

PERFORMANCE AUDIT

**MANAGEMENT OF BRIGHTWATER
TREATMENT PLANT
ENGINEERING SERVICES
CONTRACT AMENDMENTS**



King County

Presented to
the Metropolitan King County Council
Labor, Operations & Technology Committee
by the
County Auditor's Office

Cheryle A. Broom, King County Auditor
Susan Baugh, Senior Principal Management Auditor
Jan Lee, Auditor Assistant

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EXECUTIVE SUMMARY

Introduction

This performance audit, included in the council-adopted 2006 King County Auditor's Office Annual Work Program, is the second of two Brightwater Project audits. The first audit focused on the Wastewater Treatment Division's (WTD) procurement practices for professional design engineering services for the Brightwater conveyance system. The second audit, presented in this report, evaluates WTD's management of contract amendments for Brightwater treatment plant design engineering services. In addition, this audit assesses the cost-effectiveness of WTD's contracting methods for treatment plant design and preconstruction services.¹

General Conclusions and Findings

The design of the Brightwater treatment plant is a particularly complex project that has been managed by a highly experienced and diligent project manager and team. However, WTD's management of the final design contract amendments and associated change notices did not fully comply with countywide policies and internal WTD procedures. In addition, the contract executed for the final design phase did not contain provisions to control project costs consistent with industry standards. The implementation of the preconstruction services contract also did not maximize opportunities to control costs consistent with industry best practices. As a result, WTD did not ensure that the county received the most cost-effective design engineering services for the Brightwater treatment plant.

Design costs exceeded the initial contract amount of \$41.5 million by approximately \$13.4 million (32.3 percent). The

¹ This is an audit of the county's contract management policies and process; it is not an audit of the performance of the contractors referenced in the report.

32.3 percent figure exceeded the 10 percent contingency for contract amendments estimated by WTD based on industry standards. The treatment plant costs were also "higher than [costs] for comparable project and industry norms" according to R.W. Beck, the County Council's Brightwater Oversight Management Consultant. The Oversight Management Consultant's conclusion was based upon a comparative analysis of the design costs for the Brightwater treatment plant and two other wastewater treatment plants, as well as the firm's extensive management and consulting experience within the wastewater industry. However, the Oversight Management Consultant recently advised that specific industry benchmarks were unavailable to measure the cost performance of design services more precisely due to the complexity of the design and unique contracting methods (e.g., General Contractor/Construction Manager) selected for the Brightwater Project.

WTD's practice of amending the treatment plant design contract to provide engineering services for non-treatment plant work also contributed to higher design costs. For example, conveyance, mitigation, and marine outfall facilities were performed under and charged to the treatment plant engineering services contract. This practice makes it difficult to track project costs as well as to measure and report actual project cost performance to elected officials, who will ultimately be held accountable for the Brightwater Project.

Extensive and costly design additions and modifications contributed to the higher design costs. Many of these design changes resulted from complex design elements, siting a Greenfield treatment plant (e.g., initiating the project from scratch) in an urban area located outside of King County, extensive community and public involvement and appeals processes, and multi-jurisdictional permitting and mitigation

requirements. Comprehensive value engineering processes and redesigns also added \$17 million to the treatment plant design cost, but resulted in the identification of potential construction cost reductions of \$86 million. However, the design changes also led to a 10-month delay of the scheduled completion of the treatment plant final design.

WTD could improve its contract amendment practices by adhering to countywide contracting policies designed to ensure the cost-effectiveness of capital projects, its internal procurement procedures, and best practices for capital project management. County policies could also be strengthened and agency compliance improved by adopting recognized industry best practices.

Scope and Objectives

Our audit focused on the management of amendments for the Brightwater treatment plant professional engineering services contract. We assessed WTD's compliance with county contracting policies, overseen by the central Procurement and Contract Services Section, and industry best practices. In addition, we reviewed the cost-effectiveness of WTD's contracting methods for treatment plant design engineering and preconstruction services, and identified potential opportunities for improvement.

Summary of Recommendations

WTD project managers should adhere to all county policies and procedures for managing capital project contracts and contract amendments. Particular attention should be paid to approval authority and review requirements for contract amendments with cost estimates that exceed \$150,000 and/or 10 percent of the original contract value. In addition, the management of the Department of Natural Resources and Parks should ensure that

work on contractual design additions or revisions to the original scope of work does not proceed without fully executed and authorized contract amendments.

WTD should also collaborate with the Procurement and Contract Services Section on strengthening county policy to include recognized industry best practices, and on potential adjustments or limited exceptions to county policy that are appropriate for large-scale, complex capital projects to ensure timely project performance. For example, limited delegation of authority provisions would be beneficial in ensuring proper oversight while maintaining the critical project schedule. In addition, county guidelines should be developed for the use of unique contracting methods to maximize opportunities to design and construct capital projects cost-effectively.

Executive Response

The County Executive generally concurred with all seven recommendations offered in the report, although the executive response identified some areas of disagreement with the audit findings. WTD and the Procurement and Contracting Services Section have already begun implementing a number of recommendations, including refining the countywide policies to improve the efficiency and cost-effectiveness of capital project implementation.

Auditor's Comments

The executive response indicated disagreement with two major conclusions and an approach for measuring design cost performance.

Executive Response: Given the number of policy directives for this highly complex project, I cannot agree with the major findings that inconsistent contract amendment practices did not

ensure the cost-effective design of the treatment plant, and that the contracting methods contributed to design costs that were higher than industry average.

Auditor's Comments: These major audit conclusions are based upon a number of findings presented in the audit report. One compelling finding related to inconsistent contracting practices resulting in higher project costs was reflected in the treatment plant construction cost estimate developed at the 60 percent design threshold. The construction cost estimate was \$50 million higher than the construction budget for two reasons. First, the treatment plant design lump sum contract did not contain a "design to construction budget" provision, consistent with industry standards. Such a provision would have transferred some design risk to the consulting firm, encouraging greater due diligence by the consultant for estimating construction costs throughout the design process. Second, another consulting firm rather than the primary design consultant was tasked with estimating construction cost estimates for the treatment plant, but *only* at major design thresholds rather than as the design work progressed. These two contracting decisions resulted in substantial and costly value engineering efforts as well as design modifications to bring the treatment plant construction costs in line with the construction budget.

Executive Response: *The cost of design to the cost of construction ratio for the Brightwater treatment plant was incorrectly calculated.*

Auditor's Comments: The design/construction cost ratio presented in the draft audit report transmitted for the Executive Response was correctly calculated based on a standard industry approach, rather than the Milwaukee Metropolitan Sewage District approach that was introduced in R.W. Beck's *Project Oversight Report* published in June 2005. After further consultation with R.W. Beck and unsuccessful attempts to

identify a better benchmark to measure cost performance, this finding was deleted prior to publishing the final report. Other findings remain in the report that document the relationship between the contracting practices and design costs that were higher than industry average for the treatment plant.

Acknowledgements

The King County Auditor's Office wishes to acknowledge the Wastewater Treatment Division's Major Capital Improvements Section and the Brightwater treatment plant project manager and team for their time and cooperation throughout the audit process. We also appreciate the professional assistance provided during the audit by the Finance and Business Operations Division's Procurement and Contract Services Section.

1 INTRODUCTION

Audit Background

This performance audit, included in the council-adopted 2006 King County Auditor's Office Annual Work Program, evaluates Wastewater Treatment Division's (WTD) management of contract amendments for the Brightwater treatment plant design engineering services. (See Appendix 1 for an overview of the county contract amendment process for professional services contracts.) The audit focuses on 20 contract amendments executed during the final design phase of the treatment plant. In addition, the audit assesses the cost-effectiveness of the lump sum contracting process for the treatment plant final design and the General Contractor/Construction Manager (GC/CM) preconstruction services contract, and identifies potential opportunities for improving these contracting processes.

Brightwater Project Initiated in Response to Increased Demand for Wastewater Services

King County began developing the Brightwater Project in 1999, following the adoption of a Regional Wastewater Services Plan. The plan identified the need for a 36-million-gallon-per-day wastewater treatment plant to meet future demand for services in King and south Snohomish counties. The Brightwater Project facilities include a plant to treat and disinfect a daily average of 36 million gallons of wastewater, a conveyance system to carry wastewater to and from the treatment plant, and a marine outfall to discharge treated wastewater into Puget Sound. WTD expects the Brightwater Project facilities to be operational in 2010.

In May 2002, WTD entered into a professional engineering services contract with CH2M Hill, Inc. to design the Brightwater treatment plant. The initial contract was for the completion of

Phase I and II engineering services, which included the predesign work; technical, environmental, and site analyses; and preparation of design drawings and specifications for the treatment plant. (See Appendix 2 for overview of the treatment plant design project phases and design review thresholds.) A cost-plus-fixed-fee contract was executed for Phases I and II at a total contract price of \$9.7 million.

WTD amended the original engineering services contract with CH2M Hill in February 2004 to add Phase III for the final design of the treatment plant. WTD negotiated a lump sum agreement for the final design engineering services, and a cost-plus-fixed-fee arrangement for other design activities such as land acquisition, permitting, and geotechnical analysis. The total cost of the Phase III final design amendment was \$31.7 million, including approximately \$50,000 carried forward from scope reductions during the predesign phase of the treatment plant.

In addition to contracting with CH2M Hill as the lead treatment plant designer, WTD contracted with Mithun to provide architectural services, and with four additional engineering and construction firms to perform design-related program management and preconstruction services for the Brightwater treatment plant. The services provided by the additional firms are discussed in Chapter 3.

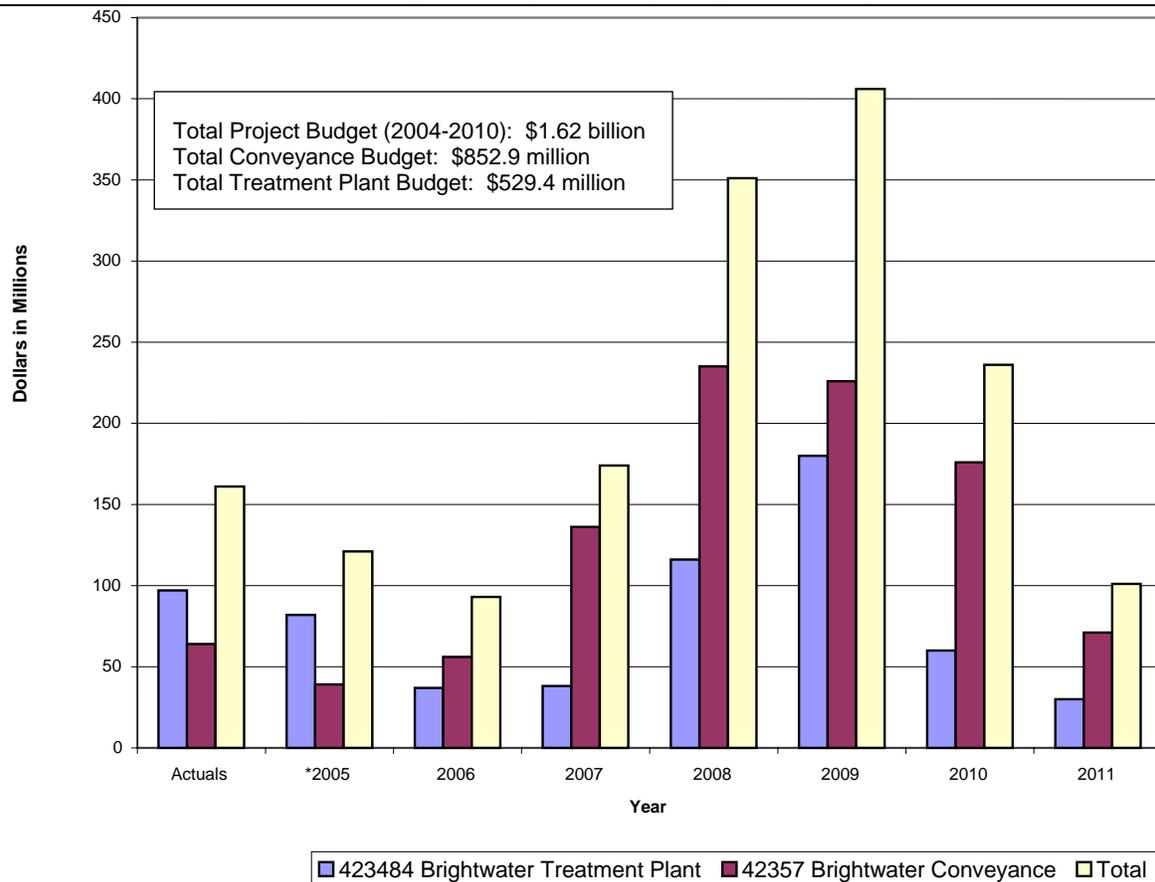
Brightwater Project Cost Estimated at \$1.6 Billion

Total costs for the Brightwater Project were estimated at \$1.62 billion in December 2005.² Exhibit A below displays the council-adopted annual capital project budgets for the Brightwater Project from 2005 to 2011.

