LITTLE SPOKANE WATER BANK FEASIBILITY STUDY

Prepared for: Spokane County Utilities

Project No. 140129 • June 30, 2015

Aspect CONSULTING

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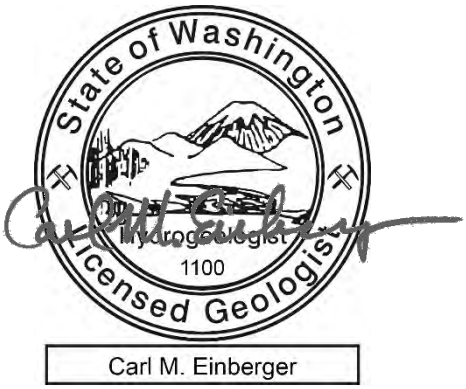

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Acronyms

1975 Basin Report	1975 Ecology WRIA 55 Basin Program Report
ac-ft	acre-foot
ac-ft/yr	acre-feet per year
AFCU	acre-foot/year consumptive use
afy	acre-feet per year
AG	Washington State Attorney General
Aspect	Aspect Consulting, LLC
ASR	aquifer storage and recovery
Basin Plan	1976 Basin Plan
cfs	cubic feet per second
Client	Spokane County
Ecology	Washington Department of Ecology
FS	Feasibility Study
ft^2	square feet
GIS	Geographic Information System
GMA	Growth Management Act
gpm	gallons per minute
NGO	Nongovernmental organization
OCPI	overriding considerations of the public interest
OCR	Office of Columbia River
OFM	Washington State Office of Financial Management
PAG	Policy Advisory Group
PCB	polychlorinated biphenyl
PCHB	Pollution Control Hearings Board
pre-Rule	records having priority date senior to the Rule
Reclamation	United States Bureau of Reclamation
SAR	shallow aquifer recharge
SVRP	Spokane Valley-Rathdrum Prairie Aquifer

TAG	Technical Advisory Group
TAZ	Spokane Regional Transportation Council Transportation Analysis Zones
TF	transaction fee
the County	Spokane County
the Rule	Little Spokane River Instream Flow Rule
TMDL	Total Maximum Daily Load
Tri-Counties	Spokane, Stevens, and Pend Orielle County
TWRP	Trust Water Right Program
TWSA	Total Water Supply Available
USDA NAIP	United States Department of Agriculture National Agriculture Imagery Program
USGS	United States Geological Survey
WAU	WA Department of Natural Resources Watershed Administrative Unit
WDNR	Washington Department of Natural Resources
WRIA	Water Resource Inventory Area
WWT	Washington Water Trust
WWWMP	Walla Walla Watershed Management Partnership

Executive Summary

Spokane County (the County), in conjunction with Stevens and Pend Oreille County (Tri-Counties), is considering setting up a water bank to address existing and potential regulatory constraints on existing and new water use in Water Resource Inventory Area (WRIA) 55, the Little Spokane Watershed (See Figure ES-1). A water bank is a mechanism that facilitates transfer of water rights between sellers and buyers. As part of this process, the County convened a Policy Advisory Group (PAG) to allow interagency and stakeholder coordination and evaluation of water banking in the watershed. Aspect, in conjunction with input from the PAG, has concluded that water banking is feasible within WRIA 55, as discussed in more detail in this report.

A summary of the key findings on each of these elements is provided in this Executive Summary, with additional detail in the FS.

Legal, Regulatory, and Policy Framework

Determining if water banking is suitable for and applicable to WRIA 55 is a complex question, bearing careful consideration by the County and PAG. Some of the key water bank drivers and findings that may inform this judgment include:

- In several basins (e.g., Kittitas, Skagit, Yakima) in Washington State (State), regulatory uncertainty over legal water availability has created economic conditions that are politically challenging for counties. WRIA 55 may face these same challenges in the future. Specific examples include the following:
    - In 2001, junior surface water users in the Yakima Basin, including 1,000 cabin owners and the City of Roslyn, were given a court-ordered water use curtailment. The curtailment resulted in a drop in property values, inability to obtain bank loans for refinancing, a less attractive market for cabin sales, and insurance challenges.
    - In 2006, new groundwater use was restricted in the Upper Kittitas basin resulting in work stoppages on active homebuilding projects, and the inability to access bank loans.
    - In 2013, a Washington State Supreme Court Decision (Swinomish Indian Tribal Community v. Ecology) invalidated a portion of an instream flow rule that allowed exempt well development in Skagit and Snohomish Counties. As a result, 500 existing homeowners and many undeveloped property owners are now faced with property devaluation, and the inability to access bank loans for refinancing and home sales.
- Case law on groundwater exempt use, impairment of instream flows, conjunctive management of surface and groundwater, county building permit and Growth Management Act (GMA) responsibilities, and over-riding considerations of the public interest (OCPI) standards continue to be clarified by the court system. There is a corresponding trend towards county co-managing with Ecology the

risk of future curtailment and the associated impacts on property values, on the ability to develop property, and on property transactions when instream flows are not met.

- The Little Spokane River instream flow rule (WAC 173-555; hereafter referred to as "the Rule") does not address groundwater and contains ambiguous exemptions for domestic use.
    - Water is frequently unavailable to fully meet adopted instream flows in WRIA 55. Existing surface water users with water rights junior to the Rule have been and continue to be curtailed by Ecology. Groundwater right holders have not historically been curtailed, but could be in the future based on Ecology's and the court system's evolving interpretation of the law, the Rule, and standards for protection of existing water rights.
    - Ecology has denied new groundwater rights based on hydraulic continuity with the river and impairment of instream flows; these denials have been upheld by the Pollution Control Hearings Board (PCHB).
    - Although groundwater is not mentioned specifically in the Rule, WAC 173-555-010 clarifies that it applies *"to waters within and contributing to the Little Spokane River basin"*.
    - The 1975 Ecology WRIA 55 Basin Program Report (1975 Basin Report) on which the Rule is based states that junior groundwater users should be interruptible.
- Domestic and stockwater uses are exempted from tributary closures, but not from Little Spokane River base flows. While this regulatory scheme works for surface water diversions, it is not clear how it applies to permit exempt groundwater uses. Additionally, court decisions (e.g., *Postema v. Pollution Control Hearings Board* and *Swinomish v. Ecology*) have created uncertainty in the statutory basis for exemptions included in instream flow rules in general.
- Developments served by permit-exempt wells are constrained by the *Department of Ecology v. Campbell & Gwinn* Decision, which limits a development project to one permit exemption, which could affect existing and future subdivisions in WRIA 55.

Summary of Water Bank Incentives

Given that considerable uncertainty exists regarding the future legal, regulatory, and policy environment that regulation of water resources in WRIA 55 will be subject to, incentives for stakeholder participation in the water bank include:

- Ecology is not issuing new water rights in WRIA 55 under current conditions.
- Existing surface water right holders junior to the Rule are curtailed on a regular basis.
- Preliminary plats that pre-date the 2002 *Campbell & Gwinn* decision may not conform to the standards therein, and there is no vesting doctrine within water law.

- Pending Ecology interpretation of the Rule, regulation of exempt wells in WRIA 55 could provide a new market for a water bank.

This FS finds that a water bank is a viable solution to begin to address this uncertainty because:

- Sufficient statutory authority exists to create a water bank in WRIA 55.
- Approximately 28 public, quasi-public, and private water banks are in operation or being studied in Washington State to address similar risks.
- Water bank management may potentially be conducted at the county level, Tri-County level, or by a contractor to one or more counties to implement its authorities. Under RCW 36.01.230, a county has authority to spend money on cooperative watershed management actions for purposes of water supply management.
- Counties that establish water banks can adopt business rules to prevent behavior that would be disruptive to the water bank (e.g., third-party speculation).
- A water bank could provide water to development in areas that are not served by public water, yet do not have legal access to water.

Water Market Economic Evaluation

Three scenarios are discussed in this FS that together provide a range of benchmarks for price and market activity outcomes, based on whether water banks are nonprofit (public) or for-profit, and whether a regulatory imperative (e.g., Ecology enforcement or future changes in county land use decisions based on legal interpretations of water availability) exists for mitigation requirements. This analysis focused on residential costs assuming a single family home with 500 ft^2 of lawn irrigation, and concludes the following:

- **Scenario 1 (public water bank, no regulatory imperative).** Costs for this scenario can be bounded by the maximum noted for Spokane/Pend Oreille/Stevens County transactions ($2,528 acre-foot/year consumptive use (AFCU), or $374 per mitigation unit/residence based on a 0.148 ac-ft/year consumptive use requirement). However, bank transaction fees would likely be added. This analysis is based on limited data and higher costs could occur.
- **Scenario 2 (public water bank with regulatory imperative).** As a benchmark for potential costs, it is assumed that water bank pricing is approximately consistent with the higher end of the range for public water banks noted in Tables 6 through 8, at $1,644 per mitigation unit/residence. This would represent less than 1 percent of the improvement value of a home.
- **Scenario 3 (private water bank with regulatory imperative).** Costs for a private bank could push costs to 10 percent or more ($20,425) of the improvement value of a home, based on the higher end of the available private water bank data.

The above costs are intended to provide a range of possible outcomes depending on the bank model chosen, and the presence or absence of a regulatory imperative for

purchasing from a water bank, but the specific seeding and administration of a WRIA 55 bank will determine its pricing structure.

Potential Demand and Bank Sizing

A major component of assessing the feasibility of establishing a water bank in WRIA 55 is understanding the magnitude and characteristics of the potential existing and future demand for water. Timing and quantity of demand is important to balance the magnitude of water rights needed to seed the water bank, the expense of establishing the water bank administrative systems, and the need for the water by the water bank customer.

The types of water uses most likely to utilize a water bank if one were available include the following:

- Future residential development in WRIA 55, which is forecasted to increase by 2,862 acre-feet per year (afy) by 2040.
- Surface water rights, issued after the Rule was adopted, containing instream flow provisions totaling 788 acre-feet per year of water.
- Pending water right applications that have been on hold since 1987 with an annual quantity on the order of 4,000 to 5,000 afy.
- Groundwater rights and current exempt uses that are junior to the Rule if Ecology or Court determinations create a new regulatory framework. Currently, these uses are not considered strong potential customers because the rights contain no restrictions, but could participate on a voluntary basis.

Prospective Bank Management Frameworks

A range of water bank basin management approaches have been applied in Washington that are discussed in detail in this FS that can incentivize or discourage water banking:

- The simplest approach in terms of the level of effort involved in water bank management is to manage the water bank as "One Bucket." This approach would require that a new use be mitigated so that there is no net decrease at the Dartford gage.
- Water bank management could be tied to the limiting factors of WRIA 55, ensuring those functions and values are preserved.
- Water bank management could consider groundwater withdrawal impacts with simplifying conservative assumptions or managed permit-by-permit.
- Water bank management could be tightly managed in time, space, and quantity.

Water Bank Seeding

The establishment of a water bank requires the input of some form of credit (seeding) for water use resulting from an action that adds to the overall condition (e.g. stream flow) of the basin. Potential seeding sources include:

Pre-Rule Irrigation Water Rights. A screening-level analysis of selected irrigation rights and claims predating the Rule for potential bank seeding was conducted, as these water rights are not subject to the instream flow requirements of the Rule and as such are

not interruptible. A tiered ranking structure was applied based on priority for further review if water bank seeding moves forward. Rankings included *high priority for further review (Rank 1), medium priority for further review (Rank 2),* and *low priority for further review (Rank 3).* Based on our screening-level analysis, water rights and claims with a high and medium priority for further review total 14,589 afy.

Surface Storage. Surface storage is another potential alternative that could support mitigation and bank seeding. Previous studies of water storage in WRIA 55 have been conducted as part of the Watershed Planning process and are discussed in this FS. Groundwater storage projects could contribute to water bank seeding and instream flow mitigation through passive surface aquifer recharge (SAR) or more active aquifer storage and recovery (ASR). The options considered as part of the WRIA 55 Watershed Planning included constructing new infiltration galleries and restoration of existing natural wetland sites for the purposes of augmenting groundwater and increasing storage.

Pend Oreille River Interbasin Transfer. Water from the Pend Oreille River could be diverted into the upper headwaters of the Little Spokane River, near the town of Newport. A review of water rights decisions and Ecology regulation of the mainstem of the Pend Oreille River indicates that water is potentially available. An appraisal-level evaluation of improvements and potential fatal flaws associated with the project is being performed, which will be submitted to the PAG as a separate memorandum in June 2015.

Habitat Restoration. Restoration of instream and near channel habitat, and fish migration barriers consistent with scientific and resource agency guidance on the sustainability of critical fish species in the Little Spokane Basin could provide out-of-kind mitigation.

Water Bank Operational and Management Considerations

Water banks can fill a variety of services when it comes to meeting out-of-stream and instream water demands. Over the course of discussions and presentations of technical memoranda with the PAG throughout 2014-2015, preferences for water bank operational and management approaches were defined. Key preferences and acknowledgements include:

- The PAG would like to continue to move forward with water bank development for WRIA 55. A general consensus was reached to further evaluate a publically run, Tri-County bank management model, as opposed to private, state, or NGO-led management structure. In this regard, a draft agreement between Pend Oreille County, Stevens County, and Spokane County is under negotiation to cooperatively move forward with evaluating water banking in WRIA 55.
- The PAG would like water bank applicants to work through each of the individual county planning and building departments to obtain mitigation certificates as part of other associated building permits. A central bank accounting management system is also preferred, with the exact structure and operator of that to be determined.
- There is overall PAG support for including a component of bank seeding from water rights purchases, including agricultural water rights. Some PAG members

have expressed concerns regarding individual solicitation of agricultural water right holders given the desire to preserve agricultural lands and potential Growth Management Act requirements, while others would like more flexibility in this regard. This issue will need to be addressed as part of setting up water banking business rules, and approaches may vary among the three counties. In addition, if available information indicates that certain water rights may be at risk of relinquishment for non-use, these could be prioritized for outreach and potential purchase.

- There is overall support from the PAG for continuing to investigate potential use of Pend Oreille watershed (WRIA 62) water from either a groundwater or surface water source in the vicinity of Newport, Washington. A groundwater source is the preferred choice if it is proven feasible.
- The Kalispel Tribe has participated in several PAG meetings, and has noted that the Tribe has unquantified water rights in the Pend Oreille watershed, as reserved by the Winters Doctrine. These rights are expected to be senior to most or all of the other water rights in the watershed, and would have senior priority to any water rights from the Pend Oreille permitted by Ecology to support Little Spokane water bank seeding. The Tribe has stated it has no objection to creating a water bank in the Little Spokane River Basin, provided it is with in-basin water. The Tribe has also expressed an opinion that it is premature to pursue seeding the LSR water bank by transferring Pend Oreille Basin water until all in-basin options are identified and exhausted including effective implementation of water conservation, reclamation, and reuse. In additional, the Tribe's opinion is that conditioning new water rights solely on WDFW's existing in-stream flow recommendations for the Pend Oreille River is not adequate to protect the Tribe's interest because their reserved rights include at least a protective minimum in-stream flow, practicably irrigable acreage, and domestic-use rights. The Tribe also expressed an opinion that a general stream adjudication should be completed on the Pend Oreille River to ensure that the system is not already over allocated.
- Some PAG members expressed the desire to initiate the water banking as a voluntary process, unless a regulatory imperative, such as a moratorium on new exempt wells, changes the current situation. This would ensure time to allow this new process to be integrated with functions in each of the counties.
- There is PAG support for using consumptive use equivalents for bank management, as this lessens the gap between supply and demand, and is accepted practice in some of the other water banks operating in Washington.
- The PAG is aware of the need to guard against use of a water bank for speculation and mitigation certificate 'flipping', and supports putting protections in place to prevent this, such as a limited development schedule for use of a mitigation certificate. The PAG recognizes the need to be proactive and timely in obtaining water rights for water bank seeding should a bank be established, also with the goal of minimizing speculation.
- There is an overall PAG preference for the bank to be managed as to a single point in the mainstem, such as the Dartford gage (i.e., as "One-Bucket"), with the

understanding that concurrence from Ecology will need to be negotiated for this approach, possibly coupled with habitat projects that would offset potential in-basin impacts to the functions and values of the instream flow. There is also recognition that a better understanding of tributary groundwater/surface water interaction and habitat issues are needed to support this approach.

- There is an understanding within the PAG that county planning and building departments will need to be educated regarding management of the water banking process, and determinations of legal water availability, in addition to filing and recording of mitigation certificates.
- There is significant PAG concern, particularly among members from the Tri-County group, regarding potential impacts to county workloads and the general fund. A key factor in final bank funding, seeding, and management will be to address and mitigate fiscal liabilities and workload burden on county staff, with one option being an enterprise funding mechanism.
- There is PAG understanding that additional development of a final management structure will be needed following completion of the FS.
- The PAG supported submittal of a Watershed Plan Implementation and Flow Achievement Grant application to seek funding for completion of water bank development. The grant application was submitted to Ecology on April 30, 2015 and is pending review.
- The PAG is open to the use of Watershed Management Partnerships, board of joint control approaches, and other cooperative means to coordinate water bank management. Potential approaches to these managements mechanisms are as follows, and discussed in more detail in the FS:
    - **Interlocal Agreements.** Interlocal agreements have the advantage being a fairly standard approach to cooperative agreements between public entities that do not require third-party involvement to enact and are established in RCW.
    - **Watershed Management Partnerships.** Watershed Management Partnerships can have the advantage of greater management flexibility, as illustrated by the Walla Walla Watershed Management Partnership. Tailoring a partnership in the Walla Walla watershed required legislative action specific to meeting the goals of the project.
    - **Boards of Joint Control.** Boards of joint control were initially codified in 1949, and have been used within several basins in Washington State to manage water management infrastructure and investments. Boards of Joint Control offer a statutorily unique water bank structure that could be adopted without legislative action.
    - **Contract Law.** Formation of a contractual agreement under State contract law would divide duties, obligations, and benefits derived from operating water banking activities in the Little Spokane Watershed. A contract of this nature could be used in conjunction with other mechanisms provided above.

There will likely be some increased code enforcement administration that the County must assume, in order to allow regulatory agencies and third parties to have confidence that the bank is operating correctly. Changes in the building permit process are also anticipated if implementation of a water bank occurs in WRIA 55:

- **No regulatory mandate.** The public is informed about the availability of the water bank through public outreach. The current building permit application forms for each county are not modified. Mitigation certificates issued by the water banking entity are recorded and attached to the property deed under a voluntary program.
- **Regulatory mandate.** As above, the public is informed about the availability of the water bank through public outreach. The public is informed about the requirements for mitigation at the Site Analysis application stage (Stevens and Pend Oreille County) or the Building Permit application stage (Spokane County). Legal and physical water availability are evaluated by county staff as part of approval of building permits. Mitigation certificates issued by the water banking entity are recorded and attached to the property deed.

Water Banking Feasibility and Implementation Plan for Continued Water Bank Development

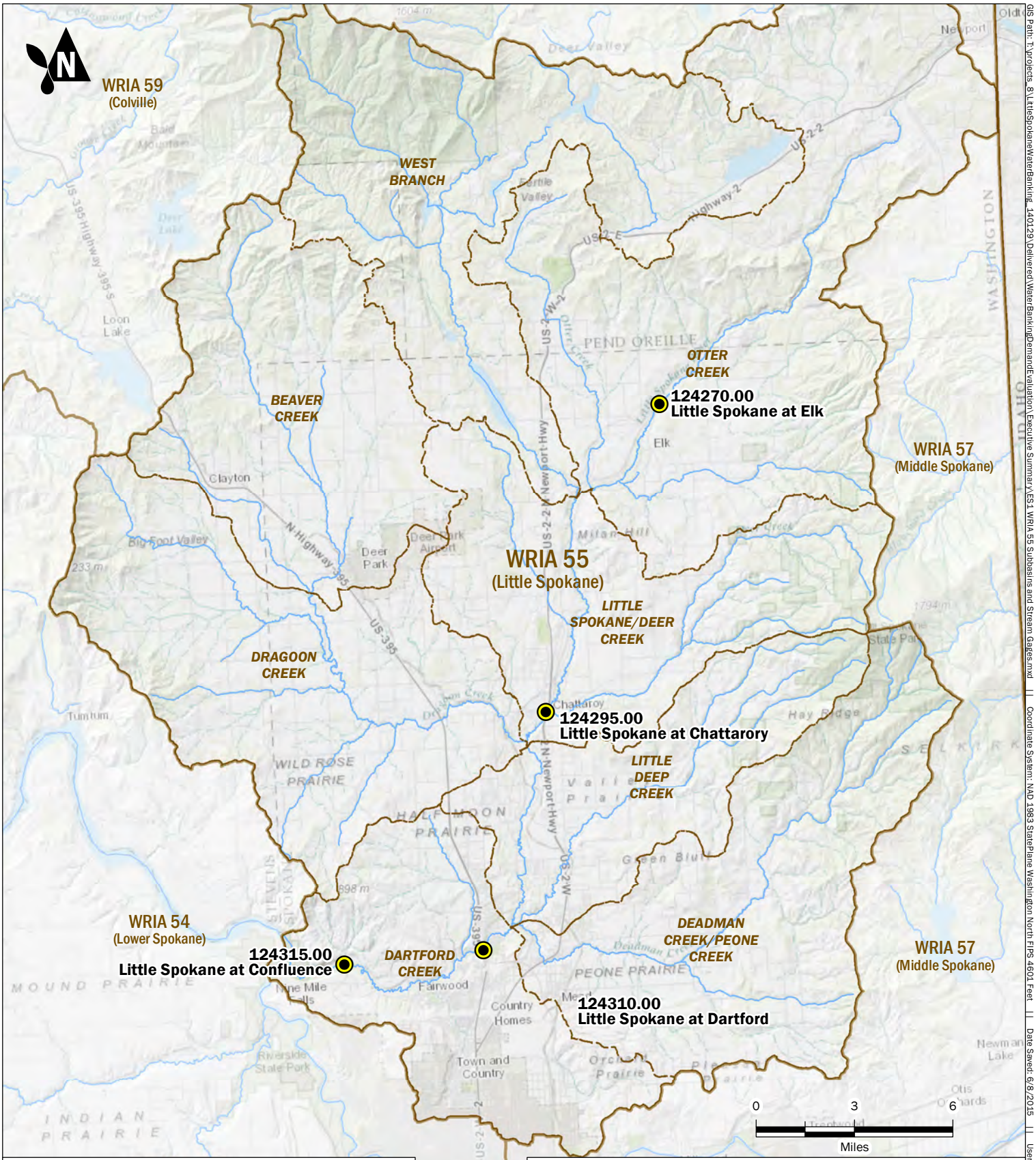
Aspect, in conjunction with input from the PAG, has concluded that water banking is feasible within WRIA 55, based on several factors, including:

- An evaluation of water bank seeding costs though water right acquisitions and other sources of supply suggests that costs will be generally compatible with those associated with other water banks and other water right transfers in the state.
- Water bank seeding opportunities appear to be sufficient in magnitude, relative to projected increases in water demand in WRIA 55.
- A coalition of local stakeholders, including Spokane, Stevens, and Pend Oreille Counties, local water purveyors, Ecology, and the Kalispel Tribe, have worked together as part of the PAG, and are supportive of moving forward with establishing a water bank within WRIA 55.

An Implementation Plan is being developed for continued water bank development. This Implementation Plan has been incorporated into a Watershed Plan Implementation and Flow Achievement Grant application to seek funding for completion of water bank development. A grant application was submitted to Ecology on April 30, 2015 to further implement WRIA 55 water banking and is pending review. Tasks incorporated into the Implementation Plan include:

- **Stakeholder Collaboration.** The goal of this work is to provide forums for communicating project issues, developing necessary agreements, policies and procedures, input related to technical work associated with the project, and reviewing project deliverables. The existing PAG and a new Technical Advisory Group would be convened during implementation.

- **Public Outreach.** Public outreach is considered essential to successful development of a functioning water bank in WRIA 55 and includes public meetings and workshops; responding to inquiries from interested citizens, media outlets, and interest groups; preparing/distributing mailers summarizing project plans to watershed property owners; and developing a project website.
- **Finalize Water Bank Operation Framework.** This includes support for completing an agreement between the Tri-Counties that details the WRIA 55 Water Bank legal and operational framework, funding, and policy guidelines and details regarding set up and operation of water banking.
- **Water Rights Acquisition Outreach.** This includes public outreach focusing on water right holders to inform them about water bank seeding opportunities, and development of a portfolio of interested water right holders
- **Water Right Procurement.** Acquiring water rights should be focused on providing bank seeding that benefits a range of users in WRIA 55, with insurances that anti-speculation mechanisms are in place. As part of this work, due diligence should be conducted to ensure that the water rights meet the identified needs of the water bank, and purchases should be completed.
- **Tributary Basin Water Bank Management Support.** Additional work is recommended for development of data and analysis at a suitable level to support the management of specific mitigation and instream flow enhancement tasks in tributary basins. This will likely require the assessment of impacts of new uses to instream resources within tributary basins and the suitability of specific mitigation approaches to address those impacts.
- **Pend Oreille Watershed Source Investigations.** An appraisal level analysis is in progress to investigate potential use of water from the Pend Oreille watershed for WRIA 55 bank seeding and instream flow enhancement. Additional detailed engineering and environmental analysis is needed to further develop and potentially implement this work, as recommended below. This work includes investigations in the Little Spokane headwaters, Pend Oreille watershed near Newport, pre-design evaluations, and preliminary engineering design.



USGS Gaging Station/Control Station

WRIA Boundary

WRIA 55 Subbasins

Named Watercourse

Notes:
-WRIA 55 Subbasin Source: Spokane County Water Resources Division of Utilities, 2015

WRIA 55 Subbasins and Stream Gages

Little Spokane Water Banking Demand Evaluation,
Supply Assessment, and Water Transfer Framework Considerations
WRIA 55, Washington

Aspect CONSULTING	JUN-2015	BY: CME / RAA	FIGURE NO. ES - 1
	PROJECT NO. 140129	REVISED BY: ---	

GIS Path: T:\projects_8\LittleSpokaneWaterBanking_140129\Delivered\WaterBankingDemandEvaluation\Executive Summary\ES1 WRIA 55 Subbasins and Stream Gages.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 6/8/2015 || User: rpepin || Print Date: 6/8/2015

1 Introduction

Spokane County Utilities Division (the County), in conjunction with Stevens and Pend Oreille County (Tri-Counties), is considering setting up a water bank to address existing and potential regulatory constraints on existing and new water use in Water Resource Inventory Area (WRIA) 55, the Little Spokane Watershed. As part of this process, the County has convened a Policy Advisory Group (PAG) to allow interagency and stakeholder coordination and evaluation of alternatives for water banking in the watershed.

Aspect Consulting LLC (Aspect) has been engaged by the County to provide consulting services for the Little Spokane Water Banking Feasibility Study (the FS). Carlstad Consulting, with support from Spokane County, contributed the water demand evaluation component of this study. Jonathan Yoder of Washington State University contributed the water market evaluation. Cascadia Law Group assisted in assessment of water bank incentives and structural frameworks for water banking.

Two previous memoranda were submitted to the PAG as part of this study:

- *Legal, Regulatory, and Policy Framework for Water Banking in Washington* was submitted to the PAG on September 30, 2014 (Aspect, 2014), followed by the first PAG meeting on October 15, 2014.

- *Little Spokane Water Banking Demand Evaluation, Supply Assessment, and Water Transfer Framework Considerations* was submitted to the PAG on January 12, 2015 (Aspect, 2015), followed by the second PAG meeting on January 15, 2015.

A third PAG meeting was held on April 29, 2015 to discuss ongoing project work, including coordination among the Tri-Counties for water bank development and management, overview of a Pend Oreille Diversion Appraisal Study, an updated water rights assessment, and review of a recently submitted Watershed Planning Implementation and Flow Achievement Grant Application to support continued water bank development in WRIA 55.

This FS includes all of the components of the two previous memoranda, with updated information, where appropriate, such as inclusion of more recent legal decisions and an expanded water rights analysis. In addition, this FS also includes a water market evaluation, additional development of water bank structural options, and an implementation plan for continuing development of a WRIA 55 water bank. An Appraisal Level Evaluation of potential use of a Pend Oreille watershed source for bank seeding will be submitted to the PAG as a separate memorandum in June 2015.

This FS includes the following key topics:

- Legal, regulatory, and policy framework for water banking, including:
    - Regulatory authority for water banking — Section 2
    - Water availability (physical and legal) in the Little Spokane Basin — Section 3
    - Review of baseflows and reservations established by WAC 173-555 — Section 3
    - Applicability of WAC 173-555 to groundwater — Section 3
    - Case law influences on regulatory drivers for a water bank — Section 3
    - Rule closures, amendments, and adjudications — Section 3
    - U.S. Bureau of Reclamation's (Reclamation) regional withdrawal of water above Priest Rapids Dam, located on the Columbia River approximately 50 miles upstream of Richland — Section 3
- A discussion with Ecology on water banking issues held prior to convening the first PAG meeting — Appendix A
- Incentives for water bank participation — Section 4
- Current Washington State water banking structures and models — Section 5
- Water market economic evaluation — Section 6
- An evaluation of potential water demand in WRIA 55, including:
    - Future self-supplied residential water needs — Section 7
    - Public water system future demand — Section 7
    - Potential water bank demand from existing water uses, including interruptible water rights and existing permit exempt wells[1] — Section 7
- Water bank basin management and seeding approaches, including:
    - Examples of Ecology basin management approaches relevant to water banking — Section 8
    - Consumptive use equivalents and bank debits — Section 8

[1] [1] Under existing law (RCW 90.44.050), the groundwater permit exemption allows, for a limited number of purposes, water users to construct and develop groundwater wells for small quantities of groundwater without obtaining a permit. For residential water use purposes, permit-exempt wells are wells that supply home and garden, and specified small uses up to 5,000 gallons per day for indoor use, and a ½ acre of lawn / garden.

  - Temporal considerations for bank management — Section 8
  - In-kind versus out-of-kind mitigation/seeding — Section 8
  - Potential acquisition of existing water rights — Section 8
  - Other potential bank seeding opportunities, including surface water storage, groundwater storage, interbasin diversion from the Pend Oreille watershed, habitat restoration, and conservation — Section 8
- Water bank operational and management considerations — Section 9
- Implementation plan for ongoing development of a WRIA 55 water bank — Section 10

2 Water Banking Statutory Authorities

The State's Trust Water Right Program (TWRP) provides the fundamental regulatory authority for water banking. A water bank is a mechanism that facilitates transfer of water rights between sellers and buyers. The source water right that is "banked" is typically held in the State's TWRP, protected from relinquishment, until its diversion authority is formally conveyed to the buyer. Although the State's TWRP was authorized in 1991, water banks have only significantly expanded in the last 10 years in response to Ecology actions to manage groundwater in closed basins (e.g., Upper Kittitas), as instream flows have been adopted (e.g., Dungeness), in response to local collaboration to solve water supply problems (e.g., Walla Walla, White Salmon, Methow Valley), and through new legislative focusses (e.g. Office of Columbia River (OCR), Cabin Owners).

The State's statute governing water banking is authorized in RCW 90.42[2]. While the concept and use of the term "water bank" has been around for years, comprehensive state-wide water banking legislation was not passed by the Legislature until 2009[3]. A trust water right is any water right acquired by the State for management in the State's TWRP on a temporary and/or permanent basis. The TWRP provides a way to legally hold water rights for future uses without concern for the relinquishment for non-use per RCW 90.14.140(2)(h). Water rights are typically held in trust to benefit instream flows or preserve groundwater, to protect them from relinquishment, to be considered beneficially used, or to offset new out-of-stream uses.

While in the TWRP, the water right maintains its original priority date, with a specified place of use (stream reach or aquifer), an instantaneous and annual quantity (typically specified as a monthly schedule), and a period of use (e.g., irrigation season, or year-round). These instream flow water right attributes are necessary for the trust water right to be beneficially used and account for the water right as instream flow to offset (mitigate) new water uses. Ecology's use of a water right it holds in trust is typically governed by a Trust Water Agreement, which is a contract between the State and the owner of the water right describing the terms of trust.

Trust water rights are considered beneficially used when they are exercised for incremental enhancement of instream flow. Ecology can provide notice of exercise of trust rights through a public notification process via the internet (http://www.ecy.wa.gov/programs/wr/market/trstdocs. html).

Ecology has a statutory role in setting up water banks via the TWRP, though day-to-day administration of the banks range from full Ecology administration (e.g., Office of Columbia River, Cabin Owners) to 3rd party administration (e.g., Dungeness, Walla Walla). Potential water bank managers need to reliably fill this function in a way that meets the public trust standard. Managers could include local government, such as counties or conservancy boards, creation of a watershed-based water resource management entity, non-profit NGO's, or a certification program for private companies or individuals.

[2] A Yakima basin trust water statute also exists in RCW 90.38; however, it focuses strictly on the trust water right statute applicable to that County.
[3] See in general RCW 90.42.100 through 130.

3 Water Availability in the Little Spokane Watershed

3.1 Baseflows Adopted in Rule and Measured By Stream Gages

Water availability for new permit-exempt (exempt) and permitted water uses in WRIA 55 is directly affected by limitations in available water supply relative to instream flows adopted by WAC 173-555, the Little Spokane Instream Flow Rule ("the Rule"). The Rule was established with a priority date of January 6, 1976, and permit exempt or permitted water uses after the date of the Rule could potentially be subject to curtailment by Ecology when flows are not met.

Baseflows have been established for four stream management units in WRIA 55, based on the stream gage locations shown on Figure 1. At the present time, Ecology manages curtailment of interruptible permitted rights based on flows at the Dartford gage. When seven-day-average flows fall below the established baseflow, Ecology sends a letter to junior water right holders requesting that they curtail water use. Three of the four gages are currently operational (the Chattaroy gage is not operational). Figures 2 through 4 illustrate average and minimum daily mean flows from 2002 to 2012 relative to the baseflows established in WAC 173-555 to illustrate the streamflow variability that can affect water availability and potential curtailment of permit exempt or permitted water uses after the January 6, 1976 priority associated with rule establishment.

The Elk gage (Figure 2) is the highest gage in the watershed, with relatively low streamflows, and it shows a more limited response to spring runoff than the Dartford or Confluence gages (Figures 3 and 4). For example, while these downstream gages met minimum instream flows at all times during April, there were occurrences throughout April at the Elk gage when baseflows were not met during those years. In contrast, the Dartford and Confluence gages show more consistent low flows in the late summer and early fall than the Elk gage. Figure 5 provides a comparison of the frequency that the Little Spokane at Dartford and at Elk do not meet baseflows and recommended flows, respectively to illustrate the different seasonal responses at the two gages.

3.2 Reservation of Water for New Uses in WAC 173-555

In addition to establishing baseflows, the Rule also established reservations of surface water for beneficial uses. It is our understanding that Ecology has not tracked accounting of the reservations. A review and interpretation of reservation debits and seasonal water availability analysis for post-Rule-permitted water rights will be an important component of water bank planning. Ecology's *"Focus on Water Availability, Little Spokane Watershed, WRIA 55"* noted that a significant number of water rights were issued after the date of the Rule, and that these have been regulated almost every year during low flow periods. Ecology concluded that all of the water has been appropriated and no water is available for consumptive uses. The language in WAC 173-555-050 describing the reservation is as follows:

(1) The department determines that these are surface waters available for appropriation from the stream management units specified in the amount specified in cubic feet per second (cfs) during the time specified as follows:

(a) Surface water available from the east branch of the Little Spokane River, confluence with Dry Creek to headwaters, based on measurement at control station number 12-4270.00 at Elk are:

Month	May		June		July		Aug.		Sept.		Oct.	
Date	1	15	1	15	1	15	1	15	1	15	1	15
Amount	26	22	17	14	11	9	5	5	5	5	5	5

(b) Surface water available from the Little Spokane River from confluence with Little Creek at Dartford to Eloika Lake outlet, and to confluence with Dry Creek based on measurement at control station number 12-4310 at Dartford are:

Month	May		June		July		Aug.		Sept.		Oct.	
Date	1	15	1	15	1	15	1	15	1	15	1	15
Amount	340	236	152	103	62	34	11	11	11	11	20	20

(c) Available surface waters for those days not specified in (a) and (b) shall be defined from Figures II-3 and II-4 in the document entitled "water resources management program in the Little Spokane River basin" dated August, 1975.

