - Project Planning Complete!

- Team agrees to the UFP-QAPP
- Transition from planning to implementation

Figure Source: pixabay.com

Presenter 1: Now let's wrap up project planning. After the remainder of the worksheets are fully populated *(click)*, the team reviews and agrees upon the UFP-QAPP. At this point *(click)*, the team successfully completes project planning and transitions to implementation that we will talk through next.

Presenter 1: Let’s now turn our focus to project implementation and monitoring, verification, validation and data usability.



Presenter 1: Let's pick up our project now that we have started data collection. The organization executing the project will conduct quality control checks and the team will conduct quality assurance assessments to provide ongoing monitoring that requirements are being met.

As you remember, we talked about the measurement quality objective that defines the required intervals of data collection you see as the yellow dots *(click)*. The field team goes out to collect data on this transect and achieves incomplete intervals *(click)* that exceed the required distance requirement.

Presenter 2: The field team conducts a root cause analysis and determines this issue was due to the GPS not operating correctly. The project team agrees to this analysis and conducts the corrective action to recollect data during the time period the GPS was not working. This new data *(click)* achieves the acceptance criteria and is now of the required quality.

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What happens if measurement quality objectives are not achieved?

Answer: Perform root cause analysis and implement a corrective action

Figure Source: pixabay.com

Presenter 1: Let’s review what we just talked about. What happens if measurement quality objectives are not achieved? (*3 second pause for audience to think about the answer*)

Presenter 2: If you said perform a root cause analysis, you are correct. The field team will conduct *(click)* a root cause analysis and implement a corrective action.

Presenter 1: In the case of our example, the corrective action was for the team to recollect data that were impacted by the GPS failure. The team then reassesses and confirms if the measurement quality objective is achieved with the new data.

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Verification and Validation

CSM → DQO → MPC → DQI → MQO → **Verif/ Valid** → DUA

- **Data verification** - confirm required activities conducted, records present, and contents of records complete
- **Data validation** - evaluates whether data conforms to requirements

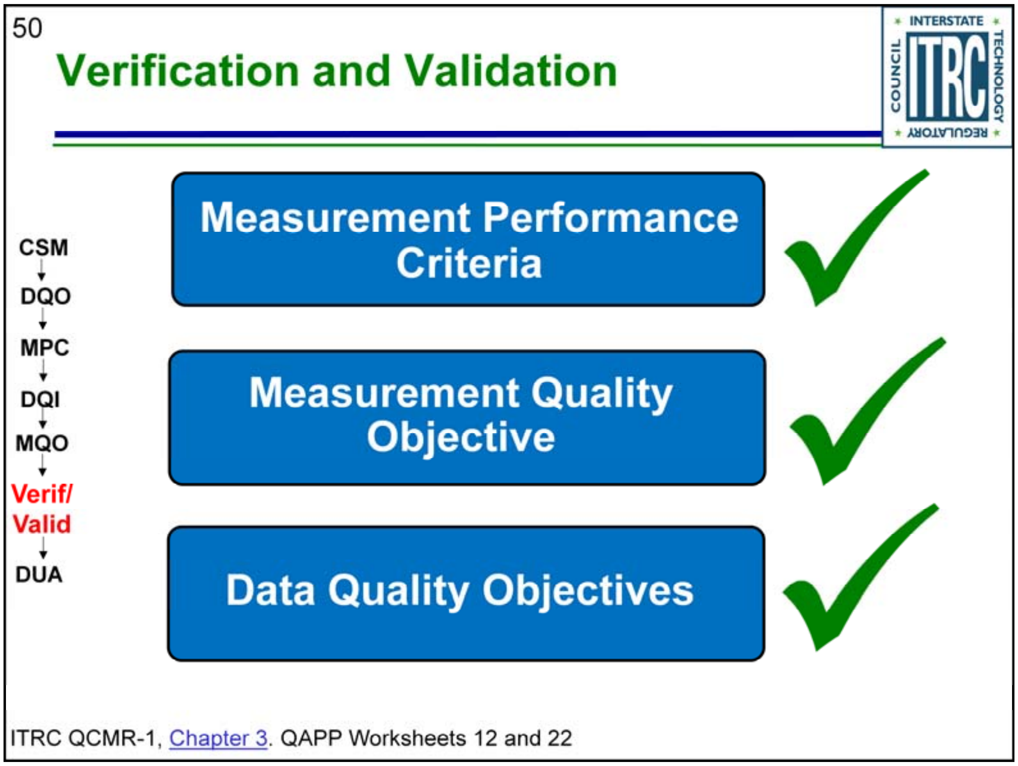
WS 34

Description	Verification	Validation	Usability
Weekly Geophysical QC Report	✓	✓	✓
DGM Data Deliverable	✓	✓	✓