² As of July 2006, the most recent cost projection for the Brightwater Project is \$1.75 billion.

EXHIBIT A

Brightwater Facilities Capital Project Budgets (in Millions)—2005 to 2011



***Note: Mitigation and land acquisition/right-of-way costs of approximately \$248.7 million and expenses incurred prior to 2005 are not depicted in the above chart.**

SOURCE: King County Wastewater Treatment Division Capital Improvement Plan: Council Adopted Budget Summary 2005 – 2010, December 2004.

As shown in Exhibit A, the capital project budget for the design and construction of the Brightwater treatment plant was estimated at \$529.4 million in 2005. The treatment plant costs accounted for approximately 36.6 percent of the total estimated \$1.62 billion for the entire Brightwater Project.

Audit Scope and Objectives

Our audit focused on the management of amendments for the Brightwater treatment plant professional engineering services contract. We assessed WTD’s compliance with county

contracting policies and industry best practices for controlling capital project scope, costs, and schedules. In addition, we reviewed the cost-effectiveness of the lump sum contract for treatment plant design engineering and GC/CM preconstruction services contract, and identified potential opportunities for improvement.

Statement of Methodology

To achieve the audit's objectives, reliance was placed on data provided and representations offered by the Brightwater project management team and coordinating agencies during the fieldwork portion of the audit. WTD management and staff stated that all relevant data and other information requested were made available within the timeframe required for the completion of this report. Based on agency statements of completeness and our limited testing of the data, we deemed the data sufficiently reliable for use in meeting the audit objectives.

Scope of Work on Internal Controls

This performance audit included a review of the internal controls established by county and WTD policies, executive orders, and procedures for amending professional services contracts. The internal controls consisted of the required policies and procedures to amend contracts, documentation of completed tasks (independent estimates, detailed review of proposals and records of negotiations, justification forms, etc.), and formal management reviews and approvals as tasks are completed and design thresholds are reached. We assessed WTD's compliance with these requirements in executing the Brightwater treatment plant final design contract amendments.

County and WTD Internal Controls Assessed During Performance Audit

The audit was conducted in accordance with applicable government auditing standards. The audit period was from December 2005 through May 2006.

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2 MANAGEMENT OF BRIGHTWATER DESIGN CONTRACT AMENDMENTS

Chapter Summary

This chapter focuses on the 20 contract amendments and associated change notices executed by WTD for the Brightwater treatment plant design engineering services contract as of May 2006. The primary audit objective was to determine whether WTD's management of contract amendments complied with county contracting policies and procedures and its internal guidelines. The impact of the amendments on the contract cost and schedule for the treatment plant design was also assessed.

County Established Capital Project Oversight Function and Administrative Policies and Procedures

The contracting policies and procedures used in the audit of the Brightwater treatment plant contract amendments were developed at the direction of the County Executive. The executive was interested in strengthening countywide oversight and management of major capital projects following the release of the County Auditor's Office 1996 *Construction Management Audit of the West Point and Renton Wastewater Treatment Facilities*. The audit identified unexplained or unsupported construction and construction engineering costs for the two wastewater treatment plants. In response to the audit findings and recommendations, the County Executive established a centralized capital project control function within the Procurement and Contract Services Section in the Department of Executive Services Finance and Business Operations Division. The primary objective for establishing the centralized project control function was to provide oversight and assistance to county agencies in managing capital project costs.

Summary of Findings

The design of the Brightwater treatment plant is a particularly complex project that has generally been managed by a highly experienced and diligent project manager and team. For example, the extensive value engineering processes conducted by WTD during the design of the treatment plant could potentially achieve an \$86 million construction cost reduction (somewhat overstated because \$17 million was spent for value engineering efforts and subsequent design modifications).

However, WTD's management of the final design contract amendments and associated change notices was not consistent with select countywide policy, internal WTD procedures, or industry best practices. Some of the inconsistent project management and contracting practices resulted in higher project costs. Treatment plant design costs exceeded the initial contract amount for professional design services by approximately \$13.4 million (32.3 percent), and resulted in design costs that were higher than industry averages for wastewater treatment plants. Although specific clarifications and exceptions to county policy may be necessary for large-scale, complex projects to balance important oversight and cost control objectives with critical scheduling requirements, WTD was responsible for complying with countywide policy intended to control project costs.

Other Factors Resulted in Design Costs That Were Higher Than Industry Averages

Other extensive design additions and modifications also contributed to the higher costs, including complex design elements, heightened environmental and community group interest, multi-jurisdictional mitigation efforts and permitting requirements. The design modifications also led to a 10-month delay of the scheduled completion of the treatment plant final design.

WTD could improve the cost-effectiveness of its contract amendment practices by adhering to county policies, its internal procurement procedures, and best practices for capital project management. County policies could also be strengthened to promote consistency with industry best practices and improved compliance by county agencies.

Summary of Recommendations

WTD project management should adhere to all county policies and procedures for managing capital project contract amendments, including requirements to: 1) obtain and maintain detailed records of independent cost estimates or written critical cost reviews for additional or revised design work; 2) identify changes between the consultant's proposed tasks and the negotiated amendment; 3) submit amendments with cost estimates that exceed \$150,000 to the central project control officer for review; and 4) obtain department director approval for amendments that exceed 10 percent of the original design contract cost.

WTD should ensure the timeliness of the department director's and the centralized project control officer's reviews and approvals by discontinuing the practice of combining multiple change notices into a single contract amendment. The Department of Natural Resources and WTD management should also ensure that new or revised contracted design work does not proceed without fully executed and authorized contract amendments, consistent with county policy and WTD procedures.

WTD, in cooperation with the Procurement and Contract Services Section, should also assess current county policies and management controls in relation to unique large-scale capital

projects and propose necessary changes to ensure their reasonableness for controlling project costs and schedules. Strengthened county policies would promote improved agency compliance and consistency with best practices described in the report.

BRIGHTWATER FINAL DESIGN CONTRACT AMENDMENTS

As noted in Chapter 1, the county and WTD have instituted policies and procedures to guide the development of major capital projects. The county also established a centralized project control function in the Procurement and Contract Services Section to increase oversight of major capital projects. King County Administrative Policies and Procedures CON 7-8-1 Change Order/Amendment Administration and CON 7-7-1 Procurement for Capital Projects identify the required process for amending county professional services contracts. In addition, WTD's *Wastewater Treatment Division Procurement Procedures Manual* outlines the process steps for amending contracts, and Section 4 of the engineering contract terms and conditions sets forth requirements for changes in work consistent with county policy.

Standard County Policies for Managing Professional Services Contract Amendments

County Established Eight Requirements for Amending Professional Services Contracts

Standard county requirements established for amending professional services contracts include:

1. Amendments shall be initiated for all changes that result in an increase or decrease in time of performance or cost.
2. The consultant shall not perform the work identified in written directives or change notices until the formal contract amendment is approved.
3. The Implementing Agency Director (or designee) shall formally authorize all contract amendments above \$25,000.

4. The Implementing Agency Director (or designee) shall review the justification form documenting the impact of proposed amendments on the project scope, budget and schedule, and approve all subsequent contract amendments when the amendments reach a cumulative value of 10 percent of the original contract amount.
5. The central project control officer shall perform price/cost analysis or review cost/price negotiations between the project manager and consultant. The central project control officer shall make recommendations and provide counsel for contract amendments that exceed \$150,000.
6. Independent cost estimates shall be required for each contract amendment.
7. Documentation for contract amendments shall include a description of the scope of work, statement on why the work is needed, and cost of work; an independent cost estimate; statement of reconciliation between the county's estimate and consultant's estimate and justification of agreed upon price; and approval signatures.
8. Contract amendments shall be used to add or delete work only when it is within the original contract scope of work. A procurement waiver shall be obtained from the Procurement and Contract Services Section prior to approving work outside the contract scope of work, and a copy of the fully executed waiver must be attached to the change order/amendment in the project file. If the procurement waiver is not approved, the proposed work shall be competitively solicited or performed by county forces within statutory guidelines.

Section 4—Changes in Work—of the design contract terms and conditions also requires written amendments prior to initiating new design work that impacts the project costs or schedules, consistent with county policy.

FINDING 1: MANAGEMENT OF THE BRIGHTWATER TREATMENT PLANT CONTRACT AMENDMENTS WAS NOT CONSISTENT WITH COUNTY POLICIES OR INDUSTRY BEST PRACTICES FOR EFFECTIVELY CONTROLLING PROJECT COSTS.

The management of the Brightwater treatment plant final design contract amendments was not consistent with county policy or industry best practices. In addition, WTD did not ensure that the county received the most cost-effective design engineering services due to inconsistent contracting practices.

The Brightwater treatment plant design services contract will be completed in four phases. Exhibit B below displays summary cost information for the initial Phases I through III contracts and solely for the Phase III final design contract amendments.

(Appendices 2 and 3 provide additional cost information and brief statements of purpose for the 20 final design contract amendments.) Exhibit B also shows the percentage increase of the amendments based on the original contract cost for Phases I and II combined with the amended Phase III cost, and the percentage increase based solely on the Phase III final design cost.

EXHIBIT B	
Summary of Design Engineering Contract Amendment Costs for Brightwater Treatment Plant	
Original Phases I and II (Predesign) Contract Cost	\$9,719,364
Original Phase III (Final Design) Contract Cost	\$31,747,643
Total Original Phase I through III Cost	\$41,467,007
Original Phases I through III Cost	\$41,467,007
Total Phase III Cost Changes	\$13,399,089
Current Total Phases I through III Cost	\$54,866,096
Percent Change from Original Phase I through III Cost ^a	32.3%
Percent Change of Phase III Final Design Cost Only ^b	42.2%

Notes:

^a (\$54.9 million - \$41.47 million) / (\$41.47 million) = 32.3%

^b (\$54.9 million - \$41.47 million) / (\$31.75 million) = 42.2%

SOURCE: Wastewater Treatment Division, E13035E Engineering Services for the Brightwater Treatment Plant Contract Amendments, Findings of Fact, 2006.

As shown in Exhibit B above, the contract amendments increased the total cost of final design services by approximately \$13.4 million, or 32.3 percent of the initial \$41.5 million contract value for Phases I through III. More importantly, the final design contract cost of \$45.1 million exceeded the \$31.7 million final design contract amendment by 42.2 percent. The percentage increase for the treatment plant design cost substantially exceeded the 10 percent industry standard increase generally budgeted for amendments to design and construction contracts.

It should be noted that Exhibit B displays all contract amendment costs under Professional Engineering Services Contract #E13035E, including \$7.1 million for conveyance, marine, and mitigation facilities design services performed by CH2M Hill under the terms of the contract amendments. It does not display the \$11.4 million cost of architectural, construction cost estimating, design review, and preconstruction services performed during the treatment plant design under separate contracts.

Adjusting the \$54.9 million total shown in Exhibit B by reducing \$7.1 million and adding \$11.4 million provides an adjusted total cost of \$59.2 million for all Phase I through Phase III treatment plant design-related costs. The adjusted contractual engineering services cost for Phase I through III, along with the estimated costs for Phase IV Construction Engineering Services, WTD's internal project management, and other services, were higher than industry averages based on industry analysis. The analysis of comparable wastewater treatment plants was conducted by R.W. Beck, a construction management firm specializing in wastewater treatment facilities.

Inconsistent management of contract amendments was a factor that contributed to the higher design costs. Exhibit C below provides an overview of WTD's compliance with the eight county policies for contract amendments that are described above. Although WTD executed 20 final design contract amendments to date, not all requirements applied to each amendment. The exhibit identifies the number of amendments that were required to comply with each policy, the number of amendments that complied with the policy, and the value of the non-compliant amendments. WTD's practices are discussed in more detail following the exhibit.

