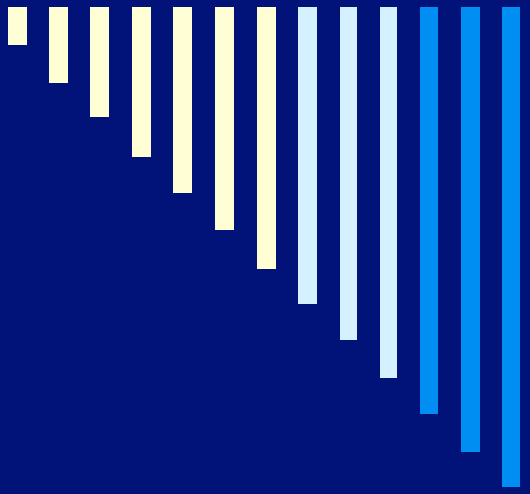


Data Quality Objectives

What are they and why are they so important?

Before We Start

- There's no single "right way" of doing something
- For any given project, the "right way"
  - Complies with the PWS
  - Follows applicable guidance
  - Is acceptable to the project team & other stakeholders
- What's right for one project, won't necessarily be right for the next

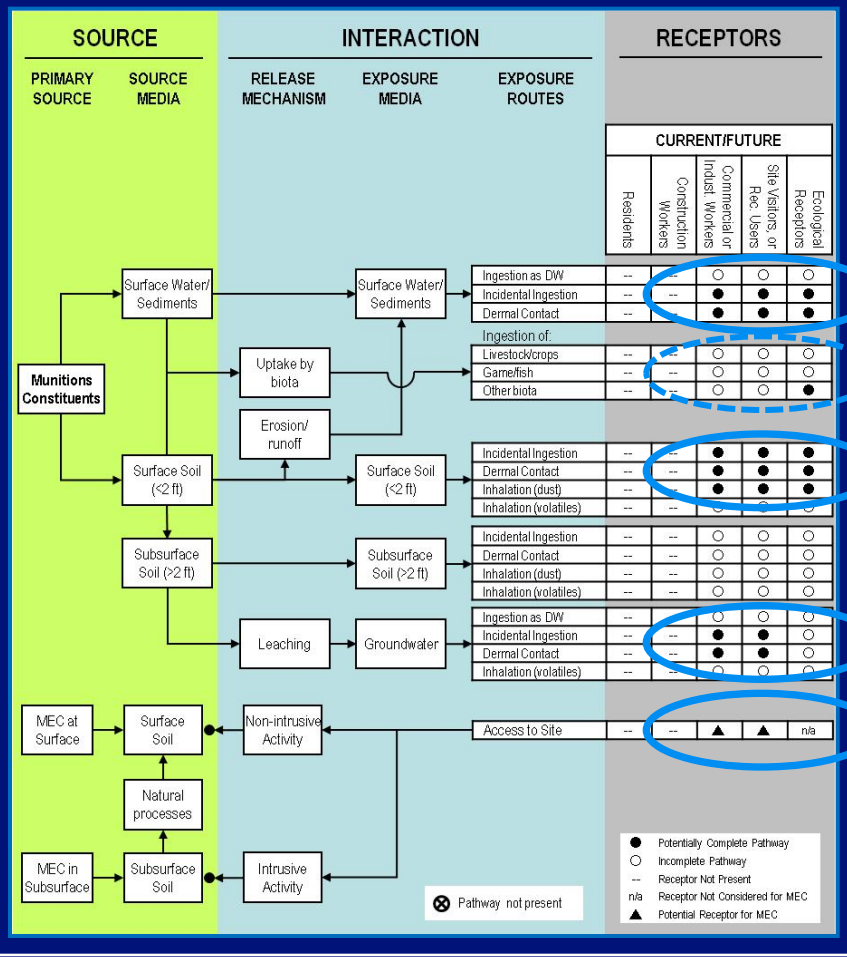
Introduction

- Clear DQOs are crucial for every project
- So it is important to understand:
  - What is a DQO?
  - How & when are they developed?
  - Why are DQOs important?
  - What makes a good DQO?
  - How can DQOs be presented?
  - How do we use them?

What is a DQO?

- Simply, a DQO is a measure letting us know *when the project is done*
- Or, more specifically, when we have project data of
  - The right type(s)
  - Sufficient quantity
  - Adequate quality
- … to support defensible project decisions & revisions to the CSM
- DQOs HAVE to be measureable!
- NOT the same as Measurement Performance Criteria (MPCs)

What is a DQO? cont'd.



- DQO for each project element
  - General contaminants (MEC or MC)
  - Environmental media
- Generally relate to potentially complete exposure pathways

DQO for MC in surface water

Ecological exposures typically addressed under other media

DQO for MC in surface soil

DQO for MC in groundwater

DQO for MEC in soil

Why are DQOs important?

- Formalize team agreement on
  - When data collection is complete
    - i.e., required data quantity & quality
  - What will be done with collected data
  - The decisions to be made using the data
- Support confidence in the revised CSM
- Underpin data supporting RAOs
- Tells everyone *when the project is done*

How/when are DQOs developed?

