



2017

Cost Estimating  
Guide

**SUBJECT: Cost Estimating Guide Update**

*SPU CEG Users:*

The Cost Estimating Guide has been updated to include additional tools and templates as well as a new chapter regarding O&M Cost Estimating. The new documents are effective for use on October 9<sup>th</sup>, 2017. The summary of changes is as per below

- The Cost Estimating Guide (CEG) has been updated effective October 9<sup>th</sup>, 2017. The revised CEG can be found at:

[SPU–Cost Estimating Guide](#)

- The following Tools and Templates, associated with CEG have been revised and updated in the new Cost Estimating Guide:
  - The Basis of Estimate After SG2 is now called the Basis of Capital Estimate for PMP
  - The Basis of Estimate Templates are now both in Excel
- The term “Market Conditions” is no longer used, and the relevant section in Chapter 3: Inflation and Escalation has been removed.
- In Chapter 2, Section 2.3 has been added to explain what schedule is to be included for an estimate. The verbiage in this section was adapted from Sound Transit’s specifications.
- A link to WSDOT bid tabulations has been added as an additional resource in Chapter 4.
- A new parametric cost estimating tool for commonly used diameters of water, sewer, and drainage pipe is now available, called the Cost Model.
- The APWA and CSI cost databases have been updated for 2017. More detailed updates are listed in their respective memos.
- In Chapter 5: Establish Project Reserves, Table 5-1 has been updated to show that Contingency Reserve is now a fixed percentage rather than a range.
- A new section in Chapter 7, Section 7.5: Lessons Learned, provides guidance on assessing project performance and future implications.
- A new chapter, titled Chapter 9: Develop the Total O&M Cost, has been added to the CEG. The chapter also includes new tools and templates for O&M Cost Estimating.
- To differentiate between Capital Cost Estimates and O&M Cost Estimates, many older documents and chapters have been renamed to reflect their use exclusively for Capital Cost Estimates.
  - For example, Chapter 4 is now entitled “Estimate the Capital Base Cost” rather than “Estimate the Base Cost”, as it was previously known.

**Effective usage date:** October 9<sup>th</sup>, 2017

**Effective new update date:** October 1<sup>st</sup>, 2018

**SUBJECT: APWA Bid Items Update (APWA 2017)**

*SPU CEG Users:*

The APWA unit rates have been revised to reflect the changes and improvements resulting from internal/external review. This is the tab titled “2017 APWA” in the Cost Estimate template. The new rates are effective for use on all new estimates, and reflect cost escalated through the end of 2016. The summary of changes is as per below:

- The Unit Cost Report has been updated effective October 9<sup>th</sup>, 2017. The revised Unit Cost Report is named 2017 APWA and can be found at:

[SPU-Cost Estimating Guide](#)

- The following Sections from the 2017 APWA have been updated with new items:

▪ <u>Sec 2-02: Remove, Abandon, Relocate Structures &amp; Obstructions</u>	13 items	▪ <u>Sec 8-02: Landscape Construction</u>	3 items
▪ <u>Sec 5-05: Cement Concrete for Roadway &amp; Related Work</u>	6 items	▪ <u>Sec 8-04: Cement Concrete Curb, Curb and Gutter</u>	3 items
▪ <u>Sec 5-06: Pervious Cement Concrete Pavement</u>	2 items	▪ <u>Sec 8-14: Cement Concrete Sidewalk</u>	7 items
▪ <u>Sec 7-05: Maintenance Hole, Catch Basins, and Inlets</u>	2 items	▪ <u>Sec 8-18: Cement Concrete Stairways, Landings, &amp; Steps</u>	1 item
▪ <u>Sec 7-11: Pipe Installation for Water Mains</u>	18 items	▪ <u>Sec 8-19: Cement Concrete Driveway</u>	6 items
▪ <u>Sec 7-12: Valves for Water Mains</u>	8 items	▪ <u>Sec 8-21: Permanent Signing and Posts</u>	2 items
▪ <u>Sec 7-14: Hydrants</u>	1 item	▪ <u>Sec 8-22: Pavement Marking</u>	4 items
▪ <u>Sec 7-17: Storms Drains and Sanitary Sewers</u>	18 items	▪ <u>Sec 8-33: Conduit and Trenching</u>	1 item

- Previously existing items in APWA have been updated with 2017 costs.
  - Labor: 2.35% increase
  - Material: 1.75% increase
  - Equipment: 2.45% increase
  - Sub: 1.15% increase
- APWA references Mobilization in CSI. Mobilization percentages have increased in CSI 2017:
  - 109005: Mobilization Small Project {Value \$0.5K-\$1M} - 15% Sub Total Const. Cost
  - 109006: Mobilization Small Project {Value \$1.5M-\$2M} - 12% Sub Total Const. Cost
  - 109007: Mobilization Small to Mid. Project {Value \$2.5M-\$5.0M} - 10% Sub Total Const. Cost
  - 109008: Mobilization Mid. to Large Project {Value \$6M-\$10M} - 5% Sub Total Const. Cost
  - 109009: Mobilization Mid. to Large Project {Value \$10M-\$15M} - 4% Sub Total Const. Cost
  - 109010: Mobilization Mid. to Large Project {Value \$15M-\$20M} - 2% Sub Total Const. Cost
- The Cost Estimate Template in the Cost Estimating Guide has been updated to reflect these revisions as of October 9<sup>th</sup>, 2017.
- Future changes to the Unit Cost Report will be made as part of the next planned revision that is scheduled for October 2018.

**Effective usage date:** October 9<sup>th</sup>, 2017

**Effective new update date:** October 1<sup>st</sup>, 2018

**SUBJECT: CSI 2017 Update**

SPU CEG Users:

The CSI unit rates have been revised to reflect the changes and improvements resulting from internal/external review. This is the tab titled “2017 CSI” in the Capital Cost Estimate Template. The new rates are effective for use on all new estimates, and reflect cost escalated through the end of 2016. The summary of changes is as per below:

- The Unit Cost Report has been updated effective October 9th, 2017. The revised Unit Cost Report 2017 CSI can be found at:

[SPU–Cost Estimating Guide](#)

- The following Sections from the 2017 CSI have been updated with new items:

▪ <u>Sec 01-00: General Requirements</u>	1 item	▪ <u>Sec 7-16: Flow Control Systems</u>	7 items
▪ <u>Sec 2-01: Clearing, Grubbing, &amp; Roadside Cleanup</u>	9 items	▪ <u>Sec 7-17: Storm Drains and Sanitary Sewers</u>	26 items
▪ <u>Sec 2-02: Remove, Abandon, or Relocate Structures &amp; Obstructions</u>	14 items	▪ <u>Sec 7-21: Bioretention</u>	1 item
▪ <u>Sec 2-40: General Requirements</u>	1 item	▪ <u>Sec 8-02: Landscape Construction</u>	6 items
▪ <u>Sec 2-03: Structural Demolition</u>	5 items	▪ <u>Sec 8-04: Cement Concrete Curb, Curb and Gutter</u>	7 items
▪ <u>Sec 2-07: Protective System</u>	5 items	▪ <u>Sec 8-14: Cement Concrete Sidewalk</u>	5 items
▪ <u>Sec 7-23: Potholing</u>	10 items	▪ <u>Sec 8-21: Permanent Signing and Posts</u>	2 items
▪ <u>Sec 2-10: Backfilling</u>	7 items	▪ <u>Sec 8-31: Traffic Signal System</u>	2 items
▪ <u>Sec 3-10: Geotech Instrumentation &amp; Monitoring</u>	2 items	▪ <u>Sec 03-00: Concrete</u>	8 items
▪ <u>Sec 4-01: Mineral Aggregates</u>	4 items	▪ <u>Sec 04-00: Masonry</u>	6 items
▪ <u>Sec 5-04: Hot Mix Asphalt (HMA) &amp; Warm Mix Asphalt (WMA) Pavement</u>	9 items	▪ <u>Sec 05-00: Metals</u>	9 items
▪ <u>Sec 6-02: Cement Concrete Structures &amp; Cement Concrete for Misc Work</u>	1 item	▪ <u>Sec 09-00: Finishes</u>	3 items
▪ <u>Sec 7-05: Maintenance Hole, Catch Basins, &amp; Inlets</u>	16 items	▪ <u>Sec 11-00: Equipment</u>	2,346 items
▪ <u>Sec 7-08: Misc Pipe Connection</u>	3 items	▪ <u>Sec 12-00: Furnishings</u>	6 items
▪ <u>Sec 7-11: Pipe Installation for Water Mains</u>	29 items	▪ <u>Sec 23-00: HVAC</u>	16 items
▪ <u>Sec 7-12: Valves for Water Mains</u>	22 items	▪ <u>Sec 26-00: Electrical</u>	46 items
▪ <u>Sec 7-15: SPU Water Connection Contractor Support</u>	8 items	▪ <u>Sec 31-00: Earthwork</u>	5 items
		▪ <u>Sec 33-00: Utilities</u>	18 items
		▪ <u>Sec 46-00: Water &amp; Waste Water Equipment &amp; Accessories</u>	13 items

- Previously existing items in CSI have been updated with 2017 costs.
  - Labor: 2.35% increase
  - Material: 1.75% increase
  - Equipment: 2.45% increase
  - Sub: 1.15% increase
- APWA references Mobilization in CSI. Mobilization percentages have increased in CSI 2017:
  - 109005: Mobilization Small Project {Value \$0.5K-\$1M} - 15% Sub Total Const. Cost
  - 109006: Mobilization Small Project {Value \$1.5M-\$2M} - 12% Sub Total Const. Cost
  - 109007: Mobilization Small to Mid. Project {Value \$2.5M-\$5.0M} - 10% Sub Total Const. Cost
  - 109008: Mobilization Mid. to Large Project {Value \$6M-\$10M} - 5% Sub Total Const. Cost
  - 109009: Mobilization Mid. to Large Project {Value \$10M-\$15M} - 4% Sub Total Const. Cost
  - 109010: Mobilization Mid. to Large Project {Value \$15M-\$20M} - 2% Sub Total Const. Cost
- The Cost Estimate Template in the Cost Estimating Guide has been updated to reflect these revisions as of October 9<sup>th</sup>, 2017.
- Future changes to this Unit Cost Report will be made as part of the next planned revision that is scheduled for October 2018.

**Effective usage date:** October 9<sup>th</sup>, 2017

**Effective new update date:** October 1<sup>st</sup>, 2018

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## Cost Estimating Guide

### Welcome

The Cost Estimating Guide improves the consistency and quality of SPU infrastructure project cost estimates by providing step-by-step directions to people who develop and review cost estimates, including LOB representatives, project managers, engineers, and consultants.

### Having Trouble Viewing the Content?

If you are having trouble viewing any of the content on this site you may need to [adjust how PDFs view in your browser](#). If you are receiving an error related to your DPI settings, adjust your browser display to 100% using the control in the lower right hand corner of the screen.



### Need Help Using the Cost Estimating Guide?

Email [SPU\\_CEG@seattle.gov](mailto:SPU_CEG@seattle.gov) for assistance.

## 1. Overview

Follow this guide when preparing cost estimates for all infrastructure projects. It is applicable to all infrastructure projects, examples include habitat, "green" infrastructure projects, pipeline, storage. This Guide also applies to facilities projects delivered by PDEB. Chapters 1 through 8 of this guide are applicable ONLY to capital costs, for information on Operations and Maintenance (O&M) cost estimates, please refer to Chapter 9.

Cost estimates prepared using this guide are used for the following purposes:

- Help with portfolio management and project prioritization
- Developing proposed rates
- Developing SPU's 6-year Capital Improvement Program (CIP)
- Developing the CIP budget submittal
- Evaluating options and making stage gate, value engineering, and other business decisions
- Use in contract advertisements
- Managing costs and ensuring projects are completed within approved funding levels
- Communicating project costs to internal and external stakeholders
- Operations and Maintenance cost estimates for capital projects (see Chapter 9)

This guide provides templates and directions for preparing project cost estimates. You may need to supplement the guide with professional construction cost estimating expertise to develop high quality project estimates, especially on large or complex projects. If you can not find the answers to your cost estimating questions in this guide, please contact the Cost Estimating Guide support team at [SPU\\_CEG@seattle.gov](mailto:SPU_CEG@seattle.gov).

For small projects, the "Small Infrastructure Project Guide" included in the "Small Infrastructure Projects" section of the [Stage Gates site](#) may be used instead of the templates in the Cost Estimating Guide. The fundamental concepts of the guide are still valid for small projects.

### 1.1. Frequency of Capital Cost Estimate Updates

Cost estimates typically are prepared and/or updated at the following times:

- During Initiation, to obtain Stage Gate 1 approval
- When the Options Analysis Plan is included as part of the Stage Gate 1<sup>1</sup>
- At the 30% Design Phase, which coincides with the culmination of the PMP<sup>2</sup>
- At 60% Design<sup>1</sup>
- At 90% Design, to obtain Stage Gate 3 approval<sup>1</sup>
- At Final Design<sup>1</sup>
- Following bid opening, to obtain Stage Gate 4 approval<sup>1</sup>
- At regular intervals during Construction, including Closeout<sup>1</sup>

<sup>1</sup> For O&M Cost Estimates see Chapter 9.

