Chelan County
Natural Resource
Program

Lake Wenatchee Water Storage Feasibility Study

June 2003

MWH
MONTGOMERY WATSON HARZA

in association with

MONTGOMERY WATER GROUP, INC.

Jones & Stokes

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Executive Summary

- **The focus on reviewing all potential solutions to shortfalls in in-stream flow and water supply was sharpened in the drought year of 2001, when streamflows dropped to historic lows in late summer and many water users across the state had their water supply interrupted as a result.**

- **The Wenatchee River Watershed is listed as one of the State's sixteen "critical basins" because of the presence of Endangered Species Act (ESA) listed species, development pressures and the potential for future water shortages.**

- **Chelan County Natural Resources Department is leading the Wenatchee Watershed Planning effort, which is to identify and study solutions to watershed problems such as in-stream flow, water quantity, water quality and fish and wildlife habitat. The County is also the recipient of the water storage grant from the State and is administering the process of completing this feasibility study.**

- **A project team consisting of a diverse group of public, local agency (city and county), irrigation, conservation, state, federal and tribal interests was assembled to direct the content of this study. Meetings were held in 2001—2003 to prepare a scope of study, select a consultant and review study products.**

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Executive Summary
Why is this study being done?

This study results from a Washington State Legislature grant to study the feasibility of storing additional water in Lake Wenatchee. The Legislature acted upon recommendations of the State's Water Storage Task Force to study the issue of water storage across the State. Many other Watersheds throughout the State are also performing studies of the potential for increased water storage to meet the increasing competitive needs of fish, farms and people.

The Legislature appropriated funds for this study because of its location within the Wenatchee River Watershed, the history of past water storage studies and permits on Lake Wenatchee and ongoing efforts in Watershed Planning undertaken by the Wenatchee Watershed Planning Unit. Previous studies and planning on water storage in Lake Wenatchee were performed by the Wenatchee Reclamation District and Chelan County PUD. The Wenatchee Reclamation District initiated a water storage project in 1930 in response to drought conditions in the Wenatchee River Watershed. They obtained permits to construct a low dam near the mouth of the Lake which would impound water to the normal high water elevation. The project was not completed and Chelan County PUD acquired the permits from the District. The PUD envisioned a water storage project that was a component of a larger hydroelectric project. That project was dropped in the 1970's and the rights reassigned back to the District.

Five broad study areas were selected by the project team to cover the scope of the feasibility study. They are noted below as well as the objective they are intended to address:

Water Needs. Determine the water needs of the Wenatchee River watershed and how additional water supplies should be apportioned between fish and community interests.

Technical Feasibility. Evaluate the technical feasibility of constructing a dam on Lake Wenatchee that complies with current fish passage standards and provides storage to Ordinary High Water and other levels. Analyze wind-caused wave erosion and prepare construction and permitting cost estimates.

Legal Feasibility. Evaluate the legal feasibility of constructing the dam taking into account federal, state, and local laws, and Tribal Nations rights. A further objective is to establish the permitting requirements and the status of the existing storage permit.

Socioeconomic Impacts. Evaluate the impacts of the project on private lake front property and other private landowners, and state and federal lands. Assessment of impacts would include recreation, cultural resources, tourism, fishing, rafting, and other uses of the river. The assessment would include costs and benefits.

Environmental Impact. Determine the impacts of storing additional water on flood water levels, lands inundated for longer periods around the lake (including wetlands), and on the fishery resources of the lake and river with particular emphasis on endangered species. The beneficial impacts of releasing stored water later in the year would also be evaluated.

During the feasibility study, project team meetings were held on December 11, 2002; February 26; April 30 and June 4, 2003. Presentations of interim work products by the MWH team were made to the project team during those meetings and discussions held on a number of issues.

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Executive Summary
Water Needs Assessment

- **Water demands will increase with expected population growth in the Wenatchee Watershed. The increase in water demands for municipal and domestic purposes is predicted to be 7.3 cfs on a peak basis and 1,868 acre-feet annually.**
- **Industrial water demands outside of municipalities are not expected to increase as minimum instream flows limit the ability to obtain new water rights.**
- **An estimated 12,836 acres of irrigated agriculture exist in the Wenatchee Watershed. Most of the agricultural land is in orchards. The agricultural land base has been stable and water use for irrigation will likely not decline on a peak daily basis.**
- **Instream flows set by WAC 173-545 are not met on an average of 87 days per year. Water rights issued after 1984 are conditioned on those instream flows being met.**
- **The average shortfall in instream flow in the Wenatchee River is 17,500 acre-feet per year. In 2001, the shortfall was over 50,000 acre-feet.**
- **Water use to meet future municipal and domestic use is predicted to reduce streamflow by 5 cfs in summertime.**
- **Approval of current water right applications for irrigation would reduce streamflow an additional 5.6 cfs in summertime.**

