



DRAFT REPORT OF THE
INDEPENDENT AUDITOR FOR
THE SANTA CLARA VALLEY
WATER DISTRICT

CONSTRUCTION
CONTRACT CHANGE
ORDER MANAGEMENT
AND ADMINISTRATION:

OPPORTUNITIES
IDENTIFIED TO
STRENGTHEN PROCESSES
AND OVERSIGHT
STRUCTURE

Public release or dissemination of the draft audit report to parties other than intended by TAP International is strictly prohibited without written consent of TAP International, Inc.

August 26, 2019



Date: August 26, 2019

Memorandum For: Board Audit Committee

From: Independent Auditor, TAP International, Inc.

Subject: Transmittal of TAP International Performance Audit Report

Attached for your information is our draft report, *Construction Contract Change Order Management and Administration: Opportunities Identified to Strengthen Processes and Oversight Structure*. The audit objective was to determine if potential improvement opportunities are present in the construction change order process.

Our audit identified improvement opportunities to strengthen the change order management and administration because the current process is not structured to effectively mitigate risks posed by large capital construction projects, especially future projects planned by Valley Water. This draft audit report contains six recommendations that call for establishing third party review of change orders proposed for large capital construction projects, centralizing change order management and administration activities, and adding other activities consistent with leading practices. Management response to the audit recommendations are included in Appendix I of our report. {This sentence to be included in the final report}

TAP International, Inc.

Table of Contents

| | |
|---|-----------|
| Results in Brief | 3 |
| Why the Audit Was Conducted | 3 |
| How the Audit Was Conducted | 3 |
| What the Audit Found..... | 3 |
| Recommendations | 4 |
| Audit Objective | 7 |
| Scope of Work | 7 |
| Project Approach | 7 |
| Key Findings | 10 |
| Finding 1: Opportunities are Present to Better Align Valley Water Change Order Management and Administration to Leading Practices | 10 |
| Finding 2: Change Order Management and Administration Needs Uniform Implementation or Other Enhancements..... | 16 |
| Finding 3: Root Cause of Change Orders is Attributed to the Absence of Strong Support Systems | 23 |

Results in Brief

Why the Audit Was Conducted

Efficient and effective service and delivery are key priorities for the Santa Clara Valley Water District (Valley Water) to accomplish the goals of providing safe and clean water, environmental stewardship, and flood protection. Valley Water plans to contract with construction companies to complete 67 capital improvement projects over the next 15 years at a cost of \$5.158B, including large construction projects involving the Anderson Dam seismic retrofit and the Pacheco Reservoir expansion. Any changes to these contracted capital projects present a risk of cost overruns and schedule delays.

With the approval of the Valley Water’s Board of Directors, a performance audit was conducted of Valley Water’s construction contract change order process to identify, if any, the presence of potential improvements.

How the Audit Was Conducted

The Independent Auditor (1) analyzed 12 completed capital construction projects between 2017 and 2018 and performed a detailed file review of six of these contracts to examine how the change order process was administered by Valley Water management and staff; (2) compared Valley Water change order policies and procedures to best practices; (3) interviewed Valley Water management and staff from the Capital Utility and Watershed Divisions, Purchasing and Consultant Contracts Services Unit, Capital Program Planning and Analysis Unit, Valley Water Counsel, Capital Improvement Program (CIP) Committee officials, Valley Water contractors, and former Dispute Resolution Board (DRB) officials, and (4) implemented root cause analysis to identify the primary reason(s) for change order initiation.

What the Audit Found

This audit report describes the opportunities to enhance Valley Water’s current change order management and administration activities. Key business process improvement opportunities that were identified include:

- enhancing existing change order policies and procedures to better align with leading practices,
- enhancing constructability reviews with third party experts,
- updating how contingency budgets are established, and
- ensuring uniform implementation of change order preparation and processing.

These enhancements are necessary because TAP International identified change orders that consolidated multiple changes taking place on projects, projects where work was allowed to commence without the approval of a formal change order, and other activities which were implemented non-uniformly without documenting the causes for change orders and documenting pricing reviews.

This report further discusses key stakeholders’ identification of project planning and design activities as the leading factor driving change orders. TAP International’s analysis on this issue further identified that the decentralized design of Valley Water’s change order management and administration process does not routinely prevent the occurrence of gaps in project planning and design activities or ensure uniform implementation of policies and procedures.

TAP International also found that when project and construction management is not outsourced, Valley Water delegates nearly all the responsibility for change order management and administration to individual employees for the purpose of providing flexibility to meet project schedules. These employees have varying levels of experience and knowledge in project management and execute other primary roles and responsibilities. With these conditions, key support structures are necessary to aid project and construction managers in carrying out change order management and administration.

TAP International determined that added support structures should include a separate advisory body to review and recommend the approval of change orders for large-scale projects. This body can include legal, procurement, capital construction subject matters experts, management, or elected officials to monitor progress, including reviewing and recommending change order approval/non-approval. A new Project Management Office (PMO) could also address the gaps with project management knowledge among existing staff assigned to serve as project and construction managers. A PMO could allow project and construction managers more time to ensure project delivery by assuming responsibility for change order negotiation, pricing analysis, ensuring uniform implementation of the Quality Environment Management System (QEMS), and better reporting. Without additional support structures and better implementation of change order management and administration, Valley Water can expect to experience a high volume of change orders and inconsistent management of these change orders on its capital construction projects.

Recommendations

1. To mitigate the potential service and financial risks created by the issuance of change orders, especially on large-scale projects, we recommend that the Chief Executive Officer (CEO) update capital construction change order policies and procedures applicable to large-scale projects to:
 - a. Require an Independent Cost Estimate (ICE) for capital construction change orders.
 - b. Use a separate advisory body to review and recommend the approval of change orders.
 - c. Prohibit commencement of work until after change order approval.
 2. To help mitigate the occurrence of change orders, the CEO should enhance constructability reviews as part of the construction project design phase with the addition of independent subject matter experts to the review team.
 3. To add and enhance support structures to aid project and construction managers in delivering capital projects, the CEO should enhance the review and approval process for change orders (including potential change orders, contract change orders, and directed change orders) on capital construction projects that are new to Valley Water and/or whose project costs exceed \$100M. Options include:
 - a. Add external subject matter experts to the existing CIP Committee and meet on a frequent schedule to review project progress and make recommendations to the Board of Directors on all change orders.
- Or,
- b. Create a Project Steering Committee for each new project to review project progress and provide authority to review and approve change orders. The Committee should include a

Board of Director member, Valley Water management, project, and construction manager, external subject matter experts, outsourced legal construction contract counsel, and a representative from the Purchasing and Consulting Contracts Services Unit.

