


**New Jersey DEP  
Site Remediation Program**

**Technical Guidance Committees**

George Nicholas  
Lead - DEP/SRP Technical Guidance Development




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**Technical Guidance Committees**

- Composed of 5 DEP Staff and 7 Stakeholders
- Topics Selected via meetings w/ DEP & Stakeholders (Fall 2010 / Summer 2012) or requested by Stakeholders/DEP
- Internal/External review of Final Draft
- Avg. 24 months to complete a document
- Final documents posted on SRP Website at <http://www.nj.gov/dep/srp/guidance/>




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**Round-1  
15 Tech Guidance Committees**

*Kicked off work Summer 2010*

1. Vapor Intrusion	9. Historic Fill
2. LNAPL	10. Technical Impracticability
3. Receptor Evaluation	11. MNA (Monitored Nat. Atten)
4. Presumptive Remedies	12. Conceptual Site Model
5. IEC (Immed. Env. Concern)	13. Analytical Methods
6. Clean/Alternative Fill	14. Eco Investigation
7. Ground Water SI/RI/RA	15. Attainment
8. Soil (4 docs; PA, SI/RI/RA, UST & Landfill)	




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## Round-2

### 8 Tech Guidance Committees

*(Round 2 - Kicked off Work September 2012)*

1. Off-Site Source
2. Co-Mingled Plumes
3. Historic Pesticide Use
4. Capping
5. Performance Monitoring of In-situ GW Remedial Actions
6. Evaluation of GW discharges to SW
7. Child Care Centers (added spring 2013)
8. Catastrophic Events: Planning & Response at SRP sites (added January 2014)




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### Analytical Technical Guidance Training

June 24, 2014

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## LSRP Continuing Education Requirements



36 Continuing Education Credits (CECs) over 3 year LSRP license renewal period

**First LSRPs (July 2012) Need 36 CECs by 4/2015**

Minimum no. of CECs must be satisfied in these categories:

- 3 CECs Ethics
  - 10 CECs Regulatory
  - 14 CECs Technical
  - +9 CECs Discretionary
- Board can require "CORE" courses

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## Continuing Ed Credits (CECs)



- One CEC is equivalent to 1 hour of instruction from university, college, DEP, LSRPA & other professional organizations
- Conferences Conventions Workshops 1hr = ½CEC
  - Up to 8 CECs allowed within 3 year renewal cycle
  - Changes to this policy are up to discretion of LSRP Board
- Webinar and On-Line Courses: CEC is 1:1 but exam is required
- CECs available for presentations, publications but not 1:1 credit

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## Dates & Events



- July 24<sup>th</sup> Impact to Ground Water Topics  
DEP 3-6 pm
- Sep.16 &17 Groundwater Contamination & Remedial Principles and Practices  
Two Day Course – 13 Technical CECs

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**Thank You**

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**Analytical Laboratory  
Data Generation  
Assessment  
and  
Usability  
Technical Guidance**

June 24, 2014




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**The Committee**

- Greg Toffoli – Chair, DEP, Office of Data Quality
- Nancy Rothman, Ph.D. - New Environmental Horizons, Inc.
- Rodger Ferguson, CHMM LSRP, Pennjersey Env. Consulting
- Stuart Nagourney - DEP, Office of Quality Assurance
- David Robinson - Synergy Environmental, Inc.
- Joseph Sanguiliano – DEP, Office of Data Quality
- Phillip Worby - Accutest Laboratories, Inc.




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## Relationship With Data



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### Then

- All compounds meeting all Standards
- CLP-like acceptance criteria
- Qualified = Unusable



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### Now

- Ability to reduce number of targeted compounds
- All standards do not have to be necessarily met
- Qualified  $\neq$  Unusable



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### Ultimate Goal

Remediation

QAPP



Methods

Non-Conformances

Evaluation

Data usable?

YES NO



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### We Live or Die by an Analytical Result



- Decisions from Grab Samples
- Results Compared to Standards
- Dirty Versus Clean



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### All Analytical Data Inherently Have Associated Error

Element of Uncertainty – Bias –  
Not Representative of Concentrations

- Nature of Environmental Matrices;
- Sample Collection and Homogeneity (Sample Aliquoting)
- Limitations of Analytical Methods
  - Sample Preparation; And
  - Sample Preservation;
  - Sample Analysis
- Characteristics of Analytes



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 **Purpose of the Guidance Documents**

- To assist investigator to review and subsequently use the analytical data generated during the remediation of a contaminated site (Data Quality Assessment/Data Usability Evaluation)
- Discuss Laboratory Quality Assurance and Quality Control (QA/QC) as a comprehensive program to enhance and document the quality of analytical data
- Reduce Errors
- Limit Vulnerability



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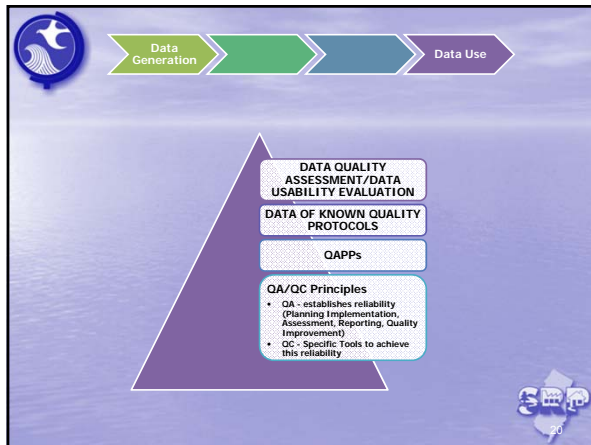
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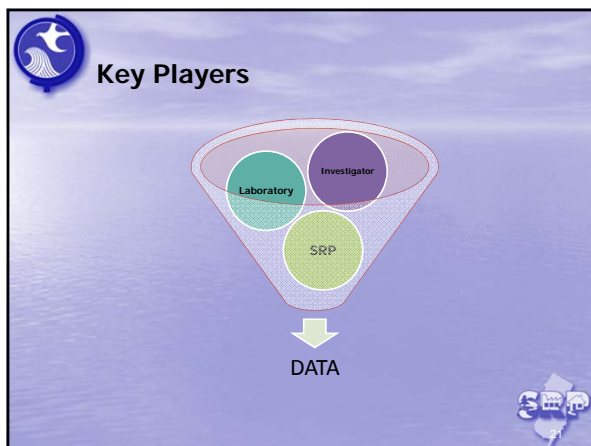
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### Data of Known Quality Protocols

- Certification Alone Cannot Guarantee the Validity of Analytical Data
- Methods Can Be "Performance Based"
- DKQPs Provide a Minimum Set of QA/QC Criteria
- Provide Consistent Usability Decisions



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### Data Quality Assessment/Data Usability Evaluation