The water stored in Lake Wenatchee could be used for several purposes: instream flow augmentation, water supply for future surface water users in the Wenatchee River Basin Watershed or as mitigation for future groundwater use either in the aquifers supplying the Wenatchee River or in tributaries to the Wenatchee River. The Water Needs assessment portion of this study summarizes the current and potential future use of water in the Wenatchee River Watershed (also referred to as Water Resources Inventory Area [WRIA] 45) for municipal, residential, commercial, industrial and agricultural needs and environmental uses.

A review of potential population growth and growth in municipal, domestic, industrial and agricultural water needs was made. Chelan County is forecast to grow from 66,616 people to 101,860 people by 2025. Of that growth, an increase of 26,500 is forecast for the Wenatchee Watershed. The City of Wenatchee receives its water from wells located alongside the Columbia River and its future water use is not addressed in this study. The estimated increase in municipal and domestic water demands over the next 20 years is 7.3 cfs on a peak daily basis and 1,868 acre-feet annually. No growth in self-supplied industrial and commercial water use is forecast unless additional water is made available that would not be subject to interruption by minimum instream flows set by Chapter 173-545 WAC. The area of irrigated agriculture is estimated to be 12,863 acres and appears to be stable and not declining. There is a substantial area of land that is currently zoned for residential use that can be converted from agricultural use. Although annual water use may decline if that land is developed, peak water use may not change. The peak water demands are important as they have the most immediate effect on streamflow, especially during summer low flow periods.

Pending water right applications are requesting use of an additional 43 cfs from surface water and 10.9 cfs from ground water. The type of use requested on the applications is primarily municipal and domestic for surface water and irrigation for ground water. Most of the applications, if approved, would be subject to minimum instream flows and therefore interruptible during low streamflow periods. Some of the applications, such as those contained in the Peshastin Creek basin, would not likely be approved as the basin is closed for further appropriation from June 15 to October 15. It was estimated the increase in irrigation demand from approval of those applications to be 8 cfs; the estimated effect on streamflow is a reduction of 5.6 cfs. The estimated increase in municipal and domestic demand is 7.3 cfs and the estimated effect on streamflow is a reduction of about 5 cfs. The total estimated reduction in streamflow is estimated to be 10.6 cfs. That reduction would occur in the Wenatchee River.

The largest potential water need is for instream flow. Chapter 173-545 WAC has set minimum flows for the Wenatchee River and some tributaries. Hydrologic analyses have determined the average shortfall between Wenatchee River streamflow (measured at Plain) and the minimum flows is 17,500 acre-feet per year. In 2001, the shortfall was 50,400 acre-feet for the time period of July to October.

- **Ordinary High Water (OHW) is the most important water level evaluated because it is the demarcation between private property and State-owned shorelands, except those second-class shorelands sold to property owners. The OHW elevation is 1,870.3 ft.**

- **A low rubber dam was studied that would impound water to two elevations: 1,872.4 ft. or 1,870.3 ft. (OHW).**

- **The rubber dam and concrete supports would be submerged and mostly hidden from view**

- **The estimated costs of designing, permitting and constructing a rubber dam to impound water to 1872.4 ft are $5.8M (excluding indirect costs such as financing, legal, interest, project mitigation, land purchase or easement, etc.)**

- **The estimated costs to construct a rubber dam to impound water to 1870.3 ft are $5.4M (excluding indirect costs)**

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- **Wind analysis shows a large potential increase in wave energy (and erosion) if water levels are maintained at 1872.4 ft and a much smaller or no increase if water levels are maintained at 1870.3 ft.**

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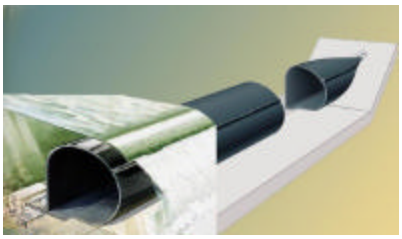
Executive Summary
Technical Feasibility



To enable seasonal storage and release of water from Lake Wenatchee, an inflatable rubber dam was identified as the most suitable type of structure for the site. The dam would be located on the Wenatchee River approximately 1,600 feet downstream of the mouth of the lake where the river is narrowest. The flow stored and released would increase instream flow in the Wenatchee River in late summer, during the lowest flow period.

