



San Diego County Water Authority



Engineering Department



***Design Manual
Volume One***

Design Contractor Guide

ESD-160

March 2007

ESD 160 Design Manual

Volume One: Design Contractor Guide

REVISION LOG	

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SDCWA
San Diego County Water Authority
Engineering Department



ESD 160

Design Manual: Volume One

Design Contractor Guide

March 2007

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ESD 160 Design Manual: Volume One (Design Contractor Guide)

Introduction and use

The *ESD 160 Design Manual: Volume One (Design Contractor Guide)* documents the practices and standards that are used for design of projects at the San Diego County Water Authority.

Personnel involved in design of Water Authority projects shall adhere to the practices and procedures described in this document. Engineering management shall be responsible for enforcement of these practices in their respective design management of projects.

Revisions and maintenance

This manual is intended to be a living document that evolves to meet changing San Diego County Water Authority needs.

Engineering management continuously monitors the design activities for its various projects and will identify refinements to or additional practices and procedures.

The Engineering Department is responsible for maintaining this manual, for revising chapters as practices and procedures change, and for issuing manuals and revisions to appropriate personnel.

Users may suggest changes or additions to this document by submitting a Change Request Form to the Manager of the Administration and Controls Group. This form is available at the Water Authority server in the directory I:\0130.00\Resources\Forms&Templates. Comments will be reviewed, and if changes are instituted, the manual will be revised and revisions will be distributed to manual users.

Personnel entrusted with this manual are responsible for maintaining it in a current and update condition as revised chapters are published.

Validation

The San Diego County Water Authority *Engineering ESD 160 Design Manual: Volume One (Design Contractor Guide)* is hereby accepted and approved.

John A. Economides, Director of Engineering
San Diego County Water Authority

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Chapter 1 Introduction and Administration

Overview

Purpose This chapter presents an introduction to standards and procedures to be followed by Design Contractors.

Topics This chapter is composed of the following topics:

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1.1 Mission, Purpose, and Scope

1.1.1 Mission of the Water Authority

1. The mission of the San Diego County Water Authority (Water Authority) is to provide a safe, secure, and reliable supply of water to the San Diego region through its twenty-three member agencies. With an acute awareness of San Diego's dependence on imported water sources, the Water Authority has implemented numerous studies, programs, and initiatives to manage, conserve, and reclaim water.

1.1.2 Purpose of the Design Manual

1. The Design Manual provides general administrative and technical guidelines that shall be followed by Design Contractors selected by the Water Authority to prepare engineering reports, construction drawings, and specifications for the facilities necessary to implement the CIP and/or to provide services during other project phases. The design of these facilities shall be based on the Design Manual and other criteria presented in the Predesign Report.
2. The Design Manual consists of two volumes, the Design Contractor Guide and Facility Design Guide:
 - 2.1. The Design Contractor Guide provides design management requirements, including requirements for design schedule and budget control, reporting, QA/QC program, deliverables at different levels of design, construction cost estimating, records management, and other topics. The Design Contractor Guide also describes the relationships between the Design Contractor and the Design Manager.
 - 2.2. The Facility Design Guide provides common design requirements for different types of facilities, including pipelines, pump stations, and flow control facilities.
3. The primary purpose of the Design Manual is to ensure uniformity of design concepts, formats, methodologies, procedures, construction materials, types of equipment, and quality of work products to be produced under the CIP.
4. Recognizing the need to maintain creativity, innovation, and ingenuity, Design Contractors are expected to adapt the Design Manual for design of the facilities for which they are responsible and to take full responsibility for the designs produced. This responsibility of the Design Contractor is in no way diluted or absolved by the Design Manual.

**1.1.3
Scope of the
Design Manual**

5. The Water Authority intends to contract directly with the Design Contractor for the preparation of Contract Documents. The Design Contractor's contract with the Water Authority (Contract) for design services will incorporate a detailed scope of work and specific administrative requirements.
 6. A Design Manager will be assigned to administer each project and will be the Design Contractor's point of contact with the Water Authority for the project. The Design Manager will administer the Contract to ensure compliance with provisions of the Contract and the Design Manual.
 7. At the discretion of the Design Manager, the Design Manual may be referenced in the project scope of work as a requirement for the Design Contractor. The scope of work may also list any project-specific changes or deviations from Design Manual requirements.
 8. During different project phases, the Design Manager may delegate to others, including the Project Manager and Construction Manager, the authority to directly contact the Design Contractor. However, any direction given by others is not binding on the Water Authority unless such delegation is authorized in advance and in writing by the Design Manager. In addition, such delegation does not alter the Design Manager's position as the Design Contractor's point of contact with the Water Authority for the project.
-

**1.1.4
Chapter
Descriptions in
the Design
Contractor
Guide**

1. The Design Contractor Guide is composed of the following chapters:
 - Chapter 1 – Introduction and Administration
 - Presents an introduction to standards and procedures to be followed by Design Contractors.
 - Chapter 2 – Design Cost and Schedule Control
 - Presents Design Contractor requirements for control of design costs and schedules.
 - Chapter 3 – QA/QC Program
 - Presents the Quality Control and Quality Assurance standards and procedures to be followed by Design Contractors.
 - Chapter 4 – Design Development
 - Describes Design Contractor requirements and responsibilities at each level of design development, from the Basis of Design Report thorough the Accepted Final Design submittal.
 - Chapter 5 – Records Research, Utility Coordination, and Field Investigations

Outlines Design Contractor responsibilities in researching existing and planned utilities, and coordinating with public and utilities agencies including the Water Authority Right of Way Department.

Chapter 6 – Surveying and Mapping

Presents Design Contractor responsibilities in providing the necessary topographical surveys and mapping to perform proper design.

Chapter 7 – Rights-of-Way, Easements, Encroachments, and Land Acquisition

Describes Design Contractor requirements in preparing the necessary documents needed to acquire right-of-ways, easements, or encroachment permits from other agencies and private parties. It also outlines the requirements for coordination with the Water Authority Right of Way Department.

Chapter 8 – Geotechnical, Seismic, and Hazardous Materials Investigations

Outlines requirements and procedures for performing the necessary geotechnical, seismic and hazardous material investigation by the Design Contractor.

Chapter 9 – Transient Analysis and Surge Control

Presents requirements to perform transient hydraulic analysis and design surge control measures for Water Authority projects.

Chapter 10 – Environmental Compliance and Permit Support

Outlines Design Contractor requirements to obtain the necessary permits to perform design and field-related design activities.

Chapter 11 – Risk Management

Describes Design Contractor requirements and responsibilities to develop a Risk Management Plan and reduce the risk inherent in the project design and construction.

Chapter 12 – Public Coordination and Community Outreach

Describes the Design Contractor's role in coordination with the Water Authority Public Affairs Department.

Chapter 13 – Traffic Control

Specifies Design Contractor requirements for coordination with traffic engineers of public utilities and agencies and in development of traffic control plans.

Chapter 14 – Technical Specifications, Drawings, and Calculations

Outlines Design Contractor requirements to follow Water Authority standards in preparing specifications, drawings, calculations,

and other documents for Water Authority projects.

Chapter 15 – Construction Cost Estimates and Schedules

Presents Design Contractor requirements for developing cost estimates and schedules at different design levels.

Chapter 16 – O&M Manuals, and Lifecycle Cost Analysis and O&M Impact Reports

Outlines Design Contractor requirements to produce O&M Manuals, develop lifecycle cost analyses, and O&M impact studies.

Chapter 17 – Owner-Procured Equipment

Presents the Design Contractor requirement to coordinate design documents in consideration of owner-procured equipment.

Chapter 18 – Bid and Award Phase

Outlines Design Contractor responsibilities during the Bid and Award Phase of projects.

Chapter 19 – Construction Phase

Presents Design Contractor responsibilities during the project Construction Phase.

Chapter 20 – Startup and Commissioning, Closeout, and Warranty

Outlines Design Contractor responsibilities during the startup and commissioning of project components, as well as responsibilities during project closeout and administration of warranty.

Chapter 21 – Document Control and Records Management

Illustrates Design Contractor requirements for submitting project documents to the Water Authority for proper documentation.

1.1.5 Chapter Sections

1. Each chapter is composed of a series of sections.

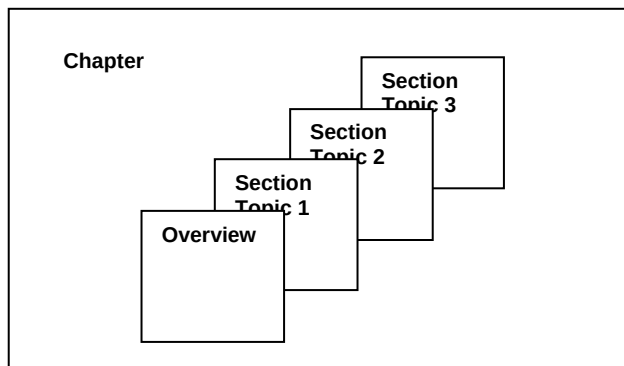


Figure 1-1: Chapter Layout

2. An overview is provided for each chapter, identifying the specific sections within that chapter, and reference documents used to develop the chapter.
 3. Each subsequent section in the chapters is a major chapter topic, and the blocks of information provided within each section are the chapter subtopics.
-

1.1.6
Hyperlinks

1. The Design Contractor Guide chapter tables of contents are hyperlinked. Other references are not hyperlinked.
-

1.1.7
Water Authority
Reference
Documents

1. A partial list of other Water Authority manuals and documents referred to in the Design Manual is included in Attachment 1-1.
-

1.1.8
CIP Terms and
Nomenclature

1. A list and description of terms, abbreviations, and acronyms used in the Design Manual is included in Attachment 1-2.
-

1.2 Technical Input to the Project Delivery Plan

1.2.1 Project Delivery Plan

1. The Water Authority Project Manager will develop a Project Delivery Plan (PDP) for each project during the planning phase prior to entering into the Contract with the Design Contractor. Certain technical aspects of the PDP may change and evolve as the project is developed during the design phase. The Design Contractor is responsible for providing technical input to the Design Manager so the PDP can be updated appropriately to reflect these changes.
-

1.3 Distribution and Maintenance of the Design Manual

1.3.1 Distribution and Maintenance

2. Refer to Chapter 21, Document Control and Records Management, for procedures related to maintenance and distribution of the Design Manual. These procedures include the following:
 - 2.1. Control of Design Manual revisions
 - 2.2. Distribution of Design Manual revision
 - 2.3. Control of Design Manual distribution
 - 2.4. Maintenance of Design Manual inventory
 - 2.5. Electronic and Internet Design Manual distribution
-

1.4 Resolving Inconsistencies

1.4.1 Discovery of Inconsistencies

1. If the Design Contractor finds inconsistencies between different Design Manual sections, or if inconsistencies should develop during design (necessitated by site-specific and/or project-specified considerations and constraints), the Design Contractor shall immediately notify the Design Manager in writing of their findings, recommendations, and reasons for such recommendations.
 2. The Design Contractor is ultimately responsible for their design and shall resolve all conflicts, inconsistencies, errors, and omissions discovered in any conflicting or inconsistent guidelines and standards to ensure that the designs meet the highest professional standards.
-

1.4.2 Order of Precedence

1. Design Contractors will be provided with both the Design Manual and pertinent predesign reports for their projects. However, inconsistencies and conflicts may exist between these documents.
 2. Should such inconsistencies and conflicts be discovered, the Design Contractor must immediately notify the Design Manager in writing. In general, the following order of precedence shall be in effect:
 - 2.1. Scope of work.
 - 2.2. Predesign (planning) reports.
 - 2.3. Design Manual.
 3. Scope of work and predesign reports take precedence over the Design Manual because these documents are site- and project-specific, while the Design Manual may be more generic in nature. If in specific instances the Design Contractor feels that adherence to the Design Manual, rather than the predesign report, would provide a better facility or product, the Design Contractor shall recommend such adherence as described below.
-

1.5 Procedure to Deviate from the Design Manual, Pre-design Report, or Scope of Work

1.5.1 Deviation Requests during Negotiations

1. During scope and fee negotiations, the Design Contractor may desire to propose deviations from the scope of work, predesign report, and/or the Design Manual. This situation could be prompted by a design concept or a feature that the Design Contractor believes is better or more cost-effective than the one provided in the scope of work, predesign report, and/or Design Manual, or by the development of new equipment or systems since the completion of predesign report.
 2. In such cases, the Design Contractor shall propose the deviations in writing, and, if accepted, the Design Manager will revise the scope of work accordingly.
-

1.5.2 Deviation Requests during Design

1. During development of the project design, the Design Contractor may desire to deviate from the scope of work, predesign report, and/or Design Manual. This situation could be prompted by discovery of new or unforeseen conditions during the investigations phase of the design or by introduction of new or improved equipment or materials to the market.
 2. In such cases, the Design Contractor shall submit a deviation request to the Design Manager. Each request must be accompanied by full documentation and justification for the proposed deviation(s). Attachment 1-3 shows an example deviation request.
-

1.5.3 Deviation Request Procedure

1. The Design Manager will meet with the Design Contractor within one week from the receipt of the deviation request to discuss the proposed deviation(s). The Design Manager will transmit written notice of acceptance or rejection of the deviation request no later than two weeks after the initial meeting.
2. If the deviation request is not accepted, no change to the scope of work or other documents will be made.
3. If the deviation request is accepted as presented, or in some modified form, the Design Manager will execute the form shown in Attachment 1-3 listing any conditions applicable to its acceptance. No deviation(s) to the design requirements will be permitted without prior written authorization from the Design Manager.

1.6 Project Administration

1.6.1 Use of the Design Manual

1. In addition to the provisions of the Contract, the Design Manager will use the Design Manual for guidance in administering each project. The Design Manual provides a basis for uniformity of format, methodology, procedures, and quality of work products. Design Contractors and their subcontractors shall familiarize themselves, in detail, with the provisions and requirements of the Design Manual.
-

1.6.2 Progress Meetings

1. The Design Contractor shall meet monthly with the Design Manager to discuss progress of the Project. The Design Manager may designate time intervals other than monthly. Other Contractor or subcontractor personnel may also be required to attend progress meetings to address specific technical issues.
 2. The Design Contractor shall prepare a written agenda for each progress meeting. The agenda shall be submitted to the Design Manager a minimum of two days in advance of the progress meeting.
 3. The Design Contractor shall submit draft minutes of the progress meeting to the Design Manager within five days of the progress meeting. The Design Manager will review the minutes and notify the Contractor of changes, corrections, or additions, if any. The Design Contractor shall incorporate the comments and submit the revised minutes to the Design Manager for review and approval. The approved progress meeting minutes shall become part of the Project record.
-

1.6.3 Progress Report

1. The Design Contractor shall prepare and submit a work progress report to the Design Manager a minimum of two days prior to the monthly progress meeting. The updated project schedule, resource allocation, and discussion shall be included in the Design Contractor's monthly progress report.
2. Physical progress may be verified by the Design Manager using various techniques, such as drawing counts, achievement of milestones, or acceptance of progress at defined gates. Refer to the Water Authority Gateway Process for an explanation of defined gates.
3. The accepted progress report shall also be submitted with the Design Contractor's monthly invoice. The progress report shall be a condition of acceptance of the invoice.

4. Refer to Chapter 2, Design Cost and Schedule Control, for additional progress reporting requirements.
-

**1.6.4
Issue
Resolution**

1. The Design Contractor shall track the resolution of design issues, and shall prepare and submit separate tracking reports with the monthly progress report. When the issue resolution is final, the Design Contractor shall prepare and submit a final issue resolution report to the Design Manager for review, comment, and acceptance.
-

**1.6.5
Change
Management**

1. For each proposed change to the project, regardless of the source of the change request, the Design Contractor shall prepare a separate change impact report. The report shall contain, as a minimum, the following:
 - 1.1. A narrative description, including justification and impacts.
 - 1.2. An estimate of the cost impact of the change.
 - 1.3. An estimate of the change, if any, to the project schedule.
 - 1.4. An estimate of changes in project risk, if any.
 - 1.5. Status of processing the change request.
 - 1.6. Final resolution of the change request.
 - 1.7. Other information relevant to the change.
 2. The change impact report shall be drafted as soon as a potential change is identified and updated with each monthly progress report. On final resolution of the change request, the Design Contractor shall submit a final change impact report to the Design Manager for review, comment, and acceptance. This final report shall be made regardless of whether or not the change is implemented.
-

**1.6.6
Project Design
Schedule**

1. The purpose of the project schedule is to assist the Design Contractor in planning and organizing their sequence of activities, determining the longest path of activities through the project, identifying potential bottlenecks and proposing solutions, and making work assignments. The schedule also assists all project team members to communicate about work requirements and the progress of the work, and assists the Design Manager in monitoring work progress and in reviewing the Design Contractor's invoices.
2. The scope of work provides requirements for scheduling the Design Contractor's design effort, and for the number, timing and contents of submittals. The required schedule must include all project

activities and subactivities, interrelationships, milestones, and intermediate and final design deliverables. The schedule shall incorporate sufficient detail to permit straightforward, accurate monitoring of progress. Schedule standards and procedures are provided in Chapter 2, Design Cost and Schedule Control.

3. The Design Contractor shall update and re-evaluate the project schedule each month, using actual dates and resources (defined in the scope of work) expended. Potential delays caused by circumstances beyond the Design Contractor's control, or which could result from the failure of others to provide timely inputs to the design effort, shall be identified in the schedule. The work remaining shall be compared with remaining resources to determine if the project can be completed on time and within budget. If resources must be reallocated, or if the schedule must be revised, the Design Contractor shall immediately notify the Design Manager.
 4. The Design Contractor shall maintain an accurate record of the budget expended and shall forecast the amount required for project completion. The Design Contractor shall immediately notify the Design manager in writing either when 80% of the budgeted amount for any task is expended or when the forecasted amount to complete any task exceeds the budgeted amount.
-

**1.6.7
Design
Deliverables**

1. Chapter 4, Design Development, provides requirements for the number, timing and content of design deliverables. The Design Manager will review project work products and forward written comments to the Design Contractor. The Design Contractor shall address written comments resulting from the reviews in writing in a timely manner. The Design Manager's review of work products does not, however, relieve the Design Contractor of full responsibility for their work in accordance with their contractual agreement with the Water Authority.
 2. The Design Manager will schedule formal design review meetings to discuss and resolve comments on the submittals. The Design Contractor shall prepare and distribute minutes of these meetings within 10 calendar days of each session. As a minimum, these minutes shall include a summary of items discussed, decisions reached and items needing further development or action.
-

**1.6.8
Records
Management**

1. The Design Contractor shall provide a document control and records management system that complies with the provisions of Chapter 21, Document Control and Records Management, and ensure documents and deliverables generated by the design team

can be easily and cost-effectively retrieved.

**1.6.9
SCOOP and
Equal
Opportunity
Policies**

1. The Water Authority has a broad-based and comprehensive Small Contractor Outreach and Opportunities Program (SCOOP) designed to promote the participation of qualified, small, and diverse construction contractors, professional services contractors, and vendors on Water Authority procurements. Extra effort is made to fully inform the small business community of contract opportunities and to ensure that Design Contractors contracted with the Water Authority make the necessary effort to maximize participation on their teams.
2. Design Contractors doing business with the Water Authority shall report contracting activity on SCOOP Schedule A-1, Designation of All Subcontractors, Including Subcontractors/ Vendors/ Service Providers. (Refer to Attachment 1-4 for a blank Schedule A-1). This report shall be submitted by the Design Contractor as follows:
 - 2.1. With the signed contract, indicating the initial commitment to SCOOP firms.
 - 2.2. With each contract amendment, indicating the current SCOOP commitment and participation.
 - 2.3. Upon completion of the contract, when the Design Contractor shall submit a final update of Schedule A-1 indicating the final amount committed to and paid to all subcontractors.
3. SCOOP will prepare a quarterly SCOOP report for the Water Authority Board of Directors. The Water Authority may request a quarterly update and the Design Contractor shall ensure their SCOOP participation information is current.
4. The basis for reporting contracting activity includes all expenditures except for:
 - 4.1. Payment to employees, including payroll and reimbursements
 - 4.2. Expenditures for employee benefits
 - 4.3. Refunds
 - 4.4. Legal settlements
 - 4.5. Rents and leases for property
 - 4.6. Payments for utilities and telephone service
 - 4.7. Interagency payments and payments to governmental entities
 - 4.8. Memberships (e.g., professional organizations)
 - 4.9. Payments to nonprofit organizations
5. These are the only approved exclusions; all other payments shall be

included in the reporting base. Reporting periods shall correspond with the Water Authority's fiscal year beginning July 1 and ending June 30.

6. Design Contractors shall comply with their stated subcontractor commitments throughout the duration of the Contract. Written authorization from the Water Authority is required prior to substitution of any subcontractor. Substitutions include requests by the Design Contractor to self-perform work originally designated to a subcontractor. Prior to completion of the Contract, Design Contractors shall submit a final update of SCOOP Schedule A-1 noting the final amount committed and paid to all subcontractors.

**1.6.10
Invoice
Procedures**

1. Design Contractor's invoices to the Water Authority for work performed under the Contract shall be prepared and submitted in accordance with the Contract.
2. Refer to Chapter 2, Design Cost and Schedule Control, for additional invoicing requirements.

**1.6.11
Contract
Amendments**

1. Contract amendments shall be requested, prepared, and submitted according to the provisions of the Contract.
-

1.7 Coordination Requirements

1.7.1 Other Design Contractors

1. The Water Authority anticipates that several Design Contractors will be under Contract simultaneously for the design of Water Authority facilities. The Design Contractors selected for the design of such facilities shall coordinate work closely to ensure that necessary operational links are accommodated in their respective designs. However, the Design Manager maintains overall responsibility for such design coordination, and will take measures to synchronize designs and construction schedules so linked facilities become operational at the time required by the Water Authority.
2. However, immitigable factors may arise which prevent successful simultaneous completion of linked facilities. Design Contractors shall provide flexibility in their design(s) so that the construction work associated with the operational links between projects can be added or deleted, depending on the timing of construction.

1.7.2 Other Professional Services Contractors

1. The Water Authority anticipates other professional services contractors will be under Contract during the same time as the Project. These contractors may provide services for planning, environmental work, public affairs and community outreach, operations and maintenance, right-of-way, and other services.
2. The Design Contractor shall coordinate with these other professional services contractors to ensure no conflicts or adverse situations develop.

1.7.3 Water Authority Member Agencies and Governmental Entities

1. The Project may affect or involve Water Authority member agencies. This shall include the Metropolitan Water District of Southern California (MWD).
 2. The Project may be located in, affect, or involve governmental entities, including federal and state land or jurisdictions, the County of San Diego, Indian reservations, and cities.
 3. The Design Contractor shall coordinate with the affected member agencies and governmental entities to ensure no conflicts or adverse situations develop, and all applicable requirements are in compliance.
-

1.7.4
Permitting and
Regulatory
Agencies

1. The Design Contractor shall coordinate affected permitting and regulatory agencies to ensure applicable permits are obtained and requirements are included in the design.
-

1.7.5
Board of Senior
Professional
Services
Contractors

1. For complex projects or programs that involve a number of linked projects, the Water Authority may engage a Board of Senior Professional Services Contractors to coordinate the work.
 2. In such instances, the Design Contractor shall coordinate with the Board of Senior Professional Services Contractors to ensure no conflicts or adverse situations develop.
-

1.8 Permits

1.8.1 Types of Permits

1. Most Water Authority projects, depending on their characteristics and location, will require planning, temporary access, and/or encroachment and environmental permits from regulatory and private agencies prior to construction. Key permitting agencies include the U.S. Army Corps of Engineers; the California Department of Water Resources; the California Department of Transportation (Caltrans); the Regional Water Quality Control Board; the California and San Diego County Departments of Health Services; the California Department of Fish and Game; the California Coastal Commission; the California Department of Water Resources Division of Safety of Dams; the Atchison, Topeka, and Santa Fe Railroad; and the Metropolitan Transit Development Board. In addition, the Design Contractor shall comply with the plan check and permitting processes of the different cities, County of San Diego, and other jurisdictions that may be involved in the project.
 2. Refer to Chapter 10 for additional information and requirements regarding permits.
-

1.8.2 Identification of and Application for Permits

1. The Design Contractor shall identify all required permits early in the design process and shall prepare and submit timely permit application packages to the appropriate jurisdictional agencies.
 2. This preparation includes conducting any necessary analytical studies required to submit the application packages.
 3. Such permit applications will be reviewed by the Water Authority Water Resources Department prior to submittal and shall be submitted by the Design Contractor to the jurisdictional agencies in a timely manner so no project delays result from permits not being in place at the appropriate time.
 4. The Design Contractor shall comply with any follow-up requests for additional information or clarification of permit submittals, and shall incorporate permit conditions and requirements into the project design.
-

1.8.3 Permits Obtained by the Water Authority

In some cases, usually in situations where the permit application and approval process exceeds the time scheduled for the design phase, the Water Authority will separately submit permit applications. In such cases, the Design Contractor shall work with the Design Manager and the Water Resources Department staff to monitor the progress of the permit applications, and, when

approved, shall incorporate the permit conditions and requirements into the project design. Refer to Chapter 10, Environmental Compliance and Permit Support, for additional information and requirements.

1.9 Design Contractor Evaluation

1.9.1 Design Contractor Evaluation

1. Performance of the Design Contractor will be evaluated as part of the contract closeout activities. At the discretion of the Design Manager, intermediate performance evaluations may be conducted at one or more points during the course of the project.
 2. Refer to Attachment 1-5 for an example Professional Services Contractor Performance Evaluation template.
-

Attachment 1-1: Documents Referenced in the Design Manual

Documents referenced in the Design Manual may include but are not limited to those listed below. The lists are provided for the convenience of the Design Contractor only and may not be inclusive or exhaustive.

WATER AUTHORITY DOCUMENTS AND MANUALS	
WATER AUTHORITY DOCUMENT NUMBER	DOCUMENT TITLE
ESD-100	Construction Management Manual
ESD-110	Corrosion Control Manual
ESD-120	Drafting Manual
ESD-130	Field Inspection Manual
ESD-140	Urgent Repair Manual
ESD-150	Specifications Style Guide
ESD-170	Engineering Guidelines for Review of Proposed Right-of Way Encroachments
ESD-500	Engineering Invoice Policy and Processing Procedures
ESD-510	Policies, Procedures, and Practices
	Design Manual, Volume 2, Facilities Design Guide
	Estimating Process Manual
	General Conditions and Standard Specifications
	Human Machine Interface (HMI) Standards
	Operations and Maintenance Procedures Manual
	Procurement Procedures Manual
	Standard Drawings

DOCUMENTS AND MANUALS ISSUED BY OTHER AGENCIES	
ISSUING AGENCY	DOCUMENT TITLE
American Society of Professional Estimators (ASPE)	Certification requirements for cost estimators
Association for Advancement of Cost Engineering International (AACEI)	Definitions of cost estimate types and classes
California Department of Health Services (CDHS)	Abandoned Site Program Information System (ASPIS)
California Department of Health Services (CDHS)	Expenditure Plan for the Hazardous Substance Cleanup Bond Act
California Department of Health Services	Toxic Substances Control Division, Potential Hazardous

DOCUMENTS AND MANUALS ISSUED BY OTHER AGENCIES	
ISSUING AGENCY	DOCUMENT TITLE
(CDHS)	Waste Properties in California
California Department of Transportation (CalTrans)	CalTrans Traffic Manual
California Integrated Waste Management Board (CIWMB)	Active Landfills
California Integrated Waste Management Board (CIWMB)	Inactive Landfills
California Office of Planning and Research	Hazardous Waste and Substance Sites List (Governor's List)
California Regional Water Quality Control Board (CRWQCB)	CRWQCB, San Diego Region, Leaking Underground Tank Facilities List
City of San Diego	City of San Diego Standard Drawings
Construction Specifications Institute (CSI)	MasterFormat, 1988 Edition
County of San Diego	Regional Standard Drawings
San Diego Department of Environmental Health Services, Hazardous Materials Management Division (HMMD)	Selected Hazardous Materials Records List (SHMRL)
Southern California Chapter of American Public Works Association (APWA) and the Southern California Districts of the Associated General Contractors (AGC) of California.	Standard Specifications for Public Works Construction (SSPWC or Greenbook)
U.S. Environmental Protection Agency (EPA)	Comprehensive Environmental Response Cleanup and Liability Act Information System (CERCLIS) List
U.S. Environmental Protection Agency (EPA)	National Priority List (Superfund Site)

Attachment 1-2: Water Authority Terms, Abbreviations, and Acronyms

BODR	Basis of Design Report, as defined in Chapter 4, Design Development, of the Design Manual.
CIP Projects	Projects specifically identified in the Water Authority's Capital Improvement Program (CIP).
Construction Administrator or CA	The person designated by the Water Authority to administer the construction contract and be the Construction Manager's primary point of contact.
Construction Contractor or Contractor	An individual, partnership, corporation, joint-venture, or other legal entity that has signed a contract with the Water Authority to construct the project based on the Contract Documents.
Construction Engineer	A person, either retained by the Construction Manager or employed by the Water Authority, designated to monitor and inspect the day-to-day onsite construction activities.
Construction Manager or CM	The person, partnership, corporation, joint-venture, or other legal entity under contract to the Water Authority during the construction phase of the project that has overall responsibility for managing construction of the project and executing the Quality Assurance Plan.
Contract	The professional services contract between the Design Contractor and the Water Authority.
Contract Documents	The entire set of documents comprising the contract between the Water Authority and a Construction Contractor, including but not limited to the Notice Inviting Bids, Instruction to Bidders, Bid Forms (including the Bid, Bid Schedule(s), Information Required of Bidder, Bid Bond, and all required certificates and affidavits), Agreement, Performance Bond, Payment Bond, General Conditions, Supplementary General Conditions, Technical Specification, Drawings, and all addenda, change orders, and payment requirements.
Corrosion Control Engineer	A person or private entity retained by the Design Contractor to provide specialized expertise in corrosion control.
Design Contractor	A private or public person, partnership, corporation, joint-venture, or other legal entity under contract to the Water Authority to provide engineering services for design of facilities.
Design Contractor's Project Manager	The person designated by the Design Contractor to manage the Design Contractor's project team, and interact with the Water Authority Design Manager.
Design Manager	The person designated by the Water Authority to administer the design contract and be the Design Contractor's primary point of contact.
Geotechnical Engineer	A person or private entity retained by the Design Contractor to

	provide specialized geotechnical expertise.
Includes or Including	Means “includes (or including) but not limited to”.
Predesign Report	A report prepared by the Water Authority describing the project prior to engagement of the Design Contractor. Also referred to as a Planning Report.
Project Manager or PM	The person designated by the Water Authority to shepherd a project through all phases to achieve the project objectives.
Water Authority	The San Diego County Water Authority. May also be referred to as Owner, Authority, CWA, or SDCWA.

Attachment 1-3: Request for Deviation

Request to Deviate from the Design Manual Or Pre-design Reports

-
1. Request No.: _____ 2. Date: _____
 3. Project Title: _____ 4. CIP No.: _____
 5. Design Contractor: _____
 6. Affected Documents:
(Provide description of the Design Manual and/or Predesign Report element from which deviation or change is requested. Include affected specification section and/or subsection, equipment number, drawing number, etc., to enable the Design Manager to easily understand the element from which deviation is proposed.)
 7. Proposed Change:
(Provide a detailed description of proposed change. Attach sketches, specifications or other applicable material which fully describes the scope of the proposal.)
 8. Reason for Request:
(Provide complete documentation and justification for this request. Include cost-effectiveness analysis if applicable, and any other supporting data and analysis which will facilitate evaluation.)
 9. Date by Which Approval is Requested (please explain why): _____
 10. Impact of Proposal On:
 - a. Design Schedule & Cost (Please explain as necessary)
 - b. Construction Schedule & Cost (Please explain as necessary)
 - c. Previous Design and Construction Work
 - d. Operations and Maintenance
 - e. QA/QC of Project
 - f. Compliance with Environmental Document
 11. Remarks:

SUBMITTED:

APPROVED:

(Project Manager)

(Water Authority)

(Name of Design Contractor)

Date Approved

(Date Submitted)

Attachment 1-4: SCOOP Schedule A-4, Designation of Subcontractors

**SCHEDULE A-1: DESIGNATION of ALL SUBCONTRACTORS,
INCLUDING SUBCONTRACTORS/VENDORS/SERVICE PROVIDERS**



Company Name: _____ **Project Name:** _____ **Date:** _____ **Change Order # :** _____

Water Authority Project Manager: _____ **Amendment #:** _____

NAME AND CONTACT OF SUBCONTRACTOR(S)	ADDRESS, TELEPHONE NUMBER, E-MAIL OF PLACE OF BUSINESS	LICENSE NO. (1)	SPECIFIC WORK TO BE DONE BY SUBCONTRACTOR (2)	SMALL BUSINESS YES/NO	MINORITY- OWNED	WOMAN- OWNED	DOLLAR AMOUNT (3)	% OF TOTAL FEE	LIST ANY CERTIFICATIONS (4)

TOTAL INITIAL DOLLAR AMOUNT COMMITTED TO SMALL CONTRACTORS: \$ _____

TOTAL INITIAL DOLLAR AMOUNT COMMITTED TO ALL SUBCONTRACTORS: \$ _____

CHANGE ORDER / AMENDED DOLLAR AMOUNT: \$ _____

TOTAL DOLLAR AMOUNT COMMITTED TO SMALL CONTRACTORS: \$ _____

TOTAL DOLLAR AMOUNT COMMITTED TO ALL SUBCONTRACTORS: \$ _____

Note: San Diego County Water Authority reserves the right to verify contents of this report by contacting subcontractors, including subcontractors, subconsultants, vendors and service providers.

(1) For use by construction contractors only.

(2) If 100 percent of item will **NOT** be performed or furnished by listed small contractor, describe exact portion of the item that will be performed or furnished by the small contractor.

(3) Must show total price for specific work by subcontractor, subconsultant, vendor, service provider, or broker. For Material Brokers, show Broker Fee for Service.

(4) Small businesses meet the size criteria of 13CFR 121 (as amended) and may be certified as a small business by the California Department of Transportation (CalTrans) or a signatory agency within the California Unified Certification Program (CUCP), the U.S. Small Business Administration, the City of San Diego's Diverse Emerging Vendor Outreach (DEVO) and Minor Construction programs, the Metropolitan Water District of Southern California, the San Diego County Water Authority's Small Contractor Outreach and Opportunities Program (SCOOP), and the California State Department of General Services' Small Business Enterprise and Disabled Veteran Business Enterprise programs.

C:\Documents and Settings\woodwa\My Documents\Group 01 (Rev Flow) Projects\Rev Flow RFP\SCOOP Attachments\SCOOP-New A1.doc
Rev. 03/04

SCHEDULE A-1

Attachment 1-5: Example of Professional Services Contractor Performance Evaluation Form

PERFORMANCE EVALUATION
(Professional Services)

Consultant:
Consultant Proj Mngr:
Construction Admin:
Project Manager:
Project Name:
Contract Type:

Evaluation Date:
Contract No:
Grant Code:
Reviewed By:

Criteria		Rating
1	Consultant worked in accordance with PSA schedule.	
2	Consultant was able to work within the PSA scope of work.	
3	Consultant provided written revisions to scope and cost of work when requested.	
4	Consultant made timely notification of out of scope work.	
5	Quality and performance of the Project Manager.	
6	Quality and performance of the Consultant's subconsultants.	
7	Quality and performance of the Consultant's staff.	
8	Consultant worked well as part of multidisciplinary project team.	
9	Consultant Project Manager successfully obtained resources within the project team.	
10	Quality of work products. Deliverables were acceptable to Water Authority with no more than two reviews of drafts. Documentation and reports comply with standard Water Authority practices. Specifications and Plans formatted in accordance with Water Authority standards, requiring minimal rework by Water Authority	
11	Construction contract documents produced or modified by the Consultant met Water Authority standards and requirements.	
12	Technical work and/or work practices complied with Water Authority standards and guidelines unless exceptions were clearly identified by the Water Authority.	
13	Quality control performed in accordance with submitted plan.	
14	Internal quality audits were performed and improvements made as needed.	
15	Construction cost estimate not more than 5% below, nor 10% higher than the low bid.	
16	Performed accurate cost estimates for each change request to construction contract.	
17	Consultant and subconsultants billings accurate and timely with an error rate less than 1% of invoiced amount.	
TOTAL RATING		Max Score = Error #Error

Rating Guidelines

- 3 Exceeds Expectations
- 2 Meets Expectations
- 1 Does Not Meet Expectations
- 0 Not Applicable

Attachment 1-5: Professional Services Contractor Performance Evaluation Form *(continued)*

PERFORMANCE EVALUATION
(Professional Services)

Project Details		
PSA Amount:	<i>Initial</i>	<i>Final</i>
Construction Contract Amount:	<i>Initial</i>	<i>Final</i>
Project Description		
PSA Description, Primary Technical Disciplines, and Subconsultants Provided		
Comments		
Consultant's Comments		

Consultant Contract Manager:

Signature

Date

Construction Administrator:

Signature

Date

Project Manager:

Signature

Date

Group Leader:

Signature

Date

Attachment 1-5: Professional Services Contractor Performance Evaluation Form (*continued*)

PERFORMANCE EVALUATION
(Professional Services)

Rating Criteria	
1	Consultant met and worked in accordance with PSA schedule. Deliverables provided by the dates/time frame specified in PSA
2	Consultant was able to work within the PSA scope of work. - No changes made to scope of work - Consultant willingness to discuss sensitive scope issues
3	Consultant provided written revisions to scope and cost of work when requested. - Revisions to scope of work provided when requested - Costs of change to scope of work provided when requested
4	Consultant made timely notification of out of scope work. - Out of scope work was anticipated in advance of need - Notification sent to Authority Contract Manager in time to execute PSA amendment prior to performing work
5	Quality and performance of the Project Manager. - Consultant assigned PM with proper experience and credentials to manage the Consultant's efforts - Oversight by Authority PM was nominal - Consultant Project Manager's ability to manage Consultant's staff
6	Quality and performance of the Consultant's subconsultants. Consultant selected, oversaw, and coached subconsultants
7	Quality and performance of the Consultant's staff. Consultant assigned technical and non-technical staff with appropriate experience and education to ensure project success
8	Consultant worked well as part of multidisciplinary project team. Participated with Authority PM team and other consultants in ways that contributed to project success
9	Consultant Project Manager successfully obtained resources within the project team. - Project staff had few turnovers - Substandard performers were replaced or assisted in meeting Authority standards
10	Quality of work products (Deliverables). - Deliverables were acceptable to Authority with no more than two reviews of drafts. - Documentation and reports comply with standard Authority practices. - Specifications and Plans formatted in accordance with Authority standards, requiring minimal rework by Authority
11	Construction contract documents produced or modified by the Consultant met Authority standards and requirements. - Only minor additional changes made by Authority personnel - Second submittal acceptable more than 90 percent of the time
12	Technical work and/or work practices complied with Authority standards and guidelines unless exceptions were clearly identified by the Authority. Self explanatory
13	Quality control performed in accordance with submitted plan. Self explanatory
14	Internal quality audits were performed and improvements made as needed. - Consultant performed self audits - Improvements were made to improve performance
15	Construction cost estimate not more than 5% below, nor 10% higher than the low bid. Self explanatory
16	Performed accurate cost estimates for each change request to construction contract. - Cost estimates were provided timely - Cost estimates were in sufficient detail to support negotiations
17	Consultant and subconsultants billings accurate and timely with an error rate less than 1% of invoiced amount. Self explanatory

Chapter 2 Design Cost and Schedule Control

Overview

Purpose This chapter presents Design Contractor requirements for control of design costs and schedules, preparation of invoices, and submittal of monthly progress reports.

Topics This chapter is composed of the following topics:

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2.2.4 CONSTRUCTION SCHEDULE REQUIREMENTS	2-3
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ATTACHMENT 2-2: DESIGN PROJECT PROGRESS REPORT	2-7

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2.1 Introduction

2.1.1 General

1. This chapter establishes the requirements for the control of cost and schedule for work performed by Design Contractors under contract to the Water Authority. Additional requirements or exceptions, if any, to the Design Manual will be addressed in the scope of work of each design contract.
 2. Each Design Contractor shall schedule, monitor, control, and report the work under contract in conformance with the Design Contractor Guide and the scope of work. While each Design Contractor may use their own system of control, the Design Contractor Guide specifies the basic elements the Water Authority requires each Design Contractor to manage and report.
-

2.2 Schedule Control

2.2.1 Design Schedule Requirements

1. The Design Contractor shall submit a detailed, cost-loaded, critical path method (CPM) project design schedule to the Design Manager not later than 30 calendar days after receipt of Notice to Proceed (NTP). This schedule is referred to as the Initial Schedule and shall be an amplification of the milestone schedule included in the professional services contract between the Water Authority and Design Contractor (Contract). It shall include all design activities, project deliverables, and required project reviews. It shall also identify the critical path of project activities.
2. Design activities are the tasks required to create each deliverable, described in Chapter 4, Design Development, and shall be broken down by professional discipline. These detailed design schedules shall contain sufficient detail to ensure the work can be monitored and managed efficiently, and the project can be completed on time and within the Contract price.
3. On acceptance of by the Design Manager, the Initial Schedule shall become the Baseline Schedule.
4. The Design Contractor shall submit a Monthly Updated Schedule to the Design Manager no later than the fifth day of every month after submittal acceptance of the Baseline Schedule. The Monthly Updated Schedule shall also be included in the Design Contractor's monthly progress report. The Monthly Updated Schedule shall show the percent completed and the forecasted remaining time to complete each design activity.
5. In the cover letter for this submittal, the Design Contractor shall explain any changes to start and/or end dates in the Baseline Schedule, and shall provide a schedule recovery plan for any critical activity that is delayed in the prior month. The Design Manager will approve proposed schedule changes in writing before implementation. The effective date of the Monthly Updated Schedule is the last day of the accounting period of the previous month.

2.2.2 Schedule Standards

1. The Design Contractor shall submit all schedules in bar chart format and ensure that they contain the design activity number, the activity description (brief description of the work), start and finish dates, duration of the activity in calendar days, budgeted cost, the forecasted remaining time to completion, and a percent complete. The schedule shall show the project critical path and activity float times. The overall project percent complete shall be calculated as

follows:

- 1.1. Evaluate the activity to determine percent progress completed at the end of the period.
- 1.2. Subtract the percent progress of the previous period from the current percent progress, and then multiply this difference by the budget for the activity to determine the earned value for the period.
- 1.3. Divide the summation of all earned values by the total budget to calculate the total percent complete.
2. If the Water Authority specifies a Schedule of Values (SOV) in the contracted scope of services, the Design Contractor shall prepare the schedule in accordance with the SOV.
3. All pages of an earned value and schedule report shall be clearly identified with the project CIP number, project name, effective date of the schedule, and name of the Design Contractor. If the report is more than one page, all pages shall be numbered and referenced to the total number of pages (i.e., Page 1 of 10, Page 2 of 10, etc.). All activities shall be plotted so that beginning and end dates can be visually determined by comparison with a calendar scale.

2.2.3
Electronic Data
Files

1. The Design Contractor shall submit an electronic form of the schedule data on a CD-R data disk or disks formatted in the current version of Primavera (P3) in use by the Water Authority. The data file shall contain all required data.
2. If the Design Contractor desires to use scheduling software other than P3, the Design Contractor shall propose the substitution and obtain written acceptance from the Design Manager prior to signing the Contract. No scheduling software substitutions will be accepted after the Contract is signed and executed.
3. The data disk(s) shall have a permanent exterior label indicating the CIP project number and the name, submittal date, Design Contractor name, and file names and extensions contained in the disk.

2.2.4
Construction
Schedule
Requirements

1. Refer to Chapter 15, Construction Cost Estimates and Schedules, for construction schedule requirements.
-

2.3 Invoicing, Progress Report, and Control of Design Costs

2.3.1 Progress Report

1. The Design Contractor shall submit a progress report with each application for payment that provides the following minimum information:
 - 1.1. A brief narrative summary of work performed during the period covered by the invoice identified by task. The schedule update shall be in agreement with this summary.
 - 1.2. The percentage of each task actually completed compared to the percentage planned to be complete. These percentages shall be based on evaluation of work completed (earned value) rather than budget expended.
 - 1.3. A description of issues/problems identified, solved, and/or unresolved. For unresolved items, define a resolution action plan and identify a resolution due date.
 - 1.4. The Monthly Updated Schedule including:
 - 1.4.1. An explanation of deviations, if any, of critical path activities from the Baseline Schedule.
 - 1.4.2. The recovery plan that the Design Contractor will implement to ensure the Project will be completed on schedule.
 - 1.5. A spreadsheet showing cost breakdown by task that provides the following minimum information:
 - 1.5.1. The amounts of earned value by task for the payment period.
 - 1.5.2. The cumulative total of earned value amounts for each task to date.
 - 1.5.3. An Estimate of Cost to Complete (ETC) and Estimate of Cost at Completion (EAC) for each task.
 - 1.5.4. The total earned value for the payment period.
 - 1.5.5. A forecast and description of work planned for the next payment period.
 - 1.5.6. Code tasks matching the cost breakdown structure used in the cost-loaded schedule.
 - 1.6. Identification of tasks with expenditures approaching or at 80% of planned budget.
 - 1.7. Identification of tasks with projected completion costs exceed-

ing 100% of planned budget.

1.8. The proposed budget recovery plan.

1.9. The updated change management report.

1.9.1. Description of changes proposed during the reporting period.

1.9.2. Schedule and budget impacts of the proposed changes.

1.9.3. Proposed change resolutions occurring during the reporting period.

1.10. Other items and issues the Design Contractor or Design Manager may deem important to project progress.

**2.3.2
Requests for
Payment**

1. Requests for payment (invoices) and progress reports shall follow the format established by the Water Authority. Requests for payment and progress reports that do not comply with these requirements will be returned to the Design Contractor and payment will be withheld until a complete progress report is submitted and accepted by the Design Manager.
2. Refer to Attachment 2-1 for a request for payment example format.

**2.3.3
Notification**

1. The Design Contractor shall notify the Design Manager in writing when either the funds expended for any task exceeds 80% of the authorized or budgeted amount for that task or phase, or when the projected expenditures for any task exceed the total budget for that task or phase.
 2. The Water Authority is not liable for any amounts in excess of budgeted amounts if:
 - 2.1. Such notifications are not made by the Design Contractor, and,
 - 2.2. Prior written authorization to exceed the budgeted amounts is not transmitted by the Design Manager to the Design Contractor.
-

Attachment 2-1: Example Request for Payment

REQUEST FOR PAYMENT

CIP Project Name/No.: _____

Company Name: _____

OWNER:	The San Diego County Water Authority 4677 Overland Avenue San Diego, CA 92123	BILLING SUMMARY: From Date: _____ To Date: _____ Invoice No.: _____ Date Submitted: _____ SIGNATURE/DATE: _____ TYPED NAME/TITLE: _____
ATTENTION:	_____, Project Manager	
CIP No.:		
WBS No.:		
Purchase Order No.:		

INVOICE SUMMARY:

TASK/ SUBTASK NO.*	TASK/ SUBTASK DESCRIPTION*	BUDGETED AMOUNT: CONTRACTOR	BUDGETED AMOUNT: SUBS	DUE THIS BILLING	AMOUNT BILLED TO DATE	PERCENT COMPLETE THIS BILLING	FUNDS REMAINING
1.0	Enter task 1 name	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00
1.1	Enter subtask 1.1 name	\$0.00	\$0.00	\$0.00			
2.0	Enter task 2 name	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00
2.1	Enter subtask 2.1 name	\$0.00	\$0.00	\$0.00			
2.2	Enter subtask 2.2 name	\$0.00	\$0.00	\$0.00			
3.0	Enter task 3 name	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00
3.1	Enter subtask 3.1 name	\$0.00	\$0.00	\$0.00			
3.2	Enter subtask 3.2 name	\$0.00	\$0.00	\$0.00			
TOTALS		\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00

* Tasks correspond to items listed in the Scope; Subtasks provide additional detail as required.

Attachment 2-2: Design Project Progress Report

PROJECT NAME: _____	Date NTP Issued: _____
CIP Project No: _____	Schd Completion Date: _____
Reporting Period: From: _____ To: _____	
Date Submitted: _____	Date Received: _____

DESIGN CONTRACTOR:	WATER AUTHORITY:
Name: _____	Design Manager: _____
Address: _____ _____ _____	Address: _____ _____ _____
Phone: _____ FAX: _____	Phone: _____ FAX: _____
Email: _____	Email: _____

1. Attach Narrative Summary of Progress During the Reporting Period:

- Identify by task
- Agree with schedule and budget update

2. Attach Issues Resolution Report:

- Identify problems and issues
- Describe solutions to problems and issues resolved during reporting period
- Describe action plans and resolution due dates for unresolved problems and issues

3. Attach Change Management Report:

- Description of proposed change
- Budget and schedule impacts of proposed change
- Resolutions of proposed changes

4. Attach Task Completion Report:

- Compare actual completion percent to planned

5. Attach Cost Breakdown and Budget Update:

- Notification of task budgets 80% expended
- Notification of task budget projections exceeding 100%
- Provide budget recovery plan

6. Attach Schedule Update:

- Identify critical path activity deviations
- Provide schedule recovery plan

7. Other Issues:

Chapter 3 QA/QC Program

Overview

Purpose This chapter presents the Quality Control and Quality Assurance standards and procedures to be followed by Design Contractors.

Topics This chapter is composed of the following topics:

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3.1 Introduction

3.1.1 General

1. The concept of quality has evolved from simply conformance with specifications to that of meeting owner requirements. Design Contractor quality control has advanced from checking deliverables to multiple reviews and evaluations, concurrent with the Water Authority reviews described in Chapter 4, Design Development. All design services must result in a facility that meets the Water Authority's needs.
 2. This chapter presents the Quality Assurance/Quality Control (QA/QC) concepts and procedures that shall be followed by the Design Contractor during design of facilities for the Water Authority. Adherence shall be necessary for design activities to support the objectives of the Water Authority.
-

3.1.2 Quality Objectives

1. Quality objectives applicable to Water Authority design work include the following:
 - 1.1. Designed facilities shall meet the scope and objectives in the Predesign (or Planning) Report, Project Delivery Plan (PDP), the Design Contractor's contracted Scope of Work (Scope), and changes approved during design.
 - 1.1.1. The Predesign Report is developed during the project planning phase prior to the start of design. It typically describes each facility in moderate detail (layout, functions, major equipment items, environmental compliance requirements, and other general project requirements) and provides performance goals, operating requirements, preliminary design and construction schedules, and a budgetary cost estimate, thereby establishing a baseline for each facility.
 - 1.1.2. The PDP is developed during or prior to the planning phase, and may be updated by the Project Manager in coordination with the Design Manager after project changes are approved.
 - 1.1.3. The Scope may modify the Predesign Report, PDP, and/or add additional Design Contractor requirements.
 - 1.1.4. Project changes that revise the original Scope may be approved during the design phase.
 - 1.2. Designed facilities shall conform to the design guidelines pre-

sented in the Design Manual, including Volume 2, Facility Design Guide, the design parameters and overall criteria set forth in the project-specific Predesign Report, PDP, and the Scope. Adherence to the design parameters and overall criteria will be judged by comparing the designed facility to these documents.

- 1.3. Design services shall be performed in accordance with design contracts. Required procedures and activities, schedules for deliverables, and budgets shall be followed to meet this goal.
- 1.4. Contract Documents shall be prepared to appropriate standards of engineering practice for clarity, uniformity, and completeness, and shall comply with Water Authority standards. Multiple reviews will be conducted by the Water Authority to promote achievement of these goals. Review comments will be stored in a database so that action taken on the comments can be tracked to verify the comment is incorporated or otherwise resolved in a manner acceptable to the Water Authority.

3.1.3
Purpose of the
QA/QC Program

1. The purpose of the QA/QC Program is twofold:
 - 1.1. To communicate the goals, responsibilities and procedures to each Design Contractor so emphasis on quality can be planned into all phases of the project, from the project proposal through the completed facility.
 - 1.2. To establish minimum QA/QC requirements that the Design Contractor shall follow in producing designs and providing other technical support services to the Water Authority.
 2. The guidelines and requirements of the QA/QC Program is contained in or referenced in the request for qualifications or proposals, thus enabling the Design Contractor to understand the requirements at the beginning of the Design Contractor selection process.
-

3.2 QA/QC Program

3.2.1 General

1. Prior to the start of design, the Design Manager will develop a detailed project Scope that will be part of the contract between the Design Contractor and the Water Authority. Requirements in the Scope will include:
 - 1.1. Detailed QA/QC requirements, including submittal of a project QA/QC plan.
 - 1.2. Establishing a process for conducting monthly design progress meetings, including preparing and submitting meeting minutes.
 - 1.3. Requirements for safety in design and related QA/QC requirements.
 - 1.4. Design schedule and budget requirements.
 - 1.5. Subcontractor Outreach and Opportunities Program (SCOOP) requirements. Refer to Chapter 1 for additional information and requirements.
 - 1.6. Requirements for and definitions of deliverables at milestone points in the design development, including technical memoranda, reports, calculations, cost estimates, specification, and drawings.
 - 1.7. A process of ensuring completion of value engineering, technical review, expert review, operations and maintenance (O&M) review, and environmental compliance review, and of securing Water Authority Gate Process and Contract Approval Committee approvals.
 - 1.8. A process of ensuring all comments from review and other sources are addressed.
 - 1.9. Descriptions of the input required by the Design Contractor during the construction and commissioning phases.
 - 1.10. An O&M Plan, including an assessment of project impacts to O&M staffing and system operation.
 - 1.11. A Commissioning Plan, including identifying and scheduling system shutdowns necessary to complete the work.
 - 1.12. Development of the O&M Manual.
 - 1.13. Development of the Contract Documents.
 - 1.14. Establishment of software requirements (MS Word, MS Excel, Primavera, AutoCAD, etc).
 - 1.15. Other issues and requirements required to complete the

design.

1.16. Additional Scope requirements may be defined elsewhere in the Design Manual.

**3.2.2
Safety in
Design**

1. Safety requirements will be included in the Design Contractor's contract with the Water Authority. For example, the Design Contractor shall be responsible for the safety of their own employees and shall be required to conform to safety program requirements in effect at construction sites.
2. In addition, safety requirements will be included in Water Authority checklists developed for reviewing designs, contracts, and other documents requiring signoffs.

**3.2.2.1
Safety
Considerations
in Design
Contractor
Selection**

1. During selection of Design Contractor, proof of safety competence will be required. This requirement shall apply to the design of facilities that are safe for operation and maintenance activities. Satisfying the proof requirement shall require submittal of verifiable references from previous similar projects and the company's OSHA recorded incident and accident rates. Other documentation may also be required.
2. The Design Contractor's Scope will require the design to meet minimum facility safety standards, including the obtaining of applicable permits under building or similar codes, depending on the specific jurisdiction(s) of the project. The Scope will also reference and require compliance with applicable safety standards and codes, and may contain additional project-specific design safety requirements.

**3.2.2.2
Safety
Considerations
in Design
Reviews**

1. During design reviews, a safety audit of the facility being designed will be conducted and shall be approved prior to proceeding with additional design work.
 2. For projects determined by the Design Manager to have significant safety hazards and issues, a formal Health and Safety in Operations (HASOP) review may be conducted to determine if changes can be made to reduce the safety hazard. This requirement will be in the Scope.
 3. Safety reviews of all projects will be conducted at each design development level as defined in Chapter 4, Design Development.
-

**3.2.3
Design
Contractor
QA/QC
Responsibilities**

1. The general Design Contractor QA/QC process is summarized below. Additional procedures may be required elsewhere in the Design Manual or in the Scope. Responsibilities of the Design Contractor for quality design shall include the following:

**3.2.3.1
Design
Contractor**

1. The Design Contractor shall be solely responsible to the Water Authority for the quality of service provided and the construction Contract Documents prepared. The Design Manager will monitor the Design Contractor's efforts and provide certain reviews from an independent perspective as described in Chapter 4, Design Development.
2. The Design Contractor shall implement QA/QC procedures at least as extensive and effective as the procedures discussed in this chapter. The Design Contractor shall schedule and budget for design submittal reviews as described in Chapter 4, Design Development, and shall assist the Design Manager in presenting the design to reviewers.

**3.2.3.2
Design
Contractor
Project
Manager**

1. As the Design Contractor's primary representative, the Design Contractor's Project Manager (DCPM) shall prepare and implement an action plan for QA/QC activities.
2. In general, the DCPM shall be a professional engineer registered in the state of California (PE).
 - 2.1. However, there may be situations where the DCPM is not a PE. In those situations, the Design Contractor shall identify in the proposal an appropriately qualified PE who will serve as the technical manager for the project and will seal and sign all required documents. The proposal shall clearly define the division of responsibilities between the DCPM and proposed technical manager.
 - 2.2. This substitution of technical responsibility must be accepted in writing by the Design Manager prior to issuance of the Notice to Proceed (NTP).
 - 2.3. In the Design Manual, references to the DCPM shall be interpreted as referring to and binding on the accepted technical manager, when applicable.
3. After transmittal of the NTP by the Design Manager, the DCPM shall organize, plan, schedule, and budget for design and QA/QC activities related to the project.
4. The DCPM shall prepare a QA/QC plan for all project QA/QC activities and later shall add supplements to the QA/QC plan to

record actual activities that occur during plan implementation. The QA/QC plan shall be submitted within ten working days from NTP to the Design Manager for review and comment.

5. Design work started prior to receipt of written approval by the Design Manager of the Design Contractor's final QA/QC plan shall be at the Design Contractor's risk. Such design work shall be subject to rejection and/or reworking at no additional cost to the Water Authority if the work does not meet requirements of the QA/QC Plan.
6. The purposes of the QA/QC plan are to:
 - 6.1. Develop a specific comprehensive approach to project QA/QC activities.
 - 6.2. Document the actual QA/QC effort and related activities.
7. The following suggestions are provided to help the Design Contractor develop the QA/QC plan:
 - 7.1. List every document or work product element to be checked, reviewed, and approved, such as drawings, specification sections, calculations by discipline, report sections, study tasks, document files, etc.
 - 7.2. List the criteria to be checked, reviewed, and approved for each document or work product element. Use the Design Contractor's standard checklists where appropriate or feasible.
 - 7.3. Develop a matrix of the persons assigned to conduct the checks, reviews, and approvals. Include a schedule defining when the tasks are to be done.
 - 7.4. Establish a method for documenting QA/QC comments made during checks, reviews, or approvals, and the person(s) assigned to maintain the records.
 - 7.5. Establish procedures for implementing QA/QC comments and assign a person or persons to verify that they have been implemented.
8. Include a Review and Comment Form so Design Contractor staff can respond to review comments. See Attachment 4-5 in Chapter 4 for an example.
9. The DCPM shall prepare submittal packages at different levels of design development as described in Chapter 4, Design Development. The DCPM shall conduct an internal QA/QC review of design submittal packages, technical memoranda, reports, and other submitted documents, prior to submittal to the Design Manager. Descriptions of minimum Design Contractor QA/QC reviews are presented in later paragraphs of this chapter.
10. The DCPM shall ensure the internal QA/QC comments are

addressed by the appropriate design resources and shall verify the appropriate actions are taken. On request by the Design Manager, copies of the comment-response-resolution record shall be submitted to the Design Manager, indicating the internal QA/QC review is complete and reviewers concur with the resolutions.

11. Following internal QA/QC review, design review packages shall be submitted to the Design Manager for review and comment at the times shown on the project schedule. Design reviews will be conducted regardless of changes to the design schedule. If a design schedule change occurs, the DCPM shall reschedule the reviews and communicate the changes to the Design Manager in writing.
 12. On receipt of design review comments from the Design Manager, the DCPM shall ensure the comments are addressed by the appropriate design resources. The DCPM shall provide written notification to the Design Manager detailing that each design review comment has been addressed, the proposed action to be taken, and verification the proposed action was completed.
 13. The DCPM shall submit monthly progress reports, including discussions of QA/QC issues. Specific reporting requirements and formats are defined in Chapters 1 and 2. If the DCPM detects impending deviations from the Scope, schedule, or budget, the DCPM shall take appropriate action to correct such deviations or to obtain written approval from the Design Manager if deviations cannot be avoided.
-

**3.2.3.3
Design
Contractor Staff
Members**

1. Each person assigned by the Design Contractor to a specific task shall be sensitive to the need for quality in the task and shall be appropriately qualified to perform the task. They shall document work thoroughly so it can be checked, including assumptions with appropriate references, calculations, and input parameters to computerized programs. All documentation shall be arranged in a logical fashion for easy review.
-

**3.2.4
Design Process**

1. Design elements include drawings, specification, calculations, design and construction schedules, construction cost estimates, design studies, technical memoranda and reports, and other documents necessary to complete the design. Each element shall be prepared by the Design Contractor using the QA/QC process summarized in Paragraphs 3.2.4.1 through 3.2.4.4.
2. Additional minimum requirements and procedures for specific types of documents as defined in the Appendices shall also be followed. Documents other than those listed shall be prepared in a manner

appropriate for the specific document and preparation shall follow the procedures outlined in the following paragraphs and the Appendices.

**3.2.4.1
Design
Contractor
Preparer**

1. The preparer shall be appropriately qualified to perform the design task.
2. The preparer shall research a problem, determine the analysis to be performed, list assumptions and references, select formulas or programs of solution, perform data entry, perform mathematics either manually or by computer, and record the entire process on drawings, calculation sheets, specification sections, technical memoranda, or other design documents.
3. The preparer shall sign and date the document at the time of completion and at any time the preparer completes revisions to documents.
4. The preparer shall conform to the minimum preparation requirements for specific design elements as defined in the Appendices attached to this chapter.

**3.2.4.2
Design
Contractor
Checker**

1. The checker and preparer shall not be the same person and the checker shall have at least equal qualifications as the preparer.
2. The checker shall check the accuracy of data transfer to calculation sheets, computer programs, drawings, or specification, and ensure the accuracy of solutions presented. The objective of this exercise is to document that data has been accurately transferred and recorded, and the preparer's analysis and procedures are correct.
3. The checker shall sign and date the document at the time checking is complete and at any time the checker completes review of revisions to the document.
4. The checker shall conform to the minimum checking requirements for specific design elements as defined in the Appendices attached to this chapter.

**3.2.4.3
Design
Contractor
Reviewer**

1. The reviewer and preparer shall not be the same person, but the reviewer may be the checker or DCPM.
2. The reviewer shall verify the appropriateness of the preparer's decisions regarding choice of analysis performed, the appropriateness of references and assumptions, adherence to codes and standards, selection of formulas or programs of solution, and

reasonableness of the results.

3. The reviewer shall sign and date final design documents in the same manner as the preparer and checker.

3.2.4.4
Design
Contractor
Project
Manager

1. The DCPM shall verify that all calculations, specification, drawings, technical memoranda and reports, schedules, cost estimates, and other documents have been checked and reviewed, the results are reasonable, and the concepts documented in the calculations are compatible and applicable with the overall project goals and objectives.
-

3.3 Design Contractor Internal QA/QC Reviews

3.3.1 General

1. All design work shall be thoroughly checked, reviewed and approved by experienced, knowledgeable personnel who are not involved in the original design work. The Design Contractor shall be completely responsible for quality reviews of their design work and shall conduct the following minimum reviews prior to submitting each design package to the Design Manager.
-

3.3.2 Value Engineering

1. For most projects, Value Engineering (VE) will be conducted separately prior to starting design and VE recommendations will be included in the Design Contractor's Scope.
 2. However, in some situations the available project information will be insufficient to conduct VE prior to starting design. In these instances, the Design Manager may include Scope requirements for the Design Contractor to prepare a predesign report according to Chapter 4, Design Development, and conduct VE according to the minimum requirements listed in Chapter 4, Design Development. The Design Manager may then decide to modify the Scope to include approved VE recommendations.
-

3.3.3 Calculation Review

1. The Design Contractor shall ensure that participants preparing, checking, reviewing, and approving calculations sign and date the preprinted calculation sheets. All original calculation sheets shall be indexed in file folders or binders maintained in a single location where all original calculations for the entire project can be found. The Final Design submittal to the Design Manager shall include legible copies of all calculations organized in file folders or binders.
2. Calculations shall be in file folders or binders for easy retrieval of specific calculations. A calculation index shall be maintained to allow easy access to the information. The index shall include the applicable items listed in Chapter 21, Document Control and Records Management.
3. Records of computer generated calculations shall provide sufficient information for the reviewer to understand how the analysis was prepared. This includes the name or type of software, description and sketches of the system analyzed, input data and assumptions made, or other necessary information.
4. Every calculation, including computer generated output, shall be checked within one week after the calculation is prepared, and every design assumption shall be reviewed and approved for

reasonableness and correctness before being presented to the Water Authority. Checked, reviewed, and approved calculations shall be identified and placed in the file folders or binders for all original calculations. Refer to Attachment 3-3 for additional requirements. Erroneous calculations shall be marked "VOID" and the reason for doing so noted, and placed in the file folders or binders with the corrected calculations. Voided and corrected calculations shall be cross-referenced.

5. Revised, superseded, or voided calculations shall be clearly identified, dated and initialed.
 6. During construction, any revisions to the calculations shall be clearly identified with revision numbers placed in the file folders or binders. Revised calculations shall be checked in the same manner as original calculations, signed, and cross-referenced to the original calculations.
 7. The DCPM shall monitor the design team to ensure that the file folders or binders of calculations are maintained as required. As part of Quality Assurance, the Design Manager may monitor and spot check the calculation file folders or binders to ensure that they are properly maintained.
 8. All information generated in the calculation process shall be submitted to the Water Authority as part of the design development process described in Chapter 4, Design Development.
-

3.3.4 BODR Review

1. For some projects, the Scope may require the Design Contractor to prepare a Basis of Design Report (BODR) as defined in Chapter 4, Design Development. The BODR is important to establishing design criteria, and guidelines for the project being designed.
 2. The Design Contractor's internal BODR review shall include an examination and evaluation of all calculations, analysis of alternatives, mass balances, P&IDs, materials of construction, and layouts, and shall include discipline, constructability, and O&M reviews. The BODR shall then be submitted to the Design Manager for review in the same manner as other design submittals. The DCPM shall ensure review comments are incorporated and a final BODR is submitted to the Design Manager.
-

3.3.5 Intradisciplinary Review

1. These reviews shall include all completed calculations, drawings, and specification sections, and other design documents at the prescribed completion level of design development as defined in Chapter 4, Design Development.

2. The intradisciplinary review shall be organized by the DCPM and shall be conducted by qualified reviewers within each of the design disciplines. Reviewers shall ensure results of investigations and calculations, and approved recommendations of VE, technical memoranda, and reports are incorporated in the design. Comments shall be recorded on the Design Contractor's Review and Comment Form, issues (if any) resolved, and incorporated into the design documents.
-

**3.3.6
Interdisciplinary
Review**

1. The DCPM shall organize a review to eliminate design problems that may arise from inconsistencies between disciplines. One or more engineers shall perform detailed interdisciplinary reviews to ensure consistency between disciplines on drawings, and between drawings and the specification.
 2. These problems can be identified by examining the specification page by page, verifying consistency with drawings in information or procedures, and ensuring that all project elements are specified and/or detailed.
 3. In addition, the reviewers shall ensure results of investigations and calculations, and approved recommendations of VE, technical memoranda, and reports are incorporated in the design. Typical checklists for interdisciplinary reviews are presented in the Appendices and are included here for use by the Design Contractor.
-

**3.3.7
Peer Review**

1. The DCPM shall arrange for peer reviews to be conducted at the BODR (if included in the Scope), Preliminary, and Mid-Point Design levels. Peer reviews shall be carried out by independent discipline representatives not directly associated with the project whose qualifications and experience are equal to or greater than the preparer, checker, and reviewer. Peers may be members of the Design Contractor's staff or may be independent reviewers, depending on the policies of the Design Contractor. They shall freely evaluate, without constraints, elements of Contract Documents for appropriateness.
2. After review comments are written and tabulated, reviewers shall convene for a day or two with no interruptions to resolve comments resulting from the review(s). The DCPM shall also attend this meeting to resolve or arbitrate conflicts or points of contention.
3. The DCPM shall meet with the Design Manager to discuss the final peer review recommendations, and shall incorporate approved recommendations into the design before submittal.