EXHIBIT C
Summary of Brightwater Treatment Plant Contract Amendments
Compliance with County Policy

County Policy	Number of Amendments Required to Comply ^a	Number of Non-Compliant Amendments	Value of Non-Compliant Amendments
Amendments Initiated for Changes with Cost Increase or Decrease	17	0	Not Applicable
Performed Work Ahead of Approval	17	10	\$4,836,574
Director Approved Amendments Above \$25,000	17	10	\$4,836,574
Department Director Review at 10 Percent Threshold	7	4	\$2,385,060
Central Project Control Review at \$150,000	14	12	\$6,307,269
Independent Estimate Obtained ^b	17	11	\$4,484,777
Complete Documentation Maintained	20	11	\$4,484,777
Waiver Obtained for Work Outside Original Scope	3	2	\$757,183

NOTES

^aAn amendment was considered non-compliant if county requirements were bypassed for one or more change notices. Amendments #4 through #20 were included in the analysis. Amendments #1 and #2 did not have a cost impact and were excluded from the analysis, and Amendment #3 initiated the Phase III final design services and was negotiated as a separate contract.

^bAlthough independent estimates were not generated for 11 of 17 contract amendments, 'critical reviews' were well-documented for 15 of the 17 amendments.

SOURCE: Wastewater Treatment Division, E13035E Engineering Services for the Brightwater treatment plant Contract Amendments, Findings of Fact, 2006.

Additional Design Work Initiated Without Approved Contract Amendments

WTD processed contract amendments for all design changes with cost impacts, consistent with county policy. However, WTD preauthorized design work on change notices for ten amendments with a total value of \$4.83 million, which was contrary to existing county policy and best practices. (County agencies are also required to comply with R.C.W. 39.04.120, which requires written authorization by department directors of work not covered in original contracts for public works projects.) County policy currently limits project managers' approval of contract amendments or change notices to \$25,000. Yet, the Brightwater treatment plant project manager frequently

authorized design work for change notices that exceeded \$25,000 well in advance of the approved contract amendments.

Preauthorization of design work without formal amendments is not uncommon in the engineering and construction industry, and primarily occurs due to efforts to maintain the critical project schedule. Frequent preauthorization of work, however, is generally an indication of poor management practices or the need to delegate approval authority below top management. Industry best practices suggest that the conditions for delegating approval authority be identified, preferably in advance, along with “stair-stepped” approval levels and thresholds such as:

<u>Approval Level</u>	<u>Approval Thresholds</u>
Department Director	\$150,000 and above
Division Manager	\$100,000 to 149,999
Section Manager	\$50,000 to \$99,999
Project Manager	\$0 to \$49,999

Moderately higher approval levels could be considered selectively to reduce inefficiencies in review processes for large-scale county capital projects with substantially greater project budgets and more complex scopes of work and schedules. Delegating approval authority for contract amendments to lower levels of management for the Brightwater Project and other large-scale projects would require a change to existing county policy. The frequency of high-level management reviews is an important consideration in establishing a delegation policy and review thresholds for amendments with low or moderate costs in relation to substantially larger project budgets.

**Department-Level
Reviews Bypassed for
Design Amendments
that Exceeded Ten
Percent of Original
Contract Value**

Preauthorization of Brightwater change notices well in advance of approved contract amendments also minimized the opportunity for increased levels of review and accountability as project costs increased. Current county policy requires the department director's review and approval for each amendment once the cumulative value of all amendments exceeds 10 percent of the original design contract value (10 percent is the industry standard). However, design work was preauthorized for change notices for four contract amendments with a combined value of \$2.39 million without director-level review after the 10 percent threshold was reached. This is significant because the intent of the director-level reviews is to ensure prompt corrective action if trends are identified that could potentially place the project at risk. Prompt reviews and proper authorization of change notices are also important to help avoid potential liability issues for both parties if formal contract amendments are not ultimately approved along with payments for completed work initiated under individual change notices.

**Contract Amendments
Exceeding \$150,000
Were Approved
Without the Project
Control Officer's
Price/Cost Review**

Preauthorization of work identified in change notices also precluded the centralized project control officer's review of amendments and opportunity to offer potential recommendations to control costs. County policy requires the project control officer to review and offer recommendations on all contract amendments with cost changes exceeding \$150,000. CH2M Hill was authorized to proceed on design work for 12 contract amendments that exceeded the \$150,000 threshold without review by the project control officer. The value of the 12 contract amendments was \$6.3 million. Bypassing the project control officer's review was noteworthy because one of the project control officer's primary responsibilities is to ensure the cost-effectiveness of county contracts for professional design and construction services.

It should be noted that WTD and the Procurement and Contracting Services Section did not agree that county policy required the project control officer to review and consult with the implementing county agency on contract amendments more than \$150,000. WTD correctly cited a provision in county policy that assigns responsibility for cost/price analysis and executing amendments to the implementing agency. Although the project control officer confirmed that county policy requires review of amendments (as well as original contracts) more than \$150,000 for professional services contracts with a contract value greater than \$2 million, she also agreed that county policy could be clarified in regard to the project control officer's and the implementing agencies' responsibilities.

WTD did not consistently develop or obtain independent cost estimates for final design contract amendments. County policy and WTD's internal procedures require independent cost estimates for any amendment that increases or decreases the contract cost. Industry best practices also emphasize the importance of obtaining independent cost estimates for additional contract work proposed by consultants, but consider documented *critical cost reviews* of the proposed work and related cost estimates to be an acceptable foundation for negotiating competitive contracts or amendments.

WTD Performed Critical Cost Reviews in Lieu of Independent Estimates for Eight Amendments Without Independent Estimates

WTD did not obtain independent cost estimates for 11 contract amendments with a total value of \$4.48 million. WTD later provided files containing critical reviews for all but two amendments. WTD did not gather and organize the necessary documentation of the critical cost reviews, however, until May 2006. The absence of supporting documentation for critical cost reviews is significant, because adequate information would not have been available for department level reviews and

authorizations for the ten contract amendments without independent estimates.

Given industry's acceptance of well-documented critical cost reviews and the WTD's standard practice of using these reviews in lieu of cost estimates, it would be prudent for WTD and the Procurement and Contract Services Section to collaborate on a potential change to the existing county policy. Criteria for critical cost reviews and parameters for consistently documenting the reviews would be required if county agencies are permitted to use well-documented critical reviews in lieu of independent cost estimates for contract amendments.

**Required Project
Management
Documentation Was
Incomplete**

Although the treatment plant project manager consistently developed *Findings of Fact* documents (justification forms) for each contract amendment, WTD did not consistently adhere to all the requirements established by county policies. Required documents included a description of scope of work, why the work is needed, the proposed cost of work, independent cost estimates, reconciliation between the county's estimate and consultant's estimate, justification of agreed upon price, and approval signatures. The *Findings of Fact* documents contained summaries that covered these topics, but referred to the project files for complete information. A substantial number of the treatment plant project hard-copy files were empty or incomplete. A search of the electronic files in WTD's Constructware project management files yielded similar results. For example, the files did not contain important communications between the WTD and the design consultant that could verify the negotiation of contract amendments.

WTD acknowledged that improvements were necessary and underway to strengthen project documentation. WTD also revised its amendment justification form during the audit to

reference relevant county policy requirements and facilitate reviews of the project files.

WTD Did Not Request Procurement Waivers for Work Changes Beyond the Original Contract Scope of Work

County policies and WTD procedures restrict the use of contract amendments to design changes that are within the original contract scope of work. A procurement waiver must be obtained from the Procurement and Contract Services Section prior to agency approval of work changes outside the contract scope of work. If the waiver is not approved, the proposed work must be competitively solicited or performed by county forces. WTD obtained a waiver for one of three executed contract amendments with scope changes outside the original contract scope of work. The two amendments without waivers, valued at \$757,183, were executed to correct technical omissions (e.g., anthropological services) in the original contract. Although proceeding on this work without approved waivers was not consistent with county policy, it would not have been reasonable to competitively solicit another firm to perform the omitted work from an efficiency standpoint. Thus, the amendments did not violate the intent of the policy, which is to ensure efficient and equitable contracting opportunities and practices.

Finally, WTD's practice of amending the treatment plant contract to provide engineering services for non-treatment plant design work also contributed to the design costs that were higher than industry standards. Approximately \$7.1 million in design services for conveyance, mitigation, and marine outfall facilities was performed under the treatment plant engineering services contract. Again, this practice makes it difficult to track actual project costs as well as to measure and accurately report actual project performance to elected officials.

In conclusion, some inconsistent management of the Brightwater treatment plant contract amendments, such as

director-level and central project control officer reviews, did not ensure that the final design services were cost-effective. Final design costs increased by approximately \$13.4 million, which represented a 32.3 percent increase from the combined predesign and final design contract value of \$41.5 million. The \$13.4 million also represented a 42.2 percent increase from the final design contract value of \$31.7 million. As noted earlier, other factors contributing to the cost increases included complex design elements, siting a Greenfield treatment plant in an urban area, environmental requirements, extensive public involvement and appeals processes, multi-jurisdictional permitting and mitigation requirements, and comprehensive value engineering processes.

**Questions Regarding
the Effectiveness of
County Policies for
Large-Scale, Complex
Capital Projects**

WTD's inconsistent compliance with county policies and best practices, as well as the substantial impact of the contract amendments on the treatment plant design cost, raise questions about the effectiveness of some county and WTD contracting policies for large-scale, complex capital projects. Examples of questions include:

- Do the documentation requirements need to be refined to ensure accountability while implementing the critical project schedule?
- Are the thresholds for director-level and project control officer reviews reasonable in relation to the overall project cost?
- Should approval authority be further delegated to reduce high-level management reviews of amendments with low or moderate costs in relation to the overall project scale?

Best industry practices recognize the need for effective and efficient project management and project controls.

Reassessment of county policies and management controls for unique large-scale projects may be necessary to ensure the

reasonableness of the eight policies, and to promote consistent compliance by county agencies as recommended below. Until then, all county agencies are responsible for adhering to the countywide contracting policies that are currently in place to promote accountability and cost-effectiveness in managing capital projects.

**WTD Initiatives
Undertaken to Control
Overall Brightwater
Project Costs**

Despite the substantial amount of the contract amendments and compliance issues, WTD and the Brightwater treatment plant project management have taken actions to control project costs. For example, WTD developed trend cost estimates between design milestones to promptly identify significant cost changes. WTD also conducted value engineering processes following the completion of the Final Environmental Impact Statement, the 30 percent design and 60 percent design of the treatment plant. WTD expects the design improvements identified during the last two value engineering processes to potentially mitigate the treatment plant construction costs increases by \$86 million. This figure, however, does not take into account the \$17 million spent for value engineering efforts and subsequent design modifications.

RECOMMENDATION 1

WTD project management should adhere to all county policies and procedures for managing capital project contract amendments, particularly requirements to document independent cost estimates or critical cost reviews for additional or revised design work and develop detailed records of negotiations. Design changes should be identified by project tasks along with cost and schedule impacts.

RECOMMENDATION 2

WTD project management should submit amendments with cost estimates that exceed \$150,000 to the central project control officer for review and recommendations. Amendments with costs that individually or cumulatively exceed 10 percent of the original design contract value should be submitted consistently to the department director for review and approval.

RECOMMENDATION 3

The Department of Natural Resources and Parks management, along with WTD project management, should ensure that new or revised design work does not proceed without fully executed and authorized contract amendments, consistent with county and WTD requirements.

RECOMMENDATION 4

The Procurement and Contract Services Section, in cooperation with the Department of Natural Resources and Parks and WTD management, should assess current county policies in relation to unique large-scale capital projects to ensure their reasonableness and to promote consistent compliance by county agencies. Particular attention should be given to adequate delegation of approval authority to ensure critical project schedules can be met while maintaining public accountability. County policies related to central project control officer review of contract amendments greater than \$150,000 should also be clarified to avoid confusion among implementing agencies.

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3 BRIGHTWATER TREATMENT PLANT CONTRACTING METHODS

Chapter Summary

This chapter focuses on WTD's contracting methods for the Brightwater treatment plant design engineering services. WTD selected two unique contracting approaches for the Brightwater treatment plant: a combined lump sum and cost-plus-fixed-fee contract for final design services, and a General Contractor/Construction Manager (GC/CM) contract for preconstruction and construction services. This chapter considers the impact of the contracting approaches on the cost-effectiveness of the treatment plant design engineering services and opportunities for improvement.

