RECLAMATION
Managing Water in the West

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Questions from the March 29, 2005, Public Meeting
Yakima River Basin Water Storage Feasibility Study

How did the Bureau of Reclamation estimate excavation costs/depth?

After developing preliminary sizes for the various features of the Black Rock Alternative, Reclamation computed quantities of rock and soil excavation based on available topographic and geologic data. Unit prices, adjusted for location and current construction cost trends, were determined for these pay items and applied to the calculated volumes of excavation.

How significant are the faults at the damsite? What is an active and inactive fault?

Our present understanding of the geology at the damsite indicates that faults are present in the Black Rock Valley. At this time, we do not know how significant these faults are. Additional study of the faults will be conducted at the Black Rock site in the fall of 2005 and in 2006 to guide engineering decisions on design and placement of the dam and related structures. Faults which are capable of producing earthquakes are called active faults. Inactive faults are older faults that are no longer capable of producing earthquakes.

Will the proposed Black Rock dam hold water?

In 2004, a single borehole was tested to assess the hydrogeologic conditions at the alternative damsite. At the borehole location, there was some vertical leakage between the basalt flows that underlie the sand and gravel "overburden." Additional testing is necessary to determine the aerial variability of the hydrogeologic conditions. In the fall of 2005 and in 2006, groundwater testing will be performed to examine the leakage issue. As part of the feasibility investigations, we are planning to conduct additional hydrologic tests at several locations within the proposed reservoir basin and reservoir rim. These tests will further characterize the hydraulic properties of the underlying geologic units and the amount of leakage that could occur. Hydrologic modeling, in conjunction with the Pacific Northwest Laboratories, is planned to determine the impact of potential leakage from the reservoir.

Why is it necessary to deliver water upstream in the Roza system?

The current Black Rock alternative includes several options for water delivery including delivering irrigation water to all the users of Roza Irrigation District. These options are displayed so informed decisions can be made about which irrigators will receive water. A decision may be made later that delivering Columbia River water to irrigators located above MP22.6 on the Roza Canal is too expensive and they will continue to receive Yakima River water for irrigation. Those decisions will be deliberated in the feasibility phase of the Storage Study.

What is wrong with a "design-construct" process?

The design-construct process typically involves one entity being responsible for both project design and construction. Reclamation typically employs a process called "design-bid-construct" because it has the in-house expertise to prepare design, award construction contracts, and perform construction management. The significant liabilities associated with high dams with large reservoirs generally do not favor the design-construct process whereby the owner sets general performance requirements and the design-builder warrants after completion that the facility will perform as required.

Where is the highway located in the Black Rock Alternative?

The Assessment Study relocated State Highway 24 to the south of the potential Black Rock Reservoir because of concerns with topography and land ownership on the north side. (See Figure 53 of Technical Series Report No. TS-YSS-2.) Because of the estimated high cost for this road relocation, future studies will consider alternate routes both on the south and north sides of the reservoir.

What were the historic fish flows? Are you trying to go back to the historic flows? How will we determine the number of fish to be produced by each alternative?

First, historic fish flows and historic flows are synonymous. From an adaptation perspective, Yakima salmon and steelhead populations have adjusted their life history patterns to maximize survival to the historical Yakima basin hydrograph. We are not trying to achieve the exact historical flow levels (i.e., cubic feet per second), but rather the historic flow pattern. The generalized historical flow pattern was one that produced high spring flows coinciding with snowmelt and low summer base streamflows that were largely groundwater fed. We are using the RiverWare and the Indicators of Hydrologic Alteration hydrologic models to generate annual hydrographs for several gauging sites (i.e., Easton, Cle Elum, Naches, and Parker) to determine how well they mimic the historical flow pattern. The two models were also used to produce an unregulated annual hydrograph which we are using as the historic flow pattern. For the unregulated annual hydrograph, snowmelt and rainfall were allowed to flow through the five storage reservoirs in a natural manner, as if the reservoirs were not in place. Also, all irrigation diversions were turned off for the unregulated flow hydrograph.

