Chapter 1
U.S. ARMY CORPS OF ENGINEERS CHEMICAL DATA QUALITY MANAGEMENT PROCEDURES AND NOTIFICATIONS

1-1. Introduction. Execution of the USACE Chemical Data Quality Management (CDQM) program for HTRW contamination requires the interface and coordination of several Corps personnel. Procedures and responsibilities for USACE staff performing government CDQM activities are defined and detailed in this Chapter. The USACE project manager (PM) is responsible for initiating and coordinating the defined CDQM activities.

1-2. Goals of the CDQM Program. The goals of the USACE CDQM program are to: 1) generate data of acceptable quality for the intended use; 2) satisfy the needs of the customer and the regulators; 3) generate sufficient data of known quality on the first attempt; and 4) provide an historical record for potential future use. When CDQM is used properly, the PM can readily measure the success of the team in meeting the project-specific DQOs. The USACE CDQM program consists of activities presented in ER 1110-1-263, CDQM for Hazardous Toxic and Radioactive Waste Remedial Activities, Engineer Manual (EM) 200-1-1, Validation of Analytical Chemistry Laboratories, EM 200-1-2, Technical Project Planning Guidance for HTRW Data Quality Design, and EM 200-1-3, Requirements for the Preparation of Sampling and Analysis Plans (SAPs).

1-3. Technical Project Planning. Each district is responsible for assessment of chemical data quality, including determination of data useability and DQO attainment. The district project chemist is a critical team member for this effort, and must be involved in preparation and review of project documents including scopes of work, SAPs, contract specifications, and final chemical data reports. The district project chemist must be involved at each step of an HTRW project, so that adequate data quality is maintained. The TPP process for design of DQOs is described in EM 200-1-2.

1-4. CDQM Activities. All HTRW projects require a comprehensive and multifaceted approach to QC and QA in order to achieve and document attainment of appropriate quality for the intended data usage. The district project chemist is the focal point to ensure that chemical data meet DQOs for each HTRW project. The district project chemist has several techniques to monitor and ensure the quality of chemical data. The district project chemist in conjunction with other members of the TPP team determine the appropriate level of compliance monitoring as discussed in ER 1110-1-263, Appendix A. This determination should be based upon the intended use of the data and the degree of confidence needed in the quality of the data. Compliance monitoring may consist of a combination of activities. Described below are twelve (12) activities that may be applied on a project-specific basis to assist in generating data of known quality. The twelve CDQM activities, their relative cost, and typical use are summarized in Table 1-1.

a. Validation of Primary and QA Laboratories. In general, commercial and government laboratories that support the USACE HTRW program should obtain a USACE laboratory validation prior to field studies or sample analysis. The QA laboratory is defined as the Chemistry and Materials Quality Assurance Laboratory (CMQAL), located in Omaha, Nebraska or a subcontracted agent that is responsible for analysis of the project QA samples. For some data uses, other programs (*i.e.*, State Fuel Storage Tank Program, A2LA, Navy and Air Force Installation Restoration Program (IRP) Audits) can be utilized. Projects should not be implemented without utilization of information from some accreditation authority. Validation should be maintained throughout the duration of the project. The USACE laboratory validation program is project specific. The validation is a parameter, method, and matrix-specific approval. For each new contract or delivery order awarded during the validation period, a project-specific request for validation should be sent to CENWO-HX-C (Corps of Engineers, Northwestern Division, Missouri River Region, HTRW-Center of Expertise, Chemical Data Quality Management Branch) for verification of laboratory status regardless of their expiration date on the list of validated laboratories. The primary objectives of the USACE laboratory validation program are to communicate to analytical service providers the USACE QC/QA requirements, verify the laboratories are performing specified analytical methods, and to ensure these laboratories meet the USACE requirements prior to sample analysis. Laboratory validations are performed under the administration of the HTRW-CX applying guidance outlined in EM 200-1-1. The USACE validation program is primarily based on SW-846 methods. The first step of the validation program is a paper review of the laboratory's capabilities to ensure that the proposed laboratory has the facility, equipment and personnel to meet the project required analyses. The laboratory must demonstrate capabilities by providing acceptable standard operating procedures (SOP) and successfully analyzing project required performance evaluation (PE) samples. The final step of the validation program is an on-site inspection of the laboratory's facility. Validation can be terminated at any step of the process due to inadequate laboratory documentation performance and/or execution. No notice or short notice on-site audits of facilities listed as USACE validated are available, but require the participation of at least one member of the project planning team.

b. Technical Document Review. The roles and responsibilities for document review are defined in the Environmental Cleanup and Protection Management Plan for Military Programs, 17 January 1996 and Corps of Engineers, Military Programs Directorate, Environmental Division, Policy and Technology Branch (CEMP-RT) Memoranda: 1) Environmental Cleanup and Protection Management Plan for Military programs, 17 January 1996; and 2) Technical Roles and Responsibilities for the USACE HTRW Program, 23 September 1997 (herein referred to as the HTRW Management Plan).