<sup>2</sup> This project baseline is a new Governance point in 2017.

Unlike the initial estimate and other updates, the update prepared for the Stage Gate 2 business case includes estimates for each option. The economic analysis in the business case at Stage Gate 2 compares the present value of Triple Bottom Line life cycle costs for all options.

In addition to the updates listed above, cost estimates are updated as part of SPU's change management process and are reviewed monthly in the [Enterprise Project Management System \(EPMS\)](#) and annually as part of SPU's budget and spending plan development processes.

## **1.2. Capital Cost Estimate Guide Diagrams**

Figure 1-1 shows the step-by-step process used to develop and update cost estimates. The remainder of this guide follows the order of these steps and provides directions for each step. Each time you update a project cost estimate, you need to update the Basis of Estimate and each Basis of Estimate update needs to describe what has changed.

Figure 1-2 shows the estimate components and how these components are aggregated.

Figure 1-3 shows cost estimate attributes and uses by project phase, including who is responsible for preparing estimates and updates, the expected approach and level of detail, the level of uncertainty at various times in the project delivery cycle, and the decision-making processes where cost estimates are used, including stage gates, rates and budgeting, and value engineering.

Figure 1-4 shows the methods used in each phase to estimate the main cost estimate components. The figure also shows how, as a project progresses through its phases, uncertainty decreases with successive updates of the cost estimate. As design details are developed, unknowns become known, the allowance for indeterminates decreases, identified risk events are passed, more rigorous estimating methods are used, actual project costs are incurred, the uncertainty in the estimated remaining project costs decreases, and the project reserves decrease.

**Figure 1-1:  
Capital Cost Estimating  
Process**

\*This process is for capital estimates only and  
does not apply to O&M cost estimates

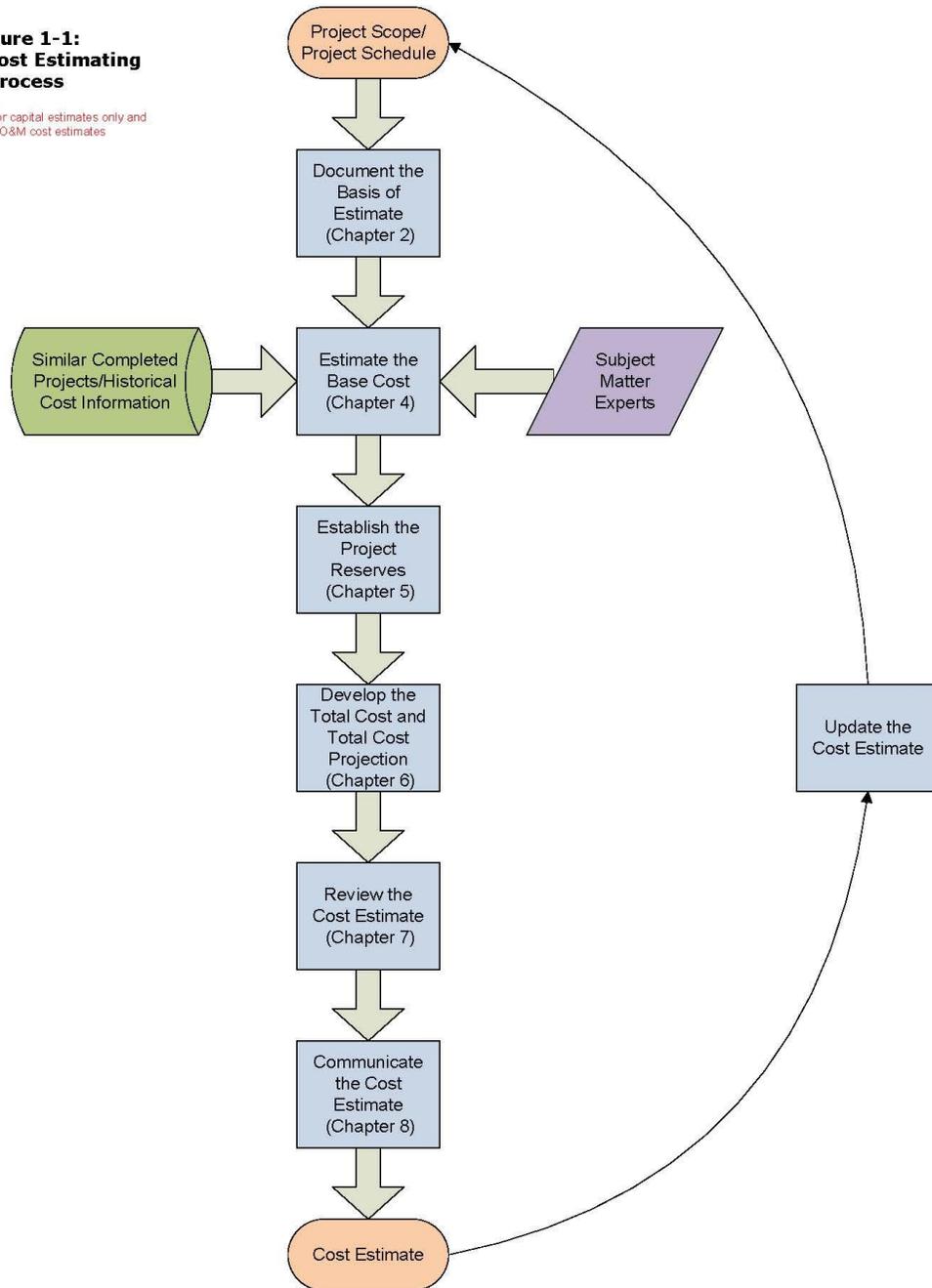


Figure 1-2: Capital Cost Estimate Components

Reserves	Inflation		BASE COST	TOTAL COST (expressed in today's dollars)	TOTAL COST PROJECTION (all costs escalated to year of projected spending)
	Management Reserve				
	Contingency Reserve				
Soft Cost	Property Acquisition Costs		CONSTRUCTION COST	TOTAL COST (expressed in today's dollars)	TOTAL COST PROJECTION (all costs escalated to year of projected spending)
	Soft Costs				
Hard Costs	Crew Construction Costs		CONSTRUCTION BID AMOUNT	CONSTRUCTION CONTRACT AMOUNT	TOTAL COST PROJECTION (all costs escalated to year of projected spending)
	Miscellaneous Hard Costs				
	Sales Tax				
	Escalation Adjustment				
	Allowance for Indeterminates				
	Construction Line Item Pricing				

Figure 1-3: Capital Cost Estimate Attributes and Uses by Project Phase

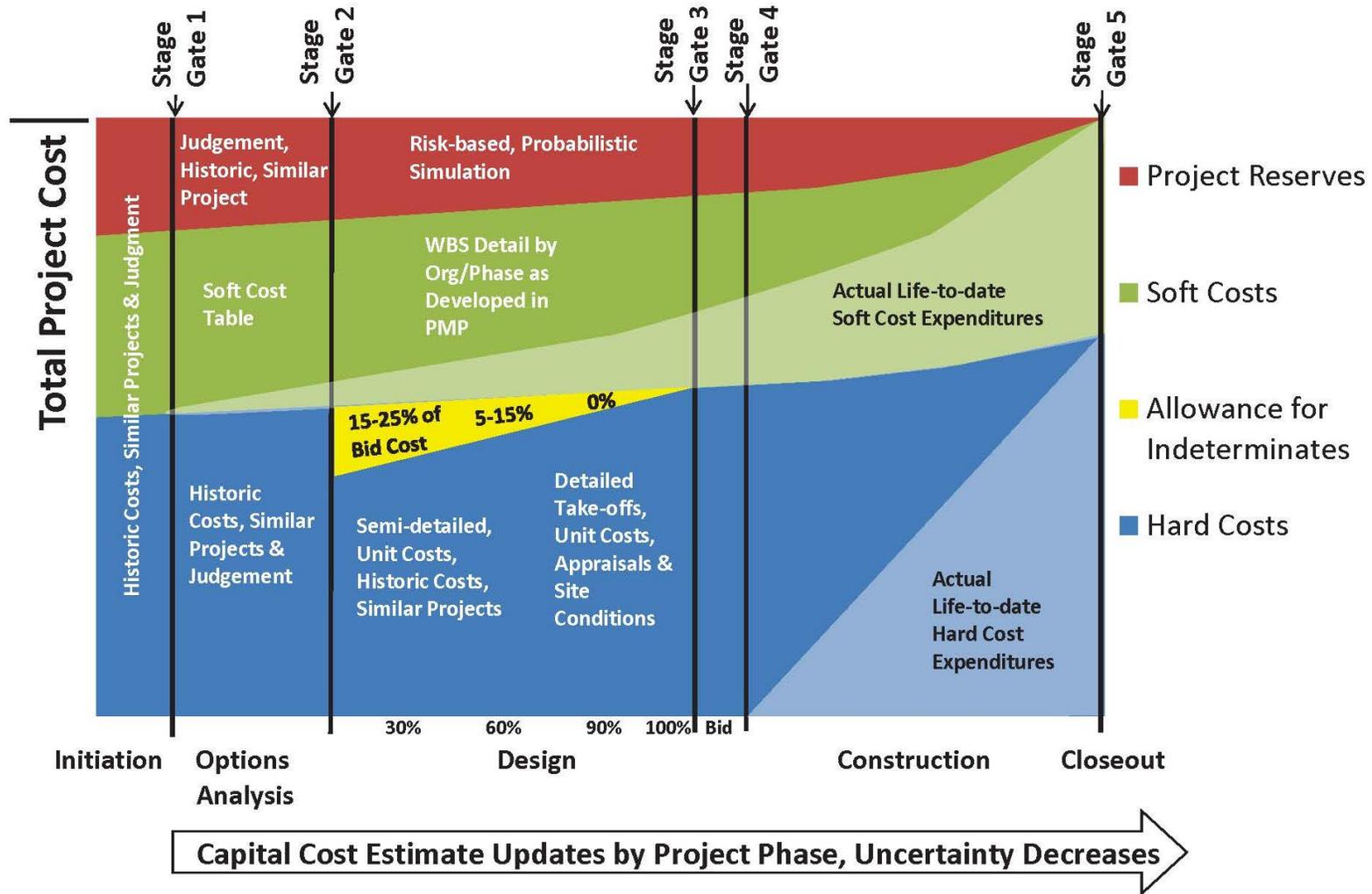
Phase	Initiation	Options Analysis	Design					Construction & Close Out	
			30%	60%	90%	Final	Bid		
What activity is cost estimate used or updated for?	Comprehensive Planning Portfolio Prioritization Project Identification Financial Planning	Feasibility Analysis/Select Preferred Option	Project Management and Control			Ensure funding	Publish to inform bidders and validate / review contractor bid	Change orders and contractor negotiations	
Stage Gate/Funding Request		1. Approve Funding for Options Analysis		2. Approve Preferred Option, Funding for Design, Placeholder for Total Cost Projection and O&M			3. Approve Construction Cost	4. Approve Const. Contract	5. Approve Project Close Out & Asset Costing
Rates and Budget	6 Yr. CIP Budget, Annual Spending Plan							Depreciation Schedule	
Project Management Plan		May Be Used for Options Analysis		Cost Estimate Used to Set Baseline			Update Cost Estimate in PMP		
Value Analysis/ Value Engineering		Estimate Required for VA		Updated Estimate Required for VE					
Who's responsible for cost estimate?	LOB Representative	Project Manager							
AACE Estimate Class (see AACE for guidance)		Class 5	Class 4	Class 3	Class 2	Class 1			
Basis of Estimate	On Problem Statement/Project Objectives, Project Schedule. Construction Costs Based on Historical Unit Costs, Costs of Similar Completed Projects, and/or Expert Judgement. Soft Costs Based on SPU Recent Soft Costs.		Project Scope, Schedule, CCBS for construction cost and WBS for soft cost. Vendor Quote, Industry data and historical costs.	Project Scope, Schedule, Preferred Design Solution. Construction Costs based on CCBS and Soft Costs based on WBS		Apparent Low or Best Value Bidder	Actual and Anticipated Cost		
Construction Bid Cost	Historical Unit Costs, Costs of Similar Completed Projects, and/or Expert Judgement		Line Item Costs for Major Items and Equipment	Line Item Costs for Major Items and Equipment; Semi-detailed Line Item Unit Costs for Remainder	Line Item Costs for Major Items and Equipment; Increased Detailing of Remainder	Detailed Take Off, Unit Costs	Apparent Low or Best Value Bidder	Including Change Orders	
Allowance for Indeterminates	Included in Base Cost		15% to 25% of Bid Cost	5% to 15% of Bid Cost	0% to 5% of Bid Cost	0% of Bid Cost	N/A	N/A	
Property/Permit Fees	Include KC assessment if site determined	Desktop Geotech, Property based on KC Assessor and \$/sq ft for Easements	Based on Appraisals and Site Conditions						
Soft Cost	Recent SPU Soft Costs	By Phase/Org, Based on Recent SPU Soft Costs	Based on PMP and Consultants SOW						
Contingency	25% to 40% of Base Cost	15% to 25% of Base cost	Based on PMP Risk Register						
Management Reserve	25% of Base Cost	20% of Base Cost	15% of Base Cost	10% of Base Cost	5% of Base Cost	5% of Base Cost	5% of Base Cost	5% of Base Cost	

Base Cost

Reserves

Total Cost (in today's dollars); Total Cost Projection (all costs escalated to year of projected spending)

CIP - Capital Improvement Project, SOW - Scope of Work, CCBS - Construction Cost Breakdown Structure, WBS - Work Breakdown Structure, KC - King County, PMP - Project Management Plan,



### **1.3. Roles and Responsibilities**

Roles and responsibilities for developing, compiling and reviewing cost estimates and basis of estimate documents vary depending on the stage of the project and whether the project is designed by in-house staff or consultants.

