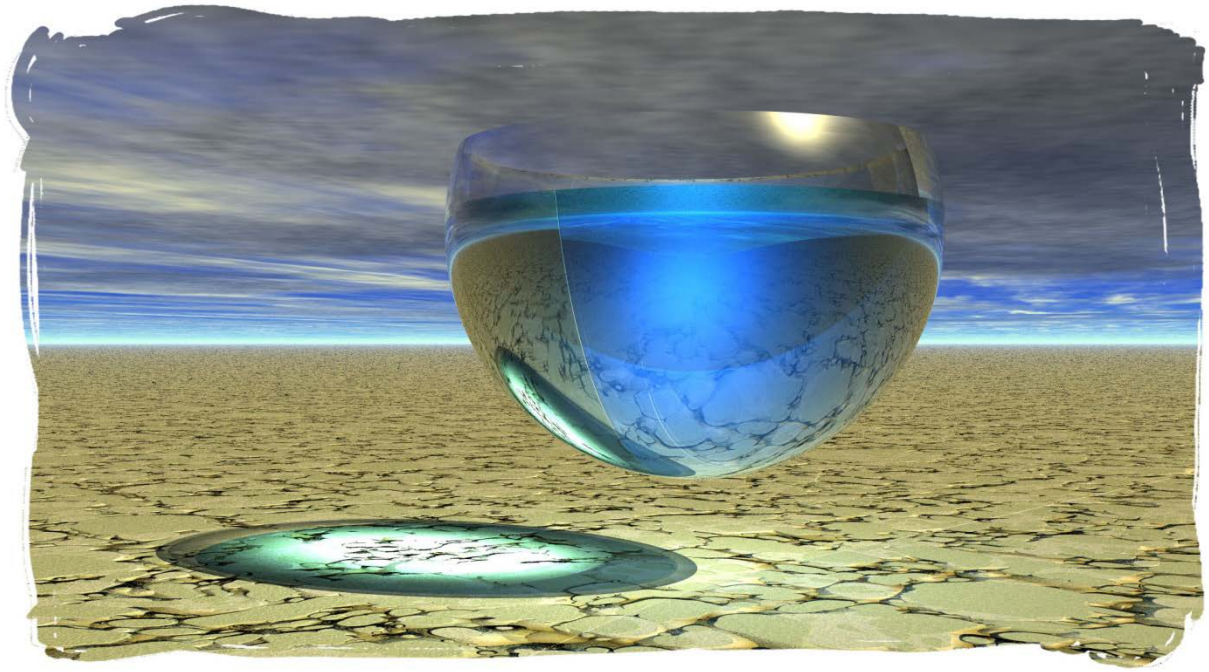
Surface Water Section
Quality Assurance Program Plan



Prepared by the

ADEQ
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CHAPTER 1 INTRODUCTION

1.1 Purpose

The purpose of this Quality Assurance Program Plan (QAPP) is to document the Quality Assurance, Quality Control, and other technical activities to be implemented to ensure that the results of Arizona Department of Environmental Quality (ADEQ) surface water program operations are of the type and quality needed for intended use by the Environmental Protection Agency (EPA) and the State of Arizona. The development, review, approval, and implementation of the QAPP are part of the EPA's mandatory Quality System.

This QAPP is also intended to meet the requirements of the Credible Data requirements of the Impaired Water Rule pursuant to Arizona Administrative Code (A.A.C) R18-11-602(A)(1) found on the Arizona Secretary of State website, in Article 6 of Title 18, Chapter 11, the Water Quality Standards Rules: http://www.azsos.gov/public_services/Title_18/18-11.htm.

This QAPP will provide sufficient detail to demonstrate that:

- the program's regulatory, technical and quality objectives are identified and agreed upon;
- the intended measurements, data generation, or data acquisition methods are appropriate for achieving program objectives;
- assessment procedures are sufficient for confirming that data of the type and quality needed and expected are obtained; and
- any limitations on the use of the data will be identified and documented.

Surface Water Section (SWS) field sampling and measurement techniques are continually undergoing review and modification. It is envisioned that all SWS procedures will continue to evolve and to be refined. Techniques will never be considered "final," but will always be examined for possible improvements. The findings of procedural evaluations should be shared and discussed with other SWS field personnel, team leaders, and program managers. Decisions will be made by team leaders and program managers, with input from field staff, whether to continue with existing methods and techniques, switch to new methods and techniques or to use combinations of both. Any changes to procedures covered or referenced by this QAPP will be reflected by future revisions to the document. Procedural changes may be made by staff during the field season with concurrence of the appropriate program manager and team leaders, when the need arises, and subsequently be documented in the revised QAPP. The collection of high-quality and representative data is the most important consideration. All techniques and procedures used must be consistent with or yield results equal to or better than those techniques and procedures listed in or referenced by 40 CFR 136 or those techniques and procedures currently accepted by USEPA. This Quality Assurance Program Plan was developed with guidance provided in USEPA Region 9 QAPP requirements (USEPA, 2001), Guidance for Quality Assurance Plans (USEPA, 2002), and Guidance of systematic planning using data quality objectives (USEPA, 2006).

1.2 Program Authority

The general authority for monitoring surface water comes from the objective statement in Section 101(a) of the Clean Water Act; to restore and maintain the chemical, physical, and biological integrity of the nation's waters. The Clean Water Act mandates that ADEQ collect water quality data on navigable waters in Arizona. §106(e)(1) of the Clean Water Act requires that Arizona establish and operate a program to monitor, compile, and analyze data on the quality of navigable waters in the state, including biological monitoring. §106(e)(1) also requires that Arizona provide water quality data for annual and biennial updates of the state's water quality assessment reports required by §§ 205(j) and 305(b) of the Clean Water Act. Surface Water Section staff acquire surface water quality data for these purposes which are described in detail in Arizona's Comprehensive Monitoring Strategy (ADEQ, 2011).

1.3 Programs Covered by this QAPP

This document applies to all personnel within the SWS of the ADEQ, Water Quality Division who sample surface water. This QAPP applies to the following Surface Water Section Programs:

1. Ambient Stream Monitoring
2. Ambient Lake Monitoring
3. Biocriteria
4. Priority Pollutant / Fish Advisory Program
5. Total Maximum Daily Load
6. Water Quality Improvement Grants

1.4 Quality Assurance through Contract Water Quality Laboratories

All ADEQ Contract Laboratories that conduct water quality tests for ADEQ are required to meet several criteria for data to be accepted as valid and entered into the ADEQ Water Quality Database. ADEQ contract lab quality assurance is addressed via their respective quality assurance manuals, SOP's for each analytical procedure, and the QC data summary provided with each lab report. In addition, contract labs must pass licensing requirements of the Arizona Department of Health Services State Laboratory every two years, pass a proficiency test annually, and meet the QC limits for spikes & blanks in each QC report they produce (generally 20%). In addition, ADEQ requires that contract labs must provide tests for matrix effects that include dilution, standard additions and lab fortified blanks that meet our acceptance criteria and that test results that fall outside those acceptance criteria shall be flagged as an estimated quantity. Accutest Laboratories is ADEQ's primary lab for FY2015; their San Jose, CA lab conducts the inorganic chemistry tests and Houston, TX conducts the nutrients and SSC tests (see Appendix K for a list of supporting documents). ADEQ Surface Water Section currently has five Water Quality Labs under contract. Specific laboratories are listed in each Sampling and Analysis Plan, (see Section 2.4).

1.5 QAPP Location and Updates

The QAPP for surface water sampling will be kept on-file at ADEQ. This document will be updated as needed. A copy of this QAPP will be sent to the distribution list electronically after each update is complete.

1.6 QA Liaison

The Surface Water Section Manager shall appoint an appropriate Surface Water staff member to be the Quality Assurance Liaison for the Water Quality Division. This duty will last for a term not to exceed two years. The QA Liaison is currently Jason Jones who will serve this capacity until January 1, 2015 or until replaced by the Section Manager. The QA Liaison is responsible for the following:

1) Updating the QAPP,
2) Ensuring the appropriate program personnel have the most current approved version of the Surface Water QAPP,
3) Ensuring that the audits are completed, corrective actions taken and the checklist filed with the supervisor, and staff
4) Producing QA quarterly reports for unapproved data and suspect data in the WQDB,
5) Ensuring that SWS QA/QC objectives are met by completing the QA Liaison Worksheet in Appendix F.

The QA Liaison may reject poor quality data at any step in the quality assurance process with Section Manager or Agency QA Lead approval.

CHAPTER 2 ORGANIZATION AND PLANNING

2.1 Program/Task Organization

TABLE 1 reflects staffing as of June 2014. An organization chart for the Surface Water Section (SWS) is included in FIGURE 1.

TABLE 1. List of key positions and their role regarding the QAPP.

Position	Function	Role/responsibility
Surface Water Section Manager	Surface Water Section Oversight	Has the overall responsibility for direction, and any changes, in the scope of work for the program. The Section Manager will also oversee scheduling and management of all technical and non-technical aspects of the program.
QA Liaison	QA Liaison	The QA Liaison will be responsible for ensuring the appropriate program personnel have the most current approved version of the Surface Water QAPP and for updating the QAPP, conducting/overseeing field audits of staff, The QA Liaison shall ensure that SWS QA/QC objectives are met by completing the QA Liaison Worksheet in Appendix F. The QA Liaison may reject poor quality data at any step in the quality assurance process with Section Manager or Agency QA Lead approval.
Watershed Protection Unit and Monitoring Unit Staff or Supervisors	Sampling Design	Creates the Sample Plan and coordinates water and/or biological sampling needs, staff assignments, schedules and budgets.
SWS Staff	Project Lead "Team Leader"	Responsible for on-schedule completion of assigned sampling field work with strict adherence to Standard Operating Procedures (SOPs). Responsible for data entry, processing, and data quality assurance and quality control throughout the data analysis process. Responsible for all aspects of document production including: data interpretation, in-house and outside technical reviews, editing and publishing ADEQ documents.
Lab Manager	Lab Analysis	Processes chemical and/or biological samples. **Chemical**: Analyses chemical parameters in accordance with lab QAPP and SOPs. Produces reports either electronically or manually to ADEQ. **Biological**: Determines taxonomic identifications of specimens, records taxonomic names and abundances on bench sheets and in a database, performs QC evaluations of adherence to lab SOPs, and produces lab reports for ADEQ.
Biocriteria Program Coordinator	Biocriteria Program Oversight	Responsible for project implementation, and to guarantee that technical, and scheduling objectives are achieved successfully. The Program Manager coordinates all biocriteria program activities, and provides technical guidance to staff and management. The Program. Manager communicates to the Section Manager and will be the primary point of contact for the program. Oversees data upload process.
Fish Tissue Program Manager	Fish Tissue Program Oversight	Responsible for project implementation, and to guarantee that technical, and scheduling objectives are achieved successfully. The Program Manager coordinates all fish tissue program activities, and provides technical guidance to staff and management. The Program. Manager communicates to the Section Manager and will be the primary point of contact for the program. Oversees data upload process.
SWS Database Manager	WQDB Oversight	Upload data into EPA's Water Quality Data Exchange (WQX). Maintain WQDB.

Position	Function	Role/responsibility
Data Validator/ Verifier	Checks data for Quality	Has the main role of reviewing the project leader's data for quality control purposes.
Data Portal	Receives data from labs	Receives data from ADHS, contractors and other laboratories.
Occupational Safety Officer	Agency QA Lead	Helps to solve agency level problems that project leads and the QA liaison cannot address. Writes agency Quality Management Plan.
Lab Coordinator	Order supplies, invoicing, administrative coordination	Receive and distribute lab data, invoices, and ordering lab supplies (bottles, preservatives). Assists in all administrative aspects of coordination with lab from shipping of samples to ensuring calibration solutions are available and replaced before expiration.

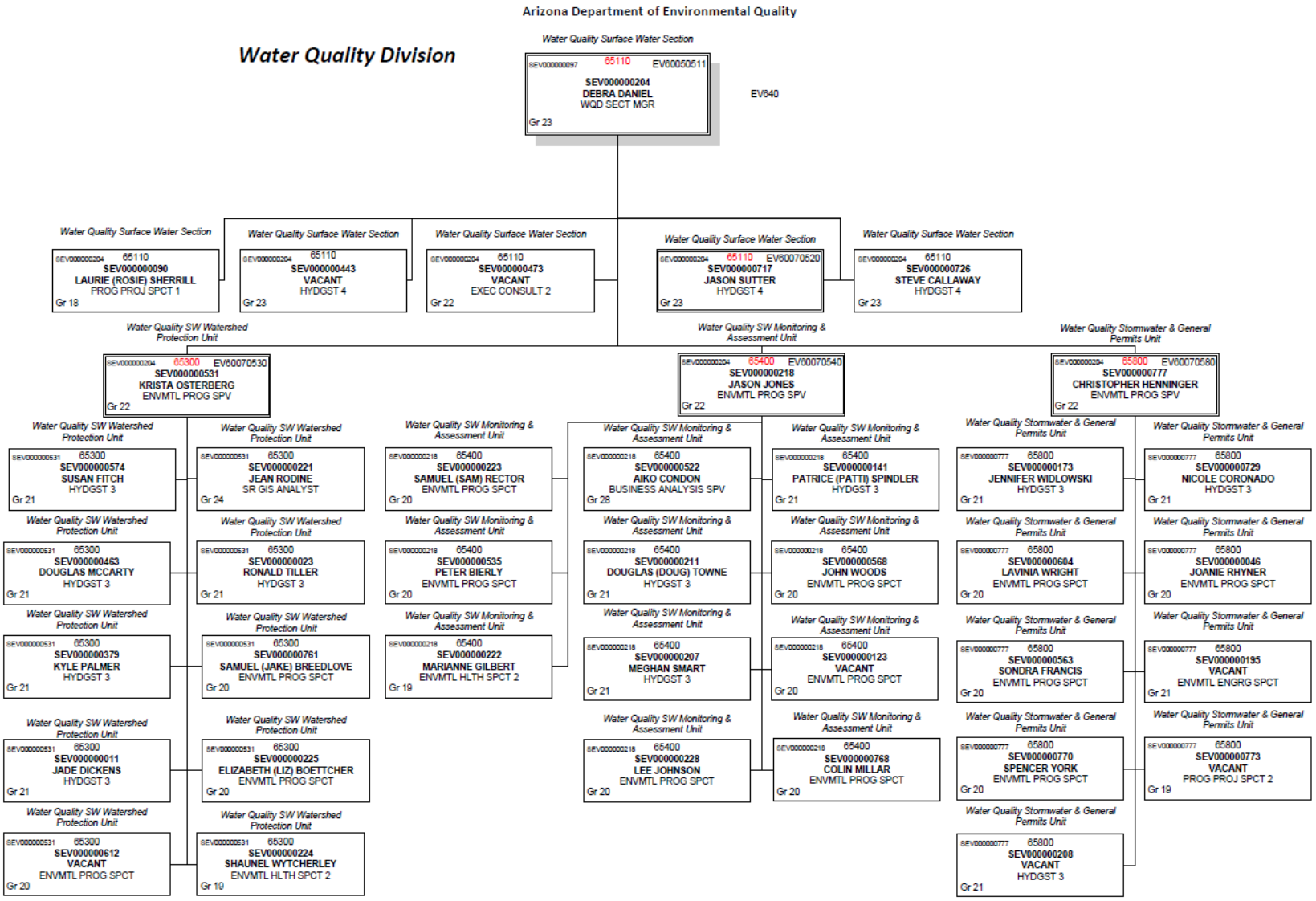


FIGURE 1. SWS Organization Chart

2.2 Program Descriptions

2.2.1 Streams – Ambient Water Chemistry Monitoring

The ambient monitoring program is a statewide data collection program, which uses a probabilistic and targeted monitoring design. The ambient stream monitoring program primarily focuses on perennial wadeable streams for the 305(b) assessment.

ADEQ began using probabilistic monitoring in FY 2006 and has incorporated it into the routine monitoring program. Probabilistic monitoring allows the state to assess sites that were not visited using statistical inferences. A stratified spatial survey design ensures representativeness of sites. Sites are selected using EPA's "R Statistical Program".

Targeted sites are selected to address data gaps for reaches identified in the 305(b) assessment, to monitor Outstanding Waters, to monitor reference sites for the biocriteria program, to monitor effluent dominated waters and to monitor special studies such as impacts from wildfires.

The specific objectives of the Ambient Monitoring Program are:

- To determine water quality trends over time;
- To compare water quality between basins;
- To provide credible data;
- To characterize baseline water quality of wadeable, perennial streams located in selected river basins;
- To provide data for surface water quality assessments required by §305(b) of the Clean Water Act;
- To identify impaired surface waters pursuant to §303(d) of the Clean Water Act;
- To determine compliance with applicable surface water quality standards;
- To characterize baseline water quality in unique waters and to determine whether water quality is being maintained, protected or is being degraded.

2.2.1.1 Monitoring to Fill Data Gaps for Sites Assessed as Inconclusive Waters

§305(b) of the Clean Water Act requires ADEQ to conduct a water quality assessment of Arizona's surface waters every two years. Current EPA guidance states that each surface water assessed should be placed in one of five assessment categories. The five categories are as follows:

1) Surface waters where all designated uses are being attained;
2) Surface waters that are attaining some designated uses but there is insufficient data to assess the remaining uses;
3) Surface waters with insufficient data to assess any designated use;
4) Surface waters that are not attaining one or more designated uses, but a Total Maximum Daily Load (TMDL) analysis is not required; and
5) Surface waters that are impaired for one or more designated uses and a TMDL is required.