To determine the number of fish produced for each alternative, we are using the Yakima Basin Ecosystem Diagnostic & Treatment (EDT) model. This is a fish habitat based model, which uses information about the quality and quantity of fish habitat in the Yakima River basin to estimate fish abundance. We are using other models to generate habitat information (in terms of quality and quantity) for each alternative that is analyzed. The output from these models will be used as input information to the EDT model.

How will the false attraction issue be addressed? This is anticipated to occur if Columbia River water is put directly into the Yakima River system.

The false attraction issue is being addressed primarily through investigation of similar transbasin water transfer projects in other basins. Recently, we solicited for information on this topic from a fish-passage news group and got several responses that are being reviewed (most were from California). One example in the Northwest is the Columbia River exchange project in the Umatilla basin (where Columbia River water is exchanged for Umatilla River water). We will use Reclamation employees who are familiar with the operation of the Yakima Irrigation Project, as well as other people who have experience in this field such as fisheries biologists with the Umatilla Tribe, staff from the Yakama Tribe, and people from the University of Washington, School of Aquatics and Fishery Sciences. We will also review existing fishery scientific literature to determine what has been done in the past to investigate the issue of false attraction with salmonids. The intent is to use the information provided from these various examples and knowledge, and incorporate it into the engineering design and irrigation operation procedures for a Columbia River water exchange in the Yakima basin.

Would Bonneville Power Administration power revenues constitute Federal or non-Federal cost-share for construction?

Reclamation has not determined the final category of any cost share received from Bonneville Power Administration (BPA) rate payers. We have contacted BPA to start these determinations. The disposition of the power revenues will be determined during the feasibility phase when the features of a possible project are determined.

What is the Federal policy on cost-sharing projects, and what other projects have been cost-shared?

Reclamation policy requires cost sharing of the planning costs with non-Federal partners. Non-Federal cost share must equal or exceed 50 percent of the total feasibility study cost.

Reclamation policy also requires non-Federal parties to provide up-front funding (i.e., financing) for a significant portion of a project's construction costs. This has been Reclamation's policy since the early 1980s. The amount of cost-share needed by the non-Federal entity is negotiable and is a function of the cost and size of the project, available Federal dollars, and other factors pertinent to the specific project.

Since the mid-1980s, Reclamation has uniformly sought and obtained up-front funding from non-Federal parties and Congress has generally concurred or itself imposed this requirement on individual projects. Examples include

the Animas-La Plata Project in Colorado, several rural water projects in Reclamation's Great Plains Region, the Plan Six phase of the Central Arizona Project, and the recently executed Multi-Species Conservation Plan for the Lower Colorado River.

What experience does Reclamation have in building large projects, and what is its track record?

Since 1902, Reclamation has designed and constructed over 240 water storage embankment dams in the Western United States. The list of embankment dams built by Reclamation includes many of the most innovative, largest, and highest dams of their eras as well as several in the Columbia Basin and all the major water storage structures in the Yakima Basin. Reclamation maintains an extensive design and construction management staff to perform safety of dam analyses and reconstruction to keep those storage structures operating at their peak capacity. Reclamation has an excellent track record in design and construction methods as other Federal agencies and foreign governments utilize Reclamation's experienced staff for consultation, design, and construction.

The Pacific Northwest Region of Reclamation includes the entire Columbia River Basin watershed in the United States. Beginning in 1904, Congress has authorized 39 projects throughout the region. There are 72 dams, dikes, and diversions and more than 4,700 miles of canals. In the Pacific Northwest, Reclamation delivers water to 175 irrigation districts which irrigate approximately 2.9 million acres. Annual power production averages about 23.8 billion kilowatt-hours of electricity from 10 power- plants.

Can the study be completed within a year or shortened somehow?