- Evaluating the quality of analytical data = 2-step process
- Data Quality Assessment (DQA)
  - Identify QC Issues
  - Non-Conformance Summaries
- Data Usability Evaluation (DUE)
  - Use results of DQA
  - Are data sufficient for intended purposes?
- Alternative Processes



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### Key Distinctions

Reporting Limit	Vs.	MDL
• Lowest Standard in Calibration Curve (Organics)		
• Lowest Level Check Standard (Inorganics)		
Data Review	Vs.	Data Validation
Validation	Vs.	Usability
Investigator	Vs.	Laboratory



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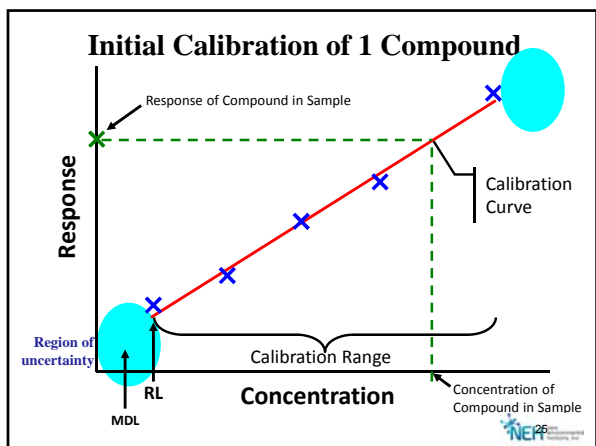
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## Data Quality Objectives Analysis Method and Data of Known Quality Protocols

Nancy C. Rothman, Ph.D  
New Environmental Horizons, Inc.  
[www.neh-inc.com](http://www.neh-inc.com)



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## Quality Decisions

- Project decisions are based on information -- historical, field measurements, analytical data
- NJDEP developed data quality tools -- to ensure comparable analytical data and comparable data use decisions from site-to-site
- Quality is built-in at the beginning -- and flows through the process rather than only being inspected at the end



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## Demystifying the DQO Process



- **Step 1:** Establish project objectives, conceptual models, regulatory drivers
- **Step 2:** Identify data uses and needs
- **Step 3:** Design data collection, sampling and analysis activities



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### Benefits of DQO Process

- Roadmap for Quality Investigation
- Savings in Time and Cost
- Corrective Actions
  - in-place before project begins
  - allows for real-time QA evaluation




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### Data Quality Using PARCCS

**Precision**


- Variability, reproducibility
- QC = Duplicates

**Accuracy**

- Bias from "true"
- QC = Blanks, Spikes, Calibration

**Representativeness**

- Data point vs. population
- QC = Field Duplicates, sample locations



**Comparability**


- Temporal and methodological consistency
- Field vs. Lab data

**Completeness**

- Amount of data planned vs. usable data collected

**Sensitivity**

- Reporting Limits
- Regulatory Standards




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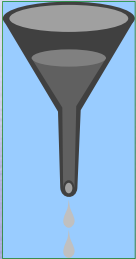
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### Field Issues



**Sample Integrity** maintained throughout collection, handling, and transport?

- Preservation / Container / Handling & Holding Times
- Chain-of-Custody
- Sample transformations can affect accuracy




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## Why Establish Data of Known Quality Protocols (DKQP)?

**Narratives**

- N.J.A.C. 7-26E Appendix A:
  - "This summary shall state that the laboratory has reviewed the QA/QC measures for sample analysis and has identified any deviations from the acceptable performance criteria or results."
- **How is Acceptable Performance defined?**




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## Why Establish DKQP?

Lab	Surrogate	% Recovery	Lab Recovery Criteria
A	Toluene-d8	53%	50-150%
B	Toluene-d8	75%	

- Which Lab is reporting better quality data?
- How do you answer the question, "Were all Surrogates in control"?
- How would you combine data from Lab A & Lab B into one report?
- **If you defined Acceptance Criteria 70-130%, then what do you think of these results?**




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## How Were DKQP Developed?

- Based on the experience of MassDEP (Compendium of Analytical Methods (CAM)) and CTDEP (Reasonable Confidence Protocols (RCP))
- Close working relationships with stakeholders: Technical Guidance Document Working Group (NJDEP, LSRPs, Laboratory, & Industry Reps)
- Special Focus on addressing all of the PARCCS parameters
- Goals to ensure:
  - **Ease-of-Use**
  - **Clarity - Straight-forward (eliminate method ambiguities)**
  - **Best possible data for the decision-maker**




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## What are the DKQP?


- Tables expressing QA/QC which mimic needs for QAPP (e.g., Uniform Federal Policy (UFP) QAPP Worksheet #12)

QAPP Worksheet #12  
(UFP-QAPP Manual Section 2.6.2)

Title:  
Revision Number:

Measurement Performance Criteria Table

Matrix					
Analytical Group <sup>1</sup>					
Concentration Level					
Sampling Procedure <sup>2</sup>	Analytical Method/SOP <sup>3</sup>	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample: Assess Error for Sampling (S), Analytical (A) or both (S&A)




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## Methods Addressed

Organic Methods with DKQP Tables

Volatiles: 8260B, 8260C, & 524.2  
 Semi-Volatiles: 8270C & 8270D  
 Pesticides: 8081A & 8081B  
 PCBs: 8082 & 8082A  
 Air: TO-15, LL TO-15, & TO-17  
 Hydrocarbons: NJDEP EPH

Inorganic Methods with DKQP Tables

Metals: 6010B, 6010C, 6020, & 6020A  
 Mercury: 7470A & 7471A  
 Cyanide: 9010C, 9013, 9014, & 9012B  
 Hex Chrom: 7196A & 7199




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## Format for Organic Methods

DKQP Tables for the Organic Methods give specific Acceptance Criteria and Corrective Action for the following QC Samples/Activities, as applicable to the method:

Tune (GC/MS only)	Initial Calibration
Continuing Calibration	Method Blanks
Laboratory Control Samples	Surrogates
Matrix Spikes	Matrix Spike Duplicates
Sample Duplicates	Internal Standards
Quantitation	Reporting of non-Detects
Field Duplicates	Preservation
Holding Time	Equipment Blank




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## Format for Inorganic Methods

DKQP Tables for the Inorganic Methods give specific Acceptance Criteria and Corrective Action for the following QC Samples/Activities, as applicable to method:

Tune (ICP/MS only)	Initial Calibration & Verification
Continuing Calibration	Calibration Blanks
Method Blanks	Interference Check Standards
Laboratory Control Samples	Sample Duplicates
Matrix Spikes	Matrix Spike Duplicates
Post Digestion Spikes	Serial Dilution
Quantitation	Internal Standards (ICP/MS only)
Field Duplicates	Preservation
Holding Time	Equipment Blank




