DEVELOPMENT OF BEST MANAGEMENT PRACTICES TO EXECUTE A SUCCESSFUL CAPITAL IMPROVEMENT PROGRAM

2015 Business Plan
Chapter 3, Water Facilities Focus Area, Goal Number 4
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CAPITAL IMPROVEMENT PROGRAM
BEST MANAGEMENT PRACTICES

Background

Development of Best Management Practices (BMP’s) to Execute a Successful Capital Improvement Program is Goal Number 4 in Chapter 3 (Water Facilities Focus Area) of the San Diego County Water Authority’s (Water Authority) 2015 Business Plan. This goal is to be complete by December 2011. The Water Authority developed business and technical process BMP’s for implementing their CIP in collaboration with its professional service contractors. In addition, for the past several years, the Water Authority participated in the Western Water Agencies Benchmarking Group (WWABG) and used their work products to enhance the CIP Planning, Design, and Construction Phase BMP’s.

Definition of Best Management Practices

Best management practices are methods or techniques found to be the most effective and practical means in achieving an objective while making the optimum use of the firm’s resources (Businessdictionary.com, 2012, para. 1).

Goal of CIP BMP

The goal of the BMP is to attain sustained, high levels of program and project success. Success is defined as consistently meeting project schedules, budgets, and cash flow projections, while maintaining scope and meeting stakeholder expectations. The goal is achieved by identifying and implementing the fundamental principles and practices for a CIP Program that provide these positive results.

Major Categories of CIP BMP

This document breaks down CIP BMP into the following six major categories.
1. Organizational Culture and Business Processes
2. Project Management/Project Controls/Budget Management
3. Contract Administration
4. Planning Phase
5. Design Phase
6. Construction Phase
Organizational Culture and Business Processes

Organizational Culture is the culmination of the values, beliefs, experiences, and behaviors that influence an organization’s internal environment. Business Processes are the standardized activities that agencies use to fulfill their core mission. Organizational Culture and Business Processes define how organizations conduct business. The BMP’s listed below foster an Organizational Culture and Businesses Processes that provide a foundation for the success of CIP projects.

Organizational Culture and Business Processes BMP’s

1. Ensure that the agency has a clear vision, mission, and strategic and business plan goals. (i.e. Update and discuss frequently).
2. Select CIP projects that directly contribute to the organizational vision, mission, and strategic and business plan goals. (i.e. Choose projects where the benefits exceed the costs).
3. Build projects “just-in-time” to stabilize rates and maintain assets.
4. Promote effective, efficient, collaborative, and innovative teams (i.e. Use a flatter organizational structure that pushes decision-making to lower levels).
5. Balance control and innovation. (i.e. Encourage critical thinking, but emphasize the importance of processes in helping to promote fiscal integrity and public value). Develop and hold staff accountable (i.e. Use stretch assignments and a willingness to accept modest levels of risk to foster an accountability ethic.
6. Foster trust and interpersonal rapport between stakeholders (i.e. Share information via public forums, websites, newsletters, emails, and other media.).
7. Implement a managed succession planning program.
8. Encourage continuous improvement (i.e. Capture and apply lessons learned).
9. Be an employer and “owner of choice” by marketing projects and using consistent and fair business practices. (i.e. Host construction contractor outreach workshops and apply standardized procurement processes).
10. Provide proactive management tools and processes to facilitate early issues resolution (i.e. Use project risk management, action plans, and issues resolution ladders).
11. Perform internal audits to ensure that critical project tasks have been appropriately completed as prerequisite to moving onto the Planning, Design, and Construction Phases (i.e. Establish a checks and balances process such as a “Gate Process” to facilitate transition from one milestone and/or phase to the next).
12. Apply style standards and templates to ensure accurate, consistent and effective communication (i.e. Develop design, project management and other key technical and business manuals).
13. Implement cost control processes that foster fiscal responsibility (i.e. Use Earned Value Management and schedule and cost performance indicators (SPI/CPI) to measure project progress and ensure that the public is getting what it is paying for).
Project Management/Project Controls/Budget Management

Introduction

“Project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements and is accomplished through the application of project management processes of initiating, planning, executing, monitoring” (PMI, 2004, p. 8). Project managers are responsible for ensuring that project execution aligns with the CIP implementation plan. They are involved in Planning, Design, and Construction Phases of the project. Successful project management, inclusive of project controls and budget administration, incorporates the BMP’s listed below.

Project Management/Project Controls/Budget Management BMP’s

1. Project Management Manual: Create a project management manual. The manual includes standards and best practices related to project management, several of which are described below.

   *Benefit:* A project management manual is a resource and reference for project managers implementing the CIP in a standardized manner.

2. Project Delivery Plan (PDP): Prepare PDP’s for CIP projects. At the beginning of the Design Phase, develop a PDP to serve as a roadmap for the project. This document communicates the project scope of work, budget, schedule, stakeholders, key issues, and overall execution plan to the project team members and management. The PDP follows a standardized outline that includes: Project Overview, Project Team, Project Background, Location, Schedule, Budget, Site Security, Execution Plan, Overview, Key Issues, Coordination with Stakeholders, Studies/Reports, and Agreements/Contracts sections.

   *Benefit:* PDP’s align the project team in the execution of a project. They are centralized locations for project information and tool for orienting new project team members.

3. Create a Checks and Balance Process (i.e. Gate Process): Establish a gate process that includes gate milestones for CIP projects. Gates are internal audits required at certain milestones in a project that allow a Project Manager to report out to management as to what decisions have been made on projects and what has been completed. The initial gates, developed as part of the PDP, and subsequent passages are reviewed and approved by senior managers from all functional disciplines. The following is a list of the gates.