(2) The amounts of waters referred to in WAC 173-555-040(1) above are allocated for beneficial uses in the future as follows:

(a) Three cubic feet per second from the amount available in the east branch of the Little Spokane River referred to in WAC 173-555-040 (1)(a) above and five cubic feet per second from the amount available in the Little Spokane River, besides east branch, referred to in WAC 173-555-040 (1)(b) are allocated to future domestic, stockwatering and noncommercial agricultural irrigation purposes within the stream reaches specified therein throughout the year.

(b) The remainder of the amount referred to in WAC 173-555-040 (1)(a) and (b) besides the amount specified in WAC 173-555-040 (2)(a) are allocated to consumptive and nonconsumptive uses not specified in WAC 173-555-040 (2)(a). These are further described in the figures appended hereto.

[Order DE 75-24, § 173-555-040, filed 1/6/76.]

Actual water availability in the Little Spokane Basin will be defined in the future by additional review and analysis of permitting of post-rule water rights debiting against the reservation, seasonal water reliability of post-rule water rights, and the extent of permit exempt water use. If balances remain in the reservation, which is not considered likely based on Ecology's interpretation, then they may be able to help offset new consumptive uses and potentially seed a water bank. Note that water rights under the reservation are

still subject to WAC 173-555-030(4), which states "all rights hereafter established shall be expressly subject to the base flows established in sections WAC 173-555-030 (1) through (3)."

3.3 Applicability of WAC 173-555 to Groundwater

Based on our initial assessment, there appears to be conflicting information with respect to the question of whether WAC 173-555 applies to groundwater, whether exempt or permitted, based on the following:

- WAC 173-555 does not contain any explicit references to groundwater.
- In the past Ecology has appeared to interpret the Rule as not applying to groundwater based on the historic issuance of groundwater rights with no references to WAC 173-555.
- Ecology recently appeared to interpret the Rule as not applying to groundwater, demonstrated by a recent Report of Examination approving changes to groundwater rights junior to WAC 173-555.
- Ecology has not actively curtailed permitted groundwater users junior to WAC 173-555.
- Although groundwater is not mentioned specifically in the Rule, WAC 173-555-010 clarifies that it applies "to waters within and contributing to the Little Spokane River basin". The 1975 Ecology WRIA 55 Basin Program Report (1975 Basin Report) on which the Rule is based states: "Surface water and/or ground water appropriation permits that will allow direct diversion from, or have measurable effect on, streams where base flows have been established, shall be subject to the base flow limitations, and any such permits or certificates shall be appropriately conditioned to assure maintenance of said base flows." We note that this only identifies "ground water appropriation permits" and not exempt groundwater uses.
- WAC 173-555-030(4) states "all rights hereafter established shall be expressly subject to the base flows established in sections WAC 173-555-030 (1) through (3)."
- Domestic and stockwater uses were exempted from tributary and lake rule closures under WAC 173-555-060; however, this exemption is not referenced in WAC 173-555-040, which addresses water reservations in the mainstem of the river.
- Ecology's focus sheet on water availability for WRIA 55 states that the rule does apply to groundwater and that Ecology has stopped issuing water rights based on this. The focus sheet states: "The appropriation of groundwater connected to surface water is subject to the same conditions as surface water uses", and "The Little Spokane watershed is generally closed to new consumptive water uses from surface water and connected groundwater." This document also indicates that exempt uses can still move forward, but may be subject to future interruptability.

- Ecology has denied new groundwater rights based on continuity with the river and impairment of instream flows; these denials have been upheld by the Pollution Control Hearings Board (PCHB).
- In addition, WAC 173-500-060, General Provisions for Water Resources Management Program Established Pursuant to the Water Resources Act states "Surface water and/or groundwater appropriation permits, issued subsequent to the effective dates of chapters 173-501 through 173-599 WAC, that will allow either direct diversion from or have a measurable effect on streams where base flow limitations of this chapter, and any such permits or certificates shall be appropriately conditioned to assure maintenance of said base flows."

Based on the initial information available, it is possible that:

1. Groundwater is subject to the Rule as "water within and contributing to the Little Spokane River basin" under WAC 173-555-010, and all permitted and exempt uses after 1976 are subject to future curtailment risk; or

2. Absent an explicit groundwater reference, no risk exists for existing groundwater users; or

3. Even without an explicit groundwater reference, impairment of senior water rights and case law could create curtailment risk.

4. Based on the language of the Rule and the 1975 Basin Report, groundwater permitted uses are subject to the Rule, but exempt groundwater uses are not. Alternatively, only domestic and stockwatering portions of exempt uses are not subject to the Rule.

5. Based on the language of the Rule, all permitted and exempt uses after 1976 are subject to base flows in the Little Spokane River, but domestic and normal stockwater uses are exempt from tributary closures.

3.4 Case Law Affecting Counties and Water Banking

Case law on water rights issues has been evolving based on several relevant recent decisions and will continue to affect water rights decisions in the state, given that several more key decisions are pending. Table 1 presents a summary of relevant legal cases for consideration in this study. Significant cases reviewed in Table 1 include:

- *Postema v. Pollution Control Hearings Board.* This decision defined the "one molecule" standard for instream flow impairment (i.e., Impairment does not need to be physically measureable, but scientifically-acceptable methods that demonstrate de minimus impacts can constitute impairment.)

- *Swinomish Indian Tribal Community v. Ecology.* This decision invalidated reservations for new water uses, including exempt wells, created through amendments to the Skagit instream flow rule. It also decided that Ecology went beyond its statutory authority in applying overriding consideration of the public interest (OCPI) to rulemaking that conflicted with the established instream flows.

- *Whatcom County v. Hirst.* This recent decision essentially directs local governments to follow Ecology's interpretation of instream flow rules. According to the decision, if Ecology interprets a particular instream flow rule to provide a specific exemption for domestic exempt wells, then a county can rely on that interpretation in making water availability determinations related to land use decisions. This is the case even if there are unmet senior instream flows. This decision also acknowledges that each instream flow rule must be interpreted individually. Ecology has indicated that they are completing an analysis of each rule, and plan to provide their interpretation to local governments in the future. There is now a petition pending before the Washington Supreme Court on behalf of the appellants to review this decision, and as a result some uncertainty still exists regarding the final outcome of this case.

Case law on exempt use, impairment of instream flows, conjunctive management of surface and groundwater, county building permit and GMA responsibilities, and OCPI standards continue to be clarified by the court system. There is a corresponding trend towards county co-management with Ecology of the risk of future curtailment and the associated impacts on property values, on the ability to develop property, and on property transactions when instream flows are not met. Several court decisions and pending decisions also have significant potential to affect water availability and the structure and management of any future water bank in WRIA 55.

Ecology and counties are exploring ways to co-manage risk based on the direction being provided by the courts, such as the evaluation of water bank feasibility for particular basins like WRIA 55. In addition, Ecology is preparing an updated guidance document (*Guidelines for Determining Water Availability for Subdivisions and Buildings*) and has convened a stakeholder workgroup to provide input to Ecology during development of the guidance. The guidance document will address the roles and responsibilities of both Ecology and local governments in physical and legal water availability determinations.

One of the emerging challenges that is playing out in the courts, in stakeholder forums, and potentially the Legislature, is the standard under which OCPI authority can be exercised by Ecology. This becomes important when seeding a water bank, and trying to match supply and demand through banking transactions while striving for a "zero risk" of future curtailment under WAC 173-555, often to meet public health and safety reliability criteria.

Water banks are often seeded through existing irrigation water rights or infrastructure projects. Irrigation rights are not typically authorized year-round, and most infrastructure projects cannot be managed in a way to completely match supply and demand. In these cases and absent operational storage in the basin to re-time these occurrences, OCPI can be a supporting component of the water bank by waiving very small impacts to instream flows, with much greater benefits at other times.

The ability to use OCPI to address imperfect supply and demand matching in water banking is in a state of flux at this time. The *Swinomish Indian Tribal Community v. Ecology* case invalidated the 2006 Amendment to the Skagit Rule that provided water for new uses of the permit exemption and clarified that OCPI should be used less broadly

than Ecology applied it in this case. The *Foster v. Eco*logy and *Okanogan Wilderness League v. Methow Valley* cases (Table 1) are currently before the courts evaluating whether OCPI in the context of an individual permitting decision was appropriate, including relying in part on out-of-kind benefits (e.g. habitat, water quality, passage). The recently settled *Okanogan Wilderness League and Center for Environmental Law and Policy v. Ecology and Kennewick General Hospital* case considered under what standards OCPI needs to be used, and whether impairment exists if the functions and values of the instream flow are still met. This case was settled based on a combination of out-of-kind mitigation and a component of interruptibility of water use. Three options exist that may play out over the next few years that may affect the viability of a water bank in WRIA 55:

1) **The current regulatory framework is the new normal.** While it is clear that Ecology and many stakeholders would like to see greater clarity and changes to OCPI, with legislation being a potentially viable pathway, other key water resource issues, such as relinquishment, have had limited success in legislative change. Bills have been frequently introduced to change relinquishment, and only modest changes have occurred in that pivotal statute since 1967. The implications of the current OCPI case law and legislative inertia is that it may be more suitable to permitting actions than rulemaking, and will likely require broad stakeholder consensus and a robust compensatory mitigation package.

2) **The Legislature may change or clarify the OCPI standard.** Ecology is leading a process with stakeholders (Rural Water Supply Workshops) to determine whether legislative action is appropriate in the future to address OCPI. It is difficult to speculate on what this effort may yield, and it may take multiple legislative sessions for an agreement to be reached.

3) **The courts could clarify that impairment of instream flows is more sophisticated than a simple "one molecule" standard**. Several cases identified in Table 1 are evaluated as to whether projects that create impacts to adopted instream flows during certain time periods, but maintain base flows that preserve and protect the instream flow values of wildlife, fish, scenic, aesthetic and other environmental values, and navigation values, represent impairment and even require an OCPI determination.

    a) If future court decisions or legislation allow a functions and values approach to considering impairment of instream flow as an acceptable standard, or when evaluating options related to seeding a water bank, the aquatic conditions of WRIA 55 should be considered. Based on the WRIA 55/57 Watershed Management Plan (2005), and Ecology's total maximum daily load (TMDL; 2010), WRIA 55 has the following aquatic conditions:

        i) Elevated temperature;

        ii) Fecal coliform levels above water quality standards;

        iii) Phosphorus concentrations that lead to low dissolved oxygen; and

iv) Polychlorinated biphenyls (PCB's) concentrations above water quality standards.

b) The WRIA 55/57 Watershed Management Plan listed the following aquatic species of concern:

i) Redband/Rainbow Trout, O. mykiss; and

ii) Mountain Whitefish, P. wiliamsoni.

Regulatory agencies will likely consider impacts to these criteria and species in future permitting efforts. Projects aimed at improving these issues in the watershed could be used for bank seeding or offsetting mitigation in the future.

3.5 Rule Closures, Amendments, and Adjudications

In addition to the statewide uncertainty regarding exempt wells, OCPI, and instream flow rules, specific uncertainty exists for WAC 173-555. Some of these factors that may affect water availability are discussed below.

The Rule closed streams and lakes to further consumptive appropriations, with the noted exception of domestic and stockwater uses from June 1 to October 31. The omission of these purposes of use appears to significantly reduce the risk of curtailment of these purposes, even if groundwater is subject to the Rule; however, there is no inclusion of this exemption in the section on management of baseflows, with WAC 173-555-030(4) stating "all rights hereafter established shall be expressly subject to the base flows established in sections WAC 173-555-030 (1) through (3)."

Specific surface water closures include Dry, Otter, Bear, Deer, Dragoon, Deep, Deadman, and Little Creeks; the West Branch of the Little Spokane River from the outlet of Eloika Lake, and all natural lakes in the basin. Water banking would need to consider impacts on specific closures. The challenge is that these tributary closures could create the need for many mini-banks with geographically targeted mitigation, rather than a more regional bank with gage-triggered mitigation.

Two tributaries within the watershed have been adjudicated (Deadman Creek and Bigelow Gulch). On one hand, this offers more certainty than in other basins where unadjudicated claims exist. However, this creates a greater impetus in those basins to protect senior out-of-stream uses that have been confirmed in addition to instream flows.

A recent rule amendment for the Little Spokane Basin is linked with recently adopted rule for the mainstem Spokane River (173-557). This provision is targeted to areas where the Spokane Valley-Rathdrum Prairie Aquifer (SVRP) is within WRIA 55. A small group of exempt wells will be mitigated by water rights purchased by Ecology under the rule amendment, but only from withdrawals from the SVRP aquifer. A key change in the Rule is that groundwater is, for the first time, explicitly considered as being subject to WAC 173-555. However, the language only ties groundwater from the "shallow aquifer associated with the Little Spokane River" to the Rule, and not groundwater from the SVRP aquifer to WAC 173-555. Groundwater from the SVRP aquifer is covered under WAC 173-557. Because Ecology did not amend the portion of WAC 173-555 outside the

SVRP footprint (which is less than 5 percent of the WRIA), it does not do much to clarify groundwater uncertainty in the WRIA. The amended language is as follows:

AMENDATORY SECTION (Amending Order DE 75-24, filed 1/6/76)

WAC 173-555-010 General provision. These rules, including any subsequent additions and amendments, apply to waters within and contributing to the Little Spokane River basin, WRIA-55 (see WAC 173-500-040). Chapter 173-500 WAC, the general rules of the department of ecology for the implementation of the comprehensive water resources program, applies to this chapter 173-555 WAC. In the area where this rule and chapter 173-557 WAC overlap, the application of each rule shall be determined as follows:

(1) New water use from the Little Spokane River, its tributaries, and the shallow aquifer associated with the Little Spokane River and its tributaries shall be regulated under this rule (chapter 173-555 WAC).

(2) New water use from the Spokane Valley Rathdrum Prairie aquifer shall be regulated under chapter 173-557 WAC, Water resource management program for the Spokane River and Spokane Valley Rathdrum Prairie (SVRP) aquifer.

A new water bank in WRIA 55 would likely need to include business rules that cover different conditions spatially and temporally to deal with the unique character of WRIA 55, and the existing and proposed rule framework for the basin.

3.6 Withdrawal of Water for Tributaries above Priest Rapids Dam

In 2004, Reclamation filed notice with Ecology that it intended to make examinations and surveys to withdraw unappropriated waters of the Columbia River and its tributaries above Priest Rapids Dam, located on the Columbia River approximately 50 miles upstream of Richland (RCW 90.40.030). This withdrawal expired on December 23, 2014. An extension request was filed with Ecology prior to expiration, and Ecology considers the withdrawal to remain in effect until the extension request is processed. According to Ecology's Focus Sheet on Water Availability:

- All new applications for surface water and potentially groundwater connected to surface water within WRIA 55 cannot be processed until a release from the Reclamation is obtained or the withdrawal has expired.

Reclamation typically does not grant releases of new consumptive use, but has accepted nonconsumptive uses and fully mitigated consumptive uses as not being in conflict with the withdrawal. Additionally, in granting this release to Reclamation, Ecology withholds a small quantity of water for new consumptive uses for projects and permits it is working on in Eastern Washington. Ecology and Reclamation are negotiating the magnitude and location of the consumptive quantities exempt from the withdrawal. A new water bank in WRIA 55 should be able to incorporate this withdrawal into its business rules.

4 Incentives for Water Bank Participation

There are a number of reasons why existing and future water users in the Little Spokane Basin would potentially participate in a water bank. The incentives are related to a number of factors, many of which are still in flux. Considerable uncertainty exists regarding the future legal, regulatory, and policy environment that regulation of water resources in WRIA 55 will be subject to, given a number of factors that are discussed in detail in Aspect's first memorandum on water banking in WRIA 55 (Aspect, 2014). These issues were discussed in a September 2014 Pre-PAG conference call with Spokane County, Aspect, and Ecology. In that call, Ecology responded to a number of preliminary questions on the feasibility of water banking in WRIA 55. A summary of the questions and responses is included in Appendix A.

Incentives for participation include:

- **Current hold on new water right permits.** Ecology has stated that it does not intend to issue new unmitigated water rights in the basin under the current conditions. A water bank could provide a mitigated source of water for new permits.

- **Potential changes to Ecology interpretation of statewide instream flow rules**. Ecology is currently reviewing and formulating an interpretation of existing instream flow rules statewide in the context of current understanding of hydraulic continuity and new Washington State Supreme Court decisions. While they have not yet communicated their interpretation, it is possible that new restrictions could result.

- **Potential regulation of exempt wells in WRIA 55**. If Ecology's interpretation does not lead to new restrictions, uncertainty will still exist. If property owners and/or building permit applicants are aware of the risks associated with their water supply, including potential ramifications for property transfers, they may opt to participate in a water bank even without explicit restrictions or regulation of exempt wells. A pending petition for review of the recent *Hirst v Whatcom County* decision before the Washington State Supreme Court may provide additional clarity on this issue.

- **Source of permitted water for new rural subdivision/cluster development projects.** Development served by exempt wells is constrained by the 2002 legal case *Department of Ecology v. Campbell & Gwinn Decision*, which limits a development project to one permit exemption thereby limiting the number of residences and the allowable area of irrigated landscape. Some plats in WRIA 55 were approved before 2002 when *Department of Ecology v. Campbell & Gwinn Decision* clarified exempt authorizations, which bear some risk that their water supply may not be viewed as adequate in the future. Since Ecology is not issuing new water rights in WRIA 55 under current conditions, a water bank could provide a permitted source of water for these types of development and other water right applicants seeking water for beneficial use.

- **Source of water during curtailment periods for water rights junior to the Little Spokane River Instream Flow Rule.** Water is frequently unavailable to fully meet adopted instream flows in WRIA 55. Existing surface water users with water rights junior to the Rule have been and continue to be curtailed through notification by Ecology. Groundwater right holders have not historically been curtailed, but could be in the future based on Ecology's and the court's evolving interpretation of the law, the Rule, and standards for protection of existing water rights. A water bank could provide water for use during the curtailment periods.

5 Current Washington State Water Banking Structures and Models

Approximately 27 water banks are in some form of study or active management in Washington. A summary of the location and structure of these banks is provided in Figure 6.

A number of operational and structural framework factors should be considered as part of planning for water banking in WRIA 55. A summary of water bank establishment under state water code and water bank structures and pricing is presented in the following sections, along with four examples of active water banking models.

5.1 Water Bank Establishment

The establishment of a water bank requires the input of some form of credit for water use resulting from an action that adds to the overall condition of the basin. Bank seeding can potentially take the form of in-kind (the most typical approach), out-of-kind, in-time, out-of-time, in-place, or out-of-place metrics Ecology uses in determining the value of a given action. These credits can potentially come in the form of:

- Retiring an existing senior water right and placing it in the State's TWRP;
- Building in-basin surface water storage;
- Importing water through inter-basin transfers;
- Water conservation (usually related to agricultural irrigation);
- Implementing a shallow aquifer recharge (SAR) or aquifer storage and recovery project (ASR);
- Reserves in instream flow rules, although there is more uncertainty regarding use of reserves based on the *Swinomish* Decision;
- Restoring habitat or wetlands that improve conditions addressing the functions and values of critical fish species or water quality; and
- Other watershed improvement activities.

Most existing water banks in Washington State rely consistently on the State's TWRP to transfer and store bank credits, but several also combine some of the other elements described above. Water is typically held in trust to benefit groundwater maintenance and surface water instream flows, and later permanently conveyed to Ecology to offset new uses through a prearranged trust water agreement with Ecology.

As noted earlier in this FS, there is significant uncertainty at the present time regarding application of out-of-kind mitigation and seeding approaches, based on recent OCPI court

outcomes and pending outcomes; however, these approaches may ultimately be options for a WRIA 55 Water Bank.

While utilization of the State's TWRP attributes offer some common benefits applicable to seeding all water banks (e.g. no relinquishment, certainty in regulation, in-kind), there are numerous ways that water banks can be structured, seeded, and maintained that should be considered by the County and the PAG to best fit the Little Spokane Basin.

5.2 Comparing Water Banks

Water banks transact quantities of water for a variety of purposes, from groundwater use under the permit exemption of generally less than one acre-foot (i.e. indoor and outdoor domestic use for a single residence) to permitted water rights in the tens, hundreds, or thousands of acre-feet (i.e., irrigation, industrial and municipal uses). For example: one transaction from a private water bank in Kittitas County conveyed 0.137 acre-feet per year consumptive for indoor and 500 square feet of outdoor domestic mitigation. Alternatively, one transaction from the Office of Columbia River for the Sullivan Lake Water Bank conveyed 1,100 acre-feet per year to the City of Bridgeport as a new water right permit.

For the purposes of this FS, Aspect has consolidated the significant variation in quantities of water involved in each transaction to a "unit of mitigation." This helps compare one water bank to the next when reporting transaction volumes (i.e. units of mitigation sold) and unit pricing (i.e. cost per unit). To standardize reporting across different bank metrics, when reporting acre-foot consumptive pricing, we have quantified water conveyed by the residential unit, and water conveyed by the acre-foot, to the acre-foot consumptive equivalent. In summary, significant variation exists between water banks based on market forces, demand, purpose, and regulatory requirements. The above assumptions are built into the analysis to provide a platform to equally compare the overall productivity of water banks.

5.3 Water Bank Structures

The several existing approaches to water banking in Washington have strengths and weaknesses that should be considered by the County and the PAG. To date, water banks have operated under four general water bank formational, operational, and managerial structures. The operational structures include:

- Public
- Quasi-Government
- Nongovernmental Organizations (NGO)
- Private

A water bank can be formed, operated, and managed by a single entity or different entities, while achieving the goals of providing reliable and legally defensible water transfers to the customer base. The following sections summarize each of these four structures and provide pros and cons of each.

5.3.1 Public

Public entities for the purpose of this section are considered to be State, County, City, or other local governments. Many public entities in the State operate water banks. In some cases, these are called “water banks”, in others “water exchanges”, in some cases by the entities served (e.g. Cabin Owners), or by the supply that seeded the bank (Lake Roosevelt Drawdown). Regardless of whether the public entity calls it a “water bank”, it is a water bank if it uses the TWRP to convert senior water rights into new appropriations. However, the footprint of the public entity could range from merely their typical regulatory function to also include all formation, operation, and management functions of a water bank. When a public entity contracts with a third party to perform the non-regulatory functions, hybrid banks result.

Washington State water banks formed, operated, and/or managed under the jurisdiction of public entities for the purposes of providing domestic mitigation to-date include:

- Yakima Basin Cabin Owners.
- Chelan County Reserve Program.
- Kittitas County Water Bank.

These banks have focused specifically on providing mitigation for domestic, exempt well use, with the exception of Chelan, which also includes opportunities for permitted uses under WAC 173-545.

Other water banks are being studied or are in development to facilitate counties in meeting legal availability requirements for domestic, exempt well water demand. These developing water banks are associated with areas of heightened groundwater management and groundwater rules in the following areas: Yakima County, Skagit County, Douglas County, and Klickitat County, and WRIA 59 (Colville Basin).

In addition, Ecology, through the Office of Columbia River is operating water banks and permitting water rights for new uses beyond domestic water use with the following programs: Lake Roosevelt Drawdown, Sullivan Lake, and the Port of Walla Walla. The following table summarizes the pros and cons of public water banks:

Table 2.Summary of Pros and Cons of Public Water Banks

Pros	Cons
May be formed, operated, and/or managed by public entities	Timing – generally slow to establish (1 to 3 years)
Set parameters on pricing, unit volume, service area, etc., through public process; ability to manage market activity, trading zones, targeted users	Potential concerns over divestiture of assets; potential third-party litigation
Most favorable pricing	Sustainability/duration based on low cost
Typically established and seeded through public funds	Restrictions on availability and use of public funds
Established to serve basic and extended public services (outside irrigation, stockwater, etc.)	Costs associated with bank management

A summary of public water bank transaction costs and volumes is provided in Figure 7. To date, public water banks have accounted for an estimated 250 units of domestic mitigation transacted. Costs have ranged in price from $1,000 per mitigation unit and consumptive acre-foot (Sullivan Lake), to $60 per mitigation unit and $3,600/acre-foot consumptive (Ecology, Yakima Basin Cabin Owners).

5.3.2 Quasi-Government and Nongovernmental Organizations (NGO)

Quasi-government organizations for the purpose of this section are considered to be entities formed by the legislature (i.e. Irrigation Districts, Walla Walla Watershed Management Partnership) and Nongovernmental Organizations (NGO) are considered to be entities formed under IRS tax code 501c3 (i.e. Washington Water Trust). Washington State water banks formed, operated, and/or managed under the jurisdiction of quasi-government and NGO entities for the purposes of providing domestic mitigation include:

- Dungeness Water Exchange (hybrid with Public)
- Walla Walla Water Exchange.

The following table summarizes the pros and cons of quasi-government and NGO Water Banks:

Table 3.Summary of Pros and Cons of Quasi-Government / NGO Water Banks

Pros	Cons
May be formed, operated, and/or managed by public interest entities	Timing – generally slow to establish (1 to 3 years)
Typically set parameters on pricing, unit volume, service area, ext. through public process	Decreased concerns over divestiture of assets, although retained as a concern if NGO works on behalf of a public entity
Generally mid-range prices	Restrictions on availability and use public funds
Usually established and seeded through public funds	Management of the water bank likely to be less costly than public banks
Established to serve basic and extended public services (outside irrigation, stock water, etc.)	Potential long-term fiduciary liability to managing entity
Ability to establish market activity, trading zones, ext.	
Sustainability, higher prices than public banks can extend longevity	

A summary of quasi-government and NGO water bank transaction costs and volumes is provided in Figure 8. To date, Quasi-Government and NGO water banks have accounted for an estimated 60 units[4] of domestic mitigation transacted at a price ranging from $1,000 per mitigation unit and $11,100/acre-foot consumptive (Dungeness Water Exchange, Clallam County/Washington Water Trust), to $2,000 per mitigation unit and $3,600/acre-foot consumptive (Walla Walla Watershed Management Partnership, Walla Walla Water Exchange).

5.3.3 Private

Private entities for the purpose of this section are considered to be private for-profit corporations incorporated under State and Federal Law. Private water banks currently in operation are limited to the Yakima Basin where an Ecology Upper Kittitas County Emergency Groundwater Rule, and now permanent Groundwater Rule, WAC 173-539A, requires mitigation of all new groundwater uses in Upper Kittitas County (specifically exempt wells).. Ecology ceased permitting new groundwater uses in the Yakima Basin in 1999 and surface water has been closed to new appropriation since May 10, 1905.

In response, 11 private water banks formed to fill the new market demand of individual rural landowners needing to mitigate for new exempt wells for domestic purposes. Prices have adjusted as the market has matured over the last five years since 2009, and can be expected to further mature, resulting in general downward price pressure. In the case of Kittitas County, the recently developed County public water bank has the potential to

[4] 50 units of mitigation are also attributed to the previous Public Water Bank discussion in Section 5.3.1.

exert additional downward price pressure. The following table summarizes the pros and cons of private water banks.

Table 4.Summary of Pros and Cons of Private Water Banks

Pros	Cons
Timing – generally the quickest to establish (6 months to 1 year)	Formed, operated, and managed to generate profit, with associated higher pricing.
Established and seeded through private investment funds	Generally highest prices and highest transaction costs.
Usually serves basic and extended public services (outside irrigation, stock water, ext.) based on market demand	Limited ability to establish market activity, trading zones, ext.
Control over divestiture of assets	Sustainability – limited controls on longevity

A summary of private water bank transaction costs and volumes is provided in Figure 9. To date, private water banks have accounted for an estimated 700 units of mitigation transacted in the Yakima Basin at a price ranging from $1,250 per mitigation unit, $41,600/acre-foot consumptive (Kittitas “Private” #1), to $10,000 per mitigation unit, $72,900/acre-foot consumptive (Kittitas “Private” #1 and 2).

5.4 Water Bank Structures Summary

Selection of the type of water banking model is dependent on the regulatory environment, timing of the need for water bank development relative to regulatory actions, and ability of Ecology and counties to agree on the standards for legal water availability and physical availability.

Price and volume of units transacted is highly variable between water banking models, as shown in Table 5. Public water banks account for the lowest overall cost per unit and cost per acre-foot, but with the lowest number of units transacted to-date. Private water banks account for the highest cost per unit and cost per acre-foot, and include the highest number of units transacted. Private water banks appear to the be the most productive based on the number of units transacted, but the units transacted is skewed in favor of private water banks based on the nature of regulatory actions related to rural growth and scale of Upper Kittitas County in the Yakima Basin. A summary of transaction differences between public and private banks is shown on Figure 10.

Within private water banks, there is competition for market share. Two of the water banks shown on Figure 10 show much higher activity than the others. Some of the reasons for this are hard to determine, but in at least one case is likely due to Water Bank #6 (Suncadia) being the first into the market, a high visibility and marketing strategy, and partly a built-in customer base. The following table presents a summary of water banking costs and activity based on our review of available data.

Table 5. Summary of Cost of Water for Public/Private Water Banks

	Cost of Water/Unit	Cost/acre-foot	Units Transacted
Public			
Average	$580	$1,290	46
Minimum	$35	$35	0
Maximum	$1,700	$3,600	200
Sum	-	-	230
Quasi-Government/NGO			
Average	$1,500	$7,350	27
Minimum	$1,000	$3,600	3
Maximum	$2,000	$11,100	50
Sum	-	-	60
Private			
Average	$5,620	$54,345	62
Minimum	$1,250	$27,000	1
Maximum	$10,000	$131,200	329
Sum	-	-	700

Notes:
Unit = Watershed Administrative Unit

5.5 Evaluation of Four Active Water Banking Models

To provide additional detail on how different water banks were formed and have influenced the market, the following sections summarize four different water banks.

5.5.1 Yakima Basin Cabin Owners (Public)

The Yakima Basin Cabin Owners (Cabin Owners) water bank is a public water bank operated by Ecology. Washington State Senate Bill 6861, with an effective date of June 07, 2006, provided guidance to Ecology to develop a water bank to solve curtailment issues associated with junior Cabin Owners water needs by providing administrative and seed funds to develop the water bank. Ecology seeded this bank with a senior irrigation water right they purchased, and are using Reclamation's Storage Exchange Contract to convert the seasonal right to year-round authority. Because there is robust storage in the basin that is managed to meet federal instream flow targets, they can manage it and mitigate instream flow impacts from Cabin Owners without having to reach to an OCPI finding. To date, Ecology has conveyed 200 units of mitigation at a rate of $60/unit and $3,600/acre-foot consumptive.

Website: http://www.ecy.wa.gov/programs/wr/cro/sb6861.html

5.5.2 Dungeness Water Exchange (Public/NGO Partnership)

The Dungeness Water Exchange is a Public/NGO partnership water bank operated by Clallam County and Washington Water Trust (WWT). The Dungeness Water Management Rule, Chapter 173-518 WAC, went into effect on January 02, 2013 and required new uses of groundwater to be mitigated. Ecology provided administrative and

seed funds to develop the water bank through the acquisition of senior irrigation rights, which were appropriate in this case because it was determined that mitigation was not necessary outside the irrigation season. A portion of the bank involves development of infrastructure projects to retime and recharge high flow events to augment base flow through groundwater augmentation. To date, WWT and Clallam County have conveyed an estimated 50 units of mitigation at a rate of $1,000/unit and $11,100/acre-foot consumptive.

Websites: http://www.washingtonwatertrust.org/water-exchange; and

http://www.ecy.wa.gov/programs/wr/instream-flows/dungeness.html

5.5.3 Walla Walla Water Exchange (Quasi-government)

The Walla Walla Water Exchange is a Quasi-government water bank operated by the Walla Walla Watershed Management Partnership (WWWMP). The Walla Walla River Basin Rule, Chapter 173-532 WAC, was amended in September 2007 to require new outdoor irrigation uses of groundwater under the permit exemption to be mitigated. Ecology provided state administrative and seed funds to develop the water bank through the acquisition of senior irrigation rights. Only irrigation season offsets are being provided, so the use of irrigation rights for bank seeding is appropriate. To date, WWWMP has conveyed less than 10 units of mitigation at a rate of $2,000/unit and $3,600/acre-foot consumptive.

Website: http://www.wallawallawatershed.org/partnership/participate/138-wb-ewmp

5.5.4 Yakima Basin Water Exchanges (Private Sector)

The Yakima Basin Water Exchanges are predominately a series of private water banks operated by for-profit corporations. The Yakima Basin Water Exchanges began when Ecology enacted a series of emergency groundwater rules in Upper Kittitas County beginning on July 16, 2009 requiring all new permit exempt groundwater uses to be mitigated. On January 22, 2011, Ecology formalized the permanent Upper Kittitas Ground Water Rule, Chapter 173-539 WAC, cementing groundwater mitigation requirements. The State of Washington, through Ecology, has used public funds to provide regulatory administrative services (issuing Water Budget Neutral Determinations) and regulatory oversight, but has not participated in the development of water banks. Private investors have seeded their own water banks and manage all of the administration. Seeding has occurred through acquisition of senior irrigation rights, and either the use of the Bureau of Reclamation Storage Exchange Contract to cover offseason impacts, or use of private on-site storage-and-release ponds for off-season mitigation. To date, the 11 private water banks in the Yakima Basin have conveyed an estimated 700 units of mitigation at rates ranging from $1,250 per mitigation unit, $41,600/acre-foot consumptive, to $10,000 per mitigation unit, $72,900/acre-foot consumptive.

Website: http://www.ecy.wa.gov/programs/wr/cro/wtrxchng.html

6 Water Market Economic Evaluation

6.1 Market conditions important for sellers, buyers, market price, and water bank effectiveness

The driving force behind the value of a water market is the net gains from trade that accrue to buyers and sellers in mutually beneficial exchange. These gains from trade are dependent on two basic factors: the difference between the value of water in its current use and the value of water for their highest-valued use, and the transaction costs associated with water market transactions.

Water banks are one of a wide variety of institutional approaches designed to reduce the transaction costs associated with water market transactions and transfer water from lower to higher valued uses, thereby facilitating water market activity and promoting gains from trade.

Many factors affect the difference between the value of water under current use/ownership versus potential future uses and the willingness to participate in a water market transaction. Many senior water rights were appropriated and perfected for agricultural uses, but emerging demands for municipal and domestic water consumption are increasing in many basins, and are often associated with high-valued uses. Some of the existing and/or new municipal and domestic water rights are interruptible, and owners of these rights may be interested in purchasing uninterruptible water rights to mitigate their risk of water curtailments. Regulatory restrictions and requirements for water use and development also affects the demand for water purchases. In particular, potential exists for mitigation requirements to be applied to exempt wells for rural residential development as a result of instream flow rules within a specific basin. This would increase the demand for senior water rights for mitigation purchases, shifting present water market dynamics.

6.2 Basic water bank structure and its influence on water prices and market effectiveness

The structure of water banks and their operations will affect water bank participation, as well as water prices and price volatility. One fundamental factor for prices faced by buyers is whether the water bank is operated as a for-profit or non-profit (public or private) venture. If operated not-for-profit, prices paid by buyers must only cover the fixed and variable costs of the water to the bank, which include the cost of bank acquisition of the water, transaction costs, and other administrative costs.

If the bank is operated as a for-profit enterprise, the asking price for water need not be limited to cost recovery, but will tend to reflect seller expectations about buyer willingness to pay, which in some cases may be substantially higher than the costs to the bank to generate profit to the water bank owners. This is in part due to the sometimes large differences in the value of water for current senior agricultural irrigation and the value (willingness-to-pay) to acquire water for developing municipal and domestic uses.

6.3 Water price and market scenarios

Given the above discussion, we provide some price and market expectations under three scenarios:

1. **Low cost/low participation scenario:** Public, cost recovery based water bank, no regulatory mitigation requirement for exempt well development, some purchases to address junior surface water right interruptibility for 'security' of water supply, some purchases by new or junior exempt well users to mitigate risk of future mitigation requirements, and potential purchases for grouped residential non-permit exempt developments.