When Federal water resource projects are being proposed, Congress and the President expect the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&Gs) to be followed. These rules were developed to provide consistent economic and environmental information to Congress and the President about possible projects to be developed with Federal funds. All reasonable alternatives that might solve the identified problem must be analyzed in a feasibility study and the environmental impacts of the final or preferred alternative have to be displayed. In addition, benefits must be determined for those alternatives to show the comparison of the benefits to the potential project costs. A thorough analysis of the impacts, costs, and benefits of the alternatives must be completed to make it through the public scrutiny that a project of this magnitude will surely create.

Reclamation is developing computer models to show how the alternatives, Black Rock, Bumping Lake Enlargement, Wymer Dam, Keechelus to Kachess pipeline, and any other alternatives which are proposed, will impact the environment. This takes time to develop the models and make the models as accurate as possible. Information on the physical characteristics of the Yakima River has to be gathered to be able to determine how river flow patterns might change due to the alternatives and thus provide benefits to fish production, irrigation water delivery in drought years and future municipal water supply.

In addition to the computer models, geologic and groundwater information must be collected so the best designs can be prepared to build the safest and most efficient project possible. Performing the drilling for this work takes time and must be completed correctly in order to ensure a good design. An environmental impact statement takes about a year to finalize once it is drafted and presented to the public for comment. This timeframe varies, depending on the amount and complexity of public comments.

The study, as authorized by Congress in 2003, and outlined in the Plan of Study, was initially scheduled for completion at the end of 2008. The study is still on schedule.

What are the economic benefits of the Black Rock alternative, and why are they not in the Appraisal Assessment of the Black Rock Alternative (Appraisal Assessment) report?

Reclamation expects economic benefits to come from agriculture production, fish production, and supplying municipal water for future needs. There may be benefits to recreation, power production, and flood control as well.

At this time, Reclamation has not completed the estimate of benefits provided by any alternative in the study. While we know that the Black Rock alternative will provide water for the proratable irrigators and improve the hydrograph for the Yakima River fishery, and supply the future municipal water needs, we do not know the amount of those benefits. We need to complete computer models so we can estimate the amount of the benefits, such as how many more acres of land will be able to produce crops during a drought situation or how many more fish can we expect to have produced in the Yakima River. When the amount of benefits is estimated, we will be able to compute the economic impact of those benefits.

Will the other irrigation districts in the Yakima River basin benefit from a Black Rock alternative (water exchange)?

Yes, by delivering water to Roza, Sunnyside, Terrace Heights, Union Gap, and Selah-Moxee irrigation districts, there is enough Yakima River water freed up to provide the 70 percent water supply to the other prorated Yakima basin prorated irrigation districts. That water exchange is displayed in the Appraisal Assessment of the Black Rock Alternative.

Is it possible to design a smaller project at a smaller cost? Would the benefits be acceptable?

Yes, it may be possible to design a smaller project. The Principles and Guidelines mentioned in an earlier question require the display of the alternative which maximizes the benefits to the nation.
Typically this is the smallest size alternative which will meet the objectives of the study. Additional study will be required to determine the alternative which will accomplish the most benefits for the least cost. Other alternatives can be displayed but the alternative which maximizes the benefits has to be displayed.

Are the pumping costs the same every year?

Pumping costs will vary, depending on the amount of water required to be pumped. There may be years when there is "carry over" in the reservoir, thereby reducing the amount of water to be pumped the following year. Pumping costs also vary by the time of day and year when the pumping occurs. For example, night time pumping is usually less expensive than pumping at peak hours such as 7 to 9 a.m. Sometimes, Columbia River water may not be available during off-peak hours, which means pumping will have to happen when the power to pump is the most expensive which will increase costs.

What would be the economic losses if no project is developed from the study?

The economic losses would be those that are calculated by the State of Washington or others. Reclamation does not calculate economic losses per se. The economic benefits are based on acres of land that will be kept in production by building a feature. These benefits may not be the same as the economic losses estimated from droughts.

Will you look at global warming as it affects the ability of the basin to produce water for all the demands?

Reclamation will try to estimate the impacts of potential global warming on the Yakima Basin.
Reclamation will work with experts in and around the Northwest to develop a scenario to include in the water supply analysis being prepared. These experts may include university professors, consultants, federal, state, local and tribal people.