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**Table 11 QAPP Worksheet All Matrices – VOAs by USEPA SW-846 8260B  
Measurement Performance Criteria & QC Samples**

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	BFB Tune	Every 12 hours	Method tune criteria based on criteria in Table 4 of USEPA-SW846 Method 8260B	Perform instrument maintenance; reanalyze until acceptable	Analyst
Accuracy	A	Initial Calibration (ICAL)	Initially and when CCV fails	Minimum 5-standards; must contain all targets and lowest standard $\leq$ RL; Full Scan; RF for SPCCs Section 7.3.5.4; %RSD $\leq$ 15% for all compounds except COCs which must be $\leq$ 30% RSD or $Y^2 \geq 0.99$ ; S&M; %RSD $\leq$ 20% or $Y^2 \geq 0.99$ for all compounds; regression analysis, if used, must not be forced through the origin	Recalibrate as required by method; analysis cannot proceed without a valid initial calibration	Analyst
Accuracy/ Sensitivity	A	Method Blank	1 per preparatory batch of up to 20 field samples (matrix-specific)	Targets analytes must be $<$ RL except for common laboratory contaminants (acetone, methylene chloride and MEK) which must be $<$ 5x RL; surrogates in criteria	Reanalyze and, if necessary, re-extract. Report non-conformance in narrative; compounds present in blank should be flagged "D" in samples, if detected.	Analyst

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**Table 11 QAPP Worksheet All Matrices – VOAs by USEPA SW-846 8260B  
Measurement Performance Criteria & QC Samples**

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Matrix Spike/ Matrix Spike Duplicate (Site-specific QC)	1 per $\leq$ 20 field samples per matrix	Must contain all target analytes, performed on Site field sample, % recovery 70-130% except for difficult analytes** which must exhibit % recovery between 40-160%	Evaluate LCS, unspiked sample, reanalyze, if necessary, and qualify data and narrate issue	Analyst/Data Reviewer
Precision	A	Matrix Spike/ Matrix Spike Duplicate (Site-specific QC)	1 per $\leq$ 20 field samples per matrix	Must contain all target analytes, performed on Site field sample, recovery criteria same as MS; RPDs $\leq$ 20% for waters and $\leq$ 30% for solids	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Accuracy	A	Laboratory Control Sample (LCS)	1 per preparatory batch of up to 20 samples	Must contain all target analytes, be matrix-matched; % Recovery 70-130% except for difficult analytes ** must exhibit percent recoveries between 40-160%	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Precision	A	Sample Duplicate (DUP)	1 per $\leq$ 20 field samples if a MS&SD was not performed	Must be performed on a Site field sample. RPDs $\leq$ 20% for waters and $\leq$ 30% for solids for results $>$ 2x RL	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Accuracy	A	Surrogates	Every sample including QC	Minimum of 3 surrogates at retention times across GC run for all matrices; surrogates must be between 70-130% for all compounds.	Reanalyze, if necessary, qualify data	Analyst/Data Reviewer

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**Table 11 QAPP Worksheet All Matrices – VOAs by USEPA SW-846 8260B Measurement Performance Criteria & QC Samples**

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Internal Standards (IS)	3 per sample including QC	Minimum of 3 IS. Areas 50,000% of the most recent CCV. RTs $\pm$ 30 sec. from midpoint ICAL standard	Reanalyze and qualify data	Analyst/Data Reviewer
Accuracy	A	Continuing Calibration Verification (CCV)	1 every 12 hours prior to analysis of samples	Concentration level near mid-point of ICAL curve containing all target compounds; Full Scan and SIM min RRF criteria met; $\pm$ SD or % Drift $\leq$ 20% for all compounds	Recalibrate as required by method, note outliers in narrative.	Analyst
Accuracy	A	Quantitation	Every sample	RL $\leq$ results $\leq$ upper calibration range on a sample-specific basis; IS must be used; and average response factors or curve-statistics generated from the ICAL must be used for quantitation. Results reported between the MDL and RL qualified "C"	Perform dilution to bring analyte within linear range, qualify data	Analyst/Data Reviewer
Sensitivity	A	Reporting of Non-Detects	Every sample	Reported at the sample-specific RL which must be $\leq$ PRL	Potential data usability issue	Data Reviewer

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**Table 11 QAPP Worksheet All Matrices – VOAs by USEPA SW-846 8260B Measurement Performance Criteria & QC Samples**

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Overall Precision & Representativeness	S & A	Field Duplicate Samples (Site-specific QC)	1 per 20 field samples	RPD $\leq$ 30% for waters or RPD $\leq$ 50% for solids w/results > 2x RL; Professional judgment for results < 2xRL	Potential data usability issue	Data Reviewer
Accuracy (preservation)	S	Temperature Blank or other Cooler Temperature Reading	1 Temperature reading per cooler to be recorded upon receipt at lab	4 $\pm$ 2° C; allow for < 2° C if samples intact sample preservation per SW-846 Chapter 4 Table 4-1	Potential data usability issue	Data Reviewer
Accuracy/ Sensitivity	S & A	Holding Time (HT)	Every field sample	Analyses within 14 days of collection (7 days if unpreserved). Aqueous samples adjust pH to $\leq$ 2 with HCL or per SW-846 Table 4-1 preservatives.	Potential data usability issue	Data Reviewer
Accuracy/ Sensitivity	S	Equipment Blank (Site-specific QC)	Not Required if using dedicated sampling equipment; if performing decontamination of equipment, collect 1 EB per 20 field samples collected by the same method.	Target analytes < RL	Potential data usability issue	Data Reviewer

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**Table 11 QAPP Worksheet All Matrices – VOAs by USEPA SW-846 8260B Measurement Performance Criteria & QC Samples**

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Data Completeness	S & A	Calculate from valid/ usable data collected	Not applicable	$\geq$ 90% Overall	Potential data usability / data gap issue	Data Reviewer/ Investigator
Comparability	S & A	Based on Method (SOP) and QAPP/FSP protocols	Not applicable	Comparison between historical data for qualitative integrity of the data. Comparison between spatially similar samples.	Potential data usability issue	Based on Method (SOP) and QAPP/FSP protocols

- NOTES:
- This table was prepared by NJDEP April 2014; to be compliant with EPA Region 2 guidance, and meet the data quality needs of the Department.
  - Volatile Organic Compound analyses via USEPA 524.2 (Measurement of Purgeable Organic Compounds in water by Capillary Column Gas Chromatography/Mass Spectroscopy (GC/MS)).
  - "Potentially "difficult" analytes include: acetone, methyl ethyl ketone, 4-methyl-2-pentanone, 2-hexanone, dichlorodifluoromethane, bromomethane, chloromethane, and 1, 4-dioxane.