**3.3.8
Final Review**

1. The final review shall be conducted after all design review comments have been incorporated and before submittal of the Final Design. The final review shall also confirm that all previous Design Contractor and Water Authority design review comments have been addressed and issues resolved.
-

**3.3.9
Review and
Comment Form**

1. Each reviewer's comments shall be placed on the Design Contractor's Review and Comment Form, which shall contain the following minimum information (refer to Attachment 4-5 in Chapter 4 for an example):
 - 1.1. Name of Project
 - 1.2. Contract Number
 - 1.3. Type of Review
 - 1.4. Document Being Reviewed
 - 1.5. Identification of Page, Paragraph or Drawing
 - 1.6. Review Comment
 - 1.7. Designer Response
 - 1.8. Agreed Upon Resolution
 - 1.9. Signature and Date of Reviewer
 - 1.10. Signature and Date of Design (Responder)
 - 1.11. Signature and Date of DCPM
 2. Each reviewer's comments shall be constructive and professional in tone. The Design Contractor staff shall complete the Response to Comments and Comment Resolution area of the form and properly file the forms to document that all comments have been appropriately addressed.
-

3.4 Water Authority QA/QC Reviews

3.4.1 General

1. After conducting Design Contractor's internal reviews, the DCPM shall submit design packages as defined in Chapter 4, Design Development, to the Design Manager for review.
 2. Figures 3-1 through 3-4 attached at the end of this chapter illustrate the design review QA/QC process and show additional Design Contractor requirements and detail at specific design development levels.
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3.4.2 Review Process

1. An outline of the Water Authority design review process is as follows:
 - 1.1. The Design Contractor shall prepare and submit the design package to the Design Manager.
 - 1.2. The Design Manager will review the package for completeness and conformance to contract requirements. If unacceptable, the package will be returned to the Design Contractor for additional preparation at no additional cost to the Water Authority.
 - 1.3. The Design Manager will organize the design submittal review. The DCPM will present the design to the various reviewers to improve understanding of the design and the concepts leading to it.
 - 1.4. The Design Manager will collect comments from reviewers and return them to the DCPM. If required, the Design Manager and DCPM will meet to resolve differences of opinion.
 - 1.5. Following receipt of Water Authority design review comments for the Mid-Point and Final Design submittals, the Design Contractor shall prepare a conformed design that incorporates all design review comments. No conformed design submittal is required after the Preliminary Design submittal. The conformed design shall be submitted to the Design Manager for review and approval. If unacceptable, the conformed design will be returned to the Design Contractor for additional preparation at no additional cost to the Water Authority.
 - 1.6. The Design Manager will submit the conformed design for Water Authority Gateway Process approval. If unapproved, the conformed design will be returned to the Design Contractor for additional preparation at no additional cost to the Water Authority.
 - 1.7. The Design Manager will submit the conformed design for

Project Management approval. If unapproved, the conformed design will be returned to the Design Contractor for additional preparation.

- 1.8. When the conformed design is accepted, the Design Manager will issue written authorization for the Design Contractor to proceed to the next design development level.
-

3.5 Record Keeping Requirements

3.5.1 General

1. The Design Contractor shall retain all check prints, checked draft specification sections, and other checking documents on file until final closeout of the project. Checking documents for calculations shall be included with all calculation packages submitted for review.
 2. Check prints and other types of checking documents shall be submitted for review only on request of the Design Manager. Refer to Chapter 21, Document Control and Records Management, for additional requirements.
-

3.6 Certification of the Design

3.6.1 General

1. Final Design documents shall be certified by the DCPM prior to submittal to the Design Manager. Such certification shall mean the DCPM has reviewed the Final Design documents and verified they meet project objectives and requirements, including any Scope or design changes that may have been authorized during the course of the design.
 2. Certification shall also mean the DCPM has verified the approved QA/QC plan has been followed and the specified minimum QA/QC procedures have been conducted.
 3. Within sixty days prior to certification, the DCPM or other qualified Design Contractor representative shall conduct a field visit to the project site(s) to verify that no site changes have occurred since the initial field visit that may impact construction.
-

3.6.2 Design Certification Requirements

1. The DCPM shall certify the Final Design documents as follows:
 - 1.1. Drawings: Seal, wet sign, and date all individual construction contract drawings as the Engineer of Record. In addition, drawings prepared under the supervision of a responsible engineer other than the DCPM, e.g., by other disciplines within the Design Contractor's firm or by subcontractors, shall also be sealed, wet signed, and dated by the responsible engineer.
 - 1.2. Specification: Seal, wet sign, and date the title page of the final specification to be transmitted to the Design Manager.
 - 1.3. Calculations: Seal, wet sign, and date the title page of all final calculations to be transmitted to the Design Manager.
 - 1.4. Cost Estimates: Seal, wet sign, and date the title page of all final cost estimates to be transmitted to the Design Manager.
 - 1.5. Technical Memoranda and Reports: Seal, wet sign, and date the title page of all final technical memoranda and reports to be transmitted to the Design Manager.
 - 1.6. O&M Impact and Life Cycle Cost Analysis: Seal, wet sign, and date the title page of the O&M impact and life cycle cost analysis report to be transmitted to the Design Manager.
 - 1.7. O&M Manual: Seal, wet sign, and date the title page of the O&M Manual to be transmitted to the Design Manager.
 - 1.8. Other Documents: The Scope may require other documents to be sealed, wet signed, and dated, including project startup,

testing, commissioning, and closeout procedures.

3.7 Design Contractor QA/QC Requirements During Other Project Phases

3.7.1 General

1. The Design Contractor's obligation and requirement for QA/QC shall continue through the project phases following design. These obligations and requirements shall include those listed in the following paragraphs.
-

3.7.2 Bid Phase

1. The Design Contractor's QA/QC obligations and responsibilities during this project phase fall into the categories listed below:
 - 1.1. Attend the project pre-bid meeting.
 - 1.2. Respond to bidder questions:
 - 1.2.1. At the request of the Design Manager, the DCPM shall prepare responses to bidder questions following the general four-step QA/QC process outlined in this chapter.
 - 1.2.2. Prior to submitting the written responses to the Design Manager, the DCPM shall certify the responses by sealing, wet signing, and dating the first page of the set of questions and responses.
 - 1.3. Assist in Preparation of Addenda Documents:
 - 1.3.1. At the request of the Design Manager, the DCPM shall prepare drawings, specification sections, or other documents for inclusion in addenda following the general four-step QA/QC process outlined in this chapter. Such drawing and specification changes shall be prepared in Addendum format, including clouding and lettering the change, providing the appropriate entries in the drawing status block or specification footer, and so forth.
 - 1.3.2. All QA/QC processes required to produce the design shall be applied to the production of addenda materials prior to submittal to the Design Manager. Care shall be taken to ensure no unexpected ramifications occur as a result of the design changes issued in addenda.
 - 1.3.3. The Design Contractor shall seal and wet sign the first page of addenda containing technical information. The Design Contractor is not required to seal or sign addenda containing only

administrative information.

**3.7.3
Construction
Phase**

1. The Design Contractor's QA/QC obligations and responsibilities during this project phase include the categories listed below:

- 1.1. Review Contractor Submittals and Substitution Requests:

- 1.1.1. On receipt of the submittal or substitution request from the Construction Manager (CM), the DCPM shall organize the review such that the response is returned within the specified time.
 - 1.1.2. The reviewer shall first review the submittal or substitution request for completeness and compliance with Division 1 requirements. If the submittal or substitution request is incomplete or non-compliant, the DCPM shall return the document to the CM marked as incomplete/non-compliant and not reviewed.
 - 1.1.3. If the submittal or substitution request is accepted for review, the reviewer shall review the document for compliance to the Contract Documents and shall grade or score the document as defined in the Contract Documents.
 - 1.1.4. Prior to returning the document to the CM, the DCPM shall verify the review is complete and accurate, and shall sign and date the cover sheet.
 - 1.1.5. The Design Manager will review the returned document and evaluate the Design Contractor's comments. At the Design Manager's sole discretion, the Design Manager may request the Design Contractor to re-assess the comments, or, in extreme cases, overturn the Design Contractor's comments and/or scoring.

- 1.2. Respond to Requests for Information (RFIs):

- 1.2.1. On receipt of the RFI from the Construction Manager (CM), the DCPM shall organize the review such that the response is returned within the specified time.
 - 1.2.2. The reviewer shall first review the RFI for completeness and compliance with Division 1 requirements. If the RFI is incomplete or non-compliant, the DCPM shall return the document to the CM marked as incomplete/non-compliant and

not reviewed.

- 1.2.3. If the RFI is accepted, the reviewer shall review and prepare a response to the RFI.
- 1.2.4. Care shall be taken to avoid directing the construction contractor to take action not provided for in the Contract Documents. If such direction cannot be avoided, a change order shall be initiated and the change order number referred to in the RFI response.
- 1.2.5. If the reviewer accepts a change requested by the construction contractor, the RFI response shall indicate the change was accepted at the request of and for the convenience of the construction contractor and shall be at no additional cost to the Water Authority.
- 1.2.6. Care shall be taken to ensure no unexpected ramifications occur as a result of design changes approved in RFIs.
- 1.2.7. Prior to returning the document to the CM, the DCPM shall verify the RFI review is complete, the response is accurate and appropriate, and shall sign and date the cover sheet.
- 1.2.8. The Design Manager will review the returned RFI and evaluate the Design Contractor's response. At the Design Manager's sole discretion, the Design Manager may request the Design Contractor to re-assess the response, or, in extreme cases, overturn the Design Contractor's response.

1.3. Assist in Preparation of Construction Change Orders:

- 1.3.1. The Construction Manager has responsibility for preparation of Change Orders. However, the Design Manager may direct the Design Contractor to provide Change Order assistance, such as preparation of drawing and/or specification changes. Such drawing and specification changes shall be prepared in Change Order format, including clouding and numbering the change, providing the appropriate entries in the drawing status block or specification footer, and so forth.
- 1.3.2. QA/QC procedures conducted by the Design Contractor for developing Change Orders shall be the same as for developing the original design. However, in the interest of time, the design review

process shall be limited to one submittal-comment-review cycle unless directed otherwise by the Design Manager.

- 1.3.3. Care shall be taken to ensure no unexpected ramifications occur as a result of design changes approved in Change Orders.
-

**3.7.4
Commissioning
and Closeout
Phase**

1. The Design Contractor's QA/QC obligations and responsibilities during this project phase include the categories listed below:
 - 1.1. Startup and Commissioning Plan: QA/QC procedures conducted by the Design Contractor for developing the Startup and Commissioning Plan shall be the same as for developing the original design. However, the design review process shall be limited to one submittal-comment-review cycle unless directed otherwise by the Design Manager. It may be necessary for the Design Contractor to prepare multiple Startup and Commissioning Plans for complex projects.
 - 1.2. O&M Manual: QA/QC procedures conducted by the Design Contractor for developing the O&M Manual shall be the same as for developing the original design. However, the design review process shall be limited to one submittal-comment-review cycle unless directed otherwise by the Design Manager.
 - 1.3. Record Drawings: QA/QC procedures conducted by the Design Contractor for developing the Record Drawings shall be the same as for developing the original design. However, the design review process shall be limited to one submittal-comment-review cycle unless directed otherwise by the Design Manager.
-

Figure 3-1: QA/QC Process – Preliminary Design

Figure 3-1

QA/QC Process – Preliminary Design

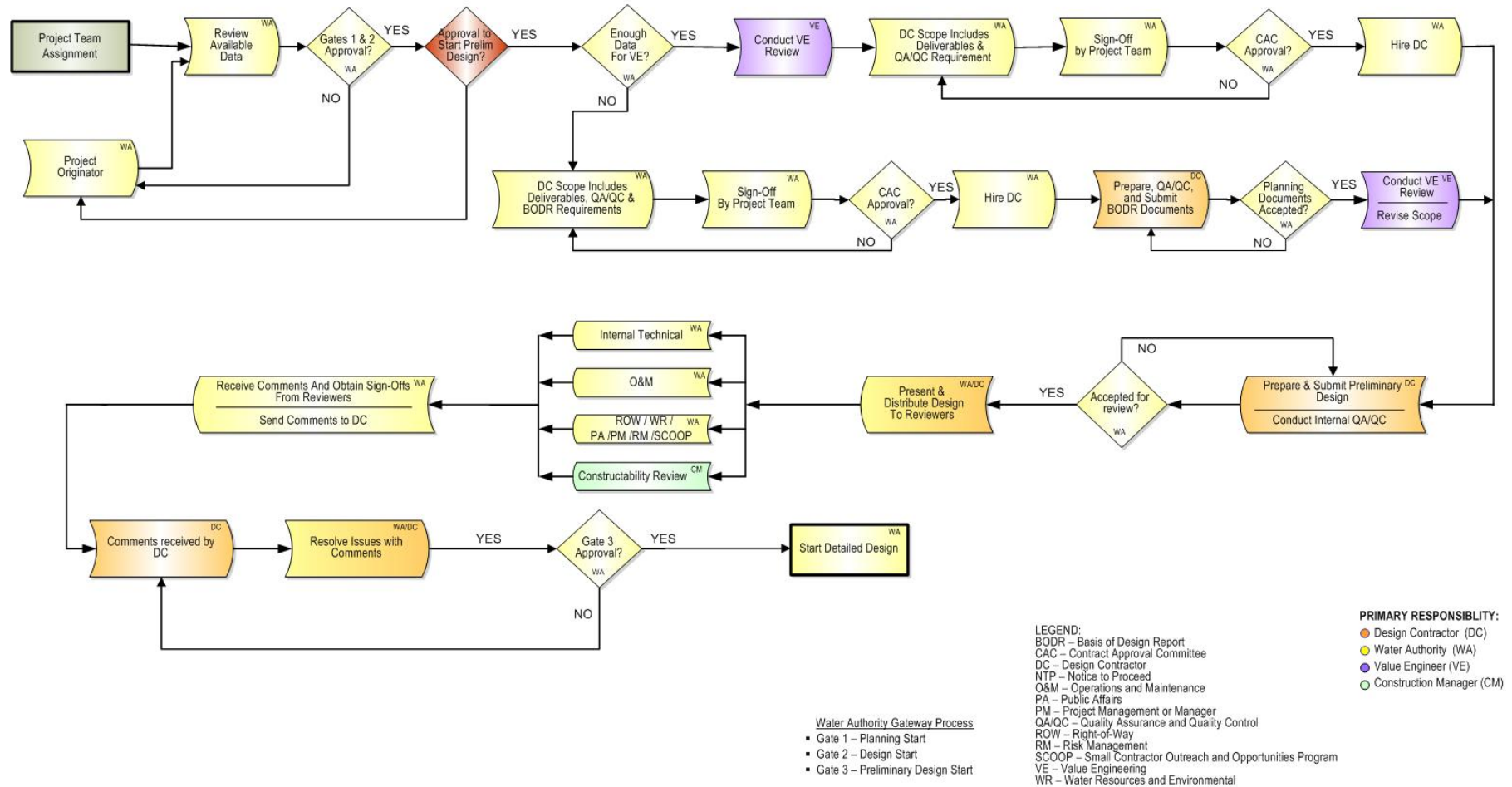


Figure 3-2: QA/QC Process Mid-Point and Final Detailed Design

Figure 3-2
QA/QC Process - Mid-Point & Final Detailed Design

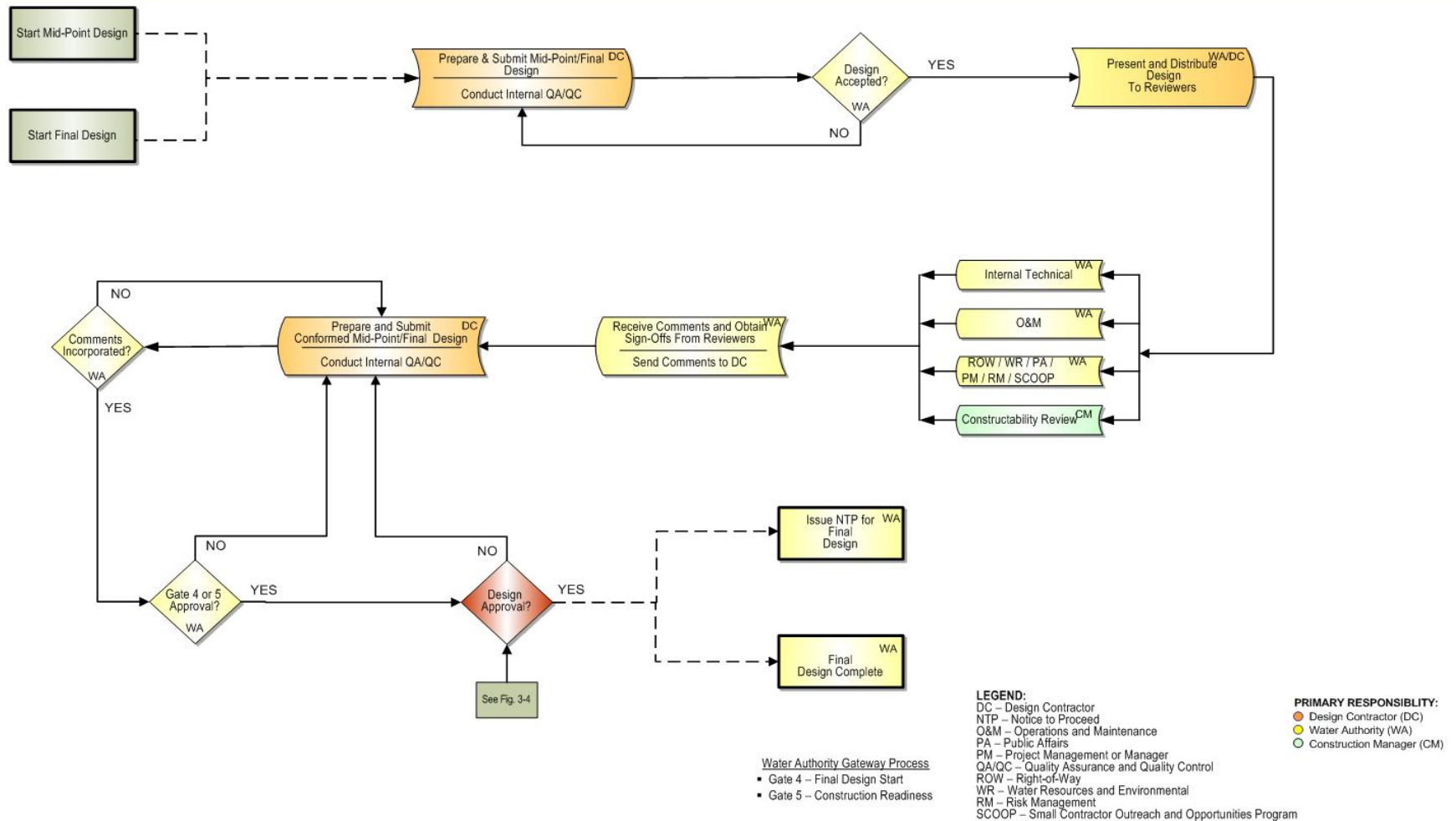
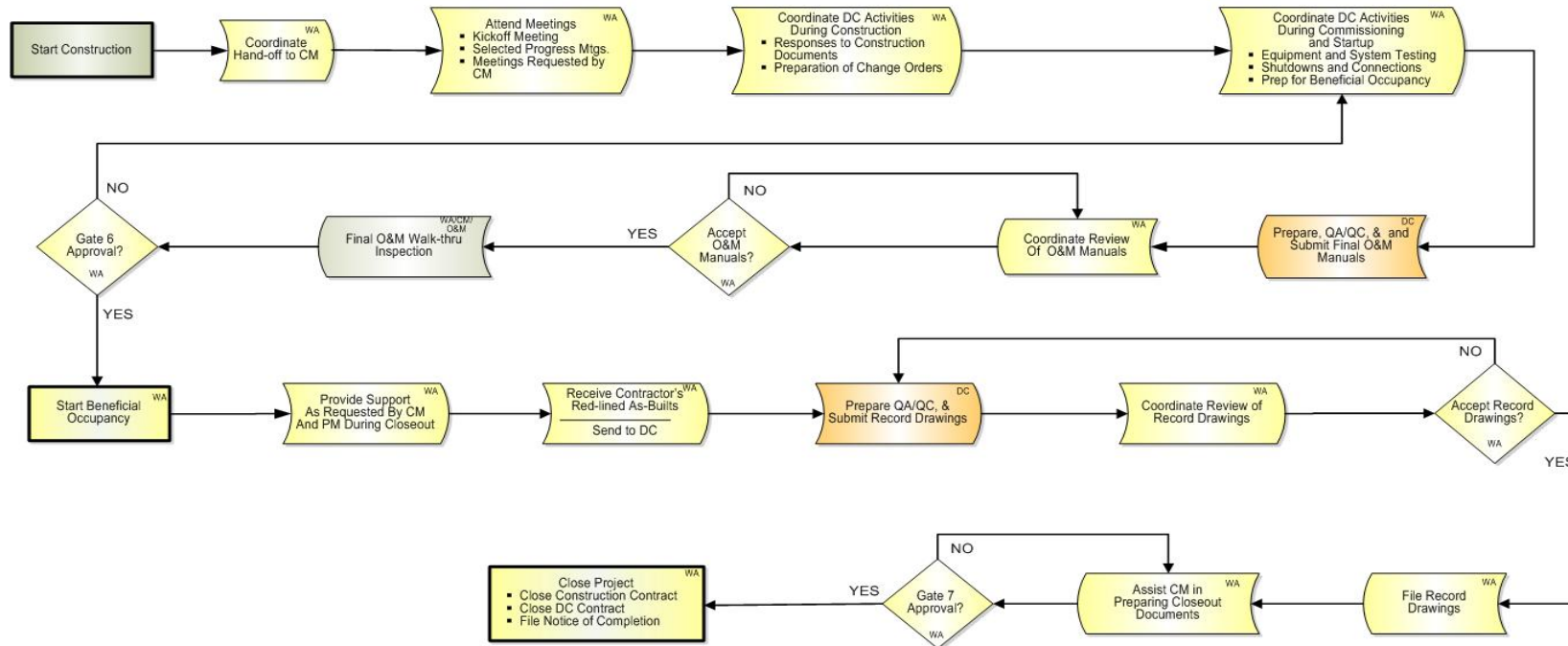


Figure 3-3: QA/QC Process – Construction, Commissioning, and Closeout

Figure 3-3

QA/QC Process – Construction, Commissioning, and Closeout

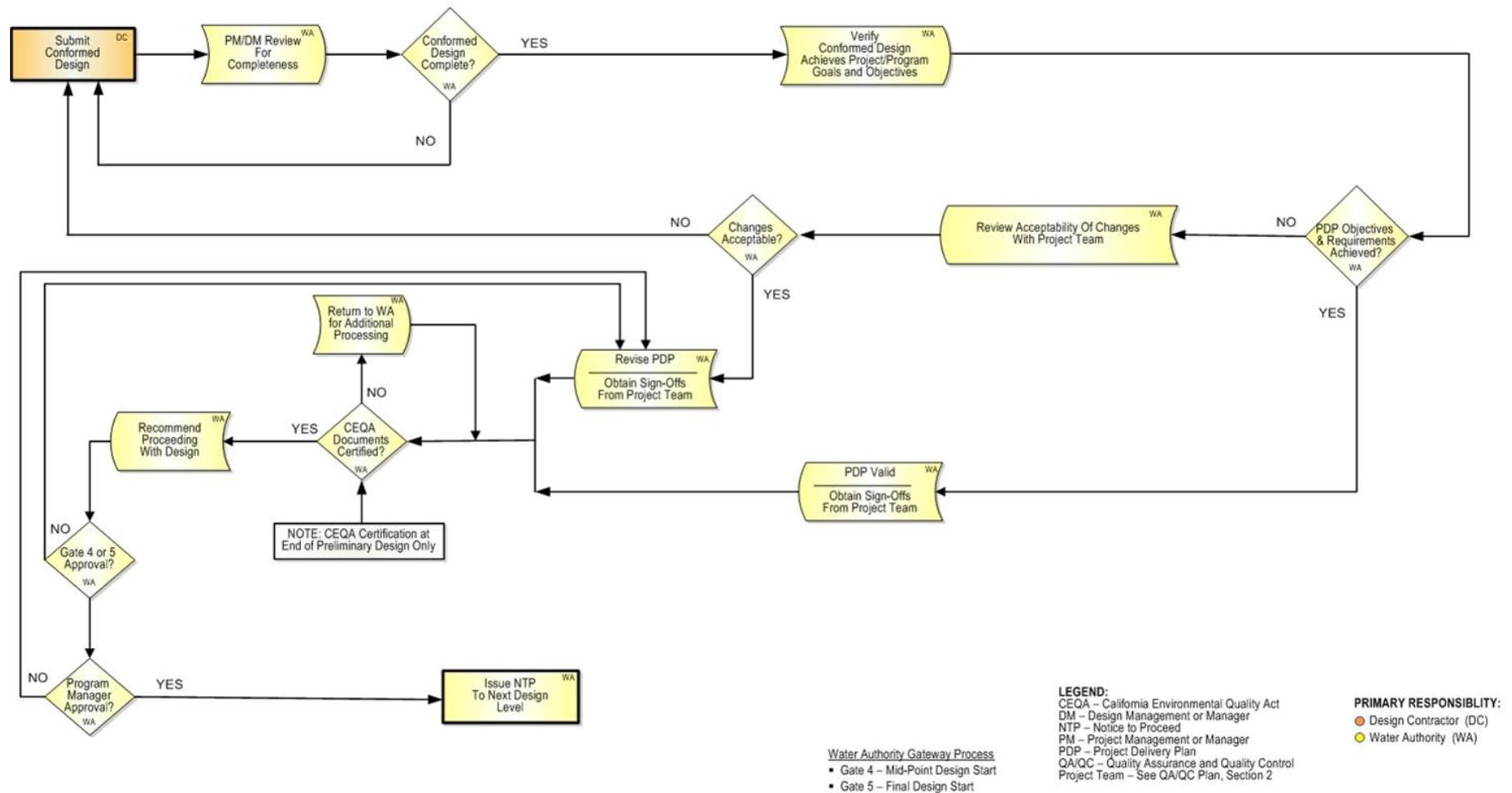


LEGEND:
CM – Construction Management or Manager
DC – Design Contractor
O&M – Operations and Maintenance
PM – Project Management or Manager
QA/QC – Quality Assurance and Quality Control

PRIMARY RESPONSIBILITY:
● Design Contractor (DC)
● Water Authority (WA)

Water Authority Gateway Process
■ Gate 6 – Beneficial Occupancy
■ Gate 7 – Project Closeout

Figure 3-4: QA/QC Process – Conformed Design Review Process



Attachment 3-1: Summary of QA/QC Reviews

SUBMITTAL PACKAGE	REVIEW(S) BY THE DESIGN CONTRACTOR	REVIEW(S) BY THE WATER AUTHORITY
Predesign Report or Basis of Design Report (BODR)	Peer Review(1); Interdisciplinary Progress Review	Interdisciplinary Progress Review Value Engineering – prior to start of Preliminary Design
Preliminary Design	Interdisciplinary Progress Review	Biddability/Constructability Review(2); Operations and Maintenance Review(2); Interdisciplinary Progress Review
Mid-Point Design	Interdisciplinary Progress Review; Interdisciplinary Review; Peer Review	Biddability/Constructability Review(2); Operations and Maintenance Review; Interdisciplinary Progress Review
Final Design	Interdisciplinary Progress Review; Interdisciplinary Review; Peer Review	Biddability/Constructability Review(2); Operations and Maintenance Review; Interdisciplinary Progress Review
Final Conformed Design	Final Review	Final Review

NOTES:

1. Peer reviews are required for "larger" projects and are so indicated in the project contracted scope of services.
2. See Chapter 4, Design Development, for discussions of Value Engineering Review, Operations and Maintenance Review, and Biddability/Constructability Review.

Attachment 3-2: QA/QC Procedure for Preparing and Checking Drawings

PREPARER		CHECKER
1. Drawings shall be prepared using AutoCAD CADD software and in accordance with Water Authority standards, including ESD-120, the Design Manual, and the Scope. 2. On completion of a drawing, print a bond paper copy and clearly stamp it "CHECK PRINT." 3. After signing and dating, transmit the check print to the checker for review and comment. 4. On return of the check print from the checker, incorporate any revisions or changes made by the checker. Make a second check print in the manner described above, and transmit both check prints back to the checker. 5. As the design progresses, the preparer may also receive written design review comments from the DCPM or checker. Incorporate, color-code, and staple these comments to the check print. 6. This process shall repeat until the checker accepts the check print without revisions or changes. 7. A suggested check print color coding is shown below. If a different color coding scheme is used, the DCPM shall notify the Design Manager of the alternate color coding scheme to be used. Regardless, the color coding scheme used shall be consistent for all project documents. a. RED – corrections, changes, additions, or revisions made by the checker. b. YELLOW – verification by the preparer that the checker's revisions have been incorporated into the document. c. BLUE – verification by the checker that the document has been backchecked and the revisions are properly incorporated. d. Final Design (100%) drawings shall be signed and dated by the preparer as required.		1. Drawings shall be checked within one week of the preparation date. 2. On receipt of the check print, check the drawing for conformance to project requirements, Water Authority CADD standards, and good engineering practice. 3. If changes or corrections are required, return the check print it to the preparer for revision. 4. This process shall repeat until the check print is accepted without revision by the checker. 5. On acceptance of the check print, sign and date the accepted check print. If more than one check print is involved to document the revisions, the check prints shall be stapled together prior to filing.

Attachment 3-3: QA/QC Procedure for Preparing and Checking the Specification

PREPARER		CHECKER
1. The specification shall be prepared using MS Word software in accordance with the standards of the Construction Specifications Institute (CSI), and in accordance with Water Authority standards, the Design Manual, and the Scope. 2. Any proposed deviations from Water Authority shall be clearly identified and presented as a proposal. Use of the "Tracked Changes" feature of MS Word is an acceptable method of identification. The proposed change shall not be incorporated into the specification until written acceptance is received from the Design Manager. 3. On completion of a specification section, print a copy clearly marked as "DRAFT". 4. After signing and dating the first page of the draft section, transmit the draft section to the checker for review and comment. 5. On return of the draft section from the checker, incorporate any revisions or changes made by the checker. Make a second draft section in the manner described above, and transmit both draft sections back to the checker. 6. As the design progresses, the preparer may also receive written design review comments from the DCPM or checker. Incorporate, color-code, and staple these comments to the draft specification section. 7. This process shall repeat until the checker accepts the draft section without revisions or changes. 8. The specification section color-coding scheme shall be the same as defined for check prints. 9. Sign and date the first page of all Final Design specification sections.		1. Specification sections shall be checked within one week of the preparation date. 2. Check the specification section to verify it satisfies project requirements and meets standards of good engineering practice. 3. Verify all proposed changes to Water Authority standards are clearly indicated. 4. Verify all design review comments are properly incorporated. 5. On completion of review, sign and date the first page of the specification section and return the draft section to the preparer for corrections. 6. On return of the draft section from the preparer, verify all revisions or changes have been incorporated. 7. This process shall repeat until the checker accepts the draft section without revisions or changes. 8. The specification section color-coding scheme shall be the same as defined for drawings. 9. Sign and date the first page of all Final Design specification sections.

Attachment 3-4: QA/QC Procedure for Preparing and Checking Calculations

PREPARER		CHECKER
1. The preparer shall select formulas or programs of solution, do data entry, and perform calculation mathematics either manually or by computer. 2. Record the entire process on calculation sheets with reference material attached. Reference material shall include drawings, specifications, manufacturer's catalog cuts for equipment, charts, graphs, tables, copies of procedures and formulae from reference texts, and any other data required to understand and replicate the calculation. 3. On the first page of the calculation, show the project name and number, the calculation name, and other identification information. Show abbreviations or brief versions of the project and calculation names on all other pages. 4. Number all pages of the calculation, showing both the page number and the total number of pages (e.g., Page 6 of 13). 5. Clearly mark reference material to show the specific equipment or data used for the project. Such marking shall be done with an arrow stamp, clouding, or other means that can be copied using standard office copying equipment. Use of highlighters is not acceptable. 6. On completion of the calculation, sign and date the first page, and initial and date all other pages. Transmit the calculation to the checker. 7. If the calculation is returned with revisions from the checker, resolve any issues and incorporate the revisions into the calculation following the procedures described above. 8. As the design progresses, the preparer may also receive written design review comments from the DCPM or checker. Incorporate, color-code, and attach these comments to the calculation. 9. This process shall repeat until the calculation is accepted without revision by the checker.		1. Calculations shall be checked within one week of the preparation date. 2. Check the calculation to ensure accuracy of the solution presented, and for conformance to project requirements and good engineering practice. 3. Acceptable checking procedures are: a. Repeat the preparer's calculation using the same assumptions and methods, and arriving at the same conclusion. b. Conduct the calculation by a different method, providing the same information as stated for the preparer, and arriving at substantially the same conclusion. 4. Attach all calculations or revisions to the original calculation. 5. If the checker believes changes, revisions, or additions should be made to the calculation, return the calculation to the preparer and resolve any issues or differences of opinion with the preparer. 6. This process shall repeat until the checker accepts the calculation without revision. 7. On acceptance of the calculation, sign and date the first page of the calculation, and initial and date all other pages.

Attachment 3-5: QA/QC Procedure for Preparing and Checking Construction Schedules

PREPARER		CHECKER
1. Construction schedules shall be prepared using Primavera scheduling software in accordance with Water Authority standards, the Design Manual, and the Scope. 2. On completion of the construction schedule, print a copy clearly marked as "DRAFT". 3. After signing and dating the first page of the draft schedule, transmit the draft schedule to the checker for review and comment. 4. On return of the draft section from the checker, incorporate any revisions or changes made by the checker. Make a second draft schedule in the manner described above, and transmit both draft schedules back to the checker. 5. As the design progresses, the preparer may also receive written design review comments from the DCPM or checker. Incorporate, color-code, and staple these comments to the draft schedule. 6. This process shall repeat until the checker accepts the draft schedule without revisions or changes. 7. The schedule section color-coding scheme shall be the same as defined for check prints. 8. Sign and date the first page of all Final Design construction schedules.		1. Construction schedules shall be checked within one week of the preparation date. 2. Check the construction schedule to verify it satisfies project requirements and meets standards of good engineering practice. Examples of items to check include: c. Verify no project activities are missing, logic linking is appropriate, and durations are reasonable. d. Verify all design review comments are properly incorporated. e. Verify seasonal work restrictions, environmental limitations, moratoria, and similar schedule factors are shown. f. Verify an appropriate critical path is identified. 3. On completion of review, sign and date the first page of the construction schedule and return the draft section to the preparer for corrections. 4. On return of the draft from the preparer, re-check the construction schedule to verify all revisions or changes are incorporated. 5. This process shall repeat until the checker accepts the draft without revisions or changes. 6. The construction schedule color-coding scheme shall be the same as defined for drawings. 7. Sign and date the first page of all Final Design construction schedules.

**Attachment 3-6: QA/QC Procedure for Preparing and
Checking Construction Cost Estimates**

PREPARER		CHECKER
1. The construction cost estimate shall be prepared in accordance with Water Authority standards, the Design Manual, and the Scope. 2. On completion of a construction cost estimate, print a copy clearly marked as "DRAFT". 3. After signing and dating the first page of the construction cost estimate, transmit the draft construction cost estimate to the checker for review and comment. 4. On return of the draft construction cost estimate from the checker, incorporate any revisions or changes made by the checker. Make a second draft construction cost estimate in the manner described above, and transmit both draft construction cost estimates back to the checker. 5. As the design progresses, the preparer may also receive written design review comments from the DCPM or checker. Incorporate, color-code, and staple these comments to the draft construction cost estimate. 6. This process shall repeat until the checker accepts the draft construction cost estimate without revisions or changes. 7. The specification section color-coding scheme shall be the same as defined for check prints. 8. Sign and date the first page of all Final Design construction cost estimate.		1. Construction cost estimates shall be checked within one week of preparation date. 2. Check the construction cost estimate to verify it satisfies project requirements and meets standards of good engineering practice. Examples include: g. Verify the cost estimate conforms to the specified standards and is appropriate for the level of design development. h. Verify all Division 1 costs – insurance, bonds, submittals, substitution requests, temporary environmental controls, preconstruction videotaping and photos, CM field office, and the like – are included and reasonable. i. Verify all major cost items are included and the estimated amounts listed are reasonable. j. Verify sales taxes are included for purchased items. k. Verify markups, profit margins, and contingencies are included and correct. l. Verify mathematical computations. 3. Verify all design review comments are properly incorporated. 4. On completion of review, sign and date the first page of the construction cost estimate and return to the preparer for corrections. 5. This process shall repeat until the checker accepts the draft construction cost estimate without revisions or changes. 6. The construction cost estimate color-coding scheme shall be the same as defined for drawings under the paragraph titled "Design Contractor Checker." 7. Sign and date the first page of all Final Design construction cost estimates.

**Attachment 3-7: QA/QC Procedure for Preparing and
Checking Technical Memoranda and Reports**

PREPARER		CHECKER
1. Technical memoranda and reports shall be prepared in accordance with Water Authority standards, the Design Manual, and the Scope. 2. On completion of a technical memorandum or report, print a copy clearly marked as "DRAFT". 3. After signing and dating the first page of the draft technical memorandum or report, transmit the draft technical memorandum or report to the checker for review and comment. 4. On return of the draft section from the checker, incorporate any revisions or changes made by the checker. Make a second draft technical memorandum or report in the manner described above, and transmit both drafts back to the checker. 5. As the design progresses, the preparer may also receive written design review comments from the DCPM or checker. Incorporate, color-code, and staple these comments to the draft technical memorandum or report. 6. This process shall repeat until the checker accepts the draft technical memorandum or report without revisions or changes. 7. The technical memorandum or report section color-coding scheme shall be the same as defined for check prints. 8. Sign and date the first page of all final technical memorandum or report.		1. Technical memoranda and reports shall be checked within one week of the preparation date. 2. Check the technical memorandum or report to verify it satisfies project requirements and meets standards of good engineering practice. 3. Verify all proposed changes to Water Authority standards are clearly indicated. 4. Verify all design review comments are properly incorporated. 5. On completion of review, sign and date the first page of the technical memorandum or report and return the draft section to the preparer for corrections. 6. On return of the draft technical memorandum or report from the preparer, backcheck the technical memorandum or report to verify the revisions have been incorporated. 7. This process shall repeat until the checker accepts the draft technical memorandum or report without revisions or changes. 8. The technical memorandum or report color-coding scheme shall be the same as defined for drawings under the paragraph titled "Design Contractor Checker." 9. Sign and date the first page of all final technical memoranda or reports.

Attachment 3-8: QA/QC Checklist for Design Safety Review

Project: _____ CIP Project No.: _____ Reviewer: _____ Date Reviewed: _____ _____			
ITEM No:	SAFETY REQUIREMENT	Approved by:	Date Checked:
1.	Design in compliance with generally accepted safety standards applicable to the project type.		
2.	Design in compliance with specific safety standards and codes identified in the Design Manual, Predesign Report, Scope of Services, and other specified documents.		
3.	Facility safety audit conducted and approved.		
4.	Approved recommendations of the safety audit incorporated into the design.		
5.	Health and Safety in Operations (HASOP) review conducted.		
6.	Approved HASOP recommendations incorporated into the design.		
7.	Contract Documents reviewed to verify they contain appropriate safety requirements for the construction contractor, including requirements for the construction contractor to comply with the following:		
a)	Conduct an approved 10-Hour OSHA Safety Training Program for construction contractor supervisory personnel.		
b)	Provide a qualified or competent safety person (as defined in the contract documents) on the construction site at all times when work is being performed.		
c)	Submit an overall Site Safety Plan prior to the start of contract work.		
d)	Submit safety plans for temporary work. Such work shall not proceed without prior approval of these plans.		
e)	Comply with CalOSHA codes and requirements, including proper reporting of Incident and Accident Reports.		
f)	Provide safety instruction for employees, including requirements for developing Safe Plans of Action (SPAs).		
g)	Provide submittals for shoring, fall protection, confined space entry, and other safety issues, and to obtain approval prior to proceeding with the work.		
h)	Record safety issues in the daily work report.		
i)	Comply promptly with Safety Observation Reports (SORs) and other safety notices issued by the CM.		

Drawings Reviewed: Dwg No. _____ through _____
 Reviewed by: _____ Date: _____

Attachment 3-9: Architectural Interdisciplinary Checklist

Project Name: _____ Project No.: _____

		Completed	Not Applicable
1.	GRAPHICS		
1.	Check for North arrows on plan views of all drawings and verify orientation	☐	☐
2.	Verify all matchline drawing references	☐	☐
3	Verify that drawing titles and numbers match indexes	☐	☐
4.	Verify all section and detail references and orientation	☐	☐
5	Verify all abbreviations used are on abbreviation list	☐	☐
6	Verify all references in notes to see other drawings and correct	☐	☐
7.	Verify all architectural symbols used are on and/or agree with legend	☐	☐
8.	Verify directions indicated on all elevations match	☐	☐
9.	Verify all door swings are correct	☐	☐
10.	Verify that room names and numbers on plans match schedules	☐	☐
2.	SPECIFICATION	☐	☐
1.	Verify flashing material names, gauge, and construction match specification descriptions	☐	☐
2.	Verify sealant and caulking material names match specification descriptions	☐	☐
3.	Verify all materials listed in finish schedules are specified	☐	☐
3.	CIVIL		
1.	Using overlays or interdisciplinary layer plots, verify architectural structure locations match civil site layout	☐	☐
4.	STRUCTURAL		
1.	Using overlays or interdisciplinary plots, verify columns, walls, and dimensions match structural plans	☐	☐
2.	Verify architectural wall sections match structural	☐	☐
3.	Verify building expansion joints match structural	☐	☐
4.	Verify size and location of doors and windows match structural	☐	☐
5.	ELECTRICAL		
1.	Using overlays or interdisciplinary plots, verify reflected ceiling plan matches lighting fixture plan	☐	☐

Drawings Reviewed: Dwg No. _____ through _____
Reviewed by: _____ Date: _____

Attachment 3-10: Electrical Interdisciplinary Checklist

Project Name: _____ Project No.: _____

		Completed	Not Applicable
1.	GRAPHICS		
1.	Check for North arrows on plan views of all drawings and verify orientation	☐	☐
2.	Verify all matchline drawing references	☐	☐
3.	Verify drawing titles and numbers match index	☐	☐
4.	Verify all section and detail references and orientation	☐	☐
5.	Verify all abbreviations used are on abbreviation list	☐	☐
6.	Verify all references in notes to see other drawings are correct	☐	☐
7.	Verify electrical symbols used are on legend and/or are adequately noted	☐	☐
8.	Verify electrical schematics are provided for all 3-phase equipment	☐	☐
2.	SPECIFICATION		
1.	Verify horsepower ratings, phases, and voltages on one-line diagrams match mechanical equipment specifications	☐	☐
2.	Verify all references to granular material names in trench specifications match electrical details	☐	☐
3.	Verify all references to concrete indicate a grade or strength included in concrete specifications	☐	☐
3.	CIVIL		
1.	Using overlays or interdisciplinary layer plots, verify site electrical utilities do not interfere with yard piping	☐	☐
2.	Using overlays or interdisciplinary layer plots, verify site electrical poles or structures do not conflict with pavement or parking	☐	☐
3.	Verify trench excavation details are adequate for buried electrical beams	☐	☐
4.	STRUCTURAL		
1.	Using overlays or interdisciplinary layer plots, verify lighting fixtures do not conflict with structural plans	☐	☐
2.	Verify structural supports are provided for electrical equipment	☐	☐
5.	BUILDING SYSTEMS MECHANICAL		
1.	Using overlays or interdisciplinary layer plots, verify lighting fixtures do not conflict with HVAC equipment or ductwork	☐	☐
6.	INSTRUMENTATION		
1.	Verify names and/or numbers match those on P&IDs	☐	☐

Drawings Reviewed: Dwg No. _____ through _____
Reviewed by: _____ Date: _____

Attachment 3-11: Mechanical Interdisciplinary Checklist

Project Name: _____ Project No.: _____

		Completed	Not Applicable
1.	GRAPHICS		
1.	Check for North arrows on plan views of all drawings and verify orientation	☐	☐
2.	Verify all matchline drawing references	☐	☐
3.	Verify drawing titles and numbers match index	☐	☐
4.	Verify all section and detail references and orientation	☐	☐
5.	Verify all abbreviations used are on abbreviation list	☐	☐
6.	Verify all references in notes to see other drawings are correct	☐	☐
7.	Verify shutoff valves provided for all equipment	☐	☐
8.	Verify adequate maintenance space for removing filters, etc..	☐	☐
2.	SPECIFICATION		
1.	Verify same names and equipment numbers for each piece of equipment shown on drawings	☐	☐
2.	Verify same-type pipe joints shown as those specified	☐	☐
3.	Verify any pipe material callouts match specifications	☐	☐
4.	Verify all valve types shown match specifications	☐	☐
5.	Verify all equipment sizes designated on drawings match those in specifications	☐	☐
3.	CIVIL		
1.	Verify all new utilities and drains are connected to either new or existing site utilities	☐	☐
4.	ARCHITECTURAL		
1.	Using overlays or interdisciplinary plots, verify all plumbing fixtures match architectural locations	☐	☐
2.	Using overlays or interdisciplinary layer plots, verify roof drain locations and roof slopes match architectural roof plan	☐	☐
3.	Using overlays or interdisciplinary layer plots, verify air conditioners, heaters, and exhaust fans match architectural roof plan	☐	☐
4.	Verify wall chases are provided on architectural to conceal vertical pipeline	☐	☐
5.	STRUCTURAL		
1.	Verify adequate ceiling height at worst-case ductwork intersections with largest beams	☐	☐
2.	Verify structural supports are included for all HVAC equipment	☐	☐
3.	Using overlays or interdisciplinary layer plots, verify opening for roof penetrations are indicated don structural roof plans	☐	☐
6.	ELECTRICAL		
1.	Using overlays or interdisciplinary layer plots, verify all equipment is provided with power	☐	☐
2.	Verify that equipment names and/or numbers match those on one-line diagrams for all 3-phase motors	☐	☐

Drawings Reviewed: Dwg No. _____ through _____
Reviewed by: _____ Date: _____

Attachment 3-12: Civil Interdisciplinary Checklist

Project Name: _____ Project No.: _____

		Completed	Not Applicable
1.	GRAPHICS		
1.	Check for North arrows on plan views of all drawings and verify orientation	☐	☐
2.	Verify all matchline drawing references	☐	☐
3.	Verify drawing titles and numbers match index	☐	☐
4.	Verify all section and detail references and orientation	☐	☐
5.	Verify all abbreviations used are on abbreviation list	☐	☐
6.	Verify all reference in notes to see other drawings are correct	☐	☐
7.	Verify all sitework symbols used are on and/or agree with legend	☐	☐
8.	Verify all facilities and structure locations are defined on site plan	☐	☐
9.	Verify all yard piping and electrical utilities are shown on profiles at crossings to avoid conflict	☐	☐
10.	Verify lengths stated in profiles match stationing	☐	☐
11.	Verify air relief is provided at high points on pressure man profiles	☐	☐
2.	SPECIFICATION		
1.	Verify all references to granular material match specification names and descriptions	☐	☐
2.	Verify fence specifications material description matches details and site layout	☐	☐
3.	Verify names given on pavement details match specification names and descriptions	☐	☐
4.	Verify names and details given for drainage structure components and piping match specifications	☐	☐
5.	Verify all items in Civil Specifications indicated "as shown" or "as detailed" are actually on drawings	☐	☐
6.	Verify all references to concrete indicate a grade or strength included in specifications	☐	☐
3	PROCESS MECHANICAL		
1.	Verify all piping entering structures matched mechanical drawings for size, location and elevation	☐	☐

Drawings Reviewed: Dwg No. _____ through _____
Reviewed by: _____ Date: _____

Attachment 3-13: Instrumentation Interdisciplinary Checklist

Project Name: _____ Project No.: _____

		Completed	Not Applicable
1.	GRAPHICS		
	1. Verify all process line-continuation arrow numbers	☐	☐
	2. Verify drawing titles and numbers match index	☐	☐
	3. Verify all abbreviations are on abbreviation list	☐	☐
	4. Verify all symbols and line descriptions used are in legend and/or are adequately noted	☐	☐
	5. Verify all equipment names and major flow patterns match those on process flow diagram	☐	☐
	6. Verify sufficient space is provided to access the instrument panels	☐	☐
2.	STRUCTURAL		
	1. Verify structural supports are provided for instruments and panels	☐	☐
3.	ELECTRICAL		
	1. Verify electrical power provided for all instruments are required	☐	☐
	2. Where applicable, verify insulation and heat tracing have been indicated on P&IDs, when appropriate	☐	☐

Drawings Reviewed: Dwg No. _____ through _____
Reviewed by: _____ Date: _____

Attachment 3-14: Process Mechanical Interdisciplinary Checklist

Project Name: _____

Project No.: _____

		Completed	Not Applicable
1.	GRAPHICS		
	1. Check for North arrows on plan views of all drawings and verify orientation	☐	☐
	2. Verify all matchline drawing references	☐	☐
	3. Verify drawing titles and numbers match index	☐	☐
	4. Verify all section and detail references and orientation	☐	☐
	5. Verify all abbreviations used are on abbreviation list	☐	☐
	6. Verify all references in notes to see other drawings are correct	☐	☐
	7. Verify all mechanical symbols used are on legend or adequately noted	☐	☐
2.	SPECIFICATION		
	1. Verify same names and/or equipment numbers for each piece of equipment shown on drawings match specifications	☐	☐
	2. Verify same-type pipe joints shown as those specified for each service	☐	☐
	3. Verify any pipe material callouts match specifications	☐	☐
	4. Verify all gates (sluice, slide, etc.) shown or scheduled match specifications	☐	☐
	5. Verify all valve types shown match specifications for each service	☐	☐
	6. Verify all equipment sizes designated on drawings match those in specifications	☐	☐
3.	ELECTRICAL		
	1. Verify all 3-phase motors specified are shown on one-line diagrams and that names and/or numbers match	☐	☐
	2. Using overlays or interdisciplinary layer plots, verify each electric powered piece of equipment is located in same location as on mechanical drawings and that names and/or equipment numbers match	☐	☐
	3. Using overlays or interdisciplinary layer plots verify conduit and cable trays do not interfere with process piping	☐	☐
4.	STRUCTURAL		
	1. Using overlays or interdisciplinary layer plots and comparing dimensions, verify equipment layout similar with structural	☐	☐
	2. Verify similar elevations used for all slabs and walls	☐	☐
	3. Verify wall pipe types, location, size, and elevations are similar	☐	☐
	4. Verify same sizes and locations for all slab openings	☐	☐
	5. Verify adequate structural hoist supports provided for equipment removal	☐	☐
5.	BUILDING SYSTEMS MECHANICAL		
	1. Using overlays or interdisciplinary layer plots, verify duct work does not conflict with process piping	☐	☐
	2. Verify adequate floor drains are provided for all wet equipment	☐	☐
6.	INSTRUMENTATION		
	1. Verify same equipment names and/or numbers used on mechanical drawings and P&IDs	☐	☐
	2. Verify same drawings and/or numbers used on mechanical and instrumentation drawings	☐	☐

Drawings Reviewed: Dwg No. _____ through _____

Reviewed by: _____ Date: _____

Attachment 3-15: Structural Interdisciplinary Checklist

Project Name: _____ Project No.: _____

		Completed	Not Applicable
1.	GRAPHICS		
1.	Check for North arrows on plan views of all drawings and verify orientation	☐	☐
2.	Verify all matchline drawing references	☐	☐
3.	Verify drawing titles and numbers match index	☐	☐
4.	Verify all section and detail references and orientation	☐	☐
5.	Verify all abbreviations used are on abbreviation list	☐	☐
6.	Verify all references in notes to see other drawings are correct	☐	☐
7.	Verify structural symbols used are on legend and/or that they are adequately noted	☐	☐
8.	Verify schedule provided for all columns and footings match details	☐	☐
9.	Verify schedules for concrete beams match	☐	☐
10.	Verify all weld symbols are correct	☐	☐
2.	SPECIFICATION		
1.	Verify structural notes on drawings are identical to specifications description (preferable not to have structural notes on drawings)	☐	☐
3.	ARCHITECTURAL		
1.	Using overlays or interdisciplinary plots, verify depressed or raised concrete slabs match architectural plans	☐	☐
2.	Verify all slab elevations match structural plans	☐	☐
3.	Verify there is not cross bracing across door or window openings	☐	☐
4.	PROCESS MECHANICAL		
1.	Using overlays or interdisciplinary plots, verify equipment pad locations match equipment locations	☐	☐
5.	BUILDING MECHANICAL		
1.	Using overlays or interdisciplinary plots, verify equipment pad locations match equipment locations	☐	☐

Drawings Reviewed: Dwg No. _____ through _____
Reviewed by: _____ Date: _____

Attachment 3-16: Pipeline Constructability Checklist

Attachment 3-16: Pipeline Constructability Checklist						
Project: _____		CIP Project No.: _____				
Reviewer: _____		Date Reviewed: _____				
ITEM No:	CONSTRUCTABILITY ITEM	Yes	No	N/A	Initials	Date
8.	Title and General Sheets:					
a)	Project title and number					
b)	Standard north arrow					
c)	Drawing scale					
d)	Vicinity map					
e)	Location map					
f)	Major streets identified					
g)	Work limits, table					
h)	Benchmark, datum, field notes					
i)	Work to be done paragraph					
j)	Traffic control notes					
k)	Special notes					
l)						
9.	Title Block:					
a)	Drawing title					
b)	Drawing numbers					
c)						
10.	Drawings -- General:					
a)	All disciplines in agreement					
b)	Notes and call-outs agree with specification					
c)	Construction control points with stations					
d)	Accurate scales on plans and profiles					
e)	Bearing and distance on all pipelines					
f)	All sheets in set consecutively numbered					
g)	Special structures					
h)	Reference and standard drawings					
i)	Section, elevation, and detail call-outs					
j)						
11.	Drawings – Plans:					
a)	Agrees with profiles					
b)	New pipeline with all appurtenances – fittings, valves, manholes, vaults, meters, instruments, SCADA,					

Attachment 3-16: Pipeline Constructability Checklist						
Project: _____		CIP Project No.: _____				
Reviewer: _____		Date Reviewed: _____				
ITEM No:	CONSTRUCTABILITY ITEM	Yes	No	N/A	Initials	Date
	corrosion protection, blowoffs, air/vacuum release valves, vents, flow and pressure control stations, special crossings, etc.					
c)	Stationing continuous from start to finish					
d)	Dimensioning					
e)	Correct matchlines on drawings					
f)	Horizontal scales					
g)	Ownership, lot, right-of-way, and easement lines					
h)	Water lines and appurtenances					
i)	Sewer lines and appurtenances					
j)	Storm drains and appurtenances					
k)	Gas lines and appurtenances					
l)	Electric lines, ductbanks, boxes, and appurtenances					
m)	Telephone lines, ductbanks, boxes, and appurtenances					
n)	Cable TV, fiber optic lines, boxes, and appurtenances					
o)	Streets and street names					
p)	Trolley and railroad lines with names					
q)						
12.	Drawings – Profiles:					
a)	Agrees with plans					
b)	New pipeline with all appurtenances – fittings, valves, manholes, vaults, meters, instruments, SCADA, corrosion protection, blowoffs, air/vacuum release valves, vents, flow and pressure control stations, special crossings, etc.					
c)	Stationing continuous from start to finish					
d)	Dimensioning					
e)	Correct matchlines on drawings					
f)	Vertical and horizontal scales					
g)	Water lines					
h)	Sewer lines					
i)	Storm drains					
j)	Gas lines					
k)	Electric lines and ductbanks,					
l)	Telephone lines and ductbanks,					

Attachment 3-16: Pipeline Constructability Checklist

Project: _____ CIP Project No.: _____

Reviewer: _____ Date Reviewed: _____

ITEM No:	CONSTRUCTABILITY ITEM	Yes	No	N/A	Initials	Date
m)	Cable TV and fiber optic lines					
n)	Crossing streets and street names					
o)	Crossing trolley and railroad lines with names					
p)						
13.	Drawings – Details:					
a)	Trench cross section					
b)	Pipe joint and welding cross section					
c)	Buttstraps and couplings					
d)	Special fittings, crossings, and connections					
e)	Manholes					
f)	Valve installations					
g)	Blowoffs and air/vacuum release valves					
h)	Flow and pressure control facilities					
i)	Metering facilities					
j)	Other details as required					
k)						
14.	Drawings – Other:					
a)	Mechanical					
b)	Structural					
c)	Electrical					
d)	Instrumentation and SCADA					
e)	Landscaping					
f)	Curb (pedestrian) ramps					
g)	Street and surface resurfacing					
h)	Work by others					
i)						

Drawings Reviewed: Dwg No. _____ Through _____

Reviewed by: _____ Date: _____

Attachment 3-17: Calculations Sign-Off Checklist

DESCRIPTION OF ITEM REVIEWED	CALC NAME(S) & PAGE NO.	REVIEWER INITIALS	DATE	COMMENTS
All disciplines accounted for – civil, structural, mechanical, electrical, instrumentation and control, transient (surge) analysis, any others in project				
Signed, dated by preparer				
Signed, dated by checker w/in 1 week of preparation				
Checkers verification included – verify preparer calc; recalc by different method				
Revisions noted, signed, dated by preparer and checker				
Signed, dated by reviewer				
Stamped, signed, dated by PE – final calc only				
Certified by project manager – final calc only				

By signing this form, I accept the contents of the items named above in the document being reviewed, subject to the comments indicated.

Typed/Printed Name

Typed/Printed Title

Signature

Date

Attachment 3-18: Construction Contractor Safety Sign-Off Checklist

DESCRIPTION OF ITEM REVIEWED	LOCATION OF ITEM IN DOCUMENT	REVIEWER INITIALS	DATE	COMMENTS
Verify adequacy of Contract Document language for the following:				
• Submittal of Contractor Safety Plan				
• Review of Contractor Safety Plan Submittal				
• "Sole responsibility for safety" language for contractor				
• Safety training for contractor personnel				
• Personal protective equipment (PPE) requirements				
• Compliance with "laws/regulations" language				
• Accident/Incident reporting requirements				
• Monitor/recording activities				
• Work stoppages				
• Notices of non-compliance				
• Handling of visitors to the construction site				
• Safety Audits and required responses				
• CALOSHA inspections				
• Emergency Response Actions				
• Other safety requirements				

By signing this form, I accept the contents of the items named above in the document being reviewed, subject to the comments indicated.

_____ Typed/Printed Name	_____ Typed/Printed Title
_____ Signature	_____ Date

Attachment 3-19: Drawings Sign-Off Checklist

DESCRIPTION OF ITEM REVIEWED	DRAWING NUMBER	REVIEWER INITIALS	DATE	COMMENTS
Correct format – size, border, title block, revision block, line weights, lettering style and size, other drafting standards, etc.				
Electronic files – meet drafting standards				
Correct discipline and sheet numbering system used				
Correct information on general sheets – project title and number, location and vicinity maps, general and other notes, symbols legend, abbreviations, references to code and standards				
Environmental and other permit requirements shown				
PFD and P&ID show process completely and correctly				
Civil, mechanical, electrical, other disciplines agree with P&ID and PFD				
No conflict between engineering disciplines				
No conflict between drawings and specification				
Project shown completely and correctly, including access routes and laydown areas				
Jurisdiction limits shown – county, cities, Indian reservations, federal, private property, other limits				
Limits of contract identified				
Property acquisition requirements shown				
Environmental issues identified and requirements shown				
Plans and profiles – piping shown correctly				
Structural plans, elevations, sections, details acceptable				
Correct building and seismic codes used				
Mechanical plans, elevations, sections, details acceptable				
Provision for O&M access				
Level of instrumentation and control redundancy appropriate for system; agrees with PDP				
Electrical drawings agree with civil, mechanical, I&C, and other disciplines				
Architectural and landscaping drawings agree with PDP				

By signing this form, I accept the contents of the items named above in the document being reviewed, subject to the comments indicated.

Typed/Printed Name

Typed/Printed Title/Dept

Signature

Date

Chapter 4 Design Development

Overview

Purpose This chapter describes Design Contractor requirements and responsibilities at each level of design development, from the Basis of Design Report through the final Construction Document submittal.

Topics This chapter is composed of the following topics:

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4.1 Design Phase

4.1.1 General

1. The design phase of a project starts with issuance of the notice to proceed (NTP) to the Design Contractor and ends with the completion and acceptance of the Final Design documents.
2. Prior to the start of the design phase, a Predesign (Planning) Report will be completed that will contain the following minimum elements:
 - 2.1. Definition of objectives and description.
 - 2.2. Alternatives analysis culminating in the preferred alternative.
 - 2.3. Sufficient environmental information to initiate CEQA process.
 - 2.4. Preliminary hydraulic analysis.
 - 2.5. Sufficient right-of-way analysis to initiate acquisition of property or easements.
 - 2.6. Level 5 project cost estimate.
 - 2.7. Planning level operating plan, including a discussion of operation during normal, emergency, start-up, and shutdown modes.
 - 2.8. Planning level operations and maintenance (O&M) impact analysis.
 - 2.9. Planning level life cycle cost analysis
 - 2.10. Planning level project schedule.
3. The Design Contractor's responsibilities during the design phase of a project shall include:
 - 3.1. Prepare basis of design report (BODR)
 - 3.2. Prepare construction documents
 - 3.3. Prepare owner procurement documents
 - 3.4. Organize and coordinate in Value Engineering review
 - 3.5. Prepare construction cost estimates
 - 3.6. Assist in program scheduling
 - 3.7. Complete QA/QC reviews
 - 3.8. Provide planning/environmental assistance
 - 3.9. Assist in land acquisition, permits, and rights-of-way
 - 3.10. Assist in public information program
 - 3.11. Implement SCOOP compliance program
 - 3.12. Prepare permit applications

- 3.13. Obtain approval of plan checks
 - 3.14. Prepare O&M manuals
 - 3.15. Prepare O&M impact report
 - 3.16. Prepare life-cycle cost analysis
 - 3.17. Manage claims avoidance
 - 4. Additional Design Contractor responsibilities are defined in Chapter 18, Bid and Award Phase, Chapter 19, Construction Phase, Chapter 20, Startup, Commissioning, Closeout, and Warranty, and elsewhere in the Design Contractor Guide.
-

**4.1.2
Purpose**

- 1. The purpose of this chapter is to establish the Design Contractor's deliverable milestones, define the contents of each deliverable package, and describe the reviews to be conducted by the Water Authority for the facilities necessary to implement the project.
 - 2. Internal reviews required to be conducted by the Design Contractor and reviews normally conducted by the Water Authority are defined in Chapter 3, QA/QC Program.
-

4.2 Investigations Reports and Technical Memoranda

4.2.1 Investigations Reports and Technical Memo- randa

1. The investigations reports, technical memoranda, and other investigations documents prepared and submitted by the Design Contractor shall include the following:
 - 1.1. Review the Water Authority's Lessons Learned files and incorporate applicable recommendations derived from experience on previous projects. Submit a Lessons Learned memorandum report within 30 days of NTP.
 - 1.2. Records Research Coordination Report. See Chapter 5 for additional requirements.
 - 1.3. Utility Coordination Report. See Chapter 5 for additional requirements.
 - 1.4. Field Investigations and Potholing Report. See Chapter 5 for additional requirements.
 - 1.5. Surveying, Mapping, and Aerial Photogrammetry Report. See Chapter 6 for additional requirements.
 - 1.6. Rights-of-Way, Easements, Encroachments, and Land Acquisition documents. See Chapter 7 for additional requirements.
 - 1.7. Geotechnical investigations reports, including field investigations, engineering and material characteristics and testing, geotechnical design criteria, conclusions, and recommendations. See Chapter 8 for additional requirements.
 - 1.8. As-Built (As-Graded) Reports, including placement of fill, compaction testing, other testing, as-graded conditions, conclusions, and recommendations. See Chapter 19 for additional requirements.
 - 1.9. Seismic Reports, including description of field investigations, conclusions, and recommendations. See Chapter 8 for additional requirements.
 - 1.10. Hazardous Materials Report. See Chapter 8 for additional requirements.
 - 1.11. Hydraulic and Transient Analysis Report, including system description, analysis procedure, conclusions, and recommendations. See Chapter 9 for additional requirements.
 - 1.12. Environmental Compliance, Permitting Support, and Public Coordination, including identification of permits and required coordination, environmental compliance (California Environmental Quality Act review, special monitoring and permitting requirements, noise control, visual aesthetics, water quality,

site contamination), public information requirements, including moratoria, public outreach, and coordination. See Chapter 10 for additional requirements.

- 1.13. Traffic control report, including design procedure and requirements to be included in the Contract Documents. See Chapter 13 for additional requirements.
 - 1.14. Project risk analysis as defined in Chapter 11, Risk Management.
 - 1.15. Recommendations for equipment to be procured by the Water Authority. See Chapter 17 for additional requirements.
-

4.3 Basis of Design Report

4.3.1 Basis of Design Report

1. When included in the Design Contractor's Scope, the Basis of Design Report (BODR) shall be developed prior to the start of Preliminary Design. Some less complex projects may not require a BODR. The BODR is normally preceded by a Predesign Report (also called a Planning Study). The BODR includes:
 - 1.1. A statement of the purpose and objectives of the project
 - 1.2. An assessment of existing conditions
 - 1.3. A determination of future requirements
 - 1.4. The identification of major alternatives (including facility sites, alignments, configurations, processes, materials, and construction methods)
2. The BODR shall provide:
 - 2.1. A concise, definitive description of the alternatives evaluated and the facilities recommended for detailed design. This description typically includes:
 - 2.1.1. A presentation of design criteria.
 - 2.1.2. Summary descriptions of major systems.
 - 2.1.3. Description of how the project will incorporate corrosion control and SCADA into the existing system, and mitigate transients and surge.
 - 2.1.4. Preliminary drawings.
 - 2.1.5. Preliminary risk analysis report.
 - 2.1.6. Description of operation during normal, emergency, start-up, and shutdown modes.
 - 2.1.7. Impact on other parts of the system.
 - 2.1.8. Other supporting information.
 - 2.2. A re-evaluation of the original Predesign Report if conditions have changed significantly.
 - 2.3. An expanded description of the recommended design, including critical processes, materials of construction, key design features, and volumes or flow rate pressure needs or constraints.
 - 2.4. Facility arrangements at or along the project site.
 - 2.5. Identification of utilities, agencies, and governmental jurisdictions with which the project will interact.