Figure 1-5A identifies tasks to be accomplished, who completes the task, and who reviews the work product by project stage for projects that are designed by in-house resources.

Figure 1-5B identifies tasks to be accomplished, who completes the task, and who reviews the work product by project stage for projects that are designed by consultants.

Figure 1-5A

Capital Cost Estimating Roles and Responsibilities for In-House Design

Project Stage	Task	Preparer	Review
<b>Project Initiation</b>			
SG 1	Total Project Cost for a Range of Options	<ul style="list-style-type: none"> <li>• LOB Representative</li> <li>• Project Manager</li> </ul>	<ul style="list-style-type: none"> <li>• LOB Representative Supervisor</li> </ul>
Options Analysis Plan (OAP)	Cost Projection for Options Analysis Phase work	<ul style="list-style-type: none"> <li>• LOB Representative input from PMP team (follow PM Methodology)</li> </ul>	<ul style="list-style-type: none"> <li>• LOB Representative Supervisor</li> </ul>
<b>Option Analysis</b>			
Options analysis on all options	Create Basis of Estimate	<ul style="list-style-type: none"> <li>• Project Engineer with input from Design Engineers</li> <li>• LOB Representative</li> </ul>	<ul style="list-style-type: none"> <li>• CIP Design Section Supervisor</li> </ul>
	Construction Contract Amount Estimate (CCAЕ)	<ul style="list-style-type: none"> <li>• Design Engineer from each discipline compiled by Project Engineer</li> <li>• LOB Representative</li> </ul>	<ul style="list-style-type: none"> <li>• Project Engineer</li> <li>• Cost Engineer</li> </ul>
	Soft Cost Estimate, Property Acquisition, Reserves	<ul style="list-style-type: none"> <li>• Project Manager</li> <li>• LOB Representative</li> </ul>	<ul style="list-style-type: none"> <li>• PM Supervisor</li> </ul>
SG 2	Update Total Cost Projection for each option	<ul style="list-style-type: none"> <li>• Project Engineer</li> <li>• Project Manager</li> </ul>	<ul style="list-style-type: none"> <li>• CIP Design Section Supervisor</li> <li>• PM Supervisor</li> <li>• Cost Engineer</li> <li>• Economist</li> </ul>
30% Design	Update Basis of Estimate	<ul style="list-style-type: none"> <li>• Project Engineer compiles input from Design Engineers</li> </ul>	<ul style="list-style-type: none"> <li>• CIP Design Section Supervisor</li> </ul>
PMP	Soft Cost Estimate, Property Acquisition, and Reserves	<ul style="list-style-type: none"> <li>• Project Manager with input from PMP team</li> </ul>	<ul style="list-style-type: none"> <li>• PM Supervisor</li> </ul>
<b>Design</b>			
60%	Update CCAЕ	<ul style="list-style-type: none"> <li>• Project Engineer compiles input from Design Engineers</li> </ul>	<ul style="list-style-type: none"> <li>• Project Engineer</li> <li>• Cost Engineer</li> </ul>
	Update all other non-CCAЕ cost estimates (if necessary)	<ul style="list-style-type: none"> <li>• Project Manager</li> </ul>	<ul style="list-style-type: none"> <li>• PM Supervisor</li> </ul>
	Update Total Cost Projection	<ul style="list-style-type: none"> <li>• Project Engineer</li> <li>• Project Manager</li> </ul>	<ul style="list-style-type: none"> <li>• CIP Design Section Supervisor</li> <li>• PM Supervisor</li> <li>• Cost Engineer</li> </ul>
90% and Final Design	Update Basis of Estimate	<ul style="list-style-type: none"> <li>• Public Works Contracts staff</li> </ul>	<ul style="list-style-type: none"> <li>• Public Works Contracts Supervisor</li> <li>• Cost Engineer</li> </ul>
	CCAЕ (Engineer's estimate)	<ul style="list-style-type: none"> <li>• Public Works Contracts staff</li> </ul>	<ul style="list-style-type: none"> <li>• Public Works Contracts Supervisor and Cost Engineer</li> </ul>

Note: The PM is ultimately responsible to ensure that all elements of the cost estimating guide have been completed prior to finalizing for each milestone.

Figure 1-5B

Capital Cost Estimating Roles and Responsibilities for Consultant Design

Project Stage	Task	Preparer	Review
<b>Project Initiation</b>			
SG 1	Total Project Cost for a Range of Options	<ul style="list-style-type: none"> <li>• LOB Representative</li> <li>• Project Manager</li> </ul>	<ul style="list-style-type: none"> <li>• LOB Representative Supervisor</li> </ul>
Options Analysis Plan (OAP)	Cost Projection for Options Analysis phase work	<ul style="list-style-type: none"> <li>• LOB Representative input from PMP team (follow PM Methodology)</li> </ul>	<ul style="list-style-type: none"> <li>• LOB Representative Supervisor</li> </ul>
<b>Option Analysis</b>			
Options analysis on all options	Create Basis of Estimate	<ul style="list-style-type: none"> <li>• Consultant</li> </ul>	<ul style="list-style-type: none"> <li>• Consultant QC</li> </ul>
	Construction Contract Amount Estimate (CCAЕ)	<ul style="list-style-type: none"> <li>• Consultant</li> </ul>	<ul style="list-style-type: none"> <li>• Consultant QC</li> </ul>
	Soft Cost Estimate, Property Acquisition, Reserves	<ul style="list-style-type: none"> <li>• Project Manager</li> <li>• Consultant</li> </ul>	<ul style="list-style-type: none"> <li>• PM Supervisor</li> </ul>
SG 2	Update Total Cost Projection for each option	<ul style="list-style-type: none"> <li>• Consultant</li> <li>• Project Manager</li> </ul>	<ul style="list-style-type: none"> <li>• Project Engineer</li> <li>• PM Supervisor</li> <li>• Cost Engineer</li> <li>• Economist</li> </ul>
30% Design	Update Basis of Estimate	<ul style="list-style-type: none"> <li>• Consultant</li> </ul>	<ul style="list-style-type: none"> <li>• Consultant QC</li> </ul>
PMP	Soft Cost Estimate, Property Acquisition, and Reserves	<ul style="list-style-type: none"> <li>• Project Manager input from PMP team and Consultant</li> </ul>	<ul style="list-style-type: none"> <li>• PM Supervisor</li> </ul>
<b>Design</b>			
60%	Update CCAЕ	<ul style="list-style-type: none"> <li>• Consultant</li> </ul>	<ul style="list-style-type: none"> <li>• Consultant QC</li> </ul>
	Update all other non-CCAЕ cost estimates (if necessary)	<ul style="list-style-type: none"> <li>• Project Manager</li> </ul>	<ul style="list-style-type: none"> <li>• PM Supervisor</li> </ul>
	Update Total Cost Projection	<ul style="list-style-type: none"> <li>• Consultant</li> <li>• Project Manager</li> </ul>	<ul style="list-style-type: none"> <li>• Project Engineer</li> <li>• PM Supervisor</li> <li>• Cost Engineer</li> </ul>
90% and Final Design	Update Basis of Estimate	<ul style="list-style-type: none"> <li>• Consultant</li> </ul>	<ul style="list-style-type: none"> <li>• Public Works Contracts Staff</li> <li>• Cost Engineer</li> </ul>
	CCAЕ (Engineer's estimate)	<ul style="list-style-type: none"> <li>• Consultant</li> </ul>	<ul style="list-style-type: none"> <li>• Public Works Contracts Staff</li> <li>• Cost Engineer</li> </ul>

Note: The PM is ultimately responsible to ensure that all elements of the cost estimating guide have been completed prior to finalizing for each milestone.

## 2. Document the Capital Basis of Estimate

The information in this chapter applies only to capital cost estimates, for information and guidance on **Basis of Estimates** for Operations and Maintenance (O&M), please refer to Chapter 9.

The **Basis of Estimate** summarizes the information, assumptions, and methodology used to develop a project cost estimate. A well-prepared Basis of Estimate helps people develop, understand, use, and update a cost estimate, and helps avoid estimating errors and omissions. Each time you update an estimate, update the Basis of Estimate and show what has changed. During the Options Analysis phase, complete one Basis of Estimate template, noting any differences between the alternatives that are being considered. If the options are substantially different, complete a separate Basis of Estimate for each alternative.

The topics you'll need to cover in a Basis of Estimate are listed below. Some may find it easier to go directly to the template, which includes instructions:

Tools and Templates



[Capital Basis of Estimate Template Before Stage Gate 2](#)

[Capital Basis of Estimate Template for PMP](#)

### 2.1. Determine the Appropriate Level of Detail

Use your best judgment to determine the appropriate level of detail in the Basis of Estimate. Consider the project size and complexity, the type of project, the degree of project definition (well-defined versus vague), and the number and type of estimate assumptions. The Basis of Estimate should include enough detail to communicate key assumptions, to enable an independent review of the estimate, and to provide a basis for change management.

### 2.2. Complete the Capital Basis of Estimate Template

You'll need to provide basic template information, including the project name, activity number(s), line of business, estimate date, names, and roles of the estimators, and current project phase. A complete Basis of Estimate also includes the following information:

- Project Objectives
- Project Scope
- Project Location, including constraints and site issues
- Project Schedule
- Project Labor Resourcing Strategy
- Construction Contracting Strategy
- Cost Estimating Methodology and Sources of Information
- Allowances
- Other Assumptions
- Exceptions
- Risks
- Estimate Reviews
- How and Why the Estimate Has Changed (with each update)
- Benchmarking

- Reference Documents

Before Stage Gate 2 you may not have some of this information, but after Stage Gate 2 all of these sections should be completed. You may find it helpful to keep an estimate variance log to track how and why your estimate has changed. Benchmarking is especially helpful on projects with high cost uncertainty and/or significant changes in the overall estimate.

The O&M Basis of Estimate can be found in Chapter 9 or on the O&M [Sharepoint](#) site.

### **2.3. Schedule to be Included for Cost Estimate**

A schedule should be defined during options analysis and design so that the estimate accurately costs the projects for its whole duration. During the construction phase, submit and receive acceptance of the Schedule of Values allocating the total Contract Price, prior to Seattle Public Utilities acceptance of the Contract Baseline CPM Schedule. The accepted Schedule of Values shall be used as the basis for progress payments. Payment for Work will be made only for and in accordance with those items included in the Schedule of Values. Each item in the schedule of values should be represented by one or more activity in the Contract Baseline CPM Schedule. The sum of all activities should equal the sum of the item on the Schedule of Values. Change Orders and Provisional Sums will be added as separate items to the Schedule of Values and to the Monthly CPM Schedule as they are Accepted by Seattle Public Utilities.<sup>3</sup>

### **2.4. Where to Get Additional Information**

Additional information on preparing a Basis of Estimate is available from the [Association for the Advancement of Cost Engineering \(AACE\), Recommended Practice No. 34R-05, Cost Estimating and Budgeting—Basis of Estimate.](#)

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<sup>3</sup> Literature regarding the schedule for estimate is adapted from Sound Transit's specifications.

### 3. Inflation and Escalation

The adjustments for inflation and escalation described here are for capital projects only, not for Operations and Maintenance.

Accounting for **Inflation and Escalation** can be complex, and an understanding of these concepts can help an estimator avoid errors when applying them to cost estimates. Fortunately, most of the task of adjusting for inflation and escalation is handled automatically by the Capital Cost Estimate Template.

Tools and References



[Seattle Public Utilities–Inflation and Escalation Adjustment](#)

The following material includes:

- Definitions
- Pre-Determined Values
- Additional Information

#### 3.1. Inflation

A persistent increase in the level of consumer prices, or a persistent decline in the purchasing power of money, caused by an increase in available currency and credit beyond the proportion of available goods and services (AAE 2011).

Finance has set the annual inflation rate to be used for cost projections at 2.3%. Project Managers should confirm that the 2.3% annual inflation rate appears in the Capital Cost Estimate Template (cell B3 of the “Cash Flow for Early Estimates” tab), and after Stage Gate 2 in the Cost Plan Spreadsheet (Project Management Methodology) for all cost projections. Enter the inflated cost projections into EPMS.