2. **Moderate cost/high participation scenario:** Public, cost-recovery based water bank, regulatory mitigation requirement for exempt well development, purchases to address junior surface water right interruptibility for 'security' of water supply, and potential purchases for grouped residential non-permit exempt developments.

3. **High cost/high participation scenario:** For-profit water bank(s), regulatory mitigation requirement for exempt well development, purchases to address junior surface water right interruptibility for 'security' of water supply, and potential purchases for grouped residential non-permit exempt developments.

These three scenarios cover a wide range of possible outcomes. The analysis provided below uses data from past transactions in a variety of conditions that are generally comparable to the scenarios above.

6.4 Existing Data on Water Pricing and Sales

The analysis for the scenarios presented above is based on a price and sales comparison approach. This method uses existing data from actual transactions in similar situations as a basis for developing expectations about market development in the Little Spokane watershed in the event of water bank development.

The transaction data are from two basic types of sources to match each respective scenario. First, mitigation bank market activity and pricing were obtained through personal communication with existing private and public water bank managers in Washington State, and a series of public disclosure requests filed with Ecology, conducted from October through November 2014. Second, water right transaction data were obtained through telephone conversation and file research with Ecology, and a recent valuation report conducted by WestWater Research, LLC for Ecology, dated October 2014.

Consumptive water use, rather than total water use, is utilized by many water banks as the unit of water bought and sold. Consumptive water use is also the unit of mitigation used for new uses within a basin with regulatory restrictions. The data from outside of Spokane, Pend Oreille, and Stevens Counties are associated with a variety of consumptive use rates. To make all prices comparable, we have normalized prices to reflect the same consumptive use rate.

Consumptive use rates for WRIA 55 have yet to be developed, so we estimated consumptive use rates based on Ecology's methodology established in the Upper Kittitas

Water Exchange. First, we adopted Ecology's methodology on consumptive use percentages for indoor domestic water use and irrigation from the Upper Kittitas Water Exchange, and incorporated lawn irrigation requirements from the Washington Irrigation Guide (Spokane station, pasture/turf crop when estimating irrigation requirement and resulting consumptive use.) We also adopted 500 ft^2 as the standard minimum irrigation footprint for outdoor water use, as it has been used as a basis for transactions in the Upper Kittitas Water Exchange. For indoor domestic use, we used Ecology's typical standard of 350 gallons/day at a rate of 30 percent consumptive as used in the Upper Kittitas Water Exchange. Using the same Upper Kittitas Water Exchange standard of 350 gallons/day for indoor use plus outdoor water use for 500 ft^2 of irrigated landscape, we calculated the following consumptive use requirement/unit of mitigation (CUR) amount:

- Kittitas County – CUR = 0.137 acre-feet/year consumptive use
- Spokane County – CUR = 0.148 acre-feet/year consumptive use

While consumptive use in our data range from 0.016 to 0.137 acre-foot/year consumptive use (AFCU), for purposes of comparison, we normalize all consumptive use values in the dataset using the CUR for Spokane County. The following equation allows normalization of the cost per acre-foot of consumptive use per mitigation unit (e.g. residence) for comparison: (Cost per AFCU [Spokane]) = (Cost per AFCU) × 0.148. Administration fees per transaction were added to this value to provide an estimate of costs for a representative mitigation unit, since per-water-unit charges and transaction fees can to some degree be used interchangeably to cover revenue needs of banks to cover costs and profit margins per mitigation transaction.

6.5 Price analysis

Two Datasets were created. Dataset 1 includes mitigation markets outside of Spokane, Pend Oreille, and Stevens Counties. These can be considered "retail" transactions. Dataset 2 includes bulk water right sales (not mitigation) of water rights within Spokane, Pend Oreille, and Stevens Counties. Bulk water right sales are used to represent "wholesale" water bank acquisitions for later sale to end users ("retail").

For Dataset 1 (outside of Stevens/Pend Oreille/Spokane county), the biggest difference across sales prices is between public water banks and private water banks (all of the prices in Dataset 1 are in areas with regulatory mitigation requirements). Table 6 shows summary statistics for prices per acre-foot of consumptive use for public and private water banks outside of WRIA 55. Prices per AFCU are significantly higher for private banks compared to public banks.

Table 6. Average Public and Private Water Bank Prices per acre-foot Consumptive Use Outside of Stevens/Pend Oreille/Spokane (dollars)

Bank Structure	Mean	St. Dev.	Median	Min.	Max.
Private	$53,460	$30,439	$41,606	$27,007	$131,250
Public	$6,130	$4,314	$3,643	$3,636	$11,111

Notes: St. Dev. = Standard Deviation

Table 7 shows that administrative fees per mitigation transaction also tend to be higher for private banks. The minimum transaction fee for private banks was $1,000, whereas the maximum for public banks is $500.

Table 7. Administrative costs per mitigation transaction Outside of Stevens/Pend Oreille/Spokane (dollars)

Bank Structure	Mean	St. Dev.	Median	Min.	Max.
Private	$2,775	$493	$2,400	$1,000	$3,900
Public	$395	$249	$500	$0	$500

Notes: St. Dev. = Standard Deviation

The numbers in Tables 6 and 7 can be used to estimate charges per mitigation unit (represented by a residence with 500 ft^2 of irrigated landscape) for WRIA 55 as $/CUR = $AFCU*0.148 + TF, where $AFCU is a measure (average, median, or value), and TF is the transaction fee. As shown in Table 8, weighted average prices charged by public banks including transaction fees is $1,153 per mitigation unit, ranging from $538/AFCU (Walla Walla Water Exchange) to $1,644/AFCU (Dungeness Water Exchange). The higher prices associated with the Dungeness transactions, arguably correspond most closely to the likely water bank structure in WRIA 55, as some of the lower cost banks have more significant state subsidies per mitigation unit. Prices received by private (for profit) banks in Dataset 1 are about 9 times higher than the average price from public banks, with a weighted average price of $8,926 and a corresponding range of $7,716 to $20,425/AFCU.

Table 8. Average Public and Private Water Bank Prices per Mitigation Unit (dollars)

Bank Structure	Mean	St. Dev.	Median	Min.	Max.
Private	$8,926	$2,043	$8,558	$7,716	$20,425
Public	$1,153	$306	$1,039	$538	$1,644

Notes: St. Dev. = Standard Deviation

Dataset 2 includes information on eight water right sales in Spokane and Stevens Counties consisting of public and private buyers. As provided in Table 2, the weighted average price per AFCU is $1,716, with a range of $781 to $2,528/AFCU. Prices per AFCU tend to exhibit variability irrespective of buyer type and location.

Table 9. Summary statistics for Spokane/Pend Oreille/Stevens County sales data (dollars)

Variable	Mean	St. Dev.	Median	Min	Max
$/AFCU	$1,716	$646	$1,823	$781	$2,528

Notes: St. Dev. = Standard Deviation

Tables 6 through 8 (Dataset 1) includes data for both public and private banks, but in all cases representing locations with regulatory mitigation requirements, which would be expected to increase demand and push prices higher in comparison to a location without mitigation requirements. Table 9 (Dataset 2) includes a range of wholesale water right transactions (but no formal local water bank as such) between private and public entities, agriculture, municipalities, industrial, and mitigation uses. All but one transaction were in locations that do not face exempt-well mitigation requirements. One transaction, purchased by Ecology for exempt well mitigation, and in an area where exempt-well mitigation is required by the Spokane River and Spokane Valley-Rathdrum Prairie

Aquifer Instream Flow Rule (Chapter 173-557 WAC), was acquired in 2014 at a rate of $2,250/acre-foot CU.

These two datasets and their range of prices provide a basis for assessing likely water price ranges given a public water bank and with or without regulatory mitigation requirements, assuming otherwise similar conditions.

Scenario 1, (low-cost/low participation scenario) is defined by (a) no exempt-well mitigation requirement, and/or (b) public rather than private banks. Based on our data, given a public (County-managed) water bank and no exempt well or groundwater use mitigation requirement, we would expect to see prices and price ranges similar to those in dataset 2 (Table 9). To the extent that a public water bank facilitates (and reduces the full transaction costs) of buying and selling, higher transaction volumes might be expected. However, without a more stringent regulatory imperative for mitigation, high transaction volume would not be expected, and significantly higher prices would not be expected except in idiosyncratic cases in which a buyer is in a poor bargaining position relative to a seller.

In contrast, if more stringent mitigation requirements were to be imposed in the basin (Scenario 2), the high end of the price range would likely be pushed upward, for private transactions in particular. This can be seen in the private bank prices, which might be expected to range up around $20,000 per mitigation unit under similar circumstances.

Assuming a public county-managed water bank, prices in the range of the maximum for public banks in Table 6 through 8 of about $11,111/AFCU ($1,644 per mitigation unit/residence with 500 ft^2 of irrigated landscape) is a reasonable benchmark if mitigation requirements were imposed for residential wells and assuming a public, non-profit water bank. Because of the non-profit characteristic of a public bank structure, it is unlikely that prices would inflate to those charged by private banks summarized in Table 6. However, the higher private bank costs would be the more likely outcome for the third, privately run water bank scenario (Scenario 3).

6.6 Other factors affecting water prices

Many factors affect water markets, water transaction activity, and prices. Some of these act through the water "supply" side by affecting the value of water to current water rights holders. The higher the value of water under current (or expected future) uses, the higher the price must be before a current owner sells or leases water. Other factors act through the "demand" side, by affecting the value of water to potential buyers for alternative uses. The higher values for alternative uses will tend to induce prices to be bid up.

The scarcity of water, either as the volume of water available under current entitlements or the risk of curtailment due to drought for a given volume of water entitlements will affect prices as well: the more scarce water is to meet current or future demands, the higher prices will likely be. Additionally, market prices of water can be affected by its reliability and location. Unreliable water rights (those that are frequently curtailed or pro-rated) tend to exhibit lower values. Similarly, water rights that are located furthest downstream in a watershed tend to have a more restricted pool of potential buyers due to

potential regulatory concerns with upstream transfers, and may exhibit lower values due to lower demand.

The volume of transactions is determined by the number of buyers and sellers in a region for whom gains from trade can accrue, which depends on the distribution of existing rights in relation to the distribution of high and low-valued uses. If current water uses by many current water rights holders provide low economic value relative to potential new uses, then transaction volumes are expected to be high.

6.6.1 Supply side factors that may affect price

Most of the existing senior water rights likely to be available for sale are held and used for agricultural irrigation. As such, changes in agricultural markets that affect crop values may affect prices. While agricultural markets will fluctuate and crop acreage will tend to change over time, it is unlikely that major changes in agricultural markets or production alone will induce higher water value and therefore higher water market prices.

A critical supply-side factor that will affect both water available to purchase as well as water prices is whether an interbasin transfer from the Pend Oreille River is implemented. If it is, then pumping, maintenance, and annuitized capital, operation, and maintenance costs would form the basis for the costs of providing that water.

6.6.2 Demand side factors that may affect price

There are numerous demand-side factors that might affect water prices. Residential development pressure in the basin would be important if mitigation requirements are put into place. This impact is evident in upper Kittitas County where mitigation is required for exempt well and residential development, and the consequence is an active mitigation water market and relatively high prices, especially from private water banks.

For related reasons, it is reasonable to expect that the willingness to pay for mitigation water would be positively correlated with the value of the property being developed. A cursory qualitative analysis of property sales in Kittitas and the Little Spokane regions suggests that there are not big differences in median and average sale values for rural residential homes, nor is there a big difference in the rate of change in prices over time between these two regions. Based on this, significant differences in water transaction prices as a result of home values differences between the two areas are not expected.

Based on Spokane County Assessor's data, the median home values for homes outside of water service areas in Spokane County between 2009 and 2014 was approximately $263,500, with the median improvement value of approximately $193,000. Scenario 1 (public water bank, no regulatory imperative) has limited transaction data to bound potential pricing. Costs for this scenario can be bounded by the maximum noted for Spokane/Pend Oreille/Stevens county transactions ($2,528/AFCU, or $374 per mitigation unit/residence based on a 0.148 ac-ft/year consumptive use requirement). However, bank transaction fees would likely need to be added to this, and it is unlikely that costs would be this low given additional bank administrative costs.

For a public bank with regulatory restrictions and mitigation requirements (Scenario 2), if it is assumed that water bank pricing is approximately consistent with the higher end of the range for public water banks noted in Tables 6 through 8, at $1,644 per mitigation unit/residence, this would represent less than 1 percent of the improvement value of a

home, while higher costs associated with a privately run bank (Scenario 3), could push costs as high as 10 percent or more ($20,425) of the improvement value of a home.

Longer term water demand pressures can be better inferred from long-term population growth projections. A discussion of anticipated demand is presented in Section 7 of this report, and describes the increasing residential development trends and expected growth within WRIA 55. The demand discussion also addresses additional potential demand for water bank purchases by current owners of interruptible water rights junior to the instream flow rule.

7 Evaluation of Potential Water Demand

7.1 Need and Approach for Demand Evaluation

A major component of assessing the feasibility of establishing a water bank in WRIA 55 is understanding the magnitude and characteristics of the potential demand for water. The demand includes both future water demand and also potentially existing water uses that are junior to the instream flow rule. Figure 1 shows the subbasins within WRIA 55 evaluated in this demand analysis. The evaluation includes the quantity, timing, and geographic distribution of demand. These are all essential components to matching supply and demand. The geographic distribution is important because a water bank can be constrained to sell water within specified geographic boundaries based on attributes of the water right(s) used to fund the bank. Timing and quantity of demand is important to balance the magnitude of water rights needed to seed the water bank, expense of establishing the water bank administrative systems, and need for the water by the water bank customer.

This evaluation utilized the following information sources and tools to evaluate water banking demand in WRIA 55:

- Washington Department of Ecology water rights database to compile and assess records for new water right applications, change applications, and water right permits and certificates;
- Recent and historical orthophoto coverage was used to help characterize land use and development patterns;
- Spokane Regional Transportation Council housing unit growth projections and distribution;
- Washington State Office of Financial Management (OFM) growth projections;
- Input from Pend Oreille and Stevens County Planning Division directors regarding growth patterns and trends;
- Spokane County Water Demand Forecast Model (Spokane County, 2013) to estimate future water demand; and
- Water System Plans for major public water supply purveyors in WRIA 55.

Categories of potential demand are discussed below, organized relative to existing and future water needs.

7.2 Water Use Sectors

The framework for water use sectors considered for water banking potential demand is shown in Figure 11, and corresponds to the Spokane County Water Demand Forecast Model used to develop future demand estimates. This framework divides water use broadly into public supplied uses and self-supplied uses that include residential, industry

and agriculture. Within each of these broad groupings, the types of water uses are further specified according to the types of uses that occur in WRIA 55.

Self-supplied residential and public-supplied residential uses are the primary potential water bank customers. Self-supplied industries and agricultural operations typically need greater quantities of water than would be economically feasible to acquire through a water bank, and are more likely to seek outright purchase and transfer of individual water rights.

Self-supplied residential uses are those homes that are not served by a public water system. They typically use an exempt well to provide water to their home. In some cases they may use a spring or surface water diversion, such as lakefront homes on Sacheen, Diamond, and Eloika Lakes. These homes tend to be located in more rural areas, and usually have irrigated landscaping. A few livestock are also commonly associated with these homes. The methodology for estimating the number of self-supplied homes and water usage rates associated with these homes is fully described in the Water Demand Forecast Model Report (Spokane County, 2013).

The major public water supply agencies in WRIA 55 are Whitworth Water District No. 2, Spokane County Water District No. 3, City of Deer Park, and Stevens County PUD. A few smaller public water systems are present in the northern portion of the watershed, including Diamond Lake Water and Sewer and Sacheen Lake Water and Sewer District. The City of Spokane also provides water within WRIA 55; however, this system draws all of its water from the SVRP, and is managed separately from the Little Spokane River watershed. All of these municipal water purveyors operate systems that use multiple wells and piped conveyance networks to provide water to customers within their defined service areas. Some of these are interconnected, but several operate as separate subsystems within the purveyor's service area. They could be potential water bank customers if additional water right authorizations were needed.

Numerous smaller Group A and Group B water systems exist in WRIA 55. For the purposes of this feasibility study, the potential demand from these systems has been captured through the self-supplied residential category.

7.3 WRIA 55 Potential Future Water Needs

Estimates for potential future demand were primarily developed through the Spokane County Water Demand Forecast Model (Spokane County, 2013). This model was created for Spokane County in 2010, and updated in 2013 with demographics, population growth projections, climate, and land use characteristics linked to water use. Stevens and Pend Oreille County areas of WRIA 55 were added to the model by Mike Hermanson of Spokane County, and water use estimates were generated that can be applied to all of WRIA 55. A parcel-based build out analysis completed by Spokane County is also provided for comparison.

7.3.1 Future self-supplied residential water needs

Future self-supplied, single-family homes are a large category of potential water bank customers. If restrictions were to be placed on new exempt wells in WRIA 55 as they have been in the Skagit and Kittitas watersheds, this category of water user would not

have a secure water supply. Lending institutions have responded to a similar situation in the Skagit with additional proof of water supply requirements for home loans. Without a water bank option to secure a mitigated water supply, these self-supplied homes would likely be faced with trucking in and storing water from an off-site source; the Washington State Department of Health has expressed public water reliability concerns over trucking in the past, which may further limit this option. The Spokane Regional Health District does not currently approve building permits for residences that will rely on water stored in a tank or cistern. It should be noted though that some residences that were approved with a well now rely on stored water during portions of the year.

Two methods of estimating potential demand from future self–supplied users are presented here. The first uses the Spokane County Water Demand Forecast Model, considered to be the most accurate because the model was developed and tailored to regional water use patterns. The second method uses build-out analysis, based on zoning and presence of critical areas. Build-out analysis provides a likely upper limit for development density under current zoning and does not factor in the likelihood of that development actually occurring.

Demand Forecast Estimates

The Spokane County Water Demand Forecast Model was updated to add Stevens and Pend Oreille County areas within WRIA 55. It provides water use estimates in five-year increments, beginning in 2010 when the model was created, and ending in 2040. The geographic distribution of data and results are classified by major subbasin within WRIA 55, using the Washington Department of Natural Resources Watershed Administrative Unit (WAU) delineations in the rural areas and the Spokane Regional Transportation Council Transportation Analysis Zones (TAZ) in the more populated areas of Spokane County.

As discussed above, new self-supplied single-family residential water users are a major potential water bank customer category. New homes outside public water system service areas commonly rely on exempt wells for water, which could require mitigation in the future.

Table 10 summarizes the predicted growth of water use by self-supplied residences in WRIA 55 between 2010 and 2040. In bulk, the water use created by new demand for single-family residences in WRIA 55 is 2,862 acre-feet annually by the year 2040. This represents a 27 percent increase over single-family residential demand in 2015.

Based on the Demand Forecast Model, this demand will be created by a population increase that increases self-supplied, single-family homes from 12,122 to 15,247, or 3,126 new homes relying primarily on exempt wells to supply water to their homes. The distribution of these forecasted new homes throughout WRIA 55 is shown in Table 11. As a comparison, in the 35-year period from 1972 to 2007, 9,369 water wells were drilled in WRIA 55.

Table 10. Estimated Monthly Increase in Water Use for New Single-Family, Self-Supplied Residences in WRIA 55, 2010 - 2040 (Acre-Feet)													
Year	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Total**
2010	217	196	217	210	1,025	1,271	1,743	1,744	1,220	815	210	217	9,081
2015	254	229	254	246	1,207	1,497	2,053	2,055	1,437	959	246	254	10,692
2020	269	243	269	260	1,278	1,585	2,175	2,177	1,522	1,015	260	269	11,321
2025	284	256	284	274	1,351	1,676	2,300	2,302	1,609	1,073	274	284	11,966
2030	298	269	298	288	1,422	1,765	2,422	2,424	1,694	1,129	288	298	12,596
2035	309	279	309	299	1,477	1,833	2,516	2,517	1,759	1,172	299	309	13,077
2040	320	289	320	310	1,531	1,900	2,608	2,610	1,823	1,215	310	320	13,553
Total New Demand Forecasted Between 2015 and 2040													
	66	**59**	**66**	**64**	**323**	**403**	**555**	**555**	**386**	**256**	**64**	**66**	**2,862**

Single-family residential water use ranges widely from winter to summer months because of outdoor water use during summer months. Water use during July and August is over nine times higher than during the months of November through April. This results in a predicted peak new demand of 555 acre-feet during July and August in 2040. This new demand equates to approximately 9 cubic feet per second (cfs) during peak months, and approximately 1.1 cfs during the lowest-demand months.

Modeled indoor water use ranges from 135 to 259 gallons per day per residential dwelling unit. This range is primarily driven by household income, which was found to correlate closely with water use when the demand model was developed. Outdoor water use estimates were based on estimated area of irrigated landscape (ranging from 5,405 to 12,609 square feet) and accounting for a small number of livestock at a percentage of homes based on analysis conducted when the demand forecast model was developed. Other factors that the model uses to calculate outdoor water use estimates are assessed value, lot size, temperature and precipitation, location of home in forested or water-short areas, and presence of livestock.

Table 11. Estimated Distribution of New Single-Family, Self-Supplied Residence Water Demand, 2015-2040

Watershed Administrative Unit	Forecasted New Demand (ac-ft /yr)	New Single-Family Residences
Beaver Creek	305	392
Dartford Creek	332	403
Deadman Creek/ Peone Creek	457	582
Dragoon Creek	557	573
Little Deep Creek	200	205
Little Spokane/ Deer Creek	323	385
Otter Creek	367	351
West Branch	320	235
Total	2,862	3,126

Notes:
ac-ft/yr = acre-feet per year

Parcel-based Build-out Estimates

Spokane County completed a parcel-based build out analysis in its 2009 Little Spokane River Groundwater Inventory and Mapping Project. It evaluated the number of residences that could be built, based on parcel size, comprehensive plan allowable density, and critical areas limitations on building in certain areas. It also considered privately-owned forest land that could be converted to residential use.

The parcel-based build-out estimate totaled 12,738 new residences that could be built outside of identified future public water service areas. In contrast, the demand model in this FS estimates 3,126 new self-supplied residences between 2015 and 2040. While the build-out analysis informs us to what magnitude of growth is possible under current land use regulations, it does not provide a realistic picture of the magnitude of growth that is likely to occur, given historical population growth rates and future population increase projections.

7.3.2 Public Water System Future Demand

Public water system uses are a potential water bank demand. Municipal purveyors could look to a water bank if they need additional water rights to serve new customers within the urban growth area, or to add smaller failing community systems that may currently be operating as Group B systems under a exempt well.

Table 12 provides a high-level summary of current and projected water right volume capacity for the major public water systems in WRIA 55. Based on this data, no major water right volume deficiencies are apparent. However, it is important to note that most municipal purveyors operate under an interrelated suite of water rights and water sources, which are not always completely interconnected. Individual purveyors may have needs not shown in Table 12 for specific portions of their system.

Table 12. Summary of Current and Projected Water Right Capacity for Public Water Systems

Public Water System	Water Right Annual Excess/Deficiency Based on Existing Consumption (acre feet)	Projected Water Right Annual Excess/Deficiency by 2030 (acre feet)	Date of Water System Plan
Spokane County Water District No. 3			
Pine River Park	182	Same as existing	2007
Riverview Hills	-11	Same as existing	2007
Chattaroy Hills[1]	233	Same as existing	2007
Stevens PUD			
Clayton	239	224	2011
Chattaroy Springs West	28.9	26.9	2011
Riverside	296.2	282.2	2011
Halfmoon Ranchos	25	20	2011
River Park Estates[2]	31	21	2011
Denison	16	12	2011
Deer Park	1,654	961 [3]	
Riverside Village Mobile Home Park	29.07	0.23	2009
Whitworth Water District #2[4]	13,132	12,336 [5]	2008
Diamond Lake Water and Sewer District	Not available	Not available	-
Sacheen Lake Water and Sewer District	Not available	Not available	-

Notes:
[1]This system transferred to Whitworth Water District in 2014.
[2]The source for this system is SVRP groundwater.
[3]Projection is for 2026.
[4]Total for 27 different water rights as reported in the Water System Plan.
[5]Projection is for 2028.

In Pend Oreille County, water and sewer improvements within the Granite Shores Water System around Sacheen Lake may create an interest for new homes to seek water service because of setback requirements that will make it more difficult to locate a well on individual properties (from Cynthia Carlstad's personal communications with Mike Lithgow of Pend Oreille County Community Development; Carlstad, 2014).

Water Right Applications

Requests for new water appropriation through a water right application indicates an interest in obtaining authorization to use water, and these could be water bank customers. There are currently seven active water right applications on file with Ecology, and an additional nine change applications that request some sort of change to an existing water right. These applications are summarized in Table 13 (attached).

The active applications are all for new groundwater withdrawals, and range in priority date from 1987 to 2014. All but one are for municipal supply; the remaining application is for golf course irrigation and domestic supply for associated commercial and residential buildings.

One of the new applications (priority date 2/28/2006) and one of the change applications (priority date 11/24/2014) relate to a community water system for the River Bluff Estates development. According the 2007 River Bluff Estates Water System Plan, the allowable density of one home to ten acres within their service area would accommodate 260 homes; however, the water system is sized to service up to 150 homes under its proposed water right. The water system plan notes that system capacity could be increased to serve up to 498 homes if water rights and zoning were not a limiting factor.

All but one of the change applications relate to municipal or domestic multiple supply and relate to existing groundwater rights. One change application requests moving a point of diversion on the Little Spokane River and place of use for irrigation. Change applications cannot request new water to be appropriated.

Applicants in both groups could be water bank customers. Considerations such as cost, timing of availability, required infrastructure modifications for water withdrawal and distribution system are likely to determine whether a water bank would be a good option for their particular situation.

7.3.3 Potential Water Bank Demand from Existing Water Users

In theory, existing water users would have no reason to seek water from a water bank. However, there may be cases where existing users would use this option. A few of such cases are discussed in the following sections.

Surface Water Rights Provisioned with Instream Flow Restrictions

The Rule was filed on January 6, 1976 (WAC 173-555), and surface water rights issued after that date contain provisions that restrict water use when river flows drop below specified levels. The provisions specify that only indoor domestic supply, stock water, and fire suppression uses may continue during restricted flow periods.

Little Spokane River flows regularly drop below the regulatory minimum flows specified in the Rule. The uncertainties associated with the ability to use water authorized by instream flow provisioned surface water rights may lead the water right holder to be interested in obtaining a more secure authorization, for example by purchasing water through a water bank. Table 14 shows the percentage of times during the period 1993 to 2013 that instream flows fell below baseflows during each month at the Dartford Gage (based on a seven-day average). This provides an indication of when curtailment could occur, since Ecology has managed curtailment to this gage. This chance of interruptibility over the course of a year is important to consider when seeding a water bank, as ideally banks will match supply and demand to eliminate risk of curtailment.

Table 14. Total and Percentage of Days below Baseflows at Dartford by Month, 1993-2013

Month	Number of Days Below Established Baseflows, 1993-2013	Percentage of Days Below Established Baseflows, 1993-2013
January	25	4%
February	30	5%
March	20	3%
April	6	1%
May	33	5%
June	33	6%
July	112	18%
August	322	52%
September	329	55%
October	222	36%
November	118	20%
December	47	8%

1 - Flow provided by USGS from gauge station 12-4310.00 Little Spokane River at Dartford, WA
2 - Baseflow Established in WAC 173-555 for Little Spokane River at Dartford
3 - Based on a 7-day moving average, consistent with Ecology's management of curtailment in WRIA 55

Table 15 summarizes the instream flow provisioned surface water rights in WRIA 55. The table summarizes surface water rights according to their location along the mainstem Little Spokane River or one of its tributaries. Watershed Administrative Units (WAUs) are subbasin areas used in the Water Demand Forecast Model (Spokane County, 2013) to estimate future water needs. In some cases, these WAUs contain both mainstem and tributary areas; these are separated in the table below.

A total of 129 surface water rights have been issued with instream flow provisions in the Little Spokane watershed, and an additional 17 rights issued subsequent to the Rule that do not carry instream flow provisions. The majority of these are single-family domestic supply that include a small amount of irrigation and stock water. Most of the rights without instream flow provisions are for in-house domestic and/or stock water only.

Sacheen Lake, located in the West Branch WAU, is the source for 34 water rights, the largest number from a single source in the watershed. The West Branch WAU has the greatest number of water rights with52; however, it ranks third in terms of instantaneous authorized quantity (1.05 cfs / 473 gpm) and fourth in terms of authorized annual quantity (91.8 acre-feet). This is caused by the large number of small rights overall in the West Branch WAU; there are only 4.1 total irrigated acres authorized by these water rights.

The Dartford Creek WAU, located along the lower mainstem and including Dartford Creek, has the highest instantaneous (1.36 cfs / 608 gpm) and annual (178.14 acre-feet) authorized quantity, with only 11 water rights. These rights are primarily for irrigation, with a total of 66.5 acres authorized. Based on a review of report of examination documents developed for these rights during the application review, it appears that these properties obtain domestic supply from Whitworth Water District, and choose to pull

irrigation water from the Little Spokane River, probably for cost savings during periods of allowable flows.

The Otter Creek WAU, which is the headwaters of the Little Spokane River in Pend Oreille County, contains a mixture of domestic supply, irrigation, recreational uses and wildlife enhancement rights. With 24 water rights in this basin authorizing combined instantaneous quantity of 1.23 cfs/574 gpm and an annual limit of 95.28 acre-feet, this WAU has a significant interruptible water demand.

Table 15. Summary Of Water Rights With Instream Flow Provisions In The Little Spokane Watershed

Stream Segment	Watershed Administrative Unit	Number of Water Rights[1]	Total Instantaneous Quantity		Total Annual Quantity (Acre-Feet)	Irrigated Acreage
			CFS	GPM		
Mainstem	Otter Creek	24	1.28	574	95.28	20.5
	Little Spokane / Deer Creek - Little Spokane drainage	5	0.43	193	59.05	12.5
	Little Deep Creek - Little Spokane drainage	8	0.81	365	170	43
	Dartford Creek	11	1.36	608	178.14	66.52
Tributaries	West Branch WAU	52	1.05	473	91.8	4.1
	Little Spokane / Deer Creek - Deer Creek drainage	10	0.10	45	14	1.75
	Beaver Creek	7	0.81	365	121.8	32
	Dragoon Creek	5	0.20	90	44	0
	Little Deep Creek - Deep Creek drainage	0	0.00	0	0	0
	Deadman Creek / Peone Creek	7	0.15	67	13.9	1
	Totals	129	6.19	2779	787.97	181.37

[1]Water rights include surface water certificates and two permits that were issued after the Rule was adopted. These rights are provisioned with instream flow restrictions.
Notes:
CFS = cubic feet per second.
GPM = gallons per minute.

A summary of the 10 largest instream flow provisioned water rights is shown in Table 16 (attached). Two multiple domestic rights are in this category (PUD No. 1 of Pend Oreille County and A & A Properties). The remaining water rights list irrigation, stock water, and recreation for purpose of use. Like domestic single rights, the two community water systems are required to cease lawn and garden irrigation when river flows are below the

regulatory minimum flows. The 10 largest instream flow provisioned rights capture 525.9 acre-feet of annual interruptible appropriation, which is 67% of the total annual interruptible right appropriation.

The potential interest of these water right holders in securing a non-interruptible water right through a water bank is hard to predict. If they have adapted to regular limitations on their access to water for outdoor uses, they may not be inclined to purchase through a water bank unless the price was very low. The level of compliance to low flow curtailments is unknown, as Ecology has focused on curtailment notifications but not enforcement. If curtailment periods have been largely disregarded by property owners, a more active enforcement effort would raise awareness, and likely generate significant interest in a water bank among these users. The two community water systems may be attracted to the concept of being able to offer this additional water service to their customers; however, the practicalities of accounting for and regulating the variable service may be a disincentive.

Groundwater Water Rights Issued after Instream Flow Rule Adopted

Groundwater rights issued after the Rule was adopted do not contain instream flow provisions. However, these rights are subject to prior appropriation impairment regulation, including impairment of instream flows, and could be subject to curtailment or reduction based on future Ecology management decisions.

There are 179 groundwater certificates and permits in this category, including all of the major WRIA 55 water purveyors:

- City of Deer Park
- Diamond Lake Water & Sewer District
- Spokane County Water District No. 3
- Stevens County PUD #1
- Whitworth Water District #2

Limited analysis was conducted on these water rights; however, in bulk, they appear to appropriate approximately 26,051 acre-feet per year, based on the water right documents. The source for some of these rights is likely to be the SVRP aquifer, which would not be likely be connected to the Little Spokane Instream Flow Rule. Whitworth Water District #2, Spokane County Water District No. 3, and City of Deer Park hold the largest of these rights.

Existing Exempt Wells

Exempt wells are wells that provide water for domestic, lawn and garden, stock watering and small industrial use (see RCW 90.54.050 for specific limits) and are not required to go through the water right permitting process. They are the most common way for self-supplied residential homes to obtain water.

Using an exempt well is considered a secure water source, and exempt well users have never been asked to curtail usage in WRIA 55. However, a growing awareness of regulatory uncertainties associated with exempt wells may make the water source unreliable in the future in the eyes of a lending institution, even without active restrictions on exempt wells. If a water bank were available, there may be a percentage of exempt well users who would choose to purchase water to eliminate the risk of any possible future regulation of their exempt well. This could be encouraged (or required) by their home lending institution.

Exempt wells are sometimes used to supply water to small subdivisions, with the number of homes limited by the 5,000 gallon-per-day legal limit (RCW 90.44.050) for an exempt well. In this case, a single well serves as the source for a small community water system. As with individual home exempt wells, the risk tolerance for lending institutions to consider this a secure water source appears to be decreasing.

Based on the analysis of self-supplied homes done by Spokane County for the Water Demand Forecast Model (Spokane County, 2013), there are approximately 11,741 exempt wells in WRIA 55. The relative numbers of these wells between the three WRIA 55 counties is shown in Figure 12, as well as the estimated number drilled before and after the Rule was adopted.

The distinction between exempt wells drilled before and after the Rule was adopted is shown to illustrate the magnitude of exempt wells that are junior to the priority date for the Rule, and carry some level of regulatory risk associated with streamflow impairment. Using the water use rates for self-supplied homes from the Water Demand Forecast Model (annual average of 703 gallons per day per home that includes indoor and outdoor use), the 7,916 exempt wells drilled subsequent to the Rule adoption use approximately 6,123 acre-feet of water annually. As stated earlier, these wells have not historically been regulated under the Rule, and there are no policies in place for future regulation of these wells.

7.4 Water Demand Evaluation Conclusions

This evaluation focused on the types of water uses most likely to utilize a water bank if one were available. These include the following:

- Future residential development
- Water rights issued after the Rule was adopted, which placed instream flow provisions on all surface water rights
- Pending water right applications that have been on hold since 1987 (surface water and groundwater)

Agricultural and industrial water uses were not examined, as these uses are unreliable to forecast, and as larger single source uses, are considered more likely to seek water through a specific water right transfer. Table 17 summarizes the total estimated potential water bank demand in WRIA 55, and Figure 13 shows the geographic distribution of this demand by subbasins used in the analysis.

Table 17. Total Estimated Potential Water Bank Demand in WRIA 55

Category / Watershed Subbasin	Dartford Creek	Deadman Creek/ Peone Creek	Little Deep Creek	Little Spokane / Deer Creek	Dragoon Creek	Beaver Creek	West Branch	Otter Creek	Total
Forecasted New Demand (ac-ft /yr) from Self-Supplied Homes (2015-2040)	332	457	200	323	557	305	320	367	2,861
Possible Demand from Interruptible Surface Water Rights	178	14	170	73	44	122	92	95	788
Possible Demand from Pending Water Right Applications	All pending new applications are located in these two WAUs. Annual quantities not determined, but may reach 2500 ac-ft / year								
Totals without new applications	**510**	**471**	**370**	**396**	**601**	**427**	**412**	**462**	**3649**
Totals with new applications									**6149**

Notes:
ac-ft/yr = acre-feet per year.

