



Environmental Resources Management Quality Management Plan

**City of Austin
Watershed Protection Department
Environmental Resource Management Division
March 13, 2017**

Introduction

A quality management plan (QMP), as defined by EPA (2001), describes “the organizational structure, policy and procedures, functional responsibilities of management and staff, lines of authority, and (the organization’s) processes for planning, implementing, documenting and assessing all activities conducted under the organization’s quality system.” The guidelines for QMPs originate with the American National Standard ASQ/ANSI E4-2014, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs" and an equivalent alternative is often ISO 9000 certification in industry. Most federal, state, and regional environmental agencies utilize QMPs, sometimes called quality management systems or manuals in their water quality programs (EPA 2001, USGS 2014, TCEQ 2015, TSSWCB 2015, LCRA 2014). A tailored QMP was also needed for similar environmental data collection in the Environmental Resource Management (ERM) division of the City of Austin Watershed Protection Department (WPD). This document outlines the current QMP for three sections of ERM, Water Resource Evaluation (WRE), Data Analytics and Decision Support (DADS) and Water Quality Monitoring (WQM).

The mission of the WPD is to protect lives, property, and the environment of the Austin community by reducing the impact of flooding, erosion, and water pollution. ERM focuses on improving water quality in Austin’s creeks, reservoirs, and aquifers by preventing, detecting, evaluating, and reducing water pollution. One function in ERM is providing technical information and recommendations to citizens, City staff, regulatory agencies, and policy makers in regards to the current and future state of water quality in Austin’s reservoirs, streams, and aquifers and the impacts of proposed projects, policies, and regulations. ERM enables data-driven decision-making, relying on scientific literature and a body of knowledge gathered through environmental data collection projects.

In order to ensure a consistent level of support, analysis, and detail among the various projects, the first QMP was implemented for the Water Resources Evaluation Section (WRE) in August 2004. The document was updated in January 2016 and this revision reflects organizational changes through March 2017. These latest changes included combining the surface water monitoring and restoration functions formerly in WRE with the stormwater monitoring functions in the Water Quality Monitoring (WQM) section. Also, the database management, analysis, and modeling functions in WRE and WQM were combined into a new section referred to as the Data Analysis and Decision Support section (DADS). The groundwater and endangered salamander species science functions remain in the re-formed Water Resources Evaluation section (WRE). The current QMP covers processes for WRE/WQM/DADS collection of data and performance of applied research projects to meet the water quality goals and objectives of the WPD. Depending on business needs, the QMP may be adapted to cover such projects across the division.

This revision of the QMP also incorporates two graded project plans for specific case groups. First is the OOOPS or One-time in the field Observational or Otherwise Providential Sampling. This is the case when a staff member while in the field for some other purpose or project observes an event or condition that warrants immediate quality data collection under the QMP, but does not warrant a planned study, even a small one. The second is the Critical Situation Investigation (CSI) where staff are directed by supervisor or manager to take samples within a day or so due to an event of an emergency or time-sensitive nature. Examples may be a spill event or a unique environmental condition reported by a member of the public or another department or agency. The key feature is that there is that the event would be over by the time a normal QAPP could be in place for sampling, something like 2 weeks.

Although time sensitive, the investigation still needs to be carried out under the umbrella of the QMP; therefore, specifications for this grade of study and the OOPS are included herein.

With the flatter organizational structure, cooperation in meeting data quality objectives is more important than ever. With the nexus of supervision being at the division level, consensus building at the staff level and then at the section manager level is the preferred modus operandi.

The Quality Management Plan (QMP)

The central tenet of the QMP is quality. The QMP is a framework for ensuring that proposed projects are managed, executed, and documented in a manner that is effective with reliable and repeatable results. This is accomplished by the project managers following a consistent process, and by requiring documentation to support the design, analysis, and reporting of the project. The process is discussed in this QMP and the supporting documentation, and implemented through the application of quality assurance and quality control activities to activity-specific efforts documented in a Quality Assurance Project Plan (QAPP) which references a common set of Standard Operating Procedures (SOP). While at this point it may sound like a bunch of bureaucratic snot to some, it does have a purpose and does place our data on the same field as the other levels of government that we are often in, ahem, close cooperation with.

The Process

The QMP process of planning, conducting, evaluating, and documenting environmental data collection projects is meant to provide quality assurance (QA) and quality control (QC) for the project at key decision points. While we often refer to the single term QA/QC, they are distinct checks used to ensure data quality. Quality assurance checks that the project manager conducted the project according to the adopted process through the QAPP steps and associated SOPs. Quality control checks that the subsequent data collected meets the standards for quality and accuracy dictated by proposed data use. Throughout a project's lifecycle, the QMP relies on QA and QC to produce data quality consistent with its purpose in ERM decision-making.

Quality Assurance Project Plan

The QAPP is the framework which staff use to guide the implementation of a project. It provides an initial record of the project objectives along with the project sampling plan and analytic methods proposed to be used on the data. The structure of the QAPP for each project as defined in this QMP generally follow EPA (2001b) guidelines, such that the QAPP is a "...written document that describes the quality assurance procedures, quality control specifications, and other technical activities that must be implemented to ensure that the results of the project or task to be performed will meet project specifications." In other words, the QAPP details data collection, data processing, and data usage prior to sampling in order to avoid claims of data manipulation and to serve as the mechanism for transparency. It also provides a record of the approach to the experiment as a contingency in the event that the project manager needs to depart from the original design during the project lifecycle. The QA history of the project can be used in final reporting to define the strength of conclusions or recommendations. Templates for preparation of a QAPP can be found at [..\QAPP\QAPP Templates\modular template](#)

Standard Operating Procedures

The second document under the QMP is a compiled set of Standard Operation Procedures (SOP) (COA 2016). The SOP contains details on data collection methodologies and stipulates how to perform the more common statistical analytic methods on the data. The SOP manual in conjunction with the QMP and the individual QAPP should completely describe the management and implementation of the project. Current SOP can be found at: [..\SOP](#). A new set of SOP for stormwater monitoring is under preparation by WQM.

Goals

Within the QMP process, there exist several sub-processes. This level of complexity is necessary to ensure reproducibility and has evolved over time to address problems encountered in the management, collection, and analysis of environmental data. The QMP process is a “Project Management” process. Within this are “Experimental Design”, “Data Design”, “Data Collection” and “Analysis and Reporting” sub-processes. Each of these will be discussed in following sections.

The QMP process, as laid out in this document, is intended to minimize unnecessary steps, make the QMP process accessible to incoming employees, and to minimize inconsistent decision making. A graded approach was taken to allow flexibility and reduction in effort for simpler projects because a “one size fits all” approach to quality specifications rarely works. However, we have a measure of standardization necessary to maintain consistent quality data across all projects big and small.

The primary means of achieving WPD goals of maintaining, restoring, and improving Austin’s water quality is through policies, regulations, education, restoration, and stormwater structural control measures. Recommendations made by ERM for application of these tools are based on research from peer reviewed journal publications, local academic, consultant, and agency research, and/or by applied research projects conducted by ERM staff. On this basis, the activities of WPD can be said to be data-driven. The following section lays out the general process by which the project manager should conduct these applied research projects for environmental data collection from their initial conception to completion.