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**DATA OF KNOWN QUALITY CONFORMANCE/NON-CONFORMANCE SUMMARY QUESTIONNAIRE**  
 Laboratory Name: \_\_\_\_\_ Client: \_\_\_\_\_  
 Project Location: \_\_\_\_\_ Project Number: \_\_\_\_\_  
 Laboratory Sample ID(s): \_\_\_\_\_ Sampling Date(s): \_\_\_\_\_  
 List DKQP Methods Used (e.g., 8260, 8270, et cetera) \_\_\_\_\_

1	For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the NJDEP Data of Known Quality performance standards?	<input type="checkbox"/> Yes <input type="checkbox"/> No
1A	Were the method specified handling, preservation, and holding time requirements met?	<input type="checkbox"/> Yes <input type="checkbox"/> No
1B	<i>EPH Method:</i> Was the EPH method conducted without significant modifications (see Section 11.3 of respective DKQ methods)?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
2	Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody documents?	<input type="checkbox"/> Yes <input type="checkbox"/> No
3	Were samples received at an appropriate temperature (< 6° C)?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
4	Were all QA/QC performance criteria specified in the NJDEP DKQP standards achieved?	<input type="checkbox"/> Yes <input type="checkbox"/> No
5	a) Were reporting limits specified or referenced on the chain-of-custody or communicated to the laboratory prior to sample receipt? b) Were these reporting limits met?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
6	For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the DKQP documents and/or site-specific QAPP?	<input type="checkbox"/> Yes <input type="checkbox"/> No
7	Are project-specific matrix spikes and/or laboratory duplicates included in this data set?	<input type="checkbox"/> Yes <input type="checkbox"/> No

Any "No" response, except to question 7, should trigger a narrative explanation

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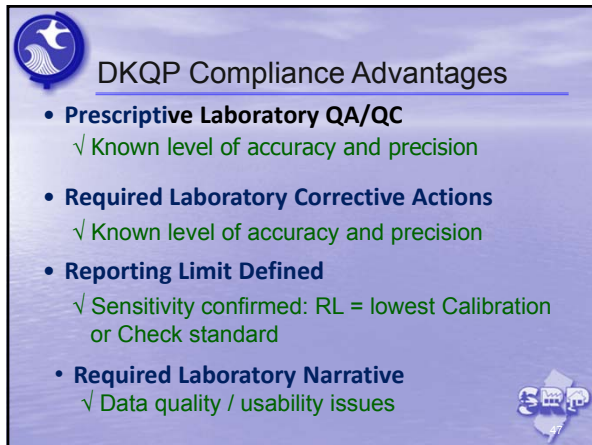
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**DKQP Compliance Advantages**

- **Prescriptive Laboratory QA/QC**  
 ✓ Known level of accuracy and precision
- **Required Laboratory Corrective Actions**  
 ✓ Known level of accuracy and precision
- **Reporting Limit Defined**  
 ✓ Sensitivity confirmed: RL = lowest Calibration or Check standard
- **Required Laboratory Narrative**  
 ✓ Data quality / usability issues

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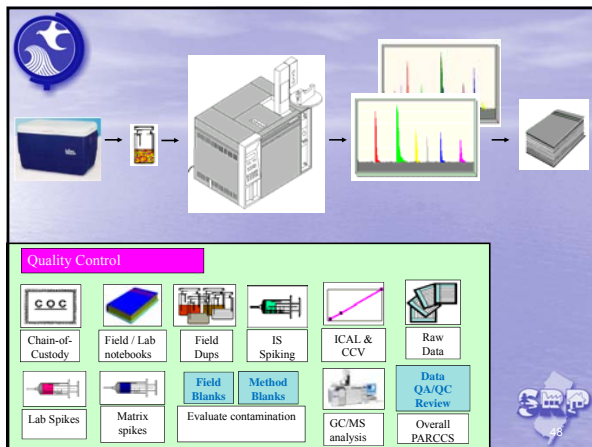
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**Quality Control**

Chain-of-Custody → Field / Lab notebooks → Field Dups → IS Spiking → ICAL & CCV → Raw Data → Data QA/QC Review → Overall PARCCS

Lab Spikes → Matrix spikes → Evaluate contamination → GC/MS analysis

Field Blanks → Method Blanks

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**QUESTIONS?**



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**Quality Assurance  
Project Plans**

Rodger A. Ferguson., Jr., CHMM LSRP  
*PennJersey Environmental Consulting*



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**Disclaimer**

There is an extremely small but nonzero chance that, through a process know as "tunneling," this presentation may spontaneously disappear from its present location and reappear at any random place in the universe, including your neighbor's cubicle. We will not be responsible for any damages or inconvenience that may result.

*The Journal of Irreproducible Results, Volume 36, Number 1 ,1991.*



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### Course Objectives

After this training, you will be able to:

- Discuss what information is required in a QAPP
- Describe your role and responsibility in the QAPP development, review, and approval process



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### What is meant by environmental data?

Information that describes environmental processes, locations or conditions, and health effects or consequences. It can be:

- Collected directly from measurements (primary data)
- Produced from models, or
- Compiled from other sources (existing or secondary data)



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### What is a Quality System?

- A structured and documented management system which has a system in place for ensuring the quality of its work process, products and services.
- The system describes the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of the organization



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## NJDEP Guidance Design

- Required by an USEPA Audit of NJDEP
- Program modeled after the MADEP LSP and CTDEP LEP guidance documents.
  - A QAPP has always been required by the TRSR
  - QAPP guidance modeled after USEPA Region II
  - Use of USEPA or the Unified Guidance is allowable in NJ
- The *Field Sampling Procedures Manual* is a critical component of data quality.




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## NJDEP Regulatory References

Current TRSR requires a QAPP

- **General Reporting Requirements 7:26E-1.6(a)4**
  - "Submit a quality assurance project plan prepared pursuant to N.J.A.C. 7:26E-2.2 with each remedial phase workplan and report required by this chapter..."
- **General Reporting Requirements 7:26E-1.6(b)9**
  - "A discussion of the usability of laboratory analytical data;"
- **Quality Assurance Project Plan 7:26E-2.2(a)**
  - "The person responsible for conducting the remediation shall prepare and follow a quality assurance project plan for *all sample and data collection*."

*This is nothing new, but some references changed.*




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## What does a QAPP do for you?

When you are asked:

- What did you do?
- How did you do it?
- Why did you do it?
- Did you do it correctly?

**The QAPP has the answer.**




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### Why do we want to do this?

- To protect the LSRP's professional opinion
- To protect the LSRP and PRCR's liability, and
- To assure that the data is defensible.