- DQOs should be developed by PDT
  - Because DQOs are so important, it is best to have whole team in agreement
- Develop as early as possible
  - Outline in the PWS?
  - Suggest them in the proposal?
  - Definitely should be discussed at the first TPP meeting
  - Have to be finalized in work plan

DQOs & Different CERCLA Phases

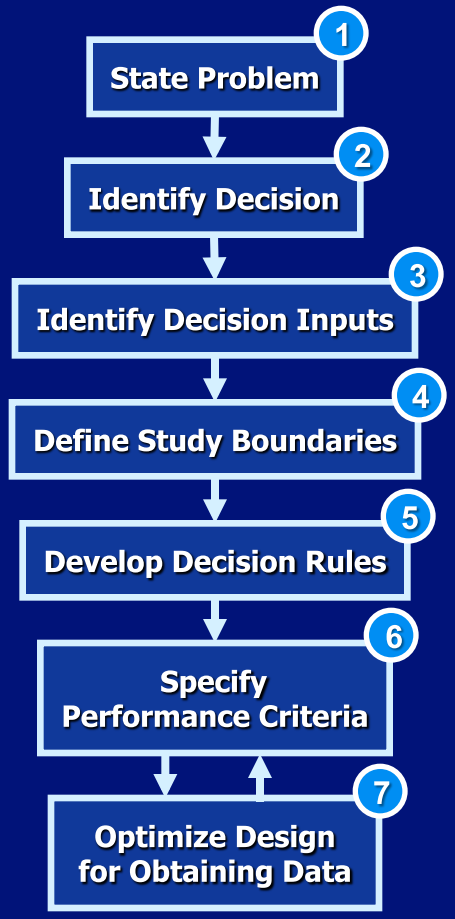
- Detail required will vary by CERCLA phase
- Site Inspection
  - Least detailed; only need to establish presence/absence
- Remedial Investigation
  - More detailed; need to characterize nature/ extent
- Remedial Action
  - Should specify cleanup levels & response
  - Refer to Decision Document (DD)
- Similar for parallel RCRA phases
  - RFA, RFI, & corrective action

What makes a good DQO?

- EM 200-1-2, TPP Process includes a DQO Worksheet with the following elements:
  - Project Objective(s) Satisfied
  - Data User Perspective(s)
  - Contaminant or Characteristic of Interest
  - Media of Interest
  - Required Sampling Locations or Areas & Depths
  - Number of Samples Required
  - Reference Concentration of Interest or Other Performance Criteria
  - Sampling Method
  - Analytical Method

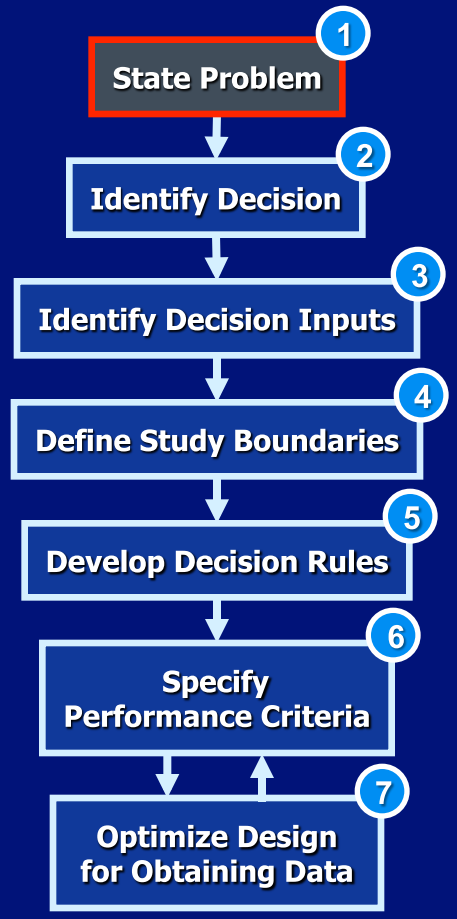
What makes a good DQO?

- EPA QA/G-4 & EPA QA/G-4HW details 7-step DQO process:
  1) State the problem
  2) Identify the decision to be made
  3) Identify inputs to decision
  4) Define study boundaries
  5) Develop decision rules
  6) Specify limits on decision errors (*performance criteria*)
  7) Optimize design for obtaining data (*technical approach*)
- EPA/DoD UFP-QAPP guidance also references 7-step DQO process
  - Section 2.6 & Worksheet #11