Two operating water levels were analyzed: 1) the Ordinary High Water (OHW), field surveyed and estimated to be 1870.3 ft., and 2) the spring high water level, estimated at 1872.4 feet, which occurs nine out of ten years. Five potential operating alternatives were analyzed with the model:

Alternative 1. Maximum lake level controlled by the rubber dam = 1872.4 ft. The dam would start storing water July 1 and releasing water August 23. Lake outflow would ramp up to 100 cfs in excess of historic outflows on September 1 and water released until storage is exhausted.

Alternative 2. Maximum lake level controlled by the rubber dam = 1872.4 ft. The dam would start storing water July 1 and releasing water August 23. Lake outflow would ramp up to 200 cfs in excess of historic outflows on September 1 and water released until storage is exhausted.

Alternative 3. Maximum lake level controlled by the rubber dam = 1872.4 ft. The dam would start storing water June 1 and releasing water July 1. Pulse flows would be released at a rate of 100 cfs for 4 hours per day until August 15. Lake outflow would be augmented by 100 cfs in excess of historic outflows starting August 16 and water released until storage is exhausted.

Alternative 4. Maximum lake level controlled by the rubber dam = 1870.3 ft. The dam would start storing water July 1 and releasing water August 23. Lake outflow would ramp up to 50 cfs in excess of historic outflows on September 1 and water released until storage is exhausted.

Alternative 5. Maximum lake level controlled by the rubber dam = 1870.3 ft. The dam would start storing water July 1 and releasing water August 23. Lake outflow would ramp up to 100 cfs in excess of historic outflows on September 1 and water released until storage is exhausted.

Alternative 2 provides the greatest flow augmentation, but for a shorter time period than Alternative 1, which can augment flow through much of October if needed. Alternative 3 has less water to store and release because it has different storage and release seasons in comparison to Alternatives 1 and 2. Alternatives 1 and 2 were found to provide a maximum storage of 12,300 af. The maximum increase in lake levels from historic levels is about 2.7 feet in July, 3.9 feet in August and 2.6 feet in September from Alternatives 1-3.

Alternative 5 can reliably provide a flow augmentation of 75 cfs in September. Alternative 4 can provide 50 cfs in September and for about one-half of October. Alternatives 4 and 5 would provide a maximum storage of 6,750 af. The increase in lake levels from historic for the two alternatives is about 0.6 feet in July, 2.0 feet in August and 1.0 feet in September.

- **The Wenatchee Reclamation District purchased an easement from the State of Washington in 1944 to overflow 2nd class shorelines in Lake Wenatchee.**
- **There exists 20,380 feet of 2nd class shoreline that is not subject to the easement. An easement to inundate those 2nd class shorelines would need to be acquired from adjacent property owners if a storage project was to be constructed to hold water to the Ordinary High Water level (1870.3 ft).**
- **If a storage project were to hold water to a level higher than the OHW, easements to inundate 70,000 lineal feet of shoreline on private property would be required.**
- **A number of permits that are required from Federal, State and local Agencies would be required. An EIS under SEPA or EA under NEPA would be required for the project. Because of the presence of endangered species, consultation with the U.S. Fish and Wildlife Service and NOAA Fisheries would be required. The permitting timeframe could stretch out over 3 years.**
- **Although no entity has proposed the project, a number of Federal, State and local agencies could construct and operate the project. The project would need to be operated with multiple objectives including instream flow augmentation, water supply and recreation.**

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Executive Summary
Legal and Permitting Requirements

An assessment of legal and permitting requirements was made for construction and operation of a low dam at the outlet of Lake Wenatchee. The review covered existing permits to operate a reservoir and the requirements for acquiring new permits.

A reservoir permit was issued by the State of Washington in 1934 to the Wenatchee Reclamation District (WRD), which would have allowed the district to construct a dam at that time. The permit was transferred in 1963 to Chelan County PUD for their use in a potential water storage project. The PUD project did not proceed and the State cancelled the reservoir permit in 1976. In addition to the reservoir permit, the WRD obtained an easement in 1944 to overflow 2nd class shorelines around Lake Wenatchee. The easement is subject to the rights of previous purchasers of 2nd class shorelines around the lake. Second-class shorelands extend up to the line of Ordinary High Water (OHW). It was found that private property owners with a total of 10,950 feet and Washington State Parks and Recreation with 9,430 feet of waterfront own 2nd class shorelands that were purchased prior to the issuance of the overflow easement. An easement would need to be purchased or leased from those property owners to maintain water levels at the OHW level. A total of 70,000 feet of shoreline exists around Lake Wenatchee and overflow easements from all property owners on the lake would need to be obtained to maintain water levels at any water level higher than OHW, such as 1872.4 ft.

