

# Council Business Meeting

May 18, 2021

<b>Agenda Item</b>	Award of a Professional Services Contract; Dam Safety Improvement Project for Final Engineering	
<b>From</b>	Scott Fleury PE	Public Works Director
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## **SUMMARY**

Before the Council is an award of a professional services contract with GEI consultants for the Dam Safety Project as defined and approved in the City's capital improvement program. This contract is for phase 2, final engineering for a cost not to exceed, \$698,718.

## **POLICIES, PLANS & GOALS SUPPORTED**

City Council Goals:

Essential Service-Drinking Water System  
Emergency Preparedness  
Address Climate Change

Climate Energy Action Plan:

Natural Systems: Air, water, and ecosystem health, including opportunities to reduce emissions and prepare for climate change through improved resource conservation and ecosystem management.

*Strategy NS-2: Manage and conserve community water resources*

Continue to leverage resources to develop and/or enhance Value Services

Department Goals:

- Maintain existing infrastructure to meet regulatory requirements and minimize life-cycle costs
- Deliver timely life cycle capital improvement projects
- Maintain and improve infrastructure that enhances the economic vitality of the community
- Evaluate all city infrastructure regarding planning management and financial resources

## **PREVIOUS COUNCIL ACTION**

The Council approved a preliminary engineering and alternatives analysis contract with GEI for the Dam Safety Project on October 15, 2020 ([Minutes](#), [Staff Report](#)).

The Council has also taken numerous previous actions to support Dam Safety including approvals of professional services contracts to analyze all aspects of Hosler Dam and approving the 2020/21 Biennium Budget which included appropriations for dam safety improvements. Future appropriation requests to support the project are included in the 2021-2023 Biennial Budget.

## **BACKGROUND AND ADDITIONAL INFORMATION**

Hosler Dam is maintained and operated by the Department of Public Works. Hosler Dam is a concrete arch dam on Ashland Creek that impounds the City's raw water supply in Reeder Reservoir. The Dam was constructed in 1928. In addition to Hosler Dam, there are two small concrete diversion dams at the upper end of the reservoir across the East and West Forks of Ashland Creek that predate Hosler Dam.

The City generates hydroelectric power at the power house located with the water treatment plant approximately 4,200 feet north of Hosler Dam. The power house is operated by the City's Electric Department. The City being a purveyor of hydroelectric power fall under the regulatory oversight of the Federal

Energy Regulatory Commission (FERC) Part 12. The Part 12 contains five subparts A-E that detail requirements a licenses must follow to ensure the safe operation of the system and provide protection for the residents of Ashland. Maintenance and improvement actions for Hosler Dam and associated appurtenances evolve from Part12D-Inspections and as required by FERC.

**Part 12D-Inspection by Independent Consultant:**

The purpose of this project is the continued protection of the City’s drinking water system through development of specific safety improvements for the Hosler Dam project as required by FERC, associated independent professional review of the dam.

Part 12D requires the City to hire an independent inspection consultant every five years to perform a formal inspection of the facility and detail findings in a final report. This consultant must be approved by FERC before they can perform any inspection and analysis duties associated with the project. At the June 5, 2018 Business Meeting, Council award a professional services contract to Cornforth Consultants to perform the Eighth Independent Consultant Inspection. The formal inspection with Cornforth, FERC and city staff occurred in September 2018. The independent review also requires the potential failure modes (PFM) of Hosler Dam to be formally evaluated and revised as necessary in direct coordination with FERC at a PFM workshop after the inspection. The Eighth Inspection report was finalized in December 2018 and transmitted to FERC for review.

A major point of emphasis from FERC with respect to the PFM update is the potential erosivity of the left abutment under defined maximum flood loading conditions. FERC has requested the City develop a plan and schedule to address the erosivity concern. FERC has also requested the City review additional dam features for improvement, including evaluation of the spillway, spillway structures and dam piping penetrations. In order to mitigate the risk associated with this failure mode and address other dam maintenance concerns, staff drafted a Qualifications Based Solicitation (QBS) to formally solicit engineering services for the development of final plans, specifications and estimates to mitigate safety concerns. The project is broken into three distinct phases, preliminary engineering/alternatives analysis, final engineering, and construction administration. The contract before Council as attachment #1 is for final engineering. Construction administration and a formal construction contract will be brought forth at dates to be determined once final engineering is completed and FERC approval on the solution has been obtained.