Surface waters with insufficient data to determine whether a surface water is attaining designated uses or is impaired are identified in categories 2 and 3 on the assessment list. Surface waters in categories 2 and 3 are included on a planning list and targeted for water quality monitoring to fill existing data gaps. In some cases, data sets for some sample sites are incomplete and do not include all core parameters required for §305(b) water quality assessment. In other cases, there were an insufficient number of sampling events to make an assessment.

2.2.1.2 Sites not on the Planning List

The planning list only addresses sites where data has been collected. It does not address data gaps for sites where no data has been collected. Wadeable perennial sites not assessed in the 305(b) assessment were identified using ArcMap. Streams with no existing sites were chosen. Sites with easy access were given priority.

2.2.1.3 Outstanding Arizona Waters Monitoring

Monitoring Unit staff collect surface water quality data to characterize existing water quality and to determine whether water quality is being maintained and protected in Arizona's outstanding waters. Currently, there are 22 outstanding Arizona waters listed in Arizona's Administrative Code R18-11-112. The primary purpose of monitoring outstanding waters is to collect surface water quality data to characterize baseline water quality. A long-term goal of this program is to acquire enough water quality data over time to determine water quality trends in

Arizona's outstanding waters and to determine whether state antidegradation requirements are being met (i.e., is water quality improving, being maintained, or is it degrading).

2.2.1.4 Biocriteria Reference Program Monitoring

The MU's goal is to conduct bioassessments at a variety of reference sites in warm and cold regions of the state. MU staff collect benthic macroinvertebrate samples in wadeable, perennial streams with suitable riffle habitats during the spring index period (April, May, or June).

2.2.1.5 Effluent Dominated Water

Effluent dominated waters are selected to evaluate the impact on wadeable perennial streams. Monitoring shall include the normal chemical monitoring and stream ecosystem monitoring in the spring.

2.2.2 Streams – Biocriteria Program

ADEQ defines "reference condition" in the surface water quality rules at A.A.C. R18-11-101(33) as "a set of ecological measurements from a population of relatively undisturbed water bodies within a region that establish a basis for making comparisons of biological condition among samples." The new narrative biocriteria standard (based on the macroinvertebrate community) for wadeable, perennial streams can be found in the 2009 Surface Water Quality Standards for Arizona in R18-11-108(E). The numeric targets for biocriteria and associated applicability rules are listed in R18-11-108.01. The biocriteria standard overall consists of the narrative biocriterion, statement of applicability, rules explaining how the biocriterion is met, and associated IBI scores for cold and warm water streams. ADEQ added R18-11-108.01 to the surface water quality standards rules, adopted as of January 2009. The narrative biocriteria standard is:

"*A wadeable, perennial stream shall support and maintain a community of organisms having a taxa richness, species composition, tolerance, and functional organization comparable to that of a stream with reference conditions in Arizona."*[A.A.C. R18-11-108(E)]

ADEQ began development of its Biocriteria Program in 1992 with a statewide reference site sampling network and creation of a standard operating procedures manual (Meyerhoff and Spindler, 1994) in order to develop a new biocriteria standard. Classification of streams with similar macroinvertebrate communities was performed using the statewide biological monitoring data. An elevation based classification system was defined based on macroinvertebrate species distribution across the Arizona. This classification scheme consists of two broad macroinvertebrate regions and community types: 1) a warm water community located at <5000' feet and a cold water community located at >5000' feet (Spindler, 2001). All small to medium sized, wadeable, non-effluent dependent, perennial streams located in these regions, with a few exceptions, are predicted to have the same general macroinvertebrate community type. Indexes of Biological Integrity (IBI) were developed for warm water and cold water communities (Gerritsen and Leppo, 1998; Leppo and Gerritsen, 2000).

ADEQ's cold and warm water indexes consist of several metrics or key attributes of the benthic macroinvertebrate community which best distinguish impairment from the reference condition. The cold water IBI consists of seven metrics selected for their ability to discriminate impairments in cold water streams located at >5000' elevation:

1) Total taxa richness,
2) Diptera taxa richness,
3) Intolerant taxa richness,
4) Hilsenhoff Biotic Index,
5) Percent composition by Plecoptera (stoneflies),
6) Percent composition by scrapers,and
7) Scraper taxa richness.

The warm water IBI consists of nine metrics which best discern impairment in warm water streams located at <5000' elevation:

1) Total taxa richness,
2) Ephemeroptera taxa richness (mayflies),
3) Trichoptera taxa richness (caddisflies),
4) Diptera taxa richness,
5) Percent composition of Ephemeroptera (mayflies),

6) Percent composition by the dominant taxon,
7) Percent Hilsenhoff Biotic Index,
8) Percent composition by scrapers, and
9) Scraper taxa richness.

The metrics are calculated from a list of species and their abundances. The total IBI score is an average of the metric scores. The macroinvertebrate community is then rated as attaining the aquatic life use meeting the biocriteria standard when a sample IBI score is greater than or equal to the 25th percentile of reference scores, inconclusive when a sample IBI score falls between the 10th and 25th percentile of reference score, or violating when the sample IBI score falls below the 10th percentile of reference scores. An IBI score that falls between the 10th and 25th percentile of reference condition is determined to be inconclusive and a verification bioassessment is required to determine whether there is a violation. If the verification sample IBI score falls below the 25th percentile, the biocriterion is violated. In effect, a violation of the biocriteria standard occurs when a sample result from a study site either: 1) has an IBI score less than the 10th percentile of reference threshold value, or 2) has an IBI score between the 10th and 25th percentile of reference threshold values and a verification sample also falls below the 25th percentile of reference threshold value. The narrative biocriterion applies only to perennial, wadeable stream segments with either a warm or cold water aquatic life designated use. ADEQ has not characterized reference conditions for other waterbody types.

ADEQ will determine compliance with the narrative biocriterion based on a macroinvertebrate sample collected from a wadeable, perennial stream with riffle or run habitat that is collected during the appropriate spring index period. The warm water IBI will apply to perennial, wadeable streams found at <5,000' elevation and the cold water IBI will apply to perennial, wadeable streams found at >5,000' elevation. ADEQ standard methods for biological sample collection and data analysis must be followed to compare bioassessment results to these macroinvertebrate based IBIs. The procedures for sample collection, laboratory analysis and for calculating the indexes are provided in the standard operating procedures for surface water quality sampling.

In general, macroinvertebrate samples are collected and composited from three 1m^2 areas of riffle habitats at each site, using a D-frame kick net. Samples are only minimally processed to remove large debris and sand in the field. Samples are preserved with 99% isopropyl alcohol on-site. Samples are held in chain of custody from time of collection until delivery to the taxonomy laboratory, as per chain of custody and shipping procedures. Laboratory analysis consists of sorting and enumerating a minimum of 500 macroinvertebrates per sample. The macroinvertebrates are identified to genus or species level for the insects and levels specified in the Appendix H for all other taxa groups. General lab procedures are also listed in Appendix H. There is no maximum holding time for preserved macroinvertebrate samples, however ADEQ requests that lab analyses be completed within 6 months of sample delivery. Procedures for calculating the Indexes are provided in Appendix J and the IBI scoring thresholds are shown in TABLE 2.

TABLE 2. Macroinvertebrate IBI thresholds for wadeable, perennial streams of Arizona

Macroinvertebrate bioassessment result	**Index of Biological Integrity Score**	
	Cold water	Warm water
Greater than the 25th percentile of reference condition	≥ 52	≥ 50
Between the 10th and 25th percentile of reference condition	41 –519	40 - 49
Less than the 10th percentile of reference condition	≤ 45	≤ 39

The biocriteria program also uses a probabilistic and targeted design and collects samples at the same sites as the ambient water chemistry sites mentioned above (FIGURE 2). The objectives of the biocriteria program are:

- Establish and refine biocriteria standards
- Assess biological condition of AZ streams (305b) and identify biologically "impaired waters" (303d) and their stressors
- Update reference conditions through ambient monitoring

2.2.3 Lakes – Ambient Lake Monitoring Program

The ADEQ Ambient Lakes Program (also known as the Clean Lakes Program) conducts ambient water quality monitoring to determine trophic status and water quality trends in lakes and reservoirs. At the inception of the

Ambient Lakes Program in 1989, monitoring objectives related primarily to basic water quality characterization and diagnostic / feasibility studies. Since 1991, the Ambient Lakes monitoring program has expanded in scope to include research monitoring to develop nutrient criteria for lakes and reservoirs, trophic analyses of lakes and reservoirs, and special water quality investigations (e.g., perchlorate, hexavalent chromium, and bacteria studies). The Ambient Lakes Program also is involved in developing TMDLs for impaired lakes and reservoirs listed on the §303(d) list.

Specific Ambient Lakes Program objectives are to:

- Characterize lake water quality conditions in relation to watershed conditions;
- Conduct monitoring to identify potential point and non-point sources of pollutants that may affect lake water quality;
- Provide an organized system to evaluate lake water quality status by identifying natural and anthropogenic conditions affecting lake water quality;
- Develop feasible ways to conserve, protect, and restore lake water quality;
- Develop and maintain a computerized data management system to allow rapid data analysis and provide evaluation of water quality trends;
- Implement nutrient criteria to be included in CWA 305b assessment; and
- Conduct TMDL research and analysis and submit final TMDLs to EPA for approval for impaired lakes and reservoirs.

2.2.4 Lakes and Streams –Fish Advisory Program

The primary objective of the Fish Advisory Program is to obtain fish tissue data to assess the need for the issuance of a fish consumption advisory. The primary target analyte for the Priority Pollutant / Fish Advisory Program is mercury in fish tissue.

Fish sampling is typically performed either for bioassessment purposes or for tissue collection for contaminant analysis. Fish tissue istypically sampled to determine if there is a human health risk associated with eating a fish. Fish bioassessments are usually done in lotic waters (wadeable streams); tissue collections for contaminant analysis are typically done in lentic waters (lakes or reservoirs) consistent with the USEPA fish advisory guidance document (USEPA, 2000).

A list of current fish advisories can be found at http://www.azdeq.gov/environ/water/assessment/download/fca.pdf. Specific priority pollutant / fish advisory program objectives are to:

- Improve the quality of data used by ADEQ for issuing fish consumption advisories.
- Ensure that limited resources of the Fish Advisory Program are allocated in the most cost-effective way. The use of screening studies helps to reduce overall program costs by limiting the number of lakes and reservoirs targeted for intensive studies.
- Ensure that data are appropriate for developing risk-based consumption advisories.
- Ensure that fish tissue data are appropriate for determining contaminant concentrations in various size (age) classes of target fish species so that ADEQ can give size-specific advice on contaminant concentrations (as appropriate).
- Develop a yearly sample and analysis plan to target water bodies where data gaps exist.
- Ensure that proper sample hold times (6 months), preservation, chain of custody and shipping procedures are followed.

2.2.5 Total Maximum Daily Load (TMDL)

The Total Daily Maximum Daily Load (TMDL) Program within the Watershed Protection Unit collects data to support development of TMDLs for impaired lakes and streams in Arizona, per Arizona Revised Statutes 49-232. ADEQ adopted the Impaired Waters Identification Rule (Arizona Administrative Code (A.A.C. 18-11. Article 6) and developed methodology to be used in identifying waters as impaired. The TMDL group uses a targeted monitoring design or intensive survey approach to obtain water quality data to characterize impaired surface waters and support the development of TMDLs. This often involves collecting stormwater samples in ephemeral or intermittent streams.

Specific TMDL program monitoring objectives are to:

- Identify sources and causes of pollutant loadings
- Provide data for water quality models used to calculate wasteload allocations, load allocations, and margins of safety in TMDL analyses.
- Develop TMDLs for the Clean Water Act §303(d) listed water bodies
- Develop TMDL implementation plans
- Conduct TMDL effectiveness monitoring

Expand staff knowledge of narrative water quality standards as their implementation procedures are adopted in order to determine potential sources of impairment

2.2.6 Water Quality Improvement Grant Program:

ADEQ's Section 319 Grants are awarded for on the ground restoration projects. QAPP/SAP requirements do apply to 319 grantees who will conduct water quality monitoring. There are two options for developing a SAP:

1) ADEQ will prepare the SAP if the grant proposal targets a 303d listed stream that is included as part of our effectiveness program or
2) ADEQ will work with a Grantee to prepare a SAP that fulfills ADEQ QA requirements. In addition, ADEQ will prepare watershed scale effectiveness monitoring efforts.

ADEQ QAPP and SAP provisions will be met for these future SAPs, including internal peer review and approval by the Unit Supervisor.

2.3 Measurement Quality Objectives

The intent of the Measurement Quality Objective (MQO) process is to control errors at every level in the decision process. The intent of developing measurement criteria is to control errors in the measurement process. ADEQ will do the following to ensure quality objectives are met:

- Data will be scientifically sound and legally defensible,
- Chain-of-custody procedures will be used whenever possible;
- Data will support program objectives;
- Water quality analyses will reflect data needs;
- Samples and field data will be collected and analyzed using identical pre-approved sample collection and analysis techniques with as few deviations from protocol as possible. Any deviations from standard protocols will be noted;
- Data exceeding state water quality standards will be acted upon with county health department notification and / or follow-up monitoring or other activities;
- Analyses shall be performed by a laboratory licensed by the Arizona Department of Health Services, Office of Laboratory Licensure and Certification.
- Sufficient sample volumes will be collected for proper water quality Laboratory quality control work, including sample matrix spikes where necessary.

Measurement quality objectives can be expressed in terms of accuracy, precision, completeness, and sensitivity goals. Accuracy and precision are monitored by the laboratory conducting the analyses through the use of Quality Control (QC) samples. Completeness is a calculated value. Sensitivity is monitored through instrument calibration and the determination of method detection limits (MDLs) and reporting limits.

Additional detail regarding the Precision, Accuracy, Representativeness, Completeness and Comparability (PARCC) standards can be found in Appendix H.

2.4 Sampling and Analysis Plans

Sample and Analysis Plans (SAPs) are created on an annual or as-needed basis (see Appendix K for ADEQ's FY15 Ambient Monitoring SAP). Sample Plans should reference the Surface Water Section QAPP if surface water sample collection will occur as part of the sampling activities. Sample plans are approved by the Unit Managers and fulfill the many of the functions of the Quality Assurance Project Plan.

All Sampling and Analysis Plans will contain an explicit statement indicating that the laboratories limits have been reviewed by ADEQ and that ADEQ is adopting the laboratories criteria as the Measurement Quality Objective described in Section 2.3.

SAPs shall be developed for each Surface Water Program that conducts water quality monitoring. The Impaired Water Identification Rule (A.A.C. R18-11-602(A)(2)) requires that the following items be included in a SAP:

1. The experimental design of the project, the project goals and objectives, and evaluation criteria for data results;
2. The background or historical perspective of the project;
3. Identification of target conditions, including a discussion of whether any weather, seasonal variations, stream flow, lake level, or site access may affect the project and the consideration of these factors;
4. The data quality objectives for measurement of data that describe in quantitative and qualitative terms how the data meet the project objectives of precision, accuracy, completeness, comparability, and representativeness;
5. The types of samples scheduled for collection;
6. The sampling frequency;
7. The sampling periods;
8. The sampling locations and rationale for the site selection, how site locations are benchmarked, including scaled maps indicating approximate location of sites; and
9. A list of the field equipment, including tolerance range and any other manufacturer's specifications relating to accuracy and precision.

TABLE 3. Sampling and Analysis Plans by Program

Program	What the SAP Covers	When is one done?
Ambient Monitoring & Biocriteria	Chemistry and Biocriteria in Streams	Annual by Fiscal Year
Lakes	Chemistry in Lakes	Annual by Fiscal Year
Priority Pollutant	Fish Tissue monitoring in Lakes and Streams	Annual by Fiscal Year
TMDL	Chemistry in Lakes and Streams	For each Project

2.5 Standard Operating Procedures

Standard Operating Procedures (SOPs) describe how samples are collected. ADEQ uses SOPs to take consistent measurements and as a general reference for all the water quality monitoring that the agency conducts.

All programs shall use the most current Standard Operating Procedures for Surface Water Sampling (currently 2015). The most current version of the SOPs for Surface Water Sampling can be downloaded at http://www.azdeq.gov/environ/water/assessment/download/sampling.pdf.

2.6 Training

2.6.1 Initial Training

All new sampling personnel will be given access to the most recent sampling SOPs. Experienced staff will take new employees on field trips and guide staff through all steps of the sampling process (including post trip activities such as quality assurance and data entry).

2.6.2 Program Specific Training

Program specific training should be provided by experienced ADEQ staff to new staff who participate in TMDL, ambient, fish tissue, or lakes monitoring before a monitoring event. This training will cover field and/or laboratory methods for the collection of surface water samples such as *E. coli* or macroinvertebrates.

2.6.3 Refresher Training

All sampling personnel shall attend the ADEQ Water Quality Sampling training, (typically held every year). The refresher training includes discussion of topics identified in the QAPP, SOPs, along with a field demonstration.

2.7 Verification of completeness through Documentation and Recordkeeping

This QAPP and referenced SOPs include written procedures for all methods and procedures related to the collection, processing, analysis, reporting and tracking of environmental data. All data generated must be of sufficient quality to withstand challenges to their validity, accuracy and legibility. To meet this objective, data are recorded in standardized formats and in accordance with prescribed procedures. The documentation of all environmental data collection activities must meet the following minimum requirements:

- Data must be documented directly, promptly, and legibly. All reported data must be uniquely traceable to the raw data. All data reduction formulas must be documented.