7.4.1 Future Residential Water Uses Served by Municipal Purveyors

Municipal purveyors in WRIA 55 have indicated a need to obtain increased water right authorization to serve the customers expected within their service areas. Spokane County Water District No. 3, Whitworth Water District, and Stevens County PUD have filed applications for new water rights within the Little Spokane River reach from Chattaroy downstream, as summarized in Table 13. Spokane County Water District No. 3's applications would draw entirely from the SVRP aquifer, which is regulated separately from the Little Spokane System. Stevens County PUD has requested additional instantaneous quantity for fire flow, with no increase in annual usage. Although requested annual quantities are not indicated on most applications, the intended number of connections indicates an annual quantity of approximately 2,500 acre-feet associated with pending new applications from Little Spokane Watershed groundwater. This is the most significant potential water demand component examined in this evaluation.

Each of these purveyors holds a number of interrelated water rights and wells, and it is currently unknown whether they would be inclined to purchase water through a water bank.

7.4.2 Future Self-Supplied Residential Uses

Future water demand for self-supplied, single-family homes in WRIA 55 is forecasted to increase by 2,862 acre-feet per year by 2040. All of these homes will drill an exempt well for water supply. Under current regulations, there are no restrictions on exempt wells in WRIA 55, as long as the well use complies with usage restrictions. It is unlikely that owners of these new homes would choose to purchase water from a water bank unless the homeowner (or potentially their lending institution) understands and is motivated by the uncertainties of future regulation of exempt wells and can purchase water through a water bank at a reasonable price. Of course, either the State or Counties could modify the regulatory environment, either through a rule amendment (State) or water availability determinations required by the Growth Management Act associated with platting and building permits (County), which would create a regulatory requirement for mitigation that does not exist today.

7.4.3 Water Rights Issued After the 1976 Rule was Adopted

Surface water rights issued after the Rule was adopted require curtailment of outdoor water use (except stock watering) when flows drop below the regulatory minimum flows stated in the Rule. Use curtailment has been a common occurrence, as described earlier.

It is likely that a portion of these water right holders would purchase an uninterruptible water use authorization through a water bank if the price was reasonable. Such security would allow more permanent landscaping and gardening choices, and would also enhance property value and/or property resale assets.

A total of 787.93 acre-feet per year of water is appropriated through these interruptible water rights. Of particular note, the West Branch contains many small interruptible rights associated with homes around Sacheen and Eloika Lakes. These right holders are likely to be more favorably inclined toward purchasing water from a water bank. With most existing water banks in Washington, the cost of the water increment relative to the home value is a strong indicator of customer willingness to buy; for lakefront properties, this ratio tends to be favorable.

Groundwater rights issued after the Rule was adopted were compiled and considered, but these are not currently considered to be strong potential customers because the rights contain no restrictions. This situation could change if impairments to senior rights, including the instream flow, were shown to exist.

7.4.4 Potential Water Bank Influences on Water Demand

All of the water use estimates described above are based on existing water use practices that includes indoor uses and outdoor uses (lawn, garden, small amount of stock watering). Obtaining water use authorization through a water bank may influence water use through the following scenarios:

- Many water banks offer a tiered rate structure for indoor use, limited outdoor use, and more extensive outdoor use. When faced with the reality of paying for the outdoor use, homeowners are likely to choose limited landscaping and outdoor water use. One example of a tiered rate structure is the Dungeness Water Exchange in Jefferson County (Table 18) which offers packages for indoor, limited outdoor, extended outdoor, and three stock water options.

Table 18. Dungeness Water Exchange Tiered Water Bank Packages

Package Description	Indoor Use[1]	Outdoor Use	Price
Indoor Only Package	150 gpd (average)	-	$1,000
Indoor with Basic Outdoor Package	150 gpd (average)	2,500 square feet of lawn (approx. 50 x 50 feet)	$2,000
Indoor with Extended Outdoor Package	150 gpd (average)	5,625 square feet of lawn (approx. 75 x 75 feet)	$3,000
Stock Water – 5 Animal Limit	-	60 gpd (average)	$1,300
Stock Water – 10 Animal Limit	-	120 gp(average)	$1,800
Stock Water – 15 Animal Limit	-	180 gpd (average)	$2,200
[1]Indoor water use increments are based on consumptive use for homes served by a sanitary sewer system.			

Notes: gpd = gallons per day; Price is a one-time fee for purchase of mitigation certificates from the water bank.

- Availability and supply certainty could increase certain types of use. For example, higher-priced homes where the cost of purchasing water is minor relative to home value and family income may be more likely to absorb the additional cost for obtaining water. Because of this, patronage of a water bank is likely to be higher in areas with higher land/home values.

- Although most private landowners are not well informed about water law issues, risk-adverse landowners may currently be delaying site development because of water supply uncertainties.

If the cost of water increases through implementation of a water bank, residents and utilities are likely to implement conservation measures for both indoor and outdoor uses. Larger scale implementation of low water landscaping could influence community perceptions of what defines attractive, well maintained landscaping, which would support greater expansion of such water conserving landscaping.

8 Water Bank Management and Seeding Approaches

The establishment of a water bank requires the input of some form of credit (seeding) for water use resulting from an action that adds to the overall condition of the basin. Seeding can come from several sources, including:

- Retiring an existing senior water right and placing it in Washington State's TWRP;
- Building in-basin surface water storage;
- Importing water through inter-basin transfers;
- Water conservation (usually related to agricultural irrigation);
- Implementing a SAR or ASR project;
- Reserves in instream flow rules;
- Restoring habitat or wetlands that improve conditions addressing the functions and values of critical fish species or water quality; and
- Other watershed improvement activities.

Before understanding what type of seeding will work for a water bank, there must be agreement on basin management structures, such as bank accounting, and the areas where bank-seeding components can be allocated. For example, will consumptive use be the standard for bank accounting, and to what geographic extent can water rights used for bank seeding be distributed? (e.g., can a water right from the Dragoon Creek subbasin mitigate for a new use in the Little Deep Creek Subbasin) Depending on how coarse or fine of an administrative structure is adopted for basin management, it can incentivize or discourage opportunities for bank seeding. The following sections describe examples where Ecology has adopted varying administrative structures that are being co-managed with water banks. Then, we discuss bank-seeding opportunities for WRIA 55.

8.1 Water Bank Basin Management Approaches

A range of water bank basin management approaches have been applied in Washington and supported by Ecology. Establishing where and when in-kind mitigation (and potentially out-of-kind mitigation) will need to occur to offset new uses is critical to establishing mitigation water supply options. For example, the approach that would incentivize water banking the most is if the Little Spokane River Basin were managed as "One Bucket" at the Dartford gage (or the Confluence gage, the most downstream gage in WRIA 55). In essence, this approach only requires that a new use be mitigated so that there is no net decrease at the Dartford gage. For example if a new use was proposed in the Dragoon subbasin and the mitigation was from the Little Deep Creek subbasin, but there was no net change at Dartford, the mitigation would be acceptable even though

there could be a net decrease in the Dragoon Basin. This approach is clearly preferable with regard to the level of effort involved in bank management, given the simplicity of the approach, and is consistent with Ecology's use of the Dartford gage to determine periods of curtailment. Using a "One Bucket" model can provide for more flexibility and allow the conjunctive use of a variety of mitigation offsets, allowing purchased water rights that seed the bank to be used over a broad area of the watershed.

Another tool for bank management could be a modification to the Rule (WAC 173-555) so that exempt well use is expressly addressed including a legal framework for water bank mitigation approaches, as has occurred in the Dungeness and Walla Walla watersheds. Based on discussions between the County, Aspect, and Ecology, it is our understanding that there are no plans for a rule amendment at this time given the existing moratorium on rule making, and Ecology does not currently consider this necessary to implement water banking in WRIA 55.

8.1.1 Examples of Ecology Basin Management Approaches

Basin management approaches previously accepted by Ecology that could apply in WRIA 55 include:

- In the Yakima Basin, water is generally managed in "One Bucket" to meet Total Water Supply Available (TWSA), measured at a key location in the basin (Parker Dam). Any consumptive use of water cannot impact TWSA, as measured at Parker Dam. A local advisory group, called the Water Transfer Working Group, determines impacts to TWSA and assesses local impacts and impairments on a case-by-case basis. There are additional in-basin constraints that can also contribute to mitigation requirements in tributaries in some cases, but the overall simplicity of a central control point is a part of the Yakima Basin's success in water banking.

- In the Wenatchee Basin, a reservation of water for future uses was established under WAC 173-545-080[5]. Ecology made the following management decisions for reservation administration:

    - Reserve debits are based on consumptive use, rather than total diversions or withdrawals.

    - Reserve accounting is based on the critical low flow month of September, with presumed availability outside that time period.

    - Habitat projects and instream flow augmentation was assumed to be sufficient for basin-wide management of the reserve, rather than permit specific evaluations. For example, lag times associated with individual groundwater permits under the reserve are not evaluated.

[5] Ecology recently notified Chelan County that the Wenatchee Reserve may not represent a secure water source given procedurally-similar rule adoption procedures between the Wenatchee Rule and the Skagit Rule, which was overturned in the Swinomish Decision. Ecology and Chelan County are working collaboratively on procedural and substantive remedies to ensure the Wenatchee Rule is reliable in the future.

- In some water rights decisions, Ecology has used the "one molecule" approach, requiring drop for drop mitigation at the specific points of withdrawal or diversion associated with individual water right applications. This stems from the 2000 case *Postema v. Pollution Control Hearings Board*, which defined the "one molecule" standard for instream flow impairment (i.e., impairment can be established through mathematical and/or conceptual models and de minimus impacts constitute impairment). This has been applied in Kittitas County, for example, where a "water budget neutral" determination is required prior to any approval of water bank transfers that could affect certain closed tributaries.

- In circumstances where Ecology, other state agencies, tribes, and Federal Government are managing water use as "One Bucket," inclusion of out-of-kind water supply has been successful. For example, in the Teanaway River, a tributary to the Yakima River, Ecology agreed to establish an in-lieu mitigation fund for the construction and monitoring of habitat projects to solve out-of-time water supply needs. On the mainstem Columbia River, Ecology issued a new water right permit to the Quad Cities on the basis of a 50/50 (consumptive use water/habitat restoration) mitigation offset for new water supplies. The Kennewick General Hospital case recently before the PCHB also relies on an out-of-kind component to the mitigation plan.

8.1.2 Consumptive Use Equivalents and Bank Debits

As noted above, Ecology has supported management of water banks using consumptive use equivalents (i.e., accounting for return flows from septic systems and lawn irrigation) to determine the bank debit for individual users. For example, one transaction from the Suncadia private water bank in Kittitas County will convey 0.137-acre feet per year (122 gpd) for a single residence with an on-site septic system for indoor use and 500 ft^2 of outdoor use (Figure 15). Lawn sizes under the Suncadia water bank are limited to 1,500 ft^2, which result in a consumptive use increase to 0.176-acre-feet per year (157 gpd). A similar approach can be tailored to WRIA 55, with appropriate modifications to account for differences in consumptive use from irrigation based on local climatic conditions.

Note that the Demand Evaluation discussed in Section 7 above does not factor in consumptive use equivalents, which could reduce bank demand significantly. For example, total indoor use in the Kittitas Basin is considered only 20 to 30 percent consumptive, and irrigation is considered 90 percent consumptive. If water banking moves forward in WRIA 55, agreements on consumptive use equivalents with Ecology will be a key component of balancing bank seeding and water demand. The demand evaluation is also based on current landscaping practices, which include over 7,000 ft^2 of irrigated land on average.

8.1.3 Temporal Considerations for Bank Management

In addition to incorporating consumptive use equivalents, other temporal considerations for bank management include whether water is available outside the irrigation season that can be re-timed to seed a water bank, whether out-of-kind mitigation meets the functions and values underlying or implied by the instream flow rule, and to what degree groundwater/surface water interactions are regulated. A description of these issues is presented in the following sections.

8.2 In-Kind versus Out-of-Kind Mitigation/Seeding

In this FS, our focus is on the physical transfer of water in WRIA 55 for in-kind (water-for-water) mitigation, where credit inputs are generally of the same consumptive water quantity equivalency as the conveyed mitigation; however, out-of-kind mitigation considerations should remain part of ongoing water bank planning and have been accepted elsewhere by Ecology. One critical reason for including out-of-kind mitigation bank seeding is to address temporal issues associated with bank seeding from irrigation rights, as the period of use for these is generally limited to the irrigation season and do not provide water for water mitigation outside of that timeframe. This leads to the potential need for non-irrigation season bank seeding, either through water storage or inter-basin transfers, through habitat improvement activities, or through adoption of a regulatory framework that does not require a narrow time step for regulatory compliance as long as the overall functions and values of the instream flow rule are preserved or advanced.

There is significant uncertainty at the present time regarding application of out-of-kind mitigation and seeding approaches, based on recent and pending court decisions related to the use of OCPI. Uncertainty stems from several pending court cases, including:

- *Foster v. Ecology* and *Okanogan Wilderness League v. Methow Valley*. These cases are focused on whether OCPI in the context of an individual permitting decision is appropriate, including relying in part on out-of-kind benefits (e.g., habitat, water quality, fish passage).

- *Okanogan Wilderness League and Center for Environmental Law and Policy v. Ecology and Kennewick General Hospital.* This case evaluated under what standards OCPI can be used, and whether impairment exists if the functions and values of the instream flow are still met. The case settled, but the PCHB concluded on summary judgment that Ecology had the authority to utilize out-of-kind mitigation when considering the functions and values of instream flows.

If out-of-kind mitigation ultimately becomes part of water bank management, the foundation for identifying potential mitigation areas and stream reaches has been developed through previous studies of habitat limiting factors identified in the WRIA 55/57 Watershed Management Plan (2005) and Ecology's coliform, temperature, and turbidity TMDL (2010). Examples of determining the value of out-of-kind mitigation for water right allocation, such as recent water right decisions for the City of Yelm, are available to draw upon for potential application in WRIA 55. Aquatic conditions that could be addressed include elevated temperature; fecal coliform levels above water quality standards; and phosphorus concentrations that lead to low dissolved oxygen.

8.3 Potential Acquisition of Existing Water Rights

Aspect has conducted a screening-level analysis of selected irrigation rights and claims from groundwater and surface water sources for potential bank seeding. We reviewed a selection of water right certificates, adjudicated certificates and claims with priority dates predating the Rule (prior to January 6, 1976), as they are not considered interruptible because they are senior water rights to the Rule. In total, 5,900 water right records in the

Little Spokane Basin were identified, with 5,400 of those records having a priority date senior to the Rule (pre-Rule subset). The selection focused on water rights with a purpose of use containing irrigation and with an annual quantity equal to or greater than 100 acre-feet in the Little Spokane Basin, resulting in a total of 144 water rights and claims

Water rights with a component of irrigation use tend to historically be the most acquired water rights in active markets statewide. Aspect conducted a focused aerial imagery review on these pre-Rule water rights, consisting of 88 water right records. These water rights have been screened to prioritize them for further review. Any water rights that would ultimately be purchased would need a complete due diligence review, including a full extent and validity analysis consistent with Ecology's requirements for water transfers.

Conclusions from the screening-level assessment are intended as a market snapshot of a portion of potential water rights that could be transferred to the proposed water bank. Note that this does not constitute a complete water right due diligence review, or evaluations of market viability and water right holders' willingness to participate. Most importantly, Aspect did not evaluate whether any of the 22 relinquishment exemptions in RCW 90.14.140 may apply to specific water rights that would affect their validity.

In addition to the aerial image review, we evaluated reported irrigation quantities in comparison to irrigated acreage. In cases where excessive water duty was reported relative to the acreage reportedly irrigated, a water duty of three feet was assumed. If annual quantities were below 100-acre-feet per year (afy) based on this calculation, the water rights were removed from further ranking at this time. Two irrigation water rights transferred to the Deer Park's municipal system were also removed from the ranking, since they are intended to provide public water supply

A subset of the pre-rule Little Spokane Basin water rights includes those without a component of irrigation, such as commercial, industrial, multiple domestic, stock water, heat exchange, power generation, recreation, and fish propagation uses. Some of these water rights could potentially include consumptive uses, and, in total, numbered less than one hundred with acre-feet quantities equaling or exceeding 100 acre-feet within the basin. To assess these water rights we used the following selection criteria: 1) acre-feet quantity equal to or greater than 100 acre-feet; 2) priority date preceding the Rule; 3) purposes of use other than municipal and irrigation purpose; and 4) geographically located north (upstream) of the SVRP boundary. Aspect analyzed the initial subset using the selection criteria, above, and found that 15water rights met our selection criteria. Of those 15 water rights, five water rights (claims) were further omitted due to excessively high acre-feet quantities asserted in the claim sheet. Selection efforts left 10 water rights to be assessed and ranked.

Figure 16 presents a map summary of the analysis, with supporting details provided in Table 19 (attached). The analysis evaluated the likelihood of active irrigation using three publicly available Geographic Information System (GIS) images sources, and applied a beneficial use ranking structure based on the GIS image review. The three aerial image sources are: 1) NASA Landsat images; 2) United States Department of

Agriculture National Agriculture Imagery Program (USDA NAIP) images; and 3) Google Earth images. A tiered ranking structure was applied based on the following criteria:

- Rank 1 – High priority for further review (irrigation apparent most of the time over a majority of the place of use)
- Rank 2 - Medium priority for further review (some evidence for irrigation, but not necessarily throughout the place of use or in each photo)
- Rank 3 – Low priority for further review

Ranking was determined for the non-irrigation water rights using aerial images to identify infrastructure consistent with the purposes of use of the water right (i.e. commercial/industrial purposes – a factory or large building present; reservoir purposes – a constructed dam or other impoundment with water present, etc.). Depending on the degree of infrastructure present consistent with the purposes of use of the water right, the water right was ranked consistent with the following criteria:

- Rank 1 – High priority for further review (visible infrastructure consistent with the purpose of use of the water right)
- Rank 2 - Medium priority for further review (some evidence of visible infrastructure consistent with the purpose of use of the water right, but not necessarily matching the extent or purposes of the water right)
- Rank 3 – Low priority for further review (limited or no evidence of visible infrastructure consistent with the purpose of use of the water right)

Older water rights, especially water right claims, tend to assert more water use than can necessarily be established, and in other cases have reported quantities in units other than requested on claim forms (e.g., gallons instead of acre-feet). For the purposes of our review, claims with apparently overstated water use or minimal aerial imagery support for beneficial use were included in Rank 3 if they appeared to have less than 100 afy of use.

8.3.1 Summary of Screening-Level Water Rights Assessment

Table 20 presents a summary of pre-Rule irrigation water right quantities resulting from this analysis.

Table 20. Summary of Pre-Rule Irrigation Water Right Quantities

Rank	Acre-Feet/Year	Acres Irrigated
1	*9,888*	*2,586*
2	*4,701*	*1,442*
3	*9,073*	*2,676*
Totals of Ranks 1 and 2	***14,589***	***4,028***
Totals of Ranks 1, 2, and 3	***23,661***	***6,704***

As shown on Table 20, the most reliable water right estimates, based on the screening-level analysis (Rank 1) total 9,888 afy. This is a significant amount of water relative to the demand estimates for WRIA 55. Clearly, not all of these water rights can be assumed to be available for seeding a water bank, and there is a public interest in having agricultural land continue to be cultivated in WRIA 55; however, some of the owners of these water rights may be interested in transferring their rights to a water bank. Addition of Rank 2 water rights to Rank 1 water rights raises this amount to 14,589 afy, although not all of the Rank 2 rights may have their assumed quantity of water confirmed if a detailed extent and validity study were to be completed. Adding the least reliable, Rank 3 water rights, brings the total to 23,661 afy, which may be an overestimate of the potential water availability.

8.3.2 Comparison of Subbasin Demand vs. Potential Supply

Table 21 presents a summary of the ranking of pre-Rule irrigation water rights by subbasins with a comparison to estimates from the demand analysis. Total new demand in Table 21 is taken from Table 17, and represents the combination of forecasted new demand from self-supplied, single-family homes and possible demand from interruptible surface water rights. The totals exclude possible demand from pending water right applications in the Dartford and Deadman/Peone Creek subbasins, which could be 4,000 to 5,000 afy. Further, the demand projections are based on water use totals, but the potential supply is reported as consumptive use, which should be considered when reviewing the data.

Table 21. Summary of Pre-Rule Irrigation Water Right Quantities by Subbasin

Subbasin	Volume (Acre-Feet/Year)					
	Rank 1	Rank 2	Rank 3	Total of Rank 1 and 2	Total of Ranks 1 through 3	Total New Demand (from Table 17)
Beaver Creek	1,266	420	160	1,686	1,846	510
Dartford Creek	1,047	494	2,962	1,541	4,503	471
Deadman Creek/Peone Creek	550	440	0	990	990	370
Little Deep Creek	1,260	1,531	375	2,791	3,166	601
Little Spokane/Deer Creek	844	464	827	1,308	2,135	427
Dragoon Creek	2,289	1,242	1,618	3,531	5,149	396
Otter Creek	1,552	0	1,840	1,552	3,392	412
West Branch	1,080	110	1,291	1,190	2,481	462
Total	9,888	4,701	9,073	14,589	23,661	3,649

Note: Total New Demand is taken from Table 17, and excludes possible total demand from pending water right applications.

Total available water rights from a combination of Ranks 1 and 2 have volumes that generally exceed estimated total demand from new self-supplied, single-family homes and interruptible surface water rights. Including all of the rankings in the volume estimates result in substantially more water than estimated demand.

Although this information provides some measure of the potential for bank seeding, two important qualifiers must be emphasized:

- A rigorous extent and validity analysis on these water rights has not been completed, and has been limited to the screening approach discussed previously.
- Both owner interest in selling water rights and public interest considerations regarding fallowing of irrigated lands can be expected to limit the availability of irrigation water rights for bank seeding.

Geographic locations of the ranked water rights vary and a more defined water rights analysis should occur in the next phase of water bank development in order to assess the viability of those water rights as sources of supply for the water bank. This work should consider:

- Overall goals and regional management structure to be incorporated into the water bank
- Detailed extent and validity analyses on water rights of interest
- Evaluations of market viability

Performance of a detailed water rights evaluation within WRIA 55 focusing on review of individual pre-Rule water rights across the full spectrum of uses will proactively position a water acquisition program to purchase water to appropriately seed the water bank.

8.4 Other Potential Bank Seeding Opportunities

8.4.1 Surface Water Storage

Surface storage is another potential alternative that could support mitigation and bank seeding. Storage could create manageable blocks of water, retimed by surface water storage via in-channel or off-channel water storage facilities, as another tool to develop water sources in the Little Spokane Basin in support of water banking.

Previous studies of water storage in WRIA 55 have been conducted as part of the Watershed Planning process. Golder (2004) looked at a number of storage sites in WRIA 55, with the only options evaluated in detail being new dams at Buck Creek and Beaver Creek in the Beaver Creek subbasin. They concluded that additional storage from a Beaver Creek dam would cost from $3,500 to $8,600 per acre-foot, based on potential storage ranging from 1,175 to 1,930 acre feet. On Buck Creek, a costs ranging from $4,300 to $5,400 acre feet were estimated for a 4,750 acre feet reservoir.

PBS&J (2009) conducted additional storage investigations focused on the West Branch of the Little Spokane River. This study evaluated use of existing dams, natural lakes, and new dams, and infiltration using existing lakes or depressions. PBS&J concluded:

- Revising existing dams to increase storage is not feasible primarily because sufficient storage would not be obtained.
- Buck and Beaver Creek dams were reviewed, but at the direction of the watershed groups, additional review was not conducted.
- Increasing storage in natural lakes is limited by the extent of development along the lakes, and associated effects on existing residential properties. Eloika Lake was considered the best opportunity for this, because of the support of the Eloika Lake Association (homeowners) and the lake was historically at a higher level.
- A number of wetland restoration opportunities were identified and further study was recommended.

8.4.2 Groundwater Storage

Groundwater storage projects could contribute to water bank seeding through passive surface aquifer recharge (SAR) or more active aquifer storage and recovery (ASR). The WRIA 55/57 Watershed Management Plan (2005) discussed using a series of strategies to augment and mitigate for impacts in the Little Spokane Basin. The options considered generally include constructing new infiltration galleries or restoration of existing natural, albeit dry, wetland sites for the purposes of augmenting groundwater and increasing storage.

Inducing groundwater supplies and allowing it to passively return to surface water generally alters the timing of water availability in the surface water body. By altering the

timing of groundwater recharge of surface water, improvement to surface water flow, at critical stages, can be specifically targeted for development of new water supplies and improvement of baseline conditions. Development of enhanced water supplies and water availability, at critical locations and during critical periods, has potential to create water available to seed mitigation activities. To effectively use the ground water storage strategies described above for mitigation it may be necessary to quantify the resulting flow enhancement within the surface water bodies, which will require additional data collection and hydrogeologic analysis.

8.4.3 Interbasin Transfer

A unique opportunity exists to potentially withdraw groundwater or divert surface water from the Pend Oreille watershed into the upper headwaters of the Little Spokane River, near the town of Newport (Figure 17). The watershed boundary, and the upper headwaters of the Little Spokane River, reaches within approximately three miles of the mainstem of the Pend Oreille River. According to Washington State's WRIA 55 boundary GIS layer, the drainage divide between the Little Spokane Basin and Pend Oreille Basin is approximately 200 feet higher than the Pend Oreille River shoreline, and a pipeline and pumping station would be required to convey either groundwater or surface water. Water thus conveyed could serve as water for bank seeding and instream flow enhancement in WRIA 55 after transfer.

A review of water rights decisions and Ecology regulation of the mainstem of the Pend Oreille River indicates that water is potentially available for a project of this nature. Ecology has not closed the Pend Oreille River to further consumptive appropriations, but has provisioned recent water right decisions with a curtailment flow of 7,700 cfs at the Newport gage (USGS #12395500), based on a Surface Water Source Limitation (SWSL) recommended by the Washington State Department of Fish and Wildlife. Figure 18 presents average and minimum daily mean discharges at the Newport gage, along with the WDFW curtailment flow of 7,700 cfs. As the graph indicates, there are periods where the minimum daily discharge has fallen below 7,700 cfs in drier years in spring and late summer to early fall, but there still appears to be opportunity for significant withdrawals or diversions to take place over much of the year, given the scale of flows in the mainstem. Figure 19 provides a comparison of the frequency that the Little Spokane at Dartford and the Pend Oreille River at Newport do not meet baseflows and recommended flows, respectively. As illustrated by the figure, recommend flows are met substantially more often at in the Pend Oreille River at Newport versus baseflow at the Dartford gage on the Little Spokane River.

Aspect has completed an appraisal level evaluation of necessary infrastructure and potential fatal flaws associated with conveying water from the Pend Oreille River to the upper headwaters of the Little Spokane River (Appendix B). An interim project flow criteria has been estimated at a 10-cfs average mitigation flow rate for a combination of bank seeding and additional instream flow mitigation, based on consideration of future water demand and preliminary estimates of stream channel capacity. Both surface water and groundwater supply options in the vicinity of Newport may be feasible, pending further study.

Two discharge options were considered. The first discharge option involves discharge at the uppermost surface water reaches of the Little Spokane River where there is an expansive wetland complex present. The second option involves additional piped conveyance further downstream bypassing wetlands into a reach of the Little Spokane River with potentially higher channel conveyance capacity to better handle the 10-cfs flow without major channel improvements and potential impact to wetland function.

There are numerous variables that could have a significant impact on the ultimate construction and operation and maintenance costs, including permitting, obtaining easements, soil conditions, and other considerations. Further detailed hydrologic and hydrogeologic evaluations, along with biological/habitat and water quality assessments will be required to determine which discharge option is most feasible, as recommended in Appendix B and summarized in Section 10 of this report (Implementation Plan).

8.4.4 Habitat or Other Aquatic Restoration

Restoration of instream and near channel habitat, and fish migration barriers consistent with scientific and resource agency guidance on the sustainability of critical fish species in the Little Spokane Basin could provide out-of-kind mitigation. Benefits from these activities are likely to be more significant when approaching creation of a consolidated mitigation package at the Basin scale. In other instances, out-of-kind mitigation has been acceptable solutions to buffering impacts to out-of-time and out-of-place mitigation, or providing additional quantities of consumptive water relative to the value of the habitat restored.

8.4.5 Floodplains and Function

In locations where degraded floodplain function exists and in-kind consumptive water supply options are limited, restoring floodplains and their function, as it relates to watershed health and groundwater storage, could be a viable out-of-kind mitigation option. Restoration of floodplains and incised channels can improve instream habitat conditions for aquatic species of concern. Additional potential exists to increase bank groundwater storage and alluvial aquifer groundwater recharge in the restored area. Stored and re-timed water might have the potential to deliver higher baseflows longer into the low-flow season and mitigate for impacts to flow targets.

8.4.6 Upland Restoration and Forest Management

Restoration of upland meadows, wetlands, and overall forest health can ease surface water runoff pressure in the spring and retain water further into the dry or low flow season. Utilization of upland restoration and forest management, as part of a mitigation package, can ease out-of-time impacts from new water use. As with all restoration, the value of these efforts are in the context of a more significant program.

8.4.7 Conservation

Through a series of workshops starting on June 16, 2014, Ecology has been gathering input from the Identifying Rural Water Supply Strategies Workgroup (Workgroup). At the most recent meeting on January 05, 2015, Ecology and the Workgroup reviewed the Final Draft of Ecology's report titled, *Finding Rural Domestic Water Solutions While Protecting Instream Resources* (Final Draft) for accuracy and completeness. From Workgroup discussion and the Final Draft, one of

the most applicable possibilities for developing water supply in the Little Spokane is incentivizing conservation within existing water users (permitted and exempt) to free up water withdrawn (pg. 12, Paragraph 2.4). This concept could prove useful in the Little Spokane when considering pre-rule exempt well use and post-rule exempt well uses in the reservations. Use of conservation in this manner is likely dependent on hydrogeology, spatial location in the basin and whether conserved water is consumptive or non-consumptive use.

For example, because lawn use is much more consumptive than indoor use (e.g., 90 percent vs. 30 percent), modest reductions in lawn size can seed a water bank for future indoor use. A WRIA or county-run bank that promoted xeriscaping with property covenants could work in rural areas where other bank seeding programs may struggle.

8.5 Groundwater Considerations in WRIA 55

Groundwater sources in WRIA 55 are derived from a combination of unconsolidated basin fill, and isolated basalt layers overlying crystalline bedrock. Figure 14 shows the distribution of surficial bedrock and the depth of basin fill in the watershed, based on a recent USGS Study: *Hydrogeology of the Little Spokane River Basin, Spokane, Stevens, and Pend Oreille Counties, Washington* (2013). Groundwater movement in the basin generally follows surface topography, moving from high to low elevation areas. The USGS identified several key hydrogeologic units that serve as water sources, including:

- **Upper Aquifer.** This unit is unconsolidated basin fill and serves as a common water source over much of the watershed. Its distribution is widespread in the northeast (Little Spokane headwaters), the west central (Dragoon Creek), and south (mainstem and other tributaries) portions of the basin. Its distribution generally overlaps with the extent of basin fill on Figure 14. Some of the outlying areas of basin fill were not considered of sufficient production by the USGS to be an 'aquifer', but do, in some cases, produce water sufficient for residential use.

- **Lower Aquifer.** This unit is also unconsolidated basin fill, and is separated in some cases from the Upper Aquifer by a confining unit. The Lower Aquifer occurs in highly localized areas, generally along the mainstem of the Little Spokane River and is not widespread in the watershed.

- **Isolated basalt units of the Columbia River Basalt Group (Wanapum and Grand Rhonde).** Basalt occurrences are generally limited to the west central portion of the basin, in the Dragoon Creek drainage.

- **Bedrock.** Crystalline bedrock underlies all of the watershed, but tends to be exposed in the upland, outlying areas of WRIA 55. Bedrock in WRIA 55 typically produces small quantities of water, but is relied upon by a number of users as a residential water source.

Basin fill thicknesses (primarily Upper Aquifer) of over several hundred feet are present across significant portions of the watershed, and may allow opportunities for aquifer recharge through surficial infiltration or aquifer storage and recovery (ASR). This could provide a pathway for supporting instream flow mitigation, by capture of surface water during high flow periods and allowing a buffered release of the infiltrated groundwater over time back to surface water. Additional evaluation, beyond the scope of this study, would need to be conducted to evaluate if feasible alternatives for such an approach exist.

The Rule (WAC 173-555) does not address groundwater and is ambiguous on the application of exemptions for domestic use[6]. Groundwater right holders have not historically been curtailed, but could be in the future based on Ecology's and the Court's evolving interpretation of the law, the Rule, and standards for protection of existing water rights.

Groundwater and surface water in WRIA 55 are assumed to be hydraulically connected, and as such additional groundwater appropriations have not been authorized by Ecology since 1996, based on associated reductions of instream flows expected from newly authorized withdrawals. The 1975 Basin Report on which the Rule is based states: "Surface water and/or ground water appropriation permits that will allow direct diversion from, or have measurable effect on, streams where base flows have been established, shall be subject to the base flow limitations, and any such permits or certificates shall be appropriately conditioned to assure maintenance of said base flows". Ecology has denied new groundwater rights on the basis of hydraulic continuity with the river and impairment of instream flows. These denials have been upheld by the Pollution Control Hearings Board.

The SVRP is a significant and prolific aquifer in the Spokane region, and extends into a relatively small area in the southern portion of WRIA 55. In this area, the aquifer has shallow and deeper units separated by a confining layer. The northern shallower portions of the SVRP discharge to the Little Spokane River, downstream of the Dartford gage, while the deeper portions (and shallower portions on the southern edge of WRIA 55) discharge directly to the mainstem Spokane River.

[6] The Rule does include a reference to 173-500, general provisions for instream flow rules, and that does include a connection to groundwater. These provisions include: (5) Base flow provisions for water rights.
(a) Surface water and/or groundwater appropriation permits, issued subsequent to the effective dates of chapters 173-501 through 173-599 WAC, that will allow either direct diversion from or have a measurable effect on streams where base flow limitations of this chapter, and any such permits or certificates shall be appropriately conditioned to assure maintenance of said base flows.

9 Water Bank Operational and Management Considerations

There are a number of operational and management elements that must be considered when considering the "business" of developing and managing a water bank. Those elements include water banking roles, services, business decisions, and design. These elements are important because they will dictate who the water bank serves, water bank pricing, sustainability and longevity, and managing the resource amongst other competing demands.

9.1 Water Bank Roles

When considering the operating structure of a water bank, there are many different roles and responsibilities that are required by the formation, operation, and maintenance of a water bank. These roles can be handled completely by one entity or responsibility can be delegated to separate entities with different timelines.

Some water bank roles include:

- Deciding on the water bank model;
- Developing water bank framework and implementation;
- Seeking funding;
- Seeding the water bank;
- Constructions of projects/funding for seeding activities;
- Operating the water bank;
- Integrating the water bank with current county business functions;
- Ensuring customers use the water bank; and
- Marketing the water bank.

9.2 Water Bank Services

Water banks can fill a variety of services when it comes to meeting out-of-stream and instream water demands. Each water bank model will dictate who the water bank will eventually serve and for what reason. The Counties could elect to try a universal solution, or a master water bank for the entire watershed. Or, given the spatial and temporal complexities of the basin, the Counties could create a smaller water bank to start, with conditions that give it the best chance of success in solving a particular problem (e.g. perhaps mainstem only). Finally, the County could adopt ordinances that encourage development of small scale specialized water banks for the following purposes:

- Retail (domestic, lawn irrigation, limited stock water);
- Wholesale (agricultural, municipal, small water systems, industrial);
- Single user (self-mitigating); and
- Other (banking for instream flow).