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### Case Study

- Electronic Manufacturing Corp of America (EMCA) operated at site from 1965 to 1985, when site was sold to Energy Components Company (ECC). Both companies went bankrupt in 1990.
- In 1991, chlorinated solvents discovered in water from city well field east of site.
- Waste oil contaminated with PCBs was sprayed on a dirt road for dust suppression.
- Problem: Determine if PCB contamination is present




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### Is this an acceptable QAPP?

**Project Scope**

This section provides a brief overview of the quality assurance/quality control (QA/QC) measures that will be implemented by [redacted] to ensure the validity of the data generated during the Remedial Investigation/Action soil sampling at [redacted]. This Quality Assurance Project Plan (QAPP) was prepared in accordance with N.J.A.C 7:26E-2.2

**Objective**

The objective of the soil sampling is to characterize/determine the extent of the contaminated soil [redacted] and to verify the remediation of the impacted areas.

**Laboratory**

Laboratory analysis for the project will be conducted by [redacted]. The laboratory deliverables are being validated by [redacted].

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 **Is this an acceptable QAPP? (Cont.)**

**Analytical Methods/Quality Assurance Summary Table**

Analysis	Media	EPA Method	Preservation	Holding Time	Container
SVOC	Soil	8270	cool to 4 deg c	14 Days (Extraction)	Amber Glass Teflon-lined cap
PP Metals	Soil	6610 7471 Hg	cool to 4 deg c	180 days (Extraction)	Amber Glass Teflon-lined cap
Pesticides	Soil	8081	cool to 4 deg c	14 Days (Extraction)	Amber Glass Teflon-lined cap
PCBs	Soil	8082	cool to 4 deg c	14 Days (Extraction)	Amber Glass Teflon-lined cap

**Sampling Methods**

All sampling will be conducted in accordance with NJDEP Field Sampling Procedures Manual (FSPM) August 2005 and NJDEP Technical Requirements for Site Remediation (TSR) November 2009. All sample locations will be documented in the site field book and will include sample depth, collection time, field screening equipment readings and observations/characterizations. Each soil sample collected for laboratory analysis will be clearly labeled and placed in a cooler at 4°C (wet ice) for transport to the laboratory.

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 **Is this an acceptable QAPP? (Cont.)**

**Conceptual Site Model (CSM)**

A Conceptual Site Model (CSM) will be designed as the initial step in developing a sampling plan for characterization. This model will identify all possible sources of PCBs, their release mechanisms, and classes of remediation waste potentially impacted. Characterization sampling to assess the nature and extent of PCB impacted materials will be performed as described in Subpart N (40 CFR 761.260). Core samples will be performed in accordance with 40 CFR 761.286. Verification sampling of PCBs will be performed after remediation to assess achievement of remediation goals as described in Subpart O (40 CFR 761.260).

**Sample Collection**

Soil borings were performed with a direct push truck mounted Geoprobe rig, using four (4) foot stainless steel macrocores. Stainless steel macrocores were field decontaminated after each use. A dedicated acetate liner was used in each macrocore and discarded after each use. The soil samples were collected using properly decontaminated and dedicated stainless steel trowels.

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 **Is this an acceptable QAPP? (Cont.)**

**Chain of Custody Procedures**

Upon completion of sample collection, a chain of custody for the samples will be completed by the sampler. The chain of custody will be maintained with the samples at all times. Strict chain of custody protocol will be maintained to ensure the validity of the data generated by the sampling activities. Every transfer of custody will be noted and signed for with a copy of the record being kept for each individual that endorsed it. The chain of custody record will always include the following information

- Contactor name and address
- Sample identification number
- Sample collection date and time
- Sample information (matrix type, analysis, number of containers etc.)
- Name and signature of sampler
- Signatures of all individuals who have had custody of the samples

**Sample Storage Procedures**

All sample holding times will be met. Chain of Custody procedures will be implemented to document and track the samples and temperature inside the shipping cooler was noted as 4 degrees Celsius upon receipt at [REDACTED]

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## Is this an acceptable QAPP? (Cont.)

**Laboratory Data Deliverable Format**

Laboratory data deliverables will be provide in a NJDEP reduced formst, in both paper copy and electronic Portable Document Format (PDF). Electronic Data Deliverables (EDDs) will also be provided with the required Dataset (DTST), Sample (HZSAMPLE) and Result (HZRESULT) files.

**NO**




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## Soil Results

Sample	S1		S2		S3		S4		S5		S6	
Date	10/02/13		10/02/13		10/02/13		10/02/13		10/02/13		10/02/13	
Depth (ft)	0.0-0.5		0.0-0.5		0.0-0.5		0.0-0.5		0.0-0.5		0.0-0.5	
	Results	Q	Results	Q	Results	Q	Results	Q	Results	Q	Results	Q
	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Aroclor 1016	0.174	U	0.0339	U	1.25	U	0.0344	U	0.0342	U	0.0692	U
Aroclor 1221	0.174	U	0.0339	U	1.25	U	0.0344	U	0.0342	U	0.0692	U
Aroclor 1232	0.174	U	0.0339	U	1.25	U	0.0344	U	0.0342	U	0.0692	U
Aroclor 1248	0.153	J	0.0339	U	1.25	U	0.0344	U	0.0342	U	0.1453	J
Aroclor 1254	0.0466	J	0.0339	U	1.25	U	0.0344	U	0.0342	U	0.0447	J
Aroclor 1260	0.0521	J	0.0292	J	1.25	U	0.0584	J	0.0339	J	0.0185	J
Aroclor 1262	0.174	U	0.0339	U	1.25	U	0.0344	U	0.0342	U	0.0692	U
Aroclor 1268	0.174	U	0.0339	U	1.25	U	0.0344	U	0.0342	U	0.0692	U
Total Aroclors	0.2517	J	0.0292	J	0		0.0584	J	0.0339	J	0.2085	J

The LSRP concluded that the compliance average of 0.09695 mg/kg is below SRS of 0.2 mg/kg total PCBs and issued the unrestricted use RAO.




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## Discussion

- What were the Data Quality Objectives?
- Would data collected using this QAPP be reliable and defensible?
- Does the LSRP or PRCR have liability?
- How is the LSRP vulnerable inadequate data are collected?


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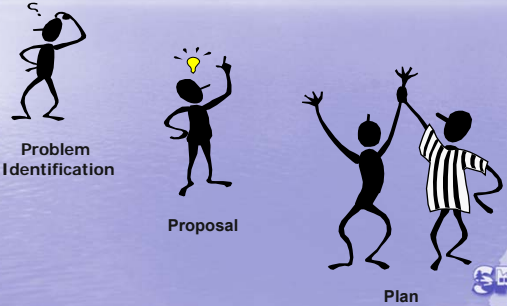
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### Preparing the QAPP



Problem Identification

Proposal

Plan



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
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### QAPP Elements

N.J.A.C. 7:26E-2.2

1. Problem definition;
2. Site specific project and data quality objectives;
3. Sample design and rationale, including where samples will be taken;
4. Names and contact information of the following project specific personnel:
  - i. Project manager;
  - ii. Quality assurance coordinator;
  - iii. Health and safety coordinator;
  - iv. Identification of laboratory(ies) that will be used for sample analyses including certification number(s); and
  - v. Laboratory contact;



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### QAPP Elements (Cont.)