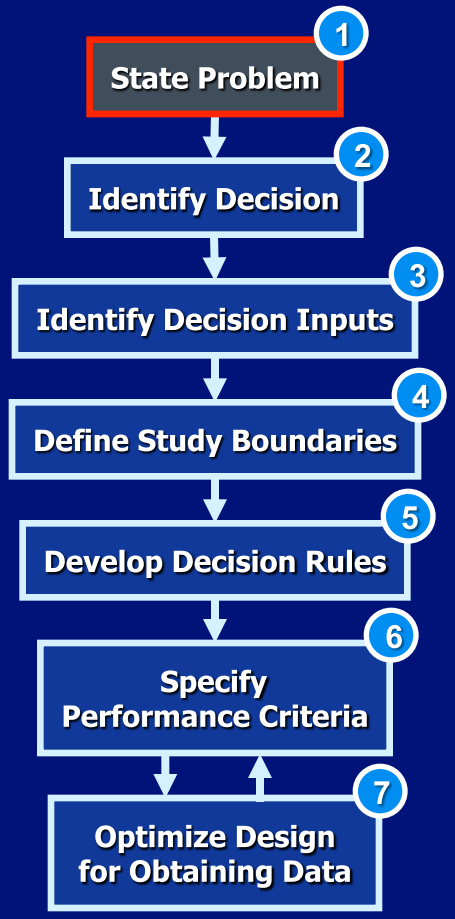
State the Problem

- Concise description of contamination problem
- Describe CSM
  - Contaminants (MEC/MC)
  - Potentially complete pathways
  - Current & future receptors
- Also at this stage
  - Establish PDT
  - Identify resources, constraints, & deadlines



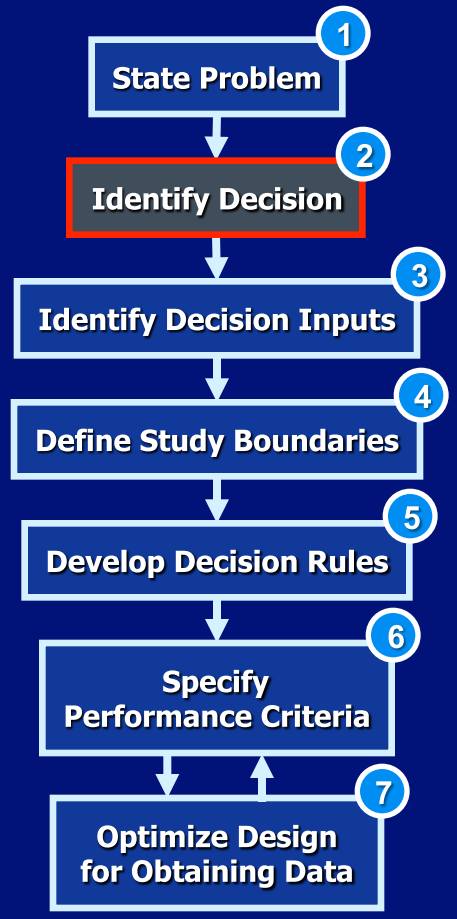
State the Problem, cont'd.

Stage	Example Problem Statements (Simple)
SI	Evidence of possible past use as artillery target area; if MEC remain in MRS & complete exposure pathways exist, there may be hazards to human health & the environment
RI	Confirmed past use as artillery target area; MEC/MC presence confirmed; nature & extent of MEC/MC contamination needs to be defined to facilitate selection & execution of remedial response
RA	Confirmed past use as artillery target area; UXO needs to be removed from contaminated area & LUCs need to be implemented to achieve RIP/RC



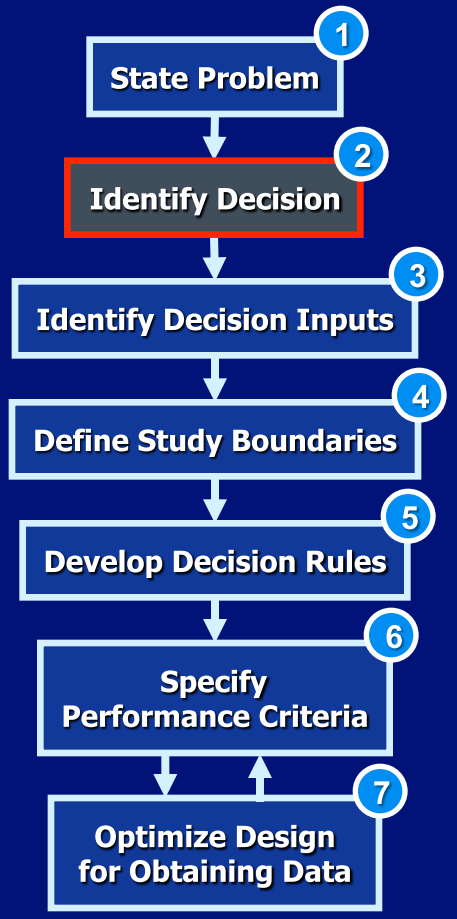
Identify Decision

- Identify principal question(s) to be answered by the project
  - Focus on information needed
- Define project actions that could be taken to address problem
- Combine these elements into a decision statement
  - "Determine if [conditions/criteria from principal study question] require/support [taking actions]"
- Organize multiple decision statements
  - Based on sequence or priority



