CITY OF PORTLAND
AGREEMENT FOR PROFESSIONAL, TECHNICAL, OR EXPERT SERVICES

CONTRACT NUMBER XXXXXX

COLUMBIA BOULEVARD WASTEWATER TREATMENT PLANT SECONDARY TREATMENT EXPANSION PROGRAM DESIGN, PERMITTING, AND CONSTRUCTION SUPPORT ENGINEERING SERVICES

This Contract is between the City of Portland ("City," or "Bureau") and "CH2M HILL Engineers, Inc.", hereafter called Consultant. The City's Project Manager for this Contract is Muriel Gueissaz-Teufel.

Effective Date and Duration
This Contract shall become effective on July 1, 2018. This Contract shall expire, unless otherwise terminated or extended, on July 1, 2023.

Consideration
(a) City agrees to pay Consultant a sum not to exceed $28,300,000 for accomplishment of the work.
(b) Interim payments shall be made to Consultant according to the schedule identified in the STATEMENT OF THE WORK AND PAYMENT SCHEDULE.

==========

CONSULTANT DATA AND CERTIFICATION

Name (print full legal name): CH2M Hill Engineers, Inc

Address: 2020 SW 4th Ave, Suite 300, Portland, Oregon, 97201-4953

Employer Identification Number (EIN): 32-0100027

City of Portland Business Tax Registration Number: 308278

Citizenship: Nonresident alien ☐ Yes ☒ No

Business Designation (check one): ☐ Individual ☐ Sole Proprietorship ☐ Partnership ☒ Corporation

☐ Limited Liability Co (LLC) ☐ Estate/Trust ☐ Public Service Corp. ☐ Government/Nonprofit

Payment information will be reported to the IRS under the name and taxpayer I.D. number provided above. Information must be provided prior to Contract approval.

==========

TERMS AND CONDITIONS

1. Standard of Care
Consultant shall perform all services under this Contract using that care, skill, and diligence that would ordinarily be used by similar professionals in this community in similar circumstances.

2. Effect of Expiration
Passage of the Contract expiration date shall not extinguish, prejudice, or limit either party's right to enforce this Contract with respect to any default or defect in performance that has not been corrected.

3. Order of Precedence
This Contract consists of these Terms and Conditions, the Statement of Work and Payment Schedule, and any exhibits that are attached. Any apparent or alleged conflict between these items will be resolved by using the following order of precedence: a) these Terms and Conditions; b) Statement of Work and Payment Schedule; and c) any exhibits attached to the Contract.

4. Early Termination of Contract
(a) The City may terminate this Contract for convenience at any time for any reason deemed appropriate in its sole discretion. Termination is effective immediately upon notice of termination given by the City.
(b) Either party may terminate this Contract in the event of a material breach by the other party that is not cured. Before termination is permitted, the party seeking termination shall give the other party written notice of the breach, its intent to terminate, and fifteen (15) calendar days to cure the breach. If the breach is not cured within 15 calendar days, the party seeking termination may terminate immediately by giving written notice that the Contract is terminated.

5. Remedies and Payment on Early Termination

(a) If the City terminates pursuant to 4(a) above, the City shall pay the Consultant for work performed in accordance with the Contract prior to the termination date. No other costs or loss of anticipated profits shall be paid.

(b) If the City terminates pursuant to 4(b) above, the City is entitled all remedies available at law or equity. In addition, Consultant shall pay the City all damages, costs, and sums incurred by the City as a result of the breach.

(c) If the Consultant justifiably terminates the Contract pursuant to subsection 4(b), the Consultant's only remedy is payment for work prior to the termination. No other costs or loss of anticipated profits shall be paid.

(d) If the City's termination under Section 4(b) was wrongful, the termination shall be automatically converted to one for convenience and the Consultant shall be paid as if the Contract was terminated under Section 4(a).

(e) In the event of early termination, the Consultant's work product before the date of termination becomes property of the City.

6. Assignment

Consultant shall not subcontract, assign, or transfer any of the work scheduled under this agreement, without the prior written consent of the City. Notwithstanding City approval of a subconsultant, the Consultant shall remain obligated for full performance hereunder, and the City shall incur no obligation other than its obligations to the Consultant hereunder. The Consultant agrees that if subconsultants are employed in the performance of this Agreement, the Consultant and its subconsultants are subject to the requirements and sanctions of ORS Chapter 656, Workers' Compensation.

7. Compliance with Applicable Law

Consultant shall comply with all applicable federal, state, and local laws and regulations. Consultant agrees it currently is in compliance with all tax laws. Consultant shall comply with Title VI of the Civil Rights Act of 1964 and its corresponding regulations. In connection with its activities under this Contract, the Consultant shall comply with all applicable Grant Terms and conditions. This includes all terms and conditions contained in this Contract and, for a Contract involving a grant, the Grant Terms and Conditions.

8. Indemnification for Property Damage and Personal Injury

Consultant shall indemnify, defend, and hold harmless the City, its officers, agents, and employees, from all claims, losses, damages, and costs (including reasonable attorney fees) for personal injury and property damage arising out of the intentional misconduct or negligent acts or omissions of the Consultant, its Subconsultants, suppliers, employees or agents in the performance of its services. Nothing in this paragraph requires the Consultant or its insurer to indemnify the City for claims of personal injury or property damage caused by the negligence of the City. This duty shall survive the expiration or termination of this Contract.

9. Insurance

Consultant shall obtain and maintain in full force at Consultant expense, throughout the duration of the Contract and any warranty or extension periods, the required insurance identified below. The City reserves the right to require additional insurance coverage as required by statutory or legal changes to the maximum liability that may be imposed on Oregon cities during the term of the Contract.

(a) Workers' compensation insurance as required by ORS Chapter 656 and as it may be amended. Unless exempt under ORS Chapter 656, the Consultant and all subconsultants shall maintain coverage for all subject workers.

☒ Required and attached // ☐ Proof of exemption (i.e., completion of Workers' Compensation Insurance Statement)

(b) General commercial liability (CGL) insurance covering bodily injury, personal injury, property damage, including coverage for independent consultant's protection (required if any work will be subcontracted), premises/operations, Contractual liability, products and completed operations, in per occurrence limit of not less than $1,000,000, and aggregate limit of not less than $2,000,000.

☒ Required and attached // ☐ Waived by Bureau Director or designee // ☐ Reduce by Bureau Director or designee

(c) Automobile liability insurance with coverage of not less than $1,000,000 each accident, and an umbrella or excess liability coverage of $2,000,000. The insurance shall include coverage for any auto or all owned, scheduled, hired and non-owned auto. This coverage may be combined with the commercial general liability insurance policy.

☒ Required and attached // ☐ Waived by Bureau Director or designee // ☐ Reduce by Bureau Director or designee

(d) Professional Liability and/or Errors & Omissions insurance to cover damages caused by negligent acts, errors or omissions related to the professional services, and performance of duties and responsibilities of the Consultant under this Contract in an amount with a combined single limit of not less than $1,000,000 per occurrence and aggregate of $3,000,000 for all claims per occurrence. In lieu of an occurrence based policy, Consultant may have claims-made policy in an amount not less than $1,000,000 per claim and $3,000,000 annual aggregate, if the Consultant obtains an extended reporting period or tail coverage for not less than three (3) years following the termination or expiration of the Contract.

☒ Required and attached // ☐ Waived by Bureau Director or designee // ☐ Reduce by Bureau Director or designee

Continuous Coverage; Notice of Cancellation: The Consultant agrees to maintain continuous, uninterrupted coverage for the duration of the Contract. There shall be no termination, cancellation, material change, potential exhaustion of aggregate limits or non-renewal of coverage without thirty (30) calendar days written notice from Consultant to the City. If the insurance is canceled

or terminated prior to completion of the Contract, Consultant shall immediately notify the City and provide a new policy with the same terms. Any failure to comply with this clause shall constitute a material breach of Contract and shall be grounds for immediate termination of this Contract.

Additional Insured: The liability insurance coverages, except Professional Liability, Errors and Omissions, or Workers' Compensation, shall be without prejudice to coverage otherwise existing, and shall name the City of Portland and its bureaus/divisions, officers, agents and employees as Additional Insureds, with respect to the Consultant's activities to be performed, or products or services to be provided. Coverage shall be primary and non-contributory with any other insurance and self-insurance. Notwithstanding the naming of additional insureds, the insurance shall protect each additional insured in the same manner as though a separate policy had been issued to each, but nothing herein shall operate to increase the insurer's liability as set forth elsewhere in the policy beyond the amount or amounts for which the insurer would have been liable if only one person or interest had been named as insured.

Certificate(s) of Insurance: Consultant shall provide proof of insurance through acceptable certificate(s) of insurance, including additional insured endorsement form(s) and all other relevant endorsements, to the City prior to the award of the Contract if required by the procurement documents (e.g., request for proposal), or at execution of Contract and prior to any commencement of work or delivery of goods or services under the Contract. The Certificate(s) will specify all of the parties who are endorsed on the policy as Additional Insureds (or Loss Payees). Insurance coverages required under this Contract shall be obtained from insurance companies acceptable to the City of Portland. The Consultant shall pay for all deductibles and premium. The City reserves the right to require, at any time, complete, certified copies of required insurance policies, including endorsements evidencing the coverage the required.

Subconsultant(s): Upon request, Consultant shall provide evidence that any subconsultant, if any, performing work or providing goods or service under the Contract has the same types and amounts of coverages as required herein or that the subconsultant is included under Consultant's policy.

10. Ownership of Work Product

All work product produced by the Consultant under this Contract is the exclusive property of the City. "Work Product" includes, but is not limited to: research, reports, computer programs, manuals, drawings, recordings, photographs, artwork and any data or information in any form. The Consultant and the City intend that such Work Product shall be deemed "work made for hire" of which the City shall be deemed the author. If for any reason a Work Product is deemed not to be a "work made for hire," the Consultant hereby irrevocably assigns and transfers to the City all right, title and interest in such work product, whether arising from copyright, patent, trademark, trade secret, or any other state or federal intellectual property law or doctrines. Consultant shall obtain such interests and execute all documents necessary to fully vest such rights in the City. Consultant waives all rights relating to work product, including any rights arising under 17 USC 106A, or any other rights of authorship, identification or approval, restriction or limitation on use or subsequent modifications. If the Consultant is an architect, the Work Product is the property of the Consultant-Architect, and by execution of this Contract, the Consultant-Architect grants the City an exclusive and irrevocable license to use that Work Product.

Notwithstanding the above, all pre-existing trademarks, services marks, patents, copyrights, trade secrets, and other proprietary rights of Consultant are and will remain the exclusive property of Consultant.

11. EEO Certification

The Consultant must be certified prior to Contract execution, as Equal Employment Opportunity Affirmative Action Employers as prescribed by Chapter 5.33.076 of the Code of the City of Portland.

12. Equal Benefits

Consultant must certify prior to Contract execution, that they do not discriminate by policy or practice in the provision of employee benefits between employees with domestic partners and employees with spouses as prescribed by Chapter 5.33.077 of the Code of the City of Portland.

13. Successors in Interest

The provisions of this Contract shall be binding upon and shall inure to the benefit of the parties hereto, and their respective successors and approved assigns.

14. Severability

The parties agree that if any term or provision of this Contract is declared by a court of competent jurisdiction to be illegal or in conflict with any law, the validity of the remaining terms and provisions shall not be affected, and the rights and obligations of the parties shall be construed and enforced as if the Contract did not contain the particular term or provision held to be invalid.

15. Waiver

The failure of the City to enforce any provision of this Contract shall not constitute a waiver by the City of that or any other provision.

16. Errors

The Consultant shall promptly perform such additional services as may be necessary to correct errors in the services required by this Contract without undue delays and without additional cost.

17. Governing Law/Venue
The provisions of this Contract shall be interpreted, construed and enforced in accordance with, and governed by, the laws of the State of Oregon without reference to its conflict of laws provisions that might otherwise require the application of the law of any other jurisdiction. Any action or suits involving any question arising under this Contract must be brought in the appropriate court in Multnomah County Oregon.

18. Amendments
All changes to this Contract, including changes to the scope of work, Contract amount and D/M/W/ESB subcontracting commitments, must be made by written amendment and approved by the Chief Procurement Officer to be valid. Any amendment that increases the original Contract amount by more than 25% must be approved by the City Council to be valid.

19. Business Tax Registration
The Consultant shall obtain a City of Portland business tax registration number as required by PCC 7.02 prior to beginning work under this Contract.

20. Prohibited Conduct
The Consultant shall not hire any City employee who evaluated the proposals or authorized the award of this Contract for two years after the date the Contract was authorized without the express written permission of the City and provided the hiring is permitted by state law.

21. Payment to Vendors and Subconsultants
The Consultant shall timely pay all subconsultants and suppliers providing services or goods for this Contract.

22. Access to Records
The Consultant shall maintain all records relating to this Contract for three (3) years after final payment. The City may examine, audit and copy the Consultant's books, documents, papers, and records relating to this Contract at any time during this period upon reasonable notice. Copies of these records shall be made available upon request. Payment for the reasonable cost of requested copies shall be made by the City.

23. Audits
(a) The City may conduct financial and performance audits of the billings and services specified in this Contract at any time in the course of the Contract and during the three (3) year period established by paragraph 22. Audits will be conducted in accordance with generally accepted auditing standards as promulgated in Government Auditing Standards by the Comptroller General of the United States Government Accountability Office.
(b) If an audit discloses that payments to the Consultant exceed the amount to which the Consultant was entitled, the Consultant shall repay the amount of the excess to the City.

24. Electronic Signatures
The City and Consultant may conduct this transaction, including any Contract amendments, by electronic means, including the use of electronic signatures.

25. Merger Clause
This Contract encompasses the entire agreement of the parties, and supersedes all previous understandings and agreements between the parties, whether verbal or written.

26. Dispute Resolution/Work Regardless of Disputes
The parties shall participate in mediation to resolve disputes before conducting litigation. The mediation shall occur at a reasonable time after the conclusion of the Contract with a mediator jointly selected by the parties. Notwithstanding any dispute under this Contract, the Consultant shall continue to perform its work pending resolution of a dispute, and the City shall make payments as required by the Contract for undisputed portions of the work. In the event of litigation, no attorney fees are recoverable. No different dispute resolution paragraph(s) in this Contract or any attachment hereto shall supersede or take precedence over this provision.

27. Progress Reports: /☒/ Applicable /☐/ Not Applicable
If applicable, the Consultant shall provide monthly progress reports to the Project Manager as described in the Statement of the Work and Payment Schedule.

28. Consultant's Key Personnel: /☒/ Applicable /☐/ Not Applicable
If applicable, the Consultant shall assign the key personnel listed in the Statement of the Work and Payment Schedule for the work required by the Contract and shall not change personnel without the prior written consent of the City, which shall not be unreasonably withheld.

29. Subconsultants
The Consultant shall use the subconsultants identified in its proposals. The Consultant shall not change subconsultant's assignments without the prior written consent of the Chief Procurement Officer. The City will enforce all social equity Contracting and Disadvantaged, Minority, Women and Emerging Small Business (D/M/W/ESB) subcontracting commitments submitted by the Consultant in its proposals. Failure to use the identified D/M/W/ESB subconsultants without prior written consent is a material breach of contract.

For Contracts valued $50,000 or more, the Consultant shall submit subconsultant payment and utilization information electronically, reporting ALL subconsultants employed in the performance of this agreement. More information on this process may be viewed on the City Procurement website at: https://www.portlandoregon.gov/brfs/75932. Contact the PTE Contract Compliance Specialist for submission guidelines.

Subconsultants are responsible for meeting all requirements applicable to the Consultant under this contract, including compliance with City policies and all applicable federal, state, and local laws and regulations.

30. Third Party Beneficiaries
There are no third-party beneficiaries to this Contract. Enforcement of this Contract is reserved to the parties.

31. Conflict of Interest
Consultant hereby certifies that, if applicable, its Contract proposal is made in good faith without fraud, collusion or connection of any kind with any other proposer of the same request for proposals or other City procurement solicitation(s), that the Consultant as a proposer has competed solely on its own behalf without connection or obligation to, any undisclosed person or firm. Consultant certifies that it is not a City official/employee or a business with which a City official/employee is associated, and that to the best of its knowledge, Consultant, its employee(s), its officer(s) or its director(s) is not a City official/employee or a relative of any City official/employee who: i) has responsibility in making decisions or ability to influence decision-making on the Contract or project to which this Contract pertains; ii) has or will participate in evaluation or management of the Contract; or iii) has or will have financial benefits in the Contract. Consultant understands that should it elect to employ any former City official/employee during the term of the Contract then that the former City official/Consultant employee must comply with applicable government ethics and conflicts of interest provisions in ORS Chapter 244, including but not limited to ORS 244.040(5) and ORS 244.047, and the City's Charter, Codes and administrative rules, including lobbying prohibitions under Portland City Code Section 2.12.080.

32. Respectful Workplace Behavior
The City of Portland is committed to a respectful work environment, free of harassment, discrimination and retaliation and other inappropriate conduct. Every individual has a right to work in a professional atmosphere where all individuals are treated with respect and dignity. The City's HR Rule 2.02 covers all employees with the City of Portland as well as consultants, vendors or consultants who provide services to the City of Portland. By signing this Contract/Agreement, the Consultant indicates compliance with all terms and conditions contained in this Contract including HR 2.02.

==========

STATEMENT OF THE WORK AND PAYMENT SCHEDULE

SCOPE OF WORK

Consultant shall provide the services described in Attachment A – Statement of Work.

CONSULTANT KEY PERSONNEL

The Consultant shall assign the following key personnel to do the work in the capacities designated:

NAME	COMPANY	ROLE ON PROJECT
Dave Green	CH2M	Project Manager
Quitterie Cotten	CH2M	Assistant Project Manager
Craig Massie	CH2M	QA/QC Manager
Michelle Green	CH2M	CM/GC Lead & RAS Replacement Facility Lead
Nicki Pozos	Barney & Worth	DMWESB Coordinator
Janelle Booth	CH2M	Engineer of Record - Civil
Todd Cotten	CH2M	Engineer of Record - Geotechnical
Jason Krumsick	CH2M	Engineer of Record - Mechanical
Nathan Wallace	CH2M	Engineer of Record - Structural
Ryan Harbert	CH2M	Engineer of Record – Electrical and Facility Lead for Electrical Upgrade
Craig Rawie	RaTec	Engineer of Record – I&C
Patrick Rausch	CH2M	Engineer of Record – HVAC
Goeff Kirsten	CH2M	Engineer of Record - Architectural
Kevin Nielsen	CH2M	Engineer of Record - Hydraulics
Shawn Kummer	CH2M	Engineer of Record - Landscape Architect and Design Manager for Site and Non-Process
Dave Parry	CH2M	Technical Director – Solids Process
Glen Daigger	One Water	Technical Director – Secondary Process
Nathan Corser	CH2M	Technical Director – Site and Non Process
Gregg Thompson	CH2M	Design Manager – Secondary Process
Brady Fuller	CH2M	Design Manager – Solids Process

Dave Oerke	CH2M	Facility Lead – Solids Handling
Scott Cowden	CH2M	Facility Lead – Odor Control
Bill Leaf	CH2M	Facility Lead - Secondary Clarifiers
Corey Morris	Carleton Hart	Facility Lead – Non Process Buildings

SUBCONSULTANTS

The Consultant shall assign the following subconsultants to perform work in the capacities designated:

NAME	DMWESB CERTIFICATION TYPE	ROLE ON PROJECT	SUBCONTRACT AMOUNT
One Water Solutions, LLC	None	Water Management Consulting	$50,000
OCD	ESB 10811	Programming	$482,063
Carleton Hart Architecture, PC	DBE/MBE 343	Architectural Services	$973,738
Emerio Design, LLC	MBE/DBE 5611	Civil Engineering - General and Stormwater	$552,170
NNA Landscape Architecture LLC	MBE/ESB 11078	Landscape Architecture	$196,993
Barney & Worth, Inc	WBE 10587	Land Use/Public Involvement	$302,367
Winterbrook Permitting	ESB 4523	Permitting Support	$149,539
Heritage Research Associates, Inc.	DBE/WBE 653	Archaeological Investigations	$59,273
Concise Communications LLC	D/M/W/ESB 9079	Technical Editing	$74,433
Rhino One LLC	DBE/MBE/ESB 6760	Geotechnical Engineering and Design	$574,699
RaTec Services	None	Instrumentation and Control	$75,000
Ott-Sakai & Associates LLC	DBE/MBE 9994	Constructability Services, Cost Estimating and VE, Scheduling	$193,846
Life Simplified, LLC	WBE/ESB 10879	Document Control	$978,362
ABHT Structural Engineers (CHA sub)	DBE/MBE 3230	Structural	$171,400
Reyes Engineering, Inc. (CHA Sub)	MBE/DBE/ESB 2285	Electrical	$122,780
Brightworks (CHA Sub)	ESB 9949	Sustainability	$35,311
The Greenbusch Group, Inc. (CH2M/Jacobs)	WBE 638	Acoustical Services, HVAC, Noise, and Vibration Consulting	$439,839
The Greenbusch Group, Inc. (CHA)	WBE 638	Acoustical Services, HVAC, Noise, and Vibration Consulting	$252,300

WaterDude	ESB 10792	Ops and Maintenance Support	$539,993
Elcon Associates Inc.	ESB 9251	Electrical Short Circuit/Arc Flash Study	$216,039

Total Subcontracting Participation (as a Percentage of the Total Contract Amount w/out Owner's Contingency)	25.7%
Total DMWESB Subcontracting Participation (as a Percentage of the Total Contract Amount w/out Owner's Contingency)	25.1%

The City will enforce all social equity Contracting and Disadvantaged, Minority, Women and Emerging Small Business (D/M/W/ESB) subcontracting commitments indicated in the table above. Consultant shall not add, eliminate, or replace any Subconsultant assignments without the prior written consent of the Chief Procurement Officer; failure to use the identified D/M/W/ESB Subconsultants without prior written consent is a material breach of contract. Any changes must be reported and submitted to the PTE Contract Compliance Specialist on the Subconsultant Change Request Form found on Procurement Services' website under Contractor Resources. All changes to this Contract, including changes to the D/M/W/ESB subcontracting commitments, must be made by written amendment and approved by the Chief Procurement Officer to be valid.

For Contracts valued $50,000 or more, the Consultant shall submit monthly subconsultant payment and utilization information electronically, reporting ALL subconsultants employed in the performance of this Contract. More information on this process may be viewed on the City Procurement website at: https://www.portlandoregon.gov/brfs/75932. Contact the PTE Contract Compliance Specialist for submission guidelines.

COMPENSATION

The maximum that the Consultant can be paid on this Contract is $28,300,000 (hereafter the "not to exceed" amount.). The "not to exceed" amount includes all payments to be made pursuant to this Contract, including reimbursable expenses, if any. Nothing in this Contract requires the City to pay for work that does not meet the Standard of Care or other requirements of the Contract. The actual amount to be paid Consultant may be less than that amount.

The Consultant is entitled to receive progress payments for its work pursuant to the Contract as provided in more detail below. The City will pay Consultant based on these invoices for acceptable work performed and approved until the "not to exceed" amount is reached. Thereafter, Consultant must complete work based on the Contract without additional compensation unless there is a change to the scope of work.

Any estimate of the hours necessary to perform the work is not binding on the City. The Consultant remains responsible if the estimate proves to be incorrect. Exceeding the number of estimated hours of work does not impose any liability on the City for additional payment.

If work is completed before the "not to exceed" amount is reached, the Consultant's compensation will be based on the Consultant's bills previously submitted for acceptable work performed and approved.

PAYMENT TERMS: Net 30 Days

The estimated task breakdown of the "not to exceed" amount is shown in the table below. Consultant may reallocate compensation between tasks with the approval of the BES Project Manager, provided the total "not to exceed" amount is not exceeded.

Task	Description	Not to Exceed Amount
1	Preliminary Design	$6,219,000
2	Detailed Design Phase Services	$12,000,000
3	Construction Phase Design Services	$8,919,000
4	Startup and Closeout Phase	$1,162,000
	TOTAL CONTRACT AMOUNT	**$28,300,000**

Hourly Rates

Hourly billing rates on progress payment invoices shall be the salary multiplier in the table below applied to salaries paid to employees' subject to the maximum hourly billing rate by labor category in the table below. This multiplier shall not exceed 3.1 and shall include the following non-reimbursable expenses: fringe benefits, payroll bonuses, autos and other defined perquisites, telecommunications, facsimile services, overhead expenses including but not limited to local and long distance telephone, parking,

delivery/courier, general business and professional liability insurance, advertising costs, postage, internal copying, lease of office equipment, mileage and other local travel costs (travel within 100-mile radius of Consultant's office), information technology, all other direct costs not identified as reimbursable, other indirect costs and profit.

Labor Category	Hourly Billing Rate (Includes escalation of 2.5% per year)							
	2018	2019	2020	2021	2022	2023	2024	2025
Prime - Salary Multiplier = 3.075								
Senior Consultant	$255	$262	$268	$275	$282	$289	$296	$304
Senior Engineer 3	$252	$259	$265	$272	$279	$286	$293	$300
Senior Engineer 2	$245	$252	$258	$264	$271	$278	$285	$292
Senior Engineer 1	$220	$226	$232	$237	$243	$249	$256	$262
Staff Engineer 4	$185	$190	$195	$200	$205	$210	$215	$220
Staff Engineer 3	$170	$175	$179	$184	$188	$193	$198	$203
Staff Engineer 2	$140	$144	$148	$151	$155	$159	$163	$167
Junior Engineer 1	$125	$129	$132	$135	$138	$142	$145	$149
Junior Engineer	$115	$118	$121	$124	$127	$131	$134	$137
Senior Technician	$155	$159	$163	$167	$172	$176	$180	$185
Staff Technician 4	$130	$134	$137	$140	$144	$148	$151	$155
Staff Technician 3	$95	$98	$100	$103	$105	$108	$111	$113
Junior Technician	$90	$93	$95	$97	$100	$102	$105	$107
Specs Editor/Office Support	$100	$103	$106	$108	$111	$114	$116	$119
Senior Office Support	$110	$113	$116	$119	$122	$125	$128	$131
Barney and Worth - Salary Multiplier = 3.10								
Principal	$230	$236	$242	$248	$254	$261	$267	$274
Managing Associate	$230	$236	$242	$248	$254	$261	$267	$274
Senior Associate	$190	$195	$200	$205	$210	$215	$221	$226
Associate	$170	$175	$179	$184	$188	$193	$198	$203
Research Associate	$130	$134	$137	$140	$144	$148	$151	$155
Graphic Designer	$90	$93	$95	$97	$100	$102	$105	$107
Clerical/Support	$100	$103	$106	$108	$111	$114	$116	$119
Heritage Archeology - Salary Multiplier = 2.83								
Project Archeologist	$105	$108	$111	$114	$116	$119	$122	$125
Assistant Archeologist	$80	$82	$85	$87	$89	$91	$93	$96
CR Project Manager	$140	$144	$148	$151	$155	$159	$163	$167
Graphics	$75	$77	$79	$81	$83	$85	$87	$90
Historic Preservationalist	$85	$88	$90	$92	$94	$97	$99	$102
NNA - Salary Multiplier = 3.09								
Senior Landscape Architect	$145	$149	$153	$157	$161	$165	$169	$173
Landscape Architect 5	$104	$107	$110	$112	$115	$118	$121	$124
Rhino One - Salary Multiplier = 2.78								
Senior Engineer	$160	$164	$169	$173	$177	$182	$186	$191
Staff Engineer	$95	$98	$100	$103	$105	$108	$111	$113
Staff Technician	$90	$93	$95	$97	$100	$102	$105	$107
Senior Office Support	$75	$77	$79	$81	$83	$85	$87	$90
Life Simplified – Salary Multiplier = 2.00								

Lead Project Control Specialist	$160	$164	$169	$173	$177	$182	$186	$191
Project Control Specialist	$110	$113	$116	$119	$122	$125	$128	$131
One Water Solutions - Salary Multiplier = 1.89								
Senior Consultant	$300	$308	$316	$324	$332	$340	$348	$357
OCD – Salary Multiplier = 2.81								
PIC	$225	$231	$237	$243	$249	$255	$261	$268
Senior Software Engineer	$125	$129	$132	$135	$138	$142	$145	$149
Junior Software Engineer	$100	$103	$106	$108	$111	$114	$116	$119
Emerio Design – Salary Multiplier = 3.10								
Senior Project Engineer	$153	$157	$161	$165	$169	$174	$178	$182
Senior Designer	$98	$101	$103	$106	$109	$111	$114	$117
Junior Designer	$77	$79	$81	$83	$85	$88	$90	$92
Senior Professional Land Surveyor	$127	$131	$134	$137	$141	$144	$148	$151
Senior Survey Technician	$98	$101	$103	$106	$109	$111	$114	$117
Survey Technician	$92	$95	$97	$100	$102	$105	$107	$110
2-Man Survey Crew	$180	$185	$190	$194	$199	$204	$209	$214
Project Assistant	$81	$84	$86	$88	$90	$92	$94	$97
The Greenbusch Group – Salary Multiplier = 2.71								
Acoustical Principal	$210	$216	$221	$227	$232	$238	$244	$250
Senior Acoustician	$190	$195	$200	$205	$210	$215	$221	$226
Acoustician 1	$140	$144	$148	$151	$155	$159	$163	$167
Acoustician 2	$125	$129	$132	$135	$138	$142	$145	$149
Acoustician 3	$120	$123	$127	$130	$133	$136	$140	$143
Mechanical Principal	$110	$113	$116	$119	$122	$125	$128	$131
Consultant 1	$105	$108	$111	$114	$116	$119	$122	$125
Senior Engineer	$95	$98	$100	$103	$105	$108	$111	$113
Graphics 1	$85	$88	$90	$92	$94	$97	$99	$102
Graphics 2	$116	$119	$122	$125	$129	$132	$135	$138
Clerical	$60	$62	$64	$65	$67	$68	$70	$72
Waterdude Solutions – Salary Multiplier = 2.50								
Operations Specialist	$150	$154	$158	$162	$166	$170	$174	$179
Administration Assistant	$110	$113	$116	$119	$122	$125	$128	$131
Concise Communications – Salary Multiplier = 1.00								
Editor	$90	$93	$95	$97	$100	$102	$105	$107
Winterbrook Planning – Salary Multiplier = 3.10								
Principal	$174	$179	$183	$188	$193	$197	$202	$207
Senior Environmental Planner	$130	$134	$137	$140	$144	$148	$151	$155
Senior Planner	$127	$131	$134	$137	$141	$144	$148	$151
Senior Planner / GIS Manager	$116	$119	$122	$125	$129	$132	$135	$138
Environmental Scientist	$110	$113	$116	$119	$122	$125	$128	$131
Project Coordinator/Planner	$92	$95	$97	$100	$102	$105	$107	$110
Ott-Sakai – Salary Multiplier = 1.73								
Principal	$225	$231	$237	$243	$249	$255	$261	$268
Contract Manager	$164	$169	$173	$177	$182	$186	$191	$195

CHA – Salary Multiplier = 3.1								
Principal	$241	$248	$254	$260	$267	$273	$280	$287
Senior Project Manager	$151	$155	$159	$163	$167	$171	$176	$180
Project Manager	$121	$125	$128	$131	$134	$137	$141	$144
Senior Project Assistant	$116	$119	$122	$125	$129	$132	$135	$138
Project Assistant	$101	$104	$107	$109	$112	$115	$118	$121
Junior Consultant	$82	$85	$87	$89	$91	$93	$96	$98
Administration	$75	$77	$79	$81	$83	$85	$87	$90
Staff	$78	$80	$82	$84	$87	$89	$91	$93
Elcon Associates – Salary Multiplier = 2.89								
Project Manager	$160	$164	$169	$173	$177	$182	$186	$191
Senior Engineer	$140	$144	$148	$151	$155	$159	$163	$167
Engineer	$130	$134	$137	$140	$144	$148	$151	$155
Senior Designer	$124	$128	$131	$134	$137	$141	$144	$148
Designer	$120	$123	$127	$130	$133	$136	$140	$143
CADD Technician	$88	$91	$93	$95	$98	$100	$103	$105
Clerical / Administration / Accounting	$75	$77	$79	$81	$83	$85	$87	$90

Lump Sum Task Rates

In lieu of hourly billing rates, the following subconsultant subtasks will be billed as set forth below upon subtask completion:

Subconsultant	**Lump Sum Task**	**Lump Sum Task Amount**

Standard Reimbursable Costs

The following costs will be reimbursed without mark-up:

- Out-of-Town Travel. Travel (transportation, lodging and per diem) of Consultant and/or experts when specified in the contract or requested by BES, directly attributed to specific tasks and when to a location outside a 100-mile radius of Consultant's project office. All out-of-town travel must be pre-approved by BES. Travel costs will be reimbursed in accordance with the City's Travel Expense Guidelines which are based on the General Services Administration (GSA) per diem rates plus applicable lodging taxes.
- Photocopying/Reproduction Costs. Reproduction of required drawings, reports, specifications, bidding documents, in excess of the number required as part of the contract excluding the cost of reproduction for Consultant's or sub's own use.
- Equipment Rental. Rental of testing equipment for odor control evaluations.