(1) HTRW Project Technical Verification Process. It is the responsibility of the contractor and the district to produce a quality product. Rather than employing multiple levels of detailed document review to ensure quality, the technical verification process transfers project

responsibility to the district and its contractors. In general, the HTRW design district is responsible for a QC review of the prime contractor's QC Plan and all project-specific deliverables. QC Plans, scopes of work, and other project documents completed in-house should be reviewed by an independent technical review function established by the design district. The Major Subordinate Command (MSC) will provide oversight of the district's QC process. Only inventory project reports for the FUDS program require approval at the division level. Districts may request HTRW-CX participation in a design district's independent technical review process. The MSCs may request HTRW-CX support in performing QA oversight and audits of HTRW design districts QC processes. HTRW-CX review is required on Category B projects (see below).

(2) HTRW Project Technical Categories. The HTRW design district screens each HTRW project against the decision tree criteria provided in Attachments 1 and 2 of the Management Plan to determine the appropriate review process. Category A includes all routine HTRW (as defined in the Management Plan), and all projects in the Preliminary Assessment(PA) phase and those beyond the Site Inspection (SI) or Resource Conservation Recovery Act (RCRA) Facility Assessment (RFA) phase. Category A excludes, however, National Priorities List (NPL) sites, Base Realignment and Closure (BRAC) sites, sites where innovative technologies are used, and sites with construction estimates greater than $5 million. Category B includes all projects not in Category A, and any projects of special district, MSC, or HQ concern.

(3) Roles and Responsibilities for Review of Specific HTRW Products. Review responsibilities will vary depending on the category (Category A or Category B) of projects. The HTRW design district is responsible for all reviews of projects in Category A (Attachments 1, 2, and 3 of the Management Plan). Key documents for projects in Category B will be reviewed and approved by the HTRW design district and reviewed by the HTRW-CX. The PM provides appropriate technical documents to the HTRW-CX and QA laboratory for their information or review. Technical chemistry review by the HTRW-CX will be completed within two weeks for a Scope of Work and within three weeks for all other documents from time of receipt. If shorter review times are required, the PM coordinates with the Technical Liaison Manager (TLM) at the HTRW-CX. Comments from the HTRW-CX will be provided to the PM for all projects reviewed. A copy of all review comments and responses is placed in the permanent project file. Districts/centers with insufficient staff chemist resources to provide in-house review should rely upon the military design district, CMQAL or the HTRW-CX for document review. Note only certain key documents have been identified for HTRW-CX review as Category B projects; these are identified in Table 2 of the Management Plan. In addition, Chemical Quality Assurance Reports (CQARs)(Chapter 4) and Chemical Data Quality Assessment Reports (CDQARs) (Chapter 5) from all projects will be sent to the HTRW-CX. The HTRW-CX is responsible for 10% review of both CQARs and CDQARs. A summary of the reviews will be sent quarterly to CEMP-RT by the HTRW-CX.

c. Sample Handling Quality Assurance. The QA laboratory provides quick feedback regarding problems with sample shipments. The QA laboratory is responsible for checking the sample shipment for temperature, proper preservatives, correct containers *etc.* The Technical Manager (TM) or district project chemist is then notified within 24 hours regarding the status of the sample shipment via facsimile, electronic mail or telephone call. For most projects, this is beneficial because problems are detected and resolved while the sampling team is still in the field. This approach reduces the re-mobilizations to the field. The CMQAL or contract QA laboratory, and the primary laboratory complete and report a “Cooler Receipt Checklist" for all shipments sent to the laboratory. An example cooler receipt checklist is found in EM 200-1-1. A chain-of-custody (CoC) record must be initiated at the sampling stage and maintained throughout the analysis and reporting stages of the process. Sample reports must be easily traceable to CoC records. All documentation pertaining to sample receipt or analysis should be included in the laboratory's data report. If this function is performed without analysis of QA samples, samples must either be shipped back to the project site or additional funds provided to properly dispose of samples.