General Project Management Process

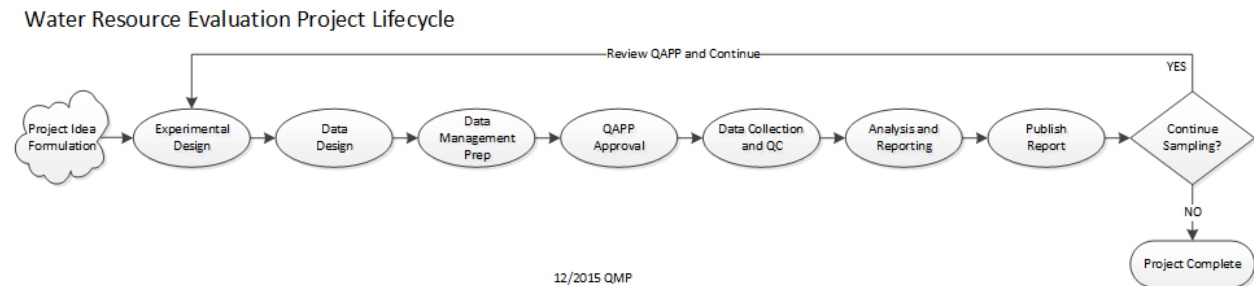


Figure 1. Overall QAPP Lifecycle Flowchart

Figure 1 displays the process necessary for project management, development, and approval. Each of the steps in Figure 1 is explained more fully below. The process begins with an initial proposal from staff or management which ideally arises from the goals to be outlined and updated in the 3-year plan. Council directives, management needs, or outside forces such as state regulation or permit actions may also result in a project initiation. For most projects, it will be obvious which section would be best equipped to conduct the projects, and the appropriate sponsoring section manager will assign a project manager based on workload, education, experience, and/or interest. However, any staff member can propose a project to their section manager and become the de-facto project manager subject to their approval. The project manager then becomes responsible for directing the workflow through the Project Lifecycle (Figure 1). The first step of the project manager is to proceed through the Project Idea Formulation phase (Figure 2).

Project Idea Formulation

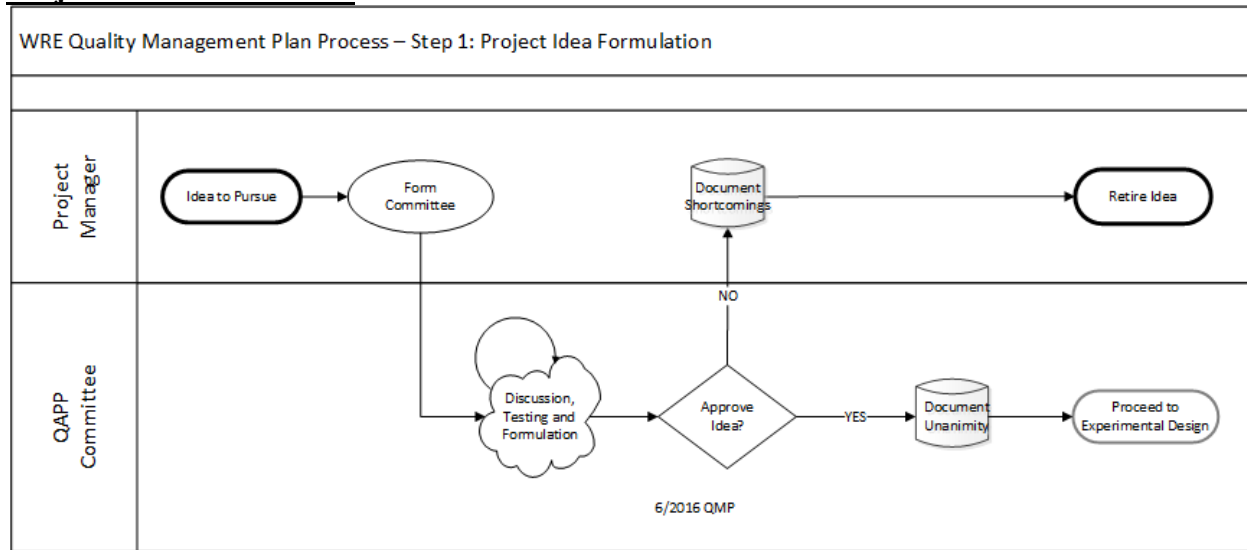


Figure 2. Project Idea Formulation Flowchart

QAPP Committee Formation

SWE, WRE, and DADS will continue to use the QMP procedures under the new organizational structure. All three of the section managers will be notified of new projects at initiation and have the choice of opting in and assigning staff or opting out of individual QAPP committees based on their level of interest. For projects collecting environmental data that will be stored in the FSDB, GIS, or WQM databases, the DADS section manager will assign a staff member to serve as data manager on the QAPP committee for the project and potentially another staff member who can assist with data analysis questions during experimental design. However, it is conceivable that a project may not generate data stored in ERM databases and/or not be used to make inferences or decisions based on data analysis. Therefore, either a Data Manager or a Data Analyst representative of DADS may not be necessary for a committee with consensus of the section managers. Also, under the flatter organizational structure, the three sections report to one division manager who also supervises three other sections and has no time to serve on every QAPP committee. For these reasons, a minimum number or standardized composition of the committee no longer serves. While this places a greater burden on the three participating section managers to provide oversight to QAPP projects and reach consensus in technical differences during project development, it allows the QMP to operate under the flatter organizational structure.

A QAPP committee may consist of any reasonable number of staff including staff from other sections, divisions, departments or agencies as proposed by the project manager and consensus of the section managers. There is no absolute composition of committee members but it should be commensurate with the scope and complexity of the project. For the vast majority of projects, there will be specific defined roles and tasks for the project manager (PM), DADS data manager (DDM), DADS data analysis (DDA), peer review members (PR) and an oversight or sponsor section manager (SSM) usually the PM's supervisor (whether on the committee or not). The following is a description of these potential members and roles.

Sponsoring Section Manager (SSM): Although they may or may not be on committee, the SSM is responsible for discussing project initiation with other section managers as soon as project idea is articulated enough to start the idea formulation and assign committee members. The SSM is responsible for ensuring that project objectives are appropriate and compatible with section/division/department objectives and for being able to communicate progress and findings of project to the Division Manager.

The SSM counsels the PM in committee formation and idea formulation. The SSM reviews the QAPP and other intermediate work products to assist project manager when requested. They also ultimately have an important role in the final report review process.

Project Manager (PM): Responsible for integrating project objectives with section and division objectives, oversight of resource scheduling, updating the committee on project's progress and changes, maintenance of project timelines, data collection, data entry, QC of the data, and report generation. PM is responsible for keeping his/her section informed on assigned projects for feedback and collaboration. Details of responsibilities are explained further in later sections and are central to the success of the project.

DADS Data Manager (DDM): Responsible for data storage strategies, development of applications for data collection and QC efforts, technical assistance in development of the QAPP and management of data flow throughout the project. Ultimately other staff on DADS may be able to assist with this task, but currently the FSDB database manager has this role and may serve on nearly every committee requiring electronic data collection and FSDB usage.

DADS Data Analyst (DDA): Responsible for technical assistance in design of project sampling plan and analysis methodology, review of analyses and report. Currently, a member of the DADS section will also serve as intermediary to the programmer of applications for electronic data collection when capable. When PM is capable of doing the planned analysis, a DDA may not be needed for a project. When capable, a DDA can also serve as DDM on a project.

Peer Review Member (PRM)(optional): During formulation of the project and discussion among section managers additional staff may be assigned to a committee by any section manager. This can be a way to further collaboration and cross-training between sections or access limited time of subject matter specialists. Additional members can be added at any point in the project upon consensus of the committee or section managers..