Subconsultant Costs

Compensation for subconsultants shall be limited to the same restrictions imposed on the Consultant. The maximum markup on subconsultant services shall not exceed 5.0%.

Progress Payments

On or before the 15th of each month, the Consultant shall submit to the City's Project Manager an invoice for work performed by the Consultant during the preceding month. The invoice shall contain the City's Contract Number and set out all items for payment including, but not limited to: the name of the individual, labor category, direct labor rate, hours worked during the period, and tasks performed. The Consultant t shall also attach photocopies of claimed reimbursable expenses, if applicable. The Consultant shall stamp and approve all subconsultant invoices and note on the subconsultant invoice what they are approving as "billable" under the Contract. The billing from the prime should clearly roll up labor and reimbursable costs for the prime and subconsultants – matching the subconsultant invoices. Prior to initial billing, the Consultant shall develop a billing format for approval by the City.

The City shall pay all amounts to which no dispute exists within 30 calendar days of receipt of the invoice. Payment of any bill, however, does not preclude the City from later determining that an error in payment was made and from withholding the disputed sum from the next progress payment until the dispute is resolved.

The Consultant shall make full payment to its subconsultants within 10 business days following receipt of any payment made by the City to Consultant.

ACH Payments

It is the City's policy to pay its Consultant invoices via electronic funds transfers through the automated clearing house (ACH) network. To initiate payment of invoices, Consultant shall execute the City's standard ACH Vendor Payment Authorization Agreement.

Upon verification of the data provided, the Payment Authorization Agreement will authorize the City to deposit payment for services rendered directly into Consultant accounts with financial institutions. All payments shall be in United States currency.

WORKERS' COMPENSATION INSURANCE STATEMENT

IF YOUR FIRM HAS CURRENT WORKERS' COMPENSATION INSURANCE, CONSULTANT MUST SIGN HERE:

I, undersigned, am authorized to act on behalf of entity designated below, and I hereby certify that this entity has current Workers' Compensation Insurance.

Consultant Signature: _____ Date: _____ Entity: _____

IF YOUR FIRM DOES NOT HAVE CURRENT WORKERS' COMPENSATION INSURANCE, CONSULTANT MUST COMPLETE THE FOLLOWING INDEPENDENT CONSULTANT CERTIFICATION STATEMENT:

As an independent Consultant, I certify that I meet the following standards:

1. The individual or business entity providing labor or services is registered under ORS Chapter 701, if the individual or business entity provides labor or services for which such registration is required;

2. Federal and state income tax returns in the name of the business or a business Schedule C or form Schedule F as part of the personal income tax return were filed for the previous year if the individual or business entity performed labor or services as an independent Consultant in the previous year; and

3. The individual or business entity represents to the public that the labor or services are to be provided by an independently established business. Except when an individual or business entity files a Schedule F as part of the personal income tax returns and the individual or business entity performs farm labor or services that are reportable on Schedule C, an individual or business entity is considered to be engaged in an independently established business when four or more of the following circumstances exist. Consultant: check four or more of the following:

_____ A. The labor or services are primarily carried out at a location that is separate from the residence of an individual who performs the labor or services, or are primarily carried out in a specific portion of the residence, which portion is set aside as the location of the business;

_____ B. Commercial advertising or business cards as is customary in operating similar businesses are purchased for the business, or the individual or business entity has a trade association membership;

_____ C. Telephone listing and service are used for the business that is separate from the personal residence listing and service used by an individual who performs the labor or services;

_____ D. Labor or services are performed only pursuant to written Contracts;

_____ E. Labor or services are performed for two or more different persons within a period of one year; or

_____ F. The individual or business entity assumes financial responsibility for defective workmanship or for service not provided as evidenced by the ownership of performance bonds, warranties, errors and omission insurance or liability insurance relating to the labor or services to be provided.

_____ _____
Consultant Signature Date

FOR CITY USE ONLY

PROJECT MANANGER-COMPLETE ONLY IF CONSULTANT DOES NOT HAVE WORKER'S COMPENSATION INSURANCE
ORS 670.600 Independent Consultant standards. As used in various provisions of ORS Chapters 316, 656, 657, and 701, an individual or business entity that performs labor or services for remuneration shall be considered to perform the labor or services as an "independent consultant" if the standards of this section are met. The Contracted work meets the following standards:

1. The individual or business entity providing the labor or services is free from direction and control over the means and manner of providing the labor or services, subject only to the right of the person for whom the labor or services are provided to specify the desired results;

2. The individual or business entity providing labor or services is responsible for obtaining all assumed business registrations or professional occupation licenses required by state law or local government ordinances for the individual or business entity to conduct the business;

3. The individual or business entity providing labor or services furnishes the tools or equipment necessary for performance of the Contracted labor or services;

4. The individual or business entity providing labor or services has the authority to hire and fire employees to perform the labor or services;

5. Payment for the labor or services is made upon completion of the performance of specific portions of the project or is made on the basis of an annual or periodic retainer.

_____ _____
City Project Manager Signature Date

CONSULTANT SIGNATURE:

This Contract may be signed in two (2) or more counterparts, each of which shall be deemed an original, and which, when taken together, shall constitute one and the same Agreement.

The parties agree the City and Consultant may conduct this transaction, including any Contract amendments, by electronic means, including the use of electronic signatures.

I, the undersigned, agree to perform work outlined in this Contract in accordance to the STANDARD CONTRACT PROVISIONS, the terms and conditions, made part of this Contract by reference, and the STATEMENT OF THE WORK made part of this Contract by reference; hereby certify under penalty of perjury that I/my business am not/is not in violation of any Oregon tax laws; hereby certify that my business is certified as an Equal Employment Opportunity Affirmative Action Employer and is in compliance with the Equal Benefits Program as prescribed by Chapters 5.33.076 and 5.33.077 of Code of the City of Portland; and hereby certify I am an independent consultant as defined in ORS 670.600.

CH2M Engineers, Inc.

By:_____ Date:_____

Name:_____

Title:_____

CONTRACT NUMBER: _____

CONTRACT TITLE: _____

CITY OF PORTLAND SIGNATURES:

By: _____ Date: _____
Elected Official

Approved:

By: _____ Date: _____
Office of City Auditor

Approved as to Form:

By: _____ Date: _____
Office of City Attorney

Statement of Work
Columbia Boulevard Wastewater Treatment Plant
Secondary Treatment Expansion Program
BES Project No. E07947

Project Understanding

The City of Portland, Bureau of Environmental Services (BES) serves the Portland community by providing water quality protection, watershed planning, wastewater collection and treatment, sewer installation and stormwater management. The Columbia Boulevard Wastewater Treatment Plant (CBWTP) treats an annual daily average of 76 million gallons per day of municipal wastewater and is essential to BES to accomplish its mission. To support its mission, Consultant is to provide engineering services related to its Secondary Treatment Expansion Program (Program), which includes the addition of two new 150-foot-diameter secondary clarifiers, along with a combination of projects that are either in close proximity or operationally connected, including a complete upgrade of its biosolids thickening and dewatering facilities.

BES will act as Program Manager, where the Program will be implemented under a Construction Manager-General Contractor (CM/GC) delivery approach and with assistance from an Owner Agent. The Program is driven by a compliance schedule in BES's Mutual Agreement and Order with the Oregon Department of Environmental Quality (DEQ), with an amended completion date for secondary treatment facilities of December 30, 2024.

Engineering services will be provided under this contract to define the project, complete the design, and support construction and startup of the following elements:

- Secondary Clarifiers Expansion:
  - Two 150-foot-diameter secondary clarifiers and associated return activated sludge (RAS) and waste activated sludge (WAS) facilities. Based on the proposed hydraulic grade line, intermediate pumping is not planned to be included in the project.
  - Effluent metering.
  - Mixed liquor (ML) piping and flow split to the new secondary clarifiers.
  - RAS pump station and secondary scum pumping. The scope of work is based on a dry well type RAS pump station.
  - New RAS piping from the new secondary clarifiers to the aeration basins.
  - Demolition of existing, aging structures, including a staff modular unit, storage space, a shop area, and a decommissioned Taulman-Weiss composting facility that is partially used for odor control of 29,000 standard cubic feet per minute (scfm) from the solids handling building.
  - Replacement of the double-ended medium voltage composting facilities unit substation with a substation that can supply the new secondary clarifiers, any existing loads to remain and potentially the new non-process facilities.

- RAS Line Replacement and Tunnel Piping Work:
  - Replacement of the RAS lines. The Program is intended to provide a more efficient layout of the tunnel piping, including RAS and ML piping modifications, and remove the liability from existing in-gallery piping, which is an aging and failing critical asset, while coordinating with the new process piping from the addition of the new clarifiers.
  - Replacement of the Silver Tunnel Boilers. Evaluation of more efficient building heating approaches that would provide constructability benefits to the Program and long-term energy efficiency, while restoring the building heating systems to current standards.
  - Improvement/upgrades to tunnel ventilation to meet National Fire Protection Association (NFPA) 820 requirements and environmental ventilation requirements.
  - Removal/demolition of abandoned piping and equipment in the existing gallery.
- Solids Handling Improvements:
  - Complete process mechanical upgrades are required for the solids handling facilities, including the replacement of dewatering, thickening, conveyance and biosolids load out equipment, odor control, polymer feed system, and associated support systems.
  - Upgrade the existing structure to current seismic criteria, BES resiliency standards, Portland green building standards, and structural codes, or beyond, depending on what is feasible, to provide a safe and resilient working environment. An extension/expansion of the structure to house the new dewatering facilities will be considered.
  - Co-thickening of primary sludge (PS) will be considered as an opportunity for increased solids processing performance and to lessen the cost of a separate PS facility, which is currently identified in BES's capital improvement plan.
  - Demolition of the existing odor control system (existing fans and biofilters located in the existing compost facilities). Temporary odor control facilities (as needed) during demolition and construction of new odor control system to serve the new solids handling facilities.
- Electrical Switchgear, Substation Transformers and Motor Control Centers (MCCs) in the Silver and Blue tunnels:
  - Removal and replacement of these 480-volt MCCs and associated medium-voltage switchgear and transformers to an aboveground location within a building.
  - Replacement of MCCs and associated 15-kilovolt (kV) switchgear and transformers:
    - MCTA (tag number) and associated transformer supplies various equipment items in the Silver Tunnel including RAS pump, lighting, ventilation fans, and dewatering filtrate pumps.
    - MCTB (tag number) supplies various solids handling equipment, along with the biogas transfer building, the SLPR booster compressors, and the Wet Weather Effluent Flow Control Structure hydraulic power unit and sump pump, a poly feed tank mixer, a chlorine unload pump, and some distribution panels.
    - TUSI-MCCWA (tag number, TUSI = Silver Tunnel) and associated 15-kV composter supplies the odor control equipment and screw and belt conveyors for the Solids Handling facilities.
    - The two Effluent Pump House MCCs (EPH-MCCA/B) that supply the secondary clarifier variable frequency drives (VFDs), effluent pump VFDs, channel gates, and other small loads from the Blue Tunnel, and the reuse system.
  - New above-grade electrical building to house the replaced electrical gear.

  - Coordinate with other electrical work at the CBWTP, especially the CBWTP Main Substation Replacement.

- Non-Process Facilities:
  - New buildings to provide up to 30,000 square feet of combined staff space, workshop area, warehouse/storage space intended to replace the demolished non-process facilities in the way of the new secondary clarifiers, addressing vehicle maintenance needs and other long-term goals.
  - Metal Storage Building 05 (STO 05) rehabilitation, including new siding, roofing, and power.
  - Storage Building 04 (STO 04) demolition and truck scale relocation.
- Aeration Basins Interior Walls Surface Rehabilitation to address concrete spalling, cracks, and erosion.
- Effluent measurement and hypochlorite disinfection relocation and upgrades.

Scope of Work and Deliverables

Contents

Task 1 Preliminary Design

The primary purpose of the preliminary design phase (through 30% design) is to firmly establish the project design criteria, conduct key evaluations, define the recommended project, and develop a project cost estimate and schedule. Work during this phase will culminate in the preparation of the Basis of Design Report. The preliminary design phase consists of four phases, with project initiation activities, a 20% design (project definition), a value engineering (VE) effort, and the preparation of the 30% (schematic) design submittal captured in the Basis of Design Report.

Task 1.1 Project Initiation

Provide services to manage the work tasks and team to achieve the objectives of this scope of work. This work task includes regular communications with BES staff, issuance of monthly project reports, preparation for management meetings and/or other presentations, quality assurance/quality control (QA/QC) planning, change management, and monthly invoicing. An overall schedule and work plan will be developed and regularly updated to assure work activities are completed in a properly integrated and timely manner. In addition, this task includes those elements necessary to properly manage, lead, coordinate, and control the Project team toward the intended results and min risks to the success of the Program, including the management and development of Disadvantaged Minority-owned Women-owned Emerging Small Business (DMWESB) subconsultants.

The following subtasks are provided under this task.

Task 1.1.1 Project Management Planning and Initiation

Develop a set of procedures in the form of Work Plan and a Management Plan to facilitate management of the project. The project instructions and management plan will cover operating procedures, information and BES review requests, communications flow, document and file management, records management, and communications protocol between BES and the Consultant team, regulatory agencies, and other outside parties.

Prepare for and conduct a Project Kickoff/Chartering Meeting, including Agenda and Summary Notes, including decisions/action items.

Using the work breakdown structure (WBS) developed in this scope of work and respecting the approved regulatory timelines for completion of the program, develop a comprehensive design schedule showing the expected timing of all tasks, preliminary dates for deliverables, and anticipated dates for workshops, meetings, submittals and critical points of coordination with BES and/or the CM/GC. Identify float or contingencies.

Prepare a Change Management Plan that addresses the schedule and budget impacts of implementing changes and scope modifications. Develop a change log template.

Meetings

- Project Initiation/Chartering Meeting.

Deliverables

- Project Work Plan/Management Plan, including approach to project progress, communications, and expenditure tracking.
- Agenda and summary notes for project kickoff/chartering meeting and “refresher” meetings.
- Integrated design schedule.
- Project meeting and project workshop templates.
- Change management plan, including templates for forms/logs.
- Invoice templates.
- Project status report template.
- Risk Register template.

Task 1.1.2 Quality Management Planning

Execution of the quality assurance program (QAP) will be scoped/budgeted as part of each discrete design task. This Quality Management Planning task under Project Management covers the development of the QAP and management of that process.

As part of each design phase, the Consultant will carry out a QAP. The purpose of this QAP is to monitor the quality of the Project using workshops and internal QA/QC reviews as described herein, as well as meeting the requirements of the BES Design Checklists. The Consultant will manage multidiscipline internal QA/QC review activities with the senior review team during the progress of the design. Formal QC reviews by the Consulting team will be performed before BES review of the design.

BES will consolidate the BES staff review comments into one comprehensive package before submitting review comments to the Consultant. For major deliverables, Consultant will provide 15 printed copies and one electronic copy in PDF format, and BES will submit review comments within the period allocated in the project schedule (typically 4 weeks following BES receipt of the review submittal). For

smaller technical memorandums (TMs) and meeting notes, Consultant will provide one electronic copy in PDF format, and BES will submit review comments within 14 calendar days following BES receipt of the deliverable. Consultant's responses to BES consolidated review comments will be returned to BES for their records. Consultant will provide native files with final deliverables.

Under this task, a Quality Management Plan (QMP) will be prepared for the project to serve as a guide for all phases of the project. Key features of the QMP will include:

- A single point of contact (Craig Massie) responsible for all quality management.
- A project-specific QMP that focuses on delivering BES project quality objectives and guiding principles and meeting the requirements of the BES Design Checklists.
- Consistent quality policy and procedures instituted and subcontractors.
- Independent quality review performed by discipline-specific quality reviewers to ensure critical analysis without bias. The focus of this effort will:
  - Establish functional QA/QC processes and procedures.
  - Train design team personnel to use the processes and procedures.
  - Verify that the processes have been properly implemented and all requirements are being met through checking and auditing.
- Design criteria, standards, and processes.
- Procedures for engineers; detailed checks of design reports, calculations, drawings, and specifications.

Audits by QA personnel will be conducted to verify conformance with the approved QMP and confirm that required checking and review functions are completed, culminating in either approval or a non-conformance report (NCR). The QA audits follow checklists based on project procedures applicable to the area being audited.

Design quality review documentation will demonstrate that the quality review process is complete and review comments are acceptably addressed as a component of the overall records management system. BES or its delegate will be provided access to QMP-related documentation for auditing purposes. The following documentation will be prepared, collected, and properly stored in the project records system:

- Quality review forms (QRFs) used during internal quality reviews.
- Issue tracking forms used to document quality-related issues.
- Design review forms (DRFs) used by BES to document quality review comments.
- Project checklists or milestone checklists, signed by the reviewer and the appropriate project staff.
- Copies of quality review markups or comments not included on the QRFs or DRFs.
- Review-related correspondence with BES staff and other external agencies or entities.
- QMP-related documents for subcontracted work.
- Audit correspondence, including results and corrective action documentation.

Deliverables

- Quality Management Plan.
- QAP-related forms for each deliverable.
- Consultant responses to BES's consolidated review comments.

Task 1.1.3 DMWESB Development Plan

Provide structured support to DMWESB subconsultants with the goals of: high quality deliverables production, schedule compliance, and long-term DMWESB capacity development. Conduct a DMWESB Development Program, as described in the following subtasks.

Assumptions

- Assumes participation of eight firms in the DMWESB program, assuming most subconsultants engaged on only an as needed basis will not participate.
- Fees are based on an average level of effort per participating firm. Allocation among firms will depend on level of effort and duration of engagement on the project.

Task 1.1.3.1. Project Planning

The Consultant will do the following as part of this subtask:

- Develop DMWESB Development Plan Memorandum.
- Develop draft outline for DMWESB project plans.
- Conduct a kickoff meeting with BES. Discuss DMWESB subconsultant's identified scopes of work, roles and responsibilities, lessons learned from past projects, and review draft outline for DMWESB project plans.
- Conduct an initial meeting to confirm project schedule, delivery requirements, communication procedures, and potential opportunities for DMWESB mentoring.
- Meet with DMWESB subconsultant firms to develop a project plan for each firm. Elements will include:
  - Project expectations including deadlines, quality requirements, and communication expectations.
  - Capacity development strategy identifying specific opportunities to increase the technical or management capacity of the DMWESB and a specific approach to transfer knowledge from the prime Consultant.
  - Staffing strategy ensuring sufficient staff capacity and opportunities to increase capabilities of existing staff.
  - Specific metrics that will be used to track performance and progress (e.g., deliverables that meet quality standards, mentoring opportunities completed).
- Review project plans. Confirm structure and timing of mentoring and development opportunities.

Assumptions

- Fee for this task assumes 8 hours for each project plan.

Deliverables

- Draft and final versions of the DMWESB Development Plan Memorandum.
- DMWESB Development Program Kickoff meeting agenda and notes.
- Up to eight individual firm draft and final project work plans.

Task 1.1.3.2. On-Going Quality Assurance Check-Ins

Perform quarterly check-ins to discuss any new challenges or successes. Facilitate kickoff and interim check-in meetings with DMWESB firms. Timing of check-ins will be such that they will allow DMWESB to incorporate feedback before major deliverables. Check-ins will include the following:

- Check-in with BES.
- Two-way feedback between DMWESB firms and prime Consultant.
- Tracking of metric identified in project plans (e.g., schedule compliance, quality compliance, mentoring hours).
- Identify any concerns or challenges that need to be addressed. Where needed, develop a performance plan with prime Consultant and DMWESB firm to address concerns.

Assumptions

- Assumes an average of 12 hours per firm for on-going QA check-ins.

Deliverables

- Meeting notes summarizing quarterly check-in meetings.
- Up to forty-eight progress reports (includes overall monthly project progress reporting), which may be issued monthly or quarterly, depending on project phase.

Task 1.1.3.3. DMWESB Development Support

Provide support to DMWESB firms, either as identified in their project plans or in response to corrective actions within a performance plan. Examples of support are as follows:

- Coaching of individual team members to improve time management.
- Developing or refining QA/QC procedures.
- Implementing earned value project management.
- Improving workload planning systems.

Assumptions

- Fee for this task assumes an average of 12 hours for each DMWESB firm.

Deliverables

- Documentation of development support activities provided to each firm.

Task 1.1.3.4. Tracking and Reporting

Produce the following reports:

- DMWESB Development Program Summary: Summarize DMWESB development approach and planned efforts. Develop DMWESB development fact sheet for internal and external stakeholders.
- DMWESB Development Program Progress Memoranda: Provide two progress reports summarizing performance on metrics and highlighting program wins and challenges. Meet with BES to identify needed adjustments to DMWESB Development Program.
- DMWESB Development Program Results Memorandum. Near project completion, develop a summary of DMWESB Development Program results, including successes and lessons learned. Include one-page executive summary for stakeholders.

Deliverables

- DMWESB development fact sheets.
- Draft and final versions of two DMWESB Development Program Progress Memorandum, including reporting on DMWESB development support activities.
- Draft and final versions of DMWESB Development Program Results Memorandum.

Task 1.1.3.5. Project Closeout

Develop a project close-out summary for each DMWESB firm, including review of metrics in project plan, lessons learned with prime Consultant and DMWESB subconsultant, and additional action items for DMWESB firm to leverage experience from the project on future marketing efforts and projects.

Assumptions

- Assumes an average of 6 hours for each DMWESB firm for closing out and documenting lessons-learned.

Deliverables

- Up to eight individual firm closeout reports.

Task 1.1.4 Develop Initial Risk Register

Develop a Risk Register using a template approved by BES. The register will be used to inform initial project development to characterize items that have the potential to significantly impact cost. The Initial Risk Register shall include the following information, at a minimum:

- Risk and opportunity identification.
- Activity or activities affected (tied to schedule activities).
- Risk description including qualitative categorization of risk.
- Estimated probability that risk may occur.
- Phase of project that risk could impact.
- Potential schedule impact should risk occur.
- Potential cost impact should risk occur.
- Potential health and safety impacts should risk occur.
- Risk trigger.
- Risk owner.
- Risk management strategy (transfer, mitigate, accept, exploit).

Assumptions

- Consultant team will develop the initial Risk Register and then hold a workshop with BES and Program Support Consultant to review and support additional development.

Workshops

- One initial Risk Register review workshop.

Deliverables

- Draft and Final Initial Risk Register.
- Workshop material.

Task 1.2 20% Design

The intent of this task is to produce a Basis of Design Report that will include TMs and drawings incorporating preliminary engineering evaluations, criteria development, input received from BES in design workshops, and document decisions made during the Project Definition phase.

The primary purpose of the Project Definition phase is to firmly establish the project design criteria. The Project Definition phase work, as defined below, will culminate in preparation of the Basis of Design Report.

Task 1.2.1 Client Objectives, Standards, and Preferences

The purpose of this task is to define BES's objectives and success factors for the project and to document BES's institutional standards as they pertain to this work. The Consultant will focus on the intended outcome achieved from established standards to propose, as applicable, updates to be in line with current industry standards and emerging trends. Project objectives and standards (coordinated with the Program Support Consultant) in the following areas will be considered and documented in a TM:

- **Project objectives:** Discussion of the overall purpose for this project to ensure that all participants have the same understanding. BES will define for the project team what will make this a successful project from their perspective.
- **BES design criteria standards and preferences:** Document BES guidelines and standards for design criteria or standard products.
- **Seismic Resiliency Criteria:** Document City of Portland and BES standard seismic resiliency goals and criteria. Consistent with the Oregon Structural Specialty Code and drawing on the Level of Service work previously done by Portland BES, as well as the seismic resiliency criteria developed for the Tryon Creek Headworks Improvements project, seismic resiliency criteria will be defined for structures, equipment, etc.
- **Graphic standards:** Standard drawing size/border, standard symbols/legends, CAD software standards (including software versions), requirements for electronic deliverables, standards/preferences for process and instrumentation diagrams (P&IDs), process flow stream IDs etc. This task will also include a kickoff meeting and follow-up with all design team subconsultants to coordinate CAD design standards, document presentation standards, etc.
- **Procurement policies:** Bidding/procurement requirements, sole source restrictions, any existing master agreement for the purchase of materials, and equipment.
- **Labor standards and policies:** Design provisions for staff/visitors with accessibility limitations, any existing noise restrictions, any existing labor union restrictions, site security requirements, parking requirements, etc.
- **Equipment and materials:** Preferences on indoor versus (vs.) outdoor locations for equipment; heating, ventilation, and air conditioning (HVAC) preferences (natural gas vs. electric heat, air conditioning requirements, etc.); preferred equipment types and suppliers; local control/local disconnect preferences (lockable MCCs vs. local disconnect switches); and preferences regarding the use of adjustable frequency drives, etc.
- **Approach to alternatives analysis and decision process:** Document approach to alternative evaluations, to be applied throughout the project. Evaluations will include triple-bottom-line analysis, including life-cycle cost criteria, capital costs, and non-cost criteria to support the decision process. Establish local parameters to be utilized in cost models and estimating tools for the purposes of Task 1.2 evaluations.

Deliverables

- Draft and final Client Objectives, Standards and Preferences TM.
- Draft and final chapter/TM of the Basis of Design Report.

Task 1.2.2 External Constraints and Standards

The purpose of this task is to define the external standards and criteria that influence the project design work. The standards and criteria in the following areas will be considered and documented in a TM:

- **Industry Standards:** Identify industry standards applicable to this project. General standards will be included here and specific standards will also be captured in the individual discipline fact sheets.
- **Regulatory Agencies:** Document natural resource and environmental regulatory agencies with jurisdiction for this project and specific contact people. List all known permits required for construction and operation. Document specific requirements that may dictate approach. Note that effort to develop this information is included in Task 2.5.
- **Civil:** Identify local stormwater control agency, document restrictions as they pertain to the proposed project, define permitting requirements; identify any local public work standards as they pertain to roads, stormwater, sewer etc.; any local restriction regarding dust control, demolition, construction traffic/noise, excess earthwork disposal, any existing floodplain restrictions etc.
- **Reliability/Redundancy requirements:** Document DEQ/U.S. Environmental Protection Agency (EPA) minimum requirements in addition to BES in-plant standards and goals.
- **Structural/Architectural/Mechanical:** Identify local building permitting agency, obtain current local design codes and standards that are in effect, including Portland's Green Building Policy, and document building permitting requirements.
- **Electrical/Instrumentation and Control (I&C):** Define redundancy requirements and identify primary contact at local utility.
- **Construction Phasing Constraints:** Identify which existing unit treatment processes and facilities must remain in service while any improvements or expansion facilities are being constructed; document known weather-related constraints for outage requests; using information provided by the Program Support Consultant team, document other projects at CBWTP that may impact this program, identifying issues to track and potentially identify in the Risk Register.

Deliverables

- Draft and final External Constraints and Standards TM.
- Draft and final chapter/section of the Basis of Design Report.

Task 1.2.3 Define Existing Conditions

The purpose of this task is to document characteristics of the existing facility. Results of this task will be documented in several TMs and/or field reports, intended to serve as appendixes to the Basis of Design Report.

Task 1.2.3.1. Data Review and Initial Condition Assessment

Provide initial assessment of the major components affected by the proposed scope of work including such assets as structural components, pumping systems, electrical, communications network, and major equipment. The intent of this initial condition assessment is a broad-based review of the age, the capacity, and the condition of existing facilities that are likely to be re-used as part of the future facilities.

The approach will be as follows:

- Collect existing documents and data, including but not limited to hydraulic profiles, effluent pump station operation information, odor control records, dimensions and location of treatment

infrastructure (basins, channels, pipeline, substations, control panels, utilities, etc.), process data, electrical data, communication data, etc.

- Review collected documentation and identify data gaps and inconsistencies.
- Meet with BES staff to develop the limits of this initial evaluation and a list of the key individual components or systems to be assessed. Develop the methodology for assessment and determination of the useful life of an asset. It is assumed that the condition assessment will be based on record drawing information, maintenance records, visual observations and staff knowledge.
- Conduct field survey to determine condition of selected assets.
- Document findings.

Assumptions

- BES will provide 5 years of process performance data.
- BES will provide existing information relative to existing equipment, capacities, age, etc.

Deliverables

- Draft Condition Assessment TM (note that draft TM will be appended during follow-up condition assessment work conducted during the 30% design phase).

Task 1.2.3.2. Structural Assessments

- Site visit for structural evaluation of the existing solids building, including the floor and basement, the Silver Tunnel (for RAS and ML pipes and pipe supports for these pipes), the Wet Weather Effluent Channel, and major tie in points. Evaluations do not include an evaluation of equipment anchoring or other elements that are not a part of the structure. The structural evaluation will be presented in a workshop.
- Structural condition assessment (visual assessment) of the Aeration Basins to confirm recommended wall repair and rehabilitation requirements.

Assumptions

- The structural team can rely on the existing February 12, 2016, BergerABAM report for information related to the wall repair recommendations for the existing aeration basins.
- Visual observations will only serve to orient the design team and confirm BergerABAM recommendations.
- Evaluation of structural problems associated with existing plant facilities, other than the existing thickening/dewatering building.

Deliverables

- Draft Structural Assessment TM.

Task 1.2.3.3. Electrical Assessments

- Site visit for electrical evaluation of the existing facilities, including substations, MCCs, and conduit runs in the project area.