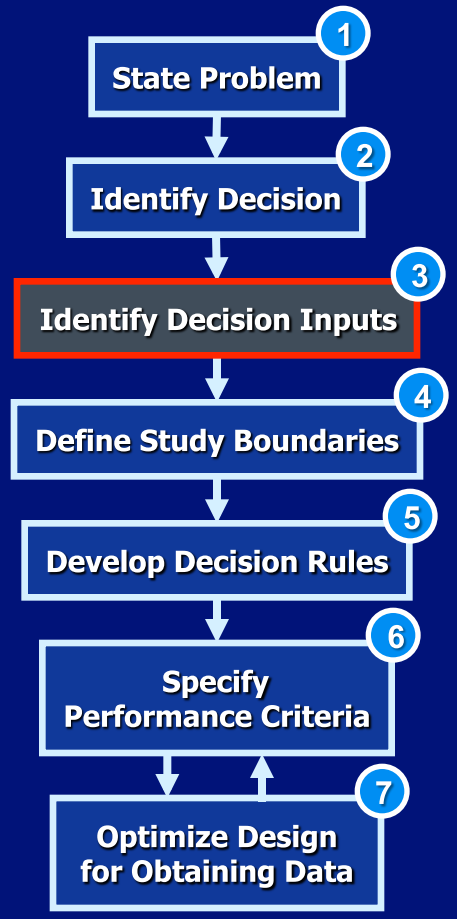
Identify Decision, cont'd.

Stage	Example Decision Statements
SI	Determine if MEC/MC contamination is present & requires further response action, or if no further action is needed
RI	Characterize where CMUAs are located & require further response action, & where no further action is needed *or* Determine where MC concentrations exceed project action levels & require further response action, & where no further action is needed
RA	Determine if RAOs have been met & where Response Complete has been achieved, or if further response is needed



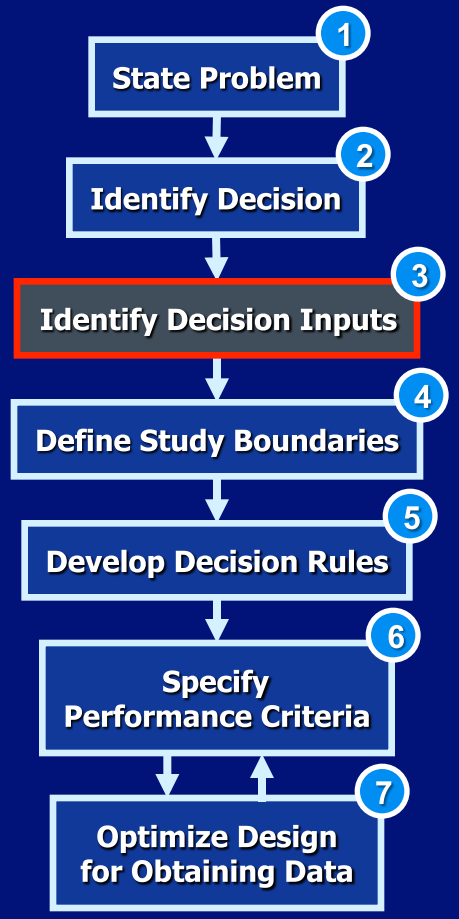
Identify Decision Inputs

- Identify information needed to resolve decision statement
  - What, where, & how much?
- Determine sources of identified information
  - e.g., prior studies, new field investigations
- Identify information needed to establish "action levels"
  - For MEC & MC, as needed
- Confirm investigation methods
  - e.g., DGM, intrusive, MC sampling



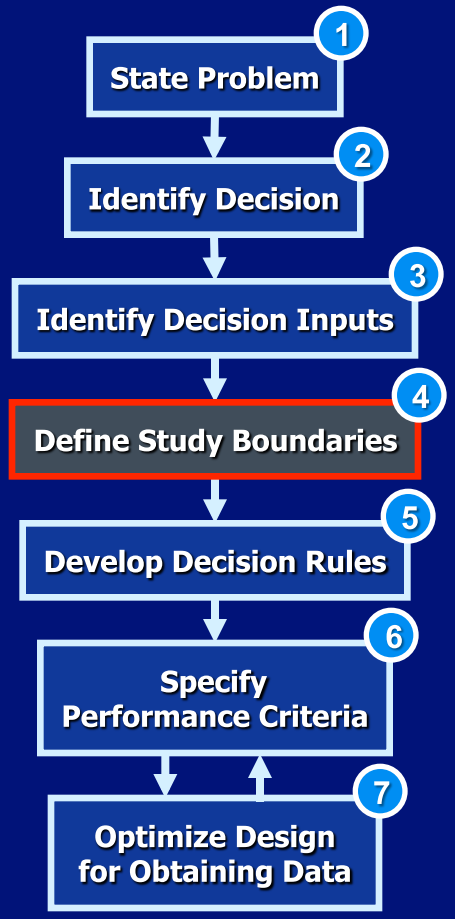
Identify Decision Inputs, cont'd.