- All original data records include, as appropriate, a description of the data collected, units of measurement, unique sample identification, station or location identification (if applicable), name (signature or initials) of the person collecting the data, and date of data collection.
- Any changes to the original (raw data) entry must not obscure the original entry. The reason for the change must be documented, the change must be initialed and dated by the person making the change.

Other specific documentation requirements are discussed throughout this QAPP and the Standard Operating Procedures for Surface Water Sampling.

2.7.1 Field Documentation and Forms

Records are maintained for each field activity to ensure that samples and data are traceable and defensible. Field records will be documented on field forms or in designated field logbooks to provide a secure record of field activities, observations and measurements during sampling. Field data and observations will be recorded in real time on activity-specific data forms. Completion of appropriate field documentation and forms for each sample is the responsibility of the project lead or designee.

2.7.2 Recordkeeping

2.7.2.1 Site Files

A site file containing raw data and field notes is maintained by SWS for no less than 15 years according to ADEQ's retention schedule (See Section 10.7.6 of the SOP). This file contains all analytical request forms, all field notes concerning the investigation, and all data verification/validation results for the survey. In addition to water quality data, this file also contains all copies of benthic macroinvertebrate, habitat, fish, pebble count, cross sectional, periphyton data, and site photos.

2.7.2.2 Database Records

An electronic copy of the data is housed in the following formats:

1. Oracle Database – All chemistry data
2. Access Database – All macroinvertebrate, fish and habitat data. These data are entered into the Ecological Data Application System (EDAS). EDAS (ADEQ, 2004) is a database management tool used to facilitate biological monitoring and assessment and is compatible with the WQX.

2.7.2.3 Quality Control Files

Quality assurance information is contained in either the site files or a section quality assurance file (TABLE 4).

TABLE 4. QA Files.

Information	Location/Level
Water Quality Control Worksheets (chemistry, biocriteria, and/or fish tissue for each site), including any correspondence with the lab regarding rerunning samples or other data quality issues (see Appendices B – D).	Site File
Unit Manager Quality Control Worksheets for each quarter (Appendix E)	Section QA File
Quality Assurance Liaison Worksheet for each fiscal year (Appendix F)	Section QA File
Field audit information (Appendix G)	Section QA File
Certifications (for example, mercury free tubing, bottles, and filters)	Section QA File
Quality Control results (duplicates, splits, or blanks)	Site File

2.7.2.4 Equipment Files

All field equipment must be inspected and refurbished as necessary prior to each sampling trip. Results of equipment inspections will be noted in the file for each instrument. Any deficiencies in equipment must be noted in the equipment log in the file and reported immediately to appropriate staff that will recheck the equipment and arrange for repair by the manufacturer or for purchase of a replacement. SWS staff will not use equipment if the working condition of the equipment is in doubt.

2.7.3 Validation of datasets: Data Entry, Quality Control and Data Management

Field and laboratory water quality data shall be entered by the project lead into the Water Quality Database in accordance with Chapter 10 Data Management chapter of the most recent "Standard Operating Procedures for Surface Water Quality Sampling" manual.

For ADEQ internally collected data, it is the project lead's responsibility to conduct a lab data review to ensure that all necessary data verification and validation procedures have been completed (Appendix A). These checklists walk through the quality control steps of scanning for obvious errors and standards violations, checking RPDs between duplicates and regular samples, adding applicable lab and field data qualifiers and event flags, conducting chemistry ion checks, checking Lab QC data and obtaining a data entry QC check by a second staff member. The project lead is responsible for making decisions to reject data that does not meet QC criteria.

Section 10.6.2 of the SOP walks samplers through each section of the checklist.

The applicable data qualifiers are then entered into the WQDB to flag the results in question (Appendix L). Data that contain lab qualifiers that are identified as 'Reject' are not entered into the WQDB. Qualifiers that have a 'No' in the 'For 303d list' column are flagged in the WQDB so that the data will not be used for 303d listing decisions. Rejected data is not used for the assessment or listings. Blank cells in the decision and 303d list columns indicate that the data will be loaded into the WQDB and used for the assessment. Qualified data are still assessed by staff and may still be rejected or flagged as not to be used for assessment based on best professional judgment. The QC Checklists are retained in the site files along with the sample lab reports.

ADEQ's primary water quality Lab, Accutest Laboratories, provides the sample test results as well as a comprehensive "QC Data Summary" that includes results for blanks, matrix spikes/duplicates, spiked blanks, and serial dilutions. QC limits and results out of limits are indicated. QC limits are generally ±20%, which is an accepted practice according the State Laboratory licensing office. These QC data summaries are reviewed by staff, data qualifiers selected to flag water quality results in the WQDB, requests for rerun analyses made, and/or data rejections made, and then the WQDB Data Entry & Lab Data Package Review Checklist (Appendix A) is completed and placed in the site file. This review process, in addition to the lab's licensing and annual performance testing comprises the validation process.

For external datasets, the Assessment staff conduct the data review. Assessment staff spend a significant amount of time reviewing and formatting the data so that the WQDB will accept it. They also look for null values, outliers, and various other QA checks that are outlined in the Surface Water Assessment Methods and Technical Support document (ADEQ, 2014, Appendix K) Additional qualifiers may be added by assessment staff when external data's credibility is being checked (see Credible Data Rule http://www.azsos.gov/public_services/Title_18/18-11.htm).

All SWS water quality data which meets QA requirements is uploaded on a regular basis into WQX. Data is currently uploaded through ADEQ's node regularly to WQX and is publicly available.

2.7.3.1 Electronic Uploading of Data from Laboratories

Data upload procedures are located at http://www.azdeq.gov/environ/water/assessment/download/sw/swds.pdf. Most laboratory QC flags are attached to the sample test results when they are uploaded to the WQDB. Additional data flags are added during the Data Package review, as needed.

2.7.3.2 Database Rights

Water Quality Database rights are indicated in TABLE 5. The WQDB is divided into three basic related levels. Staff only have "Read-Only" rights for approved data. Data is 'approved' after it has gone through the WQDB Data Entry & Lab Data Package Review Checklist (Appendix A). This effectively locks the records and prevents accidental changes and deletions. The approved data must be unapproved by a unit manager or project lead before making additional changes.

TABLE 5. Database rights by Level

	Unapproved Data		Approved Data	
Database Level	**SWS Staff**	**Unit Manager**	**SWS Staff**	**Unit Manager**
Site	Read, Add	Read, Add, Delete	NA	NA

	Unapproved Data		Approved Data	
Database Level	**SWS Staff**	**Unit Manager**	**SWS Staff**	**Unit Manager**
Sample	Read, Add, Delete	Read, Add, Delete	Read	Read
Test Results	Read, Add, Delete	Read, Add, Delete	Read	Read

2.7.4 Biocriteria Reference Specimen Collection Storage

The ADEQ Biocriteria Program macroinvertebrate voucher specimen collection shall be maintained permanently in the laboratory at the Phoenix ADEQ office. The ADEQ taxonomist has prepared the collection by preserving a few specimens of each macroinvertebrate taxon in a 5 ml vial with a solution of 70-80% isopropanol containing a rite-in-the-rain® paper label which includes taxon name, site id/stream name, date collected, habitat sampled, and collector name (ADEQ). New specimens are added when new taxa are encountered, when needed to refresh degraded specimens, and to ensure that there is replicate material from different locations around the state. The Biocriteria Program Coordinator will ensure that the isopropanol solution is checked and refreshed annually. The voucher specimen collection is maintained for several reasons:

1) The voucher collection supports all the research and reports produced by the Department,
2) To periodically perform inter-laboratory taxonomy QC checks on the voucher specimens,
3) Other laboratories study the ADEQ voucher collection for QC purposes, and
4) To use the voucher collection for occasional in-house taxonomic identifications, training and internal study purposes.

CHAPTER 3 QUALITY CONTROL SAMPLES

The following sections outline the types of quality control (QC) samples used by ADEQ for the collection of surface water samples. Acceptable limits for each type of QC sample can be found in Section 10.6.2 of the Standard Operating Procedures for Surface Water Sampling. Collection & labeling of QC samples can be found in Sections 3.2.5 and 4.1.3 of the same manual.

3.1. Blanks

A blank is a water sample that is processed and handled in the same manner as the associated environmental samples and is intended to be free of the analytes of interest. Blank samples are analyzed to test for contamination of environmental samples by the analytes of interest during any stage of sample collection, processing, and analysis. The following types of QC blank samples are used by the SWS:

- Field Blanks - De-ionized water placed in a clean sample container during the field trip. Field blanks are treated as regular samples in all respects, including contact with the sampling devices and exposure to sampling station conditions, storage, preservation and filtration, if applicable. The purpose of these blanks is to determine if any of these conditions or processes have caused sample contamination, and, if so, to what extent.
- Trip Blanks - A sample of analyte-free water that is prepared in the laboratory. It is transported, unopened, to the field with other sample containers and is shipped to the laboratory for analysis with the collected samples. Trip blanks are used to identify contamination that might occur during sample transport and analysis rather than because of sample collection and processing in the field. Trip blanks are normally prepared only for volatile organic chemicals (VOCs) and trace metals.
- Equipment Blanks – De-ionized water processed using applicable field equipment in the same manner as environmental samples. Equipment Blanks are used to demonstrate that sample-collection equipment and sample-processing equipment are not introducing contamination. Equipment blanks can be prepared for individual pieces of collection and processing equipment. Typically, equipment blanks are only prepared to assure non-contamination of samples during the filtration process, for churn splitters or autosamplers.

TABLE 6 lists the minimum collection frequencies for QC blank samples. The overall QC percentage is the sum of the blank plus the split/duplicate percentages. Most parameters for blanks have a minimum percentage of five percent. For example if a sampler visited 20 sites and sampled for total metals then at least one blank (5% of 20 samples) and one split or duplicate (5% of 20 samples) should be collected for a total of 10 percent QC.

In general, blank contamination above the method reporting level should be rejected except for parameters that are normally detected such as TDS and conductivity. See Section 10.6.2.3 of the Standard Operating Procedures for Surface Water Sampling for additional information.

An analysis of blanks results is conducted during the data validation process. After validation is completed, qualifier codes are assigned to the data points that may have been contaminated. To the data user, qualifier codes indicate that chemicals were detected in the associated blank and the sample may be potentially contaminated.

Labs use the B1-B7 qualifiers. Field blanks use FB2 qualifier (See Appendix L).

3.2 Duplicates and Splits

A split sample is one sample that is divided equally into two or more sample containers and then analyzed by different analysts or laboratories. Splits samples are taken from a churn splitter that has been filled with sub-samples and homogenized. Split samples may be equated to “identical twins” in that they contain the same chemical composition as each other. Laboratory analyses of split samples ideally produce identical results. Protocols for labeling split samples are found in the most current Standard Operating Procedures for Surface Water Sampling.

Duplicate samples are a set of similar samples collected from the same site, at about the same time, and analyzed in the same manner. Duplicate samples may be equated to “fraternal twins” in that they originate from one source but each sample may contain a slightly different chemical composition. Duplicate samples are usually taken when it is not possible to use a churn splitter to collect sub-samples and produce split samples (i.e., grab samples are collected). Also, some types of analyses preclude the use of a plastic churn splitter (e.g., volatile organic chemicals).

Target frequencies for collecting split and duplicate samples are listed in TABLE 6. Criteria for determining reasonable agreement between splits and duplicates can be found in Chapter 10 Section 10.6.2.2 of the Standard Operating Procedures for Surface Water Sampling. Most parameters for blanks have a minimum percentage of five percent. For example if a sampler visited 20 sites and sampled for total metals then at least one blank (5% of 20 samples) and one split or duplicate (5% of 20 samples) should be collected for a total of 10 percent QC.

In general, acceptable relative percent difference between split or duplicate samples is 20% or less, if the value of the results of the duplicate samples are greater than two times the method reporting limit.

3.3 Frequency of Field Quality Control Samples

TABLE 6. Summary of Typical Quality Control Sampling Frequencies.

Parameter	Field Splits or Duplicates	Equipment / Churn Blanks	Total
D Metals	None	5%	5%
T Metals	5%	5%	10%
Nutrients	5%	5%	10%
Inorganics	5%	5%	10%
Radiochemistry	5%	5%	10%
Bacteria	1 per trip		
Clean Metals	1 per trip		
Pesticides	5%	5%	10%
Biocriteria	10%	None	10%
Fish Tissue	5%	5%	10%
Algae	5%	None	5%

CHAPTER 4 QUALITY ASSURANCE AND QUALITY CONTROL

4.1 Level 1 - Staff Level Quality Control – add a level for Lab QC?

Quality control is divided into 3 different levels. Level 1 includes quality control at the staff level and includes water chemistry, fish tissue and biocriteria. Level 2 involves the unit manager review of staff work and Level 3 involves the QA Liaisons' review of staff and unit manager work. FIGURE 2 illustrates the relationships between the different levels of Quality Control.

Staff have the largest role in assuring quality data. Staff are responsible for collecting the water chemistry data, transferring the data to the database, and reviewing the data to insure quality. The project lead is responsible for all aspects of data handling from field to laboratory, from laboratory to storage, and from storage to validation.

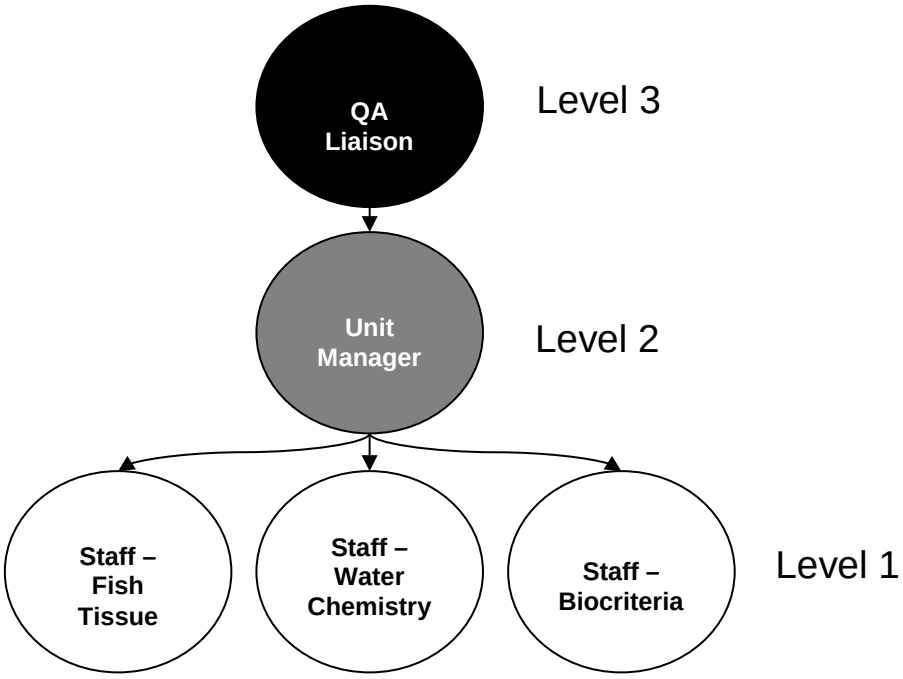
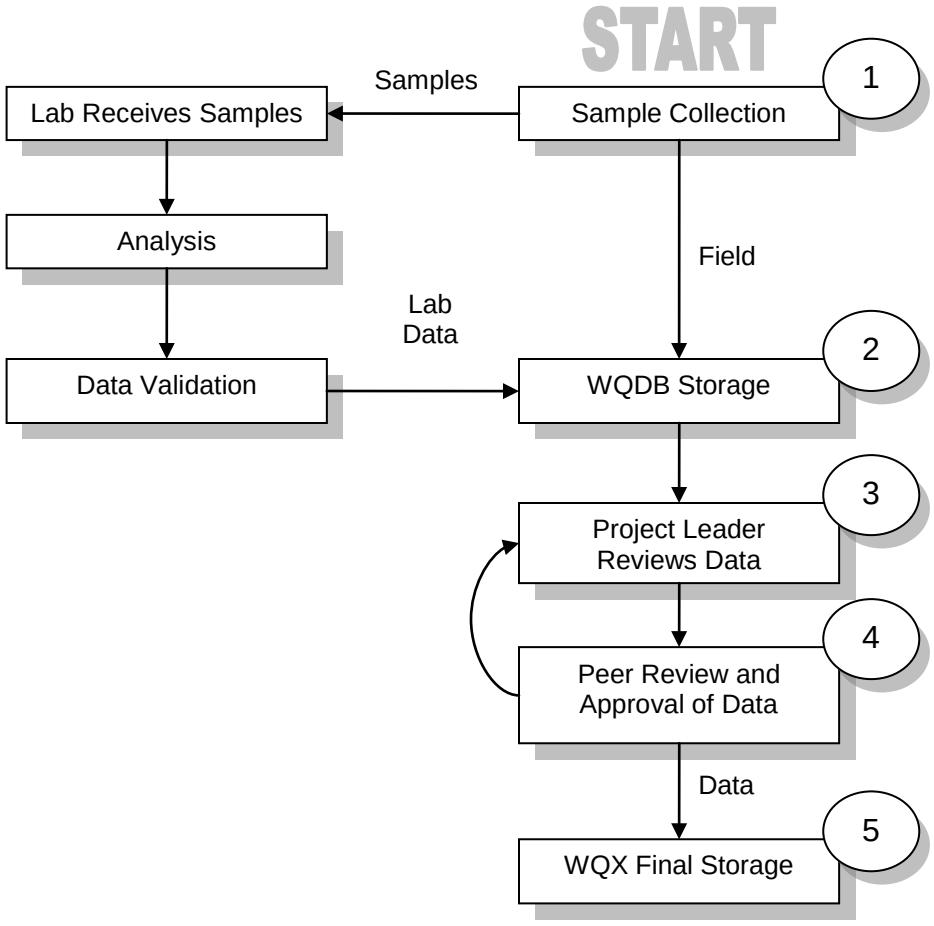


FIGURE 2. Flow diagram the different levels of Quality Control within the SWS.