   - Gate 1 – Project Development (Project Initiation)
   - Gate 2 - Design Initiation
   - Gate 3 - Preliminary Design
   - Gate 4 - Mid-Point Design
• Gate 5 - Final Design
• Gate 6 - Beneficial Occupancy
• Gate 7 - Approval by to Present Notice of Completion to Governing Authority for Approval
• Gate 8 – Project Closeout

**Benefit:** A gate process advances communication and buy-in from management on the direction of the project and the health of the budget and schedule before the project team is ready to move past a gate.

4. **Lessons Learned:** Capture lessons learned from past projects so that they may be applied to new projects. Lessons learned include technical, managerial, and process aspects of the project. The Project Manager ensures that relevant issues, including process changes, are documented, approved by management, and transferred to a historical database prior to passing each gate.

**Benefit:** Lessons learned are shared with staff and professional service contractors to improve future project performance and overall CIP processes.

5. **Issues Resolution Process:** Establish a clear process within the agency for elevating internal issues (i.e. elevation ladder starts from project manager to senior management to executives to General Manager Office - Board policy level) throughout all phases of the project. The project manager should update management regularly on project progress and issue status and should establish an issues log to monitor issues until closure. The log includes a description of the issue; history of its emergence; responsible party; pending contract amendment and/or change orders; major project scope, budget, or schedule changes; and target resolution date. The log is regularly reviewed and updated. When an issue cannot be resolved at the project team or any other level, the issue is immediately elevated to the next higher level.

**Benefit:** An issues resolution process establishes clear and simple elevation processes to increase construction management team effectiveness in resolving issues and avoiding delays (i.e. “time is money”).

6. **Project Risk Management:** Establish a project risk management process. The objectives of project risk management are to maximize the probability and impact of positive events (or opportunities), and minimize the likelihood and impact of adverse events (or threats) to the project. To manage risks, project teams develop a risk management plan or risk register. A project risk management process involves: identification, analysis, response, monitoring, and management. The project team meets to brainstorm and identify potential risks and capture them in a risk register. They analyze risks in terms of probability of occurrence and impact if the risk comes to fruition. They then prioritize risks based probability of
occurrence, impact, and cost. In response to the risk, the assigned risk owner works collaboratively with the project team to develop a risk mitigation plan. They develop this risk mitigation plan using one of the following strategies:

- **Avoidance** - Eliminate the risk or to protect the project objectives from impact by changing scope, adding time, or adding resources.
- **Capture** - Capture cost or time savings by changing scope, schedule or resources.
- **Transference** - Transfer the financial impact of risk by contracting out some aspect of the work to entities that are more able to take steps to reduce the risk.
- **Mitigation** - Reduce the probability or consequence of a risk event to an acceptable threshold by taking mitigation steps that may add costs and time, but are still be preferable to going forward with unmitigated risk.
- **Acceptance** - Accept certain risks and agree to address the risk if it occurs.

The risks, risk owner, probability of occurrence, impact, and risk mitigation plans are included in a risk register, which is reviewed and updated at the project team meetings throughout the Planning, Design and Construction Phases.

**Benefit:** A project risk management process anticipates, and addresses priority risks, and allocates resources to ensure that the project schedule, scope, and budget are met.

7. **Reporting:** Report project progress. Project managers routinely provide project status. The project manager and project controls staff assess the status at a detailed level using the cost-loaded schedule and the monthly task level variance and expenditure reports. The Project Manager verifies progress with team members. Project reports present the cost and schedule performance data and narrate the reason for deviation from the plan.

**Benefit:** Project managers use the detailed reports to manage projects. The higher-level reports keep management informed on areas of concern to facilitate decision-making.

8. **Resource Loaded Schedules:** Use resource loaded schedules to monitor project progress. Resource loaded schedules evaluate and plan the duration and sequencing of activities needed to complete the project. The initial schedule is developed using during the Planning Phase process and use appropriate software to handle the size and magnitude of the projects within a CIP. This schedule is updated in more detail once it enters the CIP and Design Phase. The schedule is cost loaded and includes key project milestones and a critical path that meets the defined project completion date. The initial schedule is saved as a baseline so that changes can be documented.

**Benefit:** Resource loaded schedules communicate to the project team, the resources and timeline for completing their respective tasks and the project progress to management to avoid surprises. They facilitate financial and workforce management of the CIP.
9. **Earned Value Management**: Use Earned Value Management (EVM) to track performance throughout all phases of the project. EVM measures performance objectively by comparing the actual cost of the work (earned value) to the budgeted cost of the work (planned value) (PMI, 2004, p. 60). EVM uses cost and schedule performance indicators (CPI/SPI) to measure project performance as compared to the original baseline plan.

   *Benefit:* EVM is used by staff and management to analyze CPI and SPI variances and to make the necessary adjustments needed to achieve the plan before schedule and budget are affected.

10. **Budget and Cost Management**: Establish a process for monitoring costs and managing budget. The project manager works collaboratively with project controls and budget analyst staff to review the project baseline in terms of budget. Once approved, the project baseline is reflected in the budget for the CIP. The project manager and project controls use project reports to analyze significant task level variances at completion to identify their causes and possible mitigation measures.

   *Benefit:* Budget and cost management avoids cost overruns.

11. **Cash Flow Management**: Create a process for projecting and managing cash flow. The project manager works collaboratively with project controls and budget analyst staff to review the project baseline in terms of timing of completion of activities. Once approved, the project baseline is used to plan bond sales and appropriations by analyzing significant variance from actual execution and planned appropriations.

   *Benefit:* Cash flow management facilitates debt, and associated water rate, management.

12. **Construction Cost Estimates**: Prepare realistic construction cost estimates. To realize the benefits of consistent construction cost estimating methods on all CIP projects, create a construction cost estimating manual. The manual provides standardized processes for construction cost estimates. This process includes updating estimates based on cost escalation of materials and labor based on economic conditions that affect the types of projects that are included in the agencies CIP. For example, Water Authority projects costs are primarily affected by cost escalation associated with fuel prices, labor costs, material costs such as steel and concrete, global economic impacts, bidding environment/competition, and other agencies’ bid results.