The final engineering scope includes moving the preferred alternative forward to 100 percent design, geotechnical site work, development of construction specifications and bid documents, permitting, cost estimating and project management, reference attached scope and fee document for itemized details.

**Preliminary Engineering Phase**

To date GEI consultants have completed the preliminary engineering phase of the contract. The preliminary engineering phase included an alternatives analysis for solutions (five percent design) to mitigate the critical PFM, an alternatives workshop, cost estimating for improvements and geotechnical investigation/analysis. At staff direction the preliminary engineering scope was modified to include more geotechnical analysis site work to better affirm alternatives solutions moving towards selection of the primary alternative. This additional geotechnical work included a seismic refraction survey of the site and development of a geotechnical work plan for core drilling of the embankment areas to determine true extents of erosive soil limits. The geotechnical work plan has been submitted to FERC and must be approved by them in order to proceed forward with any core drilling investigations.

Primary alternatives to mitigate the critical PFM event included a complete dam raise, parapet wall height increase, construction of a piano key or labyrinth weirs, spillway modifications and concrete buttress protection of left abutment embankment. All of these alternative solutions were vetted in the alternatives workshop and could be designed and constructed to pass the PMF and/or protect the left abutment

embankment. The parapet wall raise was determined to be the preferred alternative due to, constructability, cost, schedule, environmental permitting, construction risk, minimal maintenance and overall design life when compared against the other options.

GEI and staff also looked at other components of the project for improvement/rehabilitation in associated with mitigating the PFM. These included restoration of the lower level outfalls, replacement of the walkway (outside of PMF), and maintenance activities for the raw water intake tower. Some of these improvement components were placed in the 20-year Capital Improvement Plan with expenditures starting in Fiscal Year 2024-2025 as they are secondary items in relation to resolving the critical PFM and can be vetted based on risk moving forward.

### **FISCAL IMPACTS**

The proposed fee for the final engineering phase is \$698,718. The five percent design level cost estimate for the parapet wall raise is \$4,276,575, which includes a 50 percent contingency at this point in time due to the level of uncertainty. To date \$299,667.74 has been expended towards the preliminary engineering contract. \$800,000 was appropriated in the 2019-2021 Biennium Budget for the project and staff has requested \$4,800,000 in appropriation funding in the 2021-2023 Biennium Budget to support the project engineering and construction moving forward.

### **STAFF RECOMMENDATION**

Staff recommends approval of the professional services contract with GEI Consultants for final engineering of the Dam Safety Improvement Project.

### **ACTIONS, OPTIONS & POTENTIAL MOTIONS**

1. I move to approve a professional services contract with the attached scope of services with GEI Consultants for final engineering of dam safety improvements in the amount of \$698,718.
2. I move to add or modify scope of services (add modification).

### **REFERENCES & ATTACHMENTS**

Attachment 1: GEI Consultants Scope and Fee for Final Engineering

## HOSLER DAM SAFETY IMPROVEMENT PROJECT PROPOSED ADDITIONAL SCOPE OF SERVICES

May 4, 2021

### SCOPE OF SERVICES

Consulting  
Engineers and  
Scientists

The following task descriptions summarize our proposed additional scope of services for the tasks presented in the attached cost estimate spreadsheet. Our original proposal presented our services under Tasks 1 through 10. These additional services are numbered Task 5 and Tasks 11 through 14.