Although WTD generally uses cost-plus-fixed-fee contracts for professional design engineering services, WTD selected the lump sum method in contracting with CH2M Hill, Inc. for the Brightwater treatment plant final design engineering services. (WTD selected the standard county cost-plus-fixed-fee method for other services such as permitting and right-of-way acquisitions.) The total cost of the final design contract was \$31.6 million, with approximately \$27.7 million for the lump sum design services, and approximately \$3.9 million for the cost-plus-fixed-fee services contract.

WTD also entered into a GC/CM contract with the Hoffman Construction Company to provide preconstruction services for the Brightwater treatment plant. The preconstruction services included design input, constructability reviews, value engineering, construction cost estimating, and development of the detailed construction schedule for the treatment plant. The total cost of the preconstruction services contract was \$2 million.

Three Additional Firms Provided Design-Related Services

WTD retained three additional firms to provide other design-related services for the treatment plant. URS, Inc. was retained to develop independent cost estimates for the design contracts and select amendments, and participate in value engineering reviews for the treatment plant design. Camp Dresser & McKee, Inc. (CDM) was retained to provide construction management and planning services to support WTD management; participate in constructability reviews, review and refine cost estimates; and provide assistance in negotiating the maximum allowable construction cost (MACC). WTD also contracted with CH2M Hill Constructors to provide additional cost information and estimates from a construction perspective. The total value of these other treatment plant contract engineering and preconstruction services was \$7.1 million (\$11.4 million with architectural services).

Summary of Findings

WTD did not have previous experience with the contracting methods it selected for the Brightwater treatment plant final design and construction. The lump sum contract for the final design services did not contain standard provisions to control project costs, which contributed to a 60 percent design cost that exceeded the estimated treatment plant construction budget. The use of multiple consulting firms with duplicative responsibilities also led to higher design costs. In addition, WTD did not maximize the full benefits of the GC/CM approach during the early implementation of the preconstruction services contract to identify opportunities to reduce treatment plant costs.

Summary of Recommendations

WTD should develop internal guidelines for the use of lump sum contracts to ensure implementation is consistent with industry best practices, and consider adhering to the county's standard cost-plus-fixed-fee contracting method for complex design projects with an evolving scope of work. WTD, in cooperation with the Procurement and Contract Services Section, should also ensure that a design to construction budget provision is incorporated into future design contracts along with provisions to allow sufficient time for design reviews at the conclusion of major thresholds. WTD's design review and cost estimating practices should also be strengthened to promote timely results, and to avoid redesigns that contribute to higher project costs.

The Procurement and Contracting Services Section should establish guidelines for the utilization of GC/CM contracts. Guidelines for early involvement of the GC/CM would help ensure that the method is appropriately utilized to achieve cost-effective delivery of preconstruction and construction services for county facilities.

BRIGHTWATER TREATMENT PLANT CONTRACTING METHODS

King County generally executes cost-plus-fixed-fee contracts with a provision not to exceed a maximum amount/total price for professional design engineering services. The cost-plus-fixed-fee contracting method compensates consulting firms based on the actual costs of direct labor, indirect labor, other direct costs, and the fixed professional fee. Consulting firms generally submit monthly progress reports detailing tasks performed, work completed, and costs incurred with invoices for payment. Because payments typically reflect the earned value or percentage of work completed, the cost-plus-fixed-fee method provides greater assurance than the lump sum method that

payments are based upon actual costs incurred by consultants to perform design services.

WTD used the standard cost-plus-fixed-fee contracting method for the Brightwater treatment plant predesign services, and initiated negotiations for the final design phase adhering to scope and level of effort analysis requirements for the cost-plus-fixed-fee approach. Later in the contract negotiation process, WTD selected the lump sum method to contract for a large portion of the final design engineering services, and the cost-plus-fixed-fee method for the balance. According to the WTD project manager, the lump sum approach seemed reasonable because the scope of work for the treatment plant was well defined. Lump sum contracts have greater potential than cost-plus-fixed-fee contracts to complete projects at a fixed and generally lower cost, provided that the project scope is well defined.

**WTD Selected
Alternative Contracting
Method for Treatment
Plant Construction**

WTD also selected the GC/CM contracting alternative for the construction of the Brightwater treatment plant rather than the standard design-bid-build contracting approach. Under the GC/CM approach, the contractor or GC/CM is typically selected early in the design phase to assist the owner in managing the project based on expert knowledge, construction experience, and proven project management skills. WTD selected the alternative method due to the complexity of the Brightwater treatment plant design and the critical phasing requirements for the treatment plant and conveyance system. The GC/CM alternative also provided the opportunity for WTD to select a construction contractor based on best value. In addition to price considerations, the contractor was selected on qualifications, project approach, and other factors important to the successful delivery of the project. (Appendix 4 provides a conceptual overview of the GC/CM construction delivery method.)

FINDING 2: THE CONTRACTING METHODS SELECTED FOR THE BRIGHTWATER TREATMENT PLANT FINAL DESIGN SERVICES CONTRIBUTED TO HIGHER DESIGN COST.

The Brightwater treatment plant lump sum design contract was not cost-effective and was difficult to administer, particularly given the absence of contract provisions to control project costs combined with the substantial scope and cost revisions. Two noteworthy contract provisions, standard in lump sum design contracts, were omitted from the lump sum contract due to inexperience with the contracting method: a design to construction budget provision and a stop work provision to allow time for thorough design reviews at major design thresholds.

Lump Sum Contracting Method Contributed to Estimated Costs that Exceeded the Estimated Construction Budget

The absence of a design to construction budget provision in the lump sum contract contributed to a 60 percent estimate that significantly exceeded the estimated construction budget. In addition, the lump sum contract did not contain requirements for CH2M Hill to generate construction cost estimates for its design work. WTD contracted with URS for construction cost estimates to ensure the estimates reflected a construction perspective. Because the lump sum contract did not contain requirements for the design consultant to develop construction cost estimates during the final design phase, and did not contain a design to construction budget provision, the county rather than the consultant absorbed the additional costs of the redesign efforts. A \$4.5 million contract amendment was required to implement substantial design improvements and reductions identified during value engineering efforts undertaken at the 60 percent design milestone. This amendment was the single most costly contract amendment executed during the final design of the Brightwater treatment plant. (As noted earlier, a total of \$17 million has been spent to date for treatment plant value engineering processes and subsequent design revisions.)

The absence of a stop work provision also contributed to higher design costs. Standard industry practice is to stop or substantially slow down design work to allow time for design reviews when major design thresholds are reached. However, CH2M Hill was reluctant to stop work in progress because its design team was already mobilized based on the work and scheduled payments for deliverables identified in the lump sum contract. Thus, design work continued at both the 30 and 60 percent design thresholds that ultimately led to subsequent redesigns.

Another concern regarding the 30 percent design was the degree to which the construction cost estimates were based on allowances rather than more definitive design elements.

R.W. Beck, the independent Brightwater Oversight Management Consultant, reported to the County Council that 56 percent of the cost estimates completed at the 30 percent design milestone were based on allowances. R.W. Beck was concerned about the reliability of the construction cost estimate developed at 30 percent design because of the dependence on allowances for a substantial portion of the estimate.

WTD May Not Have Ensured that County Received Full Value for Contract Design Services

The dependence on allowances implies that decisions were not reached on major systems to generate a sufficiently defined schematic design. We raised the question about whether the county received the full contract value at the 30 percent design threshold. We had the same question when WTD indicated that the treatment plant predesign work was only 15 to 20 percent complete when the transition occurred from the predesign phase to final design phase of the contract. The predesign contract required the completion of a schematic design for the treatment plant, which is commonly submitted at the 30 percent design threshold. (The terms “30 percent design” and “schematic design” are used interchangeably in the construction industry.) In

addition, the Request for Proposal for the treatment plant engineering services, which was appended to and considered part of the treatment plant engineering services contract, required the submission of the schematic design at the end of the predesign phase.

The Washington State Office of Financial Management has developed *Guidelines for Determining Architect/Engineer Fees for Public Works Building Projects*, which state agencies are required to use in preparing capital budget requests. The guidelines include a basic services fee breakdown into approximate percentages of each phase of work, as shown in Exhibit D below.

EXHIBIT D	
Washington State Basic Architect/Engineer Services Fee Breakdown	
Project Phase	Basic Services Fee
Phase I and II – Predesign/Schematic Design Services (30 Percent)	13 Percent
Phase III – Final Design/Design Development Services (60 Percent)	20 Percent
Construction Document Services (90-100 Percent)	36 Percent
Bidding Services	2 Percent
Phase IV – Construction Services	27 Percent
Project Administration	2 Percent
Total Basic Services Fee	100 Percent

SOURCE: Washington State Office of Financial Management, 2005-15 Capital Budget Instructions. Wastewater treatment facilities are specifically referenced in the Washington State guidelines.

Contract Engineering Services Costs Were a Higher Proportion Than Suggested Based on Estimated Budget for Contract Services

Based on the state schedule shown above, compensation equivalent to 69 percent of the total contract engineering services fees for the treatment plant would be reasonable at the conclusion of the Phase I through III design services. If the same fee structure were applied to the total amount budgeted for contract engineering services, \$49.6 million would represent 69 percent of the \$71.9 million budget in 2005. To date, WTD has authorized \$59.2 million or 82 percent of the estimated \$71.9 million budgeted for contractual design and design-related engineering services. The \$59.2 million figure excludes additional design services totaling \$7.1 million for the influent pumping station, mitigation, and the marine outfall that were performed under the CH2M Hill contract.

It should also be noted that CH2M Hill received compensation, in monthly increments, based on its progress toward the next project milestone and detailed schedule of values (deliverables) in the lump sum contract. Tying compensation to the overall budget for the design phases as well as the negotiated schedule of values would provide added assurance about the reasonableness of professional engineering services costs. The values established for compensating the design consultant for completed work would be unique to the project, but take into account the pre-established budget for each design phase.

Finally, the use of a lump sum contract was questionable due to the complexity of the treatment plant technology and evolving nature of the design work. Lump sum contracts are generally cost-effective for projects with well-defined scopes of work. Although contract amendments are generally required for all capital projects, regardless of the contracting method, many of the Brightwater final design contract amendments with cost increases were anticipated when the lump sum contract was negotiated. For example, several costly amendments were

executed for additional testing and development of complex design elements, such as the new chemically enhanced primary clarification process. In addition, environmental issues and mitigation measures surfaced during the predesign phase of the contract that could have been expected to impact the final design, as well as the amendments to implement design improvements identified during value engineering reviews.

WTD Institutes Cost Control Improvements for Professional Engineering Services

Despite the absence of a design to construction budget provision, Section 7 of the contract terms and conditions for both the original design contract and the lump sum final design amendment for the treatment plant contained provisions directing the consultant to manage design costs. The consultant was contractually obligated to:

- “Make its best efforts to manage the work and provide services in a cost-effective and efficient manner” and
- “Complete the work within the task budget because the budget would not be increased because of unwarranted costs attributable to the consultant.”

WTD also attempted, but was unable, to negotiate the addition of a design to construction budget provision with the consultant when the 60 percent value engineering amendments were executed. However, WTD was successful in negotiating requirements for CH2M Hill to generate construction cost estimates for future work, identify changes with potential to significantly increase costs, and structure collaborative design review efforts with the GC/CM that should help control future project costs.

Initial Implementation of Brightwater GC/CM Preconstruction Services Contract and Other Contracting Practices Offer Lessons Learned for Controlling Costs.

The County Council adopted Ordinance 14684 in June 2003, authorizing the Department of Natural Resources and Parks to

use the GC/CM contracting method for the construction of the Brightwater treatment plant. The department's justification for the use of the GC/CM approach was based on the complexity of the treatment plant design and phasing requirements that required early GC/CM involvement and advice during the design phase on logistics, constructability, and value engineering proposals. Early GC/CM involvement was determined to be crucial to managing the project budget and the critical project schedule. The department selected the Hoffman Construction Company as the GC/CM for the Brightwater treatment plant, and entered into a preconstruction services contract with the firm in May 2004.