What would the return flows be? How much runoff goes back into the system?

Runoff will be estimated through the water supply computer models that are being used for the feasibility study. Each alternative that goes into the water supply models will be analyzed to determine how much and when return flows get to the Yakima River and ultimately back to the Columbia River.

Is there a possibility that water from Hanford could leach into the Black Rock project and/or the Yakima River?

Since the groundwater at the Hanford Site flows generally southeast, we do not expect the groundwater to flow "uphill" into the Black Rock valley or into the Yakima basin. Reclamation is going to perform testing at the Black

Rock site to determine in more detail the amount and direction of the groundwater flows. This work will be done in conjunction with Pacific Northwest Laboratory staff beginning in the fall of 2005.

What is the "isotopic signature" of water and why do we need to know about it?

Isotopes are atoms that are a slightly different version of the same element (e.g., oxygen or hydrogen) because they contain a different number of neutrons within the atomic nucleus. For example, most naturally occurring atoms of hydrogen contain only one neutron. However, there is a small, but measurable, percentage that contains two neutrons. The isotope of hydrogen with two neutrons is called deuterium (D) and occurs naturally in rainwater. Water bodies such as lakes and regional precipitation have characteristic isotopic ratios (e.g., D/H: deuterium/regular hydrogen) which can be used to identify their origin.

This "isotopic signature" is useful in identifying the source of waters. For example, subsurface waters near the Black Rock reservoir could be identified as either reservoir leakage (from the Columbia River water that filled the reservoir) or naturally occurring groundwater.

What is the Yakima River Basin Water Storage Feasibility Study?

In 2003, Reclamation was directed by the Congress to address the feasibility of constructing additional water storage facilities for the Yakima River Basin in Washington. While the Storage Study will investigate several alternatives, the congressional authorization directed that initial study activities examine storage of Columbia River water in an off-stream reservoir (the Black Rock alternative).

What are the Study objectives?

The Storage Study will identify storage options that could provide benefits to the (1) irrigation water supply for junior water rights holders in dry years; (2) flows in the Yakima River for fish; and (3) municipal water supply.

What alternatives will the Storage Study examine?

A potential Black Rock project is one alternative being assessed as part of a solution to water storage and fishery issues in the Yakima River Basin. Other alternatives being evaluated at this stage are in-basin storage opportunities--a Bumping Lake enlargement, a new Wymer dam and reservoir, and a Keechelus Reservoir to Kachess Reservoir pipeline.

What was included in the Appraisal Assessment, dated December 2004?

This report addresses only the Black Rock alternative. It is limited to certain engineering and technical aspects of this potential project and is based on preliminary, appraisal-level information only.

What is not included in the Appraisal Assessment?

Economic, financial, environmental, cultural, and social evaluations of the Black Rock alternative have not yet been completed. This report is not a feasibility study.

What is Reclamation's conclusion about the Black Rock alternative?

Reclamation has concluded that a potential Black Rock project appears to be technically viable and would meet study objectives. Reclamation plans to carry this alternative forward in the plan formulation phase of the study.

How is the Summary Report, Appraisal Assessment of the Black Rock Alternative, different from previous reports about Black Rock?

This report summarizes information from six technical documents prepared by the Bureau of Reclamation and consultants. These documents were released in February 2005, and provide more detailed design and cost estimates than previous studies.

What facilities would a Black Rock alternative include?

The Black Rock alternative, as described in the Appraisal Assessment, would consist of:

- A pumping plant and tunnel through Umtanum and Yakima Ridges, which would pump Columbia River water about 6 miles from Priest Rapids Lake to a new reservoir, requiring a total lift of about 1,400 feet.
- A reservoir and dam. One alternative for a reservoir would have an active capacity of 1.3 million acre feet, while the other would have an active capacity of 800,000 acre feet.
- At its largest option, the storage dam in the Black Rock Valley would be approximately 600 feet high and 6,000 feet long.
- A 14-mile-long tunnel and a 3-mile-long pipeline that would carry water from the reservoir to Roza Canal, with a capacity as large as the current combined capacity of Roza and Sunnyside canals.
- Two new hydropower generation plants at the Roza and Sunnyside delivery system discharge points to provide a combined capacity of 53 megawatts.