Assumptions

- BES will provide existing record drawing information and existing equipment information.
- BES will provide latest electrical system study information and current site electrical metering information.

- Not included: Electrical review of existing facilities or building areas that are not specifically included in the project scope.

Deliverables

- Draft Data Collection and Condition Assessment Electrical TM.

Task 1.2.3.4. Site Survey Work

The site survey work will include of the following activities:

- Establish a horizontal and vertical control network for the project area. Horizontal control will be based upon the Oregon Coordinate Reference System datum. Vertical control shall be based upon City of Portland vertical datum.
- Perform site survey of the intended project area with the following guidelines:
  - Tie features within the survey limits of the project and include three-dimensional (3D) coordinates. Topographic features include, but are not limited to, utilities, drainage, trees (6 inches diameter at breast height or greater) and shrubs, and improvements (paved areas, curb, sidewalk, fences, and structures).
  - Collect supplemental topographical data to create points and break lines in adequate quantity to accurately represent the surface of the ground to be included in the digital terrain model (DTM).
  - Map and record utility facility structures (e.g., concrete pads, top slab of vaults, pump station housing, equipment pads and enclosures, barrier screens or fenced enclosures). Individual pieces of equipment will not be tied.
  - Establish field ties of utility features including, but not limited to, underground storm water lines and structures, underground wastewater lines and structures, underground water lines and structures, underground and overhead power lines, and underground gas lines.
  - Collect data for the top of each of the eight existing secondary clarifiers basin walls (and influent/effluent channels, Wet Weather Effluent Channel) and measure 8 to 10 water surface elevation points. This activity will be coordinated with the BES staff to note the specific flows at the time of measurement.
- Perform 3D scanning of Silver Tunnel, Blue Tunnel and Tunnel 8 (east of Squircles). Collect data for existing underground tunnels between the secondary clarifiers and aeration tanks utilizing stationary scanners.
- Perform 3D scanning of solids building, including basement.
- Create detailed base map file in AutoCAD format with survey data collected.
- Not included: Location/verification of existing belowground utilities using test pits, magnetic meters, or ground penetrating radar.

Assumptions

- An existing base map in AutoCAD format featuring the major site improvements will serve as the base for the addition of the topographic data that are collected for the project.
- BES will coordinate the marking of onsite utilities, provide record maps, and assist with the mapping/identification of the various utility lines in the production of the base map.
- Surveyors will provide for one additional site visit for the collection of supplemental topographic data identified as necessary with the design development task.

- Detailed topographic data will not be collected for the reactor building (Composter) and associated equipment because this area is proposed to be demolished. Consultant will collect sufficient data for the generation of the DTM for the future design and surface visible utilities.
- Legal, easement, or plat surveys will not be provided under this scope.

Workshops

- Surveyors will attend a kickoff meeting and one mid-project meeting to discuss scope, schedule, and project progress.

Deliverables

- DTM and CAD files of surveyed data.
- Workshop materials.

Task 1.2.3.5. Geotechnical Investigations

Perform geotechnical investigations to support design development. This subtask includes the following:

- Perform desktop review of existing geotechnical information. Review existing groundwater and dewatering data.
- Geotechnical Field Explorations Planning. Develop preliminary approach and locations for geotechnical field explorations.
- Site visit to observe site access and ground conditions for geotechnical field investigations.
- Finalize geotechnical field exploration plan.
- Stake out locations of proposed explorations and complete the “1-811” one-call utility locates notification. Provide locations to BES staff to allow for evaluation of potential utility interferences. Evaluate the presence of underground utilities using a third-party utility locates firm.
- Utilize results of environmental review (prepared as part of Task 1.3.1.1) to inform drilling and decontamination practices.
- Perform a geotechnical exploration program consisting of the following:
  - 12 geotechnical soil borings. The depth of these borings will be on the order of 60 to 100 feet.
  - 8 cone penetrometer test (CPT) probes with seismic shear wave measurements at 1-meter intervals. The depth of CPT soundings will be on the order of 60 to 80 feet.
  - Install 5 vibrating wire piezometers with data loggers to facilitate observation of groundwater fluctuations near the secondary clarifiers.
- Collect soil samples from soil borings using standard penetration test samplers and thin-walled Shelby tube samples at regular 5-foot intervals. Rhino One personnel will log the borings in accordance with the Unified Soil Classification System and ASTM D2488 by observing cuttings and collect samples.
- Develop laboratory testing program and complete laboratory testing on select, representative soil samples to develop engineering parameters. The laboratory testing will consist of up to 200 moisture contents, 36 grain size analysis, 36 Atterberg Limits, 6 one-dimensional consolidation tests, and up to four sets of pH, electrical resistivity, chlorides, and sulfates.
- Complete specialized laboratory testing to evaluate the ground response of low plasticity silts to cyclic shaking. The evaluation of these silts is often conservatively based on assuming the same behavior as clean sand, whereas these silts can often be shown to be more resistant to liquefaction triggering when using specialized laboratory testing.

- Prepare a preliminary Geotechnical Data Report that includes both previously existing geotechnical information and data obtained during the current geotechnical exploration.

Assumptions

- BES will provide copies of all available geotechnical, geologic, and groundwater reports and studies completed at the project site.
- BES will provide access to site required to complete geotechnical explorations.
- BES will assist Consultant with reviewing potential underground utility interferences with proposed geotechnical exploration locations.
- Geotechnical exploration will commence within 2 months of notice to proceed (NTP) and be completed within 3 months of NTP.
- Assume that explorations will encounter ground having limited contamination. Therefore:
  - The drill cuttings will be stored in 55-gallon drums. Drums will be stored onsite until environmental testing/characterization is complete. It is assumed that the cuttings are non-hazardous and therefore disposed as such.
  - Drums and drill cuttings/investigation derived waste (IDW) will be removed from the site. Level of effort includes costs for transport and disposal of the drums and cuttings. The level of effort does not include costs for constructing storage facilities.
  - Air monitoring during completion of the geotechnical explorations will not be required.
  - Mud-rotary drilling techniques will be used. The drill rods will be steam cleaned between the drill holes if needed.
  - A different geo-probe/drill rig will be utilized for samples collected for environmental testing (Task 1.3.1.1).

Meetings

- Three site visits before field work.
- Field exploration.

Deliverables

- Preliminary and Final Geotechnical Data Report.

Task 1.2.3.6. Contaminated Soil

Environmental Sampling and Analysis Plan

A soil Sampling and Analysis Plan will be prepared for CBWTP to provide guidance in executing environmental sampling to provide baseline anticipated environmental site conditions to be considered during construction. Based on a review of the historical information, and the *1998 Environmental Data Report for Dry Weather Primary Clarifiers and Odor Control Facilities* (CH2M, 1998) the Sampling and Analysis Plan will describe the proposed sampling techniques and analytical methods to be used for environmental sampling for the project.

Assumptions

- The analytical methods are assumed to be total polychlorinated biphenyls, total metals (As, Pb, Hg, Cu, Cd, Cr, Se, Ag), total petroleum hydrocarbons, and pesticides.
- No site visits are included in this task.
- BES will provide one set of consolidated comments on the Draft Sampling and Analysis Plan.

- Groundwater will not be sampled.

Deliverables

- Draft and final Sampling and Analysis Plan.

Field Sampling (Conducted by BES with Consultant Oversight)

After approval of the Sampling and Analysis Plan from BES, BES will conduct the soil sampling. Sampling will be conducted to obtain a discrete sample from each location at two depth intervals at each location, from surface to 10 feet below ground surface. Samples will be obtained from a depth of up to 10 feet, with a Geoprobe, using stainless steel hand tools to collect the sample. Samples will be collected at the direction of the Consultant. A total of 25 individual samples will be analyzed.

BES will place IDW into a 55-gallon drum, labeled as analysis pending, and stored onsite. Based on previous soil results, the IDW is assumed to be non-hazardous. Consultant will coordinate disposal of the IDW at a BES-approved facility. Consultant will provide BES an email summary at the end of the field day documenting field activities.

Assumptions

- Field work will be conducted by one Consultant staff member, and will be completed in one 10-hour day.
- Consultant will conduct the necessary utility locate notification services.
- Consultant will provide 3rd party utility locate services for each decision unit before conducting the sampling.
- Disposal costs are not included in this scope of work.

Deliverables

- Email summary of field sampling activities.

Reporting

Following the completion of investigation sampling activities, the field information and analytical data will be reviewed in detail and evaluated to identify potential additional data needs. The evaluation will include a qualitative review of laboratory QA/QC data to validate analytical data.

A subsurface investigation summary report will be prepared, and the following information will be included:

- A description of the work completed, a summary of the results, and the proposed scope of subsequent field work, if needed.
- Tables presenting results for Contaminants of Potential Concern for the media (soil) and IDW.
- Soil data will be compared to DEQ risk-based concentration screening levels for construction worker, direct contact pathway, or similar screening value.
- Up to four figures will be prepared that show the results for the two decision units.

Deliverables

- Draft and final Subsurface Investigation Summary Report.

Task 1.2.3.7. Odor Characterization

Perform sampling and analysis of specific solids odors to better understand and characterize odorants. This rolls into the technology selection effort. Some technologies do a better job of removing complex odorants than others. Data will be used as starting point for Basic of Design Report. Guidelines for this task are as follows:

- Sampling from separate locations as follows:
  - Biosolids storage.
  - Biofilter inlet/outlet.
  - Thickening/dewatering facilities at other facilities.[1]
  - Fat, oil, and grease (FOG) receiving station/sludge storage tank at other facilities.[1]
- Laboratory Analysis:
  - Reduced sulfur analysis (bag samples, Australian Laboratory Services (ALS)).
  - Carboxylic acid analysis (sorption tubes, ALS).
  - Aldehyde analysis (sorption tubes, EPA Method TO-11A).
  - NH_3/amine analysis (sorption tubes, ALS).
- Field Analysis:
  - OdaLogs® (at inlet of biofilter to obtain better understanding of diurnal loadings).
  - Jerome meter.
  - SMS100 field olfactometer.
  - Gastech sorption tubes.
  - Airflow rates (to determine odor emission rates).
  - Negative pressure under covered process units (to determine odor capture efficiency).

Assumptions

- Sampling from a total of six separate locations at two or, at maximum, three facilities, including CBWTP.
- Field equipment and laboratory analysis provided by Consultant.
- Access to facilities provided by BES.

Deliverables

- Sample plan: plan for sampling, measurements and analysis with plant input/agreement.
- Raw sampling data.

Task 1.2.3.8. Baseline Noise Condition

Conduct ambient noise monitoring at property lines to inform development of acoustical design criteria and construction phase performance limits. If existing noise levels are below code limits, BES may prefer to establish project design criteria more stringent than code limits. In preparation for this effort, a noise monitoring plan will be prepared and submitted to BES for review. After the measurements are completed, a Baseline Noise Study TM will be developed, comparing measured levels with code limits, and recommended design criteria for the project.

Assumptions

- Ambient noise monitoring will be conducted at up to two locations at property lines for up to 72 hours.
- Short-term measurements would also be conducted in the nearby community (receptors to the south, including commercial and residential zones) for interpreting property line sound levels.

Deliverables

- Draft and final Baseline Noise Study, with noise measurement data.

[1] This will depend on the FOG/Food Waste and the change in thickening/dewatering approaches and technologies that will be proposed for the CBWTP.

Task 1.2.4 Update CBWTP Process Model

The purpose of this task is to establish the basis for Task 1.2 evaluation efforts.

Update existing CBWTP process models (developed as part of Secondary Process Improvements project) to prepare a whole-plant model to support Task 1.2 evaluations and subsequent design effort. Calibrate model utilizing facility parameters and performance data captured and presented in the *Columbia Boulevard Wastewater Treatment Plant Facilities Plan Update* (2016 Facilities Plan Update) (HDR, December 2016).

Present model inputs, assumptions, and results of calibration effort in a TM. Document secondary treatment and digestion system capacities based on current operational strategy.

Assumptions

- Effort will rely on information captured in 2016 Facilities Plan Update, including
  - Influent flow and load criteria (current and projected) (Tables 4-1 through 4-9).
  - Influent characterization (Tables A1 and A2 in Appendix 4-A).
  - Unit process performance (as described in Chapter 5).
- BES will provide native (spreadsheet) files of unit process performance data, captured in 2016 Facilities Plan Update.
- BES will provide updated process control data (post-2016).

Deliverables

- Calibrated process models (solids/liquids process model and mass balance).
- Draft and final Existing CBWTP Process Model TM.

Task 1.2.5 Define Long-Term Process Scenarios and Resulting Unit Process Criteria

Develop and evaluate long-term process configuration alternatives, resulting unit process criteria, and document results in a TM. Document system capacities, resulting wastewater/sludge characteristics, and range of criteria to inform subsequent unit process development for which the design should make provisions. Document the impact on sludge and recycle stream quantities and characteristics resulting from up to eight scenarios, including:

- Co-thickening vs. separate PS/WAS thickening.
- Current digestion configuration vs. a more streamlined parallel flow with co-digestion of primary, secondary, FOG, and food waste. Consider operation of WAS storage tank as a phosphorus release tank for struvite control. Evaluate impact of eliminating use of Digesters 1 through 4 from digestion processing.
- Increasing sludge production, food waste, and FOG acceptance. Document impact on gas production and solids dewatering.
- Long-term biosolids utilization/management options, like pilot or small-scale Class A dryer with local (internal to BES) distribution.
- Varying solids and wastewater characteristics resulting from Chemically Enhanced Primary Treatment (CEPT).
- Future nutrient removal requirements (ammonia limits, or operation with nitrification).

Scenario development will address:

- Digestion capacity.
- Solids processing capacity.
- Biogas generation.
- Biosolids management and use.
- Liquids process impacts.
- Sludge dewaterability.

Assumptions

- Assume four model scenarios will be developed.

Deliverables

- Draft and final Unit Process Criteria TM.
- Process model output (solids/liquids process model and mass balance).
- Process flow diagrams.
- Range of unit process design criteria for follow-on Secondary Treatment and Solids Processing tasks below.

Task 1.2.5.1. Optional Subtask – Evaluate Future Scenarios

As part of BES long-range planning, once the scenarios above are developed, BES may choose to further evaluate the most plausible scenarios by developing the following:

- Capital cost, life-cycle cost, and non-cost evaluations.
- Conceptual site plans.

Assumptions

If authorized, this scenario development would be conducted to the extent of the available budget. Deliverables would be defined as part of the authorization process.

Task 1.2.6 Seismic Resiliency Approach

Develop and evaluate alternative design approaches to support adequate seismic resiliency of improvements. TM will include results of the following activities:

- Perform a site visit to observe and collect information on existing structures intended for reuse (e.g., solids building, secondary tunnels).
- Analyze and perform evaluation of seismic stability of said structures.
- Drawing on established BES goals and criteria, as well as the seismic resiliency criteria developed for the Tryon Creek project, work with BES to define specific seismic resiliency criteria for program improvements.
- Document seismic retrofit alternatives evaluation and recommended approaches for existing solids handling building. Reflect building uses by different equipment configuration options. Identify potential limited rehab, if re-use of existing building is found possible in some sub-alternatives. Include order-of-magnitude cost estimates for use in Task 1.2.10 evaluations.
- Establish seismic resiliency criteria for new facilities.

- Develop and document foundation and construction approaches for East Pad buildings, secondary clarifiers, new solids building, and miscellaneous new structures.

Deliverables

- Seismic Resiliency TM.

Task 1.2.7 Geotechnical Design Approach

Develop and evaluate alternative geotechnical design approaches to support development of improvements. TM will include results of the following activities:

- Develop code-based spectral accelerations to be used for preliminary seismic design.
- Complete simplified liquefaction triggering evaluation. Use results to estimate the magnitude of seismically induced settlements.
- Utilize simplified methods to evaluate potential for seismically induced flow failures and lateral spread.
- Complete preliminary assessment of ground improvement methods to mitigate seismically induced settlement and lateral spread.
- Document ground improvement alternatives evaluation and recommended approaches for secondary clarifiers and Columbia River Slough stabilization. Include order-of-magnitude cost estimates for use in Task 1.2.8 evaluations.
- Document ground improvement alternatives evaluation for potential new solids building. Include order-of-magnitude cost estimates for use in Task 1.2.10 evaluations.
- Document ground improvement alternatives evaluation and recommended approaches for East Pad buildings. Include order-of-magnitude cost estimates for use in Non-Process Building evaluations.
- Document potential dewatering approaches to support development of 20% cost estimate.

Deliverables

- Geotechnical TM documenting assessment of ground improvements.

Task 1.2.8 Secondary Treatment

Develop and evaluate components of secondary treatment improvements related to the addition of two new clarifiers. Secondary Treatment TM will address major components of the secondary treatment expansion, as described below.

Task 1.2.8.1. Mixed Liquor Withdrawal

The CBWTP secondary process currently relies on symmetry, with eight aeration basins and eight clarifiers. The mismatch that occurs with the addition of two clarifiers requires careful management. The number of units, configuration, dimension, depth, elevation, grade, allowable loading rate, and performance of the new clarifiers will differ significantly from the existing squircles. Since the new clarifiers will be maximized and have capacity to treat more flow and load per unit than the existing ones, accurately managing the split of flow and ML to the new clarifiers is critical to optimizing their benefit.

Investigate options to promote consistent ML withdrawal from the existing eight aeration basins. This task includes development of a sequence of computational fluid dynamic (CFD) models to evaluate the hydraulic flow characteristics of the CBWTP at the section from aeration basin outlet to the secondary clarifiers. This information will help minimize risk and improve the design for the distribution of flow from the existing aerations basins to the expanded clarifier arrangement. This analysis will assist with

understanding the flow split hydraulics, identifying potential inefficiencies, and developing comparative analysis for the existing and proposed upgrades. The models will be used to do the following:

- Characterize the hydraulics between the aeration basins and secondary clarifiers as currently designed.
- Evaluate the flow split hydraulics to determine the potential for inefficiencies and poor performance.
- Evaluate changes to determine the potential for performance improvement based on alternative configurations.

The scope of the analysis will include the following main points:

- Review historic data, including but not limited to inlet and outlet flow and velocity, and clarifier operating levels, if available.
- Create a 3D model of the overall model domain. This will include key hydraulic features such as aeration basin walls, the location, size and orientation of inlets and outlets, and lengths of piping relevant to the analysis. Extended piping and clarifier weirs will be incorporated via boundary conditions to maintain reasonable computational size and corresponding run times.
- Review model geometry and boundaries with the project team and BES to determine appropriate scenarios for analysis. This may include maximum, minimum, or critical flow rate conditions.
- Develop the CFD model including appropriate mesh and to capture overall hydraulic performance and spatial variation within the model and appropriate boundaries based on the agreed scenarios.
- Run the initial model over an appropriate period to characterize the hydraulics and flow distribution. Similarly, run the subsequent upgraded configuration models to identify potential for improvements or inefficiencies within the tank relative to the existing configuration.
- The initial model will be evaluated to determine level of convergence of the solution and overall hydraulics. The mesh will be updated and refined to ensure accuracy of results appropriate to describe the hydraulic features.
- Repeat analysis for up to two modifications to the specific tank model based on the initial results and discussion with the project team.
- Various post-processing techniques will be used to describe the results of the model. These may include 3D velocity streamlines, contour planes, iso-surfaces, and volumetric rendering of velocity, tracer concentration, pressure, or other parameters.
- Other numerical techniques may be used to characterize hydraulic performance such as an analysis of the flow split.

Assumptions

- The aeration basin flow rates will be evaluated for an initial scenario under steady inlet and outlet conditions. Further scenarios may evaluate additional steady flow conditions.
- Depending on configuration, the model may be modeled as two-fluid (air and water) or single fluid (water). A fixed free water surface, if applicable, will be modeled as a zero-shear stress boundary.
- Small features that do not significantly impact the analysis may not be included.
- Moving mechanical parts may be simplified or omitted from the model.
- Because of the lengthy computer computation run times associated with CFD modeling, it will require approximately 8 weeks after authorization to complete the work. Preliminary information will be provided after approximately 5 weeks for input and discussion to help direct the final runs.

- BES will provide a description of the geometric features of the collection tanks and the flow conditions to be evaluated. These fundamental information requirements are listed below:
  - Dimensioned drawings or hand sketches to build all solid surfaces the water will contact. This includes structural drawings for the inlet, outlet, and tank. For existing structures, as-built drawings are preferred and pictures are helpful for understanding the project features.
  - Description of flow magnitude and water surface elevation ranges for the basins.
  - Specific scenarios to be evaluated: flow rates, water levels, and physical configurations.
  - Any history of past problems or flow characteristic data.

Deliverables

- Draft CFD Model TM describing model inputs and results.

Task 1.2.8.2. Mixed Liquor and Secondary Effluent Flow Routing to and from New Clarifiers

The purpose of this subtask is to develop alternatives for routing of flow to the new secondary clarifiers. This subtask specifically considers whether this can be accomplished with gravity flow, or if an intermediate pump station is required. This subtask includes the following:

- Use existing plant drawings to develop an accurate hydraulic model from the aeration basin to the outfall.
- Document existing operation and operational limitations of existing Effluent Pump Station.
- Work with plant operational staff to incorporate existing plant control strategy for squircles and effluent pump station, and effluent flow measurement into simulation model.
- Work with BES staff to determine critical flow scenarios.
- Use plant data to calibrate model and ensure hydraulic and controls accuracy.
- Develop and evaluate alternatives (five alternatives at three flow scenarios), including proposed control strategies so that operational philosophies and performance can be evaluated. Include consideration of impacts to existing disinfection dosing location and configuration. Alternatives may include:
  - Discharge to Wet Weather Effluent Channel.
  - Discharge to dry weather pump station.
  - Pump from aeration basins to secondary clarifier.
  - Pump from new secondary clarifier to disinfection.
  - Additional alternative to be determined.

Deliverables

- Information from this Task will be used to prepare the memorandum in Task 1.2.8.8 Prepare Technical Memorandum.

Task 1.2.8.3. Secondary Clarifier Configuration

Develop and document configuration of the new secondary clarifiers. The following characteristics will be addressed:

- Secondary clarifier interior baffling.
- Mechanism type.

- Inlet/sludge withdrawal.
- RAS Pump Station Location and configuration (e.g., dry well).
- Integration of new RAS system with existing, including consideration of operational upgrades to the existing RAS pumps, notably the addition of a second VFD to each pair of pumps.

Deliverables

- Information from this Task will be used to prepare the memorandum in Task 1.2.8.8 Prepare Technical Memorandum.

Task 1.2.8.4. Identify Design Considerations for Future Secondary Treatment Alternatives

Identify and document accommodations for the following future secondary treatment alternatives, incorporating:

- Squircle upgrades/conversion (and evaluate possible upgrades to existing RAS pumping).
- West clarifier expansion.
- CEPT.
- Ammonia management alternatives.

Deliverables

- Information from this Task will be used to prepare the memorandum in Task 1.2.8.8 Prepare Technical Memorandum.

Task 1.2.8.5. Silver Tunnel Upgrades

Document upgrades required within the Silver Tunnel. Consider the following system components:

- Existing piping: define limits of current and proposed use and portions of piping that can be demolished.
- Existing RAS pump drives and control.
- Non-process facilities heating alternatives to replace the Silver Tunnel boilers and restore the building heating systems to current standards. Address constructability benefits in the tunnel and the replacement of a dated building heating system with more efficient alternatives, including distributed system, and consideration of potential energy incentives.
- Ventilation and lighting.
- Access.
- Evaluate existing dewatering pump stations.
- Addition of WiFi connectivity.

Assumptions

- Assume direct buried piping between Silver Tunnel and new circular clarifiers (no new gallery or tunnel).

Deliverables

- Information from this Task will be used to prepare the memorandum in Task 1.2.8.8 Prepare Technical Memorandum.

Task 1.2.8.6. Aeration Basins Structural Rehabilitation

Work includes updating the structural condition assessment prepared by BergerABAM and preparing specific repair methods for implementation. Task includes the following:

- Document findings and recommendations captured in *Columbia Boulevard Wastewater Treatment Plant Aeration Basins 1 through 6 Structural Evaluation* (BergerABAM, February 12, 2016).

Assumptions

- No additional evaluation of aeration basin rehabilitation is required to define the basis of cost for the 20% design phase.

Deliverables

- Information from this Task will be used to prepare the memorandum in Task 1.2.8.8 Prepare Technical Memorandum.

Task 1.2.8.7. Hypochlorite System Upgrades and Relocation

Work includes a condition assessment of the existing system, identifying needed upgrades, and evaluating alternative locations, as follows:

- Background review and site visit preparation.
- Site visit: two Consultant staff will visit the site 1 day.
- Develop report of assessment findings. Develop alternatives to address condition items and opportunities for relocation, including key considerations for current design.
- Prepare cost estimate and schedule, considering other upgrades to secondary treatment.
- Present results to BES.
- Prepare the final report.

Task 1.2.8.8. Prepare Technical Memorandum

- Compile results of Task 1.2.8.1 through Task 1.2.8.7 evaluations in a comprehensive draft TM.
- Review draft with BES staff and prepare final TM.

Deliverable

- Draft and final Secondary Treatment TM.

Task 1.2.9 Major Electrical Systems Replacement

Develop and evaluate electrical requirements, including the following:

- Conduct an initial walk-through with BES staff (budgeted under Existing Conditions Task).
- In a workshop, identify objectives for the relocation of medium voltage system (such as speed of recovery, asset protection, or continuous operation).
- In a workshop, identify the limits of the project, flood scenarios, and task objectives.
- Develop a consolidated one-line diagram within the scope of the work.
- Identify decisions from other project elements (such as secondary and solids projects that will impact substation design [location, backup power, capacity, sump pumps]).
- Participate in two coordination meetings for main substation replacement.
- Flood elevation criteria, considering risk and cost analysis.
- Develop three flood scenarios such as cause of flood, depth of the flood, and duration of the flood.
- Evaluate the electrical components affected by flood and prioritize with BES the items to be removed and replaced in a flood protected area. Evaluation will include the following:

  - Medium voltage switchgear, and cabling.
  - Low voltage cabling and distribution equipment.
  - Unit substation (transformers).
  - MCCs.
  - Local control panels.
  - Plant control system (programmable logic controller [PLC]) panels.
- Identify three electrical system approaches:
  - System diagrams.
  - Conduct cost/non-financial evaluations.
- Identify preferred alternative and resulting infrastructure (electrical building, etc.).
- Evaluate sump pump approach.
- Evaluate relocation or elimination of unit substation at Composter Facility.
- Evaluate electrical construction sequencing constraints, temporary provisions, and shutdowns.
- Evaluate electrical classification as a result of this work (NFPA 820 considerations): area classifications, ventilation requirements, alarm requirements.
- Check load on medium voltage (related to impacts of centrifuge installation, potentially 1,200 horsepower). Critical driver for substation decisions. Critical driver for substation decisions.
- Review existing SKM model and reports.
- Compile results of evaluations in a comprehensive draft TM. Review draft with BES staff and prepare final TM.

Assumptions

- NFPA 820 analysis is limited to the facilities to be modified in this project.
- Two workshops: one to develop flood scenarios and then one to present evaluation results and proposed approach.

Deliverables

- Draft and final Electrical System Replacement TM.
- Workshop materials and minutes.

Task 1.2.10 Solids Processing

Develop and evaluate components of solids processing improvements. Solids Processing TM will address major components of the secondary treatment program expansion, as described below.

Task 1.2.10.1. Thickening Technology Evaluations (and Building/Housing Evaluation)

- Develop sizing criteria for thickening equipment.
- Evaluate and select equipment. Consider co-thickening and separate WAS/PS thickening and impacts on equipment, number of operating units, future solids processing operation such as thermal hydrolysis, and layout. Reflect odor control/ventilation with each option. Develop raw sludge blend tank requirements for co-thickening. Develop thickened sludge blend tank requirements before digestion.

- Evaluate filtrate/centrate management, conveyance.
- Evaluate temporary thickening and related facilities.
- Evaluate co-digestion impacts (effect of enhanced thickening on additional digestion capacity).

Deliverables

- Information from this Task will be used to prepare the memorandum in Task 1.2.10.7 Prepare Technical Memorandum.

Task 1.2.10.2. Dewatering Technology Evaluations (and Building/Housing Evaluation)

- Develop sizing criteria for dewatering equipment.
- Develop long list of alternatives and screen to a short list of alternatives
- Evaluate and select dewatering equipment (including pumping, grinders). Consider operations schedule, impacts on dewatering feed and cake storage facility sizing. Evaluate dewatering feed tank mixing alternative.
- Evaluate filtrate/centrate management, conveyance.
- Evaluate temporary dewatering and related facilities.

Deliverables

- Information from this Task will be used to prepare the memorandum in Task 1.2.10.7 Prepare Technical Memorandum.

Task 1.2.10.3. Cake Conveyance and Cake Storage/Loadout Technology Evaluations (and Location Evaluation)

- Develop sizing criteria for cake conveyance/storage/loadout equipment.
- Consider conveyance type.
- Consider hopper type (live bottom, push-floor, rotary discharger, are assumed technologies for evaluation), and loadout gate type.
- Consider operational requirements.
- Identify cake hauling vehicle/trailer requirements, including multi-modal containers.
- Evaluate possible phasing options for cake handling.
- Identify truck scale requirements.

Deliverables

- Information from this Task will be used to prepare the memorandum in Task 1.2.10.7 Prepare Technical Memorandum.

Task 1.2.10.4. Identify Design Considerations for Future Solids Treatment Alternatives

Identify and document accommodations for the following future treatment alternatives:

- Drying/Class A product.
- CEPT.
- Ammonia management alternatives.
- Others, e.g., Thermal hydrolysis, gasification, etc.

Deliverables

- Information from this Task will be used to prepare the memorandum in Task 1.2.10.7 Prepare Technical Memorandum.

Task 1.2.10.5. Site Visits to Operating Facilities (for All Candidate Technology Evaluations)

Work with equipment manufacturers to arrange site visits to observed top candidate technologies. Assume all site visits are within the northwest. Assume two staff will attend each site visit. Assume three separate all-day visits are required.

Deliverables

- Site visit reports.

Task 1.2.10.6. Solids Processing Configuration

Determine disposition of existing solids building and evaluate up to four full building configurations including modification/addition to existing facility, and new solids handling facility layouts (including two-story or three-story new building). Task includes the following:

- Determine disposition of existing solids building and evaluate up to four full building configurations including modification/addition to existing facility, and new solids handling facility layouts (including 2-story or 3-story new building).
- Evaluate WAS and PS thickening alternatives, including co-thickening; evaluate thickened WAS (TWAS) storage tank requirements, and modifications to TWAS feed to digestion.
- Evaluate PS thickening alternatives potentially including CEPT, gravity thickening, gravity belt or rotary drum thickener, and modification to existing primary clarifier structure or operations.
- Evaluate impact on ammonia return stream from intermittent dewatering and centrate return. Intent of this activity is to confirm that existing secondary process can operate in anticipated compliance with permit limits with planned dewatering centrate return.
- Coordinate with civil discipline for site truck circulation, truck scale location, and construction phase circulation and site constraints.
- Dewatering feed tank need/sizing.
- Sludge pumping (i.e., WAS, PS, TWAS, digested sludge [dewatering feed]), scum pumping, and filtrate/centrate pumping (if required) upgrades/modifications.
- Sludge sampling requirements. Identify special sampling facilities required.
- Identify solids building laboratory facilities required by BES (polymer trials, optimization).
- Polymer feed systems:
  - Common or separate systems for thickening/dewatering.
  - Dry vs. liquid.
  - Polymer activation equipment.
  - Bulk polymer storage.
  - Dilute polymer storage and use of day tanks. Tank mixing, and/or recirculation requirements.
  - Polymer spill management facilities (sump location, pump types).
- Cranes, monorails, and hoisting requirements.