4. To further add and enhance project support structures, the CEO should create a PMO (or restructure the current Capital Program Planning and Analysis Unit) for all capital construction projects. The roles and responsibilities of the PMO will be to ensure consistent and uniform implementation of project management standards; manage and administer the contract management and change order process; consolidate, analyze, and disseminate lessons learned activities and historical project information for future project planning; coordinate projects and resources; and to serve as the information source for executive staff and committees.
5. To support the centralization of procurement activities, the CEO should transfer the responsibility to administer procurement activities on capital projects (i.e. request for bid preparation and bid processing) from the Capital Program Planning and Analysis Unit to Valley Water’s Purchasing and Consultant Contracts Services Unit. The PMO should assume responsibility for contract administration and change order management upon execution of the contract by the Purchasing and Consultant Contracts Services Unit. The Purchasing and Consultant Contracts Services Unit can also embed an employee into the PMO to oversee change order management or administer an oversight role in coordinating updated change order policies and procedures, and conduct spot audits to ensure change orders comply with contractual terms and conditions.
6. To promote uniform implementation of change order management and administration, the CEO should:
 - a. Develop and establish specific criteria for establishing contingency budgets for change orders that consider project complexity and size, such as \$0 contingency for capital projects less than \$100,000 ranging to an amount over \$1M for projects over \$500M eliminating the need for the Board of Directors to separately approve contingency budgets for each capital construction contract.
 - b. Update the Quality and Environmental Management System (QEMS) forms to:
 - Develop templates within the Capital Improvement Program Planning document to provide clarification on how the Quality Records should be completed.
 - Add a step in the Close-Out Checklist for the review of open change orders and potential change orders.
 - Enhance the Risk Management Process document to include a review of similar projects in the Capital Improvement Program Historical Information Retrieval (CIPHIR) tool to identify additional project risks and corrective actions that may not have been previously identified.
 - c. Enhance project management training to address change order management and administration, including negotiation, pricing analysis, and contract closeout activities.

TAP International thanks the Valley Water staff from the Capital Utility and Watershed Divisions that participated in this audit.

Background

Over the next 15 years, the total estimate for construction contracts to be awarded is approximately \$5.158 billion for capital improvement projects that improve, repair, replace, or construct infrastructure. Valley Water has 28 Water Supply projects, 19 projects to increase flood protection, 10 projects for environmental restoration, enhancement and mitigation projects, two projects to repair or maintain Valley Water buildings and grounds, and eight projects to upgrade or expand existing information technology.

What is a Change Order?

During the construction of a capital improvement project, change orders may be utilized. A construction contract change order, according to established industry definitions, is a written alteration that is issued to modify or amend a contract or purchase order. It can be bilateral (agreed to by all parties) or a unilateral (the public agency orders a contract change without the consent of the contractor) request that directs the contractor to make changes to the contracted scope of work or project's specifications. For construction contracts, the primary reason for a change order is the unanticipated conditions encountered during construction that were not covered by the drawings, plans, or specifications of the project.¹ Change orders at Valley Water can result in modifications to the established project specifications, schedule, cost, or scope of work, among other things.

Valley Water has three distinct types of construction-related change orders that can modify the original contract, which will be referred as change orders throughout this report. The various change orders include:

- potential change orders (PCO) (project issues that can lead to a contract change order),
- directed change orders (unilateral change directed to the contractor by Valley Water),
- contract change orders (changes agreed to by all parties).

Who Can Initiate a Construction Contract Change Order?

Change orders can be initiated by Valley Water, or at the request of contractors or both parties. In some cases, potential project issues can be prevented or disagreement over contractual terms or change orders resolved by using a Dispute Resolution Board (DRB). Each construction contract specifies whether a DRB will be used for the project and how the costs of the DRB will be shared between Valley Water and the contractor.

What is the Difference Between a Construction Contract Change Order and a Professional Services Agreement Amendment at Valley Water?

Contract change orders refer to changes that take place on construction contracts between Valley Water and companies involved in the construction of the capital project. These changes, such as schedule updates, costs, specification changes, scope of work expansions, and unanticipated changes are reflected on separate change order forms. Modification to the original base contract does not generally take place except for

¹ <https://www.nigp.org/home/find-procurement-resources/dictionary-of-terms>

modifications to certain terms and or conditions. Valley Water Counsel and the Purchasing and Consultant Contracts Services Unit do not have a formal role in the review of change orders.

Similarly, amendments to a Professional Services Agreement refer to changes that take place on base contracts for services provided to Valley Water. These services include project management services, engineering design services, staffing services, media services, and more. Amendments made directly on professional services contracts address all types of changes, such as modifications to completion dates, price, scope of work modifications, staffing changes, and terms and conditions among others. Valley Water Counsel and the Purchasing and Consultant Contracts Services Unit have a formal role in the review of amendments to professional service agreements.

Audit Objective

In 2018, Valley Water’s Independent Auditor (TAP International, Inc.) conducted an enterprise-wide audit risk assessment and identified construction contract change orders as an area that needed further review to ensure that the change order process is administered efficiently and effectively.

Our specific audit objective for this audit was to determine if potential improvement opportunities are present in the construction change order process.

Scope of Work

The scope of this audit included an evaluation of the change order business process for construction contracts completed between 2017 and 2018. The work focused on the Watershed Design and Construction Division as well as Water Utility.

Project Approach

To assess whether potential improvement opportunities are present in the capital construction change order process, TAP International performed the following activities:

- Examined change order policies and procedures against best practices for construction contract management applicable to change orders. Leading practices were gathered from the following sources:
 - Capital construction subject matter experts.
 - Federal Transit Administration's Best Practices Procurement Manual.
 - Washington State Department of Transportation - Construction Contract Order Process Guide.
 - Oregon Department of Transportation - Construction Manual.
 - Federal Acquisition Regulations (FAR 43.1 - General, subpart 43.2 Change Orders).
 - TAP International experience in examining capital construction programs in other public agencies.

The construction change order practices selected are applicable to business processes and were not in conflict with California state requirements.

