DRAFT - WALLA WALLA BASIN INTEGRATED FLOW ENHANCEMENT STUDY	
PRELIMINARY PROJECT PROPOSAL TEMPLATE	
1. Title: ASR for Direct Stream Benefit: Alluvial Aquifer Source Water	**2. Proposal Preparer(s):**

3. Project Status: *Identify whether the proposed project is a past, ongoing or new project and briefly explain the status of the project, including the requested role of the Flow Study in further consideration of the project. If past project, some of the questions below may not be applicable.*

x a. NEW PROJECT □ b. ON-GOING PROJECT □ c. PAST PROJECT

The new project described herein is intended to serve as a template for any potential future basalt ASR project that has the basic following elements: (1) goal - use the basalt aquifer to store winter/spring water for summer delivery to a nearby stream for flow/habitat enhancement, (2) source of stored water - alluvial aquifer in hydraulic connection with surface water, (3) alluvial extraction well(s) and basalt injection/recovery well(s) need to be retrofitted or purpose built, (4) project is in close proximity to targeted stream to minimize need for new water distribution infrastructure, and (5) Flow Study stakeholders will work with regulators and other stakeholders to identify potential existing water rights that could be used for the project, or gain support for new water rights.

Note: Existing rules present significant administrative challenges for permitting new alluvial water rights for use as the source water, especially in light of recent Washington Supreme Court cases, notably those generally referred to as the Foster decision and the Hirst Decision. Given these Court decisions active stakeholder involvement to define a specific water rights portfolio for any potential future ASR project using the alluvial aquifer as a source will be needed. This involvement will be needed to address Ecology concerns, senior water rights, and potential mitigation of alluvial aquifer withdrawals.

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4. General Description of Proposal: *Identify the category(s) and briefly explain the proposed project (e.g. location, infrastructure requirements, maintenance requirements, connection to other new, ongoing or past projects, other stakeholders, various sizing or phasing, etc.).*

□ a. Water Conservation & Infrastructure **x b. Aquifer Recharge & Aquifer Storage and Recovery** □ c. Surface – Groundwater Source Switch □ d. Surface Water Storage □ e. Pump Exchange □ f. Water Right Transactions □ g. Point of Diversion Transfers x **h. Other (stream flow/habitat restoration)**

Basic Hypothetical Project Description: This type of project would focus on storing water in the basalt aquifer for later delivery to a selected stream or stream reach. Water would be diverted from an alluvial aquifer source, routed through some sort of treatment system (to be determined based oon source water chemistry), and injected into the basalt aquifer via basalt aquifer well(s). Stored water would then be recovered from basalt well(s) and delivered to a targeted stream or stream reach. Stored water would be geochemically compatible with native basalt groundwater and storage would not degrade native groundwater for other uses. The direct benefits of such a flow enhancement project would be measured by the volume and rate of water delivered to a stream or stream reach. Indirect flow enhancement benefits might also accrue from enhanced stream flows supporting existing active surface diversions that do not reduce stream flows below specified targets. In addition, by recharging the basalt aquifer system there is the potential for indirect benefits associated with reversing groundwater level declinces, such as reducing pumping lift for existing basalt water rights or potentially enhancing base flow to streams.

No projects such as this currently exist in the project area. Given that, infrastructure for water diversion, treatment and delivery to the basalt aquifer and streams would need to be built or modified for any project. Also, one or more new wells likely will need to built for a particular project given the scarcity of existing wells that appear to be suitable for, or easily reconfigured for, basalt ASR use. Given these considerations though, such a project might be build in close proximity to the two existing Washington alluvial aquifer AR projects, Locher Road or Stiller Pond.

Use of the alluvial aquifer system as source water will include:

- Pumping of one or more alluvial pumping wells, either existing or purpose built, capable of delivering the required water quantities.
- Distribution system to move source water from the alluvial well(s) to the ASR injection well.
- Treatment system, yet to be determined, to ensure that native groundwater is not degraded by injected source water, and that with mixing the two waters are compatible.