5. A sample summary table containing (at a minimum) the following:
  - i. Matrix type;
  - ii. Analytical parameters;
  - iii. Number of samples for each matrix;
  - iv. Frequency of sample collection;
  - v. Number and frequency of field/trip blanks; and
  - vi. Number and frequency of duplicate samples;
6. A detailed description of sampling methodologies for each matrix tested along with standard operating procedures references;
7. Field documentation procedures;



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### QAPP Elements (Cont.)

8. A list of all field instrumentation being utilized;

9. Inclusion of a reference to a standard operating procedure that describes the operation of all field instrumentation being utilized including:

- i. Calibration procedures;
- ii. Calibration check procedures;
- iii. Proper usage;
- iv. Data recording;
- v. Preventative maintenance; and
- vi. A detailed description of field quality assurance/quality control procedures;



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### QAPP Elements (Cont.)


10. A detailed description of sample handling and chain-of-custody procedures;

11. A detailed description of field storage and transport procedures;

12. A sample container/preservation/holding time table including:

- i. Sample volumes to be collected per matrix;
- ii. Sample containers used per matrix;
- iii. Sample preservation required per method and matrix; and
- iv. Sample holding times;

13. An analytical methods summary table listing all analytical methods to be used to analyze all samples;



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### QAPP Elements (Cont.)


14. Project compounds summary including:

- i. List of compounds by method and matrix;
- ii. Project action limits by method and matrix; and
- iii. Project quantitation limits denoting analytical sensitivity requirements by method and matrix;

15. Measurement performance criteria and quality control samples to be used by method and matrix;

16. Quality assurance and quality control requirements for analysis;

17. Laboratory data deliverable formats to be used;



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### QAPP Elements (cont.)

- 18. Procedure for review (verification and usability procedures) including data assessment versus stated data quality objectives of laboratory data;
- 19. A discussion of how corrective action procedures are to be implemented and documented relative to potential deviations to the project quality objectives;
- 20. A detailed description of the laboratories quality assurance/quality control procedures; and
- 21. Data and records management and archive procedures.




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### Issues Addressed by a QAPP

The QAPP must provide **sufficient detail** such as:

- The project's **technical and quality objectives** – these must be well defined and agreed upon by all affected parties and stakeholders
- The **program-specific** and site-specific requirements (stipulated in consent decrees, records of decision, regulations, statutes, etc.).
- The **intended measurements**, data generation or data acquisition **methods** that are appropriate for achieving project goals/objectives.




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### Issues Addressed by a QAPP (Cont.)

- A summary of the assessment procedures for **confirming** that data of the type, quantity and quality required and expected were obtained, and
- A description of the process for evaluating the **limitations** on the use of the information or data obtained that includes identifying, documenting and communicating the limitations to all affected parties and stakeholders.




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### Some Cautionary Tips!!!

- Avoid using ***generic language*** that does not provide the required information or level of detail required.
- For projects requiring the generation of chemical or biological data, make sure that you ***produce a list of contaminants of concern*** – or ***identify the biological parameters of interest***.
- Make sure the ***QAPP is distributed to project personnel and laboratory staff***



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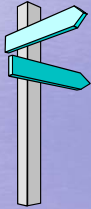
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### The Graded Approach

The level of detail in each QA Project Plan will vary according to the nature of the work being performed and the intended use of the data.



- highly detailed – complex site
- less detailed – less complex site



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### Components of a QAPP

According to USEPA, a QAPP is composed of approximately 25 elements that are grouped into four classes or categories as follows:

- Class A – Project Management
- Class B – Measurement/Data Acquisition
- Class C – Assessment/Oversight
- Class D – Data Validation/Data Usability



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## Project Management

- Administrative
  - Title and Approval Pages
  - Table of Contents (If > 10 pages)
- Project Definition/Background
  - Project Definition
  - Background
  - Project/Task Description
- Project/Task Organization
  - Project Team
  - Special Training Needs/Certification



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## Project Management

- Reporting, Documents, and Records



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## Measurement/Data Acquisition

- Data Quality Objectives and Criteria for Measurement Data - PARCCS
  - Precision
  - Accuracy
  - Representativeness
  - Comparability
  - Completeness
  - Sensitivity



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### Measurement/Data Acquisition

- Historical and Secondary Information / Data
- Investigation Process Design
- Investigation Methods
- Field Quality Control
- Field Instrument/Equipment Calibration and Frequency
  - Inspection/Acceptance of Supplies and Consumables
  - Sample Handling and Custody Requirements
  - Field Storage and Transport Procedures



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### Measurement/Data Acquisition

- Analytical Laboratory Requirements
  - Project Compounds, reporting limits and Analytical Summary
  - Analytical Quality Control
  - Laboratory Deliverables



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### Data Validation/Data Usability

- Data Review and Usability
  - Data Management
  - Data Verification and Usability
  - Reconciliation with User Requirements



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### Data Quality

- Data quality is meaningful only when "data quality" relates to intended use of data
- Some data are of adequate quality for some purposes but not for others
- Need to determine if the data are of the right type, quality, and quantity for their intended use



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### Data Quality Assessment

Decision maker's responsibility:

- Inspection of data for scientific anomalies
- Responsibility for transcription errors
- Assessment of effect of QA and QC deviations
- Professional contextual judgment



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### Assessment/Oversight

- Assessments
  - Performance and System Audits
  - Corrective Action Processes



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## Remember this???

**Project Scope**

This section provides a brief overview of the quality assurance/quality control (QA/QC) measures that will be implemented by [redacted] to ensure the validity of the data generated during the Remedial Investigation/Action soil sampling at [redacted]. This Quality Assurance Project Plan (QAPP) was prepared in accordance with N.J.A.C. 7:26E-2.2

**Objective**

The objective of the soil sampling is to characterize/determine the extent of the contaminated soil [redacted] and to verify the remediation of the impacted areas.

**Laboratory**

Laboratory analysis for the project will be conducted by [redacted]. The laboratory deliverables are being validated by [redacted].

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## How about this?

### This is the table of contents of an acceptable QAPP

<b>3.0</b>	<b>Quality Assurance Project Plan</b>	
3.1	Data of Known Quality	5
3.2	Data Quality Objectives	6
3.2.1	Precision	6
3.2.2	Accuracy	6
3.2.3	Representativeness	6
3.2.4	Comparability	6
3.2.5	Completeness	6
3.2.6	Sensitivity	7




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## Example QAPP TOC (Cont.)