9.3 Water Bank Business Decisions

When developing a water bank, the County and the PAG will need to consider a number of different business options regarding how to functionally operate the water bank. These issues are often resolved through County ordinances coupled with input from citizen's and policy advisory groups. Here are some of the common business decisions the Counties could face in setting up a water bank:

- Who to serve – What types of mitigated uses will be allowed? Understanding the customer the bank is trying to reach is critical for bank success.
- Where to serve – Which geographic region(s) to serve? Should services be limited to particular regions? Mainstem versus tributary choices is a common decision to make during the early stages of bank formation.
- Quantities available for sale – What is the water unit size(s) for sale? There are tradeoffs to consider between bank longevity and what the bank sells. This typically manifests itself in discussions and policies regarding allowable lawn size, since consumptive use impacts from outdoor lawn watering have the biggest impact on debits from the bank.
- New uses/existing uses – What existing uses will be allowed? Will all exempt and permitted uses be allowed initially by the bank (e.g. domestic, lawn irrigation, agricultural irrigation, commercial/industrial use, and stockwatering), or will some be prioritized over others (e.g. domestic uses first)?
- Pricing and Packages – How much to charge? Will different mitigation packages be offered to accommodate multiple customer values or will customers be expected to conform to a single land use choice? Will there be difference in price between indoor-only vs. outdoor uses to incentivize smaller lawn sizes? How will other uses be priced (e.g. stockwater, commercial/industrial uses)? Will pricing be flat rate or include an escalator to incentivize conservation? How will use be verified (e.g. individual meters, aerial photo review)?
- Cost-recovery– Will cost-recovery include water/development cost and/or administration? Will administrative costs be recovered? Price signals undoubtedly affect bank participation, although a regulatory imperative will soften the price reaction.
- Longevity/Sustainability – How long will the water bank operate with a particular project or water right seeding? In general, the less the bank tries to accommodate

individual user preferences, the longer a particular mitigation source seeding the bank will last. For example, requiring new uses to conform to new construction standards (e.g. water use efficient appliances), small lawn sizes, and conservation-based indoor uses would stretch bank seeding the furthest. Allowing variable lawn sizes (e.g. with commensurately higher consumptive use), more generous indoor allowances, and including existing uses (which may have less efficient practices or larger water needs) will all reduce bank longevity or require more frequent bank seeding.

- Bank administration – There are trade-offs between customer choices and ease in bank administration. In general, the more a bank tries to accommodate individual customer preferences, the more complex it is for a bank to operate, the higher the administrative cost, and the greater the effort it takes to ensure compliance (e.g. code enforcement).

Each of these choices has potential impacts on the departments within the counties that will need to interact with the water bank. This is complicated by the fact that WRIA 55 spans three counties, each with their own organizational structure and division of responsibilities. The following table summarizes some of the key banking functions and the potential departments within each county that could have a participatory role:

Table 22. Summary of Potentially Affected County Departments under Water Banking

	Formation	Operations	Management
Stevens County			
Land Services	X	X	
Auditors		X	X
Treasurers	X	X	
Public Works		X	X
Assessor		X	
Pend Oreille			
Planning	X	X	
Auditors		X	X
Treasurers	X	X	
Public Works		X	X
Assessor		X	
Spokane County			
Building and Planning	X	X	
Auditors		X	X
Treasurers	X	X	
Utilities	X	X	X
Assessor		X	
Spokane Regional Health District		X	X

9.4 Water Bank Design

As an institution, a water bank can be designed to accomplish various public interest goals of value to the region. For example, the bank can be designed to prevent exceedingly high water market prices, moving too much water from one region to the next (e.g., upstream to downstream, tributary to mainstem), moving too much water from one user group to another (e.g., agriculture to municipal, or rural growth limitations), speculative hoarding of mitigation credits, and other undesirable conditions. The counties could decide to engineer limitations by adopting business rules on the marketplace to ensure sustainability into the future. Essentially this is a tradeoff between free market principles, and social engineering around what is perceived to be "fair" or of value in WRIA 55. For example, some guidelines or business rule topics could include:

- Establishing water pricing standards;
- Defining mitigation credit unit size;
- Defining specific quantities to preserve or to develop incentives to access, such as price breaks;
- Reserving tributary basin water for in-tributary basin use only or allowing portability for reverse-transfer of mitigation credits back to their point of origin;
- Determining the degree to which administrative costs are discounted, if at all;
- Creating trading zones divided up by county, tributaries, control points, or subwatersheds;
- Establishing market longevity goals (i.e. perpetuity, short-term, long-term, etc.); and
- Develop an oversight Board with equal representation from each county to review policy issues.

The importance of these factors is typically a function of:

1. How much water is available for bank seeding? The more water that is available, the less important the need to adopt stringent business rules that will promote bank longevity.
2. How is the basin managed? The terms of agreement between the water bank and Ecology relative to basin management may influence the importance of tributary versus mainstem reservations.
3. How variable is rural demand? If demand in rural areas can be classified into one or two mitigation credit sizes that represent the super-majority (e.g. 90%) of homes, then customer response to fewer mitigation credit offerings will be favorable and administrative costs will be less.

4. How cost effective are the mitigation credits? The cost of mitigation credits relative to standard connection fees for municipal systems, and relative to the overall cost of new home construction, will help determine whether pressure for administrative costs subsidies will arise.

5. How quickly must the County make such decisions? If the Counties are able to initiate a water bank without an initial regulatory imperative (e.g. growth moratorium for exempt wells), then it can afford to do some "learning" and allow business rules to adapt over time. Conversely, if a bank is formed against the backdrop of a regulatory imperative, then often more stringent business rules are needed within a shorter time frame.

Some counties have found value in forming a Citizen's Advisory Committee to help contribute to business rule adoption and water bank design.

9.5 PAG Preferences for Bank Operational and Management Approaches

Over the course of three PAG meetings held on October 15, 2014, January 15, 2015, and April 29, 2015 discussions were held to present technical memoranda summaries and to solicit input from the PAG on preferences for water bank operational and management approaches. Key preferences and acknowledgements include:

- The PAG would like to continue to move forward with water bank development for WRIA 55.

- A general consensus was reached to further evaluate a publically run, Tri-County bank management model, as opposed to private, state, or NGO-led management structure. In this regard, a draft agreement between Pend Oreille County, Stevens County, and Spokane County is under negotiation to cooperatively move forward with evaluating water banking in WRIA 55.

- The PAG would like water bank applicants to work through each of the individual county planning and building departments to obtain mitigation certificates as part of other associated building permits. A central bank accounting management system is also preferred, with the exact structure and operator of that to be determined.

- There is overall PAG support for including a component of bank seeding from water rights purchases, including agricultural water rights. Some PAG members have expressed concerns regarding individual solicitation of agricultural water right holders given the desire to preserve agricultural lands and potential Growth Management Act requirements, while others would like more flexibility in this regard. This issue will need to be addressed as part of setting up water banking business rules, and approaches may vary among the three counties. In addition, if available information indicates that certain water rights may be at risk of relinquishment for non-use, these could be prioritized for outreach and potential purchase.

- There is overall support from the PAG for continuing to investigate potential use of Pend Oreille watershed (WRIA 62) water from either a groundwater or surface water source in the vicinity of Newport, Washington. A groundwater source is the preferred choice if it is proven feasible.
- The Kalispel Tribe has participated in several PAG meetings, and has noted that the Tribe has unquantified water rights in the Pend Oreille watershed, as reserved by the Winters Doctrine. These rights are expected to be senior to most or all of the other water rights in the watershed, and would have senior priority to any water rights from the Pend Oreille permitted by Ecology to support Little Spokane water bank seeding. The Tribe has stated it has no objection to creating a water bank in the Little Spokane River Basin, provided it is with in-basin water. The Tribe has also expressed an opinion that it is premature to pursue seeding the LSR water bank by transferring Pend Oreille Basin water until all in-basin options are identified and exhausted including effective implementation of water conservation, reclamation, and reuse. In additional, the Tribe's opinion is that conditioning new water rights solely on WDFW's existing in-stream flow recommendations for the Pend Oreille River is not adequate to protect the Tribe's interest because their reserved rights include at least a protective minimum in-stream flow, practicably irrigable acreage, and domestic-use rights. The Tribe also expressed an opinion that a general stream adjudication should be completed on the Pend Oreille River to ensure that the system is not already over allocated.
- Some PAG members expressed the desire to initiate the water banking as a voluntary process, unless a regulatory imperative, such as a moratorium on new exempt wells, changes the current situation. This would ensure time to allow this new process to be integrated with functions in each of the counties.
- There is PAG support for using consumptive use equivalents for bank management, as this lessens the gap between supply and demand, and is accepted practice in some of the other water banks operating in Washington.
- The PAG is aware of the need to guard against use of a water bank for speculation and mitigation certificate 'flipping', and supports putting protections in place to prevent this, such as a limited development schedule for use of a mitigation certificate. The PAG recognizes the need to be proactive and timely in obtaining water rights for water bank seeding should a bank be established, also with the goal of minimizing speculation.
- There is an overall PAG preference for the bank to be managed as to a single point in the mainstem, such as the Dartford gage (i.e. 'one-bucket'), with the understanding that concurrence from Ecology will need to be negotiated for this approach, possibly coupled with habitat projects that would offset potential in-basin impacts to the functions and values of the instream flow. There is also recognition that a better understanding of tributary groundwater/surface water interaction and habitat issues are needed to support this approach.
- There is an understanding within the PAG that county planning and building departments will need to be educated regarding management of the water banking

process, and determinations of legal water availability, in addition to filing and recording of mitigation certificates.

- There is significant PAG concern, particularly among members from the Tri-County group, regarding potential impacts to county workloads and the general fund. A key factor in final bank funding, seeding, and management will be to address and mitigate fiscal liabilities and workload burden on county staff, with one option being an enterprise funding mechanism.
- The PAG is open to the use of Watershed Management Partnerships, board of joint control approaches, and other cooperative means to coordinate water bank management. These approaches are discussed in more detail below.
- There is PAG understanding that additional development of a final management structure will be needed following completion of the FS.
- The PAG supported submittal of a Watershed Plan Implementation and Flow Achievement Grant application to seek funding for completion of water bank development. The grant application was submitted to Ecology on April 30, 2015 and is pending review.

9.6 Water Management and Collaboration Structures

In order to develop a Tri-County management structure for a Little Spokane water bank, a mechanism for supporting cooperation among the counties needs to be established. Several options are discussed below, and further examples are summarized in Table 23.

9.6.1 Interlocal Agreements

Washington State passed the Interlocal Cooperation Act (ICA), Chapter 39.34 RCW, in 1967. Since 1967, numerous counties, cities, and local government entities have utilized authorization contained in the ICA to leverage local resources for planning and management activities. RCW 39.34.010 of the ICA states that, "*It is the purpose of this chapter to permit local governmental units to make the most efficient use of their powers by enabling them to cooperate with other localities on a basis of mutual advantage…that will accord best with geographic, economic, population and other factors influencing the needs and development of local communities*."

Because WRIA 55 has portions in Stevens, Pend Oreille, and Spokane Counties, forming an interlocal agreement is one viable option for water bank management. The nature of the agreement could leverage the resources of each county and provide a foundation for Tri-County cooperative water bank management. Interlocal agreements are in common use throughout the state. Some examples are:

- White Salmon, Bingen, Port of Klickitat, and Ecology interlocal agreement for managing a regional wellfield and associated water rights and infrastructure (Table 23).

- Stemilt Irrigation District and Malaga Water District interlocal agreement for managing irrigation and municipal supply transfers (Table 23).
- Interlocal agreement for joint planning between Spokane County and the City of Spokane. This is not focused specifically on water issues, but it addresses how zoning, subdivision, and other land use approvals for joint planning will be coordinated to ensure that consistent development standards are used and concurrency requirements are met.
- Spokane Aquifer Joint Board – 21 purveyors that draw from the SVRP aquifer are part of a board of control to cooperatively address issues associated with well protection activities, water conservation, and water rights.

Interlocal agreements have the advantage being a fairly standard approach to cooperative agreements between public entities that do not require third-party involvement to enact and are established in RCW It is believed that interlocal agreements can encompass the full range of authorities necessary for formation of a WRIA 55 water bank.

9.6.2 Watershed Management Partnership

Another organizing and collaboration entity the Counties could choose to pursue is the formation of a Watershed Management Partnership, under the ICA. This approach has been also used for the Walla Walla Watershed Management Partnership, which was established through Title 90.92 RCW. The Walla Walla Watershed Management Partnership was legislatively authorized in 2009 as a unique pilot local water management program. The Partnership's innovative program was developed by local stakeholders in cooperation with the Washington State Department of Ecology. This effort is based on the principle that the key to augmenting stream flows for fish habitat is to allow water users greater local control and flexibility beyond what conventional water management options and regulation can deliver. Additional information regarding this partnership can be found at:

http://www.wallawallawatershed.org/

Watershed Management Partnerships can have the advantage of greater management flexibility, but incorporating this flexibility as the Walla Walla partnership has can be more challenging to establish than other more standard approaches such as an interlocal agreement, because of it would likely require legislative action. However, by crafting a unique solution to WRIA 55 with a broad coalition of the three counties, as well as instream and out-of-stream interests, legislative action could overcome the rule ambiguity and provide the kinds of flexible basin management that would incentivize water banking in WRIA 55. Additionally, if a Pend Oreille water source becomes one of the preferred options for bank seeding, legislative action may be necessary anyway for funding or other policy action (e.g. Sullivan Lake Storage Release Project from Pend Oreille County). In that event, the typical challenge of initiating Legislative action could be less.

9.6.3 Boards of Joint Control

A board of joint control is a subset of irrigation districts statute authorized under RCW 87.80.010. Board of joint controls were initially codified in 1949, and has been used within several basins in Washington State to manage water management infrastructure

and investments. Most notably is the long-standing Yakima County Board of Joint Control #1 (Rosa-Sunnyside Irrigation Districts) and more recently the Stemilt/Malaga Board of Joint Control (Table 23). Boards of Joint Control have typically been responsible for changing places of use of water rights within its authorized area. More recently, Stemilt/Malaga has approved changes in point of diversion and purpose of use based on a no-impairment standard in the statute. The potential exists to couple board of joint control authorization with other authorizations to adapt to the unique water banking demands of the Little Spokane Basin. Boards of Joint Control offer a statutorily unique water bank structure that could be adopted without legislative action. However, they have not been expansively paired with water banking goals as much as standard interlocal agreement authority.

9.6.4 Contract Law

Another option to consider pursuing is the formation of a contractual agreement under Washington State contract law to divide duties, obligations, and benefits derived from operating water banking activities in the Little Spokane Watershed. An agreement of this nature could be mutually drafted to satisfy the business needs of counties with divisions of labor, liabilities, costs, and benefits from operation of a water bank. A contract of this nature could be used in conjunction with other mechanisms provided above. This option would be most useful if the County selected an NGO or private party to operate elements of the water bank.

9.6.5 Building Permit Processes

Each of the three Counties manages issuance of building permits individually and there are no major structural changes to the current permitting processes expected as a result of water banking. The key changes anticipated to be needed will be educating both county staff and the public regarding the water banking process, along with filing and recording of mitigation certificates.

In the case of Stevens and Pend Oreille Counties, both require a Site Analysis application to be submitted to the respective Planning Divisions that requires information on the proposed project, whether residential or otherwise, including a site plan. The site plan must include any existing or proposed wells and waterlines, but no other information on water sources is required at this stage. Following approval of the Site Analysis application, a Building Permit application can be filed with the respective Building Divisions. The Building Permit application requires the water supply to be noted, and in the case of a private supply, water quality testing results and a well log must be submitted. Legal and physical water availability is subject to some scrutiny, which would need to be enhanced under a formal water banking framework.

Spokane County does not use the Site Analysis process and initiates the process directly with a Building Permit application. This requires a plot plan and reference to water source, including the future use of an onsite well. The Spokane Regional Health District is responsible for water quality and quantity issues associated with a water source. Similar to Stevens and Pend Oreille Counties, and physical water availability is subject to limited scrutiny, with the exception of new exempt wells drawing from the SVRP aquifer within WRIA 55. The recently promulgated WAC 173-557 restricts the use of any new unmitigated exempt well within the rule boundaries. The process to address this new

restriction and manage mitigation credits for new exempt wells is still being established by the County and Ecology (see Section 3.5 for more details on this). The number of new exempt wells within the rule boundary is anticipated to be small. In this case, Ecology issues the mitigation certificates.

9.6.6 Building Permit Process Under a Water Banking Framework

Obtaining a building permit is an essential step in utilizing water sourced from permit-exempt wells. As noted above, the building permit processes under a water banking framework is not anticipated to be substantially different than at the present time, with the key additional components being outreach to the public and to key county staff regarding the water banking process, along with filing, receiving payment for, and recording of mitigation certificates. In addition, an agreement will need to be negotiated with Ecology to allow the managing entity of the water bank to issue mitigation certificates, unless Ecology assumes that role.

The key factor that could add more complication to the process is if a regulatory mandate is imposed that requires exempt well users to obtain mitigation certificates. Successful mitigation programs where a regulatory mandate exists, such as the Dungeness Water Exchange and Yakima Basin Water Exchange, have used the building permit process as insurance as to whether an individual has or has not obtained mitigation. Providing for legal water availability has, in the case of the Dungeness Water Exchange and Yakima Basin Water Exchange, become a step in the building permit process. To facilitate the process and provide transparency, mitigation requirements are addressed in up-front consultation, and in the building permit application. Depending on the entity that operates the water bank, the individual is informed of their options and expenses at that time.

Legal water availability issues must be addressed as part of the subdivision process under RCW 58.17. Similar to a building permit, RCW 58.17 requires a showing of adequate water availability, both legal and physical, for the intended use of the parcels created during the subdivision. A regulatory mandate on exempt wells, in particular, could affect this process and possibly require mitigation certificates prior to final plat approval.

In the case of implementation of a water bank in WRIA 55, two approaches are anticipated:

- No regulatory mandate. The public is informed about the availability of the water bank through public outreach. The current building permit application forms for each county are not modified. Mitigation certificates issued by the water banking entity are recorded and attached to the property deed under a voluntary program.

- Regulatory mandate. As above, the public is informed about the availability of the water bank through public outreach. The public is informed about the requirements for mitigation at the Site Analysis application stage (Stevens and Pend Oreille County) or the Building Permit application stage (Spokane County). Legal and physical water availability are evaluated by county staff as part of approval of building permits. Mitigation certificates issued by the water banking entity are recorded and attached to the property deed.

9.6.7 New Compliance Efforts under Water Banking

Depending on the types of mitigation certificates sold and assumptions and quantities on which they are based, various levels of new compliance and code enforcement could be imposed by the County as part of a water bank. These could include the following:

- Rural metering or water use monitoring. In order to assure that mitigation certificates are offsetting new uses, some level of monitoring of new uses is typical. This could include standard metering of wells, which under Ecology's metering rule (WAC 173-173) would be read on at least a monthly basis with annual totals reported annually. Another option would be to have the County compile water use information on a 5-year interval, which was the negotiated framework between Ecology and Chelan County under the Wenatchee Rule (WAC 173-545). This water use reporting is not necessarily metered, and includes aerial photo and crop duty estimates for lawn use.

- Exceedance of mitigation certificates. Compliance with mitigation certificates can either be at the individual user level or at the bank level. Some water banks require individual user compliance with reporting to Ecology (e.g. private banks in Kittitas County). Other water banks (e.g. Kittitas County Public Health) have selected bank compliance, because it allows for some attenuation of individual customer issues while still being protective of the overall bank purpose. For example, if a bank presumes an average person/household residency, there will be some homes with more and some homes with less people, with water use varying accordingly. Bank-wide compliance would help the County avoid unnecessary enforcement situations where a mitigation certificate for 3 people per house is being compared against a 6 person/house residency, because elsewhere in the bank there is likely a 1 person per house offsetting use.

- Lawn size. This is the code enforcement issue that is the most straightforward to track, and the one that is likely to most affect the water bank because of the consumptive nature of the use, is lawn size. If a water bank selects a small outdoor irrigation footprint (500 square feet), it is typically easy to identify violators from infrequent windshield surveys or aerial photo review.

Irrespective of who operates the bank and how it is seeded, there will likely be some increased code enforcement administration that the County must assume, in order to allow regulatory agencies and third parties to have confidence that the bank is operating as assumed.

10 Implementation Plan for Continued Water Bank Development in WRIA 55

Aspect and the County have worked together to develop an Implementation Plan for continued water bank development. During development of the Implementation Plan and grant application, a summary was presented to the PAG. This Implementation Plan has been incorporated into a Watershed Plan Implementation and Flow Achievement Grant application to seek funding for completion of water bank development. The grant application was submitted to Ecology on April 30, 2015 and is pending review. A summary of proposed tasks follows.

10.1 Stakeholder Collaboration

Ongoing stakeholder collaboration is essential to successful development of a functioning water bank in WRIA 55. The goal of this work is to provide forums for the effective and efficient communication of project issues, development of necessary agreements, policies and procedures, input related to technical work associated with the project, and review of project deliverables.

The existing Policy Advisory Group (PAG) should continue to meet to address public outreach associated with the project, develop agreements necessary for the establishment and operation of the water bank, facilitate communication of project activities and deliverable review, develop water bank policies and procedures, and discuss other associated issues as identified by the PAG.

A Technical Advisory Group (TAG) should be convened to facilitate communication of technical work associated with the project. The TAG will provide a venue for stakeholders to provide input on specific scoping of technical work, review and input as technical work is conducted, and facilitate efficient and effective communication of technical topics to the PAG.

10.2 Public Outreach

Public outreach is considered essential to successful development of a functioning water bank in WRIA 55. Public meetings and/or workshops in each County within WRIA 55 are recommended to provide information related to the establishment and operation of the water bank and other associated projects. Public outreach should also involve responding to inquiries from interested citizens, media outlets, interest groups, and others as appropriate. Preparation and distribution of mailers summarizing project plans to watershed property owners should be conducted, as well as development and maintenance of a project website.

10.3 Finalize Water Bank Operation Framework

An agreement between Pend Oreille County, Stevens County, and Spokane County should be developed that details the legal and operational framework, funding, policy guidelines and other aspects considered appropriate and necessary under which a WRIA 55 Water Bank will be operated building upon the framework established in this FS. The framework should also address in detail water bank accounting and long-term water bank and instream flow mitigation management.

An agreement should also be developed between the WRIA 55 Water Bank and Ecology that establishes how water made available through the WRIA 55 Water Bank will satisfy mitigation requirements for new water uses within WRIA 55. The agreement should also address any additional mitigation in support of instream flow and habitat enhancement.

10.4 Water Right Acquisition Outreach

Additional public outreach should be conducted, focusing on water right holders to inform them about water bank seeding opportunities. A portfolio of interested water right holders should be developed through mechanisms that may include responses from interested participants based on public outreach, review of real estate listings, individual solicitations, and networking with purveyors, conservation districts and others. Some PAG members have expressed concerns regarding individual solicitation of water right holders given the desire to preserve agricultural lands and potential Growth Management Act requirements, while others would like more flexibility in this regard. This issue will need to be addressed as part of setting up water banking business rules, and approaches may vary among the three counties. In addition, if available information indicates that certain water rights may be at risk of relinquishment for non-use, these could be prioritized for outreach and potential purchase. Reverse auctions can be considered to bring agricultural water right holders to the water bank in a voluntary manner, as well as ensuring that competition and non-speculative market forces are observed. Water rights should also be prioritized for purchase based on location and mitigation agreements with Ecology to efficiently meet the needs of the water bank and additional instream flow/habitat enhancement.

10.5 Water Right Procurement

Following development of a water rights portfolio of potentially interested water right holders, negotiations for the purchase of suitable water rights should be conducted. As part of this, due diligence should be conducted to ensure that the water rights meet extent and validity requirements and the identified needs of the water bank. Purchases should be completed to allow placement of acquired water rights in the State's TWRP. A trust water right agreement that details the specific management of the water right for mitigation of new water uses and instream flow benefits in WRIA 55 should be established.

Acquiring water rights should be focused on providing bank seeding that benefits a range of users in WRIA 55, with insurances that anti-speculation mechanisms are in place.

10.6 Tributary Basin Water Bank Management Support

Additional work is recommended for development of data and analysis at a suitable level to support the management of specific mitigation and instream flow enhancement tasks in tributary basins. This will likely require the assessment of impacts of new uses to instream resources within tributary basins and the suitability of specific mitigation approaches to address those impacts.

Recommended data collection and analysis includes:

- Historical flow data research and analysis of natural tributary flow regime;
- Review of available hydrogeologic information;
- Research of available information related to aquatic habitat needs in tributary basins;
- Aquatic habitat field investigations in selected tributary basins as needed;
- Development of conceptual hydrogeology related to groundwater and surface water interaction in tributary basins; and
- Field investigations to develop tributary basin conceptual hydrogeology. These investigations should consider inclusion of periodic stream flow measurements, seepage runs, stable isotope comparison of surface and ground water, stream temperature measurements, installation and monitoring of near stream piezometers, and private and public well water level measurements.

Consultation with Ecology staff, the PAG, and the TAG is recommended to prioritize investigation of tributary basins as to the level of scientific inquiry necessary to facilitate effective bank management.

10.7 Pend Oreille Watershed Source Investigations

An appraisal level analysis is in progress to investigate potential use of water from the Pend Oreille watershed for WRIA 55 bank seeding and instream flow enhancement. Additional detailed engineering and environmental analysis is needed to further develop and potentially implement this work, as recommended below.

10.7.1 Little Spokane Headwaters

This work is intended to provide data and analysis focused on engineering and environmental issues specific to the Little Spokane headwaters. Recommended data gathering and analysis includes:

- Establishment of gaging stations;
- Stream geomorphology/hydrology/flood plain assessment, including road crossings;
- Evaluation of wetland and stream habitat enhancement opportunities;
- Water quality data review, sampling, and analysis;

- Evaluation groundwater/surface water interaction;
- Streamflow flow and temperature measurements/seepage runs;
- Installation and monitoring of near stream piezometers;
- Private/public well water level measurements;
- Isotope comparison of surface water and groundwater to evaluate hydraulic connection;
- Evaluation of SAR as a mechanism to enhance stream flow; and
- Limited numerical groundwater/surface water flow modeling if deemed appropriate following further study (would also include portions of the Pend Oreille watershed).

10.7.2 Pend Oreille Watershed

This work is intended to provide data and analysis focused on engineering and environmental issues specific to the Pend Oreille watershed. Recommended data gathering and analysis includes:

- Installation of a test well(s) and associated aquifer testing;
- Water quality data review, sampling, and analysis, to include development of a Quality Assurance Project Plan (QAPP);
- Evaluation groundwater/surface water interaction;
- Monitoring/water quality testing during aquifer testing;
- Review of existing well data;
- Development of a conceptual hydrogeologic model of Pend Oreille River and adjacent aquifer; and
- Limited numerical groundwater/surface water flow modeling if appropriate.

10.7.3 Pre-Design Evaluations

These investigations and data analyses are recommend to support an assessment of the viability and if viable, engineering design for development and use of a suitable water source and operational system to obtain and convey water to the headwaters of the Little Spokane River. Recommended evaluations include:

- Update of the existing data review and data gap analysis;
- Evaluation of land access options (contact with property owners, physical limitations, right-of-way issues);
- Coordination with City of Newport and other entities as required;
- Evaluation of reclaimed water options;

- Evaluation of potential water quality impacts;
- Evaluation of potential impacts on future water allocations from the Pend Oreille River;
- Preparation of a final assessment of preferred alternative (groundwater or surface water source);
- Establishment of a conveyance approach; and
- Development of additional mitigation options (wetland enhancement, instream flow augmentation, SAR).

10.7.4 Preliminary Engineering Design

Recommendations for preliminary design support the assessment of the project's viability. If determined viable, future detailed engineering design for the development of a suitable Pend Oreille water source and associated operational system will be performed. Recommended preliminary design tasks include:

- Conveyance system, road crossing modifications and associated field work (surveying);
- Stream channel modifications;
- Wetland/habitat enhancement;
- Wellfield (or pump station) design; and
- Detailed cost estimates.

If preliminary design continues to support the viability of the Pend Oreille source for WRIA 55, additional detailed design and implementation approaches should be developed as part of completing preliminary design work.

Limitations

Work for this project was performed for Spokane County (Client), and this report was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This memorandum does not represent a legal opinion. No other warranty, expressed or implied, is made.

All reports prepared by Aspect Consulting for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect Consulting. Aspect Consulting's original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

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TABLES

Table 1 – Relevant Legal Cases

Project 140129 - Little Spokane River Basin Water Bank Feasibility Study

Case Reference	Key Issues	Date Decided or Pending	Significant Findings	Potential Implications for WRIA 55 Water Bank
Postema v. Pollution Control Hearings Board (142 Wn2d 68)	Instream flow impairment, OCPI[1], exempt well use[2]	2000	1. Instream flow impairment does not need to 'direct and measureable', and where there is hydraulic continuity with the stream based on current modeling, even de minimus impacts ("one molecule") on a stream may be considered to be impairment of existing surface water rights including an minimum instream flow 2. The Court recognized that OCPI can provide a 'narrow exception' that can allow impairment.	1. The "one-molecule" standard makes mitigation challenging without any recognition of the underlying functions and values of the instream flow rule or the "relief valve" of OCPI. 2. Could be used as a rationale for regulation of post-rule permit exempt and permitted water use in the Little Spokane Basin. 3. The decision does suggest that OCPI in support of new permit exempt and permitted water uses is allowable under a narrow set of circumstances.
Department of Ecology v. Campbell & Gwinn (146 Wn.2d 1)	Exempt well use	2002	1. Exempt well use cannot be 'bundled' for a single project above the established 5,000 gpd ceiling. A project developer is limited to one exemption for a single development regardless of the number of wells in the development.	1. Provides a legal standard for use of exempt wells at new developments/projects.
Kim v. Pollution Control Hearings Board	Exempt well use	2003	1. 5,000 gpd allowable under the industrial portion of the groundwater exemption applies to the agricultural industry, and is not limited to ½ acre.	1. Small agricultural use including mitigation is allowed under the exemption and could provide additional demand in the water bank.

[1] OCPI is "overriding considerations of the public interest", and it is the standard that must be met to allow water use that will impair a minimum instream flow or the base flow necessary to protect instream flow resources.

[2] Exempt well use is a term used to describe statutory exemptions of a water right permit for specific uses of groundwater. RCW 90.44.050.

Table 1 – Relevant Legal Cases

Project 140129 - Little Spokane River Basin Water Bank Feasibility Study

Case Reference	Key Issues	Date Decided or Pending	Significant Findings	Potential Implications for WRIA 55 Water Bank
Knight v. City of Yelm (173 Wn2d 325, 267 P.3d 973); see also Kittitas County v. the Eastern Wash. GMHB, 172 Wn.2d 144 (2011).	Water availability, exempt well use	2011	1. Adequate water supply must be confirmed prior to final development approval by local jurisdictions. 2. Concern over water availability and impacts from water use can be grounds for standing to challenge a land use decision.	1. Water availability needs to be established as part of County approved development permit approvals. 2. The risk of litigation regarding water availability and instream flow issues is supported by the standing granted in this case.
Five Corners Family Farmers v. State of Washington (PCHB No. 84632-44)	Exempt well use	2011	1. Stock water permit exemption is not subject to a quantity limit. 2. Permit exempt well use can be 'stacked" for a single project: stock watering, watering of ½ acre, single or group domestic use up to 5,000 gpd, and industrial use up to 5,000 gpd.	1. Provides clarity on beneficial use and allowable quantities for exempt wells that could provide additional demand for the water bank.
Kittitas County Conservation et al v. Kittitas County [with intervenors New Suncadia} and Roan)	Exempt well use, water availability, GMA compliance, senior water right impairment	2014	1. Kittitas County's water bank planning is in compliance with GMA and associated regulations to protect surface and groundwater resources. 2. State statues administered by Ecology protect senior water right holders from impairment.	1. Appropriately mitigated water banking structures can be legally managed at a county level under GMA, provided that compliance with Ecology regulations is established.
Swinomish Indian Tribal Community v. Department of Ecology (178 Wn.2d 571)	Exempt well use, OCPI, instream flow impairment	2013	1. Invalidated 2006 amendments to the Skagit instream flow rule, including tributary reservations of water for both new permit exempt and permitted water uses	2. The Court interpreted the OCPI exception to be very narrow, not allowing general application of OCPI to create a reservation for water for another beneficial use, such as domestic use, if minimum instream flows are impaired. 1. Significant uncertainty now exists regarding the potential for future application of OCPI to support

Table 1 – Relevant Legal Cases

Project 140129 - Little Spokane River Basin Water Bank Feasibility Study

Case Reference	Key Issues	Date Decided or Pending	Significant Findings	Potential Implications for WRIA 55 Water Bank
			2. Supreme Court found that Ecology went beyond its statutory authority in applying OCPI to rulemaking that conflicted with previously established instream flows.	new permit exempt and permitted water uses, including those mitigated with out-of-kind approaches.
Okanogan Wilderness League v. Methow Valley Irrigation District and Ecology (PCHB #14-100)	OCPI, out-of-kind mitigation, instream flow rule impairment	Pending PCHB Hearing.	TBD	1. May provide greater clarity on whether impairment of instream flows occurs when flow is diminished but the functions and values of the instream flow rule are enhanced. 2. May clarify when out-of-kind mitigation is appropriate. 3. May provide greater clarity on the kinds of "rare circumstances" that OCPI can be used.
Okanogan Wilderness League and Center for Environmental Law and Policy v. Ecology and Kennewick General Hospital (PCHB #13-146)	OCPI, out-of-kind mitigation, instream flow impairment	Summary judgment ruling; Settled based on addition of interuptibility	1. Ecology has authority to utilize out-of-kind mitigation for new water permits. 2. The Board interpreted the specific instream flow rule to allow Ecology to approve a water use that would impair a minimum instream flow if the water use would otherwise maintain base flows that preserve and protect the instream flow values of wildlife, fish, scenic, aesthetic and other environmental values, and navigation values. 3. Ecology cannot issue a permit that impairs the instream flow values that stand behind the	1. This case was settled based on the addition of a component of interruptibility of water use, in addition to the out-of-kind mitigation.

Table 1 – Relevant Legal Cases

Project 140129 - Little Spokane River Basin Water Bank Feasibility Study

Case Reference	Key Issues	Date Decided or Pending	Significant Findings	Potential Implications for WRIA 55 Water Bank
			established minimum instream flows, and Ecology must demonstrate how such values are adequately protected and how the water right associated with those values is not impaired.	
Whatcom County v Hirst (WWGMHB #12-2-0013) see also Kittitas County v. the Eastern Wash. GMHB, 172 Wn.2d 144 (2011).	Exempt well use, water availability, GMA applicability to exempt wells, instream flow impairment	2015 (State Court of Appeals). Request for review by appellants pending before State Supreme Court	1. The Court directed local governments to follow Ecology's interpretation of instream flow rules. 2. This decision also acknowledges that each instream flow rule must be interpreted individually	1. Depending on potential Supreme Court Review, the case may provide greater clarity of County responsibility for adequately protecting water availability, and specifically when approving developments having an intent to use exempt wells. 2. While Ecology's position is that the Nooksack instream flow rule (WAC 173-501) does not apply to exempt wells, Ecology has not yet issued a specific interpretation of the Little Spokane Rule (WAC 173-555) in this regard.
Foster v. Ecology (Case No. 13-2-01080-9)	OCPI, instream flow impairment	Pending before Thurston County Superior Court.	3. The PCHB upheld a new water right for the City Yelm based on OCPI associated with out-of-kind mitigation (under appeal).	1. Should provide greater clarity on the kinds of "rare circumstances" that OCPI can be used, in a specific permit decision, rather than in a reservation under a rule as decided in the Swinomish case.