- Reviewed all construction contracts completed between 2017 and 2018 (12) and related change orders to determine the frequency of change orders issued and the financial impact to the original contract. These 12 completed projects were:
 - Boardroom Audiovisual Modernization Project
 - Installation of Cathodic Protection Rectifiers and Deep Well Anodes on Santa Clara Conduit
 - Installation of Cathodic Protection Rectifies and Deep-Well Anodes on the Pacheco Conduit
 - Matadero Creek Sediment Removal & Erosion Repair and San Tomas Aquino Creek Erosion Repair Project
 - Almaden Valley Pipeline Carbon Fiber Reinforced Polymer Structural Repair Project
 - El Camino Storm Drain Erosion Repair Project
 - John D. Morgan Park Monitoring Wells Project
 - Pacheco Conduit & Rehabilitation Project
 - Fluoridation at WTP's
 - IRP2 Water Treatment Plant Operations Buildings Seismic Retrofit Project - PWTP and the PWTP Clearwell Recoat and Repair Project
 - Lower Berryessa Creek Project Phase 1
 - Penitencia Delivery Main and Penitencia Force Main Seismic Retrofit Project

- Examined six construction contracts for:
 - Review and authorization activities. For the six contracts, we examined the two formal documents used in the change order approval process identified by staff: the change order form (FC 207) and the Board Agenda Memorandum for Completion and Acceptance of each contract. We examined the Change Order form (FC 207) because it is used to obtain approvals from the project engineer up to the CEO for change orders that do not exceed the dollar value of the project contingency (and would require Board approval). The Board Agenda Memorandum for Completion and Acceptance was also used because it is a key approval document for the Board of Directors.
 - Pricing review and approval.
 - Nature of the change orders.
 - Time required to process the change order.

The six contracts subject to this review were:

- Installation of Cathodic Protection Rectifiers and Deep Well Anodes on Santa Clara Conduit
 - Installation of Cathodic Protection Rectifiers and Deep-Well Anodes on the Pacheco Conduit
 - IRP2 Water Treatment Plant Operations Buildings Seismic Retrofit Project - PWTP and the PWTP Clearwell Recoat and Repair Project
 - Penitencia Delivery Main and Penitencia Force Main Seismic Retrofit
 - Matadero Creek Sediment Removal & Erosion Repair and San Tomas Aquino Creek Erosion Repair Project
 - Lower Berryessa Creek Project Phase 1
- Interviewed Valley Water management and staff involved with the design and implementation of the construction contracts, project support, and financial management to discuss how change orders are processed, reviewed, approved, and monitored. Staff from the Dam Safety and Capital Delivery Division participated in these interviews.
- Examined the use of the Quality and Environmental Management System (QEMS) in the capital construction change order management process.
- Evaluated the process for the review and approval of change orders through interviews with members of the CIP Committee, Valley Water management and staff, and former DRB members.
- Performed a root cause analysis focused on the initiation of change orders. For this, we completed a qualitative analysis because documentation was not consistently prepared to conduct a quantitative analysis of root causes. TAP International interviewed Valley Water management, construction and project managers, contractors, former Dispute Resolution Board (DRB) members, and considered the results of our evaluation of Valley Water’s change order management and administration.

This audit is known as a performance audit. A performance audit evaluates the economy, efficiency, and effectiveness of programs, services, and operations. This performance audit was conducted in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. TAP International believes that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. A draft report was provided to Valley Water for review. Comments were incorporated as applicable throughout the report. [See Appendix 1 for formal agency comments to the recommendations included in this report. *[To be included in final report version, only]*]

Key Findings

Finding 1: Opportunities are Present to Better Align Valley Water Change Order Management and Administration to Leading Practices

Policies and Procedures Help Mitigate the Risks Presented by Change Orders

Large-scale construction projects generally have higher inherent risk because of their size and complexity. Key risks include implementing unnecessary change orders, unauthorized change orders, or over-priced change orders. Other risks include significantly changing the nature of the project, changing original scope of work specifications without appropriate justification, and not ensuring change order requirements were properly monitored through completion. These risks can significantly impact the cost, quality, or time to complete the project. For agencies to mitigate the risks associated with change orders, their policies and procedures play a critical role.

TAP International identified that Valley Water’s policies and procedures for the construction management contract change order process address many leading practices. Leading practices are industry accepted practices and procedures recommended as most effective to enhance service delivery and to mitigate risks. As shown in Table 1, Valley Water’s change order policies and procedures fully or partially address 22 of 30 leading practices reviewed. These leading practices include adding change order terms and conditions in capital contracts, use of quality control checklists, and change order pricing requirements. Change order policies and procedures do not address eight other leading practices related to review of cost adjustments (pricing) commencement of work, and the use of advisory bodies.

Table 1: Leading Change Order Management Practices Administered by Valley Water

| | Total Number (30) |
|---|-------------------|
| Leading Practices Addressed or Partially Addressed in Policies and Procedures | 22 |
| Leading Practices Not Addressed in Policies and Procedures | 8 |

Potential to Add the Use of Independent Cost Estimates

Leading practices suggest the need for reviewing change orders with large cost adjustments against ICEs. The practice serves to determine if there are differences between the ICE and the contractor estimate and if so, then the basis for each estimate is discussed, which could prevent the overpricing of work. Although Valley Water’s change order policies and procedures call for the review of contractor cost estimates, staff explained that ICEs were not needed because Valley Water has sufficient expertise from prior comparable projects to determine the appropriateness of cost estimates. Without ICEs, Valley Water must rely on the expertise and experience of the project manager or construction manager to discuss and negotiate differences in pricing. TAP International determined that some managers may not challenge contractor cost estimates because they do not have the depth of knowledge in comparison to more experienced project and construction managers.

Prohibit Commencement of Work Until Approval of Change Orders

Leading practices suggest that construction work should not begin until change orders have been reviewed and approved. Valley Water’s construction policies and procedures do not explicitly address this practice and places Valley Water at higher financial risk. TAP International determined that on four of the six contracts, Valley Water allowed work to begin on multiple potential change orders (PCO), including beginning work on a time and materials basis until completion whereby Valley Water converts the PCO or combines multiple PCO(s) into a change order for formal review and approval. Table 2 below shows the formal approval of change orders after final inspection but before project completion. Project and construction managers explained that much of the capital project work is driven by seasonality that requires the opening of change orders as negotiations take place concurrently. Contractors reported that the process for developing project schedules should be reviewed as some project work is known to be delayed and should not have commenced until the following year. The known delays, if not addressed in the project schedules, create seasonal pressures that lead to change orders.