#### Task 5 – Develop 30% Design and AACE Class 3 Cost Estimate for Alternative 7 (Parapet Wall)

Based on the results of the workshop conducted in 2020, the City has decided to carry forward Alternative 7 (Parapet Wall) in order to mitigate the potential left and right bank erosion immediately downstream of Hosler Dam. GEI proposes to bring Alternative 7 (Parapet Wall) to 30% design and includes the associated AACE Class 3 cost estimate. We anticipate the following analyses will be needed for this alternative, as appropriate, and at the City's discretion:

- **30% Structural Design:** We propose to complete a 30% design of Alternative 7 utilizing a 3D FEM modeling approach. GEI will utilize SAP2000 to perform the FEM analysis. The analysis will incorporate the material properties and geometry used from previous evaluations of the arch dam. The model will be loaded per the load types and combinations put forth in FERC's *Engineering Guidelines for the Evaluation of Hydropower Project, Chapter 11 – Arch Dams*. Seismic loading for the 30% analysis will utilize a response spectrum approach. GEI will review the results of the model for dam stability and strength at representative sections to determine if the factors of safety for pre- and post-seismic loading combinations can be met for Alternative 7. The analysis effort and results will be summarized and presented in the Basis of Design Report. The information from the modeling will be used to generate representative plans, section, and details for each alternative that will be used to prepare the 30% cost estimate.
- **30% Hydrologic and Hydraulic Model Evaluation:** We will validate the existing condition flow versus stage rating curve and modeling weir coefficient with best available recorded flow data and updated with best available topographic data. We will provide documentation for validating the model parameters and results for the proposed alternative.
- **30% Mechanical and Electrical and SCADA:** We proposed to provide 30% complete flow diagrams with basic mechanical, electrical and control concepts shown for Alternative 7. The flow diagrams will show instrumentation and SCADA concept. Preliminary drawings showing mechanical and electrical design concepts to the 30% design complete level will be provided. It is anticipated that mechanical, electrical lighting and power control devices, and field instrumentation and control panel design concepts will be shown. Construction cost estimates will be provided for each option.

For cost-estimating purposes, we have assumed a reasonable level of effort will be required to complete the analyses.

We have also included environmental services for this task in order to evaluate regulatory requirements associated with the design and construction of a parapet wall on top of the existing concrete dam. In order to determine the regulatory requirements, we have budgeted time in this task for outreach to FERC regulatory specialists, U.S. Forest Service, and the Oregon Department of Fish and Wildlife. We note that this outreach would be done in conjunction with City staff, and only with your approval.

It will be important to coordinate with FERC during this effort to ensure to the best of our abilities that our design alternative(s) are agreeable to FERC.

The work performed under Task 5 will be presented in a 30% design package which will include the following:

- Basis of Design Report (30%)
- Plans (30%)
- Specifications – List of specifications to be used for the project (30%)
- Cost Estimate – AACE Class 3 (30%)

**Deliverables:** The design package will be provided as a “draft” to the City for review. The final 30% design package will incorporate the City’s comments, as appropriate. We have assumed 3 weeks for the City and FERC to review the 30% design package. For the final deliverable, we will provide three hard copies with the “native” and “.pdf” electronic files uploaded through a secure server.

### Task 11 – Develop 100% Design and AACE Class 1 Cost Estimate

Following the completion of Task 5, GEI will proceed with Alternative 7 to 100% design and will include the associated AACE Class 1 cost estimate. We anticipate the following analyses will be needed for this alternative, as appropriate, and at the City’s discretion:

- Full Structural Design (Full 3D finite element model (FEM) with supporting calcs): GEI will utilize SAP2000 to perform the FEM analysis. The analysis will meet the guidelines presents in FERC’s *Engineering Guidelines for the Evaluation of Hydropower Project, Chapter 11 – Arch Dams*. The FEM will utilize a non-linear analysis. Concrete cracking between monoliths and horizontal joints will be model using gap elements to capture the full behavior and stress relief of tension cracking. A post-seismic analysis will be completed based on cracking behavior observed during the seismic analysis. The results of the FEM analysis will be used to verify the stability and stress factor of safety for the existing dam components. The new components will be sized and reinforced to meet current FERC and USACE guidelines for factors of safety and demand capacity ratios. Note: Although we understand FERC has approved the use of SAP2000 for the FEM analyses and GEI has successfully performed SAP2000 on other FERC regulated projects, FERC may require a more time intensive FEM using LS-DYNA. If LS-DYNA is required, the additional time and expense for this modeling will require additional cost. We estimate the **additional** cost to perform the FEM using LS-DYNA to be approximately \$80,000 (**which is not included in our attached cost estimate**)

Upon completion of the FEM analysis the results will be used to detail and design the new dam elements. The design will be summarized in the Basis of Design Report and an appendix added with the full calculations and analysis results. Structural drawings including plans, sections, and details will be generated utilizing the design information.