3.3	Sampling Design and Rationale	7
3.3.1	Monitoring Process Design	7
3.3.2	Field QA/QC	7
3.3.2.1	Field Blanks	7
3.3.2.2	Trip Blanks	7
3.3.2.3	Field Duplicates	8
3.3.2.4	Matrix Spike/Matrix Spike Duplicates	8
3.3.3	Field Instrument/Equipment Calibration	8
3.3.4	Inspection/Acceptance of Supplies and Consumables	8
3.3.5	Sampling Handling and Custody Requirements	9
3.3.5.1	Sampling Locations and Identification	9
3.3.5.2	Sample Labeling	9
3.3.5.3	Chain of Custody	9
3.3.6	Field Storage and Transport Procedures	9




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### Example QAPP TOC (Cont.)

3.4	Analytical Laboratory Requirements	10
3.4.1	Certified Laboratory and Data Validator	10
3.4.2	Project Compounds and Analytical Summary	10
3.4.3	Analytical Quality Control	11
3.4.4	Laboratory Data Deliverables	11
3.5	Data Review and Usability	12
3.5.1	Data Management	12
3.5.2	Data Review	12
3.6	Assessment and Oversight	13
3.6.1	Performance and System Audits	13
3.6.2	Documentation	13
3.6.2.1	Report Retention	13
3.6.2.2	Field Log Books	13



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### Questions?



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### Data Quality Assessment and Data Usability

David Robinson, LSRP  
Synergy Environmental, Inc.  
[www.synergyenvinc.com](http://www.synergyenvinc.com)



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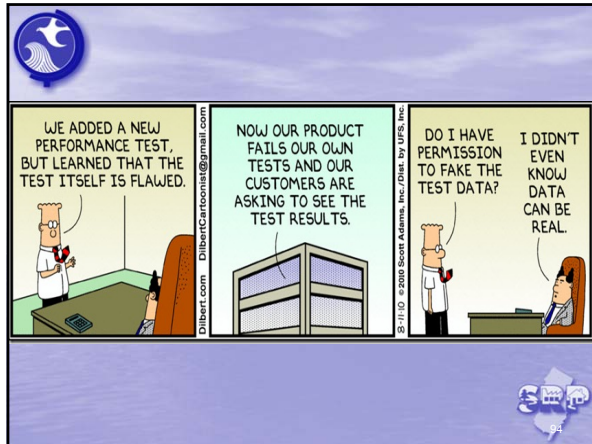
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### What is Data Quality Assessment

Data Quality Assessment (DQA) is the scientific and statistical evaluation of environmental data to determine if they meet the planning objectives of the project, and thus are of the right type, quality, and quantity to support their intended use.

-USEP QA/G-9R




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### Data Quality Assessment

- Process of identifying and summarizing QC nonconformances.
- DQA is not static – should be performed throughout the life of the project
  - Update the CSM
  - Update/add DQOs
- The Data of Known Quality Protocols Technical Guidance contains worksheets to assist in the DQA process
- Appendix B - Data Quality Assessment and Data Usability Evaluation Technical Guidance summarizes parameters required for DQA




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### Data Quality Assessment

- Data must be assessed based on the intended use of the data
  - Due Diligence
  - Site Investigation
  - Remedial Investigation
  - Closure
- Data does not exist in a vacuum
  - Need to know the context in which the data is going to be used in order to establish the metric for judging its usability

**Before we assess data we must collect data!**



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### Questions to Ask

- Can a decision be made with the desired level of certainty, given the quality of the data? **Protective of human health and the environment**
- How well did the sampling design perform? **Were the results "real" or artificial**
- If the same sampling design strategy is used again, would the data be expected to support the same intended use with the desired level of certainty? **Reproducible**
- Is it likely that sufficient samples were taken to enable the investigator to see an effect if it was really present? **False positive/negative**
- **Establish Data Quality Objectives**



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### Data Quality Objectives (DQOs)

- Developed to ensure that a sufficient quantity/quality of analytical data are generated to meet project goals and support defensible conclusions
  - Number of samples collected
  - Number of QC samples required
  - Reporting levels required
    - Applicable regulatory criteria
    - Including Non-Detects!



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### Questions Asked/Answered in DQO Process

- What is needed to complete the project phase?
- Why is it needed?
- How will I use the data?
  - Planning for additional investigation
  - Site closure
- What is my tolerance for error?
  - Will depend on phase of project
    - Generally more tolerance early (site investigation)



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### Data Quality Objectives (DQOs)

- Should be developed at the beginning of the project and included in the CSM
  - Number of samples collected
  - Number of QC samples required
  - Detection levels required
    - Applicable regulatory criteria
      - Including Reporting Limits!
    - Are you running the correct analytical methodology

**In order to develop sufficient DQO you need to understand uncertainty and where it comes from**



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### Uncertainty in Field and Laboratory

- Field
  - Historic data
  - Sample homogeneity
  - Cross contamination
- Laboratory
  - Sample/solvent measurement
    - Extraction
    - Dilution
    - Instrument introduction



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### Uncertainty Leads to Error

- Random Error
  - Unavoidable errors that are always present in any measurement. Impossible to eliminate, possible to minimize
- Systemic Error
  - Avoidable error due to controllable variables in a measurement
- The overall error is the sum of all the errors associated with sample collection and analysis
- You need to understand the impact of each uncertainty to establish Data of Known Quality (DKQ) to determine data usability




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### Minimize Uncertainty in the Field

- Establish exact (or at least close) sample locations
  - Survey
  - Measure
  - When all else fails, redo
- Follow the NJDEP *Field Sampling Procedures Manual*
  - Homogenization
  - Decontamination




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### Minimize Uncertainty with the Laboratory

- Use a NJDEP certified lab
  - NJDEP certifies per analyte/method
- Use a reputable lab
- Understand the lab's processes
 

receipt → prep → analysis → reporting
- Carefully review **all** information
  - Data, QC summaries, non-conformance summaries
- Communicate, communicate, communicate




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## Data Usability Assessment

- *Critical and required component for all analytical deliverables used in environmental decision making*
- **Answers the following questions:**
  - How will lab data be reconciled with the DQOs in the Sampling and Analysis Plan?
  - How will data quality issues be addressed?
  - How will the limitations on the use of the data be reported and managed by decision-makers?
- Review of field and laboratory information using Data Quality Indicators (DQI)




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## Data Quality Indicators

- **Precision**
- **Accuracy**
- **Representativeness**
- **Comparability**
- **Completeness**
- **Sensitivity**




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10. Were rejected data used? .....  Yes  No

If "Yes," please indicate reasons rejected data were used:

For Hex Chrome, data were rejected because spike recovery was less than 50%.