Table 2. Timing of Change Order Approval (Six Contracts Reviewed)

| Project Name | Contract No. & Submittals | Division | Total Number of Change Orders | When Change Orders were Approved | | | |
|---|---------------------------|---------------|-------------------------------|---|---|--|-------------------------------|
| | | | | After Contract Award, Before Final Inspection | After Final Inspection, Before Project Completion | After Project Completion, Before Completion & Acceptance | After Completion & Acceptance |
| Installation of Cathodic Protection Rectifiers and Deep Well Anodes on the Santa Clara Conduit | C0632 | Water Utility | 2 | 2 | 0 | 0 | 0 |
| Installation of Cathodic Protection Rectifiers and Deep-Well Anodes on the Pacheco Conduit | C0623 | Water Utility | 2 | 0 | 0 | 1 | 1* |
| IRP2 Water Treatment Plant Operations Buildings Seismic Retrofit Project- PWTP and the PWTP Clearwell Recoat and Repair Project | C0609 | Water Utility | 9 | 6 | 2 | 1 | 0 |
| Penitencia Delivery Main and Penitencia Force Main Seismic Retrofit | C0611 | Water Utility | 18 | 13 | 5 | 0 | 0 |

| | | | | | | | |
|---|------------|-----------|-----------|-----------|----------|----------|----------|
| Matadero Creek Sediment Removal & Erosion Repair and San Tomas Aquino Creek Erosion Repair Project | C0642 | Watershed | 0 | NA | NA | NA | NA |
| Lower Berryessa Creek Project Phase 1 | C0604 | Watershed | 3 | 1 | 0 | 2 | 0 |
| Totals | All | | 34 | 22 | 7 | 4 | 1 |

* One change order was processed after the Board approved the Notice of Completion and Acceptance for the contract because the Board had to increase the contract amount to pay for the change in work. This is contract 623, also discussed in another section of this analysis.

Establish Advisory Body to Support Change Order Management and Administration

To enhance oversight and accountability, leading practices suggest that a headquarters construction office (or Change Control Board) review all construction change orders and (if appropriate) recommend for approval. Valley Water’s construction policies and procedures do not address the use of a central body to oversee change orders. Instead, Valley Water implements delegated review and approval authority for change orders for both small and large-scale projects.

TAP International determined that the change order review and approval process can benefit from a different oversight process because the current process is not fully effective at mitigating potential risks, especially on large-scale projects. Presently, Valley Water relies on various individuals delegated to review and approve change orders from project and construction managers to the CEO, including requesting Board of Director approval on some of them depending on the price of the change. However, Valley Water has not assigned responsibility and authority to one single body or unit within Valley Water to:

- conduct uniform review of change orders for compliance to contract terms and conditions;
- ensure the change order adheres to contractual terms and conditions as well as other procurement requirements;
- determine whether the proposed change is not within the scope of the statement of work;
- determine if the proposed change is within the scope of the statement of work in the base construction contract but has been modified already by a previously approved change order.

These compliance responsibilities fall on the project or construction manager. Counsel staff do not have a formal role in the review or approval of change orders, including those that change the specifications, cost, and/or schedule of the contract, but informal discussions do occur. District Counsel staff explained that change orders generally include technical specifications, which are best handled by the project or construction management staff although TAP International determined that change orders address a variety of circumstances, discussed later in this report. The Purchasing and Consultant Contracts Services Unit does not have an informal or formal role.

In contrast, Valley Water has established a more formalized review process for amendments to professional services agreement, which provide consultant services that include project management services, engineering design services, staffing services, media services, and more. Counsel staff reviews all prepared amendments resulting in suggested modifications and then returns the document to the Purchasing and

Consultant Contracts Unit for updates. This process is cyclical, repeating multiple times spanning months before approval of the final draft of the amendment. The types of amendments that require CEO approval include schedule changes and other minor adjustments.

With some staff taking exception, project and construction managers agreed that changes to the authorization process may be needed for large capital projects and projects with scopes of work that are new to the District. These projects pose a greater potential financial and project delivery risk because Valley Water does not have prior project or construction management experience to anticipate project needs. For example, staff explained that even with a very small capital project that built a public restroom facility, it generated multiple change orders and additional costs because the agency had no prior experience with that type of project. Board officials and other construction experts also reported a need to implement stronger oversight for Valley Water’s planned large-scale projects, explaining that by the time the change orders reach the Board of Directors for approval, the project may be in completion phase, thus preventing any in-depth review or challenge of the change order.

Oversight mechanisms, such as an advisory body could be able to closely review change orders for Valley Water’s planned large-scale capital construction projects. The existing CIP Committee, comprised of Board members, can potentially provide change order reviews and recommend approval or denial by the full Board for high-risk capital improvement projects.² The advantages of establishing a greater role of the CIP Committee in the review and approval of change orders includes providing greater oversight of high-risk capital projects and streamlining the approval process for the Board of Directors. However, key disadvantages include ensuring that CIP members have sufficient knowledge of change order requirements, cost estimates, contract specifications, and capital construction project activities to provide effective oversight. While the current composition of the CIP Committee has elected Board Directors with requisite capital construction contract and legal experience, the composition of the Committee can change as future Board of Director elections are held, leaving the CIP Committee with gaps in knowledge and expertise. In addition, the CIP Committee would have to modify its meeting schedule to meet more frequently as well as determining whether to have a 3-day or 10 day agenda posting to ensure timely review and approval of construction change orders. Finally, risks in politicizing change order decisions may be present without established decision-making criteria in place.

A new standing or a project-specific steering committee can be comprised of a Board member, Valley Water management and staff, outsourced legal counsel with expertise in capital construction, Purchasing and Consultant Contracts Services Unit staff, independent construction industry subject matter experts to vet the change order and recommend approval to the Chief Operating Officer. Key advantages include providing third party oversight to evaluate and challenge construction contract change orders, more timely review and approval, and the capability of offering advisory services to project and construction management staff to help prevent issues that could require DRB resolution. While the DRB presently offers advisory services on some contracts, the Board composition includes only construction contract experts, and its use is not routine. A key disadvantage with implementing a project steering committee are the consulting costs involved with

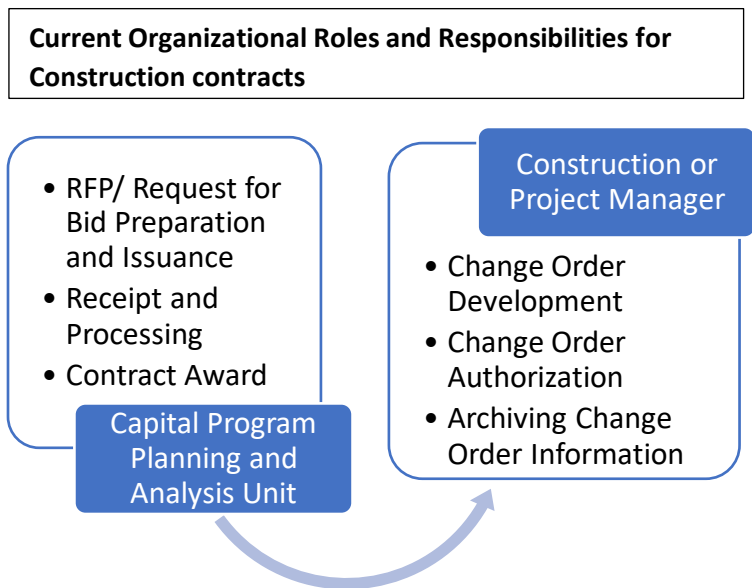
² The CIP does not currently have authority to approve and recommend approval of change orders by the Board of Directors.

implementing a standing committee or ad-hoc committees for each high-risk capital construction project, but there could be a return on this investment if costly change orders can be prevented.