- 100% Hydrologic and Hydraulic Model Evaluation: We will provide model results (flow versus stage rating curve) and documentation based on final design. Documentation deliverable will include final model parameters, assumptions and flow and stage rating curve.

- Mechanical and Electrical and SCADA: Final Process and Instrumentation Diagrams (P&IDs) will be developed for Alternative 7 and detailed instrumentation, control functionality, and SCADA functions will be shown and specified. The P&ID drawing will be accompanied with detailed mechanical, lighting, and electrical power and control wiring drawings and specifications. The design requirements for these devices will be coordinated with the structural design. Detailed specifications will have been developed and reviewed with vendors and updated estimates provided.

For cost-estimating purposes, we have assumed a reasonable level of effort will be required to complete the analyses.

It will be important to coordinate with FERC during this effort to ensure to the best of our abilities that the selected design alternative is reviewed at each submittal design stage by FERC.

The work performed under Task 11 will be prepared and presented at the 65%, 90%, 100% (draft), and 100% (final) stages which will include the following:

- Basis of Design Report (65%, 90%, 100% (draft), and 100% (final))
- Plans (65%, 90%, 100% (draft), and 100% (final))
- Technical Specifications – 65%, 90%, 100% (draft), and 100% (final)
- Cost Estimate – AACE Class 1 and 2 (65%, 90%, 100% (draft), and 100% (final))

**Deliverables:** The design packages will be provided at 65%, 90%, 100% (draft), and 100% (final) to the City for review. Comments received from the City and FERC at each submittal stage will be incorporated in the subsequent submittal package, as appropriate. We have assumed 3 weeks for the City and FERC to review each design submittal package. For the final deliverable, we will provide three hard copies with the “native” and “.pdf” electronic files uploaded through a secure server.

## Task 12 – Phase 2 Geotechnical Investigation

The focus of the field exploration program will be to understand the dam foundation contact and the geologic conditions related to potential erodibility of the rock directly beneath the dam. The geologic conditions of the foundation rock will be evaluated during drilling with focus on weathering, discontinuity spacing, joint infilling and other factors. This information will be evaluated during the drilling to determine how many boreholes will be necessary. From review of the erodibility assessments by AECOM (2015) and Hatch (2008), we are assuming that rock of “R2” and/or “R1” quality as described by AECOM (2015) will be considered non-erodible, which we are characterizing as slightly weathered to fresh, moderate (0.3-1.0 feet) to slightly (1.0-3.0 feet) spaced fracture density, moderately hard (or harder), and strong.

A work plan prepared by GEI is currently with FERC for review and comment. An approved work plan will be required prior to GEI conducting the drilling. We anticipate minor edits, if any, will be required after FERC’s review. However, it is possible that the scope of the drilling could change following FERC’s review of the work plan.

GEI proposes to drill up to six (6) borings along the crest of the dam one (1) boring at the right abutment. Depending on the quality and strength of the rock encountered, the total borings drilled could be reduced to three (3) borings at the crest. The planned depths range from approximately 20 to 90 feet in depth and are



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based on the anticipated depth to the bedrock plus an additional 15-feet below the dam-bedrock contact. The final depths may vary based on field conditions encountered. For our cost estimate, we have assumed all six borings will be drilled and that the drilling will require 14 days to complete. To be efficient in the days to complete our proposed investigation, we have assumed the 10-hour days to perform drilling from Monday through Saturday. Hence the proposed 12 days will be completed during a 2 calendar-week period (i.e. 14 calendar days).

Due to site access limitations, the borings located along the crest of the dam will be drilled using a modular remote access drill rig. The drill rig will be transported by foot/hand cart to the proposed boring locations along the crest of the dam. The boring proposed at the right abutment is to better understand the foundation conditions of the proposed parapet wall at the abutment. A boring at the left abutment was deemed not warranted since there is a sizeable outcrop to inform the foundation material properties.