If you think your project should use an inflation rate different than 2.3%, please contact [cameron.findlay@seattle.gov](mailto:cameron.findlay@seattle.gov)

### **3.2. Escalation**

Escalation can be defined as the change in price levels due to underlying economic conditions. Escalation is affected by changes in price-drivers such as technology and productivity. Changes in the market conditions such as high demand, profit margins, and labor shortages also impacts escalation. As an estimator, escalation is another specific *risk* cost that must be accounted for. Accurately representing escalation is a complicated issue because the value varies between office and field labor, equipment, and bulk materials. Escalation can also vary between regions and procurement strategies.

Project Managers are instructed to confirm that the 1% escalation adjustment rate of appears in the Capital Cost Estimate Template (cell B4 of the “Cash Flow for Early Estimates” tab). This represents the amount by which escalation is expected to exceed the rate of general inflation. The escalation adjustment is applied only to the Construction Cost Amount. If you have any questions, please contact [SPU\\_CEG@seattle.gov](mailto:SPU_CEG@seattle.gov).

### **3.3. Additional Information**

Many terms are defined by the Association for the Advancement of Cost Engineering (AACE) can be found at the following location:

[AACE Terminology Resource](#)

Inflation is defined within this document.

When Completing the Capital Cost Estimate Template “Cash Flow for Early Estimates” Tab, fill out only the items (cells) highlighted in yellow. The appropriate inflation and escalation rates are already included in the Capital Cost Estimate Template and do not need to be entered by the Project Manager.

## 4. Estimate the Capital Base Cost

This chapter describes the **Base Cost Estimate** for capital projects only, for information and guidance on cost estimates for Operations and Maintenance (O&M), please refer to Chapter 9.

The **Base Cost** is the sum of life-to-date and remaining project costs except Project Reserves, expressed in today's dollars. The Base Cost includes all Hard Costs, Soft Costs and Property Acquisition.

**Hard Costs** include contractor construction costs, an Allowance for Indeterminates (prior to 100% Design), sales tax (see [Appendix B—Sales Tax Guide](#)), permit fees, construction phase survey, construction materials testing, and crew construction costs.

**Soft Costs** are non-construction labor costs. See [Appendix A—Hard & Soft Costs Guide](#) and [Appendix D—Labor Overhead, Miscellaneous Fees](#) for additional details. Property Acquisition costs are the actual cost associated with purchasing property rights for the project, not including labor.

The **Allowance for Indeterminates (AFI)** provides an estimated cost to address known construction scope that cannot yet be accurately quantified during the design phases; this allowance is highest at 30% Design and decreases as design details are finalized.<sup>4</sup>

What follows are the steps for preparing the Base Cost, listed in the order they should be followed. Some may find it easier to jump directly to the Cost Estimate Template.

Tools and Templates



[Cost Estimate Template](#)  
[Cost Plan Spreadsheet \(PMM\)](#)

For additional specialty cost item information see [WSDOT BID Tabulations](#).

### 4.1. Estimate the Construction Bid Amount<sup>5</sup>

#### 4.1.1. Before Stage Gate 2 Approval

- A. Estimate the construction bid amount using: historical unit costs expressed in cost/linear foot, cost/square foot, cost/gallon, etc. (also known as **parametric estimating**), the construction costs of similar completed projects (also known as **analogous estimating**), or professional cost estimating judgment.

<sup>4</sup> Typically, AFIs are first used at the 30% Design phase but could be used earlier if the scope is well defined (e.g. multiple drawing sheets to take quantities off of) allowing the estimate to be based on construction bid items and not parametric or analogous cost estimates.

<sup>5</sup> The estimated Construction Bid Amount is also called the **Engineer's Estimate**.

Summary Cost items are entered in the [Total Cost Projection](#) tab and are used to calculate an estimate at this phase. They should only be for the major items of work. Each Summary Cost Item should include all work required to construct that major item of work. There may only be one cost item on some projects (combined sewer pipe), or several (storm water pipe, storm water tank, storm water above ground storage), but usually not more than 5 major summary cost items on a project. It is important to document the assumptions behind the Summary Cost Items in your Basis of Estimate.

- B. Check with the SPU Cost Engineer to determine whether your parametric or analogous estimate needs to be converted to today's dollars and if so, what that adjustment should be.
- C. A SPU specific parametric estimating tool for specific commonly used diameters of water, sewer, and drainage pipe is now available, named [Cost Model](#).

**4.1.2. After Stage Gate 2 Approval**

Include the Stage Gate 2 construction cost estimate, modified if necessary to reflect the approved scope of work, in the Project Management Plan (PMP) that is prepared following Stage Gate 2 at the 30% Design Phase. The scope, schedule, and budget at the 30% Design Phase and PMP when approved, becomes Project Governance only if the [Establish Baseline at 30% Design Template](#) is also approved. For projects that have reached 30% Design (and projects not yet at 30% Design if there is enough information to prepare a Class 3 estimate), follow the steps in this section, which parallel this equation:

$$\text{Construction Bid Amount} = \text{Construction Line Item Pricing (in today's dollars)} + \text{AFI}$$

- A. Choose American Public Works Association (APWA) formatting for pipeline projects and other horizontal construction or Construction Specifications Institute (CSI) formatting for storage facilities, pump stations, and other vertical construction.
- B. In the Cost Estimate Template, populate the Construction Contract Amount Worksheet with bid items and quantity estimates from the APWA and CSI Bid Item lists.

Item	Bid Item	Bid Item Description	Quantity	Unit	Unit Price	
1	107005	SAFETY AND HEALTH PROGRAM		LS	\$ 2,000.00	\$
2	107010	PERSONAL PROTECTIVE EQUIPMENT, LEVEL B		PDAY	\$ 500.00	\$
3	109005	MOBILIZATION		LS	\$ -	\$
4						\$

Be sure to include the contractor's costs for any environmental remediation or demolition work, and always include the contractor's costs for commissioning and startup, including the cost of spare parts.

- C. Add estimated bid item costs and unit costs, and include contractor overhead, mark-ups, and profit within the unit costs.
- D. The worksheet automatically multiplies the quantities and unit costs to obtain a unit price extension and sums the results to obtain the Construction Line Item Pricing.

- E. Add an appropriate Allowance for Indeterminates (AFI) based on the specifics of the design.  
On smaller projects with limited uncertainties, it would be appropriate to assume a single AFI equal to a percent of the Construction Line Item Pricing as shown in Table 4-1 below.

**Table 4-1: Allowance for Indeterminate Ranges**

<b>Project Phase</b>	<b>Amount to Include for AFI, Expressed as Percent of the Construction Line Item Pricing</b>
Initiation	Already included in parametric and analogous estimates
Options Analysis <sup>6</sup>	Already included in parametric and analogous estimates
30% Design	15–25%
60% Design	5–15%
90% Design	0–5%
100% Design	0%

On larger, more complex projects, and projects that have more uncertainty regarding site conditions or other project elements, it may be appropriate for the construction cost estimator to estimate and identify the components of the AFI individually (e.g., site work AFI, drainage AFI, piping AFI, electrical AFI, instrumentation & control AFI, HVAC AFI, etc.).

Before the AFI(s) is calculated, make sure the Basis of Estimate describes how the AFI(s) will be estimated and why you’ve chosen this approach. Label the new total the Construction Bid Amount.

<sup>6</sup> Applying an AFI on an Options Analysis estimate would be appropriate if the scope is well defined (e.g. multiple drawing sheets to take quantities off of) allowing the estimate to be based on construction bid items and not parametric or analogous cost estimates.

## 4.2. Estimate Sales Tax and Construction Contract Amount

The Capital Cost Estimate Template automatically multiplies the Construction Bid Amount by the [applicable sales tax rate](#) to obtain the estimated sales tax. See [Appendix B](#) to determine non-taxable status. After entering the appropriate sales tax, the Template will also automatically add the resulting sales tax to the Construction Bid Amount and label it Construction Contract Amount:

Construction Contract Amount = Construction Bid Amount + Sales Tax

If your Construction Bid Amount is based on historical data or the costs of similar completed projects, make sure sales tax isn't already included in the historical data.

## 4.3. Estimate the Construction Cost

### 4.3.1. Estimate Miscellaneous Hard Costs

Estimate the cost of permit fees (not including the costs to prepare permit applications, which are included in the project Soft Costs). Also estimate the costs to conduct construction phase site survey work and construction phase materials testing by adding the SPU-provided labor, overhead, and materials costs. Enter each of these costs as line items in the cost estimate. If your estimate is based on historical data or the costs of similar completed projects, make sure these costs are not already included in the historical data. See [Appendix A—Hard and Soft Costs Guide](#) for additional details on miscellaneous hard costs.

### 4.3.2. Estimate Crew Construction Costs

Estimate the crew construction costs by adding the SPU-provided labor, overhead, equipment, and material costs for the capital portion of the project. If your estimate is based on historical data or the costs of similar completed projects, make sure these costs aren't already included in the historical data.

### 4.3.3. Total the Construction Cost/Hard Cost

	Construction Contract Amount
	Miscellaneous Hard Costs
+	<u>Crew Construction</u>
	Construction Cost

Construction Cost = Hard Costs

#### 4.4. Estimate Soft Costs

##### 4.4.1. Before Stage Gate 2 Approval

If the project is in Initiation or Options Analysis, use actual soft cost percentages by project phase from recently completed SPU infrastructure projects as a guide (see Table 4-2). If you adjust the percentages based on professional judgment, document the reasons in your Basis of Estimate.

**Table 4-2: Soft Costs by Phase (Expressed as % of Hard Costs)<sup>7</sup>**

Project Phase	Soft Costs as a Percent of Hard Costs			
	Large Projects		Small to Mid-Sized Projects	
	Water	Drainage & Wastewater	Water	Drainage & Wastewater
Initiation	0.8%	1%	1%	1.2%
Options Analysis	2.3%	3%	3%	3.7%
Design	19.5%	24.5%	25%	30%
Construction	15.7%	19.6%	20%	23.9%
Closeout	0.8%	1%	1%	1.2%
Total	39%	49%	50%	60%

**Table 4-3: Soft Costs Expressed as % of Hard Costs and as % of Total Cost**

Type of Project	Soft Costs as Percent of Hard Costs	Soft Costs as Percent of Total Cost
Large water projects (TCP>\$5M) <sup>8</sup>	39%	28%
Large drainage or wastewater projects (TCP>\$5M) <sup>5</sup>	49%	33%
Small to mid-size water projects	50%	33%
Small to mid-size drainage or wastewater projects	60%	38%

<sup>7</sup> Table 4-2, Table 4-3, and Table 4-4 are based on 130 projects completed between 1998-2010

<sup>8</sup> For Table 4-2 and Table 4-3, large projects have a Total Cost Projection >\$5M

#### 4.4.2. PMP Soft Costs

After Stage Gate 2 approval, project teams use the [Project Management Methodology](#) to estimate soft costs through the development of a Project Management Plan (PMP). Be sure to include life-to-date labor and externally driven Soft Costs such as the public works contracting fees charged by the Department of Finance and Administration (FAS) and SPU non-construction vehicle O&M costs. Once you have finished estimating the Soft Costs in the PMP, use Table 4-3 as a reality check.

**Table 4-4: Soft Costs by Low Org**

SPU Branch	Low Org	Division or Section	Soft Costs as % of Hard Cost	Soft Cost as % of Total Cost
Project Delivery	WS480	Project Management & Engineering Division	23.5%	15.3%
	WS433	Land Survey & Technical Resources	1.4%	0.9%
	WS424	Contracts & Standards	2.0%	1.3%
	WS421	Construction Engineering	7.4%	4.8%
	WS422	Contract Administration	1.4%	0.9%
	WS423	Materials Engineering	1.6%	1.0%
	Other	Various	0.7%	0.5%
	Total Project Delivery			39.0%
LOB Operations & Maintenance <sup>9</sup>			3.8%	2.5%
F&A Office of the General Manager and Chief Executive Officer			1.4%	0.9%
Customer Service			1.1%	0.7%
Other			3.2%	2.1%
<b>Total Soft Cost</b>			<b>53.9%</b>	<b>35.0%</b>

#### 4.5. Estimate Property Acquisition Costs

Estimate the property acquisition costs. Include only the cost of the property and/or easements; **do not include the labor or other costs of negotiating sales price or property agreements.**

#### 4.6. Compile the Base Cost

Hard Costs + Soft Costs + Property Acquisition Costs = Base Cost

<sup>9</sup> This Operations & Maintenance applies to Water Operations & System Maintenance; Solid Waste Operations; Drainage and Wastewater System Maintenance; and Shared Services.

## 5. Establish Project Reserves

This chapter is guidance for establishing **Project Reserves** for capital costs only.

**Project Reserves** are the combination of Contingency Reserve and Management Reserve. **Contingency Reserve** is an amount added to the Base Cost to cover identified risk events that occur on the project, excluding changes in project scope; once a project has passed Stage Gate 2, these risks and contingency response plans are identified in the Risk Management Plan that can be found in the Project Management Methodology (PMM) guideline. **Management Reserve** is an amount added to the Base Cost to cover unidentified risk events that occur on the project, including minor changes in project scope. Examples of Contingency Reserve and Management Reserve are provided in [Appendix C](#).