Centralization of Some Support Service Activities

Other public agencies with large capital construction program utilize their procurement departments in preparing request for proposals and request for bid, including their issuance, receipt, bid evaluation, and award. Valley Water’s Purchasing and Consultant Contracts Services Unit does not have a role in Valley Water’s construction procurement activities because this role has been long administered by another unit within the Water Utility Capital Division - the Capital Program Planning and Analysis Unit. Without a role by Purchasing and Consultant Contracts Services, Valley Water primarily relies on the Counsel’s office to review the Notice to Bidders; the memo for Board action authorizing, advertisement for bids; the bid submittals; and the memo for Board action awarding a contract. These activities should be the primary responsibility of the Purchasing and Consultant Contracts Services to ensure that staff is complying with state and federal procurement requirements. Valley Water staff further explained that the Capital Program Planning and Analysis Unit supports procurement activities because these activities are completed on a timelier basis in comparison to having the Purchasing and Consultant Contracts Services Unit assume responsibility. A Valley Water management official responsible for general administration explained that given the current changes within the Purchasing and Consultant Contracts Services Unit, timeliness risks can be mitigated and that capital construction procurement activities could be centralized to ensure proper adherence to contractual and other procurement requirements.

Best practices describe the use of central management and administration of change orders on capital construction projects. The current Capital Program Planning and Analysis Unit serves more of a support role than a compliance role as it does not fully oversee the processing of change orders, which is the responsibility of the project manager and construction manager. Capital Program Planning and Analysis Unit staff capture information from change orders to track on worksheets, but it is not formally responsible for ensuring that change orders have all required documentation or ensuring that open preliminary change orders have been formally prepared. In addition, the Capital Program Planning and Analysis Unit prepares information for the CIP Committee, tracks capital projects and change orders, and collects QEMS reports among other things.



While project managers and construction managers did not report any significant concerns with the current structure of the Unit, TAP International identified areas for enhancement. These enhancements include:

- Analyzing the magnitude of cost overruns by comparing the total value of the change orders to the base contract amount. Presently, the Capital Program Planning and Analysis Unit combines the contingency budget with the original contract amount to compute whether costs exceeded the total construction amount. Other public agencies with large construction programs exclude the contingency amount from the total construction budget to determine the level of cost overruns in comparison to the original budget. These agencies use the information to target potential changes in the change order process to prevent excess costs over the original contract amount. TAP International determined that of the 12 capital projects completed between 2017 and 2018, nine had cost overruns averaging \$337,000³ excluding contract contingency budget amounts.
- Conducting robust data analysis to support design activities. The Capital Program Planning and Analysis Unit does not provide robust data analysis on the capital projects that would help project managers identify needed design changes on future projects. The Capital Program and Planning Analysis Unit generally uses Excel databases to capture project history, but the data includes basic contract data that cannot be used to identify trends and patterns to prevent future issues on capital projects.

As an alternative to the Capital Program Planning and Analysis Unit or a hybrid version of it, public agencies that implement large-scale capital projects use a formal PMO. A PMO assumes responsibility for implementing capital projects in a standardized way by providing information to support decision-making and ensures that policies and procedures are consistently followed. The range of functions, which are not currently performed by the Capital Program Planning and Analysis Unit can include:

- conducting analytics on historical projects to identify areas that need attention in planning future projects;
- consolidation and reporting of lessons learned information;
- ensuring uniformity and consistency in business processes over construction contracts; and,
- ensuring the accuracy of information and data reported to executive management.

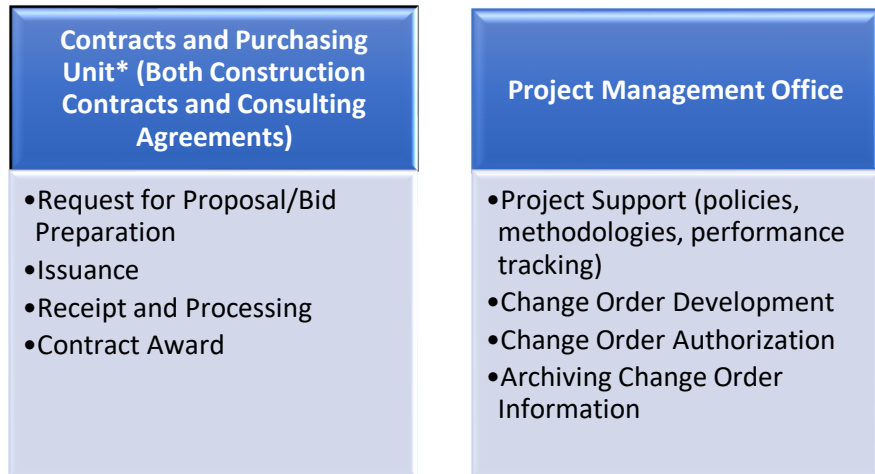
Presently, Valley Water decentralizes many of the above activities to the project manager or construction manager level. Establishing a centralized PMO will promote consistency among projects and sharing of project information.

Other functions of the PMO can include centralized change order management; QEMS oversight and monitoring; and implementation of continuous process improvement activities. At a very basic level, the PMO supports the project and construction management teams by facilitating information sharing, conducting analytics, seeking funding, and resourcing. Leading practices show that PMOs can offer:

³ When factoring in the contingency budget, one of the 12 projects incurred a cost overrun.

- **Governance-** The PMO ensures that decisions are made by the right people, based on accurate information. The governance role can also include audits or peer reviews, developing project and program structures, and ensuring accountability at all levels.
- **Transparency-** The PMO is responsible for providing information and being the single source of data. Information needs to be relevant and accurate to support effective decision-making and provided to people in a way they can understand.
- **Reusability-** The PMO facilitates the sharing of knowledge for the purpose of preventing project teams from reinventing the wheel, making the PMO the central point for lessons learned, templates, and best practice.