We have assumed clear water without an additive (i.e., polymer) will be used for the rotary wash drilling techniques for the borings along the crest. The water will be sourced from the reservoir with the aid of a water pump and hose. The use of an additive such as a polymer will be avoided if possible, for borings along the crest. For the boring at the right abutment a polymer may be used to improve circulation. A safety data sheet for the polymer (if needed) will be provided prior to commencement of our proposed field exploration activities.

All borings will be logged continuously by or under the direct supervision of a Registered Geologist or Engineer registered in the State of California or Oregon. Based on previous characterizations of the site it is anticipated that the majority of the borings will be cored through rock. The logging will be in accordance with ASTM D5434 Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock and ASTM D2113 Standard Practice for Rock Core Drilling and Sampling of Rock for Site Exploration.

We have assumed the hard rock sampled will be using either NQ3 (~1.8-inch diameter core) or HQ3 (~2.4-inch diameter core) diamond core rotary equipment and recovered in appropriate (e.g., double or triple) core barrels. Depending on the depth of the hole and concrete and rock conditions, it may be necessary to reduce the hole size to NQ3 to produce greater torque and advance the hole efficiently. Recovered core will be stored in wood core boxes. Rock cores will be photographed run-by-run prior to placement in the core boxes. Movement and transportation of core boxes will be minimized to reduce disturbance of the core.

All boreholes will be backfilled with cement-bentonite grout using the tremie method. Field survey using hand level and existing reference drawings will be performed to locate borings and obtain ground surface elevation. Estimates of elevation will be made to the nearest two feet. If an estimate is made, it will be so noted on the logs.

Disposal of rock cuttings and drilling fluids generated during the drilling operations will be coordinated with the City. It is anticipated that the materials encountered in the boreholes will be free of any environmental substances of concern (i.e., the cuttings/fluids will be non-hazardous). Thus, it may be possible to spread the cuttings and fluids out on the ground surface at or near the drill site (above the creek line), using small hand dug ditches or berms, as necessary, to control runoff. If this is not acceptable to the City, the cuttings and

fluids will be temporarily stored in 55-gallon drums or 20-cubic-yard, plastic-lined bins located near the Dam, prior to disposal at an appropriate landfill. The temporary placement and storage of these materials will be coordinated with the City. The time and expense to dispose of drum and/or bins to an off-site location is not included in this scope and fee estimate.

Samples obtained from the borings will be submitted for laboratory testing. Anticipated laboratory tests on rock and concrete samples could include the following:

- Unconfined compressive strength
- Petrographic analysis
- Point load index
- Tensile shear strength

The actual type and number of each test will be determined based on the subsurface conditions encountered in the borings. GEI and the City will review the field borehole logs and core photographs to develop a geotechnical laboratory testing program. After the testing program is determined, the samples will be removed from the core boxes, packaged, labeled, and sent to the appropriate laboratory. It is anticipated that the testing program will be completed approximately four to eight weeks after completion of the drilling.

A Geotechnical Data Report (GDR) will be prepared for the geotechnical investigation completed at the project site. The GDR will describe the field exploration procedures and the results of the field investigation, including the boring logs, surveying, field and laboratory testing results, site conditions, and any issues/concerns encountered during the investigation.

The GDR will be prepared as a draft for review and comment by the City prior to finalizing for FERC's approval. The bedrock will be thoroughly discussed in terms of its potential for erodibility. This will include detailed descriptions of the weathering, joint spacing, infilling characteristics, joint surface roughness and other factors.

It should also be noted the estimated fee shown on the attached cost estimate spreadsheet assumes the followings:

- Availability of onsite water for driller's use. We have assumed the reservoir water can be used for the drilling activities
- A drilling production rate of at least 50 feet/day
- No delays and/or standby due to weather and/or natural/manmade catastrophe

Estimating the cost for drilling through rock is difficult given the potential complications for site access and underlying rock conditions encountered during drilling. As such we have provided a reasonable estimate of the fee anticipated for this level of work. If complications occur (such as the need for a crane to position drill rig) or if additional borings are required, we will contact you to discuss.

