Background

The purpose of the Walla Walla River Water Exchange is to reduce irrigation surface water withdrawals from the Walla Walla River. This would be accomplished by supplying an alternate source of water directly to the existing irrigation distribution systems located in the upper Walla Walla River Basin, thus leaving more of the natural flows in the Walla Walla River. The alternate source of water under this proposal would be the Columbia River.

Two studies have been completed by CH2M Hill, with the first completed in 2007 looking at the alternative conveyance systems that could potentially perform this task. They performed this work under the auspices of the United States Army Corps of Engineers (Corps). The second study provided a revision of the first study looking at the potential for cost reductions. The 2007 study estimated the costs of constructing the system at $267 million. The second study resulted in estimated costs greater than the initial study. This proposal did not include looking at a storage dam nor did that estimated cost include engineering and legal costs. In the previous Corps of Engineers study when dams and reservoirs were included, the estimated costs increased dramatically. None of the estimated costs included legal or engineering fees as well.

Previously a Walla Walla River Stakeholder group met with IRZ Consulting to discuss the possibility of IRZ reviewing the Corps studies, and providing a non-federal look at the project. The discussions made it clear that the Corps’ proposal was cost prohibitive, and that the Stakeholders felt that the costs could be reduced significantly if a non-federal / private approach was investigated. That group requested that IRZ look at various alternatives, with associated estimated costs for a non-federally designed project.

Under that initial study Phase-I conducted in 2012, IRZ presented its feasibility level findings on providing either 100 cfs or 200 cfs of exchange water to Gardena at Hill Top (Gardena) utilizing various sizes of pipes. A copy of the Phase I Report is attached. The estimated costs determined, ranged from a low of approximately $58 million for a small pipeline providing 100 cfs to Gardena, to a high of slightly more than $99 million for a large pipeline providing 200 cfs to Gardena.

Subsequently after the initial report was completed, the Walla Walla Basin Watershed Council retained IRZ Consulting to conduct a Phase II study in 2014 that would extend the exchange system from Gardena to the location on the main Hudson Bay canal known as The Frog near Milton Freewater, Oregon, and to do an initial review of a storage dam located in the Pine Creek Drainage.
That Phase II Report provided a feasibility study overview for providing exchange water from Gardena to The Frog, including providing water at various delivery points serving Hudson Bay Irrigation District irrigators. That Phase II Report also included a high level feasibility review for placing a storage dam in the Pine Creek Drainage, and how that would interact with the existing system. The estimated cost of installing this Phase II portion of the new pipeline system was approximately $52 million. The proposed dam (smaller than the proposed Corps dams) was estimated to cost an additional $100 million to construct.

In 2015 the Walla Walla Watershed Council commissioned this Phase III feasibility study. The purpose of this study is to look more closely at a total project-wide approach, with the exception of the storage dam and reservoir in the Pine Creek Drainage that was previously looked at in Phase II. This Phase III study also looked at providing water to the upper portions of the Gardena Irrigation District as well as to the various Louden irrigation districts. As part of the study the locations of the specific delivery points were identified in more detail, and specific pipeline routes finalized with the assistance of irrigators, district representatives and field inspections.

**Design Criteria**

In order to design and model the proposed system from Gardena to the various Hudson Bay Irrigation District designated delivery points, The Frog, the upper Gardena deliveries, and the Louden districts main delivery point, (see map attached) design criteria were established. The criteria were based upon meetings and discussions with representatives of the Walla Walla Basin Watershed Council, Hudson Bay Irrigation District, Gardena Irrigation District and the managers of those districts. The criteria are as follows:

1. State and Federal funding will be utilized, and the design and cost estimates need to reflect this.

2. For the purpose of this study the system will be designed for a total capacity of 200 cfs from the Columbia River.
3. Design delivery rates to specified diversion points (see attached map) are as follows:

A. 100 cfs to Gardena
B. 45.7 cfs to Pine Creek
C. 31 cfs to Richartz/Huffman
D. 15.9 cfs to White Pipe
E. 35.2 cfs to Highline
F. 6.9 cfs to The Duff Weir
G. 9.3 cfs to Barrett
H. 65.0 cfs to The Frog
I. 25.8 cfs to Upper Gardena
J. 15.6 cfs to Louden

The total of these deliveries exceed the 200 cfs that is the design capacity of the proposed Columbia River pump station. Each section of the proposed pipelines will be designed to carry the full designed delivery rates for the diversion points they serve, with the exception of the main pipeline from Gardena to the take offs for both Louden and Upper Gardena. It is assumed that owing to timing of when water rights are authorized, and the various crops being grown in the area, that the system will never call for all deliveries to be served at 100% at any given time.

4. The pipelines are designed with a velocity between 4 and 6 feet per second in order to maintain energy efficiency and minimize costs.

5. From Gardena the pipelines will be routed along existing canal and road right-of-ways as much as possible as shown on the attached map in order to minimize right of way acquisition. Significant time, effort and cost will be associated with acquiring the required right of ways for the project.

6. From the Highline diversion point to The Frog the pipeline system will be designed for a capacity of 65 cfs to serve the Walla Walla River Irrigation District. If this district doesn’t participate this section of pipe can be eliminated and the pipeline from Gardena to Highline diversion point could be downsized. If this pipe is eliminated no bi-directional utilization of the new pipeline could be made.