- 2.6. Preliminary construction cost estimate and schedule according to the requirements of Chapter 15.
 3. The BODR serves the following specific purposes:
 - 3.1. Technical Guide for Conducting the Project Design. The BODR shall provide the basic outline of plans for each design discipline (process, civil, general mechanical systems, structural, electrical, instrumentation and control, and architectural). Because it presents preliminary information on all aspects of the design, it shall serve as a technical guide for completing the final design.
 - 3.2. Document for Review. The draft BODR shall provide a document for formal in-house QA/QC review by the Design Contractor and the subsequent review by the Water Authority. Its preparation will require coordination with the Water Authority to select alternatives, resolve technical issues, define the process, define requirements for ancillary facilities, establish space and support requirements, define requirements for future operation and maintenance, and define architectural concepts, among other steps. Changes resulting from these reviews shall be incorporated into the final BODR which, upon approval by the Water Authority, will become the basis for preparing the detailed design documents. The final BODR shall be used as a baseline for defining scope changes.
 - 3.3. Convenient Reference Guide for the Water Authority and Design Contractor. In addition to its use by the project design team, the BODR will be distributed to Water Authority management, design staff, and operations and maintenance staff as a convenient guide for review, coordination, and reference.
 - 3.4. Definition of Scope for Subcontractors. Because it defines overall work requirements, the BODR can be used as a tool to establish the scope of services for Design Contractor's subcontractors participating in the project design.
 - 3.5. Tool for Interdisciplinary Communication. The BODR establishes a baseline document for discussion between disciplines. Summarizing essential project-related information in one document, the BODR optimizes communication between disciplines.
 4. Refer to Attachment 4-1 for a typical BODR outline for a pump station project. The outline for other types of facilities, including pipelines, pressure and flow control facilities, regulating reservoirs, would be revised according to the needs of the project.
-

4.4 Preliminary Design Submittal Package

4.4.1 Preliminary Design Submittal

1. The Preliminary Design submittal package shall include the following minimum elements:
 - 1.1. Investigations and Technical Memoranda complete and approved. Includes records research, field investigation, surveying, determination of environmental and other permit requirements, preliminary property acquisition requirements, geotechnical investigation, corrosion survey, potholing, risk analysis report, and others.
 - 1.2. Hydraulic and transient (surge) analysis complete and approved.
 - 1.3. Comments from BODR review incorporated.
 - 1.4. Approved comments from Value Engineering incorporated.
 - 1.5. List of special conditions, if any.
 - 1.6. An Exceptions Report memorandum detailing any proposed exceptions from Water Authority standards or BODR comments. Provide explanations for each exception.
 - 1.7. Specification table of contents in CSI format – complete and finished. Refer to Chapter 14 for additional information.
 - 1.8. Process control strategy descriptions – complete and finished, including tag numbers.
 - 1.9. Structural, mechanical, and other calculations – prepared and checked, but not certified by DCPM. Shall include a system description, formulas used, references, assumptions, manufacturer's catalog data, and the mathematical computation, as described in Chapter 14.
 - 1.10. Preliminary construction schedule. Refer to Chapter 15 for specific requirements.
 - 1.11. Preliminary construction cost estimate. Refer to Chapter 15 for specific requirements.
 - 1.12. Preliminary life cycle cost analysis in a format suitable for input to the Water Authority's Maximo system. Refer to Chapter 16 for additional requirements
 - 1.13. Preliminary O&M impact analysis in a format suitable for input to the Water Authority's Maximo system. Refer to Chapter 16 for additional requirements.
 - 1.14. Preliminary design-stage O&M Manual, including a table of contents and draft description of the project process, in a format suitable for input to the Water Authority's Maximo sys-

tem. Refer to Chapter 16 for additional requirements.

- 1.15. Preliminary equipment list, anticipated delivery schedules, and recommendations for pre-purchase of equipment and/or materials by the Water Authority.
- 1.16. Memorandum report for input into the Water Authority's Lessons Learned database.

**4.4.2
Preliminary Design Drawing
Submittal**

1. As a minimum, the Preliminary Design submittal package shall contain the following drawings prepared in accordance with ESD-120, Drafting Manual:
 2. Requirements from environmental documents and permits, and from other permits, shall be shown on the drawings.
 3. Preliminary right of way and property acquisition requirements shall be shown on the drawings.
 4. Complete and finished drawings, including plans, profiles, schematics, elevations, sections, and details:
 - 4.1. Title sheet, including project name, Water Authority name and logo, title and signature blocks, date blocks, specification number, and other required information.
 - 4.2. General drawing(s), including vicinity and location maps, drawing list, general and project notes, legend of existing and new improvements, section and detail designation list, abbreviation and symbols list, agency index, project basis of bearings and benchmark data, and project construction sign.
 - 4.3. Piping and instrumentation diagrams (P&IDs), including instrument tag numbers, type of instrumentation and control philosophy, all primary and secondary control devices (elements, transmitters, etc.), valve and equipment numbers, equipment names and power requirements, pipe sizes and materials, pipe identification numbers, process flow direction arrows, and identification of the primary process flow path.
 - 4.4. Process flow diagrams (PFDs), including flow rates, pressures, fluid types, and temperatures (if applicable). Sufficient PFD sheets shall be provided to show all operating configurations and conditions including emergency operations.
 - 4.5. Civil and mechanical general arrangement drawings, including project boundaries, access routes, and Construction Contractor laydown areas. Equipment numbering system shall be finalized. Limits of construction and interfaces with the existing system shall be identified. Utilities, piping connections, and roadways shall be shown.

- 4.6. Piping plan and profile drawings, showing pipeline horizontal and vertical alignments, current topographic and culture mapping, location, size, and material of existing utilities adjoining and crossing pipeline alignment, existing roadways, existing structures, and existing grade above center of pipeline alignment. Profiles shall show existing ground surface elevations directly above the pipeline alignment, and the size and location of existing utilities crossing the pipeline alignment.
 - 4.7. Electrical schematics, motor control centers, and electrical single-line diagrams.
 - 4.8. Area designation drawings.
 - 5. Preliminary drawings – complete in concept, but some details may be missing:
 - 5.1. Civil drawings, showing site plan with current topographic and culture mapping, existing utilities, site improvements, facility layout, grading, and yard piping. Existing utilities shall be plotted and existing facility horizontal controls and elevations shall be confirmed with a current survey.
 - 5.2. Structural drawings locating all major system structures. Establish layouts for structural design. Establish the main structural system and detailed design approach for each structural component.
 - 5.3. Mechanical drawings showing major equipment, pipe sizes, work clearances, equipment spacing, and access.
 - 5.4. Architectural drawings establishing the preliminary architectural design and show building floor plans, exterior elevations, and roof plans.
 - 5.5. Landscape architectural drawings showing a concept design complete and ready for review. Show all areas to be revegetated as open space, including access routes and laydown areas. Show hardscape and planting areas, grading, and berming. Describe the plant palette.
 - 5.6. Electrical site layouts showing locations of switchgear, transformers, main motor control centers, emergency power generation systems, and other equipment.
 - 5.7. Equipment control schematic diagrams.
 - 5.8. Traffic control conceptual drawings and permit applications.
-

4.5 Mid-Point Design Submittal Package

4.5.1 Mid-Point Design Submittal Pack- age

1. The Mid-Point Design submittal package shall include the following minimum elements:
 - 1.1. Updated investigations reports, technical memoranda, transient analysis, and calculations with revisions signed by preparer and checker.
 - 1.2. Updated construction schedule. Refer to Chapter 15 for specific requirements.
 - 1.3. Updated life cycle cost analysis.
 - 1.4. Updated O&M impact analysis.
 - 1.5. Updated design-stage O&M Manual, including a complete description of the project process with flowcharts and other aids to explain the process, O&M requirements, manufacturer's catalog data, and selected design drawings.
 - 1.6. Construction cost estimate updated to the Mid-Point Design level. Refer to Chapter 15 for specific requirements.
 - 1.7. Complete specification in CSI format, including the Mitigation and Monitoring Report (MMRP), other permitting and environmental requirements, equipment data sheets, and drafts of sections developed by the Design Contractor. Refer to Chapter 14 for additional information.
 - 1.8. Updated equipment list with equipment data sheets, anticipated delivery schedules, and recommendations for pre-purchase of equipment and/or materials by the Water Authority.
 - 1.9. An Exceptions Report memorandum detailing any proposed exceptions from Water Authority standards or Preliminary Design comments. Provide explanations for each exception.
 - 1.10. A preliminary list of submittals and shop drawings required to be submitted by the Construction Contractor.
 - 1.11. A preliminary facility shutdown and tie-in plan. Refer to Chapter 19, Construction Phase, for additional information and requirements.
 - 1.12. Updated memorandum report for input into the Water Authority's Lessons Learned database.

4.5.2 Mid-Point Design Drawings Sub-

1. The Mid-Point Design submittal package shall include the following minimum drawings prepared in accordance with ESD-120, Drafting

mittal

Manual:

- 1.1. Requirements from environmental documents and permits, and from other permits, shall be shown on the drawings.
 - 1.2. Final right of way and property acquisition requirements shall be shown on the drawings.
 - 1.3. Complete and finished drawings, including plans, profiles, elevations, schematics, sections, and details:
 - 1.3.1. Civil, mechanical, architectural, landscape, and corrosion control drawings.
 - 1.3.2. Equipment control schematics.
 - 1.3.3. Corrosion control plans, elevations, layouts, and details.
 - 1.3.4. Traffic control drawings and permit applications.
 - 1.4. Mid-Point level drawings – some sections and details may be partially complete:
 - 1.4.1. Structural drawings.
 - 1.4.2. Electrical Drawings:
 - 1.4.2.1. Power block diagrams, single-line diagrams, and motor control diagrams complete.
 - 1.4.2.2. Panel, duct-bank, pull box, and cable/conduit schedules partially complete.
 - 1.4.2.3. Electrical equipment elevations partially completed.
 - 1.4.2.4. Power and control layouts partially complete.
 - 1.4.2.5. Lighting plans partially completed.
 - 1.4.2.6. Grounding plans partially completed.
-

4.6 Conformed Mid-Point Design Submittal Package

4.6.1 Conformed Submittal

1. Following receipt of design review comments from the Water Authority, the Design Contractor shall incorporate all design review comments and submit the conformed Mid-Point Design documents to the Design Manager for review and acceptance.

4.6.2 Conformed Submittal Proc- ess

1. If the conformed submittal is not accepted by the Design Manager, it will be returned to the DCPM for additional development and re-submittal. Such additional development and resubmittal shall be at no additional cost to the Water Authority.
 2. The process shall repeat until the conformed submittal is accepted by the Design Manager. Upon acceptance, the Design Manager will issue written notice to the DCPM to proceed to the next design development level.
-

4.7 Final Design Submittal

4.7.1 Final Design Submittal

1. The Final Design shall be complete in all respects, and shall include:
 - 1.1. All comments from the design review process complete and incorporated, or otherwise resolved and accepted by the Design Manager.
 - 1.2. All comments incorporated from Value Engineering, bidability and constructability review, operability review, safety review, and comments from other reviews not part of the standard design review process.
 - 1.3. All comments from CEQA and other environmental permitting processes incorporated.
 - 1.4. Investigations reports, technical memoranda, and transient analysis complete and updated, signed and dated by preparer, checker, and approver.
 - 1.5. Calculations complete and updated, signed and dated by preparer, checker, and approver.
 - 1.6. All drawings in all disciplines complete and prepared in accordance with ESD-120, Drafting Manual, and signed and dated by preparer, checker, and approver. Requirements from environmental documents and permits, and from other permits, shall be shown on the drawings. Right of way and property acquisition requirements shall be shown on the drawings.
 - 1.7. Specification complete in CSI format, including the Mitigation and Monitoring Report (MMRP), other permitting and environmental requirements, and drafts of sections developed by the Design Contractor, and signed and dated by preparer, checker, and approver.
 - 1.8. Final equipment list with equipment data sheets, anticipated delivery schedules, and recommendations for pre-purchase of equipment and/or materials by the Water Authority.
 - 1.9. Construction schedule complete and updated, and signed and dated by preparer, checker, and approver. Refer to Chapter 15 for specific requirements.
 - 1.10. Construction cost estimate complete and updated to the Final Design level, and signed and dated by preparer, checker, and approver. Refer to Chapter 15 for specific requirements.
 - 1.11. Final life-cycle cost analysis complete and updated, and

signed and dated by preparer, checker, and approver.

- 1.12. Final O&M impact analysis complete and updated, and signed and dated by preparer, checker, and approver.
- 1.13. Final design-stage O&M Manual, complete and updated, and signed and dated by the preparer, checker, and approver.
- 1.14. An Exceptions Report memorandum detailing any proposed exceptions from Water Authority standards or Mid-Point Design comments. Provide explanations for each exception.
- 1.15. A final list of submittals and shop drawings required to be submitted by the Construction Contractor.
- 1.13. A final facility shutdown and tie-in plan.
- 1.16. Final memorandum report for input into the Water Authority's Lessons Learned database.
- 1.17. Other documents required by the Scope complete and updated, signed and dated by preparer, checker, and approver.

**4.7.2
Permit Acquisition**

- 1. The Design Contractor shall coordinate with the Water Authority and the agency (or agencies) having jurisdiction at the project location to determine if permits are required. The Design Contractor shall use the Final Design documents to apply for and obtain plan check approvals for building permits, if building permits are required for the project. This shall include any required electrical, mechanical, plumbing, fire, or similar permits.
 - 2. The Design Contractor shall use the Final Design documents to apply for and obtain any other permits that are required to construct the project. Comments made by permitting authorities or agencies shall be incorporated by the Design Contractor into the design documents.
-

4.8 Conformed Final Design Submittal

4.8.1 Conformed Submittal

1. Following receipt of design review comments from the Water Authority, the Design Contractor shall incorporate all design review comments and submit the conformed Final Design documents to the Design Manager for review and acceptance.
2. All comments from building permit applications, plan checks, and similar processes for permits required to construct the project shall be incorporated by the Design Contractor.

4.8.2 Conformed Submittal Process

1. If the conformed submittal is not accepted by the Design Manager, it will be returned to the DCPM for additional development and resubmittal. Such additional development and resubmittal shall be at no additional cost to the Water Authority.
 2. The process shall repeat until the conformed submittal is accepted by the Design Manager. Upon acceptance, the Design Manager will issue written notice to the DCPM to proceed to the next design development level.
-

4.9 Construction Document Submittal

4.9.1 Design Complete

1. The construction document submittal shall be complete and ready to bid in all respects, and shall include:
 - 1.1. Documents described in Final Design and conformed Final Design submittals.
 - 1.2. Documents certified, sealed, and signed as required elsewhere in the Design Contractor Guide.
 2. A final Exceptions Report memorandum detailing any exceptions from Water Authority standards or Final Design comments shall be submitted. Provide explanations for each exception. The final Exceptions Report shall be approved in writing by the Design Manager.
-

4.10 Submittal Requirements

4.10.1 Elements of Submittals

1. Submittals shall include but not be limited to the items listed in Attachment 4-2, Submittal Requirements. Additional items may be required by the Scope or other parts of the Contract.
-

4.11 Water Authority Reviews

4.11.1 Design Progress Reviews

1. The Water Authority will conduct design progress reviews for each project at the BODR, Preliminary, Mid-Point, and Final levels of design development. Progress reviews will be conducted by a team of experienced reviewers and will include examinations of the specification, calculations, drawings, schedule, cost estimate, and other required documents. These reviews are not substitutes for the Design Contractor's internal QA/QC process nor do they absolve the Design Contractor from responsibility for providing an accurate, complete, and technically correct design.
2. Design progress review comments and responses will be recorded and tracked until completion of satisfactory resolution is verified by the Water Authority. Refer to Attachment 4-5 for an example of a Design Review Comment-Response spreadsheet.
3. The Design Contractor shall respond to all written design progress review comments, suggestions, and recommendations transmitted by the Design Manager, and, for the Mid-Point and Final Design submittals, shall incorporate the design review comments into the design prior to the next conformed design submittal. If the Design Manager determines comments have not been incorporated, the design will be returned to the DCPM for further development at no additional cost to the Water Authority.

4.11.2 O&M Reviews

1. General: O&M reviews will be conducted by experienced O&M staff at all design development levels. The DCPM shall respond to all written O&M comments, suggestions, and recommendations transmitted by the Design Manager and shall incorporate the O&M review comments into the design prior to the next submittal.
2. Review Issues: Items to be considered during an O&M Review include but are not limited to:
 - 2.1. Can an operator or maintenance person safely access equipment that may require attention? Is there laydown room for equipment components and tools? Is there room for removal of equipment?
 - 2.2. Has standby equipment been provided for use when critical equipment must be removed? Are isolation valves provided?
 - 2.3. Has consideration been given to sole source procurement for equipment or products that are already in use at the site to minimize inventory of spare parts?

- 2.4. Does the process control strategy meet the needs of the operational staff?
 - 2.5. Does the O&M staff have favorable experience with the equipment specified?
 - 2.6. Does the facility have any unsafe areas? If unsafe areas cannot be eliminated, are they clearly indicated?
 - 2.7. Does the location of equipment and circuit breakers or motor control centers provide for safe operation, maintenance, and repairs?
 - 2.8. Have OSHA issues, including confined space entry, been adequately addressed?
 - 2.9. Have Water Authority security issues been adequately addressed?
 - 2.10. Does the project require a shutdown of the Water Authority system and have related issues been adequately addressed? Has the proposed shutdown been discussed with and approved by the O&M Department?
 - 2.11. Do the project documents provide the required equipment data to serve the Water Authority's Maximo requirements?
 - 2.12. Does the project provide seamless integration into the Water Authority's current and planned corrosion control system?
 - 2.13. Does the project provide seamless integration into the Water Authority's current and planned SCADA system?
 - 2.14. Will the project conform to system-wide criteria for transients and surge?
-

**4.11.3
Bidability and
Constructability
Reviews**

1. **General:** A bidability-constructability review scrutinizes the design from the perspective of a Construction Contractor and may be conducted at any level in the design development process.
 - 1.1. The review will examine the design for clarity and completeness and will verify the facility described in the specification and drawings can be constructed and is free from problems that may increase costs unnecessarily. A design that requires complex, difficult to build items when simpler construction would perform satisfactorily, or unusual materials and custom fabrication techniques when standard materials and techniques would suffice equally well, are examples of potentially avoidable high cost features. Ambiguous or ill-defined requirements that may lead to requests for clarifications and/or change orders will be flagged in this review. Reviewers will verify the design contains provisions that require the Construction Contractor

tor to properly plan, control, and conduct the work and to carry out construction in a safe manner.

2. **Responsibilities:** Following the review, the Design Manager will transmit written comments to the DCPM. The DCPM shall incorporate the bidability-constructability review comments into the design prior to the next design submittal.
3. **Review Issues:** Items that may be considered during a bidability-constructability review include but are not limited to:
 - 3.1. On projects with contracts that overlap in time or in use of the same site, check that each contractor's responsibilities, constraints and work boundaries are clearly specified and that the Contract Documents clearly reflect the presence of the work of other contractors.
 - 3.2. Check that delivery, storage and installation responsibilities for Owner-procured equipment and materials are clearly spelled out.
 - 3.3. Check to see that reasonable space is provided for each Construction Contractor's operations. Temporary easements or rights-of-way must be shown and must agree with environmental documents. Space allocations must be explicit in the Contract Documents.
 - 3.4. Verify the project can be conducted safely.
 - 3.5. Compare the drawings and the specification: Can all requirements of the specification be reasonably accomplished?
 - 3.6. Verify the important features upon which substitutes and "or equals" will be judged are clear.
 - 3.7. Special provisions in the specification must include allowable durations of equipment outage when the Construction Contractor must tie into existing operating equipment. All sequencing requirements must be clear.
 - 3.8. Verify that major construction components are buildable with conventional construction methods unless a compelling reason exists to specify otherwise.
 - 3.9. Verify that the specification and drawings are clear about temporary operating facilities or special conditions, access routes and laydown areas, hours of construction, and other limitations or restrictions imposed by the site.
 - 3.10. Review the configuration of building components for unnecessary construction difficulties.
 - 3.11. Consider whether the allowed construction duration is reasonable.

- 3.12. Identify any conflicts, ambiguities or omissions that may result in change orders.

**4.11.4
Value Engineering Review**

1. A Value Engineering (VE) review may be conducted under the direction of the Water Authority prior to the start of design. In these situations, the approved VE recommendations will be included in the Scope.
2. In situations where VE was not conducted prior to the start of design, or when additional VE is desired, the Scope may contain provisions requiring the Design Contractor to engage a third-party VE team to conduct these VE reviews under the direction of the Design Contractor.
3. Value Engineering (VE) is a process used to systematically analyze a project to improve its cost-effectiveness without sacrificing quality. VE provides the most benefit when conducted early in a project after the basic outlines of the project have been established, but before the effort of defining details. VE is conducted in intense, two-to-five day workshop sessions, and results in a report containing recommendations for improving the project value.
4. If required, the DCPM shall prepare project information and provide technical support for the VE team, within design budget constraints, and make a presentation to the VE team at the orientation session early in the VE process. This presentation shall discuss the design objectives, concept, and status.
5. A typical VE review shall include the following:
 - 5.1. Facilitator – usually an outside consultant hired to conduct the VE review, but also could be a qualified member of the Design Contractor staff not directly associated with the project. In either case, the proposed VE facilitator shall be approved in writing by the Design Manager prior to the start of the VE workshop.
 - 5.2. Review team – usually five to seven people (an odd number works the best) selected to evaluate the project. Members of the review team are stakeholders in some manner, technical or non-technical, and may be from within or without the CIP or SDCWA organization. If a project affects a community, one or more residents may be asked to participate. A diverse group often yields the best results.
 - 5.3. Stakeholders – any person or group that may be affected by the project.
 - 5.4. Kickoff meeting – the Design Contractor, facilitator, and review team will present the project to a group of invited stakeholders.

Other members of the Design Contractor's staff may also need to participate in the kickoff meeting. In addition to presenting the project to the stakeholders, the goals and schedule of the VE review will be defined.

- 5.5. Project design review – the facilitator and review team will conduct a detailed review of the design. Outside personnel may be called in if some design aspect or implication is not well understood.
- 5.6. Alternatives development and evaluation – the facilitator encourages development of alternatives to measures presented in the design. Usually a brainstorming technique is employed to list alternatives, and then the facilitator assigns groups of the review team to evaluate each proposed alternative and prepare a short written report. The alternatives list will always include “no change” and “no project” alternatives.
- 5.7. Development of preferred alternatives – the end result of the evaluation process is a list of preferred alternatives, including life cycle cost analyses for each.
- 5.8. Draft VE report – the facilitator will assign the tasks of developing different sections of the report to the review team. A written draft VE report will be prepared.
- 5.9. VE presentation – elements of the draft VE report will be extracted and condensed to prepare the presentation, usually in a PowerPoint format. The facilitator will assign each reviewer a portion of the presentation to present. The stakeholders, including the DCPM and possibly others from the Design Contractor's staff, will be reassembled. The presentation, including recommendations and potential cost savings of each, will be made by the review team. Discussions of the recommendations will follow. Comments will be incorporated and draft VE reports (either handwritten or computer generated) will be distributed.
- 5.10. Response to the VE report – the stakeholders and the Design Contractor will review the draft VE report and will provide written responses. The facilitator will coordinate resolution of disagreements. This may be done via e-mail, conference calls, or reassembling the VE review team, Design Contractor, and stakeholders in a face-to-face session.
- 5.11. The Design Contractor will review the VE recommendations and prepare written responses to each proposal. The Design Manager will review the VE recommendations and the Design Contractor's responses for impacts to the program intent and objectives, and may make additional responses. The Water Authority will accept or reject each proposed VE recommenda-

tion, providing supporting reasons for the decision and, where feasible, life-cycle cost comparisons.

- 5.12. Final VE report – after all issues are resolved, the facilitator will prepare and issue the final VE report for implementation. All recommendations will include life cycle cost analyses, impacts on project schedule, and identify any special requirements or conditions that could impact the recommendation.
 6. The Design Contractor shall incorporate VE recommendations approved by the Water Authority into the design prior to the next submittal.
 7. Follow-up VE reviews may be conducted later in the design after additional detail is developed. The procedure for follow-up VE review is similar to the above, except it may be abbreviated. The Design Consultant shall incorporate recommendations developed during the follow-up VE reviews and approved by the Water Authority into the design prior to the next submittal.
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4.12 Design Review Comments

4.12.1 Design Review Comment Proc- ess

1. The Water Authority's design submittal review process involving the Design Contractor consists of the following steps:
 - 1.1. The Design Contractor will make an oral presentation (or presentations) describing the design to Water Authority project review staff at each design submittal level.
 - 1.2. The Design Manager will collect and compile review comments and transmit compiled review comments to the DCPM.
 - 1.3. The Design Contractor shall prepare and submit a written draft response containing a proposal for the disposition of each review comment. The Design Manager will review this draft response and take one or more of the following actions:
 - 1.3.1. Accept the response as stated.
 - 1.3.2. Resolve minor issues by phone, fax, or e-mail.
 - 1.3.3. Arrange a meeting with the DCPM to resolve major conflicts with the Design Contractor's response.
 - 1.4. The Design Manager shall then prepare and transmit a written response to the Design Contractor that defines the agreed-upon disposition of each design review comment.
 - 1.5. The Design Manager may arrange a meeting with the Design Contractor for a final review of responses to design review comments. The Design Manager will issue a signed confirmation of the agreed-upon project design development and, for the Mid-Point and Final Design submittals, an authorization for the Design Contractor to prepare a conformed submittal that incorporates all design review comments.
 - 1.6. The Design Contractor shall incorporate all design review comments into the design documents as indicated in the final written response, and, for the Mid-Point and Final Design submittals, submit the conformed submittal to the Design Manager for review and acceptance.
 - 1.6.1. If the Design Manager does not accept the conformed submittal, it will be returned for corrections at no additional cost to the Water Authority.
 - 1.6.2. This process will repeat until the Design Manager accepts the conformed submittal and issues written authorization to proceed to the next level of design.
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Attachment 4-1: Typical BODR Outline

Attachment 4-1: Typical BODR Outline	
SECTION	TITLE
1.	Introduction • Introduction • Scope of Services
2.	Re-evaluation of Predesign Report (if required) • Discussion of Design Factors Changed Since Predesign Report was Completed • Description of Alternatives Evaluated • Comparison of Alternatives • Summary and Revised Recommendations
3.	Evaluation of BODR Alternatives • Description of Alternatives Evaluated • Comparison of Alternatives • Summary and Recommendations • Description of Future Successfully Completed Project
4.	Description of Process Design Criteria • Process Design Criteria • System Descriptions • Hydraulic Design
5.	Geotechnical Investigations and Design Criteria • Design Codes and Standards • Seismic Protection • Slope Stability (if applicable)
6.	Site Development and Civil Design Criteria • Design Codes and Standards • Building Arrangements • Roads, Parking and Paving • Process and Yard Piping • Drainage and Erosion Control • Interacting Utilities, Agencies, and Governmental Jurisdictions
7.	Structural Design Criteria • Design Codes and Standards • Design Loads • Reinforced Concrete and Foundation Design • Structural Steel Design
8.	Architectural Design Criteria • Building Codes and Standards • Building Architecture Concept • Noise Control
9.	Mechanical Systems Design Criteria • Design Codes and Standards • Pumps, Hoists, Compressors, and Other Mechanical

Attachment 4-1: Typical BODR Outline	
SECTION	TITLE
	Equipment • Mechanical Process Equipment and Piping • HVAC • Corrosion Protection • Plumbing Codes • Fire Protection
10.	Electrical Design Criteria • Design Codes and Standards • Power Distribution • Lighting • Communications • Corrosion Control • Standby Power Requirements
11.	Instrumentation, Control, and Monitoring System Design Criteria • Design Philosophy • Hardware Requirements • Computer Interfaces • Telemetry/Radio/SCADA • Software • Control Strategies
12.	Assessment of Required Environmental and Other Permits • Identification of Required Permits • Assessment of Impacts to the Project • Applications for Long-Lead Permits, Including Developing the Required Information
Appendix A	Preliminary Construction Contract Drawing List
Appendix B	Preliminary Drawings • Process Flow Diagram (PFD) • Piping and Instrumentation Diagram (P&ID) • Site Plan(s) • Hydraulic Profile
Appendix C	Calculations
Appendix D	Preliminary AACEI Level 4 Construction Cost Estimate
Appendix E	Preliminary Life Cycle Cost Analysis
Appendix F	Preliminary Construction Schedule
Appendix G	Topographic Survey

Attachment 4-2: Submittal Requirements

Submittals shall include but not be limited to the items listed below. Additional items may be required by the Scope or other parts of the Contract.

SUBMITTAL ELEMENT	DESCRIPTION	NUMBER OF COPIES SUBMITTED				
		BODR	PRELIMINARY DESIGN	MID-POINT DESIGN	FINAL DESIGN	CONSTRUCTION DOCUMENT SUBMITTAL
Specification	Printed single-sided on 8½"x11", white, 20-pound, bond paper.	NA	NA	10 (1 - conformed)	10 (1 - conformed)	NA
	CD-R data disks in Microsoft Word format. The Specification shall be a single Word file, i.e., sections and divisions shall be linked together and not saved as separate files.	NA	NA	2 (1 - conformed)	2 (1 - conformed)	2
	Final Specification shall be complete and updated, first pages signed and dated by preparer, checker, and approver, and first pages sealed and wet-signed by the DCPM.	NA	NA	NA	NA	1
Drawings	Bound sets printed on 22"x34" (full-sized), white, 20-pound bond paper.	NA	2	2 (0 - conformed)	2 (0 - conformed)	NA
	Bound sets printed on 11"x17" (half-sized), white, 20-pound bond paper.	NA	8	8 (5 - conformed)	8 (5 - conformed)	8
	Electronic drawing submittal in AutoCAD format per ESD-120, Drafting Manual.	NA	2	2 (1 - conformed)	2 (1 - conformed)	2
	Final Drawings shall be one complete set printed on 22"x34" (full-sized) 18-lb, white, translucent, bond paper. Drawings shall be sealed, signed, and dated as specified. All drawings in all disciplines shall be complete and updated, and signed and dated by preparer, checker, and approver, and sealed and wet-signed by the DCPM. Signatures, initials, and dates shall be permanent and wet-ink (not printed or plotted).	NA	NA	NA	NA	1
Calculations	Bound sets printed on 8½"x11", white, 20-pound bond paper. Some sheets may need to be 11"x17".	5	5	5 (1 - conformed)	5 (1 - conformed)	NA
	CD-R data disks in PDF electronic format.	2	2	2 (0 - conformed)	2 (0 - conformed)	2
	Final calculations shall be complete and updated, signed and dated by preparer, checker, and approver, and first pages sealed and wet-signed by the DCPM.	NA	NA	NA	NA	1 set of each calculation
Investigations Reports, Technical Memoranda, and Transient Analysis	Bound documents printed on 8½"x11", white, 20-pound bond paper. Some sheets may need to be 11"x17".	5	5	5 (1 - conformed)	5 (1 - conformed)	NA
	CD-R data disks in Microsoft Word format for each document	2	2	2 (0 - conformed)	2 (0 - conformed)	2
	Final investigations reports, technical memoranda, and transient analysis shall be complete and updated, signed and dated by preparer, checker, and approver, and first pages sealed and wet-signed by the DCPM.	NA	NA	NA	NA	1 copy of each
Construction Schedule	Bound sets printed on 11"x17" (half-sized), white, 20-pound bond paper.	10	10	10 (1 - conformed)	10 (0 - conformed)	10 (not signed)

SUBMITTAL ELEMENT	DESCRIPTION	NUMBER OF COPIES SUBMITTED				
		BODR	PRELIMINARY DESIGN	MID-POINT DESIGN	FINAL DESIGN	CONSTRUCTION DOCUMENT SUBMITTAL
	CD-R data disks in approved electronic format.	2	2	2 (0 - conformed)	2 (0 - conformed)	2
	The construction schedule shall be complete and updated, signed and dated by preparer, checker, and approver, and signed and sealed by the DCPM.	NA	NA	NA	NA	1
Construction Cost Estimate	Bound document printed on 8½"x11" or 11"x17" white, 20-pound bond paper.	10	10	10 (1 - conformed)	10 (1 - conformed)	10 (not signed)
	CD-R data disks in approved electronic format.	2	2	2 (1 - conformed)	2 (1 - conformed)	2
	The final construction cost estimate shall be complete and updated to the Final Design level, signed and dated by preparer, checker, and approver, and signed and sealed by the DCPM.	NA	NA	NA	NA	1
Life-Cycle Cost Analysis	Bound document printed on 8½"x11", white, 20-pound bond paper.	5	5	5 (1 - conformed)	5 (1 - conformed)	NA
	CD-R data disks in format in a format suitable for input to the Water Authority's Maximo system.	2	2	2 (0 - conformed)	2 (0 - conformed)	2
	The final life-cycle cost analysis shall be complete and updated to the Final Design level, signed and dated by preparer, checker, and approver, and signed and sealed by the DCPM.	NA	NA	NA	NA	1
O&M Impact Report	Bound document printed on 8½"x11", white, 20-pound bond paper. Some parts may need to be sized 11"x17".	5	5	5 (1 - conformed)	5 (1 - conformed)	NA
	CD-R data disks in a format suitable for input to the Water Authority's Maximo system.	2	2	2 (0 - conformed)	2 (0 - conformed)	2
	The final O&M Impact Report shall be complete and updated to the Final Design level, signed and dated by preparer, checker, and approver, and signed and sealed by the DCPM.	NA	NA	NA	NA	1
O&M Manual	Bound document printed on 8½"x11", white, 20-pound bond paper. Some parts may need to be sized 11"x17".	5	5	5 (2 - conformed)	5 (2 - conformed)	NA
	CD-R data disks in a format suitable for input to the Water Authority's Maximo system.	2	2	2 (0 - conformed)	2 (0 - conformed)	2
	The final design-stage O&M Manual shall be complete and updated to the Final Design level, signed and dated by preparer, checker, and approver, and signed and sealed by the DCPM.	NA	NA	NA	NA	1
Exceptions Report	Stapled or bound memorandum printed on 8½"x11", white, 20-pound bond paper.	5	5	5 (1 - conformed)	5 (1 - conformed)	NA
	CD-R data disks in Microsoft Word and/or Excel format.	2	2	2 (0 - conformed)	2 (0 - conformed)	2
	The final Exceptions Report memorandum shall be signed and dated by the DCPM and	NA	NA	NA	NA	1

SUBMITTAL ELEMENT	DESCRIPTION	NUMBER OF COPIES SUBMITTED				
		BODR	PRELIMINARY DESIGN	MID-POINT DESIGN	FINAL DESIGN	CONSTRUCTION DOCUMENT SUBMITTAL
	Design Manager.					
Equipment List, Data Sheets, and Pre-Purchase Recommendations Report	Stapled or bound memorandum printed on 8½"x11", white, 20-pound bond paper.	5	5	5 (1 - conformed)	5 (1 - conformed)	NA
	CD-R data disks in Microsoft Word and/or Excel format. Equipment List shall be in a format suitable for input to the Water Authority's Maximo system.	2	2	2 (0 - conformed)	2 (0 - conformed)	2
	The final Equipment List and Pre-Purchase Recommendations Report memorandum shall be signed and dated by the DCPM and Design Manager.	NA	NA	NA	NA	1
Lessons Learned Report	Stapled or bound memorandum printed on 8½"x11", white, 20-pound bond paper.	5	5	5 (1 - conformed)	5 (1 - conformed)	NA
	CD-R data disks in Microsoft Word and/or Excel format.	2	2	2 (0 - conformed)	2 (0 - conformed)	2
	The final Lessons Learned memorandum shall be signed and dated by the DCPM and Design Manager.	NA	NA	NA	NA	1
Other Documents	Other documents required by the Scope or other parts of the Contract shall be submitted as bound documents printed on 8½"x11", white, 20-pound bond paper. Some sheets may need to be 11"x17".	5	5	5 (1 - conformed)	5 (1 - conformed)	NA
	CD-R data disks in Microsoft Word and/or Excel, or other approved electronic format.	2	2	2 (0 - conformed)	2 (0 - conformed)	2
	Final documents shall be complete and signed and dated by preparer, checker, and approver, and signed and sealed by the DCPM.	NA	NA	NA	NA	1

Attachment 4-3: Checklist of Chapter 4 Deliverables

ATTACHMENT 4-3 CHECKLIST OF DESIGN CONTRACTOR DELIVERABLES LISTED IN CHAPTER 4, DESIGN DELIVERABLES This list is presented as a convenience only and may not be complete. Refer to Design Manual chapters for additional requirements.				
DESIGN DEVELOPMENT LEVEL	DELIVERABLE	DATE DUE	DATE REC'D	DATE ACCEPTED
Investigations Refer to Section 4.2 for additional information and requirements	Lessons Learned review report	1/		
	Records research coordination report	2/		
	Utility coordination report.	2/		
	Field investigations and potholing report	2/		
	Surveying, mapping, and aerial photogrammetry report	2/		
	Rights-of-way, easements, encroachments, and land acquisition report	2/		
	Geotechnical investigations report	2/		
	As-built (as-graded) report	3/		
	Seismic report	2/		
	Hazardous materials report	2/		
	Hydraulic and transient analysis report	2/		
	Environmental compliance, permitting support, and public coordination report	2/		
	Traffic control report	2/		
	Project risk management plan	1/		
	Owner-procured equipment / material report	2/		
NOTES: 1/ = within 30 days from NTP; 2/ = prior to Preliminary Design submittal; 3/ = during construction;				
Basis of Design Report Refer to Section 4.3 and Attachment 4-1 for additional information and requirements	Statement of the purpose and objectives	4/		
	Assessment of existing conditions	4/		
	Determination of future requirements	4/		
	Re-evaluation of the original predesign report	4/		
	Identification and evaluation of major alternatives	4/		
	Expanded description of the recommended design	4/		
	Facility arrangements at or along the project site, including preliminary layouts and drawings in all disciplines	4/		
	Sufficient environmental information to initiate the CEQA process	4/		
	Identification of land purchase and ROW requirements.	4/		
NOTE: 4/ = With BODR submittal				

ATTACHMENT 4-3 CHECKLIST OF DESIGN CONTRACTOR DELIVERABLES LISTED IN CHAPTER 4, DESIGN DELIVERABLES This list is presented as a convenience only and may not be complete. Refer to Design Manual chapters for additional requirements.				
DESIGN DEVELOPMENT LEVEL	DELIVERABLE	DATE DUE	DATE REC'D	DATE ACCEPTED
Preliminary Design Submittal Refer to Section 4.4 and Attachment 4-2 for additional information and requirements	Investigations and technical memoranda	5/		
	Special conditions list	5/		
	Exceptions report memorandum	5/		
	Specification table of contents	5/		
	Process control strategy descriptions	5/		
	Calculations	5/		
	Preliminary construction schedule	5/		
	Preliminary construction cost estimate	5/		
	Preliminary life cycle cost analysis	5/		
	Preliminary O&M impact analysis	5/		
	Preliminary Design stage O&M Manual	5/		
	Preliminary equipment list	5/		
	Complete and finished drawings:			
	Title sheet	5/		
	General drawings	5/		
	Piping and instrumentation diagrams (P&IDs)	5/		
	Process flow diagrams (PFDs)	5/		
	General arrangement drawings	5/		
	Piping plan and profile drawings	5/		
	Electrical schematics, MCCs, and single-line drawings	5/		
	Preliminary drawings:			
	Civil	5/		
	Structural	5/		
	Mechanical	5/		
	Architectural	5/		
	Landscape	5/		
	Electrical	5/		
	Control schematics	5/		
	Corrosion control	5/		
	Traffic control	5/		
NOTE: 5/ = With Preliminary Design submittal				

ATTACHMENT 4-3 CHECKLIST OF DESIGN CONTRACTOR DELIVERABLES LISTED IN CHAPTER 4, DESIGN DELIVERABLES This list is presented as a convenience only and may not be complete. Refer to Design Manual chapters for additional requirements.				
DESIGN DEVELOPMENT LEVEL	DELIVERABLE	DATE DUE	DATE REC'D	DATE ACCEPTED
Mid-Point Design Submittal Refer to Section 4.5 and Attachment 4-2 for additional information and requirements	Updated reports, schedules, cost estimates, calculations, and other documents submitted at Preliminary Design	6/		
	Complete specification	6/		
	List of construction contractor submittals	6/		
	Shutdown and tie-in plan	6/		
	Completed drawings:			
	Civil, mechanical, architectural, landscape, and corrosion control	6/		
	Equipment control schematics	6/		
	Traffic control drawings and permit applications	6/		
	Mid-Point level drawings:			
	Structural	6/		
	Electrical	6/		
NOTE: 6/ = With Mid-Point Design submittal				
Conformed Mid-Point Design Submittal Refer to Section 4.6 and Attachment 4-2 for additional information and requirements	Mid-Point Design submittal documents with design review comments incorporated.	Prior to start of Final Design		
Final Design Submittal Refer to Section 4.7 and Attachment 4-2 for additional information and requirements	All reports, schedules, cost estimates, calculations, drawings, specification, and other documents complete and final.	With Final Design submittal		
Conformed Final Design Submittal Refer to Section 4.8 and Attachment 4-2 for additional information and requirements	Final Design submittal documents with design review, plan check, and other comments incorporated.	Prior to Construction Document submittal		

ATTACHMENT 4-3 CHECKLIST OF DESIGN CONTRACTOR DELIVERABLES LISTED IN CHAPTER 4, DESIGN DELIVERABLES This list is presented as a convenience only and may not be complete. Refer to Design Manual chapters for additional requirements.				
DESIGN DEVELOPMENT LEVEL	DELIVERABLE	DATE DUE	DATE REC'D	DATE ACCEPTED
Construction Document Submittal Refer to Section 4.9 and Attachment 4-2 for additional information and requirements	Conformed Final Design reports, schedules, cost estimates, calculations, drawings, specification, and other documents complete and final, certified, sealed, and signed.	With Construction Document submittal		

Attachment 4-4: Checklist of Other Deliverables

ATTACHMENT 4-4 CHECKLIST OF DESIGN CONTRACTOR DELIVERABLES LISTED IN CHAPTERS OTHER THAN CHAPTER 4, DESIGN DELIVERABLES This list is presented as a convenience only and may not be complete. Refer to Design Manual chapters for additional requirements.					
CHAPTER	PARAGRAPH	DELIVERABLE	DATE DUE	DATE REC'D	DATE ACCEPTED
1 Introduction and Administration	1.5.1	Deviation Request	As required		
	1.6.3; 2.3.1	Work Progress Report	Monthly		
	1.6.5	Change Impact Report	As required		
	1.6.6; 2.2	Project Schedule	1/		
	1.6.6; 2.2	Schedule Updates	Monthly		
	1.6.9	SCOOP Report	Quarterly		
	1.6.10; 2.3.2	Invoices	Monthly		
NOTE: 1/ = Within 30 days from NTP					
2 Design Cost and Schedule Control	1.6.6; 2.2	Project Schedule	1/		
	1.6.6; 2.2	Schedule Updates	Monthly		
	1.6.3; 2.3.1	Work Progress Report	Monthly		
	1.6.10; 2.3.2	Invoices	Monthly		
NOTE: 1/ = Within 30 days from NTP					
3 QA/QC Plan	3.2.3.2.4	QA/QC Plan	2/		
NOTE: 2/ = Within 10 days from NTP					
18 Bid and Award Phase	18.4.2	Responses to Bidder Questions	As required		
	18.4.3	Drawings and Other Support for Addenda Preparation	As required		
	18.5	Bid Evaluation Report	As required		
	18.6	Conformed Set of Contract Documents	Prior to construction start		
19 Construction Phase	19.2	As-Graded Geotechnical Investigation	During construction		
	19.4	Responses to Requests for Information (RFIs)	During construction		
	19.5	Drawings and Other Support for Change Order Preparation	During construction		
	19.6	Responses to Contractor Submittals	During construction		
	19.7	Shutdown and Tie-In Plan	During Design		
	19.8	Responses to Substitution Requests and Cost Reduction Proposals	During construction		

ATTACHMENT 4-4 CHECKLIST OF DESIGN CONTRACTOR DELIVERABLES LISTED IN CHAPTERS OTHER THAN CHAPTER 4, DESIGN DELIVERABLES This list is presented as a convenience only and may not be complete. Refer to Design Manual chapters for additional requirements.					
CHAPTER	PARAGRAPH	DELIVERABLE	DATE DUE	DATE REC'D	DATE ACCEPTED
	19.9	Field Evaluation and Test Reports	Prior to startup		
	19.11	Engineering Considerations and Communication Report	Prior to startup		
20 Startup and Commissioning, Closeout, and Warranty	20.2	Responses to the Final Integration Plan	Prior to startup		
	20.3	Responses to the Startup and Testing Plan	Prior to startup		
	20.3	Responses to Factory Test Reports	Prior to startup		
	20.3	Responses to Field Test Reports	After startup		
	20.3	Conformance to Intent of Design Report	After startup		
	20.4.1	Record Drawings	After startup		
	20.4.2	Operator Training Plan	Prior to operator training		

**Attachment 4-5
Example Design Submittal Comment-Response Form**

Project Title: _____ CIP Project Number: _____ [Preliminary] [Mid-Point] [Pre-Final] Design Submittal San Diego County Water Authority Date Submitted: _____											
Reviewers (Water Authority):											
Responders (Design Contractor):											
Reviewer Initials	Dwg. No. Spec. No. Calc. Title	Page No.	Comment No.	Comment	Initial DC ¹ Response/ Resolution	Final DC ² Response/ Resolution	Comments ³ in Conformed Submittal	DC - Check ⁴ Conformed Submittal Comments	Team - Check ⁵ Conformed Submittal Comments	DC - Check ⁶ Next Submittal Comments	Team - Check ⁷ Next Submittal Comments
Date & Signature											
			1								
			2								
			3								
			4								
			5								
Footnotes:											
1 - Initial Design Contractor (DC) response to the comments including whether comment will be incorporated or not and if not, state why. Responder initials shall be included with the response. Date and signature by the Design Contractor Project Manager (DCPM)											
2 - Final DC response to the comments following meeting with the project team to close the loop on the comments having schedule, budget, or technical issues. Responder initials shall be included with the response. Date and signature by the DCPM											
3 - The list of comments prepared by the Water Authority Project Team (Team) to be incorporated into the conformed submittal. Date and signature by the DM											
4 - DC attesting that each comment in the selected conformed-set comments (footnote 3) is incorporated appropriately. This attestation shall accompany the conformed set submittal. Date and signature by the DCPM											
5 - Team confirming that each comment in the selected conformed-set comments (footnote 3) is incorporated appropriately. Date and signature by the DM											
6 - DC attesting that each comment is incorporated appropriately. This attestation shall accompany the submittal. Date and signature by the DCPM											
7 - Team confirming that each comment is incorporated appropriately. Date and signature by the DM											

Chapter 5 **Records Research, Utility Coordination, and Field Investigations**

Overview

Purpose This chapter outlines the Design Contractors responsibilities in researching existing and planned utilities, and coordinating with public and utilities agencies including the Water Authority Right of Way Department.

Topics This chapter is composed of the following topics:

<u>CHAPTER 5</u>	<u>RECORDS RESEARCH, UTILITY COORDINATION, AND FIELD INVESTIGATIONS</u>	<u>5</u>
5.1	INTRODUCTION	5-1
5.2	PROCEDURE FOR UTILITY COORDINATION.....	5-2
5.2.1	REFER TO THE PROJECT PLANNING STUDIES	5-2
5.2.2	CONDUCT RECORDS RESEARCH	5-2
5.2.3	VERIFY OR IMPLEMENT NECESSARY TOPOGRAPHICAL SURVEYS	5-3
5.2.4	IDENTIFY THE PRELIMINARY PROJECT ALIGNMENT / CONFIGURATION.....	5-4
5.2.5	CONDUCT POTHOLING	5-4
5.2.6	PREPARE PRELIMINARY LOCATION / ALIGNMENT PLANS	5-6
5.2.7	COORDINATE WITH IMPACTED AGENCIES	5-7
ATTACHMENT 5-1 –	STEPS TO SECURE NO OBJECTION FROM UTILITIES / AGENCIES.....	5-9

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5.1 Introduction

1. This chapter provides guidelines for coordinating with various public utilities and agencies on design work performed as part of the Water Authority's projects. The Design Contractor shall investigate, research, coordinate, and provide other services necessary to ensure that the design minimizes unforeseen conflicts with existing or planned utilities during construction. In all cases, the Design Contractor shall coordinate with utilities and agencies to locate existing and proposed facilities to minimize disruptions to or modifications of existing utilities.
 2. Typical utilities that may be encountered in the implementation of the Water Authority's projects include:
 - 2.1. Potable water pipelines
 - 2.2. Television cables
 - 2.3. Reclaimed water pipelines
 - 2.4. Electric power Lines
 - 2.5. Sewers and force mains
 - 2.6. Street lights
 - 2.7. Storm drains
 - 2.8. Railroad and light rail transit
 - 2.9. Traffic control signal loops
 - 2.10. Roads and highways
 - 2.11. Oil and gas pipelines
 - 2.12. Telephone lines
 - 2.13. Telecommunication cables
 - 2.14. Cathodic protection devices
 - 2.15. Underground concrete vaults and other structures
 - 2.16. Underground ductbanks for telephone and electric utilities
-

5.2 Procedure for Utility Coordination

1. The Design Contractor shall follow the process outlined below to ensure utility coordination and avoid any conflict with existing and proposed location/alignment of new facilities.
 - 1.1. Refer to the project planning studies.
 - 1.2. Conduct records research.
 - 1.3. Verify or implement necessary topographical and surface culture surveys.
 - 1.4. Identify the preferred project alignment/configuration,
 - 1.5. Conduct potholing.
 - 1.6. Prepare preliminary location/alignment plans.
 - 1.7. Coordinate with impacted agencies.
 2. The following sections are detailed descriptions of the above items:
-

5.2.1 Refer to the Project Planning Studies

1. The Design Contractor shall collect available planning studies and/or pre-design reports on the project. The planning studies will include the intent of the project and proposed initial location/alignment of facilities. The Design Contractor shall study all the information provided in the planning studies. A topographical survey and aerial maps may be available along with the planning studies. An environmental framework and permitting requirements may also be available with the planning studies. The Design Contractor shall immediately alert the Design Manager of any additional special studies that are required to perform the design activities.
-

5.2.2 Conduct Records Research

1. The Design Contractor shall investigate existing and proposed utilities that may impact the design and/or construction of the Water Authority's project. It is crucial that a list of pertinent utilities be prepared in the early stages of the project. Owners of these utilities shall also be identified.
2. The Design Contractor shall collect record information of Water Authority-owned improvements, including water pipelines, sewers, storm drains, pump stations, and other improvements through the Right of Way Department of the Water Authority. Base maps, including available surveys, can be acquired from the Survey and Records Group of the Right of Way Department.
3. For each project, a right-of-way agent will be assigned to assist the

Design Contractor with title searches and gathering information on existing utilities. The Design Contractor shall coordinate with the assigned right-of-way agent in obtaining the most current maps and records of utilities within the project area. The right-of-way agent may provide the Design Contractor with contact information for the different utility agencies. It is to be noted that the utility coordination effort is the responsibility of the Design Contractor. The role of the right-of-way agent is only to help and assist. The following is a partial list of some utility agencies to contact. The Design Contractor shall coordinate with other utilities and agencies, as appropriate.

- 3.1. Caltrans (Director of Engineering)
 - 3.2. Cox Communications (Project Planning Supervisor)
 - 3.3. MCI (Investigations Team Leader)
 - 3.4. MTDB Trolley (Right-of-Way Manager)
 - 3.5. North County Transit (Right-of-Way)
 - 3.6. City of San Diego
 - 3.7. County of San Diego
 - 3.8. United States Navy
 - 3.9. San Diego Gas & Electric Company (Real Estate Operations)
 - 3.10. Time Warner TV Cable (Director of Construction)
 - 3.11. Sprint (Outside Plant Engineer)
 - 3.12. AT&T (Operations Supervisor)
 - 3.13. Underground Service Alert (Administrative Assistant)
4. The Design Contractor shall keep the Design Manager informed of the records research efforts. The Design Contractor shall maintain a file for each public utility and agency, which includes records of all correspondence, submittals, and discussions about the project. A copy of these files shall be sent to the Design Manager upon request. The Design Contractor shall conduct the appropriate QA/QC procedures throughout the design process to ensure that utility coordination requirements are fulfilled.

**5.2.3
Verify or
Implement
Necessary
Topographical
Surveys**

1. The Design Contractor shall thoroughly check the topographical survey performed for the project, if one is available. It is the Design Contractor's responsibility to verify and certify the survey information provided to them. Spot checks may be required to verify the accuracy of the performed survey. The Water Authority Right-of-Way Department (Survey and Records Group) will facilitate the communication between the Design Contractor and the Survey

Contractor to resolve or clarify any issues that the Design Contractor may have on the performed survey.

2. If no survey is available, the Design Contractor shall conduct the necessary topographical and surface culture surveys, and aerial mapping in accordance with guidelines outlined in Chapter 6 of this Guide. The survey shall highlight surface features as manholes, vaults, vents, storm inlets, etc., from which the Design Contractor can obtain valuable information on existing utilities.
 3. The Design Contractor shall conduct field visits to confirm that topography and utility structures shown on the topographical and surface culture surveys are accurately represented on the drawings.
-

**5.2.4
Identify the
Preliminary
Project
Alignment /
Configuration**

1. Based on all the gathered information, surveys, and field visits, the Design Contractor shall lay out one or more preliminary locations/alignments of the project. The selected locations should, if possible, completely avoid existing and known-planned utilities. This process is a continuous effort that goes in parallel with the gathered information and surveys.
-

**5.2.5
Conduct
Potholing**

1. The Design Contractor shall conduct adequate potholing during the design phase to confirm the locations, bearing, elevations, depths, and dimensions of buried utilities. The Design Contractor shall prepare a potholing plan for the project. The Design Manager shall review the plan for approval prior to implementation.
2. The potholing plan shall be coordinated with all impacted utilities, including the Water Authority, and the Design Contractor shall secure their approval prior to conducting any excavation or potholing work.
3. At a minimum, potholing shall be performed at locations where the proposed facility crosses or ties into major existing utilities. In some cases, the identification of potential conflicts may make it necessary to pothole at additional tie-in points and crossing points, as well as other sites where the proposed facility is close to an existing utility.
4. All potholing performed in the public right-of-way shall be performed in accordance with the requirements of the Traffic Engineer of the agency having jurisdiction (refer to Chapter 13 of this Guide for more information). As soon as the potholing results are received, the Design Contractor shall immediately update the project plans and modify the design, if necessary. The Design Contractor shall submit a copy of the pothole results report to the Design Manager for review and acceptance.

5. The Design Contractor shall follow the following guidelines for potholing.
 - 5.1. Coordinate all potholing activities with Underground Service Alert (DigAlert; Tel. 800-227-2600).
 - 5.2. Large potholes for large underground structures, large crossing utilities, etc. These potholes shall be of sufficient size, approximately 10 feet by 10 feet, to permit evaluation of underground conditions. The Design Contractor shall excavate and expose all proposed underground piping at tie-ins to the Water Authority's water system.
 - 5.2.1. At each excavation, survey and determine accurate locations, elevations, connection requirements, and pipe condition with respect to corrosion, other deterioration, and suitability for the proposed tie-ins. All concrete encasements, whether for pipelines or other utilities, shall be surveyed and identified.
 - 5.3. Small potholes. The Design Contractor shall excavate sufficient small potholes to verify (or determine) accurate locations and elevations of significant utility crossings and existing piping to be removed or replaced in the Project. Special attention shall be paid to locating large or difficult to move underground facilities such as high pressure gas lines, electrical, telephone, TV cable, or fiber optic duct banks, storm drains, concrete encasements, and sewers. These potholes may be made using small diameter, vacuum-type equipment, if appropriate. The Design Contractor shall survey location and surface elevation of each pothole.
 - 5.4. The Design Contractor shall provide construction staging, noise and dust control, and traffic control during excavation for potholing and surveying to minimize impacts on local neighborhood and environment.
 - 5.5. The Design Contractor shall notify the Water Authority immediately of any damage caused to any pipe, or other underground structure, during potholing activities.
 - 5.6. The Design Contractor shall provide all services related to the excavation and backfilling of potholes. Pothole excavations shall be in compliance with CAL-OSHA and Water Authority safety requirements, and any excavations left open shall be covered with anti-skid steel plates. The Design Contractor shall be responsible for restoration and clean-up of all work sites, in accordance with local jurisdiction's permit requirements.
 - 5.7. At the completion of examining each pothole:
 - 5.7.1. Replace the pipe bedding that was removed. Tamp

- and compact to provide suitable support for the pipe.
- 5.7.2. Backfill and cover the pipe with native soil.
 - 5.7.3. For those pothole excavations located in the roadway, provide a six to eight inch concrete cap over the pipe.
 - 5.7.4. Repair the street disturbed by the pothole excavation according to requirements of agency of jurisdiction. For City of San Diego, repair with a thin, Class F asphalt wearing surface feathered into the existing asphalt street surface.
 - 5.7.5. All backfilling, compaction, and trench caps shall be according to current Water Authority Standards.
- 5.8. Streets, curbs, gutters, sidewalks, and other improvements shall be restored to original condition in accordance with agency requirements having jurisdiction over the street.
- 5.9. Upon completion of the potholing activities, the Design Contractor shall submit for acceptance a potholing report to the Design Manager that details the proposed potholing work. The report shall include a table listing at least the following:
- 5.9.1. Map(s) showing location(s) of potholing.
 - 5.9.2. Potholed utilities sizes and types.
 - 5.9.3. Impacted utilities.
 - 5.9.4. List of agencies of jurisdiction of impacted utilities.
 - 5.9.5. Location referenced to the Water Authority Field Book drawings (or other reference acceptable to the Design Manager).
 - 5.9.6. Elevation as measured in the field. Convert measurement from depth from surface to elevation. Indicate whether the measurement is to top of pipe, invert elevation, etc.
 - 5.9.7. Indicate whether or not interference exists. Suggest a solution if interference exists.

**5.2.6
Prepare
Preliminary
Location /
Alignment
Plans**

1. To facilitate reviews by public utilities and state/local agencies, the Design Contractor shall develop preliminary plans that show the project limits, centerline, rights-of-way, and other pertinent information (i.e., poles, aboveground structures, etc.). Such plans shall be developed by the Design Contractor as early in the design process as possible. The Design Contractor shall locate proposed

facilities to minimize disruptions and modifications to existing utilities. The Design Contractor may be required to perform presentations of the preliminary plans to utilities and/or agencies.

**5.2.7
Coordinate with
Impacted
Agencies**

1. The Design Contractor shall coordinate with all impacted agencies and utilities to secure their no objection on the project. The Design Contractor shall maintain a file with a list of all impacted agencies and the status of their no objection.
2. The Design Contractor shall send the preliminary plans along with a formal request to all pertinent and impacted utility agencies to mark out all their facilities within the project boundaries. The purpose of this request is to solicit the agencies' no objection of the project location/alignment and identify potential conflicts, if any. The steps required to carryout this process are outlined in Attachment 5-1. The Design Contractor shall directly coordinate with the right-of-way agent assigned to the project in obtaining contact information of utility agencies.
3. Information received on pertinent existing utilities shall be incorporated into the design documents. If conflicts with existing utilities become apparent, the Design Contractor shall immediately bring the conflict issues to the attention of the Design Manager and the right-of-way agent for resolution.
4. In some cases, it may prove feasible to relocate existing utilities to avoid conflict with the new project. In such cases, The Design Contractor shall prepare a feasibility study showing that relocation is necessary. In addition, the Design Contractor may be asked to present and coordinate the issues with the pertinent utilities/agencies. Relocation of utilities is time consuming and may take months. Consequently, utility relocations shall be adopted as a last resort and only in cases where feasible alternatives to relocation cannot be achieved. It should be noted that utilities relocation, not identified as part of the project initially, may require additional permitting or environmental review requirements.
5. The right-of-way agent will request the public utility or agency to develop plans for the necessary relocation. The Design Contractor shall monitor the progress of the public utility or agency in the design of its relocation, noting and adjusting for any scheduling changes or difficulties in the relocation project. Relocation projects by public utilities or agencies are often discretionary actions, such as obtaining railroad permits or acquiring additional right-of-way, etc., and may induce unwanted delays.
6. The Final Design documents shall reflect the new location of utilities or clearly refer to that effect, if relocation will occur following the

Final Design submittal. A copy of the Final Design plans shall be submitted by the Design Contractor to all utilities/agencies that have been coordinated with for their records.

7. In addition to obtaining no objection from utilities and agencies, the Design Contractor shall also prepare all permit applications required for securing permits for easements, encroachments, etc (refer to Chapter 7 of this Guide for more details). The right-of-way agent will directly coordinate with the respective agency in submitting the permit and securing the approval.
-

Attachment 5-1: Steps to Secure No Objection from Utilities / Agencies

1. Send utility information request to utility/franchise operator.
2. Utility/franchise operator research for conflicts.
3. Utility/franchise operator returns utility information request with the following information:
 1. () No facilities – No conflicts.
 2. () We have facilities – No apparent conflicts, enclose one set of underground utility/franchise plans.
 3. () We have facilities with apparent conflicts; enclose one set of underground utility/franchise plans.
4. Incorporate utility/franchise operator information in preliminary improvement plans and mail to utility/franchise operators.
5. Utility/franchise operators review preliminary improvement plans and prepare preliminary relocation plans.
 1. Negotiate change in agency improvement plans when possible to clear conflicts.
 2. Prepare preliminary relocation plans to clear conflicts.
 3. Preliminary relocation plans are put on hold awaiting final improvement plans.
6. Send final improvement plans to utility/franchise operators.
7. Utility/franchise operator finalizes their plans to relocate facilities. Bid out relocation of facilities.
8. Utility/franchise operator budgets relocation, prepares work orders, and acquires management approvals.
9. Utility/franchise operator issues the relocation plans and work orders for construction.

Chapter 6 Surveying and Mapping

Overview

Purpose This chapter presents the Design Contractor Responsibilities in providing the necessary topographical surveys and mapping to perform proper design.

Topics This chapter is composed of the following topics:

CHAPTER 6	SURVEYING AND MAPPING	6
6.1	INTRODUCTION	6-1
6.2	FIELD SURVEYING.....	6-2
6.2.1	STANDARDS OF WORK.....	6-2
6.2.2	HORIZONTAL ALIGNMENT CONTROL	6-2
6.2.3	VERTICAL ALIGNMENT CONTROL	6-3
6.2.4	MONUMENTATION.....	6-4
6.2.5	AERIAL PHOTOMAPPING.....	6-4
6.2.6	DELIVERABLES	6-6
6.3	AERIAL PHOTOGRAMMETRY.....	6-7
6.3.1	STANDARDS OF WORK.....	6-7
6.3.2	ITEMS PROVIDED FOR PHOTOGRAM-METRIST.....	6-7
6.3.3	REQUIREMENTS OF THE PHOTOGRAM-METRY	6-7
6.3.4	DELIVERABLES	6-10
ATTACHMENT 6-1 - CHECKLIST FOR SURVEYING AND MAPPING.....		6-13
ATTACHMENT 6-2: COVER PAGE OF THE WATER AUTHORITY DRAFTING MANUAL		6-17

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6.1 Introduction

1. This chapter describes guidelines for topographical surveying and aerial mapping to be performed for Water Authority's projects. The Design Contractor shall conduct the necessary surveying and mapping if no recent survey is available or none has been performed for the project.
 2. In cases where recent survey and mapping are available, the Design Contractor shall verify and certify the information provided to them by the Water Authority through spot checking or by other means. The Water Authority Right-of-Way Department, Survey and Records Group, will facilitate communication between the Design Contractor and the Contractor who performed the survey to resolve or clarify any issues that the Design Contractor may have.
-

6.2 Field Surveying

6.2.1 Standards of Work

1. The Design Contractor shall conduct field surveying (e.g., topographic base maps, cadastral, and boundary surveying and mapping), as required, to obtain sufficient information required to perform proper design of Water Authority projects.
2. All surveying for design purposes, rights-of-way determination, and land acquisition shall be in conformance with the state of California Professional Land Surveyors Act and all applicable state and local regulations.
3. All surveying work shall be done under the supervision of a licensed land surveyor or a registered civil engineer qualified to practice land surveying in the state of California.
4. Base maps shall include, as a minimum, topographic information, roads, property lines, utility information and easements, existing structures, jurisdictional limits, horizontal and vertical construction control, water authority facilities, other facilities, and other information as deemed necessary.
5. Measurements are made to a precision compatible with the particular project requirements and consistent with the accuracy desired. Topographic maps displaying contours and planimetrics shall be prepared at a scale and contour interval commensurate with project requirements. Measurements are recorded and shown on the final presentation to the number of significant figures representative of the precision of the work.

6.2.2 Horizontal Alignment Control

1. Horizontal alignment control is established on the California State Plane Coordinate System, NAD 83 (epoch 1991.35; Zone 6 CCS), by ties to monuments with values published by the National Geodetic Survey (N.G.S.), San Diego County, City of San Diego and other Cities, or Caltrans, or established by global positioning systems (GPS), minimum standards per Federal Geodetic Control Committee for Second Order Class II. Horizontal alignment control is established to a minimum accuracy of 1:20,000 (Caltrans modified 2nd order, 2nd class).
2. The monuments set for horizontal alignment control shall be stamped with the license number of the land surveyor in charge, and are spaced at a maximum interval of 1,000 feet with a clear line of sight between them. The Surveyor must establish systematic numbering system for the monuments.
3. All horizontal control data, including found and set monuments and Basis of Bearings ties, shall be shown and described on the survey

drawings for design. All measurements shall be in decimal feet.

4. The Surveyor shall provide a complete listing of control points used, including the following items:
 - 4.1. A person or an agency that established the points
 - 4.2. Order of accuracy
 - 4.3. Description
 - 4.4. Coordinates
 - 4.5. Elevation and datum, if known
 - 4.6. If new control, indicate how it was established, and include field notes and calculations

**6.2.3
Vertical
Alignment
Control**

1. Several of the Water Authority projects are designed and built using the NGVD 29 (National Geodetic Vertical Datum) for vertical alignment control. In addition, most if not all of the City of San Diego benchmarks still reference the NGVD 29. However, the Water Authority would prefer using the newer vertical alignment control of 1988; NAVD 88 (North American Vertical Datum) in new projects. In addition, other local agencies are currently adopting the NAVD 88 for vertical alignment control, and they may have benchmarks that reference NAVD 88. Consequently, the Design Contractor shall:
 - 1.1. Perform the proper analysis and research in locating benchmarks to be used for the project vertical alignment control.
 - 1.2. Use extreme caution in properly selecting the appropriate vertical alignment control for the project.
 - 1.3. Use only a single vertical alignment control for the entire project.
 - 1.4. Obtain approval from the Water Authority Right of Way Department on the selected vertical alignment control for the project.
 - 1.5. Clearly mark the pertinent sections of the project documents with the selected vertical alignment control (NGVD 29 or NAVD 88).
2. Control surveys greater than 1 mile in length shall be tied to benchmarks established within 3,000 feet of the alignment. At least two benchmarks must be used.
3. Additional benchmarks shall be tied in at a maximum interval of 5 miles along the alignment. Benchmarks within 1 mile of the alignment must be used.

4. All vertical control data, including found and set monuments and benchmarks, shall be shown and described on survey drawings for design. All measurements shall be in decimal feet.
 5. The Surveyor shall provide a complete listing of benchmarks used, including the following items:
 - 5.1. A person or an agency that established the benchmark
 - 5.2. Order of accuracy
 - 5.3. Description
 - 5.4. Coordinates, if known
 - 5.5. Elevation and datum
 - 5.6. If new benchmark, indicate how it was established, and include field notes and calculations
-

**6.2.4
Monumentation**

1. The control lines and points to which the survey is referenced shall be marked with physical monuments providing a degree of permanency consistent with the terrain, physical features and purpose of the survey. Sufficient information for all lines and points shall be shown to allow the efficient re-tracement of the work. Monuments shall be shown and described, with coordinate data and elevations, on the survey drawings for design.
 2. On public right-of-way areas, sufficient monumentation shall be located to determine street centerlines and boundary lines in the project area. All street centerline monuments and right-of-way and boundary monuments at street intersections in the project area must be located and referenced to permanent project control during the field survey for design. Street centerline monuments and right-of-way and boundary monuments shall be shown and described, with coordinates, on the survey drawings for design.
 3. Survey monuments, in both open and right-of-way areas, shall be three inch diameter, domed type, die-cast from solid brass, with two-inch ribbed shank.
-

**6.2.5
Aerial
Photomapping**

1. Premarking for Aerial Photomapping:
 - 1.1. All control points, both project alignment control and supplemental photo control, shall be marked prior to aerial photography. Project control points outside the photo coverage need not be premarked. Markings are centered on the survey point and may not deviate from the center of the point by more than 0.02 foot horizontally. The pattern markings must conform to those used by Caltrans for similar mapping. The Surveyor

shall obtain permission to premark and to dispose of the premark in a satisfactory manner. Photo identification of control points is not allowed without the Design Manager's permission.