ITRC QCMR-1, Chapter 3. QAPP Worksheets 34 and 35

Presenter 1: Let’s move forward in time as the project approaches completion and data collection efforts are finished. The project team will conduct data verification and validation activities. Data verification *(click)* is a completeness check to confirm that all required activities were conducted, all records are present, and the contents of the records are complete. The data validation *(click)* process evaluates whether data conforms to the stated requirements.

Presenter 2: Worksheets 34 and 35 define the required documentation and establish the procedures to support these processes. This slide presents *(click)* a subset of examples from Worksheet 34 that lists the inputs that will be used. These inputs include planning documents and field records and are successfully *(click)* completed for our example site.



Presenter 1: As part of this process, the team assesses the measurement performance criteria and measurement quality objectives to verify and validate they were achieved. The team will review the performance and acceptance criteria to confirm their completion *(click)*. At that point, the overall data quality objectives are achieved *(click).*

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Estimated Anomaly Density Map

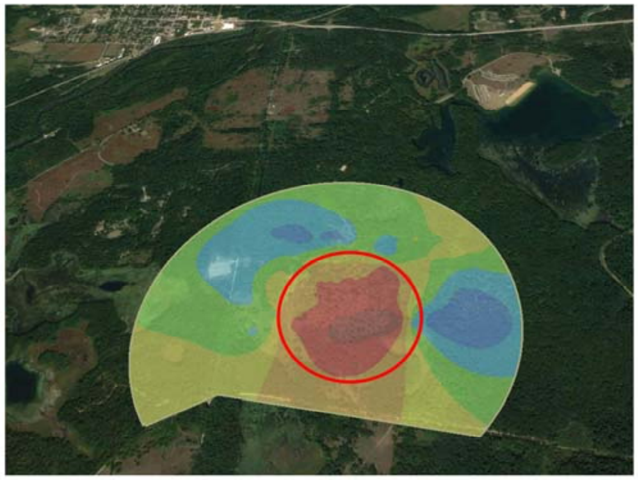

Figure Source: USACE

Presenter 1: The Remedial Investigation transect data were analyzed and the map presented on this slide presents the estimated anomaly density for the site. A high anomaly density area *(click)* was identified above background, which confirms the original study question for this training.

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Data Usability Assessment

CSM → DQO → MPC → DQI → MQO → Verif/Valid → **DUA**

- Performed by key team members
- Supported assumptions
- Managed uncertainty
- Quality data
- Usable results

PROJECT OBJECTIVES AND SAMPLING DESIGN – WS 37	
Evaluation	**Yes/No**
Are the DQO still relevant to CSM?	Yes
Have we met our measurement performance criteria and measurement quality objectives?	Yes
Is the sampling design consistent with project objectives?	Yes

ITRC QCMR-1, Chapter 3. QAPP Worksheet 37

Presenter 1: Now let's talk about the data usability assessment. It is the final step in a project and performed *(click)* by key members of the team before proceeding to the next munitions response phase. It includes a review of the systematic planning process to evaluate whether *(click)* underlying assumptions are supported, *(click)* sources of uncertainty in data have been managed appropriately, *(click)* data are the right type, quality, and quantity, and *(click)* the results can be used as intended with an acceptable level of confidence. Worksheet 37 *(click)* defines and documents the process. A subset of a data usability assessment for our example site regarding the project objectives and sampling design is shown in this slide. The team agrees the answer is yes *(click)* to these project questions.

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Now what? What do we do with this additional data?