Table 13 – Pending Water Right Applications in WRIA 55

Project 140129 - Little Spokane River Basin Water Bank Feasibility Study

Record Number	Document Holder	Purpose of Use	Priority Date	Quantity Requested	Source	Comments
New Applications						
G3-28396	Spokane County Water District No 3	Domestic Multiple	10/01/1987	5500 gpm, 730 acre feet/year	Wells (5)	Intended to supersede other rights for Mead service area
G3-30073	Whitworth Water District 2	Municipal	10/11/1994	5000 gpm	Well	Well to be located in Home Acre Tract 1st Addition
G3-30313	Spokane County Water District No 3	Municipal	06/01/1995	2000 gpm	Wells (2)	Intended to serve 1585 homes
G3-30161	Whitworth Water District 2	Municipal	04/13/1998	5000 gpm	Well	To serve Systems 8 & 9; 3400 homes. Backup according to water system plan.
G3-30261	Leonard	Domestic Multiple, Irrigation	03/25/1999	1800 gpm	Existing well	Irrigation is for golf course; 8 homes or other commercial structures associated with golf course
G3-30508	Riverbluff Land Company LLC	Municipal	02/28/2006	600 gpm	Wells (4)	150 connections requested; related to superseding Groundwater Certificate No. G3-21440C.
G3-30714	Stevens County PUD 1	Municipal	07/28/2014	150 gpm	2 wells	Need additional instantaneous quantity for existing Chattaroy Springs Public Water System
Change Applications						
CG3-*01099S@1	NMC Mead LLC	Municipal	06/27/2011	1427 gpm	Wells	Proposed change of use from industrial to municipal to serve the North Kaiser Service area of Spokane County Water District #3.
CG3-*01098S@1	NMC Mead LLC	Municipal	06/27/2011	1250 gpm	Wells	
CG3-*06833C@1	NMC Mead LLC	Municipal	06/30/2011	2475 gpm	Wells	
CG3-*00734S	Whitworth University	Municipal	05/15/2013	550 gpm	Wells (2)	Expand place of use to new Whitworth facilities; Add a well
CS3-*20510C	Woodke	Irrigation	03/04/2014	0.18 cfs	Little Spokane River	Move Point of Diversion downstream, adjust Place of Use
CG3-25373C(A)@2	Dragoon Lake LLC & Short Road DP	Commercial / Industrial, Domestic Group, Irrigation	03/24/2014	128.25 gpm	Wells (3)	Change point of withdrawal and place of use location. Some relationship with Stevens County PUD.
CS3-23946C	Wimpy	Domestic Multiple, Fire Response	09/29/2014	0.02 cs, 2 acre feet/year	Diamond Lake	Add point of diversion to serve second home
CG3-24890C@1	RB Water Association	Municipal	11/24/2014	240 gpm	Wells (2?)	River Bluff Water System - move POW and Place of Use from San Dance Estates (Nine Mile Manor) to River Bluff Water System service area
CG3-28077C	Whitworth Water District 2	Domestic Single, Irrigation, Stock water	12/02/2014	75 gpm	Wells (6)	Change purpose of use - irrigation to municipal

Notes:
acre feet/year = acre feet per year
gpm = gallons per minute

Table 16 – Largest Instream Flow Provisioned Water Rights in WRIA 55 Based on Annual Authorized Quantity

Project 140129 - Little Spokane River Basin Water Bank Feasibility Study

File Number	Name of Record	Water Right Type	Water Source	Watershed Administrative Unit	Priority Date	Purpose of Use	Instantaneous Quantity Authorized		Annual Authorized Quantity (acre feet/year)	Authorized Acres for Irrigation
							cfs	gpm		
S3-29684	Severn, David R	Permit	Unnamed spring	Dartford Creek	4/13/1994	Irrigation, Stock water	1.00	449	128.1	43
S3-29144	Innes, Clyde	Certificate	Little Spokane River	Beaver Creek	2/4/1992	Irrigation	0.67	299	104	30
S3-28247GWRIS	Gatlin, Howard H	Certificate	Little Spokane River	Little Deep Creek	11/25/1986	Irrigation	0.27	120	78.5	20
S3-28248GWRIS	Gatlin, Howard H	Certificate	Little Spokane River	Little Deep Creek	11/25/1986	Irrigation	0.27	120	66.7	17
S3-25196C	A & A Properties	Certificate	Unnamed spring	Dragoon Creek	1/28/1977	Domestic Multiple	0.06	27	40	-
S3-26357GWRIS	Roening, Jack B	Certificate	Little Spokane River	Otter Creek	9/18/1979	Irrigation, Recreation	0.20	90	31.4	8
S3-28117GWRIS	Smart, Stephen B	Certificate	Little Spokane River	Little Spokane / Deer Creek	1/15/1986	Irrigation	0.11	49	19.6	5
S3-24985CWRIS	PUD No. 1 of Pend Oreille Cnty	Certificate	Sacheen Lake	West Branch	7/1/1976	Domestic Multiple	0.12	54	16.2	-
S3-25711C	Spokane County	Certificate	Little Spokane River	Otter Creek	10/26/1977	Irrigation	0.08	36	16	4
S3-28288C	Grizzly Bear Bluff Trust	Certificate	Little Spokane River	Otter Creek	3/9/1987	Irrigation, Stock water	0.04	20	12.7	3
S3-28339	Wahl, Herman	Certificate	Little Spokane River	Little Spokane / Deer Creek	6/1/1987	Irrigation, Stock water	0.1	44.88	12.7	3

Notes:
acre feet/year = acre feet per year gpm = gallons per minute
cfs = cubic feet per second

Table 19. Summary and Ranking of Irrigation Rights Evaluated for Bank Seeding

Project 140129 -Little Spokane River Watershed, WRIA 55

Subbasin	Rank	Source	WR_Doc	WR Doc File No.	Priority Date	cfs	gpm	Acres Irrigated	Purpose	Acre-feet/Year Recorded by Ecology	Acre-feet/Year Assuming Water Duty of 3 ft	Acre-feet/Year Used In Summary
Beaver Creek	1	G	2142608	G3-*00759CWRIS	19480305		300.0	50.0	IR	200.0	150	200.0
Beaver Creek	1	G	2141914	G3-*03978CWRIS	19550429		400.0	70.0	IR	280.0	210	280.0
Beaver Creek	1	G	2139212	G3-01505CWRIS	19680821	0	780	78	IR	177	234	177
Beaver Creek	1	G	2138274	G3-24214CWRIS	19750329		720.0	200.0	IR	469.0	600	469.0
Beaver Creek	1	G	2141491	G3-*06055CWRIS	19610914	0	180	35	IR	140	105	140
										Rank 1 Subbasin total		1,266
Beaver Creek	2	S	2114211	S3-071194CL	18821020	663	0	100	IR	100	300	100
Beaver Creek	2	G	2141714	G3-*04346CWRIS	19560611	0	400	40	IR	160	120	160
Beaver Creek	2	G	2141371	G3-*05449CWRIS	19591221	0	200	120	IR	160	360	160
										Rank 2 Subbasin total		420
Beaver Creek	3	G	2141812	G3-*04680CWRIS	19570912	0	200	60	IR	160	180	160
										Rank 3 Subbasin total		160
										Subbasin Acre-feet/year total		**1,846**
Dartford Creek	1	S	2109800	S3-094310CL	19110501	1,720.00		90.0	IR	547.0	270	547.0
Dartford Creek	1	S	2104770	S3-118876CL	19510501	1.67	0	125	DG IR ST	500	375	500.0
										Rank 1 Subbasin total		1,047
Dartford Creek	2	G	2142417	G3-*02079CWRIS	19510810		215.0	240.0	IR	344.0	720	344.0
Dartford Creek	2	S	2120767	S3-041806CL	19080401	1.01	0	50	DG IR	202	150	150
										Rank 2 Subbasin total		494
Dartford Creek	3	G	2141940	G3-*04077CWRIS	19550729		1,000.0	190.0	IR	760.0	570	760.0
Dartford Creek	3	G	2141669	G3-*04180CWRIS	19551212		1,200.0	210.0	IR	840.0	630	840.0
Dartford Creek	3	S	2124840	S3-020930CL	19701015	1.024	0	120	DG IR ST	163	360	163
Dartford Creek	3	S	2102620	S3-129240CL	19750401	0.05	0	80	DG IR ST	777,600.00	240	240
Dartford Creek	3	S	2132452	S3-01529CWRIS	19680809	1.11	0	56	IR	194	168	194
Dartford Creek	3	S	2123590	S3-028362CL	19050601	5.10		255.0	IR	765.0	765	765.0
										Rank 3 Subbasin total		2,962
										Subbasin Acre-feet/year total		**4,503**
Deadman Creek/Peone Creek	1	G	2142122	G3-*02228CWRIS	19511120	0	300	60	IR	180	180	180
Deadman Creek/Peone Creek	1	G	2142376	G3-*01844CWRIS	19510301	0	600	40	IR	160	120	160
Deadman Creek/Peone Creek	1	S	2129818	S3-77083JWRIS	19660920	0.7		70.0	IR	210.0	210	210.0
										Rank 1 Subbasin total		550
Deadman Creek/Peone Creek	2	G	2141394	G3-*05554CWRIS	19600405		400.0	70.0	IR	280.0	210	280.0
Deadman Creek/Peone Creek	2	S	2120766	S3-041805CL	19720415	0.8	0	40	IR ST	160	120	160
										Rank 2 Subbasin total		440
										Subbasin Acre-feet/year total		**990**

Table 19. Summary and Ranking of Irrigation Rights Evaluated for Bank Seeding

Project 140129 -Little Spokane River Watershed, WRIA 55

Subbasin	Rank	Source	WR_Doc	WR Doc File No.	Priority Date	cfs	gpm	Acres Irrigated	Purpose	Acre-feet/Year Recorded by Ecology	Acre-feet/Year Assuming Water Duty of 3 ft	Acre-feet/Year Used In Summary
Little Deep Creek	1	S	2104614	S3-120006CL	19130816	6	0	300	DG IR	2,028.00	900	900
Little Deep Creek	1	S	2135563	S3-*16904CWRIS	19610918	1		90.0	IR	360.0	270	360.0
										Rank 1 Subbasin total		1,260
Little Deep Creek	2	S	2127921	S3-007284CL	19150501	2,600.00		85.0	IR ST	340.0	255	1,260.0
Little Deep Creek	2	S	2135068	S3-*20263C	19670525	0.79	0	90	FS IR ST	271	270	271
										Rank 2 Subbasin total		1,531
Little Deep Creek	3	G	2141575	G3-*04929CWRIS	19580718	0	500	0	DM	135	-	135
Little Deep Creek	3	S	2102619	S3-129239CL	19750401	0.4	0	80	DG IR ST	1,306,800.00	240	240
										Rank 3 Subbasin total		375
										Subbasin Acre-feet/year total		**3,166**
Little Spokane/Deer Creek	1	G	2138896	G3-21336CWRIS	19730703	0	250	80	IR	151	240	151
Little Spokane/Deer Creek	1	G	2144605	G3-23977C	19741213	0	260	50	DM IR	226	150	150
Little Spokane/Deer Creek	1	G	2101688	G3-134214CL	19300601	0	200	35	IR	140	105	140
Little Spokane/Deer Creek	1	G	2138711	G3-22126CWRIS	19731121	0	400	40	DS IR	139.1	120	139.1
Little Spokane/Deer Creek	1	S	2135608	S3-*17547C	19530713	0.34	0	35	IR	105	105	105
Little Spokane/Deer Creek	1	S	2132094	S3-21113GWRIS	19730510	0.46	0	60	DS IR	158.8	180	158.8
										Rank 1 Subbasin total		844
Little Spokane/Deer Creek	2	G	2139166	G3-21083ALCWRIS	19730503	0	400	100	DS IR	169	300	169
Little Spokane/Deer Creek	2	S	2131223	S3-24277GWRIS	19750611	0.5	0	46	IR	180	138	180
Little Spokane/Deer Creek	2	S	2129825	S3-77090JWRIS	19680909	0.5	0	40	IR ST	115	120	115
										Rank 2 Subbasin total		464
Little Spokane/Deer Creek	3	G	2138246	G3-24120CWRIS	19750304	0	200	70	IR	134	210	134
Little Spokane/Deer Creek	3	G	2138618	G3-23099	19740501	0	1,410.00	140	DS IR	453	420	453
Little Spokane/Deer Creek	3	S	2118458	S3-051129CL	19240601	5.00		80.0	IR	3,650.0	240	240
										Rank 3 Subbasin total		827
										Subbasin Acre-feet/year total		**2,135**
Dragoon Creek	1	G	2141503	G3-*06089CWRIS	19611013		600.0	175.0	IR	480.0	525	480.0
Dragoon Creek	1	G	2108348	G3-102469CL	19680101	0	150	40	DG IR	240	120	120
Dragoon Creek	1	G	2126066	G3-015334CL	19520312	0	600	40	IR	160	120	160
Dragoon Creek	1	G	2142301	G3-*01448CWRIS	19500316	0	180	35	IR	123	105	123
Dragoon Creek	1	G	2088860	G3-01610C	19691126	0	1,375.00	200	DS IR ST	693	600	693
Dragoon Creek	1	S	2135365	S3-*18178C	19630924	0.54	0	40	IR	138	120	138
Dragoon Creek	1	S	2129835	S3-77100JWRIS	19700923	0.44	0	38	FS IR RE ST	101	114	101
Dragoon Creek	1	S	2132395	S3-01229CWRIS	19691218	0.45	0	40	IR	114	120	114
Dragoon Creek	1	S	2096219	S3-158794CL	19740614	450.00		80.0	IR	360.0	240	360.0
										Rank 1 Subbasin total		2,289

Table 19. Summary and Ranking of Irrigation Rights Evaluated for Bank Seeding

Project 140129 -Little Spokane River Watershed, WRIA 55

Subbasin	Rank	Source	WR_Doc	WR Doc File No.	Priority Date	cfs	gpm	Acres Irrigated	Purpose	Acre-feet/Year Recorded by Ecology	Acre-feet/Year Assuming Water Duty of 3 ft	Acre-feet/Year Used In Summary
Dragoon Creek	2	G	2141961	G3-*04119CWRIS	19550922	0	240	60	IR ST	180	180	180
Dragoon Creek	2	G	2141879	G3-*03879CWRIS	19550218	0	220	40	IR	160	120	160
Dragoon Creek	2	G	2138375	G3-24651CWRIS	19751028		620.0	186.0	IR	581.6	558	581.6
Dragoon Creek	2	S	2106253	S3-112127CL	19070401	4.00		80.0	IR	320.0	240	320.0
										Rank 2 Subbasin total		1,242
Dragoon Creek	3	G	2143016	G3-*00469CWRIS	19470305		150.0	60.0	IR	240.0	180	240.0
Dragoon Creek	3	G	2142226	G3-*02781CWRIS	19521027	0	400	55	IR	165	165	165
Dragoon Creek	3	G	2118527	G3-051439CL	19240101	0	400	160	DG IR ST	553	480	553
Dragoon Creek	3	G	2119881	G3-045904CL	19731001	0	200	65	DG IR	260	195	195
Dragoon Creek	3	G	2104977	G3-117886CL	19400701	0	269	80	DG IR	322	240	322
Dragoon Creek	3	S	2105451	S3-115776CL	19350501	0.4	0	80	IR	142.8	240	142.8
										Rank 3 Subbasin total		1,618
										Subbasin Acre-feet/year total		**5,148**
Otter Creek	1	G	2143304	G3-*08507C	19670127		750.0	95.0	IR	380.0	285.0	380.0
Otter Creek	1	S	2135996	S3-*12860AWCWRIS	19540408	1.04	0	80	DS IR ST	240	240	240
Otter Creek	1	S	2116329	S3-061878CL	19010901	0.155	0	0	CI DM	112	-	112
Otter Creek	1	S	2132366	S3-01083CWRIS	19650323	0.61		65.0	IR	220.0	195	220.0
Otter Creek	1	S	2126694	S3-011696CL	19100101	8	0	115	DG IR	460	345	460
Otter Creek	1	S	2100640	S3-136634CL		0.115	0	35	IR	140	105	140
										Rank 1 Subbasin total		1,552
Otter Creek	3	G	2108349	G3-102470CL	19560101	0	150	0	DG	160	-	160
Otter Creek	3	G	2127730	G3-006416CL	19710910	0	50	35	DG IR ST	425	105	105
Otter Creek	3	S	2129151	S3-000668CL	19160101	0.02	0	35	IR	105	105	105
Otter Creek	3	S	2136371	S3-*11254CWRIS	19520418	0.4	0	75	IR	150	225	150
Otter Creek	3	S	2126785	S3-012190CL	19240601	450.00		80.0	IR	720.0	240	720.0
Otter Creek	3	S	2109737	S3-094048CL	19120801	50.00		80.0	IR	36,500.0	240	240
Otter Creek	3	S	2103790	S3-122247CL	19480801	0.50		90.0	FR IR	360.0	270	360.0
										Rank 3 Subbasin total		1,840
										Subbasin Acre-feet/year total		**3,392**

Table 19. Summary and Ranking of Irrigation Rights Evaluated for Bank Seeding

Project 140129 -Little Spokane River Watershed, WRIA 55

Subbasin	Rank	Source	WR_Doc	WR Doc File No.	Priority Date	cfs	gpm	Acres Irrigated	Purpose	Acre-feet/Year Recorded by Ecology	Acre-feet/Year Assuming Water Duty of 3 ft	Acre-feet/Year Used In Summary
West Branch	1	S	2128096	S3-006189CL	19250301		600.0		IR	960.0	0	960.0
West Branch	1	S	2131317	S3-23689CWRIS	19740629	0.17	0	0	DM	120	-	120
										Rank 1 Subbasin total		1,080
West Branch	2	S	2095509	S3-200042CL	19080501	0.757	0	55	IR ST	110	165	110
										Rank 2 Subbasin total		110
West Branch	3	G	2127342	G3-008667CL	19700501	0	250	80	IR ST	125	240	125
West Branch	3	G	2139589	G3-01070CWRIS	19680904	0	270	80	IR ST	123	240	123
West Branch	3	G	2128421	G3-003608CL	19570701	0	160	0	DG	258	-	258
West Branch	3	G	2126383	G3-012478CL	19690801	0	100	0	DG	100	-	100
West Branch	3	G	2141140	G3-*07200CWRIS	19640602		400.0	150.0	IR	320.0	450	320.0
West Branch	3	G	2128402	G3-003541CL	19440101	0	65	50	DG IR ST	125	150	125
West Branch	3	S	2136076	S3-*13113CWRIS	19540903	1.00		80.0	IR	240.0	240	240.0
										Rank 3 Subbasin total		1,291
										Subbasin Acre-feet/year total		**2,481**

Little Spokane Watershed Combined Water Rights Total (Groundater+Surface Water)	**23,661**

Legend and Notes

Legend:

Code	Description	Rank
CI	Commercial/Industrial	1 - High priority for further review
DM	Domestic Multiple	2 - Medium priority for further review
DG	Domestic General	3 - Low priority for further review
FR	Fire Protection	
FS	Fish Propogation	
IR	Irrigation	
PO	Power	
ST	Stockwater	
WL	Wildlife	

Notes:

"Acre feet/year Used in Summary" was adjusted based on an assumed water duty of 3 feet in cases where the reported acre-feet/year was excessive relative to the reported acerage.

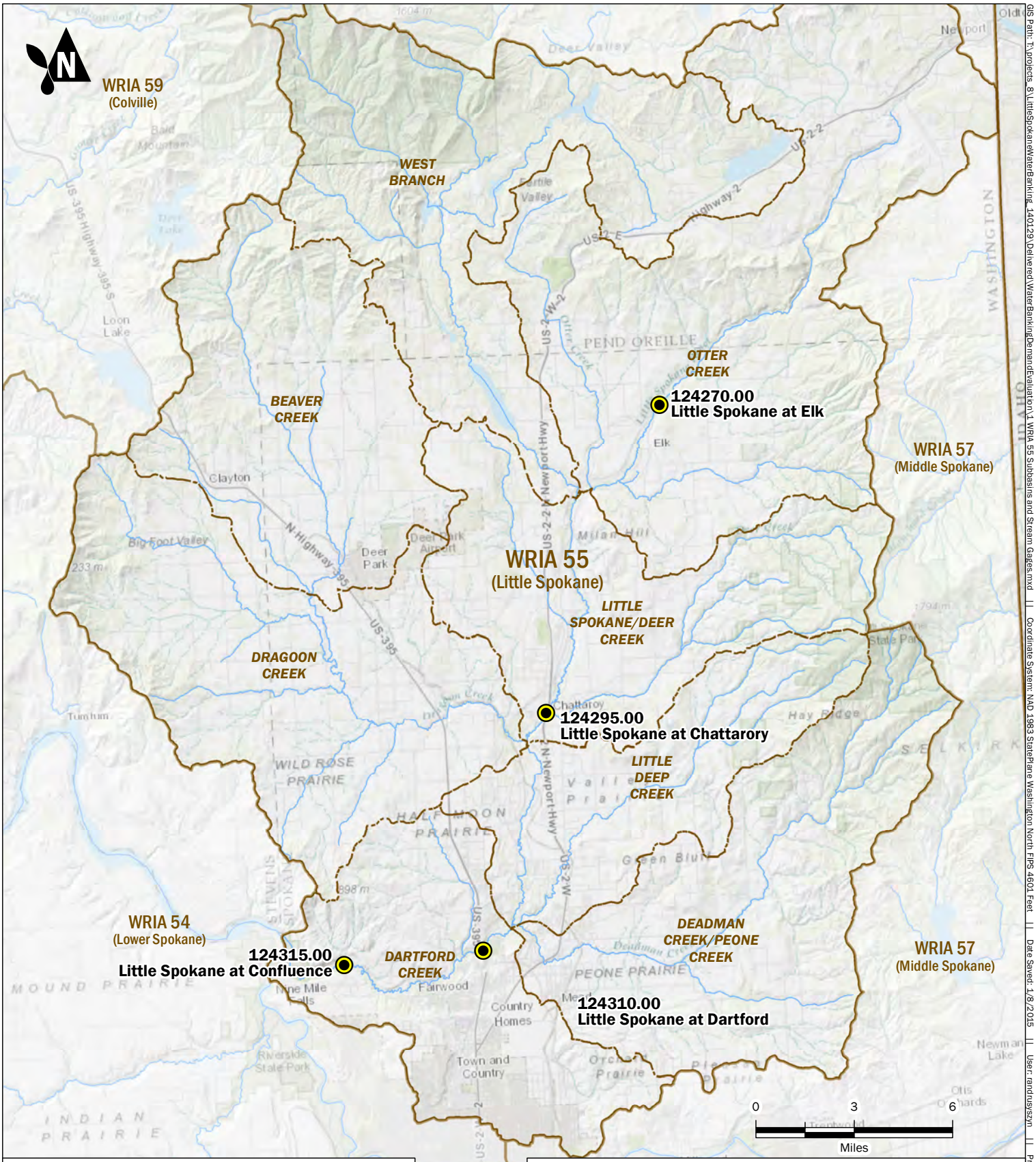
cfs = cubic feet per second
gpm = gallons per minute
G = groundwater
S = surface water

Table 23. Examples of WA Interagency Agreements

Project 140129 -Little Spokane River Watershed, WRIA 55

Entities	Purpose	Authorization	Agreements
Quad Cities (Richland, West Richland, Pasco, Kennewick)	Collaboration planning and mitigation for regional permit G4-30976P,which authorizes 96,619 ac-ft. Mitigation (at least 50% in-kind) must be provided whenever the Columbia River BiOp is not met.	RCW 39.34	1. Quad Cities Interagency Agreement governing shared costs and benefits. 2. Quad Cities / Ecology / CELP Settlement Agreement related to appeal on original permit issuance. 3. Kennewick / Ecology ASR MOU to develop new ASR facility, which can be used in part as future mitigation. 4. Quad Cities / Ecology MOU to jointly developm mitigation supplies to hydrate permit.
White Salmon, Bingen, Port of Klickitat, Ecology	Jointly manage a regional wellfield and associated water rights, water infrastructure costs, conservation, and future planning.	RCW 39.34, RCW 90.42	1. Interlocal agreement documenting shared ownership of three parties of common wellfield, terms of service, financing, conservation, and planning coordination.
Klickitat County, Benton County, Ecology	Collaborate on development of a new proposed 44,000 acre-foot Switzler Reservoir, documentation of shared SEPA responsibilities.	RCW 39.34	1. SEPA Co-Lead Agreement to coordinate environmental review of proposed new reservoir.
Methow Valley Irrigation District (MVID), Twisp, Ecology	Collaborate on formation of a water bank for instream flow, new irrigation supplies, and expanded muncipal use.	RCW 39.34, RCW 90.42	1. Trust Water Agreement to document how current irrigation water rights will be held by Ecology, how quantities reserved for instream flows will be managed, and how quantities for existing and new irrigation and municipal supplies will be managed. 2. Purchase and Sale Agreement (PSA) transferring surplus irrigation supplies from MVID to Twisp. 3. Water Service Agreement documenting payment terms for Ecology Office of Columbia River to finance PSA over 20 year term to faciliate water purchase by Twisp of surplus irrigation water.
Stemilt Irrigation District, Malaga Water District	Collaboratively manage irrigation and municipal supply transfers in the Stemilt Basin. These transfers can be managed within the jurisdiction of the Board without Ecology oversight.	RCW 87.80	1. Interlocal agreement documenting shared costs, risks, and responsibilities under Board of Joint Control. 2. Board of Joint Control Formation Agreement.

FIGURES



USGS Gaging Station/Control Station

WRIA Boundary

WRIA 55 Subbasins

Named Watercourse

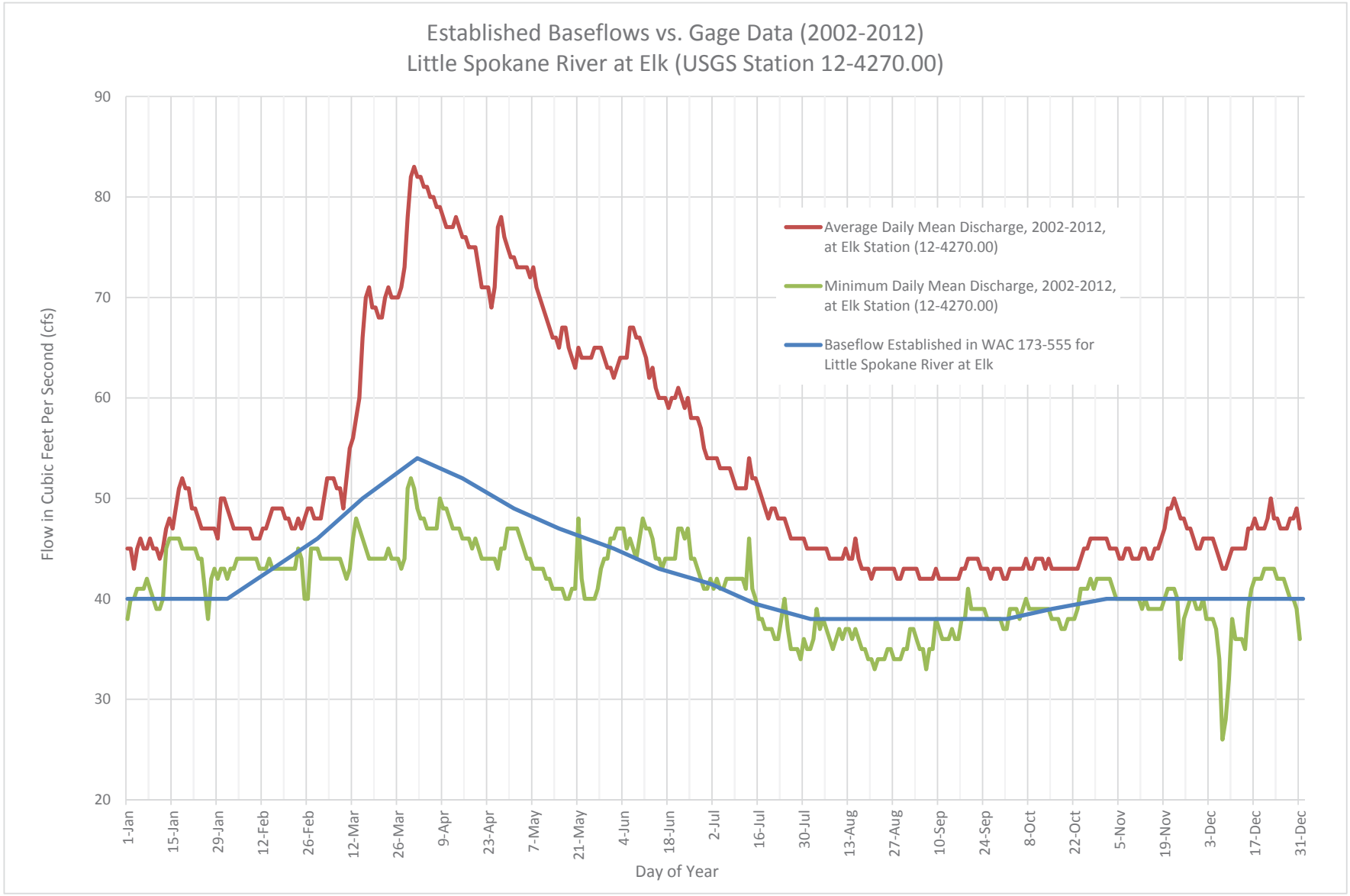
Notes:
-WRIA 55 Subbasin Source: Spokane County Water Resources Division of Utilities, 2015

WRIA 55 Subbasins and Stream Gages

Little Spokane Water Banking Demand Evaluation,
Supply Assessment, and Water Transfer Framework Considerations
WRIA 55, Washington

Aspect CONSULTING	JAN-2015	BY: CME / RAA	FIGURE NO. 1
	PROJECT NO. 140129	REVISED BY: ---	

GIS Path: T:\projects_8\LittleSpokaneWaterBanking_140129\Delivered\WaterBankingDemandEvaluation\1 WRIA 55 Subbasins and Stream Gages.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 1/8/2015 || User: randrusyszyn || Print Date: 1/8/2015

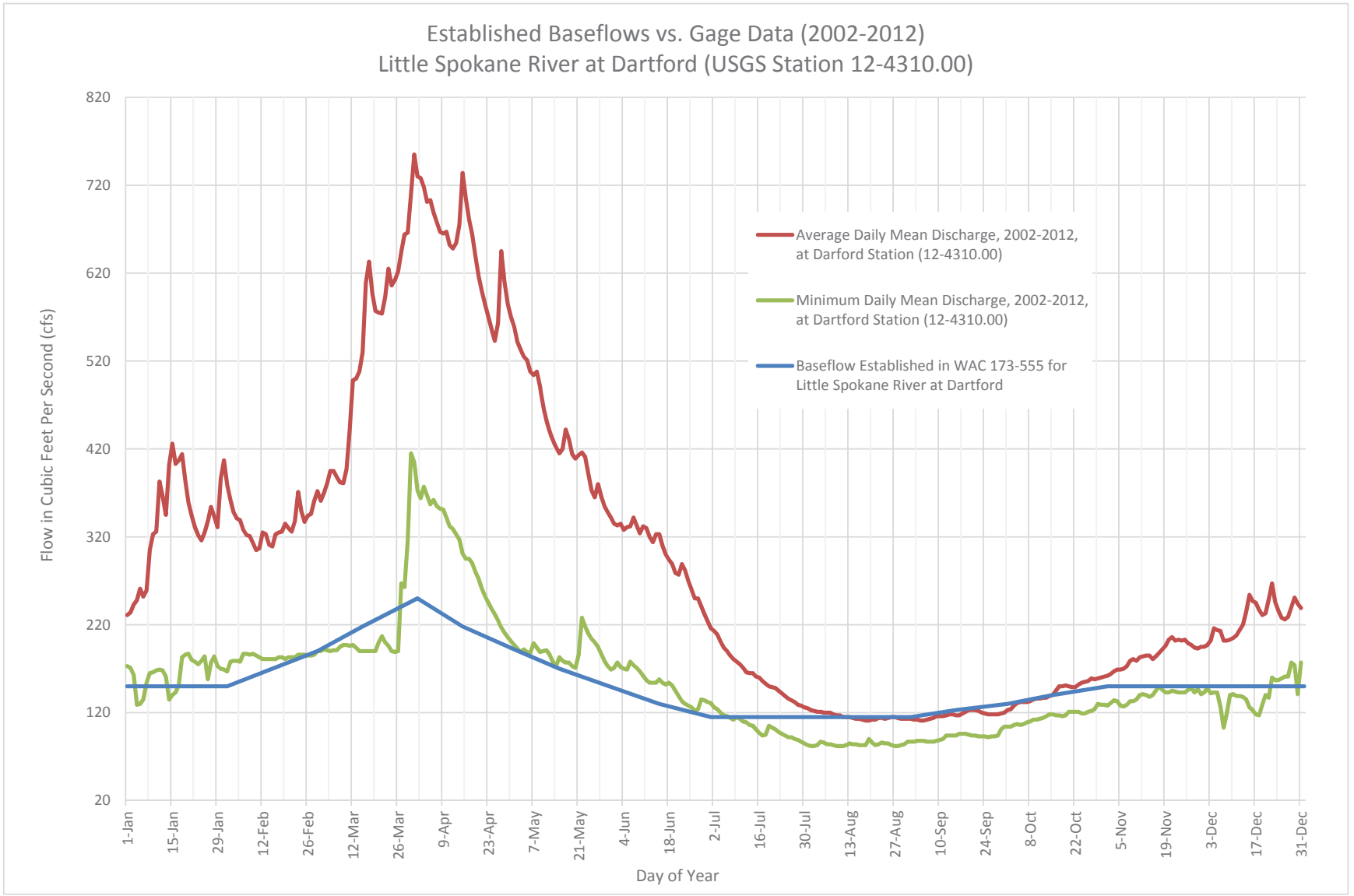


Established Baseflows vs. Gage Data (2002-2012)
Little Spokane River at Elk Gage

Little Spokane Water Banking Demand Evaluation,
Supply Assessment, and Water Transfer Framework Considerations
WRIA 55, Washington

Aspect CONSULTING	MAY-2015	BY: CME / RAP	FIGURE NO. 2
	PROJECT NO. 140129	REVISED BY: ---	

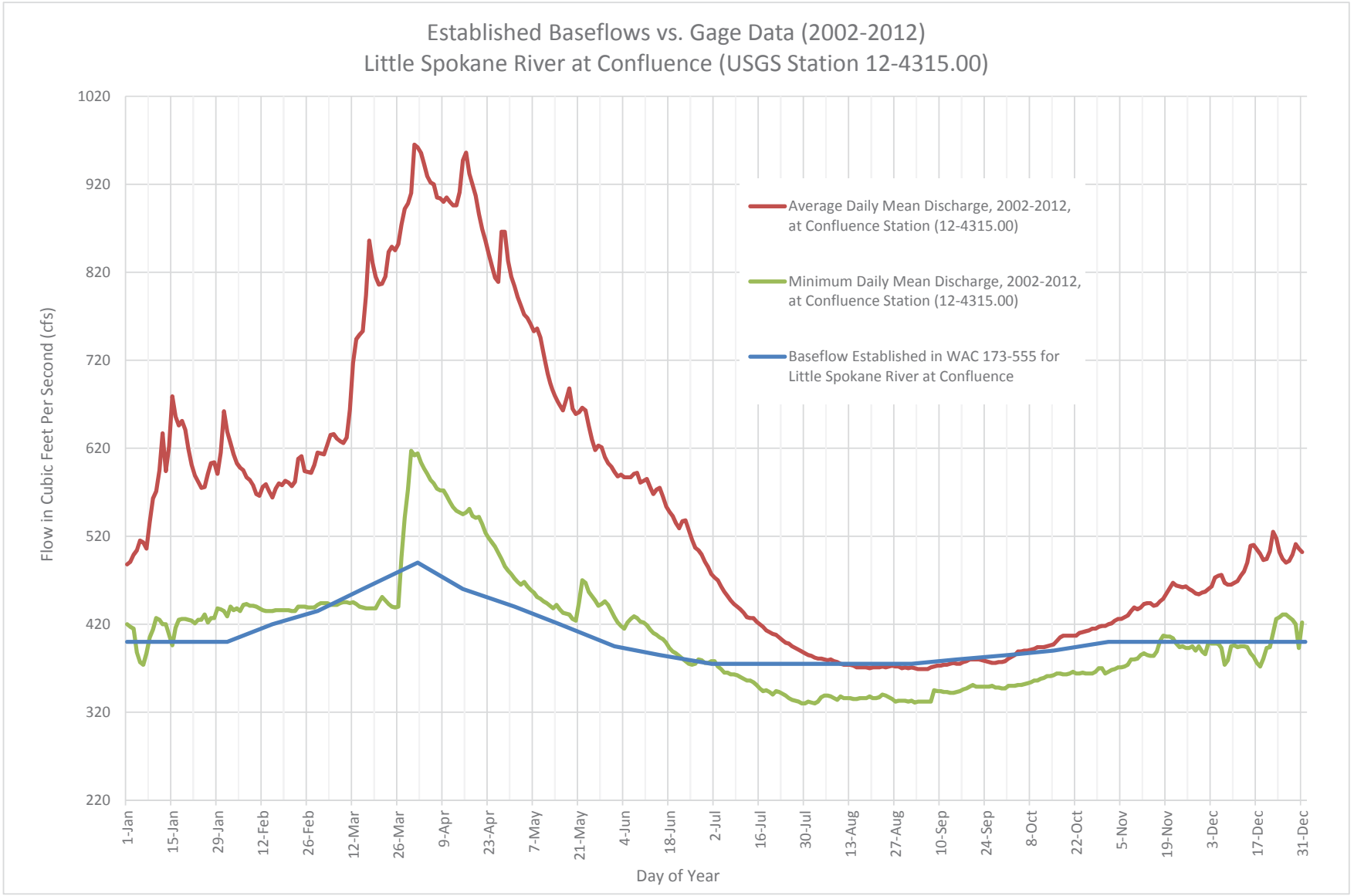
GIS Path: T:\projects_8\Little&SpokaneWaterBanking_140129\Delivered\WaterBankingDemandEvaluation\2 Established Baseflows vs Gage Data Elk Gage.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || User: rpepin