d. QA Sample Collection and Analysis. QA sample collection and analysis is the main tool to determine that the data generated by primary laboratories is technically valid and of adequate quality for the intended data usage. Based on the needs of the project, a percentage of samples are homogenized (except samples for volatiles testing, which are co-located), split, given a unique sample identification (ID) and sent to a primary contract laboratory and to a QA laboratory for analysis. QA sample collection does not have to be performed at the same frequency or rate for all test parameters, on all matrices, during all project phases, nor for any one type of project. General considerations should include: 1) the data use and users as defined by the project-specific DQOs; 2) the total number of samples being generated (*e.g.*, a larger number of total samples collected may lower the percentage of QA samples needed); and 3) the need for statistically significant information from QA sample data. Ideally, the USACE QA sample collection and analysis program is an interactive process whereby the QA laboratory in conjunction with the TM or district project chemist detects and solves problems as sampling and analysis occurs to ensure that the data generated for the project meets the project DQOs. The “value added” by this program can be divided into two areas.

(1) Detecting Analytical Problems. A primary function of the QA laboratory is to analyze samples as prescribed by the project and produce a data package that is reviewed real-time (at the bench during the time of analysis) for later comparison to the primary laboratory’s data. Analysis and comparison of the QA sample data to the primary sample data can reveal problems with primary laboratory data even when all other data quality measurements are in control. A common problem is over-dilution of semi-volatile organic analytes by the contract laboratories. Analysis by the QA laboratory can help in deciding whether this was due to actual matrix effect or due to inadequate sample cleanup by the primary laboratory.

(2) Salvaging Data Useability. When the data comparison shows good correlation between the QA laboratory and primary laboratory data, this may bolster the credibility and useability of the data generated by the primary laboratory. This is especially true in cases where primary laboratory data comes under close scrutiny and fails some data quality criteria. Good correlation also reflects consistency in the sampling process, the lack of which is a major source of error or variation. The criteria that establish acceptable correlation between project, QC and QA sample results are described in Chapter 4.

e. Chemical Quality Assurance Reports (CQARs). CQARs are usually prepared by the CMQAL. The CQAR documents review of the QA laboratory data and the corresponding primary laboratory data. Data for project samples, QC samples and QA samples are compared, and the impact on the primary laboratory's data is documented. CQAR format is discussed in Chapter 4.

f. Chemical Data Quality Assessment Reports (CDQARs). CDQARs are prepared by the district project chemist. The CDQAR documents data useability, DQO attainment, and contract compliance. CDQAR format is discussed in Chapter 5.

g. Single or Double Blind PE Sample Analysis. Another means of testing the analyst’s proficiency in identifying and quantifying analytes of interest is the use of single or double blind PE samples. The composition of PE samples is known to the originator, but not the analyst. In a single blind PE sample, both the originator and the analyst know that the sample is a PE sample. The USACE uses single blind PE samples as part of the process to validate laboratories. In a double blind PE, the sample is containerized, labeled, and submitted as an environmental sample. The analyst does not know that the sample is a PE sample; ideally, the PE sample will be indistinguishable from the other project samples. The use of double blind PE samples is considered a more effective way of detecting problems, since the laboratory would not be aware that it was being evaluated. However, it may be difficult to disguise a standard reference sample as a project sample. PE sample data are evaluated for compound ID, quantitation, and sample contamination. PE samples are recommended for sites that have the potential for a majority of non-detects, or for sites where the contaminants of concern have already been identified. Currently, the complete range of organic and inorganic PE samples are available for water only. Selected organic and inorganic PE samples are available for soil.

h. Review of Primary Laboratory Data. An independent data review of the entire primary data set should be performed by the prime contractor for contracted projects. In addition, the district project chemist or QA laboratory should review a portion of the primary laboratory data. The percentage of primary laboratory data reviewed by the government depends upon the project-specific DQOs. The district project chemist or CMQAL should review all the primary laboratory data for in-house projects. Data review is conducted to ensure that: 1) QC data provided in the laboratory deliverables are scientifically sound, appropriate to the method, and

completely documented; 2) QC samples are within established guidelines; 3) data were appropriately flagged by the laboratory; 4) documentation of all anomalies in sample preparation and analysis is complete and correct; 5) corrective action forms, if required, are complete; 6) holding times and preservation are documented; 7) data are ready for incorporation into the final report; and 8) data package is complete and ready for data archive. Details of the data review process are described in Chapter 3.

i. Validation of Data. Data validation is the process of data assessment in accordance with EPA regional or national functional guidelines or project-specific guidelines. Data validation includes assessment of the whole raw data package from the laboratory.

j. Field Audits. Sample collection field oversight is discussed in detail in Chapter 6. Audits should be performed on both an announced and unannounced basis, and should be coordinated with government geotechnical personnel, as appropriate. Audits may be performed during any stage of the project.