What is the cost estimate for the Black Rock alternative, and what does this include?

The preliminary total project construction cost estimate, based on appraisal-level analysis, is approximately $3.5-$4 billion (June 2004 price levels). This includes field construction contract costs of $2.8-3.0 billion, plus estimated additional, noncontract costs (such as construction management, land acquisition, regulatory compliance, environmental and cultural mitigation, etc.).

What are the most significant questions about the Black Rock alternative?

If the Black Rock alternative moves into the next phase of the storage study, economic, financial, environmental, cultural, social, and further technical analyses will be performed. These analyses will identify and answer many questions about the alternative. As the public engages in discussion and debate over the next few months, more questions will arise about the Black Rock alternative and the other three alternatives currently being studied. Questions will also likely emerge and be answered during the NEPA analysis of feasible alternatives.

Why are cost estimates in the Appraisal Assessment of the Black Rock Alternative so much higher than for Washington Infrastructure Services (WIS) report?

Washington Infrastructure Services (WIS) was commissioned by Benton County in 2001 to conduct a very preliminary analysis (or reconnaissance-level study) to determine if there were “fatal flaws” with the Black Rock concept. WIS's preliminary estimate of field construction costs was $1.7 billion. Reclamation’s appraisal is a more complete analysis, including new field work. Significant differences are described below:

- The depth to foundation level (i.e., rock upon which to build a dam) was determined to be 200 feet instead of 20 feet as assumed by WIS;
- Reclamation designed for a larger and more complete system to deliver the exchange water to the users, while WIS did not design a distribution system beyond the delivery point at the Roza Canal;
- Reclamation designed for a more extensive water exchange of 869,000 acre-feet instead of 500,000 acre-feet as assumed by WIS;
- Price inflation for materials has occurred since the consultant’s report was done, especially for cement and steel.

Who is paying for the Storage Study?

Reclamation requires non-Federal parties to pay 50 percent of the cost of feasibility studies unless the Congress directs otherwise. So far, the State of Washington has committed $4 million to the Storage Study and the Congress has appropriated a similar amount.

What is the total estimated cost of the Storage Study?

The feasibility study is expected to cost $8-12 million over a period of 5 years.

Who would pay for the cost of constructing a project?

Reclamation seeks up-front cost sharing from non-Federal parties to pay for a substantial portion of the cost of constructing a project. The balance of construction costs are funded from congressional appropriations received by Reclamation. Without satisfactory non-Federal financing, Reclamation could not recommend that the Congress authorize the construction of a project or appropriate monies for construction.

In addition, under Reclamation law, project beneficiaries repay the Federal construction costs of water projects that are allocated to irrigation, municipal and industrial water, and power generation. Construction costs allocated to fish and wildlife purposes, because they provide general public benefits, are not reimbursable.

What is the estimated annual cost of the operation and maintenance of the Black Rock alternative, and who would pay that?

Total annual O&M costs have not yet been determined. Project beneficiaries are required by Federal Reclamation law to pay O&M costs allocated to irrigation, municipal/industrial uses, and power generation unless Congress directs otherwise.

What is the estimated annual cost of pumping the water from the Columbia River into the Black Rock Reservoir? Annual pumping costs are estimated by the Bonneville Power Administration to be between $22 million and $121 million (average annual cost of $55-$62 million).

What are the engineering issues that require more study?

Technical questions that would be studied intensively for the Black Rock alternative are: (1) potential for leakage, some of which could affect groundwater at the Hanford site; and (2) seismic characteristics of the dam site, given that it is located in an area with earthquake potential.

Are there other issues that have not been addressed?

Yes. Economic, financial, environmental, cultural, and social aspects will be addressed in the next phase of the Storage Study.

What is necessary for a viable water exchange?