Leading Practice Organizational Roles and Responsibilities for Construction Contracts



*Graphic illustrates key leading practices and not Valley Water’s processes.

Finding 2: Change Order Management and Administration Needs Uniform Implementation or Other Enhancements

Official Forms Should Capture Reasons for the Changes

Of the six contracts reviewed, Valley Water processed 34 change orders across the six contracts completed between 2017 and 2018. These 34 change orders do not reflect the actual quantity of changes implemented on the contracts because TAP International identified another 110 individual change orders in the form of authorized PCO’s that took place across the six projects.

Although Valley Water maintains information on the specific nature of the change in individual project files or across three different information systems, TAP International could not quantify the reasons for the change orders because formal documentation required for change order initiation, review and approval did not consistently or clearly document the reason for the requested change or related justification. The form used by staff for initiating a change order (form FC 207) does not require the reason for a change to be documented. Form FC 207 is the official form used by the project and construction manager to obtain approval for change orders.

TAP International examined the documentation presented to the Board at the completion of a construction contract for review of the staff-approved change orders. We found in the six contracts we reviewed that the

Board Agenda Memorandums for Completion and Acceptance did not consistently or clearly describe the reasons for change orders approved by staff. For example, four contracts (632, 623, 609, 611) cited “unforeseen” site circumstances or conditions as one of the reasons for changes in the work across the change orders to each respective contract. Valley Water staff differentiated between Valley Water-requested changes and post-design clarifications in the Board Memo for one contract (609), but in another contract (611) grouped these two categories as the reason for the changes. Another contract (604) grouped Valley Water-requested and Contractor-requested changes as the reason. Finally, one contract (604) stated that “issues” were the reason for the change orders. Another category used in two contracts (611, 642) cited “unused supplemental bid items” as the reason for the changes but did not explain why these items went unused. A Valley Water management official explained that while projects files or information systems capture the specific reason for the change, the information is not consolidated for reporting purposes. Without having information about the reason(s) and justification for the change documented on the change order itself or in formal documentation provided to the Board, it raises transparency concerns about the status of the capital project, how available funds were spent, if cost reductions occurred, and how well Board of Director expectations for project and service delivery were met.

Final and Balancing Change Orders Need Consistent Preparation

Valley Water’s Construction Manual (Section 9, Change Orders) requires the Construction Manager to prepare a “final and balancing” change order designed to reconcile all change orders for the contract, and that this final change order accompanies the “Notice of Completion and Acceptance” of the contract to the Valley Water Board for approval. TAP International determined that although staff may implement this policy on other contracts, this practice was not implemented on the six contracts that we reviewed. Instead, Valley Water staff appear to use the Board Agenda Memorandum to transmit this information, instead of a required formal change order, to accompany the “Notice of Completion and Acceptance” to the Valley Water Board for approval. This information helps the Board of Directors determine if the project was delivered in accordance with the financial terms of the contract, which takes on greater importance for large scale capital projects. Valley Water staff confirmed that its current practice is to prepare a summary of all changes and their amounts and their final contract amount at the time of Notice of Contract Completion and Acceptance of Work. Valley Water staff also acknowledged that the Construction Manual requires an update.

Contingency Budget Development Should Consider Potential Risks

Valley Water establishes contingency budgets on most construction contracts to fund the cost of change orders. Although Valley Water does not have written policies and procedures in place that guide contingency budget development, project managers commonly apply 10 percent or 15 percent of the contract value (see Table 3) with limited consideration of risk factors. Based on our sample of contracts, TAP International determined that Valley Water establishes contingency budgets that are 10 percent of the contract amount for higher dollar value projects and 15 percent of the contract value for lower dollar value projects. Staff stated that where additional construction risks and complexities are known, higher contingency budgets are established.

Other public agencies have taken different approaches that consider capital project size and complexity risk factors. For example, some agencies establish a range of contingency budgets in that capital contracts valued

up to \$25M have contingency budgets of \$500,000 and capital contracts valued over \$500M have contingency budgets of up to \$1.2M.

Table 3. Award and Contingency Amounts for the Six Contracts Reviewed*

| Project Name | Contract No. | Division | Award Amount | Contingency \$ | Contingency % |
|---|--------------|---------------|------------------|-----------------|---------------|
| Installation of Cathodic Protection Rectifiers and Deep Well Anodes on the Santa Clara Conduit | C0632 | Water Utility | \$ 244,400.00 | \$ 36,600.00 | 15% |
| Installation of Cathodic Protection Rectifiers and Deep-Well Anodes on the Pacheco Conduit | C0623 | Water Utility | \$ 291,740.00 | \$ 43,761.00 | 15% |
| IRP2 Water Treatment Plant Operations Buildings Seismic Retrofit Project- PWTP and the PWTP Clearwell Recoat and Repair Project | C0609 | Water Utility | \$ 6,072,500.00 | \$ 910,875.00 | 15% |
| Penitencia Delivery Main and Penitencia Force Main Seismic Retrofit | C0611 | Water Utility | \$ 21,535,025.00 | \$ 2,153,500.00 | 10% |
| Matadero Creek Sediment Removal & Erosion Repair and San Tomas Aquino Creek Erosion Repair Project | C0642 | Watershed** | \$ 1,650,750.00 | \$ 165,075.00 | 10% |
| Lower Berryessa Creek Project Phase 1 | C0604 | Watershed** | \$ 12,186,600.00 | \$ 1,219,000.00 | 10% |

*Valley Water does not have a written policy that establishes the basis to use in establishing a contingency budget.

**Construction management was outsourced.

While contingency budgets are disclosed separately in Board memos and approved by the Board of Directors for each capital construction contract, this practice, allows Contractors to know early on the amount of potential revenue that could be earned on the contract from change orders. When this occurs, Contractors may be more prone to propose activities that could increase project costs – a potential financial risk to Valley Water. Valley Water executives explained that disclosure of the contingency budget allows the Board of Directors to know the level of funding dedicated within their representational zone. Other agencies do not establish contingency budgets and instead require governing body review and approval of each change or allow the contingency budgets for unforeseen circumstances only.