Committee Processes

The QAPP Committee operates on a consensus decision-making model and all committee members have equal responsibility for collaboration in the final product. However, the project manager bears significant responsibility for progress towards completion. Any member of the committee may ask questions or call a meeting at any time to discuss any facet of the project and it is the responsibility of all members of the committee to participate in the project lifecycle. Communication through long conversations in email is discouraged unless the resolution of a concern can be stated and resolved through simple exchanges of facts. The QAPP committee is an opportunity to engage in collaboration with fellow staff.

The process used by the committee is simply defined by sequential discussion of each issue of objectives, methods, locality, parameters sampled, frequency/duration of sampling, and any other matters of procedure required by the project. Ideally, this can be accomplished in a few meetings and completed through review of documents drafted by committee members after introduction and decision whether to proceed with the project. A checklist of these issues should be prepared by the PM going into the meeting(s) and the committee should call for a consensus on the products of each step in the QAPP development or agree on bundling review of several steps for simpler projects. Unanimity should be recorded for each milestone document in the Experimental Design and Data Design along with Reporting and Analysis. Any issues where unanimity is not forthcoming can either be researched and discussed at a subsequent meeting, discussed through email or other communication medium, or discussed and decided by consensus of the section managers outside of the committee. For simple projects, when the PM is

prepared, the bulk of the entire process can be determined in very few meetings. Recording of unanimity or section managers' consensus should be kept by the PM and attached to the QAPP.

When a project idea moves forward, it becomes the shared goal of the committee to:

1. Develop an approved QAPP.
2. Make the approved QAPP document available to staff.
3. Successfully implement the approved QAPP.
4. Iteratively adjust the objectives or criteria of a project as new information becomes available.
5. Publish a report documenting the outcome(s) of the QAPP.
6. Document the recommendations of the report a central spreadsheet on common ERM directory.
(insert link)

Developing the Project Idea

The project manager gathers a project committee which must first review the idea and decide whether or not to devote resources to the project at that time (Figure 2). Any project that incorporates data collection must be overseen by a QAPP committee composed of ERM staff and if applicable, staff from other agencies. The project manager is responsible for facilitating and encouraging participation and collaboration at this early stage. The committee should first discuss the idea presented by the project manager and conceptually test the idea and its value as a priority project to be pursued. What questions are being posed and attempted to be answered by the project. What hypothesis are being proposed and tested and how? Is a statistical or deterministic model involved? Has it been tested elsewhere in similar circumstances? The contribution of the idea should be conceptually traced up from perceived project results to City goals and objectives. The larger organizational goals are documented through the WPD Business Plan, Masterplan, Imagine Austin and other documents. Refinement of the project idea should also be done resulting in a more focused description of the project and its' utility for WPD. In the event that the project is not approved, the project manager should then document the shortcomings of the idea or funding/timing difficulties for posterity (where). Once a project has been approved, the QAPP committee should aid the project manager in the development, execution, and review of the project.

Experimental Design

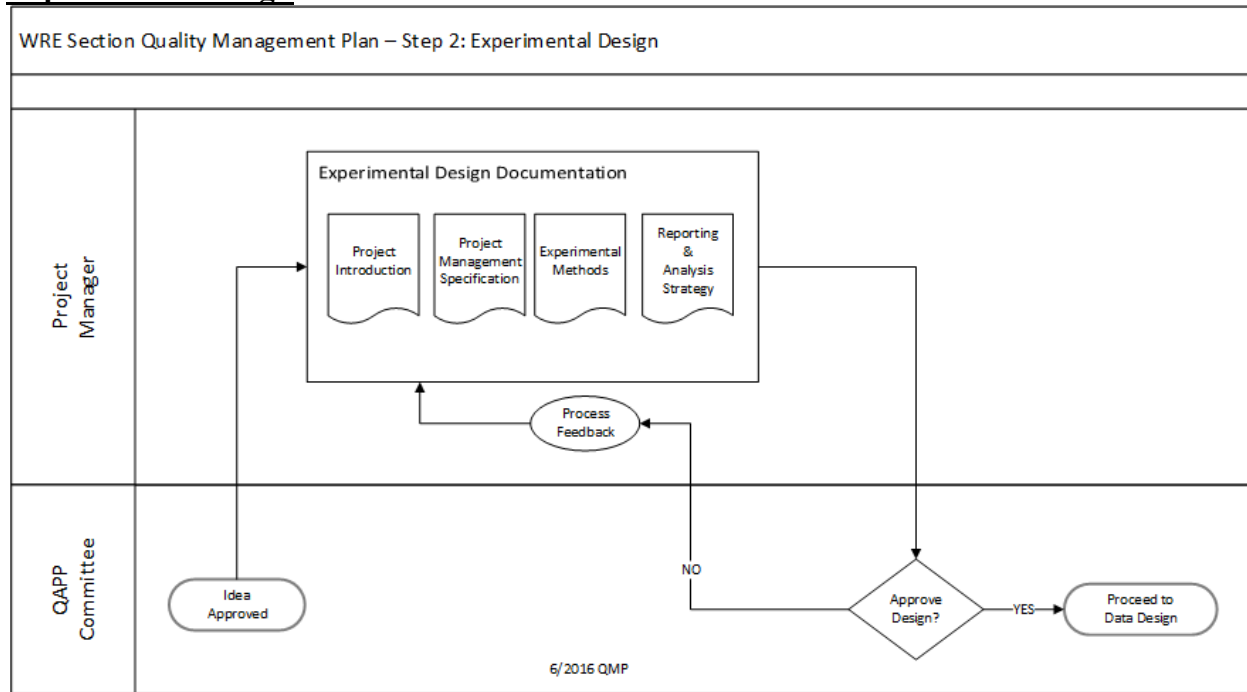


Figure 3. Experimental Design Flowchart.

Once the initial idea has been properly formulated into a focused project, the project manager is responsible for completing the initial experimental design documentation as completely as possible. SOP Section 9 can be used to guide the committee (or provide choices for the committee) to an appropriate statistical approach given the overall objectives of the project.

The following sub-sections outline different documents to be addressed that should be considered “modules” of the QAPP. References germane to each section’s content should be included in each section as they are developed. Experimental design documentation consists of the following and templates for each module can be found at: [..\QAPP\QAPP Templates\modular template\Experimental Design](#)

- **Project Introduction** – This should consist of: A brief literature review on subject matter and knowledge gaps related to the project (commensurate with scale and scope of study);
- Project history leading to why, specifically, the section wishes to perform the project at this time and why local data is needed;
- Project objectives and alignment with WPD goals and objectives from business and/or masterplan including contributions to any current performance measures;
- Specific WPD policies that may be impacted by project results (including regulatory initiatives); and
- Logical justification for why we are the most appropriate agency to complete this project within our jurisdiction and mandate.

Project Management Specification – This section aims to establish a record of the mechanics of the project such as who is involved, , laboratories to be used, if any, and costs associated with the project. As such, the following will be documented in this section:

- The committee members and their roles, additional collaborators or stakeholders, and persons responsible for database administration, programming, project analyses and reporting;

- Laboratories that will be used for sample analysis along with associated costs of sampling (including staff time); and
- Planned project schedule, milestones, duration and estimated deliverable dates for the analysis and reporting.

Experimental Methods – This section will address overarching questions related to the project and develop the details of the experimental design required to meet the objectives outlined in previous sections. In addition, the project manager will document the sampling scheme including data collection methods, sampling locations, parameters to be collected, number of samples to be collected and QC specifications. This may involve jumping ahead to drafting parts of the data forms for documentation such as the site/parameter/frequency table if it makes things easier. The main goal is to have the project conceptually planned and thought through from start to finish before final design of the data management portion of the project.