   *Benefit:* Up to date construction cost estimates establish realistic budgets, cash flows, and bidding ranges, and facilitates debt management.
13. **Metrics:** Develop metrics for all project phases (Planning/Design/Construction). Metrics are established criteria by which to measure progress. Define and document the success criteria by which the project will be periodically evaluated through completion by the end of each Phase.

*Benefit:* Metrics communicate to staff management expectations for successful CIP projects. Metrics measure progress, promote accountability, and facilitate continuous improvement.

14. **Benchmark Planning Phase Changes to Cost and Schedule:** Benchmark cost before exiting the Planning Phase. Benchmarking compares actual progress with established criteria or metrics. Before completing the Planning Phase, benchmark the:
   - Total project cost and schedule to previous budgets; and estimates of capital construction cost developed during Project Development;
   - Detailed Design Phase budget and schedule to actual costs and schedule developed during Project Development;
   - Estimates of capital construction cost to previous budgets and estimates of capital construction cost developed during Project Development;
   - Construction services budget and schedule to previous budgets and estimates of capital construction cost developed during Project Development.

*Benefit:* Benchmarking compares actual with planned performance and other projects to determine team effectiveness for project execution. It determines the required project implementation, required process and business changes, and fosters continuous improvement.

15. **Benchmark Design Phase Changes to Cost and Schedule:** Benchmark cost and schedule before exiting the Design Phase. Benchmarking compares actual progress with established criteria or metrics. Before completing the Design Phase, benchmark the:
   - Total project cost and schedule to previous budgets and estimates of capital construction cost developed during Planning Phase;
   - Detailed Design Phase budget and schedule to actual costs and schedule developed during Planning Phase;
   - Estimates of capital construction cost to previous budgets and estimates of capital construction cost developed from Planning Phase;
   - Construction services budget and schedule to previous budgets and estimates of capital construction cost developed during the Planning Phase.
Benefit: Benchmarking compares actual with planned performance and other projects to determine team effectiveness for project execution. It determines the required project implementation, required process and business changes, and fosters continuous improvement.

16. Benchmark Construction Phase Changes to Cost and Schedule: Benchmark cost and schedule before exiting the Construction Phase. Benchmarking compares actual progress with established criteria or metrics. Before completing the Construction Phase of the project, benchmark the:
   - Estimated project cost and schedule to previous budgets estimated during the Design Phase;
   - Estimated construction budget and schedule developed during the Design Phase to actual costs and schedule;
   - Actual capital construction cost to previous budgets and estimates of capital construction cost developed during the Design Phase;
   - Lowest apparent bid to final capital construction cost.
   - Actual soft costs versus total project costs; and
   - Actual hard capital construction costs versus actual total project costs.

Benefit: Benchmarking compares actual with planned performance and other projects to determine team effectiveness for project execution. It determines the required project implementation, required process and business changes, and fosters continuous improvement.

17. Exception Management: Define and implement criteria for identifying and managing exceptions in scope, schedule, quality, and cost performance. “Exceptions” are projects that substantially deviate from the planned execution.

Benefit: Exception management informs management when a project requires additional attention to monitor, control, and mitigate potential negative issues. Exception Management promotes development of action plans to correct issues.
Contract Administration

Introduction

Contracts Administration ensures that service providers perform in accordance with the contractual commitments and those obligations to the purchaser are fulfilled. Contract administration responsibilities include preparing procurement documents for professional services, construction, and products in a standardized manner and in accordance with government codes. Other responsibilities include processing invoices, contract amendments, and construction change orders. Contracts administration is required for the Planning, Design, and Construction Phases.

Contract Administration BMP’s

1. **Contract Administration Group**: Establish a contract administration group who coordinates with Project Managers, Construction Administrators, and other functional CIP groups to analyze, review, and revise Scopes of Work for completeness, clearness, and consistency within contract documents, the project and standard documents, and government codes. This group leads the public works bidding process and reviews professional service and construction contractor invoices against contract terms to ensure compliance and certify payment. It also is the lead for responding to Publics Records Requests, prequalifying construction contractors, and evaluating bid to ensure that they are “responsive” and ”responsible.”

   *Benefit:* A contract administration group is a clearinghouse that provides checks and balances to promote a fair and consistent contracting process and public value. Ensures timely payments to professional service and construction contractors, which is particularly important for the sustainability of small contractors.

2. **CIP Procurement Procedures**: Develop consistent CIP procurement procedures. Ensure that policies and procedures are in place and are consistently being used across the CIP. These include signature and approval policies, services and professional service procurement procedures, public works procurement procedures, and other procurement procedures that facilitate implementation of the CIP.

   *Benefit:* CIP procurement procedures teach professional service and construction contractors how to do business with the agency to promote an equal playing field and enhanced competition.

3. **Procurement Procedures Training**: Develop a procurement procedures training program for staff working on CIP projects. Provide training to all staff responsible for planning, design, and construction of CIP projects.
**Benefit:** Procurement procedures training promotes agency’s reputation as an *owner of choice* by ensuring consistency and fairness in dealing with all contractors, vendors, and suppliers.

4. **Specifications Style Manual:** Create a specifications style manual that outlines the standard format and style for preparing specifications. The guide includes provisions for language to use in directing construction contractors, standard documents that must be completed by construction contractors bidding the project, use of abbreviations, and other guidelines that clarify contract requirements.

   **Benefit:** A specifications style manual promotes clear, concise, complete, and consistent contract specifications.

5. **Utilize Electronic Communication to Potential Bidders and Existing Professional service and construction contractors:** Use world-wide-web electronic sites and internal websites in addition to traditional advertisements such as newspapers, and other media to communicate upcoming procurement activities such as Request for Proposals and Public Works Bids.