Delegation of Review and Approval Authority of Change Orders Needs Consistency

Each capital contract has a financial threshold established that delegates review and approval authority of change orders. These authorization thresholds can vary from project to project. Valley Water’s CEO (or designee) can approve change orders up to the dollar amount of the contingency budget. Valley Water used dollar amounts as thresholds, rather than percentages, to set staff-delegated approval authorities for change

orders, which adds a greater complexity to change order management, as shown in Table 4. For two Water Utility contracts, the Engineering Unit Manager and Deputy Operating Officer had approval authority for changes valued up to \$5,000 and \$10,000, respectively. For the two other Water Utility contracts, the Engineering Unit Manager and Deputy Operating Officer were authorized to approve changes up to \$100,000 and \$250,000, respectively. For the two Watershed contracts, with construction management outsourced, for example, the Board authorized Deputy Operating Officer approval of contract changes for one contract up to \$50,000, while on the other contract, authorized changes up to the contingency amount of \$165,000. Streamlining the financial thresholds for delegated review and authorization facilitates the effectiveness of service delivery.

Table 4. Comparison of Change Order Approval Thresholds for the Six Contracts Reviewed

| Contact Name | Contract No. & Submittals | Division | Contract Award Amount | Contingency Amount | Contingency % | Approval Thresholds |
|---|---------------------------|---------------|-----------------------|--------------------|---------------|--|
| Installation of Cathodic Protection Rectifiers and Deep Well Anodes on the Santa Clara Conduit | C0632 | Water Utility | \$244,400. | \$36,600.00 | 15% | EUM* \$5K and DOO* \$10K |
| Installation of Cathodic Protection Rectifiers and Deep-Well Anodes on the Pacheco Conduit | C0623 | Water Utility | \$291,740.00 | \$43,761.00 | 15% | EUM \$5K and DOO \$10K |
| IRP2 Water Treatment Plant Operations Buildings Seismic Retrofit Project- PWTP and the PWTP Clearwell Recoat and Repair Project | C0609 | Water Utility | \$6,072,500.00 | \$910,875.00 | 15% | EUM \$100K and DOO \$250K |
| Penitencia Delivery Main and Penitencia Force Main Seismic Retrofit | C0611 | Water Utility | \$21,535,025.00 | \$2,153,500.00 | 10% | EUM \$100K and DOO \$250K |
| Matadero Creek Sediment Removal & Erosion Repair and San Tomas Aquino Creek Erosion Repair Project | C0642 | Watershed | \$1,650,750.00 | \$165,075.00 | 10% | EUM \$50K and DOO up to contingency amount |
| Lower Berryessa Creek Project Phase 1 | C0604 | Watershed | \$12,186,600.00 | \$1,219,000.00 | 10% | EUM \$30K and DOO \$50K |

*EUM – Engineering Unit Manager; DOO -Deputy Operating Officer.

Cost Reductions on Capital Projects Should be Consistently Processed Through Change Orders

Valley Water change order procedures require the issuance of change orders to reflect cost reductions in the capital project. These change orders can then be used by Valley Water’s Budget & Financial Analysis Unit to modify the budget information in the financial management system.

TAP International determined that Valley Water uses change orders inconsistently to document changes that resulted in cost reductions/savings. On three of the six construction contracts (604, 611, 642), five change orders were processed with cost savings for these three contracts, including both Water Utility and Watershed Division contracts. For contract 604 (Lower Berryessa Creek, Phase 1), the Watershed Division project management staff reported about \$1.2 million in cost savings across the three change orders⁴. Further, in change order #15 for Water Utility contract 611 (Penitencia Force Main Seismic Retrofit), a change order documented a cost reduction of \$135,025 from deletion of Supplemental Bid Items in their entirety because naturally occurring asbestos was not encountered on the project.

In contrast, Valley Water did not issue a change order for cost reductions on Watershed Division contract for Matadero Creek Sediment Removal & Erosion Repair and San Tomas Aquino Creek Erosion Repair Project (contract 642). It is unclear how Valley Water staff otherwise formally documented changes in the project files given that Valley Water outsourced construction management for this contract. The Board Agenda Memorandum for the Notice of Completion and Acceptance for contract 642 states there were no change orders, but that there was a cost reduction to the contract in the amount of \$219,810, as shown in Table 5. The Board Memo for contract 642 stated that “Various cost reduction for quantity adjustments attributed by value engineering; non-implementation of supplemental bid items such as winterization, resulted in a net savings amount of \$219,810.00 less than the original contract award amount.” When change orders are not consistently issued for cost reductions, management cannot easily track the amount of funds available that could be expended for other purposes.

Table 5: Board Memo Showing Cost Reductions Without a Change Order (Board Agenda Memorandum, File #19-0208)

| Description | Contract Amount | Contingency Amount |
|--|-----------------|--------------------|
| Original Contract (Board Approved) | \$1,650,750 | \$1,650,750 |
| Cost Reduction Net Savings | <\$219,810> | \$1,650,750 |
| Final Contract Amount and Remaining Contingency | \$1,430,940 | \$1,650,750 |

Separating Change Orders to Retain Staff Approval Authority Should be Avoided

Valley Water assumes financial risk when multiple change orders are issued to likely avoid triggering an additional layer of review. For Water Utility contract #623, Valley Water staff used two separate change orders to reflect cost increases. The split allowed Valley Water staff to use the approval authorizations established when the Board of Directors approved the contract. The Board had initially authorized the CEO to approve up to \$43,761 in changes (a 15% contingency) for the almost \$292K project.

⁴ Valley Water had outsourced construction management on this contract.

The first change order was approved for \$40,000 “lump sum” for “hard rock drilling” at four well locations “to address an unforeseen condition.” The change order also states that:

“The additional cost of \$34,643.40 for disposal associated with the hard rock drilling requested” by the contractor “will be deferred and subject to action by the Valley Water’s Board of Directors. Valley Water staff will recommend the Board approve an increase in delegated change order authority for the requested amount of \$34,643.40 for disposal costs. If approved, a final change order will be submitted in that amount.”

Valley Water executed the second change order about one month after the Valley Water Board approved the Completion and Acceptance of the contract, with an increase of about \$31,000 to the contract’s contingency to pay for the second change order.⁵

While Valley Water management staff explained the change orders were prepared for two separate issues (increase in delegated approval authority and to approve a change order), the discussion acknowledged that in hindsight, that the order and sequence in which the change orders were processed would have been managed differently if Construction Services Unit staff had performed the construction management on the project. TAP International determined that the two change orders should have been combined. When the second change order was issued, it was too late for the Board of Directors to perform in-depth review of the change order, if needed.

QEMS System Can Be Expanded and Enhanced

Valley Water implements a quality controls program called the Quality Environment Manager System (QEMS) with the goal of accomplishing organizational excellence and environmental stewardship. The QEMS conforms to International Organization for Standardization (ISO), allows Valley Water to support continual improvement activities through developing employee knowledge, establishing controls and activities for products, services, and good practices, and helping to make Valley Water more efficient and effective. To this end, Valley Water requires project and construction managers to complete standardized checklists and other forms to help ensure quality assurance over program and services.