Information Needed	Possible Source(s)
Types of MEC/MC potentially present	Historical documents, previous response actions, results of DGM surveys & intrusive investigations
Locations of MEC/CMUAs	Historical documents, previous response actions, results of DGM surveys & intrusive investigations
Action levels for MEC	PDT & stakeholder agreement, DD
MC concentrations in soil	Results of MC sampling & analysis
Action levels for MC	Screening levels, DD



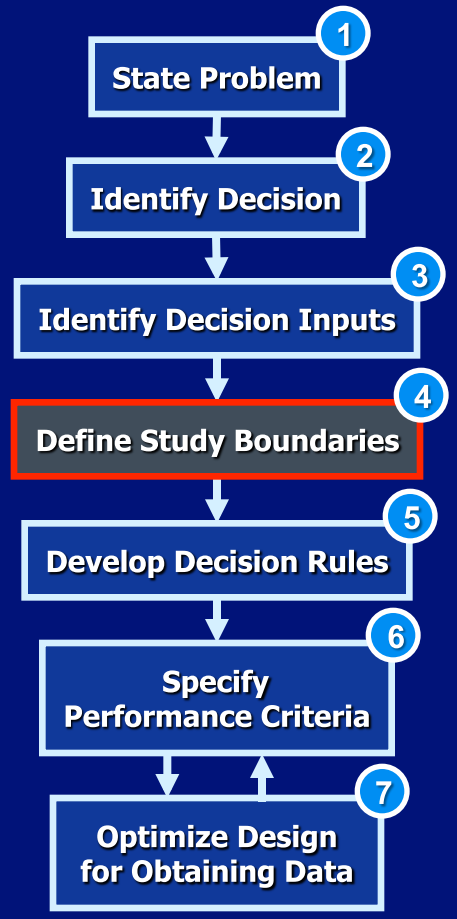
Define Study Boundaries

- Population of interest
  - Contaminants & media
- Spatial boundaries
  - Horizontal & vertical limits
- Temporal boundaries
  - Timeframe to which data apply
  - When to collect data
- Scale of decision making
  - e.g., decision unit size
- Constraints on data collection
  - e.g., where/when data can be collected



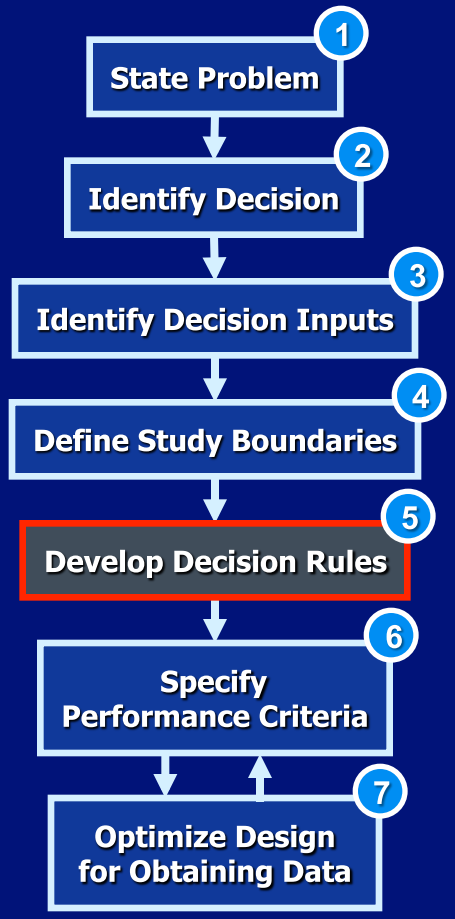
Define Study Boundaries, cont'd.

Stage	Example Information
ALL	Contaminants & media of interest Requirements for field work schedule Necessary ROEs Locations of inaccessible areas
SI	MRS boundary defined in PA or ASR Any subdivisions based on CSM Maximum sampling depth (s)
RI	MRS boundary defined in SI Any subdivisions based on CSM Maximum sampling depth(s)
RA	MRS boundary defined in RI & DD Any subdivisions based on selected remedy Maximum removal depth



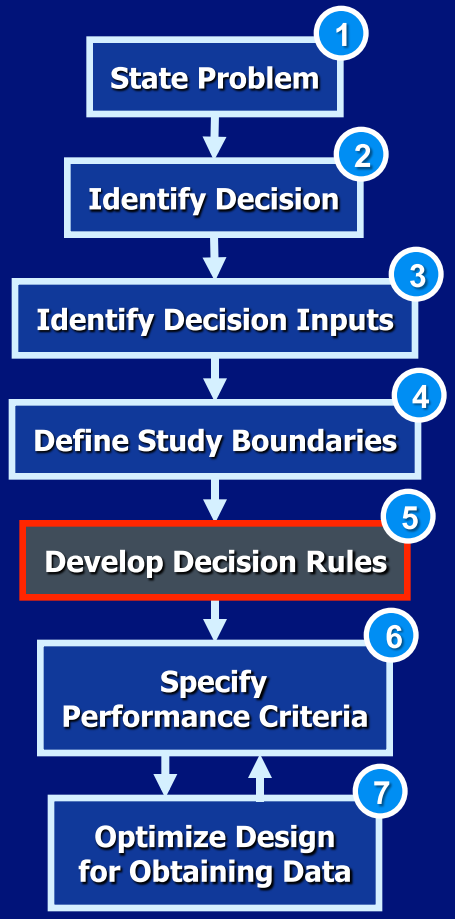
Develop Decision Rules

- Specify the parameters that characterize the COPCs
  - e.g., MEC density, max. MC conc.
- Specify "action levels"
  - Action levels must be detectable
  - **DEFINE what "contamination" means!**
- Develop "decision rules"
  - Combine previous outputs into "if… then…" statements
  - May be multiple decision rules per DQO; may be linked/chained
  - Can present in flow chart