(1) Procedures. The auditor is responsible for checking that samples are collected and handled in accordance with the approved project plans and for confirming that documentation of work is adequate and complete. Specifically, the auditor should ensure that performance of field activities satisfies the project DQOs. Original records generated for all audits are retained within permanent project files. Records may include audit reports, written responses, record of the completed corrective actions, and documents associated with the conduct of audits that support audit findings and corrective actions. Checklists included in Chapter 6 can be used to guide performance of a field audit. For construction activities, the audit should assess the prime contractor's implementation of the three-phase chemical data control process. Details on contractor QC of field activities are found in EM 200-1-3.

(2) Personnel. Trained and experienced personnel should perform the field audits. These personnel should be knowledgeable in the subjects necessary for assessing the quality of the work being observed, including thorough knowledge of the contractual requirements. Preferably, field audits should be carried out by government personnel. The field audits may be performed by contract personnel with some objective relationship to the work being conducted in the field (*e.g.*, a prime contractor auditing its subcontractors).

(3) Desk Audit of Field Activities. Another mechanism for auditing field activities as they occur is to include government technical review of Daily QC Reports and field logs while the contractor is in the field. Desk audits of field activities require that these reports be supplied on a periodic basis (*e.g.*, daily or weekly) to the USACE technical staff. The requirement for periodic reporting must be included in the contract specifications or project delivery order, as well as in the project work plans. Since the contractor knows of this reporting requirement, it is not possible to perform an unannounced desk audit of field work.

k. Laboratory Audits. The primary and QA laboratories are responsible for maintaining detailed procedures to support the validity of all analytical work. Laboratory audits may consist of on-site inspections and/or analysis of PE samples. The audit verifies the laboratory's continuing ability to produce acceptable analytical data. If a performance problem is identified for sample analysis or data reporting, the HTRW-CX reserves the right to audit the laboratory anytime during the eighteen month period of validation. Laboratory audits may be carried out on either an announced or unannounced basis. More detail on this type of audit is found in EM 200-1-1.

l. Tape Audits. The purpose of a raw data review (tape audit) is to assess the quality of the data and to evaluate the overall laboratory performance. This information is then used by the data user to evaluate data quality and make a determination on the acceptability and the useability of the data. The tape audit is designed to independently verify the data reduction practices of an individual laboratory. All of the raw data from a given batch is recalculated by the evaluator and is compared to the results reported by the laboratory. The data quality is measured by laboratory compliance with the required methods and acceptable laboratory practices for analysis and for data reduction. Tape audits can only be performed when a specific analytical instrumental raw data output has been stored electronically. To implement this type of audit the contract must require the laboratory to provide electronic data (*i.e.*, magnetic tapes) needed to perform the audit. In addition, a means to read the data must be made available.

1-5. Primary CDQM Activities. While all twelve of the CDQM activities discussed in the previous section may be used on a project, six of the twelve should be used on most projects. The six primary CDQM activities for USACE HTRW projects are 1) validation of primary and QA laboratories, 2) technical document review, 3) sample handling QA, 4) QA sample collection and analysis, 5) preparation of CQARs by a qualified entity, and 6) preparation of CDQARs by the district project chemist. These elements should routinely be considered as candidates for inclusion in each project's set of CDQM activities.

a. Documentation of Selected CDQM Activities. The CDQM activities selected for each project shall be documented in the project-specific DQOs. A recommended procedure for documentation of the CDQM process is presented in American National Standard, Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs (ANSI/ASQC E-4-1994).

b. Waiver of CDQM Activities. ER 1110-1-263 allows for any aspect of the program to be waived except for the DQO element specified in ER 1110-1-263 Section 7.b. ER 1110-1-263 states that all other CDQM elements may be waived for a specific project by the district PM with concurrence from the technical project team as defined in EM 200-1-2. The intent of ER 1110-1-263 is to provide a flexible CDQM program that produces data of known quality to satisfy the project-specific DQOs.

c. Documentation of Waiver. If the district project chemist in conjunction with the PM and technical project team decides not to use all of the six primary CDQM elements discussed above, a memorandum for record (MFR) is required. The district PM must document in the MFR what procedures will replace the waived compliance monitoring activity and demonstrate the concurrence of the technical project team including the district project chemist. The district project chemist will typically be tasked by the PM to prepare this documentation. The MFR should include the PM's signature and the project team's concurrence along with the following elements: 1) brief description of the project; 2) summary of the project objective; 3) description of the waived CDQM activities; and 4) description of alternate procedures to ensure data quality. Districts with insufficient staff chemist resources to provide technical team support should rely upon other HTRW design districts, the CMQAL, or the HTRW-CX for chemistry support.