Figure 1-4, from Chapter 1 shows how Project Reserves are drawn down as a project is delivered. What follows are the steps for establishing the Project Reserves, which are entered either on the Cost Estimate Template at or before Stage Gate 2 or in the Cost Plan Spreadsheet (part of the PMM guide) after Stage Gate 2.

Tools and Templates



Before or at Stage Gate 2: [Cost Estimate Template](#)

After Stage Gate 2: [Cost Plan Spreadsheet \(PMM\)](#)

### 5.1. Determine the Contingency Reserve

#### 5.1.1. All Projects Before Stage Gate 2 Approval

Before Stage Gate 2 approval, establish the Contingency Reserve by adding an appropriate percentage of the Base Cost (see Table 5-1). Unusually complex or simple projects may use higher or lower contingencies, respectively.

If the Project includes an Options Analysis Plan, reserves are calculated and included in that documentation.

Summarize known project risks and their probability and consequences in your Basis of Estimate, and use the information to determine the appropriate Contingency Reserve using the ranges provided in Table 5-1. If your estimate is based on unit costs (e.g., cost/linear foot, cost/square foot, cost/gallon), make sure Contingency Reserve isn't already included in the unit costs.

**Table 5-1: Contingency Reserve Guidelines Through Stage Gate 2**

Project Phase	AACE Estimate	Contingency Reserve as
Initiation	Class 5	40%
Options Analysis	Class 4	25%

<sup>10</sup> See the [AACE Cost Estimate Classification System](#) for details.

### **5.1.2. Projects Following Stage Gate 2**

After projects pass Stage Gate 2, project teams follow [SPU's Project Management Methodology](#) to develop a Risk Plan through the Risk Register template. Determine the phase the risk is likely to occur, identify the minimum cost impact, the maximum cost impact, the probability rating, manageability rating and a response strategy. If the risks require contingent responses, it will calculate the contingency reserve.

Risks identified at this point are Capital risks only, any risks relating to O&M are not included, nor are they monetized. For more information refer to Section 9.2.

One of the outcomes of developing a Risk Plan is a Contingency Reserve amount which is based on the probability and impact of risks chosen to be covered by a contingency response plan. The range of risks evaluated includes but is not limited to the following:

Clarity and degree of project definition

- Size and complexity of project
- Inclusion of new technology on the project
- Quality of reference cost data
- Maturity of organizational and management system and control processes
- Experience of project team

The summation of the Contingency Reserves should be equal to or less than the Contingency Reserve amount estimated for Stage Gate 2 Approval. If the Contingency Reserve amount is greater, then management reserves may need to be used with the approval of the Deputy Director of the Project Delivery and Engineering Branch for Risks that were previously unidentified. Reserves baselined at 30% Design (PMP Completion) should be included and calculated as a part of the Risk Plan.

### **5.2. Determine the Management Reserve**

Establish the Management Reserve by adding a percentage of the Base Cost, as shown in Table 5-2. Unusually, complex or simple projects may use higher or lower Management Reserve percentages, but the justification for doing so must be documented in the Basis of Estimate. Be sure to summarize project unknowns in your Basis of Estimate, and use this information to determine the appropriate Management Reserve percentage from Table 5-2. At the end of 30% Design, which coincides with the culmination of the PMP, cost estimates will be a Class 3.

If the project includes an Options Analysis Plan, reserves are calculated and included with that documentation.

**Table 5-2: Management Reserve Guidelines**

<b>Project Phase</b>	<b>AACE Estimate Class<sup>11</sup></b>	<b>Management Reserve as % of Base Cost</b>
Initiation	Class 5	25%
Options Analysis	Class 4	20%
30% Design	Class 3	15%
60% Design	Class 2	10%
90%/Final Design	Class 1	5%

**SPU Original Table**

### **5.3. Compile the Project Reserves**

Add the Contingency and Management Reserves to obtain the Project Reserves.

<sup>11</sup> See the [AACE Cost Estimate Classification System](#) for details.

## 6. Develop the Total Cost and the Total Cost Projection

This chapter provides guidance for **Total Capital Costs**, it does not apply to Operations and Maintenance (O&M) costs. Total cost does not include O&M costs. For information regarding O&M costs, please refer to Chapter 9.

The **Total Cost** is the sum of the Base Cost and the Project Reserves, expressed in today's dollars. The **Total Cost Projection** is the Total Cost inflated and adjusted for escalation to the expected year of spending. **Inflated and Escalated cost estimates** are calculated automatically in the "Cash Flow for Early Estimates" sheet of the Capital Cost Estimate Template.<sup>1</sup>

The economic analysis in Stage Gate 2 uses Total Cost, expressed in today's dollars<sup>12</sup> to ensure an apples-to-apples comparison of all the options. Total Cost Projection, expressed in inflated and escalation-adjusted dollars, is used in the Funding and Schedule Request section of Stage Gate 2, and is the estimated project cost for all internal and external communications.

What follows are the steps for preparing the Total Cost and the Total Cost Projection. Some may find it easier to jump directly to the template.

Tools and Templates



[Capital Cost Estimate Template](#)

[Cost Plan Spreadsheet \(PMM\)](#)

### 6.1. Compile the Total Cost

Base Cost + Project Reserves = Total Cost.

For the Base Cost, refer to Chapter 4. For the Project Reserves, refer to Chapter 5.

### 6.2. Forecast the Capital Cash Flow

Spread the Total Cost in a cash flow forecast, showing life-to-date actual costs and projected expenditures by year, expressed in today's dollars and based on the project schedule. The cash flow should take into consideration the 2-month lag that typically occurs between completion of consultant and construction contractor work, invoicing, and payment. Enter the percent of total costs to be spent in each year into the appropriate cells in the "Cash Flow for Early Estimates" sheet of the Capital Cost Estimate Template (rows 18, 25, 32, and 39 are highlighted in yellow to indicate inputs supplied by the user).

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<sup>12</sup> Today's dollars are also called "constant" or "real" dollars.

### 6.3. Inflate the Capital Cash Flow

The task of adjusting for inflation and escalation is handled automatically by the Capital Cost Estimate Template after the percent of costs spent in each year have been entered. Use the resulting Total Cost Projection in EPMS and anywhere else project cash flow is reported.

### 6.4. Obtain the Total Cost Projection

Total the life-to-date actual costs, the inflated and the adjusted annual spending forecasts. The result is the Total Cost Projection. Use the Total Cost Projection whenever you need to provide an estimate of what the project will cost, including when you request AMC funding authorization, when you report total cost projections in EPMS, and when you tell SPU management, elected officials, stakeholders, or the community what the project will cost.

### 6.5. Express Total Cost Projection in a Range

Once the Total Cost Projection is developed, you'll need to present it as a "most likely" estimate as well as in a range that communicates the relative uncertainty of the estimate. Use the [AAACE Cost Estimate Classification System](#) as a guide. Typical ranges are summarized in Table 6-1. Apply the ranges to the Total Cost Projection to obtain the estimated cost range. Note that cost ranges are used only to communicate the level of cost uncertainty; they are not part of the authorized project spending nor are the ranges tracked in SUMMIT or EPMS. Cost estimates for Stage Gate 2 will be Class 4 estimates so that the best triple-bottom line decision can be made at Stage Gate 2 and governance (GAA) can be set. At the end of 30% Design, which coincides with the culmination of the PMP, cost estimates will be a Class 3.

**Table 6-1: Typical Range of Estimate Uncertainty by AAACE Class Estimate**

<b>Project Phase</b>	<b>AAACE Estimate Class</b>	<b>Stage Gate</b>	<b>Typical Uncertainty as % Range</b>
Initiation	Class 5	SG1	-30% to +50%
Options Analysis	Class 4	SG2	-20% to +30%
30% Design	Class 3	After SG2	-15% to +20%
60% Design	Class 2	After SG2	-10% to +15%
90%/Final Design	Class 1	SG3	-5% to +10%

## 7. Review the Capital Cost Estimate

This chapter applies to **Reviewing the Cost Estimate** for capital costs only, for guidance regarding Operations and Maintenance (O&M), please refer to Chapter 9.

Estimates are checked for quality and accuracy and to ensure that they are organized correctly and include all required information.

What follows are the steps for conducting an estimate review. Some may find it easier to jump directly to the checklist, which includes instructions.

Tools and Templates



[Capital Estimate Review Checklist](#)

### 7.1. Determine the Appropriate Types of Capital Review

All estimate reviews start with a checker's review. The next required step for all projects that have reached 30% design is a detailed review, which is scaled in scope and magnitude to be commensurate with the size and complexity of the project. Cost estimates for large and/or complex projects may also be reviewed by other internal groups, external reviewers, and management. Independent estimates may also be prepared as needed. Project size and complexity are the most important drivers in determining whether these additional types of review are appropriate.

Refer to Figure 1-5a and Figure 1-5b—Capital Cost Estimating Roles and Responsibilities for both In-House and Consultant Estimate Reviews.

Before you have the reviewers begin the estimate review process, you may want to prepare a second version of the construction cost estimate that lists the construction cost items in order of magnitude (i.e., highest cost line items at the top, lowest at the bottom). That way, reviewers can focus on the cost items that contribute to about 80% of the cost (usually on a single page), and check to see if they are reasonable. This expedites review and avoids having the reviewer focus on cost items that do not contribute significantly to the overall cost.

### 7.2. Complete the First Level Review

The assigned project checker conducts this review, but the role may be assigned to a designated person with cost estimating experience.

The first step is to check the Capital BOE to ensure it is correct and complete. Make sure the scope, assumptions, and estimating approach and methodologies are described clearly. Verify that the estimating methodologies are appropriate to the state or class of the project. Confirm that any significant changes from previous estimates are identified and explained. Next, check the math—quantities, prices and arithmetic. Spot-check spreadsheet formulas and totals. Confirm that the overall cost and schedule are reasonable for the project scope, size, location and complexity. Then, verify that allowances and multipliers are appropriate to the stage or class of the estimate. Ensure that detailed and summary information is presented in the proper

format. Ensure that backup information is organized, and that it's easy to see how the backup information supports information in the estimate summary. Document your findings and return the estimate to the cost estimator, who is responsible for reconciling and revising the estimate as needed to respond to review comments.

### **7.3. Complete the Detailed Review**

Detailed reviews are performed for all projects that have reached at least 30% design. This review is also conducted by the assigned project checker. Ideally, they are performed by people with cost estimating experience who are familiar with the type of work in the project and who have not been involved in developing the cost estimate. On large projects, you may want to have another City department, SPU Branch, PDEB project team, or consultant (if skilled City cost estimators are not available) conduct the review to ensure objectivity.

Detailed reviews start with the steps listed in the section 7.2. In addition:

- A. Spot-check in detail any cost items that would have significant cost impacts if estimated incorrectly. You may need to consult with design engineers, construction managers, or other estimators on specialty equipment and work. On large cost items of larger projects, your spot check may need to include a quick takeoff from the pertinent plans or a separate estimate using a different estimating methodology.
- B. Whenever possible, validate the estimate by comparing the cost and schedule to similar past projects, verifying that hard and Soft Costs are reasonable, Project Reserves are appropriate, etc.
- C. Document your findings and return the estimate to the cost estimator, who is responsible for reconciling and revising the estimate as needed to respond to review comments.

### **7.4. Prepare Independent Capital Construction Estimate**

For projects that have an estimated Total Cost Projection of at least \$5M, an independent construction cost estimate must be prepared as part of a Value Engineering process. For large, complex projects, if there is no clear best choice between the top alternatives it may also be appropriate to prepare an independent construction cost estimate during Options Analysis.

An independent estimate is a stand-alone second estimate, rather than a review of the first estimate or an estimate that takes the place of the regular estimate. An estimate reconciliation meeting is held to review and discuss any significant differences between the two estimates. All differences between the estimates must be documented. All conclusions must be summarized in writing, shared with the project team, and saved in the project files.

### **7.5. Lessons Learned**

Accounting for **Lessons Learned** is an important issue. Having completed projects in the past, it is easy to see what was successful and what was not. Using this previous knowledge to benefit future projects is crucial. To better understand this topic, information is provided below. This section is intended as guidance for project managers to use in reflecting on lessons learned from completed projects.

The following material includes:

- Definitions
- Implications
- Recommendations
- Additional Information

Tools and Templates



[Lessons Learned Agenda Template](#)

[Lessons Learned Sharepoint](#)

### **7.5.1. Lessons Learned**

Qualitative information that describes what was learned during the performance of a process, method, or tool. Lessons learned are captured in a database to support development or improvement of processes, methods, and tools.

### **7.5.2. Implications**

Contractors or owners may elect to take the information gathered, which is an evaluation of the causes of performance variances, and investigate what management practices require modification, implementation, or additional training. As a result, long term performance improvement (i.e., reduced risk of future failure) of an asset will be gained and future variances will thereby be reduced as the new procedure and training become routine management practices.