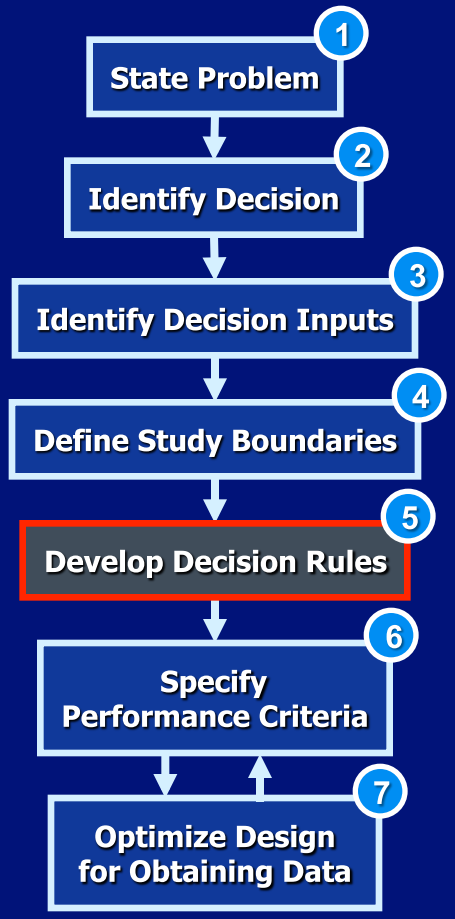
Develop Decision Rules, cont'd.

- Defining contamination
  - Cannot characterize nature & extent of CMUA **UNLESS** contamination is defined
  - So it is vital to do this & get team concurrence
  - Also need to decide what "uncontaminated" means
    - No further action required?
    - Reduced action required?
  - Use statistical tools for MEC/MC
  - Use risk-based concs. for MC



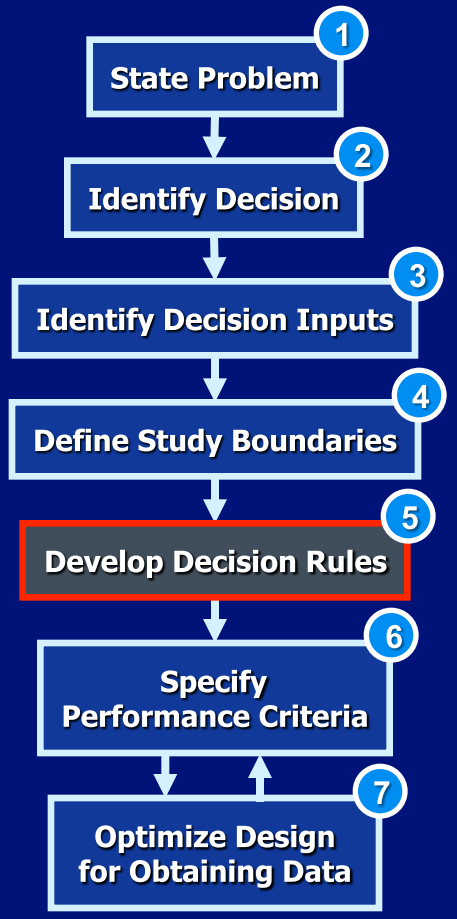
Develop Decision Rules, cont'd.

Parameter	Example RI Decision Rules
MEC	IF no high density (HD) areas (i.e., "target areas") identified & transects have 90% conf. of locating 150-foot radius target area, THEN MRS contains no CMUAs
	IF HD areas identified, THEN investigate [*number, size*] DGM grids in HD areas
	IF grid anomalies in a HD area are MEC or related items, THEN HD area is CMUA & MEC HA will be conducted to evaluate hazards
	IF no grid anomalies in HD area are MEC or related items, THEN HD area is not CMUA



Develop Decision Rules, cont'd.