Source water and native groundwater should be geochemically compatible so that their mixing does not result in reactions that reduce porosity/permeability in the basalt aquifer, so that the recovered water is compatible with planned use, and so that potable uses are not impaired. This will be addressed prior to the start of pilot testing via sample collection and analysis to establish potential compatibility and/or incompatibility. Early in an ASR project pilot testing of geochemical compatibility will be further evaluated via short duration injection/recovery tests.

Source water will need to be delivered to an ASR well(s) via a pipeline delivery system, either existing, refurbished, or purpose built. An existing pipeline system capable of delivering source water to an ASR well likely does not currently exist because that activity is not currently being done in the project area. However, it might be possible to refurbish an existing delivery system. A refurbished delivery system, would at a minimum, need valving to direct water from the source towards the ASR well, and from the ASR well to the point/location of eventual use. This minimum refurbishment would assume that pipelines are already located and sized to accommodate the back and forth transmission of source water towards the ASR well and delivery to point of use. If such is lacking, refurbishment would require installation of additional infrastructure to meet operational needs. In addition, refurbishment would require installation of necessary treatment. A purpose built system would include all pumps, pipes, and

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controls to move the desired water volumes at the desired rates from the source, to the ASR well, and from the ASR well to the targeted steam. Wellhead and/or in-well infrastructure will be needed to control injection rate and prevent oxygenation of the injection water column.

A basalt ASR well, either existing or purpose built, will be needed for a successful project. Basic criteria that should be evaluated when determining if a purpose built well or an existing well is suitable for an ASR project include: (1) depth the well penetrates into basalt, (2) difference between the depth to top of basalt and the bottom of casing, (3) open interval length, (4) minimum diameter, (5) difference between the bottom of casing and static water level, and (6) specific capacity. In addition to these criteria, an ASR well should be compliant with the water supply well construction rules described in WAC 163-170.

Recovered water generally will be delivered for its intended use via a pipeline delivery system, either existing, refurbished, or purpose built. Direct delivery for flow enhancement in a targeted stream likely will require a new purpose built delivery system as basalt well discharge to a stream is not a normal activity on the project area. Because the source water for storage is a stream, the delivery pipeline would be built/retrofitted to accommodate movement of source water to the ASR well and delivery of the recovered stored water back to the stream.

In any of these cases wellhead and/or in-well infrastructure will be needed to control recovery and distribution of the stored water.

Hypothetical Project Size and Design Estimates: Because a specific project site has not yet been selected we cannot at this time propose design and cost estimates for a specific project. Given that, it is possible to propose a basic design template and an estimated construction cost estimate for it. These elements are as follows:

- New 200 foot deep, 20 inch diameter alluvial well, approximate capacity 1,500 gpm, 3.3 cfs, or 6.6 acre-ft/day. Needs to be winterized and include source water treatment disinfection. Assume approximately 160 days of operation, yielding approximately 1,056 acre-feet of treated source water.
- Source water delivery piping would be minimized by placing the alluvial well near the new basalt ASR well near the creek as the creek is where recovered water gets delivered to.
- ASR well, assumed to be approximately 1,000 feet deep, including 600 foot cased and sealed interval and 400 foot, 16-inch diameter open-hole interval. In-well pump/valving needs to accommodate both injection and recovery. Well design capacity approximately 1,500 gpm, 3.3 cfs, or 6.6 acre-ft/day injection and 2,000 gpm, 4.4 cfs, and 8.8 acre-ft/day recovery.
- Delivery of stored water back to creek would be via a fairly short delivery line as the ASR well would be built near the creek. At the recovery rate of 2,000 gpm, 4.4 cfs, or 8.8 acre-feet/day 90% of the annual stored volume (950 of 1,056 acre-feet) could be recovered in approximately 108 days.
- Assuming 1,056 acre-feet of stored water and 90% recovery of that water each year, a 20 year life cycle for the project, total stored/recovered water is 19,008 acre-feet.
- Additional capacity might be developed by interconnecting multiple alluvial and ASR wells if hydrologic characterization shows that it is feasible.

Additional annual project elements include: (1) operations and maintenance (O&M) which is in part controlled by equipment life cycles, power to operate (which can fluctuate), and well pumping characteristics and (2) monitoring and reporting requirements which are based on permit conditions.

5. Source of Produced Water: *Mark all applicable and identify (water right number, shallow or deep basalt aquifer, stream name).*

□ a. Existing Water Right

x b. Groundwater – alluvial aquifer in hydraulic connection with targeted stream.