- Evaluate sludge conditioning requirements/facilities (evaluate Orege conditioning process on dewatering feed; motorized polymer blenders on feed to thickening and dewatering equipment).
- Strategies for solids building space, including ventilation, air transfer, space heating needs, large duct routing requirements, conflicts with equipment removal.
- Provide data to support construction cost estimate.

Deliverables

- Information from this Task will be used to prepare the memorandum in Task 1.2.10.7 Prepare Technical Memorandum.

Task 1.2.10.7. Prepare Technical Memorandum

Compile results of Task 1.2.10.1 through Task 1.2.10.6 evaluations in a comprehensive draft TM. Review draft with BES staff and prepare final TM.

Deliverables

- Draft and final Solids Processing TM.

Task 1.2.10.8. Solids Dewatering Piloting

This task describes the scope for performing demonstration pilot testing of candidate dewatering equipment. The goals of the pilot testing program are as follows:

- Allow staff to gain operator familiarity with high solids centrifuge dewatering technology.
- Provide operational data and verify the process design criteria, including solids throughput, cake concentration, solids capture, and polymer dosage.
- Determine potential/actual centrifuge performance and polymer requirements on the CBWTP solids.
- Provide a summary report of the testing results and recommended design criteria for the centrifuges, which will enable the design Consultant to develop more precise, performance-based specifications.

Pilot testing requires significant staff and Consultant resources to implement, and while the pilot test performance is helpful to confirming design criteria, uncertainty remains in actual full-scale implementation pilot testing due to factors that may change in feed solids. For these reasons, only one centrifuge manufacturer will be identified to pilot its high solids dewatering centrifuge system. Consultant will identify and coordinate with a vendor who can meet schedule requirements, and identify compensation to be paid by BES to support the required equipment-related services and staff-related services for conducting the pilot tests. A detailed schedule for the program will be prepared upon consultation with the selected vendor. The following tasks will be performed.

Prepare Pilot Testing Plan for Dewatering

A pilot testing plan and protocol will be developed and a draft plan submitted to BES. The pilot testing plan will delineate procedures, sequences, and responsibilities of the parties (BES, centrifuge manufacturer, and Consultant). It is anticipated that BES will be responsible for providing personnel and resources for: (1) procurement support for pilot testing contracting, (2) the installation of miscellaneous support facilities, (3) utility hookups, (4) site preparation, (5) disposal of generated dewatered biosolids, and (6) supervisory staffing during testing. BES and each pilot testing manufacturer staff will coordinate pilot testing activities associated with the delivery, installation, system checkout, and system startup of the pilot test equipment.

The testing plan will define data collection requirements that focus on information required to determine anticipated operating costs, system performance, and system reliability.

Consultant will arrange with up to four dewatering equipment manufacturers (including selected pilot test manufacturer) for shipment of dewatering feed samples for bench-scale testing of the sludge samples.

BES staff will have the opportunity to operate the pilot centrifuge for a minimum of 1 day during the pilot testing period to gain direct centrifuge-operating experience.

The Consultant will act as BES representative and full-time observer during the demonstration tests.

The Consultant and the pilot testing manufacturer staff will assist BES in coordinating pilot testing activities associated with the delivery, installation, system checkout, and system startup of the pilot test equipment.

The Consultant will assist BES staff in the supervision of the centrifuge tests. The Consultant will work in cooperation with BES staff to coordinate utilities requirements, miscellaneous support facilities, and site preparation requirements. It is anticipated that the pilot system will be trailer- or skid-mounted, and that utility hookups, site preparation, and miscellaneous support facilities (such as feed pumps and dump truck or dumpsters for dewatered biosolids handling), will be provided by BES.

It is anticipated that the manufacturer will provide a startup Consultant and field technician to perform system checkout and system startup services, and provide training for BES operations staff.

It is anticipated that the staff of the centrifuge pilot test manufacturer will operate the pilot system on an 8-hour per day basis for up to 2 weeks (Monday through Friday) to obtain the required data on system performance, reliability, and operating characteristics. These data will be used by the Consultant to prepare the Report of Pilot Testing Results.

Sampling Requirements and Data Collection

Samples for each individual test will be split: one sample will be taken by Consultant staff and analyzed by a third-party laboratory, and one sample will be taken and analyzed by manufacturer-selected laboratory. This scope includes allowance for sampling as follows (including shipping):

Flow Stream/Parameter	Expected Lab Samples
Centrifuge Sludge Feed	
Percent total solids (each test)	8 tests per day, x 8 days per vendor x 1 vendor = 64 tests
Percent volatile solids (once per day)	8 tests per day, x 8 days per vendor x 1 vendor = 64 tests
pH (once per day)	Assume field measurement
Temperature (once per day)	Assume field measurement
Cake Solids	
Percent total solids (each test)	8 tests per day, x 8 days per vendor x 1 vendor = 64 tests
Centrate	
Percent total suspended solids (each test)	8 tests per day, x 8 days per vendor x 1 vendor = 64 tests
Total dissolved solids (once per week)	1 test per day = 1 x 8 days per vendor x 1 vendor = 8 tests

Reporting of Test Results

After completion of the pilot test and sample analysis, the centrifuge manufacturer shall provide a report detailing the procedures followed, variations from the set protocol, results of the testing, and full-scale performance recommendation.

Upon completion of the pilot testing program, the Consultant will prepare a summary technical report. The Consultant will evaluate the field test data collected by BES and the centrifuge manufacturer, discuss the trends and results with representatives of the centrifuge pilot test manufacturer, and recommend full-scale design criteria for the centrifuges based on the pilot test results. The design criteria will be sufficient for use in the preparation of evaluation-based bids (if such approach is selected during final design) and performance-based specifications for the centrifuges. A draft report will be submitted to BES for review and comment. A final draft will be submitted incorporating BES comments.

Deliverables

- Pilot Testing Plan.
- Pilot Testing Report including laboratory results.

Task 1.2.11 Odor Control

Task 1.2.11.1. Permanent Odor Control

Develop alternatives and recommendation for the permanent odor control approach:

- Initial screening of established technologies. Develop a short-list of technologies for moving forward into alternatives analysis. Consider odor characterization data from Odor Assessment and Characterization Study (described above) to remove any not considered viable.
- Develop non-financial criteria for technology ranking.
- Workshop 1: Non-Financial Criteria Ranking Workshop. Useful in gathering stakeholder input and understanding value system and hot buttons. Forced-choice exercise. Output is final listing of all non-financial criteria along with specific rankings/weightings.
- Alternatives Development:
  - Short-list of technologies includes dry media adsorption, chemical scrubbing, organic media biofilter, engineered media biofilter, and biotrickling filter (BTF) (includes high rate BTFs and possibly dual-stage combinations of technologies).
  - Consider odor characterization data from separate study (described above, including data collected from other facilities) to rank specific technologies.
  - Utilize CH2M in-house Multi-Criteria Analysis (MCA) tool to cost and compare all alternatives. Output includes benefit-to-cost and net-present worth for all alternatives.
- Air Dispersion Modeling:
  - Using AERMOD, develop a model for the entire plant. Model provides understanding of offsite impacts related to various technologies, treatment system locations, and stack heights.
- Workshop 2: Alternatives Analysis Odor Control Workshop. Present analysis summary, findings, and recommendations and gather BES/operator input for designing permanent odor control system.

Meetings

- Workshop 1 and Workshop 2.

Deliverables

- Draft and final TM on selected technology, including model report.
- Workshop materials.

Task 1.2.11.2. Temporary Odor Control

Considering alternatives for permanent odor control and the potential construction schedule, develop alternatives and recommendation for temporary odor control approach during construction, as follows:

- Alternatives Development:
  - Technologies to consider include activated carbon, existing biofilter, and ultraviolet photoionization, dispersion.
  - Criteria: Footprint, location, performance, duct routing, costs, opportunity to phase-in with permanent odor control, and operator experiences.
  - Utilize MCA tool to cost and compare all alternatives. Output includes benefit-to-cost and net-present worth for all alternatives.
- Air Dispersion Modeling:
  - Utilize model developed from the permanent alternatives analysis. The model will assist in selecting the best location, technology, and stack height.
- Workshop: A single workshop summarizing the analysis, findings, and recommendations.

Meetings

- Workshop: Present analysis summary, findings, and recommendations for permanent odor control.

Deliverables

- Draft and final TM on selected technology.
- Workshop materials and minutes.

Task 1.2.12 Non-Process Facilities

With the campus-wide programming work being completed by others, the evaluation and development of the non-process facility design can be carried to a higher level of completion (30% level) during the 20% design phase.

Programming for the three new buildings to replace these functions is being completed by MWA Architects (under separate contract with BES). MWA is expected to provide the following as the basis for schematic design:

- Functional and space programs for three proposed buildings.
- Three concept design options for each building, including architectural themes, building systems and envelope design, building materials selections, initial floor plans, architectural volumes and schematic roof designs, sketches and 3D views. These options will vary by size: base program, “wish list” program, and a compromise in-between.
- Green Building Policy (Leadership in Energy and Environmental Design [LEED]) checklist to confirm certification path for each option.
- Construction cost estimate for each option.
- Summary report including information from the programming and concept design effort.

This scope of services for the project includes schematic design, final design, construction documents and construction administration for three non-process buildings that are part of the larger expansion program. These non-process buildings are anticipated to be on the East Pad of the site and will replace the following existing buildings, in addition to some electrical and instrument functions currently in the Dodd Building:

Building	Area (square feet)	Use
STO1	5,000	Special Operations Group (SOG), computer terminals, break room, showers and locker rooms, shop space and storage
STO1 Outbuilding	1,500	Unused prefabricated building
STO2 – SOG/Stores	5,000	Used by SOG as shop space for small portable equipment repair, and by Stores for equipment and supply storage
STO2 Outbuilding	1,500	Training and office space
Composter Building	5,000	Portion of building is used for storage
STO4	2,500	Storage and truck scale
STO3	600	Parks maintenance building located on the East Pad

Beginning with the three design concepts developed by Others, conduct the following tasks during this phase of the work:

- Review the program and other information furnished by BES.
- Provide minor refinements to the program and produce a final Program Statement.
- Provide BES with comments on the conceptual designs, systems, and materials options.
- Meet with stakeholders to assess each option and select one design concept for further development.
- Review laws, codes, and regulations and meet with planning and building department staff to review design and obtain feedback that affects the proposed design.
- Review Geotechnical Report findings.
- Refine and produce final schematic design package including a site plan and preliminary building plans that show room wall, building sections, and elevations. Major building systems and construction materials shall be noted on the drawings or described in writing.
- With Project Team, evaluate sustainability goals with respect to budget and make go/no-go decisions. Coordinate development of a cost estimate; then review that estimate with BES and stakeholders. Refine documents as required to meet budget.
- Develop a site traffic evaluation reflecting vehicle and foot traffic.
- Develop educational signage concepts associated with the public face of these buildings (public trail, etc.).

Schematic design of the non-process facilities will proceed for the selected design option and includes the following tasks:

- Attend and facilitate regular design team meetings to refine work scope, budget, and schedule, including producing and publishing meeting minutes.
- Attend and facilitate regular stakeholder design workshops to develop the design, and to refine the budget and schedule.
- Review laws, codes, and regulations and meet with BES planning and building department staff to review design and obtain feedback that affects the proposed design.
- Work with BES to set seismic resiliency goals and features for each structure.

- Facilitate an eco-charrette workshop, inclusive of all stakeholders and design team to establish clear project priorities, responsibilities, and sustainability strategies, concluded in a summary report.
- Refine and produce final schematic design package including a site plan, preliminary building plans, sections and elevations, and conceptual 3D views. Major building systems and construction materials will be noted on the drawings or described in a systems narrative.
- With the stakeholders and the design team, evaluate sustainability goals with respect to budget and make go/no-go decisions.
- Support development of a construction cost estimate.
- Conduct internal QA of schematic design documents.
- Conduct QA activities in accordance with the project-wide QMP.

Assumptions

- Design includes up to three buildings totaling 30,000 square feet and a covered storage area.
- Buildings to be designed on the East Pad are for maintenance, storage, shared, and administration uses.
- The administration building is anticipated to be a two-story building. The remaining structures are single story.
- Stormwater management features and landscaping plans and sections are included as part of the overall site/civil and landscape architecture work.
- Scope assumes security/access from the public trail are unchanged from current configuration.
- Assume that the City of Portland will engage a CM/GC before start of construction documents, and the project will be delivered following a CM/GC process.

Meetings

- Five schematic design workshops.
- One eco-charrette.

Deliverables

- Meeting minutes of stakeholder meetings and workshops.
- Meeting notes from planning and building department meetings.
- Draft and final Schematic Design Report, including:
  - Building and zoning code review summary.
  - Narrative describing major building systems and construction materials.
  - Memorandum of comments in response to construction cost estimate.
- Drawings, including site plan, preliminary building plans, sections, and elevations.
- Eco-charrette scorecard, listing project priorities related to sustainability, strategies for achieving certification, and responsibilities of various parties of the design team.

Task 1.2.13 Demolition

A preliminary Decommissioning and Demolition (D&D) Plan will be prepared with the primary objective of providing a roadmap to demolishing the composter and sludge hoppers, and planning key aspects of that work: work sequencing, material surveys that would be needed, permitting requirements, salvage

items, proposed schedule (Level 1) for the process, a Class 4 budgetary estimate (Concept/Feasibility Study level), and any other information that would provide value to BES. At this phase of the project, it is recommended that the preliminary D&D Plan focus on demolition planning because detailed technical issues will be addressed in more detail during project implementation when the work is better defined.

Strategic Planning
Strategic planning will be the guide for BES to meet the objectives of the D&D of the planned facilities. To accomplish this objective, Consultant proposes a robust effort to salvage and recycle as much equipment and materials as reasonable to provide for an economical, efficient, and effective D&D that is completed safely and in compliance with federal and state laws and regulations as well as identification of the permits that will be required to complete the D&D.

Initial reviews of the as-builts for the plant will be completed noting the location, age, type, and amount of salvageable equipment and recyclable materials. Based on this information, a conceptual plan for removal, staging, and selling and or recycling will be completed. Materials that could potentially have reuse value include the boilers, turbines, MCCs, transformers, tanks, and vessels. Materials that could potentially have recycle value include metal support infrastructure, wiring, piping, alloy metals, miscellaneous metals, concrete, and asphalt.

Sequencing
An overview of the sequence of activities proposed for the demolition engineering and contractor procurement will be developed. To expedite permitting and reduce overall demolition costs, agency requirements and potential impacts will be considered during planning and the plans will include items that provide mitigation measures or avoid potential impacts altogether.

The aboveground and belowground features to be demolished and the existing facilities that should be protected and remain in place post-demolition will be established.

The aboveground and belowground utilities that will need to be disconnected and or relocated to allow for D&D, such as transmission systems, gas, water, communications, and related underground piping and duct banks will be identified.

The major foundations and underground structures at the facility that will be included in the D&D will be established. It will be generally assumed that all aboveground features will be decommissioned and demolished utilizing one of several approaches including a top down surgical approach or a felling and material segregation approach. Logistical and safety considerations will be evaluated to determine the most efficient and safest approach. The onsite and offsite sources of borrow material to backfill excavations will be identified and may include use of crushed concrete from foundations. The D&D Plan will define testing requirements for imported fill.

General and Specific Information
Other objectives of the strategic D&D Plan are to provide both general and specific information to be used for the planning, budgeting, and eventual demolition of the composter, sludge hopper and non-process buildings at CBWTP.

The strategic D&D Plan will be prepared using best professional judgment and best management practices (BMPs) and is intended to describe how the demolition will occur, the sequence it will follow, what equipment and manpower will be required, what material will be brought onto the site, types and estimated volumes of material and waste that will leave the site, and what can be salvaged for resale, reuse, or recycling. Additionally, the D&D Plan needs to be of sufficient quality and detail to be included as part of a formal Request for Proposals (RFP) to be solicited to prospective bidders for the demolition work in the future.

Waste Management and Minimization

In conformance with City of Portland policies and requirements, the D&D Plan will be based on the assumption that demolition of the compost area of CBWTP will utilize waste diversion techniques intended to maximize recycling, reduce the volume of material requiring transport offsite, and reduce the waste that would require disposal at local landfills. However, the actual methods and techniques employed during demolition will be the choice of the demolition contractor selected to conduct the demolition, and those methods and techniques might vary from those described in the proposed D&D Plan.

Requirements for management of demolition debris and waste include, but are not limited to, general demolition debris, environmentally regulated materials (ERMs), recyclable materials, spill prevention and control, decontamination water, construction dewatering (if required), soil, and reporting requirements. Identify materials that are deemed acceptable for onsite disposal (if allowed), offsite disposal, or recycle. Identify existing BES-approved offsite waste transport contractors and disposal/recycling facilities.

Project Total Installed Cost Estimate

The estimate that will be prepared for this D&D Plan will follow the guidance provided by the Association for the Advancement of Cost Engineering (AACE) International standard for Class 4 budgetary cost estimates.

The estimate will be prepared using available historical reports and information provided by BES, including quantity takeoffs for concrete, major equipment/components, and site work items. Historical percentages will then be used to compute values for other divisions of work. Consultant will try to obtain budgetary quotes for salvage of major equipment/component items. In the absence of quoted prices, these estimates can be produced with parametric models and historical pricing data.

Assumptions

- Facilities or systems included in demolition scope include: a staff modular unit, storage space, a shop area, a decommissioned Taulman-Weiss composting facility that is partially used for odor control, abandoned piping and equipment in the existing gallery, scum removal system, existing odor control system, Building STO 03, and Building STO 04.
- BES will provide as-builts of the facility in electronic and/or hard copy.
- A visual and desktop review for ERMs will be completed to identify and estimate the types and volumes of ERMs that will require offsite disposal.
- The Level 1 schedule will include the critical milestones and supporting tasks for the pre-shutdown planning as well as the schedule for the D&D (cradle to grave).
- The Class 4 budgetary cost estimate will be provided in a summary and will include detail information for the summary. Volumes of materials will be estimated based on review of the as-builts and site walk observations. Detailed take offs of each as-built are not included in this scope of work.
- Current permitting requirements will be evaluated and included in the plan; however, they may change or increase before the actual D&D. A plan will be developed that will assist in monitoring these potential changes.
- Planning documents including a Traffic Control Plan and Waste Management Plan will be developed in an abbreviated format to allow for the initial planning activities. More detailed plans will be required as the planning moves into the final stages before D&D.
- Descriptions of work for the various structures and supporting systems will be included based on information obtained through reviews and the site walk.

- The graphics for the individual areas of the plant site will be simple blow ups of the overall site map with some highlights and call outs that will be referenced in the text.

The tables and graphs for the equipment usage, labor, and cost will be excel spreadsheets and graphs that will provide a visual look at the total and estimated monthly utilization of resources and burn rate of costs.

Task 1.2.14 Develop Recommended Program Technical Memorandum

Based on the findings of Task 1.2.4 through Task 1.2.13, develop the proposed Program. This will be captured in a TM that includes fact sheets and preliminary drawings documenting a comprehensive summary of the recommended program (project definition). The intent is to perform sufficient development to support development of a Class 4 budgetary cost estimate and provide a clear basis for the VE effort. The TM will include the following:

- Unit Process Fact Sheets:
  - Process model results.
  - Hydraulic results.
  - Unit process design criteria for new and modified facilities.
  - Preliminary equipment List and major/controlling instrument list.
  - Major equipment selections.
  - Preliminary process control narratives.
  - Recommended predesign evaluations, including site visits.
  - Recommendations for construction sequencing and maintenance of plant operation during construction (Maintenance of Plant Operations Plan).
  - Temporary facilities.
- Discipline Fact Sheets:
  - Site civil, plant utilities, and stormwater criteria.
  - Landscape architecture concepts and criteria, including pedestrian circulation and hardscapes, planting and irrigation design.
  - Potholing Plan.
  - Geotechnical criteria.
  - Structural criteria, including foundation design, aeration basin rehabilitation recommendations, and seismic resiliency recommendations.
  - Preliminary excavation and shoring requirements.
  - Architectural concepts and criteria, including facility access and egress, bird-friendly design, green building policy attributes, and any lab space and control room requirements.
  - Acoustical criteria and improvements.
  - Code interpretation and permit requirements for the project to verify that all codes and standards have been included and all relevant design conditions have been met.
  - Building mechanical (HVAC and plumbing) design criteria, including ventilation to address NFPA 820 requirements.

  - Fire protection design criteria.
  - Coatings/corrosion evaluation. Identify alternatives for coating concrete sludge holding tanks, and process areas.
  - Process mechanical and acoustical criteria.
  - Initial evaluation of safety considerations for equipment access and daily maintenance considerations.
  - Electrical approach for relocating existing equipment for flood protection and providing electrical service to new facilities.
  - I&C system criteria. Review existing plant equipment/instrument tag numbering, naming, and abbreviation conventions.
- Preliminary Drawings:
  - Preliminary Process Data Sheet.
  - Process Schematics.
  - Hydraulic Profile.
  - Large Piping Layout.
  - Site Plan.
  - Preliminary Facility Structural and Mechanical Plans.
  - Electrical One-Lines.

Deliverables

- Recommended Program TM.

Task 1.2.15 Program Implementation Plan

Develop a TM that defines implementation of the proposed improvements, which includes the following:

- Develop a Preliminary Program Schedule that estimates durations and sequence of work. Reflect major activities including temporary facilities and reflect process and operational constraints identified in Task 1.2.14.
- Document Permitting Plan (developed as part of Task 2.5 Permitting).
- Document Public Outreach Plan (developed as part of Task 2.4.1 Develop Communications and Public Involvement Plan).
- Provide Construction Cost Estimate in sufficient detail to provide the expected accuracy range of an AACE International Class 4 budgetary cost estimate: -30% to +50%.

Assumptions

- Effort and budget to develop Public Outreach Plan and Permitting Plan are included in Task 2.4 Public Involvement and Task 2.5.1.1 20% Design Phase, respectively.

Deliverables

- Program Implementation Plan TM.
- Preliminary Program Schedule.
- Construction Cost Estimate.

- Cost estimate will be provided with a database of most modeled content, including size, material, flowstream, volume of concrete, and other major components.

Task 1.2.16 Prepare Basis of Design Report

Compile the Basis of Design Report. The report will encompass all of the products developed as part of Task 1.2.1 through Task 1.2.15. This subtask includes development of an Executive Summary and overall report compilation, to produce a draft report for BES review.

Prepare final report, incorporating BES comments.

Assumptions

- Using Heron (e-Builder) and its redlining tool and PDF comments, BES will provide a compiled, adjudicated set of comments to be incorporated into the 30% design.
- The scope of work does not include plant-wide communication systems, security design, and intercom systems, only accommodation of these systems for new structures. Assume that Consultant design work accommodates these systems but assume they will be installed by BES or separate vendors (to match existing systems).
- BES will provide all updated electrical one-lines.
- Assume limited BES comments since all TMs will have been reviewed and finalized under previous subtasks.

Deliverables

Draft and final Basis of Design Report (15 printed copies and one electronic copy in PDF format).

Task 1.2.17 Technical Workshops – 20% Design

During this phase, workshops with BES staff will be held to review the development of design criteria, results of technical evaluations, and review of work products. Workshop materials will be developed based on the technical work being conducted, and presented to BES in workshops. Workshops will include, but not be limited to, the following:

- Secondary process system configuration and hydraulics.
- Solids dewatering and dewatered sludge conveyance and loadout.
- Solids thickening and co-thickening alternatives.
- Electrical system relocation alternatives.
- Heating alternatives to replace the existing boiler system.

Assumptions

For the 20% design phase, assume a total of fifteen technical workshops, each 2 to 3 hours long, with BES's personnel to review the progress of the work, make decisions, and provide direction.

In addition to the technical workshops described above, the design team will conduct three half-day workshops at the end of 20% design to review work products associated with that phase of the work.

One additional workshop (2 to 3 hours long) will be conducted to review P&IDs for the 20% design phase.

Each workshop is assumed to entail 4 hours of workshop labor plus 2 hours of preparation, four consulting team members per workshop, and 2 hours of meeting notes by junior staff.

Workshops for the non-process facilities are scoped separately, under the Non-Process Schematic Design task above.

Deliverables

- Agenda and meeting materials in advance of the workshops.
- Draft meeting notes from the workshops, distributed to attendees for comment, and included in the 20% design report and submitted to BES.

Task 1.2.18 Quality Management – 20% Design

As part of each the 20% design phase, the Consultant will implement the QMP developed in Task 1.1.2 Quality Management Planning. The Consultant will ensure QA activities are conducted throughout this design phase and Consultant will manage multidiscipline internal QC review activities with the senior review team throughout this design phase. Formal QC reviews by the Consulting team will be performed before BES review of the deliverables.

Audits by QA personnel will be conducted to verify conformance with project-specific design standards, BES checklists, and the approved QMP. The Consultant will confirm that required checking and review functions are completed, culminating in either approval or an NCR. The QA audits follow checklists based on project procedures applicable to the area being audited. Quality review documentation will demonstrate that the quality review process is complete and review comments are acceptably addressed as a component of the overall records management system.

Separate from the main package (20% design), the Consultant team will also provide Quality Management services for the Non-Process Schematic Design package, providing senior quality reviews from outside the core non-process design team.

Assumptions

- BES will consolidate the BES staff review comments into one comprehensive package before submitting review comments to the Consultant. Comments will be compiled using the Heron (e-Builder) platform.
- For major deliverables, Consultant will provide 15 printed copies and one electronic copy in PDF format, and BES will submit review comments within the period allocated in the project schedule (typically 4 weeks following BES receipt of the review submittal).
- For smaller TMs and meeting notes, Consultant will provide one electronic copy in PDF format, and BES will submit review comments within 14 days following BES receipt of the deliverable.
- Consultant's responses to BES consolidated review comments will be returned to BES for their records.

Deliverables

- QRFs used during internal quality reviews.
- Responses to DRFs used by BES to document quality review comments.
- Project checklists or milestone checklists, signed by the reviewer and the appropriate project staff.
- Copies of quality review markups or comments not included on the QRFs or DRFs.
- Review-related correspondence with BES staff and other external agencies or entities.
- QMP-related documents for subcontracted work.
- Audit correspondence, including results and corrective action documentation.

Task 1.2.19 Project Management – 20% Design Phase

Perform the following activities for the duration of the 20% design phase:

- Before commencing the 20% design phase, prepare for and conduct a “refresher” kickoff/chartering meeting for Consultant team members, including subconsultants.
- Maintain and update the final work plan for the project that combines staffing commitments and budgets with the deliverables and schedule for the project. Specific responsibilities of each member of the final design project team will be maintained. Update the overall design schedule each month. and review with the BES Program Manager, as needed.
- Supervise and control activities of staff assigned to the project. Coordinate and schedule appropriate project staffing discussions and assignments to meet project requirements and commensurate with project Risk Register. Arrange for the scheduled project workshops, review meetings, and project team meetings. Coordinate the participation of senior staff at appropriate points in the project.
- Coordinate with other projects and BES staff to complete work on schedule and within budget.
- Prepare monthly progress reports and submit with the monthly invoice. The reports will include a status summary of current project tasks, activities completed in the last month, activities planned for the next month, a project action issues checklist, performance compared to budget, and identification of items of concern. Organize monthly invoice and budget status report by WBS element, including a Monthly Subconsultant Payment and Utilization Report by the 15th of each month (reference Part II, Section C.5 of the RFP). Include budget reports based on using an “S” curve that shows budgeted work complete, billings to date, and estimate at completion.
- Monitor project activities for potential changes. Should change occur, and with BES approval, modify project tasks, task budgets, and approach. Inform BES if any changes will impact the cost of engineering services, the construction cost, or the schedule.
- Consultant Project Manager and Design Manager will participate in weekly conference calls with BES Program Manager. Review the project status and discuss activities and needed actions. Prepare and discuss the 3-week look-ahead schedule.
- Submit change management forms, as needed to document scope/schedule/budget changes. Update the change log and review proposed changes and scope modifications with the BES Program Manager at the bi-weekly project management meetings.
- Support and attend (as requested) project briefings by BES project management team to upper management, City Council, etc.
- Maintain project records, manage and process project communications, and coordinate project administrative matters, utilizing the established Portland document management tool (Heron/e-Builder).
- The Program Support Consultant will update BES project standards and guidelines during the design phase. Consultant team will interface with BES and Program Support Consultant to provide input into development of new BES guidelines (led by BES and Program Support Consultant).
- The Program Support Consultant will update and maintain the Risk Register during the design phase. Consultant will participate in regular meetings with CM/GC, Program Support Consultant, and BES to provide input. Program Support Consultant will lead and document meetings.

Assumptions

- Overall design schedule of 8 months.
- Monthly invoices and major project submittals will be submitted through Heron/e-Builder.

Meetings

- One and a half hours every week to meet with BES project management.
- Monthly Risk Register Meetings. Assume three Consultant staff members participate.

Deliverables

- Updates to Program Workplan at completion of 20% design.
- Monthly project invoices and status reports.
- Completed change management forms, as needed, to document impacts of potential changes on engineering fee, construction cost, or schedule.
- Input and updates for incorporation into Risk Register.

Task 1.3 Value Engineering

BES and BES's Program Support Consultant will conduct a VE review of the Basis of Design Report. The VE review will include the following subtasks. BES's Program Support Consultant (or designated representative) will lead and facilitate the VE proceedings as described herein.

Task 1.3.1 Value Engineering Workshop

Participate in a 5-day VE workshop.

- Orient the VE team, separately contracted by BES, to the Basis of Design Report. Prepare and provide a brief project presentation, including identification of alternatives, screening and refining alternatives, detailed development of a short list of alternatives, and presentation of findings/recommendations. Assume the initial session is 1 day, including a field visit, and will be attended by four Consultant staff, including the Project Manager.
- Attend the remaining 3 days of the core VE workshop to be available to provide information and answer specific questions. Assume the VE meetings will be attended by two Consultant staff, including the Project Manager. Other staff will be available remotely for consultation throughout the workshop.
- On the final day, meet with the VE team after their workshop to receive a briefing on VE recommendations. Assume this session is 1 half-day and will be attended by four Consultant staff, including the Project Manager.

Deliverables

- Draft and final PowerPoint presentation for VE Team Kickoff.

Task 1.3.2 Design Response to Value Engineering

- Review and recommend alternatives that BES should consider for adoption and prepare a draft TM evaluating and recommending adoption of elements of the VE team's findings for BES review and action. Indicate which ideas are accepted, accepted with modification, or rejected. In cases where VE proposals are rejected, provide the reason for rejection.
- BES will review the draft memorandum and provide direction as to the final disposition of VE recommendations. These recommendations and associated cost savings will be documented in a final TM and utilized as the basis for incorporation into subsequent design activities.