1-6. Use of QA Samples by Project Phase. The use of QC and QA samples is a particularly powerful tool for maintenance of data quality. With primary, QC and QA data for a single sampling point one may perform both inter-laboratory and intra-laboratory data comparisons. In addition, QA samples may provide unique indications about the quality of the primary laboratory's data. The following sections describe the use of QA samples in various project phases.

a. Investigative Phase. The use of QA samples during the investigative phase adds value by verifying the analytes of concern and quantifying the levels of contamination. In general, QA samples are targeted in locations of known or expected contamination. If the primary and QA laboratory data are comparable, then this provides an additional level of confidence that the correct action was taken. If the primary laboratory data does not compare with the associated QA laboratory data, then this assures that the data from the site will be completely evaluated prior to a decision. In addition, the QA laboratory data yields information regarding the spatial heterogeneity of the soil contamination.

b. Pre-Design Phase. The pre-design phase of the HTRW program consists of bench and pilot scale studies. If data generated from these activities are used to size the system, accuracy of results is critical. Any false positive or false negative from the bench or pilot study could result in costly changes following construction of the completed system. QA sample collection provides a verification of the prime contractor's results for use in their design.

c. Remedial Action Phase. The remedial action phase of the HTRW program consists of treatment system analytical support. Verification of results from the actual treatment operations is a critical check for long-term operation of the system. QA samples would be useful during the early stages of the project when the system is optimized or at stages of major equipment changes. Many treatment systems focus on discharge quality, and verification of the results aids in the acceptability by the regulators.

d. Post-Remedial Action Monitoring. The post-remedial action phase of the HTRW program typically includes post-excavation confirmation sampling and/or treatment system analytical support. QA sample checks on post-excavation samples can bolster regulator's confidence in the effectiveness of remediation. Analytical support during the operation and maintenance (O&M) phase can last up to thirty years in the case of long-term monitoring. In all likelihood, the primary laboratory would change several times during the course of a long-term monitoring project. Use of the same QA laboratory would be instrumental in providing continuity from one laboratory's results to another and for resolving problems that inevitably arise when a large volume of data is collected over a long period of time.

1-7. Omission of QA Samples. For certain projects, QA samples may not be the best method of ensuring attainment of DQOs. The decision to omit QA samples for a given project must be made by the district project chemist in conjunction with the PM and technical project team. Omission of QA samples should be based on meeting project objectives and goals, rather than simply to reduce cost. The district chemist must balance the need to maintain quality with the need to perform work for a reasonable cost. The project categories that may not be good candidates for QA sample collection are described below.

a. Underground Storage Tank (UST) Removals. Samples collected to meet state or federal requirements pertaining to UST removals may omit QA samples if regulatory deadlines preclude the QA process.

b. Lead Paint Testing. Construction building material and debris sampling to test for leaded paint is not generally considered to be HTRW work. Samples of building materials or debris collected solely to test for the presence of leaded paint will not typically benefit from use of QA samples.

c. Asbestos Testing. Construction building material and debris sampling to test for asbestos is not generally considered to be HTRW work. Samples of building materials or debris collected solely to test for the presence of asbestos will not typically benefit from use of QA samples.

d. Process Monitoring. Samples collected to demonstrate the day-to-day efficacy of intermediate steps during a treatment process will not typically employ QA samples. However, collection of QA samples from the treatment system influent and discharge locations is recommended on an occasional basis.

e. Waste Characterization. Samples collected of drummed materials, tank contents, barrels, and similar materials for hazardous waste profiling do not usually employ QA samples.

f. Treatability Studies. Samples collected as part of a treatability study to demonstrate the efficacy of a remedial process do not usually employ QA samples. QA samples are

recommended for optimization studies.

g. Air Samples. Samples collected as part of an ambient air monitoring program usually do not employ QA sample collection. Specifically, this would apply to co-located air samples for both gas phase and particulate related components since co-located samples are not homogeneous. Gas phase samples collected with a split sampling device are likely to be homogeneous, and QA samples may provide added value.

h. Wipe Samples. Wipe samples (*i.e.*, for polychlorinated biphenyls (PCB) analysis) will not usually benefit from QA sample collection since co-located wipe samples are not identical.

i. Non-routine Methods. Certain methods are experimental, or laboratory-specific, and it is not possible to replicate them in a QA laboratory. If duplication of the method is difficult, QA samples are not usually employed.

j. Screening Data. Samples collected as part of a screening program usually do not employ QA sample collection. This would include screening data generated from immunoassay test kits, x-ray fluorescence, colormetric, or field gas chromatography analyses.