### **7.5.3. Recommendations**

It is a good practice for asset and project management to assess and capture how successful its assets or projects are in achieving their objectives, and what root causes contributed to success or failure. Lessons learned information is typically elicited through the use of subjective surveys, narrative descriptions, interviews, or formal lessons learned workshops to identify all contributing causes, analyze for root cause, and identify new or improved work processes. When performance is successful, subjective approaches work well because the team is generally willing to share information. However, with performance failures, when stakeholders are not so willing to share information, a more in-depth, objective forensic analysis may be the only way to identify root causes and responsibility for contract variances.

### **7.5.4. Additional Information**

More information regarding this topic can be found on the Association for the Advancement of Cost Engineering's (AACE) website:

[AACE Website](#)

## 8. Communicate the Capital Cost Estimate

This chapter applies to capital **Cost Estimates** only, for applicable guidance regarding Operations and Maintenance (O&M) estimates, please see Chapter 9.

Cost estimates are used for many purposes, some of which have additional content or formatting requirements. Links are provided below to some of the key presentation and communication requirements:

### 8.1. Basis of Capital Estimate & Capital Cost Estimate Template

Cost estimates should be saved in a place where the project team and other SPU employees as appropriate can view and use them. Save the completed Basis of Estimate and Cost Estimate Template (including the Total Cost, cash flow, and Total Cost Projection) to the project files, following the [project filing standards](#) in [SPUFORMS](#). Be sure to save the original estimate and all updates.

### 8.2. Enterprise Project Management System (EPMS)

Estimates are tracked and monitored in EPMS, and budget submittals are based on the estimates in EPMS. Project managers enter Cost Projections (i.e., inflated cash flow) in EPMS each month.

### 8.3. Asset Management/Stage Gates

Stage Gates and specific requirements are available on the [Stage Gates Site](#). Stage Gate 2 requires a Total Cost for each option included in the business case and a Total Cost Projection for the recommended option. Stage Gates 3 and 4 require updated Total Cost Projections for the recommended option.

During options analysis for Stage Gate 2, the present value of life-cycle cost of each option is developed in order to help select the preferred option. Your economist will help in developing the life-cycle costs. In order to calculate a present value of life-cycle costs you will need the project cost, an annual schedule of construction, future project costs, and project life. Project life can vary from 7 years for IT projects to 100 years for long-lived assets such as pipes. Life-cycle costs include all future costs. For example: operation and maintenance, replacement of equipment, and plant establishment for GSI. The project designer and field operations liaison can assist in collecting these future costs. Occasionally, the selection of an option is also based on risk costs. Again, your economist can help the team to identify and quantify risk costs.

For O&M related requirements, please refer to Chapter 9.

### 8.4. Value Engineering

All projects with a Total Cost Projection of at least \$5M must complete a value engineering process. Ideally, value engineering is scheduled to be completed prior to 30% design, which coincides with PMP completion and is included in the baseline. The most recent detailed project cost estimate, including the Basis of Estimate, is an important input to the value engineering exercise. Roles and expectations are described in [SPU's Value Engineering Guide](#).

### **8.5. Change Management**

Estimate updates prepared during design are used to track and manage project costs. Any significant change in project scope, schedule, or cost requires approval through SPU's Change Management Process. Update the estimated Total Cost Projection and document what costs will change and why. Variance and Change Management processes are documented in the [Project Management Methodology](#).

### **8.6. Internal and External Communications**

Project costs are communicated to a variety of internal and external audiences during project planning and delivery. With the exception of the options analysis performed as part of the Stage Gate 2 business case, always communicate the most current Total Cost Projection (i.e., inflated cash flow and inflated total)

## 9. Develop the Total O&M Cost

This chapter provides templates and directions for preparing Operations and Maintenance (O&M) cost estimates for capital projects. Involve subject matter experts early in the project development lifecycle to represent the O&M perspective and help determine O&M estimates. If the project involves a design consultant, the firm shall utilize this guide and tools.

It is the expectation that O&M budget additions and efficiencies will be documented. The O&M Basis of Cost Estimate document (MS Word) explains assumptions made to come up with estimates for future O&M costs. The O&M Cost Estimate Spreadsheet (MS Excel) includes future O&M SPU Labor and Non-Labor in dollars and Full Time Equivalents (FTE).

If you cannot find the answers to your cost estimating questions in this guide, contact the Cost Estimating Guide support team at [SPU\\_CEG@seattle.gov](mailto:SPU_CEG@seattle.gov). Additionally, each Line of Business (LOB) has a point of contact to serve as a reviewer, as a coach, and provide a feedback mechanism for continuous process improvements.

Cost estimates prepared using this guide are used for the following purposes:

- Evaluating options for Stage Gate, value management, and other business decisions
- Developing proposed rates
- Developing SPU's O&M budget
- Determining labor needs and staffing
- Communicating total project costs

There is a checklist that can help navigate the business process.

Tools and Templates



[O&M Cost Estimating Checklist](#)

### 9.1. O&M Cost Estimate Updates

During Project Initiation (pre-Stage Gate 1), the Branch/Line of Business should start thinking about the O&M needs for the most obvious options to be analyzed during the Options Analysis Phase. No further action for O&M is required at SG 1. After SG 1 approval, high-level O&M estimates need to be prepared for each option as part of the total lifecycle cost. During Options Analysis (SG 2), these O&M cost estimates, and capital estimates, are used by the Economist to calculate the present value of Triple Bottom Line (financial, social, and environmental) lifecycle costs for each option. After the One Team selects a preferred option, the O&M tools are applied to the recommended option. After SG 2 is approved, the Design Phase commences. At 30% Design Phase the project is baselined with the PMP and O&M is updated. At 60%/90%/Final Design, O&M estimates become more precise. If there are no O&M estimate changes from the previous Stage Gate, Change Management, or Phase, document that in the O&M Basis of Cost Estimate and move forward.

The Budget, Planning and Forecasting (BPF) system needs to be updated per BPF Business Rules (quarterly) and when use of O&M cost estimating tools reveal a change from the previous update. By the time the Construction Phase is complete and the asset is accepted, O&M Labor and Non-Labor costs should be well understood, confirmed, and included in SG 5. At each update, input Non-Labor estimates into BPF to feed into the O&M Budget. SPU Finance will track the incremental additions and efficiencies separately.

Note: Even if Labor and Non-Labor O&M cost estimates are justified for the capital project, this does not guarantee that new staff positions or money will be automatically included in the O&M Budget or future Strategic Business Plan.

O&M cost estimates are prepared and updated using the O&M Basis of Cost Estimate document and the O&M Cost Estimate Spreadsheet. O&M Cost Estimates are tracked and reviewed in the EMPS, Stage Gates, and BPF systems at the following times:

**Table 9-1 O&M Estimate Update Requirements**

<b>Project Lifecycle Phase &amp; Stage Gate</b>	<b>Record of O&amp;M Estimate &amp; Responsible Party*</b>	<b>Team Involvement &amp; Concurrence**</b>
Options Analysis (SG 2)	<b>BPF</b> –LOB Rep <b>SG 2</b> –LOB Rep <b>EPMS</b> –Governance Analyst	LOB Rep, PM & SME’s (incl. Economist)
30% Design: SG Change Gate or Establish the Baseline (with a PMP)	<b>BPF</b> –LOB Rep <b>SG Change</b> –LOB Rep <b>EPMS</b> –Governance Analyst	LOB Rep, PM & SME’s
60% Design: if O&M cost changes	<b>BPF</b> –LOB Rep	LOB Rep, PM & SME’s
90% Design: if O&M cost changes	<b>BPF</b> –LOB Rep	LOB Rep, PM & SME’s
Final Plan Design (SG 3: Approval to Advertise)	<b>BPF</b> –LOB Rep <b>SG 3</b> –LOB Rep <b>EPMS</b> –Governance Analyst	LOB Rep, PM & SME’s
Following bid opening (SG 4: Approval to Award), if O&M cost changes or need to rebaseline.	<b>BPF</b> –LOB Rep <b>SG 4</b> –LOB Rep <b>EPMS</b> –Governance Analyst	LOB Rep, PM & SME’s
<a href="#">Closeout (SG 5)</a>	<b>BPF</b> –LOB Rep <b>SG 5</b> –LOB Rep <b>EPMS</b> –Governance Analyst	LOB Rep, PM & SME’s
Stage Gate Change Management	<b>BPF</b> –LOB Rep <b>EPMS</b> –Governance Analyst	LOB Rep, PM& SME’s
<a href="#">Quarterly per BPF Business Rules</a>	<b>BPF</b> –LOB Rep No Governance, unless combined with SG or Change Management.	LOB Rep & SME’s

\*LOB/Branches may designate an alternate person or role to update BPF and to lead the cost estimating.

\*\*Each SG has a Gate Coach to assist staff with that phase to ultimately gain approval. The Gate Coach provides system QC, project QA, and is a resource to help projects move forward. [Here](#) is the link to the SG SharePoint site to find your Gate Coach.

## 9.2. Document the O&M Basis of Estimate

The O&M Basis of Cost Estimate uses words to explain cost estimate numerical data. It summarizes assumptions and methodology used to develop O&M data for a project cost estimate. Revise the O&M Basis of Cost Estimate at the same time as the Capital Basis of Estimate update, typically at each Stage Gate from SG 2 through SG 5, Change Management, and each Design Phase. During the Options Analysis Phase, complete one O&M Basis of Cost Estimate and one O&M Cost Estimate Spreadsheet for the recommended option. Use the SG 2 Options Summary section to note O&M differences between alternatives so the complexity of the O&M component can be understood completely.

Use historical data and best professional judgment to determine the appropriate level of detail in the O&M Basis of Cost Estimate. Consider the project size, complexity and the degree of project definition (well-defined versus conceptual). Involve Subject Matter Experts (SME's), including Planning and Scheduling Staff, early in the estimation process. The Maximo Team can help provide data, including information surrounding specific asset classes and like assets. The O&M Basis of Cost Estimate should include enough detail to communicate key assumptions, to enable independent review of the estimate, and to provide a basis for change management, as necessary. O&M risks are described in the O&M Basis of Cost Estimate, but not monetized. See [Appendix E](#) for more detail regarding SPU Labor and Non-Labor information.

If the O&M Estimate has not changed since the previous estimate, document that nothing has changed in the O&M Basis of Cost Estimate.

### Tools and Templates



[O&M Basis of Cost Estimate](#)

## 9.3. Calculate the O&M Cost Estimate

The O&M Cost Estimate Spreadsheet is used in conjunction with the O&M Basis of Cost Estimate document to summarize the O&M component of a project estimate. Use the spreadsheet completed by the Economist for the recommended option at SG 2 as the starting point for future Gate and Phase updates (Named: Sheet 1 SG 2 Econ Analysis). The team Economist will provide the O&M Cost Estimate spreadsheet to the LOB Representative to use for future refinements.

During Options Analysis, it is the LOB Rep's responsibility to seek input from the project team, including SME's, and to provide the Economist with the Total Lifecycle Cost, which includes Capital and O&M costs for each option. The estimate includes Annual, Periodic, and Operating and Replacement Costs for the expected life of the asset. The LOB Rep is also responsible for ensuring that the O&M Cost Estimate Spreadsheet is populated and that BPF is updated for the recommended option and this information is updated from SG 2 through SG 5 and Change Management. (Named: Sheet 2 Master). See Appendix A for more detail.

It is the PM's responsibility to coordinate with the Project Engineer, the LOB Rep and O&M staff to ensure Maximo Equipment numbers have been included on the design plans.

Each time an estimate is updated, revise the O&M Cost Estimate Spreadsheet to show what has changed. (Named: Sheet 2 Master). If nothing changes, then document that nothing has changed. The O&M Cost Estimating Spreadsheet should include enough detail to communicate key assumptions, to enable independent review of the estimate, and to provide a basis for change management, as necessary.

During the Design Phase, after the Maximo Equipment Numbers are assigned, insert the Asset Document Data Worksheet that PDEB Design Section completes. (Named: Sheet 3. Asset Doc Data). Update this as the project progresses and as assets are constructed.

The fourth sheet of the O&M Cost Estimating Spreadsheet (Named 4. Estimate Labor FTE) includes information regarding asset/activity, task description, craft completing the work, quantities of assets and frequency of inspections or preventative maintenance/year.

Additionally, there is a sheet (Named: Labor Rates) that contain annual Labor Rates (raw and loaded), Labor Assumptions, etc....this information should be updated annually.

#### Tools and Templates



[O&M Cost Estimate Spreadsheet](#)

### 9.4. Review the O&M Cost Estimate

Estimates are checked for quality, accuracy, and to ensure they are organized correctly and include all required information.

#### 9.4.1. Determine the Appropriate Type of Review

All O&M estimate reviews start with a first level or supervisor's review. Each step is scaled to be commensurate with size and complexity of future O&M of the SPU asset. Cost estimates for large, complex, or non-standard assets may also be reviewed by other internal groups, external reviewers, and management. Work with LOB/Branch chain of command to determine who the best reviewers are for specific asset classes or facilities. Independent estimates may also be prepared by consultants, as needed. Review of consultant estimates should be completed as determined in Roles and Responsibilities. Always include the LOB Rep, O&M SME's, and PM in O&M estimate development and review conversations. If you have questions, contact the LOB point of contact.