- 1.2. The Surveyor shall provide a complete listing of aerial panels used, including description, coordinates, and elevation. The flight plan shall be reviewed by the Design Manager prior to commencement of fieldwork.
 - 1.3. The Surveyor shall paint a 2-inch-wide outline on the outside edges of all well monuments, valves and manholes, curb inlets, and inlet grates found in streets (do not paint on sidewalks). The Surveyor shall paint 3-inch x 12-inch marks from physical street centerlines toward water meter boxes. White paint is to be used, except on light surfaces, in which case, black paint is acceptable. Paint marks shall be removed following work completion, in accordance with requirements of agency having jurisdiction on the project location.
2. Data to Supplement Aerial Photomapping:
 - 2.1. The Design Manager will provide a checklist of items to be located and/or delineated on the survey drawings (see Attachment 6-1, Checklist for Surveying and Mapping). This checklist may include property boundaries, street right-of-ways, record utilities, existing structures and improvements, traffic markings, and other site-specific features. Some items may be delineated by aerial survey only (see paragraph 6.3, Aerial Photogrammetry); others must be located by supplemental field surveys. These items are noted on the checklist. Elevations are established to an accuracy of 0.01 foot. When supplemental field surveys are made, the field data collected is added by the Surveyor to the aerial survey drawing.
3. Field Verification:
 - 3.1. To ensure the accuracy and completeness of aerial mapping, the photogrammetrist shall provide field verification of check prints before they are submitted to the Design Contractor. This requires onsite verification by the Design Contractor to ensure that marked-out utilities or other pertinent surface features that might have been missed or not originally compiled are shown on the check prints. These additional features, if any, are located and plotted within 2 feet of their actual location. This additional information is incorporated into the design file and plotted on the final copy of the check print.
-

**6.2.6
Deliverables**

1. The Surveyor shall record all pertinent information, measurements, observations and data collection in the field during the survey in appropriate field note form or by other data-recording techniques in a manner intelligible to another surveyor.
 2. The Surveyor shall provide copies of survey field notes and digital files to the Design Manager and shall furnish the survey results in an appropriate form (i.e., CAD drawings, plat maps, cross- sections, diagrams, tabulations, etc.). All items requested in Attachment 6-1 shall be included. The Surveyor shall provide other sketches and drawings as required, records of survey maps, or corner records.
 3. The Surveyor shall adhere to specified CAD data file formats (see Water Authority Drafting Manual ESD-120; see Attachment 6-2 for the cover page). Submittals include calculations, field notes, mapping used to develop site control, facility layout, and setting of survey monuments. Provide computer files of all survey data, in AutoCAD and ARCGIS software using the version currently in use by the Water Authority, tied to benchmark elevation and coordinates shown on the Plans.
 4. All mapping including digital topography and orthophotos shall be submitted in accordance with the Water Authority's latest GIS/CAD layering conventions (refer to Water Authority Drafting Manual, ESD-120). Prepare digital contours (accuracy of plus or minus one half of the contour interval) screened surface culture base plan with control points, surface cultures, and contours for the entire area surveyed. Prepare digital, lightly screened photo with surface cultures and control points for the Water Authority's Board and public presentations.
 5. All mapping submittals shall be in AutoCAD and ARCGIS software and using the version currently in use by the Water Authority.
-

6.3 Aerial Photogrammetry

6.3.1 Standards of Work

1. The Photogrammetrist shall adhere to the current edition of San Diego County's Standard Conditions and Specifications for Aerial Surveying and Topographic Mapping unless otherwise specified herein.
 2. All field surveying for horizontal and vertical control, pre-marking and locating data supplemental to aerial photomapping shall be performed under the Survey Guidelines established in section 6.2.
 3. All mapping shall adhere to specified CAD data file formats outlined in the Water Authority Drafting Manual ESD-120.
-

6.3.2 Items provided for Photogram- metrist

1. The following items shall be provided by the field Surveyor to the photogrammetrist:
 - 1.1. Map sheets with project locations clearly delineated.
 - 1.2. Specification of photo and mapping scales and contour intervals required.
 - 1.3. Horizontal and vertical control data, in accordance with the specifications in section 6.2.
 - 1.4. Checklist for Surveying and Mapping (Attachment 6-1). Checklist of items to be located and/or delineated on the survey drawings.
 - 1.5. Any additional requirements unique to the project.
-

6.3.3 Requirements of the Photogram- metry

1. Photography:
 - 1.1. The photogrammetrist shall mark a flight plan, including model layout, direction of flight, and location of premarks to be shown on the layout map provided.
 - 1.2. All flying for mapping purposes and photographs shall be done between the hours of 10:00 a.m. and 2:00 p.m. to minimize shadows. The time of flying must be recorded on each negative at the time of exposure.
 - 1.3. Flying shall be done in accordance with San Diego County's Standard Conditions and Specifications for Aerial Surveying and Topographic Mapping, with the following exceptions:
 - 1.4. The camera must have forward motion compensation and be equipped with electronic exposure system (built-in light meter).

- 1.5. The camera must have a 6-inch nominal focal length and use 9-inch x 9-inch film format for taking vertical exposures. Film yielding a 9-inch by 18-inch image may not be used.
- 1.6. On all strip mapping or on other mapping as shown or deemed necessary, an additional exposure must be taken at each end of the requested mapping area.
- 1.7. The following information must appear on all negatives used for mapping or photographs:
 - 1.7.1. Date
 - 1.7.2. Photo scale
 - 1.7.3. Project name
 - 1.7.4. Negative number
 - 1.7.5. Flight line
 - 1.7.6. Exposure number
- 1.8. Two sets of 9-inch x 9-inch color prints with glossy finish and all negatives must be provided.
- 1.9. Two color photographs of the area shown on the map sheet must be provided. Photographs must be at 1" = 100' scale and be approximately 40-inches x 40-inches in size. Enlargements are printed on double weight semi-matte paper.
- 1.10. All color contact prints and photo enlargements shall be submitted to the Design Manager immediately after flying and processing.
2. Digital Orthophoto Requirements:
 - 2.1. Digital mapping shall be based on the California Coordinate System, Zone 6, NAD83 Coordinate Base. CAD design files must have a Global Origin of $x=+6165251.6353$, $y=+1772251.6353$ and $z=-214748.3648$ to allow for the NAD83 coordinate values.
 - 2.2. The digital orthophotos shall be created by scanning diapositive transparencies produced from the aerial photography using a precise image scanner. The scanned data shall then be digitally rectified to an orthographic projection on a pixel-by-pixel basis. Source materials for digital orthophotos will be aerial photographs, ground control data, camera and scanner calibration data, and a digital elevation model (DEM). Digital orthophotos shall be created directly through the procedures described above instead of through the scanning of a hard copy orthophoto.
 - 2.3. Equipment and Production Requirements: The Design

Contractor shall prepare a plan describing the production procedures and equipment that will be used to produce the digital orthophotos for approval by the Water Authority. In particular, scanning and rectification procedures to be used shall be discussed. In formulating their technical plan, the following production requirements shall be adhered to:

- 2.4. Collection: Only the aerial photography acquired as part of this procurement shall be scanned to produce image files for orthophoto rectification. Scanning devices used for scanning aerial photography shall be precision scanning devices that produce scanning resolutions between 7.5 and 60 micrometers (microns). The scanning resolution shall be equal to or finer than the specified pixel resolution. Pixel resolution shall not be interpolated to a finer resolution than that developed through the initial image capture (scanning).
- 2.5. DEM Data Collection: Elevation data used as input in the rectification process shall be captured by photogrammetric techniques using an analytical stereoplottter. The DEM shall consist of points spaced at regular intervals along a grid, and shall be supplemented by breaklines at all significant terrain breaks. The DEM must be captured at a density level necessary to support the accuracy requirements listed below. The DEM shall be produced for the entire project area. The Design Contractor shall describe the approach to be used in creating the DEM. Specifically describe the spacing, and the locations at which breaklines will be captured to support the orthophoto production requirements.
- 2.6. Processing: Creation of the digital orthophoto shall utilize several types of inputs: (1) the unrectified raster image file acquired from the scanning of the aerial photography, (2) a digital elevation model, (3) the photoidentifiable image and ground coordinates of ground control positions acquired from aerotriangulation, and (4) camera calibration information. These input sources shall be used to register the raw image file mathematically to the scanner to determine the location of the scanner with respect to the ground and to remove relief displacement from the image file.
- 2.7. Ground Resolution: The horizontal ground resolution (x and y components) of the digital orthophotos shall be 0.5 foot (pixel size = 0.5 foot)
- 2.8. Image Radiometry: Image brightness shall be represented by 256 gray levels ranging from 0 (black) to 255 (white). All intermediate values shall represent shades of gray varying uniformly from black to white. Areas where the rectification process is incomplete due to lack of data (e.g., lack of

elevation data) shall be represented by a numeric value of 0 (black). The proposer shall also propose a standard for color image and provide a separate cost estimate in the fee schedule.

- 2.9. Image Mosaicking: Where two or more digital orthophoto images are mosaicked, the image judged to have the best contrast shall be used as the reference image. All other images shall have their contrast and brightness values adjusted to that of the reference image. Join lines between overlapping images shall be chosen so as to minimize tonal variations. Localized adjustment of the brightness values shall be performed to minimize tonal differences between join areas.
- 2.10. Image Quality: All images shall be radiometrically and geometrically corrected to enable adjacent files to be displayed simultaneously without obvious distinction between them. Orthophotos shall not contain defects such as out-of-focus imagery, dust marks, scratches, or inconsistencies in tone and density between individual orthophotos and/or adjacent sheets.
- 2.11. Radiometric Verification: Radiometric accuracy shall be verified by visual inspection of the digital orthophoto with the original unrectified image to determine if the digital orthophoto has the same or better image quality as the original unrectified aerial photography.
- 2.12. Visual Verification: Visual verification shall be performed to ensure image completeness and to ensure that no gaps occur in the image area or overage coverage. The accuracy of the data shall be verified by comparing image line and sample geometric coordinates to coordinates derived from higher order accuracies for the same points.
- 2.13. Coordinate System: All digital orthophoto maps shall be referenced horizontally to the California State Plane Coordinate System (Zone VI). The horizontal and vertical datum shall be as per section 6.2.3.

6.3.4 Deliverables

1. Hard Copy Orthophoto Products:
 - 1.1. One paper plot for each formatted orthophoto sheet shall be provided at a scale of 1" = 40' for the entire area surveyed. A reproducible positive shall also be provided for each orthophoto map sheet. Plots of orthophotos must be produced directly from the digital data and may be plotted using either an electrostatic (400 DPI or higher), inkjet, or a laser plotter.

For the plots, grid coordinate values shall be printed in the margin along the image area border along the outside edges of each map sheet. Grid ticks shall be shown at 100 foot intervals on the map. The gridline intersections shall be shown throughout the image area. The grid ticks shall not be labeled within the orthophoto image area. Grid ticks shall be one-half inch in size. The hard copy orthophoto sheets and image files shall be edge matched so that, when adjacent maps are aligned by grid ticks, imagery will not be displaced by more than 1/40th of an inch. All orthophoto prints produced shall be free from static marks, and clear and free from chemicals, stains, blemishes, light fog or streaks, creases, scratches, and other defects that would decrease their usefulness.

- 1.2. Orthophoto Sheet Format: Plots of digital orthophotos shall be produced on sheets that are formatted to be consistent with the Water Authority's existing maps. An index layout diagram shall be provided.
- 1.3. Marginal Annotation: Marginal annotation that shall be shown on the hard copy orthophotos includes:
 - 1.3.1. Project name
 - 1.3.2. Sheet number
 - 1.3.3. Coordinate datum
 - 1.3.4. Accuracy statement
 - 1.3.5. Verbal and bar scale
 - 1.3.6. North arrow
 - 1.3.7. Date/Scale of aerial photography
 - 1.3.8. Date of production
 - 1.3.9. Orthophoto sheet location diagram
 - 1.3.10. Adjoining orthophoto identification at sheet edges
 - 1.3.11. Engineer's name and/or Surveyor's name
- 1.4. The left, right, and bottom margins shall be dimensioned appropriately to allow room for marginal annotation. All marginal annotation shall be right reading from west to east. The Design Contractor will be responsible for preparing a mock-up of the proposed sheet layout which shall include the development of a proposed title block for the Water Authority's approval.
- 1.5. Sheet numbering shall match that used for the 1" = 40' topographic maps.

2. Electronic Copy Orthophoto Products:

- 2.1. The files shall be delivered to the Water Authority as Tag Image File Format (TIFF) files. The Water Authority will work with the Design Contractor to determine the appropriate size of the individual files to be provided. The files shall also be delivered in AutoCAD and ARCGIS using the version in current use by the Water Authority.

3. Accuracy Standards:

- 3.1. Inputs used to produce digital topography for the entire surveyed area and orthophotos shall be sufficiently accurate to create digital topography and orthophotos that meet National Map Accuracy Standards (NMAS). The following horizontal and vertical accuracy standards shall apply to the digital topographic and orthophoto products compiled.
- 3.2. Horizontal Accuracy: Digital topographic and orthophoto products shall meet horizontal NMAS. Specifically, ninety percent (90%) of all well-defined points tested on the digital orthophoto shall fall within 1' (1/40") of their position at the designated map scale (1" = 40'). The remaining ten percent (10%) of the features shall not be misplaced by more than one-thirtieth (1/30) of an inch from their true coordinate positions.
- 3.3. Vertical Accuracy of the DEM developed to support production of digital topography and orthophotos shall be such that 90 percent of the points used as input shall be accurate to within 0.25', and the remaining 10 percent shall be accurate to within +0.5'.
- 3.4. Quality Control: The Design Contractor shall indicate in the production plan, the specific quality control devices and procedures to be employed throughout the process, the proposed methods for correcting errors, and the proposed level of support requested of the Water Authority.

4. Packaging:

- 4.1. All hard copy products shall be packaged and delivered flat. Digital files shall be delivered on compact discs.
-

Attachment 6-1 - Checklist for Surveying and Mapping

Project Name: _____ Date: _____ W.O. _____

CIP No.: _____

The following items must be shown on all survey drawings/documents.

1. Surveyor's name, address, telephone number, registration number and date of expiration, and signature and seal.
2. Date of field work and surveyor's file names.
3. Location description of project referenced to title description (council district #) and geographic location Lambert Coordinate (L.C.) Index.
4. Statement describing the survey technique used to accomplish the work (e.g., "This map was prepared by photogrammetric methods," "Topography by total station and data collector," etc.).
5. Identification of the horizontal and vertical datums to which the work is referenced and specific descriptions of the monuments used to establish the reference.
6. North arrow and scale.
7. Pertinent dimensions and directions with sufficient notations to identify their source.
8. All pertinent monuments found or set, with notations indicating which were found and which were set, with identification of character. Found monuments are accompanied by a reference to their origin. If no documented reference is available, so state.
9. Sufficient information for all control lines or points to which the survey is referenced is shown to allow the efficient and exact retracement of the work.
10. Any compiled data of an information type is noted to the source and authority of the data and to what degree the information was verified (e.g., "Sewer information shown hereon was obtained from the record plans on file with the office of the Water Authority Engineer; manhole locations and invert elevations were field verified.")
11. Identify data intentionally excluded from the survey, such as easements and setbacks.
12. The following statement:

This survey was made by me or under my direction on date of survey.

Signature _____
Print name _____ *L.S. No.* _____ *Date* _____

13. If the presentation consists of more than a single document, all material furnished is adequately indexed and cross-referenced.

Attachment 6-1: Checklist for Surveying and Mapping
continued

Project Name: _____ Date: _____ W.O. _____

CIP No.: _____

The items checked below must be located/delineated on the survey drawings. Aerial mapping may be used. Also see attached marked up project drawings.

_____ **Mapping Specifications**

Drawing Scale: 1" = _____ feet

Contour Interval: _____ feet

Supplemental Spot Elevations (specify): _____

Orientation of North: _____

NAD83 Coordinates _____ Yes _____ Other _____

_____ **Existing Structures and Improvements**

Describe and show on the attached project drawing the limits of the area in which existing structures and improvements are located. Specify if record locations of items may be used or if actual locations must be determined.

_____ **Buildings** (specify "building fronts only" or "all corners")(If plotted from aerial survey, provide precise location from field measurements)

_____ **Pavement Items**

- _____ Edge of Paving
- _____ Curb Lines
- _____ Curb Islands
- _____ Sidewalks
- _____ Driveways

_____ **Utility Items**

- _____ Drainage Grates and Inlets, Manholes, Cleanouts
- _____ Water Gate Valves, Manholes, Meters, Fire Hydrants
- _____ Irrigation Control Valves, Sprinkler Heads
- _____ Sewer Manholes, Cleanouts
- _____ Gas Valves, Meters
- _____ Cable TV, SDG&E, Telephone Risers, Vaults, Poles, Overhead Wires
- _____ Street Light Standards

_____ **Traffic Control Items**

- _____ Traffic Signals
- _____ Traffic Actuators
- _____ Traffic Signal Control Boxes
- _____ Stop Signs, Speed Limit Signs, Street Signs

Attachment 6-1: Checklist for Surveying and Mapping
continued

Project Name: _____ Date: _____ W.O. _____

CIP No.: _____

_____ **Traffic Markings**

Describe and show on the attached project drawing which traffic markings are to be located (e.g., centerline striping, direction arrows, turn lanes, cross walks, bike lanes, etc.):

_____ **Miscellaneous Features**

_____ Fences/Gates

_____ Trees

_____ Walls

_____ Other (describe and show on attached project drawing)

_____ **Other Site-Specific Features (i.e., accident site features, erosion, etc.)**

Describe and show on attached project drawing which features are to be located:

The items checked below must be field-measured and delineated on the survey drawings. Also see attached marked up project drawings.

_____ Precise location of buildings (vs. building/roof lines from aerial mapping)

_____ Elevations of hard surfaces to be matched, met or overlaid (e.g., concrete slabs, cross gutters, street centerlines, top of curb, flowlines of gutters, and finished floor)

_____ Elevations of manhole rims

_____ Invert elevations, size, and direction of flow of sewers and storm drains

_____ Location, invert elevations and size of culverts

_____ Identification numbers of power and telephone poles and location of guy anchors

_____ Centerline location, diameter and species of trees with diameters greater than 4 inches

_____ Location, size, shape and elevation of any other topographic features not shown on the aerial photomapping

Attachment 6-1: Checklist for Surveying and Mapping
continued

Project Name: _____ Date: _____ W.O. _____

CIP No.: _____

_____ **Other items to be field measured:**

The items checked below must be shown on the survey drawings. Also see attached marked up project drawings.

_____ **Street Right-of-Way, Property Lines, Easements**

Describe and show on the attached project drawing which street right-of-way lines, property lines, and/or parcel boundaries are located and the limits of the property and right-of-way to be located. Provide Title Reports. Specify if record widths of right-of-way may be used or if actual property lines must be determined.

_____ **Utilities Research and Plotting**

Obtain record drawings and plot main utilities and/or services and laterals as checked below (see attached project drawing for locations):

Utility	Main	Service/Lateral
Sewer		
Water		
Gas		
Electric		
CATV		
Other		

_____ **Potholing to Locate Utilities**

(see attached project drawing for locations):

Utility	Main	Service/Lateral
Sewer		
Water		
Gas		
Electric		
CATV		
Other		

Requested by: _____

Attachment 6-2: Cover Page of the Water Authority Drafting Manual



SDCWA
San Diego County Water Authority
Engineering Department



Drafting Manual

ESD-120

March 2004

Chapter 7 Rights-of-way, Easements, Encroachments and Land Acquisition

Overview

Purpose This chapter describes the Design Contractor requirements in preparing the necessary documents needed to acquire right-of-ways, easements, or encroachment permits from other agencies and private parties. It also outlines the requirement to coordinate with the Water Authority Right of Way Department.

Topics This chapter is composed of the following topics:

CHAPTER 7 RIGHTS-OF-WAY, EASEMENTS, ENCROACHMENTS AND LAND ACQUISITION **..... 7**

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7.1 Introduction

1. This chapter summarizes right-of-way, easement, encroachment permit, and land acquisition processes for Water Authority projects and the required involvement of the Design Contractor in assisting the Water Authority Right of Way Department. Land acquisition of the Water Authority is managed by the Right of Way Department.
-

7.2 Definitions

7.2.1 Fee

1. Fee is a complete interest in real property wherein the owner holds all the surface and subsurface property rights. It permits the holder to have unrestricted power to dispose of the property.
-

7.2.2 Easement

1. An easement is a partial interest in real property that permits the easement holder to have specific privileges, such as construct, operate, and maintain a pipeline. Ownership of the property underlying the easement remains with the vested owner. Easements can be permanent or temporary.
 2. Temporary construction easements are sometimes required to accommodate construction activity that typically requires additional space to provide access, to store materials, and to provide working room. Temporary construction easements have a limited term and expire on a fixed date.
-

7.2.3 Encroachment Permit

1. An encroachment permit (either temporary or permanent) conveys revocable and conditional permission to temporarily work or to temporarily place improvements within another party's property. For example, a private citizen wishing to install improvements within a Water Authority right-of-way is required to obtain an encroachment permit from the Water Authority.
-

7.3 Acquisition Coordination

7.3.1 Determination of Need

1. Property requirements for Water Authority projects are usually determined during the project planning phase. The Design Contractor shall evaluate and recommend land acquisition and easement requirements for the Water Authority project that provide the greatest public benefit with the least private impact. Property required for project construction, subsequent repair and maintenance, staging areas, electrical distribution and access are among the types of property needs that should be considered in determining project's property requirements. The recommendation is subject to review and approval by the Design Manager, and the Water Authority's Right of Way and Operation and Maintenance Departments.
2. Projects that require the acquisition of property, or are wholly or partially within other municipality's easement or property, shall be coordinated between the Design Contractor and the Right of Way Department at the preliminary design level, or earlier. The Design Contractor shall contact the Right of Way Department directly during the early design phase, and shall keep the Design Manager informed at all times.

7.3.2 Encroachment Permits

1. In cases where project location/alignment traverse third-party or utility easements, the Design Contractor shall coordinate with the Right of Way Department to determine the steps needed to acquire necessary permits (e.g., encroachment). The Design Contractor shall support the Right of Way Department, as required, in acquiring encroachment permits.

7.3.3 Public Acquisition Process

1. The public acquisition process is mandated by federal and state eminent domain law. Attachments 7-1 and 7-2 are charts outlining the Water Authority's procedure for land acquisition for single-parcel projects (e.g., pumping station) and multi-parcel projects (e.g., pipeline). The major steps of the right-of-way acquisition are outlined in Attachment 7-3.
2. The Design Contractor shall assist the Right of Way Department in preparing land acquisition documents. The following documents are usually required:
 - 2.1 Signed, sealed right-of-way drawings. Requirements for right-of-way drawings are presented in Attachment 7-4 for acquisition. The Design Contractor shall meet with the Right of Way Department staff as necessary during the design

phase to revise right-of-way drawings.

- 2.2 Construction drawings. The Design Contractor shall meet with the Right of Way Department as necessary during the design phase to review engineering plans. At the Preliminary Design stage (see Chapter 4 of this Guide), the Design Contractor shall coordinate with the Right of Way Department to refine the alignment, or facility site, as necessary, and to define permanent and temporary construction easements, and any easement required for utility relocation. The Design Contractor shall note that permanent and temporary construction easements shown on drawings must match those areas analyzed in the project environmental document.
- 2.3 Legal descriptions and Plats. The Design Contractor shall prepare the necessary legal descriptions, plats, and right-of-way maps required for land acquisition.
3. The Design Contractor may be asked to prepare other documents related to the acquisition process. The following is an example of such documents
 - 3.1 Preliminary title reports. The Design Contractor shall arrange for securing preliminary title reports. These reports will be prepared by a title company selected by the Right of Way Department.

7.3.4 Acquisition Support

1. The Design Contractor shall support the Design Manager and the Right of Way Department during the acquisition process. Neither the Design Contractor nor the Design Manager will have direct contact with the property owners, or attorneys, at any time unless specifically requested by the Right of Way Department. All contact with property owners shall be by the Right of Way Department.
2. If property owners, or Water Authority attorneys, request specific information about the project and its potential impact on their property, the Right of Way Department may then ask the Design Contractor for assistance providing illustrations or other materials. The Design Contractor shall work with the Right of Way Department staff to resolve issues associated with impacts of the project on existing improvements.

7.3.5 Construction Phase

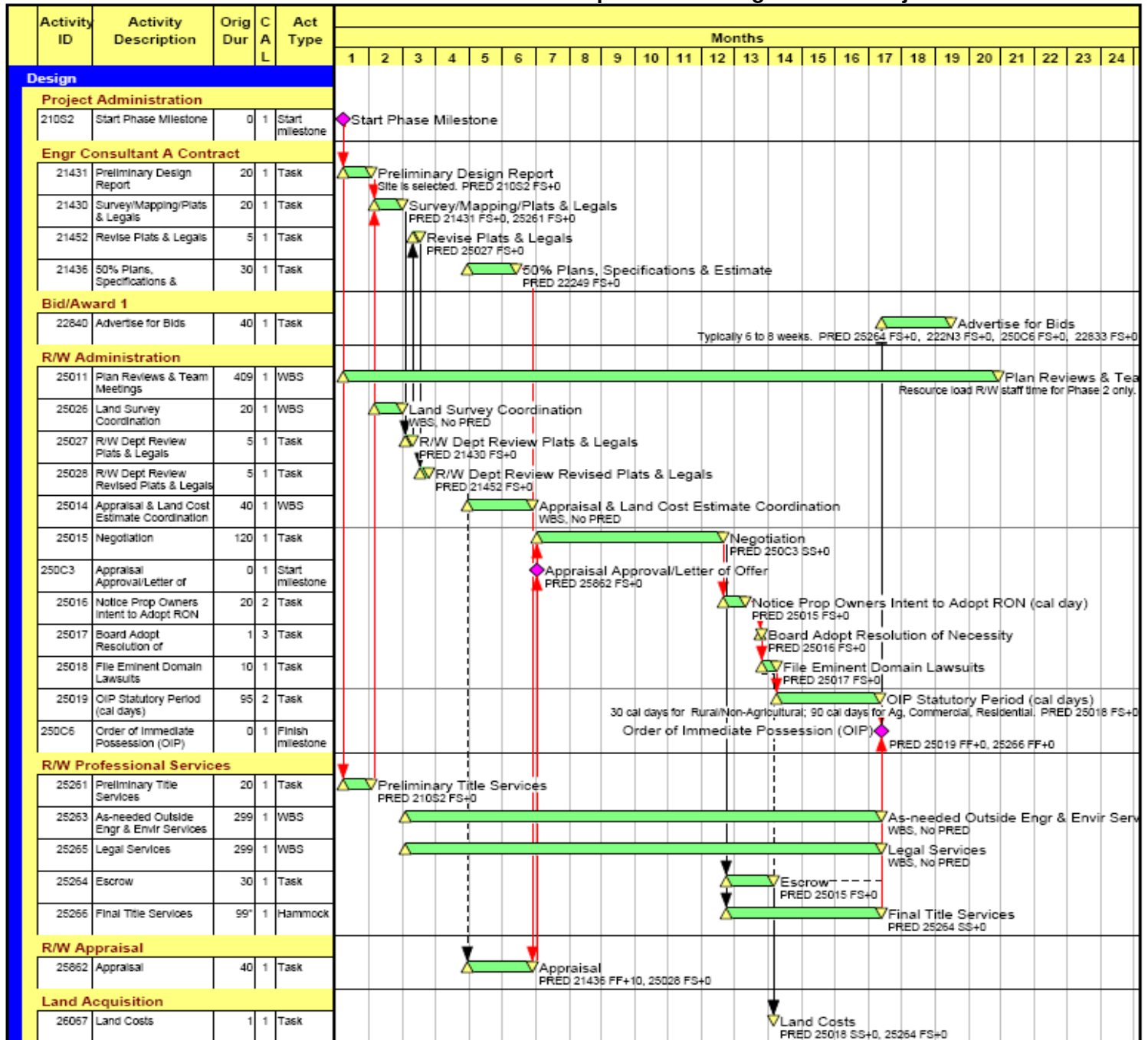
1. During the construction phase of the project, the Right of Way Department will remain the property owners' primary contact with the Water Authority. Should situations arise where additional information is needed (e.g., if additional easements are necessary, if existing improvements must be removed, or if access to a

property is adversely affected), the Design Contractor may be asked to provide design modifications or surveys to support this effort.

7.3.6
Project
Completion

2. At the completion of construction, the Right of Way Department will initiate steps to terminate any outstanding temporary construction easements and finalize other matters of real property.
-

Attachment 7-1: Procedure for Land Acquisition of Single-Parcel Projects



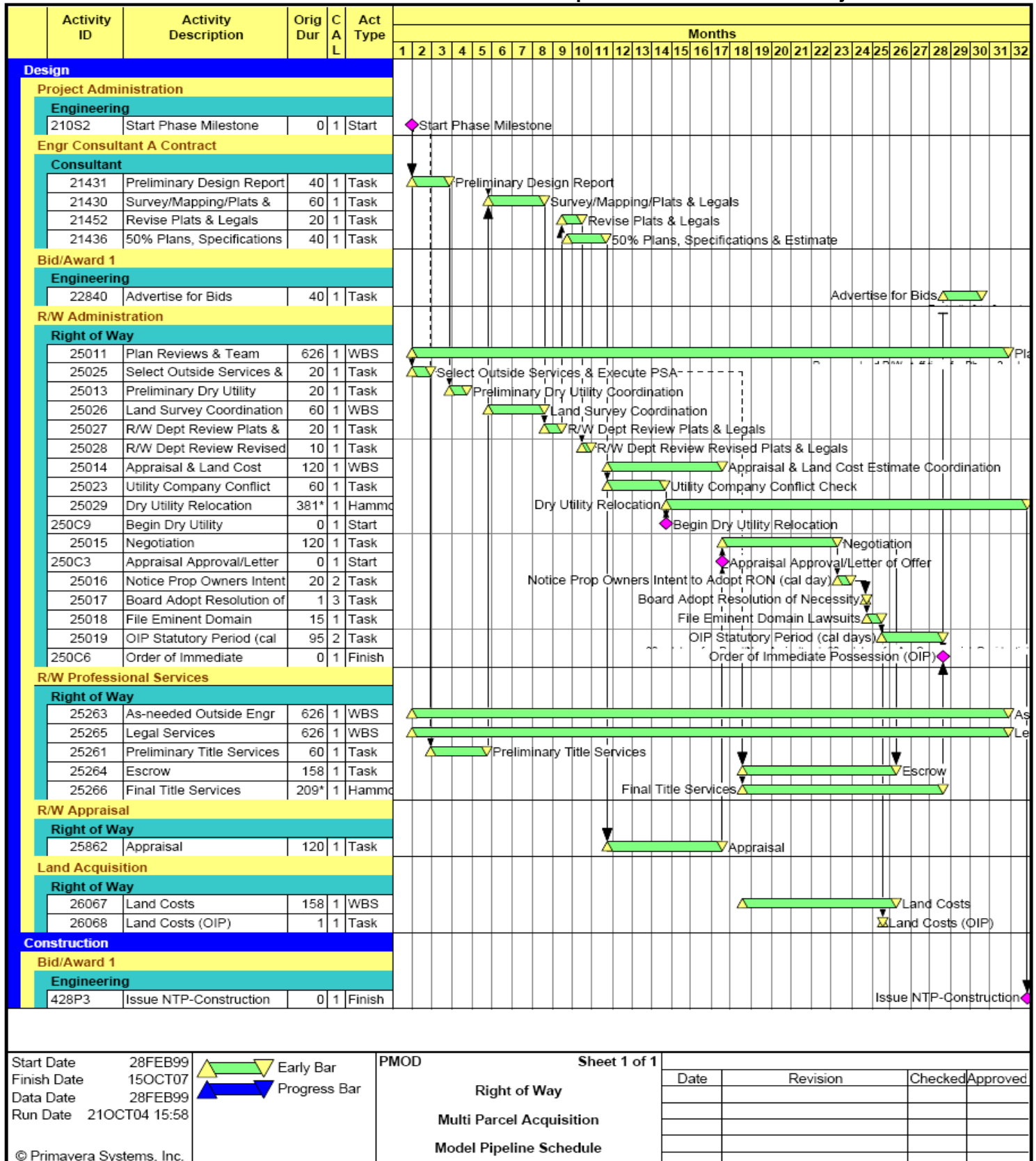
Start Date 01JUN94
Finish Date 30JAN06
Data Date 01MAR99
Run Date 21OCT04 11:45



FMOD
Sheet 1 of 1
Right of Way
Single Parcel Acquisition Process
Model Flow Control Facility Schedule

Date	Revision	Checked	Approved

Attachment 7-2: Procedure for Land Acquisition of Multi-Parcel Projects



Attachment 7-3: Land Acquisition Process

(1) Right of Way Assessment

The Right of Way Agent reviews the property impacts and potential alternatives that should be considered by the project team. This assessment helps identify potentially complicated acquisitions such as highly specialized properties or lands that might not be attainable because of their ownership or use status.

The Right of Way Agent coordinates with the Water Authority's Survey Supervisor to determine the sequence of survey events needed to support the project. This coordination identifies personnel responsible for providing aerial photography; ordering title reports; preparing right of way maps, plats and legal descriptions; and establishing due dates linked with each assignment. The Right of Way Agent also coordinates with Water Resources staff regarding the schedule for completing Phase I Environmental Site Assessments. The need for rights of entry to perform geotechnical or biological surveys should be identified.

Because the project lacks definition at this point, budgets and schedules will be prepared based on gross assumptions and will be highly conditioned.

(2) Right of Way Acquisition Plan

The Right of Way Acquisition Plan consists of a table of parcels required for the project. Following review of the project's alternative analysis and preliminary design report, specific parcels are identified by Assessor Parcel Number (APN) with the recommended type of acquisition to be pursued for each parcel (fee, easement, electrical utility easement, temporary construction easement, etc.). The Right of Way Agent, working with Right of Way's Records Manager, assigns each parcel a separate Water Authority parcel number and then prepares a table of potential acquisitions listing APN; Legal Vesting; Water Authority parcel number; type of ownership (fee, easement, temporary construction easement, etc); and parcel size. The Right of Way Agent orders preliminary title reports (unless they were already ordered as part of the survey effort referenced in gate section 1.14).

It will likely be appropriate to reserve the services of an appraiser via a task letter once the table is completed. Gate section "Right of Way Verification 4.4" should be completed before a notice to proceed can be issued to the appraiser.

(3) Right of Way Verification

The project team verifies that all components required for property appraisal are complete. These components include

- Phase I Environmental Site Assessments for all parcels to be acquired
- Certified environmental document for the project
- Title reports
- Plans that define the project's impacts to the property
- Plats & legal descriptions
- Right of way maps showing all ownership, title encumbrances, and construction plan information

- Draft acquisition documents (deed type)

These items are forwarded to the appraiser as a foundation for the appraisal effort. The team should verify the Right of Way components at least 12 to 18 months in advance of the construction contract award, depending on the complexity and number of parcels to be acquired. Once the above bulleted items are completed, the Right of Way Agent sends a Notice to Proceed letter to the appraiser and a letter to the property owner introducing the appraiser. PSM updates the budget and schedule at this time.

Upon receipt of the completed appraisal, the Right of Way Agent reviews the report for accuracy, and submits the appraisal to Water Authority management for approval. Once management approves the appraisal, the Right of Way Agent sends an offer letter to the property owner.

The Right of Way Agent will negotiate with affected property owners until each parcel is acquired. If negotiations reach impasse or if the project schedule necessitates, then the Water Authority's Board of Directors will be asked to adopt a Resolution of Necessity.

(4) Right of Way Possession

Once all the necessary parcels have been acquired, the Right of Way Agent forwards a Project Certification Memo to the project manager along with copies of all acquisition documents and summaries of right of way issues to be incorporated in final design. The PDP should reflect any Water Authority obligations to the property owners that stem from the acquisition effort. The budget should include costs that need to be reserved for eminent domain cases, if any.

Attachment 7-4: Requirements for Acquisition Drawings

All drawings used for property acquisition and easement purposes shall be prepared by the Design Contractor and shall include the items listed below, as applicable to the three types of drawings (Right-of-way drawings [type 1], Plat drawings [type 2], and Legal Descriptions drawings [type 3]).

- Index map for multiple map projects (type 1 drawings).
- Multiple maps numbered in consecutive order (types 1 & 2 drawings). .
- Appropriate title block (types 1 & 2 drawings).
- North arrow and scale (types 1 & 2 drawings).
- The total ownership parcel whether the acquisition is an easement, or total fee take (types 1 & 2 drawings).
- Distinct property lines shown and identified for all property owners (types 1 & 2 drawings).
- Bearings and distances on property lines (types 1 & 2 drawings).
- Bearings and distances for the portion to be acquired (types 1 & 2 drawings).
- Radial bearings for all non-tangent curves (types 1 & 2 drawings).
- Area of total ownerships in square feet on lot/block on smaller parcels, or in acres and square feet on larger parcels (types 1 & 2 drawings).
- Area of the portion to be acquired in square feet and acres (types 1, 2, & 3 drawings).
- Tie points to land survey net, including N & E coordinates, identified on the drawing (types 1 & 2 drawings).
- Point of beginning, including basis of bearings, and description (types 1 & 2 drawings).
- Detailed blow-ups of areas too small to be easily discerned (types 1 & 2 drawings).
- Dimensions of any public rights-of-way shown on the drawing (type 1 drawing).

- Cross hatching or other illustrative means to show existing easements from the preliminary title report. The area of the existing easement must also be shown (type 1 drawings).
- Area of any overlap of easements to be acquired (in square feet) (types 1 & 2 drawings).
- Clear definition of each type of easement, if more than one type is to be acquired (i.e., street easement, pipeline easement, working area, etc.) (types 1 & 2 drawings).
- Assessor's Parcel numbers and Water Authority parcel numbers, for property affected by the acquisition (types 1, 2, & 3 drawings).
- Property owner's name, as identified in Schedule "A" of a preliminary title report (types 1, 2, & 3 drawings).
- Street boundaries to be dedicated with appropriate bearings and distances so that a legal description can be shown for each street (types 1 & 2 drawings).
- Any additional information required by the Water Authority (types 1, 2, & 3 drawings).
- Signatures of appropriate Water Authority staff (type 1 drawing).
- Plats and Legal descriptions, stamped by a Licensed Land Surveyor or a Registered Civil Engineer authorized to practice land surveying (types 2 & 3 drawings).

In addition to drawings prepared for acquisition purposes, if condemnation is necessary, the Design Contractor shall prepare drawing(s), as required by the Water Authority.

Chapter 8 Geotechnical, Seismic, and Hazardous Materials Investigations

Overview

Purpose This chapter outlines the requirements and procedures for performing the necessary geotechnical, seismic and hazardous material investigation by the Design Contractor.

Topics This chapter is composed of the following topics:

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8.1 Introduction

1. The purpose of this chapter is to highlight the basic information required in geotechnical, seismic, and hazardous materials reports for Water Authority projects including pipelines, pump stations, pressure and flow control facilities, storage facilities, etc. The Design Contractor shall be responsible for conducting the proper geotechnical, seismic, and hazardous materials investigations for the project being considered for design. The Design Contractor shall subsequently ensure that applicable recommendations in the reports are included in the Construction Contract Documents.
 2. The type of report (geotechnical, seismic, and hazardous materials) required for each project depends on site location and project specifics. In addition, and as applicable, these reports must adhere to requirements and codes of the agency having jurisdiction on the project location.
 3. Planning-level (pre-design level) geotechnical, seismic, and hazardous materials site assessment reports shall be prepared and made available by the Design Contractor to the Design Manager prior to commencing detailed design.
-

8.2 Types of Investigations

1. There are three types of investigations that are usually carried out at the inception of a project: geotechnical, seismic, and hazardous materials. Geotechnical investigations are required on all Water Authority projects. Seismic investigations are required in areas dictated by local or state regulations (refer to Chapter 6 of the Facility Design Guide for more information). Hazardous materials investigations are required if recommended in the project pre-design report or when specifically required by the Water Authority. The following is a brief description of the contents of the report of each type of investigation:
 - 1.1. **Type I** *Geotechnical Report* – This report shall include detailed geotechnical information and an in-depth study of regional and onsite geology. The report shall be based on a review of available reference material, visual reconnaissance and detailed geologic mapping and subsurface exploration. This report shall contain the signatures and registration seals of both a California-Certified Engineering Geologist (CEG), and a California-Certified Geotechnical Engineer (GE) or Registered Civil Engineer (RCE).
 - 1.2. **Type II** *Seismic Report* – This report is required where state regulations require special seismic investigations because of the proximity of the property to a potentially active or active fault; there is a potential for landslides or liquefaction; or when required in the Design Contractor's scope of services. The report shall include all investigations and analysis required in a geotechnical report, plus any special state requirements. The signatures required for Type I reports are also required for this report (i.e., a CEG and a GE or RCE).
 - 1.3. **Type III** *Hazardous Materials Report* – This report is required when there is a strong likelihood of contamination present and shall contain the findings and recommendations of hazardous materials investigation. The work shall include subsurface investigation as outlined in section 8.5 below. The extent of investigations shall be as recommended in the project pre-design report and as described in this chapter. This report shall contain the signatures and registration seals of both a California-Certified Engineering Geologist (CEG) or Registered Geologist, and a California-Certified Geotechnical Engineer (GE) or Registered Civil Engineer (RCE).
-

8.3 Type I – Geotechnical Report

1. The geotechnical report shall be organized in four sections: General Information, Field Investigation, Engineering/Material Characteristics and Testing, and Geotechnical Design Criteria. The details of these sections are outlined below.
-

8.3.1 General Information

1. The following information shall be provided in geotechnical reports for all types of projects:
 - 1.1. Signatures and professional registration numbers of the project GEG and the GE or RCE.
 - 1.2. Job/project address.
 - 1.3. Location description and/or location index map with north reference, bar scale, etc.
 - 1.4. Source of base map with date, including from what information the map was made (e.g., aerial, land survey, etc.) and when it was last updated.
 - 1.5. Description of site conditions (topography, relief, vegetation, man-made features, drainage and watershed).
 - 1.6. Proposed grading (general scope, amount, special equipment and/or methods, if applicable, and appropriate shrinkage factor to use).
 - 1.7. Description of project and planned construction (type of structure and use, type of construction and foundation/floor system, number of stories, estimated structural loads).
 - 1.8. Description of geologic setting, geologic structure and site specific geologic conditions particularly as they relate to the proposed project.
 - 1.9. References to previous geologic and geotechnical reports (or published papers) and aerial photo of site area.
 - 1.10. Discussion of topographic features and relationship to site geology (outcrop distribution, slope height and angle and/or ratio, dip slopes, cliffs, fault contacts, erosion patterns, etc.).
 - 1.11. Description of site conditions, including distress to existing improvements in area (expansive, settlement/subsidence, mass movement, or creep areas), if any.
 - 1.12. Discussion of proposed grading and special grading equipment or methods needed for cemented, saturated, or other unusual materials or situations.

- 1.13. Proposed grading methods in areas of abundant cobbles, including discussion of source and percentage required of fine matrix material for reuse as suitable fill and backfill material.
- 1.14. Proposed rock disposal methods (for clasts and residuals larger than 12 inches). Location of rock disposal areas included on geotechnical map, if disposal area is onsite.
- 1.15. Discussion of presence and extent of existing fill soils (include associated documentation), if available.
- 1.16. Evaluation of excavation characteristics of onsite materials, including a rippability study, if needed.
- 1.17. Discussion of earthwork and grading, including general recommendations for site preparation, areas requiring remedial grading and/or special treatment (e.g., removal of unsuitable material, slope stabilization, compaction of soil on slopes, oversize rock placement, dewatering and other conditions).
- 1.18. General discussion of soil conditions for selected pipeline route, plant site, or reservoir site, including summary of existing available geotechnical data, evaluation of expansive potential of the onsite soils, and suitability of the existing material for use as fill and backfill.
- 1.19. Stability evaluation of site; slopes, tract boundary areas, etc.
- 1.20. General discussion of groundwater conditions including groundwater levels, groundwater quality, potential for natural or artificial seepage effects in the future, anticipated seasonal changes, and impact of dry vs. wet years.
- 1.21. Discussion of dewatering requirements.
- 1.22. Discussion of suspected soil and/or groundwater contamination.
- 1.23. Evaluation of scouring potential at river crossings; evaluation of erosion potential in adjacent waterways.
- 1.24. Discussion of flooding, surface water runoff, drainage and erosion and mitigation measures, if applicable.
- 1.25. E' (modulus of soil reaction, lb/sq in) values for backfill of various excavated soils and of various depths of cover.
- 1.26. Presence and influence of other major pipelines, or other underground structures.
- 1.27. Discussion of potential geologic hazards including evaluation of potential impacts of onsite geologic constraints such as faulting, ancient landslides, or other adverse geologic conditions. Include an assessment of the type and degree of

hazard and recommendations for measures to mitigate or reduce hazards.

- 1.28. Allowable lateral soil bearing pressures at a depth of approximately 4 feet below ground surface for design of restraint systems for buried pipe (thrust blocks, etc.).
- 1.29. Statements as to adequacy of site for the proposed development, including an evaluation of potential geologic hazards/adverse geologic conditions identified at the site, an assessment of the degree of hazard, and recommendations for measures to mitigate or reduce hazards.
- 1.30. For projects including potential tunneling, provide discussion of site conditions with respect to tunneling, including:
 - 1.30.1. Ground conditions.
 - 1.30.2. Excavation characteristics.
 - 1.30.3. Small tunnel criteria; jack-and-bore characteristics.
 - 1.30.4. Ground behavior.
 - 1.30.5. Rock mass discontinuities.
 - 1.30.6. Groundwater.
 - 1.30.7. Shaft/portal configuration.
 - 1.30.8. Construction staging areas.
 - 1.30.9. Tunnel excavation.
 - 1.30.10. Initial support requirements.
 - 1.30.11. Final tunnel lining.
 - 1.30.12. Muck disposal.
 - 1.30.13. Instrumentation.
 - 1.30.14. Other considerations (noise, groundwater discharge, air quality, traffic, etc.).

**8.3.2
Field
Investigation**

1. The geotechnical field investigation is planned to provide information for geotechnical analysis and design and, as appropriate, for the evaluation of potential soil/groundwater contamination. The scope of the field investigation shall include the following activities, with the results presented in the geotechnical report.
 - 1.1. Geologic reconnaissance and geologic mapping along the project route/site. Reconnaissance shall include a review of

available topographic and geologic information, aerial photographs, and available data of and near the project site.

- 1.2. Subsurface exploration and soil/rock sampling. The geotechnical engineer shall recommend the type, number, and depths of subsurface explorations and the number and type of soil/rock samples with approval from the Design Contractor. The geotechnical engineer shall determine intervals between test borings for pipeline alignments with approval from the Design Contractor. The spacing of test borings along a pipeline alignment shall vary depending on site conditions and proposed design. These borings typically extend approximately 7 feet below preliminary pipe invert elevations; however, deeper explorations shall be performed if necessary. Field screening procedures shall be used for preliminary evaluation of possible contamination.
- 1.3. Groundwater monitoring using wells or other appropriate methods for groundwater sampling. Document well design, development and sampling protocol, and sampling interval/duration.
- 1.4. Soil corrosivity survey including field resistivity survey. Refer to Chapter 8 of the Water Authority Corrosion Control Manual; ESD-110 for field resistivity sample collection and testing procedures. See Attachment 18-1 for the cover page of ESD-110.
- 1.5. Observation of possible contamination. If during subsurface investigations, field personnel suspect soil or groundwater contamination, document the possibility on the boring logs or other field notes.
- 1.6. Other field exploration (as necessary or appropriate) such as trenching, large diameter test borings, cone penetration tests, and/or geophysical surveys.
2. The following items, addressed during field investigations, shall be discussed in the Geotechnical Report in the Field Investigation section.
 - 2.1. Scope (date work done, investigative methods, sampling methods, logs of exploratory excavations, actual or assumed elevations of excavations for reference of material and samples to finished grade or footing elevations).
 - 2.2. Physical properties of soils, alluvial deposits, colluvial deposits, and other earth materials encountered.
 - 2.3. Geomorphic features that suggest the presence of landslides, mud/debris flows, faults, near surface groundwater, effluent seepage, and/or other possible adverse conditions.

- 2.4. Groundwater conditions, such as location of present water level(s), perched conditions, etc.
- 2.5. Known differences of opinion with recently available geologic reports or published data or maps of the site.
- 2.6. Earth materials (bedrock and surficial units).
 - 2.6.1. Unit classification, general lithologic type, and geologic age.
 - 2.6.2. Unit description and characteristics (in sequence of relative age) including:
 - 2.6.2.1. Composition texture, fabric, lithification, moisture, etc.
 - 2.6.2.2. Pertinent engineering geologic attributes (clayey, weak, loose); degree of cementation; alignments, fissility; planar boundaries; permeable or water-bearing zones; susceptibility to mass wasting, erosion, piping, or compressibility.
 - 2.6.2.3. Distribution, dimensions, or occurrences (supplemental to data furnished on illustrations).
 - 2.6.2.4. Suitability as construction and foundation material.
 - 2.6.2.5. Effects and extent of weathering (existing and relationship to project design and future site stability, material strength, etc.).
- 2.7. Geologic structure.
 - 2.7.1. General geologic structure.
 - 2.7.2. Distribution of structural features including position, attitude, pattern and frequency of:
 - 2.7.2.1. Fissures, joints, shears, faults, and other features of discontinuity.
 - 2.7.2.2. Bedding, folds, and other planar features.
 - 2.7.3. Character of structural features including continuity, width of zones and activity, dominant vs. subordinate, planar nature, plunge, depth, degree of cementation or infilling, gouge.
 - 2.7.4. Structural-sections or cross-sections (one or more appropriately positioned and referenced on map; especially through critical areas, building pads, slopes, and slides) of suitable size and engineering scale, with

labeled units, features and structures, and a legend. These sections shall correlate surface and subsurface data showing representative dip components, projections, and stratigraphic/structural relationships; the locations of borings and test sites utilized shall be accurately located on the cross sections.

- 2.7.5. Inferred soil profiles along the entire pipeline alignments (these are used for design purposes and by the Contractor for bidding purposes).

2.8. Stability Features and Conditions.

- 2.8.1. Adequate mapping, sections, and descriptions showing position, dimensions, and type of existing downslope movement features including soil/rock creep, flows, falls, slumps, and slides, if any.
- 2.8.2. Activity, cause, or contributing factors of downslope movement features.
- 2.8.3. Recent erosion, deposition, or flooding features.
- 2.8.4. Subsidence/settlement, piping, solution, or other void features or conditions.
- 2.8.5. Groundwater and surface drainage characteristics or features.
 - 2.8.5.1. Surface expression (past and present); permeability/porosity of near-surface materials.
 - 2.8.5.2. Actual or potential aquifers or conduits, perched situations, barriers, or other contributors to percolation and groundwater movement and fluctuation of groundwater levels at the site.
 - 2.8.5.3. Potential for groundwater migration and its effect on the project.

- 2.9. Slope stability analysis (dependent on slope height and ratios, strength of earth materials, internal structure, susceptibility to weathering, actual or potential groundwater, surficial covering, proximity to site improvements or structures); perform appropriate laboratory testing in conjunction with the stability analysis, as deemed necessary by the geotechnical subcontractor (special considerations is given to slopes steeper than 2:1 [horizontal: vertical] and/or in excess of 30 vertical feet in height).

- 2.9.1. Gross stability of natural or man-made slopes with graphics, supporting data, and applicable parameters. Proposed slopes have a minimum static factor of safety of 1.5, and minimum seismic factor of safety of 1.25.

Where factors of safety fail to meet those required, mitigating measures (i.e., buttress, etc.) are necessary. Provide stability analysis for mitigating measures. Use an appropriate seismic coefficient in the seismic analysis.

- 2.9.2. Surficial stability of slopes with graphics, supporting data, and applicable parameters. Factor of safety must exceed 1.5. Otherwise appropriate mitigating measures (e.g., buttresses, debris walls, etc.) are required.

2.10. Surface and subsurface indications of faulting.

2.11. Retaining walls: design criteria on proposed walls (surcharged or greater than 3 feet in height above the base).

- 2.11.1. Slope surcharge and geologic surcharge factors and parameters.
- 2.11.2. Drainage and backfill requirements including suitable drains.
- 2.11.3. Allowable bearing values, lateral bearing resistance and coefficient of friction based on testing or UBC (Chapter 18), current edition.
- 2.11.4. Lateral earth pressure diagrams for braced and free walls, active and passive pressures and seismic forces on walls.
- 2.11.5. Surcharge pressure distribution due to uniform load, live load and point loads through the soil and engineered fill.
- 2.11.6. Footing setback from face of slopes, in accordance with Section 1806.5.3 of UBC (Chapter 18), current edition.
- 2.11.7. Temporary stability during construction.

2.12. Plan and coordinate the procedures for the collection of soil samples with the requirements outlined in Chapter 8 of the Corrosion Control Manual (ESD-110).

2.13. Potential landslides. Discuss the potential of landslides for both existing conditions, and during and after construction following soil disturbance.

3. The following figures shall be included in the Field Investigation section of the Geotechnical Report:

- 3.1. Plan with legend showing site limits, terrain features, man-made features, boring/test pit locations, proposed improvements (including slopes with ratios, soil or formational

- contacts, daylight lines, paving areas, retaining walls, subdrains, over-excavation, cleanout, and uncompacted fill areas).
- 3.2. Logs and location of all borings drilled and test pits excavated (results of laboratory test data location of all samples taken, surface and subsurface conditions and materials).
 - 3.3. Geologic map showing (as appropriate) site geology, approximate location of proposed keyways, proposed buttresses, proposed or existing subdrains, seeps or springs, etc. The map scale is chosen so that geologic and geotechnical designations are legible. The map shall contain an adequate legend. The map shall highlight representative geologic data of sufficient amount and location for the evaluation of general rock or soil unit distribution, geologic structure, downslope movement features (including soil/rock creep), groundwater conditions, subsidence/settlement features or potential, and other pertinent site characteristics. In preparing maps, use the engineering geology map symbols referred to as the Genesis-Lithology-Qualifier System to indicate the age and formation as well as rock type or other distinguishing characteristics.
 - 3.4. Geologic cross-sections, as appropriate.
4. Prior to mobilizing for the field investigation, the Design Contractor shall:
 - 4.1. Identify and locate all underground utilities.
 - 4.2. Obtain all required permits and easements required for the investigation.
 - 4.3. Obtain all traffic control permits required for the investigation.
-

**8.3.3
Engineering /
Material
Characteristics
and Testing**

1. The geotechnical report shall contain the appropriate laboratory and/or in-situ testing data to characterize subsurface material and substantiate analyses and calculations from which conclusions and recommendations are derived. The report shall include descriptions of the sample preparation and testing procedures if the tests are not in accordance with the American Society for Testing and Materials (ASTM) standard procedures, International Society of Rock Mechanics (ISRM) procedures, local code requirements, and procedures acceptable to the geotechnical engineering profession. Materials shall be classified in accordance with the Unified Soil Classification System (USCS).
2. Note the appropriate designation numbers for ASTM and ISRM procedures or local code requirements. In general, types, numbers

and procedures of laboratory testing shall represent the site conditions before, during and after site development from a geotechnical engineering perspective. Testing procedures and time of preparation, such as length of saturation time, shall be in accordance with testing procedures for the type of earthen materials (soil and/or rock) identified by the CEG, and GE or RCE. The geotechnical report shall contain the type or condition of samples, applicable engineering graphics, results of all tests, and locations of all test samples.

3. Laboratory analysis may include any of the following tests:

3.1. Material competency and strength.

3.1.1. Field densities and moisture content, as well as relative compaction where pertinent.

3.1.2. Shear strength parameters of foundation material and those considered in stability analysis (drained or undrained conditions, effective stress or total stress analysis); identify in-situ or remolded samples.

3.1.3. Consolidation or settlement potential.

3.1.4. Expansion potential by UBC Standard No. 18-2, Expansion Index Test, or other generally accepted method. Provide anticipated at-grade expansion potential for each lot. Foundation Design Criteria are based in part on the anticipated expansion potentials and revised as necessary upon completion of grading.

3.2. Expansion Index (UBC Standard 18-2).

3.3. Maximum dry density/optimum moisture parameters as determined by ASTM D1557, Test methods for moisture-density relations of soils and soil-aggregate mixtures using 10 lb (4.54 kg) rammer and 18-in (457 mm) drop.

3.4. Penetration tests (standard penetration or other method of known correlation to material density).

3.5. Hardness.

3.6. Slake-Durability tests.

3.7. Gradational size analyses.

3.8. Specific gravity.

3.9. Atterberg limits analyses and parameters.

3.10. Appropriate chemical testing including testing of corrosive characteristics of water and soil in contact with pipelines,

concrete and utility lines.

3.11. Mechanical grain size distribution.

3.12. Electrical resistivity and conductivity

3.13. pH, cation/anion concentration, and chemical analyses.

**8.3.4
Geotechnical
Design Criteria**

1. A discussion on the following items, as appropriate, shall be included in the geotechnical report for the project.
 - 1.1. Footing depth, width, design and placement, and the criteria on which they are based.
 - 1.2. Criteria for foundation material preparation.
 - 1.3. Allowable soil bearing capacity at different depths at locations.
 - 1.4. Requirements of bedding materials and foundation support.
 - 1.5. Lateral pressures (active, passive, or at-rest conditions) and coefficient of friction.
 - 1.6. Resistance to lateral sliding.
 - 1.7. Expected settlement: total, differential, and rate of settlement.
 - 1.8. Bridging and grade beam recommendations.
 - 1.9. Prestressed (post-tensioned) flotation slab recommendations, if this system is proposed.
 - 1.10. Exterior flatwork recommendations.
 - 1.11. Moisture barriers and/or selective grading (aggregate or sand base or other subbase).
 - 1.12. Soil moisture measures.
 - 1.13. Mitigation of cut/fill or other differential transitions beneath improvements.
 - 1.14. Backfill specifications and recommendations for compaction of utility trenches under structures, pavements, and slopes (minimum recommended percent relative compaction) vs. landscape and other areas.
 - 1.15. Provisions for final observation and necessary testing during and upon completion of grading.
 - 1.16. Other pertinent geotechnical information for the development of the site, such as methods of soil treatment for expansive soil.
 - 1.17. Unsuitable material removal (canyon cleanout, over excavation, etc.).

- 1.18. Keyways and benching for existing or proposed slopes.
- 1.19. Recommendations for the compaction of soil within the zone of the slope face.
- 1.20. Slope stability: susceptibility to mass-wasting (creep to rapid failure potential).
 - 1.20.1. Favorable or unfavorable interrelationships of fractures (joints, shears, faults or zones) to planar structures (bedding, contacts, folds, plunges, weathered zones, etc.) and to each other, forming potential failure planes, veneers, masses, or blocks.
 - 1.20.2. Favorable or unfavorable interrelationships of geologic structures, conditions, and potential failure planes to natural and/or man-made topography forming actual or potential adverse dips and contracts, adverse fractures (jointing, shearing, faulting), adverse fold limbs or synclinal axes, adverse earth masses or blocks.
 - 1.20.3. Favorable or unfavorable interrelationships of height of existing or proposed slopes to present and future strength of earth materials (weathering effects; rate, depth, etc.).
 - 1.20.4. Slope stability effects onto or from developed, natural or, if known, proposed slopes of adjacent properties.
- 1.21. Opinion and recommendations regarding surficial and gross stabilities of natural and manufactured slopes.
- 1.22. Depths observed to competent material and testing methods used to determine material competency.
- 1.23. Recommendation for CEG, RCE, or GE to observe excavation of cleanouts and keyways.
- 1.24. Suitability of site for geotechnical conditions and proposed development.
- 1.25. Corrective or selective grading.
- 1.26. Recommendations for subgrade specifications.
- 1.27. Soil cement or lime stabilization measures.
- 1.28. Rock placement or disposal.
- 1.29. Blasting.
- 1.30. Irrigation and drainage controls, dewatering, surface and subsurface drains and subdrains.

- 1.31. Protection of existing structures during grading.
- 1.32. Recommendations for foundation and wall excavation.
- 1.33. Shoring requirements.
- 1.34. Potential effects extending into the site from adjacent areas, or from the site into adjacent areas, and recommendations for stability, erosion, sedimentation, groundwater, etc.
- 1.35. Stabilization measures.
 - 1.35.1. Fill blankets for pads or stabilization blankets for slopes.
 - 1.35.2. Stabilization fills: recommendations, subdrains, stability analysis and supporting test data and parameters.
- 1.36. Fill-over-cut slope recommendations.
- 1.37. Subsidence, hydrocompaction and piping potential.
- 1.38. Consolidation analysis including estimate of total and differential settlements expected due to site grading and structural loading.
- 1.39. Deep foundations, including pile type, size and penetration depth, method of support (friction or end bearing pile) in soil or rock or both, pile capacity and design load in compression and uplift, axial and lateral load deflection evolution, installation recommendations (method, equipment, drivability analysis, the need of pre-drilling or jetting, etc.) and requirements for an indicator pile program and/or pile load test.
- 1.40. Recommendations for dealing with contaminated soil and/or groundwater.
- 1.41. Pipe bedding requirement and characteristics for pipeline.
- 1.42. Corrosivity potential and corrosion protection requirements.
- 1.43. Paving section for roads for various traffic conditions.
- 1.44. Protection of existing structures during grading.
- 1.45. Recommendations for dealing with contaminated soil and/or groundwater.
- 1.46. Recommendations for trench excavation.
- 1.47. Shoring requirements.
- 1.48. Pipe bedding requirement and characteristics for pipeline.
- 1.49. Recommendations for E' (modulus of soil reaction) based on pipe depth and backfill type and depth.
- 1.50. Soil conditions related to tunneling and pipe jacking, if

applicable.

- 1.51. Scour potential, if applicable.
 - 1.52. Paving section for roads for various traffic conditions.
 - 1.53. Include geotechnical design criteria for pressure and flow control stations associated with pipelines in geotechnical reports.
 - 1.54. Buoyancy potential (for pressure and flow control stations) due to the existing or potential presence of a high water table.
 - 1.55. Suitability of native materials as backfill.
-

8.4 Type II – Seismic Report

1. The seismic report shall be required in areas where the onsite seismicity is of concern due to proximity to a potentially active or active fault. The following guidelines for the seismic report are based on the criteria established by the California Department of Conservation, Division of Mines and Geology, UBC Chapter 16 and the California Building Code. Refer to Chapter 6 of the Facility Design Guide for more information on seismic criteria. The following suggested scope is flexible and shall be tailored to the site-specific seismic and geologic conditions, and intended land use. The seismic report shall be divided into the following sections.
-

8.4.1 General Information

1. The following shall be provided in seismic reports:
 - 1.1. Signature and professional registration number of the project CEG and the project GE or RCE.
 - 1.2. Job address and location map.
 - 1.3. Description of the existing general site conditions; description of proposed development or changes in land use, as applicable.
 - 1.4. A review of existing maps and technical literature to evaluate the seismic or earthquake history of the region; to establish the relationship of the site to known faults and epicenters; and to determine groundwater levels, barriers and anomalies which may indicate the presence of faults. The report shall include a discussion of the near-site major earthquakes during historic times, with epicenter locations and magnitudes. The report shall also include the location of any major or regional fault traces affecting the site being investigated, and a discussion of the tectonic mechanics and other relationships of significance to the proposed construction.
 - 1.5. Potential for liquefaction and associated recommendations.
 - 1.6. A bibliography of the reference material utilized in the study.
 - 1.7. Geologic map of regional and/or local faults.
 - 1.8. Map(s) of earthquake epicenters.
 - 1.9. Fault strain and/or creep map.
 - 1.10. Potential for landslides and associated recommendations.
 - 1.11. Seismic evaluation, including information on local and regional seismicity, proximity to known or suspected faults, estimated

levels of strong shaking during project design life, and potential for seismic-induced ground failure (liquefaction, seismic settlement, lateral spreading, ground rupture, lurching, and other seismic effects). Include calculation/estimation of the Upper Bound Earthquake (Maximum Credible Earthquake) for earthquake faults occurring within a 100-km radius of the site. Refer to Chapter 6 (Seismic Design Criteria) of the Facility Design Guide for more information. Provide:

- 1.11.1. The potential ground acceleration having a 10 percent probability of exceedance in 50 years.
- 1.11.2. The maximum level of motion which may ever be expected at the project site within the known geological framework (i.e., the ground acceleration associated with the Upper Bound Earthquake).
- 1.11.3. Seismically induced lateral earth pressures; seismic response spectra for 0.5 percent, 2 percent, 5 percent and 10 percent damping.
- 1.11.4. Address methods to mitigate potential seismic effects.

**8.4.2
Field
Investigation**

1. The following is provided as part of the seismic report in the Field Investigation section:
 - 1.1. Location and chronology of local faults and the amount and type of displacement estimated from historic records and stratigraphic relationships. Features normally related to fault activity, including fault scarps, triangular facets, alignment of springs, offset bedding, disrupted drainage systems, closed depressions, fault valleys, offset ridges, faceted spurs, dissected alluvial fans, alignment of landslides, and vegetation patterns shall be shown on the geologic map and discussed in the report.
 - 1.2. Locations of other earthquake-induced features as the result of lurching, settlement, liquefaction, etc. Evidence of these features shall be included with the following:
 - 1.2.1. A map showing location of features relative to the proposed construction.
 - 1.2.2. A description of the features including length, width and depth of the disturbed zone.
 - 1.2.3. Estimation of amount of disturbance relative to bedrock and surficial materials.
 - 1.3. Distribution, depth, thickness, and nature of the various

unconsolidated earth materials, including groundwater, which may affect the seismic response and damage potential at the site.

- 1.4. Surface investigation, including geologic mapping, preparation of geologic cross-sections illustrating fault displacement and/or rupture, and study of aerial photographs. Geologic maps and cross-sections along with a discussion of the local fault patterns and mechanics relative to the existing and proposed ground surface. The minimum scale of the geologic map shall be 1:24,000.
- 1.5. Subsurface investigation, including:
 - 1.5.1. Trenching across any known or suspected fault zones to evaluate fault location and recency of movement, width of disturbance, physical condition of fault zone materials, type of displacement, and fault geometry. The trench logs shall be included in the report.
 - 1.5.2. Advancement of exploratory borings to evaluate depth of unconsolidated materials and groundwater levels, as well as fault plane geometry. Samples of soil and bedrock obtained from the borings for laboratory testing and soil engineering studies. The boring logs are included in the report.
 - 1.5.3. Performance of geophysical surveys that may indicate types of materials and their physical properties, groundwater conditions, and fault displacements. The geophysical survey data shall be included in the report.
 - 1.5.4. All subsurface investigations shall be properly coordinated with Digalert (Tel. 800-227-2600).

8.4.3 Conclusions and Recommendations

1. The seismic report shall conclude with the following:
 - 1.1. Estimated age, type of surface displacement, and amount of reasonable anticipated future displacements of any faults within or immediately adjacent to the site.
 - 1.2. Definition of any areas of high seismic risk.
 - 1.3. Estimated magnitude and distance to the epicenter of all relevant earthquakes.
 - 1.4. Potential for lurching and shallow ground rupture.
 - 1.5. Liquefaction potential of sediments and soils.