4.1.1 Water Chemistry Quality Assurance and Quality Control

Quality assurance and control for water chemistry is done for every sampling trip and covers the following five steps, which are also outlined in FIGURE 3:

1. Samples are collected in the field.
2. Field and lab parameters are stored in the Water Quality Database.
3. The project leader reviews the data and completes the "WQDB Data Entry & Laboratory Data Package Review Checklist" in Appendix A. Specific instructions on how to complete the worksheet are provided in Section 10.6.2 of the SOP. A copy of this form goes into the site file.
4. The worksheet is peer reviewed and approved on the worksheet and in the database. Approval means that the data has been reviewed, data qualifiers have been applied and data quality objectives have been met.
5. Once the data is approved it is ready for the public and for final storage into WQX.



FIGRUE 3. Water quality data collection process.

4.1.2 Biocriteria Quality Control Worksheet

The Biocriteria Quality Control Worksheet is split into three parts, data validation, data verification, and data review. It is split up this way because it often takes up to 6 months to process macroinvertebrate samples and it is easier to compartmentalize the data verification, review, and validation steps rather than combine them as with water chemistry.

4.1.2.1 Biocriteria Validation

The taxonomy laboratory on contract to ADEQ conducts the following quality control checks and ADEQ provides a review of these activities to validate the data package. The Biocriteria Program manager shall fill out the Biocriteria Validation report in Appendix B. A copy of this report will be included in the Biocriteria Program Data files and the yearly QC file.

- Chain-of-custody procedures were followed
- Sorting efficiency check of 90% is attained
- A minimum of 500 macroinvertebrates are identified for each sample
- Accuracy of taxonomic identifications is >90% with checks done by a second taxonomist on 10% of the annual batch of samples
- Precision of sample identifications and IBI scores is determined by comparison of duplicate samples, collected at a rate of 10% of the annual batch of samples
- Data entry of results from bench sheets to database files is correct

4.1.2.2 Biocriteria Verification

Verification of data involves determinations that overall sample collection, lab analysis, and data entry procedures have been correctly followed and data quality objectives have been met. Verification activities involve determinations that the Standard Operating Procedures for collecting samples were correctly followed, that chain-of-custody procedures were followed, that laboratory data has been validated, and that general data quality objectives have been met. The Project QA Manager will conduct a data verification review for each annual dataset collected, to be documented in the Verification Report in Appendix C. A copy of the Verification report will be filed in the site file and in the yearly QC file.

4.1.2.3 Data Review

Data review is conducted to ensure that data has been screened prior to entry into the database and data is of sufficient quality for water quality standards to be applied and for designated use support determinations.

The field and laboratory data upload process is reviewed by the Biocriteria Program Manager to ensure that database quality control procedures have been followed. Determinations that the data is acceptable for scientific analyses, calculation of Indexes of Biological Integrity, biological assessments and other purposes are made as part of the data review by the Project QA Officer. Data review will be conducted on each annual data package and will be documented in the Appendix D. A copy of this report will be included in the Biocriteria Program Data files and the yearly QC file.

4.1.3 Fish Tissue Quality Control

Quality control for fish tissue is done for every sampling event. The basic process for fish tissue collection is as follows:

1. Fish are collected in the field. Fish tissue is processed and sent to the lab.
2. Lab parameters are stored in the EDAS access database.
3. The project leader reviews the data and completes the "WQDB Data Entry & Lab Data Package Quality Control Worksheet" in Appendix B. A copy of this form goes into the site file.
4. The worksheet is peer reviewed and approved on the worksheet and in the database. Approval means that the data has been reviewed, data qualifiers have been applied and data quality objectives have been met.

4.2 Unit Manager Level Quality Assurance and Quality Control

Each Unit Manager is responsible for completing the form titled "Unit Manager Quality Control Worksheet". This form, located in Appendix E, is to be filed in the yearly quality control file. This form shall be filled out quarterly (after each quarter's samples arrive from the lab).

The unit manager acts as a check on the staff quality control and has the ability to reject data that does not meet the outlined data quality objectives. Once the data is unapproved, it will either be completely rejected or problems with the data shall be corrected submitted to the unit manager for reapproval.

4.3 Quality Assurance Liaison Level Quality Assurance and Quality Control

The QA Liaison is responsible for completing the form titled "QA Liaison Quality Control Worksheet". This form, located in Appendix F, is to be filed in the yearly quality control file. This form shall be filled out annually by the assigned QA Liaison.

The QA Liaison checks for completeness of the data and also basic data accuracy for all data collected by the Surface Water Section. The QA Liaison acts as a check on the SWS staff including other unit managers. The QA liaison has the authority to reject data that does not meet the outlined data quality objectives with Section Manager approval. Once the data is unapproved, it will either be completely rejected or problems with the data shall be corrected and resubmitted to the QA Liaison for reapproval.

4.4 Field Audits

Various SWS field personnel will accompany project leads on sampling trips to ensure standardization of procedures among staff. Field Audits will be conducted to provide assessment of the implementation of the procedures outlined and/or referenced in this QAPP.

Field Audits are typically conducted by unit managers. Senior level staff may also perform field audits if delegated by a unit manager. Field Audits shall be documented using the "Field Audit" form in Appendix G. Specific details

within the form may be modified based on the type of sampling conducted. Field Audits shall be conducted at least yearly for all staff. Forms shall be provided directly to the project lead during the trip so any immediate corrective actions can be resolved. Field Audit forms are placed in the Section QA file.

4.5 Corrective Actions

Corrective actions can be the result of situations involving field activities or laboratory activities. Corrective actions will be taken as necessary to assure that the environmental measurements will be of a known quality and will be sufficient to meet the program data quality objectives. Corrective actions will be adopted by SWS staff, laboratories, or contractors as appropriate.

Field corrective actions generally are the responsibility of the project lead. Some corrective actions can be taken in the field. Problems can result from situations such as malfunctioning or broken field equipment, inability to access a surface water sampling site, or an inability to get samples into a laboratory before their holding time is exceeded. Regardless of the source of the problem or whether or not it can be corrected, it will be documented in the appropriate field forms. Corrective actions can include items such as performing additional decontamination of equipment, re-sampling, locating alternative sample sites or obtaining additional training of field personnel. Each corrective action will be documented with a description of the deficiency and the corrective action taken, and the person responsible for implementing the corrective action.

Laboratory corrective actions are typically worked out between the project lead and the laboratory. Problems can result from situations such sample labels that do not match chain of custody documents, insufficient preservation, missed holding times, duplicate sample criteria not met, or other conditions relating to the sample or laboratory. Some corrective actions will require the notification of the individual that submitted the sample. Other corrective actions may be internal to the laboratory and automatically implemented by laboratory personnel. Corrective actions involving notification of the ADEQ will be documented in the site file.

4.6 Rejecting Data

Water chemistry, fish tissue, and biocriteria data that don't meet QC acceptance criteria must be rejected prior to entry in the WQDB or EDAS. Rejected data is deleted from database or not entered at all. Examples of when data is not entered into the database include equipment malfunction, and problems at the laboratory (contaminated blank samples, gross outliers, high relative percent difference between a routine and duplicate sample, etc.). Use the lab qualifier codes and rejection criteria in Appendix L to determine when to reject data.

Rejected data is deleted from the WQDB. Use the "General/Additional" Sample Event code to note which records were removed from the database and why. All rejected data must be noted on the Data entry & Lab data package Review Checklist and placed in the site file.

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APPENDIX A – WQDB DATA ENTRY & LAB DATA PACKAGE REVIEW CHECKLIST

Instructions for filling out this sheet are located in Section 10.6.2 of the Standard Operating Procedures for Surface Water Quality Sampling manual (2015).

WQDB Data Entry & Lab Data Package Review Checklist **Date Approved in WQDB ___/___/20__**

Site ID:	DEQ Number:
Site Name and Description:	Date/Time Sampled:

Instructions: Each section of the checklist corresponds to the applicable section in the Standard Operating Procedures for Surface Water Sampling. Check that section of the SOP for additional information.

PRELIMINARY DATA CHECK

☐ **10.6.2.1. WQS EXCEEDANCES?** Check lab report and field data sheets
List exceedance(s)_____

☐ Check hardness dependent dissolved metals (Cu, Pb, Cd, and Zn) for standards exceedances, using metals calculator.

☐ **10.6.2.2. SPLIT/DUP RPD WITHIN LIMITS?**

☐ Check split / duplicate field samples associated with the run. Acceptable relative percent difference (RPD) is <20% for results greater than 2x the MRL (Acceptable criteria for E. Coli is if confidence intervals overlap using IDEXX program). List analyte(s) with unacceptable RPD & flag with RPD qualifier _____

☐ QC samples affect the entire run; Flag all samples in that sample event with the RPD flag, in the Event Table.

☐ Rerun analytes which are out of limits (For Accutest, email Elvin Kumar)

☐ The QC sample for this run was at site_____

☐ **10.6.2.3. ARE EQUIPMENT BLANKS CLEAN?**

☐ No Blank on this run

☐ Blank clean

☐ Data Rejected (for entire run). Parameter detected above MRL (Excluding 'detectable parameters' like TDS & Conductivity). For E. Coli all wells must be clean.
List parameters _____.
Add 'REJECTED DATA DUE TO QA/QC ISSUES' event. List parameters and reason data removed.

☐ **10.6.2.4. DATASET COMPLETE?** All test results received and uploaded correctly.
Check that all test results requested from the Lab were received and verify that all data values, method reporting limits, and qualifiers were uploaded correctly to WQDB.

DATA ENTRY - FIELD

☐ **10.6.2.5. Add FIELD PARAMETERS, FIELD DUPLICATES, AND FIELD QUALIFIERS**

☐ **10.6.2.6. Add EVENT CODES** (relevant/comment event codes listed below; see Table 10.2 of the SOP for a full list)

☐ BASEFLOW CONDITIONS

☐ SIGNIFICANT RAIN DURING PAST 48 HOURS MAY AFFECT RESULTS (This will exempt any SSC standard violation).

☐ REJECTED DATA DUE TO QA/QC PROBLEMS (Indicate which parameters were rejected/removed from database & why)

☐ EQUIPMENT PROBLEMS ASSOCIATED WITH VISIT for Hydrolab and other equipment problems.
List parameter(s) affected _____

☐ DEVIATION(S) FROM SOPs _____

☐ EXCEEDANCE(S) AT TIME OF SAMPLING (pH, DO, E.Coli)

☐ EXEMPTIONS FROM "EXCEEDANCE" DUE TO NATURAL SOURCES (Low DO from upwelling or spring source)

☐ Other Events _____

DATA ENTRY – LAB QC DATA PACKAGE REVIEW

☐ **10.6.2.7. LAB QUALIFIERS UPDATED?**

☐ Verify that MRL's / Data Qualifiers match

☐ Dilutions conducted by the Lab (D)?

☐ Method blank results are <MRL and none are flagged "Outside QC limits" _____

☐ Matrix spike results: Flag if %Recoverable is outside QC limits (M1 – M7) _____

☐ ADEQ Sample requested for matrix spike/matrix spike duplicate (MS/MSD)? _____

☐ Spiked blank results: Flag if %Recoverable is outside QC limits for your sample (L5) _____

☐ Serial Dilution results: Flag if %Difference is outside QC limits for your sample (MX1) _____

☐ **Reject Data / Delete results associated with QC problems, when (See Table 10.4 of the SOP for full list):**

☐ A4 – Bacteria in method blank contaminated

☐ B1-B7 – Lab Method blank contaminated

☐ E6-E7 – Estimate, Internal Lab standard recoveries did not meet acceptance criteria

☐ L1- L4 – Blank spike recovery abv method acceptance limits

☐ M – Duplicates outside control limits

☐ N4-N6 – Minimum reporting limit verification check not meeting criteria

☐ Q1-Q10– Sample integrity not maintained

☐ R1-R13 – Internal lab duplicates exceeded control limits

☐ S – Spike blank sample recovery outside control limits.

☐ **10.6.2.8. CALCULATE F/L RATIOS & ION CHECKS:**

Field/Lab Specific Conductivity ratio between 0.9 and 1.1.	☐ Yes ☐ No _____
Field/Lab pH ratio between 0.9 and 1.1.	☐ Yes ☐ No _____
TDS/Specific Conductivity ratio between 0.55 and 0.75.	☐ Yes ☐ No _____
TDS/Calculated Sum ratio between 1.0 and 1.2	☐ Yes ☐ No _____
Cation/Anion balance percent difference in the acceptable range.	☐ Yes ☐ No _____

☐ **10.6.2.9. RERUN REQUESTED?** For Accutest, call or email Elvin Kumar at 408-588-0200 (elvink@accutest.com) to rerun samples if needed.
List Reruns requested _____

☐ Reruns within QC limits?

☐ **10.6.2.10. Data approved in WQDB (both routine & duplicate)?**

☐ **10.6.2.10. Record WQDB data approval date in Sample Tracking DB**

☐ **ACCEPT ALL TEST RESULTS AS ACCURATE?**

LIST FLAGGED TEST RESULTS: _____

LIST DELETED TEST RESULTS: _____ ☐ **ADDED EVENT FOR "REJECTED DATA"**

Data Entry completed	**Date:**_____ **Initials:**_____
Staff QC Check completed **☐ Reviewer initials added to event section**	**Date:**_____ **Initials:**_____
QA/QC completed within 30 days of data upload to WQDB?	**☐ Yes ☐ No** **If no, why?** _____
Have exceedance letters been sent out?	**☐ Yes ☐ No ☐ NA**
Has notice of exceedence been filed in both the site file and exceedence file?	**☐ Yes ☐ No ☐ NA**

APPENDIX B - BIOCRITERIA LABORATORY DATA VALIDATION REPORT

Dataset Name: ☐

Fiscal Year: ☐☐☐☐

Date of Review: ☐☐/☐☐/☐☐☐☐

Data Validator: ☐

Data Covered by this Worksheet: ☐

Note: This worksheet can be completed electronically or manually. If completed manually, the information can be attached to the worksheet, as there may not be enough room to include all information requested.

1) Have any QC problems been identified in the laboratory quality control reports? List the taxonomy issues encountered and corrective recommendations taken.

☐ Yes ☐ No

What corrective action, if any, was taken?

☐ Step 1 Completed Initials: _____

2) Have original Chain-of-Custody forms with ID numbers and laboratory receipt signatures been submitted?

☐ Yes ☐ No

☐ Step 2 Completed Initials: _____

3) Have laboratory taxonomic data results been provided for each biological sample submitted in the proper electronic format?

☐ Yes ☐ No

☐ Step 3 Completed Initials: _____

4) Has the following information included?

A) Duplicate samples have similar taxa list and IBI score
B) Record of Caton Tray proportion of sample analyzed
C) Minimum of 500 count per sample is recorded
D) List of new taxa and attributes is provided
E) Sorting efficiency check of 90% accuracy has been met
F) Taxonomic identification check on 10% of samples has yielded 90% accuracy
G) Have results been submitted within 6 months of sample delivery

☐ Yes ☐ No

☐ Step 5 Completed Initials: _____

5) Summary of laboratory communications or qualification on the dataset.

☐ Step 6 Completed Initials: _____

After all of the above steps have been completed, save and print the worksheet, attach all applicable supplemental information and sign below.

I acknowledge that the data verification and validation process has been completed for the data identified above in accordance with the procedures described in the SWS QAPP.

_____

Data Verifier/Validator Signature

APPENDIX C – BIOCRITERIA DATA VERIFICATION REPORT

Dataset Name: ☐

Fiscal Year: ☐☐☐☐

Date of Review: ☐☐/☐☐/☐☐☐☐

Data Verifier ☐

Data Covered by this Worksheet: ☐

Step 1
Were ADEQ SOP's followed during collection of biological samples (including correct habitat, index period, general sampling conditions and correct preservation of samples)?)? List number & percent of samples collected outside index period.

☐ Yes ☐ No

☐ Step 1 Completed Initials: _____

Step 2
Was the Chain-of-Custody followed by ADEQ and documentation provided by Laboratory?

☐ Yes ☐ No

☐ Step 2 Completed Initials: _____

Step 3
Were lab results produced for each sample submitted to the taxonomy lab?

☐ Yes ☐ No

Was a Laboratory Validation report produced and lab data validated for Biocriteria Program use?

☐ Yes ☐ No

☐ Step 3 Completed Initials: _____

After all of the above steps have been completed, save and print the worksheet, attach all applicable supplemental information and sign below.

I acknowledge that the data verification and validation process has been completed for the data identified above in accordance with the procedures described in the SWS QAPP.