#### 9.4.2. Review the Estimate

Usually the supervisor of the person who prepared the O&M estimate conducts this review, but the role may be assigned to a designated person with cost estimating experience or O&M staff with cost estimating experience. O&M Managers where the budget implications impact should also have an opportunity to review the O&M estimate so they can plan for future needs with Planning and Scheduling staff.

- A. O&M Basis of Cost Estimate: Ensure that scope, assumptions, estimating approach and methodologies are described clearly, that backup information is meaningful, and that significant changes from previous estimates are identified and explained.
- B. O&M Cost Estimate Spreadsheet: Ensure that quantities, prices and arithmetic are correct. Spot-check formulas and totals. Confirm that the O&M cost is reasonable for the project scope/size/location/complexity. Consider if assets are non-standard or standard, and if SPU crews or contract will maintain it. When possible, validate the O&M estimate by comparison to similar past projects.
- C. Spot check any cost items that would have significant cost impacts if estimated incorrectly. Consult with the LOB Rep, Crew Leader, O&M Managers or SME's on specialty equipment, non-standard assets, and if there are questions. On expensive or repetitive cost items within larger projects, multiple assets, or facilities, a spot check may need to include a quick review or takeoff from the pertinent plans or a separate estimate using a different estimating methodology.
- D. Contact the SPU Fleets and Warehousing Division Director if replacement parts, fleet, or equipment needs are included in the estimating or if proposed to be stored in the warehouse.
- E. Document findings and return the estimate to the O&M cost estimator who, if necessary, is responsible for reconciling and revising the estimate in response to reviewer comments; and to the LOB Rep who originated the cost estimate and is responsible for finalizing the estimates. Ensures that the latest iteration of the tools are updated and BPF is updated.

### **9.4.3. Review O&M Estimates Prepared by Others**

When arrangements are made to have O&M estimates prepared by other departments or consultants, the SPU LOB Rep must provide clear expectations (regarding level of detail, estimating methodology, extent of documentation, etc.) and must confirm who will conduct the reviews. O&M Managers where the budget implications impact should also have an opportunity to review the O&M estimate so they can plan for future needs with Planning and Scheduling staff. Once the O&M cost estimate is complete and reviewed, the LOB Rep must also check the O&M cost estimate, including:

- A. Confirm that the O&M Basis of Cost Estimate and O&M Cost Estimate Spreadsheet are complete, in the proper format, at an appropriate level of detail for stage of the estimate and that significant changes from previous estimates are identified and explained.
- B. Spot check the math and confirm that the overall O&M cost is reasonable for the project scope, size, location and complexity.
- C. Act as a liaison to ensure the LOB/Branch O&M management understands and agrees with the future SPU Labor and Non-Labor implications.
- D. Document findings and return the estimate to the O&M cost estimator, if needed, to respond to review comments.

## **9.5. O&M Cost Estimate Expectations**

### **9.5.1. Project Team**

O&M SME's, PM, LOB Rep and LOB Management collaborate on each O&M estimate. The Line of Business/Branch is responsible for unit cost information, determining FTE needs, and inputting information into BPF. The LOB Rep is responsible for obtaining

information, completing the O&M tools and refining the O&M Tools as the project progresses. The LOB Planning and Scheduling groups and the Maximo Work Management Support Team can provide detailed asset information, including O&M costs. The LOB Planning Manager responsible for the estimate provides guidance, reviews, and helps to resolve any discrepancies or issues. The LOB O&M Manager where the budget implications impact the O&M Budget provides guidance, reviews, and helps to resolve any discrepancies or issues. The Project Manager is responsible for ensuring the documents are complete and included in the governance document. If you have questions, contact the LOB point of contact.

### **9.5.2. Budget, Planning and Forecasting (BPF)**

LOB Rep or Planning & Scheduling staff update O&M estimates in BPF as Business Rules dictate (quarterly), and at specified SG and project lifecycle milestones. The LOB Rep is responsible for sending the link or the document to Planning & Scheduling for input into BPF, if Planning and Scheduling is tasked with updating BPF. Also, a project may have O&M Budget implications to multiple budgets. Make sure all the affected Planning and Scheduling sections have been provided the updated O&M Cost Estimate Spreadsheet. E.g. DWW pump stations can affect the Shared Services and the DWW Systems Maintenance budgets.

### **9.5.3. Enterprise Project Management System (EPMS)**

Approved SG O&M estimates are entered in EPMS in the Project Decision O&M Tab by the Governance Analyst (Corporate Services Division) and quality checked by the PM.

### **9.5.4. Stage Gate Change Management**

As a project is refined during design, construction and closeout phases, estimates are updated. Significant changes in Capital project scope/schedule/cost require approval through SPU's Stage Gate Change Management Process. There are currently no O&M change thresholds. If a project is proposing to rebaseline due to Capital changes, then the respective O&M should be updated and reviewed concurrently.

# Seattle Public Utilities

## *Cost Estimating Guide*

### Appendices

APPX A-Hard and Soft Costs

APPX B-Sales Tax Guide

APPX C-Contingency and Mgmt Reserve Examples

APPX D-Labor Overhead, Misc Fees

APPX E-O&M Cost Estimating

## **Appendix A—Hard and Soft Cost Guide**

Hard costs are expenditures made to construct, manufacture and/or install tangible, depreciable facilities contained in a capital improvement plan, and they can be allocated to specific CIP projects.

Soft costs are the labor and administrative expenditures associated with the planning, design, delivery and support of CIP projects.

Property, rights-of-way, and easements are either hard or soft costs.

### **Hard Costs include:**

- Construction contractor payments for construction of capital projects
- Utility work force used directly in the construction of capital projects
- Utility equipment (depreciable portion) directly associated with capital project construction
- Installed equipment, owner supplied or contractor supplied
- Construction materials
- Computer equipment purchased specifically for a capital project
- Acquisition and installation of monitoring equipment to support a planning or engineering process for a specific CIP project
- Building and environmental permit fees
- Mitigation and restoration
- Operating expenses incurred to “make-way”, or “work-around” construction activities
- Construction notification and public information
- Testing equipment for a specific project
- Plant establishment for one year (Additional years would be paid from O&M)

### **Soft Costs include:**

- Planner, scientist and economist labor
- Monitoring and modeling
- Alternatives analysis
- Project management
- Project scheduling and cost estimating
- Engineering and other labor leading to final design and bid package for contracted construction, including modeling, flow monitoring and data collection, and public involvement/community outreach,

- SEPA and environmental review process
- Building and environmental permit research and application development
- Real property services labor, including ROW and acquisition research and negotiation
- Procurement document preparation
- Bid package preparation
- Bidding services for CIP projects
- Construction inspections
- Engineering services during construction
- Construction management, construction scheduling
- Engineering leading to design documents for force account construction
- Customer services
- Materials testing equipment
- Testing and Commissioning work done by SPU staff and consultants
- As-built

Note: Some additional soft costs, such as executive management, corporate labor (e.g., human resources, finance, grants and contracts administration, legal support), and office space and equipment costs, are captured in SPU's G&A overhead rate rather than being budgeted on a project-specific basis.

## **Appendix B—Sales Tax Guide**

Visit the [State Department of Revenue web site](#) to find the latest sales tax rate. Sales tax is applied based on the jurisdiction in which infrastructure is constructed.

Taxation on Public Works projects is discussed in [WAC 458-20-171](#). This section is intended to present the rules in layman’s terms. See the Seattle Standard Specifications, Section 1-07.2(2) and Section 1-07.2(3) for more information.

### **Determining Non-Taxable Status**

#### **Requirements:**

In order to be exempt from sales tax, work must meet the following requirements:

1. It must be located in a municipally owned Right of Way (separate rules apply to property owned by WA State).
2. The overall purpose of the work is to build, repair or improve facilities used primarily for foot or vehicular traffic.
3. If utilities need to be adjusted, removed, relocated, or reconstructed in order to complete the roadway improvement, the utility work is considered to be part of the roadway improvement and is tax-exempt. This may include drainage and combined sewer system work under certain conditions. NOTE: If the utilities are upgraded or improved rather than replaced in kind, the utility work is considered an improvement and is taxable.

#### **What does “tax-exempt” mean?**

The WAC explains that the retail sales tax exemption applies to the Contractor’s costs for material, labor, and owned equipment needed to do the work. Purchased or rented equipment is always taxed regardless of what type of work it will be used on.

Basically, what this means is that the Contractor does not get the tax exemptions for purchased or rented equipment. The Contractor always has to pay sales tax when they purchase or rents equipment. This is part of their cost, and this cost will be included in their bid prices.

For **TAXABLE** bid items, when the City pays the Contractor for the Bid Item, they also pay the Contractor sales tax on that Bid Item. At the end of the Contract the Contractor is responsible for paying the entire sales tax amount that they were paid from the City to the State Dept. of Revenue. Effectively, the sales tax is paid twice on all purchases or rentals of equipment, because they have been sold twice (once when the contractor originally purchased them, and once when the City purchased them from the Contractor).

For **NON-TAXABLE** items, the City does NOT pay any additional sales tax to the Contractor, and the Contractor is not responsible for paying any sales tax to the Dept. of Revenue. The

sales tax exemption does not apply in this case and the sales tax cost the Contractor pays for material and equipment will be included in their bid item prices.

For estimating purposes, purchase and rental costs always need to have sales tax applied, regardless of the tax status of the work as a whole (reflecting the fact that the Contractor will need to pay tax on those items when he buys them). For taxable bid items, the sales tax must also be applied to the total cost for that item of work, reflecting the tax the City will pay to the contractor. The City informs the DOR about the total sales tax paid to the contractor and the contractor pays the DOR the entire sales tax amount after the project is closed out.

**Note for SPU-furnished materials:** It has been a past practice to list SPU-furnished items on the bid sheet when a construction contract is advertised, usually with a bid amount already entered. This should not be done because it results in the materials being taxed twice: once when SPU purchases the materials, and a second time when the construction contractor installs the materials. Bid items for **installation** of SPU-furnished materials are appropriate.

## Examples

For tax exempt work, the answers to all of these questions should be “yes”. If the answer to any is “No”, then the work is taxable.

- Is the work within the street Right of Way owned by the City?
- Is the purpose of the project to improve vehicular or pedestrian traffic (roadways or sidewalks)?
- Is the work necessary in order to accomplish the roadway improvement?
- Is the traveling public the ultimate beneficiary of the work?

### **Example 1:**

- A. In a roadway improvement project, a catch basin is replaced. The catch basin bid item is NON-TAXABLE, because the purpose of the work is to improve the roadway by providing drainage.
- B. Now let’s assume the purpose of the project is to replace a water main, and the catch basin needs to be removed and relocated because it is adjacent to the water main. In this case, the catch basin work is TAXABLE, because the purpose of the work was not to improve transportation facilities.

### **Example 2**

A broken sewer needs to be repaired. The pavement restoration after the repair is completed is TAXABLE, because the purpose of the work was not to improve transportation facilities.