Deliverables

- Draft and final Design Response TM.

Task 1.4 30% Design Submittal

The purpose of the 30% design phase is the selection of key project and design features over which cost estimates and risks are developed with enough confidence to proceed within the approved budget and schedule, or allowing to implement change management measures. The general approach for this task is to use the data, guidelines, and concepts developed in the Basis of Design Report, incorporate VE recommendations, develop and evaluate alternative design concepts, and identify a single design concept for detailed design development. The end products from this task will include preliminary drawings which will provide sufficient information for BES and CM/GC review and design team coordination and review.

Consultant will conduct and facilitate workshops during this phase to present project updates and solicit focused BES input to inform the development of project deliverables before the conclusion of this task.

The 30% design will be sufficient to use as the basis for beginning design development, and will provide the information needed for BES and CM/GC to make decisions related to confirming the limits of the project scope and associated risks.

Specific work activities and deliverables from this task are as identified below.

Deliverables

- Fifteen printed copies and electronic copy in native and PDF format of Predesign Report and 11 x 17 preliminary design drawings, including the following:
  - TMs for each unit process and discipline task listed in the scope below.
  - Renderings from 3D model.
  - P&IDs.
  - Preliminary Table of Contents for the Technical Specifications.
  - Preliminary equipment list that allows basic verification of equipment name and loop number, equipment size, equipment power requirements, and acceptable manufacturers.
  - Updates to the overall Design Schedule (based on the CM/GC's preliminary construction schedule).
  - Construction cost estimate in sufficient detail to provide the expected range of accuracy of an AACE International Class 3 estimate: -20% to +30%.

Task 1.4.1 30% Design

Develop the Recommended Project (as defined by the 20% Design and the Value Engineering tasks) with additional detail specific to the following disciplines.

Deliverables for Task 1.4.1

- Individual discipline fact sheets.
- Drawings and/or graphics to support the 30% design fact sheets

Task 1.4.1.1. Architectural for Process Facilities

Schematic design work for process facilities architectural will include the following activities:

- Following the 20% design evaluations, perform a code review of existing facilities (solids handling and Silver Tunnel) that require retrofit/rehabilitation to identify areas where the facilities do not meet current seismic codes and occupancy requirements. Determine requirements to bring existing facilities into compliance with current codes and standards, where necessary. Because the

requirements for this work are unknown at this time, the scope does not include design for bringing facilities into compliance with code.

- Establish preliminary room sizes and egress requirements. Develop architectural theme for exterior of buildings. Select interior and exterior construction materials for each building. Select roof type, slope, and roof support system for each building, along with maintenance access requirements and features.
- Assign code classification to each building. Meet with local code official and/or authority having jurisdiction to review code classifications and discuss any waivers, if applicable.
- Compile list of chemicals and amounts to be used. Coordinate with other disciplines (mechanical and electrical) to resolve code compliance issues specific to these disciplines (e.g., National Electrical Code and NFPA 820 issues).
- Coordinate with other disciplines to prepare preliminary building layouts (including plans, sections, and elevations). Develop alternative layouts if required.
- Review concepts and draft work products with and seek approval from QC reviewer.
- Develop life safety/egress plans for each building.
- Develop LEED and green building requirements scorecard and criteria for this phase. Incorporate decisions regarding specific LEED points criteria. Coordinate with other disciplines to incorporate requirements into the design.

Task 1.4.1.2. HVAC/Plumbing

Schematic design for HVAC and plumbing will include the following:

- For each building, select type of ventilation system to be used in process buildings (inlet air tempered with both inlet and outlet fans, simple exhaust fan system, etc.).
- Select type of heating system to be used (hot water boiler, hot air furnace, space heaters). Identify fuel (gas, oil, or other fuel) for heating buildings and identify local fuel storage requirements.
- Select type of air conditioning system to be used in personnel spaces (variable air volume system, zoned constant air volume system).
- Coordinate with the architectural discipline to establish design R-values for all exterior walls.
- Perform a ventilation code review of the existing facilities that require retrofit/rehabilitation to identify areas where the facilities do not meet current codes. Develop a plan to bring existing facilities into code compliance where necessary. The scope is based on evaluating the Silver Tunnel and the solids building.
- Coordinate with local fire marshal and architect to determine requirements for sprinklers and fire protection. Assume that combustible gas monitoring and fire/smoke alarms in non-occupied areas can be monitored through the plant PLC panels and supervisory control and data acquisition (SCADA) system.

Task 1.4.1.3. Civil and Site Development

Schematic design work will include the following activities:

- Confirm adequacy of topographical and boundary mapping. Evaluate legal, ownership, permitting and zoning constraints. Identify environmentally sensitive areas such as wetlands, floodplains, known hazardous waste areas, etc.

- Develop alternative plant site layouts as required. This will include activities such as: (1) determine structure size, location, and orientation; (2) layout roadways/truck access corridors and define maneuvering requirements (design vehicle); (3) size and locate parking lots for employees and visitors to the facility; (4) determine emergency vehicle access requirements; (5) evaluate floodplain impacts and constraints; (6) locate stormwater management facilities; (7) locate utility and piping corridors (horizontal and vertical); (8) determine dewatering needs and location of facilities; and (9) locate possible construction staging area and equipment/contractor access ways.
- Coordinate with surveyors; define surveyors' scope of work; coordinate with geotechnical engineer on boring locations; and record boring locations onsite drawings.
- Develop preliminary erosion control plan for project. Determine if erosion control ponds are required; locate ponds on site plan drawings as required. Prepare preliminary stormwater calculations suitable for submission to local site permitting authorities. Develop preliminary stormwater control concepts (swales, curb, and gutter). Meet with local stormwater and erosion and sediment control agency to determine permitting requirements for site plans, and impact of requirements on preparation of Contract Documents. Document findings.
- Set preliminary finished floor levels for new structures. Establish preliminary finished grades, overall major surfaces, road profiles, etc. Iterate preliminary surfaces and structures to optimize earthwork if necessary.
- Provide Handling and Disposal Plan if contaminated media are encountered. Assume that contaminated soils will be encountered and a Handling and Disposal Plan will be required.
- Determine dewatering needs.
- Establish preliminary finished grades; overall major surfaces, road profiles, etc. Iterate preliminary surfaces and structures to optimize earthwork if necessary.
- Work with the geotechnical team to develop excavation profiles for the areas of major earthwork. Assume three profiles will be developed through the new secondary clarifier site and two additional profiles will be developed through the site of the new dewatering/loadout building.

Task 1.4.1.4. Electrical

Schematic design work for ancillary electrical (electrical associated with new or upgraded process facilities) will include the following. Note that Major Electrical Equipment Relocation is covered in a separate task below.

- Prepare one-line diagrams for proposed facilities.
- Prepare preliminary load calculations.
- Document MCC standards.
- Provide SKM model update.
- Document flood recovery approach.
- Develop a construction phasing description for medium voltage systems.
- Document the power loss approach for the centrifuge option.
- Determine requirements for standby power.
- Identify electrical room space requirements.

- Determine redundancy requirements for power supplies and power distribution.
- Establish preferred voltages for power distribution and utilization equipment.
- Perform an electrical code review of existing facilities that require retrofit/rehabilitation to identify areas where the facilities do not meet current codes. Develop a plan to bring existing facilities into code compliance where necessary.
- Coordinate with other disciplines (for example, architectural and mechanical) to resolve code compliance issues specific to these disciplines. Develop preliminary schedule of hazardous and corrosive locations.
- Develop area classification table.
- Develop construction sequence for electrical work.

Assumptions

- The existing electrical service to the site does not require upgrades.

Task 1.4.1.5. Instrumentation and Control Systems

Schematic design work for the I&C will include the following activities:

- Using the preliminary instrument and equipment lists and the preliminary process flow diagrams, coordinate with the process engineers to refine preliminary P&IDs for each treatment process. Information to be included on each P&ID includes at a minimum: process configuration, flow streams, valve and gate locations (manual and powered), instruments, chemical additions points/types, process equipment location/type including packaged control panels and adjustable-speed drives, flow meters, and other process control or monitoring devices.
- Finalize equipment/instrument tag numbering, naming, and abbreviation conventions.
- Review existing plant equipment/instrument tag numbering, naming, and abbreviation conventions.
- Work with Process Engineer to prepare written operational description of each major process.
- Review and revise current overall control philosophy including local control approach, level of automation, and supervisory control.
- Develop overall control philosophy including local control approach, control system, level of automation, and supervisory control.
- Update control system network diagram.
- Identify fiber optic/site-wide control system requirements.

Task 1.4.1.6. Secondary Process

Schematic design for process will include the following:

- Use hydraulic simulation model to advance hydraulic design (size pumps, pipes, etc.).
- Use process model to select design criteria for major equipment.
- Select electrical equipment features and approach including automation.
- Evaluate equipment (for example, clarifier and pumps). Visit site to support equipment selections. Assume design team members accompany BES on up to five separate site visits.
- Effluent flow measurement and integration.

- Determine size/capacity of all unit treatment processes and ancillary systems.
- Review capacity of all existing processes and equipment to remain in service where appropriate. Assign capacity to existing processes.
- Prepare process flow diagrams.
- Prepare solids balance to be carried into final design.
- Develop process narratives.

Task 1.4.1.7. Solids Processing

Schematic design for process will include the following:

- Equipment evaluations (thickening, dewatering, cake conveyance and loadout, polymer storage, makeup and feed).
- Solids digestion evaluation as it impacts thickening and dewatering operations.
- Integrate findings from pilot testing into equipment sizing, design criteria, number of units, layouts.
- Support preliminary building layouts development including evaluation of two alternatives for sludge thickening and dewatering, chemical feed/loadout, and solids loadout.
- Develop ventilation and odor control concepts based on building layouts.
- Identify major yard piping, and yard electrical requirements to support facility layouts.
- Support planning for site visits to operating facilities (thickening, dewatering, cake conveyance, storage and loadout, and polymer).
- Use process model to select design criteria for major equipment and storage tankage.
- Determine size/capacity of all unit treatment processes and ancillary systems (polymer, thickening feed, filtrate/centrate conveyance, and dewatering feed).
- Advance requirements for location and layout for a new operator control room. A new small operator control room with sound attenuation and separate from odorous area, adjacent to the dewatering area will be considered in addition to the operator control room serving the entire building, depending on layout requirements.
- Review capacity of all existing processes and equipment to remain in service where appropriate. Assign capacity to existing processes.
- Prepare process flow diagrams and preliminary P&IDs for all major unit processes.
- Prepare solids balance to be carried into final design.
- Develop process narratives.

Task 1.4.1.8. Process Mechanical

Schematic design for mechanical will include the following:

- Select and size all major process equipment including pumps. Prepare sizing calculations and obtain review. Establish level of redundancy required for all process equipment.
- Prepare equipment list with sizing for major equipment. Coordinate with BES on preferences of equipment manufacturer and processes.
- Determine valve types and actuator types for each service.

- Determine pipe materials and develop preliminary pipe schedule.
- Determine approach for tie-ins of major yard piping with existing piping/facilities.
- Prepare preliminary drawings for equipment arrangements.
- Prepare preliminary hydraulic profile.
- Review capacity and condition of existing equipment to remain in service where appropriate. Review capacity requirements for existing equipment, as needed for the secondary and solids processes.
- Determine capacity requirements for ancillary facilities and utilities and determine whether adequate capacities are available for systems such as plant water and instrument air.
- Determine flow measurement and sampling requirements.
- Develop process control narratives in coordination with I&C.
- Determine pipe flexibility and seismic resiliency requirements.
- Evaluate optimum pipe routing onsite and in the gallery.
- Corrosion control engineer will develop recommendations for the project based on site and facility characteristics, including material selection.

Task 1.4.1.9. Structural

Schematic design for structural will include the following activities.

- Coordinate with architectural discipline on the selection of building concepts. Consult with lead process engineer on building/structure layouts.
- If solids building requires upgrade or modifications, conduct a feasibility study to make sure the proposed modifications can be realistically cost estimated for selection.
- Evaluate any structural problems associated with any existing plant facilities to be modified in this project. Describe the problems and recommended solutions.
- Develop building foundation and structure concepts based on schematic building layouts.
- Determine design approach for addressing groundwater conditions.

Task 1.4.1.10. Geotechnical

Schematic design for geotechnical will include the following:

- Determine site-specific geotechnical conditions for each facility and structure. Develop specific foundation requirements.
- Meet with CM/GC to discuss and evaluate alternatives for ground improvement and seismic mitigation. Include specialty ground improvements subcontractor or technical committee, if possible.
- Develop proposed approach for ground improvements.
- Determine requirements for addressing groundwater during construction and after facilities are in service.
- Verify constructability (shoring and bracing requirements, dewatering issues).

Deliverables

- In addition to the Geotechnical Fact Sheet, provide a draft geotechnical design report documenting geotechnical analyses and providing preliminary geotechnical design and construction recommendations.

Task 1.4.1.11. Fire Protection

Schematic design for fire protection will include the following:

- Define the level of design for fire protection systems that will be included in the final drawings—detailed drawings or performance specification.
- The fire protection scope is based on expanding the system to address only new facilities. The existing fire protection system and main site fire connection are expected to be sufficient for this expansion.
- Determine site-specific fire protection requirements conditions for each facility and structure.

Task 1.4.1.12. Landscape Architecture

Schematic design work for landscape architecture of process and non-process facilities will include the following activities:

- Coordinate with other disciplines to prepare preliminary design and layout of pedestrian circulation routes and exterior hardscape spaces, including the relocation of the plant egress/ingress to the public trail and Columbia Slough bridge crossing. Develop alternative layouts if required and define hardscape material options.
- Attend workshops that will focus on site-related development relevant to the landscape design.
- Identify site furnishing options, to include site lighting fixtures, benches, bike racks and other site amenities.
- Coordinate location and design of vegetated stormwater management facilities with other disciplines.
- Develop preliminary planting plan for project, including new non-process and process facilities. Work to include development of landscape typologies and specific potential plant species and materials to be used in different landscape types. Will include coordination with BES facilities maintenance staff.
- Develop preliminary irrigation plan for the project, defining areas to be irrigated, water sources, type of proposed equipment. Includes coordination with other disciplines and with BES facilities maintenance staff.
- Coordinate with architect for design of eco-roofs.
- Provide review of grading concept design and input to civil.
- Coordinate landscape design activities with other disciplines.
- Provide graphic illustrations of site and landscape improvements for public involvement meetings and website.

Assumptions

- Design includes landscape areas around new non-process and process facilities.
- Lighting and electrical design is provided by others.

- Eco-roofs are included in project.

Task 1.4.2 Risk Mitigation activities

This subtask is scoped as an allowance and utilized to pursue mitigation related to engineering effort that is identified to reduce overall risk of project implementation but not clearly defined at the onset of design activities. Examples include field investigations and analysis beyond those assumed in Task 1.2.3 Define Existing Conditions, and calculations necessary to increase design confidence in order to reduce design conservatism. While the bulk of this subtask is expected to be expended during the 30% design phase, this task could extend into subsequent design phases.

Assumptions

- The extent of the Consultant's involvement will be limited to the budget available. Additional funding would need to be authorized via Task 1.5 Owner's Contingency – Preliminary Design Phase.

Task 1.4.3 Project Cost and Construction Schedule

- Maintenance of plant operations description, building on the description in the 20% design. Identify key operational constraints for the recommended project.
- Update construction sequence and operation during construction.
- Support CM/GC's update of the preliminary construction schedule.
- Provide construction cost estimate in sufficient detail to provide the expected accuracy range of an AACE International Class 3 estimate: -20% to +30%.

Deliverables

- Updated Program Implementation Plan TM.
- Updated design schedule.
- Construction cost estimate. Cost estimate will be provided with a database of most modeled content, including size, material, flowstream, volume of concrete, and other major components.

Task 1.4.4 Technical Workshops – 30% Design

During this phase, workshops with BES staff will be held to review the development of technical evaluations, alternatives, and review of work products. Workshop materials will be developed based on the technical work being conducted, and presented to BES in workshops. Workshops will include, but not be limited to, the following:

- Secondary process system configuration equipment.
- Solids dewatering and dewatered sludge conveying and loadout equipment.
- Solids thickening equipment alternatives.
- Electrical system equipment alternatives.

Non-process building workshops are included under the non-process facilities design effort, which will progress on a separate, accelerated track.

Assumptions

- For the 30% design phase, assume a total of eight technical workshops, each 2 to 3 hours long, with BES's personnel to review the progress of the work, make decisions, and provide direction.

- In addition to the technical workshops described above, the design team will conduct three half-day workshops at the end of 30% design to review work products associated with that phase of the work.
- One additional workshop (2 to 3 hours long) will be conducted to review P&IDs for the 30% design phase.
- Assumes 4 hours of workshop labor plus 2 hours of preparation for each workshop, four consulting team members per workshop, and 2 hours of meeting notes by junior staff.
- Workshops for the non-process facilities are scoped separately, under the Non-Process Design task below.

Deliverables

- Agenda and meeting materials in advance of the workshops.
- Draft meeting notes from the workshops, distributed to attendees for comment, and included in the 30% design report and submitted to BES.

Task 1.4.5 Quality Management – 30% Design

As part of the 30% design phase, the Consultant will implement the QMP developed in the task above. The Consultant will ensure QA activities are conducted throughout this design phase and Consultant will manage multidiscipline internal QC review activities with the senior review team throughout this design phase. Formal QC reviews by the Consulting team will be performed before BES review of the deliverables.

Audits by QA personnel will be conducted to verify conformance with project-specific design standards, BES checklists, and the approved QMP. The Consultant will confirm that required checking and review functions are completed, culminating in either approval or an NCR. The QA audits follow checklists based on project procedures applicable to the area being audited. Quality review documentation will demonstrate that the quality review process is complete and review comments are acceptably addressed as a component of the overall records management system.

Assumptions

- BES will consolidate the BES staff review comments into one comprehensive package before submitting review comments to the Consultant.
- For major deliverables, Consultant will provide 15 printed copies and one electronic copy in PDF format, and BES will submit review comments within the period allocated in the project schedule (typically 4 weeks following BES receipt of the review submittal).
- For smaller TMs and meeting notes, Consultant will provide one electronic copy in PDF format, and BES will submit review comments within 14 days following BES receipt of the deliverable.
- Consultant's responses to BES consolidated review comments will be returned to BES for their records.

Deliverables

- QRFs used during internal quality reviews.
- Responses to DRFs used by BES to document quality review comments.
- Project checklists or milestone checklists, signed by the reviewer and the appropriate project staff.
- Copies of quality review markups or comments not included on the QRFs or DRFs.
- Review-related correspondence with BES staff and other external agencies or entities.

- QMP-related documents for subcontracted work.
- Audit correspondence, including results and corrective action documentation.

Task 1.4.6 Project Management – 30% Design

Perform the following activities for the duration of the 30% design phase:

- Before commencing the 30% design phase, prepare for and conduct a "refresher" Kickoff/Chartering Meeting for Consultant team members, including subconsultants.
- Maintain and update the final work plan for the project that combines staffing commitments and budgets with the deliverables and schedule for the project. Specific responsibilities of each member of the final design project team will be maintained. Update the overall design schedule each month. and review with the BES Program Manager, as needed.
- Supervise and control activities of staff assigned to the project. Coordinate and schedule appropriate project staffing discussions to meet project requirements. Arrange for the scheduled project workshops, review meetings, and project team meetings. Coordinate the participation of senior staff at appropriate points in the project.
- Coordinate with other Projects and BES staff to complete work on schedule and within budget.
- Prepare monthly progress reports and submit with the monthly invoice. The reports will include a status summary of current project tasks, activities completed in the last month, activities planned for the next month, a project action issues checklist, performance compared to budget, and identification of items of concern. Organize monthly invoice and budget status report by WBS element, including a Monthly Subconsultant Payment and Utilization Report by the 15th of each month (reference Part II, Section C.5 of the RFP). Include budget reports based on using an "S" curve that shows budgeted work complete, billings to date, and estimate at completion.
- Monitor project activities for potential changes. Should change occur, and with BES approval, modify project tasks, task budgets, and approach. Inform BES if any changes will impact the cost of engineering services, the construction cost, or the schedule.
- Participate in weekly conference calls with BES project manager (project manager and design manager). Review the project status and discuss activities and needed actions. Prepare and discuss the 3-week look-ahead schedule.
- Submit change management forms, as needed to document scope/schedule/budget changes. Update the change log and review proposed changes and scope modifications with the BES Program Manager at the bi-weekly project management meetings.
- Support and attend (as requested) project briefings by BES project management team to upper management, City Council, etc.
- Maintain project records, manage and process project communications, and coordinate project administrative matters, utilizing the established Portland document management tool (Heron/e-Builder).
- The Program Support Consultant will update and maintain the Risk Register during the design phase. Consultant will participate in regular meetings with CM/GC, Program Support Consultant, and BES to provide input. Program Support Consultant will lead and document meetings.

Assumptions

- Assume 5 months for this task (including cost optimization).
- Monthly invoices and major project submittals will be submitted through Heron/e-Builder.

Meetings

- One and a half hours every week to meet with BES project management.
- Monthly Risk Register Meetings. Assume three Consultant staff members participate.

Deliverables

- Updates to Program Workplan at completion of 20% design.
- Monthly project invoices and status reports.
- Completed change management forms, as needed, to document impacts of potential changes on engineering fee, construction cost, or schedule.

Task 1.4.7 Condition Assessment

Task 1.4.7.1. Develop Approach

Identify approach for development of a condition assessment and risk analysis process for BES's wastewater assets. Major activities include the following:

- With the 30% design complete, identify the existing facilities that are critical to long-term operation of the selected solution.
- While collaborating with BES's asset management lead and existing asset management program, review existing approach to asset management including templates used for assessing asset condition.
- Define the approach and scope for implementing a condition assessment. Determine if detailed assessments are required for mechanical systems.

Task 1.4.7.2. Field Work

Complete a unit process level condition assessment of the secondary process and solids handling facilities, again targeting facilities and equipment that are expected to be re-used to support the recommended solution coming out of the 30% design. Major activities include the following:

- Identify the physical condition of the wastewater system's vertical assets to: (1) estimate the likelihood of asset failure, which considered along with consequence of asset failure, will determine the relative risk of asset failure, and (2) forecast the remaining useful life of vertical assets to guide the capital investment profile over the next 30 years. This analysis will result in the development of a criticality analysis for the system assets.
- Complete an initial risk assessment on the secondary processes and the solids processing. The initial risk assessment will be completed during a workshop and review of available information. A detailed condition assessment will be completed for listed assets within the two selected structures. The condition assessments will be completed in coordination with BES's current asset management lead and to support the ongoing asset management activities.
- Evaluate the apparent condition of the selected vertical assets using direct observation methods. If needed/recommended, vibration, infrared analyses, and ultrasonography will be employed to gauge the condition of the asset (performed by others). No tear-downs, invasive, or destructive testing will be performed. The international convention for grading the physical condition of assets (1-Very Good through 5-Poor) will be used for reporting asset condition. Digital photographs will be taken of the assets having a condition grade of 4 or 5.

Assumptions

- BES Responsibilities:
  - One BES mechanic will be made available during field work to allow transition of the program to BES's staff.
  - One BES electrician will participate during field operations to assist in completing those tasks that require a qualified electrician, such as opening cabinets.
  - Before performing the condition assessment, detailed condition assessment criteria will be discussed with BES staff and agreed-to modifications will be made. Additionally, to facilitate the condition assessment, BES will turn equipment on and off. In order to maintain safe working conditions, BES staff must accompany the condition assessment team(s).
- Detailed assessments include ultrasound, infrared photography, vibration analysis, etc. and are outside the scope of this base work. Assume the actual testing/analysis work will be conducted only if authorized by BES and funded under the Owner's Contingency, if required.
- The extent of the Consultant's involvement will be limited to the budget available.
- Structural condition assessment of the aeration basins is already completed based on the existing BergerABAM report, as described in the initial condition assessment task (above). No additional assessment work is contemplated as part of this Task 1.4.7.

Deliverables

- Draft and final Facility Risk Analysis Overview TM.
- Draft and final Wastewater Treatment Facilities Condition Assessment TM. Provide five printed copies and electronic copy in PDF format.
- Detailed Condition Assessment (two structures) Field Report.
- Agenda and meeting materials in advance of the Initial Risk Assessment workshop.

Task 1.4.8 Cost Optimization Task

Using the 30% design cost estimate and the feedback from the CM/GC, conduct a detailed scope allocation/validation/prioritization to define the scope of the final design work (and the scope of the program). Identify scope items that can be deferred, scope items that could be contracted outside the core program, and scope items that could be advanced as bid alternates. The goal of this exercise is to develop a project that meets the program budget (defined as $100,000,000 of construction cost based on 2017 planning estimates).

Assumptions

- Assume that this process requires approximately 6 weeks.
- Assume cost estimating teams from both the CM/GC and the design team are involved with developing costs for the deleted scope items.
- BES acceptance of the recommendations will be required before NTP on the remainder of design can be issued.

Deliverables

- Draft and final TM, including a cost optimization log that identifies cost reduction items to meet BES objectives and budget.

Task 1.4.9 Optional Task: Update Basis of Design Report

Update the Basis of Design Report, incorporating changes, review comments, and CM/GC input. This subtask includes updates to the Design Criteria and the Executive Summary to reflect the Basis of Design at the end of 30% design, resulting in a draft report for BES review.

Prepare final report, incorporating BES comments.

Assumptions

- Assume that TMs and drawings produced during the 30% design effort are appended to the updated Basis of Design Report, but that only the Design Criteria and Executive Summary are updated (from what was delivered at the end of 20% design).
- If authorized, the extent of the Consultant's involvement will be limited to the budget available.

Deliverables

- Draft and final Basis of Design Report (15 printed copies and one electronic copy in PDF format).

Task 1.4.10 Optional Task: Prepare information for Energy Trust Application

Provide support to BES in the development and compilation of information needed for Energy Trust funding. Work with the Energy Trust to define the project elements that have the most likelihood of funding. Support the preparation of engineering materials as well as the applications.

Assumptions

- If authorized, the extent of the Consultant's involvement will be limited to the budget available.
- Deliverables would be defined as part of the budget authorization process.

Task 1.4.11 Operations and Maintenance Support

Provide operations and maintenance (O&M) liaison support to the BES Ops and Maintenance staff throughout design, meeting with them to understand their issues and preferences, to then be in a position to "stand in" for the plant staff during design meetings and reviews. Support staff will also relay design team O&M issues to BES staff, sitting in on lunch meetings or breaks with BES staff and explaining design progress, decisions that need to be made, helping facilitate the review of TMs or Contract Documents, etc.

Assumptions

- If authorized, the extent of the Consultant's involvement will be limited to the budget available.
- Level of effort and budget is allocated to individual design and technical workshop tasks.

Task 1.5 Owner's Contingency – Preliminary Design Phase

This task provides an Owner's Contingency for the Preliminary Design Phase equal to 10% of the sum of all other subtask amounts. The Owner's Contingency will be managed by BES's Program Manager within the overall contract not-to-exceed amount. The intent of the Owner's Contingency is to provide budget for tasks for professional services that:

- Are required to complete the project as described herein.
- Result from decisions made by permitting agencies or other parties that influence the scope of professional services required to ensure project completion.
- Are needed to increase task budgets where the assumptions made to create the budget are violated and the violation is beyond the control of the Consultant.

Written authorization from BES's Program Manager is required to reallocate budget from this Preliminary Design Owner's Contingency Task to an existing task or a new subtask that is within the overall scope of the project but not clearly defined as within the scope of Task 1 Preliminary Design.

Task 2 Detailed Design Phase Services

Task 2.1 Non-Process Facilities – Design

The Non-Process Facilities Design work builds on the Non-Process Schematic Design (Task 1.2.12). The Non-Process Facilities Design will progress on a fast-track schedule, separate from the design of the process facilities. As a result, the drawings, standard details, and specifications for the non-process facilities will not necessarily be consistent nor standardized with the process design elements.

This scope and budget assumes designing three buildings totaling 30,000 square feet and a covered storage area. The proposed buildings on the East Pad will be designed for maintenance, storage, and administration, including common areas such as lunch rooms, meeting rooms and locker/shower rooms. One of the buildings is anticipated to be a two-story building. Design of additional spaces beyond 30,000 square feet, if chosen by BES, is included in Task 2.1.3 described below.

Task 2.1.1 Design Development (60% Design)

Design development activities for 60% design are as follows:

- Incorporate VE comments
- Attend and facilitate regular design team meetings to refine work scope, budget, and schedule, including producing and publishing meeting minutes.
- Attend and facilitate regular stakeholder design workshops to identify specific design needs, develop the design, and refine the budget and schedule. Design workshops will be focused on a specific aspect of project design or a system. The preliminary workshop schedule includes eight workshops addressing the following topics, plus a final review 60% design workshop:
  - Equipment.
  - Casework.
  - Plumbing fixtures.
  - Lighting and electrical power.
  - Door hardware and security.
  - Finishes.
  - Site/civil/landscaping, and stormwater management.
  - Green Building Policy features.
- Develop interior finish schemes and exterior color schemes for review, refinement, and approval.
- Develop site/civil/landscaping, and stormwater management design.
- Develop Green Building Policy features.
- Determine, integrate, and track sustainability measures pertaining to LEED-GOLD certification as required to define, develop, and incorporate determined LEED-GOLD items into the design development documents.

- Provide early decision and design phase energy modeling per American Society of Heating, Refrigeration, and Air-Conditioning Engineers 90.1 Analysis.
- Produce 60% design drawings and specifications, including all building systems (mechanical, structural, fire protection, security, landscaping, stormwater, building mechanical including fire protection, civil, landscaping, electrical, etc.).
- Conduct QA activities in accordance with the project-wide QMP.
- Produce a refined 3D rendered view of the project for communicating the current design to stakeholders and others.
- Support development of a construction cost estimate and review prepared cost estimate.
- Provide 60% design package to BES.

Assumptions

- Building sprinkler system drawings and specifications are provided as part of design, with detailed design required of system provider.
- Initial planning concepts for non-process facilities developed by others.
- Structures will be designed to be consistent with the seismic resiliency goals identified by BES's resiliency plan.
- CM/GC will develop overall project schedule, construction cost budget, and provide constructability reviews.
- Green roofs are required on non-process facilities. Solar panels will be considered.

Meetings

- Eight workshops will be facilitated to address each of these design topics plus a final review workshop.
- Regular design team meetings will be held for coordinating the design between trades and completing the documents.
- Constructability review meeting with CM/GC.

Deliverables

- Agenda and meeting materials in advance of the workshops.
- Draft and Final Design Development Reports (15 printed copies and one electronic copy in PDF format), including:
  - Space uses, volumes, and configuration confirmation.
  - Basis of design for architectural concepts and key features, including seismic resiliency, security, and fire protection.
  - TM of comments in response to construction cost estimate.
  - Meeting minutes of all stakeholder meetings and workshops Consultant facilitates.
  - Green Building Policy Compliance Report.
  - Refined 3D rendered view of the project for communicating the current design to stakeholders and others.

- Drawings, including site plan, building plans, sections and elevations, equipment plans, finish plans and preliminary details, structural, mechanical, fire protection, plumbing and electrical systems plans, and stormwater management plan.
- Preliminary project specifications (3-part format).
- AACE International Class 3 cost estimates.