Reporting and Analysis Strategy –This section describes the approach the committee recommends is best for analysis of the data to meet the stated objectives. Analysis assumptions and methods, and the type of report planned for the the project are stated here. The analysis should be commensurate with the experimental methods and should be provided as a record of the initial approach to the analysis in the event of a departure is driven by the data collected or further research into specific statistical or presentation methods. For example, a simple linear regression may be proposed when the data collected indicates stepwise, piecewise, log-normal, nonlinear, or nonparametric regression would be more appropriate. The initial method is documented in the QAPP as the plan, and the subsequent methods leading to the best method are documented in the final report.

Data Design

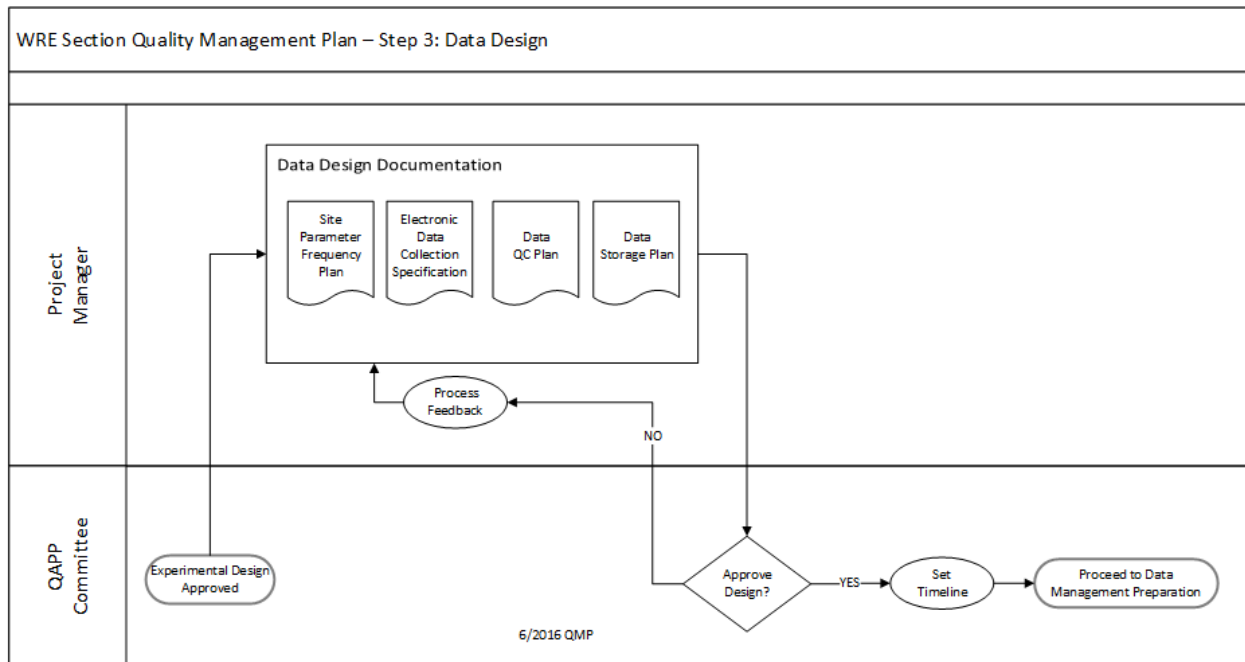


Figure 4. Data Design Flowchart.

The project manager is responsible for completing the data design documentation as completely as possible. As before, these documents should be considered “modules” of the QAPP. This documentation consists of the following and current templates for Data Design can be found at: ..\QAPP\QAPP Templates\modular_template\Data Design

Site Parameter Frequency Plan – This is a tabular breakdown of the data that will be collected consisting of four tables:

1. Sampling Locations – existing or new – with site type, latitude and longitude in WGS 1984.
2. Parameter Suites – A record for each combination of lab, medium, sample type, parameter, unit and method grouped together with a “parameter suite” id in roman numerals. Note any one-to-*n* relationships.
3. Site Parameter Frequencies – A record for each combination of sampling location, parameter suite id, duration of monitoring, and frequency of sample collection within that duration.
4. Lab Suite Cost Breakdown – A record for each parameter suite with resource allocation and lab costs.

Electronic Data Collection (EDC) Specification – Specific documentation regarding how data will be collected in the field. The use of EDC is assumed and recommended, especially for collection of field parameters, Riparian Functional Assessment, water chemistry samples, etc. for which apps have already been written. For new apps, this is a simple link to EDC app creation spreadsheet to be filled out. However, some projects still require manual methods and are allowed on a case by case basis. For site-associated data whose sampling timeline cannot allow the time required to develop a new app, other tools will be used for data entry into the FSDB. This section requires a narrative or other description of data collection when EDC is not used.

Data QC Plan – Specific documentation regarding how QC Samples will be used to validate samples. This is where the QC will be evaluated whereas in the Experimental Methods section specifies what methods were selected, and where appropriate, why. The QC Plan for FSDB data is basically written into the SOPs for current practice. However, in order to keep QAPPs in appropriate historical context, the methods of QC in use at the time the project is conducted will be documented here. In addition, QC for data not stored in the FSDB will be required to be comparable. For example, three levels of checking and locking data for manually entered data would be comparable to that required for the FSDB.

Data Storage Plan – Specific documentation regarding how data will be stored. If data is not stored in the FSDB then the Data Storage Plan must note where the production dataset will be stored. In addition, if the data is to be stored in GIS, the plan must include a diagram of the data schema.

The QAPP Committee is responsible for validating the data design by aiding the PM in making the data design documents complete (Figure 4). When the committee comes to consensus that the design is fully formed, the PM may request that the DDM begin the data management preparation with the programmer/DBA. For simple projects that need to be started immediately, the DADS section manager may approve moving ahead without the documentation being final.

Data Management Preparation

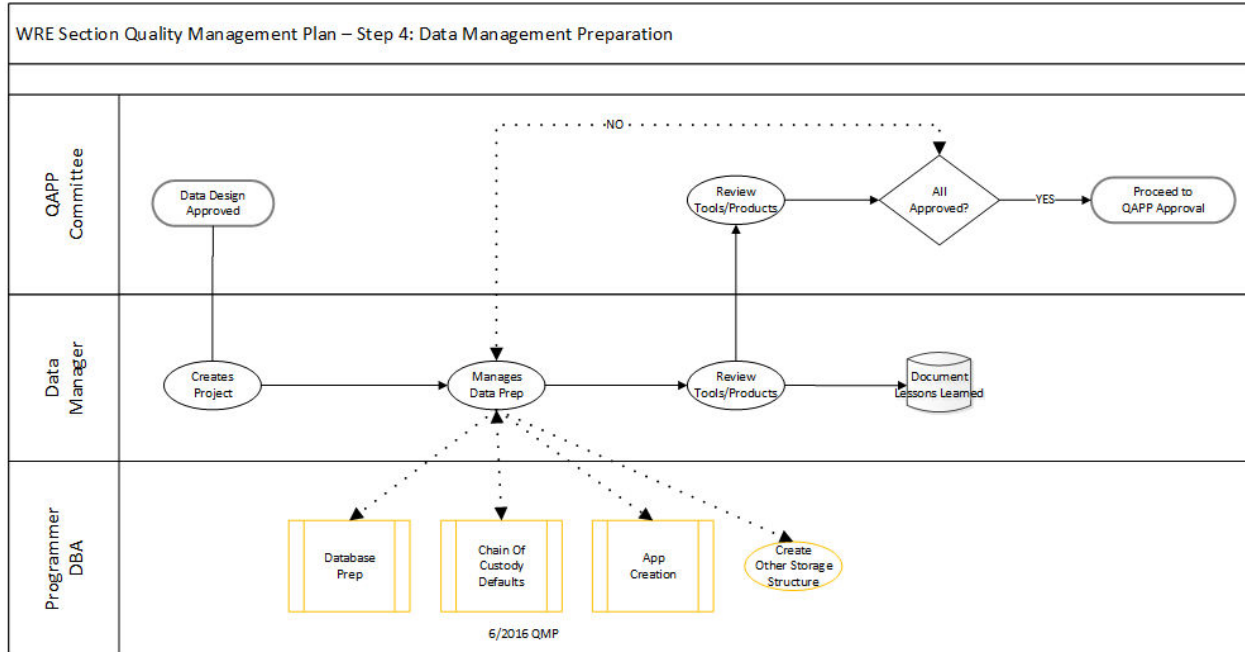


Figure 5. Data Management Preparation Flowchart.