TAP International identified the current QEMS forms used in the design and construction phases can be enhanced and better utilized. While the QEMS forms and other documents provide general procedures to mitigate capital projects risks, potential improvement to form enhancement include:

1. **Incorporate existing District practices onto QEMS project reports.** QEMS document titled, *Capital Improvement Program Planning (Q710D01)* establishes Valley Water’s goal to instill a discipline of systematic planning for CIP projects. The procedure outlines the process steps for the CIP. For many of the steps, however, the Quality Records (Outputs from Process Steps) are not always defined and could be clarified by using links to templates or document examples.

⁵ Approval of the first change order (6/11/2018) occurred after the Final Inspection (5/25/2018) and Projection Completion (6/5/2018) and Recommendation to the Board for Completion and Acceptance of the Contract (6/8/2018). The CEO approved the second change order on 7/18/18.

2. **Enhance the Close-Out Checklist by including a review of open COs and PCOs.** QEMS document number *F-751-098* (Close-Out Checklist) is a form to create the Close-Out Report for each phase and final close-out of a project. With the coordination of the project owner, Capital Program Planning and Analysis Unit, and the General Accounting Unit, a review of all PCOs and COs that may still be open should be conducted so that the orders can be closed. This form can be updated to have a PMO type of office responsible for managing and processing open change orders.

The Close-Out Checklist also defines what information will be needed from the Capital Improvement Projects Historical Information Retrieval (CIPHIR) system to develop the CIPHIR report. The CIPHIR is a tool designed to provide critical information regarding previous and existing capital projects. The CIPHIR Project Status Report should include an item/section related to lessons learned on the project specifically related to project changes that resulted in change orders. Having this information systematically reported can institutionalize continuous improvement process activities. TAP International identified inconsistent implementation of historical reviews of past project to facilitate project planning because project files are not centrally collected and stored for easy access by staff.

In addition, TAP International determined that historical change order information that could be useful in planning comparable projects is not systematically collected or analyzed for project planning purposes because the Capital Program Planning and Analysis Unit is not fully set up to perform this activity. Lessons learned information is maintained by the project manager for individual capital projects. Although Water Utility and Watershed staff acknowledge the value of having lessons learned activities, the Divisions do not institutionalize outcomes for consistent adaptation on future projects.

3. **Consistently implement document Q-751-013 (Capital Project Delivery).** Capital project delivery forms provide instruction to unit managers, project managers, and project team members on how to manage the delivery of capital projects. Step 3 (Plan Planning Phase), Step 6 (Plan Design Phase), and Step 9 (Plan Construction Phase) require the review of information in the CIPHIR tool. This step is important but TAP International identified that project management practices vary by person and that each project is managed differently, based upon the knowledge and experience of the manager.
4. **Clarify Section 11, Appendix A, (Q-751-013, Capital Project Delivery).** Appendix A of Capital Project Delivery forms defines roles and responsibilities. TAP International identified that this section needs clarification because project managers are not always involved from project design to project completion as stated. For some projects, project managers perform project planning, and upon completion of project design, another construction manager will assume responsibility for the project's implementation. For other projects, the project manager will remain assigned to the project from initiation to close-out.
5. **Enhance the Risk Management Process Document W-710-128.** This document provides instruction to unit managers, project managers, and project team members on how to identify, assess, and respond to risks in order to manage or reduce potential adverse effects on achieving project goals. Instructions address project risks, but do not require the identification of specific risks that reviewing the historical project documents of change orders may identify. Adding a step to have the project

manager/risk owners review similar project information from the CIPHIR and describe specific corrective actions will also further enhance risk assessment in project planning.

Finding 3: Root Cause of Change Orders is Attributed to the Absence of Strong Support Systems

Root cause analysis (RCA) is a methodological technique designed to pinpoint the precise cause of an occurrence of a single or set of events or problems. When that cause is identified, solutions can be addressed to prevent re-occurrence. Root cause analysis for performance auditing relies on both quantitative and/or qualitative data collection and analysis methods; this method excludes the use of scientific investigation applied in other root cause analysis methods.

Although information was not readily available on the reasons for change orders, Valley Water management and staff reported that change orders involve the:

- price of materials or labor;
- quantity of materials or labor;
- material specifications;
- project work schedule;
- scope of work;
- changes in environmental conditions;
- terms and conditions; and
- unforeseen circumstances.

Although TAP International could not perform a quantitative analysis of the root causes of change orders, our qualitative analysis determined that inconsistent implementation of project planning and design activities can be linked to change orders. For example, project and construction managers explained that one project planning activity includes reviewing past comparable projects for the types of challenges and other problems that occurred so that the issues could be resolved in the design phase of the new project. However, not all project managers said they perform this activity. Without anticipating the types of issues that occur when planning similar projects, change orders could likely result. Valley Water contractors reported that while some change orders result from unanticipated events, others result from permitting issues, jurisdiction coordination issues, and scheduling issues that could have been prevented had these issues been fully resolved in the planning phase. Finally, former DRB members for Valley Water identified ambiguities in the design of the project as the cause of change orders during their service as a representative on the DRB.

Project manager and construction managers further attributed the project planning and design activity concerns to different levels of expertise and experience by Valley Water staff. Project managers and construction managers who have experience working at other agencies said their greater level of experience and expertise empowers them to challenge contractors on requested project changes. Project managers and construction managers, who said they had less experience, cited the need for additional project management training to address gaps in their level of expertise, such as risk management, cost estimating, and negotiation. While Valley Water makes available project management training, management explained that it is staff responsibility to receive the training and staff, who have taken the training, said that more training is needed

given that project and construction management is generally a secondary role and responsibility for Valley Water staff. TAP International determined that Valley Water does not require its capital construction staff to hold project management professional certifications which may be needed on large scale projects. Possessing project management professional certification provides assurance that project and construction managers have received comprehensive project management training and have full knowledge of project management standards and practices.

TAP International determined that the likely root cause for change orders is the absence of strong support systems to aid project and construction managers. These support systems include:

- Enhanced oversight of the design process. DRB members said constructability reviews, conducted by experts independent of the design process, are an effective method to prevent change orders for both projects designed by Valley Water staff and projects designed by consultants.
- Robust project management training programs.
- Enhanced change order policies and procedures.
- Enhanced quality assurance forms.
- Utilization of an advisory body that would support decision-making on change orders.

Without development of new and enhanced support systems, Valley Water can likely expect an increase of change orders on future capital construction projects.

THIS PAGE INTENTIONALLY LEFT BLANK