_____
Data Verifier/Validator Signature

APPENDIX D - BIOCRITERIA DATA REVIEW REPORT

Dataset Name: ☐

Fiscal Year: ☐☐☐☐

Date of Review: ☐☐/☐☐/☐☐☐☐

Biocriteria coordinator: ☐

Data Covered by this Worksheet: ☐

Step 1 – Completed Reports
Biocriteria Laboratory Data Validation Report Completed (if no provide comments on follow up actions)?
☐ Yes ☐ No
Comments:

Biocriteria Laboratory Data Verification Report Completed (if no provide comments regarding follow up actions)?
☐ Yes ☐ No
Comments:

☐ Step 1 Completed Initials: _____

Step 2 - Data Outliers
Was the data reviewed for outlier values (for example the sample count should be above 500 individuals)?
☐ Yes ☐ No

☐ Step 2 Completed Initials: _____

Step 3 - Data uploads to EDAS
Has the Electronic Dataset been successfully uploaded into ADEQ's Ecological Data Application System (EDAS) and quality control checks on the data upload completed?
Was the data reviewed for outlier values?
☐ Yes ☐ No

☐ Step 3 Completed Initials: _____

Step 4 – Final Approval
Is the data acceptable for data analysis and decision making?
☐ Yes ☐ No

☐ Step 4 Completed Initials: _____

After all of the above steps have been completed, save and print the worksheet, attach all applicable supplemental information and sign below.

I acknowledge that the data verification and validation process has been completed for the data identified above in accordance with the procedures described in the SWS QAPP.

_____
Biocriteria Coordinator Signature

APPENDIX E – UNIT MANAGER QUALITY CONTROL WORKSHEET

Fiscal Year: ☐☐☐☐

Quarter: ☐

Date of Review: ☐☐/☐☐/☐☐☐☐

Unit Manager Name: ☐

Step 1: Complete Sample Set

A) Does the number of samples for the quarter equal the number requested in the sample plan (for water chemistry, biocriteria and/or fish tissue)?

☐ Yes ☐ No ☐ Not Applicable

If yes, proceed, if no then detail which batches were missing and action taken.

Step 2: Complete Data Entry

A) Has all the data been entered into the database and approved?

☐ Yes ☐ No

If yes, proceed, if no then detail deficiencies.

Step 3: Follow-up Activities and Conclusion

A) Was follow up action documented by staff?

☐ Yes ☐ No

If yes, proceed, if no then detail deficiencies.

B) Was the conclusion supported by documentation?

☐ Yes ☐ No

If yes, proceed, if no then detail deficiencies.

Don't forget to complete the following items:

- Attach all applicable supplemental information. Include what follow-up action was taken.
- Sign below
- Place a copy of this form in the yearly QC File

I acknowledge that the data verification and validation process has been completed for the data identified above in accordance with the procedures described in the SWS QAPP.

_____

Unit Manager Signature

APPENDIX F – QUALITY ASSURANCE LIAISON WORKSHEET

Instructions: QA Liaison should run the reports outlined in Step 1 and 2 at least quarterly.

Fiscal Year: ☐☐☐☐

Date of Review: ☐☐/☐☐/☐☐☐☐

Quality Assurance Liaison Name: ☐

Quarterly WQDB Checks:

1. Has all data been Approved and Reviewed?

A) Run the QA Report for Unapproved Data in the Live WQDB.mxd Access database to determine unapproved data greater than 90 days from the date the report was run.
Attach report to this file.

B) Email staff to review and approve data identified in report.

2. Is the Data Accurate?

A) Run the QA Report for Suspect Data in the Live WQDB.mxd Access database to determine which records and which staff have suspect data. Attach report to this file.

B) Email staff to assess and correct values that are incorrect.

3. Summarize WQDB Problems - Detail common QA issues during the quarter if any such as nutrient problems in blanks or split deviation. Data that does not meet acceptance criteria are rejected and removed from the WQDB.

Field and Lab Data Audits:

4. Field & Lab Data Audits – Audits have been conducted for all field staff by examining Field Audit Forms and a check on the WQDB Data Entry & Lab Package Review Checklist (Appendix A), annually and corrective actions recorded, signed off and filed.

Don't forget to complete the following items:

- Attach all applicable supplemental information. Include what follow-up action was taken.
- Sign below
- Place a copy of this form in the yearly QC File

I acknowledge that the data verification and validation process has been completed for the data identified above in accordance with the procedures described in the SWS QAPP.

_____

QA Liaison Signature

APPENDIX G – FIELD AUDIT FORM

FIELD AUDIT CHECKLIST

Fiscal Year:

Site ID:

Date of Review:

Field Auditor Name:

Name(s) of Staff being Reviewed:
(Identify Trip Lead)

Trip Preparation				
#	**Staff**	**Item**	**Pass?**	**Comments**
1		Calibrated multiprobe & clearly recorded calibration information in log book?	☐	
2		Routing form complete ?	☐	
3		Directions upto date in WQDB and Sample Plan	☐	
4		CSW/CGW # and COC's obtained & prepared in advance?	☐	

Sampling				
#	**Staff**	**Item**	**Pass?**	**Comments**
5		Completely filled out datasheet & data checked before leaving site?	☐	
6		Demonstrated safe practices (driving, hiking etc)?	☐	
7		Calibrated DO sensor at site?	☐	
8		Triple rinsed bottle?	☐	
9		Bottles labeled clearly & correctly?	☐	
10		QC sampled correctly?	☐	

Sampling				
#	**Staff**	**Item**	**Pass?**	**Comments**
11		Appropriate # of points used for flow (>15)?	☐	
12		Appropriate flow method used (1 vs. 2 point)?	☐	
13		Representative sample taken (Grab vs. EWI)?	☐	
14		Gloves w/ E. Coli collection?	☐	
15		Any equipment forgotten?	☐	
16		Were Standard Operating Procedures followed and deviations noted on field form?	☐	

Processing				
#	**Staff**	**Item**	**Pass?**	**Comments**
17		Turbidity sampled correctly?	☐	
18		Gloves w/ acid?	☐	
19		Gloves w/ E. coli?	☐	
20		Deconned equipment?	☐	
21		Dilution equipment available (DI water, graduated cylinder, extra bottles?)	☐	

Post-Trip				
#	**Staff**	**Item**	**Pass?**	**Comments**
22		Contact person called each night?	☐	
23		Sample run and trip organized well?	☐	

Post-Trip				
#	**Staff**	**Item**	**Pass?**	**Comments**
24		Appropriate permissions and contacts?	☐	
25		Samples dropped off in good shape (<4° C, clearly labeled bottles & COC, full bottle sets)	☐	
26		QC samples labeled correctly on bottles. Matching information written on field forms.	☐	
27		Post Calibration of multiprobe completed correctly?	☐	
28		E. Coli processing and enumeration done within timelines and according to protocols.	☐	

SEM ☐ NA				
#	**Staff**	**Item**	**Pass?**	**Comments**
29		Level of effort consistent (1 minute kick; 3 riffles throughout reach)?	☐	
30		Reach length representative (measured wetted with in representative areas)?	☐	
31		Bug jars labeled correctly (inside and out)?	☐	
32		Pebble counts done correctly? D100 noted?	☐	
33		Homework done (sinuosity, flood prone width, slope, maps, valley type)?	☐	
34		Thorough fieldwork and good notes?	☐	
35		Conclusions based on measurements (limited BPJ)?	☐	
36		Pacing done along or in streambed? Reach length appropriate?	☐	
37		Order of sampling appropriate (bugs before pebble count)? Sampling conducted in downstream to upstream direction.	☐	
38		Bankfull indicators used and stream type correctly identified?	☐	
39		Habitat, PFC and Pfankuch done correctly and completely. Done as a group?	☐	

SEM ☐ NA				
#	**Staff**	**Item**	**Pass?**	**Comments**
40		Work done efficiently?	☐	
41		Any equipment forgotten?	☐	
42		Canopy density (no hats, correct position 1 foot above water 1 foot from edge) done correctly?	☐	
43		Notes and measurements recorded neatly?	☐	

Auditor Comments

RECOMMENDATIONS / CORRECTIVE ACTIONS

Minor Fixes:	
Major Problems:	
Corrective Actions:	

Staff Comments

DISTRIBUTION

* Supervisor's File
* Sampler

APPENDIX H –PARCC STANDARDS

1. Water Chemistry

Water chemistry is used to determine the chemical integrity in waterbodies (lakes, streams and rivers) and to determine compliance with water quality standards. To ensure data quality, water quality field and laboratory procedures listed in the most current version of Standard Operating Procedures for Surface Water Quality Sampling shall be followed. Some of the major PARCC considerations are listed below.

A. Precision – Precision is achieved by replication of chemical tests in the Lab and duplicate and split samples in the field.
B. Accuracy – Water quality samples shall be collected in accordance with the most current ADEQ Field SOPs. Field audits shall be performed in accordance with QAPP requirements. Field equipment shall be properly maintained and calibrated according to the Surface Water SOP manual. Accuracy in the Laboratory is achieved by various tests including method and spiked blanks, matrix spikes and duplicates, and serial dilutions. ADEQ checklists will be utilized to approve Lab data packages and to approve field data for entry into the WQDB.
C. Representativeness – Representative samples are achieved primarily through sample design, selection of sites and procedures to meet project objectives. The Sampling & Analysis Plan contains the objectives for sample collection and analysis each year for the Surface Water Section. Representativeness is primarily achieved through adherence to the Sample plan design. Representativeness is also addressed in the field through collection of water samples in carefully selected locations that are most representative of the stream reach or lake region. Representativeness is also achieved in the laboratory through (1) the proper handling, homogenizing, compositing, and storage of samples and (2) analysis within the specified holding times so that the material analyzed reflects the material collected as accurately as possible.
D. Completeness – The completeness goal is 100% valid data entered into the ADEQ WQDB.
E. Comparability – Comparability is a measure of the confidence with which one data set can be compared to another. This is a qualitative assessment and is addressed primarily in sampling design through re-sampling of stations over time or duplicate samples at a station. In the laboratory, comparability is ensured through the use of comparable analytical procedures and ensuring that project staff are trained in the proper application of the procedures. Within-study comparability will be assessed through analytical performance (QC samples).

F. Sensitivity is the capability of a test method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. Sensitivity is addressed primarily through the selection of appropriate analytical methods, equipment and instrumentation. The methods selected for a study are chosen to provide the sensitivity required for the end-use of the data. This is a quantitative assessment and is monitored through the instrument calibrations and calibration verification samples and the analysis of procedural blanks with every analytical batch.

2. Biocriteria

Bioassessments are used for determining biological integrity in perennial, wadeable streams and to determine compliance with the narrative biocriterion in Arizona Administrative Code R18-11-108.01. To ensure data quality, biocriteria field and laboratory QC procedures listed in the table below are used. In addition, the following data quality criteria shall be applied for assessment purposes:

A. Precision – Studies of variability of IBI scores within reference sites across replicates or years will be conducted periodically. Target is standard deviation of <10 points.
B. Accuracy – Laboratory SOPs shall be followed such that a target of 90% sorting efficiency and 90% taxonomic accuracy is achieved for each batch of samples analyzed by our taxonomy lab.
C. Bias – Sampling bias shall be avoided by using a D-frame dip net with a standard mesh size. Only riffle habitats are sampled.
D. Bias – Samples are sorted in the laboratory with a dissecting scope; no field sorting is conducted.
E. Sampling interferences shall be avoided; sampling shall not be conducted during high flow events. Sampling shall occur during the spring index period (April-June).
F. Completeness – A target of ten reference sites is the objective for sampling from each surface water basin each monitoring year for maintenance and updating of the IBIs.
G. Samples shall only be collected from appropriate habitats. For purposes of meeting the ADEQ narrative biocriteria standard, the following sampling site conditions must be met: wadeable, perennial, riffle/run habitat,

heterogeneous substrates, sampled during the spring index period (April-May for warmwater streams and May-June for coldwater streams).

H. Decisions to be made using biological data - The ADEQ Indexes of Biological Integrity are the primary tool for analyzing macroinvertebrate data for purposes of 305b assessments of the aquatic life use. Since the new narrative biocriterion uses the 25th percentile of reference condition as the threshold value for meeting the aquatic life use standard, the warmwater and coldwater 25th percentile value is used for making decisions about whether the use is being adequately protected. A sample IBI score must be greater than or equal to the 25th percentile of reference IBI threshold to comply with the narrative biocriteria standard. When a sample IBI score is less than the 10th percentile of reference condition, the sample has exceeded the standard and is impaired. When a sample IBI score falls between the 10th and 25th percentile of reference score, the result is inconclusive and a verification sample is required. If the verification sample IBI score falls below the 25th percentile, the biocriteria standard is exceeded. ADEQ sampling and analysis methods must be followed for valid bioassessments.

TABLE H1. Biocriteria procedures related to PARCC.

Procedure	Performance Characteristic	Description
Sampling device (field)	Precision - repeatability in a habitat	We have shown good repeatability in studies of variability within sites sampled over multiple years. These samples had low variability of site IBI scores (standard deviation of 6.5 points on a 100 point scale) for replicate spring, riffle samples within a site.
	Bias - exclusion of certain taxa (mesh size)	The D-frame sampler is outfitted with a 500µ mesh size net opening, which retains organisms of a consistent size for identification and excludes very small specimens of early larval instars which are difficult to identify.
	Performance Range	The D-frame dip net is an efficient sampler for use in Arizona streams, as it can be used in large or small streams with variable habitats and substrate sizes.
	Interferences - matrix/physical limitations	The D-frame sampler functions well in a variety of water depths and velocities, without limitation.
Sampling method (field)	Precision - variable metrics or measures among replicate samples at a site	Measurement error is quantified by replicate sampling at 10% of our sampling sites each year. Samples are processed and analyzed separately and their metrics and IBI score compared to obtain a measure of the method precision. This is an estimate of the precision of the entire method which includes variability due to small-scale spatial variability within a site, operator consistency and bias, and laboratory consistency.
	Bias - exclusion of certain taxa (mesh size) or habitats	Only Riffle habitats are sampled. Pools are excluded. We exclude organisms smaller than 500µ.
	Performance range - limitations in certain habitats or substrates	Method is currently limited to only riffle habitats of wadeable, perennial streams. Intermittent and ephemeral streams, effluent dependent waters and lakes are excluded waterbody types. Bedrock/travertine dominated substrates, wetlands, pool dominated streams, and sand dominated habitats are excluded.
	Interferences - high river flows, training of personnel	Sampling is limited to low flow conditions, which are more suitable for sampling than during high flows. Our sampling SOPs recommend sampling a minimum of 4 weeks after a bankfull flood has occurred. Methods have not yet been developed for large river sampling.

Procedure	Performance Characteristic	Description
	Bias - efficiency of locating small organisms in sample transfer	The sieve is carefully rinsed after straining a sample to obtain every specimen visible to the naked eye. Then the sieve is washed prior to leaving a sample site. All samples are sorted in the laboratory using 6-10X powered dissecting scopes.
	Performance range - sample preservation and holding time	Samples are preserved with isopropanol and a capful of formalin in the field. Formalin is used for better preservation in the Arizona heat.
	Interferences – Rainfall	Field sorting is not part of our routine SOPs, so rainfall is not limiting.
	Accuracy - of sample transfer process and labeling	Our contract laboratory follows sorting and labeling procedures according to their Laboratory SOP to prevent labeling errors.
Laboratory sample processing	Precision - split samples	Duplicate samples are collected at the rate of 10% of the total # of samples during each year's index period. We do not currently compare taxonomy from different laboratories.
	Bias - sorting certain taxonomic groups or organism size	Large specimens are removed first from the entire sample for best identifications. All organisms retained by the 500 micron mesh sieve are identified utilizing a Caton Tray and subsampling procedures outlined in the Laboratory SOP manual.
	Interferences - equipment	A Caton Tray and specific subsampling SOPs are used to limit errors associated with subsampling.
	Accuracy - sorting method, lab equipment	Sorting efficacy is checked for 10% of the samples processed by a trained technician using a dissecting scope with up to 6x magnification at the contract lab. A second sorter checks a sorted subsample to ensure that the target of 90% sorting efficiency is met.
Taxonomic enumeration	Precision - split samples	We do not currently conduct split sample analyses between two different laboratories.
	Bias - counts and identifications for certain taxonomic groups	Our taxonomy lab provides a minimum 500 count of insects per sample, which accounts for approximately 90% of the taxa present in the sample, missing only those that are rarely occurring in the sample.
	Interferences - appropriateness of taxonomic keys	The taxonomy lab uses the most current southwestern, western and North American taxonomy keys for identification of Arizona samples.
	Sensitivity - level of taxonomy related to type of stressor	A standard taxonomic effort is required for various macroinvertebrate groups, with insect identifications to genus or species level and midges identified to family level.
	Accuracy - identification and counts	A quantitative check of taxonomic accuracy is provided on 10% of the samples processed by a trained and experienced taxonomist at the contract lab. The taxonomy contractor is responsible for obtaining the most accurate, consistently achievable identifications for ADEQ samples, using specialists as needed to obtain identifications to the general taxonomic levels listed in Table H2 below. A second taxonomy analyst re-identifies a subsample of specimens to ensure that the target of 90% accuracy is met. In addition, a macroinvertebrate reference specimen collection shall be permanently maintained in the laboratory at ADEQ for verification purposes.

TABLE H2. ADEQ Taxonomic levels of identification for macroinvertebrates.