A review of the potential impact on Tribal fisheries was performed and the conclusion reached the project would have a negligible effect on Tribal fisheries in the Wenatchee River Watershed.

A review of permitting issues was performed and the types of permits that would be required from Federal, State and local agencies described. The typical timeframe for acquisition of those permits was also described. The project would likely be subject to the NEPA process and would require a Corps of Engineers permit, bringing in the need for consultation under ESA. Approaches to permitting and additional information needed for the permitting process are provided.

Because of the nature of the water storage project, it would be operated by a public entity. Although no entity has proposed the project, potential operators include the US Bureau of Reclamation, Washington State Department of Ecology, Chelan County PUD, and Wenatchee Reclamation District. The project would need to operate with multiple objectives including instream flow augmentation, water supply, recreation and other objectives.

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Executive Summary Socioeconomic Impact Assessment

- **Increase in water elevations could affect shoreline property values and potentially slow the rate of increase of property values, affect shoreline access, and affect shore facilities and improvements.**
- **Purchase of easements would be necessary for all alternatives and would range in cost from $1.4 to $3.5 million under Alts 4 and 5, to $6.1 to $15.3 million under Alts 1, 2, and 3.**
- **Impacts to lake-based recreation could include loss of shoreline access, and inundation of boat ramps and beaches.**
- **Estimated cost to retrofit the boat ramp at the State Park and to construct a new launch facility downstream of the dam would be approximately $171,000.**
- **More detailed socioeconomic and parcel studies will be necessary if the project proceeds. Those studies could include shoreline topographic surveys, property-by-property appraisals, property-by-property survey of facilities and improvements, and a study of decision factors when buying shoreline property.**

The socioeconomic impact analysis of the Lake Wenatchee Water Storage Feasibility Study included a broad evaluation of property values, property improvements, lake-related recreation, river-related recreation, and potential effects on cultural resources. The analysis included a review of existing studies, acquisition and review of property assessments from the Chelan County Assessors Office, and field measurements and observations.

Land ownership on the lake includes U.S. Forest Service (45.3 percent), Washington State Parks and Recreation Commission (12.2 percent), County (0.5 percent) and private lands (42 percent). A review of Chelan County Assessor's records for 2002 indicates that there are 153 single-family residential parcels along the North Shore and 134 single-family residential parcels on the South Shore.

Recreation on the lake includes boating, fishing, wind surfing, camping and related activities, and beach recreation. Public access to the lake is provided at Lake Wenatchee State Park and from USFS land on the north and south sides of the lake. River-related recreation activities include whitewater rafting, kayaking, fishing, and access along the Wenatchee River. Two recorded archaeological sites occur on the north shore of the headwaters of the Wenatchee River; there are no recorded historic structures.

Increases in water elevations from the project could affect property values through 1) potentially slowing the rate of increase in property values, 2) perceived or real loss of property values, 3) affecting shoreline access or use, and 4) affecting shore facilities and improvements. The purchase of shoreline easements would be necessary and could range from a cost of $1.4 to $3.5 million under the OHW alternative (Alts. 4 and 5) to $6.1 to $15.3 million for elevation 1,872.4 ft. (Alts. 1,2, and 3). The impacts to shoreline improvements would be greatest under Alts.1, 2, and 3 and would vary on a parcel-by-parcel basis. Higher water elevations under Alts.1, 2, and 3 and wind-driven waves, could erode shorelines and lead to damage. These potential impacts were not quantified in this study and more detailed studies will be necessary in the future if the project proceeds.

Impacts to lake-based recreation would include the loss of shoreline access at various locations on the lake, particularly under Alts. 1, 2, and 3. Boat ramps at Lake Wenatchee State Park and at the Glacier View campground would be inundated, thereby making access more difficult. The dock at the State Park boat ramp would need to be modified (i.e., extended or rebuilt) to allow access from shore. That cost is $6,000. Beach recreation would be significantly affected by Alts.1 - 3 for all but the Lake Wenatchee State Park beach.

River-based recreation would not be adversely affected by changes in river flows by the proposed project, but construction and operation of the dam would disrupt boating access from the lake to the river. To ensure access to the river is maintained, a new launch facility would need to be constructed downstream of the dam. Construction costs for such a facility were estimated to be $165,000.