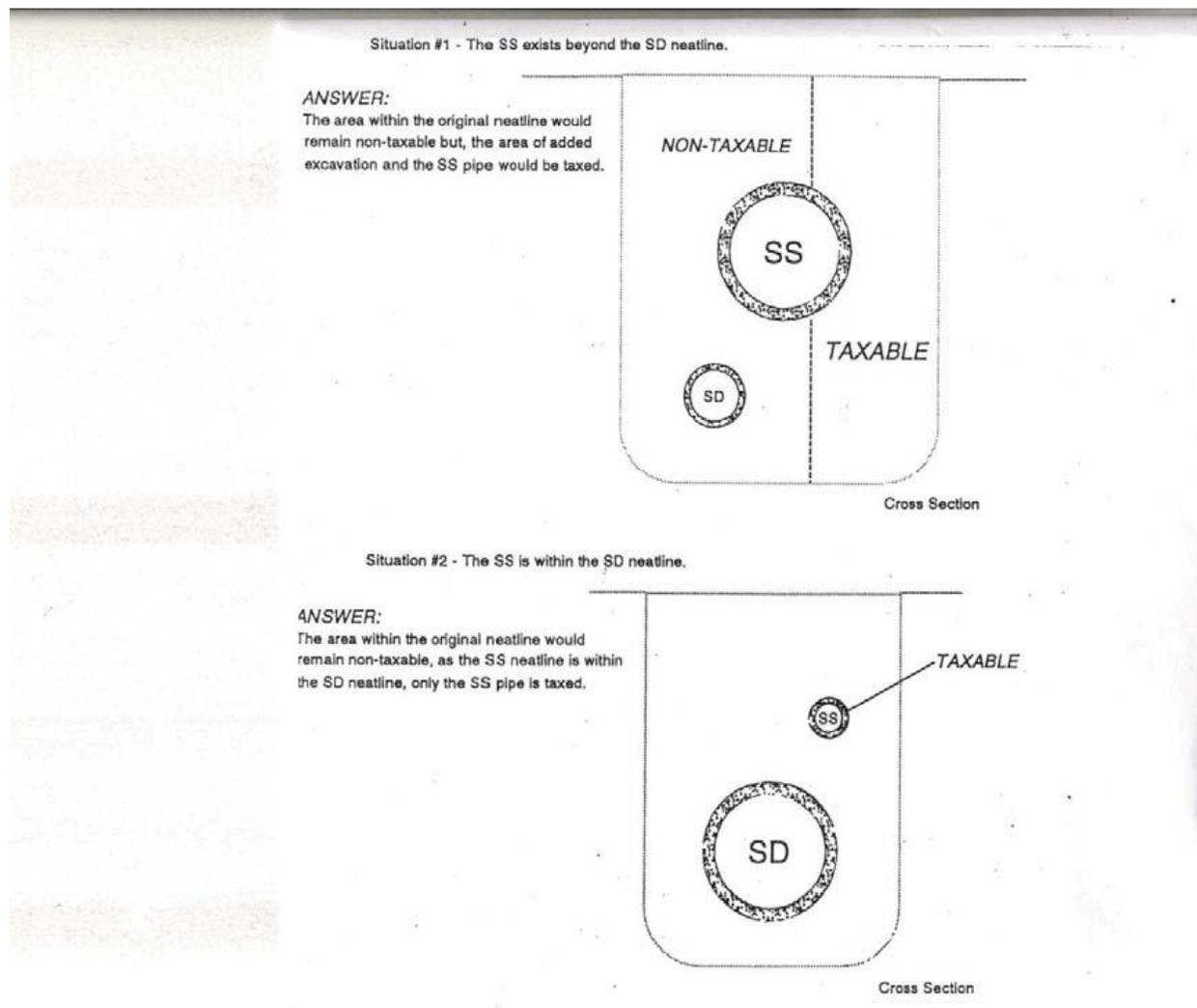
### **Example 3**

- A. The purpose of a project is to replace concrete panels in Street A. During removal of the existing panels, an 8-inch diameter water main is found which conflicts with the panel replacement. The water main will need to be relocated. The water main work is NONTAXABLE, as it is required in order to complete the transportation work.
- B. The water utility decides to replace the 8-inch diameter water main with a 10-inch diameter water main. The water main work is TAXABLE, because the nature of the work

has changed from replacement to improvement, and the beneficiary is now the water utility not the traveling public.

**Example 4**

A storm drain is being replaced as necessary to complete a roadway improvement project (i.e., non-taxable work). In the course of the work, a sanitary sewer is encountered, and it is decided that the sanitary sewer also should be replaced. Replacement is discretionary, and not required to complete the original work. The storm drain and the sanitary sewer are at different depths in the same right of way, and a single trench will be excavated to facilitate the replacements. What portion of the work is taxable, and what is tax exempt? See the following diagram for the answer.



There are some instances in which the tax exempt status of drainage and combined sewer systems may not be obvious. In these cases, SPU may want to contact the Washington Department of Revenue for a project-specific ruling prior to Stage Gate 3 to ensure that adequate funding is available.

## Appendix C—Contingency and Management Reserve Examples

### Contingency Reserve

Contingency Reserve is an amount added to the Base Cost to cover identified risk events that occur on the project, excluding changes in project scope.

**Includes:**

- Design and other changes within scope
- Unforecasted variations in market and environmental conditions
- Risks identified in the Risk Management Plan (once a PMP has been prepared).

**Does not include:**

- Scope changes
- Extraordinary, unanticipated events such as major strikes, natural disasters, and events that would be typically defined as force majeure
- Forecasted inflation (which is already included in the Total Project Cost Projection).

Contingency Reserve is sometimes described as covering the known unknowns. That is, known or identified cost risks, with an unknown outcome.

### Management Reserve

Management Reserve is an amount added to the Base Cost to cover unidentified risk events that occur on the project, including minor changes in project scope.

**Includes:**

- Planning and estimating errors
- Minor scope changes
- Other cost risks that were not explicitly identified and included in the Contingency Reserve

**Does not include:**

- Major scope changes (i.e., scope changes that exceed the reserve amount and require funding approval through a Change Management Process).

Management Reserve is sometimes described as covering the unknown unknowns—that is, unknown, unanticipated, or unidentified cost risks, with an unknown outcome.

**Table 1: Examples of Contingency and Management Reserve.**

Example Items		Cost Risks	Base Cost	Contingency Reserve	Mgmt Reserve	Change Mgmt
Working Downtown (identified, known outcome)		<ul style="list-style-type: none"> <li>● Less working space</li> <li>● Restricted construction times</li> <li>● Expensive traffic management</li> </ul>	X			
Utility Conflicts (identified, known outcome)		<ul style="list-style-type: none"> <li>● Relocate other utilities</li> </ul> Complex	X			
Community Relations	(identified, known outcome)	<ul style="list-style-type: none"> <li>● Controversial project</li> <li>● Requires community participation</li> </ul>	X			
	(identified, unknown outcome)	<ul style="list-style-type: none"> <li>● Re-design</li> <li>● Requires minor scope change</li> </ul>		X		
Property acquisition fails	(not identified, unknown outcome)	<ul style="list-style-type: none"> <li>● Re-design</li> <li>● Requires major scope change (i.e. new project location)</li> </ul>			X	
	(not identified, unknown outcome)	<ul style="list-style-type: none"> <li>● Project is delayed.</li> <li>● No scope change.</li> </ul>				X
Artifact found on site	(identified, unknown outcome)	<ul style="list-style-type: none"> <li>● Project is delayed.</li> <li>● Requires minor scope change</li> </ul>		X		
	(not identified, unknown outcome)	<ul style="list-style-type: none"> <li>● Project is delayed.</li> <li>● Requires major scope change (i.e. new project location)</li> </ul>			X	
	(not identified, unknown outcome)	<ul style="list-style-type: none"> <li>● Project is delayed</li> <li>● No scope change.</li> </ul>				X
Concrete Strike (not identified, unknown outcome)		<ul style="list-style-type: none"> <li>● Project is delayed</li> <li>● No scope change.</li> </ul>			X	
Poor condition of assets (not identified, unknown outcome)		<ul style="list-style-type: none"> <li>● Need to replace asset (e.g. valves)</li> <li>● Minor scope change</li> </ul>			X	

Some of the examples illustrate that it is not the event that determines the category of reserve, but rather whether or not the cost impact was anticipated and its magnitude that determines whether it is considered to be part of Base Cost, Contingency Reserve, Management Reserve, or additional scope requiring Change Management approval.

## Appendix D—Labor Overhead, Miscellaneous Fees

### Labor Overhead Rates

When estimating SPU labor costs, be sure to include SPU’s current labor overhead costs. For CIP work and work done for other departments, you’ll need to include two overhead costs: one for employee labor benefits and one for SPU’s general and administrative (G&A) costs. (For SPU O&M work, only the labor benefits overhead is applied.) For further guidelines on O&M costs, please refer to Chapter 9.

The current multipliers are maintained on [SPUFORMS](#).

#### **Example:**

A CIP project manager’s hourly salary rate is \$45. For each hour that the project manager will work on the project, the project cost is calculated as follows:

Project Cost/Hour	=	hourly salary rate x 125% (for G&A Cost)
	+	hourly salary rate x 121.96% (fringe benefit)
	+	\$7.02/hour (fringe benefit fixed)
	=	\$45/hour x 1.25 + \$45/hour x 1.2196 + \$7.02/hour
	=	\$56.25/hour + \$54.88/hour + \$7.02/hour
	=	\$118.15/hour

### SPU Non-Construction Vehicles

Project Soft Cost estimates should include an amount for SPU non-construction vehicles. The actual amount typically is between 0.3% and 0.4% of the Base Cost.

### SPU 1% for Art Program Funding

SPU’s 1% for Art Program is centrally funded. Do not include this item in your project cost estimate.

### Seattle Design Commission Fees

Design Commission fees are centrally funded. Do not include this item in your project cost estimate.

### Contracting and Purchasing Services Division (CPCS) Fees

Finance and Administrative Services’ (FAS’s) Contracting and Purchasing Services Division is responsible for public works contracting in the City of Seattle. CPCS charges for their services, and the charges are allocated to each project. Project-specific charges are based on the total number of City construction contracts and the value of each contract. Typically, CPCS fees are between 0.75% and 1% of the estimated construction contract amount. For small projects assume 1%, and for large projects use 0.75%.

## Appendix E–O&M Cost Estimating

SPU’s Finance and Administration Branch has defined multiple Amount Classes for O&M activities. SPU and the City’s Department of Finance & Administrative Services track O&M expenditures by Amount Classes in Summit. All O&M cost estimates must be categorized into Amount Classes. The top SPU Labor and Non-Labor Amount Classes are itemized below. If the project has a cost implication that does not fit into one of the Amount Classes, contact the Budget Analyst assigned to the LOB.

Note: The incremental Labor additions or efficiencies are tracked by Finance. The Non-Labor cost estimates are recorded in Budget, Planning and Forecasting (BPF) for the next six years in uninflated dollar amounts.

Work done by SPU crews itemized by specific craft (labor) is expressed in dollars and is expressed in hours or percentage of an FTE in the Basis of O&M Estimate, O&M Cost Estimate Spreadsheet and the SG documents. Labor dollars and FTE’s are not input into BPF. Each project requires discussion with O&M staff, managers, and executives to determine if a project surpasses the tipping point for resources, such as staff, equipment, or other. These decisions are reflected in each of the Stage Gate documents.

### SPU Labor

If an O&M requirement includes an **increase** in the overall labor for SPU staff, a decision must be made as to how that labor increase will be handled. Consider the following:

- Determine the overall FTE/hourly addition that is required
- Explore options for absorbing this labor within current staff (overtime, unused pockets)
- Overtime
- Explore options for shifting labor to non-SPU staff (contract, temporary)
- Defer project or other O&M Work.

If the only viable option is to **add** FTE’s or partial FTE’s, contact the Branch Budget Analyst and LOB/Branch Deputy Director to discuss the possibility of adding positions. If the project requires additional FTE’s, **adding the corresponding dollars to BPF or a SG document does not equate to new FTE being approved.**

If an O&M requirement results in an overall **decrease** in SPU labor (efficiencies), contact the Branch Budget Analyst and LOB Rep to discuss how the savings will be portrayed.

Do not enter or update SPU Labor in BPF.

SPU Finance will be tracking incremental additions and efficiencies to SPU Labor separately and periodically notifying each LOB/Branch.

Other Labor that is not completed by SPU staff is included in a Non-Labor Amount Class discussed below.

## **Non-Labor**

This appendix lists, defines, and provides examples for the amount classes most relevant to Non-Labor Amount Classes to help categorize costs into the correct amount class. Contact the LOB/Branch Budget Analyst if an O&M Cost does not fit into one of these categories.

### **Capital Outlay**

The Capital Outlay Amount Class is used for large purchases in excess of \$5K. For example, a new vector truck or a porous pavement vacuum.

### **Equipment Purchases**

Minor equipment purchases (less than \$5K) that are not capitalized. Examples include tools, shovels, chain saws, etc. Contact the Fleets and Warehousing Division Director prior to ordering equipment or accepting inventory from SPU contractors that would be housed in an SPU warehouse or tool room.

### **Fleet**

Vehicle use, fuel, vehicle maintenance, and vehicle rentals that are not capitalized. Vehicle purchases would be included as part of the capital project or as capital outlay. Contact the Fleets and Warehousing Division Director with fleet questions.

### **Inventory & Warehouse**

Costs of items that would be purchased through the SPU Warehouse. Contact the Fleets and Warehousing Division Director prior to ordering equipment or accepting inventory from SPU contractors that would be housed in an SPU warehouse or tool room.

### **License and Permits**

Use for future permit(s) needed to maintain the asset. Examples include a Street Use Permit to access maintenance holes from a traffic lane.

### **Maintenance**

Services (contracts) and supplies that will be used for maintenance of an SPU asset. Examples include periodic (repetitive) maintenance, landscaping, hardscape maintenance, tool repairs, etc. The contract that SPU and Seattle Department of Parks & Recreation has for the Seattle Conservation Corps to maintain GSI is included in this category.

### **Rentals**

Costs to rent equipment, buildings, or vehicles.

### **Services**

Professional services provided by another City department, private business, or non-SPU employee falls into this category. Examples include infrequent consultant contract for UIC inspection, monitoring or testing, or decant disposal.

### **Supplies and Purchases**

Materials used to maintain the incoming asset that are not capitalizable. Examples include supplies for daily production and output; water quality chemicals that are not stocked in the warehouse or by the line of business. Contact the Fleets and Warehousing Division

Director prior to ordering equipment or accepting inventory from SPU contractors that would be housed in an SPU warehouse or tool room.

**Utilities**

Any utility costs that may be added due to an asset coming online and requiring the consumption of electrical power, water, sewer service, or other utility. This could be a single event or reoccurring.