- 1.6. Estimated dynamic settlement of soils.
 - 1.7. Potential for earthquake induced landsliding.
 - 1.8. Potential for earthquake induced flooding, tsunamis, and seiches.
 - 1.9. Recommended building restrictions, set-back distances, special foundations, or remedial earthwork use limitations within any designated high risk area.
-

8.5 Type III – Hazardous Material Report

1. The Design Contractor shall investigate the possibility of finding hazardous materials along pipeline alignments and at each plant, pump station, pressure or flow control facility, reservoir, or other project site. The investigation shall review surface features, underground storage tanks, and other items that could contribute to the hazardous materials potential.
 2. Hazardous materials site investigations, or site assessments, are typically broken up into two phases. Phase I shall consist of research and reconnaissance of the project site. Phase II shall be performed when there is a strong likelihood of contamination present as based on the Phase I investigations and recommendations. The Phase II investigation shall focus on identifying subsurface site contamination.
 3. In most cases, the pre-design level of investigation done by the Water Authority will cover the research and reconnaissance (Phase I) for the site or facility. The Design Contractor shall perform the subsurface investigation (Phase II) during the project detailed design phase, if recommended in the initial site assessment (Phase I) or the geotechnical report. Additional environmental review may be required if Phase II results do not match those of Phase I.
-

8.5.1 Phase I Research and Reconnaissance

1. If the Phase I assessment is not done by the Water Authority, the Design Contractor shall perform the research and reconnaissance investigation including the following:
 2. Research and review of pertinent geologic, hydrogeologic and topographic literature about the facility sites and surrounding areas that may be available from California Department of Water Resources, California Division of Mines and Geology, County of San Diego Public Works Department, U.S. Geological Survey quadrangle maps, and other literature pertinent to the site.
 - 2.1. Research and review of historical aerial photographs along the pipeline corridors, as well as areas within one-half mile of facility sites; photographs available at the County of San Diego Public Works Department, and at other public or private photobanks shall be reviewed.
 - 2.2. Review of Water Authority in-house files as they pertain to the site.
 - 2.3. Review of site maps provided by the Water Authority staff.
 - 2.4. Visual reconnaissance of pipeline corridor and properties

within 500 feet of the corridor, and of areas within one-half mile of the facility sites to observe facilities for indications for potential to have used, stored, or disposed of hazardous substances.

- 2.5. Interview of onsite or adjacent tenants.
- 2.6. For site information, contact the San Diego County Department of Environmental Health Services and the San Diego Fire Department Underground Tank Unit.
- 2.7. Review of the current list from the following agencies: U.S. Environmental Protection Agency (EPA), state of California Department of Health Services (CDHS), state of California Regional Water Quality Control Board (CRWQCB), San Diego Department of Environmental Health Services, Hazardous Materials Management Division (HMMD), and California Integrated Waste Management Board (CIWMB). List known hazardous substance sites within 500 feet of the pipeline alignment or within one-half mile of the facility sites. At a minimum, lists reviewed shall include the following:
 - 2.7.1. U.S. EPA Comprehensive Environmental Response Cleanup and Liability Act Information System (CERCLIS) List.
 - 2.7.2. U.S. EPA National Priority List (Superfund Site).
 - 2.7.3. CDHS, Abandoned Site Program Information System (ASPIS).
 - 2.7.4. CDHS, Expenditure Plan for the Hazardous Substance Cleanup Bond Act.
 - 2.7.5. CDHS, Toxic Substances Control Division, Potential Hazardous Waste Properties in California.
 - 2.7.6. CIWMD, Active Landfills.
 - 2.7.7. CIWMD, Inactive Landfills.
 - 2.7.8. CRWQCB, San Diego Region, Leaking Underground Tank Facilities List.
 - 2.7.9. California Office of Planning and Research Hazardous Waste and Substance Sites List (Governor's List).
 - 2.7.10. HMMD, Selected Hazardous Materials Records List (SHMRL).
3. In addition to these sources, Sanborn Fire Insurance Maps and historical business directories may be used to characterize past activities along the pipeline alignment or near facility sites.

4. A summary report of the research performed, the findings and professional opinions of the potential for environmental contamination along the corridors and facility sites shall be included in hazardous material reports. These reports shall also include a discussion of existing and potential contamination sources. Specific recommendations for further investigation, if warranted, shall be included.
-

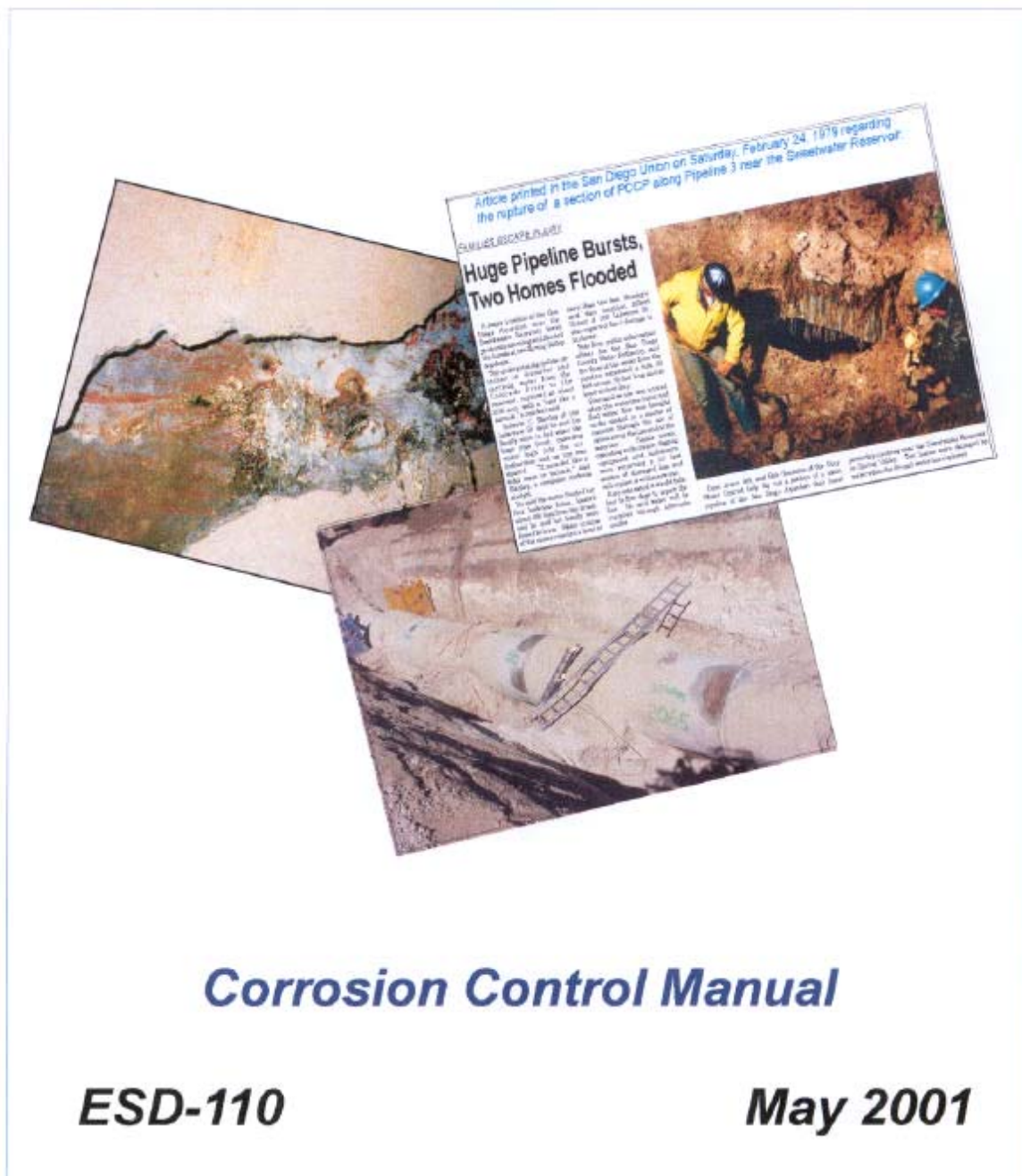
**8.5.2
Phase II
Subsurface
Investigation**

1. Where contamination is present, as indicated and recommended for further study in Phase-I report, the Design Contractor shall perform the necessary subsurface investigations with the goal of identifying the extent of contamination both vertically and horizontally, as it affects the project site. The investigation shall include at least the following activities:
 - 1.1. Preparation of a work plan for contamination delineation and characterization. The work plan shall be submitted to the Design Manager for review and acceptance.
 - 1.2. The work plan shall include, as appropriate, surface sampling, soil-gas surveys, soil borings, monitoring well installation, or other techniques recommended in the initial site assessment (Phase I), or the geotechnical report.
 - 1.3. Preparation of a site safety plan. All safety precautions and training stipulated in 29 CFR 1910:120 shall be followed.
 - 1.4. If contamination is found, the Design Contractor shall notify the appropriate regulatory agencies including the agency having jurisdiction over the project location.
 - 1.5. The Design Contractor shall prepare a report describing the investigation performed, including locations of subsurface work and a discussion of work techniques used. Consult the County of San Diego Site Assessment and Mitigation Manual for a detailed description of what to include in a site assessment report where contamination is identified. The report shall identify the extent and limits of hazardous materials found and shall present recommendations for any remediation work required.
 - 1.6. The report shall include the types and nature of contamination including a list of all contaminants found.
 - 1.7. The report shall include a list of regulatory agencies that may be contacted during cleanup and disposal activities.
-

Attachment 8-1 – Cover Page of the Water Authority Corrosion Control Manual



SDCWA
San Diego County Water Authority
Engineering Department



Chapter 9 Transient Analysis and Surge Control

Overview

Purpose This chapter presents the requirements for the Design Contractor to perform transient analysis and design surge control measures for Water Authority projects.

Topics This chapter is composed of the following topics:

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9.5	TRANSIENT ANALYSIS AND SURGE CONTROL REPORT	9-9

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9.1 Introduction

1. Pressure surges developed during startup and shutdown of hydraulic facilities, and/or under emergency conditions, such as loss of power to pumps or inadvertent valve closure, may exceed or be considerably lower than steady-state pressure design values. Hydraulic transients can produce sub-atmospheric pressures that may allow dirty water and pathogens into the system, may induce cavitation and water column separation, and can cause pipe collapse. Hydraulic transients can also produce excessive pressures that lead to pipeline or other hydraulic component failure. The potential for hydraulic transients should be assessed and mitigated with passive measures or other surge control devices for all hydraulic systems.
 2. The potential for severe hydraulic transients shall be assessed for all hydraulic systems so that catastrophic system failures and unnecessary leakage and contamination can be avoided. The Design Contractor shall consider system impacts on the new facility.
 3. The purpose of this chapter is to highlight the requirements, and the Design Contractor's responsibilities for proper transient analysis and surge control of hydraulic systems for Water Authority projects including pipelines, pump stations, pressure and flow control facilities, etc. This will enable the Water Authority to operate their systems with greater reliability and safety by avoiding the potential catastrophic effects of pressure surges and other undesirable system transients.
-

9.2 Transients and Surges

9.2.1 Overview

1. Transients in water distribution and transmission systems are a major concern for pipeline design and operation as they have the potential to damage pipeline systems and equipment, reduce system efficiency, induce adverse water quality conditions, and threaten the integrity and quality of the water-delivery system.
2. Dynamic pressure changes (sudden pressure increases and decreases) are the result of transient flow conditions. The primary causes of this type of condition are:
 - 2.1. Pump failure as a result of switching off or interrupting the power supply (power failure).
 - 2.2. Switching one or more pump(s) on or off while other pumps are in operation.
 - 2.3. Rapid closing or opening of shut-off valves in the piping system.
 - 2.4. Sudden cessation of flow in a gravity system leading to cyclic flow and water column separation.
3. The result of pressure surges are dynamic loads on piping, valves, pipe fixtures, supports, and other system components. Although pressure surges in pump piping systems generally cannot be avoided, they have to be kept within permissible limits.
4. An objectionably low-pressure transient event has the potential to cause the harmful intrusion of untreated, possibly contaminated water into pipes with leaky joints or cracks as the risk of backflow increases significantly with reduced pressure. Pathogens or chemicals in close proximity to the pipe can become a potential contamination source. In addition, low-pressure transients may lead to cavitation and water column separation, and can cause pipe collapse.

9.2.2 Surge Protective Measures

1. The preferred surge-control strategy is to design a system which is passively protected against transient impacts (i.e., a system in which a column separation event cannot occur). This is strongly favored over a system which mitigates the impacts of a transient event by means of mechanical device(s). Nevertheless, it may sometimes be necessary as a matter of last resort to utilize surge-control devices. Such devices, as discussed in this section, shall not be incorporated into a design without extensive discussion and

specific written approval in advance.

2. Surge-control devices, if allowed, may be required to prevent the development of mechanical overload of hydro-mechanical system components. Some of the most common types of surge-control devices are:
 - 2.1. Surge Tanks (Opened or Closed).
 - 2.2. Flywheel.
 - 2.3. Bypass Lines.
 - 2.4. Surge Anticipation Valves.
 - 2.5. Pressure Relief Valves.
 - 2.6. Air release/vacuum valves (Vent valves).
 - 2.7. Swing check valves.
-

9.2.3 Objectives of Transient Flow Analysis

1. The objective of a transient flow analysis is to identify and quantify surge impacts, and to determine the optimal technical and economic parameters for developing an adequate surge control strategy. Transient hydraulic analysis will help enhance the managing of:
 - 1.1. Pump Operations, Startups, Shutdowns, Pump Trips (Power Failure).
 - 1.2. Valve Operations, Tank Operations.
 - 1.3. Surge Protection (e.g., Air Release, Vacuum Breakers).
 - 1.4. Pathogen Intrusion, System Reliability and Integrity.
 - 1.5. Leakage Detection and Control, Pressure Dependent (Sensitive) Demands.
 2. The Water Authority usually performs preliminary transient flow analyses during the project planning stage. The results of the planning-stage transient analysis will be handed over to the Design Contractor who shall update to reflect changes made during design per the guidelines presented in this chapter. If no planning-stage transient flow analysis was performed, the Design Contractor shall conduct the appropriate transient flow analysis, as outlined in the below sections.
 3. The Design Contractor shall perform the proper transient flow analysis and include surge-control measures in the design of Water Authority projects to ensure safety and reliability under operational and emergency conditions.
-

**9.2.4
Transient
Analysis
Strategy**

1. The Design Contractor shall follow the strategy below in the transient flow analysis:
 - 1.1. Gather all hydraulic information developed during the project planning stage. This information may include steady-state analysis of the system as well as transient flow analysis. If planning study is part of the Design Contractor scope of work, then they shall perform the necessary steady-state hydraulic analysis and use the data for transient analysis.
 - 1.2. Update the steady-state hydraulic analysis performed during the project planning stage to reflect changes made during design.
 - 1.3. Use the updated steady state analysis information to perform an initial evaluation of the system to identify the likely worst case transient events. Several scenarios shall be investigated including
 - 1.3.1. Low flow situations.
 - 1.3.2. High flow situations.
 - 1.3.3. Maintenance.
 - 1.3.4. Emergencies.
 - 1.3.5. During construction.
 - 1.3.6. System malfunctions.
 - 1.3.7. Operator errors.
 - 1.4. Determine the need for further analysis, if harmful events are likely.
 - 1.5. Coordinate with the Design Manager to determine the extent and nature of modeling required to fully capture any harmful event.
 - 1.6. Perform modeling of the worst case scenarios.
 - 1.7. Formulate solutions and verify by modeling.
 - 1.8. Propose and demonstrate the adequacy of passive measures to counteract the negative impact of transient flow.
 - 1.9. Propose and demonstrate the adequacy of an active device (or devices) to control surges and maintain system integrity. It is to be noted that use of active surge control devices shall be heavily disputed and analyzed by the Water Authority. Consequently, the Design Contractor shall only propose active surge-control measures when it is absolutely necessary and no other passive means can be used.

- 1.10. Discuss the strategy and findings of the transient analysis with the Design Manager and Water Authority O&M staff for acceptance.
 - 1.11. Produce a report with charts that demonstrate the nature of the transient problem, the details of solutions, and background data.
-

9.3 Transient Hydraulic Modeling Program

1. The Water Authority is in the process of selecting a software for performing transient analysis and modeling transient events. Once the selection process is completed, the Design Contractor shall use the selected software for transient modeling. This will facilitate the handling and exchange of data files between the Water Authority and the Design Contractor. The Design Manager will inform the Design Contractor with the details (program name, version number, etc.) of the software requested to be used.
2. Until such process is established, the Design Contractor shall use a computer program suitable for transient flow analysis of water systems. The program shall be capable of:
 - 2.1. Modeling advanced pressure surge simulation.
 - 2.2. Analyzing complex hydraulic transients.
 - 2.3. Modeling of vapor cavitation and liquid column separation, allowing the effect of pressure surges due to vapor cavity collapse to be properly evaluated.
 - 2.4. Analyzing critical hydraulic transient events, including cavitation.
 - 2.5. Modeling of the hydraulic system following inclusion of the surge suppression/protection device(s).
 - 2.6. Utilizing the full four quadrant (head and torque versus speed and discharge) pump characteristics in addition to using the moment of inertia of the moving pump parts to compute pump rundown speeds. This approach is essential for modeling situations where abnormal pump operation occurs such as turbining, flow reversal, etc.
 - 2.7. Determine system's response to pump station power failures, valve closures, and pump speed changes, as well as assess the relative merits of various surge protection measures to reduce leaks, avoid breaks, and investigate control actions and strategies.
 - 2.8. Calculating results along the pipelines (including low and high points), at junctions, and network components.
 - 2.9. Generating comprehensive results for pressure head and flow variations for all positions in the water system in addition to gas volumes for closed surge tanks and air vacuum valves and pump speed variations for pump trips.
3. The program shall also be capable of an extended period dynamic simulation (EPS); and launch a precise surge analysis with

automatic calculation of all active boundary conditions at the selected time instant, such as tank levels, pump and valve settings and status, and demands. This will enable quick and reliable identification of the critical operational time that will result in the most severe hydraulic-transient conditions in the modeled system. With this information, the Design Contractor can more accurately predict the development of unacceptable operating conditions in the modeled system, identify risks, formulate and evaluate protective measures, and determine improved operational plans.

4. The Design Contractor shall inform the Design Manager in writing of the details of the program intended to be used in the transient analysis. Program name, version number, and developer, are information that shall be provided by the Design Contractor. The Design Contractor shall demonstrate that the selected program has been successfully used in modeling transient flow analysis and that it meets all requirements stated above. The Design Contractor shall seek the approval of the Design Manager on the selected program for transient analysis.
-

9.4 Limits of the Analysis

1. To the extent practicable, the Design Contractor shall include as many components of the existing hydraulic system as possible in the transient hydraulic analysis. This is to ensure adequate and reliable transient hydraulic modeling and the suitability of the selected surge-control device(s), if any. At a minimum, the following components shall be included in the transient hydraulic analysis modeling:
 - 1.1. All new project facilities considered for design.
 - 1.2. Existing facilities up to the first free water surface (e.g., reservoir, flow regulatory facility, vent structure).
 2. The Design Contractor shall fully coordinate with the Design Manager the delineation of the impacted area and the determination of the proper limits to perform adequate transient analysis. In many cases, the Water Authority will impose the limits of the analysis. The Water Authority will provide the Design Contractor with the data and information, of the existing hydraulic system (e.g. pipe lengths, pipe diameters, flow rates, operating conditions), that are needed in modeling the system and performing transient analysis.
-

9.5 Transient Analysis and Surge Control Report

1. The Design Contractor shall prepare a transient analysis and surge control report for the project being considered for design. At a minimum, the following topics shall be covered in the report:
 - 1.1. How the system works, including the main modes of operation as well as possible faults and/or malfunctions.
 - 1.2. A list of all critical operating conditions and possible faults and/or malfunctions.
 - 1.3. An overview of all data used as the basis for the analysis.
 - 1.4. Description of Software and method used for the analysis.
 - 1.5. The simplifications adopted for the purpose of the analysis.
 - 1.6. Comparison of potential surge-control devices.
 - 1.7. Recommendation of surge-control device(s) to be adopted.
 - 1.8. Recommended valve(s) actuation times.
 - 1.9. The results obtained (program output), including comments and explanations.
 2. The Design Contractor shall discuss the recommendations outlined in the transient analysis and surge-control report and their implications with the Design Manager. The Design Contractor shall subsequently ensure that applicable recommendations in the report are included in the construction contract documents.
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Chapter 10 Environmental Compliance and Permit Support

Overview

Purpose This chapter outlines the requirements for the Design Contractor to obtain the necessary permits to perform design and field-related design activities.

Topics This chapter is composed of the following topics:

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10.1 Introduction

1. This chapter provides guidelines for obtaining permits and complying with regulatory agency laws, regulations and other procedures for Water Authority projects. It also describes the Design Contractor's role in coordinating permitting and environmental-related activities with the Water Authority Water Resources Department.
 2. The Design Contractor shall consult with the Water Resources Department in such cases as
 - 2.1. Performing grading / earthmoving / ground disturbing activities.
 - 2.2. Impacting project surrounding area with noise / dust.
 - 2.3. Removal of any vegetation.
 - 2.4. Change in project description that leads to change of permitting or environmental requirements. Examples include change in pipeline horizontal alignment, larger footprint for a pump station, etc.
-

10.2 Permit Coordination

10.2.1 Permits and General Responsibilities

1. Attachment 10-1 (Permits Matrix) provides a list of state and local permits that potentially are required for projects. The permits listed in Attachment 10-1 are the most prevalent but do not constitute a comprehensive list of required permits. It is the Design Contractor's responsibility to identify ALL necessary permits and required approvals in a manner consistent with the project scope, location, and schedule. As indicated in Attachment 10-1, the Water Authority is exempt from some permits by State and local agencies. However, in many cases the Water Authority still approaches the pertinent agency for courtesy approvals. As such, the Design Contractor shall fully coordinate with the Water Resources Department in identifying the exempted permits. The Design Contractor shall keep the Design Manager informed at all times with the permitting process and shall provide copies of all documents to the Design Manager.
2. The Design Contractor shall obtain all permits required for performing design work and shall pay any costs associated with such permits. Examples of design-related permitted work include excavations for surveying and geotechnical operations within the public rights-of-way of a jurisdictional agency.
3. The Design Contractor shall ensure that permits and approvals required during construction phase are described in the Contract Documents (refer to the Construction Management Manual-ESD-100 for more information). Attachment 10-2 shows the cover page of the current version of the Construction Management Manual. The Design Contractor shall demonstrate that plans have been checked by responsible agencies so that the Construction Contractor could readily obtain construction permits.
4. The Design Contractor shall ensure that the latest version of any general regulatory permit (e.g., dewatering discharge, stormwater discharge, etc.) is listed in the project contract documents.
5. The Design Contractor shall submit, in a timely fashion, any additional information requested by a permitting agency. Any construction requirements by the permitting agency shall be included in the Contract Documents.
6. Documents submitted to other agencies must meet the requirements of Records Management Document Control described in Chapter 21.

**10.2.2
Procedures**

1. The typical procedure for obtaining permits and approvals, shown in Attachment 10-3, is described in the following paragraphs.
 2. The Design Contractor shall identify the permits and approvals required for the project and the information needed to fulfill the permitting agencies' requirements, and shall prepare a schedule that includes critical path activities for obtaining approvals in a sequenced and timely manner.
 3. Early on in the design process, the Design Contractor shall meet with the responsible permitting agencies, in attendance of the Design Manager and appropriate Water Authority environmental staff, to determine any project-specific special requirements. Before submitting to permitting agencies, the Design Contractor shall provide completed application or notification packages to the Design Manager for review. The Design Contractor shall also provide all necessary technical assistance and background studies to complete the documents and applications required by the agencies (for example, biological or cultural resource studies).
-

10.3 Environmental Compliance

1. Individual environmental compliance activities typically take place during the planning and design stages of Water Authority projects. All projects must be reviewed by the Water Resources Department for compliance with the California Environmental Quality Act (CEQA). Depending on project characteristics, the Water Resources Department may require separate approval for certain construction activities. The Design Contractor shall be aware of these separate activities as well as potential design requirements for site monitoring, noise/vibration control, visual aesthetics, and contaminated site avoidance.
-

10.3.1 California Environmental Quality Act Review

1. Early Consultation
 - 1.1. The California Environmental Quality Act (CEQA) encourages early consultation between the lead agency (Water Authority) and responsible (permitting) agencies to effectively address fundamental environmental issues early on in the process and to avoid unnecessary delays due to additional environmental analysis and/or project redesign. According to the CEQA Guidelines, project sponsors must incorporate environmental considerations into project planning, and design at the earliest time feasible. The lead agency is encouraged to hold meetings with permitting agencies to expedite the consultation.
 - 1.2. At the request of the Design Manager, the Design Contractor shall provide information and shall attend meetings to support the CEQA compliance process, including early consultation. The Design Contractor shall be available at all times to discuss the project description, alternative facility locations or designs, if appropriate, and the appropriateness and feasibility of potential measures to avoid or minimize environmental impacts. For large and/or complex projects, this consultation may entail frequent, ongoing discussion between the Design Manager, the Design Contractor, Water Resources Department, and the CEQA consultant.
2. Mitigation Measures
 - 2.1. Under CEQA, any potentially significant effects associated with a project must be reviewed for impact avoidance or mitigation. Mitigation measures developed through the environmental impact report or mitigated negative declaration processes are typically incorporated into a Mitigation

Monitoring and Reporting Program (MMRP) and adopted by the Water Authority as conditions of project approval. The MMRP is prepared to ensure that the mitigation measures and project revisions identified in the environmental document are implemented. The MMRP is normally prepared before the start of the mid point design level. The Design Contractor shall assist the Design Manager and the Water Resources Department in preparing the MMRP.

- 2.2. The Design Contractor shall ensure that mitigation measures affecting project construction and/or design are incorporated into the contract documents. Mitigation measures shall be incorporated verbatim from the MMRP to the specifications.
- 2.3. The Design Contractor shall make sure that the Contract Documents contain the requirements of the mitigation measures. For instance, if mitigation measures require certain noise barriers, the drawings/specifications shall reflect this requirement. The Design Contractor shall coordinate with the Water Resources Department regarding implementing any of the recommended mitigation measures.
- 2.4. The Design Contractor shall include the impact criteria for all of the mitigation measures in the Contract Documents. For instance, noise impact criteria for maximum limits or thresholds of noise. This will probably vary depending on location, the agency of jurisdiction requirements, and working hours. Another example is air quality that usually follows those adopted by the San Diego APCD (Air Pollution Control District).

**10.3.2
Special
Monitoring and
Reporting**

1. An Environmental Contractor will be retained for some Water Authority projects to monitor specific on- or off-site resources. Monitoring is usually required when impacts cannot be conclusively determined until construction commences. This activity is commonly associated with a site-specific environmental study. Impacts to biological, archaeological and paleontological resources are typically assessed as part of the monitoring process. Monitoring is also required to ensure that mitigation measures listed in the MMRP are being adhered to.
2. Biological Resources
 - 2.1. Monitoring biological resources may be required when design field work is planned in or near an area containing sensitive plants or animals. Field work during the design process, including corrosion, geotechnical, and hazardous waste studies, may require the use of a drill rig, backhoe, and trucks

which generate loud noises and can damage natural habitat. Compliance with CEQA and with the Endangered Species Acts (Federal and State) is required if a federally-listed threatened or endangered species could be affected by the activity. When any of these design-related activities is proposed on ungraded and undeveloped land, the Design Contractor shall consult with the Water Resources Department to determine any biological constraints. The Design Contractor shall coordinate with the Water Authority Water Resources Department to ensure that required environmental compliance is achieved before field work is conducted.

- 2.2. Unless specified otherwise, Biological Monitors for design-field work are retained by the Water Resources Department. The Design Contractor must give at least two weeks' notice of field work to facilitate the timely coordination of monitoring services. Additionally, when performing activities regulated under a permit from a federal agency, the Design Contractor shall give 72 hours' notice to the Water Resources Department before work begins.
 - 2.3. If a situation arises where a threatened or endangered species could be harmed, Monitors will contact the Construction Manager to temporarily stop work. The Design Manager, Water Resources Department, and Design Contractor are required to resolve such situations before work can be allowed to resume. Biological Monitors submit biweekly reports to the Water Resources Department detailing monitoring activities and any incidents of noncompliance.
 - 2.4. Biological resource monitoring may also be required when construction is planned in or near an area containing sensitive plants or animals. The Water Authority may retain a biologist to monitor area conditions and ensure that construction is conducted in compliance with the stipulations set forth in the CEQA document and any regulatory permit. If biological monitoring during construction is required, the Design Contractor shall note biological monitoring and other stipulations on the construction plans and describe them in the Contract Documents. The stipulations shall include a statement that the Construction Contractor shall give the biological monitor 72 hours notice before commencing work in areas with biological resources.
3. Archaeological Resources
 - 3.1. Archaeological resources monitoring may be required when design-related or construction field work is proposed in

previously undisturbed ground surface. Potholing or excavating above an underground utility can be assumed not to impact archaeological resources. However, activities away from existing utility lines, for instance, or opening access across undisturbed land may damage a resource. Compliance with Section 106 of the National Historic Preservation Act is required if an activity could affect an archaeological or historical resource, which includes resources eligible for the National Register of Historic Places. Consequently, if design field work is proposed on undisturbed land, the Design Contractor shall confer with the Water Resources Department to determine any potential archaeological issues. The Design Contractor shall also coordinate with the Water Resources Department to ensure that required environmental compliance is achieved before field work is conducted.

- 3.2. When construction monitoring is required, an Archaeological Monitor, retained by the Water Resources Department, will be present onsite during design-related or construction field work. If archaeological monitoring during construction is required, the Design Contractor shall note archaeological monitoring stipulations on the construction drawings and describe them in the Contract Documents. The stipulations shall include a statement that the Construction Contractor shall give the archaeological monitor 72 hours notice before commencing work in areas with archaeological resources. The Design Contractor shall also ensure that procedures for temporary work stoppage in areas where archaeological resources are discovered during grading or excavation are included in the Contract Documents.
- 3.3. If an archaeological resource is uncovered during field work or construction, monitors will contact the Construction Manager to temporarily stop work or redirect ground disturbing activities away from the find and call a representative from the Water Resources Department to the site. The potential significance of the resource is determined by the archaeologist in consultation with Water Resources staff. Water Resources must concur with the evaluation procedures before grading or excavation is allowed to resume. At this time, the agency representative may implement additional stipulations before allowing work to continue in the affected area. The Archaeological Monitor shall prepare a monitoring results report for submittal to the Water Resources Department after termination of the archaeological monitoring program.

4. Paleontological Resources

- 4.1. In some areas, permit stipulations may require that a Paleontological Monitor, retained by the Water Resources Department, be present onsite during excavation in previously undisturbed formations that may contain fossilized materials. If paleontological monitoring during construction is required, the Design Contractor shall note paleontological monitoring stipulations on the construction drawings and describe them in the Contract Documents. The stipulations shall include a statement that the Construction Contractor shall give the paleontological monitor 72 hours notice before commencing work in areas with paleontological resources.
- 4.2. The Design Contractor shall also ensure that procedures for temporary work stoppage in areas where paleontological resources are discovered during excavation are included in the Contract Documents. If well-preserved fossils are uncovered during construction, monitors will contact the Construction Manager to temporarily stop or redirect ground disturbing activities away from the find and call a Water Resources Department representative to the site. Water Resources Department must concur with the salvaging methods before excavation is allowed to resume. The Paleontological Monitor shall prepare a monitoring results report for submittal to the Water Resources Department after termination of the paleontological monitoring program.

10.3.3 Noise/Vibration Monitoring and Control

1. Noise/Vibration due to some design-related activities, construction, or operation can adversely affect human health, sensitive wildlife and the enjoyment of recreational opportunities. The potential effects of project-related noise/vibration, and measures to reduce any significant impacts, are typically discussed in the CEQA document. The Design Contractor shall incorporate site-specific noise/vibration monitoring, control, and mitigation measures into the Contract Documents.
2. The Design Contractor shall be cognizant of: (1) standards and abatement measures when conducting design-related field activities; (2) applicable noise/vibration control measures to be applied by the Construction Contractor, of which some are included in the Water Authority Standard Specifications; and (3) applicable operational noise/vibration standards. Noise and vibration standards and measures to minimize noise/vibration impacts are described below.
3. Noise/Vibration Control Measures

- 3.1. Control measures are necessary if design-related field work or construction activity is located near noise/vibration-sensitive land uses. The control measures vary depending on the project location and on the agency having jurisdiction on that location. The Design Contractor shall stipulate the proper control measures in the contract documents as contained in the project CEQA document. The Design Contractor shall incorporate the applicable elements of the control measures into the project design, or implement them as mitigation measures during construction.

**10.3.4
Visual Aesthetics
Control**

1. Visual Impacts and Mitigation

- 1.1. The potential visual effects of a project, and measures to reduce their significance, are typically discussed in the CEQA document. The Design Contractor shall incorporate site-specific measures to minimize a project's visual impacts into the Contract Documents. The Design Contractor shall design and locate aboveground structures to minimize potential visual effects and the permanent blockage of views from surrounding public and private perspectives.
- 1.2. A project's visual impacts vary depending on the nature of the project and the natural or aesthetic importance of the existing landscape. In general, aesthetic impacts shall be minimized through the following measures:
 - 1.2.1. Ensuring that architectural details incorporate materials that blend with the existing environment and structures.
 - 1.2.2. Incorporating surface painting or concrete varnishing and/or coloring to tint and match the colors of surrounding environments or structures.
 - 1.2.3. Incorporating cut-and-fill techniques that include rough and feathering cuts to minimize visual impacts.
 - 1.2.4. Using earthen berms, when appropriate, to reduce visual impact on viewsheds and adjacent communities.
 - 1.2.5. Incorporating landscape elements, such as large boulders and vegetative planting, to minimize visual impact.
 - 1.2.6. Limiting the use of artificial outdoor lighting to basic safety and security requirements, and directing light toward objects requiring illumination.

1.2.7. Burying Facilities below ground level.

- 1.3. The Design Contractor shall incorporate elements contained in the project CEQA document into the project design whenever indicated in their scope of services. Otherwise, they may be used as CEQA mitigation measures and incorporated by the Design Contractor into the Contract Documents.

2. Site Landscaping

- 2.1. The Water Authority is committed to providing aesthetically pleasing facilities with appropriate landscaping. A natural landscape theme is conducive to minimizing visual impacts caused by the construction of new facilities. Landscaping that requires minimal maintenance tends to last longer and have a better overall appearance. Plant selection and irrigation design is of utmost importance in creating a low-maintenance project. In keeping with these considerations, the Design Contractor shall specify low-maintenance, native plant materials when practicable.
- 2.2. The Design Contractor shall determine the locations and specific plant types to be used. Detailed procedures for soil preparation, planting and maintenance shall be specified by the Design Contractor and shown on the construction drawings and described in the Contract Documents. Preparation of landscape construction documents shall be performed by a licensed landscape architect or restoration specialist.
- 2.3. Resource agencies frequently require the preparation of a Revegetation Plan as part of their permitting process for projects affecting wetlands or other sensitive habitats. These plans are usually prepared by a landscape architectural or biological firm under contract to the Water Authority. Revegetation Plans include details such as fencing, soil preparation, plant palette selection, planting, irrigation, maintenance and monitoring. For projects requiring revegetation, the Design Contractor shall attach the Revegetation Plan to the Contract Documents.

**10.3.5
Water Quality
Control**

1. All Water Authority projects are designed in compliance with the following: (1) water quality objectives established by the California Regional Water Quality Control Board (RWQCB), San Diego Region; (2) federal and state anti-degradation policies; and (3) the federal Clean Water Action Plan. The Design Contractor must be aware of clean water policy and beneficial use objectives for the

watershed within which work is conducted.

2. The Clean Water Act regulates non-point and point-source pollution from construction activities. Projects involving a disturbed construction area of five acres or greater must comply with the General Construction Stormwater Permit of the RWQCB (see Attachment 10-1).
3. To comply with the general permit of the RWQCB, the Storm Water Pollution Prevention Plan (SWPPP) report must be prepared and implemented before construction begins. The SWPPP shall identify potential sources of pollution on the project site, and shall recommend best management practices (BMPs) to prevent, control or reduce stormwater from being polluted by construction activities, to eliminate non-stormwater discharges from the site, and to monitor discharges for the construction duration. For design-related field activities, the Design Contractor shall prepare the SWPPP. For project-construction activities, the Design Contractor shall include in the project specifications the requirement to prepare the SWPPP by the Construction Contractor.

**10.3.6
Air Quality
Monitoring and
Control**

1. Air quality impact would occur if the project, for instance, would result in emissions that would violate air quality standards of the San Diego Air Pollution Control District, or create objectionable odors. Grading operations, construction vehicles and equipment are all potential sources of air pollution". The Design Contractor shall incorporate site-specific air quality monitoring, control, and mitigation measures into the Contract Documents.
2. Control Measures
 - 2.1. Control measures, such as dust control BMPs, are necessary if design-related field work or construction activities could trigger an air quality standard violation. The Design Contractor shall stipulate the proper control measures in the contract documents as contained in the project CEQA document. The Design Contractor shall incorporate the applicable control measures elements into the project design, or implement them as mitigation measures during construction.

Attachment 10-1: Permits Matrix*

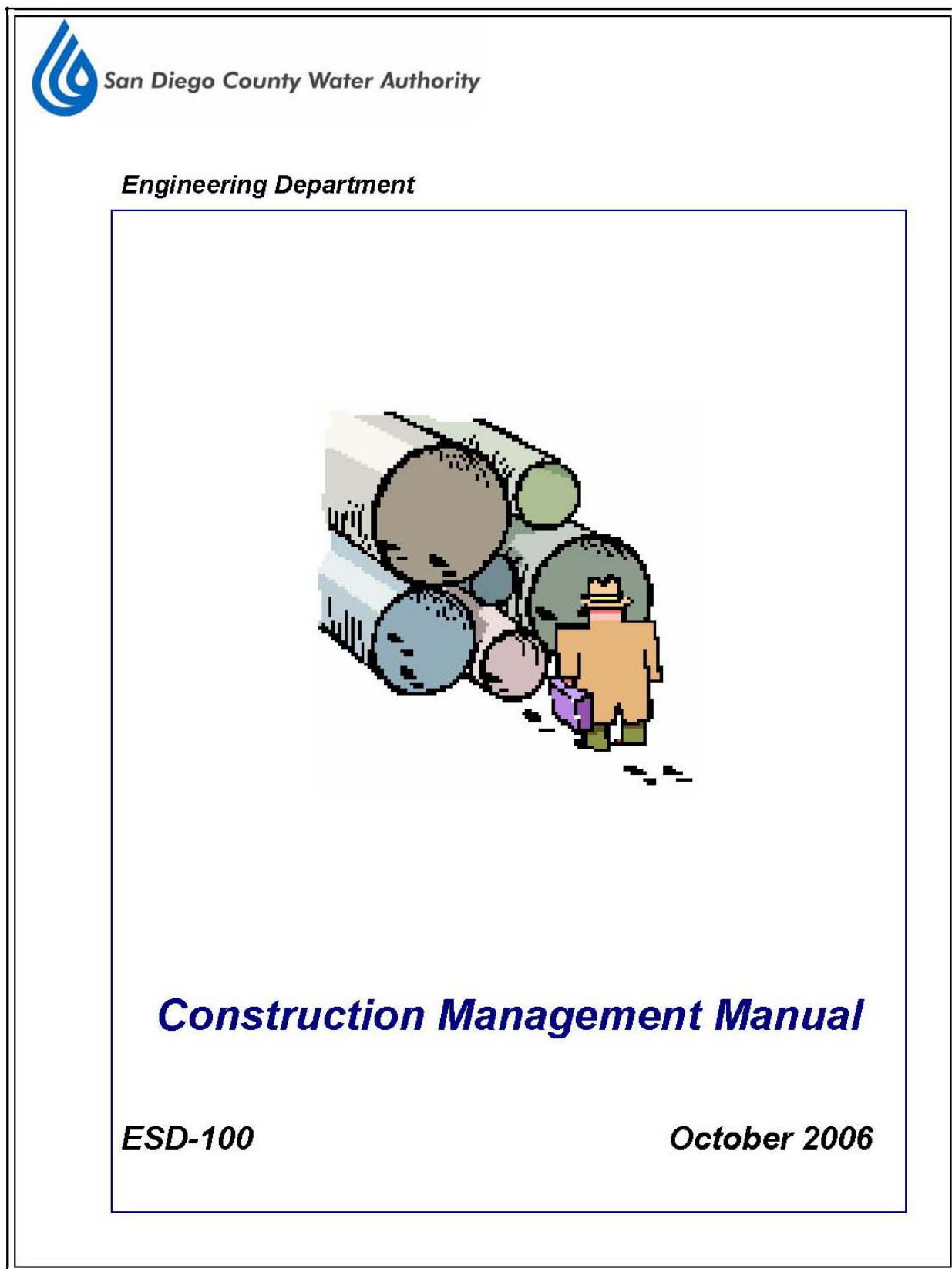
Issuing Agency	Permit/ Approval Type	Description	Project Phase / Responsible Party		
			Prior to Construction Bidding / Design Contractor	Prior to Construction Activity / Construction Contractor	Begin System Operation/ Water Authority
San Diego County Air Pollution Control District (APCD)	Registration for back-up generator	Applies to back-up diesel generator sets			X
	Authority to Construct (ATC)	Required for new or modified equipment that may emit air pollutants	X		
	Start-up Authorization	Allows equipment operations during plant testing and startup phase			X
	Permit to Operate	Second stage of ATC			X
CA Coastal Commission	Coastal Development Permit	Required for projects in coastal zone; permit authority rests with City if there is a certified Local Coastal Plan which applies to the subject area	X		
CA Dept. of Fish and Game	Streambed Alteration Agreement	Approval required for work within the banks of a streambed, including wetlands and lakes	X		
	CA Endangered Species Act Compliance	Applies to projects that could potentially Atake @ a State-listed species	X		
CA Dept. of Transportation, District 11	Encroachment Permit	Caltrans issues permits for any design or construction activity that encroaches into a state highway right-of-way	X		
CA Dept. of Water Resources, Division of Safety of Dams	Approval of Plans and Specifications	Dam safety plan check review required for construction of new dams, some reservoir tanks, and construction of new facilities within the vicinity of existing dams	X		X
CA Dept. of Health Services	Domestic Water Supply Permit	Responsible for compliance order enforcement, including project review for achievement of water quality goals			X
CA Dept. of Industrial Relations	Construction Permit for Excavation Unit	OSHA permit required for excavation greater than 5 feet and/or structures higher than 36 feet		X	
	Construction Permit for Mining and Tunneling Unit	Cal-OSHA issues underground classifications for tunnels and other underground projects 30-inch diameter or larger	X	X	
CA State Lands Commission	Land Use Lease	Lease required to build a facility on state-owned sovereign land	X		
City of Jurisdiction over Project Location	Traffic Control Plan Review	Plan check process for traffic control	X	X	
	Plan Check/Building Permit	Applies to any project which has a structure covered by the Uniform Building Code	X	X	
	NCCP/HCP Third party Beneficiary Status	T Third-party beneficiary designation is required for any project which could potentially result in a "take" of species listed in the relevant subarea plan and for which no Water Authority permit has been issued	X		
City of Jurisdiction, Fire Dept.	Tank Permit	Permit required for any outdoor storage facility containing hazardous materials; including repiping and tank removal	X	X	
City of Jurisdiction Wastewater Dept.	Industrial User Discharge Permit	To allow temporary dewatering to the sanitary sewer of excavations associated with construction activity		X	

Issuing Agency	Permit/ Approval Type	Description	Project Phase / Responsible Party		
			Prior to Construction Bidding / Design Contractor	Prior to Construction Activity / Construction Contractor	Begin System Operation/ Water Authority
County of San Diego, Hazardous Materials Management Division	CalARP Compliance / RMP Preparation	Applies to facility owner/operator of a stationary source with a process in excess of a threshold quantity of acutely hazardous materials			X
	Well Drilling Permit	Required for some exploratory borings, including test holes, as specified in the County regulations	X		
County of San Diego	Traffic Control Permit	May be required for lane closures and transportation mitigation measures during construction	X	X	
	Noise Variance	May be required for nighttime construction and daytime construction if noise ordinance construction limits are exceeded	Water Authority may be Exempt from pulling the permit; However, compliance with noise requirements is still mandatory		
			X	X	
	Cross Haul Permit	May be required to obtain approval to use County roads during construction	Water Authority Exempt		
	Plan Review	Plan review may be required for any utility conflicts and for general Plan consistency	Water Authority Exempt; A County courtesy review is required		
			X	X	
	Grading Permit		Water Authority Exempt; A County courtesy review is required		
County of San Diego	On-site Wastewater System (OSWS) Permit	Persons seeking discharge permits for types of OSWS that the County is not authorized to permit must apply directly to RWQCB for a State Permit.	X	X	
Regional Water Quality Control Board (RWQCB)	General Construction Storm water Permit	Applies to construction activities involving excavation or grading totaling 5 acres or greater	X	X	
	Section 401 Certification	Required under corps non-notifying nationwide permit			
	General NPDES permit for Dewatering	A permit is required for any discharge of ground water effluent to a stream, river or ocean	X	X	
	General NPDES	A permit is required for any discharge of hydrostatic test water or potable water to surface waters and storm drains			
State Water Resources Control Board (SWRCB)	NPDES General construction stormwater permit	Required for all construction projects in CA over one acre	X	X	
U.S. Army Corps of Engineers	Section 10 Permit	Applies to projects that would cause the obstruction or alteration of navigable waters	X		
	Clean Water Act Section 404 Nationwide Permit 39	Applies to projects that would cause the discharge of dredged or fill material into waters of the United States	X		
U.S. Fish and Wildlife Service, Coastal Resources	Section 7/10A Consultation	Coordination with the USFWS is required for any project which could potentially result in a threat to an endangered species or critical habitat	X		
U.S. Forest Service,	Use Permit	Required for any development activity involving access over or through USFS lands	X		

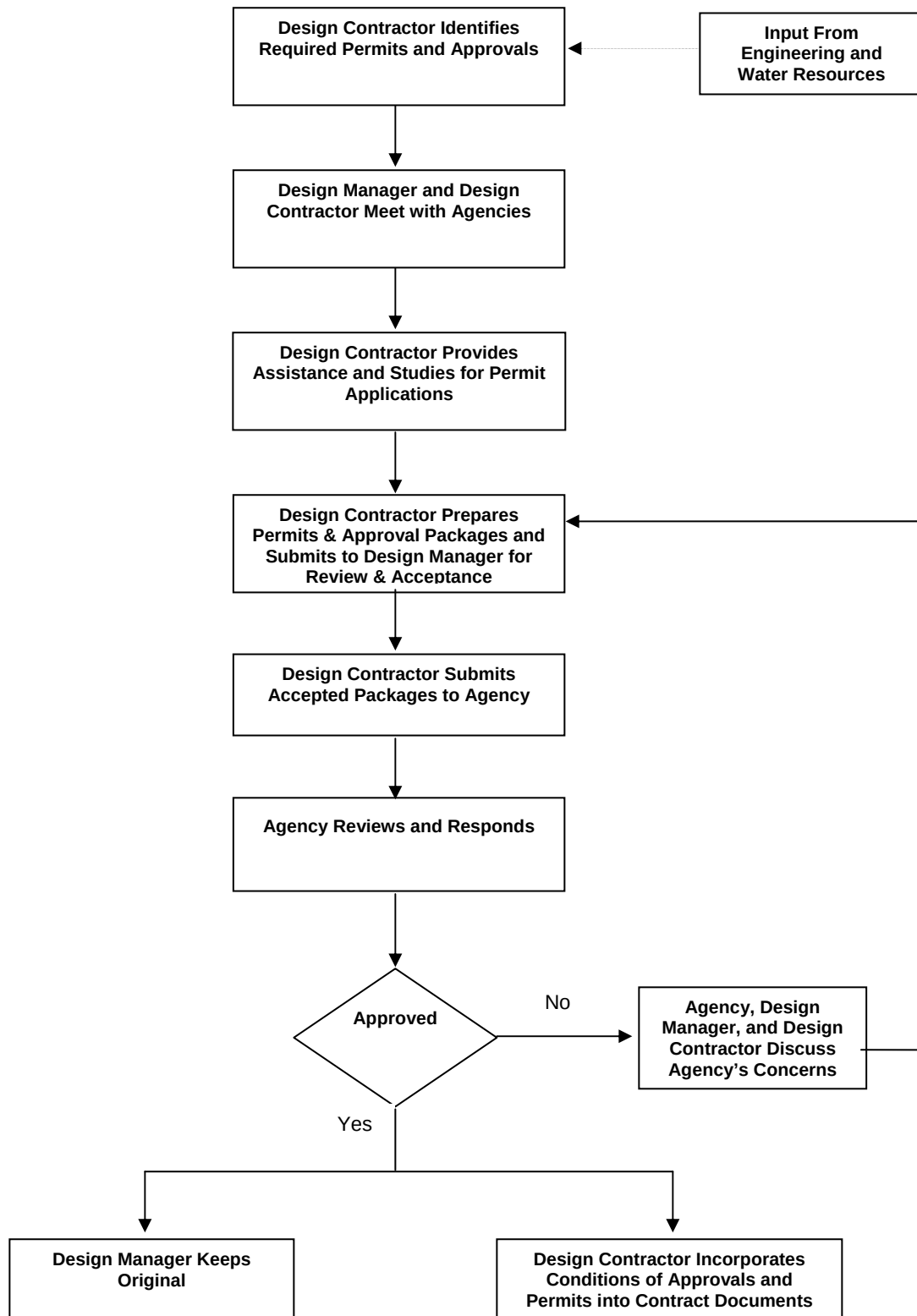
Issuing Agency	Permit/ Approval Type	Description	Project Phase / Responsible Party		
			Prior to Construction Bidding / Design Contractor	Prior to Construction Activity / Construction Contractor	Begin System Operation/ Water Authority
Cleveland National Forest					
SDG&E	Plan Review	Plan review for utility conflicts	X	X	
	Construction within the SDG&E transmission line easement	Agreement with SDG&E necessary before construction	X	X	
AT&T	Plan Review	Plan review for utility conflicts	X	X	

* This is not a comprehensive list of Permits. The Design Contractor shall determine the permits applicable to the project and shall coordinate the list of required permits with the Water Authority Department.

Attachment 10-2: Cover Page of the Construction Management Manual



Attachment 10-3: Typical Procedure for Permits and Approvals



Chapter 11 Risk Management

Overview

Purpose	This chapter describes Design Contractor requirements and responsibilities with respect to developing a Risk Management Plan and in reducing the risk inherent in the project design, construction, and operation.

Topics	This chapter is composed of the following topics:

CHAPTER 11 RISK MANAGEMENT 11

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11.1 Introduction to Risk Management

11.1.1 General

1. Uncertainty and risk are inherent to any project that is being designed or constructed. However, well established methods have been developed to identify and mitigate these inherent risks. Project teams often identify risks, but mobilization of effective action to resolve the problems rarely happens unless a defined risk management program is in place.
 2. Risk management seeks to identify and control possible adverse future events and is, by definition, proactive rather than reactive. Mathematical tools and techniques are used to help predict the likelihood of future risk events, their effects, and methods to deal with them. When properly applied, Risk Management is practiced by everyone involved in a project.
 3. It is important that project risks be assessed under normal, emergency, start-up, and shutdown operational modes.
-

11.1.2 Managing Risk

1. Use of a risk management plan helps a project team visualize the project risks and formulate effective countermeasure plans. Risk management, as a tool, helps a project manager ensure the overall project course is correct and free from major problems.
 2. Risk management works best when integrated into project planning and is built into all project processes and phases. It is important that potential problems are taken seriously. Events that have not yet happened are easy to dismiss as being unimportant. Finally, risk management involves reporting problems and rarely succeeds in an atmosphere where staff members are criticized for raising troublesome issues.
-

11.1.3 Risk Management Plan

1. The Design Contractor shall submit a Risk Management Plan to the Design Manager for review and acceptance within 30 days of issuance of Notice to Proceed. This chapter outlines the minimum requirements to be included in the Risk Management Plan. Risk Management submittals shall be as defined in Chapter 4, Design Development.
2. The Risk Management Plan shall include the following minimum elements:
 - 2.1. Identify risk events
 - 2.2. Identify risk impacts
 - 2.3. Estimate the probabilities of occurrence for both the risk event

and the risk impact will occur

- 2.4. Determine the risk exposure
 - 2.5. Develop a risk mitigation action plan for each risk event
 - 2.6. Estimate the cost of the action plan
 - 2.7. Determine risk leverage
 - 2.8. Prioritize risks
 - 2.9. Revise Action Plan, if necessary
 - 2.10. Assign action plan responsibility
 - 2.11. Monitor the action plan; report progress at monthly meetings and in monthly progress reports
 - 2.12. Submit an updated Risk Management Plan with each design submittal
 - 2.13. Complete all action plan items prior to submittal of the Final Design
 - 2.14. Submit a final updated Risk Management Plan with the Final Design submittal
-

11.2 Characteristics of Risk

11.2.1 Definition of Risk

1. Risk is defined as a measure of the severity and probability of an adverse event, and the resulting impact of that adverse event. Risk identification must include
 - 1.1. A description of the conditions that may lead to an adverse event.
 - 1.2. A description of the adverse event.
 - 1.3. Probability of occurrence.
 2. The risk event must have an associated loss or impact. The event must create a situation where something negative may impact the project, i.e., loss of time, quality, money, control, performance, understanding, and so forth. In addition, there must be a likelihood the event will occur and the analyzer must have some idea of the probability of occurrence.
-

11.2.2 Types of Risk

1. Risks can be categorized in numerous ways, including the following:
 - 1.1. Generic – inherent to all projects: misunderstanding requirements, losing key personnel, allowing insufficient time for design, testing, or other key project events.
 - 1.2. Project specific – threats that result from the particular vulnerabilities of a given project: poorly defined scope of work, poor or lack of performance by key subcontractors, interactions with the public or agencies, technology uncertainties, or environmental issues.
 - 1.3. Performance risk – inherent to the proposed approach, e.g., key project decisions based on analytical rather than empirical data; dependence on record drawings rather than pothole data of crossings and connections.
 - 1.4. Known risks – can take action to mitigate or prevent the risk event.
 - 1.5. Unknown risks or risks due to physical events beyond direct control – can only provide budget and resources contingency in the project to deal with the risk event if it occurs.
 - 1.6. Schedule risk – insufficient knowledge of construction methods and procedures can result in initial schedules being exceeded.
 - 1.7. Cost overrun risk – improper estimating methods can lead to

overruns of initial cost estimates.

- 1.8. Technical feasibility risk – can be caused by insufficient knowledge of the process, design errors or omissions, or incomplete design documents.
- 1.9. Technical obsolescence risk – especially true in control systems and other rapidly evolving technologies.

**11.2.3
Risk
Breakdown
Structure**

- 1. It is often useful to categorize risk according to a risk breakdown structure that typically includes the following:
 - 1.10. Technical – The Design Contractor has the most control over this area and it should be the main focus of the Design Contractor's efforts. Factors include project objectives and performance requirements, technology, complexity, interfaces, performance, reliability, and quality.
 - 1.11. External – Factors include performance of subcontractors and suppliers, regulatory issues, permits and jurisdictions, Water Authority actions, and weather.
 - 1.12. Organizational – Design Contractors have a major influence over their own organization, but less or none over the organization of the Water Authority, regulatory agencies, governmental entities, utilities, Construction Contractor, Construction Manager, and others involved in the project. Factors include timeliness of decisions, project dependencies, organizational structures of the entities involved, personnel and equipment resource allocations, funding, and prioritization.
 - 1.13. Project Management – Again, Design Contractors have a major influence over their own management practices, but less or none over the practices of the other entities involved. Factors include planning, estimating, controlling, and communications.
-

11.3 Risk Management

11.3.1 Risk Management Process

1. Risk management is a systematic methodology and an ongoing process by which occurrences that may substantially affect the project are identified, quantified, modeled, managed, and monitored. Risk management can be used to continuously assess what can go wrong in a project (i.e., what the risks are), determine which of these risks are most important, and implement strategies to deal with these risks.
 2. Risk management involves answering the following questions:
 - 2.1. What can go wrong?
 - 2.2. What is the likelihood that it would go wrong?
 - 2.3. What are the consequences?
 - 2.4. What can be done and what options are available?
 - 2.5. What are the associated trade-offs in terms of costs, benefits, and risks?
 - 2.6. What are the impacts of current management decisions on future options?
 3. The process gives early visibility to potential problem areas and opportunities where effort and money can be expended early in the design and construction phases to reduce vulnerability, insurance costs, business or mission interruption, and claims.
 4. To be effective and meaningful, risk management must be an integral part of the overall management of a system. This is particularly important in the management of facilities, where the failure can be caused by the failure of the hardware, the software, or the humans. The elements of risk management are:
 - 4.1. Identify Risk Events
 - 4.2. Identify Risk Impacts
 - 4.3. Prioritize Risks
 - 4.4. Develop an Action Plan (Risk Mitigation)
 - 4.5. Cost of the Action Plan
 - 4.6. Action Plan Responsibility
 - 4.7. Monitor of Action Plan
 5. These elements are outlined in the paragraphs below.
-

11.3.2 Identify Risk Events

1. **Identification:** The first step in risk management is to identify the risk events. For projects similar to previous projects, checklists are useful. They serve to point out areas that have been sources of trouble in the past. For projects not similar to any previously done, the activities must be broken down into small components and analyzed to anticipate problems. It is also important to analyze the project assumptions – how the project will be conducted, who will do it, what resources are required, and the like – to determine there are risks inherent in the assumptions.
 2. **Drivers:** Identify the factors or forces that promote occurrence of the risk event.
 3. **Probability of Occurrence:** Estimate the probability that the risk event will actually happen. This estimate may derive from past experience or analysis of factors involved in the risk event.
 4. **Example:** Consider the design and construction of a pump station.
 - 4.1. Risk Event – Pumps are not well matched to system operating characteristics.
 - 4.2. Drivers –
 - 4.2.1. Insufficient information often exists to develop the full range of system operating curves.
 - 4.2.2. Operating conditions often are not well defined.
 - 4.2.3. Experience with previous projects indicates engineers tend to optimize pump performance at extreme, rarely occurring, operating conditions rather than at conditions that occur most often.
 - 4.2.4. Experience also shows equipment vendors and others add additional layers of conservatism in pump selection.
 - 4.3. Probability – From experience, it is estimated the risk event has an 80% percent probability of occurring.
-

11.3.3 Identify Risk Impacts

1. **Identification:** Identify the impacts of the risk events. Impacts can be measured in many ways, including additional project cost, failure to meet operational objectives, or failure to meet a committed project schedule. It is necessary, however, to convert the measured impact to a dollar (\$) cost amount.
2. **Drivers:** Identify the factors or forces that promote occurrence of the risk impact.
3. **Probability of Occurrence:** Estimate the probability that the risk impact will actually happen. As before, this estimate may derive

from past experience or analysis of factors involved in the risk event.

4. **Example:** Continuing the pump station example started above:
 - 4.1. Risk Impact – Pumps operate at low efficiencies with high operating costs, and produce cavitation, unacceptably high vibration and noise, and service lives shortened by factors of two or more. Annual operating cost is \$20,000 greater than planned and pumps fail in 15 years rather than the planned 30 years at a replacement cost of \$150,000 per pump.
 - 4.2. Risk Impact = $[\$20,000/\text{year}][15 \text{ years}] + [\$150,000/\text{pump}][3 \text{ pumps}] = \$750,000$
 - 4.3. Drivers –
 - 4.3.1. Engineers and pump vendors believe their approaches to pump selection are conservative.
 - 4.3.2. Engineers and pump vendors are often criticized if the selected pumps are not optimized to worst-case conditions.
 - 4.4. Probability – From experience, it is estimated the risk impact has a 70% probability of occurring.

11.3.4 Calculate Risk Exposure

1. **Calculate Risk Exposure:** For each risk event, calculate the risk exposure as follows:
$$\text{Risk Exposure} = [\text{Probability of event}][\text{Probability of impact}][\text{Impact amount}]$$
 - 1.1. Risk exposures can be refined through use of Monte Carlo simulations to assess sensitivity of the factors involved. However, Monte Carlo simulations will only be required for large projects and will be identified in the Design Contractor's scope of services.
2. **Example:** Continuing the pump station example, risk exposure was calculated as follows;
$$\text{Risk Exposure} = [0.80][0.70][\$750,000] = \$420,000$$
3. **Categorize Risks:** Arrange risk events in descending order of risk exposure, then categorize risks events as follows:
 - 3.1. Urgent – high risk exposure; action must be taken to reduce risk.
 - 3.2. Moderate – average risk exposure; monitor risk event and take action only if schedule and budget permits or if risk exposure escalates to a higher value.

- 3.3. Low -- monitor risk event only and take action only if risk exposure escalates to a higher value.
 - 3.4. Contingent – risks that may become urgent only if certain events occur; monitor risk event only and take action only if risk exposure escalates to a higher value.
 4. **Risk Management List:** Develop risk thresholds and criteria to develop a list of risk events that will be actively managed.
 5. **Example:** Continuing the pump station example, the risk exposure was ranked high compared to others and categorized as Urgent.
-

**11.3.5
Develop an
Action Plan**

1. **Risk Mitigation Strategy:** For each risk event on the Risk Management List, develop a risk mitigation strategy
 - 1.1. Drivers often indicate an effective strategy that targets the root causes of the risk.
 - 1.2. If a strategy is not apparent, reconsider whether or not all drivers have been identified.
2. Risk reduction methods often fall into one of the following categories:
 - 2.1. Avoid the risk – Change requirements for performance or functionality. To avoid the risk by eliminating the risk cause and/or consequence (e.g., forgo certain functions of the system or shutdown the system when risks are identified).
 - 2.2. Transferring the risk – Allocate the risk to other components of the project (e.g., placing performance requirements on the Construction Contractor) or buy insurance to cover potential loss.
 - 2.3. Assuming (Limiting) the risk – Accept the risk, mitigate through an action plan, and provide project contingency if the risk event occurs.
3. **Example:** Continuing the pump station example, the following risk mitigation strategy was developed:
 - 3.1. Develop a computer model to more thoroughly analyze the hydraulic characteristics of the pumping system. Where possible, calibrate the model with actual field measurements.
 - 3.2. Review water demand records for the previous 20 years and coordinate with affected governmental agencies to develop a demand projection for the next 20 years.
 - 3.3. Coordinate with the water agency to account for any planned future changes to the pumping system.

- 3.4. Use the hydraulic model to estimate the system curves at the extreme high and low operating conditions, and at the operating condition that occurs most often.
- 3.5. Select pumps optimized at the most-often operating condition, but verify they will continue to operate under the extreme conditions.
- 3.6. Include performance curves and operating requirements, including vibration and noise limits, in the pump specification.
- 3.7. Include requirements in the specification for witnessing factory testing during construction and for permitting delivery of pumps to the project site only after factory test reports are submitted and approved.
- 3.8. Monitor the project through construction and commissioning to verify the pump vendor does not provide oversized or otherwise out-of-specification pumps in an effort to be conservative.
- 3.9. Test the pumps, both at the manufacturer's facility and at the project site, to verify they meet the planned performance and operating objectives.
- 3.10. Accept the pumps only after all testing is complete and test reports are reviewed and approved.

**11.3.6
Cost of the
Action Plan and
Risk Leverage**

1. It is imperative that the cost of mitigating any construction related risk is accounted for in developing the project budget. Estimate the cost of the action plan required to reduce the risk, and then compute the risk leverage by dividing the difference in risk exposure divided by the cost of reducing the risk.

$$\text{Risk Leverage} = [(\text{Original risk exposure}) - (\text{Mitigated risk exposure})] / [\text{Cost of reducing risk}]$$

2. If the risk leverage is too low, look for less costly ways of reducing the risk. A leverage of 2.0 or less is considered low. Re-evaluate the priority of mitigating the risk if the leverage cannot be increased.
3. **Example:** Continuing the pump station example, the project team estimated the probabilities of the risk event and risk impact occurrences would be reduced to 10% if the action plan was carried out.

$$\text{Mitigated Risk Exposure} = [0.10][0.10][\$750,000] = \$7,500$$

4. The project team also estimated the risk reduction action plan would add \$50,000 to the project design cost, yielding a risk leverage of:

5. Risk Leverage = $[\$420,000 - \$7,500] / [\$50,000] = 8.25$
 6. This risk leverage was judged to be excellent, returning more than eight dollars for every dollar spent on mitigation, and the action plan was put into effect.
-

**11.3.7
Action Plan
Responsibility**

1. For each risk event on the Risk Management List, assign a responsible person to carry out the risk mitigation strategy.
 - 1.1. Identify a due date to complete the strategy.
 - 1.2. Develop a means to measure progress.
 - 1.3. Allocate resources to execute the plan.
 - 1.4. Record all decisions and actions.
2. **Example:** Continuing the pump station example, the project manager assigned action plan responsibility to a design engineer. Together, using the information assembled during development of the action plan, they presented the plan to the water agency and secured the necessary additional budget to execute the plan. The following milestones were established:
 - 2.1. Prior to Preliminary Design submittal:
 - 2.1.1. Develop and calibrate the hydraulic model.
 - 2.1.2. Establish historical and projected demand profiles.
 - 2.1.3. Determine planned future changes to the pumping system and adjust the model to include the changes.
 - 2.1.4. Develop preliminary system performance curves.
 - 2.1.5. Select four candidate pumps based on published performance curves and data.
 - 2.2. Prior to Mid-Point Design submittal:
 - 2.2.1. Develop final system performance curves.
 - 2.2.2. Contact the candidate pump manufacturers and obtain updated performance data based on actual test results.
 - 2.2.3. Select at least two pump manufacturers and develop pump station curves by superimposing the selected pump curves on the system curves.
 - 2.2.4. Develop a final pump specification, including data sheets and required pump curves.
 - 2.3. Prior to delivery of pumps to the project site:

- 2.3.1. Verify pump submittals meet specified requirements.
 - 2.3.2. Witness the factory pump tests.
 - 2.3.3. Review and accept factory pump test reports.
 - 2.4. Prior to final acceptance of the pumps installed at the project site:
 - 2.4.1. Witness the field pump tests.
 - 2.4.2. Review and accept the field pump test reports.
 - 3. The action plan and milestones were communicated to project team members and other entities or persons involved.
-

**11.3.8
Monitor the
Action Plan**

- 1. Develop a method for the Design Consultant's Project Manager to track the progress of risk mitigation action plans. This is to determine whether or not risks are being mitigated effectively and risk mitigation plans are being performed correctly. Report progress of the risk mitigation action plans to the Design Manager in the monthly progress reports and in the reports submitted with design deliverables.
- 2. **Example:** Completing the pump station example, the following monitoring plan was put in place:
 - 2.1. The design engineer established intermediate milestones to measure status between the major milestones. The project manager met with the design engineer weekly to assess status.
 - 2.2. In addition, the design engineer updated the risk exposure calculation based on new information developed as the action plan was executed.
 - 2.3. The project manager took intervening action only when either the milestone status or risk exposure deviated from acceptable limits.
 - 2.4. During construction, the status meetings were less frequent, but the project manager reviewed the pump submittals and test reports with the design engineer prior to acceptance.
 - 2.5. Monthly progress reports were made to the water agency.
- 3. The pump station, now in service, operates without objectionable cavitation, noise, or vibration. Operating costs are less than planned.

Chapter 12 Public Coordination and Community Outreach

Overview

Purpose This chapter describes the Design Contractor role in public and media interaction and the coordination with the Water Authority Public Affairs Department.