**Deliverables:** Prior to commencing drilling, the existing work plan will be revised (as necessary) and submitted to the City and FERC for approval. Following the collection of geotechnical data, we will provide a GDR based on the results of the proposed geotechnical borings, laboratory testing, and analyses. We will



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provide a draft report for your review. The final report will be provided after incorporating the City's comments, as appropriate. We have assumed a 3-week review period for the City and FERC for each of the work plan and geotechnical report.

### Task 13 – Environmental

We will support the City in the preparation of a FERC Application to amend the existing FERC Exemption. This work will include initial consultation with the state and federal agencies with an interest in the project. This will include Oregon Department of Fish and Wildlife, the U.S. Forest Service, the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers (Corps), Oregon Department of State Lands, and the State Historic Preservation Office.

Hosler Dam is potentially an historic structure. Modifying the dam will require an evaluation to determine the dam's historical significance. In addition, any areas which will have ground disturbance will need to be inventoried for archeological resources.

We will also need to conduct a biological survey for sensitive biological resources in the project area and prepare a biological resources report.

The exemption amendment application will be submitted to FERC at the completion of initial consultation and after the completion of the above surveys.

We assume that permits from the Corps and Oregon Department of Environmental Quality would not be required. Unlike the Corps, Oregon Department of State Lands (DSL) regulates excavation (e.g., demolition) activities only (i.e., the Corps regulates the discharge of dredged or fill material); therefore, if demolition activities occur below WSE 2,870 feet, a permit from DSL may be required.

The cost estimate assumes that the Parapet Wall is the alternative for this task. If any other alternative is to be considered, we may need to revise our cost estimate for environmental compliance prior to starting work. We have also assumed that the project will not result in 'take' of any threatened or endangered species and that no significant historic or archeological sites are found in the project area.

**Deliverables:** Initial consultation package, FERC Application for Amendment of the Exemption, and Corps of Engineers permit application.

### Task 14 – Project Management

Critical to the success of any project is project management. Within this task we have budgeted a 1-hour-long monthly call between GEI and the City and have assumed this phase of work (i.e. Tasks 5 and 11-13) will have a duration of nine (9) months (May 2021 through January 2022). We have included four (4) GEI staff in each meeting, as we anticipate having various technical staff participate depending on the stage of work we are engaged in. We have also included within this task general project management time.

**Deliverables:** Where appropriate, meeting notes will be provided to the City.

## ESTIMATED SCHEDULE

Following the City's review and approval of the tasks described above, we will commence Phase 2 Geotechnical Investigation (Task 12) immediately for drilling start date of June 1, 2021.

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In addition, we can also commence with Task 5 immediately upon this proposal approval. We will complete a draft of the PS&E for Task 5 within 4 weeks following completion of the geotechnical investigation (Task 12). We have assumed FERC will review each step of the plan and specification development (i.e. 30%, 65%, 90%, and 100%). We have assumed a maximum of 4 weeks for FERC's review of each PS&E submittal package. Following FERC's 30% design review, we will commence with Task 11 (100% design).

We have included a detailed schedule of Tasks 5 and 11 through 14 assuming an approval date of May 18, 2021.

## PROJECT FEE

We propose to perform the various tasks on a time-and-materials basis for an estimated not-to-exceed cost. If additional services are required or requested beyond those described above, they will be performed on a time and expense basis in accordance with the attached Fee Schedule. The City will be notified of any additional services for concurrence prior to them being performed. Our estimated costs for the above tasks are \$698,718 and are detailed in the attached table. The estimated fees for the services proposed by our subconsultants are presented under "ODC" (Other Direct Costs) in Table 1. The fees shown include GEI's 15% mark-up. ODCs include the following:

- IEC – Cost Estimating
- Salisbury & Associates - Driller Subcontractor
- Cooper Testing - Geotechnical Laboratory Testing
- GEI Travel Expenses

## CLOSING

We appreciate the opportunity to provide you these additional services as we continue to assist the City on this important project. Please call/email Craig Hall (510.224.6242, [chall@geiconsultants.com](mailto:chall@geiconsultants.com)) or Chris Slack (503-342-3782, [cslack@geiconsultants.com](mailto:cslack@geiconsultants.com)) if you have any questions or require additional information.