Title 39.10 of the Revised Code of Washington (RCW) establishes specific conditions for using the GC/CM alternative contracting method for public work projects valued at \$10 million or more. Those conditions include selecting the GC/CM early in the design phase through a competitive process using qualifications and price, and collaboration between the GC/CM, owner and design firm. RCW 39.10.061 restates the importance of selecting the GC/CM early in the development of a capital construction project, *preferably no later than the completion of the schematic design*.

Recent GC/CM studies conducted by the states of Washington and Oregon emphasize the importance of early involvement of the GC/CM in the design process to maximize opportunities for cost savings. The interpretation of the term "early involvement" varies from study to study, but there is agreement that the GC/CM should be engaged as early as the project planning phase but no later than the end of schematic design. The studies also agree on the benefits of collaborative relationships and interaction between the GC/CM and design team in: 1) facilitating design and construction reviews, and 2) achieving project quality,

cost, and schedule objectives particularly for complex project with critical phasing requirements.

WTD retained the GC/CM in May 2004, approximately five months after the schematic design was completed, but several months before the 30 percent cost estimate was submitted and approximately six months before the value engineering and final 30 percent estimate was completed. The preconstruction services contract required the GC/CM to participate in biweekly meetings with the county and design consultant to discuss constructability issues, design process, and other issues. However, the GC/CM did not fully participate in the schematic design development. Nor did the GC/CM prepare a full 30 percent cost estimate, which would have been beneficial and could have minimized design changes after the 60 percent cost estimate. The GC/CM participated in the 60 percent design value engineering process more than a year later. That process resulted in substantial changes to improve the quality of the treatment plant design while reducing the estimated construction costs by approximately \$50 million.

The decision not to have the GC/CM fully participate in the 30 percent value engineering review did not allow the county to take full advantage of the GC/CM's expert construction knowledge and experience to optimize cost savings. For example, significant and costly design modifications occurred following both the 30 percent and 60 percent design value engineering processes. Some of the 60 percent design modifications involved further change to the 30 percent design modifications, such as the site layout modifications. Some of the multiple design changes and associated costs could have been avoided had the GC/CM been required to develop a 30 percent construction cost estimate.

Coordination and Collaborative Efforts Critical to Optimizing GC/CM Benefits

Coordination of the design consultant and GC/CM contracts, and a collaborative team effort are also critical to optimize the benefits of GC/CM contracting methods, and to promote the timely and cost-effective completion of the project. The design consultant and GC/CM contracts need to be consistent in describing the responsibility of each partner to minimize issues related to roles and responsibilities. This is particularly important in relation to the project budget, schedule, and quality. A stronger relationship could have been developed between the designer and GC/CM by assigning CH2M Hill responsibility for developing engineering estimates for comparison to the GC/CM estimates. This would have reduced the number of firms responsible for developing cost estimates (URS was also responsible for developing costs estimates), and strengthened the accountability of the design firm for controlling the treatment plant costs.

The GC/CM and CDM contracts also contained some overlapping design and construction management responsibilities. Typically, the GC/CM contracting method combines the traditional role and responsibilities of the general contractor with those of a construction manager into a single contract. However, WTD retained CDM to provide support to the construction management team, consistent with county policy requiring external project support for projects over \$10 million. According to the council's management oversight consultant, the overlapping responsibilities contributed to higher design-related costs and created a potential barrier to the collaborative relationships needed to maximize the benefits of the GC/CM method in designing and constructing the Brightwater treatment plant. Based on the management oversight consultant's recommendation, WTD subsequently developed a matrix delineating the roles and responsibilities of the GC/CM, CH2M Hill, CDM, and the WTD construction management team.

It should be noted that alternative contracting methods—GC/CM and design-build in lieu of the traditional design-bid-build to construct public facilities—were not approved in Washington State until 1994, and the authorized use of the alternative procedures were highly restricted. Neither Washington State nor King County had policies to guide agencies in the use of alternative contracting methods. Furthermore, the county only had experience using alternative contracting methods on one other project. That project was managed by the Facilities and Construction Management Division, not WTD. WTD did not have any previous experience with the GC/CM contracting approach.

However, the Washington State Legislature established a Capital Projects Advisory Review Board to evaluate construction processes for public capital projects, including the impact of alternative contracting methods on project outcomes. The board is now completing its evaluation and recommendations for the state legislature to strengthen the state policy on the implementation of alternative contracting methods. It would be beneficial to develop a countywide policy on alternative contracting methods for capital projects when the Capital Project Advisory Review Board releases its evaluation and recommendations.

RECOMMENDATION 5

WTD, in collaboration with the Procurement and Contract Services Section, should ensure that design to construction budget and stop work provisions are included in future professional engineering services contracts to avoid unnecessary design costs.

RECOMMENDATION 6

WTD should ensure that the Phase IV construction engineering services contract and the GC/CM construction contracts contain distinct and clearly defined roles and responsibilities, and that

they do not overlap with the role and responsibilities of CDM. The contracts should also address important communication issues to ensure continued collaboration in achieving the Brightwater Project quality, cost, and schedule objectives.

RECOMMENDATION 7

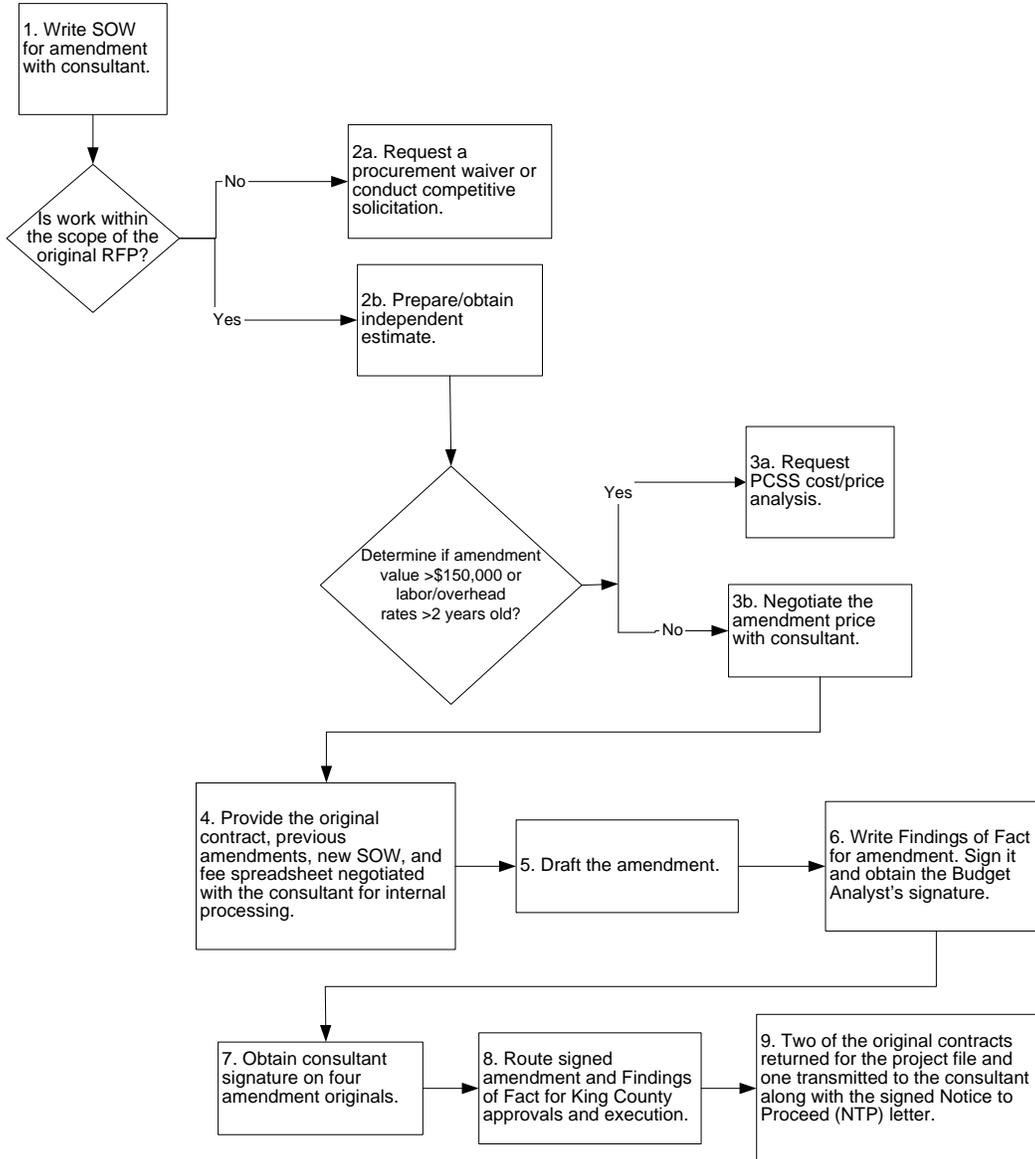
The Procurement and Contract Services Section should develop guidelines for the use of GC/CM contracting methods that maximize opportunities to design and construct capital projects cost-effectively. WTD should provide input in the development of the GC/CM guidelines based upon lessons learned in designing and constructing the Brightwater Project and other complex, large-scale capital projects.

APPENDICES

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APPENDIX 1

CONTRACT AMENDMENT PROCESS

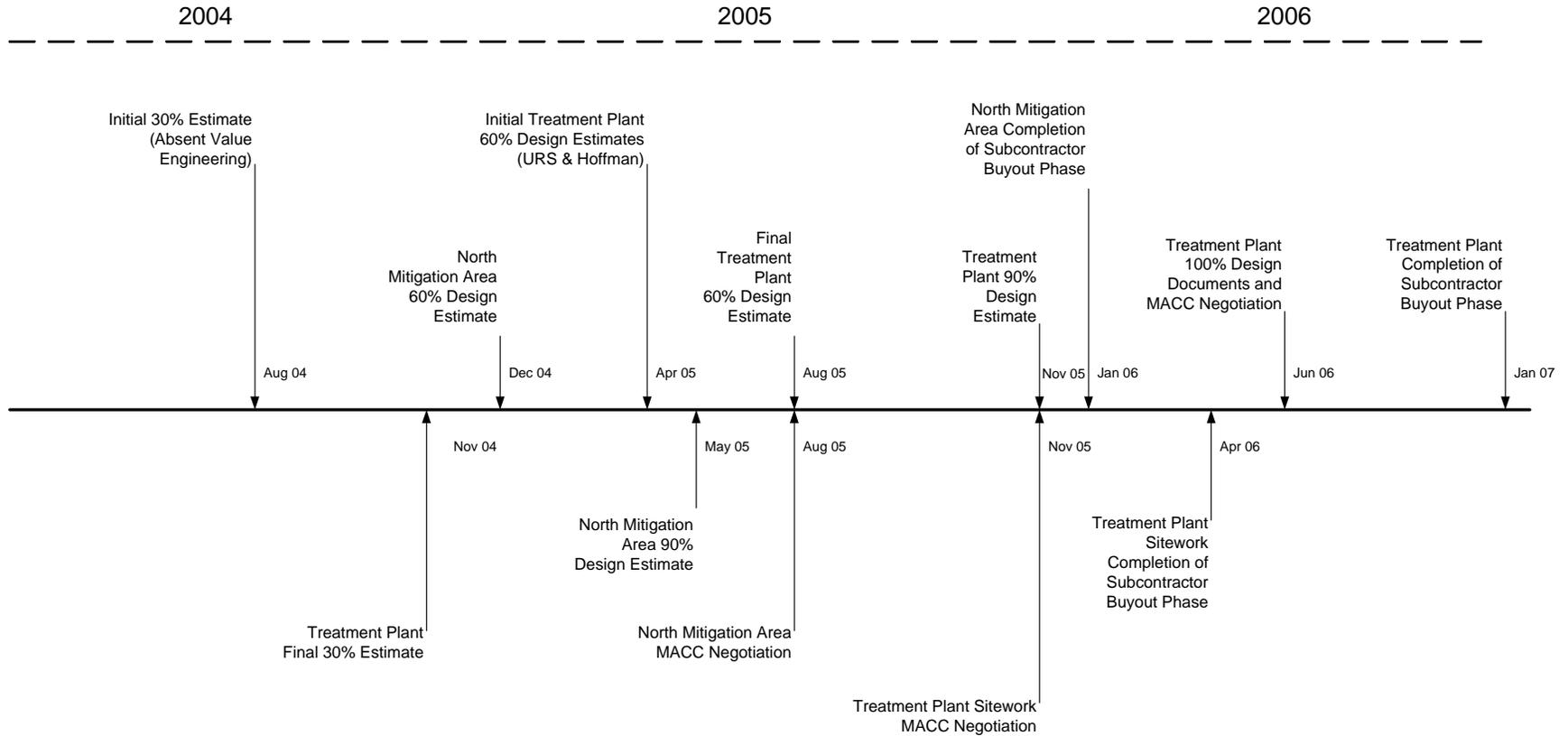


PCSS = Procurement & Contract Services Section
 RFP = Request for Proposal
 SOW = Scope of Work