Invertebrate Group	**Level of taxonomy required**
Aquatic insects (except the family Chironomidae)	Genus (or species where consistently identifiable)
Chironomidae	Family
Semi-aquatic insects	Family
Arachnida (Mites)	Class
Cladocera, Copepoda, Ostracoda	Class
Amphipoda, Decapoda, Isopoda	Class
Nematoda, Nematomorpha	Phylum
Turbellaria	Class
Annelida	Class
Mollusca	Family or Genus

APPENDIX I - ANNUAL BIOASSESSMENT REPORT, EXTERNAL PARTIES

The following guidance is provided for external parties who plan to conduct bioassessments. This guidance was prepared for AZPDES permittees, but also applies to other groups who would like to coordinate data sharing with ADEQ and/or apply the ADEQ Indexes of Biological Integrity to assess attainment of the Biocriteria water quality standard. The guidance consists of the following bioassessment recommendations:

1. Bioassessment should occur concurrently with ambient water quality monitoring
2. A bioassessment survey plan containing sample dates, locations of background and study sites, sampling personnel and qualifications, name and location of contract laboratory, biological and habitat sampling protocols and method of analysis, should be completed and submitted to ADEQ by December 31st each year.
3. ADEQ sampling and analysis protocols should be followed as closely as possible, using the most updated Quality Assurance Program Plan.
4. Laboratory protocols should follow ADEQ procedures in the ADEQ Biocriteria QA Program Plan.
5. The bioassessment report should be submitted to ADEQ for review. The report should contain: an executive summary, introduction, study area description including maps and photos, methods, results and discussion, literature cited, and appendices with complete taxa lists and copies of completed field forms for each site. The results and discussion section should cover a physical characterization of the sites, a habitat assessment, water quality, fish & wildlife, macroinvertebrates, and long term trends at the study sites.
6. Macroinvertebrate analyses should contain: a list of taxa and abundances, the calculated warm or cold water IBI score, the benthic habitat score, and graphs indicating a comparison of reference and study site IBI scores for the current year, changes in the reference and study IBI scores over a permit period and changes in the reference and study site habitat scores or habitat values over the permit period.
7. The first bioassessment shall be subject to a quality assurance review to be conducted by ADEQ. The voucher specimens from the laboratory should be submitted to ADEQ for a quality control review of the taxonomic identifications by the ADEQ contract taxonomist. Major revisions should be incorporated into the final bioassessment report.
8. External parties shall collect, QC check and maintain voucher specimen collections for each sampling site or ` stream following methods in the ADEQ Biocriteria QA Program Plan.

APPENDIX J – CALCULATING THE ARIZONA INDEX OF BIOLOGICAL INTEGRITY

The Arizona Indexes of Biological Integrity can be applied to macroinvertebrate taxonomic data generated by the sample collection procedures provided in Standard Operating Procedures for Surface Water Sampling. All the appropriate sample collection conditions must be met in order to calculate the IBIs for bioassessment purposes (i.e. application of the narrative biocriteria standard). There are currently two Indexes; a cold and a warm water IBI. The following narrative provides the steps needed to calculate these Indexes from taxonomic lists and abundance data generated by taxonomy laboratories from the
field collected macroinvertebrate samples.

1. Identify the appropriate reference community using the site elevation.
   - The warm water community is defined as being located below the 5000 foot elevation.
   - The cold water community is defined as being located above the 5000 foot elevation.
2. Calculate the macroinvertebrate metric values for the study sample following metric calculation procedures listed below. Metrics required for each index are listed in Table J1.

Use the following formula to calculate the metric score (percentage of reference) for sensitive metrics whose values decrease with disturbance. Apply this formula to the following metrics.

Metric Score = (Sample value / metric threshold value) * 100

1. Total taxa richness
2. Number of Ephemeroptera taxa
3. Number of Trichoptera taxa
4. Number of Diptera taxa
5. Number of intolerant taxa
6. Percent Ephemeroptera
7. Percent Plecoptera
8. Percent scrapers
9. Number of scraper taxa

Apply the following formulas to calculate the metric score (percentage of reference) for tolerant metrics whose values increase with disturbance.

1. Hilsenhoff Biotic Index

   Metric score = (10 – Sample value) / (10 – Metric threshold value) * 100

2. Percent dominant taxon

   Metric score = (100 – Sample value) / (100 – Metric threshold value) * 100

3. Calculate the metric percent of reference score using either the warm or cold water reference metric threshold values associated with that community type (Tables J2 and J3).
4. Calculate an average of the percent of reference scores for all metrics to produce the IBI score. Table J4 provides an example of the scoring system for a warm water stream.
5. Determine assessment category for the IBI score from Table J5.

TABLE J1. Descriptions for the warm water and cold water metrics used in Arizona's IBIs.

Category	Metric	Definition	Expected Response to increasing disturbance
Richness measures	Total number of taxa	Number of different macroinvertebrate taxa	Decrease
	# Ephemeroptera taxa	Number of mayfly taxa	Decrease
	# Trichoptera taxa	Number of caddisfly taxa	Decrease
	# Diptera taxa	Number of true fly larvae.	Decrease

Category	Metric	Definition	Expected Response to increasing disturbance
	# Intolerant taxa	Number of taxa having a tolerance value #3	Decrease
Composition measures	% Dominant taxon	Percent abundance of the single most abundant taxon.	Increase
	% Ephemeroptera	Percent abundance of mayflies, compared to total abundance of the sample	Decrease
	% Plecoptera	Percent abundance of stoneflies, compared to total abundance of the sample	Decrease
Tolerance measure	Hilsenhoff Biotic Index	Abundance-weighted average tolerance of assemblage	Increase
Trophic measures	% Scrapers	Percent abundance of the scraper functional feeding group, compared to total abundance of the sample	Decrease
	# Scraper taxa	Number of taxa in the scraper functional feeding group	Decrease

TABLE J2. Reference scoring thresholds for Warm Water metrics, used in the Arizona Warm Water Index of Biological Integrity.

Metric	Metric threshold value
Total taxa	37
Trichoptera taxa	9.0
Ephemeroptera taxa	9.0
Diptera taxa*	10.0
Scraper taxa	7.0
Percent scraper	23.7
Percent Ephemeroptera	70.0
Percent Dominant Taxon	19.1
Hilsenhoff Biotic Index	4.89

* Appropriate taxonomic effort is to genus for insects and to family for midges.

TABLE J3. Reference scoring thresholds for Cold Water metrics, used in the Arizona Cold Water Index of Biological Integrity.

Metric	Scoring threshold
Total taxa	38
Diptera taxa*	11
Intolerant taxa	6
Scraper taxa	11
Percent scraper	45.1
Percent Plecoptera	19.1
Hilsenhoff Biotic Index	4.23

* Appropriate taxonomic effort is to genus for insects and to family for midges

TABLE J4. Example of the ADEQ Warm Water Index of Biological Integrity scoring system; Sycamore Creek near Round Valley bridge (Hwy 87) collected during spring 1995.

Metric	Metric Value	Metric Score (compared to warm water reference scoring threshold)
Total taxa	24	65
Trichoptera taxa	6	67
Ephemeroptera taxa	5	56
Diptera taxa	7	70

Metric	Metric Value	Metric Score (compared to warm water reference scoring threshold)
Scraper taxa	3	43
Percent scraper	20.3	86
Percent Ephemeroptera	26	37
Percent Dominant Taxon	41	73
Hilsenhoff Biotic Index	5.73	84
Index Score(average of all Metric Scores)		65 = Attaining

TABLE J5. Assessments based on ADEQ macroinvertebrate IBI scores.

Macroinvertebrate bioassessment result	Index of Biological Integrity Score		Assessment
	Cold water	Warm water	
Greater than the 25th percentile of reference condition	≥ 52	≥ 50	Attaining
Between the 10th and 25th percentile of reference condition	46 – 51	40 – 49	Inconclusive
Less than the 10th percentile of reference condition	≤ 45	≤ 39	Impaired

APPENDIX K – DOCUMENTS PROVIDED BY ADEQ TO EPA FOR REVIEW

The following documents were provided to EPA Region IX as part of the QAPP approval process.

- Accutest Northern California San Jose Lab – Quality Systems Manual, Rev IV. August 2011
- Accutest SOP Gen 015-3 for TKN, SOP Gen 025-3 TP, SOP 004-4 Total & dissolved metals
- Accutest Lab Report #C34193 for ADEQ including QC summary
- Fiscal Year 2015 ADEQ Sampling and Analysis Plan for Streams, Lakes, Groundwater and Fish
- ADEQ Policy Addressing spikes and surrogate recovery (1998)
- ADEQ Surface Water Assessment Methods and Technical Support document (2015)

APPENDIX L – ADEQ CURRENT LAB QUALIFIER CODES USED IN THE WQDB

ADEQ Lab Qualifier codes and descriptions (Arizona Department of Health Services, 2014)

Code	Short Description	Description	Reject?	For 303d List?
A	ANALYTE - VALUE IS THE MEAN OF TWO OR MORE DETERMINATIONS	VALUE REPORTED IS THE MEAN OF TWO OR MORE DETERMINATIONS		
A1	BACTERIA - TOO NUMEROUS TO COUNT	MICROBIOLOGY: TOO NUMEROUS TO COUNT.		
A2	BACTERIA - INCUBATION PERIOD EXCEEDED	MICROBIOLOGY: SAMPLE INCUBATION PERIOD EXCEEDED METHOD REQUIREMENT.		
A3	BACTERIA - INCUBATION PERIOD SHORTER THAN REQUIRED.	MICROBIOLOGY: SAMPLE INCUBATION PERIOD WAS SHORTER THAN METHOD REQUIREMENT.		
A4	BACTERIA - DETECTED IN METHOD BLANK.	MICROBIOLOGY: TARGET ORGANISM DETECTED IN ASSOCIATED METHOD BLANK.	Reject	No
A5	BACTERIA - INCUBATOR/WATER BATH TEMP OUTSIDE REQUIREMENTS	MICROBIOLOGY: INCUBATOR/WATER BATH TEMPERATURE WAS OUTSIDE METHOD REQUIREMENTS.		
A6	BACTERIA - NOT DETECTED IN POSITIVE CONTROL	MICROBIOLOGY: TARGET ORGANISM NOT DETECTED IN ASSOCIATED POSITIVE CONTROL.	Reject	No
A7	BACTERIA - SAMPLE HAD INADEQUATE HEADSPACE	MICRO SAMPLE RECEIVED WITHOUT ADEQUATE HEADSPACE.		
A8	BACTERIA - PLATE COUNT WAS OUTSIDE THE METHOD'S REPORTING RANGE.	MICROBIOLOGY: PLATE COUNT WAS OUTSIDE THE METHOD'S REPORTING RANGE. REPORTED VALUE IS ESTIMATED.		
AB	ANALYTE - CONCENTRATION BETWEEN MDL AND PQL. USE DATA WITH CAUTION	ANALYTE CONCENTRATION DETECTED BETWEEN METHOD DETECTION LIMIT AND PRACTICAL QUANTITATION LIMIT. USE DATA WITH CAUTION.		
ASI	Lab ID assigned internally by DEQ. Data is still credible. See visit comments for details.	AA.		
B	BACTERIA - COLONY COUNTS OUTSIDE IDEAL RANGE (20-60 CFU)	COLONY COUNTS OUTSIDE ACCEPTABLE RANGE (20-60 CFU)		
B1	BLANK - ANALYTE IN METHOD BLANK DETECTED AT OR ABOVE METHOD REPORTING LIMIT	METHOD BLANK: TARGET ANALYTE DETECTED IN METHOD BLANK AT OR ABOVE THE METHOD REPORTING LIMIT.	Reject	No
B2	BLANK - NON-TARGET ANALYTE DETECTED IN METHOD BLANK AND SAMPLE PRODUCING INTERFERENCE	METHOD BLANK: NON-TARGET ANALYTE DETECTED IN METHOD BLANK AND SAMPLE, PRODUCING INTERFERENCE.	Reject	No
B3	BLANK - ANALYTE IN CALIBRATION BLANK AT OR ABOVE THE METHOD REPORTING LIMIT.	METHOD BLANK: TARGET ANALYTE DETECTED IN CALIBRATION BLANK AT OR ABOVE THE METHOD REPORTING LIMIT.	Reject	No
B4	BLANK - ANALYTE IN BLANK AT OR ABOVE METHOD ACCEPTANCE CRITERIA.	METHOD BLANK: TARGET ANALYTE DETECTED IN BLANK AT OR ABOVE METHOD ACCEPTANCE CRITERIA.	Reject	No
B5	BLANK - ANALYTE IN METHOD BLANK AT OR ABOVE THE METHOD REPORTING LIMIT, BUT BELOW STANDARD.	METHOD BLANK: TARGET ANALYTE DETECTED IN METHOD BLANK AT OR ABOVE THE METHOD REPORTING LIMIT, BUT BELOW TRIGGER LEVEL OR MCL.	Reject	No
B6	BLANK - ANALYTE IN CALIBRATION BLANK AT OR ABOVE THE METHOD REPORTING LIMIT, BUT BELOW STANDARD	METHOD BLANK: TARGET ANALYTE DETECTED IN CALIBRATION BLANK AT OR ABOVE THE METHOD REPORTING LIMIT, BUT BELOW TRIGGER LEVEL OR MCL.	Reject	No
B7	BLANK - ANALYTE IN METHOD BLANK AT OR ABOVE MRL, BUT CONC. IN SAMPLE IS 10X ABOVE CONC IN BLANK	MEHTOD BLANK: TARGET ANALYTE DETECTED IN METHOD BLANK AT OR ABOVE METHOD REPORTING LIMIT.CONCENTRATION FOUND IN THE SMP WAS 10 TIMES ABOVE THE CONCENTRATION FOUND IN THE MTHD BLK.	Reject	No
B8	BLANK - ANALYTE FOUND IN BOTH THE TRAVEL BLANK AND SAMPLE	TRIP BLANK: ANALYTE FOUND IN BOTH THE TRAVEL BLANK AND SAMPLE.	Reject	No
C	ANALYTE - VALUE IS CALCULATED	VALUE CALCULATED		

Code	Short Description	Description	Reject?	For 303d List?
C1	CONFIRMATION - ANALYSIS NOT PERFORMED AS REQUIRED.	CONFIRMATION: CONFIRMATORY ANALYSIS NOT PERFORMED AS REQUIRED BY THE METHOD.		
C3	CONFIRMATION - QUALITATIVE CONFIRMATION PERFORMED.	CONFIRMATION: QUALITATIVE CONFIRMATION PERFORMED.		
C4	CONFIRMATION - PAST HOLDING TIME.	CONFIRMATION: CONFIRMATORY ANALYSIS WAS PAST HOLDING TIME.		
C5	CONFIRMATION - NOT CONFIRMED, PAST HOLDING TIME.	CONFIRMATION. CONFIRMATORY ANALYSIS WAS PAST HOLDING TIME. ORIGINAL RESULT NOT CONFIRMED.		
CH1	FIELD - EPA METHOD 1669 FIELD PROTOCOLS EMPLOYED W/ CLEAN LAB ANALYSIS	EPA METHOD 1669 "CLEAN HANDS" FIELD PROTOCOLS EMPLOYED W/ CLEAN LAB ANALYSIS		
CH2	FIELD - STANDARD FIELD COLLECTION PROTOCOLS EMPLOYED W/ CLEAN LAB ANALYSIS	STANDARD FIELD COLLECTION/FILTRATION PROTOCOLS (NON "CLEAN HANDS") EMPLOYED W/ CLEAN LAB ANALYSIS		
CH3	FIELD - MODIFIED EPA METHOD 1669 FIELD PROTOCOLS EMPLOYED W/ CLEAN LAB ANALYSIS	MODIFIED EPA METHOD 1669 "CLEAN HANDS" PROTOCOLS EMPLOYED W/ CLEAN LAB ANALYSIS		
CH4	FIELD - EPA METHOD 1669 FIELD PROTOCOLS EMPLOYED W/ STANDARD LAB ANALYSIS	EPA METHOD 1669 FIELD PROTOCOLS EMPLOYED W/ STANDARD LAB ANALYSIS		
D	DILUTION - DILUTION FACTOR USED.	DILUTION FACTOR USED		
D1	DILUTION - REQUIRED DUE TO MATRIX INTERFERENCE.	DILUTION: SAMPLE REQUIRED DILUTION DUE TO MATRIX.		
D2	DILUTION - REQUIRED DUE TO HIGH CONCENTRATION OF ANALYTE.	DILUTION: SAMPLE REQUIRED DILUTION DUE TO HIGH CONCENTRATION OF TARGET ANALYTE. SEE CASE NARRATIVE.		
D4	DILUTION - MINIMUM REPORTING LEVEL ADJUSTED DUE TO SAMPLE AMOUNT.	DILUTION: MINIMUM REPORTING LEVEL (MRL) ADJUSTED TO REFLECT SAMPLE AMOUNT RECEIVED AND ANALYZED.		
D5	DILUTION - MINIMUM REPORTING LIMIT ADUSTED DUE TO SAMPLE DILUTION; ANALYTE NONDETECT IN SAMPLE.	DILUTION - MINIMUM REPORTING LIMIT ADUSTED DUE TO SAMPLE DILUTION; ANALYTE NONDETECT IN SAMPLE.		
D7	DILUTION - MINIMUM REPORTING LIMIT ADJUSTED TO REFLECT SAMPLE DILUTION.	DILUTION: MINIMUM REPORTING LIMIT ADJUSTED TO REFLECT SAMPLE DILUTION.		
DLR	ANALYTE - DETECTION LIMIT REPORTED	ANALYTE DETECTION LIMIT REPORTED IN LIEU OF METHOD REPORTING LIMIT		
E	ESTIMATE - ESTIMATED VALUE.	REPORTED VALUE ESTIMATED DUE TO MATRIX INTERFERENCE		
E1	ESTIMATE - ANALYTE EXCEEDED CALIBRATION RANGE. INSUFFICIENT SAMPLE TO REANALYZE.	ESTIMATED CONCENTRATION: CONCENTRATION ESTIMATED. ANALYTE EXCEEDED CALIBRATION RANGE. REANALYSIS NOT POSSIBLE DUE TO INSUFFICIENT SAMPLE.		No
E2	ESTIMATE - ANALYTE EXCEEDED CALIBRATION RANGE. NOT REANALYSED DUE TO MATRIX PROBLEMS.	ESTIMATED CONCENTRATION: CONCENTRATION ESTIMATED. ANALYTE EXCEEDED CALIBRATION RANGE. REANALYSIS NOT PERFORMED DUE TO SAMPLE MATRIX.		No
E3	ESTIMATE - ANALYTE EXCEEDED CALIBRATION RANGE. NOT REANALYSED DUE TO HOLDING TIMES.	ESTIMATED CONCENTRATION: CONCENTRATION ESTIMATED. ANALYTE EXCEEDED CALIBRATION RANGE. REANALYSIS NOT PERFORMED DUE TO HOLDING TIME REQUIREMENTS.		No
E4	ESTIMATE - ANALYTE BELOW LAB REPORTING LEVEL BUT ABOVE MDL	ESTIMATED - ANALYTE WAS DETECTED BELOW LABORATORY MINIMUM REPORTING		No
E5	ESTIMATE - ANALYTE DETECTED BELOW LAB REPORTING LEVEL. NOT CONFIRMED BY ALT ANALYSIS.	ESTIMATED CONCENTRATION: CONCENTRATION ESTIMATED. ANALYTE WAS DETECTED BELOW LABORATORY MINIMUM REPORTING LEVEL (MRL), BUT NOT CONFIRMED BY ALTERNATE ANALYSIS.		No