Relying upon the documentation produced in the data design phase, as necessary the DDM works with the programmer DBA identified in the project management specification to develop any and all the data resources that are required for data collection (Figure 5). When the DDM is satisfied that the products meet the criteria established in the data design the QAPP committee must review and approve the products or require revisions. The DDM should make note of any lessons learned for future reference. The DDM may be able to provide some of the services of the programmer/ DBA for the project, and this hopefully will become the norm over time with cross training.

QAPP Approval

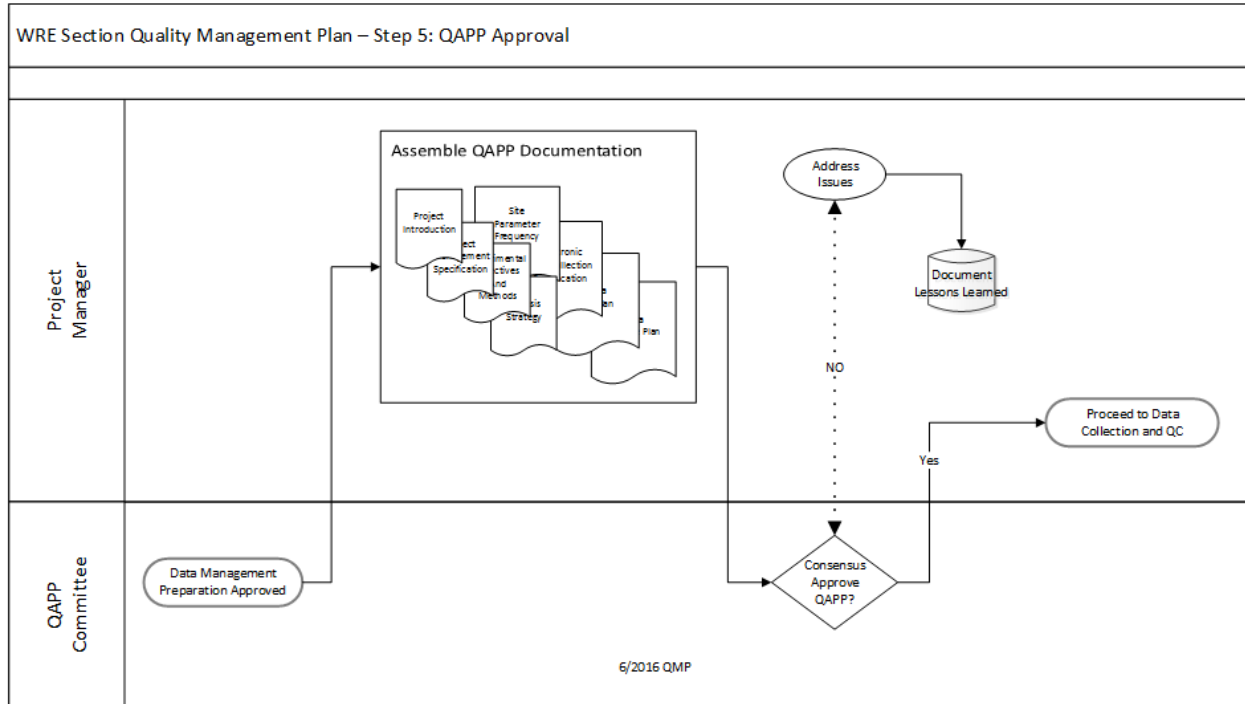


Figure 6. QAPP Approval Flowchart.

The project manager assembles all of the modules populated in the previous steps into a single document – and condenses the references sections from each module into one references section – and the QAPP Committee has one last chance to review the QAPP prior to approval. Any incomplete form fields or outstanding issues are brought up and must be resolved by the committee. Should the committee not be able to come to complete consensus over an outstanding issue, the WRE/WQM/DADS section managers will meet to decide the most appropriate way to proceed in the project. The PM should make note of any lessons learned for future reference. Such overall project management notes will be kept in a common ERM accessible network folder with a CTM backup schedule (insert location).

Data Collection and QC

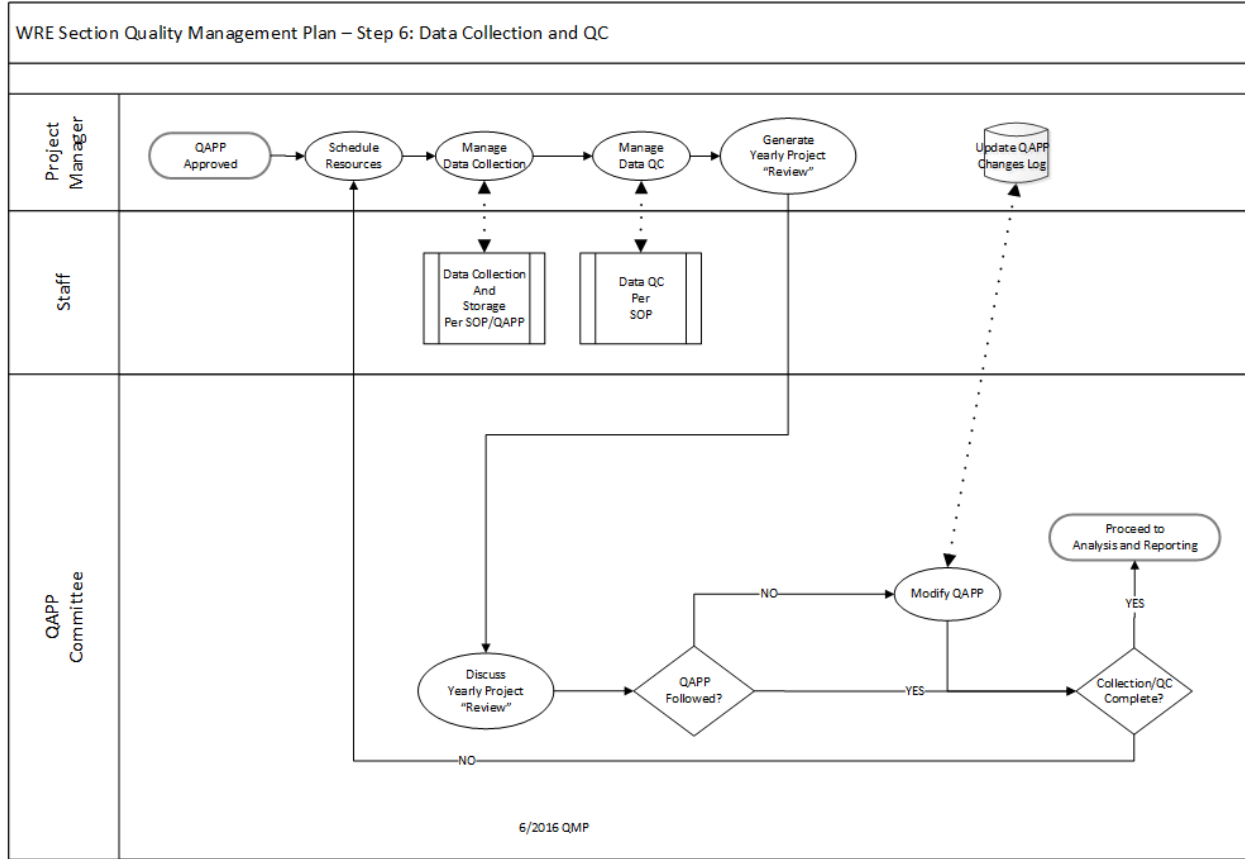


Figure 7. Data Collection and QC Flowchart.