Topics This chapter is composed of the following topics:

<u>CHAPTER 12 PUBLIC COORDINATION AND COMMUNITY OUTREACH.....</u>	<u>12</u>
12.1 INTRODUCTION	12-1
12.2 PUBLIC COORDINATION DURING DESIGN PHASE	12-2
12.3 PUBLIC COORDINATION DURING CONSTRUCTION PHASE.....	12-4
12.4 PUBLIC AFFAIRS REPRESENTATIVE.....	12-5
12.5 CONSTRUCTION MORATORIA	12-6
ATTACHMENT 12-1: COVER PAGE OF THE CONSTRUCTION MANAGEMENT MANUAL	12-7

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12.1 Introduction

1. This chapter provides guidelines for public coordination and the Design Contractor's responsibilities during both the Design and Construction phases of Water Authority projects. It also describes the Design Contractor's role in coordinating with the Public Affairs Department of the Water Authority.
 2. The Water Authority is committed to working cooperatively with the public during the planning, design, and construction phases of capital improvement projects. The Public Affairs Department of the Water Authority will communicate projects with impacted communities and will be the lead in resolving community issues.
-

12.2 Public Coordination during Design Phase

1. The Design Contractor shall assist in project presentations to community groups in conjunction with the project team. The Design Contractor shall prepare project presentations to community groups, and shall coordinate the content of these presentations with the Design Manager and the Water Authority Public Affairs Department.
 2. The Design Contractor shall also assist with the preparation of visuals and other materials such as renderings or material samples, as needed, to help explain projects to the community during the design process. All material prepared by the Design Contractor, for community group presentations, shall use plain language and avoid use of technical terms and other complex language not understood by the general public.
 3. The Design Contractor shall consider cost-effective opportunities to mitigate construction impacts to the Public. The Design Contractor shall work with the Water Authority to incorporate feedback from the community into the design process. Subject to the review of the Design Manager and the approval of the Project Manager, community input shall be incorporated as early in the project design process as possible.
 4. During public review of the project environmental documents (e.g. Environmental Impact Report or Mitigated Negative Declaration), the Public Affairs Department will assist the Water Resources Department with public outreach, as needed. Ad placement and public notices, as required by CEQA (California Environmental Quality Act), will be arranged by the Water Resources Department of the Water Authority. Additional community outreach as well as the coordination of public meetings will be handled by the Public Affairs Department of the Water Authority. The Design Contractor may be required to participate in environmental public outreach meetings to assist in explaining the project and answering questions.
 5. Media inquiries and visits to the project site are covered in the Public Affairs Media Guidelines. The Design Contractor shall include the Public Affairs Media Guidelines in contract-documents specification Section 01010, Summary of Work. See Section 3.4, of the Water Authority Construction Management Manual (ESD-100) for more information. A copy of the front page of ESD-100 is shown in Attachment 12-1.
-

6. For any design-related field work (e.g., potholing, survey), the Design Contractor shall follow the procedures outlined in Section 3.4 of the Water Authority Construction Management Manual (ESD-100) for public coordination. The Design Contractor shall coordinate all design-related field work with the Public Affairs Department and the Design Manager.

12.3 Public Coordination during Construction Phase

1. During the construction phase of projects, the Public Affairs Department will be responsible for coordinating with the public and media. The Public Affairs Department will receive input from the Construction Manager and the Design Contractor, as required to address community questions and concerns.
-

12.4 Public Affairs Representative

1. The Public Affairs Department will assign a representative for each project to coordinate with the public, resolve concerns of residents and business owners in the area near the construction site, coordinate special events such as groundbreaking and dedication, and coordinate media access.
 2. Along with other communication tools (e.g., printed material, flyers, mailings, emails, etc.), the Public Affairs Representative will establish and maintain a toll-free project information line to receive inquiries and complaints from the public. All calls to the public information line are tracked and addressed by the Public Affairs Department with input from the Design Contractor and other members of the project team, as needed. The Design Contractor shall relay any public or media inquiries and complaints to the Public Affairs Representative and the Design Manager.
-

12.5 Construction Moratoria

1. The Design Contractor shall coordinate with the agency having jurisdiction on the project location to determine construction moratoria (a suspension of ongoing construction activities) requirements, if any. The Design Contractor shall stipulate construction moratoria requirements in the contract documents.
-

Attachment 12-1: Cover Page of the Construction Management Manual



San Diego County Water Authority

Engineering Department



Construction Management Manual

ESD-100

October 2006

Chapter 13 Traffic Control

Overview

Purpose This chapter specifies the requirements for the Design Contractor to coordinate with Traffic Engineers of Public Utilities and Agencies during project design and design-related field activities.

Topics This chapter is composed of the following topics:

CHAPTER 13 TRAFFIC CONTROL	13
13.1 INTRODUCTION	13-1
13.2 REQUIREMENTS FOR CONTRACT DOCUMENTS	13-2
13.3 DESIGN REQUIREMENTS	13-3
13.4 DESIGN PROCEDURE.....	13-4
ATTACHMENT 13-1 – COVER PAGE OF THE WATER AUTHORITY DRAFTING MANUAL	13-7
ATTACHMENT 13-2 – SAMPLE TRAFFIC CONTROL NOTES.....	13-8
ATTACHMENT 13-3 – SAMPLE TRAFFIC SPECIFICATION	13-10

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13.1 Introduction

1. This chapter presents traffic control guidelines to be used in the Water Authority projects. Traffic-control plans show traffic control procedures required for design-related field work (e.g., potholing, surveys), and each construction phase. The plans shall reflect actual conditions for each mid-block and intersection location, including, but not limited to, the location of all driveways, walkways, travel lanes and bicycle lanes.
 2. The Design Contractor shall prepare project-related traffic control plans and shall meet all requirements and secure approvals from the appropriate agency having jurisdiction over the project location.
-

13.2 Requirements for Contract Documents

1. For design-related field work (e.g., potholing, surveys), the Design Contractor shall be responsible for preparing any required traffic control plans. The Design Contractor shall coordinate with the Traffic Engineer of the agency having jurisdiction over the project location (hereinafter referred to as the Agency Traffic Engineer) to determine specific requirements for traffic control plans preparation.
 2. For construction-related field work, and as part of the project construction drawings, the Design Contractor shall prepare traffic control plans for all work on or near streets carrying high-volume average daily traffic (usually 10,000 or more vehicles). Where incursions into those high-volume streets are minor, the Agency Traffic Engineer may waive the requirement for the Design Contractor to prepare traffic control plans and allow these plans to be prepared by the Construction Contractor. If the Agency Traffic Engineer deferred the traffic control plans preparation to the Construction Contractor, the Design Contractor shall include this requirement as part of the project Contract Documents.
 3. The Design Contractor shall show on traffic control plans and contract documents all CEQA (California Environmental Quality Act) requirements related to traffic control. Examples include restricted hours/use of certain streets and intersections, requirements of signals or flagmen, etc.
 4. The traffic control plans for design-related field work and construction shall cover enough area to show the location of all signs, markers, barricades, flashing arrow boards and other devices for appropriate traffic control. Working hours, acceptable to the Agency Traffic Engineer, shall be indicated on each traffic control plan sheet and referenced in the relevant portion of the specification.
 5. The Design Contractor shall include a separate bid item in the project Contract Documents for traffic control to allow the Construction Contractor to be compensated fairly for traffic control as construction progresses. It also gives the Construction Manager the flexibility to withhold payment for traffic control if it is not implemented adequately.
-

13.3 Design Requirements

1. Traffic control plans shall be prepared by or under the supervision of a Registered Professional Civil Engineer in the state of California who is experienced in traffic control.
 2. Traffic control plans shall be designed in accordance with:
 - 2.1. Part 6 of the California Manual on Uniform Traffic Control Devices (California MUTCD).
 - 2.2. Requirements of the agency having jurisdiction over the project location with respect to 'Traffic Control through Construction Zones' and 'Temporary Street Closures'.
 - 2.3. Any other requirement imposed by the Agency Traffic Engineer.
 - 2.4. Mitigation measures adopted in any CEQA document for the project.
-

13.4 Design Procedure

1. Conceptual Plan

- 1.1. For each traffic plan, the Design Contractor shall prepare a concept review package. It is prepared in 8-1/2 x 11-inch format and includes:
 - 1.1.1. Map showing location of work.
 - 1.1.2. Names of streets affected by construction.
 - 1.1.3. Daily traffic volumes of affected streets.
 - 1.1.4. Posted speed limits.
 - 1.1.5. Written description of traffic control approach, e.g., closure of number 2 lane of A Street from First to Second.
 - 1.1.6. Typical cross-sections identifying the construction work areas, trench width and depth, travel lanes and pedestrian paths, and any other relevant information.
 - 1.1.7. Aerial photo of the project area, if available.
 - 1.1.8. Other information helpful to fully understand the work area requirements, including a description of the construction, expected rate of progress of project, duration and special equipment requirements.
 - 1.1.9. Controlling Agency and their contact information.

2. Concept Review

- 2.1. The Agency Traffic Engineer will review the conceptual plan package, and will contact the Design Contractor to set up a concept review meeting. At this meeting, the Agency Traffic Engineer concerns shall be discussed and an agreement reached on a traffic control approach. The Design Contractor shall prepare meeting minutes to document this agreement and provides copies to the Design Manager and the Agency Traffic Engineer within 2 weeks of the concept review meeting.

3. Traffic Control Plan Drawings

- 3.1. Plans shall be prepared per requirements of the Water Authority Drafting Manual (ESD-120; see Attachment 13-1 for the cover page), clearly showing the traffic controls and phasing agreed to at the concept review meeting.
- 3.2. The first plan sheet shall include:
 - 3.2.1. Standard Notes (see Attachment 13-2 for an

example).

- 3.2.2. Construction Notes applicable to the project.
 - 3.2.3. Traffic Control Plan Index showing sheets and phasing.
 - 3.2.4. Legend showing all signs (shape, wording, size) barricades, flashing arrow boards, etc. This may be shown on a separate sheet if there is insufficient room on the first sheet.
- 3.3. Subsequent sheets shall show all traffic controls by construction phase. They shall each include:
- 3.3.1. Work areas and typical cross sections / excavations from conceptual plan (see details in item 1).
 - 3.3.2. Existing and temporary signs, striping, and markings.
 - 3.3.3. All adjacent streets, alleys, driveways, sidewalks, and bike lanes.
 - 3.3.4. Location and length of tapers and transitions.
 - 3.3.5. Existing traffic signal loops and replacement plans.

4. Specification

- 4.1. The specification shall include references to California MUTCD (see section 13.3). It shall also provide necessary material, measurement and payment provisions for traffic control, temporary signing and striping, barriers, permanent signing, striping, signal loop replacement and notification to adjacent residents and businesses. The Design Contractor shall develop the Traffic Plan specification in CSI (Construction Specifications Institute) format. Some of the items to be considered for inclusion in the Traffic Plan specifications are shown in Attachment 13-3.
- 4.2. If the Construction Contractor is required to submit shop drawings showing the proposed traffic controls, the Design Contractor shall indicate this requirement in the specification including all pertinent information that need to be included.

5. Traffic Control Plan Submittal and Review

- 5.1. The traffic control plans and specification shall be prepared at the mid-point design submittal (see chapter 4 for more information). The Design Contractor shall transmit the submittal package to the Agency Traffic Engineer for final review and approval. The package shall include:
 - 5.1.1. Traffic Control Plans.
 - 5.1.2. Specification.

- 5.1.3. Cost and Quantity Estimate of traffic plan related items.
- 5.1.4. Concept Review Meeting Minutes.
- 5.1.5. Cross-sections showing work areas, trench width and depth.
- 5.1.6. Mid-Point design Improvement Plans.

6. Final Traffic Control Plan

- 6.1. The Design Contractor shall address all review comments generated by the Agency Traffic Engineer and submit a final copy of the Traffic Plan for approval. The final submittal shall be prior to the submittal of the final design documents (see chapter 4 for more information). Securing approval on the Traffic Plans from the Agency Traffic Engineer shall be the Design Contractor responsibility.
-

Attachment 13-1 – Cover Page of the Water Authority Drafting Manual



SDCWA
San Diego County Water Authority
Engineering Department



Drafting Manual

ESD-120

March 2004

Attachment 13-2 – Sample Traffic Control Notes

1. Traffic control requirements shall conform to the Water Authority General Conditions and Standard Specifications, and supplemental conditions (see chapter 14 of this Manual for more information). The working hours set forth in the supplemental conditions shall be shown on these plans. The Construction Contractor shall maintain the full width of all traveled lanes on existing roadways during non-working hours and when construction operations are not actively in progress, except when specifically noted in the traffic control plans.
2. All work shall be performed during daylight hours, unless otherwise noted on the traffic control plans. All trenches shall be backfilled or trench plated at the end of each workday. An asphalt ramp shall be placed around each trench plate to prevent the plate from being dislodged. Upon completion of trench backfill, the surface of the roadway shall be brought to a smooth, even condition, free of humps and depressions, and temporary striping provided. After backfill has been completed, the Construction Contractor shall repair any damage to the roadway; including damage caused by his/her operations or construction traffic. All existing striping, pavement markings, signing and loop detection altered or damaged during construction shall be restored to its original condition.
3. The Construction Contractor shall supply, install and maintain traffic control devices that are shown herein, as well as any such additional traffic control devices required to ensure the safe movement of traffic, pedestrians and bicyclists through or around the work area and to provide maximum protection and safety to construction workers.
4. All signs, delineators, barricades, etc., shall conform to the latest Caltrans Traffic Manual, Traffic Control Through Construction Zones. The current Manual is the California Manual on Uniform Traffic Control Devices (California MUTCD).
5. The Construction Contractor shall notify all affected agencies, including DigAlert (Tel. 800-227-2600), at least 5 working days in advance of any road closure or before implementing any construction detour.
6. If construction is to be performed in stages, all work shall be completed in each stage before work begins on the next stage, unless otherwise specified herein.
7. The Construction Contractor shall post Tow Away/No Parking signs and bag parking meters as required. Signs must be posted 24 hours in advance and indicate specific days, dates, and times of restrictions.
8. Equipment, material or debris may not be stored or remain in the public right-of-way without prior approval by the Agency Traffic Engineer and the Water Authority.
9. This traffic control plan shall not be valid until work dates are approved. The Construction Contractor shall call the Agency Traffic Engineer to obtain a Traffic permit, a minimum of 2 working days prior to starting work. Prior notification of five

Attachment 13-2 – Sample Traffic Control Notes (Continued)

working days is required when work affects a traffic signal. The number of days may vary with the Agency of Jurisdiction. The Construction Contractor shall check with the Agency Traffic Engineer for the number of days required for work notification.

Attachment 13-3 – Sample Traffic Specification

Traffic Striping, Pavement Markings and Pavement Markers

The Construction Contractor shall perform all striping and installation of pavement markers and signs. Pavement markers and striping must conform to Section 84 and Section 85 of the latest Caltrans Standard Specifications, and the latest Caltrans Traffic Control Manual (current Manual is the California Manual on Uniform Traffic Control Devices).

The Construction Contractor shall control alignment and layout, subject to approval by the Construction Manager.

Section 84-03.02, Materials, of the Caltrans Standard Specifications, is amended to read:

Paint for traffic stripes shall conform to the following State Specifications:

ITEM	SPECIFICATION
Rapid Dry Water-Borne Paint, White and Yellow Glass Beads	8010-42L-30 or 8010-61g-10; 5010-51J-22 (Type 1D)

Copies of State Specifications for traffic paint and glass beads may be obtained from the Transportation Laboratory, P. O. Box 19128, Sacramento, CA 95819, (916) 739-2400.

Paint thinning is not allowed.

The Construction Contractor shall install reflectorized pavement markers on all lane lines and centerline striping.

The Construction Contractor shall perform all sandblasting of conflicting striping and replaces all striping removed during construction.

The Construction Contractor shall install all signs that shall conform to the requirements of Caltrans Traffic Manual (California MUTCD). All sign posts shall be anchored in two feet of concrete 18-24 inches from the curb face. Bottoms of signs must be seven feet above ground level.

Traffic Plates

Traffic plates shall be heavy steel plates adequately braced and capable of supporting vehicular traffic. Traffic plates shall meet the requirements of the Caltrans Highway Design Manual, Section 602.1, Temporary Steel Plate Bridging -- With a Non-Skid Surface. The adjacent pavement shall be milled and recessed such that trench plates are set flush with adjacent street pavement surface. Trench plates shall be secured in place with cold mix asphalt graded level with the street surface or other acceptable means to prevent loose, shifting, or noisy plates.

Attachment 13-3 – Sample Traffic Specification (Continued)

Notifications

The Construction Manager will inform all affected residents and businesses of the work, as per requirements stipulated in the Water Authority Construction Management Manual (ESD-100; section 3.4). Printed notices that include dates and hours of work will be distributed to all affected residents and businesses. Affected parties include all properties within one block of the construction zone, including the detour route.

Trenches through Signalized Intersections

Damaged signal equipment shall be repaired and/or replaced per Caltrans Standard Specifications.

Detector Loops are as Follows:

Bike Lane Detector Loops	=	Type O
Limit Line Detector Loops	=	Type D
Intermediate and Advanced Detector Loops	=	Type B
All other Detector Loops	=	Type A

The Construction Contractor shall notify the Agency Traffic Engineer at least 5 workdays before any disruption of normal traffic signal operations.

All detector loops, including conduits and signal poles, shall be replaced and made operational within 3 working days of initial removal or disruption.

All temporary signal pole locations shown on the drawings are approximate. Actual locations shall be field determined by the Construction Contractor. The Construction Contractor shall obtain approval, of detector loop locations, from the Agency Traffic Engineer before the loops are installed.

Chapter 14 Technical Specifications, Drawings and Calculations

Overview

Purpose This chapter outlines the requirements for the Design Contractor to follow the Water Authority standards in furnishing specifications, drawings, and calculations for Water Authority projects.

Topics This chapter is composed of the following topics:

CHAPTER 14 TECHNICAL SPECIFICATIONS, DRAWINGS AND CALCULATIONS.....14

14.1 INTRODUCTION	14-1
14.2 STANDARD SPECIFICATION	14-2
14.3 STANDARD DRAWINGS	14-4
14.4 DESIGN CONTRACTOR RESPONSIBILITIES.....	14-5
14.5 DRAWINGS AND SPECIFICATIONS FORMAT	14-7
14.6 CALCULATIONS	14-8

ATTACHMENT 14-1: CSI SPECIFICATIONS DIVISIONS.....	14-11
ATTACHMENT 14-2: COVER PAGE OF THE WATER AUTHORITY STANDARD SPECIFICATIONS	14-12
ATTACHMENT 14-3: COVER PAGE OF THE WATER AUTHORITY STANDARD DRAWINGS & DETAILS	14-13
ATTACHMENT 14-4: COVER PAGE OF THE WATER AUTHORITY CATHODIC PROTECTION GUIDE	
DRAWINGS.....	14-14
ATTACHMENT 14-5: COVER PAGE OF THE WATER AUTHORITY ELECTRICAL/INSTRUMENTATION GUIDE	
DRAWINGS.....	14-15
ATTACHMENT 14-6: COVER PAGE OF THE SAN DIEGO REGIONAL STANDARD DRAWINGS	14-16
ATTACHMENT 14-7: COVER PAGE OF THE CITY OF SAN DIEGO STANDARD DRAWINGS	14-17
ATTACHMENT 14-8: COVER PAGE OF THE WATER AUTHORITY SPECIFICATIONS STYLE GUIDE.....	14-18
ATTACHMENT 14-9: COVER PAGE OF THE WATER AUTHORITY DRAFTING MANUAL	14-19
ATTACHMENT 14-10: DRAWING NUMBERING STANDARD.....	14-20

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14.1 Introduction

1. This chapter presents an overview of the use of the Water Authority Standard Specification and Standard Drawings. The conditional use of other available San Diego Regional Specification and Drawings is also illustrated. In addition, this chapter describes the format required to be used by the Design Contractor in preparing the project specification, drawings, and calculations.
 2. Each design prepared by the Design Contractor for Water Authority projects shall be based primarily on the Water Authority Standard Specification and Standard Drawings. The goals for use of these standard documents are:
 - 2.1. Clear, concise, legally and technically sufficient language.
 - 2.2. Similar approach on similar projects.
 - 2.3. Uniform appearance and organization between different sections of a contract specification, and between different construction contracts conforming to the Water Authority format.
 - 2.4. Thorough, but not excessive, detail.
 - 2.5. Promotion of competition between bidders and suppliers of products and materials.
 - 2.6. Satisfaction of engineering and operating staff requirements for equipment and materials incorporated into Contract Documents.
 - 2.7. Standardization of construction of certain elements of work, as manholes, valve chambers, etc.
 - 2.8. Facilitating and standardizing the operation and maintenance of the constructed system.
 3. The Design Contractor shall also prepare special provisions, as necessary, to meet the additional requirements of the project, and adds new sections in CSI format which are not in the standard specifications, as needed.
-

14.2 Standard Specification

1. General

- 1.1. The Design Contractor shall use the following specification in all construction projects to define requirements. It is to be noted that the Water Authority uses the 1988 Construction Specifications Institute (CSI) format (16 Divisions).
 - 1.1.1. The Water Authority General Conditions (normally covered in the Conditions of Contract; CSI Division 00).
 - 1.1.2. The Water Authority Standard Specifications (technical Specification sections normally included in CSI Divisions 01 through 16; see Attachment 14-1).
- 1.2. The General Conditions and Standard Specification are compiled into a single document that is referred to as Water Authority Whitebook (see Attachment 14-2 for the cover page).
- 1.3. In construction projects within public rights-of-way, the Design Contractor shall use the following, specification in addition to the Water Authority Standard Specifications
 - 1.3.1. The most current approved edition of the SSPWC (Standard Specifications for Public Works Construction), which is also known as the Greenbook. The adopted Regional Supplement to the Greenbook shall be used in all projects within the County of San Diego. The adopted City Supplement to the Greenbook shall be used in all projects within the City of San Diego.
- 1.4. It is to be noted, however, that the Greenbook is considered a supplement to the Water Authority Whitebook and that the Greenbook shall be used only in cases where information is not covered in the Whitebook.

2. Influence of SSPWC on Contract Documents

- 2.1. The SSPWC was developed jointly by the Southern California Chapter of American Public Works Association (APWA) and the Southern California Districts of the Associated General Contractors (AGC) of California. The SSPWC is republished in its entirety every three years.
- 2.2. The SSPWC primarily addresses the most frequent types of projects in public works construction, such as sewers, pipelines, roads, gutters and storm sewers in public rights-of-

way. It does not adequately address the broader needs and practices of pumping stations and water storage reservoirs projects. Since SSPWC adequately covers certain facilities, it may be incorporated by reference in the Water Authority Standard Specifications.

- 2.3. Unless a specific edition of the SSPWC is listed, references to the SSPWC shall mean the latest adopted edition including the latest adopted Regional and City Supplements.
-

14.3 Standard Drawings

1. The Design Contractor shall use the following Standard Drawings, as applicable, in all construction projects
 - 1.1. The Water Authority Standard Drawings and Standard Details. Refer to Attachment 14-3 for the cover page of the current edition at the time of preparation of this document.
 - 1.2. The Water Authority Cathodic Protection Guide Drawings. Refer to Attachment 14-4 for the cover page of the current edition at the time of preparation of this document.
 - 1.3. The Water Authority Electrical and Instrumentation Guide Drawings. Refer to Attachment 14-5 for the cover page of the current edition at the time of preparation of this document.
 2. It is to be noted that the Water Authority Standard Drawings, Cathodic Protection Guide Drawings, and Electrical and Instrumentation Guide Drawings, are collectively referred to as Standard Drawings in this chapter.
 3. In construction projects within public rights-of-way, the Design Contractor shall use the following, standard drawings in addition to the Water Authority Standard Drawings
 - 3.1. The San Diego Regional Standard Drawings (see Attachment 14-6 for the cover page of the current edition) in all projects within the County of San Diego. The document is available online at <http://www.regional-stds.com/drawings.html>
 - 3.2. The City of San Diego Standard Drawings (see Attachment 14-7 for the cover page of the current edition) in all projects within the City of San Diego. The document is available online at <http://www.sandiego.gov/engineering-cip/services/consultcontract/edocref/index.shtml>
 4. It is to be noted, however, that the San Diego Regional and City standard drawings are considered supplement to the Water Authority standard drawings, and as such, shall be used only in cases where information is not covered in the Water Authority standard drawings.
 5. The standard drawings referenced above are periodically updated. It is the Design Contractor's responsibility to ensure that the latest approved version of standard drawings shall be used.
-

14.4 Design Contractor Responsibilities

1. General

- 1.1. As the Engineer of Record, the Design Contractor shall assume full responsibility for project-specific use of the above referenced specification and drawings. When preparing contract specifications and drawings, the Design Contractor shall not assume that the Water Authority standard specifications and drawings automatically meet all project requirements. For this reason, the Design Contractor shall provide revisions, modifications, additions, and quality control activities so that appropriate adaptations and refinements can be made to the standard specifications and standard drawings, as necessary to produce a complete, constructible, and operable design.
- 1.2. The standard specifications and standard drawings are by no means comprehensive. Consequently, the Design Contractor shall revise, amend, modify, and add to the standard specifications and standard drawings to suit the particular needs of the project. The Design Contractor shall highlight all proposed changes from the standard specifications and standard drawings by strikeouts and/or shading. The Design Manager will review the requested changes and deviations for adherence to existing Water Authority guidelines, regulations and policies. Refer to Chapter 1 of this Guide for deviation request procedure.
- 1.3. Changes to standard specifications either by deleting, replacing, or adding paragraphs to existing sections, or by adding new sections, shall be highlighted in the project documents. However the standard specifications shall always remain intact without permanent modifications. Changes to Standard Drawings shall constitute the production of a new drawing, and as such, shall be stamped, dated and wet signed by the Design Contractor. Refer to Chapter 1 of this Guide for deviation request procedure.

2. Coordination between Standard Specifications and Standard Drawings

- 2.1. The standard specifications and standard drawings must be fully coordinated. Although all attempts have been made to ensure conformity and compatibility between these documents, the Design Contractor shall examine all documents to ensure consistency. The Design Contractor shall immediately bring any inconsistencies to the attention of the Design Manager in

writing with recommended changes, including reasons and justification for such recommendations.

3. Acceptable Manufacturer's Names and Equipment Model Numbers

- 3.1. The Water Authority standard specifications contain acceptable manufacturers' names in some sections. The Design Contractor shall verify manufacturers' names and ensure that the information is current and up-to-date, the companies are still in business, and they manufacture the specified product(s). The Design Contractor shall verify suitability of the manufacturers and products for the specific project, and shall propose any changes to the listed acceptable manufacturers as described in the above paragraphs. Any changes in products and products will have to be approved by the Water Authority Operations and Maintenance Department..
-

14.5 Drawings and Specifications Format

1. Specification

- 1.1. The three-part CSI format (Part 1 - General; Part 2 - Products; Part 3 - Execution) shall be used to prepare the contract specification. Technical specification sections are numbered for Division 01 through Division 16 according to the 16-division CSI numbering system. The Water Authority standard specification is prepared using this format and numbering system.
- 1.2. Specification sections in Division 01 through Division 16 shall be prepared using the version of Microsoft Word currently in use by the Water Authority. The Design Contractor shall follow the Water Authority Specifications Style Guide (ESD-150) for preparing specification sections (see Attachment 14-8 for the cover page of ESD-150). For any format style not referenced in ESD-150, the Design Contractor shall follow the same formatting used in the Water Authority standard specification with respect to margins, font, tabs, justification, paragraph numbering and outline, headers, footers, etc.

2. Drawings

- 2.1. In producing project-design drawings, the Design Contractor shall adhere to the requirements described in the Water Authority Drafting Manual (ESD-120), regarding drawing format, appearance, and procedures (see Attachment 14-9 for the cover page of ESD-120). The Design Manager will provide the Design Contractor with an electronic copy of the title block required to be used in the project drawings. All drawings shall be drafted using the version of AutoCAD software currently in use by the Water Authority.
- 2.2. The Drafting Manual outlines general drafting requirements including:
 - 2.2.1. Layout, lettering, drawing numbering system (see Attachment 14-10).
 - 2.2.2. Engineering discipline drafting standards (as civil, mechanical, structural, etc.).
 - 2.2.3. Project files setup, layering, and naming convention.
 - 2.2.4. Submittal requirements (hardcopies and electronic).

14.6 Calculations

1. Calculations shall be prepared according to this chapter and shall receive the same attention to legibility and level of clarity as the design drawings and specification. Calculation sheets shall include the following information:
 - 1.1. Name of project.
 - 1.2. Water Authority project number.
 - 1.3. Subject.
 - 1.4. Sheet number.
 - 1.5. Preparer signature and date.
 - 1.6. Reviewer signature and date.
 - 1.7. Approver signature and date.
 - 1.8. Design Contractor Project Manager's (DCPM) or Technical Manager's certification, including seal, signature, and date. Refer to Chapter 3 of this Guide for DCPM and Technical Manager definitions.
2. Refer to Chapter 3, QA/QC Program, for additional requirements regarding calculations.
3. Calculations shall be prepared on the Design Contractor's preprinted 8½ by 11-inch calculation forms. When the calculation is prepared on grid paper, the grid ink must be non-reproducible blue or a very light color (screened) that drops out when the page is copied.
4. Calculations shall include the following information:
 - 4.1. Clear statement of the problem. This may include system sketches or drawings.
 - 4.2. List of all assumptions.
 - 4.3. List of all references (textbooks, papers, and design manuals) for formulae, theory, and other data, parameters and coefficients used in the calculation.
 - 4.4. Description of pertinent design criteria.
 - 4.5. Description of the methods used, including a narrative discussion if interpretation/extrapolation is necessary.
 - 4.6. Compilation of catalog data or other appropriate vendor information used for design. Data for all equipment listed in the specification is included.
 - 4.7. Name and version of any computer program used, plus verification that the program has received appropriate checking

and authorization for the application.

- 4.8. If not shown on the output, computer calculations are accompanied with input data, methodology and formulae used, and a description of assumptions made.
- 4.9. Appropriate sketches showing the results, if required.
5. Calculations shall have a title page. If a calculation is issued and later voided, a copy of the cover sheet with the VOID notation shall be maintained in the file folder for the specific calculation. Superseded/superseding calculations shall cross-reference each other and the title sheet of the superseded calculation shall be retained. Revised, superseded, or voided calculations shall be clearly identified, dated, and signed by the responsible persons.
6. Calculations shall be compiled either in folders or in loose leaf three-ring binders in the order of the unique identifying number assigned to them. Each calculation shall be separated from others by a divider page tabbed with its identifying number and identified by title pages. Provide a Table of Contents of all calculations within a single folder or binder.
7. The complete calculation package, including computer printouts, calculations, sketches, catalog data, and other pertinent information shall be included in the total page count of the calculation and listed in the table of contents.
8. The pages of each Calculation, including computer generated model outputs, shall be numbered sequentially with the last page stamped "End of Calculation". Alternatively, pages may be numbered using the page-number / total-number format (e.g., page 2/5, 4/5).
9. Calculations shall be checked, approved, and certified according to Chapter 3, QA/QC Program. Submittal requirements are defined in Chapter 4, Design Development. For security purposes, each time a calculation is signed and dated; a record copy of the calculation shall be produced and filed in a separate location.
10. The Design Contractor shall maintain a calculation index register. The minimum information the register contains shall be:
 - 10.1. Unique calculation number identifier
 - 10.2. Calculation title (subject or description)
 - 10.3. Discipline
 - 10.4. Date of final review
 - 10.5. Revision number
 - 10.6. Project name
 - 10.7. Status (Void; Canceled; Supersedes/Superseded; and so forth)

10.8. Referenced design documents

11. The calculation submittal forwarded at the end of a project shall include the record copies, the current original, and the calculation index register. The calculation index register shall be in hardcopy and electronic media in the version of Microsoft Word software in current use by the Water Authority. The record copies and the original calculations shall also be submitted.

Attachment 14-1: CSI Specifications Divisions



01 - General



**02 - Site
Construction**



**03 - Concrete, Admixtures
& Finishing**



04 - Masonry



05 - Metals



**06 - Wood & Structural
Plastics**



**07 - Thermal & Moisture
Protection**



**08 - Doors &
Windows**



09 - Finishes



10 - Specialties



**11 - Equipment &
Design**



12 - Furnishings



13 - Special Construction



14 - Conveying Systems



15 - Mechanical



16 - Electrical

Attachment 14-2: Cover Page of the Water Authority Standard Specifications

General Conditions and Standard Specifications

2005 Edition

John A. Economides
Director of Engineering



San Diego County Water Authority

Attachment 14-3: Cover Page of the Water Authority Standard Drawings & Details

STANDARD DRAWINGS & STANDARD DETAILS



*San Diego County
Water Authority*

JOHN A. ECONOMIDES
DIRECTOR OF ENGINEERING

OCTOBER 2003 ISSUE

Attachment 14-4: Cover Page of the Water Authority Cathodic Protection Guide Drawings

CATHODIC PROTECTION GUIDE DRAWINGS



San Diego County
Water Authority

OCTOBER 2005 ISSUE

JOHN A. ECONOMIDES
DIRECTOR OF ENGINEERING

USE OF GUIDE DRAWINGS
THESE DRAWINGS ARE INTENDED TO BE USED AS A STANDARDIZATION
GUIDE FOR THE PREPARATION OF CATHODIC PROTECTION DRAWINGS
FOR WATER AUTHORITY PROJECTS. MODIFICATIONS TO THESE
DRAWINGS MAY BE MADE TO CONFORM TO SPECIFIC PROJECT
REQUIREMENTS. ALL OR A PORTION OF THESE GUIDE DRAWINGS MAY
BE INCORPORATED INTO THE PROJECT CONTRACT DOCUMENTS.

Attachment 14-5: Cover of the Water Authority Electrical/Instrumentation Guide Drawings

ELECTRICAL/INSTRUMENTATION GUIDE DRAWINGS



*San Diego County
Water Authority*

JUNE 2006 ISSUE

JOHN A. ECONOMIDES
DIRECTOR OF ENGINEERING

USE OF GUIDE DRAWINGS

THESE DRAWINGS ARE INTENDED TO BE USED AS A STANDARDIZATION GUIDE FOR THE PREPARATION OF ELECTRICAL AND INSTRUMENTATION DRAWINGS FOR AUTHORITY FLOW CONTROL FACILITY PROJECTS. MODIFICATIONS TO THESE DRAWINGS MAY BE MADE TO CONFORM TO SPECIFIC PROJECT REQUIREMENTS. ALL OR A PORTION OF THESE GUIDE DRAWINGS MAY BE INCORPORATED INTO THE PROJECT CONTRACT DOCUMENTS.

Attachment 14-6: Cover Page of the San Diego Regional Standard Drawings



STANDARD DRAWINGS FOR AGENCIES IN THE SAN DIEGO REGION

Recommended by the Regional Standards Committee
Maintained and Published by the County of San Diego
Department of Public Works
April 2006
www.regional-stds.com

Attachment 14-7: Cover Page of the City of San Diego Standard Drawings

**CITY OF
SAN DIEGO**



**STANDARD
DRAWINGS**

DOCUMENT NO. AEC701042

FILED July 01, 2004

Attachment 14-8: Cover Page of the Water Authority Specifications Style Guide



SDCWA
San Diego County Water Authority
Engineering Department



SPECIFICATIONS STYLE GUIDE

ESD-150

July 2004

Attachment 14-9: Cover Page of the Water Authority Drafting Manual



SDCWA
San Diego County Water Authority
Engineering Department



Drafting Manual

ESD-120

March 2004

Attachment 14-10: Drawing Numbering Standard

Standard Drawing Numbering and Sequencing	
Pipeline	
T-1	Title Drawing
G-1, G-2, G-3...	General Drawings
C-1, C-2, C-3...	Civil Drawings
AP-1, AP-2, AP-3...	Aerial Photo Strip Drawings
T-1, T-2, T-3...	Tunnel Drawings
PA-1, PA-2, PA-3...	Pipeline Appurtenant Drawings
A-1, A-2, A-3...	Architectural Drawings
S-1, S-2, S-3...	Structural Drawings
M-1, M-2, M-3...	Mechanical Drawings
E-1, E-2, E-3...	Electrical Drawings
I-1, I-2, I-3...	Instrumentation Drawings
FO-1, FO-2, FO-3...	Fiber-Optic Drawings
CP-1, CP-2, CP-3...	Cathodic Protection Drawings
L-1, L-2, L-3...	Landscape and Irrigation Drawings
TC-1, TC-2, TC-3...	Traffic Control Drawings
B-1, B-2, B-3...	Boring Logs
R-1, R-2, R-3...	Right-of-Way Drawings
SD-1, SD-2, SD-3...	Standard Drawings
Flow Control Facility	
T-1	Title Drawing
G-1, G-2, G-3...	General Drawings
C-1, C-2, C-3...	Civil Drawings
A-1, A-2, A-3...	Architectural Drawings
S-1, S-2, S-3...	Structural Drawings
M-1, M-2, M-3...	Mechanical Drawings
E-1, E-2, E-3...	Electrical Drawings
I-1, I-2, I-3...	Instrumentation Drawings
FO-1, FO-2, FO-3...	Fiber-Optic Drawings

Attachment 14-10: Drawing Numbering Standard (*continued*)

CP-1, CP-2, CP-3...	Cathodic Protection Drawings
L-1, L-2, L-3...	Landscape and Irrigation Drawings
TC-1, TC-2, TC-3...	Traffic Control Drawings
SD-1, SD-2, SD-3...	Standard Drawings
Pump Station	
T-1	Title Drawing
G-1, G-2, G-3...	General Drawings
C-1, C-2, C-3...	Civil Drawings
A-1, A-2, A-3...	Architectural Drawings
S-1, S-2, S-3...	Structural Drawings
M-1, M-2, M-3...	Mechanical Drawings
E-1, E-2, E-3...	Electrical Drawings
I-1, I-2, I-3...	Instrumentation Drawings
FO-1, FO-2, FO-3...	Fiber-Optic Drawings
CP-1, CP-2, CP-3...	Cathodic Protection Drawings
L-1, L-2, L-3...	Landscape and Irrigation Drawings
TC-1, TC-2, TC-3...	Traffic Control Drawings

Chapter 15 Construction Cost Estimates and Schedules

Overview

Purpose This chapter presents the requirements and procedures that the Design Contractor shall use in developing cost estimates and schedules at the different design levels.

Topics This chapter is composed of the following topics:

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15.1 Introduction

15.1.1 Construction Cost Estimates

1. The Design Contractor shall apply the requirements stated in this chapter and elsewhere in the Design Contractor Guide during the preparation of construction cost estimates and preliminary construction schedules to achieve uniformity and to facilitate review by project team members. The Design Contractor shall apply the best practices of the engineering and construction industries in preparing these cost estimates and schedules.
 2. Construction cost estimates prepared under contract with the Water Authority are confidential and distribution of any part of the cost estimates beyond that specified in the Design Contractor's scope of work is prohibited.
 3. Construction cost estimates prepared by the Design Contractor shall take into account the current climate of the construction industry in the Water Authority's service area to avoid cost estimating errors stemming from local influences.
-

15.2 Minimum Qualifications for Preparing Cost Estimates

15.2.1 ASPE or Other Cost Estimator Qualifications

1. The Water Authority desires that persons preparing construction cost estimates for Water Authority projects be certified by the American Society of Professional Estimators (ASPE) and have a minimum of ten years experience in preparing construction cost estimates for similar types of projects. Alternatively, the Design Contractor may propose to use a similarly qualified, but non-ASPE certified, cost estimator. In either case, the Design Contractor shall submit the cost estimator's qualifications to the Design Manager for review prior to issuance of NTP. Cost estimates may not be accepted without prior written acceptance of the cost estimator's qualifications from the Design Manager.
 2. For some projects, cost estimating qualifications in particular fields, such as electrical, instrumentation, or mechanical, shall be required in addition to general and civil cost estimating qualifications. If the Design Contractor does not have suitably qualified staff to prepare the cost estimates, then the Design Contractor shall contract with a qualified subcontractor (or subcontractors) who have the appropriate qualifications.
 3. The Water Authority considers construction cost estimates of utmost importance. Consequently, the Design Contractor shall submit the qualifications of the proposed cost estimator(s) with their proposal to perform Design Services to the Water Authority. The qualification of the cost estimator(s) will be considered during the evaluation and selection process of the Design Contractor.
-

15.3 Types and Classes of Cost Estimates

15.3.1 AACEI Cost Estimate Classes

1. In addition to the requirements stated in this chapter, the Design Contractor shall conform to the requirements of the Water Authority Estimating Process Manual (see Attachment 15-1 for the cover page of the Manual). This chapter presents highlights, but not all requirements, of the Estimating Process Manual. In the event of conflict, the requirements of this chapter shall take precedence over the Estimating Process Manual.
2. The Association for Advancement of Cost Engineering International (AACEI) definitions of Cost Estimates Types and Classes shall be used to derive construction cost estimates. The Design Contractor shall provide construction cost estimates with each design submittal as defined below. Each cost estimate shall be titled to correspond with the design completion stage and the type of estimate. The cost estimate shall include an assessment of the difficulties inherent in the construction work and shall document the methods for determination of productivity, production rates, and pricing used in preparation of the cost estimates. This assessment shall include such factors as labor conditions, construction equipment, construction supervision, material costs, and equipment installation costs. All reasonable costs a Construction Contractor can expect to incur shall also be included.
3. The Design Contractor shall provide construction cost estimates as outlined in Table 15-1 below.

Table 15-1: Classes of Cost Estimates

Type of Cost Estimate	Class of Cost Estimate	Design Development Level	Expected Accuracy
Feasibility study or screening estimate	4	Basis of Design Report (BODR)	+50% to -30%
Budget level cost estimate	3	Preliminary	+30% to -20%
Management directed and corrected scope of services	2	Mid-Point	+20% to -15%
Definitive Estimate	1	Final	+15% to -10%

NOTE: Classes of Cost Estimates 1, 2, 3 and 4 are in accordance with AACEI.

15.3.2 Class 4 Cost Estimate

1. A Class 4 cost estimate shall be developed at the completion of and submitted with the Basis of Design Report, and shall be referred to as the BODR cost estimate. Class 4 cost estimates usually use

stochastic cost estimating methods, such as equipment factors, Lang factors, Hand factors, Chilton factors, Peters-Timmerhaus factors, Guthrie factors, the Miller method, gross unit/cost ratios, empirical formulae developed from analysis of previous projects, and other empirical and modeling techniques.

2. The Class 4 cost estimate shall include a basis for the cost estimate suitable for the design level.
3. Class 4 cost estimates shall have an expected accuracy of +50% to -30% of the actual cost of construction.

**15.3.3
Class 3 Cost
Estimate**

1. A Class 3 cost estimate shall be developed at or near the completion of Preliminary Design and is referred to as the Budget Level cost estimate. It is the first construction budget developed from project specific design criteria. This cost estimate shall be submitted with the Preliminary Design submittal. The framework of this cost estimate shall be based on quantities and unit price models developed from the design criteria, site layout, investigations, soils reports, and the completed Predesign Report.
2. The Class 3 cost estimate shall include a basis for the cost estimate suitable for the design level.
3. The Class 3 cost estimate shall have an expected accuracy of +30% to -20% of the actual cost of construction.

**15.3.4
Class 2 Cost
Estimate**

1. A Class 2 cost estimate shall be an extension of the Class 3 cost estimate and is the interim budget cost estimate developed to conform to the latest project-specific design criteria. This cost estimate shall be submitted with the Mid-Point Design submittal. The framework of this cost estimate shall be based on quantities and unit price models, refined or revised assumptions from the design criteria, site layout, recent investigations and reports, and the completed Mid-Point Design.
2. The Class 2 cost estimate shall include a basis for the cost estimate suitable for the design level.
3. The Class 2 cost estimate shall have an expected accuracy of +20% to -15% of the actual cost of construction.

**15.3.5
Class 1 Cost
Estimate**

1. A Class 1 cost estimate is referred to as the definitive cost estimate, the final Design Contractor's cost estimate, or the final Engineer's Cost Estimate. This cost estimate shall be developed independently

from earlier budget-level cost estimates, shall serve as a final check on the expected construction cost of the project, and shall be submitted with the Final Design submittal. The cost estimate shall serve as the final project cost plan and as a comparison to the interim budget level cost estimate, and shall be used as the basis for the analysis of construction bids.

2. The Class 1 cost estimate shall include a basis for the cost estimate suitable for the design level.
3. The Class 1 cost estimate has an expected accuracy of +15% to -10% of the actual cost of construction.

**15.3.6
Allowances**

1. The Water Authority may add certain allowances to the cost estimate. Allowances are for known cost items that cannot be quantified because of lack of detail.
2. Examples include allowances for security equipment, allowances for furniture items, etc. The Design Contractor shall not add any cost allowance other than those identified by the Water Authority.

**15.3.7
Deviation From
Previous Cost
Estimates**

1. For each cost estimate prepared, the Design Contractor shall identify any deviation from the previous cost estimate and explain the differences between the cost estimates. The variance in cost (over or under) from the previous cost estimate shall be identified at the cost item level and later included in the summary level cost estimate.
 2. Detailed and summary reports shall reflect the variances, with notations for each item, and shall include any changes in design scope with the cost increase for each change identified. The Design Contractor shall participate in cost estimate review meetings with the Design Manager to reconcile cost estimates and discuss each party's respective cost estimate. If necessary and on approval of the Design Manager, the cost estimator affiliated with the Design Contractor may also be invited to these meetings.
-

15.4 Basis of Cost Estimate

15.4.1 Quantities Included in Cost Estimate

1. The Design Contractor shall document and submit the basis of the construction cost estimate at each design level. This documentation shall include, as applicable to the design level, lists of drawings and specifications, quantities, equipment lists, qualifications, assumptions, inclusions, exclusions, a brief narrative of the cost estimate variances for the current design completion and the approach used in developing the cost estimate. (See Attachment 15-2, Example Basis of Cost Estimate.)
2. Substantial effort shall go into defining the basis for the cost estimates, especially at the Class 4 and 3 levels. A clear definition of the sensitivity to the actual bidding climate and site conditions shall be developed prior to starting cost estimates.
3. The Design Contractor shall provide a quantity takeoff with each applicable cost estimate and define the unit cost (pricing) data used to calculate/extend each line item. The quantity takeoff shall be adjusted between cost estimates. For pricing, the Design Contractor may use industry cost databases or estimates on unit costs developed specifically for the project. The Design Contractor shall clearly define the cost sources on which the pricing is based, including indirect costs and direct costs for labor, material, equipment, subcontractors and suppliers.
4. The Design Contractor shall not use percentages of total cost for certain elements of work such as electrical, cathodic protection, etc. The Design Contractor shall provide detailed take off sheets for all items of work.
5. Sales taxes shall be included in the direct cost of materials and equipment.
6. The Design Contractor shall not add any escalation or cost contingencies to the cost estimate. Escalation will be added later by the Water Authority.
7. The Design Contractor shall identify all major material and equipment costs, backing up each cost estimate with supporting written price quotations. These quotations shall be in written form issued by manufacturers and/or suppliers. Minor equipment costs may be documented by written telephone quotations. All backup information shall be neatly bound and sorted based on category of work (see Section 15.5 for more information). An index shall be provided identifying all support material.
8. All Water Authority-furnished equipment or materials and all labor costs associated with Water Authority system shutdowns and

connections shall be excluded from the construction cost estimates submitted by the Design Contractor unless otherwise directed by the Design Manager. Installation costs for these items incurred by the Construction Contractor shall be included in the cost estimate.

9. For some Water Authority projects, insurance to Construction Contractor's thorough an Owner Controlled Insurance Program (OCIP) will be provided. For these projects, the cost of insurance provided by the OCIP shall be deducted from the cost estimate. For all other Water Authority Capital Improvement Program (CIP) projects, the cost of insurance shall be included in the cost estimate. The Design Contractor shall check with the Design Manager to determine if the project has OCIP or not.
 10. The cost estimate shall include cost associated with environmental mitigation measures, including those related to post-construction.
-

15.4.2
Cost Estimating
Software

1. The Design Contractor shall use a computerized cost estimating software to generate cost estimates. Examples of software include Timberline, MC2 HCSS, and SUCCESS. The cost estimating system used shall clearly identify the various cost categories, types, codes, standard calculations, and defaults. The name and version of the software shall be identified in the submittal.
-

15.5 Format Requirements and Components of the Cost Estimate

15.5.1 Organization of the Cost Estimate

1. The format of the cost estimate shall allow for detailed and summary presentation of project costs. The cost estimating system used shall have summarization, sorting and selecting capabilities for items, such as category of work, equipment, or materials.
 2. The Design Contractor shall organize the cost estimate according to a Work Breakdown Structure (WBS) that follows the construction schedule and can be used to compare against the schedule of values prepared by the Construction Contractor. Refer to the Water Authority Estimating Process Manual for more information (see Attachment 15-1 for the cover page of the Manual).
-

15.5.2 WBS Organization

3. In order to achieve this objective the Design Contractor shall:
 - 3.1. Divide the work into main elements that shall, in general, follow the construction schedule (refer to section 15.9 for more information). Assign unique WBS numbers to the main elements of work (see Attachment 15-3 for an example).
 - 3.2. Within each Main WBS (element of work), provide a detailed take off of all items included within the Main WBS. These items will constitute the sub WBS elements (see Attachment 15-3).
-

15.6 Risk Analysis

15.6.1 Cost Estimate Risk Analysis

1. With the Preliminary Design submittal, the Design Consultant shall conduct and submit a Cost Estimate Risk Analysis report as defined in the Water Authority Estimating Process Manual. The Cost Estimate Risk Analysis Report shall be updated with the Mid-Point and Final Design submittals. The Risk Analysis report shall identify and highlight areas most sensitive to risk and recommend measures to mitigate the risks.
 2. Refer to Chapter 11 for additional risk analysis information.
-

15.7 Cost Estimate Reports

15.7.1 Items Included in the Cost Estimate Report

1. With each design submittal, the Design Contractor shall prepare and include a cost estimate report summarizing the cost estimating procedures and criteria, total cost, quantities of materials, labor manhours, and unit costs for materials and labor. This information shall be supported by detail that breaks down the cost components by WBS item (see Attachments 15-4 and 15-5 for examples), including:
 - 1.1. General Conditions and General Requirements (when quantifiable)
 - 1.2. Manhours
 - 1.3. Labor
 - 1.4. Material
 - 1.5. Equipment
 - 1.6. Supplies
 - 1.7. Subcontracts
 - 1.8. Environmental Mitigation (when quantifiable)
 - 1.9. Total Estimated Cost
2. Costs of intangible items shall be determined as a percentage of the total cost of other components. These costs shall appear as separate line items in the cost estimate summary as follows (see Attachments 15-4 and 15-5 for examples):
 - 2.1. General Conditions and General Requirements (for portions not quantifiable)
 - 2.2. Field Supervision
 - 2.3. Main Office Expense (overhead)
 - 2.4. Tools/Minor Equipment Expense
 - 2.5. Contingency
 - 2.6. Taxes
 - 2.7. Bonds and Insurance
 - 2.8. Permits and Fees
 - 2.9. Environmental Mitigation (when not quantifiable)
 - 2.10. Profit
3. The data shown on the sample cost estimate in Attachment 15-5 shall be the minimum information required for cost estimate

submissions. The display format used shall be similar to that shown in the sample sheet.

**15.7.2
Other Reports
Submitted with
the Cost
Estimate Report**

1. The following reports shall be developed and submitted with each cost estimate submittal as appropriate:
 - 1.1. Summary Cost Estimate Report Sorted by Work Task
 - 1.2. Summary Cost Estimate Report Sorted by WBS item
 - 1.3. Detailed Cost Estimate Report Sorted by WBS item
 - 1.4. Worksheets Report Sorted by WBS item
 - 1.5. Worksheet Report Sorted by Work Task
 - 1.6. Cost Estimate Risk Analysis Report
2. As part of each cost estimate report, the Design Contractor shall provide documentation of the sources, methods, and procedures used in developing the cost estimates. Examples of possible source documentation include:
 - 2.1. R.S. Means cost estimating database index for concrete, site work, mechanical, etc., for labor and material costs
 - 2.2. Other cost estimating databases include Saylor, CalTrans, United States Army Corps of Engineers, and the Department of Defense
 - 2.3. Pipe Quotation from XYZ Inc. dated _____
 - 2.4. Air Compressor Quotation from XYZ Inc. dated _____, with estimated installation (labor) and operator training cost requirements
 - 2.5. In-house historical unit cost rates from completed projects. These projects are: (list projects)
 - 2.6. AACEI Guide to Cost Estimating
 - 2.7. Attached details, sections, and sketches used to perform typical quantity takeoffs for _____
 - 2.8. Construction equipment costs obtained from the "Contractor's Equipment Cost Guide" published by Dataquest

**15.7.3
Comparison to
Previous Cost
Estimate
Reports**

1. The cost estimate report shall contain an analysis comparing the current cost estimate to previous cost estimate reports. The Design Contractor shall identify and state the reasons for any changes to previous cost estimates. If the current cost estimate exceeds the

project budget, the Design Contractor shall make recommendations to reduce the project cost estimate to conform to the budget, or shall provide justification for the cost increases.

15.8 Preliminary Construction Schedule Requirements

15.8.1 Construction CPM Schedule Requirements

1. The Design Contractor shall submit preliminary construction schedules in critical path method (CPM), bar chart format. Schedules shall identify the critical path, and shall contain the activity number of the different construction elements, the activity description (brief description of the work), start and finish dates, and duration of the activity in calendar days. Schedules shall be submitted in 11"x17" paper copies and in electronic form on a CD-R data disk(s) formatted in the current version of Primavera (P3) in use by the Water Authority.
-

15.8.2 CPM Scheduling Software

1. If the Design Contractor desires to use scheduling software other than P3, the Design Contractor shall propose the substitution and obtain written acceptance from the Design Manager prior to signing the contract for professional services between the Design Contractor and the Water Authority (Contract). No scheduling software substitutions will be accepted after the Contract is signed and executed.
 2. The data disk(s) shall have a permanent exterior label indicating the project name and CIP number, submittal date, Design Contractor name, and file names and extensions contained in the disk.
-

15.9 Preliminary Construction Schedule Submittals

15.9.1 Elements of Construction CPM Schedules

1. The Design Contractor shall submit a preliminary construction schedule consistent with the requirements of this chapter at each design level. The submitted schedule shall:
 - 1.1. Establish a probable sequence of construction activities and appropriate construction methods.
 - 1.2. Estimate the duration of each construction activity and the overall time to complete the project.
 - 1.3. Identify the long lead items possibly to be prepurchased and determine the necessity of packaging of the project into multiple construction packages.
 - 1.4. Establish scheduling requirements for shutdowns required for connections to existing facilities or other projects being constructed.
 - 1.5. Set schedule constraints for external factors such as regulatory agency deadlines, environmental restrictions, pipeline shutdown restrictions, imposed milestones, beneficial occupancy, etc.
 - 1.6. Provide a starting point for evaluating the Construction Contractor's initial schedule submittal.
 - 1.7. Provide guidance in breaking down the elements of work into main groups where cost estimates can be based on (refer to section 15.5 for more information).
-

15.9.2 Uses of Construction CPM Schedules

1. The preliminary construction schedule will not appear in the Construction Contract Documents, nor will it direct any Construction Contractor's approach or means-and-methods of construction. However, the Contract Documents shall include an estimated overall construction duration based on the preliminary construction schedule that establishes certain construction milestones and/or constraints.
 2. The Design Contractor shall develop and submit the first preliminary construction schedule with the Preliminary Design submittal and submit updates with subsequent design submittals. Refer to Chapter 4, Design Development for additional information.
-

15.10 Preliminary Construction Schedule Standards

15.10.1 Scheduling Standards

1. The preliminary construction schedule shall be based on:
 - 1.1. Quantities when takeoffs are available and experience in areas where quantities are not available.
 - 1.2. Predecessor and successor activities and logic ties, with a narrative explaining the basis of the logic used.
 - 1.3. Non-resource loadings.
 - 1.4. Activities corresponding to the Work Breakdown Structure.
 - 1.5. Activities shall not exceed \$200,000 in value (exclusive of material or equipment) and shall not be longer than eight weeks in duration.
-

Attachment 15-1: Estimating Process Manual



by

**San Diego County
Water Authority**

Estimating Process Manual

DRAFT

July 8, 2006

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Reviewed by

JACOBS
1400 Francis Road, Suite 200
San Diego, California 92108

Attachment 15-2: Example Basis of Cost Estimate

Type of Cost Estimate

This is a Class 1 cost estimate prepared using the quantity takeoffs and supplier quotations based on Final Design specification and design drawings. When obtainable, subcontractor quotations have been used.

Class 1 cost estimates will be used for budgeting construction funds, preparing the Water Authority Engineer's Cost Estimate, evaluating bid proposals, and to serve as a basis of comparison during change order and claim evaluation.

Estimating Methodology

This construction cost estimate includes all direct labor costs, bulk purchased materials, process equipment shown in the design submittal or on data sheets, and construction equipment. The purchase price of the microfiltration equipment is supplied by Memcor/U.S. Filter, and the purchase price of the Reverse Osmosis equipment including installation is supplied by American Services, Inc. Construction labor manhours are calculated from production rates contained in published MCA, NECA, R.S. Means, and Richardson Engineering Services. Material costs including Contractor furnished equipment are provided from vendor quotation or catalog prices.

Direct Cost Development

A detailed cost estimate of the General Conditions (GCs) and General Requirements (GRs) was performed. The estimated cost for GRs and GCs are divided into two groups: a time related group (e.g., field personnel), and non-time related group (e.g., bonds and insurance). All labor burdens such as Health & Welfare, Vacation, Union Benefits, Payroll Taxes, and Workers Compensation insurance are included in the labor rates used throughout the cost estimate. Trade discounts available to Construction Contractors have been taken and applied where applicable.

Indirect Cost Development

Sales Tax on materials and permanent equipment was applied to all related costs at a rate of 8.25%. A percentage allowance for home office expense was applied to all categories of cost at a rate of 3.9%. This rate is typical for a Construction Contractor with an annual volume of over \$10,000,000 and is based on Means Heavy Construction Cost Data – 1998.

Bidding Assumptions

That the California Construction Contractor's license classification required on this project is "A."

That the Contractor will develop their cost estimate with a competitive approach to material pricing and labor productivity, and will not include allowances for changes, extra work, unforeseen conditions, or any other unplanned costs.

That the Construction Contractor will provide for the General Conditions and Requirements of this contract, perform all mechanical work, install all instrumentation in-line devices, perform all sitework, concreting and steelworks with its own forces, (except for that required to be performed by the Reverse Osmosis specialist).

That the Construction Contractor will subcontract all the vibroflotation, electrical, instrumentation, HVAC, insulation, protective coatings and architectural finishes. That the Construction Contractor will subcontract the preparation of all Process Operation and Maintenance Training material in accordance with guidelines to be supplied by the Engineer, and associated costs paid from the allowance under Bid Item #6. Equipment Vendor training, using industry standard O&M material is included in the purchase price of major equipment items.

Construction Duration

A schedule analysis performed during the constructability review indicated that the project can be mechanically completed for the startup of Microfiltration Equipment and Reverse Osmosis Equipment within an 18-month period, and fully commissioned within 22 months. The final 4 months of the construction program will involve startup assistance as the plant begins operation. Project completion time is 545 calendar days.

Contingency

This cost estimate was based on Final Design specification and plans. During the preparation of this cost estimate, a constructability review of the drawings was conducted which is the basis for the estimating team's recommendation for a 2.5% contingency factor. This factor has been applied to all direct costs as an allowance for quantities not shown on the drawings and for the finalization of the Specification and General Requirements.

Specialty Trades

For the purposes of this cost estimate, it is assumed that this project will be constructed by a General Civil/Mechanical Contractor and that the electrical and instrumentation portions of the work will be considered specialty trade work to be subcontracted. Bid Items 17 and 18, Electrical and Instrumentation, represent approximately 12% of the total cost estimated contract cost.

Specialty Equipment

1. Microfiltration: Since the Water Authority will be purchasing the microfiltration equipment directly and having the GC install the equipment, only the labor and material costs are included in the General Construction Contractor's overhead and profit calculations.
2. Reverse Osmosis: The R.O. vendor will be a subcontractor to the General Construction Contractor to do the assembly and installation of the R.O. Only a 5% fixed fee is added to the R.O. cost estimates.
3. Instrumentation: A large portion of the instrumentation is provided by the Microfiltration and Reverse Osmosis suppliers and the associated costs are already included in their cost estimate. Only instrumentation outside the MF and R.O. is provided by the instrumentation subcontractor.

Recommended Mandatory Subcontract Minimum (MSM)

The following categories of work represent the major items that are customarily not performed by a General Construction Contractor or require a special license.

- Demolition
- Soil Stabilization by Vibrocompaction
- Miscellaneous Metalwork
- Light Metal Framing
- Thermal & Moisture Protection
- Doors and Windows
- Finishes
- Specialties
- HVAC

It is recommended that the Mandatory Subcontract Minimum, be established at 20% excluding specialty items and specialty equipment. A stricter requirement would place restraints on the successful bidder to the extent that it may interfere with the successful planning and execution of the work. It is also recommended that the General Construction Contractor execute a minimum of 50% of the work with their own forces.