Task 2.1.2 Construction Documents

Activities of this task are as follows: Construction Documents

- Attend and facilitate regular design team meetings to refine work scope, budget, and schedule, including producing and publishing meeting minutes.
- Attend three meetings with BES (and CM/GC) to update progress and refine minor design issues.
- Sustainability certification:
  - Determine, integrate, and track sustainability measures pertaining to LEED-GOLD certification as required to define, develop, and incorporate determined LEED items into the Contract Documents.
  - Provide fundamental commissioning specifications per LEED-GOLD requirements of heating, cooling, water heating, and ventilation systems.
- Work with selected CM/GC to develop project phasing plans. Detailed move plans for relocating uses are not included.
- Develop specifications: Divisions 0 and 1 sections to be reviewed and refined with BES procurement staff.
- Provide progress CD set to Contractor for constructability review and cost estimate update.
- Support development of a construction cost estimate and review prepared cost estimate.
- Develop and coordinate drawings and specifications to produce construction documents suitable for building permits, subcontractor bidding, and final construction.
- Conduct QA activities in accordance with the project-wide QMP.

Assumptions

- CM/GC will lead and Consultant will participate in development of overall project schedule, construction cost budget, and constructability reviews.

Meetings

- Regular design team meetings will be held for coordinating the design between trades and completing the documents.
- Three meetings with BES (and CM/GC) will be attended to update progress and refine minor design issues.

Deliverables

- Updated Green Building Policy scorecard.
- Construction documents (drawings and specifications) suitable for subcontractor bidding (90% documents), and final construction (100% documents).
- Construction documents (drawings and specifications) suitable for building permit application (at 90% design). Review comments will be addressed in final construction documents (100%).
- Energy Code compliance forms (COMCHECK) for permit review.

Task 2.1.3 Optional Task – Additional Building Space

Due to other needs identified at the CBWTP and possible efficiency gains, additional building space that is beyond the base scope of work may be requested. If such situation arise, formal authorization will be provided to the Consultant with funding on a not-to-exceed amount provided from Task 2.6 Owner's Contingency – Detailed Design Phase. No budget is currently authorized.

Task 2.1.4 Quality Control – Non-Process Design

As part of each Non-Process Design deliverable, the Consultant team will implement the QMP. The core Non-Process Design team will ensure QA activities are conducted throughout this design phase and the prime Consultant will manage the multidiscipline internal QC review activities with the senior review team throughout each design phase. Formal QC reviews by the Consulting team will be performed before BES review of the deliverables.

Audits by the prime Consultant will be conducted to verify conformance with project specific design standards, BES checklists, and the approved QMP. The Consultant will confirm that required checking and review functions are completed, culminating in either approval or an NCR. The QA audits follow checklists based on project procedures applicable to the area being audited. Quality review documentation will demonstrate that the quality review process is complete and review comments are acceptably addressed as a component of the overall records management system.

Assumptions

- Through the use of Heron (e-Builder), BES will consolidate the BES staff review comments into one comprehensive package before submitting review comments to the Consultant.
- For major deliverables, Consultant will provide 15 printed copies and one electronic copy in PDF format, and BES will submit review comments within the period allocated in the project schedule (typically 4 weeks following BES receipt of the review submittal).
- For smaller TMs and meeting notes, Consultant will provide one electronic copy in PDF format, and BES will submit review comments within 14 days following BES receipt of the deliverable.
- Consultant's responses to BES consolidated review comments will be returned to BES for their records.

Deliverables

- QRFs used during internal quality reviews.
- Responses to DRFs used by BES to document quality review comments.
- Project checklists or milestone checklists, signed by the reviewer and the appropriate project staff.
- Copies of quality review markups or comments not included on the QRFs or DRFs.
- Review-related correspondence with BES staff and other external agencies or entities.
- QMP-related documents for subcontracted work.
- Audit correspondence, including results and corrective action documentation.

Task 2.1.5 Building Permit Support for Non-Process Facilities

Consultant will do the following:

- Issue permit documents through Portland BES for building permit application.
- Track permit process and respond to BDS issued check sheets. Make corrections to Drawings as required.

Task 2.2 Process Facilities – Design

It is anticipated that the project scope will be refined after completion of Task 2. The basis for Task 3 efforts is included in the attached sheet list. This sheet list serves as the assumed basis for the final design.

Task 2.2.1 60% Design Submittal

The purpose of this task is to utilize the conceptual decisions of the project that were made in the previous phase and to complete and finalize the preliminary calculations of the previous phase, and develop the project design to achieve a true "design freeze" at the conclusion of this phase. Structures, equipment, major plant piping, process, major electrical, and site plan are all finalized during this phase to allow final detailing of the same in the next phase of design. Drawings and other materials that may be required exhibits for permit applications will be available at the conclusion of this phase. The majority of the QC review and approval will occur before finalization of the work products from design development phase.

As noted above, Non-Process Facilities are proceeding on a separate fast-track schedule and are therefore excluded from the work described herein. Specific activities and work products from this phase are described in the following subtasks.

Assumptions

- BES will provide Division 0 and Division 1 specifications (standard specification sections are being developed by BES Program Support Consultant). Consultant would contribute to Division 1 specifications (Scope of Work, Startup and Testing, Environmental Conditions, etc.).
- Workshops for Process Facilities Design are scoped/budgeted under Task 2.2.1.5 Technical Workshops – 60% Design.
- Piping support approaches will be preliminary during this phase and will be developed for piping 30 inches in diameter and larger. Piping smaller than 30-inch diameter will be designed by the CM/GC based on specification requirements.
- Rebar requirements will be presented in schedule format.
- Standard details will be bound in a separate volume(s) 8-1/2 x 11 format.
- Tables and schedules bound will be bound with the specifications.
- Americans with Disabilities Act compliant features are not required in facilities other than the new non-process buildings.
- Additional control system features are not part of the current design scope, including:
  - Communications and paging systems.
  - Security systems.
  - Closed circuit television systems.
  - Cable TV systems.
  - On-line O&M manuals.
  - Preventive maintenance software.
  - Process management reporting.
  - Laboratory information systems.

  - Information technology needs such as local-area networks, wide-area networks, and intranets.

- Site work, including road repaving, is only included for areas within the area affected by new facilities. Assume site grading and piping profiles are not included.
- Corrosion control systems other than materials selection and coating are not required.
- Building sprinkler system drawings and detailed specifications are not required (use performance specification).
- Piping support system drawings and detailed specifications are not required for piping less than 30-inch diameter (use performance specifications).

Deliverables

- 60% 11 x 17 drawings (15 printed copies and one electronic copy in PDF format).
- 60% specifications and draft design details (8 1/2 x 11 format) (15 printed copies and one electronic copy in PDF format).
- Equipment list that includes equipment number, equipment size, equipment power requirements, and basic controls (15 printed copies and one electronic copy in PDF format).
- Operating strategies for all major unit processes anticipated on the project (15 printed copies and one electronic copy in PDF format).
- Instrument List and Loop/Index List (15 printed copies and one electronic copy in PDF format).
- Responses to 30% BES Design Review Comments.
- Construction Cost Estimate in sufficient detail to provide the expected accuracy range of an AACE International Class 2 cost estimate: -15% to +20%. Cost estimate will be provided with a database of most modeled content, including size, material, flowstream, volume of concrete, and other major components.

Task 2.2.1.1. 60% Design

Prepare 60% Design Documents, including the following:

Architectural

- Develop building 3D electronic models or floor plans and elevations for all buildings.
- Coordinate with I&C and electrical disciplines to size and locate electrical and control rooms.
- Coordinate with the mechanical discipline to select the type of HVAC equipment, locate HVAC equipment rooms, determine space requirements and routing for ductwork if required, and establish design R-values for all exterior walls.
- Coordinate with structural engineer to define the structural design concepts for the facilities.
- Establish applicable codes for all buildings/structures with local code officials and fire marshal. Complete building and fire code analysis. Meet with local code official to review floor plans.
- Prepare first draft of technical specifications.
- Review design development and draft work products with and seek approval from QC reviewer.

HVAC

- Prepare sizing calculations for HVAC equipment based on energy code requirements and selected building construction materials. Prepare HVAC equipment data sheets and cut sheets.
- Create ventilation concept drawing (louver locations, fan locations, type of equipment, air flows).

- Identify routing or right-of-way for major duct runs. Locate major air handling equipment. Confirm size of mechanical equipment rooms.
- Prepare HVAC system block diagrams. Define HVAC system control philosophy.
- Coordinate with civil engineer for potable water and fire water supply and distribution, as well as plant drain system.
- Prepare first draft of technical specifications.
- Review design development and draft work products with and seek approval from QC reviewer.

Civil and Site Development

- Prepare site plan package at the end of the design development phase (if required) and submit it to the local site permitting agency. *Timing and content of this submittal may vary and must be coordinated with the local agency throughout the design process.*
- Freeze civil design concept. Structures, road, and major site element horizontal locations are finalized. Structure floor/control levels, and finished grades are finalized.
- Define demolition requirements and limits. Define contractor staging, storage, access, and offsite access corridors.
- Prepare preliminary site grading drawings.
- Download survey data to create site-drawing files for final design.
- Set final building and structure elevations.
- Develop preliminary yard piping (18-inch-diameter and larger) and plant drain layouts. Identify corridors for smaller piping and other utilities.
- Show stormwater control concepts (swales, curb, and gutter) on the design development drawings.
- Finalize traffic flow, parking, and lay out road access to all buildings and structures. Coordinate handicap requirements with architectural discipline and local site plan regulations.
- Prepare first draft of technical specifications.
- Review design development and draft work products with and seek approval from QC reviewer.

Landscape Architecture

- Prepare 60% hardscape plans package for pedestrian paving areas for both process and non-process project facilities. This will include definition of materials and layout of paving joints and locations of site furnishings, exterior lighting and other site elements. Develop requisite construction details.
- Coordinate exterior lighting locations with electrical and civil disciplines.
- Prepare 60% site planting and irrigation plans, eco-roof planting, and irrigation plans. Develop requisite irrigation and planting details. Coordinate with the architect and structural engineer for eco-roof landscape design.
- Review site grading and provide input to civil. For special hardscape outdoor areas, landscape architect may provide detailed grading plan to be integrated with the overall site grading plan.
- Review vegetated stormwater facility design and provide input to civil. Coordinate planting design of vegetated stormwater facilities with civil.
- Coordinate landscape improvements with work of other disciplines.
- Prepare first draft of technical specifications.

- Review design development and draft work products with and seek approval from QC reviewer.

Electrical

- Determine locations and sizes for electrical distribution equipment. Prepare preliminary one-line diagrams for proposed facilities. Coordinate with lead process engineers to size equipment motors.
- Prepare detailed electrical load calculations.
- Size electrical rooms and prepare a preliminary layout of the major electrical equipment located in each electrical room. Determine equipment requiring uninterruptable power supplies (UPS) and locations of UPS equipment. Coordinate with I&C discipline to determine space requirements and locations for control equipment. Locate major input/output (I/O) termination panels, terminal junction boxes, and control panels.
- Define/document requirements and concepts for special systems: Telephone (including incoming service location, scope of supply, etc.), Data highway (control system), Data highway (local area network, office automation), and fire alarm system. Special systems such as paging system, security system, closed-circuit television system, and security systems will be identified, but are not currently included in the scope of the project.
- Identify rights-of-way and routing methods for electrical conduit and tray. Lay out duct bank system (major runs/manholes). Coordinate with civil yard piping. Locate manholes and hand holes.
- Develop detailed lighting concepts; select luminaire types in conjunction with architect. Prepare preliminary lighting layouts and initial lighting calculations. Prepare preliminary site lighting layout.
- Define hazardous locations (NFPA 820) and document in the area classification table. Define corrosive locations and document.
- Prepare first draft of technical specifications.
- Review design development and draft work products with and seek approval from QC reviewer.

Instrumentation and Control Systems

- Coordinate with BES to generate equipment and loop numbers.
- Prepare final CAD-based P&ID drawings including loop numbers and all instrumentation.
- Prepare preliminary I/O count. Size and locate I/O panels. Coordinate space requirements with electrical and architectural disciplines.
- Summarize I&C system design philosophy for each major process in a process control narrative. Include a description of the field elements to be used for each application and preliminary set points for major I&C elements. Update/finalize control system block diagram. Finalize typical control diagrams/loop diagrams for each type of control scheme to be used.
- Coordinate with HVAC engineer regarding control system requirements.
- Coordinate with electrical on requirements for fiber optic system.
- Determine UPS requirements.
- Define control interfaces for all package systems with local controls, including adjustable frequency drives.
- Review mechanical equipment specifications to confirm coordination with P&IDs and control system interface requirements.
- Coordinate locations of control panels and instruments.

- Prepare first draft of technical specifications.
- Review design development and draft work products with and seek approval from QC reviewer.

Process

- Final major equipment sizing calculations.
- Coordinate process requirements during construction.
- Finalize hydraulics.
- Continue to use simulation model to advance hydraulics design (verify equipment selection, evaluate overflow/drain scenarios, etc.).
- Use simulation model to advance I&C design and develop process control strategies.
- Conduct failure and risk workshop with operational staff and management.
- Evaluate risk of various critical failure events (network communication error, flowmeter erroneous reading, actuator failure, etc.).
- Evaluate plant performance and risk of overflow at various storm events (1-year, 10-year, 50-year, etc.).
- Coordinate with I&C on completion of P&IDs.
- Coordinate with I&C on development of process control narratives.
- Develop process equipment specifications.
- Coordinate with all disciplines for process facility layouts, yard piping, and utility requirements.
- Review design development and draft work products with and seek approval from QC reviewer.
- Attend meetings with BES and operations staff to review facility layouts and walk through 3D models of process facilities.

Mechanical

- Calculate the hydraulic profile for all-major gravity process pipelines and hydraulic structures. Establish maximum and minimum water surface elevations for all process tanks and operating levels for effluent pump station.
- Prepare 3D electronic models or building and structure layouts (plans and major sections).
- Assemble catalog cuts for all major process equipment. Complete equipment data sheets or equipment list on all major equipment items.
- Coordinate with I&C in the finalization of P&IDs.
- Final ancillary equipment sizing and line sizing calculations.
- Final equipment selection (type, size, weight, arrangement).
- Update pipe schedule.
- Develop preliminary gate schedule and actuated valve schedule; confirm valve actuator types and power requirements.
- Determine approach for tie-ins of major yard piping with existing piping/facilities, pipe flexibility details.
- Prepare first draft of technical specifications.

- Review design development and draft work products with and seek approval from QC reviewer.

Geotechnical

- Coordinate with structural engineer to develop foundation loading criteria for proposed facilities.
- Finalize geotechnical analyses based on building layouts and loads and performance criteria.
- Develop horizontal and vertical layouts for ground improvement for proposed facilities.
- Prepare first draft of earthwork technical specifications.
- Finalize geotechnical design report.

Structural

- Coordinate with geotechnical engineer to establish foundation design criteria for proposed facilities. Review geotechnical report and discuss foundation design approach with geotechnical engineer and senior structural reviewer.
- Document structural design concept for each building (room by room) and structure. Finalize materials of construction (cast-in-place vs. precast concrete, roof structures, etc.). Preliminary framing plan for buildings and other structures.
- Engineering sizing developed for all foundations, walls, and elevated slabs.
- Coordinate major pipe tie-ins to new and existing structures.
- Prepare 3D electronic models for all major structures.
- Develop plans and sections for all structures.
- Prepare first draft of technical specifications.
- Review design development and draft work products with and seek approval from QC reviewer.

Task 2.2.1.2. Project Sequencing and Constraints Analysis

Conduct a review of the existing plant operating facilities that are impacted by the proposed construction. This review will list process areas that are impacted by the proposed construction and identify the nature and estimated duration of the impact. The results of this effort will be presented to the BES's personnel and CM/GC during a 1-day workshop. A second workshop will be conducted, if needed, to discuss additional detail of the construction sequence, overall and by facility, including temporary provisions, constraints on timing and duration of work, and any shutdown requirements. The information developed for these meetings, including BES input, will be incorporated into the project Maintenance of Plant Operation Plan.

Meetings

- Two project sequencing and constraints workshops.

Deliverables

- Meeting notes.
- Maintenance of Plant Operation Plan.

Task 2.2.1.3. 60% Cost Estimate

- Support CM/GC's update of the construction schedule.
- At 60% design, provide construction cost estimate in sufficient detail to provide the expected accuracy range of an AACE International Class 2 cost estimate: -15% to +20%.

Deliverables

- 60% cost estimate.

Task 2.2.1.4. Operational Strategy Technical Memorandum

Based on the current design, develop an Operational Strategy TM that captures the process control narratives per BES standards for each of the major unit processes. This document will narratively describe the operational strategies associated with the design (in conjunction with the process control description specifications) for each unit process. This manual will explain the various primary modes of process operation that may be used, including both normal operation and initial emergency operation procedures such as peak wet weather events, loss of duty units, power failures, etc.

Assumptions

- The Operational Strategy TM will evolve through the rest of design and then form the basis for the Process Operations Manual delivered as part of the Startup and Testing scope section below.
- Draft TM will be submitted as part of the 60% design phase. Updates will be provided at the 90% and 100% design phase.
- This Operational Strategy TM will organize and present the process control narratives developed during design, relying on the P&IDs for reference. Enhanced process flow diagrams and other graphics will be developed and funded under the Process Operations Manual task (scoped under the Startup and Closeout Phase).

Meetings

- Two project operational strategy workshops.

Deliverables

- Meeting notes.
- Draft Operational and Control Strategy TM.

Task 2.2.1.5. Technical Workshops – 60% Design

During this phase, workshops with BES staff will be held to review the development of design criteria, results of technical evaluations, and review of work products. Workshop materials will be developed based on the technical work being conducted, and presented to BES in workshops.

Assumptions

- For the design development phase (through 60% design), assume a total of eight technical workshops, each 2 to 3 hours long, with the BES's personnel to review the progress of the work, make decisions, and provide direction.
- In addition to the technical workshops described above, the design team will conduct three half-day workshops at the end of design development to review work products associated with that phase of the work.
- One additional workshop (2 to 3 hours long) will be conducted to review P&IDs for the 60% design phase.
- Assumes 4 hours of workshop labor plus 2 hours of preparation for each workshop, four consulting team members per workshop, and 2 hours of meeting notes by junior staff.
- Workshops for the non-process facilities design are scoped separately, under the Non-Process Design task above.

Deliverables

- Agenda and meeting materials in advance of the workshops.

- Draft meeting notes from the workshops, distributed to attendees for comment, and submitted to BES.

Task 2.2.1.6. Quality Management – 60% Design

As part of each the 60% design phase, the Consultant will implement the QMP developed in the task above. The Consultant will ensure QA activities are conducted throughout this design phase and Consultant will manage multidiscipline internal QC review activities with the senior review team throughout this design phase. Formal QC reviews by the Consulting team will be performed before BES review of the deliverables.

Audits by QA personnel will be conducted to verify conformance with project-specific design standards, BES checklists, and the approved QMP. The Consultant will confirm that required checking and review functions are completed, culminating in either approval or an NCR. The QA audits follow checklists based on project procedures applicable to the area being audited. Quality review documentation will demonstrate that the quality review process is complete and review comments are acceptably addressed as a component of the overall records management system.

Assumptions

- BES will consolidate the BES staff review comments into one comprehensive package before submitting review comments to the Consultant.
- For major deliverables, Consultant will provide 15 printed copies and one electronic copy in PDF format, and BES will submit review comments within the period allocated in the project schedule (typically 4 weeks following BES receipt of the review submittal).
- For smaller TMs and meeting notes, Consultant will provide one electronic copy in PDF format, and BES will submit review comments within 14 days following BES receipt of the deliverable.
- Consultant's responses to BES consolidated review comments will be returned to BES for their records.

Deliverables

- QRFs used during internal quality reviews.
- Responses to DRFs used by BES to document quality review comments.
- Project checklists or milestone checklists, signed by the reviewer and the appropriate project staff.
- Copies of quality review markups or comments not included on the QRFs or DRFs.
- Review-related correspondence with BES staff and other external agencies or entities.
- QMP-related documents for subcontracted work.
- Audit correspondence, including results and corrective action documentation.

Task 2.2.1.7. Project Management – 60% Design

Perform the following activities for the duration of the 60% design phase:

- Before commencing the 60% design phase, prepare for and conduct a "refresher" Kickoff/Chartering Meeting for Consultant team members, including subconsultants.
- Maintain and update the final work plan for the project that combines staffing commitments and budgets with the deliverables and schedule for the project. Specific responsibilities of each member of the final design project team will be maintained. Update the overall design schedule each month and review with the BES Program Manager, as needed.

- Supervise and control activities of staff assigned to the project. Coordinate and schedule appropriate project staffing discussions to meet project requirements. Arrange for the scheduled project workshops, review meetings, and project team meetings. Coordinate the participation of senior staff at appropriate points in the project.
- Coordinate with other projects and BES staff to complete work on schedule and within budget.
- Prepare monthly progress reports and submit with the monthly invoice. The reports will include a status summary of current project tasks, activities completed in the last month, activities planned for the next month, a project action issues checklist, performance compared to budget, and identification of items of concern. Organize monthly invoice and budget status report by WBS element, including a Monthly Subconsultant Payment and Utilization Report by the 15th of each month (reference Part II, Section C.5 of the RFP). Include budget reports based on using an "S" curve that shows budgeted work complete, billings to date, and estimate at completion.
- Monitor project activities for potential changes. Should change occur, and with BES approval, modify project tasks, task budgets, and approach. Inform BES if any changes will impact the cost of engineering services, the construction cost, or the schedule.
- Participate in weekly conference calls with BES project manager (project manager and design manager). Review the project status and discuss activities and needed actions. Prepare and discuss the 3-week look-ahead schedule.
- Submit change management forms, as needed to document scope/schedule/budget changes. Update the change log and review proposed changes and scope modifications with the BES Program Manager at the bi-weekly project management meetings.
- Support and attend (as requested) project briefings by BES project management team to upper management, City Council, etc.
- Maintain project records, manage and process project communications, and coordinate project administrative matters, utilizing the established Portland document management tool (Heron/e-Builder).
- The Program Support Consultant will update and maintain the Risk Register during the design phase. Consultant will participate in regular meetings with CM/GC, Program Support Consultant, and BES to provide input. Program Support Consultant will lead and document meetings.

Assumptions

- Overall 60% design schedule of 7 months.
- Monthly invoices and major project submittals will be submitted through Heron/e-Builder.
- Updates and input for incorporation in Risk Register.

Meetings

- One and a half hours every week to meet with BES project management.
- Monthly Risk Register Meetings. Assume three Consultant staff members participate.

Deliverables

- Updates to program workplan at completion of 60% design.
- Monthly project invoices and status reports.
- Completed change management forms, as needed, to document impacts of potential changes on engineering fee, construction cost, or schedule.

Task 2.2.2 90% Design Submittal

Task 2.2.2.1. 90% Design

Deliverables will include the following:

- General symbols, legends and abbreviations complete.
- Design data and criteria complete.
- Site plan with final location of structures, CM/GC staging, storage, and access.
- Pedestrian hardscape and site furnishings enlarged plan and details.
- Site landscape plans and details – planting and irrigation.
- Eco-roof landscape plans and details – planting and irrigation.
- Final grading plans and stormwater design.
- Details of pavement and trench sections, and other civil details.
- Sedimentation and Erosion Control Plan and details.
- Structural plans, sections, and details coordinated with other design disciplines. Include seismic requirements, piping supports, and structural member sizes.
- Mechanical plans, sections, and details with final location of major equipment, piping, and appurtenances. All piping layouts essentially complete.
- Final electrical site drawings, one-line diagrams, control room layouts, and panel layouts.
- Power plans, control diagrams, and schedules complete and coordinated with mechanical design.
- Final lighting plans.
- Final P&IDs coordinated with final operational control strategies and final network diagrams.
- Final version of Specifications Divisions 1 through 46 incorporating comments from the 60% submittal review and reflecting full coordination with drawings. Include final construction sequence, milestones and constraints, measurement and payment, and proposed bid form.
- Equipment list that includes equipment number, equipment size, equipment power requirements, and basic controls and operating strategies for all equipment on the project.
- Responses to 60% BES design review comments.
- At 90% design and final design, provide construction cost estimate in sufficient detail to provide the expected accuracy range of an AACE International Class 1 cost estimate: -10% to +15%.

Assumptions

- Prepare sealed final design submittal documents, calculations, reports, and other documents required for complete applications for building permits from BES of Portland Bureau of Development Services (BDS). BES staff will submit the Building permit application and pay permit and plan review fees directly to BDS.
- Provide clarifications and changes to the final design submittal documents as required to address plan review check sheets issued by BDS and comments from BES or the CM/GC.

Deliverables

- 90% 11 x 17 drawings (15 printed copies and one electronic copy in PDF format).

- 90% specifications and draft design details (8 1/2 x 11 format) (15 printed copies and one electronic copy in PDF format).
- 90% design package for building department review (15 printed copies and one electronic copy in PDF format). Assume Program Manager and BES coordinate/interface with building department.
- Class 1 cost estimate. Cost estimate will be provided with a database of most modeled content, including size, material, flowstream, volume of concrete, and other major components.

Task 2.2.2.2. Technical Workshops – 90% Design

During this phase, workshops with BES staff will be held to review the development of the design and work products. Workshop materials will be developed based on the technical work being conducted, and presented to BES in workshops.

Assumptions

- For the 90% design phase, assume a total of six technical workshops, each 2 to 3 hours long, with BES's personnel to review the progress of the work, make decisions, and provide direction.
- In addition to the technical workshops described above, the design team will conduct three half-day workshops at the end of design development to review work products associated with that phase of the work.
- One additional workshop (2 to 3 hours long) will be conducted to review P&IDs for the 90% design phase.
- Assumes 4 hours of workshop labor plus 2 hours of prep for each workshop, four consulting team members per workshop, and 2 hours of meeting notes by junior staff.
- Workshops for the non-process facilities design are scoped separately, under the Non-Process Design task above.

Deliverables

- Agenda and meeting materials in advance of the workshops.
- Draft meeting notes from the workshops, distributed to attendees for comment, and submitted to BES.

Task 2.2.2.3. Quality Management – 90% Design

As part of each the 90% design phase, the Consultant will implement the QMP developed in the task above. The Consultant will ensure QA activities are conducted throughout this design phase and Consultant will manage multidiscipline internal QC review activities with the senior review team throughout this design phase. Formal QC reviews by the Consulting team will be performed before BES review of the deliverables.

Audits by QA personnel will be conducted to verify conformance with project specific design standards, BES checklists, and the approved QMP. The Consultant will confirm that required checking and review functions are completed, culminating in either approval or an NCR. The QA audits follow checklists based on project procedures applicable to the area being audited. Quality review documentation will demonstrate that the quality review process is complete and review comments are acceptably addressed as a component of the overall records management system.

Assumptions

- BES will consolidate the BES staff review comments into one comprehensive package before submitting review comments to the Consultant.

- For major deliverables, Consultant will provide 15 printed copies and one electronic copy in PDF format, and BES will submit review comments within the period allocated in the project schedule (typically 4 weeks following BES receipt of the review submittal).
- For smaller TMs and meeting notes, Consultant will provide one electronic copy in PDF format, and BES will submit review comments within 14 days following BES receipt of the deliverable.
- Consultant's responses to BES consolidated review comments will be returned to BES for their records.

Deliverables

- QRFs used during internal quality reviews.
- Responses to DRFs used by BES to document quality review comments.
- Project checklists or milestone checklists, signed by the reviewer and the appropriate project staff.
- Copies of quality review markups or comments not included on the QRFs or DRFs.
- Review-related correspondence with BES staff and other external agencies or entities.
- QMP-related documents for subcontracted work.
- Audit correspondence, including results and corrective action documentation.

Task 2.2.2.4. 90% Cost Estimate

- Support CM/GC's update of the construction schedule.
- At 90% design and final design, provide construction cost estimate in sufficient detail to provide the expected accuracy range of an AACE International Class 1 cost estimate: -10% to +15%.

Deliverables

- Construction cost estimate.

Task 2.2.2.5. Project Management – 90% Design

Perform the following activities for the duration of the 90% design phase:

- Before commencing the 90% design phase, prepare for and conduct a "refresher" Kickoff/Chartering Meeting for Consultant team members, including subconsultants.
- Maintain and update the final work plan for the project that combines staffing commitments and budgets with the deliverables and schedule for the project. Specific responsibilities of each member of the final design project team will be maintained. Update the overall design schedule each month and review with the BES Program Manager, as needed.
- Supervise and control activities of staff assigned to the project. Coordinate and schedule appropriate project staffing discussions to meet project requirements. Arrange for the scheduled project workshops, review meetings, and project team meetings. Coordinate the participation of senior staff at appropriate points in the project.
- Coordinate with other projects and BES staff to complete work on schedule and within budget.
- Prepare monthly progress reports and submit with the monthly invoice. The reports will include a status summary of current project tasks, activities completed in the last month, activities planned for the next month, a project action issues checklist, performance compared to budget, and identification of items of concern. Organize monthly invoice and budget status report by WBS element, including a Monthly Subconsultant Payment and Utilization Report by the 15th of each

month (reference Part II, Section C.5 of the RFP). Include budget reports based on using an "S" curve that shows budgeted work complete, billings to date, and estimate at completion.

- Monitor project activities for potential changes. Should change occur, and with BES approval, modify project tasks, task budgets, and approach. Inform BES if any changes will impact the cost of engineering services, the construction cost, or the schedule.
- Participate in weekly conference calls with BES project manager (project manager and design manager). Review the project status and discuss activities and needed actions. Prepare and discuss the 3-week look-ahead schedule.
- Submit change management forms, as needed to document scope/schedule/budget changes. Update the Change Log and review proposed changes and scope modifications with the BES Program Manager at the bi-weekly project management meetings.
- Support and attend (as requested) project briefings by BES project management team to upper management, City Council, etc.
- Maintain project records, manage and process project communications, and coordinate project administrative matters, utilizing the established Portland document management tool (Heron/e-Builder).
- The Program Support Consultant will update and maintain the Risk Register during the design phase. Consultant will participate in regular meetings with CM/GC, Program Support Consultant, and BES to provide input. Program Support Consultant will lead and document meetings.

Assumptions

- Overall design schedule of 9 months.
- Monthly invoices and major project submittals will be submitted through Heron/e-Builder.

Meetings

- One and a half hours every week to meet with BES project management.
- Monthly Risk Register Meetings. Assume three Consultant staff members will participate.

Deliverables

- Updates to Program Workplan at completion of 60% design.
- Monthly project invoices and status reports.
- Completed change management forms, as needed, to document impacts of potential changes on engineering fee, construction cost, or schedule.
- Input and updates for incorporation into Risk Register.

Task 2.2.3 Final Design Document Submittal

The purpose of this task is to develop the final contract drawings, specifications, and schedules for competitive bidding. Key activities during this phase are described below.

Task 2.2.3.1. Contract Document Completion

- Finalize specifications.
- Prepare final construction drawings.
- Prepare final technical specifications.

- Update the final design documents to incorporate and consolidate all changes made during the building permit plan review.
- Prepare final calculations.
- Complete final checking and coordination review.