Code	Short Description	Description	Reject?	For 303d List?
E6	ESTIMATE - INTERNAL STANDARD RECOVERIES DID NOT MEET METHOD ACCEPTANCE CRITERIA.	ESTIMATED CONCENTRATION: CONCENTRATION ESTIMATED. INTERNAL STANDARD RECOVERIES DID NOT MEET METHOD ACCEPTANCE CRITERIA.	Reject	No
E7	ESTIMATE - INTERNAL STANDARD RECOVERIES DID NOT MEET LAB ACCEPTANCE CRITERIA.	ESTIMATED CONCENTRAITON: CONCENTRATION ESTIMATED. INTERNAL STANDARD RECOVERIES DID NOT MEET LABORATORY ACCEPTANCE CRITERIA.	Reject	No
E8	ESTIMATE - ANALYTE WAS NOT DETECTED; REPORTED TO MDL PER PROJECT SPECIFICATION.	ANALYTE REPORTED TO MDL PER PROJECT SPECIFICATION. TARGET ANALYTE WAS NOT DETECTED IN THE SAMPLE.		No
F	CONTAMINATION - ANALYTE FOUND IN SAMPLE BLANK AS WELL AS SAMPLE	ANALYTE FOUND IN SAMPLE BLANK AS WELL AS SAMPLE		No
FB1	CONTAMINATION - FIELD BLANK TAKEN FOR ANALYTE, NO CONTAMINATION	FIELD BLANK TAKEN FOR ANALYTE: NON-DETECT REPORTED, NO CONTAMINATION.		
FB2	CONTAMINATION - FIELD BLANK TAKEN FOR ANALYTE, MINOR CONTAMINATION	FIELD BLANK TAKEN FOR ANALYTE: MINOR CONTAMINATION REPORTED AT LEVELS BETWEEN MRL AND MDL. ASSOCIATED DATA CONSIDERED USABLE FOR LIMITED PURPOSES.		No
FH1	FIELD - RECOMMENDED HOLDING TIME PRIOR TO FILTRATION/PROCESSING EXCEEDED	AUTOSAMPLER DATA COLLECTION QUALIFIER. RECOMMENDED 15 MINUTE HOLDING TIME PRIOR TO FILTRATION/PROCESSING EXCEEDED.		
G	ANALYTE - VALUE IS THE MAXIMUM OF TWO OR MORE DETERMINATIONS	VALUE REPORTED IS THE MAXIMUM OF TWO OR MORE DETERMINATIONS		
H	HOLDING TIME EXCEEDED	VALUES ARE ESTIMATED BY FIELD KIT METHOD		No
H1	HOLDING TIME - ANALYSIS PERFORMED PAST HOLDING TIME	HOLD TIME: SAMPLE ANALYSIS PERFORMED PAST HOLDING TIME.		No, except E.coli
H2	HOLDING TIME - REANALYSIS FOR DILUTION WAS PAST HOLDING TIME	HOLD TIME: INITIAL ANALYSIS WITHIN HOLDING TIME. REANALYSIS FOR THE REQUIRED DILUTION WAS PAST HOLDING TIME.		No
H3	HOLDING TIME - SAMPLE RECEIVED AND/ OR ANALYSIS REQUESTED PAST HOLDING TIME.	HOLD TIME: SAMPLE WAS RECEIVED AND/ OR ANALYSIS REQUESTED PAST HOLDING TIME.		No
H4	HOLDING TIME - EXCEEDED SAMPLE EXTRACTION HOLDING TIME, BUT ANAL HOLDING TIME OK	HOLD TIME: SAMPLE WAS EXTRACTED PAST REQUIRED EXTRACTION HOLDING TIME, BUT ANALYZED WITHIN ANALYSIS HOLDING TIME.		
H5	HOLDING TIME - FIELD TEST: 15 MINUTES HT. SAMPLE RECEIVED & ANALYZED PAST HOLDING TIME.	HOLDING TIME: THIS TEST IS SPECIFIED TO BE PERFORMED IN THE FIELD WITHIN 15 MINUTES OF SAMPLING; SAMPLE WAS RECEIVED AND ANALYZED PAST THE REGULATORY HOLDING TIME.		No
H6	HOLDING TIME - FILTRATION NOT DONE WITHIN 15 MINUTES OF SAMPLING.	HOLD TIME: THE FILTRATION WAS NOT DONE WITHIN THE REQUIRED 15 MINUTES OF SAMPLING, THE SAMPLE WAS FILTERED IN THE LABORATORY.		
J	ESTIMATE	VALUES ARE ESTIMATED, DATA IS VALID FOR LIMITED PURPOSES.		No
K	ESTIMATE - COMPOUND IS PRESENT, BUT BELOW LISTED VALUE (TYPICALLY, THE LAB DETECTION LIMIT).	COMPOUND IS PRESENT, BUT BELOW LISTED VALUE(TYPICALLY, THE LAB DETECTION LIMIT).		No
K1	BOD - DILUTIONS DID NOT MEET THE OXYGEN DEPLETION CRITERIA (2 MG/L)	BOD: THE SAMLE DILUTIONS SET-UP FOR THE BOD ANALYSIS DID NOT MEET THE OXYGEN DEPLETION CRITERIA OF AT LEAST 2 MG/L. THE REPORTED RESULT IS AN ESTIMATED VALUE.		
K10	BOD - SEED CONTROL SAMPLES DO NOT DEPLETE AT LEAST 2.0 MG/L.	BOD: SEED CONTROL SAMPLES DO NOT DEPLETE AT LEAST 2.0 MG/L, WITH A RETENTION OF AT LEAST 1.0 MG/L DO CRITERIA IN ALL SAMPLES.		

Code	Short Description	Description	Reject?	For 303d List?
K11	BOD - MINIMUM DO IS LESS THAN 1.0 MG/L IN ALL DILUTIONS.	BOD: MINIMUM DO IS LESS THAN 1.0 MG/L IN ALL DILUTIONS.		
K2	BOD - DILUTIONS DID NOT MEET THE RESIDUAL D.O. CRITERIA (1 MG/L)	BOD: THE SAMPLE DILUTIONS SET UP FOR THE BOD ANALYSIS FAILED TO MEET THE CRITERIA OF A RESIDUAL DISSOLVED LXYGEN OF AT LEAST 1 MG/L. THE REPORTED RESULT IS AN ESTIMATED VALUE.		
K4	BOD - SEED DEPLETION OUTSIDE METHOD ACCEPTANCE LIMITS.	BOD: THE SEED DEPLETION WAS OUTSIDE THE METHOD AND LABORATORY ACCEPTANCE LIMITS. THE REPORTED RESULT IS AN ESTIMATED VALUE. DELETED IN REVISION 4.0 9/5/12.		
K5	BOD - DILUTION WATER D.O. DEPLETION WAS > 0.2 MG/L.	BOD: THE DILUTION WATER D.O. DEPLETION WAS > 0.2 MG/L.		
K6	BOD - GLUCOSE / GLUTAMIC ACID BOD BELOW METHOD ACCEPTANCE CRITERIA.	BOD: GLUCOSE/GLUTAMIC ACID BOD WAS BELOW METHOD ACCEPTANCE CRITERIA.		
K7	BOD - DISCREPANCY BETWEEN THE BOD AND COD. RESULTS VERIFIED BY REANALYSIS OF COD.	BOD: A DISCREPANCY BETWEEN THE BOD AND COD RESULTS HAS BEEN VERIFIED BY REANALYSIS OF THE SAMPLE FOR COD.		
K8	BOD - GLUCOSE / GLUTAMIC ACID BOD ABOVE METHOD ACCEPTANCE LEVELS.	BOD: GLUCOSE / GLUTAMIC ACID BOD WAS ABOVE METHOD ACCEPTANCE LEVELS.		
K9	BOD - TEST REPLICATES MORE THAN 30% DIFFERENCE.	BOD: TEST REPLICATES SHOW MORE THAN 30% DIFFERENCE BETWEEN HIGH AND LOW VALUES.		
L	ANALYTE - VALUE REPORTED IS ABOVE INSTRUMENT DETECTION LIMIT	RESULT BETWEEN CONTRACT QUANTITATION AND INSTRUMENT DETECTION LIMIT		
L1	SPIKE - BLANK SPIKE RECOVERY ABOVE LAB ACCEPTANCE LIMITS.	LABORATORY FORTIFIED BLANK/BLANK SPIKE: THE ASSOCIATED BLANK SPIKE RECOVERY WAS ABOVE LABORATORY ACCEPTANCE LIMITS.	Reject	No
L2	SPIKE - BLANK SPIKE RECOVERY BELOW LAB ACCEPTANCE LIMITS.	LABORATORY FORTIFIED BLANK/BLANK SPIKE: THE ASSOCIATED BLANK SPIKE RECOVERY WAS BELOW LABORATORY ACCEPTANCE LIMITS.	Reject	No
L3	SPIKE - BLANK SPIKE RECOVERY ABOVE METHOD ACCEPTANCE LIMITS.	THE ASSOCIATED BLANK SPIKE RECOVERY WAS ABOVE METHOD ACCEPTANCE LIMITS.	Reject	No
L4	SPIKE - BLANK SPIKE RECOVERY BELOW METHOD ACCEPTANCE LIMITS.	LABORATORY FORTIFIED BLANK/BLANK SPIKE: THE ASSOCIATED BLANK SPIKE RECOVERY WAS BELOW METHOD ACCEPTANCE LIMITS.	Reject	No
L5	SPIKE - BLANK SPIKE RECOVERY ABOVE METHOD ACCEPTANCE LIMITS. NO ANALYTE DETECTED IN SAMPLE.	LABORATORY FORTIFIED BLANK/BLANK SPIKE: THE ASSOCIATED BLANK SPIKE RECOVERY WAS ABOVE LABORATORY/METHOD ACCEPTANCE LIMITS. THIS ANALYTE WAS NOT DETECTED IN THE SAMPLE.		No
M	DUPLICATES - DUPLICATE ANALYSIS OUTSIDE CONTROL LIMITS	DUPLICATE ANALYSIS OUTSIDE OF CONTROL LIMITS	Reject	No
M1	SPIKE - MATRIX SPIKE - RECOVERY WAS HIGH. ACCEPTABLE METHOD CONTROL SAMPLE RECOVERY.	MATRIX SPIKE: MATRIX SPIKE RECOVERY WAS HIGH, THE METHOD CONTROL SAMPLE RECOVERY WAS ACCEPTABLE.		
M2	SPIKE - MATRIX SPIKE - RECOVERY WAS LOW. ACCEPTABLE METHOD CONTROL SAMPLE RECOVERY.	MATRIX SPIKE: MATRIX SPIKE RECOVERY WAS LOW, THE METHOD CONTROL SAMPLE RECOVERY WAS ACCEPTABLE.		
M3	SPIKE - MATRIX SPIKE - ACCURACY REDUCED AS CONC IS DISPROPORTIONATE TO SPIKE CONC.	MATRIX SPIKE: THE ACCURACY OF THE SPIKE RECOVERY VALUE IS REDUCED SINCE THE ANALYTE CONCENTRATION IN THE SAMPLE IS DISPROPORTIONATE TO SPIKE LEVEL. THE METHOD CONTROL SMPLE RECOV		
M4	SPIKE - MATRIX SPIKE - CONC DILUTED BELOW REPORT LIMIT. METHOD CONTROL SAMPLE RECOVERY OK	MATRIX SPIKE: THE ANALYSIS OF THE SPIKED SAMPLE REQUIRED A DILUTION SUCH THAT THE SPIKE CONCENTRATION WAS DILUTED BELOW THE REPORTING LIMIT. THE METHOD CONTROL SAMPLE RECOVERY WA		

Code	Short Description	Description	Reject?	For 303d List?
M5	SPIKE - MATRIX SPIKE - ANALYTE CONC. DETERMINED BY THE METHOD OF STANDARD ADDITION (MSA).	MATRIX SPIKE: ANALYTE CONCENTRATION WAS DETERMINED BY THE METHOD OF STANDARD ADDITION (MSA).		
M6	SPIKE - MATRIX SPIKE - RECOVERY WAS HIGH (ADEQ POLICY 0154).	MATRIX SPIKE: MATRIX SPIKE RECOVERY WAS HIGH. DATA REPORTED PER ADEQ POLICY 0154.000. MATRIX INTERFERENCE WAS CONFIRMED.		No
M7	SPIKE - MATRIX SPIKE - RECOVERY WAS LOW (ADEQ POLICY 0154.000).	MATRIX SPIKE: MATRIX SPIKE RECOVERY WAS LOW. DATA REPORTED PER ADEQ POLICY 0154.000. MATRIX INTERFERENCE WAS CONFIRMED.		No
MDL	ANALYTE - MDL REPORTED AS THE DETECTION LIMIT	ANALYTE - MDL REPORTED AS THE DETECTION LIMIT		
MPV	BACTERIA - MOST PROBABLE VALUE.	MOST PROBABLE VALUE.		
MX	ANALYTE - VALUE NOT DETERMINABLE DUE TO MATRIX INTERFERENCE.	VALUE NOT DETERMINABLE DUE TO MATRIX INTERFERENCE. TITRATION OR CHEMICAL ANALYSIS CAN NOT BE PERFORMED.		No
MX1	SERIAL DILUTION DETERMINED MATRIX INTERFERENCE WAS PRESENT	SERIAL DILUTION DETERMINED MATRIX INTERFERENCE WAS PRESENT FOR METAL ANALYTES		
N1	ANALYTE - SEE LAB CASE NARRATIVE.	SEE CASE NARRATIVE.		
N2	ANALYTE - SEE LAB CORRECTIVE ACTION REPORT	SEE CORRECTIVE ACTION REPORT.		
N3	METHOD - ALL METHOD REQUIREMENTS MET.	THE ANALYSIS MEETS ALL METHOD REQUIREMENTS. SEE CASE NARRATIVE. DELETED IN REVISION 4.0 9/5/12.		
N4	THE MINIMUM REPORTING LIMIT VERIFICATION CHECK DID NOT MEET THE LABORATORY ACCEPTANCE LIMIT.	THE MINIMUM REPORTING LIMIT VERIFICATION CHECK DID NOT MEET THE LABORATORY ACCEPTANCE LIMIT.	Reject	No
N5	GENERAL - MINIMUM REPORTING LIMIT VERIFICATION CHECK DID NOT MEET THE METHOD ACCEPTANCE LIMIT.	GENERAL: THE MINIMUM REPORTING LIMIT (MRL) VERIFICATION CHECK DID NOT MEET THE METHOD ACCEPTANCE LIMIT.	Reject	No
N6	GENERAL - DATA SUSPECT DUE TO QUALITY CONTROL FAILURE, REPORTED PER DATA USER'S REQUEST.	GENERAL: DATA SUSPECT DUE TO QUALITY CONTROL FAILURE, REPORTED PER DATA USER'S REQUEST.	Reject	No
N7	GENERAL - ADDITIONAL ANALYSIS WAS NOT PERFORMED BASED ON THE "TOTAL" RESULT.	GENERAL: ADDITIONAL ANALYSIS WAS NOT PERFORMED BASED ON THE "TOTAL" RESULT WHICH WAS BELOW THE REQUESTED ANALYTE'S MCL/ACTION LEVEL/TRIGGER LEVEL.		
Q1	QC - SAMPLE INTEGRITY WAS NOT MAINTAINED.	SAMPLE QUALITY: SAMPLE INTEGRITY WAS NOT MAINTAINED. SEE CASE NARRATIVE.	Reject	No
Q10	QC - SAMPLE IN INAPPROPRIATE SAMPLE CONTAINER.	SAMPLE QUALITY: SAMPLE RECEIVED IN INAPPROPRIATE SAMPLE CONTAINER.	Reject	No
Q11	QC - SAMPLE IS HETEROGENEOUS. SAMPLE HOMOGENEITY COULD NOT BE ACHIEVED.	SAMPLE QUALITY: SAMPLE IS METEROGENEOUS. SAMPLE HOMOGENEITY COULD NOT BE READILY ACHIEVED USING ROUTINE LABORATORY PRACTICES.		No
Q2	QC - SAMPLE RECEIVED WITH HEAD SPACE.	SAMPLE QUALITY: SAMPLE RECEIVED WITH HEAD SPACE.		
Q3	QC - SAMPLE RECEIVED WITH IMPROPER CHEMICAL PRESERVATION.	SAMPLE QUALITY: SAMPLE RECEIVED WITH IMPROPER CHEMICAL PRESERVATION.	Reject	No
Q4	QC - SAMPLE RECEIVED AND ANALYZED WITHOUT CHEMICAL PRESERVATION.	SAMPLE QUALITY: SAMPLE RECEIVED AND ANALYZED WITHOUT CHEMICAL PRESERVATION	Reject	No
Q5	QC - SAMPLE RECEIVED WITHOUT CHEM PRESERVATION,. PRESERVED BY THE LAB.	SAMPLE QUALITY: SAMPLE RECEIVED WITHOUT CHEMICAL PRESERVATION, BUT PRESERVED BY THE LABORATORY.	Reject	No
Q6	QC - SAMPLE RECEIVED ABOVE RECOMMENDED TEMPERATURE.	SAMPLE QUALITY: SAMPLE WAS RECEIVED ABOVE RECOMMENDED TEMPERATURE.		
Q7	QC - SAMPLE INADEQUATELY DECHLORINATED.	SAMPLE QUALITY: SAMPLE INADEQUATELY DECHLORINATED.	Reject	No