Data Collection cannot proceed without an approved QAPP unless directed by the Division manager or consensus of DADS/WRE/WQM section managers. .

Implementation of a project happens according to methods defined in the approved project QAPP and the SOP manual. Iterative efforts to schedule resources, manage data collection, lab sample drop-offs, and data QC are open to improvements as long as all parties agree to innovations. Innovations that become the norm must be documented in the SOP (Figure 7).

During data collection, quality control measures will be implemented to confirm that the data collected is within expected limits per the Data QC plan portion of the QAPP and the SOP.

The QAPP committee must review the data collected for a project at least once per year to ensure that QAPP specifications are being met for all projects lasting longer than one year. For projects lasting less than one year, the committee must review the data collected for a project prior to the data analysis phase. The PM is responsible for this review but may request assistance from committee members in this process. This review should verify that:

- Correct sites were sampled
- Correct parameters were analyzed
- Samples dates and times were correctly reported
- Required QA/QC samples were collected
- Data has been stored according to the Data Management plan and QC checked and locked

- Deviations from the QAPP are documented in the log of changes associated with the project.

Departure from the QAPP during data collection, while common, may prompt committee discussion to determine the impacts on the project. In addition, the committee members may wish to agree on changing sampling locations, targeted sampling dates or periods, parameter lists, data analyses, or QA/QC methods at any point in the project. All departures and pre-sampling changes to the QAPP must be documented in a “log of changes” associated with that particular QAPP. Again, all committee decisions must be made by unanimous decisions or consensus of DADS, WRE, and WQM section managers although meetings may seldom be necessary.

Analysis and Reporting

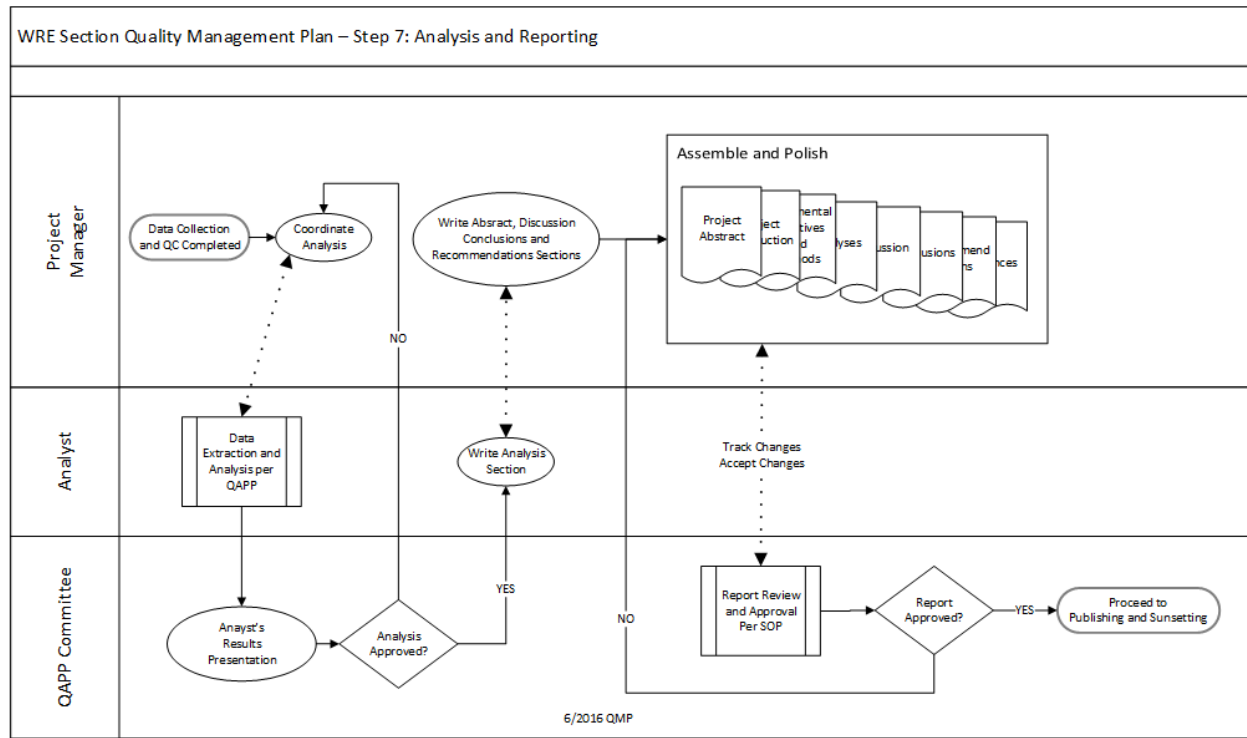


Figure 8. Analysis and Reporting Flowchart.

Once the data collection and data quality control is complete, the process of statistical analysis and report generation begins which will culminate with the publication of a data or short report. An analyst will be selected from within the committee to examine and perform the necessary calculations and charts or graphs for the report. The results will be presented to the committee and if no further analysis is deemed necessary, the documentation of the analysis and project report can proceed. Once complete, the committee will then review the written report within a set period of time and revisions will be made by the PM. The committee review will be primarily to verify the conditions of the QAPP have been substantially met, and deviations documented where important to the project. When approved by the committee, reports will be approved for publication by the section manager of the project manager’s section, and the final report made public via the internet. This basically happens between Figures 8 and 9 below. There is some overlap in the QAPP report review and the SOP report review process. For example, the SSM may be on a committee and supervising the author of the report. However, for the majority of the committee, their responsibility ends when the final report is approved unless further sampling is decided.