Deliverables

- Final 11 x 17 drawings: 15 printed copies and electronic copy in PDF format and a complete AutoCAD Word set with no password protection along with a database of all information embedded within the P&IDs.
- Final specifications and design details (8 1/2 x 11 format): 15 printed copies and electronic copy in PDF format and a complete MS Word set with no password protection.
- Sealed project plans, specifications, structural calculations, and other reports and documents required for a complete building permit application from BDS in PDF electronic format, and a complete AutoCAD/MS Word set with no password protection. Format of AutoCAD 3D models shall be dimensionally accurate and representative of true installation space requirements. These models will not have any data associated with them after they leave their native software. A database of all information embedded within the P&IDs could be provided.
- Responses to BDS check sheets, including revised project plans, structural calculations, and other reports and documents, as required by BDS, to successfully complete the BDS building permit application process. All submittals shall be in PDF electronic format with AutoCAD/MS Word sets provided to BES with no password protection.

Task 2.2.3.2. Quality Management – Final (100%) Design

As part of each the final design phase, the Consultant will implement the QMP developed in the task above. Formal consultant team QC reviews and BES reviews are not conducted during this phase, but the Consultant will ensure QA activities are conducted throughout this design phase.

Audits by QA/QC personnel will be conducted to verify that all review comments have been addressed and that the quality review documentation demonstrates that the quality review process is complete and review comments are acceptably addressed as a component of the overall records management system.

Assumptions

- Consultant's responses to BES consolidated review comments will be returned to BES for their records.

Deliverables

- Audit correspondence, including results and corrective action documentation.
- Final documentation for all design phases.

Task 2.2.3.3. Project Management – Final (100%) Design

Perform the following activities for the duration of the final (100%) design phase:

- Before commencing the final design phase, prepare for and conduct a "refresher" Kickoff/Chartering Meeting for Consultant team members, including subconsultants.
- Maintain and update the final work plan for the project that combines staffing commitments and budgets with the deliverables and schedule for the project. Specific responsibilities of each member of the final design project team will be maintained. Update the overall design schedule each month. and review with the BES Program Manager, as needed.

- Supervise and control activities of staff assigned to the project. Coordinate and schedule appropriate project staffing discussions to meet project requirements. Arrange for the scheduled project workshops, review meetings, and project team meetings. Coordinate the participation of senior staff at appropriate points in the project.
- Coordinate with other projects and BES staff to complete work on schedule and within budget.
- Prepare monthly progress reports and submit with the monthly invoice. The reports will include a status summary of current project tasks, activities completed in the last month, activities planned for the next month, a project action issues checklist, performance compared to budget, and identification of items of concern. Organize monthly invoice and budget status report by WBS element, including a Monthly Subconsultant Payment and Utilization Report by the 15th of each month (reference Part II, Section C.5 of the RFP). Include budget reports based on using an "S" curve that shows budgeted work complete, billings to date, and estimate at completion.
- Monitor project activities for potential changes. Should change occur, and with BES approval, modify project tasks, task budgets, and approach. Inform BES if any changes will impact the cost of engineering services, the construction cost, or the schedule.
- Participate in weekly conference calls with BES project manager (project manager and design manager). Review the Project status and discuss activities and needed actions. Prepare and discuss the 3-week look-ahead schedule.
- Submit change management forms, as needed to document scope/schedule/budget changes. Update the change log and review proposed changes and scope modifications with the BES Program Manager at the bi-weekly project management meetings.
- Support and attend (as requested) project briefings by BES project management team to upper management, City Council, etc.
- Maintain project records, manage and process project communications, and coordinate project administrative matters, utilizing the established Portland document management tool (Heron/e-Builder).
- The Program Support Consultant will update and maintain the Risk Register during the design phase. Consultant will participate in regular meetings with CM/GC, Program Support Consultant, and BES to provide input. Program Support Consultant will lead and document meetings.

Assumptions

- Overall design schedule of 3 months.
- Monthly invoices and major project submittals will be submitted through Heron/e-Builder.

Meetings

- One and a half hours every week to meet with BES project management.
- Monthly Risk Register Meetings. Assume three Consultant staff members will participate.

Deliverables

- Updates to program workplan at completion of 60% design.
- Monthly project invoices and status reports.
- Completed change management forms, as needed, to document impacts of potential changes on engineering fee, construction cost, or schedule.

Task 2.3 Support for CM/GC and Guaranteed Maximum Price (GMP) Development During Design

Task 2.3.1 CM/GC Onboarding

- Participate in a Kickoff/Chartering/Partnering Meeting that includes the key project team members from BES, the CM/GC and the Consultant team. Assume that Project Support Consultant will plan for and facilitate this meeting.
- Lead a series of meetings with CM/GC contractor to get them quickly up to speed and engaged on the project. Review current state of design documents, Risk Register, and cost estimate. Assume multiple workshops involving design managers, facility leads and discipline staff to review the following:
  - Project overview.
  - Facility-by-facility review.
  - Discipline-by-discipline review (involving CM/GC major subcontractors).
  - Preliminary project sequencing/schedule.
  - Known constructability issues.

Assumptions

- One 2-hour kickoff meeting with five Consultant staff members attending.
- One 8-hour Partnering meeting with eight Consultant staff members attending.
- Four 4-hour workshops with an average of eight Consultant staff members attending.

Task 2.3.2 CM/GC Design Interface

Task 2.3.2.1. Manage CM/GC Interface

Meet regularly during design with CM/GC contractor to coordinate review and feedback. These meetings are outside the regular design review and BES interface meetings described in Tasks 2 and 3. include:

- Development of a construction sequencing and packaging plan.
- Identify site features or facilities that may require CM/GC preconstruction phase field investigations by the CM/GC to support final design.
- Constructability/means and methods evaluations.
- Concrete mix design and specification details.
- Detailed development of sequencing and constraints approaches, specific to operational interfaces and connections to operating systems.

Assumptions

- 12 months of 3-hour bi-weekly meetings. Assume attendance by four consultant staff members.
- It is anticipated that CM/GC will participate in BES design review meetings described in Task 1.4 (30% Design Submittal) and Task 2 (Detailed Design Phase Services) as soon as they are under contract. No hours are included to support CM/GC review of design deliverables. Specific follow-up on CM/GC review comments is addressed as part of this Design Interface Task.

Task 2.3.2.2. Respond to CM/GC Information Requests

This task is scoped as an allowance. The task includes the following:

- Provide technical interpretation and clarification of the design documents during design and prepare proposed responses to all questions and requests, which will then be incorporated into the Contract Documents as part of design completion.
- Provide technical interpretation of design documents utilized for bidding and prepare proposed responses to bidders' questions and requests during CM/GC development of GMPs.
- Manage documentation for CM/GC information requests during the design phase. Document proposed responses to all questions and requests. Assume that the procedures, documentation log, etc. will be developed by the Program Support Consultant.

Assumptions

- The extent of the Consultant's involvement will be limited to the budget available.
- 50 RFIs at 4 hours each.
- 16 hours/month for 12 months to manage documentation process.
- Incorporation of responses and milestone review comments from the CM/GC will be addressed as part of the design progression, covered under Task 3.

Deliverables

- Responses to CM/GC requests for information.

Task 2.3.3 CM/GC Scope Management and Cost Optimization

This task is scoped as an allowance, to support scope management and cost optimization activities at various stages of the design and GMP development process. These activities are outside the scope of normal design development and are intended to allow for investigation of concepts and redesign of components to realize overall program cost and/or value goals. This task includes the following:

- Work with BES and CM/GC to identify opportunities for cost savings or value-add approaches.
- Support CM/GC cost estimating of concepts through conceptual design development.
- Perform redesign of vetted/frozen design concepts when cost optimization ideas are determined to provide overall program value.

Assumptions

- This task is specifically intended to be utilized for project scope changes to existing design concepts, driven by CM/GC innovations or means/methods.
- The extent of the Consultant's involvement will be limited to the budget available. Any additional funding would need to be authorized via in Task 2.6 Owner's Contingency – Detailed Design Phase.

Task 2.3.4 CM/GC Cost Review

- Review 30%, and 60% CM/GC cost estimates, with the intent to identify and reconcile differences between the Consultant and CM/GC estimates. Consultant will work with the CM/GC and Program Support Consultant to reconcile cost estimates and identify and update Program risk allocations and usage.

Assumptions

- Four consultant staff members (i.e., project manager, CM/GC Lead, and two estimators) at 24 hours per estimate.

- Program Support Consultant documents results of cost and quantity review.

Task 2.3.5 GMP Development Support

This subtask is scoped as a support activity and Consultant engagement will be as directed by BES. Activities include:

- Arrange and conduct up to three informational conferences to summarize key elements of the design work to support the CM/GC's bidding process for subcontractors.
- Support BES in review of major subcontractors from whom the CM/GC solicits bids during GMP development.
- Participate in review of major equipment procurement proposals solicited during GMP development. Provide review and feedback on acceptability of proposals for conformance with technical specifications.
- Support BES in discussion of appropriate allocation of risk and basis of assumptions for GMP.
- Assist BES in evaluation of GMP against Consultant's and Program Support Consultant's opinions of probable cost.

Assumptions

- The extent of the Consultant's involvement. will be limited to the budget available. Additional funding, if needed, would need be authorized via Task 2.6 Owner's Contingency – Detailed Design Phase.

Task 2.4 Public Involvement

This task will provide support to BES for involving the broader community in the implementation of the Project. Specific activities are to be authorized in advance on a task-by-task basis following the development of the project and the determination of communications and public involvement support needs.

Since the early 1990s, the CBWTP Citizen Advisory Committee has been the focal point for the community engagement, and that is planned to continue. There's an opportunity with the secondary expansion—the largest capital project in many years—to reengage the community, renew the relationship, and collaboratively find additional community benefits to be provided.

This task includes the following activities:

- Provide planning and support for public involvement that assures community understanding and approval for the planned secondary expansion and associated CBWTP improvements.
- Coordinate development of a public involvement plan that honors the Values & Guiding Principles that are the foundation for the community's highly successful and enduring relationship with BES and the CBWTP.

Task 2.4.1 Develop Communications and Public Involvement Plan

Conduct stakeholder interviews with up to six internal BES staff members to understand communications needs. Based on that input, develop a brief communications plan identifying messaging, target audiences, and appropriate communications tools. The plan will be designed to work within the designated fee for implementation.

Deliverables

- Draft and final Communications and Public Involvement Plan.

Task 2.4.2 Implement Communications and Public Involvement Plan

Implement tasks identified in the Communications Plan. Those items may include:

- Developing content for project fact sheet suitable for internal audience stakeholders.
- Developing content for project fact sheet appropriate for external, community audiences.
- Developing updated content for fact sheets following completion of preliminary design.
- Developing content for PowerPoint presentations to the Citizen Advisory Committee (assume four).
- Developing content for news releases (assume two).
- Developing content for articles for the annual CBWTP community newsletter (assume four).
- Developing content for the bureau's public webpages (updated bi-monthly or as needed).
- Developing plans, agendas, and run-of-show for plant open houses; developing content for materials that support plant open houses and/or tours, including necessary advertisements; (assume 16 hours), and attending tours (up to 4).
- Preparing drawings, graphics, and PowerPoint presentations as appropriate to convey design progress.
- Providing information regarding the construction, progress, schedules, and facilities costs, as appropriate.

Meetings

- Attend meetings with BES to provide input and coordinate communications activities (assume 3 hours per month for 48 months).

Assumptions

- BES will lead any public involvement and media activities.
- BES will have the final review and approval on all print and electronic materials.
- All print and electronic materials will adhere to BES style guides and templates.
- Consultant will plan, coordinate, and support public involvement activities conducted by BES public affairs/communications staff. CAD drawings, maps, and displays will be produced by the engineering team and BES; level of effort will be limited to hours shown in the fee.
- The limited budget and level of effort included is an allowance for use as directed by BES staff. The extent of the Consultant's involvement will be limited to the budget available.
- Active project duration of 48 months.

Deliverables

- Drawings and other design materials, such as posters and PowerPoint presentations that may be required, to the limits of the budget.
- Draft and final versions of four open house/tour announcements for BES website.
- Draft and final version of two project fact sheets and one update.
- Draft and final versions of up to four Citizen Advisory Committee PowerPoint presentations.
- Draft and final versions of two news releases.
- Draft and final versions of up to four community newsletter articles.
- Draft and final versions of initial website content and up to eight updates to that content.

- Draft and final versions of open house guide assumed to consist of a single, two-sided 11 x 17 page.
- Four open houses/tour single sheet plans and run-of-show.
- Provide monthly invoices and progress reporting for all public involvement tasks.

Task 2.4.3 Develop Plant Signage

Design permanent educational signage to support plant tours, including developing content. Assume 10 boards, designed to simply and graphically depict various process areas around the facility. Boards will be collaboratively developed with process engineers, public outreach subconsultant and BES Staff.

Assumptions

- BES will be responsible for production and installation of signage.
- BES will have final approval on design and content.

Deliverables

- Draft and final versions of signage, delivered in high quality digital format.

Task 2.5 Permitting

Identify and acquire the permits and approvals required from the BDS, the State of Oregon, and other regulatory agencies for construction of the project.

Task 2.5.1 Natural Resources Environmental Permitting

This task addresses natural resources permitting for duration of the project. The scope of the task encompasses expected environmental review as well as certain state and federal permits (e.g., U.S. Army Corps of Engineers [USACE], Oregon Department of State Lands [DSL], and DEQ).

Task 2.5.1.1. 20% Design Phase

The permitting task for this initial project stage will culminate in a Permitting TM that will serve as a working document, updated at specific stages of the project (e.g., 30%, 60%, and 90% design), and can be integrated into the Basis of Design Report. Key steps include the following:

Data Collection/Assessment

- Compile and review project information, including permit and land use history of project area, BES facility documents, environmental reports, historical data and photos, and other background information on the site and vicinity.
- Compile applicable codes and regulations, including City and BES environmental policies, and state and federal wetland and waterway regulations.
- Assess data gaps to be filled, data sources, potential data acquisition issues, and how to address these.
- Identify related project design, process, or schedule implications.

Early Field Review and Agency Coordination

- Field review of project site and proposed improvements, considering thresholds for review, approval criteria, and mitigation opportunities.
- Review field findings with design team to identify steps that may allow project to avoid or minimize specific permits (such as avoiding jurisdictional waters).
- Early coordination with Mike Reed (BES Streamlining Team coordinator) and, if warranted, coordinate early presentation of project to Streamlining Team.

- Coordination with BES environmental planning staff, DEQ, and other regulatory agencies.

Prepare Draft Permitting TM

- Prepare initial draft of a Permitting TM incorporating findings from Preliminary Design, including the following elements:
  - Permit name, issuing agency, contact information.
  - Project element triggering permit and project specific requirements.
  - Permit schedule with permit review process milestones, BES review periods, public comment periods, agency meetings, synchronized with design milestones.
  - Summary of permit status, comments, unresolved issues, and action plan.
  - Permit costs and team responsibilities.
  - Coordination and review of design plan sheets/specifications related to permit.
  - Reference section listing code citations, correspondence, supporting documentation.
- Identify opportunities for early coordination with regulatory agencies that may facilitate permitting process.
- Prepare a draft permit tracking matrix (with summary of permit needs, requirements, and criteria) to track permits and identify rapid "permit impact" response to any proposed design or construction changes.

Update Permitting TM to Address Basis of Design

- Review Basis of Design Report, including proposed structures and uses, programming, grading, access plan, stormwater and sanitary utilities. Update Permitting TM as appropriate.
- Prepare final Permitting TM for incorporation into Program Implementation TM (Task 1.2.15), identifying and describing required permits.

Meetings

- Meeting with BES staff to review permitting-related issues.
- BES review of draft deliverables.

Deliverables

- Preliminary Permitting TM.
- Draft and final Permitting TM.

Task 2.5.1.2. Design

During the design process, Consultant will attend regular design team meetings, reviewing design work, coordinating with local, state, and federal regulatory agencies, and updating the Permitting TM and matrix to reflect current design and construction plans.

Initial Design Review – 30% Design Phase

Design Team Coordination

- Ongoing review of 30% design progress for permit implications.
- Participate in up to three field meetings to review potential design and construction changes and potential impacts.
- Begin environmental documentation, including:
  - Columbia Slough and wildlife habitat field reconnaissance.

  - Wetland field reconnaissance.
  - Preliminary environmental impact assessments and alternatives analysis.

Agency Coordination

- Ongoing coordination with BES Streamlining Team and attend Streamlining Team meeting.
- Ongoing coordination with BES environmental planning staff.
- Ongoing coordination with state and federal resource agencies.
- Attend pre-application conference to review BES comments on environmental constraints.

Permitting TM Update and Preliminary Applications

- Review and comment on 30% design package.
- Identify specific drawings needed for permit submittal and coordinate with team on permit drawing requirements.
- Prepare outline of BES Environmental Review and USACE/DSL Joint Permit applications.
- Update Permitting TM and permit matrix with outstanding issues flagged.

Deliverables

- Summary of Streamlining Team meeting.
- Outline of permit applications.
- Updated Permitting TM.

BES Input/Review

- Attend meetings, as appropriate.
- BES review of updated Permitting TM and other deliverables.

Intermediate Design Review

Design Team Coordination

- Ongoing review of 60% design progress for permit implications.
- Participate in up to three field meetings to review potential design and construction changes and potential impacts.
- Complete environmental documentation started in previous phase, including:
  - Columbia Slough and wildlife habitat field reconnaissance.
  - Wetland field reconnaissance.
  - Environmental impact assessments and alternatives analysis.

Agency Coordination

- Ongoing coordination with BES Streamlining Team and attend Streamlining Team meeting (before submittal of Joint Permit Application).
- Prepare and submit wetland delineation report to DSL for concurrence.
- Ongoing coordination with state and federal resource agencies.
- Ongoing coordination with BES environmental staff.
- Participate in up to two field meetings with regulators to review potential design and construction plans, potential impacts, and any agency concerns.

Permit Preparation

- Compile and review draft permit package drawings and supporting documentation, including environmental evaluations, construction, stormwater, air emissions, noise, and mitigation plans.
- Prepare draft environmental review application and submit to BES for review.
- Prepare and submit draft Joint Permit Application to BES for review.
- Incorporate BES comments on these documents.
- Coordinate with team on compilation of land use application for BES.
- Prepare Joint Permit Application with USACE/DSL, submit to BES.
- Prepare drafts of DEQ 1200-C and other applicable permit applications. Coordinate with plant site 1200-C permit.

Update Permit Action Plan and Tracking Matrix

- Review of 60% design package, with design refinements and specifications.
- Update Permitting TM and permit matrix, identifying outstanding issues, if any.

Deliverables

- Draft and final permit applications with supporting documentation/attachments (15 printed copies and one electronic copy in PDF format).
- Updated Permitting TM.

BES Input/Review

- Attend meetings as appropriate.
- BES review of permit applications and updated Permitting TM.

Second Intermediate Design Review

Design Team Coordination

- Ongoing review of 90% design progress.
- Monitor review process for permits and respond to agency comments.
- Coordinate with team on presentations at public hearing(s).
- Compile final permits and supporting documentation as attachments to the Permitting TM.

Prepare Updated Permitting TM

- Prepare updated Permitting TM.
- Compile local environmental, state, and federal permit approvals as TM attachments.
- Deliver Permitting TM and supporting documents to BES.

Deliverables

- 90% Permitting TM.
- Completed permit approvals and decisions.

Final Design Review – 100% Design

Remaining permit applications, such as the DEQ 1200-C permit and BES Urban Forestry Permit, will be filed when design is at or near 100%. The permit team will monitor permit progress and address questions and information needs identified by the permitting agencies after review with BES. A final

Permitting TM will be prepared with permit status and any actions needed to meet the timeline for start of construction identified.

Task 2.5.1.3. Construction Phase Support Services

Following the design process, provide on-call permit assistance during construction as directed by BES. This work includes meetings and coordination with BES, the construction team, and regulatory agency staff. Also anticipated are field meetings and follow up environmental documentation. Changes to permits can also be triggered, and the permit team would lead these negotiations and permit revisions and/or prepare new submittals and documentation as needed.

Task 2.5.2 Land Use Permitting

Task 2.5.2.1. Land Use Consultation

Provide consultation on land use issues as the project develops, identifying whether planned changes fit within the existing Master Plan (land use permit). Where feasible, work with design team to incorporate changes in a fashion consistent with approved site Master Plan.

Review Basis of Design Report and provide an interpretation of compliance of the proposed project with the approved Master Plan. This documentation will be incorporated into the Program Implementation TM prepared under Task 1.2.15 Program Implementation Plan.

Assumptions

- Work under this task will be on a time and materials basis; level of effort will be limited to approximately 60 hours, unless formally authorized for additional funding under Task 2.6 Owner's Contingency – Detailed Design Phase.

Deliverables

- Brief TM documenting the review effort.

Task 2.5.2.2. Optional Task – Site Master Plan Amendment

Due to the early planning levels in the project, a Site Master Plan Amendment may be required to accommodate the most cost-effective alternatives. If so determined, formal authorization will be provided to the Consultant with funding on a not to exceed amount provided from under Task 2.6 Owner's Contingency – Detailed Design Phase.

Task 2.5.3 Archaeological

Portions of the CBWTP 5-acre project area have been investigated over the past 25 years but some portions of the project area appear to have not been intensively surveyed for cultural resources. Because the project may involve federal permitting, the project may be subject to federal review and requirements, including cultural resource compliance requirements under Section 106 of the National Historic Preservation Act. The present investigation is proposed to meet those requirements, as well as state compliance requirements, and to gain concurrence of the Oregon State Historic Preservation Office (SHPO). The investigation will include an assessment of both belowground archaeological resources and aboveground structures that are 50 years of age or older that may be located within the Area of Potential Effect (APE). If there is no federal nexus, only structures 75 years of age or older will be assessed.

Task 2.5.3.1. Background Records Search

This phase will entail a standard review of records and literature for the project area and vicinity. Prehistoric site records are on file in Salem at SHPO. HRA will also consult historical maps and aerials. Contacts with appropriate Tribes will be made at the direction of BES.

Task 2.5.3.2. Field Survey

A walkover of the project area will be conducted by archaeologists at intervals of 15 meters or less to define any evidence of sites that may be visible on the surface (i.e., fire-cracked rocks, stone chips, tools, etc.), but because the surface is known to be obscured in places by fill, a surface survey is not expected to be definitive.

Task 2.5.3.3. Geotechnical Monitoring and/or Archaeological Discovery Probing

It is assumed that a surface survey will not be sufficient to evaluate the likelihood of cultural resource sites being present within the proposed project area. Investigations on the parcel so far, including the excavation of 16 borings in 1994, have not identified any archaeological deposits. Previous investigations will be overlain on the phased site plan to determine whether there are areas proposed for construction that should be further tested. Previous work determined that fill up to 7 feet in depth is present in portions of the parcel, but not present in other areas. Due to the presence of fill, standard archaeological hand excavation techniques are not considered likely to be effective in identifying buried deposits.

An archaeologist will either monitor the upper 10 feet of each geotechnical borehole (proposed as part of Task 1.2.3) or the boring logs will be reviewed to assess the likelihood of archaeological indicators being present. If additional borings are needed for archaeological purposes, a mechanical auger with a 4-inch-diameter bore will be used to drill to 10–15 feet in depth. A State of Oregon archaeological permit will be required for archaeological augering.

Should sites or likely site areas be discovered, additional excavations may be necessary to fully define their horizontal and vertical extent. If sites are found, larger scale test excavations will be necessary to establish site significance for those sites that appear to be potentially significant based on augering. This additional work is not covered by this scope of work.

Task 2.5.3.4. Assessment of Historical Resources

A review of structures and features within the parcel that will reach 50 years of age and older during the expansion project will also be conducted if the project has a federal nexus. The intent of the inventory is to identify and characterize the historic resources that may be impacted by the project. The project inventory will consist of a tabulation of resources that are 45 years of age or older, including photographs, a brief discussion of each resource and its potential National Register of Historic Places eligibility (A-D), and a map that identifies the location of each potential historic resource in the APE.

Task 2.5.3.5. Report of Results

The project reports will include both the results of the background literature search and the results of the field survey and probing. A separate technical report will be prepared for archaeological and historical investigations. The Report Executive Summary will document the Archaeological Plan and requirements that impact project implementation, and will be incorporated into the Basis of Design Report as described in Task 1.2.16.

Deliverables

- Draft and final Project Report.

Task 2.5.3.6. Optional Task – Construction Support

If warranted or required (by previous studies/assessment tasks), provide archaeological observation during construction. Assume 2 months of support from one full time staff.

Assumptions

- If authorized, the extent of the Consultant's involvement will be limited to the budget available.

Task 2.5.4 Support for other Permits

Coordinate with BES to secure additional permits required for construction. Production of final design documentation, including specifications and calculations to support the building permit application, is provided as part of Task 2 .

Prepare building permit applications.

Prepare Erosion and Sediment Control Plan. A 1200-C Permit is anticipated to be needed for this project.

Participate in two meetings with DEQ and BES to review details of the 30% and 60% design documentation to familiarize them with the design and support DEQ's Authority to Construct, specifically considering the CM/GC delivery approach.

Assumptions

- City of Portland Bureau of Development Services: BES will submit the reports, drawings, specifications, calculations, and permit application materials prepared by the Consultant and required for Building Official review of the project compliance with applicable code requirements.
- DEQ Plan Review Approval: BES will submit the Final Project Bidding Documents to DEQ for review of plans and specifications as required by Oregon Administrative Rules 340-052. Assume no additional materials beyond the final design documentation is required.

Task 2.6 Owner's Contingency – Detailed Design Phase

This task provides an Owner's Contingency for the Detailed Design Phase equal to 10% of the sum of all other subtask amounts. The Owner's Contingency will be managed by BES's Program Manager within the overall contract not-to-exceed amount. The intent of the Owner's Contingency is to provide budget for tasks for professional services that:

- Are required to complete the project as described herein.
- Result from decisions made by permitting agencies or other parties that influence the scope of professional services required to ensure project completion.
- Are needed to increase task budgets where the assumptions made to create the budget are violated and the violation is beyond the control of the Consultant.

Written authorization from BES's Program Manager is required to reallocate budget from this Detailed Design Phase Owner's Contingency Task to an existing task or a new subtask that is within the overall scope of the project but not clearly defined as within the scope of Task 2 Detailed Design Phase Services.

Task 3 Construction Phase Design Services

Provide Services during Construction (SDC) as defined below. These SDC would commence when the CM/GC is given NTP on construction activities. These SDC are intended to assist BES to verify that the Contractor's work is in substantial compliance with the Contract Documents, monitor the performance of the construction Contractor as requested, and assist BES in responding to requests and events that occur during the construction. These SDC are based upon the understanding that BES will contract directly with the Contractor and will be actively involved in the construction process to make decisions, provide approvals, and perform other actions necessary for the completion of the construction. These SDC assume that BES will provide Program Management and Construction Management/Inspection services through other contracts or through BES staff.

Safety:

- Consultant will manage the health, safety, and environmental activities of its staff and the staff of its subcontractors to achieve compliance with applicable health and safety laws and regulations.
- Consultant will coordinate its health, safety, and environmental program with the responsibilities for health, safety, and environmental compliance specified in the contract for construction. Coordinate with responsible parties to correct conditions that do not meet applicable federal, state, and local occupational safety and health laws and regulations, when such conditions expose Consultant staff, or staff of Consultant subcontractors, to unsafe conditions.
- Consultant will notify affected personnel of any site conditions posing an imminent danger to them that Consultant observes.

Consultant is not responsible for health or safety precautions of construction workers. Consultant is not responsible for the Contractor's compliance with the health and safety requirements in the contract for construction, or with federal, state, and local occupational safety and health laws and regulations.

Task 3.1 Field Engineering Services During Construction (Onsite Services)

Provide field engineering staffs onsite to assist BES in interpretation of the design documents, communication with the office design staff, and resolution of design issues or alternative solutions offered by the CM/GC. Other field office services (i.e., Construction Manager [CM], Resident Inspector [RI], Construction Inspectors [CI], and field Office Manager [OM]) will be provided by BES or the Program Support Consultant. The field engineering services are estimated based upon the contract times set forth herein and assuming both long term general and specialty short term assignments.

Consultant field engineering services will include the following:

- **Meetings:** The Field engineer will attend the significant meetings described below under Office Engineering and will attend a weekly construction meeting coordinated by the CM/GC.
- **Submittals:** Through BES's construction management software Heron (e-Builder) the Field Engineer will track submittals in the design team's court at the project site; log in and monitor the status of the submittals and responses; and work with the designers and document control team to provide timely and complete responses. Submittals will be reviewed onsite to the extent possible based on staff availability and complexity of the submittal.
- **Requests for Information and Design Clarifications:** Clarifications requested from the contractor, or initiated by the designers, will be coordinated through the Field Engineer, working with the office design staff. Responses will be issued in a timely manner and commensurate with project risk. The Field Engineer may recommend minor variations in the work that do not involve an adjustment in the contract price nor time of construction and are consistent with the intent of the Contract Documents (e.g. field orders). All variations in work, whether Field Orders, Design Clarifications, or responses through Requests for Information, will be documented and logged through Heron.

  Design clarifications sealed by the design professional of record including sketches, drawing revisions, specifications, supporting calculations, quantity takeoffs, and cost estimates for the work will be coordinated and may be prepared by the Field Engineer on site and included in the design clarifications as required.
- **Deferred Submittals:** Review, stamp, and submit Deferred Submittals as required by the Building Official and the Oregon Structural Specialty Code.

- **Rejecting Defective Work:** Assist the CM and RI staff to disapprove or reject work that the CM and RI believe to be deficient and non-conforming to the requirements of the Contract Documents. Coordinate with the CM and the design team for the correction, acceptance, or other resolution of the work.
- **Construction Progress Meetings:** Participate in construction progress meetings as appropriate to assist in review of the work progress, response to questions and clarifications, interpretation of the Contract Documents, and coordination requirements between construction contracts. This activity assumes progress meetings are held weekly throughout the construction contract period.
- **Schedules:** The Field Engineer will support the CM's review and monitoring of the Contractor's progress schedules, the schedule of submittals, and the schedule of values prepared by the CM/GC. Field Engineer will consult with design staff as needed and provide input on key construction constraints, tie-ins to existing systems, etc.
- **Payment Requests:** The Field Engineer will support the CM and RI review of the Contractor's request for payment.
- **Design Change Notices:** The Field Engineer will assist the CM and BES with the preparation and issuance of design changes to the Contract Documents.
- **Evaluations of CM/GC Cost Savings Proposal Request and Change Order Proposal Request**: Respond to Program Support Consultant requests for information.
- **Field Observation Reports:** as required by BES of Portland Building Official.
- **Substantial and Final Completion:** The Field Engineer will support the CM and RI inspections at substantial and final completion, representing the design team, to verify the work is in accordance with the Contract Documents. Field Engineer will assist in preparing a punch list of items requiring completion or correction; and make recommendations regarding acceptance of the work.