   **Benefit:** Electronic communication provides efficient and timely notification to professional service and construction contractors and increased competition.

6. **Timely Professional Service and Construction Contractor Payment:** Provide timely payment to contractors (no more than 30 days).

   **Benefit:** Timely professional service and construction contractor payments alleviate financial burden to contractors, which is particularly important to small contractors that rely on positive cash flow to sustain their business operations. Timely payments also facilitate accurate cash flow project and debt management.
Planning Phase

Introduction

The Planning Phase of a project develops the need for a project and creates the project scope, schedule, and budget. Once the project is justified in terms of fulfilling the agency’s vision, mission, strategic and business plan goals, more detailed engineering and environmental studies and preliminary design are completed to prepare final project scope, schedule, and budget. This information is then used to help the governing authority consider inclusion of the project into the CIP.

Planning Phase BMP’s

1. **Two-Step Planning Process**: Step one of the planning process develops conceptual projects, scopes of work, budgets, and schedules through master planning efforts (i.e. Project Development). Step two of the planning process develops detailed studies, project scopes, budgets, and schedules, and clearly defines the project details, environmental compliance issues, and associated risks. Once the second part of the planning process is complete, the project is incorporated into the CIP.

   *Benefit:* A two-step planning process facilitates management’s and the governing authority’s review of the need, schedule, and total cost for the project before the project moves into the Design Phase and resources are allocated for detailed design and construction.

2. **Project Experience**: Use past projects to develop initial budgets and schedule for CIP authorization. Compare project to previous projects and other agency projects to understand total project costs. Modify based upon unique project attributes and market conditions.

   *Benefit:* Without defined project scope, project experience will give an agency a cursory indication of what it will take to build a specific project.

3. **Planning Phase Budget and Schedule**: Prepare Planning Phase budget and schedules. At the beginning of Planning Phase, establish baseline scope, schedule, and budget (including contingency) for the entire Planning Phase effort based on previous projects, other agency projects, and unique project attributes.

   *Benefit:* Planning Phase budgets and schedules provide needed staffing and resources for the Planning Phase and holds Planning Phase staff accountable to a target so planning does not extend too long. They are financial management tools that demonstrate resource needs and timing to facilitate identification of funding sources and any rate impacts.
4. **Design Phase Budget and Schedule:** Prepare Design Phase budget and schedules. By the end of Planning Phase, define and document a budget and Work Breakdown Structure (WBS) for activity management during the detailed Design Phase.

*Benefit:* Design Phase budgets and schedules provide a general plan for staffing and resources for the Design Phase and hold Design Phase staff accountable for meeting schedule and budget.

5. **Construction Phase Draft Budget and Schedule:** Prepare Construction Phase draft budget and schedules. By the end of Planning Phase, define and document a draft Work Breakdown Structure (WBS) for activity management during the Construction Phase.

*Benefit:* Construction Phase budgets and schedules provide a general plan for staffing needs and resources for the Construction Phase. They are financial management tools that demonstrate resource needs and timing to facilitate identification of funding sources and any rate impacts.

6. **Project Delivery Method:** Select appropriate project delivery method (e.g., design-bid-build, design-build, or Construction Management-at-Risk) for project by the end of the Planning and Conceptual Design Phase.

*Benefit:* Selection of a project delivery method determines the project schedule and draft budgetary needs and construction contractor pool.

7. **Permit Requirements:** Identify required permits, required information for permits, and responsible parties for obtaining permits by the end of Planning Phase.

*Benefit:* Identifying permit requirements early determines if there are any project show stoppers and also helps staff determine realistic budget and schedule needs.

8. **Right-of-Way:** Identify land needs, current owners, and responsible parties for procuring right-of-way by the end of the Planning Phase.

*Benefit:* Identifying right-of-way needs early determines if there are any project show stoppers and establishes budget and schedule needs.

9. **Environmental Requirements:** Outline environmental requirements. To meet environmental requirement, identify documents to prepare, key information to collect, decisions to be made, stakeholders to involve, and parties responsible for preparation at the beginning of the Planning Phase.

*Benefit:* Identifying environmental requirements early determines if there are any project show stoppers and establishes budget and schedule needs.
10. **Initial Risk Register:** Prepare an initial risk register (identifying project risks and potential costs) as part of step two of the planning process and by the end of the Planning Phase. This plan will be based upon information and assumptions available at the time and updated routinely through project completion.

*Benefit:* Initial risk registers are tools used to develop project budget contingencies based on potential unknown issues that could arise as the project moves along through the phases.

11. **Lessons Learned:** Review lessons learned from previous projects to determine which ones are appropriate to be reviewed further by Design Phase staff for the project as part of step two of the planning process and by the end of Planning Design Phase.

*Benefit:* Lesson learned helps Design Phase staff understand the project scope and potential issues before they develop scopes of work for design contractors.

12. **Alternatives Analysis:** Define project alternatives and complete alternatives analysis as part of step two of the planning process and by the end of Planning Phase.

*Benefit:* Alternative analyses facilitate initiation of environmental work begin before the Design Phase, shortening the project schedule. It also develops total project budget and schedule before the Design Phase.

13. **Progress Checks:** Use progress checks to define, document, and implement progress checks at key milestones during Planning Phase with management and appropriate stakeholders.

*Benefit:* Progress checks ensure effective communication so that management is aware of how a project is being executed and all project deliverables are met.

14. **Preliminary Value Engineering:** Once a preferred project alternative is selected, conduct a preliminary Value Engineering (VE) exercise to obtain expert input as part of step two of the planning process and by the end of the Planning Phase. The level of effort is scaled based on fit-for-purpose. Perform a more detailed VE during the Design Phase.

*Benefit:* Preliminary VE exercises determine more efficient ways to build a large project and establishes budget and schedule for the project.