Publishing and Sun-setting

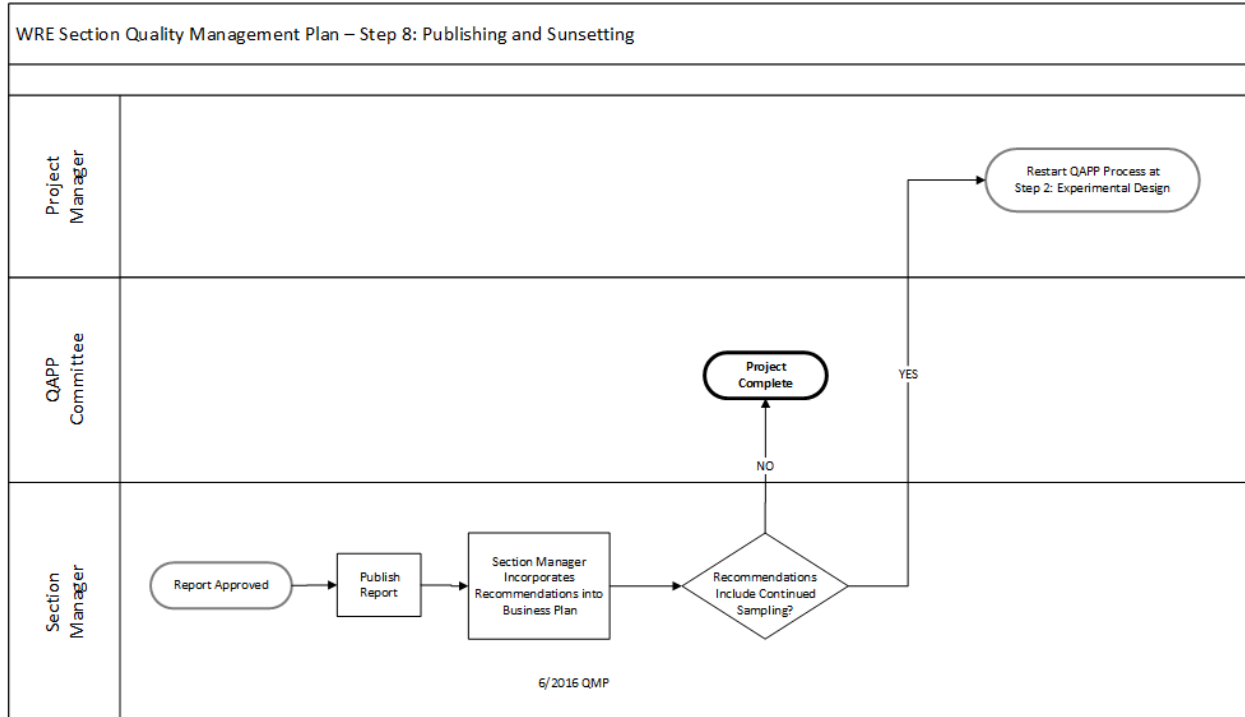


Figure 9. Report Publishing and Project Sun-setting Flowchart.

Technical and editorial review is conducted according to section 10.0 of the SOP before the report is published. Once the report has been published, its recommendations will be compiled in the ERM project recommendations list for follow-up. The project manager will assess each recommendation for further field study and/or policy, project, or regulation recommendation. The recommendations list will be available for the SSM to use in the business planning process. The SSM can consult the list to determine which projects with additional sampling recommendations should be approved by budget year. In the event that no further study is warranted in the opinion of the SSM, then the completion of the project will be documented in the ERM project recommendations list after a brief post-project review of the cradle to grave project documentation by the committee.

As part of the business planning process, the SSM may also take a recommendation, evaluate for priority, determine immediacy (1, 3 year or long-range horizon issue) and schedule/budget resources. In addition, the SSM may propose action based upon these recommendations to other sections and/or division manager. In the future, the recommendations list may be useful in aligning SSPRs with the business planning process.

Organization and Alignment

One of the common and typically required sections of a QMP concerns placing it in context of organizational structure and alignment with organization goals.

Organizational Alignment is the process connecting every component of city operations from the level of each employee's annual Success Strategy and Performance Review through work unit performance measures, section services and activities, division functions and strategies, to department objectives, goals and ultimately its mission. Alignment is also important to show a documentable and measurable benefit and contribution of each operation level to the results and achievement at the next higher level. Ultimately, alignment is to show the contribution of each employee to the goal of being the best managed city in the country. It is an ambitious undertaking, but ultimately worthwhile. The following discussion is provided to show the role of the QMP in organizational alignment.

The upper level targets for alignment can be found in the WPD masterplan, annual City business planning, and Imagine Austin comprehensive plan.

At the City of Austin, the stated goal is to be the best managed city in the country. In the Imagine Austin comprehensive plan, Priority Programs were defined to organize how this goal is to be met on an ongoing basis. WPD contributes to many of these Priority Programs especially the Water and Environment programs <http://www.austintexas.gov/department/imagine-austin>

Priority Program 2: Sustainably Manage Our Water Resources - Central goals of this priority program are to conserve water resources and improve watershed health, which will require extensive involvement in regional efforts and close coordination across all aspects of Austin's water resources. Bringing together existing efforts allows us to move forward with integrated strategies that address the range of water resources issues such as supply, quality, conservation, public health, and recreation.

Priority Program 4: Use Green Infrastructure to Protect Environmentally Sensitive Areas and Integrate Nature Into the City - A primary goal of this priority program is to manage Austin's urban and natural ecosystems in a coordinated and sustainable manner in part by increasing protection of environmentally sensitive land, improving tree cover in every neighborhood, improving health of the watershed, increasing access to parks, and linking these resources throughout the city. This program seeks to improve environmental, recreational, and transportation functions and improve the connection between people and the environment.

The Watershed Protection Master Plan is the department's strategic plan that assesses erosion, flood and water quality problems in Austin. It also prioritizes and implements effective solutions that address all three problems systematically. Solutions include projects, programs and regulations. The WPD Masterplan goals lead to objectives that state desired outcomes which are aspirational and not time-specific. The mission of the WPD as documented in the Masterplan is to "protect lives, property, and the environment of our community by reducing the impact of flooding, erosion, and water pollution". The Protection of the community through reducing watershed related impacts is part of being "best managed" through sustainably managing our water resources and protecting environmentally sensitive areas. MP goals of WPD include the following <http://www.austintexas.gov/department/watershed-protection-master-plan> :

- Protect lives and property by reducing the impact of flood events.
- Protect channel integrity and prevent property damage resulting from erosion.
- Protect and improve Austin's waterways and aquifers for citizen use and the support of aquatic life.
- Maintain the integrity and function of Utility Assets
- Meet or exceed all local, state, & federal permit and regulatory requirements.
- Improve the urban environment by fostering additional beneficial uses of waterways and drainage facilities.

- Optimize City resources by integrating flood, erosion, and water quality control measures.

The water quality protection (WQ) mission contributes to several of the above, but primarily responsible for activities to “protect and improve Austin's waterways and aquifers for citizen use and the support of aquatic life”. Implementation of this goal is further defined in the MP by the following objectives:

..\..\Common\ERM_WQ_business_planning\Current_Goals_Objectives.pdf

- In local creeks, achieve or exceed Good Environmental Integrity Index (EII) scores.
- In Urban creeks, restore baseflow quantity and quality to the maximum extent possible.
- In Nonurban creeks, preserve the existing baseflow quantity and quality to the maximum extent possible.
- In all creeks, reduce existing and future pollutant loads to the maximum extent possible.
- In the Edward's Aquifer, maintain or enhance the existing rate of recharge to the maximum extent possible.
- Maintain or enhance high quality environmental features (e.g., springs, seeps, wetlands, swimming holes, threatened or endangered species habitat) to the maximum extent possible.

In addition, common objectives we contribute to are addressed by aspiring to the following objectives:

- Maximize the use of waterways and drainage facilities for public recreation.
- Maximize areas for public use within floodplains.
- Maintain natural and traditional character of floodplains to the maximum extent possible.
- For all state designated stream segments, including Lake Travis, Lake Austin, Lady Bird Lake, the Colorado River below Austin, Barton and Onion creeks, maintain or improve the Designated Use Support status
- Comply with stormwater NPDES permit requirements.
- Minimize the risk to structures in the 100-year floodplain as required by the National Flood Insurance Program.
- Maximize flood control, pollution removal and streambank protection for all solutions including CIP projects.