Attachment 15-3: Sample Cost Estimate Work Breakdown Structure

WBS Main	WBS Sub	Description	Qty	Unit
10000	10010	Mobilization	1.00	LS
	10100	Mobilize Equipment	20.00	EA
	10200	Setup Yard & Trailers	1.00	LS
	10300	Contractor's Field Office	21.00	MTH
	10400	Temporary Utilities	21.00	MTH
	10500	Permits & Fees	1.00	LS
	10600	Photographic Documentation	2.00	EA
	10700	Survey	12.00	MTH
	10800	Cleanup & Demobilization	1.00	LS
12000	12010	Relocate Water Authority's Office Trai	1.00	LS
	12020	Relocate City of San Diego's 54-inch W	2600.00	LF
	12100	Excavate & remove existing 54" Pipelin	281.00	LF
	12200	Backfill Trench from Sta. 2+10 - 3+25	115.00	LF
	12300	Drill & Shoot alignment to lower pipel	115.00	LF
	12400	Excavate Trench from Sta 2+10 to 3+25	115.00	LF
	12500	Install 54" Pipe	281.00	LF
	12600	Encase Pipe in two locations	75.00	LF
	12610	Concrete Encase 54" Pipeline Sta 0+62	25.00	LF
	12620	Concrete Encase 54" Pipeline Sta 2+30	50.00	LF
	12700	Backfill Pipe	281.00	LF
	12800	Test Pipe	1.00	LS
	12900	Tie-in new section of pipeline to exis	2.00	EA
	12000	Install and Maintain SWPPP	1.00	LS
20000	20010	Earthworks	1.00	LS
	20100	Dam Access Road	866.00	LF
	20200	Surge Tank Access Road	1648.00	LF
	20300	Overflow Chute	224.00	CY
	20400	Reservoir Fill Chute	533.00	CY
	20500	Excavation for Surge Tank to EL 900 59	406.00	CY
	20510	Clear & Grubb	1.27	ACRE
	20520	Drill & Blast Surge Tank Site	59406.00	CY
	20530	Excavation of Surge Tanks Site to EL 9	59406.00	CY
	20540	Pioneer Haul Route & Stockpile Area	1.00	LS
	20600	Excavation for Inlet/Outlet Structure	1723.00	CY
	20700	Process Material for Backfill	213966.00	CY
	20800	Export Surplus Material	148088.00	CY
	20900	Backfill at Inlet/Outlet Structure	4612.00	CY
	30010	Reservoir and Appurtenances	1.00	LS
30000	30100	Inlet/Outlet Structure 1.000 EA	1.00	EA
	30200	Prestressed Concrete Reservoir	1.00	EA
	30300	Overflow Concrete Structure	1.00	EA
	30400	Reservior Fill Chute	599.00	LF
	30400	Excavation & Backfill	599.00	LF

Attachment 15-3: Sample Cost Estimate Work Breakdown Structure (Continued)

WBS Main	WBS Sub	Description	Qty	Unit
40000	40010	Yard Piping & Structures	1.00	LS
	40020	Procure Pipe, Valves & Meters	1.00	LS
	40030	Clear & Grubb	9.82	ACRE
	40100	Drill & Blast Trench Line	2005.00	LF
	40200	Trench Excavation 2,905.000 LF	2905.00	LF
	40300	60" Pipe from Sta. 0+00 to 9+00	900.00	LF
40000	40400	90" Inlet Pipe from Sta. 1+00 to 2+00	100.00	LF
	40500	90" Outlet Pipe from Sta. 0+00 to 1+00	100.00	LF
	40510	Joint Trench - Outlet Sta. 1+00 to 9+0	800.00	LF
	40520	Joint Trench - Outlet Pipe Sta. 9+00 t	165.00	LF
	40530	90" Inlet Pipe from Sta. 11+25 to 13+0	175.00	LF
	40540	102" Outlet Pipe from Sta. 10+66 to 12	184.00	LF
	40550	Joint Trench - Outlet Pipe Sta. 12+50	215.00	LF
	40600	84" Reservoir Fill Pipe POB to Chute	266.00	LF
	40610	Install 102" Outlet Pipe	1091.00	LF
	40620	Install 84" Reservoir Fill Pipe	265.00	LF
	40630	Install Anchor/Thrust Block	1.00	LS
	40640	Test Large 60", 84", 90" & 102" Pipeli	1.00	LS
	40650	Connect 60" MLP Pipeline to Existing	1.00	EA
	40660	Connect Outlet Pipeline to SV Pipeline	1.00	EA
	40670	12" PVC Potable Waterline	772.00	LF
	40680	Backfill Trench	2905.00	LF
	40690	60" MLP Pipeline Sta. 0+00 to 9+00	900.00	LF
	40700	90" Inlet Pipeline Sta. 1+00 to 2+00	100.00	LF
	40750	90" Outlet Pipeline Sta. 0+00 to 1+00	100.00	LF
	40760	Triple Barrel Trench Outlet Sta. 1+00	800.00	LF
	40800	102" Pipe - Encasement 1 Sta 5+17 to	68.00	LF
	40820	102" Pipe Encasement 2 - Sta 9+50 to 1	72.50	LF

Attachment 15-4: Sample 1 Construction Cost Estimate (Summary Sheet)

WBS No.	Description	Qty	Unit	Labor	Equipment	Material	Supplies	Subcontract	Total
1.00	Mobilization								
1.01	Mobilization	1	LS	370,863	126,784	120,096	14,339	254,910	886,992
	Total Mobilization			370,863	126,784	120,096	14,339	254,910	886,992
2.00	Construction of Pipeline 4 Relining								
2.001	Material Procurement								
2.0011	Fabricate Steel Liners - 93"OD x 5/8" Liner	15,669	LF			10,150,269			10,150,269
2.0012	Fabricate Steel Liners - 93"OD x 3/4" Liner	3,652	LF			2,815,907			2,815,907
2.0017	Fabricate Steel Pipe Closures	11	EA			351,087			351,087
2.0018	Fabricate Pipe Troughs	4	EA			21,335			21,335
	Total Material Procurement			0	0	13,338,598	0	0	13,338,598
2.002	General Surface Improvements & Work Area Identification								
2.0021	Install Tee Posts & Carnival Flagging to mark ROW	21,100	LF	11,555	1,014	11,733	578	10,300	35,180
2.0022	Install Environmental Fencing	14,232	LF	9,904	869	14,574	495		25,842
2.0023	Tree & encroachment removal Sta 3336+29 to 3371+40	1	LS	14,850	12,895		743	40,600	69,088
	Total General Surface Improvements			36,309	14,778	26,307	1,816	50,900	130,110
2.003	Secure Pipeline for Relining								
2.0031	Paint Mountain - Install Bulkhead	1	LS	1,227	153	2,424	61	960	4,825
2.0032	Black Mountain - Install Bulkhead	1	LS	2,093	307	3,502	105	1,280	7,287
2.0033	Install Bulkheads at FCFs & Ramona Pipeline Turnouts	1	LS	9,072	2,950	6,133	454	0	18,609
2.0033	Remove existing valving at structures	23	EA	4,016	1,257	0	201	0	5,474
2.0034	Pump Pipeline dry after initial draindown	6	Sites	3,707	1,160	1,239	185	0	6,291
	Total Secure Pipeline for Relining			20,115	5,827	13,298	1,006	2,240	42,486
2.01	Access Portal No. 1 (From Sta. 3337+79 to 3358+63)								
2.0101	Install Protective Fence & sound wall	1	LS	6,275	1,160	7,543	314	0	15,292
2.0102	Clear & Remove Topsoil	1	LS	434	316	259	22	276	1,307
2.0103	Excavate Portal, Demolish and Dispose of Pipe	1	LS	6,685	8,333	1,552	334	11,840	28,744
2.0104	Install and remove Pipe Troughs	1	LS	7,863	3,287	3,044	393	1,280	15,867
2.0105	Install Grout Rings	15	EA	8,696	962	2,424	435	2,400	14,917
2.0106	bell	106	EA	6,038	1,380		302		7,720
2.0107	Install Pipe Liners - 93"OD	106	EA	49,383	31,633	0	2,469	11,600	95,085
2.0108	Fit up 7/8" Liners for Butt Welds	5	EA	1,490	165	0	74	2,640	4,369
2.0109	Weld Pipe Liners	106	EA					115,236	115,236
2.0110	Fix Liner to existing man way	2	EA	181	20	151	9	800	1,161
2.0111	Grout Pipe Liners annular space	2097	LF	56,553	3,290	2,664	1,820	79,392	143,719
2.0112	Clean Lined Pipe	2097	LF	1,463	270	181	73	0	1,987
2.0113	Install Field Lining	2097	LF					183,802	183,802
2.0114	Install Closure Piping	1	LS	2,093	1,843	0	105	8,410	12,451
2.0115	Construct Concrete Encasement	44	LF	13,100	1,509	17,061	587	16,836	49,093
2.0116	Backfill Closure area & Hydro seed	1	LS	3,349	4,131	0	167	2,000	9,647
2.0117	Repair Access Road	1	LS	1,297	797	808	65	0	2,967
	Total Access Portal No. 1			164,900	59,096	35,687	7,169	436,512	703,364
2.02	Access Portal No. 2 (From Sta. 3359+06 to Sta. 3376+34)								
2.0201	Install Protective Fence & sound wall	1	LS	6,275	1,160	7,543	314	0	15,292
2.0202	Clear & Remove Topsoil	1	LS	434	316	259	22	276	1,307
2.0203	Excavate Portal, Demolish and Dispose of Pipe	1	LS	12,405	10,954	1,552	620	11,840	37,371
2.0204	Install and remove Pipe Troughs	1	LS	7,863	3,287	3,044	393	1,280	15,867
2.0205	Install Grout Rings	5	EA	2,899	321	808	145	800	4,973
2.0206	Install Pipe Liners	237	EA	94,678	60,648	0	4,734	22,240	182,300
2.0207	Fit up 7/8" Liners for Butt Welds	237	EA	71,321	7,900	0	3,566	126,400	209,187
2.0208	Weld Pipe Liners	237	EA					303,123	303,123
2.0209	Fix Liner to existing man way	1	EA	90	10	75	5	400	580
2.0210	Grout Pipe Liners annular space	1747	LF	58,519	3,710	2,043	2,154	97,716	164,142
2.0211	Clean Lined Pipe	1747	LF	1,219	225	151	61	0	1,656
2.0212	Install Field Lining	1747	LF					153,125	153,125
2.0213	Install Closure Piping	1	LS	2,093	1,843	0	105	11,753	15,794
2.0214	Construct Concrete Encasement	44	LF	13,100	1,509	17,061	587	16,836	49,093
2.0215	Backfill Closure area	1	LS	4,465	5,508	323	223	2,000	12,519
2.0216	Repair Access Road	1	LS	1,297	797	808	65	0	2,967
	Total Access Portal No. 2			276,658	98,188	33,667	12,994	747,789	1,169,296
2.120	Cathodic Protection	18	EA	6654	1589	5819	333	0	14,395

Attachment 15-4: Sample 1 Construction Cost Estimate (Summary Sheet) Continued

WBS No.	Description	Qty	Unit	Labor	Equipment	Material	Supplies	Subcontract	Total
2.130	Test & Disinfect Pipeline 4								
2.131	Install new Drain & Sampling Connection at Manways	9	EA	813	217	923	41	2,250	4,244
2.132	Install new Drain & Sampling Connection at Blowoffs	8	EA	2,218	290	17,279	111	0	19,898
2.133	Modify existing AVVR for Sampling Connection	6	EA	1,109	145	416	55		1,725
2.134	Test & Disinfect Pipeline 4	1	LS	5,247	2,679	3,233	262	30,000	41,421
	Total Test & Disinfect Pipeline 4			9,387	3,331	21,851	469	32,250	67,288
2.140	Reactivate Pipeline for Operation								
2.142	Black Mountain - Remove Bulhead	1	LS	1,854	460	92	93	800	3,299
2.143	Refurbish/Paint existing Line Valves	23	EA	16,020	4,361	1,194	801	30,750	53,126
2.144	Install valving at structures	23	EA	14,210	4,447	3,162	711		22,530
2.145	Reactivate FCF and Ramona Pipeline Turnouts	1	LS	9,093	3,108	2,860	455		15,516
2.146	Install Vent at Paint Mountain	1	LS	3,853	1,581	2,126	193	960	8,713
	Total Reactivation of Pipeline for Operation			45,030	13,957	9,434	2,253	32,510	103,184
	Total Construction of Pipeline 4 Relining			559,053	196,766	13,484,661	26,040	1,302,201	15,568,721
3.00	Construction of Pipeline 3 and 4 Interconnection at Paint Mountain								
3.001	Remove of existing 48" WSP interconnection & 60" Vent	1	LS	3,829	3,387	1,793	191	2,472	11,672
3.002	Install new interconnection piping & AVVR	1	LS	15,835	4,267	75,205	792	9,104	105,203
3.003	Modify existing 8" bypass piping	1	LS	1,100	177	2,975	55	320	4,627
3.004	Install new chain-link Fence & Gate	1	LS					4,900	4,900
	Total for Pipeline 3 & 4 Interconnection at Paint Mountain			20,764	7,831	79,973	1,038	16,796	126,402
4.00	Furnish, Install, Maintain & Remove Sheeting & Shoring - Portals 2, 3, 4 & 5	1	LS	41038	48232	76664	2052	8160	176,146
	Total Sheeting & Shoring			41038	48232	76664	2052	8160	176146
5.00	Record Drawings			13500					13,500
	Sub-total - Direct Cost - Items 1 through 5			1,005,218	379,613	13,761,394	43,469	1,582,067	16,771,761
	Overhead	4.7%							788,272.74
	Profit	50%	Lab						502,609.00
	All Risk Insurance	0.74%	Total						133,663.55
	Bond	1.00%							133,948.00
	Total Estimate								18,330,254

Attachment 15-5: Sample 2 Construction Cost Estimate (Summary Sheet)

WBS No.	Description	Qty	Unit	Labor	Equipment	Material	Supplies	Subcontract	Total
1.00	Mobilization								
1.01	Mobilization	1	LS	28,320	5,370	11,700	1,416	5,000	51,806
1.02	Demobilization & Cleanup	1	LS	1,649	610	-	83	5,000	7,342
	Total Mobilization			29,969	5,980	11,700	1,499	10,000	59,148
2.00	Construct Meter Vault								
2.01	Clear & Grubb	1	LS	5,594	3,751		231	6,665	16,241
2.02	Excavate Vault	623	cy	3,264	2,948	-	164	-	6,376
2.03	Remove 48" WSP Spools	3	EA	1,758	1,086	-	88	-	2,932
2.04	Construct Meter Vault - 20' x 20' x 12' inside dimension	77.2	cy	24,654	3,535	39,341	1,228	20,409	89,167
2.05	Construct exterior vault stairs & railing	1	EA	1,533	390	1,955	77	-	3,955
2.06	Waterproof exterior Vault Walls - 2 coats	880	SF					4,074	4,074
2.07	Backfill Meter Vault	379	cy	2,511	2,623	194	126	-	5,454
2.08	Install Steel Pipe Supports	2	EA	415	186	2,360	21	-	2,982
2.09	Install Steel Interior Stairs & Handrailing	1	LS	3,166	1,328	7,866	158	1,280	13,798
2.10	Install Interior & Exterior Ladders	1	LS	528	145	884	26		1,583
2.11	Install 48" Venturi Meter	1	LS	1,755	487	56,644	88	-	58,974
2.12	Install Submersible Sump Pump & Discharge Line	1	EA	704	193	830	35	160	1,922
2.13	Install 4" Blowoff Drain with Rip Rap	1	LS	3,073	1,653	5,718	154	1,920	12,518
2.14	Install Instrumentation Piping, gauges, etc.	1	LS					14,887	14,887
2.15	Electrical	1	LS					20,322	20,322
2.16	Reroute Two Existing Fiber Optics Cables	1	LS	2,230	1,244	2,327	112	2,000	7,913
2.17	Install 6 - 48LB Magnesium Anodes and Junction Box	1	EA	2,203	1,357	3,972	110	1,000	8,642
2.18	CP Test Station & internal cables	1	LS	1,572	193	821	79	500	3,165
2.20	Construct Slope	1	LS	4,253	4,818	-	213	-	9,284
2.21	Install 6" Class II Base	6,165	SF					16,600	16,600
2.22	Install new 3" AC Pavement	6,165	SF					12,017	12,017
2.23	Install Type A (SDRSD G-5) AC Dike	140	LF					2,207	2,207
2.24	Install 4" Steel Protection Posts	7	EA	1,032	329	1,067	52	-	2,480
2.25	Reinstall Chain Link Fence	180	LF					2,700	2,700
2.26	Replant Juniper Bushes	22	EA					6,586	6,586
2.27	Hydroseed	1	arces					2,000	2,000
2.28	Painting	1	LS					3,500	3,500
	Total Construct Meter Vault			60,245	26,266	123,979	2,962	118,827	332,279
3.00	Operational Testing & O&M Manuals	1	LS	2,455		150			2,605
4.00	Sheeting & Shoring	1	LS			2,000			2,000
5.00	Record Drawings	1	LS	2,500					2,500
	Total Direct Costs			95,169	32,246	137,829	4,461	128,827	398,532
	Overhead	8%	Direct Costs						31,883
	Profit	50%	labor						47,585
	Sub-total								477,999
	All Risk Insurance	0.74%	Sub-total						3,537
	Bond	1.50%	Sub-total						7,223
	Cost								\$ 488,759.30

Chapter 16 O&M Manuals, and Lifecycle Cost Analysis and O&M Impact Reports

Overview

Purpose This chapter outlines the Design Contractor requirement to produce O&M Manuals, and develop lifecycle cost analysis and O&M impact studies.

Topics This chapter is composed of the following topics:

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16.1 Introduction

1. The purpose of this chapter is to promote a consistent level of detail and content in development of project Operation and Maintenance (O&M) manuals, life cycle cost analyses, and O&M impact reports, collectively referred to in this chapter as the O&M Documents. The Design Contractor shall develop the O&M Documents during the project design and construction phases. The Design Contractor shall update the O&M Documents developed during the project design phase, based on detailed information provided by the Construction Contractor in accordance with the provisions of the contract documents. Refer to Chapters 4, 19, and 20 of this Guide for additional requirements.
 2. O&M Manuals are important for proper operation and maintenance of Water Authority facilities. Lifecycle cost analysis is an important tool in comparing different design options and alternatives. Guidelines are provided in this chapter to help the Design Contractor perform a proper lifecycle cost analysis. The impact of new facilities on O&M labor and utilization of material is of utmost importance for the appropriate operation and maintenance of Water Authority facilities. This impact analysis will enable proper planning for labor demands and distribution amongst the Water Authority different facilities. It will also help in preparing budgets and forecasting expenditures.
-

16.2 O&M Manuals

16.2.1 O&M Manuals Requirements

1. The Design Contractor shall prepare and organize the O&M Manual according to the requirements outlined in the Water Authority Operation and Maintenance Process Manual. These requirements include but are not limited to the following items:
 - 1.1. Operational Information including
 - 1.1.1. Components, Operation, and Controls.
 - 1.1.2. Equipment Summary.
 - 1.1.3. Mechanical Operational Procedures
 - 1.1.4. Wiring Diagrams
 - 1.1.5. Machine Shop Fabrication Drawings
 - 1.1.6. Safety Procedures and Precautions, including interlocks.
 - 1.1.7. Normal operational procedures, including remote operation, and impacts to associated structures and outlets.
 - 1.2. Standard Operating Procedures (SOPs) including
 - 1.2.1. Pre-Startup Procedures.
 - 1.2.2. Startup Procedures.
 - 1.2.3. Troubleshooting Procedures.
 - 1.2.4. Shutdown Procedures.
 - 1.3. Maintenance Information including
 - 1.3.1. Preventive Maintenance Procedures and Schedules.
 - 1.3.2. Parts List. The Design Contractor shall coordinate with equipment manufacturers on producing the parts list for each piece of equipment.
 - 1.3.3. Maintenance information related to required long-term environmental commitments.
 2. The Design Contractor shall ensure the provision of this information in the construction contract documents. The Design Contractor shall review all O&M related materials submitted by the Construction Contractor in accordance with the provisions of the contract documents.
-

**16.2.2
Preparation of
the O&M
Manuals**

1. The Design Contractor shall prepare and submit the O&M manuals during each project phase, as outlined below. The Design Contractor shall also attend an O&M delivery meeting, at each project phase, with the Design Manager and O&M staff. The intent of these meetings is to discuss and present the contents of the O&M manual.
 - 1.1. Design Phase: Refer to Chapter 4 of this Guide for more information. The O&M manuals shall contain the information outlined in the Water Authority O&M Process Manual and summarized in section 16.2.1.
 - 1.2. Construction Phase: Shall be submitted prior to beginning of Commissioning and Startup Phase (refer to chapter 19 for more information). The Design Contractor shall prepare the O&M manuals after acceptance of O&M-related submittals from the Construction Contractor. The O&M manuals shall contain updated Operational Information, Standard Operating Procedures, and Maintenance Information to reflect actual equipment and submitted manufacturer's information by the Construction Contractor.
 - 1.3. Closeout Phase (Final O&M Manuals): Shall be submitted after completion of commissioning and startup activities (refer to chapter 20 for more information). The O&M manuals shall contain updated Operational Information, Standard Operating Procedures, and Maintenance Information to reflect any changes made during commissioning and startup.

**16.2.3
Submittal
Formats and
Schedule**

1. The O&M manuals shall be submitted in both hardcopy and electronic format. The Design Contractor shall ensure the provision of the information in this section in the construction contract documents. The O&M manuals shall include at least the following information:
 - 1.1. Project Name.
 - 1.2. Project Water Authority number.
 - 1.3. Project Phase (Design, Construction, Closeout).
 - 1.4. Date.
 - 1.5. Document version number.
2. Hardcopies submittals of O&M manuals shall be prepared on 20-lb, 8-1/2 by 11-inch paper, bound in three-ring binders. All material shall be suitable for xerographic reproduction. Drawings and diagrams shall be presented using the latest ISO standards for presentation. Larger drawings shall be folded separately and placed in envelopes in the binders. Each envelope shall bear

suitable identification on the outside. Material shall be assembled and bound in the order presented in the detailed table of contents of the O&M manual, and each binder shall contain a table of contents and suitable index tabs.

3. The Design Contractor shall ensure that all electronic media for O&M-related submittals are provided on compact discs (CDs). All written documentation shall be prepared using Microsoft Word that is in current use by the Water Authority. CAD drawings shall be developed using AutoCAD in current use by the Water Authority. Refer to Water Authority Drafting Manual ESD-120 for specific drafting requirements (Attachment 16-9 shows the cover page of ESD-120). Information not presented in the Water Authority's current word processing software or AutoCAD format shall be presented in pdf format with highlighted or marked sections, if any, clearly shown. A complete set in pdf format shall also be prepared. The CDs shall be organized and formatted by specification section. Submitted CDs and file labeling shall clearly reflect project phase, as outlined in section 16.2.2.
 4. The Design Contractor shall ensure that the contract documents provide a reasonable schedule for the submittal and approval of the Construction Contractor's O&M-related submittals. This schedule shall be established to: (1) give the Design Contractor time to prepare the Construction Phase O&M manuals in advance of the equipment being placed in operation; and (2) allow time to train Water Authority technical staff with the aid of the final O&M manuals. The schedule developed for the submittal of O&M-related documents shall depend on the nature of each project and its duration.
 5. Other O&M submittal requirements are outlined in the Water Authority Standard Specifications (Whitebook) section 01730.
-

16.3 Life Cycle Cost Analysis

16.3.1 Overview

1. The Design Contractor shall prepare the appropriate Lifecycle Cost Analysis (LCCA) for Water Authority projects using the approach presented herein to assess the value of project components. LCCA is a method often used to forecast the economic cost of a project by evaluating the total costs of the project over its expected life, including initial capital, salvage value, replacement, and operations and maintenance (O&M) costs. It is important that the LCCA contain a listing or diagram showing the dollar amounts and timing of estimated future expenditures required to operate and maintain the facility.
2. For public works projects, the method most often employed in LCCA is the present worth analysis, where all future costs are discounted to the present value. The capital cost and present values of annual O&M costs, replacement and salvage value are then summed, yielding a total present worth value. Attachment 16-2 provides an example of LCCA and covers several of the items that shall be included in the analysis.
3. LCCA is also used to compare the economic cost of two or more project alternatives. Consequently, it is a valuable tool in value engineering alternatives. A classic example involves evaluation of two alternatives, one having low capital and high O&M costs, and the other having the opposite. The lowest capital cost alternative does not always have the lowest LCC.
4. The Design Contractor shall prepare the LCCA report during the project design phase prior to the Preliminary Design Level (see chapter 4 for more information). The Design Contractor shall update the LCCA report during the construction phase of the project to reflect latest O&M-related information received from the Construction Contractor on O&M.

16.3.2 Assumptions and Decisions

1. The Design Contractor shall use the following assumptions in performing the LCCA. The Design Contractor shall include a section in the LCCA report on the assumptions used.
2. In order to effectively conduct LCCA, several important decisions must be made prior to conducting the study. It is important that these decisions remain constant over time to ensure consistent project evaluation. These decisions include:
 - 2.1. Discount rate – This is the interest rate or return-on-investment number determined by the Water Authority. The discount rate

has three components as shown below.

I_{discount} is a function of ($I_{\text{inflation}}$), (I_{yield}), and (I_{risk})

where,

$I_{\text{inflation}}$ = the general inflation rate – check with Water Authority Finance Department for latest rates.

I_{yield} = the rate of return demanded by bond investors – has ranged between 3.5-4.5% over the past 50-60 years.

I_{risk} = a factor investors assign to account for differences in risk between bond offerings has ranged from 0% for strongly backed municipal, public agency, or federal bonds to 12%-15% for corporate “junk” bonds. Assume 0% risk for Water Authority bonds.

- 2.2. Cost escalation method used – Costs can be established using the escalated dollar approach.
 - 2.2.1. In the escalated dollar approach, all future costs are escalated at an assumed inflation rate, and then discounted to present value using discount rate that accounts for both the true cost-of-money and inflation. This approach involves additional complexity, but provides a better estimate of the actual dollar value of future projects.
- 2.3. The most appropriate discount rate for bringing back future costs to the present shall be the cost of capital to the Water Authority, unless a different rate can be justified. The cost of capital shall be the interest rate that the Water Authority would pay if it borrowed money to fund the project. The rate used shall be consistent with the rate used throughout the Water Authority for Net Present Value analyses. Check with Water Authority Finance Department for latest discount rates. Different discount rates may be used for different cost categories (labor, equipment), or within the same category.
- 2.4. The basis for the analysis shall be a lifecycle cost estimate based on a Net Present Value assessment.
- 2.5. Replacement, operating, and maintenance costs shall be estimated for the entire life of the facility to which the component is attached. The following is a list of facilities and their expected life. This list is not comprehensive and the durations indicated are indicative only. For the project they are working on, the design Contractor shall provide a complete facility list, and shall obtain approval on the list and life durations from the Water Authority Operation and Maintenance Department.

- 2.5.1. Flow control facilities - 40 years
 - 2.5.2. Hydroelectric and pumping stations - 50 years
 - 2.5.3. Pipelines - 100 years
 - 2.5.4. Concrete water retaining structures - 50 years
 - 2.5.5. Concrete vault - 50 years
 - 2.5.6. Concrete dams - 100 years
 - 2.5.7. Other facilities - TBD
- 2.6. Estimates of component life shall be consistent across projects (for example, the life of a butterfly valve shall be the same from one project to the next) unless there is something special about a particular component that merits using a different estimate. The following is a list of components and their expected life. This list is not comprehensive and the durations indicated are indicative only. For the project they are working on, the design Contractor shall provide a complete equipment list, and shall obtain approval on the list and life durations from the Water Authority Operation and Maintenance Department.
- 2.6.1. Butterfly valve - 25 years
 - 2.6.2. Sleeve valve - 25 years
 - 2.6.3. Plug valve - 25 years
 - 2.6.4. Flap Gates - 25 years
 - 2.6.5. Roller Gates - 50 years
 - 2.6.6. Pump and motor - 50 years
 - 2.6.7. Turbine and generator - 50 years
 - 2.6.8. Venturi meter - 25 years
 - 2.6.9. Mag & Sonic meters – check with manufacturer
 - 2.6.10. Air release/vacuum valve - 25 years
 - 2.6.11. Electric actuator - 10 years
 - 2.6.12. Bridge crane and hoist - 40 years
 - 2.6.13. Other equipment - TBD
- 2.7. Operating and maintenance costs shall be assessed using current known costs as a basis and inflated to future years of operation. The Design Contractor shall confirm current labor rates (direct only, direct plus fringe, or direct plus fringe plus overhead) with Operation and Maintenance Department. For the latest inflation assumptions, the Water Authority Finance Department shall be consulted. Evaluate the project-specific components of the operations and maintenance costs – if the

project will consume significant amounts of energy, it may be helpful to look at projected energy inflation estimates and create a weighted inflation rate. The inflation assumptions shall be documented in the analysis and used in the Lifecycle Cost Analysis.

- 2.8. The Design Contractor shall identify the most sensitive cost factors while performing the LCCA. For instance, LCCA sensitivity to utility power cost may need to be evaluated. It is important that sensitivity of some factors to LCCA be evaluated. This may shift the decision of selecting a particular alternative based on risk involved with varying a cost factor.
- 2.9. The safety of Water Authority's employees, employees of Contractors, and the public shall never be compromised. For example, if an additional valve is needed to provide for safe entry into a pipeline, the alternative to that valve should not be to replace it with an unsafe alternative. Alternatives should be whatever would need to be done to maintain safe conditions without the valve. In the case of a valve, for example, it may require shutting down and draining sections of pipeline to maintain safe conditions during internal inspections. In such a case, the cost of draining a pipeline and labor and materials shall be included in the Lifecycle Cost Analysis.
- 2.10. If a component is being added to address a situation or event that is intermittent, such as a power failure, an assessment shall be made of the probability of the event occurring, the frequency with which it is expected to occur, and the duration of the event (each group or related type of event is known as a risk factor). For example, a component to mitigate the risk factor of a power failure might be backup power for a major, non-emergency pump station. The risk assessment should estimate the frequency of the power failure, how long it would be expected to last, and the probability of it occurring. Power companies can often provide such information.
- 2.11. In cases of different kinds alternatives, it is important to understand the 'external consequences of failure' as well. It could be a deciding factor when LCC's are nearly the same. For example, the consequence of failure could result in loss of water supply to a retailer, thus the duration of failure/fix differences for the alternatives become a potentially important factor.
- 2.12. The actual value for mitigating each risk factor should use the following simple mathematical formula for each intermittent event: $R = P \times C$ where R is the risk exposure, P is the probability of an event occurring, and C is the consequence of failure (\$, cost associated with the event). We're looking to

determine (business) risk exposure. The duration of the event can often have an impact on the cost of each event. In addition, the frequency of the event should be taken into account in the computation. For example, if the frequency of an event is once every five years, the annual probability would be 20%. If the cost of the event is \$10,000, then the annual cost of the event would be \$2,000. If the frequency of the event is more than once per year, on average, then multiply the sum of the costs for each event in the year by the probability of each individual event occurring. This should be taken into account in the lifecycle costs by showing the Net Present Value of not implementing a feature to prevent or reduce the probability of an event causing a problem.

- 2.13. Lifecycle costs shall be spread over the standard estimated life of the overall project being analyzed. For example, a pipeline may have a 100-year life, but a particular valve may only have a 25-year life. The cost for the valve should include a replacement cost for the valve so that the life of the component matches the life of the entire facility.
- 2.14. Capital costs shall be estimated in current dollars and inflated to the year in which they will be expended using a standard inflation factor for construction costs. The Design Contractor shall consult the Water Authority Finance Department for the appropriate rate to be used. Inflation rates for different components (for example, different material costs) can be used with justification.
- 2.15. There may be risk factors that must be included in a risk assessment that are difficult to quantify. One example of this kind of risk factor can be the impact on the Water Authority member agencies for an interruption in service or the lengthening of a period of reduced service. When such risk factors are encountered, they shall be stated clearly, but not quantified.

**16.3.3
LCCA Report
Format**

1. The Design Contractor shall use the following outline for the LCCA Report:
 - 1.1. Introduction:
 - 1.1.1. Provide a summary with a brief description of the project.
 - 1.1.2. Outline the purpose of this life cycle cost analysis study.
 - 1.2. Items Considered: Provide a list of components considered in

performing the analysis. List each of the components to be analyzed in a table.

- 1.3. Assumptions and Criteria: Provide a list of assumptions and inputs used in the analysis. Examples Include: Escalation Rate, Inflation Rate, Capital Costs, Salvage Value, O&M Costs.
 - 1.4. Analysis Content:
 - 1.4.1. Include a subsection for each component in the analysis section. Subsections shall begin by listing the costs for that component. Next, provide sufficient detail for how each cost is computed.
 - 1.4.2. After the analysis of each component, summarize the costs for the component in a table. All costs shall be expressed as Net Present Value and an individual total shall be provided for costs. Include any discussions on non-quantifiable costs
 - 1.4.3. Provide the analysis calculations with a timeline of dollar amounts and timing of estimated future expenditures required to replace components/facilities.
 - 1.4.4. Calculate the Life Cycle Costs of each facility. That is the sum of the net present value of initial capital cost of all components less salvage value at end of study period, plus annual O&M cost including labor, material, and replacement items.
 - 1.5. Summary and Recommendations:
 - 1.5.1. Summarize, in a table, the Net Present Value for costs for each component, and an estimate of the capital costs of each component. In addition, note if there are non-quantifiable costs that were used in formulating the recommendation for each component. There is no need to summarize the non-quantifiable costs as the reader can refer back to the analysis section for that information.
 - 1.5.2. Provide a recommendation as to whether each component shall be included in the project based on the quantifiable and non-quantifiable cost. Provide a list of recommendations with supporting reason.
-

16.4 Operational and Maintenance Impact Report

16.4.1 Overview

1. Operation and Maintenance Impact is of utmost importance to the Water Authority and is used to plan and allocate the appropriate resources where they are needed. Both labor and material impact will help the Water Authority set the correct budget for running facilities, and assign/hire the proper and adequate labor force throughout the life of the facility.
 2. The Design Contractor shall prepare an O&M Impact Report using the operating labor and material resources analysis to determine labor, outside resources, equipment, and material resources requirements for Water Authority projects on an annual basis.
-

16.4.2 Approach and General Guidelines

1. The O&M labor and material impact analysis is normally done during the project planning phase. If no O&M labor and material impact analysis was performed during the project planning phase, the Design Contractor shall develop a new O&M labor and material impact analysis.
2. The Design Contractor shall update the project O&M labor and material impact analysis during the project design phase at the mid point design level (refer to chapter 4 for more information). This is to capture any design change impact and to confirm labor and material resources determined during the project planning phase are still valid. The Design Contractor shall also update the analysis during the project construction phase to reflect latest information received from the Construction Contractor on O&M.
3. The Design Contractor shall coordinate with the Right of Way Department during the preparation of the Project planning documents to determine how the new facilities will be inspected and maintained. Where practicable, new pipeline and related facilities will be combined with existing inspection efforts to minimize costs. Labor and material resources needed to inspect new facilities shall be documented in the O&M Impact Report.
4. The Design Contractor shall use the requirements outlined in the Water Authority Operation and Maintenance Process Manual while preparing the O&M Impact Report. These requirements include but are not limited to:
 - 4.1. Labor input is based on quantity and maintenance frequency of the system components.
 - 4.2. Materials input is based on frequency of maintenance and material and equipment purchase.

Attachment 16-1 – Cover Page of the Water Authority Drafting Manual



SDCWA
San Diego County Water Authority
Engineering Department



Drafting Manual

ESD-120

March 2004

Attachment 16-2 - Lifecycle Cost Analysis Example

Output Sheet

	Soft Cost	Civil	Mech	Elec/ICA
Project Capital Cost	\$25,813,501	\$37,216,799	\$19,172,052	\$9,928,539
			Total	\$92,130,891
Annual Operating Cost				\$4,436,078
Annual Operating Cost (Existing Asset)				\$642,000
Single Point Cost for Repair of Existing Asset				\$21,350,000
Net Present Value (New and Existing Assets)				\$130,687,763
Net Present Value (New Assets)				\$105,604,471

Assumptions added in NPV Calculation:

Attachment 16-2: Life Cycle Cost Analysis Example (continued)

Input Sheet

Enter Data in the Yellow Boxes

Soft Cost Table

Soft Cost	Start Date	End Date	Total Budget	Number of Months	Budget Per Month	Year 2006	Year 2007	Year 2008	Year 2009	Year 2010	Year 2011	Year 2012	Year 2013	Year 2014	Year 2015	Year 2016	Year 2017	Year 2018	Year 2019	Year 2020	Total
Planning	1/2/2006	12/22/2007	\$2,100,000	24	\$87,500	\$0	\$0	\$0	\$0	\$1,050,000	\$1,050,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$2,100,000
Env	1/2/2008	12/1/2009	\$2,000,000	23	\$86,957	\$0	\$0	\$0	\$0	\$0	\$0	\$1,043,478	\$956,522	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$2,000,000
Design	12/2/2009	5/18/2011	\$8,717,175	18	\$484,288	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$484,288	\$5,811,450	\$2,421,438	\$0	\$0	\$0	\$0	\$0	\$8,717,175
Procurement	5/21/2011	2/7/2012	\$758,015	8	\$94,752	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$663,263	\$94,752	\$0	\$0	\$0	\$0	\$758,015
Construction Management	2/8/2012	12/29/2014	\$4,263,836	35	\$121,824	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1,340,063	\$1,461,887	\$1,461,887	\$0	\$0	\$4,263,836
Project Management	1/2/2006	12/29/2014	\$4,974,475	108	\$46,060	\$0	\$0	\$0	\$0	\$552,719	\$552,719	\$552,719	\$552,719	\$552,719	\$552,719	\$552,719	\$552,719	\$552,719	\$0	\$0	\$4,974,475
Land Cost			\$3,000,000			\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$3,000,000	\$0	\$0	\$0	\$0	\$0	\$3,000,000
TOTAL						\$0	\$0	\$0	\$0	\$1,602,719	\$1,602,719	\$1,596,198	\$1,993,529	\$6,364,169	\$6,637,420	\$1,987,534	\$2,014,606	\$2,014,606	\$0	\$0	\$25,813,501

Construction Cost Table

Discipline	Start Date	End Date	Total Budget	Number of Months	Budget Per Month	Year 2006	Year 2007	Year 2008	Year 2009	Year 2010	Year 2011	Year 2012	Year 2013	Year 2014	Year 2015	Year 2016	Year 2017	Year 2018	Year 2019	Year 2020	Total
Civil	2/8/2012	12/29/2014	\$37,216,799	35	\$1,063,337	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$11,696,708	\$12,760,045	\$12,760,045	\$0	\$0	\$37,216,799
Mech	1/8/2013	12/29/2014	\$19,172,052	24	\$798,836	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$9,586,026	\$9,586,026	\$0	\$0	\$19,172,052
Elec/ICA	1/8/2013	12/29/2014	\$9,928,539	24	\$413,689	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$4,964,269	\$4,964,269	\$0	\$0	\$9,928,539
TOTAL						\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$11,696,708	\$27,310,341	\$27,310,341	\$0	\$0	\$66,317,390

				Base Cost	Inclusive Cost
Construction Cost		\$62,646,255	Civil	\$35,156,587	\$37,216,799
Risk		\$3,342,904	Mechanical	\$18,110,744	\$19,172,052
Insurance		\$328,231	Electrical	\$9,378,924	\$9,928,539
Other		\$0			
Total Construction Cost		\$66,317,390		\$62,646,255	\$66,317,390

Attachment 16-2: Life Cycle Cost Analysis Example (continued)

Input Sheet

Operational Expenses Start Month	1		Proect Costs (\$0,000)				
			Year	Soft Cost	Civil	Mech	Elec/ICA
Project Start Year	2006	Year 2006	1	\$0	\$0	\$0	\$0
		2007	2	\$0	\$0	\$0	\$0
NPV Discount Rate	8.2%	2008	3	\$0	\$0	\$0	\$0
		2009	4	\$0	\$0	\$0	\$0
Construction Escalation	3%	2010	5	\$1,602,719	\$0	\$0	\$0
		2011	6	\$1,602,719	\$0	\$0	\$0
Soft Cost Escalation	3.5%	2012	7	\$1,596,198	\$0	\$0	\$0
		2013	8	\$1,993,529	\$0	\$0	\$0
		2014	9	\$6,364,169	\$0	\$0	\$0
		2015	10	\$6,637,420	\$0	\$0	\$0
		2016	11	\$1,987,534	\$11,696,708	\$0	\$0
		2017	12	\$2,014,606	\$12,760,045	\$9,586,026	\$4,964,269
		2018	13	\$2,014,606	\$12,760,045	\$9,586,026	\$4,964,269
		2019	14	\$0	\$0	\$0	\$0
		2020	15	\$0	\$0	\$0	\$0

	Totals
Soft Cost	\$25,813,501.00
Civil	\$37,216,799.17
Mechanica l	\$19,172,052.23
Electrical	\$9,928,538.60
	\$92,130,891.00

Opex Start Year	10

Attachment 16-2: Life Cycle Cost Analysis Example (continued)

Summary Sheet

<u>Cost Category</u>	<u>Cost</u>
<u>Manpower</u>	
Wages	\$1,106,560
Salaries	\$475,072
Others	\$0
Sub Total	\$1,581,632
<u>Utilities</u>	
Electricity	\$1,217,937
Water	\$0
Gas	\$0
Fuel Oil	\$0
Standing Charge	\$1,200,000
Sub Total	\$2,417,937
<u>Chemicals</u>	
Treatment	\$0
Disinfection	\$0
Fluoridation	\$0
Other	\$0
Sub Total	\$0
<u>Process Contracting</u>	
Operational Maintenance	\$436,509
Grounds & Buildings Upkeep	\$0
Sampling & Analysis	\$0
Sludge Disposal	\$0
Vehicles	\$0
Materials	\$0
Other	\$0
Sub Total	\$436,509
<u>Operating Company Costs</u>	
Insurance	\$0
Audit, Banking & Comms	\$0
Management Services	\$0
Office Equipment	\$0
Other	\$0
Sub Total	\$0
<u>Taxes and Fares</u>	
Water Rates	\$0
Local Taxes	\$0
Other Taxes	\$0
Sub Total	\$0
Working Total	\$4,436,078
<u>Other</u>	
Cost of Working Capital	\$0
Management Fee	\$0

	Sub Total	\$0
<u>Single Point Cost O&M Existing Assets</u>		
Pump Station 3&4		\$1,500,000
Pump Station 1&2		\$19,850,000
	Sub Total	\$21,350,000
<u>Annual Cost O&M Existing Assets</u>		
Sludge Disposal		\$0
Repairs		\$642,000
Business Rates		\$0
Other		\$0
	Sub Total	\$642,000
	Grand Total	\$5,078,078
N.P.V. based on 50 Year Operation period discounted @	8.2%	\$130,687,763

Attachment 16-2: Life Cycle Cost Analysis Example *(continued)*

Manpower Sheet

Description	Administration Staff	Technician	Craft Labor (Pipe Fitters)	Supervision	Management
Labor					
Shift Description					
Number of Operatives	-	2.00	4.00	2.00	0.20
Rate	\$70.00	\$82.00	\$92.00	\$102.00	\$122.00
Working Hours Per Annum	-	4,160.00	8,320.00	4,160.00	416.00
SubTotal	\$0.00	\$341,120.00	\$765,440.00	\$424,320.00	\$50,752.00

Labor SubTotal	\$0.00	\$341,120.00	\$765,440.00	\$424,320.00	\$50,752.00

Total Rate Per Annum	\$0.00	\$341,120.00	\$765,440.00	\$424,320.00	\$50,752.00

Others		\$0.00

Attachment 16-2: Life Cycle Cost Analysis Example (continued)

Power Consumption Sheet

Description	Total No of Units number	Horsepower HP	Energy Efficiency %	Rated Power (kW)	Average Power (kW)	Duty excl standby	Total Duty Power (kW)	Duty days /year	Duty mins / hour	Daily Duty (hours/day)	Max Demand kWhr/hr	Power / day kWhr	Price of Elec. \$/Kwh	Daily Power Cost / Unit \$/day	Annual Cost \$
Case 1															
Booster Pump Station 1	6	3000	93	2405	1924	4	7,698	10	40	24	5,132	123,161	0.093	11,453.95	114,539.52
Booster Pump Station 2	3	1250	93	1002	802	2	1,604	10	40	24	1,069	25,658	0.093	2,386.24	23,862.40
Case2															
Booster Pump Station 1	6	3000	93	2405	1924	4	7,698	2	60	24	7,698	184,741	0.093	17,180.93	34,361.86
Booster Pump Station 2	3	1250	93	1002	802	2	1,604	2	60	24	1,604	38,488	0.093	3,579.36	7,158.72
Case 3															
Booster Pump Station 1	6	3000	93	2405	1924	4	7,698	75	40	24	5,132	123,161	0.093	11,453.95	859,046.40
Booster Pump Station 2	3	1250	93	1002	802	2	1,604	75	40	24	1,069	25,658	0.093	2,386.24	178,968.00
Totals				10,223.31			27,903.61				21,702.81				1,217,936.90

374,145.10

Standing Charge

1,200,000

The standing charge is for supplying peak demand and is included at \$50k per month per pump station

Attachment 16-2: Life Cycle Cost Analysis Example *(continued)*

Utilities Sheet

Category	Qty	Unit	Unit Cost	Total/annum	Comment
Electricity		kwh/annum	\$/kWh	\$1,217,937	
Water	0	m3/annum	0.61 m3	\$0	
Gas	0	kWh/annum	0.0082 kWh	\$0	
Fuel Oil	0	gallons/annum	0.55 gallons	\$0	
Standing Charge				\$1,200,000	

Chemicals Sheet

Totals					

Attachment 16-2: Life Cycle Cost Analysis Example *(continued)*

Process Contracting Sheet

Category	Qty	Unit Cost	Total/annum	Comment
Operational Maintenance	1.5 %	\$29,100,591	\$436,509	Total Mechanical and Electrical Direct Cost
Grounds & Buildings Upkeep	Sum		\$0	
Sampling & Analysis	no.		\$0	
Sludge Disposal	18068 Ton	\$0	\$0	
Sludge Bags	no.		\$0	
Vehicles and Plant	1 Sum		\$0	
Materials	1 Sum		\$0	
Other			\$0	

Attachment 16-2: Life Cycle Cost Analysis Example *(continued)*

Operating Office Costs Sheet

Category	Qty	Unit Cost	Total/annum	Comment
Insurance	0.1%		\$0	Total Directs Cost
Audit, Banking & Comms	1 Sum		\$0	
Management Services	1 Sum		\$0	
Office Equipment	1 Sum		\$0	
Other	1 Sum		\$0	

Attachment 16-2: Life Cycle Cost Analysis Example *(continued)*

Taxes and Fares Sheet

Category	Qty	Unit Cost	Total/annum	Comment
Water Rates	1 Sum		\$0	
Local Taxes	1 Sum		\$0	
Other Taxes	1 Sum		\$0	

Attachment 16-2: Life Cycle Cost Analysis Example *(continued)*

O&M Existing Asset Sheet

Category	Qty	Unit Cost	Total/annum	Comment
BDPL 3&4	1 Sum		\$1,500,000	
BDPL1&2	1 Sum		\$19,850,000	
Repairs	1 Sum		\$642,000	
Business Rates	1 Sum		\$0	
Other	1 Sum		\$0	

Attachment 16-2: Life Cycle Cost Analysis Example (continued)

Net Present Value Sheet

Year No.	Year	Project Costs (Data from page 3)				Operation Costs (Data from page 4)						Sub-Total	Cost of Working Capital	Single Point Cost	Replacement and Refurbishment	Total
		Soft Cost	Civil	Mech	Elec/ICA	Manpower	Utilities	Chemical	Process Contracting	Operating Company Costs	Taxes and Fares					
1	2006														\$642,000	\$642,000
2	2007														\$661,260	\$661,260
3	2008														\$681,098	\$681,098
4	2009														\$701,531	\$701,531
5	2010	\$1,839,157										\$1,839,157		\$6,007,403	\$722,577	\$8,569,137
6	2011	\$1,903,528										\$1,903,528		\$6,187,625	\$744,254	\$8,835,407
7	2012	\$1,962,135										\$1,962,135		\$6,373,254	\$766,582	\$9,101,970
8	2013	\$2,536,325										\$2,536,325		\$6,564,452	\$789,579	\$9,890,356
9	2014	\$8,380,396										\$8,380,396			\$813,266	\$9,193,662
10	2015	\$9,046,122				\$1,629,081	\$2,490,475		\$449,604			\$13,615,282			\$661,260	\$14,276,542
11	2016	\$2,803,613	\$15,719,398			\$1,677,953	\$2,565,189		\$463,092			\$23,229,246			\$681,098	\$23,910,344
12	2017	\$2,941,264	\$17,662,887	\$13,269,302	\$6,871,710	\$1,728,292	\$2,642,145		\$476,985			\$45,592,585			\$701,531	\$46,294,115
13	2018	\$3,044,208	\$18,192,774	\$13,667,381	\$7,077,861	\$1,780,141	\$2,721,409		\$491,295			\$46,975,068			\$722,577	\$47,697,645
14	2019					\$1,833,545	\$2,803,052		\$506,033			\$5,142,630			\$744,254	\$5,886,884
15	2020					\$1,888,551	\$2,887,143		\$521,214			\$5,296,909			\$766,582	\$6,063,490
16	2021					\$1,945,208	\$2,973,757		\$536,851			\$5,455,816			\$789,579	\$6,245,395
17	2022					\$2,003,564	\$3,062,970		\$552,956			\$5,619,491			\$813,266	\$6,432,757
18	2023					\$2,063,671	\$3,154,859		\$569,545			\$5,788,075			\$837,664	\$6,625,740
19	2024					\$2,125,581	\$3,249,505		\$586,631			\$5,961,718			\$862,794	\$6,824,512
20	2025					\$2,189,349	\$3,346,990		\$604,230			\$6,140,569			\$888,678	\$7,029,247
21	2026					\$2,255,029	\$3,447,400		\$622,357			\$6,324,786			\$915,338	\$7,240,125
22	2027					\$2,322,680	\$3,550,822		\$641,028			\$6,514,530			\$942,799	\$7,457,328
23	2028					\$2,392,360	\$3,657,347		\$660,259			\$6,709,966			\$971,083	\$7,681,048
24	2029					\$2,464,131	\$3,767,067		\$680,067			\$6,911,265			\$1,000,215	\$7,911,480
25	2030	\$8,791,871				\$2,538,055	\$3,880,079		\$700,469			\$15,910,473			\$1,030,222	\$16,940,695
26	2031	\$9,055,627				\$2,614,197	\$3,996,481		\$721,483			\$16,387,787			\$1,061,128	\$17,448,916
27	2032			\$20,673,140	\$10,705,900	\$2,692,623	\$4,116,376		\$743,127			\$38,931,165			\$1,092,962	\$40,024,127
28	2033			\$21,293,334	\$11,027,077	\$2,773,401	\$4,239,867		\$765,421			\$40,099,100			\$1,125,751	\$41,224,851
29	2034					\$2,856,603	\$4,367,063		\$788,384			\$8,012,050			\$1,159,523	\$9,171,573
30	2035					\$2,942,301	\$4,498,075		\$812,035			\$8,252,411			\$1,194,309	\$9,446,720
31	2036					\$3,030,570	\$4,633,017		\$836,396			\$8,499,984			\$1,230,138	\$9,730,122
32	2037					\$3,121,488	\$4,772,008		\$861,488			\$8,754,983			\$1,267,043	\$10,022,026
33	2038					\$3,215,132	\$4,915,168		\$887,333			\$9,017,633			\$1,305,054	\$10,322,687
34	2039					\$3,311,586	\$5,062,623		\$913,953			\$9,288,162			\$1,344,205	\$10,632,367
35	2040					\$3,410,934	\$5,214,502		\$941,371			\$9,566,807			\$1,384,532	\$10,951,338
36	2041					\$3,513,262	\$5,370,937		\$969,612			\$9,853,811			\$1,426,068	\$11,279,878
37	2042					\$3,618,660	\$5,532,065		\$998,701			\$10,149,425			\$1,468,850	\$11,618,275
38	2043					\$3,727,219	\$5,698,027		\$1,028,662			\$10,453,908			\$1,512,915	\$11,966,823
39	2044					\$3,839,036	\$5,868,967		\$1,059,522			\$10,767,525			\$1,558,303	\$12,325,828
40	2045	\$13,697,448				\$3,954,207	\$6,045,037		\$1,091,307			\$24,787,999			\$1,605,052	\$26,393,050
41	2046	\$14,108,372				\$4,072,833	\$6,226,388		\$1,124,046			\$25,531,639			\$1,653,203	\$27,184,842
42	2047			\$32,208,079	\$16,679,443	\$4,195,018	\$6,413,179		\$1,157,768			\$60,653,487			\$1,702,799	\$62,356,287
43	2048			\$33,174,321	\$17,179,826	\$4,320,869	\$6,605,575		\$1,192,501			\$62,473,092			\$1,753,883	\$64,226,975
44	2049					\$4,450,495	\$6,803,742		\$1,228,276			\$12,482,513			\$1,806,500	\$14,289,012
45	2050					\$4,584,010	\$7,007,854		\$1,265,124			\$12,856,988			\$1,860,695	\$14,717,683
46	2051					\$4,721,530	\$7,218,090		\$1,303,078			\$13,242,698			\$1,916,516	\$15,159,213
47	2052					\$4,863,176	\$7,434,632		\$1,342,170			\$13,639,979			\$1,974,011	\$15,613,990
48	2053	\$13,948,558				\$5,009,071	\$7,657,671		\$1,382,435			\$27,997,736			\$2,033,231	\$30,030,967
49	2054					\$5,159,343	\$7,887,402		\$1,423,908			\$14,470,653			\$2,094,228	\$16,564,882
50	2055		\$49,783,757			\$5,314,124	\$8,124,024		\$1,466,626			\$64,688,530			\$2,157,055	\$66,845,585
Totals		\$94,058,623	\$101,358,816	\$134,285,558	\$69,541,817	\$128,148,880	\$195,908,976		\$35,367,343			\$758,670,013		\$25,132,735	\$58,539,038	\$842,341,786

\$105,604,471

NPV
Discounted @

8.2%

\$130,687,763

Chapter 17 Owner-Procured Equipment

Overview

Purpose This chapter presents the Design Contractor requirement to coordinate design documents in consideration of owner-procured equipment.

Topics This chapter is composed of the following topics:

CHAPTER 17 OWNER-PROCURED EQUIPMENT 17

17.1 INTRODUCTION 17-1

17.1.1 PROCEDURES 17-1

17.2 ISSUES REGARDING OWNER-PROCUREMENT 17-2

17.2.1 BENEFITS 17-2

17.2.2 DISADVANTAGES 17-2

17.3 RESPONSIBILITIES OF THE DESIGN CONTRACTOR ON PROJECTS INVOLVING OWNER-PROCUREMENT OF EQUIPMENT OR MATERIALS 17-4

17.3.1 OWNER-PROCUREMENT DEFINED IN SCOPE 17-4

17.3.2 OWNER-PROCUREMENT NOT DEFINED IN SCOPE 17-4

17.3.3 OWNER-PROCUREMENT DOCUMENT PREPARATION 17-4

17.3.4 PROCUREMENT PROCEDURES MANUAL 17-5

ATTACHMENT 17-1: COVER PAGE OF THE WATER AUTHORITY PROCUREMENT PROCEDURES MANUAL 17-6

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17.1 Introduction

17.1.1 Procedures

1. Direct purchase of equipment and materials (owner-procurement) is not a program-wide practice for the Water Authority. Individual projects may arise, however, which benefit from owner-procurement. This chapter defines the procedures to be followed by the Design Contractor in instances where owner-procurement of equipment and materials is required or approved by the Water Authority.
-

17.2 Issues Regarding Owner-Procurement

17.2.1 Benefits

1. The benefits of owner-procurement include:
 - 1.1. Meeting Schedule Requirements. On some projects, it may only be possible to meet a schedule by pre-purchasing equipment and/or materials. These projects may require equipment or materials with long lead times for manufacturing and delivery, materials in short supply, or materials that are otherwise difficult to procure.
 - 1.2. Standardization. Pre-purchase contracts may be implemented to ensure that standardized equipment is provided in Water Authority facilities, thereby reducing operator training requirements, operating costs, and inventories of spare parts.
 - 1.3. Cost Savings. Cost savings may be realized through large volume purchases of equipment and materials directly through the Water Authority Purchasing Group of the Administrative Services Department, a procedure that eliminates handling charges otherwise assessed by Construction Contractors.
-

17.2.2 Disadvantages

1. The benefits of owner-procurement may be offset by complications or additional costs arising through:
 - 1.1. Delayed Delivery. The Construction Contractor may be delayed by the late delivery of equipment or materials under the procurement contract.
 - 1.2. Storage of Equipment and Materials. Significant costs may be associated with the storage of equipment and materials, including the costs of insurance during storage, maintenance during storage, and transportation from the storage site to the jobsite. Long storage durations may also impact warranty periods.
 - 1.3. Equipment Obsolescence. Early purchase of equipment introduces the possibility that the equipment can be overtaken by new technology and become obsolete even before it is installed. The chance of early obsolescence is especially high with electronic or controls equipment.
 - 1.4. Poorly-Defined Responsibilities. The Water Authority is responsible for defining responsibilities of equipment or materials suppliers (Supplier) and the Construction Contractor and in resolving any issues that may arise. These responsibilities must be explicitly defined with respect to installation procedures, observation of the installation, testing

of the installation, identification of installation deficiencies, certification of the installation, furnishing startup advice, recommendations regarding operations and maintenance procedures, and training of Water Authority staff.

- 1.5. Inadequate Construction Coordination. The Water Authority is responsible for coordination rather than the Construction Contractor and significant additional effort may be required of the Water Authority's staff to complete the project. Interfaces that require coordination between the Supplier and Construction Contractor must be defined, including piping, wiring, equipment anchorage, floor openings, instrumentation, and plumbing.
 - 1.6. Warranty Issues. The Supplier must provide a warranty with the warranty period defined. If the equipment does not perform as intended, the warranty may be compromised through improper installation by the Construction Contractor. Splitting responsibility between the Supplier and the Construction Contractor may also lead to ambiguities in or invalidation of a warranty. The Water Authority is responsible for securing and administering warranties and in resolving any issues that may arise in resolving administration issues.
-

17.3 Responsibilities of the Design Contractor on Projects Involving Owner-Procurement of Equipment or Materials

17.3.1 Owner- Procurement Defined in Scope

1. On some Water Authority projects, the Design Contractor's responsibilities regarding owner-procurement will be defined in the Design Contractor's scope of work.
-

17.3.2 Owner- Procurement Not Defined in Scope

1. When owner-procurement is not defined in the scope of work, the Design Contractor shall review the Water Authority project requirements to determine if owner-procurement of equipment or materials is desirable. If the Design Contractor believes significant benefits would be achieved through owner-procurement, the Design Contractor shall define the owner-procurement need in the Basis of Design Report or in a separate technical memorandum for review and evaluation by the Design Manager.
-

17.3.3 Owner- Procurement Document Preparation

1. If owner-procurement of equipment or materials is required and/or approved by the Design Manager, the Design Contractor shall provide any or all of the items listed below as directed by the Design Manager.
 - 1.1. *Preparation of the Technical Specification and Drawings.* The Design Contractor shall prepare a Technical Specification for the procurement of equipment or materials from the Supplier, and a separate Technical Specification for installation of that equipment or material by the Construction Contractor. The Technical Specification sections shall define the technical interfaces between the Construction Contractor and the Supplier, the respective technical responsibilities of the Construction Contractor and the Supplier, and performance parameters for the equipment. When needed, the Design Contractor shall also produce drawings to fully define the above stated requirements. The Technical Specification sections and drawings shall be fully compatible with the front end documents of the project Contract Documents, and the Design Contractor, as the Engineer of Record, shall assume full responsibility for the Technical Specification and drawings. The Technical Specification and drawings shall be prepared according to requirements stated in Chapter 14 and in other chapters of the Design Contractor Guide to satisfy project requirements.

- 1.2. *Coordination with the Design Manager.* The Design Contractor shall coordinate with the Design Manager in preparing Divisions 0 and 1 of the Bid Documents in CSI format on all procurement contracts. The front end of the Bid Document for the procurement of equipment or materials shall be adapted from the Water Authority General Conditions and Standard Specifications (Whitebook).
 - 1.3. *Storage.* If storage is required, the Design Contractor shall prepare a technical specification necessary for proper storage of the procured equipment or materials. Special storage requirements, such as a controlled environment, shall be included in the storage document.
 - 1.4. *Preparation of a Justification for Sole Source Procurement.* On some projects, it may be necessary to acquire equipment from a single manufacturer. This equipment may be needed to ensure compatibility with existing systems or for other equally important reasons. In such cases, the Design Contractor shall prepare a memorandum justifying sole source procurement.
 - 1.5. *Assistance in Bid Evaluation.* The Design Contractor shall assist in evaluating bids received from equipment or material suppliers. The Design Contractor shall prepare a bid evaluation report that highlights differences between Suppliers on critical items outlined in the technical specification, such as delivery time, storage requirements, warranty, support during and after installation, etc. The report shall also highlight exceptions, if any, taken by the Suppliers on any item outlined in the technical specification.
 - 1.6. *Assistance in Reviewing Supplier Submittals and Reports.* The Design Contractor shall assist in reviewing equipment submittals, responding to supplier questions, witnessing factory and field tests of equipment, reviewing test reports, and reviewing commissioning plans.
-

**17.3.4
Procurement
Procedures
Manual**

1. The Design Contractor shall conform to applicable policies and procedures stated in the Water Authority Procurement Procedures Manual. Refer to Attachment 17-1 for the cover page of the Procurement Procedures Manual. In the event of conflict, requirements of the Design Contractor's scope of work, the project planning study, and the Design Manual shall prevail.
-

Attachment 17-1: Cover Page of the Water Authority Procurement Procedures Manual



San Diego County Water Authority

Procurement Procedures Manual

***“The Keys to
Procurement”***

Revised January 2006

January 2006

San Diego County Water Authority

Chapter 18 Bid and Award Phase

Overview

Purpose This chapter outlines the Design Contractor Responsibilities during the Bid and Award Phase of projects.

Topics This chapter is composed of the following topics:

CHAPTER 18 BID AND AWARD PHASE.....	18
18.1 INTRODUCTION	18-1
18.2 BIDDING DOCUMENTS.....	18-2
18.3 BIDDING AND CONTRACTING PROCEDURES.....	18-3
18.4 ADVERTISING AND ADDENDA	18-4
18.4.1 PRE-BID CONFERENCE(S) AND SITE TOUR	18-4
18.4.2 BID PHASE QUESTIONS	18-4
18.4.3 ADDENDA.....	18-5
18.5 BID EVALUATION AND AWARD OF CONTRACT	18-7
18.6 CONFORMED SET OF CONTRACT DOCUMENTS	18-8
ATTACHMENT 18-1: BID AND AWARD PHASE ACTIVITIES IN CALENDAR DAYS.....	18-9
ATTACHMENT 18-2: COVER PAGE OF THE CONSTRUCTION MANAGEMENT MANUAL.....	18-10
ATTACHMENT 18-3: RESPONSIBILITY ASSIGNMENT MATRIX DURING BID & AWARD PHASE	18-11

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18.1 Introduction

1. The Bid and Award Phase of a construction project begins when:
 - 1.1. The Administration and Controls Group of the Water Authority Engineering Department issues the official advertisement notice of the project for competitive bids from Construction Contractors.
 2. The Bid and Award Phase ends when the notice to proceed (NTP) is issued to the selected Construction Contractor.
 3. The Design Contractor's role during the Bid and Award Phase process shall include the following tasks:
 - 3.1. Assisting the Design Manager, as required, in preparing the bid documents for submittal to the Administration and Controls Group.
 - 3.2. Participating in the project pre-bid conference(s) and site tour.
 - 3.3. Assisting the Design Manager, as required, in providing responses to technical inquiries submitted from plan holders (potential bidders).
 - 3.4. Assisting the Design Manager, as required, in preparing technical revisions for addenda.
 - 3.5. Assisting the Design Manager, as required, in conducting bid review and preparing bid-evaluation report.
 - 3.6. Preparing conformed bid documents.
-

18.2 Bidding Documents

1. At the time of bidding, the Bidding Documents (Contract Documents) will include the following:
 - 1.1. Notice Inviting Bids including: Date of opening bids, Description of Work, etc.
 - 1.2. Instructions to Bidders including: Requirements and Conditions, SCOOP, etc.
 - 1.3. Bid Forms including Bid Proposal, Non-collusion Affidavit, Bidder's Bond, Bidder's Plan for Construction, etc.
 - 1.4. Construction Contract (referred to as Public Works Contract).
 - 1.5. Bonds and Insurance requirements including: Performance Bond, Payment Bond, etc.
 - 1.6. Escrow Agreement.
 2. Collectively, the above documents are usually referred to as the Front/End documents. In addition, the Contract Documents will include:
 - 2.1. Water Authority General Conditions and Standard Specification (Whitebook).
 - 2.2. Supplemental Conditions (revisions to Water Authority General Conditions).
 - 2.3. Supplemental Specifications, including revisions and additions to the Water Authority Standard Specifications. Additional sections include Section 01010, Summary of Work; Section 01025, Measurement and Payment, and others that may be required.
 - 2.4. Water Authority Standard and Guide Drawings.
 - 2.5. Project Drawings (Plans).
-

18.3 Bidding and Contracting Procedures

1. The Design Contractor shall be familiar with the time required by the Water Authority to process construction contracts, including advertising, time for plan holder bid preparation, bid submittal and opening, bid evaluation, contract award and notice to proceed.
 2. The Design Contractor shall understand the construction contracting process to appreciate the administrative and regulatory clearances required, the timing and scheduling impacts of the process, and the importance of Bid Document completeness. Refer to Attachment 18-1 for an illustration of the contracting process and its timeline for construction contracts. The timeline shown in Attachment 18-1 is organized around the Water Authority's Board of Directors meeting date, which is usually scheduled on the fourth Thursday of each month. Board approval is required to fund and award projects. The Design Contractor may refer to the Water Authority Construction Management Manual (ESD-100) for more information on Contracting Procedure (see Attachment 18-2 for the cover page of ESD-100).
 3. The responsibilities of the Design Manager, the Administration and Controls Group, and the Design Contractor during the bid and award phase are shown in Attachment 18-3. These responsibilities are further expanded on in the sections below.
-

18.4 Advertising and Addenda

18.4.1 Pre-Bid Conference(s) and Site Tour

1. The Water Authority may decide to conduct one or two pre-bid conferences. In rare cases regarding complex projects, additional pre-bid conferences may be conducted. The first pre-bid conference will be conducted early in the bidding cycle, is introductory in nature, and may include a project site tour. The second pre-bid conference is technical in nature, may include discussion of bidder questions, and is usually held two weeks prior to the bid opening date. ,
2. The Notice Inviting Bids will cite the date(s) of the project pre-bid conference(s) and site tour. Some projects may require two pre-bid conferences (refer to Attachment 18-1 for potential dates). The Design Contractor shall attend all pre-bid conferences and the site tour.
3. The Design Contractor shall provide a project presentation during the first pre-bid conference. The presentation shall provide an overview of the project, its components, milestones, shutdowns, procured equipment, special requirements, and any other project restrictions.
4. Questions from plan holders during the pre-bid conference(s) and site tour regarding bid documents will be handled by the Design Manager. In general, questions are required to be submitted by plan holders in writing. However, the Design Manager may elect to answer some questions or refer them to the Design Contractor for answering. The Design Contractor shall not directly answer questions from plan holders.
5. The Administration and Controls Group will receive and record questions from plan holders. The Design Contractor shall prepare written responses to plan holders' technical questions. In case the Design Contractor's responses require modifications to contract documents, the Design Contractor shall prepare a contract addendum.

18.4.2 Bid Phase Questions

1. The Design Contractor shall not respond orally to questions from the plan holders during the bid phase. The Design Contractor shall respond to questions in writing (either by memorandum or draft addendum), and shall submit those responses to the Design Manager. The Design Manager will review the responses and, following finalization, will forward the responses to the

Administration and Controls Group for processing and distribution to plan holders.

**18.4.3
Addenda**

1. An addendum is the only method that will be used to notify plan holders of changes in the Bid Documents between advertisement and bid opening. Addenda may change bidding requirements, correct errors or omissions, change specifications or drawings for clarity or for technical reasons, change the contract time, or add to or reduce the scope of work.
2. During the bid process, the Design Manager will inform the Design Contractor if a technical addendum is necessary. Upon receiving the request from the Design Manager, the Design Contractor shall expeditiously prepare all required addenda. The Design Contractor shall take extra precautions to ensure that portion(s) of the work covered by the addenda are clear. The Design Contractor shall include the following specific information in a typical draft addendum: the number of pages and design sheet(s) in the addendum; new drawing(s) with number and reference to the current drawing number(s); instructions to bidders on how to insert or delete text; and identification of the pertinent specification, section, paragraph and line to be modified.
3. The Design Contractor shall follow a consistent methodology in documenting any modifications to design drawings and specifications. As a minimum, the following shall be adhered to:
 - 3.1. Contract Documents being changed are listed in the order of appearance in the documents, except for previous addenda, which are listed first.
 - 3.2. Each change is referenced and clearly explained. For changes to text, the document, paragraph, paragraph title, and subparagraph are listed, as a minimum. For changes to drawings, alphanumeric information can be changed by addendum wording. Changes to graphical information are made by describing the change in addendum wording and reissuing the drawing with a new revision date.
 - 3.3. Addenda may not modify the Front/End documents. Only the Water Authority staff are allowed to modify the Front/End documents.
 - 3.4. All drawing modifications shall be clouded and addendum number indicated within the cloud.

- 3.5. Modified specifications shall follow the standards outlined in the Water Authority Specifications Style Guide (ESD-150).
 - 3.6. Modified drawings shall follow the standards outlined in the Water Authority Drafting Manual (ESD-120) including dating, signing, updating revision number, etc.
 4. The technical revisions prepared by the Design Contractor will be compiled by the Administration and Controls Group into bid documents addenda. The Design Contractor shall perform a final check on these addenda and shall stamp and wet sign the front cover in the area between the date and addendum number designation.
 5. Addenda where contents are entirely non-technical will be prepared by the Administration and Controls Group and no signature will be required from the Design Contractor in this case. It is to be noted that addenda with mixed technical and non-technical content shall be stamped and wet-signed by the Design Contractor.
 6. The Design Contractor shall not issue addenda directly to plan holders. The Administration and Controls Group of the Engineering Department will issue the addenda (see Attachment 18-3).
-

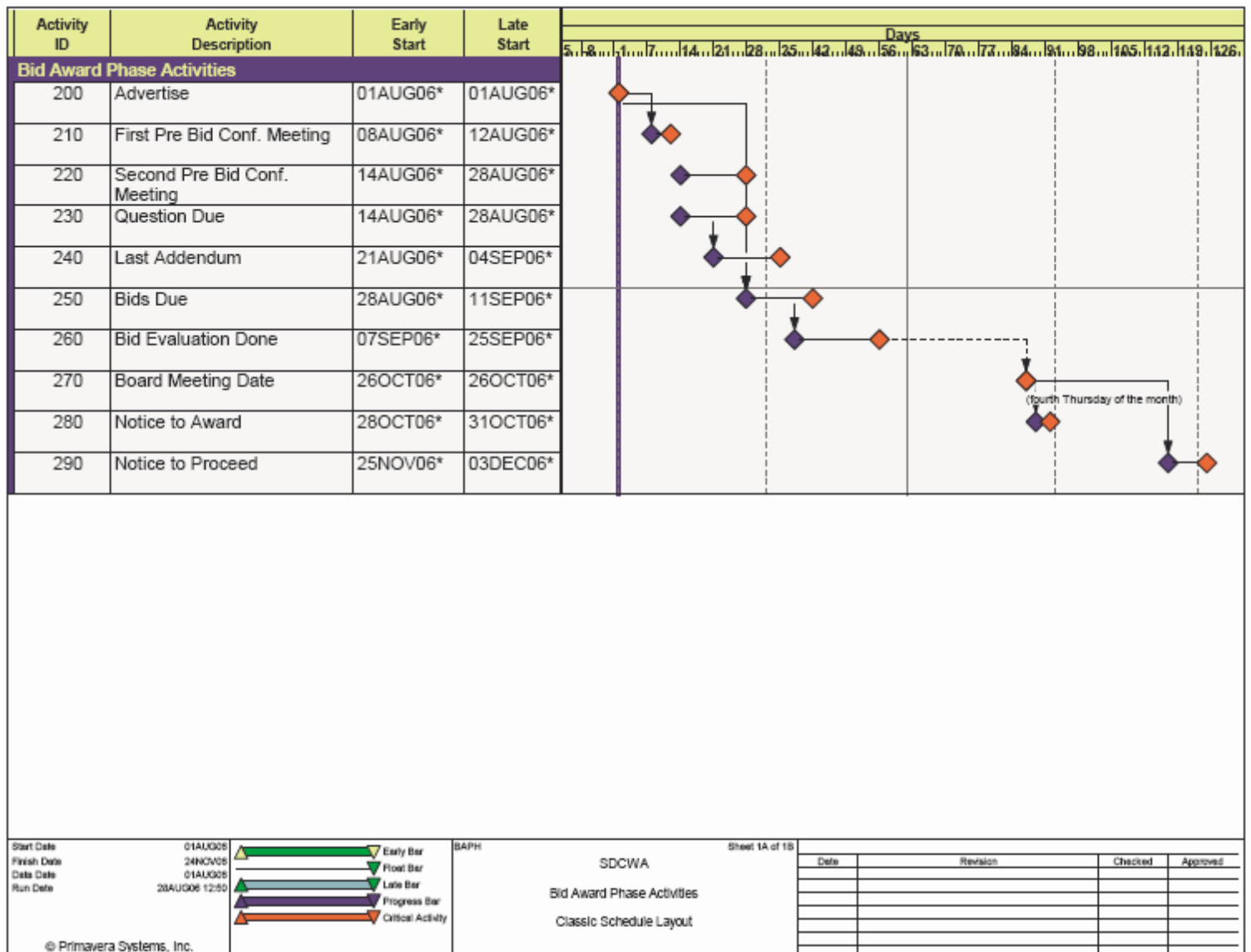
18.5 Bid Evaluation and Award of Contract

1. Upon receiving direction from the Design Manager, the Design Contractor shall prepare a bid evaluation report. The report shall highlight differences between the received bids on all items shown in the bid schedule, including the Design Contractor's opinion on each item price as to whether it is high, low, or moderate. The report shall also highlight exceptions taken by the bidders on any item outlined in the technical specification.
-

18.6 Conformed Set of Contract Documents

1. The Design Manager may require the Design Contractor to incorporate all addenda issued on the “as advertised” Contract Document set into a “conformed” Contract Document set. This approach may be necessary if the Design Manager determines that the contract addenda are excessively numerous or complicated. Refer to the Water Authority Construction Management Manual (ESD-100) for more information.
 2. Conformed drawings and/or specifications format shall follow the guidelines outlined in Chapter 14 of this Guide.
-

Attachment 18-1: Bid and Award Phase Activities in Calendar Days



Attachment 18-2: Cover Page of the Construction Management Manual



San Diego County Water Authority

Engineering Department



Construction Management Manual

ESD-100

October 2006

Attachment 18-3: Responsibility Assignment Matrix during Bid & Award Phase

Project Team Participant	Areas of Responsibility					
	Bid and Contract Package	Pre-Bid Conference(s)	Addenda	Bid Receipt/Opening	Bid Review	Award and Execution of Contract
Design Manager	Review Technical Package and Obtain Necessary Approvals.	Conduct Conference.	Review Design Contractor Responses to Technical Inquiries.	Conduct Bid Opening.	Review Design Contractor Bid Evaluation.	Prepare Board Memo and Supporting Documents for Award Action.
	Submit Technical Package to Administration and Controls.	Respond to selected questions.	Submit Responses to Technical Inquiries to Administration and Controls.		Assist in Resolution of Bid Protests.	
	Prepare Board Memo for Advertisement of Bids.					
Administration and Controls	Assemble Bid Package and Obtain Necessary Approvals.	Record and Prepare Minutes of Conference Meeting.	Receive Bidders Inquiries.	Receive Bids.	Prepare Bid Evaluation Tables and Validate Bids for Compliance.	Award Contract and Issue Notice To Proceed.
	Advertise and Issue Bid Documents.		Submit Technical Inquiries to Design Manager.		Notify Apparent Low Bidder.	
			Assemble and Issue Addenda.		Assist in Resolution of Bid Protests.	
Design Contractor	Provide Technical Package to Design Manager.	Provide an overall project presentation.	Prepare Responses to Technical Inquiries and Submit to Design Manager.	Attend.	Participate in Bid Evaluation.	Prepare Conformed Bid Documents.
		Respond to selected questions.	Prepare Technical Addenda and Submit to Design Manager.		Provide Recommendations for Contract Award.	
			Coordinate Addenda Finalization and Assembly with Admin. and Controls.			