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APPENDIX 2

BRIGHTWATER TREATMENT PLANT DESIGN PHASES & SCHEDULE



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APPENDIX 3

SUMMARY OF AMENDMENT COSTS FOR BRIGHTWATER TREATMENT PLANT DESIGN ENGINEERING SERVICE CONTRACT (E13035E)

Amendment	Amendment Amount	Cumulative Contract Budget*	Total Percent Change	Phase III Percent Change
Phase I and II Total Cost		\$9,719,364		
Amendment #1	\$0	\$9,719,364	0%	N/A
Amendment #2	\$0	\$9,719,364	0%	N/A
Phase III - Amendment #3	\$31,747,643	\$41,467,007	326.6%	0%
Amendment #4	(\$140,349)	\$41,326,658	-0.3%	-4.0%
Amendment #5	\$330,695	\$41,657,353	0.5%	0.6%
Amendment #6	\$261,587	\$42,488,568	2.5%	3.2%
Amendment #7	\$569,627	\$42,226,980	1.8%	2.4%
Amendment #8	\$426,488	\$42,915,056	3.5%	4.6%
Amendment #9	\$220,000	\$43,135,056	4.0%	5.3%
Amendment #10	\$1,140,000	\$44,275,056	6.8%	8.8%
Amendment #11	\$121,311	\$44,396,366	7.1%	9.2%
Amendment #12	\$162,352	\$44,558,718	7.5%	9.7%
Amendment #13	\$341,486	\$44,900,204	8.3%	10.8%
Amendment #14	\$810,379	\$45,710,583	10.2%	13.4%
Amendment #15	\$189,233	\$45,899,816	10.7%	14.0%
Amendment #16	\$78,583	\$45,978,399	10.9%	14.2%
Amendment #17	\$4,573,695	\$50,552,094	21.9%	28.6%
Amendment #18	\$412,356	\$50,964,450	22.9%	29.9%
Amendment #19	\$28,552	\$50,993,002	23.0%	30.0%
Amendment #20	\$973,092	\$51,966,094	25.3%	33.1%
Pending Amendments	\$2,900,000	\$54,866,094	32.3%	42.2%
Total Phase I, II and III Costs	\$54,866,094			
Total Phase III Design Costs	\$45,146,730			
Total Phase III Cost Changes	\$13,399,087			

*Note: Cumulative Contract Budget figures for Amendments #6 and #7 are skewed due to the order in which the contract amendments were actually executed. However, the amendment values and all total costs and percentage changes are correct.

SOURCE: Wastewater Treatment Division Findings of Fact; Brightwater Project – Phase II – Wastewater Treatment Plant Contract Amendments

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APPENDIX 4

**SUMMARY OF AMENDMENTS FOR BRIGHTWATER TREATMENT PLANT
DESIGN ENGINEERING SERVICE CONTRACT (E13035E)**

Amendments	Summary of Amendments for Brightwater Treatment Plant Design Engineering Contract	Amendment Amount	Cumulative Contract Budget
	Phase I and II Contract		
	Original contract, including amendments, for completion of the Brightwater Treatment Plant predesign services.	--	\$9,719,364
	Phase III Contract Amendments		
Amendment #1	Schedule Extension – No-cost amendment for two-month extension to negotiate final design amendment.	\$0	\$9,719,364
Amendment #2	Schedule Extension – No-cost amendment for additional two-month extension to negotiate final design amendment.	\$0	\$9,719,364
Amendment #3	Final Design Amendment – Initiated Phase 3 final design services for plant; amended contract to add influent pumping station under lump sum agreement and ancillary design services under cost-plus-fixed fee agreement; and extended contract end date to March 2006.	\$31,747,643	\$41,467,007
Amendment #4	Route 9 Site Selection – Revised scope of work to eliminate further design efforts on the Unocal site, and reallocated funds to an expanded and modified scope of work for the selected Route 9 site.	(\$140,349)	\$41,326,658
Amendment #5	Bioscrubbing Odor Control Pilot Test – Added new scope of work providing engineering services to manage, coordinate, and conduct pilot testing of various odor control technology.	\$330,695	\$41,657,353
Amendment #6	Pilot Test of Chemically Enhanced Primary Clarification – Funded pilot testing to verify the design of clarifiers during high flow conditions.	\$261,587	\$42,488,568
Amendment #7	Value Engineering Revisions – Implemented recommended design revisions to bring the treatment plant to 30 percent design and reduce treatment plant costs.	\$569,627	\$42,226,980
Amendment #8	Scope Additions – Amended contract to integrate arts and education in public areas, provide critical area site plans and survey surface utilities, revise the facility plan, and anthropological services.	\$426,488	\$42,915,056
Amendment #9	Value Engineering Revisions – Implemented 30 percent design revisions to achieve a higher quality and more cost-effective project.	\$220,000	\$43,135,056

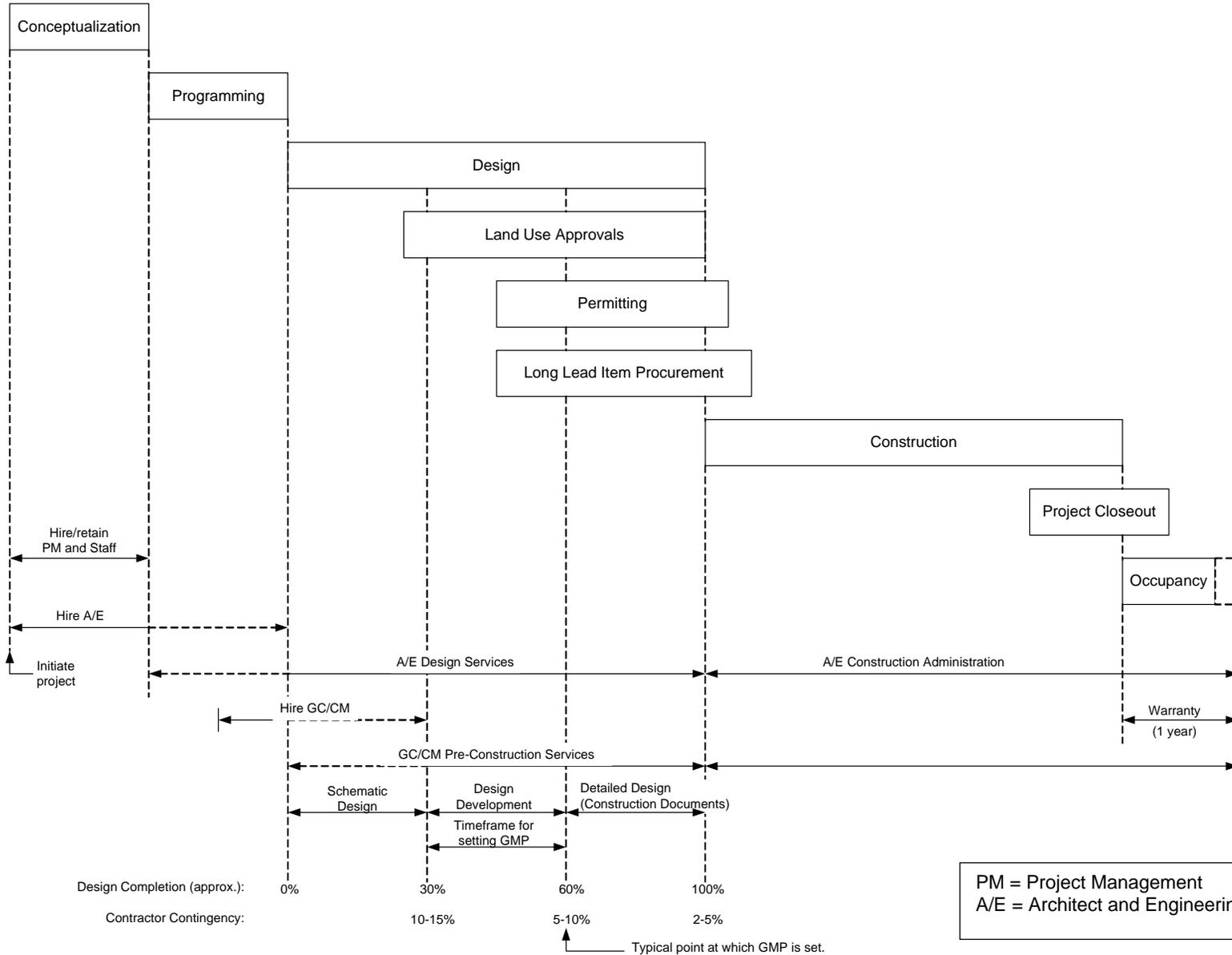
APPENDIX 4 (Continued)

Amendments	Summary of Amendments for Brightwater Treatment Plant Design Engineering Contract	Amendment Amount	Cumulative Contract Budget
Amendment #10	Influent Pump Station – Implemented value engineering changes; added work on influent structure design; pumping equipment; separation of the construction package, and detailed instrumentation and control design.	\$1,140,000	\$44,275,056
Amendment #11	Chemical Storage Facility – Provided for redesign of separate storage for acid and alkaline chemicals in the event of catastrophic earthquake.	\$121,311	\$44,396,366
Amendment #12	Scope Additions – Added scope of work to enhance off-site landscaping, provide consulting services for membrane bioreactor (MBR) procurement, and redesign the aerated grit system.	\$162,352	\$44,558,718
Amendment #13	Critical Design Changes Interim – Implemented critical redesign efforts identified during value engineering review at 60 percent design threshold.	\$341,486	\$44,900,204
Amendment #14	Scope Additions – Provided for additional aerial survey and base mapping of Brightwater site, modeling of peak capacity for MBR system; cost estimating support, permitting support, and developing feasibility study and plan for substantially modified site layout.	\$810,379	\$45,710,583
Amendment #15	MBR Cost Estimate – Funded design consultant cost estimate for the MBR facility at 60 percent design and comparison with the Hoffman Construction Company cost estimate.	\$189,233	\$45,899,816
Amendment #16	Reclaimed Water Piping – Added new scope of work for design of reclaimed water components located within the Influent Pumping Station.	\$78,583	\$45,978,399
Amendment #17	Value Engineering Revisions – Implemented design revisions identified during value engineering review at 60 percent design threshold.	\$4,573,695	\$50,552,094
Amendment #18	Ancillary Services – Provided permit support to establish a project-wide permit conditions tracking database, and provide training in the use of the database to King County staff.	\$412,356	\$50,964,450
Amendment #19	Bid Phase Support – Provided on-call support during the bid phase of the Site Preparation and North Mitigation Area construction contract.	\$28,552	\$50,993,002
Amendment #20	Value Engineering Additions, Revisions and Deletions – Implemented design changes identified during value engineering review at 60 percent design threshold, construction dewatering plan, archeological services, IPS alternative design study; membrane shop drawing submittal reviews, and lump sum design task closure and task reduction.	\$973,092	\$51,966,094
Amendments Pending	Estimated contract amendment values as of June, 2006 for variety of purposes.	\$2,900,000	\$54,866,094

SOURCE: Wastewater Treatment Division Findings of Fact; Brightwater Project – Phase II – Wastewater Treatment Plant Contract Amendments

APPENDIX 5

MODEL OVERVIEW OF GC/CM CONTRACTING METHOD & MILESTONES



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EXECUTIVE RESPONSE



King County

Ron Sims

King County Executive
701 Fifth Avenue, Suite 3210
Seattle, WA 98104
206-296-4040 Fax 206-296-0194
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AUG 08 2006

KING COUNTY AUDITOR

August 8, 2006

Cheryle A. Broom
King County Auditor
516 Third Avenue, Room W1033
Seattle, WA 98104-3272

Dear Ms. Broom:

I have reviewed the referenced performance audit on the management of the Brightwater Treatment Plant engineering services contract amendments and appreciate the opportunity to respond to the findings and recommendations in your report. Your audit evaluated the Wastewater Treatment Division's (WTD) management of contract amendments for the Brightwater Treatment Plant engineering services, assessed the cost-effectiveness of lump sum and general contractor/construction management (GC/CM) contracting methodologies, and identified opportunities for improvement. While I agree in large part with the recommendations, I take exception to some of the conclusions and findings that led to the recommendations.