1-8. Fraud Deterrence. Although not specifically designed to detect fraud, the USACE QC/QA program of laboratory validation, auditing (laboratory and field), sample receipt inspections, and review, verification, and/or validation of project, QC and QA data serves as a creditable deterrent to fraud.

1-9. Training. A number of training sessions are available (both internal and external to USACE) to provide the needed understanding of the principles and proper execution of the USACE CDQM program. USACE staff are encouraged to avail themselves of this training as appropriate.

1-10. Procedures for CDQM by Project Phase. The following outlines the procedures for CDQM for the investigative, pre-design and design, and remedial or removal action phases of the USACE HTRW program. The outlined activities demonstrate use of the six primary CDQM activities described in Section 1-5 and the technical document review process for Category A projects described in Section 1-4.b.

a. Investigative Phase. The investigative phase of the HTRW program consists of site characterization, engineering analysis, risk assessment, potentially responsible party (PRP) data gathering, and regulatory analysis. The investigative phases from the CERCLA process are the PA/SI and the Remedial Investigation/Feasibility Study (RI/FS). The investigative phase from the RCRA process are the RCRA Facility Assessment (RFA), RCRA Facility Investigation (RFI) and the Corrective Measures Study (CMS). The investigative phase of the FUDS program is

executed consistent with, but not identical to, the CERCLA process. For non-time critical removal actions, a PA/SI is performed initially and is followed by an Engineering Evaluation/Cost Analysis (EE/CA). The EE/CA takes the place of the RI/FS.

(1) HTRW design district writes Scope of Services. For Category B projects (see paragraph 1-4.b.(2)), the HTRW design district submits Scope of Services to HTRW-CX for review.

(2) HTRW design district solicits prime contractor services.

(3) HTRW design district negotiates and awards contract or delivery order.

(4) Prime contractor identifies primary laboratory to the district.

(5) The PM, TM or district project chemist requests validation of the primary laboratory by the HTRW-CX via electronic mail or facsimile.

(6) The HTRW-CX follows the process described in EM 200-1-1 to validate the laboratory. If the laboratory has not previously been validated by the HTRW-CX, the district project chemist should screen the laboratory to determine if its technical capabilities merit validation. Depending on the laboratory's validation status, some or all of the following procedures may be omitted. If requested by the HTRW-CX, the primary laboratory submits its Laboratory Quality Management Manual (LQMM) or Quality Assurance Plan (QAP), a representative SOP; to demonstrate the laboratory has the capability to run the required methods, and petroleum hydrocarbon SOPs (if necessary) to the HTRW-CX. Based on satisfactory review of the QAP and SOPs, PE samples are sent if available. The laboratory is then inspected by HTRW-CX. Personnel from the HTRW design district and CMQAL will be notified of a scheduled inspection and may assist with this process. If the laboratory fails to become validated, another laboratory should be selected.

(7) The prime contractor submits the SAP, consisting of a Quality Assurance Project Plan (QAPP) and a Field Sampling Plan (FSP), for HTRW design district's approval. Other environmental regulatory programs may require different documentation than a SAP. For Category B projects (see paragraph 1-4.b.(2)), the HTRW design district sends SAP to HTRW-CX and HTRW-CX reviews the SAP and makes recommendations to HTRW design district.

(8) From the SAP, the HTRW design district or the CMQAL makes an estimate of the cost of QA sample analysis. The budgeted amount must be funded by the HTRW design district to the CMQAL prior to sending samples for QA analysis. The QA laboratory must also be notified that QA samples will be sent. The HTRW design district must provide the QA laboratory with the following information: 1) project name; 2) approximate sampling dates; 3) number of samples; 4) matrix (matrices); 5) analyses; 6) DQOs; and 7) turnaround time. An example checklist to

submit this information is included as Figure 1-1.

(9) Field work begins after SAP is approved by the HTRW design district.

(10) The TM or district project chemist coordinates with the prime contractor for field and laboratory activities. Samples are collected in the field with project and QC samples sent to the primary laboratory and QA samples sent to the QA laboratory. QA samples are sent to the QA laboratory throughout the duration of the sampling effort or as defined by the project objectives.

(11) The primary and QA Labs should be notified upon final shipment of project samples.

(12) Prime contractor's analytical results are submitted to the HTRW design district within the time frame identified in the contract. The analytical results that correlate with the QA samples are sent to the CMQAL at the same time.