Data were rejected due to missing deliverables.

Data were rejected but an applicable standard exceedance exists.

Data were rejected in an early phase of a remediation, however, additional sampling and analysis are scheduled to be performed.

Other reasons not noted directly above. Explain:

11. Were the quality control criteria associated with the compounds of concern at the site met? .....  Yes  No

12. Were the QC Summary Forms reviewed? .....  Yes  No

13. Surrogate recoveries acceptable .....  Yes  No

14. Internal Standards acceptable .....  Yes  No

15. MS/MSDs acceptable .....  Yes  No

16. Tune summaries acceptable .....  Yes  No

17. Calibration summaries acceptable .....  Yes  No

18. Serial dilutions acceptable .....  Yes  No

19. Inorganic duplicates acceptable .....  Yes  No

20. LCS recovery acceptable .....  Yes  No

21. Other QC acceptable? .....  Yes  No

Provide a brief explanation if applicable:

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### Surrogates PARCCS

- Organic analyses
- Added to sample prior to preparation/analysis
- Not found in samples, but similar to target analytes
- Reported as Percent Recovery
  - Low recovery – sample concentrations may be higher than reported
  - High recovery – sample concentrations may be lower than reported
- Just because surrogates are outside of performance standards – data may still be usable




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### Internal Standard PARCCS

- Organic and inorganic analyses
- Generally added immediately prior to sample analysis
- Reference concentration that responses from target analytes are compared
- Not found in samples, but similar to target analytes
- Eliminates differences in random errors between samples and standards
- Reported as Percent Recovery
- Just because internal standards are outside of performance standards – data may still be usable




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### MS/MSD PARCCS

- Organic/inorganic analyses
- All compounds added to sample prior to preparation/analysis
- Reported as Relative Percent Difference (RPD)
  - High RPD
    - Sample homogeneity
    - Systemic errors
- If you want **site-specific** MS/MSD results you must send in separate samples for MS/MSD analyses




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### Tune Summaries **PARCCS**

- Makes sure that mass spectrometer is working properly
  - Organics
  - Metals
- If you are getting the data, the tune summaries should **always** PASS
- Systemic error – must be fixed prior to analysis
- If your samples are analyzed following a failing tune – good chance that the data is unusable



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### Calibration Summaries **PARCCS**

- All methods – need to compare your sample response to standard for quantitation
  - Directly (calibration curve)
  - Indirectly (IS response factor)
- Initial calibration, calibration verification, continuing calibration, etc.
  - Some (e.g., calibration verification) require different source
- Reported as Relative Response Factor, Relative Standard Deviation, Percent Deviation, Correlation Coefficient, etc.



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### Calibration Summaries **PARCCS**

- In general, there are so many analytes and several analytes that are "difficult", there will always be some that will be outside acceptable limits
  - Do these outages pertain to the contaminants of concern
  - Do these outages affect your decision making
    - Benzene detected at 40 ug/L – does it matter that the benzene CCV is out – maybe/maybe not
      - Need to look deeper into the data



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### Serial Dilution

- Metals analysis
- Performed on actual sample
- Reported as Percent Difference
- Very rarely is data rejected if serial dilution results are outside QC limits
  - Need to look deeper into the data
  - Data may be qualified



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### Inorganic Duplicates

- Performed for inorganic analyses
- Performed on site sample
- Reported as Relative Percent Difference (RPD)
  - High RPD
    - Sample homogeneity
    - Systemic errors
- If you want **site-specific** results you must send in separate samples for duplicate analyses



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### Laboratory Control Sample (LCS)

- Organic and inorganic analyses
- Must contain all target analytes
- Reported as Percent Recovery
- In general, there are so many analytes and several analytes that are "difficult", there will always be some that will be outside acceptable limits
  - Do these outages pertain to the contaminants of concern
  - Do these outages affect your decision making



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### Other Quality Control

- Method Blank – Accuracy
- Field Blank – Accuracy/Sensitivity
- Trip Blank – Representativeness
- Temperature Blanks - Accuracy
- Field Duplicates – Accuracy/Representativeness
- Sample Preservation – Accuracy
- Holding Times – Accuracy/Sensitivity

See the DKQP Tables for method specific guidance



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### DQA Process

- Laboratory narrative/nonconformance summary and analytical data package should be reviewed when it is received
  - Pay particular attention to QA/QC indicators (PARCCS)
- Make sure data meets DQOs established in the QAPP
- Communicate with the Lab
  - Question QA/QC outages
  - Make sure you understand the data



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### DQA Process

- Based on the DQA, additional activities may be required
  - Resampling
  - Change in future sample locations/parameters
- Summarize the DQA in a way that will make the Data Usability Evaluation (DUE) simple and straight forward
  - Appendix D of the *Data Quality Assessment and Data Usability Evaluation Technical Guidance* contains example worksheets
- Once the DQA is complete, the *Data Usability Evaluation* can be performed



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### Data Usability Evaluation

- The Data Usability Evaluation (DUE) is used to determine if the analytical data are of sufficient quality for their intended purpose and can be relied on to support conclusions made by the data user
  - Will remediation be conducted?
    - Use information to minimize QC issues for performance samples (e.g., post-excavation)
  - Are there significant QC outages?
    - Immediately discuss with laboratory
    - Data may be unusable
  - Can you use the data for its intended purpose even with QC outages?



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### Evaluating Significant QA/QC Variances

- Some outages are so significant that the data are virtually unusable without substantial justification
  - Failure to perform proper calibrations at the regulated frequency
  - Failing mass spectrometer tunes
  - MDLs greater than the regulatory standard
  - Non-detects at RLs significantly above the regulatory standard



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### Decision Making in the DUE

- Determining that qualified data is usable
  - Improper sampling
    - Non homogenization of soils
    - Collection time of vapor samples
  - Missed holding times
    - Field and laboratory
  - Blank contamination
  - Improper bottleware
  - Improper sample preservation



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### Decision Making in Rejecting Data

- Sometimes, unqualified "valid" data may be rejected based on professional judgment
  - You expect a sample to be severely contaminated and it comes out clean
    - Mix up in sample labeling
    - Mix up in the lab
  - Low percent solids
    - Will have elevated RLs
    - May want to phase separate, perform different analysis
  - Suspected data fraud – Report it!
    - Contact NJDEP OQA



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### Conclusions

- Determining DQOs prior to each phase of a project is critical to efficient investigation/ remediate
- DQOs should be constantly re-evaluated
- Perform DQA as soon as you receive the data so you can make "real-time" adjustments



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### Conclusions

- Almost all data will be usable in some fashion or another
  - Contamination well above the regulatory standard
- As you get closer to project closure, the tolerance for qualified data should get smaller
- The tolerance for qualified data should be less when sensitive receptors are involved



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