Established Baseflows vs. Gage Data (2002-2012)
Little Spokane River at Dartford Gage

Little Spokane Water Banking Demand Evaluation,
Supply Assessment, and Water Transfer Framework Considerations
WRIA 55, Washington

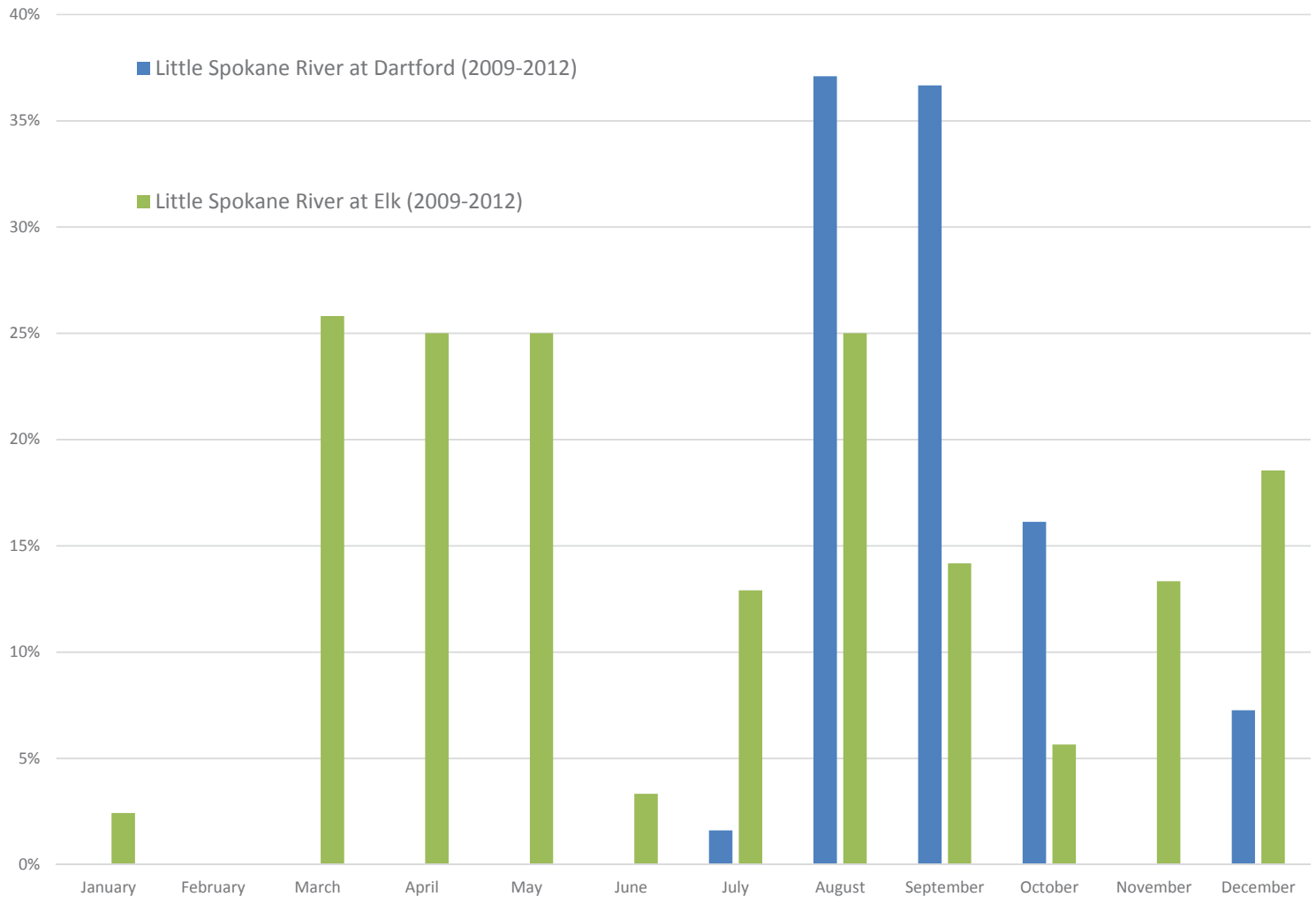
Aspect CONSULTING	MAY-2015	BY: CME / RAP	FIGURE NO. 3
	PROJECT NO. 140129	REVISED BY: ---	



Established Baseflows vs. Gage Data (2002-2012)
Little Spokane River at Confluence Gage

Little Spokane Water Banking Demand Evaluation,
Supply Assessment, and Water Transfer Framework Considerations
WRIA 55, Washington

Aspect CONSULTING	MAY-2015	BY: CME / RAP	FIGURE NO. 4
	PROJECT NO. 140129	REVISED BY: ---	



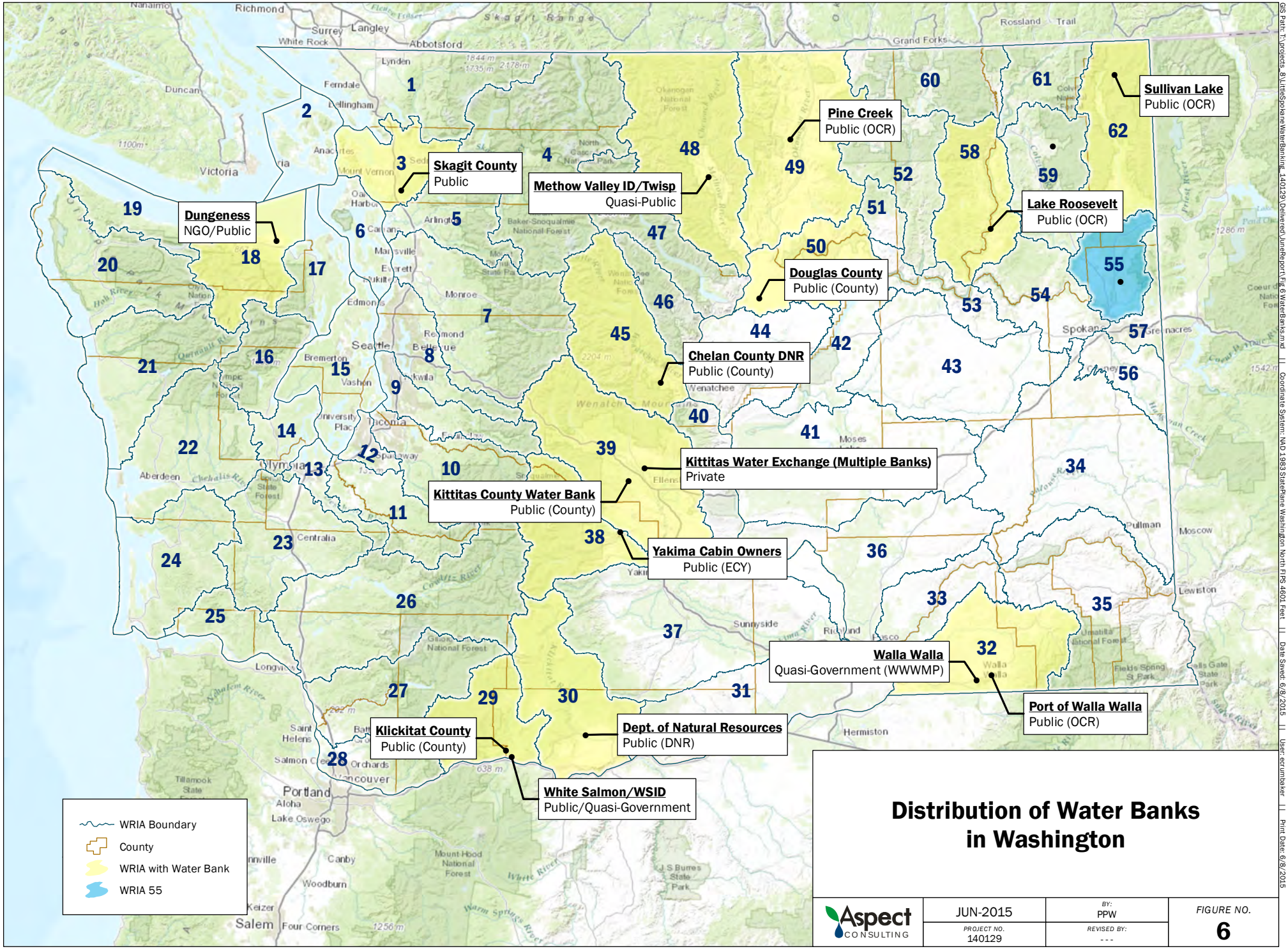
-Minimum instream flow range Little Spokane at Dartford = 115 to 250 cfs
-Minimum instream flow range Little Spokane at Elk = 38 to 52 cfs

Note: Graph shows percentage of days in which a 7-day moving average of mean daily flow did not meet base flow/curtailment flow, 2009-2012

Frequency Below Base Flows - at Dartford and Elk

Little Spokane Water Banking Demand Evaluation, Supply Assessment, and Water Transfer Framework Considerations WRIA 55, Washington

Aspect CONSULTING	JUN-2015	BY: CME / RAP	FIGURE NO. 5
	PROJECT NO. 140129	REVISED BY: ---	

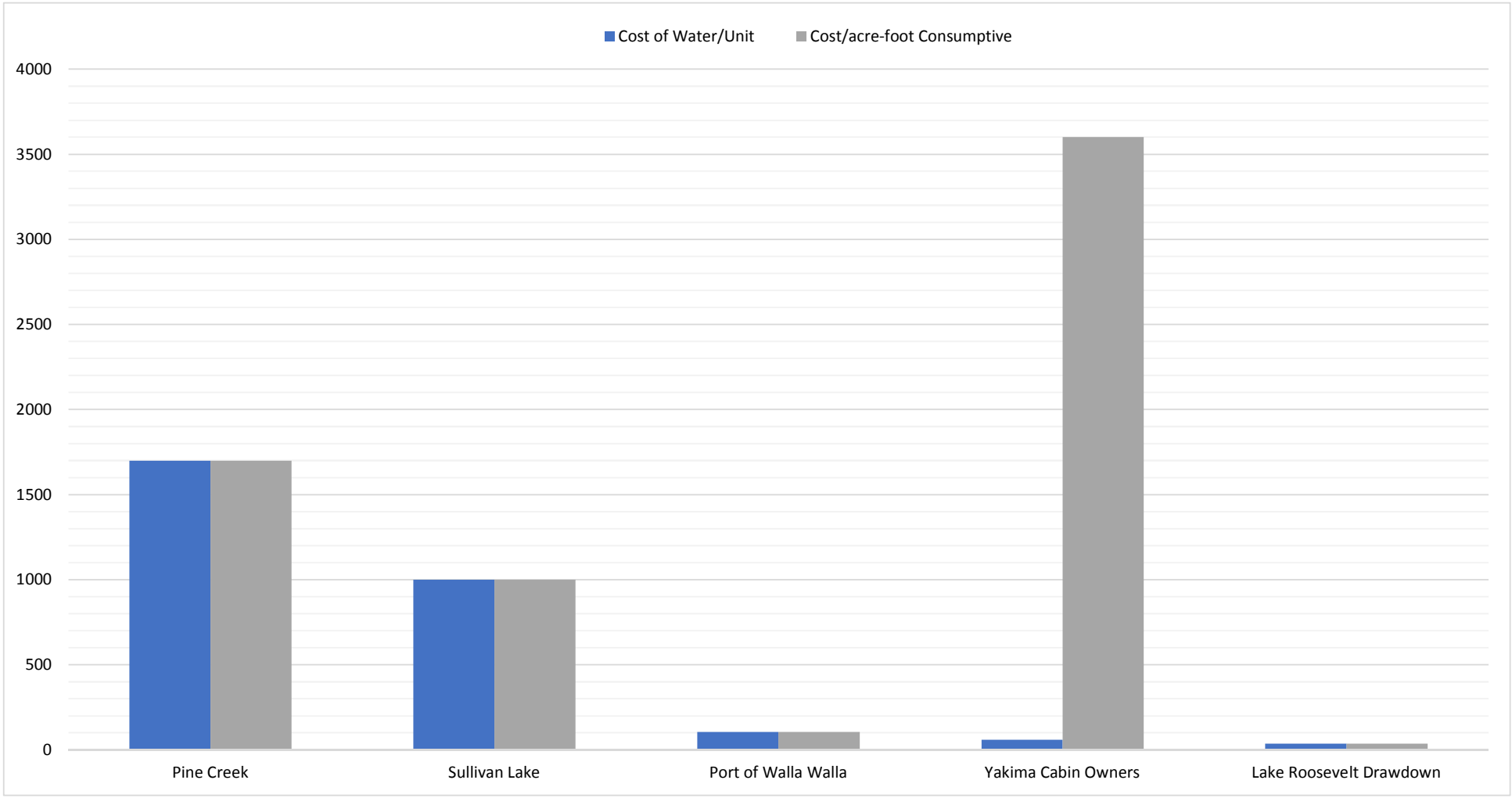


Distribution of Water Banks in Washington

Aspect Consulting	JUN-2015	BY: PPW	FIGURE NO. 6
	PROJECT NO. 140129	REVISED BY: ---	

Basemap Layer Credits || Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

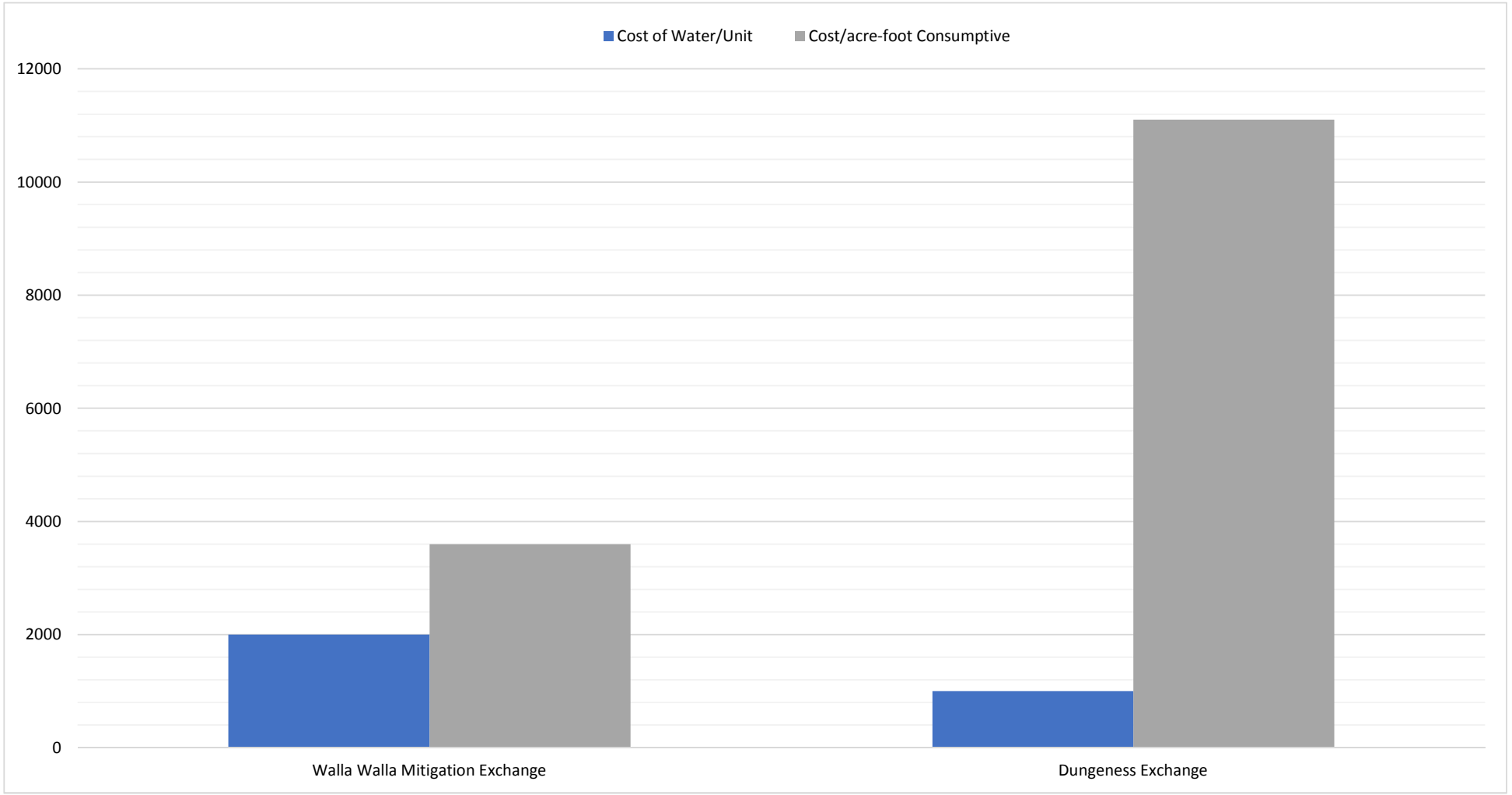
GIS Path: T:\projects_8\LittleSpokaneWaterBanking_140129\Deliverech\JuneReport\Fig 6WaterBanks.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 6/8/2015 || User: ecrumbaker || Print Date: 6/8/2015



Port of Walla Walla is based on an annual lease rate under a 10 year service contract at a rate of $105/acre-foot. Lake Roosevelt Drawdown is based on an annual lease rate under a 20 year service contract at a rate of $35/acre-foot with an inflationary adjustment based on review by US Bureau of Reclamation.

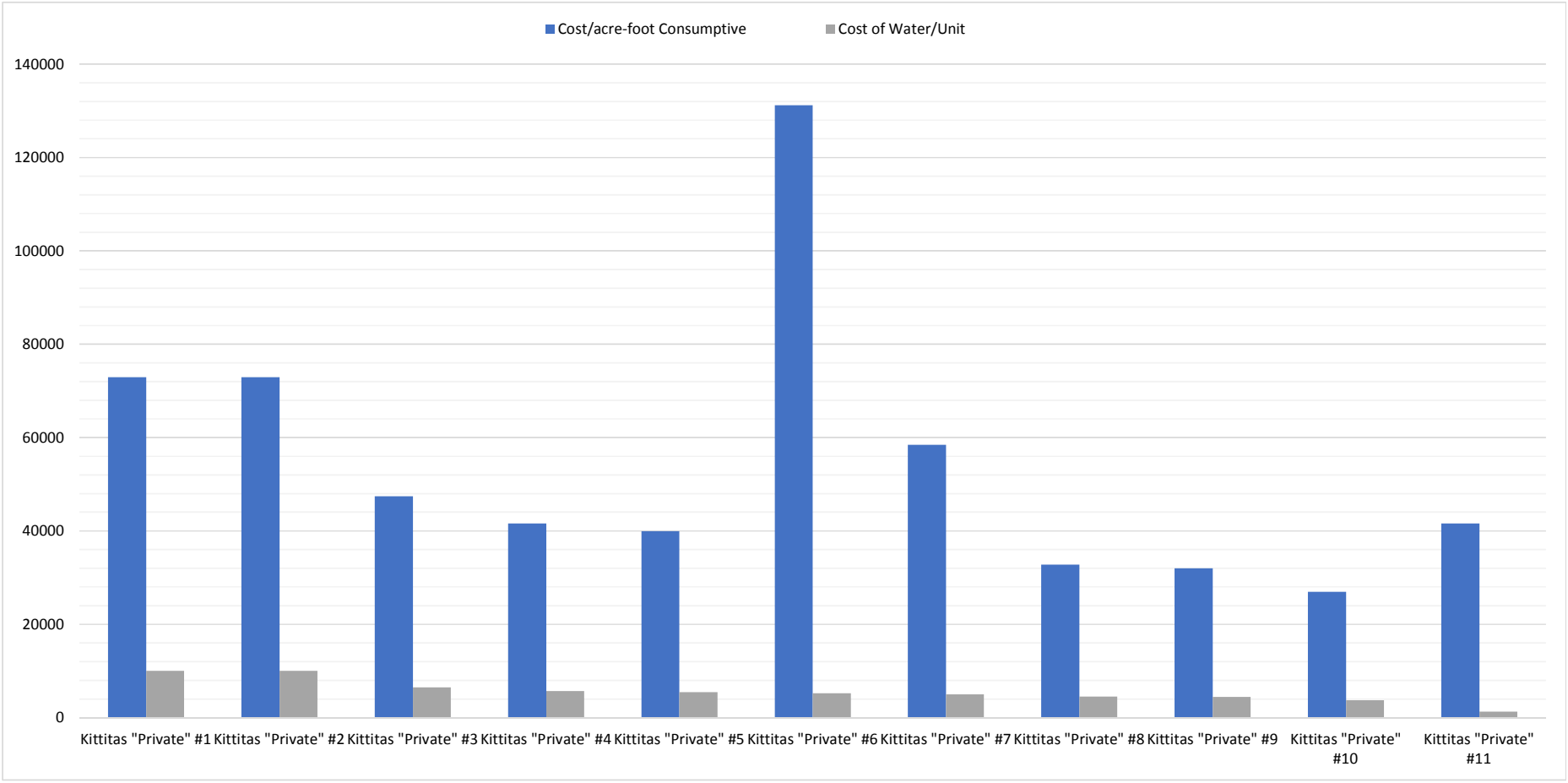
Public Water Bank Unit Cost and Cost of Water/Acre-foot Consumptive Pricing Variability

Aspect CONSULTING	JUN-2015	BY: PPW	FIGURE NO. 7
	PROJECT NO. 140129	REVISED BY: ---	



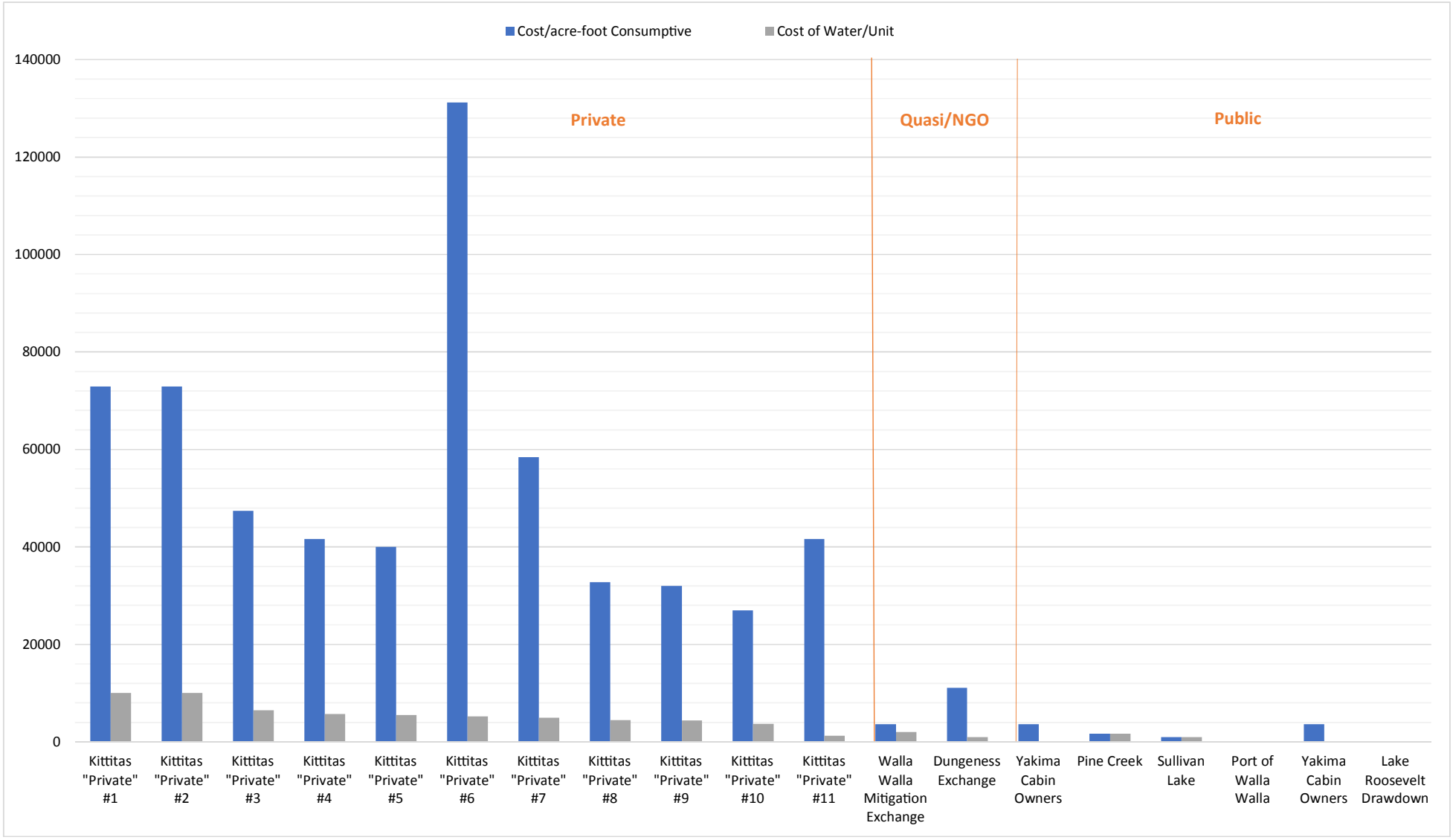
Quasi-Government and NGO Water Bank Unit Cost and Cost of Water/Acre-foot Consumptive Pricing Variability

Aspect CONSULTING	JUN-2015	BY: PPW	FIGURE NO. 8
	PROJECT NO. 140129	REVISED BY: ---	



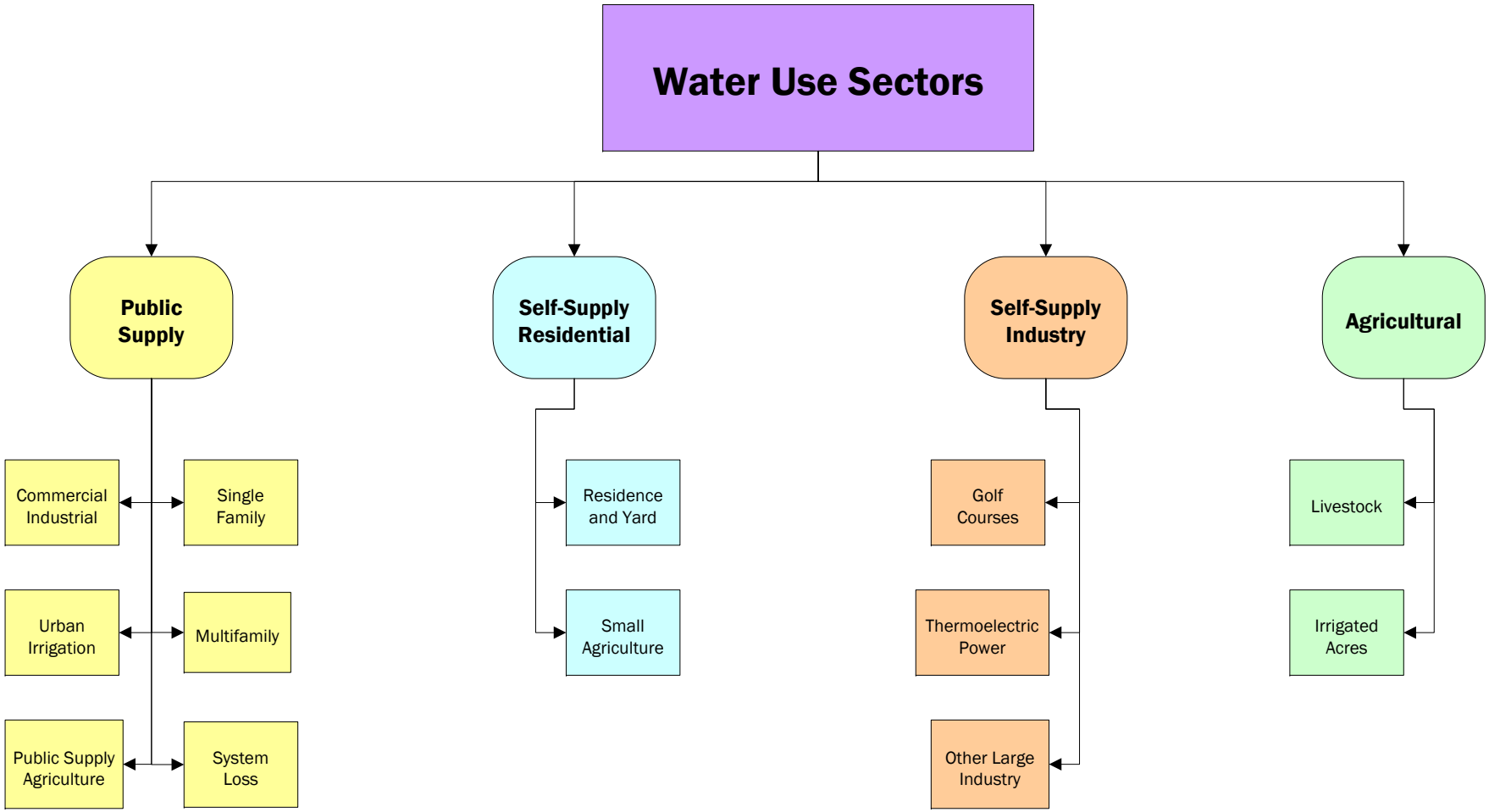
Private Water Bank Unit and Cost of Water/Acre-foot Consumptive Pricing Variability

Aspect CONSULTING	JUN-2015	BY: PPW	FIGURE NO. 9
	PROJECT NO. 140129	REVISED BY: ---	



Current Private, Quasi-Government/NGO, and Public Water Bank Pricing

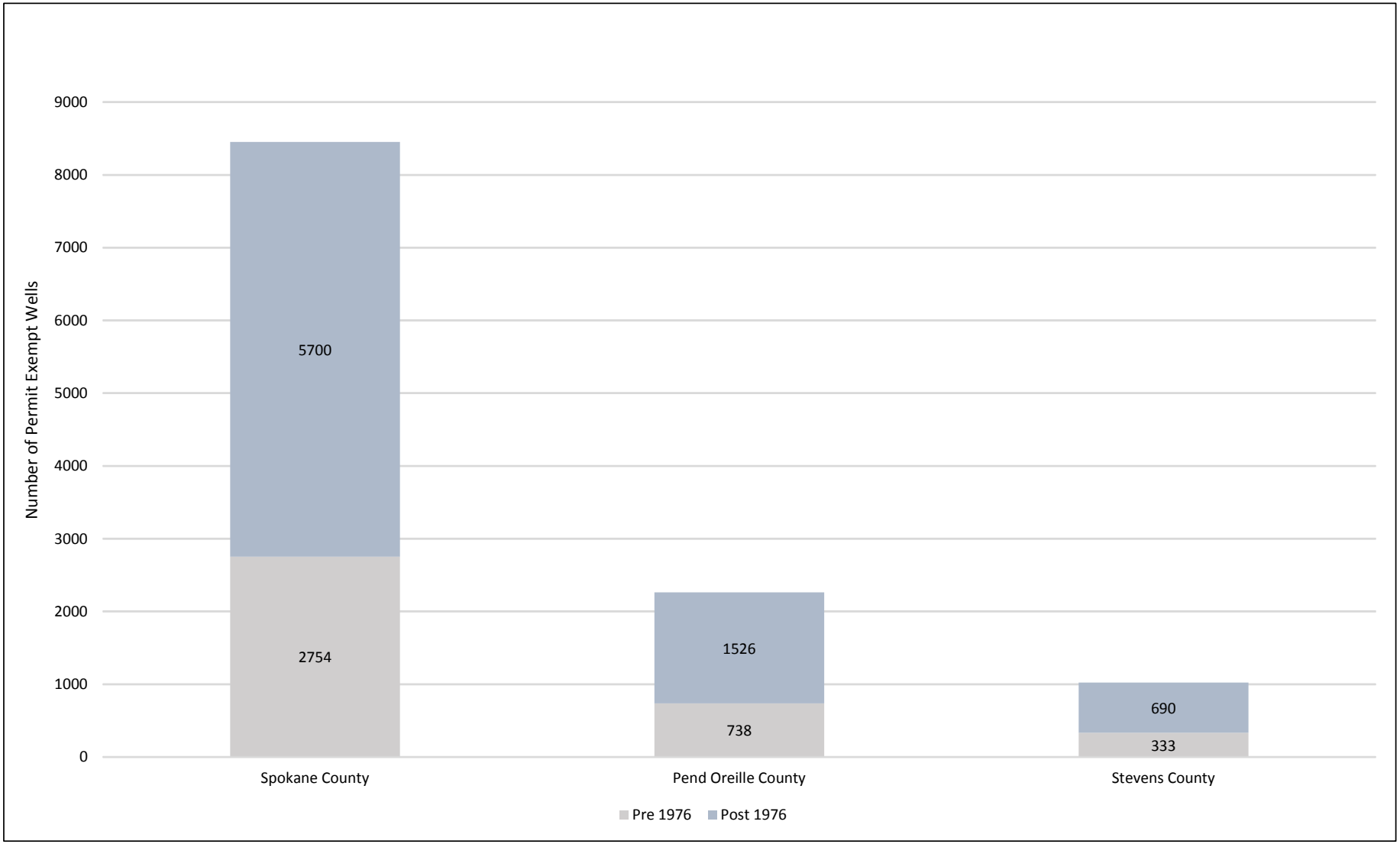
Aspect CONSULTING	JUN-2015	BY: PPW	FIGURE NO. 10
	PROJECT NO. 140129	REVISED BY: ---	



Water Use Sector Framework for Water Demand Evaluation

Little Spokane Water Banking Demand Evaluation,
Supply Assessment, and Water Transfer Framework Considerations
WRIA 55, Washington