Code	Short Description	Description	Reject?	For 303d List?
Q8	QC - INSUFFICIENT SAMPLE TO MEET METHOD QC REQUIREMENTS, BUT BATCH QC REQUIREMENTS MET.	SAMPLE QUALITY: INSUFFICIENT SAMPLE RECEIVED TO MEET METHOD QC REQUIREMENTS. BATCH QC REQUIREMENTS SATISFY ADEQ POLICY 0154.000.		
Q9	QC - INSUFFICIENT SAMPLE TO MEET METHOD QC REQUIREMENTS.	SAMPLE QUALITY: INSUFFICIENT SAMPLE RECEIVED TO MEET METHOD QC REQUIREMENTS.		
R1	DUPLICATES - RPD EXCEEDED THE METHOD CONTROL LIMIT.	DUPLICATES: RPD EXCEEDED THE METHOD CONTROL LIMIT. SEE CASE NARRATIVE.	Reject	No
R11	DUPLICATES - THE RPD CALCULATION FOR MS/MSD NOT USEFUL DUE TO THE VARYING SAMPLE WEIGHTS.	DUPLICATES: THE RPD CALCULATION FOR MS/MSD DOES NOT PROVIDE USEFUL INFORMATION DUE TO THE VARYING SAMPLE WEIGHTS WHEN ENCORE SAMPLERS / METHANOL FIELD PRESERVED SAMPLES ARE USED.		
R12	DUPLICATES - RPD/RSD EXCEEDED THE METHOD ACCEPTANCE LIMIT. RESULT LESS THAN 5 TIMES THE PQL.	DUPLICATES: RPD/RSD EXCEEDED THE METHOD ACCEPTANCE LIMIT. RESULT LESS THAN 5 TIMES THE PQL.	Reject	No
R13	DUPLICATES - MS/MSD RPD EXCEEDED METHOD ACCEPTANCE LIMIT.	DUPLICATES: MS/MSD RPD EXCEEDED METHOD ACCEPTANCE LIMIT. MATRIX SPIKE RECOVERY WAS OUTSIDE ACCEPTANCE CRITERIA. BATCH PRECISION AND ACCURACY WERE DEMONSTRATED.	Reject	No
R2	DUPLICATES - RPD EXCEEDED THE LAB CONTROL LIMIT	DUPLICATES: RPD EXCEEDED THE LABORATORY CONTROL LIMIT	Reject	No
R4	DUPLICATES - RPD > METHOD CONTROL LIMIT, BUT RECOVERY MET ACCEPTANCE CRITERIA.	DUPLICATES: RPD EXCEEDED THE METHOD CONTROL LIMIT. RECOVERY MET ACCEPTANCE CRITERIA.	Reject	No
R5	DUPLICATES - RPD > LAB CONTROL LIMIT, BUT RECOVERY MET ACCEPTANCE CRITERIA.	DUPLICATES: RPD EXCEEDED THE LABORATORY CONTROL LIMIT. RECOVERY MET ACCEPTANCE CRITERIA.	Reject	No
R6	DUPLICATES - LFB/LFBD RPD > METHOD CONTROL LIMIT, BUT RECOVERY MET ACCEPTANCE CRITERIA.	DUPLICATES: LFB/LFBD RPD EXCEEDED THE METHOD CONTROL LIMIT. RECOVERY MET ACCEPTANCE CRITERIA.	Reject	No
R7	DUPLICATES - LFB/LFBD RPD > LAB CONTROL LIMIT, BUT RECOVERY MET ACCEPTANCE CRITERIA.	DUPLICATES: LFB/LFBD RPD EXCEEDED THE LABORATORY CONTROL LIMIT. RECOVERY MET ACCEPTANCE CRITERIA.	Reject	No
R8	DUPLICATES - SAMPLE RPD EXCEEDED THE METHOD ACCEPTANCE LIMIT.	DUPLICATES: SAMPLE RPD EXCEEDED THE METHOD ACCEPTANCE LIMIT.	Reject	No
R9	DUPLICATES - SAMPLE RPD EXCEEDED THE LABORATORY ACCEPTANCE LIMIT.	DUPLICATES: SAMPLE RPD EXCEEDED THE LABORATORY ACCEPTANCE LIMIT.	Reject	No
RPD	RELATIVE PERCENT DIFFERENCE	RELATIVE PERCENT DIFFERENCE EXCEEDED CRITERIA		
S	SPIKE - BLANK SPIKE SAMPLE RECOVERY OUTSIDE CONTROL LIMITS	SPIKED SAMPLE RECOVERY OUTSIDE CONTROL LIMITS	Reject	No
S1	SUR RECOV - ABOVE LAB ACCEPT LIMITS. METHOD ACCEPTANCE LIMITS OK.	SURROGATE: SURROGATE RECOVERY WAS ABOVE LABORATORY ACCEPTANCE LIMITS, BUT WITHIN METHOD ACCEPTANCE LIMITS.		No
S10	SUR RECOV - WAS ABOVE LAB & METHOD ACCEPTANCE LIMITS.	SURROGATE: SURROGATE RECOVERY WAS ABOVE LABORATORY AND METHOD ACCEPTANCE LIMITS. SEE CASE MARRATIVE (NI).		No
S11	SUR RECOV - WAS HIGH (ADEQ POLICY 0154.000).	SURROGATE: SURROGATE RECOVERY WAS HIGH. DATA REPORTED PER ADEQ POLICY 0154.000.		No
S12	SUR RECOV - WAS LOW (ADEQ POLICY 0154.000).	SURROGATE: SURROGATE RECOVERY WAS LOW. DATA REPORTED PER ADEQ POLICY 0154.000.		No
S3	SUR RECOV - ABOVE LAB ACCEPT LIMITS. METHOD ACCEPTANCE LIMITS OK. TARGET ANALYTE NOT DETECT	SURROGATE: SURROGATE RECOVERY WAS ABOVE LABORATORY ACCEPTANCE LIMITS, BUT WITHIN METHOD ACCEPTANCE LIMITS. NO TARGET ANALYTES WERE DETECTED IN THE SAMPLE.		No

Code	Short Description	Description	Reject?	For 303d List?
S4	SUR RECOV - ABOVE LAB AND METHOD ACCEPTANCE LIMITS. TARGET ANALYTES NOT DETECTED	SURROGATE: SURROGATE RECOVERY WAS ABOVE LABORATORY AND METHOD ACCEPTANCE LIMITS. NO TARGET ANALYTES WERE DETECTED IN THE SAMPLE.		No
S5	SUR RECOV - BELOW LAB ACCEPTANCE LIMITS, BUT WITHIN METHOD ACCEPTANCE LIMITS.	SURROGATE: SURROGATE RECOVERY WAS BELOW LABORATORY ACCEPTANCE LIMITS, BUT WITHIN METHOD ACCEPTANCE LIMITS.		No
S6	SUR RECOV - BELOW LAB & METHOD ACCEPT LIMITS. REANALYSIS LOW RECOV DUE MATRIX EFFECT	SURROGATE: SURROGATE RECOVERY WAS BELOW LABORATORY AND METHOD ACCEPTANCE LIMITS. REEXTRACTION AND/OR REANALYSIS CONFIRMS LOW RECOVERY CAUSED BY MATRIX EFFECT.		
S7	SUR RECOV - BELOW LAB & METHOD ACCEPTANCE LIMITS. UNABLE TO CONFIRM MATRIX EFFECT.	SURROGATE: SURROGATE RECOVERY WAS BELOW LABORATORY AND METHOD ACCEPTANCE LIMITS. UNABLE TO CONFIRM MATRIX EFFECT.		
S8	SUR RECOV - CALC NOT USEFUL DUE SAMPLE DILUTION. METHOD CONTROL SAMP RECOV ACCEPTABLE.	SURROGATE: THE ANALYSIS OF THE SAMPLE REQUIRED A DILUTION SUCH THAT THE SURROGATE RECOVERY CALCULATION DOES NOT PROVIDE ANY USEFUL INFORMATION. THE METHOD CONTROL SAMPLE RECOVE		
SOP	FIELD - DEVIATIONS FROM STANDARD FIELD OPERATING PROCEDURES, ANALYTE-SPECIFIC	DEVIATIONS FROM STANDARD FIELD OPERATING PROCEDURES, ANALYTE-SPECIFIC		
T	ESTIMATE - VALUE IS LESS THAN DETECTION CRITERIA	VALUE REPORTED IS LESS THAN DETECTION CRITERIA		
T1	METHOD - APPROVED BY EPA, BUT NOT YET LICENCED BY ADHS.	METHOD/ANALYTE DISCREPANCIES: METHOD APPROVED BY EPA, BUT NOT YET LICENSED BY ADHS.		
T2	METHOD - APPROVED METHOD, BUT ANALYTE NOT INCLUDED IN THE METHOD COUMPOUND LIST.	METHOD/ANALYTE DISCREPANCIES: CITED ADHS LICENSED METHOD DOES NOT CONTAIN THIS ANALYTE AS PART OF METHOD COUMPOUND LIST.		
T3	METHOD - NOT PROMULGATED EITHER BY EPA OR ADHS.	METHOD/ANALYTE DISCREPANCIES: METHOD NOT PROMULGATED EITHER BY EPA OR ADHS.		
T4	ESTIMATE - TENTATIVELY IDENTIFIED COMPOUND. CONCENTRATION ESTIMATED.	METHOD/ANALYTE DISCREPANCIES: TENTATIVELY IDENTIFIED COMPOUND. CONCENTRATION IS ESTIMATED AND BASED ON THE CLOSEST INTERNAL STANDARD.		
T5	METHOD - LABORATORY NOT LICENSED FOR THIS PARAMETER.	METHOD/ANALYTE DISCREPANCIES: LABORATORY NOT LICENSED FOR THIS PARAMETER.		
T6	METHOD - THE REPORTED RESULT CANNOT BE USED FOR COMPLIANCE PURPOSES.	METHOD/ANALYTE DISCREPANCIES: THE REPORTED RESULT CANNOT BE USED FOR COMPLIANCE PURPOSES.		
T7	METHOD - INCUBATOR/OVEN TEMPERATURES NOT MONITORED DURING ALL DAYS OF USE.	METHOD/ANALYTE DISCREPANCIES: INCUBATOR/OVEN TEMPERATURES WERE NOT MONITORED AS REQUIRED DURING ALL DAYS OF USE.		
T8	METHOD - METHOD USED NOT LISTED IN 40 CFR 136; ALTERNATE METHOD CHOSEN PER PERMIT.	METHOD/ANALYTE DISCREPANCIES: METHOD USED NOT LISTED IN 40 CFR 136; ALTERNATE METHOD CHOSEN AS ACCEPTABLE PER PERMIT.		
T9	METHOD - LESS THAN THE PRESCRIBED SAMPLE AMOUNT WAS AVAILABLE FOR THE LEACHATE EXTRACTION.	METHOD/ANALYTE DISCREPANCIES: LESS THAN THE PRESCRIBED SAMPLE AMOUNT WAS AVAILABLE TO PERFORM THE LEACHATE EXTRACTION. THE VOLUME OF EXTRACTION FLUID WAS ADJUSTED PROPORTIONATELY BASED ON THE METHOD PRESCRIBED RATIO OF EXTRACTION FLUID TO SAMPLE WEIGHT.		
TR	ESTIMATE - LAB REPORTED A TRACE VALUE	LABORATORY REPORTED A TRACE VALUE FOR THE COMPOUND		

Code	Short Description	Description	Reject?	For 303d List?
UJ	ESTIMATE - QUANT LIMIT ADJUSTED DUE TO BLANK CONTAMINATION / ANAL DEFICIENCIES.	SAMPLE QUANTITATION LIMIT WAS ADJUSTED. VALUE IS ESTIMATED. DUE TO BLANK CONTAMINATION AND/OR ANALYTICAL DEFICIENCIES, ADJUSTMENT OF THE SAMPLE QUANTITATION LIMIT WAS NECESSARY.		
V	CONTAMINATION - ANALYTE DETECTED IN BOTH ENVIRONMENTAL SAMPLE & ASSOCIATED BLANKS.	ANALYTE WAS DETECTED IN BOTH THE ENVIRONMENTAL SAMPLE AND THE ASSOCIATED BLANKS & BIOLOGICAL ORGANISM ESTIMATED AS DOMINANT		
V1	CALIBRATION - RECOV ABOVE METHOD ACCEPT LIMITS. TARGET ANALYTE NOT DETECTED.	CALIBRATION VERIFICATION: CCV RECOVERY WAS ABOVE METHOD ACCEPTANCE LIMITS. THIS TARGET ANALYTE WAS NOT DETECTED IN THE SAMPLE.		
V2	CALIBRATION - RECOV ABOVE METHOD ACCEPT LIMITS. ANALYTE DET. INSUFFICIENT SAMPLE 2 CONFIRM	CALIBRATION VERIFICATION: CCV RECOVERY WAS ABOVE METHOD ACCEPTANCE LIMITS. THIS TARGET ANALYRTE WAS DETECTED IN THE SAMPLE. THE SAMPLE COULD NOT BE REANALYZED DUE TO INSUFICIENT		
V3	CALIBRATION - RECOV ABOVE METHOD ACCEPT LIMITS. ANALYTE DET. SAMPLE NOT REANALYZED.	CALIBRATION VERIFICATION: CCV RECOVERY WAS ABOVE METHOD ACCEPTANCE LIMITS. THIS TARGET ANALYTE WAS DETECTED IN THE SAMPLE, BUT THE SAMPLE WAS NOT REANALYZED. SEE CASE NARRATIVE.		
V5	CALIBRATION - RECOV AFTER GROUP OF SAMPLES ABOVE ACCEPT LIMITS. TARGET ANALYTE NOT DET.	CALIBRATION VERIFICATION: CCV RECOVERY AFTER A GROUP OF SAMPLES WAS ABOVE ACCEPTANCE LIMITS. THIS TARGET ANALYTE WAS NOT DETECTED IN THE SAMPLE. ACCEPTABLE PER PEA METHOD 8000B.		
V6	CALIBRATION - DATA FROM ONE-POINT CALIBRATION CRITERIA	CALIBRATION VERIFICATION: DATA REPORTED FROM ONE-POINT CALIBRATION CRITERIA.		
V7	CALIBRATION - RECOV ABOVE METHOD CONTROL LIMIT. AVE %DIFFERENCE (% DRIFT) MET METHOD CRIT.	CALIBRATION VERIFICATION: CV RECOVERY WAS ABOVE THE METHOD CONTROL LIMIT FOR THIS ANALYTE, HOWEVER, AVERAG % DIFFERENCE OR % DRIFT FOR ALL THE ANALYTES MET METHOD CRITERIA. DELETED IN REVISION 4.0 9/5/12.		
W	ESTIMATE - VALUE IS LOWER THAN VALUE UNDER "T"	VALUE IS LESS THAN LOWEST VALUE UNDER "T"		
X	ANALYTE - SEE EVENT DESCRIPTION OR PARAMETER FLAGS	OTHER (SEE COMMENTS FROM SAMPLE)		
Y	QC - RATIOS OUTSIDE ACCEPTABLE RANGE	QC RATIONS OUTSIDE ACCEPTABLE RANGE		
ZQL	ANALYTE - DATA QUALIFIED: SEE COMMENTS FOR FURTHER DISCUSSION.	DATA QUALIFIED, BUT STILL CONSIDERED USABLE FOR ASSESSMENTS AND TMDL PURPOSES. SEE ANALYTE COMMENT OR GENERAL COMMENTS FOR SAMPLER COMMENT ON USE.		