a) Update the CSM

b) Move to the next munitions response phase

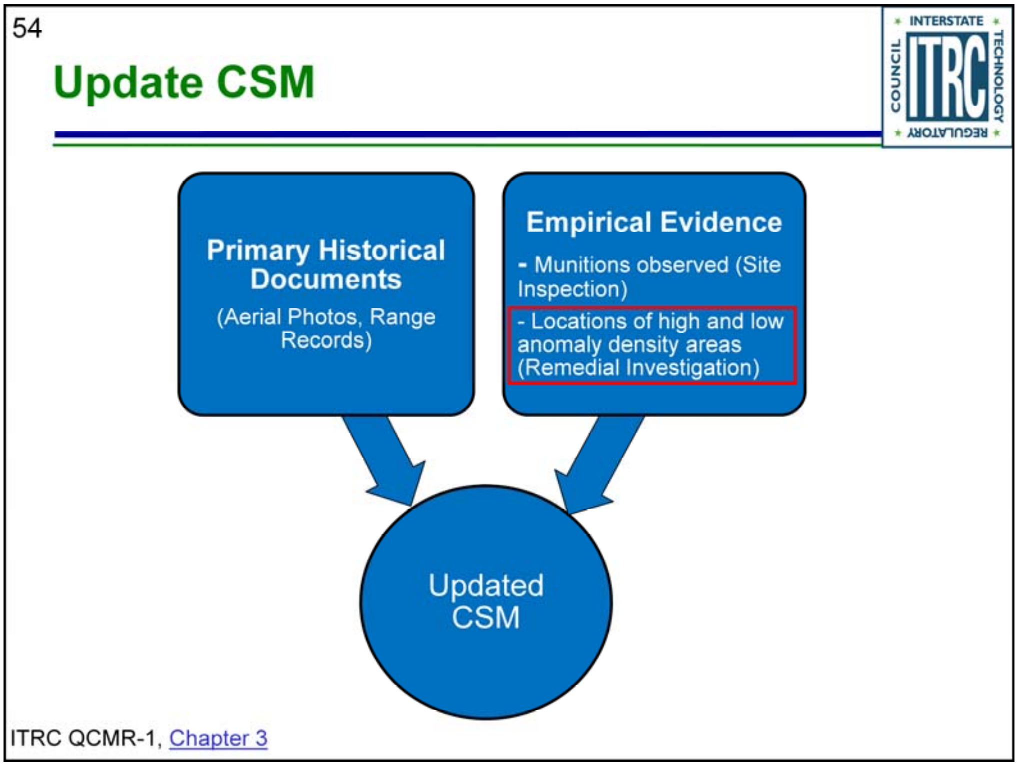
c) a & b

Figure Source: pixabay.com

Presenter 1: Now that we have more data, what do we do with it? Do you update the CSM *(click)*? Do you move on to the next investigation phase *(click)*? Or both a and b *(click)*? (*3 second pause for audience to think about the answer*)

Presenter 2: The next step is to update the CSM *(click*).

Presenter 1: Let’s talk about how that works.



Presenter 1: You'll remember this flow chart from earlier when we talked about the preliminary CSM. For our example site, the team will update the CSM with the *(click)* location of the high and low anomaly density areas and include any other information gathered during the Remedial Investigation that changes the preliminary CSM. This information feeds into the data usability assessment.

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Key Remedial Investigation Conclusions

- ✓ Confirmed explosive hazard
- ✓ Identified munition types
- ✓ Identified concentration of metallic anomalies significantly above background levels
- ✓ Defined the density and spatial distribution (horizontal and vertical extent) of the munitions
- ✓ Identified the current and anticipated future land use
- ✓ Identified the receptors and what are their activities (exposure pathways)

Presenter 1: Now that the data usability assessment and CSM update are complete, the team moves on to finalize the Remedial Investigation conclusions. A high anomaly density area *(click)* significantly above background was identified that answers our principle study question for this training. The team then finalizes the remaining conclusions and uses this information to proceed to the next munitions response phase, which is the Feasibility Study.

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Training Overview

- ▶ Quality Overview
- ▶ Project Example
  - Planning
  - Implementation and Monitoring
  - Verification/Validation and Data Usability
- ▶ **Final Thoughts**

Presenter 1: Now that we have walked you through the Remedial Investigation at our example site, we will wrap up by reviewing how you can use this information in your projects.

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Your Path Forward – Applying this Training and Guidance Document

- QCMR-1 Guidance Document as a Resource
- UFP-QAPP Resources
  - Development guidance
  - Worksheet templates
  - MR-QAPP and Training
- Other ITRC resources: www.itrcweb.org

Figure Source: pixabay.com

Presenter 1: This training provided an overview of key concepts of evidence-based decisions and related definitions. We hope this information helps support your active and informed participation in munitions response projects. *(click)* The guidance document also provides UFP-QAPP resources *(click)* that you can refer back to along the way.

Presenter 2: If you are looking for further detailed training on how this is applied, we recommend the *(click)* MR-QAPP training. In addition *(click)*, other ITRC guidance documents and training on munitions response topics are available on ITRC's website.

Presenter 1: We hope this training has been useful as you learn about munitions response projects. We appreciate your time today. Thank you!