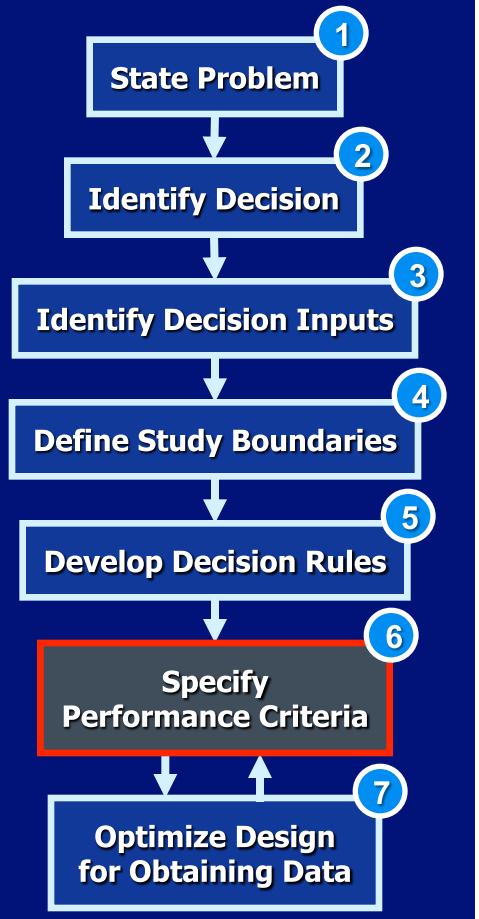
Parameter	Example RI Decision Rules, cont'd.
MC	IF MC concs. in soil < screening values, THEN there is no evidence of release & no further analysis required
	IF MC concs. in soil > screening values, THEN there is evidence of release (i.e., potential MC contamination) & further samples will be collected to delineate extent in soil & evaluate exposure risk
	IF evidence of MC release, THEN evaluate potential for migration of MC from soil to surf. water, sediment, & GW; IF migration pathways are potentially complete, THEN collect samples of potentially affected media



Specify Performance Criteria

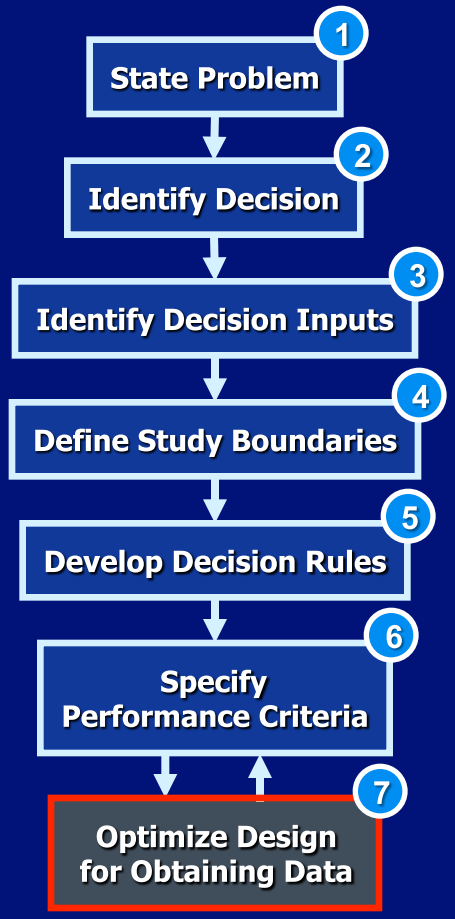
- Specify performance criteria for data to be collected
  - Reference tables or UFP-QAPP worksheets

Parameter	Overall Performance Criterion
MEC	All geophysical investigations shall achieve applicable MPCs as stated in UFP-QAPP & confirmed/modified by GSV, unless MPC failures can be adequately explained and justified
MC	Sampling & analysis shall achieve applicable MPCs as stated in UFP-QAPP, unless MPC failures can be adequately explained and justified



Optimize the Design

- Develop general plan for data collection based on Steps 1-6
- Use previous steps to develop sampling & analysis design
  - Required type(s) of data
    - DGM, intrusive, MC samples
  - Sufficient quantity
    - Survey acreages, no. of excavations & samples
  - Adequate quality
    - Relevant MPCs
- Output is technical approach
  - May need to adjust MPCs



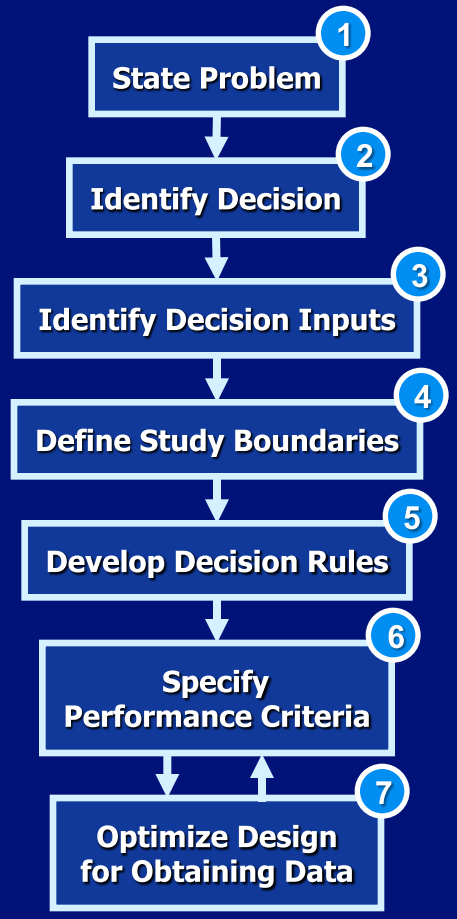
How can DQOs be presented?