Assumptions

- Assumes two separate construction packages, one for Non-Process Facilities and one for Process Facilities.
  - Field Services (and Office Services) are based on a 42-week construction schedule for the non-process facilities, plus 60 additional work days from substantial completion to final completion.
  - Field Services (and Office Services) are based on a 42-month construction schedule for the main process facilities, including early out construction work, plus 90 additional work days from substantial to final completion.
  - Contractor's schedule will be published at a later date and may vary from what was assumed. Consultant team will request additional fees if construction contract time exceeds the assumed durations.
- Staffing approach is based on two positions, as follows:
  - Long Term Assignment - A full-time extended assignment as the field engineer for the duration of construction (3.5 years). This position will be filled by a mid-level engineer onsite with assignments between 10 months to 18 months.
  - Middle Term Assignments – Full-time or part time positions as a field discipline engineer/architect during discrete periods of construction. The discipline of the engineering will be based on the type of work being performed during construction and may include geotech, architect, electrical, structural, or process. Staff members are expected to have assignments between 2 to 12 months each.

- Geotechnical work is assumed to be onsite for approximately 750 hours. That effort is considered part of the work to be performed under the field engineering task.
- Sustainability certification for Non-Process Facilities:
  - Conduct LEED pre-construction kickoff meeting to review action plan, roles/responsibilities with respect to LEED-GOLD scorecard with BES, architect, Contractor, and major subcontractors.
  - Field verification and rating by LEED rater to include initial inspection, frame-walk inspection, floor-by-floor pre-drywall inspections and final inspection post punch-list.
  - Preparation of LEED-GOLD project package:
    - Preparation of project documents for certification application.
    - Presentation of pre-certification project file to U.S. Green Building Council for final certification.
- Commissioning of Non-Process Buildings:
  - Provide fundamental commissioning per LEED-GOLD requirements of heating, cooling, water heating, and ventilation systems. Commissioning inclusive of kickoff meeting, submittal review, development of functional test procedures, review of testing and balancing, and completion of documentation per summary commissioning report.
  - Provide summary commissioning report inclusive of systems, compliance, issues, testing requirements, and completed functional test.

Task 3.2 Office Engineering Services During Construction (Offsite Services)

Furnish the following engineering support services from the Engineer's office during construction of the Project. The office support services are estimated based upon the contract times set forth herein.

The office services fee estimate is based on providing the services outlined below. The amount of time furnished and the cost of performing such services are estimates based on the assumptions listed in this Task. Additional funding, may be authorized from Task 3.5 Owner's Contingency – Construction Phase.

Assumptions

- BES will pay any fees for reviews, permits, systems development, etc., levied by applicable agencies towards the project.
- Calculating/determining development fees may be completed as an additional service.
- Point-to-point wiring diagrams will be provided by others (CM/GC).
- Materials testing, specialty testing, and construction phase surveying services will be provided by others.
- The following services are not included in the estimate of Office Engineering Services: Services necessary due to the default of the Contractor. Services for the investigation and analysis of contractor claims, preparation of reports on contractor claims, provision of professional claims analysis services, and participation in litigation or alternative dispute resolution of claims. Preparation for and serving as a witness in connection with any public or private hearing or other forum related to the project. Services to support, prepare, document, bring, defend, or assist in litigation undertaken or defended by BES.

- BES or others will provide periodic labor evaluations and processing of prevailing wage documentation.

Task 3.2.1 Meetings

Task 3.2.1.1. GMP Kickoff Meeting

Attend a kickoff meeting at the start of each GMP NTP meeting with the CM/GC, significant subcontractors, and BES at the project site before the commencement of each.

Task 3.2.1.2. Project Site Meetings

Project Site Meetings During Construction: Participate in periodic onsite meetings with the CM/GC, as requested. Others will prepare the minutes of these meetings.

Assumptions

- For the Main Process Design, Consultant's project manager, design manager, lead structural, mechanical, civil, instrumentation, electrical, and process engineers will attend these Kickoff meetings. The time for the Field Engineer is accounted for above.
- Kickoff meetings for the four major construction phases (aligning with the four major areas of work: liquids, solids, non-process, and electrical).
- Participation in one 8-hour program Construction Partnering meeting with up to eight Consultant's staff.
- Twenty project site meetings with three attendees each for the Main Process Design.
- For the Non-Process Facilities:
  - Architect will attend weekly onsite construction meetings to stay familiar with the progress and quality of the portion of the work completed and prepare meeting minutes.
  - In conjunction with weekly onsite construction meetings, Consultant will observe the construction work and produce field reports.
  - Consultant will provide required structural observation and produce observation reports.
  - Attend three additional onsite meetings for mock-up reviews of key envelope assemblies.

Task 3.2.2 Shop Drawings and Samples Reviews

Submittals: Review and approve shop drawings and samples in accordance with the Schedule of Shop Drawings and Sample submittals.

Assist BES in reviewing and responding to the CM/GC's requests for substitution of materials and equipment. Review such requests and advise BES as to the acceptability of such substitutions.

Assumptions

- Office staff effort is based on two submittals (including resubmittals and substitutions) per drawing and each submittal/resubmittal will require 5.7 hours of effort. This assumes that some submittal review will be accomplished by BES's Project Representative or Consultant's field engineer.
- Review of all shop drawings, samples, and submittals shall be for general conformance with the design concept and general compliance with the requirements of the contract for construction. Such review shall not relieve the CM/GC from its responsibility for performance in accordance with the contract for construction, nor is such review a guarantee that the work covered by the shop drawings, samples, and submittals is free of errors, inconsistencies, or omissions.

Task 3.2.3 Interpretation of Contract Documents (RFIs)

Office support staff will issue such written clarifications or interpretations of the requirements of the Contract Documents as BES may determine necessary. Coordinate such review with the design team and BES as appropriate. Such written clarifications shall be binding on BES and the CM/GC for the limited purposes established in the Contract Documents associated with the role of the Engineer. If BES and CM/GC are unable to agree on the amount or extent, if any, of any adjustment in the contract price or contract times, or both, that should be allowed as a result of a written clarification or interpretation, a claim may be made as provided for in the Contract Documents.

The team will also respond to any questions raised by regulatory agencies (e.g., DEQ) or the building department.

Assumptions

- Three RFI per drawing, and each RFI will require 2 hours of effort. This assumes that some interpretation of Contract Documents will be accomplished by BES's Project Representative or Consultant's field engineer.

Task 3.2.4 Design Team Site Visits

The elements of this task are as follows:

- **Construction Visits:** Consultant will coordinate visits to the site by the design team members to review progress and quality of the work. The visits shall observe the general quality of the work at the time of the visit and review any specific items of work that are brought to the attention of the design team members by the CM/GC or BES. Schedule and frequency of visits will be as needed.
- **Structural Observations**: Structural engineers will provide the required structural observations, as defined in the final design documents. The Structural Engineer of Record's responsibilities are described below:
  - Provide onsite structural inspection and review as required by the Contract Documents.
  - Monitor Contractor compliance with plans and specs for rebar placement, concrete placement, dimensional requirements, completeness and acceptability of structural work.
  - Provide special inspections.
  - Report to Building Official.
- **Performance and Witness Testing:** Attend and witness field and performance tests as specified in the contract for construction and this contract scope.
- **Factory and Offsite Tests and Inspections:** Coordinate tests and inspections of work, materials, and equipment for the project at offsite facilities and suppliers, as specified in the contract for construction.
- **Subsurface and Physical Conditions:** When the CM/GC notifies BES of subsurface or physical conditions at the site that the contract for construction provides should be so notified, advise BES and inspect the conditions at the site. Advise BES as to the appropriate action(s), and assist BES in responding to the CM/GC.
- **Substantial and Final Completion:** Assist BES with inspections at substantial and final completion for each construction package, in accordance with the contract for construction. Assist in the preparation of up to eight separate punch lists of items requiring completion or correction. Make recommendations to BES regarding acceptance of the work based upon the results of the final inspection.

Assumptions

- Construction Visits – Assume design team visits average 8 hours per week during the entire project. This estimate is reduced assuming the presence of a field engineer as described above.
- Performance and Witness Testing – Assume 8 work weeks to startup the major processes.
- Factory and Offsite Tests and Inspections – Assume 15 visits of 2 person-days each to an offsite location.
- Subsurface and Physical Conditions – Assume 10 visits of 6 hours of onsite work. Assume an additional 10 visits of 4 hours each for QC of geotechnical field engineering. Significant field assignment for subsurface improvements is identified under the field engineering services.
- Substantial and Final Completion – Assume 8 staff for 1 day for each of six partial substantial completion and final completion.
- Expenses assume all site visits are within the Portland metropolitan area except for Factory Tests.

Task 3.2.5 Contract Modifications

Assist BES with the issuance of contract modifications during construction, as follows:

- **Rejecting Defective Work**: Office support staff will support BES's Project Representative and field staff to disapprove or reject work that Consultant believes to be defective, or that Consultant believes will not produce a completed project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed project as a functioning whole as indicated by the Contract Documents.
- **Authorizing Variations in Work:** Office support staff will support BES's Project Representative and field staff to authorize minor variations in the work from the requirements of the Contract Documents that do not involve an adjustment in the contract price or the contract times and are compatible with the design concept of the completed project as a functioning whole as indicated by the Contract Documents.
- **Contract Modifications:** Office support staff will review potential changes to the contract as requested by BES's Project Representative and field staff and make recommendations to BES regarding the acceptability of the change. Office staff will assist in preparation of contract modifications to the Contract Documents for the CM/GC and BES's review and approval. Design and engineering services to review Contractor-initiated changes and to prepare drawings and specifications for issuance to the Contractor shall be considered as Additional Services, entitling Consultant to additional compensation.

Assumptions

- Assuming that the BES Project Representative and Program Manager lead the contract modification effort, the total Consultant effort for this task is estimated to be 1,000 hours, split between consultants based on the preliminary drawing count.
- Design and engineering services beyond the limits of this budget will be subject to additional compensation.

Task 3.2.6 Operations and Maintenance Support During Construction and Startup

Provide O&M liaison support to the BES Ops and Maintenance staff throughout construction and startup/commissioning, assisting with O&M training, coordinating operational issues with the CM/GC, representing plant staff during construction meetings, etc. Support staff will also relay CM/GC issues

that affect O&M to BES staff, sitting in on lunch meetings or breaks with BES staff and explaining construction progress, decisions that need to be made, facilitating training sessions, providing operations support during training, etc.

Assumptions

- If authorized, the extent of the Consultant's involvement will be limited to the budget available.
- Level of effort and budget is allocated to SDC and Startup Testing tasks.
- BES or Program Support Consultant will coordinate vendor O&M manuals and training.

Task 3.2.7 Update 3D Model during Construction

Update original 3D model electronically until the end of construction. The budget and level of effort included for this task is an allowance for use as directed by BES's staff. Provide services under this task up to the limits of the budget allocated. Specific activities are to be authorized in advance.

Assumptions

- Assume 1.0 hours of effort per drawing for updating the 3D model.

The extent of the Consultant's involvement will be limited to the budget available.

Task 3.2.8 Record Drawings and Closeout Files

At the conclusion of the project, prepare record drawings on the basis of information furnished by the Contractor and the field staff. The record drawings will revise the Contract Document drawings, where applicable, and include the following deliverables:

- Three electronic copies of files on compact disc. Format of AutoCAD 3D models will be dimensionally accurate and representative of true installation space requirements. These models will not have data associated with them.
- Three printed copies of full-size drawings.
- Three printed copies of half-size drawings.

Assume 2.0 hours of effort per drawing for preparation of final record documents, assuming 3D model is also being updated in parallel.

Provide to BES an organized set of project documents, closeout files, and records from the office engineering tasks.

Task 3.2.9 Warranty Period Services

Provide the following warranty performance review services during the 1-year warranty period to assist BES in coordinating corrections of deficient equipment or construction:

- Participate in an end-of-warranty period inspection 1 month before completion of the warranty period and provide a letter identifying any deficiencies found and recommended actions.
- Make periodic visits to the site during the warranty period to monitor contract deficiencies in workmanship, materials, or equipment and prepare correspondence informing the Contractor of such deficiencies.
- Provide periodic onsite observation during correction of the deficiencies.

Assumptions

- The fee estimate is based on 500 hours total for inspections during the 11th month (before the end of the Correction Period) for three major packages including two claims made during the Correction Period.
- Coordination of warranties, guarantees, lien releases will be managed by BES or the Program Support Consultant.
- Additional services related to warranty claims, enforcement, and inspection can be provided, if needed, funded through the Owner's Contingency.

Task 3.2.10 Electrical Short Circuit Study

Provide draft short circuit, protective device coordination, harmonic and arc flash study report. Perform a study on propose new equipment and modified existing equipment for short circuit analysis, protective device coordination, harmonic and arc flash analysis. Existing equipment included in the study will only include items being replaced or modified. Equipment included will be those devices defined by National Electrical Code and NFPA 70E. Coordinate with Utility to obtain short circuit data and X/R ratios. Coordinate with BES to obtain copies of previous electrical studies and models and use this to inform updated studies. Draft studies shall be prepared during design and will be used to inform final equipment ratings. Final studies will be coordinated with equipment submittals and construction sequencing. Arc Flash labels will be provided and applied to all installed equipment in coordination with Contractor's work. PowerTools for Windows SKM shall be used for all power system modelling.

Assumptions

- Assume seven double-ended 15-kV unit substations, 17 MCCs, 4 switchboards, 40 distribution panels, 80 disconnect switches, and 20 packaged control panels (with starters/VFDs).

Deliverables

- Draft and final short circuit study, protective device coordination, harmonics and arc flash study reports.
- Create arc flash labels, to be field applied by the Contractor.
- Electronic power model files shall be provided to BES.

Task 3.3 Programming

The objective of this task is to ensure BES staff is comfortable with the planned software functionality that will be used to control and monitor all of the process equipment in the Program. Consultant will then proceed to develop that functionality, working closely with City staff, test it, and provide startup support.

Overall Assumptions

- BES will provide reproduction of training materials.
- BES will provide edits to software standards capturing workshop decisions.
- Traditional analog/discrete wiring methods where limited device data are available.
- Upgrading existing databases to the latest Configuration Offline Database (COD) application is not included.
- Program flow diagrams will be developed for more complex portions of code or where new DFB is used.

- PLC and human-machine interface (HMI) software development will be at location chosen by Consultant.
- BES will provide PLC hardware to Consultant during the software development phase.
- BES will provide temporary software licenses necessary for PLC and HMI programming.
- BES will provide minor graphical revisions to screens once they are functionally correct and operating in BES environment.
- BES will make available AST staff during the operational readiness test (ORT) and performance acceptance test (PAT) phases to assist in installing integrated applications into operating environment.
- BES will provide access to workstation capable of running both PLC and HMI software during ORT and PAT phases.

Task 3.3.1 Software Predesign and Workshops

Develop preliminary HMI screen sketches based on the project's latest design functionality requirements and prepare a PowerPoint presentation. A collective workshop with Engineering, operations, and maintenance staff will be held at the project site to review this functionality and proposed screens. A TM will be provided to summarize the decisions agreed upon.

Assumptions

- The level of effort for this task includes up to four trips to CBWTP.

Deliverables

- TM summarizing decisions on HMI screens and functionality requirements.

Task 3.3.2 COD Database Development

The COD tool will be used to develop and manage the points that will be created on this project. BES staff will be given the opportunity to review the tagging standards utilized. BES staff will be consulted to determine appropriate alarm behavior and will be configured into the database. Alarm responses and suggested actions will be developed and incorporated into the database, also for later use by O&M staff in the iFIX environment.

Assumptions

- Conventional control architecture, in lieu of a bus structure, will be used in the design.
- The level of effort for this task includes up to 1,200 hard wired I/O points and 4,000 software points.

Task 3.3.3 PLC Software Development

Consultant with AST staff will perform a review of available user definable function blocks and general code from other projects. New function blocks will be developed as needed. Program flow diagrams will be developed where needed to clarify more complex portions of code. The PLC applications software will then be developed specific to this project.

Assumptions

- The level of effort for this task includes up to three trips to CBWTP.

Deliverables

- Program flow diagrams.

Task 3.3.4 HMI Software Development

Develop the iFIX objects and displays. Leveraging screen sketches agreed upon by BES staff, Consultant will configure up to twelve new screens.

Assumptions

- The level of effort for this task includes up to three trips to CBWTP.

Deliverables

- HMI screens.

Task 3.3.5 Hardware Field Testing/ORT1 Support

Develop testing forms to supplement the field hardware Operational Readiness Test 1 (ORT1). Each loop, control circuit, and I/O point will be tested by the Contractor for proper operation.

Assumptions

- The level of effort for this task includes up to two trips to CBWTP to support ORT1 testing.

Deliverables

- I/O and loop based testing forms to supplement typical startup forms.

Task 3.3.6 Integrated Software Testing

Perform a combined PLC/HMI test offsite and/or at the staging site using simulated inputs and outputs. A loop-by-loop testing form will be developed and utilized to exercise the software and aid in troubleshooting.

During Phase 2 of the Operational Readiness Test 2 (ORT2), software will be re-tested by programmers and AST staff with actual field devices.

During PAT, the software will be re-tested again for other BES staff to confirm the software is performing as expected.

Assumptions

- The level of effort for this task includes up to ten trips to CBWTP.

Deliverables

- PLC and HMI import files as needed during startup.

Task 3.3.7 System Tuning

Tune the system during and after startup of the system to help the plant staff resolve software problems. Maintain a log of problems encountered and actions taken to resolve them.

Assumptions

- The level of effort for this task includes services provided before final completion and up to three trips to CBWTP.

Task 3.3.8 Training

Develop training material and train CBWTP staff in the operation of the process through the HMI screens. Additional training will be provided to a subset of the staff on the PLC software. The training sessions will be held at CBWTP. Training will occur on a live system supplemented with simulations to reflect operating conditions over the range of expected operating conditions.

Assumptions

- The level of effort for this task includes up to three 2-hour training sessions.

Deliverables

- Training materials in electronic format.

Task 3.3.9 Loop Sheet Updating

Update the process and loop narratives and loop drawings with software configuration information (i.e., alarms, etc.).

Deliverables

- Updated process narratives and loop narratives, loop drawings.

Task 3.4 Project Management for Construction Phase Design Services

Perform the following activities for the duration of the final (100%) design phase:

- **Workplan**: Consultant will update the design phase workplan to define the Consultant team's delivery approach, staffing, responsibilities, and project deliverables.
- **Reporting**: The Consultant will keep BES advised of the progress of the design support services during construction. This includes submitting monthly progress reports and burn charts to BES (with the invoice) and holding periodic meetings and consultations with BES.
- **Kickoff Meeting**: Before commencing the construction design phase, prepare for and conduct a "refresher" Kickoff/Chartering Meeting for Consultant team members, including subconsultants.

Assumptions

- The extent of the Consultant's involvement will be limited to the budget available.
- Consultant's SDC are based upon the schedule or duration of construction anticipated at the time that these services are agreed to. Deviations from the anticipated schedule or duration of construction will materially affect the scope of these SDC and Consultant's compensation for the SDC, and will require an adjustment to Consultant's compensation.
- Consultant will not be responsible for the means, methods, techniques, sequences, or procedures of the Contractor, nor shall Consultant be responsible for the Contractor's failure to perform in accordance with the Contract Documents.
- The main construction period will last 42 months beginning January 2021 (early out projects) and ending in August 2024. Expected duration of the main construction phase (secondary clarifiers and thickening/dewatering facilities) is 36 months after completion of final design.
- The construction will be delivered as a CM/GC project.
- Support/review of CM/GC bid packages is included in Task 2.3 above.
- Any reproduction, distribution, and mailing costs for the bidding of the contract for construction will be paid by BES.
- BES (or their Agent) will review monthly pay requests from the Contractor.
- BES (or their Agent) will provide surveying for baseline control for construction.
- Only BES (or their Agent) will issue decisions on Contractor claims and disputes. Consultant will not issue decisions on Contractor claims or disputes. Consultant will not, except as part of Additional Services, undertake comprehensive and detailed investigation or analysis of Contractor's claims and

disputes, nor participate in judicial or alternative dispute resolution procedures for the claims or disputes.

- Separate from Contract Modification support described above, labor and expenses required to address construction claims, claims resolution or litigation assistance requested of Consultant will constitute additional services.
- BES will provide to Consultant all data in BES's possession relating to Consultant's services on the project. Consultant will reasonably rely upon the accuracy, timeliness, and completeness of the information provided by BES.
- BES will make its facilities accessible to Consultant as required for Consultant's performance of its services and will provide labor and safety equipment as required by Consultant for such access. BES will perform, at no cost to Consultant, such tests of equipment, machinery, pipelines, and other components of BES's facilities as may be required in connection with Consultant's services.
- BES will give prompt notice to Consultant whenever BES observes or becomes aware of any development that affects the scope or timing of Consultant's services, or of any defect in the work of Consultant or the Contractor.
- BES will examine information submitted by Consultant and render in writing or otherwise provide decisions in a timely manner.
- BES will furnish required information and approvals in a timely manner.
- BES will cause all agreements with the Contractor to be consistent with Consultant's Agreement.

Task 3.5 Owner's Contingency – Construction Phase

This task provides an Owner's Contingency for the Construction Phase equal to 10% of the sum of all other subtask amounts. The Owner's Contingency will be managed by BES's Program Manager within the overall contract not-to-exceed amount. The intent of the Owner's Contingency is to provide budget for tasks for professional services that:

- Are required to complete the project as described herein.
- Result from decisions made by permitting agencies or other parties that influence the scope of professional services required to ensure project completion.
- Are needed to increase task budgets where the assumptions made to create the budget are violated and the violation is beyond the control of the Consultant.

Written authorization from BES's Program Manager is required to reallocate budget from this Construction Phase Owner's Contingency Task to an existing task or a new subtask that is within the overall scope of the project but not clearly defined as within the scope of Task 3.

Task 4 Startup and Closeout Phase

Task 4.1 Operator Process Training

Provide supplemental instruction to BES's staff in the operation, maintenance, and testing of the unit processes provided under this project. This instruction will cover both the basic operational concept and actual operation of the systems and components under both normal and abnormal operations that are likely to occur. The instruction will also include training of the staff for equipment maintenance. This task includes the following:

- Support BES staff in providing operator training based on design intent and installed systems.
- Conduct three workshops to discuss process theory, project improvements, and operational strategies associated with each process area (secondary, solids, electrical). Each workshop will be conducted twice to allow multiple shifts to attend.
- Conduct training sessions for the new process facilities by conducting classroom training and field training using the new process equipment. This instruction will cover both the basic operational concept and actual operation of the systems and components under both normal and abnormal operations that are likely to occur.
- Set up a series of scenarios in simulation model and conduct operator training for plant staff.

Assumptions

- Process training will be developed and coordinated with BES' senior process engineer.
- Provide 24 hours (8 hours x 3 shifts) of combined classroom and field training per major unit process. Assume there are approximately 15 unit processes (thickening, dewatering, polymer, sludge pumping, cake loadout, secondary clarifiers, WAS pumping, heating systems, hypochlorite, etc.).
- An additional 24 hours (8 hours x 3 shifts) of combined classroom and field training for the major electrical systems will be provided.
- 4 hours of preparation required per session (4 hours x 16 sessions).
- BES or the Program/Construction Manager will separately coordinate the services of qualified representatives from equipment manufacturers. Process engineer will attend manufacturers' training, assuming 2 hours for 25 pieces of equipment.
- 600 hours required for Replica Flight Simulator Training.

Deliverables

- Agenda and workshop material provided to BES ahead of the three workshops.
- Agenda and training material provided to BES ahead of training sessions.

Task 4.2 Process Operations Manual

Task 4.2.1 Develop Process Operations Manual

Develop a Process Operations Manual describing the operation of the project facilities and systems. This manual will explain the various primary modes of process operation that may be used, including both normal operation and initial emergency operation procedures. The manual will explain the purpose and basic concept of the various processes that are incorporated into the overall plant. Where appropriate, reference will be made to the manufacturers' detailed O&M submittals. It will include instructions for process operations and test or laboratory procedures that may be required to monitor the performance of the facilities. The manual will be suitable for use as an operational tool and to facilitate operator training. The manual will be produced in a computerized format using commercially available software.

Assumptions

- Process Operations Manual will be developed and coordinated with BES' senior process engineer.
- The Operational Strategy TM (developed above) will form the basis for the Process Operations Manual.

- Development of the Process Operations Manual is typically shared with BES's Operations staff. The exact scope of the Consultant's work will be determined before beginning work on this task, and the extent of the Consultant's involvement will be limited to the budget available.
- Fee assumes 480 hours to prepare a Process Operations Manual.

Deliverables

- Draft and final Process Operations Manual, including preliminary standard operating procedures (SOPs).

Task 4.2.2 Optional Subtask – Process Operations Manual Update

The Consulting team will coordinate with BES staff to revise and update the Process Operations Manual at the end of 1-year of operations, based on actual O&M experience and input from BES staff.

Assumptions

- If this task is authorized, the extent of the Consultant's involvement will be limited to the budget available.

Deliverables

- Update to Process Operations Manual.

Task 4.3 Startup Support

Provide process engineering support and operations and maintenance support during startup of each major process system. Process engineering support will be involved in ensuring that the new process systems are operating as they were designed. This assistance includes the following:

- Review Contractor's startup plan.
- Assist the CM/GC team in preparing a Startup and Commissioning Plan, which will include:
  - Specific actions and related completion dates for startup and operation of the new facilities.
  - Definition of testing parameters to verify conformance with design conditions.
- Provide engineering input and oversight during startup and commissioning of individual unit processes:
  - Witness performance tests as specified in the Contract Documents, review test reports applicable to the equipment and systems, and make recommendations to BES as to acceptance.
  - Analyze equipment and process performance for conformance with intended design conditions.
  - Assist with punch list and deficiency items identification.
- Assist BES during initial startup of the facilities by assisting assigned operating personnel.
  - Provide certified operations support to advise BES staff during startup/testing or to operate existing facilities while BES staff are engaged in startup/testing and training activities.
  - Use simulation model to verify that startup performance is as anticipated and to troubleshoot any unexpected outcomes.
  - Participate in weekly teleconferences, respond to email inquiries, and evaluate operational data and procedures.
  - Provide recommendations for operational, system, or control narrative changes to improve system performance.

Assumptions

- Engineering startup support will be closely coordinated with BES' senior process engineer.
- Engineering startup support will be split between senior process engineers and mid-level process engineers.
- Operational support will be split between prime consultant and subconsultants.
- The extent of the Consultant's involvement will be limited to the budget available. Additional funding, if needed, would need to be authorized via Task 4.7 Owner's Contingency – Startup and Closeout Phase.

Task 4.4 Operational Process Support

- In addition to the Process Operations Manual described above, assist BES process and operations staff in preparing SOPs describing step-by-step operations for each unit process.
- Visit the CBWTP to observe system operation and conformance with the intended design.
- Approximately 3 months after full process startup, once system is determined to be operating as intended in a steady state fashion, use simulation model to verify that startup performance is as anticipated and to troubleshoot any unexpected outcomes. Update process model to calibrate against operating conditions and provide updated model to BES.
- Provide certified operations support after startup, as requested.
- Provide additional support as requested by BES. Support may include the following activities:
  - Provide support to plant's process analyst.
  - Onsite support during transition of process operating modes.
  - Troubleshooting of operational and process issues during and after startup.

Assumptions

- A monthly half-day visit will be required for the first 12 months of operation.
- 480 hours of additional engineering and operational process support will be required (separate from site visits and modeling effort).
- The extent of the Consultant's involvement will be limited to the budget available.

Task 4.5 Project Management – Startup and Closeout Phase

Perform the following activities for the duration of the startup and closeout phase:

- Before commencing the startup and closeout phase, prepare for and conduct a "refresher" Kickoff/Chartering Meeting for Consultant team members, including subconsultants.
- Maintain and update the final work plan for the project that combines staffing commitments and budgets with the deliverables and schedule for the project. Specific responsibilities of each member of the final design Project team will be maintained. Update the overall design schedule each month. and review with the BES Program Manager, as needed.
- Supervise and control activities of staff assigned to the project. Coordinate and schedule appropriate project staffing discussions to meet project requirements. Arrange for the scheduled project workshops, review meetings, and project team meetings. Coordinate the participation of senior staff at appropriate points in the project.

- Coordinate with other projects and BES staff to complete work on schedule and within budget.
- Prepare monthly progress reports and submit with the monthly invoice. The reports will include a status summary of current project tasks, activities completed in the last month, activities planned for the next month, a project action issues checklist, performance compared to budget, and identification of items of concern. Organize monthly invoice and budget status report by WBS element, including a Monthly Subconsultant Payment and Utilization Report by the 15th of each month (reference Part II, Section C.5 of the RFP). Include budget reports based on using an "S" curve that shows budgeted work complete, billings to date, and estimate at completion.
- Monitor project activities for potential changes. Should change occur, and with BES approval, modify project tasks, task budgets, and approach. Inform BES if any changes will impact the cost of engineering services, the construction cost, or the schedule.
- Participate in weekly conference calls with BES project manager (project manager and design manager). Review the project status and discuss activities and needed actions. Prepare and discuss the 3-week look-ahead schedule.
- Submit change management forms, as needed to document scope/schedule/budget changes. Update the change log and review proposed changes and scope modifications with the BES Program Manager at the bi-weekly project management meetings.
- Support and attend (as requested) project briefings by BES project management team to upper management, City Council, etc.
- Maintain project records, manage and process project communications, and coordinate project administrative matters, utilizing the established Portland document management tool (Heron/e-Builder).

Assumptions

- Overall startup schedule of 4 months.
- Monthly invoices and major project submittals will be submitted through Heron/e-Builder.

Meetings

- 2 hours every week for 4 months to meet with BES project management and startup team.

Deliverables

- Updates to program workplan.
- Monthly project invoices and status reports.
- Completed change management forms, as needed, to document impacts of potential changes on engineering fee, construction cost, or schedule.

Task 4.6 Optional Task: Facility Automation – HMI with Dynamic Process and Hydraulic Model

Elements of the task are as follows:

- Utilize simulation model to help software integrator understand the intent of process control narratives to support programming effort.
- Advance the simulation model to connect directly to the programed software (PLC, SCADA, etc.) so that the programmed logic can be tested in a simulation environment against simulated hydraulic conditions before being used on the actual plant.

- Advance simulation model to either:
  - Incorporate plant SCADA screens into model so that the operator inputs/set points in the simulation environment are the same as in SCADA.
  - Connect the simulation model directly to the plant SCADA system so that the operator inputs/set points in SCADA are connected to the simulation model.

Task 4.7 Owner's Contingency – Startup and Closeout Phase

This task provides an Owner's Contingency for the Startup and Closeout Phase equal to 10% of the sum of all other subtask amounts. The Owner's Contingency will be managed by BES's Program Manager within the overall contract not-to-exceed amount. The intent of the Owner's Contingency is to provide budget for tasks for professional services that:

- Are required to complete the project as described herein.
- Result from decisions made by permitting agencies or other parties that influence the scope of professional services required to ensure project completion.
- Are needed to increase task budgets where the assumptions made to create the budget are violated and the violation is beyond the control of the Consultant.

Written authorization from BES's Program Manager is required to reallocate budget from this Startup and Closeout Owner's Contingency Task to an existing task or a new subtask that is within the overall scope of the project but not clearly defined as within the scope of Task 4.

Attachments to the Scope

- Level of Effort and Budget.
- Project Schedule.