(13) The QA laboratory or another qualified entity prepares the CQAR and submits it to the HTRW design district and the HTRW-CX. The HTRW design district provides the CQAR to the prime contractor for inclusion in the project report.

(14) Prime contractor prepares the draft project report and submits it to the HTRW design district. The project report should include the CQAR, as well as the contractor's assessment of the primary laboratory data. The report is reviewed by the same office(s) that reviewed the SAP.

(15) District project chemist writes the CDQAR addressing data useability and DQO attainment from information received from the prime contractor and the CQAR. CDQARs must be prepared for all in-house and contractor executed projects. CDQARs will be sent by the HTRW design district to the HTRW-CX for all projects.

b. Pre-Design and Design Phase. The pre-design and design phase of the HTRW program consists of remedial action selection and design. The CERCLA design phase is remedial design (RD). The corresponding RCRA phase is called the Corrective Measures Design (CMD). The following outline applies when the design is prepared by a contractor. Modifications will be required if the design is performed in-house.

(1) Design district writes Scope of Services. For Category B projects (see paragraph 1-4.b.(2)), the HTRW design district submits Scope of Services to HTRW-CX for review.

(2) Design district solicits prime contractor services.

(3) Design district negotiates and awards prime contractor design contract or delivery order.

(4) If investigative activities are included in the design contract, steps 4-15 of paragraph 1-10.a. should be followed.

(5) Prime contractor submits Design Analysis Reports that contains a section that specifically addresses chemical quality management concerns. The prime contractor also submits plans and specifications which include chemical quality management at the preliminary, intermediate, and final phases. For the Total Environmental Restoration Contract (TERC), the prime contractor submits a Work Plan for each delivery order. All these documents are submitted by the prime contractor for HTRW design district's approval. The chemical section of the plans and specifications or work plan should give the construction contractor instructions for writing the SAP in addition to including all necessary site-specific chemical detail. For Category B projects (see paragraph 1-4.b.(2)), the HTRW design district submits these documents (to include the design analysis, plans and specifications, and the work plan) to the HTRW-CX for technical review, and comments are sent back to the design district.

(6) Design district assures that appropriate comments are addressed and incorporated into the documents. Revised documents and annotated comments are sent to the offices generating comments at the next submittal stage.

(7) Final (100%) plans and specifications are approved by the design district. From the contract specifications, a preliminary estimate is made of the funding required to support specified QA activities. The district advertises and awards the construction contract. For a Request for Proposal (RFP), the district solicits proposals from construction contractors. The district technical team evaluates the proposals and selects a contractor. Several other contracting mechanisms (*i.e.*, Invitation for Bid (IFB), cost-plus, *etc.*) exist that could be used instead of the RFP.

c. Remedial or Removal Action Phase. Many construction offices do not have sufficient chemistry training to make the decisions necessary to support the HTRW program. These construction offices should rely on basic chemistry support from resources at their HTRW design district, CMQAL or the HTRW-CX. Several guidance documents integrate chemical data QA for remedial actions into existing QA procedures for construction:

ER 415-1-10 Contractor Submittal Procedures

ER 1180-1-6 Quality Management

EP 715-1-2 A Guide to Effective Contractor Quality Control

CEGS 01451 Contractor Quality Control

CEGS 01450 Chemical Data Quality Control

(1) District representative requests validation of the primary laboratory by the HTRW-CX via electronic mail or facsimile.

(2) See paragraph 1-10.a(6) for the process and procedures for laboratory validation.

(3) The designated HTRW design district, CMQAL or HTRW-CX (depending upon which organization is providing the basic chemistry support for the project) assists the Construction District in reviewing the SAP and makes recommendations to the construction district. Construction district approves or disapproves the prime contractor's SAP.

(4) See paragraph 1-10.a.(8) for estimating and funding QA analysis.

(5) Construction begins after SAP and prime contractor's laboratory are approved.

(6) The construction representative coordinates with the prime contractor for field and laboratory activities. See paragraph 1-10.a.(10) for laboratory coordination and shipment. QA samples are sent to the QA laboratory throughout the duration of the sampling effort or as defined by the contract specifications.

(7) Prime contractor notifies the primary laboratory and the CMQAL when the final project samples have been sent.

(8) Prime contractor's analytical results are submitted to the construction office for transmittal to the CMQAL within the time frame identified in the contract.

(9) The QA laboratory or another qualified entity prepares the CQAR and submits it to the construction district, associated HTRW design district and the HTRW-CX. The construction district provides the CQAR to the prime contractor for inclusion in the project report.