15. **Life Cycle Cost Benefit Analysis:** Perform a life cycle cost benefit analysis on the planning study’s scope or work to determine initial capital cost versus operation and maintenance cost. Include items such as alternative equipment costs, and manpower and resources needed to operate and maintain the completed facility. Update this analysis during the Design Phase to include changes in scope.
Benefit: Life cycle cost benefit analyses compares initial investment versus long term benefits of a project to determine the true cost of a project and facilitate decision-making in terms of whether the project is a viable addition to the CIP. These analyses develop the business case for the project to inform management of the estimated operations and maintenance costs associated with this project.

16. Third Party Reviews: Convene an expert review panel to provide support, advocacy, guidance, and review for high-risk projects.

Benefit: Third party reviews mitigate risk to the Agency.

17. Project Manager Appointment: Appoint a project manager for the Design Phase while project is still in the Planning Phase and include them in the Planning Phase team.

Benefit: Appointing a project manager early facilitates effective knowledge transfer.

18. Public Outreach Plan: Conduct stakeholder analysis to identify those interested in and impacted by the project. Prepare a public outreach plan, that addresses stakeholder needs and begin public outreach during the Planning Phase.

Benefit: Public outreach plans foster a positive relationship with stakeholders and Identify stakeholders, stakeholder needs, and how they will be incorporated into the project scope, schedule, and budget.

19. Business Case (Justification) for Project: At the end of Planning Phase, prepare a business case for the project or justification as to why the project is ready to proceed into the Design Phase. Elements may include alignment with organizational vision and mission, support of strategic and business plan goals, system operational needs, funding availability, service-level commitments, stakeholder support, and cost-effectiveness.

Benefit: Business cases determine if the project is feasible before resources are expended.
Design Phase

Introduction

The Design Phase begins when the Planning Phase has completed scope, schedule, and budget definition and the project has been adopted and approved by the governing authority to be funded and included in the CIP. Environmental and right-of-way requirements for the project will have been defined. The goal is to complete environmental documents, land acquisition, permits, and other project approvals before completing final design so that the project can be bid for construction on schedule.

Design Phase BMP’s

1. Design Manual: Create a design manual to provide general administrative and technical guidelines to be followed by staff and design contractors selected 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 manual is a living document that must be updated regularly to address lessons learned and the refinement of processes and procedures.

   Benefit: A design manual provides a consistent method that is aligned with agency CIP standards on how to do business and design CIP projects for an agency and serves as a resource to Project Managers in the preparation of in-house designs.

2. Drafting Manual: Create a drafting manual to ensure that design contractors and staff prepare contract drawings in a consistent and standard manner.

   Benefit: A drafting manual is a resource for drafters and design contractors who prepare and check contract drawings. The manual ensures that contract drawings are consistent and adhere to industry standards.


   Benefit: Standardized specifications provide consistent standards for execution of CIP projects and address the owner/operator’s expectations for materials and equipment, as well as warehousing spare parts/equipment in regard to selection of type and quantity. They familiarize construction contractors and construction management staff and consultants with agency standards and expectations.

4. Planning Phase Deliverables: Complete steps one and two of the planning process and Planning Phase deliverables before beginning the detailed Design Phase. Do not accept the project into the Design Phase until stipulated deliverables have been produced at an
acceptable level (conceptual design, scope of work, resource loaded schedule, project budget, and project delivery method).

*Benefit:* Completing Planning Phase deliverables before moving onto the Design Phase minimize changes to approved, scope, budget, and schedule.

5. **Maintain Project Team:** As the project moves from the Planning to the Design Phase, maintain continuity of the project team that was involved in the Planning Phase.

*Benefit:* Maintaining project teams from the Planning Phase to the Design Phases facilitates efficient knowledge transfer and resource management, and maintains design and operational intent.

6. **Design Contractor Selection:** If using an outside design contractor, use the Request for Proposal process and employ a qualifications-based selection process in selecting a design contractor.

*Benefit:* Using a qualifications-based design contractor selection process produces competition, quality designs, and provides fairness to contracting/consulting community.

7. **Constructability Reviews:** Appoint construction staff and hire construction manager before beginning mid-point of design to provide constructability reviews and become familiar with the contract they must enforce. When selecting a construction manager, use a qualifications-based selection process.

*Benefit:* Selecting the construction manager and appointing construction staff by mid-point design facilitates constructability reviews before the final design is complete, ensuring the project is buildable and mitigating potential construction change orders in the Construction Phase.

8. **Construction Cost Estimate:** During the Design Phase, prepare a construction cost estimate. Construction cost estimates are bottoms-up construction contractor-type estimates, include current market and economic conditions, and are verified by a second independent party (may need third independent estimate for highly complex projects) estimate (to be completed by CM and/or internal staff cost estimator). Research significant variances to understand and resolve them.

*Benefit:* Construction cost estimates provide an accurate prediction of construction costs to create a realistic CIP project budget and funding/financial management requirements.
9. **Weekly Progress Meetings:** Employ weekly The Design Phase team meetings to ensure that the design is progressing and issues are identified and resolved in an expeditious manner.

   *Benefit:* Weekly progress meetings promote effective communication to maintain scope, schedule, and budget.

10. **Update Risk Register:** Update the initial risk register that was developed during the Planning Phase.

   *Benefit:* Updating the initial risk register identifies new risks as the project scope is refined. The risks then can be addressed as part of the project design to leverage opportunities and avoid negative impacts to scope, schedule, and budget.

11. **Public Outreach Plan:** Implement the public outreach plan that was prepared during the Planning Phase. Identify any additional stakeholders and respective issues. Update and continue implementing the public outreach plan.

   *Benefit:* Developing public outreach plans and engaging in public outreach early creates a foundation for a positive, inclusive relationship with stakeholders and determines stakeholder issues that can be incorporated into design.