I would like to begin by stating that I am extremely proud of the progress that we, in King County, have made in siting and designing a new regional wastewater treatment facility for citizens in our service area. This project has presented us with multiple challenges, as well as opportunities, ranging from a complex siting process, demanding technical requirements, public acceptance issues, extensive permitting requirements, and cost control during extraordinary market inflation.

I believe we have responded appropriately and prudently to these challenges and opportunities, while at the same time maintaining a firm commitment to deliver a high performance treatment facility on schedule. In fact, the value engineering changes proposed by the design team helped the county avoid \$86 million in construction cost increases without compromising quality or backsliding on any of our promises to the community.

In my judgment, the success of the Brightwater project to date reflects sound and flexible management by the WTD. It is generally recognized that the Brightwater project is one of the most complex undertaken by King County. The council's oversight monitoring consultant, appointed by the King County Council, stated in its June 2005 report to the council that the project has been well managed. It is also noteworthy that King County's bond rating has been upgraded, in part, due to the confidence that the rating agencies have regarding management of the Brightwater project.



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EXECUTIVE RESPONSE (Continued)

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I have long understood that the successful siting and construction of a new wastewater treatment facility would be difficult and would require creativity and innovation by both the executive and legislative branches of King County. The progress we have made to date reflects a full understanding of the complicated needs of this project as well as the willingness by King County to take actions necessary to ensure success of the project. I believe it is important that we reflect on some of our policy directives on this project.

For example, I proposed, and the King County Council approved, the WTD Productivity Program, which directed WTD to undertake innovative techniques, including alternative contracting strategies, to improve capital program delivery and contain costs. This resulted in the selection of the "lump sum" for the final design and GC/CM contracting approach for construction of the treatment plant as a means to ensure that the project will be delivered on time and with decreased risk.

During the past several years, significant scrutiny and review of the Brightwater project has been undertaken by citizens, regulatory agencies, environmental groups, local jurisdictions, and other interested parties. It has always been my position that, in order to successfully complete the Brightwater Treatment Plant, we would need to work with all interested parties to develop effective policies for dealing with legitimate concerns and issues. Many of these policies imposed additional administration requirements on the Brightwater project, but were directly linked to success of the project. Among these initiatives, which I proposed and the council approved or endorsed are:

- Project Labor Agreements – one for the treatment plant and one for conveyance;
- Owner Controlled Insurance Program (OCIP);
- an emphasis on small business and women/minority business enterprise participation, including a commitment to fund up to \$1 million in additional costs to compensate small business for payment of double fringe benefits;
- use of sustainable building practices;
- state-of-the-art odor control; and
- mitigation agreements with affected communities.

Given the number of policy directives for the highly complex project, I cannot agree with one of the major findings in your report: that inconsistent management practices and contracting methods contributed to higher design costs that were higher than industry averages. To help put these statements in context, it is important to emphasize that the primary driver for cost increases has been extraordinary inflation in construction materials, which has been outside the control of the county, or conditions agreed to in order to address community and environmental concerns. The council has been briefed on a regular basis on outside factors, including the effect of inflationary pressures from construction commodity and material price increases, new regulatory changes and other requirements, and the resultant value engineering efforts undertaken to mitigate construction cost increases. Although the value engineering required that the county pay more for design of Brightwater than originally anticipated, it was deemed to be a cost-effective investment to mitigate the increased construction estimates by \$86 million.

EXECUTIVE RESPONSE (Continued)

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The number of and dollar amount of consultant contract amendments reflect the need to respond to changing conditions, not inconsistent management. Each amendment went through extensive negotiations between the consultant and King County, resulting in amendments to the treatment plant design contract that were \$10.5 million lower than what was proposed by the consultant.

The audit compares the Brightwater design costs to a survey conducted by the Milwaukee Metropolitan Sewerage District (MMSD) in 1982. This report states that design costs should be in the six to 12 percent range of total projects costs. The audit report puts the Brightwater treatment plant design costs at 17 percent, but this is not an apples-to-apples comparison of Brightwater to the projects surveyed in the MMSD survey. When Brightwater's comparable design costs are compared to the survey projects, the design cost is 9.2 percent of construction or 10.7 percent if the land costs are removed. Brightwater falls within the MMSD survey results.

King County has much to be proud of regarding the Brightwater project. Nevertheless, we also recognize that improvements should be made to the Executive policies and procedures governing procurement and contracting and to the manner in which the engineering services contract is managed by WTD. We support the majority of the auditor's recommendations. I have attached our specific responses to the findings and recommendations.

You may be assured that we are committed to making the necessary changes to more closely adhere to county policy and procedures. It is significant to note, at this point, only 17.3 percent of the budget for the Brightwater Treatment Plant has been expended. As such, it is an excellent point in time to receive this valuable feedback on our performance. If you have any questions regarding our response, please feel free to contact Christie True, Manager of the Major Capital Improvements Program in the Wastewater Treatment Division of the Department of Natural Resources and Parks, at 206-684-1236.

Sincerely,



Ron Sims
King County Executive

Attachments

cc: Paul Tanaka, County Administrative Officer, Department of Executive Services (DES)
Pam Bissonnette, Director, Department of Natural Resources and Parks (DNRP)
Ken Guy, Division Director, Finance and Business Operations Division, DES
Don Theiler, Division Director, Wastewater Treatment Division (WTD), DNRP
Christie True, Manager, Major Capital Improvements Program, WTD, DNRP
Dave Lawson, Internal Audit Manager, Office of Management and Budget

Council Audit Recommendations and Executive Response

<p>Finding 1: Management of the Brightwater Treatment Plant contract amendments was not consistent with county policies or industry best practices for effectively controlling project costs.</p>	<p>The Executive acknowledges that management of contract amendments needs to be improved to ensure full compliance with policies and procedures. The Wastewater Treatment Division (WTD) has already implemented procedures to strengthen documentation and compliance. However, WTD did perform either critical reviews or independent estimates for negotiation of all contract amendments, and although negotiations records are not complete, it is fully documented that WTD negotiated \$10.5 million in cost reductions to the contract amendments reviewed by the Council Auditor.</p> <p>The Council Auditor's report stated that design costs for the Brightwater Treatment Plant exceeded industry standards. Based on WTD's review of the methodology cited in the reference documents, the calculation methodology utilized by the Auditor does not provide an <i>apples-to-apples</i> comparison. The Milwaukee Metropolitan Sewerage District (MMSD) report cited by the Auditor compared design costs to total program costs. The Auditor calculation used only construction cost, which resulted in an overstatement of Brightwater's design costs percentages. Using MMSD methodology, the design cost for Brightwater is 9.2 percent of the total project costs or 10.7 percent of the total project cost if land costs are removed. This is within the six to 12 percent range identified as the industry average.</p> <p>Significant changes were made to the design of the treatment plant to reduce cost, which resulted in the need for additional engineering. Rapid escalation of construction commodity prices was the primary driver behind the need to perform extensive value engineering reviews to mitigate construction cost increases and to deliver the project.</p> <p><u>Concur</u></p> <ul style="list-style-type: none"> • The Wastewater Treatment Division (WTD) has initiated changes to improve the project file documentation. <p>The Executive will assess the existing county policies and management controls and propose refinements that are reasonable and appropriate to meet the needs of unique large-scale projects. Changes to the design to implement value engineering have resulted in more than \$86 million in construction cost reductions, while maintaining the project schedule.</p>
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EXECUTIVE RESPONSE (Continued)

Council Audit Recommendations and Executive Response

Recommendation	Executive Response	Schedule for Implementation	Comments
<p><u>Recommendation 1:</u> WTD project management should adhere to all county policies and procedures for managing capital project contract amendments, particularly requirements to document independent cost estimates or critical reviews for additional or revised design work and develop detailed records of negotiations. Design changes should be identified by project tasks along with cost and schedule impacts.</p>	<p><u>Concur</u></p> <ul style="list-style-type: none"> The Wastewater Treatment Division (WTD) has initiated changes to improve the project file documentation. The Executive will assess the existing county policies and management controls and propose refinements that are reasonable and appropriate to meet the needs of unique large-scale projects. 	<p>The Interdepartmental Forum on Procurement will draft appropriate revisions to county policies and procedures by the second quarter 2007.</p>	
<p><u>Recommendation 2:</u> WTD project management should submit amendments with cost estimates that exceed \$150,000 to the central Project Control Officer (PCO) for review and recommendations. Amendments with costs that individually or cumulatively exceed 10 percent of the original design contract value should be submitted to the department director for review and approval.</p>	<p><u>Partially concur</u></p> <ul style="list-style-type: none"> The Executive branch will initiate a review and clarification of threshold requirements for county contracts. WTD will submit all applicable amendments over \$150,000 for PCO review pending a formal 	<p>Review and clarify threshold for review of contract amendments by fourth quarter 2007 as part of the work program for the Interdepartmental Forum on Procurement.</p> <p>Implemented.</p>	<p>The audit revealed that WTD had different interpretations of the policy with regard to the \$150,000 threshold for amendment reviews by the Finance Division's central PCO.</p>

EXECUTIVE RESPONSE (Continued)

Council Audit Recommendations and Executive Response

<p>review and clarification of the threshold in Executive policy and procedures.</p> <ul style="list-style-type: none"> The Executive branch believes WTD met the obligation for informing the department director of significant cost changes; however, the Executive agrees that documents related to such processes could be improved and associated procedures clarified. WTD has already initiated draft forms and is currently preparing associated procedures revisions. 	<p>Third quarter 2006.</p>	<p>WTD recognizes that work has been authorized to proceed without a fully executed amendment, but has not done any work without securing additional budget or appropriation authority.</p>
<p><u>Recommendation 3:</u> The Department of Natural Resources and Parks and WTD management should ensure that new or revised design work does not proceed without fully executed and authorized contract amendments, consistent with county and WTD requirements. Contracts should not be amended to include work that is outside the original contract scope and contract budget in advance of securing additional</p>	<p><u>Concur</u></p>	<p>Implemented. Follow-up work on the <i>delegation of authority</i> topic will be addressed as part of Recommendation 4.</p>

EXECUTIVE RESPONSE (Continued)

Council Audit Recommendations and Executive Response

<p>budget or appropriation authority.</p>			
<p><u>Recommendation 4:</u> The Procurement and Contract Services Section, in cooperation with the Department of Natural Resources and Parks and WTD management, should assess current county policies in relation to unique large-scale capital projects to ensure their reasonableness and to promote consistent compliance by county agencies. Particular attention should be given to adequate delegation of approval authority to ensure critical project schedules can be met while maintaining public accountability. County policies related to central project control officer review of contract amendments greater than \$150,000 should also be clarified to avoid confusion among implementing agencies.</p>	<p><u>Concur</u> The Executive branch will direct the departments of Finance and Natural Resources and Parks to collaborate on the development of a <i>delegation of authority</i> proposal that will address critical project schedules while remaining consistent with best business practices.</p>	<p>The Interdepartmental Forum on Procurement will draft revisions to county policies and procedures by first quarter 2007, with focus on the delegation of approval authority. The clarification of existing county policies for contract amendments greater than \$150,000 will take place as part of responding to Recommendation 2, above.</p>	

EXECUTIVE RESPONSE (Continued)