Chapter 19 Construction Phase

Overview

Purpose	This chapter presents the Design Contractor Responsibilities during the Construction Phase of projects.

Topics	This chapter is composed of the following topics:

CHAPTER 19 CONSTRUCTION PHASE..... 19

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19.2	AS-GRADED GEOTECHNICAL INVESTIGATION	19-3
19.2.1	GENERAL.....	19-3
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19.1 Introduction

1. The construction phase of a project begins with issuance of Notice to Proceed (NTP) to the selected Construction Contractor and ends with issuance of the Notice of Completion. This chapter covers potential Design Contractor responsibilities during the construction phase.
2. The Design Contractor shall provide construction-phase assistance to the Construction Manager and the Design Manager. This assistance shall include the following tasks:
 - 2.1. Attending selected or regular construction progress meetings.
 - 2.2. Responding to Construction Contractor's requests for information (RFI).
 - 2.3. Assisting with change order preparation.
 - 2.4. Reviewing Construction Contractor's submittals for completeness and conformance to contract documents.
 - 2.5. Reviewing Construction Contractor substitution requests, including "or equal" items.
 - 2.6. Reviewing Construction Contractor value engineering (cost reduction) proposals.
 - 2.7. Providing engineering support for planning facility-shutdowns for tie-ins.
 - 2.8. Providing field evaluation of construction.
 - 2.9. Meeting with the Construction Contractor to resolve RFI, submittal, shop drawing, and substitution issues.
 - 2.10. Periodic inspections of work progress and Construction Contractor record drawings.
 - 2.11. Assisting with change orders and field orders.
 - 2.12. Assisting with non-compliance reports and resolution.
 - 2.13. Assisting with claims management.
 - 2.14. Attending and participating in partnering sessions with the Construction Contractor and the Construction Manager.
 - 2.15. Witnessing and reporting factory and field testing of components, equipment, and systems.
 - 2.16. Performing the necessary geotechnical investigations following major grading operations.
 - 2.17. Assisting with facility startup and commissioning, as detailed in

Chapter 20.

- 2.18. Preparing operation and maintenance (O&M) manuals, as detailed in Chapter 20.
 - 2.19. Preparing construction record drawings, as detailed in Chapter 20.
 - 2.20. Participating in final site inspections and providing input in preparing Construction Contractor's punchlists, as detailed in Chapter 20.
 - 2.21. Conducting the appropriate As-Graded investigations (see Section 19.2 for more information).
3. During the construction phase of a project, the Design Contractor shall report to the Design Manager on all construction-related activities. However, and as the need arises, the Design Contractor shall also closely coordinate with other construction team members including:
- 3.1. The Construction Administrator who will manage the Construction Manager contract and closely monitor and track the construction budget and schedule activities.
 - 3.2. The Construction Manager who will manage the Construction Contractor and construction activities.
 - 3.3. The Project Manager who is the overall manager of the project.
-

19.2 As-Graded Geotechnical Investigation

19.2.1 General

1. The Design Contractor shall conduct geotechnical monitoring for major-grading and/or deep-excavation operations. The geotechnical monitoring shall be performed by a qualified geotechnical engineer (GE), or a Registered Civil Engineer (RCE) and, if geologic conditions dictate, a Certified Engineering Geologist (CEG).
2. The geotechnical monitoring shall not include normal investigations and testing that are usually performed by the Construction Manager. These normal investigations include:
 - 2.1. Documenting any special problems encountered during the grading and/or excavation operations.
 - 2.2. Confirming whether the grading and/or excavation operations are conducted according to the approved grading plans.
 - 2.3. Confirming whether the grading and/or excavation operations are performed in compliance with the geotechnical requirements of the grading plans and specifications.
 - 2.4. Documenting fill placement including: Purpose for which fill was placed; Method of preparation of natural grade to receive fill; Placement of fill (depth of layers, watering, etc.); Equipment used for compaction; Method of compacting and testing the outer slope area.
3. The purpose of the geotechnical monitoring is for the Design Contractor to confirm whether or not the findings and technical recommendations documented in the project geotechnical report (refer to chapter 8 for more information) are impacted because of the grading and/or excavation operations, and if new findings and technical recommendations should replace the old ones. Based on the geotechnical monitoring, the Design Contractor shall recommend whether or not additional as-graded geotechnical investigation, to document the changed geotechnical conditions and final technical recommendations, is required.
4. In case of additional as-graded geotechnical investigation, the Design Contractor shall prepare an As-Graded geotechnical report to document the final design recommendations for the project based on actual finished grade conditions. Summary of in-place and laboratory compaction test results, along with any new recommendations, shall be included in the As-Graded geotechnical report. If site grading is done by area or structure, an As-Graded geotechnical report shall be provided for each area or structure as the grading is completed. The report shall contain the signature

and registration seal of a GE, RCE, or CEG.

5. The following sections describe in more detail the information to be included by the Design Contractor in the As-Graded geotechnical report. Items may be deleted from the report if no work of that type occurred in the actual grading operations.

**19.2.2
Compaction
Testing**

1. The following items shall be provided in As-Graded geotechnical report:
 - 1.1. Test procedures used (field and laboratory), including rock corrections, if applicable.
 - 1.2. Plot plan showing the location of all density tests; the plan shall be sized to be easily read.
 - 1.3. Summary of test results.
 - 1.3.1. Test identification number.
 - 1.3.2. Date test performed.
 - 1.3.3. Maximum dry density test.
 - 1.3.4. Optimum moisture.
 - 1.3.5. Field dry density.
 - 1.3.6. Field moisture.
 - 1.3.7. Relative compaction.
 - 1.3.8. Approximate elevation of test.
 - 1.3.9. Approximate finish grade elevation at test site.

**19.2.3
Utility Trench
Compaction
Testing**

1. The following items shall be provided in As-Graded geotechnical report:
 - 1.1. Location of test.
 - 1.2. Depth of test.
 - 1.3. Method of backfill and compaction equipment.
 - 1.4. Summary of test results described under Compaction Testing.

**19.2.4
Other Testing**

1. The following items shall be provided in As-Graded geotechnical report:
 - 1.1. Summary of expansion test results (identify areas with swelling potential). Expansivity tests, as described in the UBC Standard No. 18-2 and which are representative of at least the

top 3 feet of the finished soil profile. The results of these tests, in the form of a list of areas and representative expansivity indices for the soil of all areas, along with the results of the soil compaction tests, shall be included in the record soil report for the project.

- 1.2. Summary of chemical test results, as required.
- 1.3. Summary of corrosion testing results, as required.

**19.2.5
As-Graded
Conditions**

1. The following items shall be provided in the As-Graded geotechnical report:
 - 1.1. Plot plan showing limits of the compacted fill area (approximate pad elevation, depth of fill, areas of over-excavation, keys and subdrains). If slope failures occurred during construction, the limits of these failed areas shall be shown on the plan.
 - 1.2. Method of treatment of "daylight" or cut/fill transition zones (extent of over excavation outside of footing).
 - 1.3. Type of soil encountered and used during grading (fill, native, imported borrow).
 - 1.4. Groundwater conditions identified and details on subdrains or other methods used to mitigate adverse effects.
 - 1.5. Geologic conditions encountered, including geologic contacts, structural attitudes, marker beds, faults, and bedding plane shears. Geologic data shall be included in areas mapped as fill and in buttress excavations.
 - 1.6. Comments on changes made during grading and their effect on the recommendations in the geotechnical report.
 - 1.7. Exploratory borings and trenches performed during grading shall be shown on the as-graded maps, and logs of these excavations shall be included in the report.
 - 1.8. Locations of instrumentation at the site, including settlement monuments, extensometers, piezometers, etc., shall be plotted on the as-graded maps; results of instrument readings shall be included in the report.
 - 1.9. Elevations at the bottom of cleanouts, keyways, or other excavations; these areas shall be shown on the geologic map.

**19.2.6
Recommendations and
Opinions**

1. The following items shall be provided in the As-Graded geotechnical report if different from the original geotechnical report (refer to chapter 8 for more details):

- 1.1. Footing recommendations and bearing value of compacted fill or formational material.
 - 1.2. Footing and floor slab recommendations based on the results of expansion and soluble sulfate tests (construction details of footing if applicable). Foundation and floor slab design details appropriate for use on soils having an expansive index greater than 20, per UBC Standard No. 18-2. In lieu of the expansivity index of 20, expansive soils may also be identified by the use of a greater than 2% swell factor, which is determined by the test method prescribed in Chapter 6, Division 7, Title 8 of the San Diego County Code. If the expansion index is greater than 20, or the swell test is greater than 2%, special design considerations as required by UBC section 2904 (b) are submitted.
 - 1.3. Opinion of the suitability of natural soil to support the fill or structure.
 - 1.4. Opinion of the adequacy of the site for the intended use, as affected by soil engineering and/or geologic factors.
 - 1.5. Opinion of the gross and surficial stability of slopes; cross-sections prepared during grading for stability calculations shall be included, as well as a description of the calculation method, summary of calculation results, and conclusions.
 - 1.6. A statement about whether the soil engineering and geologic aspects of the grading comply with the applicable conditions of the geotechnical engineer's and engineering geologist's recommendations.
-

**19.2.7
Contract
Documents
Modifications**

1. Based on the As-Graded report findings and recommendations, the Design Contractor shall immediately check the new design parameters and their impact on the contract documents. The Design Contractor shall incorporate any required design modifications and issue to the Construction Manager new drawings, specifications, or other design-related contract document. Modifications and review process to drawings and specifications shall follow the same format and standards outlined in Chapter 14 of this Guide.
-

19.3 Construction Progress Meetings

1. Regular progress meetings are held throughout the construction phase of a project. Typically, these meetings are held weekly or biweekly at the project site to discuss construction needs, issues, requests for information (RFIs), submittal reviews, change orders and construction progress. The Design Contractor shall designate a representative to attend selected or all regular construction progress meeting(s), as outlined in their scope of services and approved by the Project Manager. Additional Design Contractor personnel shall attend any of the progress meetings, if so requested by the Project Manager.
 2. If necessary, special meetings are held in addition to, and separate from, the regular progress meetings to address specific issues. The Design Contractor shall attend any of the special meetings based on the Construction Administrator or Design Manager request.
-

19.4 Request for Information (RFI)

1. The Design Contractor shall assist the Construction Manager in responding to questions from the Construction Contractor about the Contract Documents. Questions from the Construction Contractor are transmitted through a formal RFI. The procedure for processing RFIs is in accordance with the Water Authority standards as stipulated in the Water Authority Construction Management Manual (ESD-100; section 7.3). See Attachment 19-1 for the cover page of ESD-100. The RFI procedure is outlined in Attachment 19-2. The Design Contractor shall pay additional attention to sections in ESD-100 explaining the RFI response procedure. RFI response time shall not exceed five calendar days.
 2. In case the response to the RFI requires a design modification or issuance of new construction documents, then the Design Contractor shall coordinate the RFI response with the Operations and Maintenance Department.
-

19.5 Change Orders Processing

1. The Design Contractor shall assist the Construction Manager in reviewing Preliminary Change Orders (PCOs) and making recommendations to either terminate PCOs, if invalid, or to elevate them to Contract Change Order (CCO) status. The Design Contractor shall assist the Construction Manager in evaluating the Construction Contractor's cost proposal for CCOs. The Design Contractor shall verify, by signing the CCO, that agreed changes will not adversely impact the design. The Design Contractor shall meet the stipulated durations for processing PCOs and CCOs.
 2. The Design Contractor shall prepare construction documents for owner-initiated change orders.
-

19.6 Construction Contractor Submittals

1. The Design Contractor shall assist the Construction Manager in comparing the Construction Contractor submittal schedule with the project master submittal list prepared during the Design Phase. Refer to the Construction Management Manual (ESD-100) for more information on the Construction Contractor submittal schedule.
 2. The Design Contractor shall review submittals from the Construction Contractor. The Construction Contractor will submit all submittals (e.g., shop drawings, samples, certificates or other items) directly to the Construction Manager. The Construction Manager will log and forward each submittal to the Design Contractor for review following established routing procedures. The submittal turnaround time is generally 2 to 4 weeks, depending on specific project contract requirements. The turnaround time and other submittal review parameters shall be defined in the Contract Documents. The Design Contractor shall return submittals to the Construction Manager indicating submittal status (i.e., approved, rejected, etc.) in accordance with Water Authority standards (see ESD-100).
-

19.7 Shutdowns and Facility Tie-Ins

1. Water facility shutdowns are the responsibility of the Water Authority Operation and Maintenance Department. During the Design Phase, the Design Contractor shall prepare the project preliminary shutdown and tie-in plan in full coordination with the Operation and Maintenance Department. These plans shall form part of the contract documents.
 2. During construction phase, the Design Contractor shall assist the Construction Manager in presenting the shutdown plan, with temporal and physical constraints, to the Construction Contractor. The Construction Contractor will then submit a detailed shutdown and tie-in methodology plan in conformance with the contract specifications. These plans shall be reviewed by the Design Contractor, Construction Manager, and Operations and Maintenance Department for accuracy, conformance to construction documents and feasibility.
 3. Each project will be assigned a representative from the Water Authority Operations and Maintenance Department. The Construction Manager will coordinate with the Operations and Maintenance representative on shutdowns for facility tie-ins and may ask support from the Design Contractor in presenting the Construction-Contractor shutdown plans to the Operations and Maintenance Department.
-

19.8 Substitution Requests and Value Engineering Proposals

1. The Design Contractor shall review substitution requests, including “or equal” items and cost reduction (“value engineering”) proposals from the Construction Contractor. Product substitution shall be in conformance with section 01630 in the Water Authority Standard Specification (Whitebook). For more information on product substitution, the Design Contractor shall refer to the Water Authority Construction Management Manual (ESD-100).
-

19.9 Field Evaluation of Construction

1. Inspection and testing are the overall responsibility of the Construction Manager and are performed to ensure that construction work and materials furnished conform to the project contract documents. The Design Contractor, if directed in their scope of services, shall be available to assist the Construction Manager at any time to perform field evaluation of the construction. This also includes availability to visit a mill, batch plant or manufacturing facility to verify compliance of the manufactured product or material or to witness an equipment factory test. For more information, the Design Contractor shall refer to the Water Authority Field Inspection Manual (ESD-130), the cover page of which is shown in Attachment 19-3.
-

19.10 Claims Management

1. If claims arise during construction, the Design Contractor shall assist, as requested, the Construction Manager in claims review and resolution. Refer to the Construction Management Manual (ESD-100) for more information on claims and resolution.
-

19.11 Engineering Considerations / Communications Report

1. The Design Contractor shall prepare a report that highlights special design concepts or unique features of the design, so that the Construction Manager can identify and properly inspect these special items of work. This report will also enable the Construction Manager to transmit special design concepts, assumptions and instructions about unique design details to field personnel.
 2. Attachment 19-4 shows the minimum requirements for this Engineering Considerations / Communication report.
-

Attachment 19-1 – Cover Page of Construction Management Manual



San Diego County Water Authority

Engineering Department

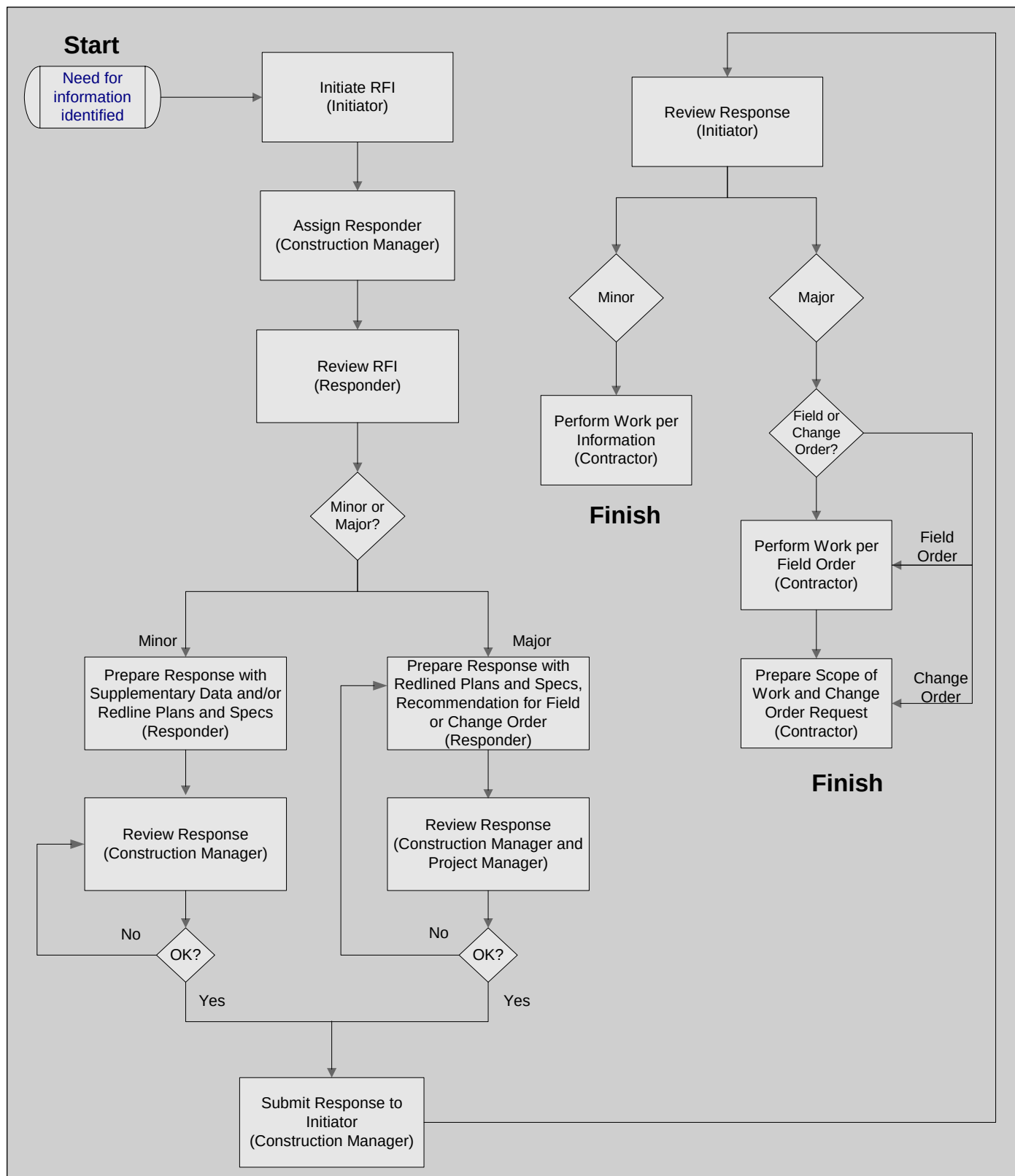


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Attachment 19-2 – RFI Process



Attachment 19-3 – Cover Page of Field Inspection Manual



SDCWA
San Diego County Water Authority
Engineering Department

Field Inspection Manual

Interim Working Instructions

ESD-130

September 2002

Attachment 19-4 – Engineering Considerations / Communications Report

As applicable, the Design Contractor shall include the following information for a project.

- a. Title Page. List project title, location and date of report.
- b. List of Design Personnel. List key design personnel that can be contacted for technical assistance during construction. Include name, design specialty and telephone number.
- c. Special Design Considerations. Provide a clear, concise explanation of special design concepts and/or unique features by discipline; Civil, Architectural, Structural, Mechanical, Electrical, etc., so that the Construction Manager can identify and properly inspect these special items of work. Examples of items to discuss include:
 - Special testing requirements involving design personnel.
 - Critical or unusual products and performance specifications such as high pressure, temperatures or capacities.
 - Situations where a manufacturer shall oversee equipment installation.
 - Long-lead procurement items, receipt, storage, preservation.
 - Special operational constraints, i.e., utility outage periods, special construction phasing required.
 - Any permits that must be obtained before and during construction.
 - Critical safety precautions required or other minimum quality assurance testing amount/frequency for critical items.
 - Coordination with other agencies.
 - Items requiring special inspection.
 - Environmental mitigation.
- d. Schedule of Required Site Visits by Design Personnel. If site visits on certain proposed phases of construction are necessary, a site visitation schedule shall be prepared identifying the critical construction stages and the number of days of notification required from the Construction Manager.

Chapter 20 Startup and Commissioning, Closeout, and Warranty

Overview

Purpose This chapter outlines the Design Contractor Responsibilities during the startup and commissioning of project components as well as responsibilities during project closeout and administration of warranty.

Topics This chapter is composed of the following topics:

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20.1 Introduction

20.1.1 Responsibilities

1. The Design Contractor shall provide assistance to the Construction Manager and the Design Manager in project startup and commissioning, closeout, and warranty.
 2. The Design Contractor's responsibilities during facility startup and commissioning, closeout, and warranty may include:
 - 2.1. Providing system integration and testing support
 - 2.2. Review of the Construction Contractor's functional-equipment test plan, witnessing functional testing of equipment, and review of functional-test reports.
 - 2.3. Other assistance required for successful startup and operational test of systems.
 - 2.4. Assisting the Construction Manager in preparing punchlists (deficiency lists) and final inspection procedures
 - 2.5. Providing project closeout support.
 - 2.6. Review of project completion and Final acceptance activities and documents.
 - 2.7. Submittal of final Operation and Maintenance (O&M) Manuals.
 - 2.8. Submittal of updated O&M Impact Analysis.
 - 2.9. Submittal of Record Drawings.
 - 2.10. Providing technical assistance in administering warranty issues.
-

20.2 System Integration Support

20.2.1 System Integration Plan – Design Phase

1. During the project Design Phase, the Design Contractor shall prepare a Preliminary System Integration Plan outlining the required procedures to integrate the new facility into the existing system. The Plan shall be prepared in full coordination with the Water Authority Operations and Maintenance Department. The Design Contractor shall include the Preliminary Integration Plan in the project contract documents for the Construction Contractor to finalize. The plan shall at least include the following requirements
 - 1.1. Shut down procedures including requirements of the Operation and Maintenance Department. If other agencies are impacted, then their procedures shall also be considered.
 - 1.2. Shut down limitations and timing constraints, including working hours and date limitations. If other agencies are impacted, then their limitations shall also be considered.
 - 1.3. Tie-in requirements, including all material and labor requirements.
2. Backup plans including planning and provision of alternatives in case of malfunctions, errors, and such.

20.2.2 System Integration Plan – Construction Phase

1. During the project Construction Phase, the Construction Contractor shall submit the Final Integration Plan including requirements stipulated in the Contract documents and other requirements discussed during the project construction meetings. The Design Contractor shall review the tie-in work Plan for conformance and adherence to project and Operations and Maintenance Department requirements. The Design Contractor shall then submit a review report of the integration plan to the attention of the Construction Manager and the Design Manager.
-

20.3 Startup Testing and Commissioning Support

20.3.1 Design Phase

1. During the project Design Phase, the Design Contractor shall prepare a Preliminary Startup and Testing Plan outlining the required procedures necessary for facilities startup and commissioning. The Plan shall be prepared in full coordination with the Water Authority Operations and Maintenance Department. The Design Contractor shall include the Preliminary Startup Plan in the project contract documents for the Construction Contractor to finalize.
-

20.3.2 Construction and Startup Phases

1. During the project Construction Phase, the Design Contractor shall review and comment on the Construction Contractor's submittal of the proposed plan for startup testing and commissioning of the constructed facilities. The Design Contractor shall then submit a review report of the startup and commissioning plan to the attention of the Design Manager and the Construction Manager.
 2. The Design Contractor shall review startup and preliminary operational data during system testing, observe the startup testing, and report to the Construction Manager and the Design Manager on the system performance with respect to its conformance to the intent of the design.
 3. Following startup and successful operational testing and turnover, the Design Contractor shall assist the Construction Manager in preparing the final acceptance documents and Notice of Completion.
-

20.4 Operator Training

20.4.1 O&M Training Program Organized by the Design Contractor

1. The Design Contractor shall stipulate in the contract documents training requirements for Operations and Maintenance staff by vendors and manufacturer's representatives. This training (Construction Contractor-related training) requirement shall cover all pieces of equipment and their associated instrumentation.
2. In addition to Construction Contractor-related training, the Design Contractor shall organize and conduct other types of training for Operations and Maintenance staff. The training shall be done separately from the Construction Contractor-related training. The purpose of the Design Contractor-related training is to:
 - 2.1. Complement and cover the gap of the training provided by the Construction Contractor.
 - 2.2. Share with Operations and Maintenance staff how the system, with all its equipment and instrumentation, will operate to meet the intent of the project
3. O&M training developed by the Design Contractor shall:
 - 3.1. Provide an overview and summary of the entire system equipment, controls, and operational processes.
 - 3.2. Contain a discussion on Piping and Instrumentation Diagrams (P&IDs), and control system narratives.
 - 3.3. Contain examples of controlling different equipment during normal and emergency situations.
4. The Design Contractor shall submit the proposed program for their training to the Design Manager for review and approval. The program shall contain the training schedule as well as detailed descriptions of what will be covered.
5. The timing of the Design Contractor training shall be at least two weeks before the startup and commissioning of facilities.
6. The Design Contractor training shall, at a minimum, contain the following:
 - 6.1. Appropriate visual illustrations.
 - 6.2. Be in a program of classroom training and hands-on operating instruction.
 - 6.3. Hands-on operational training.
 - 6.4. Appropriate handouts that support the training.
7. The project O&M manuals shall be made available during the Design Contractor training.

8. The Water Authority may videotape the Design Contractor training sessions.
 9. Depending on the nature and size of project, and on Operations and Maintenance staff schedule, the training sessions may have to be more than one session.
-

20.5 Project Closeout and Warranty Support

20.5.1 Project Closeout Requirements

1. Closing of a construction project consists of a series of activities that bring it to a final reporting status, with no further activity other than those associated with the warranty period. The Design Contractor shall assist the Design Manager during project closeout, and support the project closeout process. The following is a list of activities that are typically completed during the closing of a project:
 - 1.1. Compile punchlists and performing final inspection procedures to make sure every item in the punchlist is completed.
 - 1.2. Preparing Record Drawings.
 - 1.3. Finalizing technical manuals prepared during the construction phase of the project.
 - 1.4. Finalizing O&M Manuals prepared during the construction phase of the project (refer to chapter 16 of this Guide for more information).
 - 1.5. Finalizing equipment record forms and spare parts list checkoff prepared during the construction phase of the project.
 - 1.6. Preparing project final report.
 - 1.7. Preparing lesson learned report.
2. Following the completion of the closeout activities, the Design Contractor shall assist with technical aspect of the project warranty administration.

20.5.2 Record Drawings Support

1. The Design Contractor shall incorporate all changes made during construction into Record Drawings. The master set of contract redline drawings prepared by the Construction Contractor will be submitted to the Construction Manager for review and finalization then furnished to the Design Contractor for Record Drawing drafting, and production.
2. The drafting standards outlined within the Drafting Manual (ESD-120) shall be followed in preparation of the Record Drawings. The Design Contractor shall also follow the standards for preparing Record Drawings outlined within the Water Authority's Engineering Department Policies, Procedures, and Practices (ESD-510), section 3.1 Record Drawings Preparation and Revisions to Existing Record Drawings. A copy of the front page of ESD-510 is shown in Attachment 20-1.

3. The project Record Drawings set shall be prepared as follows:
 - 3.1. At the completion of project construction, the Construction Contractor shall submit the master set of contract redline drawings to the Construction Manager. The Construction Manager will review the master set of contract redline drawings for completeness. The master set of contract redline drawings must comply with at least the following:
 - 3.1.1. All project Change Orders noted.
 - 3.1.2. All project changes not requiring a formal Change Order also reflected.
 - 3.1.3. Agree with the Construction Manager's marked-up drawing prints and other records.
 - 3.2. Before preparation of the Record Drawings, the Construction Manager will forward the master set of contract redline drawings to the Design Manager for review by Water Authority staff (for example, field inspectors, resident engineers, and staff from Right-of-Way, Operations and Maintenance, and Water Resources departments) when applicable, to ensure the master set of contract redline drawings represent completely what was constructed.
 - 3.3. Upon acceptance of the master set of contract redline drawings by the Construction Manager and Design Manager, the Design Manager or Construction Manager will transmit the master set of contract redline drawings to the Design Contractor for preparation of the Record Drawings.
 - 3.4. The Design Contractor shall prepare the Record Drawings by modifying the most current version of the AutoCAD bid/addendum/conformed CAD drawing files to reflect the as-constructed configuration of the project.
 - 3.5. Line work for profiles, plans, details, and other elements that require modifications shall be erased on the original CAD drawing files and drafted according to the master redline drawings developed during construction. All lettering, line patterns, and weights required to revise the original CAD drawings shall match those shown on the existing original CAD drawings. Revisions to the drawings shall be bubble outlined to highlight the revised areas on each drawing. The bubbled outline shall also contain a small triangle with a corresponding revision number as shown in the revision block.
 - 3.6. Notes shall be added on the plan and profile sheets identifying the stations and the type of materials (for example, sand, concrete, or gravel) used for backfill in the pipe zone.

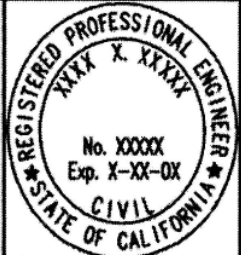
Additional information to be noted on the record drawings includes, but is not limited to:

- 3.6.1. Locations of excavation; give approximate dimensions and materials.
 - 3.6.2. Dewater well heads/casings left in place.
 - 3.6.3. Zones where groundwater was encountered; estimate seepage rate and elevation.
 - 3.6.4. Trench conditions that deviate from the originally assumed conditions; give trench width, failures, approximate dimensions of backfill, and type of material.
 - 3.6.5. Soil description of trench sidewalls.
 - 3.6.6. Soil stabilization treatments left in place, such as piles and bracing.
 - 3.6.7. Location of any shoring left in place, such as soldier beams and tunnel supports.
 - 3.6.8. Utility relocations.
- 3.7. This information and any other unusual conditions are to be recorded in the construction daily reports and transferred to the drawings during the preparation of the record drawings.
- 3.8. The Design Contractor preparing the record drawings is responsible for ensuring all revised CAD drawing files have the appropriate signatures and registered professional engineer's seal as provided on the original CAD drawings.
- 3.9. The master set of contract redline drawings shall be returned to the Water Authority with the record drawings. Water Authority staff from the Engineering and Right of Way departments provide a review and note any discrepancies between the master redline drawings and the record drawings. Where discrepancies occur, the Design Contractor shall make corrections. This process is repeated until Water Authority staff is satisfied that the record drawings are complete.
- 3.10. Following completion of all work, every revised drawing in the contract documents shall have the description of the change filled in the revision block. When multiple revisions to a drawing are required, the words "Revised for the Record" may be filled in the revision block in lieu of a multiple-lined description. The revision number, date, drawn, checked, and approved boxes are to be filled in.
- 3.11. After review by the Design Manager, the Director or Assistant

Director of Engineering approves the record drawings. The Water Authority's Record Drawing disclaimer is placed within the title block on each sheet and on the title sheet as shown in Figure 1. The Water Authority will furnish a CAD Record Drawing disclaimer file for this purpose.

- 3.12. If construction management services are not performed by the Design Contractor, then the Construction Manager's registered professional engineer's stamp is required on the record drawings for construction revisions/record drawing purposes only.
- 3.13. The record drawings CAD files are submitted to the Water Authority and all other drawing sets and redline drawings are destroyed.

Figure 20-1 – Record Drawing Disclaimer

RECORD DRAWING SAN DIEGO COUNTY WATER AUTHORITY THIS IS A RECORD DRAWING ONLY OF THE FACILITIES OWNED BY THE AUTHORITY AND IDENTIFIED IN THE TITLE BLOCK. IT HAS BEEN PREPARED IN PART ON THE BASIS OF INFORMATION COMPILED AND FURNISHED BY OTHERS. THE AUTHORITY IS NOT RESPONSIBLE FOR ANY ERROR(S) OR OMISSION(S) WHICH HAVE BEEN INCORPORATED INTO THIS DRAWING. ACTUAL CONDITIONS WILL VARY SOMEWHAT FROM THE CONDITIONS SHOWN HERE AND AT SOME LOCATIONS THE VARIANCE MAY BE LARGE. IF THE PRECISE LOCATION OF ANY FACILITY OWNED BY THE AUTHORITY IS REQUIRED, THE FACILITY MUST BE FIELD LOCATED IN THE PRESENCE OF AN AUTHORIZED REPRESENTATIVE OF THE AUTHORITY. APPR	ENGINEERING COMPANY LOGO		DESIGN BY _____
			DRAWN BY _____
			CHECKED BY _____

3.14. The disclaimer in the above figure reads

- 3.14.1. "THIS IS A RECORD DRAWING ONLY OF THE FACILITIES OWNED BY THE AUTHORITY AND IDENTIFIED IN THE TITLE BLOCK. IT HAS BEEN PREPARED IN PART ON THE BASIS OF INFORMATION COMPILED AND FURNISHED BY OTHERS. THE AUTHORITY IS NOT RESPONSIBLE FOR ANY ERROR(S) OR OMISSION(S) WHICH HAVE BEEN INCORPORATED INTO THIS DRAWING. ACTUAL CONDITIONS WILL VARY SOMEWHAT FROM THE CONDITIONS SHOWN HERE AND AT SOME LOCATIONS THE VARIANCE MAY BE LARGE. IF THE PRECISE LOCATION OF ANY FACILITY OWNED BY THE AUTHORITY IS REQUIRED, THE FACILITY MUST BE FIELD LOCATED IN THE PRESENCE OF AN AUTHORIZED REPRESENTATIVE FROM THE AUTHORITY."

**20.5.3
Punchlists**

1. The punchlists constitute a final listing of all items that are to be completed, repaired, replaced, corrected, or submitted before the project can be accepted as complete. The punchlists are compiled by the Construction Manager during the substantial completion process and typically is enclosed with the substantial completion letter or provided to the Construction Contractor shortly after declaring substantial completion.
2. The Design Contractor shall assist the Construction Manager in preparing the punchlists.

**20.5.4
Warranty Period**

1. The Construction Contractor will be responsible for repairing any defect in workmanship or materials, typically for a period of 730 calendar days (two years) from the date of recording the Notice of Completion (NOC). Refer to the Water Authority General Conditions and Standard Specifications (Whitebook), Section 9.0 (Indemnification and Warranty) for more information.
 2. Recording of the NOC marks the beginning of the post-construction phase and warranty period for the project. Some major equipment items such as valves may have warranty periods that extend beyond the general warranty period. The Design Contractor shall identify these items and include inspection requirements in the final project report. The Design Contractor shall also ensure that the equipment is listed in the Major Equipment Warranty Record spreadsheet. This spreadsheet will enlist all equipment under warranty with warranty expiration dates and schedule for inspection by Operations and Maintenance Department prior to expiration of the warranty period.
-

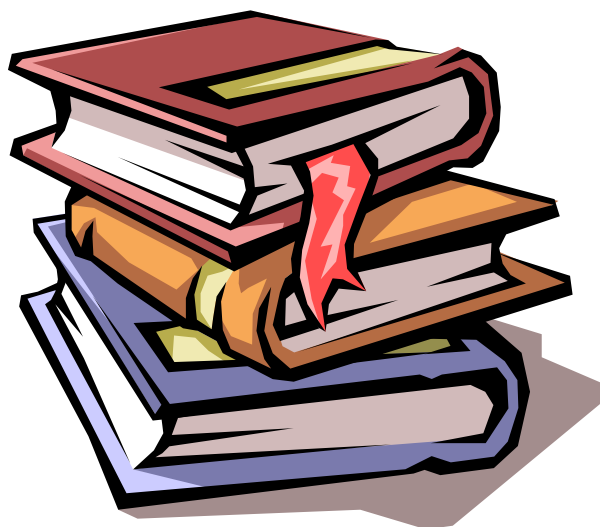
Attachment 20-1 – Cover Page of Policies, Procedures, and Practices Manual



SDCWA

San Diego County Water Authority

Engineering Department



Policies, Procedures, and Practices

ESD-510

September 2002

Chapter 21 Document Control and Records Management

Overview

Purpose	This chapter illustrates requirements for setting up document control system, and in submitting project documents to the Water Authority for proper documentation.

Topics	This chapter is composed of the following topics:

CHAPTER 21 DOCUMENT CONTROL AND RECORDS MANAGEMENT	21
21.1 OVERVIEW	21-1
21.2 RECORDS MANAGEMENT SYSTEM	21-3
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ATTACHMENT 21-2: COVER PAGE OF CONSTRUCTION MANAGEMENT MANUAL	21-20

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21.1 Overview

1. Managing and controlling project records and documents are important aspects of designing and constructing of projects. Records management provides the Water Authority Engineering Department (Engineering Department) the ability to:
 - 1.1. Reconstruct events that developed the project to the as-designed and/or as-constructed configurations, including conceptual design, pre-design, design criteria, detailed design, and value engineering. This information may provide determinations of responsibility, if required, for various aspects of a project, and determinations of how specific actions affected the ultimate design of a project.
 - 1.2. Provide available information for maintenance, upgrading, and later expansion of facilities. This information includes structural, mechanical, electrical, and other calculations; sketches and drawings; and manufacturers' datasheets for materials and equipment provided.
 - 1.3. Provide as-constructed information for future construction activities to proceed without interfering with existing buried utilities. Lack or inaccuracy of this information can delay and/or hamper future development activities, and has the potential to lead to litigation.
2. The Water Authority Engineering Records Management System contains the following:
 - 2.1. Official records reflecting the final and official position of the Water Authority. The submitted official records will become the Engineering Department's legal record for the project. These official records include hardcopies and electronic files of project documents, correspondence, reports, drawings, specification, calculations, meeting minutes, contracts, daily construction progress reports, design clarifications, Construction Contractor submittals, operation and maintenance manuals, field orders, change orders, contracts, and other similar items.
 - 2.2. Unofficial records including drafts, works in progress, electronic records used to create final documents, copies of records, hand-written notes and materials in a preliminary state that may not yet reflect the official position of the Engineering Department.
 - 2.3. Non-record materials, including library/research materials, publications, blank forms or other public information that does not reflect the official position of the Engineering Department.

3. The Engineering Department owns all documents generated by Design Contractors, Construction Managers, Construction Contractors, and other entities entered into contracts with the Water Authority for the design and/or construction of Water Authority projects. Design documents forwarded to the Engineering Department will be logged, recorded, and filed as defined in this chapter.
 4. The current practice within the Water Authority is all documents are directly sent to the addressee (Project Manager, Design Manager, etc.) and later recorded and filed by the Engineering Department Library (Library) staff.
 5. For proper document control, the new plan is to forward all documents generated by the Design Contractor to the Library staff for recording and logging before distributing copies to the project team. Library staff will follow the established project distribution list or matrix, and original document will be maintained in the Engineering Department's project file.
 6. Consequently, the Design Contractor shall always notify the addressee, via email, of the intended submittal stating contents, date of mailing, form of mailing, and carrier (USPS, UPS, FEDEX, etc.). This will provide for proper coordination between the Library staff and Project Managers, Design Managers, and any others.
-

21.2 Records Management System

1. This section defines the responsibilities of the Design Contractor in maintaining the project records. The Records Management System procedure adopted and maintained by the Design Contractor shall ensure:
 - 1.1. Consistency in the identification and control of documents.
 - 1.2. Consistency in the manner in which documents are prepared, including format and media.
 - 1.3. Consistency in the manner in which documents are filed.
 - 1.4. Compliance with Engineering Department document control requirements.
-

21.2.1 General

1. Documents generated by the Design Contractor for Water Authority projects shall be properly recorded and logged in a computerized database (discussed in 21.2.2), and shall be readily retrievable when needed. All Water Authority records shall be filed in accordance with the Engineering Department File Plan codes. Refer to Attachment 21-1 for a complete list of identification number to be used based on the document type and/or subject or content of the record, the record series, and the function activities of the Water Authority.
2. In addition to the computerized database, the Design Contractor shall also maintain a hardcopy file of all project documents. The hardcopy file shall be in a single location and documents shall match the ones submitted to the Water Authority. The Design Contractor shall refer to Sections 21.3 and 21.4 for additional requirements.
3. The following list provides examples of the types of documents covered by the guidelines in this chapter. Other types of documents generated by the Design Contractor may also be covered.
 - 3.1. All correspondence (hardcopy and electronic), including correspondence with subcontractors, utilities, agencies, local, state, and federal institutions, etc.
 - 3.2. Design documents (specification, design drawings) and the design support documents (calculations, design review comments, studies, technical memoranda, value engineering evaluations, and reports).
 - 3.3. Addenda issued during the bidding period.
 - 3.4. Conformed (as-bid) design documents incorporating Addenda into design documents issued for bid, i.e., a conformed set of

Contract Documents.

- 3.5. Shop drawings for materials, components, and equipment installed at Water Authority facilities.
 - 3.6. Responses to requests for information, shop drawing submittals, design clarifications, substitution requests, and other similar documents issued during construction.
 - 3.7. Change orders issued during construction that require design changes.
 - 3.8. Equipment operations and maintenance manuals.
 - 3.9. Record Drawings.
 - 3.10. Records documenting construction activities, such as quality assurance/quality control documents, progress meeting minutes, inspection reports, and the like.
4. Documents generated by the Construction Contractor or the Construction Manager shall not be submitted by the Design Contractor to the Water Authority. However, the Design Contractor shall submit any document they produce that contains all, or portions of, a Construction Contractor's or Construction Manager's submittal.

**21.2.2
Database for
Design
Documents**

1. The Design Contractor shall prepare a computerized database for all project documents. The database for drawings, specification, correspondence, and other project documents shall contain the following fields:
 - 1.1. Project name
 - 1.2. Water Authority project number
 - 1.3. Document File No., (refer to Attachment 21-1)
 - 1.4. Document title (subject or description)
 - 1.5. Document date
 - 1.6. A unique identifying number for each design drawing
 - 1.7. Revision number
 - 1.8. Revision date
 - 1.9. Revision description
 - 1.10. Status of document (issued for bid, issued for construction, issued as Record Drawing; VOID, canceled, supersedes/superseded by, with cross-reference information to old or new documents)

- 1.11. Document control number (DCN), a unique identifier, as assigned in the Design Contractor database by the Design Contractor.

**21.2.3
Letters of
Transmittal**

1. All documents transmitted by the Design Contractor to the Water Authority shall be accompanied by a letter of transmittal containing the following information:
 - 1.1. A list of all documents included in the transmittal
 - 1.2. The date of transmittal
 - 1.3. The DCN of each document transmitted as assigned in the Design Contractor database
 - 1.4. The document sheet number
 - 1.5. The document revision number
 - 1.6. The document media
 - 1.7. The purpose of the transmittal
2. The letter of transmittal shall be signed by the Design Contractor Project Manager (DCPM). The original transmittal with submittal will be sent to the Engineering Department Document Control and a file copy of the transmitted document and letter of transmittal shall be retained by the Design Contractor.

**21.2.4
Correspondence**

1. Correspondence (e.g., incoming, outgoing, and internal letters; memoranda; facsimile and email letters and memoranda; and letters of transmittal) shall be recorded by the Design Contractor by using a unique DCN and also identifying the File No. (Refer to Attachment 21-1).
2. Documents containing more than one page shall be paginated, indicating the total number of pages and the final page. Exhibits, figures, attachments, and/or appendices shall be listed in a table of contents. Attachments, or other such items, shall be listed on the transmittal letter by title or, if applicable, by File No.
3. Facsimile transmittals shall include the same information and shall be given the same attention to detail as a letter. Facsimiles shall be registered with a DCN and identified by File No. before transmittal, and shall be signed by a person of appropriate authority.
4. Email transmittals shall include the same information and shall be given the same attention to detail as a letter. The Water Authority policy regarding emails is quoted from the General Manager's

Administrative Policy (section 601) as follows:

“Electronic mail is not intended for permanent storage and is not part of the regular system backup process. It is important that each employee regularly purge e-mail “Inbox”, “Sent Items”, “Deleted Items” and similar e-mail files and folders. If a user intends to retain a message in the e-mail system for more than a short duration, the message should be stored in an appropriate e-mail file. After the e-mail is printed, the e-mail should be deleted immediately. The Water Authority may purge files at any time subject to the records management program.

5. Consequently, all important email shall be printed, registered with a DCN, identified by File No., and documented in accordance with requirements outlined above.
 6. Correspondence hardcopies shall be filed in the applicable project file and in a separate chronological file. The Design Contractor shall maintain and update a computerized log of all project correspondence.
-

21.3 Design Phase Records

21.3.1 Design Drawings

1. All design drawings shall comply with the Water Authority standards (refer to Chapter 14, Technical Specification, Drawings, and Calculations, for more information). The Design Contractor shall sign and seal the original final design drawings, and sign and date the appropriate places in the drawing title blocks. Refer to other chapters of the Design Contractor Guide, principally Chapters 3 and 4, for additional requirements regarding signing and sealing of drawings and other documents.
2. The procedure outlined below shall be followed to ensure orderly processing and completion of design drawings for proper storage.
 - 2.1. Before submitting design drawings to the Water Authority, the Design Contractor shall verify that:
 - 2.1.1. Drawings are the correct drawings for the intended project, and that the drawing set is complete with no missing drawings.
 - 2.1.2. Drawings incorporate all agreed-upon revisions.
 - 2.1.3. Each design drawing is stamped and signed by a Professional Engineer registered in the state of California and duly designated by the Design Contractor as in charge of the design. Refer to other chapters of the Design Contractor Guide, principally Chapters 3 and 4,
 - 2.1.4. The drawing title, drawing number assigned by the Water Authority, work order number, and specification section number are correct and placed appropriately in the title block.
 - 2.1.5. Each sheet, including the cover sheet, is sequentially numbered.
 - 2.1.6. No self-adhesive tapes or sticky-backs are used on the drawings.
 - 2.2. The drawings hardcopies and electronic files shall be submitted to the Library staff with a letter of transmittal listing the drawings included, with cc: and File Nos. listed. A cross-reference list between the hardcopy drawings and electronic file shall be provided.
 - 2.3. Changes to the project design may be issued during the bidding process in the form of Addenda. The Design Contractor shall sign and seal the first page of all technical addenda. A copy of the addenda shall be given to the Library

staff for inclusion in the project records.

- 2.4. At the end of the bidding process, the Design Contractor shall prepare and provide conformed design drawings (also known as Issued for Construction, as-awarded, or as-bid drawings) that incorporate all changes made during the bidding process. A copy of the conformed design drawings shall be given to the Library staff for inclusion in the project records.

**21.3.2
Specification**

1. The Design Contractor shall prepare the specification in accordance with provisions outlined in Chapter 14, Technical Specification, Drawings, and Calculations. Revised specification pages shall include a revision number and date consisting of month and year.
2. The specification hardcopies and electronic files shall be submitted to the Library staff with a letter of transmittal listing the specification sections included with cc: and File Nos. listed. A cross-reference list between the specification hardcopy and the electronic file shall be provided.

**21.3.3
Calculations**

1. Calculations shall be prepared in accordance with provisions outlined in Chapter 14, Technical Specification, Drawings, and Calculations. The Design Contractor shall maintain a calculation index register. The minimum information the register contains shall be:
 - 1.1. Unique calculation number identifier
 - 1.2. Document File No., per File Plan (see Attachment 21-1)
 - 1.3. Calculation title (subject or description)
 - 1.4. Discipline
 - 1.5. Date of final review
 - 1.6. Revision number
 - 1.7. Project name
 - 1.8. Status (Void; Canceled; Supersedes/Superseded; and so forth)
 - 1.9. Referenced design documents
2. The calculation submittal forwarded to the Library staff shall include a transmittal with DCN, record copies, the current original, and the calculation index register. The calculation index register shall be in hardcopy and electronic media in the version of Microsoft Word software in current use by the Water Authority.

**21.3.4
Other Design
Documents**

1. Chapter 4, Design Development, requires specific types of design documents to be submitted to the Water Authority for review before they are completed. Each time these documents are submitted to the Library staff, the following information shall be included for each document:
 - 1.1. Title block:
 - 1.1.1. Project Name
 - 1.1.2. Water Authority Project Number
 - 1.1.3. Unique document identifier
 - 1.1.4. Document File No., per File Plan (refer to Attachment 21-1)
 - 1.1.5. Date of issue
 - 1.1.6. Reason for issue
 - 1.1.7. Revision number
 - 1.2. Table of contents:
 - 1.2.1. Project identifier
 - 1.2.2. Unique document identifier
 - 1.2.3. Document File No., per File Plan
 - 1.2.4. Date of issue
 - 1.2.5. Revision number
 - 1.2.6. List of sections/chapters
 - 1.2.7. List of tables
 - 1.2.8. List of figures
 - 1.2.9. List of attachments
 - 1.2.10. List of any other items comprising the document
 - 1.3. Each page/sheet:
 - 1.3.1. Project identifier
 - 1.3.2. Unique document identifier
 - 1.3.3. Document File No., per File Plan
 - 1.3.4. Page/sheet number on each page/sheet
 - 1.3.5. Indicator for last page/sheet
-

21.3.5
Design Review
Comments

-
1. The design review comments process is described in Chapter 3, QA/QC Program and Chapter 4, Design Development. The Design Contractor shall transmit the QA/QC documentation to the Library staff for recording, logging, and filing.
-

21.4 Bid and Construction Phase Records

21.4.1 Design Drawings

1. Key points in handling and processing design drawings are listed below
 - 1.1. The Design Manager will transmit the original bid set design drawings to the Administration and Controls Group of the Engineering Department to initiate the project bidding process (see Chapter 18 for more information). Once the bid process is complete, a final bid document will be given to the Library staff for inclusion in the project file and will constitute the Water Authority's legal record drawings for the project during bidding.
 - 1.2. At the end of the bidding process, the original bid design drawings, all addenda issued during bidding, and the conformed design drawings (also known as Issued for Construction, as-awarded, or as-bid drawings) will reside in the Library. These documents will constitute the Water Authority's legal record drawings during construction.
 - 1.3. During construction, the Construction Contractor will maintain, and update a set of red-marked design drawing prints (also known as the master set of contract redline drawings) that show all changes and deviations from the contract documents, including authorized change orders, that may occur during construction. Refer to the Water Authority Construction Management Manual (ESD-100) for more information. The cover page of ESD-100 is shown as Attachment 21-2.
 - 1.4. After construction is complete, the Design Contractor shall prepare record drawings that incorporate all changes made during construction (see chapter 19 for record drawing requirements). The original record drawing set and CAD files will be turned over to the Library after all seals and signatures are obtained, and will constitute the Water Authority's legal record drawings for the completed project.
-

21.4.2 Specifications

1. Key points for handling and processing the specification are listed below.
 - 1.1. The Design Manager will transmit the original bid specification to the Administration and Controls Group of the Engineering Department when the bidding process is initiated. The bid specification will reside with that Group throughout the bidding process (see chapter 18 for more information).
 - 1.2. After processing, printing, and distribution, the Library staff will file and maintain the conformed specification (also known as

the Issued for Construction, as-awarded, or as-bid specification). The conformed specification shall be prepared by the Design Contractor and shall incorporate all changes and addenda issued during bidding.

- 1.3. After construction is complete, the Design Contractor shall produce a Record Specification incorporating all changes made during construction, commissioning, and startup. The Record Specification shall be turned over to the Library staff for proper logging, recording, and filing.

**21.4.3
Other
Documents**

1. Other documents produced by the Design Contractor during construction, or during design-related field activities, shall also be sent to the Library staff for proper recording and logging. Such documents may include:
 - 1.1. Testing and inspection of facilities plans, results and reports.
 - 1.2. Design Clarifications.
 - 1.3. Punchlists.
 - 1.4. Startup and Commissioning of Facilities.
 - 1.5. Training of Operations and Maintenance Staff.
 - 1.6. Operations and Maintenance Manuals.
 - 1.7. QA/QC Audit Records.
-

Attachment 21-1: Water Authority File Plan Codes

ENGINEERING DEPARTMENT CIP PROJECTS FILE PLAN

Grant Code:

Project Name:

Specification(s):

Project Manager:

Phase:

Completion Date:

This is a template and is modified for each CIP project by the Project Manager.

Code	File No.	Title	Description	HR/HO	Retention
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BOARD MEMOS – 001					
	001	Board Memos			
AGREEMENTS and INSURANCE – 002					
	002.1	Agreement – Consultant 1 (TBD)	NTP/NOA/ESA (Can be agreement with consultants or agency)	HR	
	002.1-1	Amendments		HR	
	002.1-2	Invoices		HR	
	002.1-3	Supporting Information	Consultant Performance Evaluation/Req for Additional Personnel/Resumes/Travel Authorization		
	002.1-4	SCOOP			
	002.2	Agreement – Consultant 2 (TBD)		HR	
	002.2-1	Amendments		HR	
	002.2-2	Invoices		HR	
	002.2-3	Supporting Information			
	002.2-4	SCOOP			
CONTRACTS – 003					
	003.1	Contract – TBD	NTP/NOA/NOC	HR	
	003.1-1	Change Orders		HR	
	003.1-2	Invoices		HR	
	003.1-3	Supporting Information	Waiver & Release Form		
	003.1-4	SCOOP			
	003.1-5	Certified Payroll			
BUDGET – 004					
	004.1	Project Life			
	004.2	Cost Estimates			
	004.3	Cash Flow Projections			
	004.4	Budget Transfers			
	004.5	Project Actual Cost			
	004.6	Purchase Orders	Purchase orders pertaining to the whole project; if purchase order is for agreement, file in Supporting Information.		
	004.7	PSM Schedules			
	004.8	Labor Costs			
PARTNERING – 005					
	005.1				
PHOTOGRAPHS – 006					
		<i>All photos except those taken during Construction</i>			
	006.1				IND
RISK MANAGEMENT – 007					
	007.1				
COORDINATION WITH MUNICIPALITIES/AGENCIES – 008					
	008.1	Coordination w/		HR	IND

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	008.2	Coordination w/		HR	IND
PUBLIC AFFAIRS – 009					
	009.1	Ground Breaking			
	009.2	Dedication			
	009.3	Newspaper Clippings			
	009.4	Mailing List Information			
	009.5	Community Correspondence			
	009.6	Public Affairs Issues			
SPECIFICATION – 010					
	010.1	Final Specifications	Put one set of specifications here when design is complete (As of 07-01-05 original specs will be filed here.)		IND
	010.2	Record Specifications	Put one set of record specifications here when design is complete.		IND
PLANNING – 100					
	101	CONSULTANT SELECTION			
	101.1	Consultant No. 1 - Type of Service			
	101.1-1	Consultant Selection	Mailing Lists/Planholders Lists		
	101.1-2	Consultant Evaluation	Proposals/SOQ's/Interviews/Rating Sheets/Negotiations		
	102	CORRESPONDENCE			
	102.1	Incoming Correspondence			
	102.2	Outgoing Correspondence			
	102.3	Internal Correspondence			
	103	MEETINGS			
	104	REPORTS			
	104.1	Planning Review General			
	104.2		Enter Report Title		
	105	RIGHT OF WAY			
DESIGN – 200					
	201	CONSULTANT/DESIGN BUILD SELECTION	If project is design build, bid phase notebook and evaluation will be filed under 201. Note that projects vary. Check w/ Lynn if questions.		
	201.1	Consultant No. 1 – Type of Service		HR	
	201-1-1	Consultant Selection - Type of Service	RFQ/RFP/Advertising/ Mailing Lists/Planholders Lists		
	201.1-2	Consultant Evaluation	Proposals/SOQ's/Interviews/Rating Sheets/Negotiations		
	201.2	Consultant No. 2 – Type of Service		HR	
	202	CORRESPONDENCE	Put Correspondence Log Here		
	202.1	Incoming Correspondence			
	202.2	Outgoing Correspondence			
	202.3	Internal Correspondence			
	203	MEETING NOTES AND MINUTES			
	204	REPORTS		HR	IND
	204.1	Preliminary Design		HR	IND
	204.1-1	Prelim Conceptual Estimate	Cross ref only. See W0001A.804.3	HR	IND

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	204.2	Final Design		HR	IND
	204.3	Environmental		HR	IND
	205	RIGHT OF WAY			
	206	BID AWARD			
	206.1-1	Bid Notebook – Bid No. 1	Bid for pre-procurement, prequalification or construction work	HR	
	206.1-2	Bid Summary and Evaluation – Bid No. 1		HR	
	207	Bid Proposals	Bid proposals for pre-procurement, prequalification or construction work		
	208	Design Criteria			IND
	209	Engineering Technical Review			IND
	210	Engineering Calculations/Drawings			IND
	211	Water Resources			
CONSTRUCTION – 400					
	401	CM CONSULTANT SELECTION	If CM is not selected in the planning or design phases.	HR	
CORRESPONDENCE – 402					
	402	CORRESPONDENCE LOGS	Incoming/Outgoing Correspondence Logs		
	402.1	Incoming Correspondence	General Incoming correspondence not filed in other designated categories below		
	402.1-1	Incoming Correspondence - Contractor	From Contractor to SDCWA		
	402.1-2	Incoming Correspondence – Consultant	From CM to SDCWA		
	402.1-3	Incoming Correspondence - Public			
	402.2	Outgoing Correspondence	General Outgoing correspondence not filed in other designated categories below		
	402.2-1	Outgoing Correspondence- Contractor	Water Authority correspondence to Contractor		
	402.2-2	Outgoing Correspondence – CM or Consultant	Water Authority correspondence to CM or Consultant		
	402.2-3	Outgoing Correspondence - Public			
	402.3	Internal Correspondence	Correspondence from one Water Authority person to another Water Authority person		
	402.4	Telephone Conversations	Memorandum to File regarding Telephone Conversations (include Tele-Log, Form ESD 100 1.2)		
	402.5	Request for Information	Request for Information correspondence, inquiries and responses and RFI Log		
	402.6	Field Orders	Field Orders sent to Contractor and Field Order log		IND
	402.7	Non-Compliance	Non-Compliance Reports (NCR) sent to Contractor and NCR log		IND
	402.8	Resident Inquiry Records	Inquiries from Residents recorded mainly by Public Affairs Rep		
	402.9				

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MEETING NOTES & MINUTES – 403					
	403.1	Pre-Construction Meetings	All meetings held with Contractor and others prior to Construction		
	403.2	Construction Management Meetings	CM Team meetings: Agendas, notes, and action item logs		
	403.3	Weekly Construction Progress Meetings	WCPM meetings with Contractor: agenda, notes, minutes, handouts, attachments		
	403.3-1	Historical - WCPM	All WCPM minutes by topic sections and date (CD before close out of project)		
	403.4	Schedule Meetings	Meetings to discuss Schedule		
	403.5	Other Meetings	Other meetings related to Project activities		
REPORTS – 404					
Reports and Quality Assurance Plan, also known as Inspection Plan		Generally, reports from the CM Team and others are filed in the 404 section of the filing plan. With the exception of the Daily Report, all other reports from the Contractor are treated as a submittal item and are placed in the related submittal file.			All files in 404 are IND
	404.1	Daily Inspection Reports	Inspectors' daily reports		IND
	404.1-1	Accident Reports	Inspector's accident reports		IND
	404.1-2	Incident Reports	Inspector's incident reports		IND
	404.2	Daily Report from Contractor			IND
	404.3	Photo Documentation	WA and CM Team photo doc during construction including videos and printouts of WA standard photo logs and photo sheets not specified below.		IND
	404.3-1	Pre-Construction Photo Documentation	Pre-con photos taken by SDCWA inspectors		IND
	404.3-2	Post Construction Photo Documentation	Post con photos taken by SDCWA inspectors		IND
	404.4	In-Plant Fabrication Reports	Signed final reports and CD from in-plant inspector		IND
	404.5	Geotechnical Reports			IND
	404.6	Environmental Reports			IND
	404.7	Corrosion Protection Reports			IND
	404.8	Concrete Testing Reports			IND
	404.9	Weld Reports			IND
	404.10	CM Monthly Reports			IND
	404.11	Construction Project Report – U. S. Census Bureau			IND
	404.12	Field Office Site Visitor Log			IND
	404.13	Field Office Inventory	See CM 1.3-9 (video)		IND
	404.14	Radiographic Testing Reports			IND
	404.14-1	Radiographic Testing Film	Use special x-ray storage box for films		IND
	404.15	Final CM Project Summary Report			IND
RIGHT OF WAY – 405					
	405.1	Right of Way	Survey Requests		

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SUBMITTALS – 406					
Submittal Log		<i>Submittals are those items required to be submitted by the Contractor to the Water Authority. Generally, all items required under the General Conditions and the Supplementary General Conditions (Section 01001) are filed in the contract files (003.1 to .003.X). Otherwise, file in this 406 section of the file plan. Update submittal lists as necessary depending on the project's specs.</i>			
	406	SUBMITTAL LOGS	Print out of Submittal Log and Master Submittal List		
	406.01010	Summary of Work			
	406.01050	Survey Control			IND
	406.01300	Contractor Submittals			
	406.01310	Progress Schedules			
	406.01370	Schedule of Values			
	406.01505	Mobilization			
	406.01510	Temporary Utilities			
	406.01530	Protection of Existing Facilities			
	406.01560	Temporary Controls			
	406.01630	Product Substitution			
	406.01700	Contract Close Out			
	406.01730	Operation and Maintenance Data			IND
	406.02110	Clearing and Grubbing			
	406.02140	Dewatering			
	406.02200	Earthwork			IND
	406.02229	Blasting			IND
	406.02270	Temporary Erosion Control			
	406.02305	Tunnel Instrumentation and Monitoring			IND
	406.02310	Tunneling			IND
	406.02315	Portal Area Development			
	406.02330	Concrete Backfill and Grouting for Tunnels			IND
	406.02340	Tunnel Support Systems			IND
	406.02510	Access Roads			
	406.02612	Ductile Iron Pipe			
	406.02653	Steel Pipe			IND
	406.02655	Installation of Pipe			IND
	406.02675	Disinfection of Piping			IND
	406.02676	Pressure Testing of Piping			IND
	406.02830	Fencing			
	406.02940	Revegetation			
	406.03000	General Concrete Construction			IND
	406.03480	Precast Concrete Vaults			
	406.04220	Reinforced Hollow Concrete Masonry			
	406.05120	Structural Steel, Aluminum and Misc. Metalwork			
	406.09820	Crystalline Waterproofing			

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	406.09870	Plant-Applied Cement Mortar Lining			IND
	406.09871	Cement Mortar Coating			IND
	406.09872	Coal-Tar Coating			IND
	406.09873	Cold-Applied Plastic Tape Coating			IND
	406.09874	Fusion-Bonded Epoxy Lining and Coating			IND
	406.09875	Field-Applied Cement Mortar Lining			IND
	406.09900	Painting and Coating			
	406.13750	Leakage Testing of Concrete Structures			
	406.15000	Piping Schedule and General Piping Requirements			IND
	406.15034	Pressure Gages			
	406.15057	Copper Tubing			
	406.15058	PVC Pipe and Fittings, 3 Inches and smaller			
	406.15100	Valves			
	406.15108	Air-Release and Vacuum-Relief Valves			
	406.15119	Electric Motor Actuators			IND
	406.15122	Pipe Couplings and Expansion Joints			
	406.15142	Wall Pipes, Seep Rings, and Penetrations			IND
	406.15144	Pipe Hangars and Supports			
	406.15190	Equipment, Piping, Duct, and Valve Identification			
	406.15891	PVC Pipe Vent Systems			
	406.16050	General Electrical Requirements			
	406.16110	Raceways and Fittings			
	406.16120	Wires and Cables			
	406.16140	Wiring Devices			
	406.16160	Cabinets and Consoles			
	406.16161	Safety Socket Can			
	406.16450	Grounding			IND
	406.16460	General Purpose Dry-Type Transformers			
	406.16470	Panelboards			
	406.16500	Lighting Systems			
	406.16640	Cathodic Protection			
	406.16720	Intrusion Alarm System			
	406.16890	Fiber Optic Cable and Hardware			

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	406.16900	Electrical Controls and Misc. Electrical Equipment			
	406.16910	Programmable Logic Controller			
	406.16911	Programming Software for Programmable Logic Controller			
	406.16940	General Instrumentation System Requirements			
	406.16941	Field-Mounted Instruments			
NOTICES – 407					
	407.1	Preliminary Notices	Notices filed by subcontractors		
	407.2	Stop Notices and Release of	Notices filed by subcontractors		
	407.3	Public Notices	Notices to Public from Contractor		
	407.4	Blasting Notices			
	407.5	Concrete Pour Notices			
DRAWINGS – 408					
	408.1	Other Drawings	Miscellaneous drawings		IND
CLOSE OUT ISSUES – 409					
	409.1	Close Out Issues	Punch Lists/ <i>INOC</i> /Electronic or Expedition CD's		
	409.1-1	Audits	Audit results, project close out activities, emails (<i>this file will be kept in Engineering Library</i>)		
MANUALS – 410					
	410.1	Project Communication Manual	Issued at Pre-construction meeting to Contractor		
	410.2	CM Procedures Manuals			
	410.3	O&M Manuals			IND
	410.4	Quality Assurance Manuals			
SURVEY DATA – 411					
	411.1	Survey Data			
ENVIRONMENTAL PERMITTING PROGRAM – 412					
	412.1	Environmental Permitting Program			

Attachment 21-2: Cover Page of Construction Management Manual



Engineering Department



Construction Management Manual

ESD-100

October 2006