12. **Establish Construction Phase Budget and Schedule:** Before completing the detailed Design Phase, establish a baseline budget and schedule for the Construction Phase. Construction Phase budgets and schedules plan the resources and time needed to complete Construction Phase activities.

13. *Benefit:* Construction Phase budgets and schedules provide a realistic plan for the execution of the Construction Phase and funding/financial management requirements.

14. **Lessons Learned:** Review lessons learned from previous projects to determine which ones are appropriate to be reviewed further by staff in the Design and Construction Phases of the project.

   *Benefit:* Lessons learned help design and construction staff to understand scope of project and possible issues before they develop scopes of work for design contractors.

15. **Independent Reviews:** Provide independent third-party quality assurance plan and specification reviews for complicated projects as well as those that staff might not have significant expertise on such as a large, complex pump station or dam to minimize risk to agency.
Benefit: Independent reviews ensure that construction contract documents are clear, complete, biddable, and constructible. They minimize construction change orders during the Construction Phase and provide the intended deliverables.

16. Right-of-Way: Obtain all land acquisition, rights-of-entry, and permanent/temporary easements needed before final design is complete.

Benefit: Addressing right-of-way issues during the Design Phase minimizes risk of delay to start of construction due to potential land issues.

17. Environmental Compliance and Permits: Complete all environmental documents and obtain all major permits before completing final design.

Benefit: Completing all environmental documents and permits during the Design Phase ensures that the necessary environmental compliance and permit requirements are incorporated in the contract documents and minimizes risk of delay to start of construction due to potential environmental and permit issues.

18. Construction Contractor Outreach Workshops: Conduct construction contractor outreach workshops during design and hold at the project site.

Benefit: Construction contractor outreach workshops market CIP projects to construction prime contractors, subcontractors, vendors, and suppliers, and familiarize them with the project and provide a networking opportunity. The workshops promote a competitive bidding environment and the agency’s reputation as owner of choice.

19. Owner/Operator Representative: Engage the owner/operator representative in a detailed review of the project design to ensure that the project meets the intended operational purpose.

Benefit: Engaging the owner/operator representative in the Design Phase ensures that owner/operator requirements are addressed in the project design.

20. Design Comments Tracking: Use a spreadsheet to compile design comments and resolution of comments. Distribute to the project team for team members to type their comments directly into the spreadsheet with reference to specification and plan sheets.

Benefit: Tracking design comments, ensures that all comments are addressed to the reviewers’ satisfaction.
Construction Phase

Introduction

The Construction Phase begins when the design plans and specifications or contract documents, are competitively bid and awarded to the lowest responsive, responsible bidder. The construction contract documents define the project scope and quality standards for quality and the timeliness of construction. A critical factor for a successful construction project is clear contract documents that represent the requirements and expectations of all stakeholders. The Construction Phase ends when final payment is issued to the construction contractor after verifying the work performed is in compliance with the contract documents, and the constructed facility is capitalized and turned over to the owner/operator.

Construction Phase BMP’s

1. Construction Management Manual: Create a construction management manual that documents the practices, procedures, and standards for construction management, covering administration and quality assurance activities, from pre-construction through construction, and post construction. A construction management manual is a living document that must be updated regularly to address lessons learned and the refinement of processes and procedures.

   Benefit: A construction management manual is a reference and guide for staff and construction management teams, and ensures construction projects are administered consistently to meet or exceed industry quality assurance standards.

2. Field Inspection Manual: Create a field inspection manual that establishes inspection processes and procedures based on industry standard inspection principles and practices. Inspection staff determines the amount, quality, and acceptability of the work and the fitness of all labor, materials, or equipment relative to contract document requirements. A field inspection manual is a living document that must be updated regularly to address lessons learned the refinement of processes and procedures, and technological advances.

   Benefit: A field inspection manual ensures inspection is performed consistently to standards and that the final product is equivalent across all CIP projects.

3. Experienced Construction Management Team: Establish a construction management team with experience tailored to the construction project scope. Include agency personnel on the team who can ensure the contract construction management staff administers CIP construction to the agency’s established standards.

   Benefit: Establishing an experienced construction management team offers lessons learned from past similar projects that can be applied to current project.
4. **Owner/Operator Representative**: Ensure an owner/operator representative or a representative of the owner agency is included on the construction management team. Involve this representative early in start-up and testing the facility so they become familiar with the facility they will be taking over.

   *Benefit*: Engaging the owner/operator representative during construction establishes lines of communication and interdepartmental/interagency issues elevation procedures well before taking on the challenges of start-up testing and bringing a facility on-line.

5. **Document and Standardized File System**: Establish a standard file system for construction documentation to serve as a detailed record for the project. Require that the construction team documents and includes in the file system items such as correspondence, meeting minutes, submittals, requests for information, change orders, inspection reports and photos, claims documentation, and a chronology of issues from development through resolution.

   *Benefit*: A document and standardized file system ensures consistent documentation procedures are being followed, improves construction management team responsiveness, ensures project records are developed to agency standards, and assists in resolving project disputes and defending improper claims.

6. **Pre-construction Documentation**: Document the pre-construction site conditions, including surrounding roadways, adjacent private property fences and driveways to verify that surrounding properties and topography are returned to preconstruction conditions.

   *Benefit*: Pre-construction documentation ensures that property is returned to existing conditions and assists in settling damage claims and lawsuits.

7. **Project Partnering**: Use project partnering at the beginning of large CIP construction projects. Use an independent third party facilitator for partnering on large projects and meet at least quarterly with contractor’s project management, sponsor level, and executive level teams. Encourage significant stakeholders such as regulatory and/or member agencies to attend these partnering meetings as appropriate.

   *Benefit*: Project partnering creates a work environment and construction contractor/owner relationship that fosters honest communication, trust, alignment with project goals, and mutually agreed dispute elevation procedures.