Council Audit Recommendations and Executive Response

<p>Finding 2: The contracting methods selected for the Brightwater Treatment Plant final design services contributed to higher design costs.</p>	<p>WTD used a lump sum method of contracting for design services and a general contractor/construction management (GC/CM) methodology for construction/construction management. These contracting methods were selected because of their potential benefit to meet the challenges associated with completing large complex capital projects on schedule and within budget. While, there are some <i>lessons learned</i>, both are appropriate for this project and have provided numerous project benefits.</p> <p>As noted above, record increases in the cost of construction commodity prices occurred during the design phase requiring extensive value engineering and redesign to manage the construction costs. High environmental and community interest in Brightwater, in addition to new permitting requirements such as the need to perform extensive seismic investigations, also required significant design modifications. The county's use of the GC/CM to provide construction input during the design phase, while adding cost, has resulted in significant construction cost reductions as its input has been incorporated into the design, rather than appearing as change orders or additional construction cost. It is anticipated that the amount invested in design will result in higher quality, lower construction costs, and fewer changes during construction. The value engineering savings of more than \$86 million could not have been achieved without the GC/CM's involvement.</p> <p>The external influences and pressures experienced on this project, resulting in significant scope changes during the design phase, would have required contractual revisions and amendments regardless of the contracting method employed.</p>		
<p>Recommendation</p>	<p>Executive Response</p>	<p>Schedule for Implementation</p>	<p>Comments</p>
<p><u>Recommendation 5:</u> WTD, in collaboration with the Procurement and Contract Services Section, should ensure that design to construction budget and stop work provisions are included in future professional engineering services contracts to avoid</p>	<p><u>Partially concur</u></p> <ul style="list-style-type: none"> <i>Design to construction budget and stop work provisions</i> are contracting management options that should be <i>considered</i> in the development of professional engineering services contracts. 	<p>The Interdepartmental Forum on Procurement will draft new contract clauses for county-wide use along with guidelines by second quarter 2007.</p>	

EXECUTIVE RESPONSE (Continued)

Council Audit Recommendations and Executive Response

<p>unnecessary design costs.</p>	<ul style="list-style-type: none"> The Executive will direct the Interdepartmental Forum on Procurement to assess current guidelines and prepare new contract language and guidelines for the most effective contract management provisions, including <i>design to construction budget</i> and <i>stop work</i> provisions. The new guidelines will address how the provisions should be applied to various types of contracts and projects. 		
<p><u>Recommendation 6:</u> WTD should ensure that the Phase IV construction engineering services contract and the GC/CM construction contracts contain distinct and clearly defined roles and responsibilities and do not overlap with the role and responsibilities of CDM. The contracts should also address important communication issues, including dispute resolution issues, to ensure continued collaboration in achieving the Brightwater project quality, cost, and schedule objectives.</p>	<p><u>Concur</u></p> <ul style="list-style-type: none"> In response to a similar recommendation from the council's Oversight Management Consultant, R. W. Beck, in June 2005, WTD has developed a clear matrix of responsibilities and communication protocols for all contracts on the Brightwater project. 	<p>Complete.</p>	

EXECUTIVE RESPONSE (Continued)

Council Audit Recommendations and Executive Response

<p><u>Recommendation 7:</u></p> <p>The Procurement and Contract Services Section should develop guidelines for the use of GC/CM contracting methods that maximize opportunities to design and construct capital projects cost-effectively. WTD should provide input in the development of the GC/CM guidelines based upon lessons learned in designing and constructing the Brightwater project and other complex, large-scale capital projects.</p>	<p><u>Concur</u></p> <ul style="list-style-type: none"> WTD will prepare a <i>lessons learned</i> review of the GC/CM contracting process for Brightwater and the Executive will appoint an internal task force to develop guidelines for using GC/CM on future county projects. 	<p><i>Lessons learned</i> following completion of preconstruction services and MACC negotiation February 2007.</p> <p>Guidelines developed by fourth quarter 2007.</p>	
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LIST OF RECOMMENDATIONS AND IMPLEMENTATION SCHEDULE

Recommendation 1: WTD project management should adhere to all county policies and procedures for managing capital project contract amendments, particularly requirements to document independent cost estimates or critical cost reviews for additional or revised design work and develop detailed records of negotiations. Design changes should be identified by project tasks along with cost and schedule impacts.

Implementation Date: Second quarter, 2007

Potential Impact: Adherence to county contracting policies and procedures ensures that capital projects are completed cost-effectively. Independent cost estimates or critical reviews of the consultant's proposed work and associated costs provides a basis for negotiations to obtain the best price. Identifying design changes by project task along with performance impacts ensures that sufficient documentation of the work performed is available over the life of the project, and that management is informed of potential impacts on the overall project performance prior to approving amendments.

Recommendation 2: WTD project management should submit amendments with cost estimates that exceed \$150,000 to the central project control officer for review and recommendations. Amendments with costs that individually or cumulatively exceed 10 percent of the original design contract value should be submitted to the department director for review and approval.

Implementation Date: Fourth quarter, 2007

Potential Impact: Central project control officer reviews oversight by an independent county agency when the proposed amendment costs are high in relation to the original contract value. The county typically budgets 10 percent of the original contract value for capital improvements project contingency, so department director-level reviews ensure added funds are available if needed, and may prompt corrective action if trends are evolving that place the project at risk. (Note: An interdepartmental forum has been convened to determine whether reviews at the \$150,000 threshold should be adjusted for large-scale capital projects.)

Recommendation 3: The Department of Natural Resources and Parks and WTD management should ensure that new or revised design work does not proceed without fully authorized and executed contract amendments, consistent with county and WTD requirements.

Implementation Date: Implemented

Potential Impact: Proper authorization of contract amendments ensures that potential liability issues are avoided for both the county and its contractors if agreement is not reached on terms for amended scopes of work, or if the formal amendment is ultimately not approved along with payment for additional work by the proper county authorities.

Recommendation 4: The Procurement and Contract Services Section, in cooperation with the Department of Natural Resources and Parks and WTD management, should assess current county policies in relation to unique large-scale capital projects to ensure their reasonableness and to promote consistent compliance by county agencies. Particular attention should be given to adequate delegation of approval authority to ensure critical project schedules can be met while maintaining public accountability. County policies related to central project control officer review of contract

LIST OF RECOMMENDATIONS & IMPLEMENTATION SCHEDULE (Continued)

amendments greater than \$150,000 should also be clarified to avoid confusion among implementing agencies.

Implementation Date: First quarter, 2007

Potential Impact: Clarification of county policy and appropriate policy modifications will help balance appropriate oversight with capital project performance objectives (e.g., meeting the critical project schedule) for large-scale projects. An interdepartmental forum has been convened to determine whether review thresholds should be adjusted and whether authority for approving amendments should be delegated to agency and project managers for large-scale projects.

Recommendation 5: WTD, in collaboration with the Procurement and Contract Services Section, should ensure that design to construction budget and stop work provisions are included in future professional engineering services contracts to avoid unnecessary design costs.

Implementation Date: Second quarter, 2007

Potential Impact: Design to construct budget and stop work provisions will provide greater protection to county agencies in the event that project designs exceed established construction budgets and/or more time is needed for design or constructability reviews. Typically, stop work provisions also include stop gaps for consultants and contractors to ensure that mobilized teams and crews are not idle for extended periods.

Recommendation 6: WTD should ensure that the Phase IV construction engineering services contract and the GC/CM construction contracts contain distinct and clearly defined roles and responsibilities, and do not overlap with the role and responsibilities of CDM. The contracts should also address important communication issues to ensure continued collaboration in achieving the Brightwater Project quality, cost and schedule objectives.

Implementation Date: Implemented

Potential Impact: Implementation of these recommendations ensure that capital projects, particularly large-scale GC/CM projects, will be delivered cost effectively by avoiding duplication of roles and responsibilities and fostering effective communication among multiple county consultants and contractors.

Recommendation 7: The Procurement and Contract Services Section should develop guidelines for the use of GC/CM contracting method that maximize opportunities to design and construct capital projects cost effectively. WTD should provide input in the development of the GC/CM guidelines based upon lessons learned in designing and constructing the Brightwater Project and other complex, large-scale capital projects.

Implementation Date: Fourth quarter, 2007

Potential Impact: Guidelines for the use of the GC/CM contracting methods will avoid missed opportunities to maximize the use of project resources in designing and scheduling the implementation of large-scale capital projects.

GLOSSARY

Allied Services: A term used to describe all non-construction services for capital projects, except land acquisition services. Allied services generally include professional engineering and architectural contract services, project management and staff labor, permitting fees and other “soft costs.”

Allowances: A convenient method of estimating construction costs or allocating construction funds to portions of the work that have not yet been specified sufficiently for competitive bidding. This includes systems or items that have not yet been selected, or for which definite criteria for selection have not yet been established.

Alternative Contracting Method: A selection method other than traditional design-bid-build method that generally considers factors in addition to cost (and competitive, low bid) for the selection of a contractor. The most common alternative contracting methods are design-build and General Contract/Construction Manager.

Change Order/Notices: A document usually authorized in writing by the owner to alter or modify some aspect of a project. Change orders are generally accompanied by adjustments to the contract amount and/or the contract duration.

Constructability: A process for optimizing project cost, time, and quality factors with the materials, equipment, construction means, methods, and techniques used on a project, and involves matching owner values with available construction industry practices.

Construction Documents: The documentation developed by the project designer for use by the contractor in constructing the project. Also used to signify the portion of the design phase, approximately from 90 percent to 100 percent of the design, in which the detailed design documents are finalized and construction documents are prepared.

Contingency: An amount of funds set aside in a line item budget to cover unforeseen occurrences that arise during the course of the project.

Critical Path: A sequence of key activities from project start to project finish, whose duration cannot be exceeded if the project is to be completed on schedule. The duration of the sequence often reflects the shortest time possible from project start to completion.

Critical Cost Review: A detailed review of the cost breakdown developed by a consultant or contractor to complete a defined scope of work.

Cost-Plus-Fixed-Fee Contract: A contracting method in which the contractor is reimbursed for the actual cost of labor and materials and is paid a fee for overhead and profit (the fee may be a percentage of the labor and materials costs or a fixed amount). With this method, the contract sum is not fully determined until the work is completed (the initial contract sum is the amount of the fixed fee or the percentage due to the contractor which will be converted to a dollar amount after completion of the work). In many cases, the cost-plus-fixed-fee contract stipulates a guaranteed maximum sum that cannot be exceeded.

Design Thresholds: Defined milestones in the progression of a design project (e.g., 30, 60, 90 and 100 percent) at which certain deliverables or reviews can generally be expected.

GLOSSARY (Continued)

Design to Construction Budget Provision: Contract clause directing a consultant to design a specified project that can be constructed within a specified or budgeted amount. This provision reduces the risk that the owner will receive an unaffordable design.

Deliverables: The drawings, specifications commentary, models, and other documents prepared by the proposer in response to a Request for Proposals (RFP). RFP deliverables are sometimes referred to as “submittal requirements” in RFPs and are not to be confused with contract deliverables.

Design-Bid-Build: The “traditional” project delivery approach where the owner commissions an architect or engineer to prepare drawings and specifications under a design services contract, and separately and subsequently contracts for construction by engaging a contractor through competitive bidding or negotiation.

Design-Build: The system of contracting under which a single entity performs both architecture/engineering and construction services under a single contract with the owner. Also known as “design-construct” or “single responsibility.”

Detailed Design: The portion of the design phase, from approximately 30 percent to 60 percent completion of the design, during which the project design is developed or detailed.

Lump Sum Contract: A fixed dollar amount contract that includes all costs of services, including overhead and project. Lump sum is the simplest method of determining and stating the contract sum, and the contractor may be paid the contract sum in one or more installments.

Notice to Proceed: A letter from an owner directing the contractor to begin work on a contract (often on a specified date), subject to specific stated conditions.

Owner: The entity for which the project is being designed and built.

Procurement: The process for purchasing professional design engineering or construction services.

Request for Proposals (RFP): The RFP document issued by the owner describes the procurement process, and consists of proposal requirements, contract requirements, program requirements, and performance requirements. The RFP is the basis for development of proposals, and may be incorporated in or appended to the final contract.

Schedule of Values: A breakdown or division of a lump sum price (including overhead and profit) for all major work items on the project into component parts in sufficient detail to serve as the basis for progress payments and cost changes.

Schematic Design: The portion of the design phase, from 0 percent to approximately 30 percent completion of the design, in which the major features of the design are determined.

Scope of Work: A description of required work incorporated into a contractual agreement.

Stop Work Provision: Contract clause allowing the owner to direct the consultant or contractor to discontinue work, or slow down work progress, until further notice. Typically, these provisions are used to discontinue work at major thresholds to allow time for value engineering or other design reviews.

GLOSSARY (Continued)

Submittals: Information or products to be incorporated in a project that must be approved by the owner. This information may include samples, calculations, performance tests, and manufacturer's literature.

Value Engineering: A technical design review process undertaken to determine the most cost-effective means of achieving the owner's project objectives. Value engineering often results in additional architectural and engineering design services that reduce construction costs, increase scope, or otherwise enhance the value of the project. (Value engineering should not be confused with a scope reduction to reduce cost.)