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□ c. Surface Water

□ d. Other

Water right(s) will depend on a specific, yet to be determined, project location. At a minimum water rights to alluvial water and stored water will need to be acquired through transfer or new permit. In addition, surface water rights may be explored if a surface water source can be transferred to an alluvial aquifer location in direct hydraulic continuity with the stream. Because there is no consumptive use of water, it's diverted, stored, and resupplied to targeted stream, a water rights portfolio may target transfers as a preferred approach.

6. Quantity/Timing/Location of Produced Water Instream: *Estimate average amount of water, when and where. Can project be considered at various sizes(flow outputs) and/or considered in phases?*

a. Acre-feet and/or Cubic-feet-per-second: (as described in section 5)

- Maximum of 1,056 acre-feet withdrawn from alluvial aquifer, stored in basalt aquifer.
- 90% recovery of stored water, 950 acre-feet withdrawn from basalt aquifer, delivered to targeted stream.

b. Timeframe(s):

- Alluvial aquifer withdrawal, maximum of 160 days during period of approximately December 1 through May 31, each season, delivered to basalt aquifer.
- Recover stored water from basalt aquifer, approximately 180 days during period of June 1 through November 30.

c. Stream Reach Location(s):

- Yet to be determined.

□ d. UNKNOWN - Need more work (engineering/design/modeling, etc.) to estimate potential instream flow outputs of project. Will results of this work be concluded within one year to inform potential project flow outputs? Describe additional work needed and cost estimate.

A specific site needs to be identified and access to it secured. Need for additional work will be determined based on that final selection.

7. Ability to Protect Produced Water Instream: *Briefly explain how the produced water will be quantified, monitored and protected instream or why it is not currently protectable.*

□ a. YES - protection under existing regulations expected to WW River mouth or in limited reach?

□ b. NO or

x c. UNKNOWN – Results and implementation of flow protection study likely necessary to ensure flow protection.

Cannot be done until a site specific project is identified.

8. Cost Estimates: *Provide known and estimated costs to develop and implement the project.*

a. Project Development and Design: Basic project outline developed, site specific work remains to be done, pending identification of a specific project.
Approximate planning level cost estimate: $75,000 +/-25%.

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b. Project Construction: ***Approximate planning level cost estimate: $1,145,000 +/-25%.***

c. Construction cost per AF and/or CFS: ***Approximate planning level cost estimate: $1,204.80 acre-foot,*** or over a 20 year life cycle for the project, total stored/recovered water is 19,008 acre-feet and ***annual per acre-foot capital cost $60.24 +/- 25%.***

d. Project Annual O&M: ***Approximate planning level cost estimate: $42,500 to $75,000, or $34 to $79 per acre-foot,*** at the design size described above.

□ e. UNKNOWN - Need engineering/design work to estimate costs

9. Secured Costs: *Has any funding been secured in the past or currently and what is source?*

None

10. Other Potential Project Advantages: *In addition to helping address flow targets and basin-wide flow issues (Endangered Species Act, Tribal Water Rights, Clean Water Act, etc.), briefly explain other potential benefits (e.g. reduced O&M costs, restores/mimics ecological processes, cropping flexibility,)*

Yet to be determined, requires a specific site location.

11. Other Potential Project Disadvantages: *Briefly explain potential drawbacks of the proposal (e.g. reduced GW supply - recharge mitigation need, increased O&M costs, legal implications)*

Existing rules present significant administrative challenges for permitting new alluvial water rights for use as the source water, especially in light of recent Washington Supreme Court cases, notable those generally referred to as the Foster decision and the Hirst Decision. Given these Court decisions active stakeholder involvement to define a specific water rights portfolio for any potential future ASR project using the alluvial aquifer as a source will be needed. This involvement will be needed to address Ecology concerns, senior water rights, and potential mitigation options alluvial aquifer withdrawals.

12. Estimated Time Frame to Implement Project?

Year 1 to 2: Locate specific site, conduct final design and permitting, identify and secure water rights.
Year 2 to 3: Construction and testing.
Years 3 to 5: Operational refinement, followed by final operational permit and long-term operations.

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