8. **Baseline Schedule**: Ensure the construction contractor develops an accurate and logical baseline schedule that demonstrates the construction of the project in accordance with contract requirements. Document the construction management team’s review of the
baseline schedule that address items such as feasibility, activity sequencing, duration, and logic, productivity, and means and methods assumptions.

*Benefit:* A baseline schedule establishes a documented record of project progress, and minimizes disputes regarding causes for delays.

9. **Three-Week Look-Ahead Schedule:** Require that the construction contractor provide a three-week look-ahead schedule after the baseline schedule is accepted by the construction management team. Discuss progress using the construction contractor’s three-week look-ahead schedule at the weekly construction progress meetings. Require monthly schedule updates and review meetings.

*Benefit:* The three-week look-ahead schedule verifies progress payments requests; promotes accurate, up-to-date record drawings of asbuilt conditions; and ensures that construction delays are documented and contractor recovery plans are in place.

10. **Schedule of Values:** Require a detailed schedule of values to establish measurable fair value of the work performed relative to the construction contractor’s bid. Ensure the schedule of values is based on activities in the Critical Path Method baseline schedule and that the values assigned to work activities are balanced and fair assessments and that payments are timely. Use this tool to verify monthly progress payments.

*Benefit:* A detailed schedule of values increases the efficiency of the payment process by minimizing disputes over payment values and ensures that the construction contractor is fairly paid as they complete the required work.

11. **Change Order and Dispute Resolution Process:** Review contract change order and contract dispute resolution process with the construction contractor early in the project and emphasize that written change orders are required to change the contract and authorize and pay for work. Establish a change order approval process that ensures prompt processing and execution of project change orders.

*Benefit:* Reviewing the change order and dispute resolution process with the construction contractor minimizes disputes over extra work, and ensures each party understands the contract procedures requirements to protect their rights.

12. **Contract Record Drawings:** Maintain a redline set of record drawings and specifications during construction of the project that serves as the basis for the electronic contract record drawings. Update the redline drawings on a monthly basis as part of the monthly progress payment review process.

*Benefit:* Contract record drawings are the as-built record for the constructed work that is used in operations and maintenance of the facility and an accurate reference for the design of future improvements.
13. **Weekly Progress Meetings**: Convene weekly, on-site, progress meetings with the construction management team and the construction contractor. The agenda includes items such as safety, public affairs, environmental concerns, and construction concerns, inspection issues, and progress on submittal, requests for information review, change orders, and non-compliance reports.

*Benefit*: Weekly progress meetings document progress and discussions and facilitate coordination between the construction manager and construction contractor on construction-related issues.

14. **Start-up, Testing, and Commissioning Coordination**: Begin start-up, testing and commissioning coordination with the owner/operator early in construction. Ensure that the construction manager holds the construction contractor accountable for contractually required operations and maintenance training.

*Benefit*: Start-up, testing and commissioning coordination ensures that the owner/operator participates, becomes familiar with the operation and maintenance requirements of the facility, and confirms future resource needs.

15. **Contract Closeout**: Establish a construction contract closeout plan that addresses substantial completion and beneficial occupancy, the development of a punchlist, an internal process to facilitate stakeholder department review and acceptance of the facility, and procedures for project acceptance and Notice of Completion including documented resolution of commitments and agreements.

*Benefit*: Contract closeout ensures that the construction contractor punchlist items and other project commitments are completed in a timely manner and in accordance with contract requirements and stakeholder expectations.

16. **Warranty Management Plan**: Develop a warranty management plan for inspection of the facility and equipment prior to expiration of contract warranties. Coordinate the development of a warranty management plan with the owner/operator, early in construction, to plan for any shutdown requirements. Warranty issues include revegetation and site restoration requirements, member agency agreement terms, and stakeholder obligations.

*Benefit*: A warranty management plan ensures timely completion of warranty items, in accordance with construction contract, permit requirements, and stakeholder expectations, and in a manner to put the project into operations as soon as possible.
Conclusion

In conclusion, and as discussed above, this document presented the Organizational Culture and Business Processes, Project Management, Contract Administration, Planning Phase, Design Phase, and Construction Phase BMP’s. These BMP’s were developed by the Water Authority and further enhanced using the work product created by WWAGB. They are currently in use by the Water Authority and assist the agency in fulfilling its mission to provide a safe and reliable water supply to San Diego County in a fiscally responsible manner. This BMP document fulfilled Development of BMP’s to Execute a Successful CIP is Goal Number 4 in Chapter 3 (Water Facilities Focus Area) of the Water Authority’s 2015 Business Plan. These BMP’s will continue to be used and updated to continue to attain sustained, high levels of program and project success.

Appendices A through J contain some of the Water Authority’s BMP’s, including tables of contents for the project management manual, design manual, construction cost estimating guidelines, drafting manual, general conditions and standard specifications, specification style guide, field inspection manual, construction management manual, and PDP, and the project risk management process.
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Water Authority staff will prepare the following items:
- Notice Inviting Bids
- Bid Proposal (Consultant to prepare the bid sheet)
- Contract
- Bond and insurance forms
- Schedules B-1 and B-2
- SCOOP forms

CSI Format
Prepare final technical specifications in CSI format.

Margins
One-inch inside margin. .5-inch top, bottom, and outside margin. Mirror margins.

Header
Do not include a header.

Footer
8 point, Times New Roman, specification #, file path\file name, section name, and section #\page #. Example:

<table>
<thead>
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<th>Specification #</th>
<th>Section Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>File Path\File Name (automatically updated)</td>
<td>Section #\Page #</td>
</tr>
</tbody>
</table>

Headings
11 point, Times New Roman, all capitals, regular font style (not bold).

Body
11 point, Times New Roman.