Meeting the objective of reducing Yakima River withdrawals will require willing exchange partners, situated in the right location on the river, and water available from the Columbia River. The Black Rock Assessment confirmed that Columbia River water would be available, but only when flows exceed the quantity necessary to meet obligations for fish under the Endangered Species Act. That is why it would be necessary to store the water in a reservoir, because water can be pumped from the Columbia River only during limited times, primarily during the winter.

What is the impact to the Columbia River of these withdrawals?

Part of the Black Rock Assessment was to determine the time of year during which withdrawals from the Columbia River could be made without adverse effects. Withdrawals would be made only when specific hydrologic conditions could be met to avoid negative impacts.

What are the major water rights issues?

Any diversion from the Columbia River would require the granting of a water right from the state of Washington, administered by the Department of Ecology. In accordance with state water law, Reclamation in 2004 initiated a water withdrawal in the event the exchange project is constructed. The effects of a potential water exchange on participants' existing Yakima River water rights must be examined further. There would be no net increase in the amount of water withdrawn, but the point of diversion would change from the Yakima River to the Columbia River.

What would be the effect on the fishery?

The potential project is intended to have positive benefits to the Yakima River fishery through restoration of more normative flows, while avoiding adverse impacts to the Columbia River by diverting only when water supply conditions permit.

How does this potential project tie into the effort by Federal agencies to restore anadromous fish throughout the Columbia River Basin?

Water operations described in the Black Rock Assessment conform to flow requirements established in the 2004 Biological Opinion on operation of the Federal Columbia River Power System. The Black Rock alternative would improve habitat conditions on the Yakima River for anadromous fish.

What are the benefits to recreation?

Recreation benefits have not been analyzed yet. A large reservoir between Yakima and the Tri-Cities would attract recreational users. However, operation of the reservoir for its primary purpose would result in drawdown of the reservoir in the summer. This drawdown may create mud flats which could potentially limit recreational use at times.

What happens next?

Reclamation is continuing with the Pre-Plan Formulation (Phase 2 of the September 2003 Plan of Study) activities relating to the Yakima River Basin Storage alternatives. These activities will determine the availability of water from the Yakima River for these alternatives, impacts to the normative instream flow concept if additional water is stored from the Yakima River Basin, and identify preliminary benefits. A range of technically viable alternatives, including the Black Rock alternative, will be compared in the next phase of the Storage Study (the plan formulation phase), and one or more alternatives will be selected for further analysis in the final (feasibility) phase of the study.

How will Reclamation decide which alternatives to carry into the plan formulation stage?

Reclamation intends to carry the Black Rock alternative and the other Yakima Basin storage alternatives into the next phase of the Storage Study, the plan formulation phase.

How will Reclamation decide which alternatives to carry forward into the feasibility phase?

The feasibility phase, the last stage of the Storage Study, is the detailed evaluation of selected alternatives to meet the Storage Study objectives in terms of engineering, economic, and environmental considerations, cultural and social acceptability, and financial feasibility. Preparation of the Feasibility Report/Environmental Impact Statement is part of this final phase. Alternatives which meet the three water supply objectives of the study and are deemed reasonable will be carried forward into the feasibility phase.

Where can I find the Appraisal Assessment?

More information about the Yakima River Basin Water Storage Feasibility Study, including the Summary Report, Appraisal Assessment of the Black Rock Alternative (a summary of preliminary findings of the Appraisal Assessment) is available at www.usbr.gov/pn/programs/storage_study. Printed copies are also available upon request from Mr. Kim McCartney, Study Manager, Bureau of Reclamation, 1917 Marsh Road, Yakima, WA 98901; (509) 575-5848, ext. 370. The technical reports from which the information in the Summary Report is drawn are posted on the same web site.

How can I find out more?

Reclamation will continue to hold public meetings to explain reports, study process, and the study schedule. Please check our web site and sign up on the Washington Department of Ecology's list-serve to be notified of future events. Questions and comments about the Storage Study and its process will be posted on the web site.