The WPD Business Plan (BP) goals are similar but are further developed into more specific, measurable, attainable, realistic/relevant, and time specific objectives. These goals are stated as http://coasweb1.coacd.org/sites/WPD/Shared%20Documents/Presentations/Business_Workshop_2.29.16.pdf:

- Reduce flood impacts to life, property, and the environment.
- Create a stable stream system that decreases property loss from erosion and increases the beneficial uses of waterways.
- Maintain and, when possible, improve water quality.
- Provide adequate assessment and maintenance of drainage infrastructure.
- Maintain 100% of activities in compliance with Federal and State permits and regulatory requirements each year.

Objectives under these BP goals concerning the maintenance or improvement of water quality are listed as:

- Construct water quality controls to reduce stormwater pollutants from 7,300 acres by FY 2016.
- Conduct business inspections and spills response to recover a total of 700,000 gallons and 300 cubic yards of pollutants in FY 2016.

- Maintain or improve baseline levels of the Environmental Integrity Index and Austin Lakes Index (water, sediment and recreational quality, aquatic habitat and physical integrity) in 100% of water bodies evaluated during FY 2016.

Although listed as Objectives in the BP, the above are also Key Indicators and Performance Measures found in ePerf online <http://www.ci.austin.tx.us/budget/eperf/index.cfm>. Many of the activities that ERM performs contribute to the BP and MP water quality objectives by determining how to maintain or improve water quality and compliance with relevant regulatory requirements. Specifically, the performance measure to “maintain or improve the water quality indices of all water bodies evaluated over a year” requires more investigation into local causes of water quality degradation and recommendations for selection and implementation of actions to mitigate or avoid these impacts. The water quality indices mentioned are collected by the WQM section including the Environmental Integrity Index covering streams and rivers in the area and the Austin Lakes Index (ALI) although there are several other performance measures for DADS and WRE that are used operationally in the business plan:

Public Measures

- Area (square feet) of threatened or endangered salamander habitat restored or improved
- Cumulative number of environmental quality reports published on City webpage
- Cumulative area of Critical Environmental Feature buffers
- Percent of water bodies that maintained or improved water quality relative to baseline levels
- Total number of environmental reviews completed

Operations Measures

City of Austin/Department Internal Measures

- Number of salamanders released from captivity to the wild or transferred to other captive facilities
- Acres of riparian areas restored or managed sustainably
- Number of outreach events conducted annually
- Percent of local, state and federal operating permit reports submitted on time
- Percent compliance with US Fish and Wildlife Service operating permit requirements for Barton Spring
- Acres draining to improved green stormwater treatment infrastructure

Each of the reports completed under the QMP are counted under the Cumulative number of environmental quality reports published on the City webpage. In addition the percent of water bodies maintaining or improving water quality relative to baseline levels are calculated through methods derived and revised through QAPP projects. Finally, data collection under QAPPs are used in compliance of operating permits and compliance with USFWS permits at Barton Springs. Many of the measures above highlight other tasks of DADS, WQM, and WRE in the area of development review, regulatory compliance, and riparian restoration; however, the methods used in restoration projects are also developed and tested through a variety of projects for which environmental data collection was necessary. These developmental projects would also be required to follow the QMP and operate under an approved QAPP.

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Glossary

Blocking member – Committee member who does not agree with approval of a step in the QAPP development or decisions made during a project. Under the consensus decision-making model, the blocking member states rationale and committee evaluates and if it still does not reach unanimity, the WQM, WRE, and DADS section managers will discuss and arrive at a concluding consensus decision on each matter of contention

Consensus decision-making – QAPP Committee process of striving (through discussion and logical argument supported by facts, literature, and/or experience) towards unanimity in any disagreement on efficacy, methods, parameters, analysis, or data management.

Consensus decision – The endpoint to the consensus decision making process where the group has reached unanimity and documented in a record of consensus

Data – Any information that is collected by WRE/WQM/DADS to be used in the making of inferences, recommendations, decisions of WPD policy/project/or regulation, or responsive to management request

including that is to be stored in perpetuity in the FSDB, GIS, WQM Hydstra files, or other method TBD by ERM Management.

Data quality assurance (DQA) is the process of verifying the reliability and effectiveness of data.

Data schema – In GIS data storage, the structure used to logically group objects such as tables, views, index, stored procedures, etc. that is documented in a data dictionary. A diagram of the structure is necessary to be defined in the QAPP Data Storage Plan when the project collects GIS data.

Dependable results – Results that are reviewed, audited, assessed and consistently are not contradicted or invalidated by serious investigation of the data by peers, agencies, consultants, or other interests.

Environmental data - any measurements or information that describe environmental processes, location or conditions; ecological or health effects and consequences; or the performance of environmental technology. For ERM, environmental data include information collected directly from measurements, produced from models, and compiled from other sources such as data bases or the literature.

Experiment - An experiment is a procedure carried out to verify, refute, or validate a hypothesis. May be controlled or natural field experiments. In ERM, this would include observational studies where data is collected.

Graded approach - the process of basing the level of application of managerial controls applied to an item or work according to the intended use of the results and the degree of confidence needed in the quality of the results to reach project objectives.

Module – Subsection of the QAPP that independently addresses a portion of experimental design or data design or data management needing to be defined to conduct a quality project.

Project-discrete, contained data collection, interpretation, analysis, leading to reporting on a question or need in the areas of environmental protection that has been assigned.

Project requiring a QAPP – See “Project” above. However, a committee or the Section Manager may determine a particular project should not continue through the QAPP process during the initial formulation stage.

Quality – the totality of features and characteristics of a product or service that bear on its ability to meet the stated or implied needs and expectations of the user.- Aspects of data quality include accuracy, completeness, currency (update status), relevance, consistency across data sources, reliability, appropriate presentation, and accessibility. Within an organization, acceptable data quality is crucial to operational and transactional processes and to the reliability of analytics and reporting. Data quality is affected by the way data is entered, stored and managed. Data quality assurance (DQA) is the process of verifying the reliability and effectiveness of data.

Quality assurance - an integrated system of management activities involving planning, implementation, documentation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the client.

Quality assurance project plan - a document describing in comprehensive detail the necessary QA, QC, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria.

Quality control - the overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality.

Quality system - a structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, documenting, and assessing work performed by the organization and for carrying out required QA and QC activities.

Quality review or assessment - a systematic and independent examination to determine whether quality activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve objectives. Also a statistical and scientific evaluation of the data set to determine the validity and performance of the data collection design and statistical test, and to determine the adequacy of the data set for its intended use.

Quality data – meaning “high” quality data as per definition of quality above. Basically, has been objectively verified through Quality Assurance program.

Record of Consensus – The documentation of a step in the QAPP process or a disputed portion of the QAPP committee activity on a project where a consensus decision has been reached. If unanimity in the committee has not been reached, this will be replaced by a record of section management decision.

Report – Any publication of WRE/WQM/DADS collected data, especially those making inferences, conclusions, recommendations, or proposing policy, projects, or regulations in written form transmitted by memo, letter, short report, compilation report, or presentation to management, technical organizations, commissions, regulators, stakeholders, or general public.

Standards for Quality and Accuracy – objective measures of data quality used in the particular field of study of a project. May include statistical test and laboratory result rejection levels.

Section management decision – If at any point after QAPP committee consensus-decision making process does not produce unanimity, the WRE, WQM, and DADS section managers will discuss a technical or process impasse and reach a consensus or otherwise resolve the issue.

Unanimity – when all of the members are agreed to the approval of a document, module, resolution of an impasse or disagreement, concerning any portion of the QAPP committee activities.