7. As part of the design of the pipeline system the ability for water to flow bi-directionally from The Frog to Gardena in the proposed pipeline was reviewed. When live flow Walla Walla River water is available significant amounts of water could potentially flow in the reverse direction in the pipeline utilizing gravity, significantly reducing canal losses. If the Walla Walla Irrigation District does not participate this would not be feasible as there would be no need to run pipeline to The Frog. From The Frog to the Duff Weir the pipeline has been upsized to allow for this reverse flow.
8. In order to serve the Louden districts with water from the Columbia River a pipeline with a capacity to deliver 15.6 cfs would need to be installed.

9. Based upon the above criteria and analysis of results from our detailed hydraulic modeling, the following are the basic findings:

A. The Phase I Report indicated that 200 cfs could be supplied from the Columbia River utilizing a main 4,400 HP pump station at the Columbia River, a single 4,400 HP booster station, and an 86” steel pipeline to Gardena. The estimated costs associated with this system would be approximately $99 million.

B. The Phase II Report provided a feasibility study overview for providing exchange water from Gardena to The Frog, including providing water at various delivery points serving Hudson Bay Irrigation District irrigators. That Phase II Report also included a high level feasibility review for placing a storage dam in the Pine Creek Drainage, and how that would interact with the existing system.

C. This Phase III report takes a closer look at the pipeline, and pump portions of the Phase II report, and expands that review to consider providing water to the upper reaches of the Gardena District, and to the Louden Districts. This phase did not take a further look at a Pine Creek Reservoir or the pipes and pumps that would be required to serve it. The estimated costs for the total pipe and pump system from the Columbia River to The Frog, not including a reservoir would total to approximately $162,950,000. A summary of the project follows:

1. The Columbia River pump station to pump 200 cfs would be include a river intake system and a 4,400 HP pumping plant.

2. In order to provide the design flow to Gardena a pipeline was designed along with a 4,400 HP booster station.

3. In order to provide the design flows to the various delivery points, pipelines were sized and located as shown on the maps attached.

4. To provide water to The Frog a 4,000 HP booster station will need to be installed after the Hudson Bay Irrigation District’s, Richartz/Huffman diversion point.
5. Given the elevation change from The Frog to the various locations along the pipeline route back to Gardena, significant Walla Walla River water can be run backwards in the system to Gardena reducing significant canal losses, when live flow from the Walla Walla River is available.

6. The routing of the pipelines will be critical to the operation of the system, and to minimize the acquisition of right-of-ways. It is intended to route the pipelines utilizing canal company, along with county and city road right-of-ways as shown on the attached maps as much as possible.

Those routes are based upon discussions with irrigation district representatives and the best judgment of the system designer. These locations will need to be confirmed and surveyed prior to final design. The routing of the steel pipeline within Milton Freewater to The Frog appears to be quite problematic owing to the nature of permanent crops and residential areas that will need to be crossed.

7. Utilizing a private sector system design will significantly reduce costs and provide for greater operational flexibility when compared to a federally designed system.

Costs

Costs were estimated based upon historical information taken from previously constructed projects and contacting pump and pipe suppliers (2015). The costs that have been generated are at a feasibility estimate level. The table showing the estimated costs is on the following page.
The total estimated annual power costs to operate the river station, Booster 1 and Booster 2 would then be approximately $2.15 million for 90 days of operation.

The estimated costs generated as part of this study are significantly less than those reported in the previous Corps reports. These cost estimates are based upon a design that more closely reflects how a project of this type would be constructed in the private sector utilizing Government funding. These costs could be further reduced if private funding is utilized.
Conclusion

This Phase III feasibility study is a continuation, and expansion of the previously completed Phase I and Phase II studies looking at exchanging Walla Walla River water with water pumped from the Columbia River. This study specifically looked at the portion of the proposed project that would deliver water from Gardena to The Frog, with the additions of portions of the system to serve the Louden Irrigation Districts, and the upper portions of the Gardena Irrigation District. The study formalized specific delivery point design volumes and locations throughout the system. Routing of the pipelines was verified through field inspection and client comments. The estimated costs associated with this portion of the exchange system were updated. The previously proposed Pine Creek Dam and Reservoir were not included in this study, and it is understood that others would be looking at that option in more detail.

In reviewing the design, location and associated costs it became clear that this would not be a simple system, with many potential hurdles including acquiring many right-of-ways to meet the needs of the system. The estimated costs of installing a private sector designed system appears to be significantly less than a government type system. Taking the savings into account this would still be a costly system to design, build and operate.

Based upon the findings of the various Phases several different approaches and alternatives could be utilized that would generate significant environmental and instream benefits to various degrees. The alternative(s) selected will be based upon many factors including the availability and level of funding.

Recommendations

1. In order to move forward with getting the project started an organization needs to be established that has legal authority to set goals and timelines, determine sources of funding, and be able to authorize taking the next steps in the process. This organization must represent the stakeholders in the Walla Walla Watershed that would be impacted by this project. IRZ would be available to assist in establishing this organization.

2. There have been a number of studies that have been performed. The overseeing organization needs to review those documents and determine how best to utilize them.

3. The source of potential funding needs to be determined early in the process. The source of funding, and the amounts available will play a major role in establishing guidelines for completing the project. Federal, state and private funding or combinations thereof should be explored.
4. This project is broken up into various components. By taking a phased approach the project can get started without the need for full funding to be in place. By accounting for future development, benefits of the project can continue to expand over time, and as the availability of funding comes to fruition.

5. When a course of action is established and funding acquired, a construction level design will be required. This design will need to match up to the requirements established by the controlling organization along with the entity(s) funding the project.

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