(10) The prime contractor submits the project report to the construction district. The project report includes the CQAR, as well as the contractor's evaluation of the primary laboratory data. The report is reviewed by the construction representative with assistance from HTRW design district, CMQAL, or HTRW-CX staff, if requested.

(11) Construction district writes the CDQAR addressing contract compliance, data useability and DQO attainment from information provided by the construction contractor and the CQAR. CDQARs will be sent by the construction district to the associated HTRW design district, and HTRW-CX for all projects.

1-11. Data Management and Archive Process. The prime contractor and laboratories are responsible for generating, controlling and archiving laboratory and field records for all projects. This information should be maintained with a system that is effective for retrieval of any documentation that affects the reported results. The TM determines whether supporting data should be transferred from the prime contractor to the USACE upon contract completion or remain the prime contractor's responsibility for archiving the data. This includes record generation and control, security, and maintenance of all project related documents. The duration of laboratory data and field record retention should be specified as part of the project DQOs.

a. Laboratory. The laboratory prepares and retains full analytical and QC documentation that can be tracked from initiation to disposal for each sample. The following minimum records should be stored for each project: 1) original work order, CoC, and other pertinent documents received with the samples, 2) communications between the laboratory, field, and the customer, 3)any associated corrective actions, 4) laboratory data packages, 5) finalized data report, 6) laboratory log books, and 7) electronic data. The laboratory should also maintain its QAP and relevant SOPs for the methods performed.

b. Field. Project-specific records that relate to field work performed should also be retained. These records may include correspondence, CoC records, field notes, and reports issued as a result of the work. In addition, records that document all field operations should be retained. This may include equipment performance records, maintenance logs, personnel files, general field procedures, and corrective action reports. For field operations hard copy records are acceptable.

Laboratory Notification Information Checklist

__ project name
__ project location
__ general project objectives
__ intended use(s) of data
__ name and address of sampler's firm
__ approximate sampling dates
__ approximate number of samples, by matrix
__ required data package turnaround time
__ funding source (contract number and/or MIPR number)
__ name, phone and facsimile numbers for person to be contacted by the laboratory if there are problems with the sample shipment
__ name and address of primary (contractor's) laboratory (to be included in notification to CMQAL)
__ project specific requirements

- analysis method(s)
- matrices
- extraction method(s)
- required sensitivity (reporting limits)
- required precision
- required accuracy
- required comparability

__ sample retention after analysis is complete
__ disposition of samples after required retention time
__ special data reporting requirements
__ any special needs or comments (*i.e.*, unusual target analytes)
__ revision number of notification

Figure 1-1

Table 1-1 CDQM Activities

QA Activity	Characteristics	Cost	Project Phase(s) In Which Commonly Used					
			PA	SI or RFA	RI/FS or RFI/ CMS	RD or CMD	RA or CMI	O&M
Lab Validation	Provides assurance that lab has necessary personnel & equipment to produce data of known and adequate quality	*	X	X	X	X	X	X
Document Review	Checks technical adequacy of project documents and monitors program compliance	$ to $$	X	X	X	X	X	X
Sample Handling QA	Quick feedback regarding problems with sample shipments	$	X	X	X		X	X
QA Sample Collection & Analysis	Detects analytical problems and may salvage data usability	$$ to $$$$$	X	X	X		X	X
CQAR Preparation	Monitors intra- and inter-laboratory data comparability	$ to $$$$	X	X	X		X	X
CDQAR Preparation	Checks contract compliance, data usability, and DQO attainment	$ to $$	X	X	X		X	X
Performance Evaluation Samples	Provides assurance that lab correctly identifies and quantitates analytes of interest	$ to $$$$$	X		X			
Primary Lab Data Review	Monitors precision, accuracy, completeness, reproducibility, and sensitivity of primary data	$ to $$$	X	X	X		X	
Data Validation	Rigorous evaluation of data according to explicit EPA or other agency guidelines	$$ to $$$$	X		X			
Field Audits	Real-time oversight of accuracy & adequacy of field activities	$ to $$	X		X		X	
Laboratory Audits	Unannounced audits verify lab's ability to produce acceptable data	$ to $$			X			X
Tape Audits	Raw data review verifies data reduction procedures of lab	$$$$ to $$$$$			X			

Cost ratings range from $ to $$$$$. $ corresponds to <$1000, while $$$$$ corresponds to >$10,000.
* For most programs, the cost of laboratory validation is funded by the HTRW-CX, not by the district or division. If laboratory validation is requested for a project that is outside those programs for which there is validation funding by the HTRW-CX, validation costs would typically be in the range $$ to $$$.