- Can use text or a table (or both)
- Reference relevant info
  - Sections of work plan (or UFP-QAPP worksheets)
  - Figures/maps

MRS	Problem	Decision	Decision Inputs	Study Boundaries	Decision Rules	Performance Criteria	Technical Approach
Artillery Range	*Complete Pathway 1*	*Goal for Pathway 1*	*Data required*	*Location*	*IF/THEN*	*Reference relevant MPCs*	*Summarize approach 1*
	Complete Pathway 2	*Goal for Pathway 2*	*Data required*	*Location*	*IF/THEN*	*Reference relevant MPCs*	*Summarize approach 2*
	Complete Pathway 3	*Goal for Pathway 3*	*Data required*	*Location*	*IF/THEN*	*Reference relevant MPCs*	*Summarize approach 3*

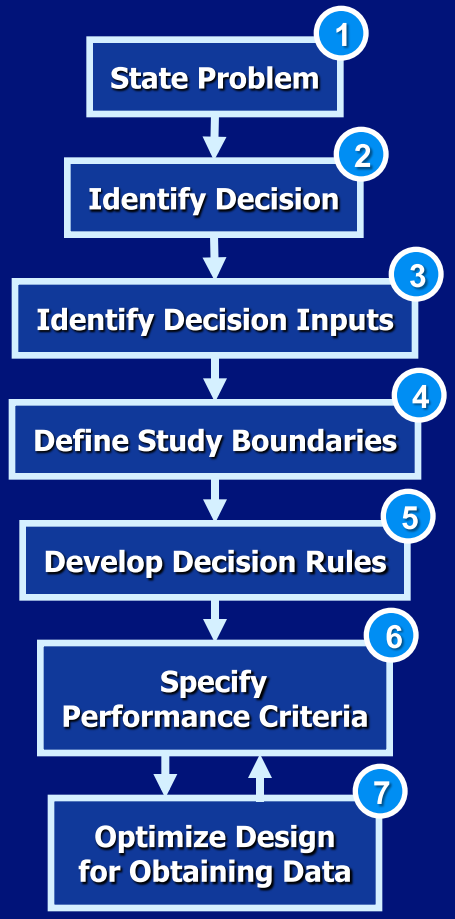
DQOs & UFP-QAPP

- EPA/DoD UFP-QAPP guidance
  - Part 1: UFP-QAPP Manual
  - Part 2A (Revised): Optimized UFP-QAPP Worksheets
  - Part 2B: QA/QC Compendium
  - http://www.epa.gov/fedfac/documents/qualityassurance.htm
- UFP-QAPP Worksheets
  - #10 – Conceptual Site Model
    - Relates to Step 1
    - Helps define problem(s) to be addressed



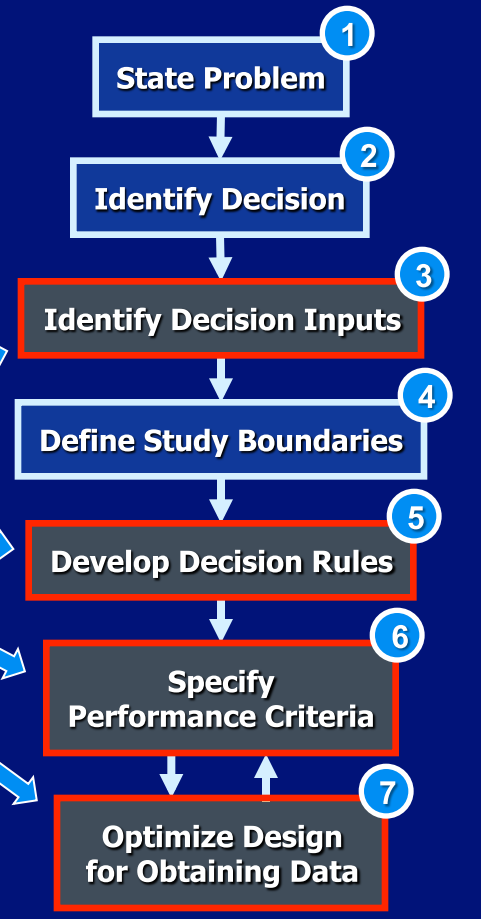
DQOs & UFP-QAPP, cont'd.

- UFP-QAPP worksheets
  - #11 – Data Quality Objectives
    - Summarizes Steps 1 through 7
    - Use text or table (or both)
  - #12 – Measurement Performance Criteria
    - Relates to Step 6
    - Also reference Worksheet #15 for MC criteria
  - #17 – Sampling Design & Rationale
    - Relates to Step 7



So now what?

- Track DQOs during fieldwork
  - Present on daily report?
  - Implement corrective actions
- How to check your DQOs
  - Did you…?
    - Gather all data inputs?
    - Follow decision rules?
    - Attain performance criteria?
  - Did you do what you said?
  - Can you make the decision?
- Document DQO status in final report!



Summary

- Develop DQOs ASAP
- DQO for each element of investigation (e.g., exposure pathway)
- Make DQOs measurable
- Defining contamination is essential
- Get project team concurrence
- Track DQOs during fieldwork/project
- Document DQO status in final report

Feedback/Questions

- If you have…
  - Questions
  - Comments
  - Hate mail
  - Sole source task orders
- Please feel free to contact me
  - James.Salisbury@Parsons.com
  - (512) 719-6028