Abbreviations & Acronyms
Use “San Diego County Water Authority” on first use of name. Subsequent occurrences may be shortened to “Water Authority”.
Minimize the use of parenthesis.
Use industry-standard abbreviations and acronyms on first (and subsequent) occurrences.
Include abbreviations and acronyms, which are not industry-standard, in the Abbreviations section of the specification.

Numbers
Spell out numbers from zero to nine.
Spell out numbers at the beginning of a sentence.
Use numerical figures for any number with "percent", a fraction, or a decimal point.
Use a preceding zero for any number with a decimal point and a value of less than 1.0 (for example, “0.25” instead of “.25”).

Units of Measure
Spell out units of measure (for example, “feet”, “foot”, “inches”, “degrees”, and “percent”).

Hyphens
Hyphenate number and unit of measure when followed by a noun (for example, “ten-foot pipe”).
Hyphenate compound numbers (for example, “thirty-four”).

Dates
Format dates as per the following example: “November 10, 2003”.
Do not use weeks; specify calendar or working days (for example, “14 calendar days”).
Words & Phrases to Exclude
- "insofar as possible"
- "as soon as practicable"
- "adequate"
- "satisfactory"
- "in the opinion of"
- "competent"
- "it is preferred"
- "appropriate"
- contractions (for example, use "is not" instead of "isn’t")

Shall
Use "shall" in place of "should", "is", "are", and "be" (for example, "The dials shall be white, with black scale markings.").
Use "shall" for the Contractor (for example, "the Contractor shall be responsible for...").
Use "will" for the Water Authority (for example, "The Water Authority will...").
Avoid using "shall" (except when following examples above); replace with command verbs (for example, "Design, prepare, and submit full line interconnection diagrams for all the equipment furnished under this Contract.")

Consistency
Use terms consistently throughout the document (for example, use "plans" not "drawings", etc.).

References
Refer to other parts of the Contract Documents per the following example:
"Refer to Section #, Part #, Paragraph #, Item #, Sub-Paragraph #, Sub-Item #", etc.
QA/QC all references to other sections of the Contract Documents to ensure accurate cross-references.

Approval
If approval is needed, specify per the following example:
"Engineer will approve in writing" or "obtain written approval of the Engineer"

Additions & Revisions
If additions or revisions exist, specify per the following examples:
"Delete Section 01530, Part 1.03, Paragraph A, Item 1 and replace with the following:":
"Delete Section 01530, Part 1.03 "in its entirety" and replace with the following:" 
"Add Section 01530, Part 1.03, Paragraph B as follows:" 

Cover
Format cover sheet per the attached example.

Printing
Print double-sided.

Stamp
Stamp cover sheet of the specifications with Registered Engineer stamp per the attached example.
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Field Inspection Manual
Field Inspection Manual

ESD 130

November 2007
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ESD-100
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Appendix I

Project Delivery Plan
Project Delivery Plan

San Vicente Dam Raise Project
N0401, N0404, N0405, N0406

November 2010

Project Manager

Submittal: Revision 5
Validation

This Project Delivery Plan is a “living document” and will be updated throughout each phase of the project to capture completion of project milestones, key decisions and progress as well as document lessons learned. The project is now in the planning phase and has been updated to reflect this phase. The next major update will occur before design phase of this project.

This Engineering Project Delivery Plan has been reviewed.

______________________________
Gate Review Chairperson
Project Overview

Project History and Justification

This project is part of the fourth and final phase of the Water Authority’s Emergency Storage Project. The Emergency Storage Project will protect the San Diego region from potential disruptions to the water delivery system by increasing the amount of water stored locally. New water storage and pipeline connections will distribute water throughout the region if imported water supplies are cut off. It will provide up to six months of emergency water storage in the San Diego region while the damaged facilities are being repaired. The Emergency Storage Project is expected to meet the county’s emergency water needs through 2030. Furthermore, the San Vicente Reservoir will also provide the region carryover storage capacity to capture/store water in wet periods for use in dry periods.

Project Objective

The San Vicente Dam, owned and operated by the City of San Diego, is to be raised a total of approximately 117 feet higher than the current height of 220 feet. This increase in height would provide an additional 152,000 acre-feet of combined emergency and carryover storage for the region. Expansion of the San Vicente Reservoir is associated with several other Water Authority projects at the San Vicente site, including the San Vicente to Second Aqueduct Pipeline, San Vicente Pumping Facilities, San Vicente Reservoir Interconnect Pipeline, and San Vicente Interconnect Pipeline to the Moreno-Lakeside Pipeline.

The San Vicente Dam Raise Project also includes the possibility of a pumped storage project, wherein the San Vicente Reservoir would be the “lower” reservoir. The location of an upper reservoir has not been established. On March 8, 2007, the Water Authority received a Preliminary Permit from the Federal Energy Regulatory Commission that will allow the Water Authority to conduct preliminary feasibility analyses, while maintaining priority of application for a license for a future pumped storage project.

Lessons learned for this project may be found in the Lessons Learned Database located on the Water Authority’s Intranet.
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Project Risk Management Process
PROJECT RISK MANAGEMENT

Risk Concepts

Risk Elements
- Definable Event
- Probability of occurrence
- Impact of occurrence

Project Risk
- Event that could positively or negatively impact project scope, schedule, budget, and/or quality

Project Risk Management
- Addresses Risks
- Quantifies “True” Costs
- Ensures Objectives are Met

Risk Register
- Captures Risks, Risk Owners, Impacts, and Mitigation Plans

Risks Types
- Leverage Positive Risks
- Mitigate Negative Risks

Project Risk Management Process

Identify
Update
Analyze
Monitor
Mitigate

Manage Risks During All Project Phases
Qualitative Analysis
- Categorizes Risks

Quantitative Analysis
- Quantifies Impacts

### RISK RATING MATRIX

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### PROJECT RISK REGISTER

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