Cultural resources could be affected by the project by prolonging the saturation of artifact-bearing sediments and increasing the risk of erosion as a result of wave action. The magnitude of the impact would be greatest under Alts. 1, 2, and 3. A systematic survey of the dam site and other project elements should be conducted if future project studies are undertaken.

- **The sockeye salmon population in Lake Wenatchee is one of only two runs still existing in the Columbia River Basin. A popular recreational fishery exists for sockeye and kokanee.**
- **Spring chinook salmon and steelhead in the Wenatchee River system are listed as endangered under the Endangered Species Act. Bull trout are listed as threatened. Different life-stages of these fish can be found in the river or lake throughout the year.**
- **Low instream flows in the Wenatchee River may result in summer water temperatures that stress bull trout and other salmonid fish. Low instream flows can also delay upstream migration of adult salmonids and reduce the summer carrying capacity of juvenile fish.**
- **During low water years, the release of increased flows from Lake Wenatchee in late-summer and early-fall may improve fisheries habitat in the mainstem Wenatchee River. Alts. 1 and 2 would provide the greatest opportunity for benefit; Alts. 4 and 5 would provide some benefit, especially under extreme low flow conditions. Alt. 3 would benefit adult upstream passage during low flow conditions.**
- **The extended storage of high water in Lake Wenatchee may result in some alteration of the wetland community along the shoreline of the lake and in the backwatered areas of the White and Little Wenatchee rivers. Alts. 1—3 have a high probability of altering the communities; Alts. 4 and 5 a moderate probability.**
- **Construction and operation of the dam will need to consider and accommodate both upstream and downstream passage of anadromous salmonids and bull trout into and from Lake Wenatchee.**

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Lake Wenatchee Water Storage Feasibility Study—June 2003

Executive Summary Environmental Impact Assessment

The storage of water in Lake Wenatchee and its release in late-summer and early-fall could have direct and indirect effects on the aquatic habitat and fish populations in the Wenatchee River system. This includes potential beneficial and negative effects on three fish species listed under the federal Endangered Species Act: spring chinook salmon, steelhead, and bull trout.

Lake Wenatchee is a cold, deep lake that is fed principally by the Little Wenatchee River and the White River. Extensive wetlands exist at the western end of the lake at the deltas of these two rivers. The lake drains to the Wenatchee River, which eventually empties into the Columbia River. Several populations of economically and culturally important fish species are found in the Wenatchee River system including chinook and sockeye salmon, kokanee, steelhead, bull trout, rainbow trout, westslope cutthroat trout, and Pacific lamprey. Coho salmon have recently been reintroduced to the basin. The Wenatchee River is an important migration corridor for many of these fish. In particular chinook, sockeye, steelhead, and Pacific lamprey mature in the ocean and then swim back upstream to spawn in the river, the smaller streams or along the shoreline of the lake. Bull trout are known to have a complex life history, where adult fish can spawn in the Chiwawa River and then return six miles upstream to feed in Lake Wenatchee. Their progeny may also migrate upstream as juveniles to rear in the lake. During the summer, low instream flow and associated warm water temperatures in the Wenatchee River have been identified as water quality concerns that can negatively affect many of these fish species.

The operation of the Lake Wenatchee Water Storage Project during low-flow water years could benefit anadromous salmonids in the Wenatchee River downstream of the lake outlet by providing added flows of cool water during the late-summer and early fall. This release of water could improve the quantity and quality of pool habitat used by adult fish for holding and passage conditions during their upstream migration, as well as result in more suitable areas to support spawning. Because of the greater volume of water that would be available for release, Alts.1 and 2 would have the greatest potential instream flow benefit for salmonids. Some instream flow benefits would also be provided by Alts.4 and 5 but these would be of lower magnitude and duration compared to Alts.1 and 2. Alt. 3 could benefit early passage of sockeye and spring Chinook into the upper watershed. Potential negative impacts identified during this analysis include the potential stranding of juvenile fish and the possibility of dewatering of incubating eggs if river flows are rapidly reduced (as the amount of stored water becomes depleted) prior to Fall rains. However, these potential impacts can be avoided or minimized if ramping rates are used and flows are adjusted to consider egg incubation. The extended storage of water in Lake Wenatchee may result in some alteration of the wetland community along the shoreline of the lake and in the backwatered areas of the White and Little Wenatchee Rivers. Alts.1—3 have a high probability of altering the communities; Alts.4 and 5 a moderate probability. In addition, the location of a dam at the lake outlet could affect the overall connectivity of the lake with the lower Wenatchee River. Construction and operation of the dam will need to consider and accommodate both upstream and downstream passage of anadromous salmonids and bull trout into and from Lake Wenatchee.

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