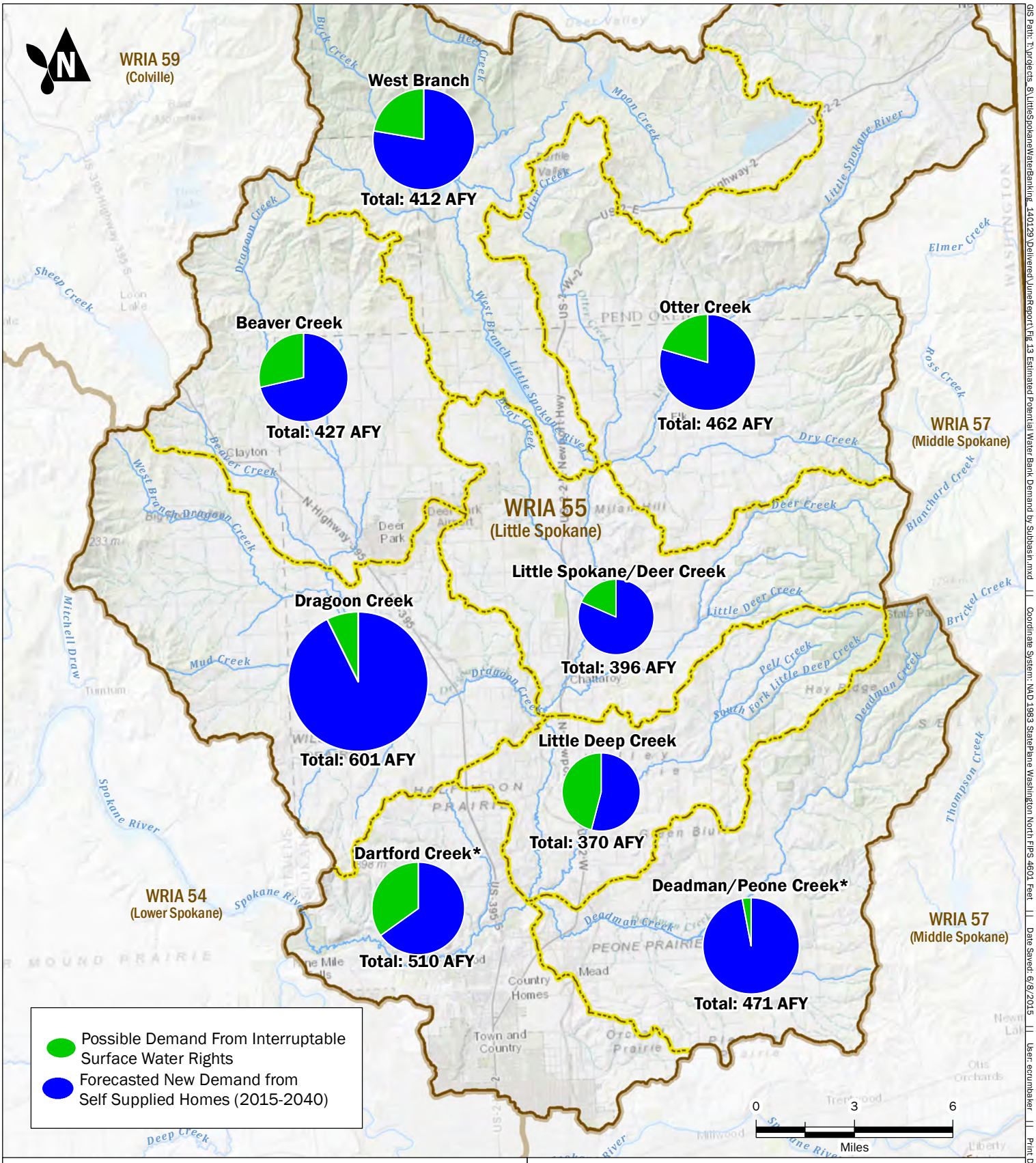
Aspect CONSULTING	JUN-2015	BY: CME / RAP	FIGURE NO. 11
	PROJECT NO. 140129	REVISED BY: ---	



Estimates of Pre- and Post-Rule Permit Exempt Wells in WRIA 55

Little Spokane Water Banking Demand Evaluation,
Supply Assessment, and Water Transfer Framework Considerations
WRIA 55, Washington

Aspect CONSULTING	JUN-2015	BY: CME / RAP	FIGURE NO. 12
	PROJECT NO. 140129	REVISED BY: ---	



WRIA 55 Demand Forecast Units

Named Watercourse

WRIA Boundary

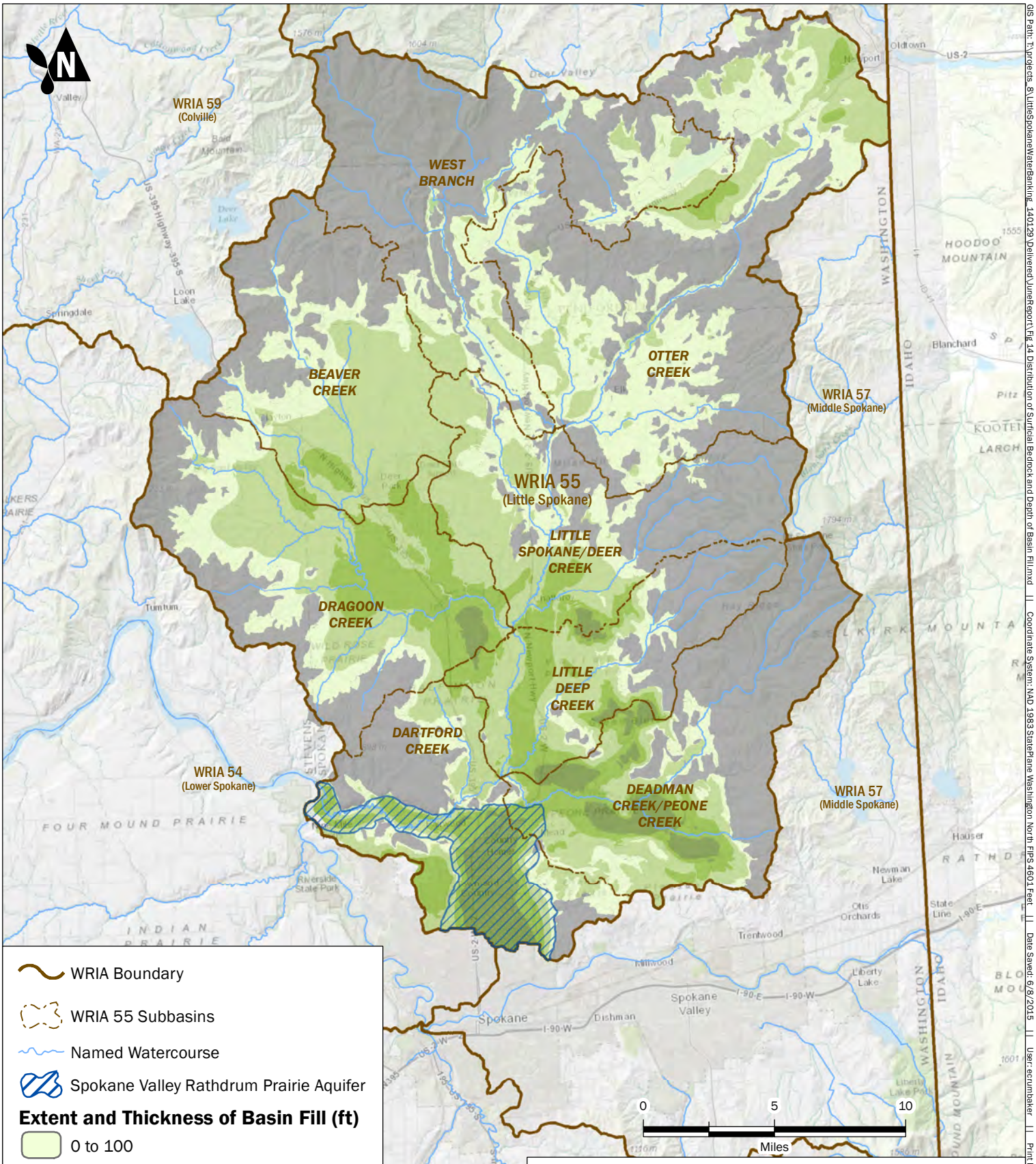
Notes:
**Possible Demand for pending new water applications in Dartford Creek and Deadman/Peone Creeks may total 4000-5000 Acre-Feet/Year (AFY)*
-Water Demand values are in AFY
-Demand Forecast Unit Source: Spokane County Water Resources Division of Utilities, 2015

Estimated Potential Water Bank Demand by Subbasin

Little Spokane Water Banking Demand Evaluation,
Supply Assessment, and Water Transfer Framework Considerations
WRIA 55, Washington

Aspect Consulting	JUN-2015	BY: CME / RAP	FIGURE NO. 13
	PROJECT NO. 140129	REVISED BY: ---	

GIS Path: T:\projects_8\LittleSpokaneWaterBanking_140129\Delivered\JuneReport\Fig 13 Estimated Potential Water Bank Demand by Subbasin.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 6/8/2015 || User: ecrumbaker || Print Date: 6/8/2015



Notes:
-Basin Fill, Bedrock, and Aquifer Data Source: USGS Scientific Investigations Report 2013-5124
-WRIA 55 Subbasin Source: Spokane County Water Resources Division of Utilities, 2015

Distribution of Surficial Bedrock and Depth of Basin Fill

Little Spokane Water Banking Demand Evaluation,
Supply Assessment, and Water Transfer Framework Considerations
WRIA 55, Washington

Aspect Consulting	JUN-2015	BY: CME / RAP	FIGURE NO. 14
	PROJECT NO. 140129	REVISED BY: ---	

GIS Path: T:\projects_8\LittleSpokaneWaterBanking_140129\Delivered\JuneReport\Fig 14 Distribution of Surficial Bedrock and Depth of Basin Fill.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 6/8/2015 || User: ecrumbaker || Print Date: 6/8/2015

Consumptive Water Use Calculator

Percentage of Water Consumed by Rule

Water Use	% Consumed
In-house Use with a On-site Septic System	30%
In-house Use Hooked up to a Sanitary Septic System	20%
Outdoor Use (Irrigation)	90%

How Much Water Do I need?

In-House Use	Number of Connections		Amount of water per Connection (gallons per day) *
In-house Use with a On-site Septic System	1		350
In-house Use Hooked up to a Sanitary Septic System	0		350

* This value is a default value based on Dept of Health minimum service requirements.

Outdoor Use	Number of Square Feet	Number of Acres	Amount of water per acre (ac-ft)**
Irrigation	500	0.011	1.89

** This value is based on an irrigation requirement for pasture/turf in the Cle Elum area and an irrigation efficiency of 80% consistent with WAC 173-539A.

TOTAL CONSUMED
Consumptive Water Use (ac-ft)
0.118
0.000
Consumptive Water Use (ac-ft)
0.019
Total Consumptive Water Use (ac-ft)
0.137

The total consumptive water use is based on the assumptions in WAC 173-539A

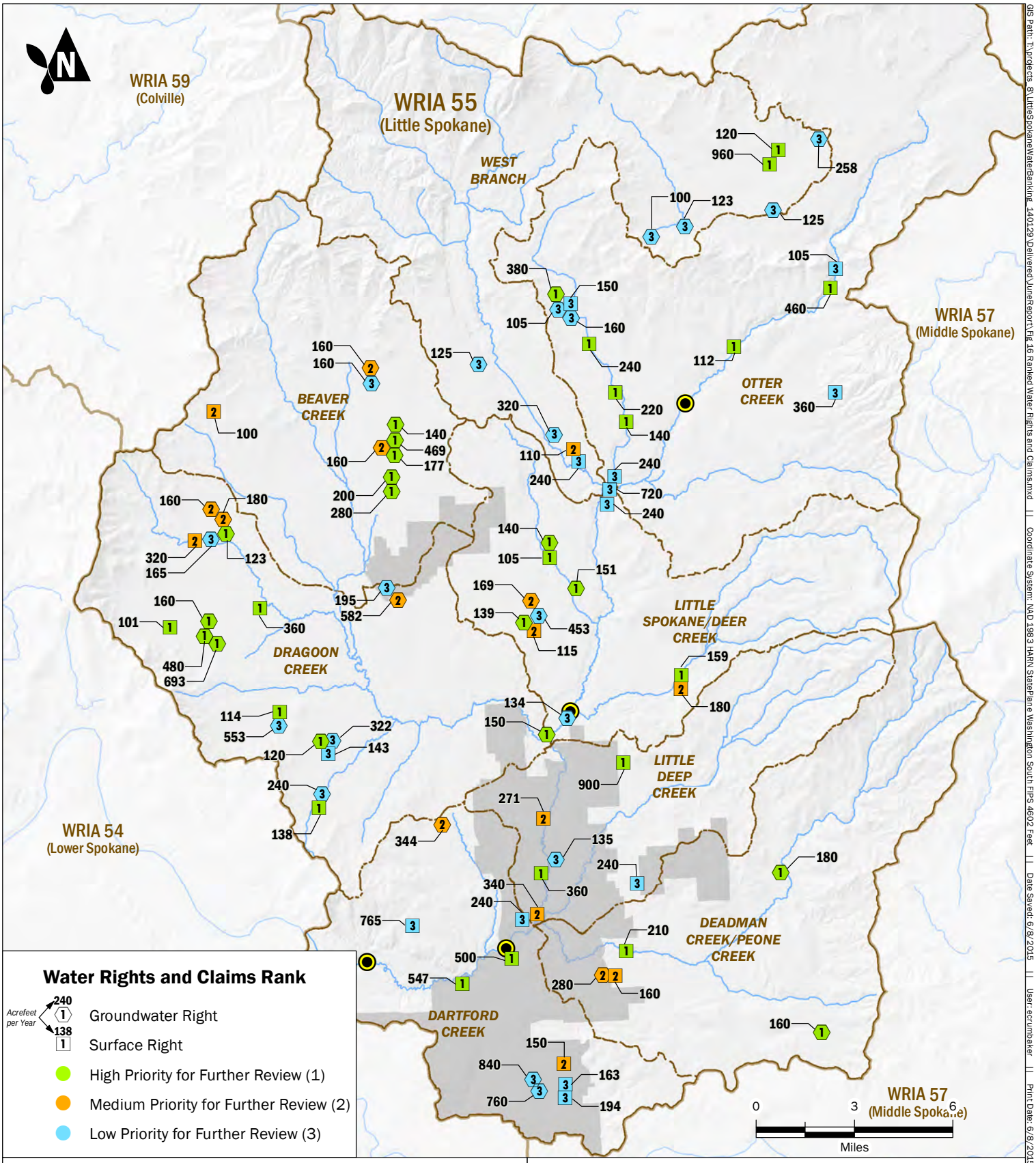
TOTAL USE
Water Use (ac-ft)
0.392
0.000
Water Use (ac-ft)
0.022
Total Water Use (ac-ft)
0.414

Total water use is the quantity of water required for the project.

Ecology Consumptive Use Equivalents Calculator

Little Spokane Water Banking Demand Evaluation,
Supply Assessment, and Water Transfer Framework Considerations
WRIA 55, Washington

Aspect CONSULTING	JUN-2015	BY: CME / RAP	FIGURE NO. 15
	PROJECT NO. 140129	REVISED BY: ---	

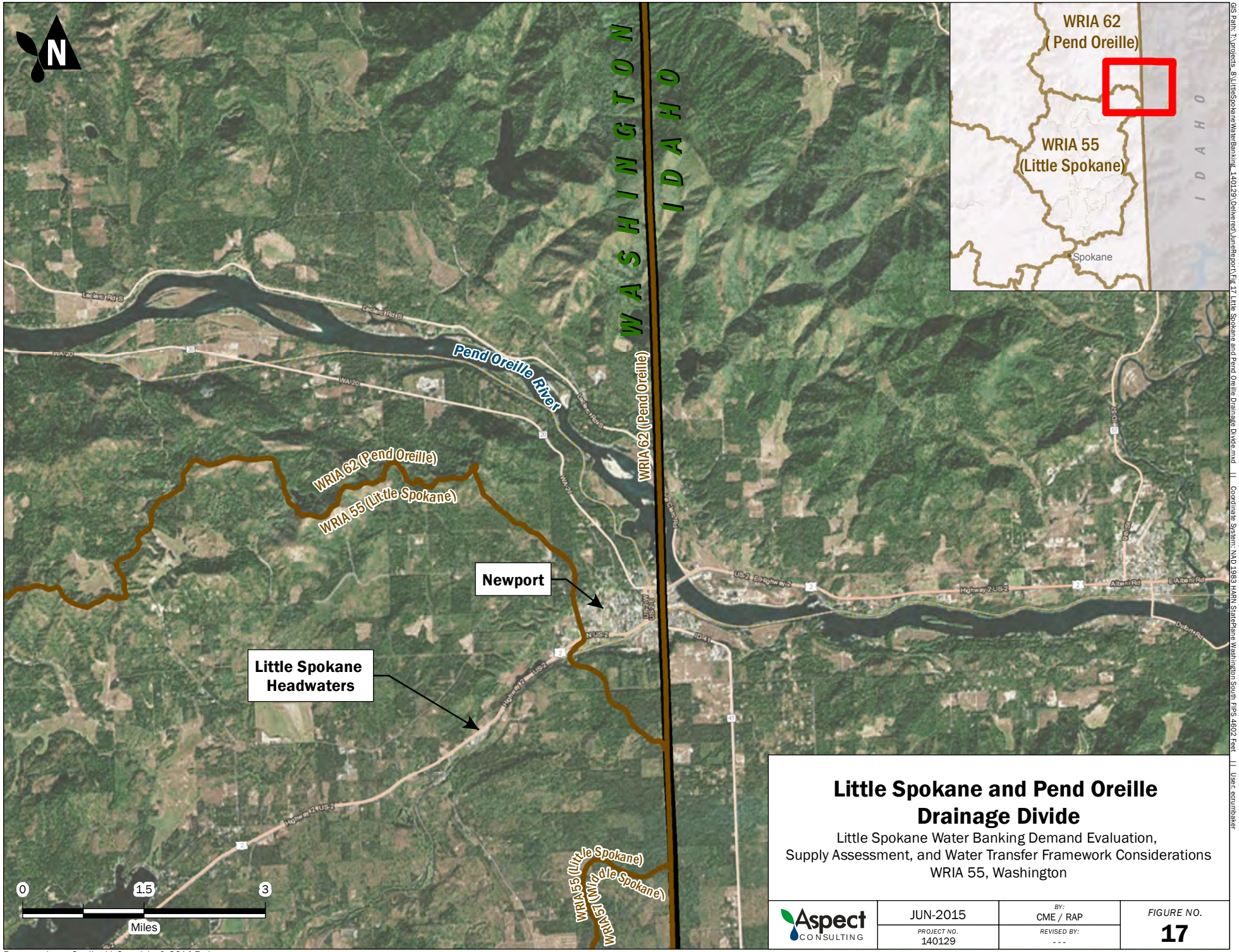


Notes:
-Evaluation based on preliminary screening of aerial and LandSat photography. Relinquishment exceptions under RCW 90.14.140 may excuse prolonged nonuse and change these rankings.
-Water Rights/Claims with multiple Point of Dispersion locations are displayed as an average location.
-WRIA 55 Subbasin Source: Spokane County Water Resources Division of Utilities, 2015

Pre-Rule Ranked Water Rights & Claims

Little Spokane Water Banking Demand Evaluation,
Supply Assessment, and Water Transfer Framework Considerations
WRIA 55, Washington

Aspect CONSULTING	JUN-2015	BY: RAP	FIGURE NO. 16
	PROJECT NO. 140129	REVISED BY: ---	

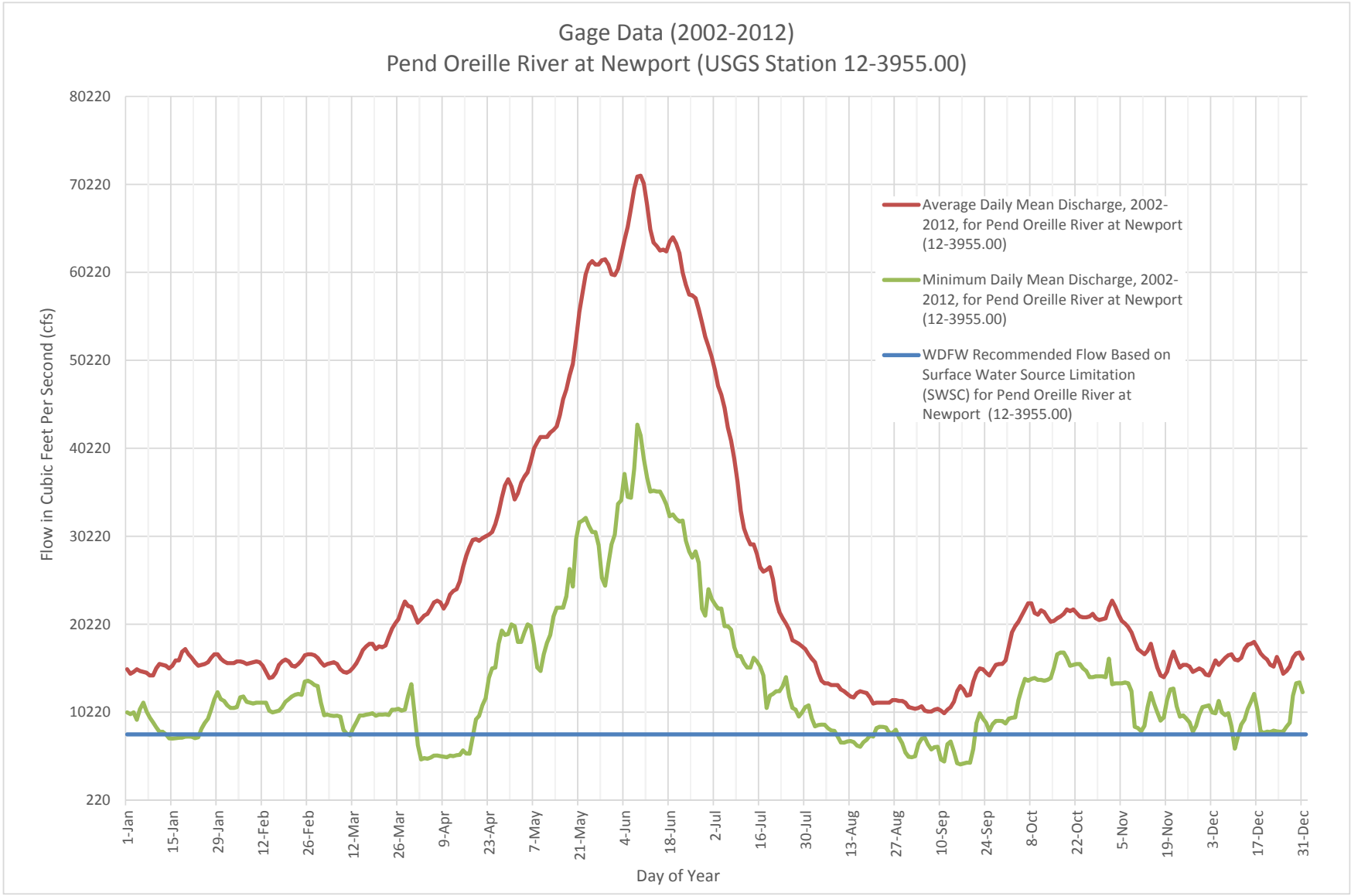


Little Spokane and Pend Oreille Drainage Divide

Little Spokane Water Banking Demand Evaluation,
Supply Assessment, and Water Transfer Framework Considerations
WRIA 55, Washington

Aspect CONSULTING	JUN-2015	BY: CME / RAP	FIGURE NO. 17
	PROJECT NO. 140129	REVISED BY: ---	

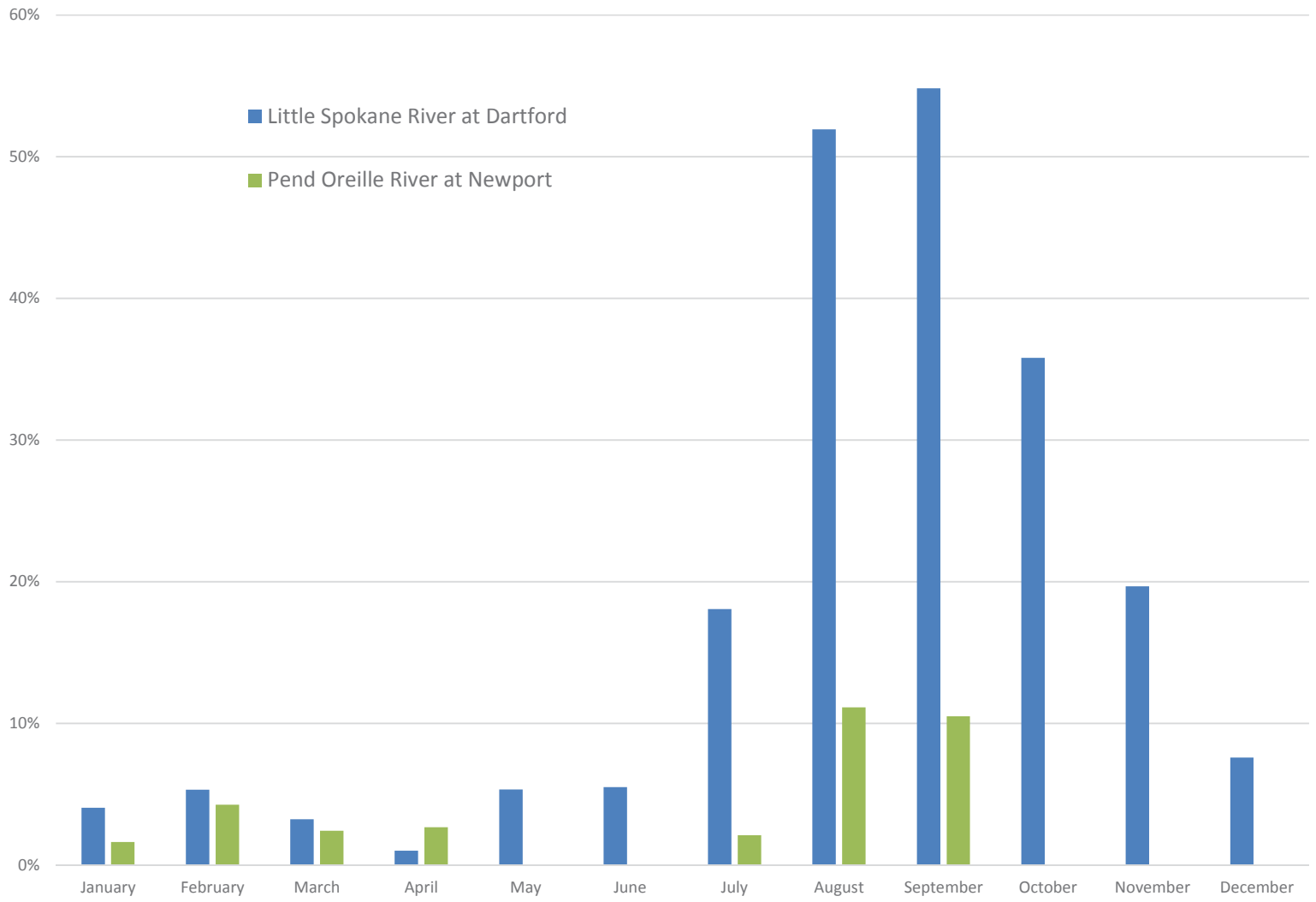
GIS Path: T:\projects_8\LittleSpokaneWaterBanking_140129\Delivered\JuneReport\Fig 17 Little Spokane and Pend Oreille Drainage Divide.mxd || Coordinate System: NAD 1983 HARN StatePlane Washington South FIPS 4602 Feet || User: ecrumbaker



WDFW Recommended Flow vs. Gage Data (2002-2012)
Pend Oreille River at Newport

Little Spokane Water Banking Demand Evaluation,
Supply Assessment, and Water Transfer Framework Considerations
WRIA 55, Washington

Aspect CONSULTING	JUN-2015	BY: CME / RAP	FIGURE NO. 18
	PROJECT NO. 140129	REVISED BY: ---	



-Minimum instream flow range Little Spokane at Dartford = 115 to 250 cfs
-WDFW recommendation (SWSL) for Pend Oreille at Newport = 7,700 cfs

Note: Graph shows percentage of days in which a 7-day moving average of mean daily flow did not meet base flow/curtailment flow, 1993-2013

Frequency Below Base/Recommended Flows - at Dartford and Newport

Little Spokane Water Banking Demand Evaluation, Supply Assessment, and Water Transfer Framework Considerations WRIA 55, Washington

Aspect CONSULTING	MAY-2015	BY: CME / RAP	FIGURE NO. 19
	PROJECT NO. 140129	REVISED BY: ---	

APPENDIX A

Preliminary Ecology Responses to WRIA 55 Water Banking Feasibility – Pre-PAG September 2014 Conference Call

On September 19, 2014, Ecology participated in a conference call to discuss several questions relevant to the WRIA 55 Water Banking Feasibility Study, at the request of Spokane County and Aspect. Participants were Keith Stoffel, Kelsey Collins, and Rusty Post (Ecology), Mike Hermanson and Rob Lindsay (Spokane County Utilities), and Dan Haller and Carl Einberger (Aspect).

A summary of key questions and initial responses is presented below. Ecology clarified that these initial responses were in the spirit of trying to provide some technical assistance to the counties in this feasibility study, but the positions were evolving and could change in the near future. Ecology and the AG's office are actively conducting an audit of older instream flow rules, including the Little Spokane Rule (WAC 173-555) that may provide further clarity on some of the questions and uncertainties and preliminary Ecology responses outlined below:

- There appears to be conflicting information with respect to the question of whether WAC 173-555 applies to groundwater, whether exempt or permitted. Can Ecology clarify this issue?

  Ecology acknowledged that its management history in WRIA 55 has been inconsistent in regulating groundwater permitting under the rule. Clarity is needed as to whether groundwater has ever been subject to curtailment. Some groundwater right applications have been denied based on the Rule, while other permits have been approved without reference to the Rule. At this time, processing of applications for groundwater rights will remain on hold. The AG's review of WAC 173-555 may provide additional clarity on this broad issue, including potential regulation of exempt wells under the rule.

- The draft rule amendment language specifying that "new water use" from the "shallow aquifer associated with the Little Spokane River" is subject to the existing rule could be read to imply that "existing" groundwater use from the "shallow aquifer associated with the Little Spokane River" is not subject to the existing rule, and only new uses would be interruptible or require mitigation. If this is the correct interpretation, would the date after which groundwater supplies would be interruptible be the effective date of the rule amendment?

  Ecology noted that the amendment language is intended to be 'surgical'; that is, it is only intended to address the area of the SVRP aquifer that is within the mapped boundaries of WRIA 55 and is in known hydraulic connection with the mainstem Spokane River. In this area the SVRP is separated into shallow and deep systems that are separated by a clay layer; the shallow system is connected to the Little Spokane River, while the deep system is not. The question of whether existing uses in that area are also subject to the rule is unresolved at this time.

- What does Ecology see as the key drivers for pursuing a water bank?

Ecology has no intention of issuing new water rights in the basin under the current conditions. Ecology acknowledged that there is potential risk for regulation of exempt wells based on current and pending case law, and the significant uncertainty in this regard. The AG's office recently filed an Amicus Curie brief on behalf of Ecology in the *Whatcom v. Hirst* case stating the opinion that the Nooksack instream flow rule (WAC 173-501) does not apply to exempt wells. The language in the two rules is not the same, but it is possible that exempt wells (or some purposes authorized under an exemption) may be excluded from the rule. (Note that although the court recently concurred with Ecology's position, a pending petition for review of the recent Hirst v Whatcom County decision before the Washington State Supreme Court may impact this decision.)

- To what extent is the document "Water Resources Management Program – Little Spokane River Basin" (August 1975) utilized in interpreting and implementing WAC 173-555?

  Additional clarity is needed regarding the applicability and use of this document.

- WAC 173-555-060 closed surface water appropriations in several tributary subbasins. Will Ecology allow the water bank to provide for new appropriations in these basins if the bank is seeded with downstream rights, or rights in the lower reaches of the tributaries? This brings up the broader issue of the approach for establishing bank management areas (for example, will the bank managed with respect to the three working gages only?).

  Right now only Dartford is managed, but all gages need to apply. The mitigation Ecology is buying is only in the lower SVRP, not the shallow SVRP in continuity with the Little Spokane.

- Has Ecology tracked reservation debits and what is the current status? What is Ecology's view on the reliability of the reservation? Is it possible that there may be non-irrigation season water reserve unallocated based on existing allocations to irrigation? This could serve as important mitigation water to supplement seeding of the water bank with irrigation rights.

  Ecology does not have reservation accounting available. This will require a review of water rights authorized since the Rule was established.

- Is Ecology open to clarifications on how the reserve accounting should be done? For example, can the reservation be managed based on consumptive use rather than total use?
  Ecology is open to clarifications and potential management of the reserve based on consumptive use.

- Under what circumstances would Ecology support a rule amendment? Does this need to occur to support a future water bank?

Ecology has no plans for a rule amendment at this time given the existing moratorium on rule making (with the notable exception of the pending mainstem Spokane River Rule amendments). Ecology does not consider this necessary to implement water banking in WRIA 55.

- Are future restrictions on lawn watering being contemplated by Ecology in the basin?

  Ecology is not planning this at the present time.

- Is Ecology willing to consider a suite of mitigation options to preserve the functions and values of instream flow, including in-kind and out-of-kind mitigation, and in-place and out-of-place mitigation, with the understanding that mitigation has to preserve the overall function and quality of instream flow?

  Yes, Ecology is willing to consider this.

- Is Ecology willing to consider out of basin transfers to seed the water bank (from the Pend Oreille River during surplus times for example)?

  Yes, Ecology is willing to consider this.

- Is Ecology open to project-based water bank seeding (SAR, conservation, ASR, or others)?

  Yes, Ecology is willing to consider this.

- To what extent is OCPI still allowable in bridging the gap between supply and demand?

  There is considerable uncertainty based on recent case law, such as *Swinomish v. Ecology*. One of the goals of the recently convened Rural Water Supply Workshops is to develop solutions to this uncertainty. Additional pending legal cases may provide more clarity.

- Is there a water right holder that would not be eligible for participating in a water bank, such as Group A, Group B, or exempt wells?

  No, Ecology would have no restrictions in this regard.

- Does Ecology have funding (OCR) project investment for projects like a pipeline from Pend Oreille River? Is Ecology open to buying and transferring water into trust to support bank seeding?

  This is unknown at this time.

- Is there operational funding from Ecology potentially available to support bank management?

This is uncertain. Ecology has asked the legislature for $15 M in the capital budget for watershed planning funding target to instream flow achievement work.

APPENDIX B

PEND OREILLE INTERBASIN TRANSFER MEMO

MEMORANDUM

Project No.: 140129

June 30, 2015

To: Mike Hermanson, Rob Lindsay – Spokane County Utilities

cc: Todd Mielke, Spokane County; Wes McCart, Stevens County
Karen Skoog, Pend Oreille County; Keith Stoffel, Department of Ecology
Rusty Post, Department of Ecology; Ty Wick, Spokane County Water District #3
Dick Price, Stevens PUD; Susan McGeorge, Whitworth Water District
John Pederson, Spokane County; Mike Lithgow, Pend Oreille County Community Development
Erik Johansen, Stevens County Land Services; Kevin Cooke, Spokane County
Steve Davenport, Spokane County; Randy Vissia, Spokane County
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Re: **Appraisal Study - Pend Oreille Interbasin Transfer for Little Spokane Water Bank Seeding**

Executive Summary

Spokane County (the County), in conjunction with Stevens and Pend Oreille County (Tri-Counties), is considering setting up a water bank to address existing and potential regulatory constraints on existing and new water use in Water Resource Inventory Area (WRIA) 55, the Little Spokane Watershed. One of the options for water bank seeding that has been discussed with the Tri-Counties and other members of the project Policy Advisory Group (PAG) is potential use of a water source from WRIA 62, the Pend Oreille River Watershed. A review of water rights decisions and Ecology regulation of the mainstem of the Pend Oreille River indicates that water is potentially available for a project of this nature, as Ecology has not closed the Pend Oreille River to further consumptive appropriations.

Aspect has conducted an appraisal-level evaluation of necessary infrastructure and potential fatal flaws associated with conveying water from the Pend Oreille River to the upper headwaters of the Little Spokane River. An interim project flow criteria has been estimated at a 10 cubic feet per second (cfs) average mitigation flow rate for a combination of bank seeding and additional instream flow mitigation, based on consideration of future water demand and preliminary estimates of stream channel capacity. Both surface water and groundwater supply options near the City of Newport may be feasible.

Consideration of Existing Conditions and Water Availability

There are several key existing conditions and water availability issues relevant to project feasibility. These include:

- The watershed boundary--and the upper headwaters of the Little Spokane River--reaches within approximately three miles of the mainstem of the Pend Oreille River, with about 110 feet of elevation difference at the topographic divide.
- Subsurface geology in the project area includes both unconsolidated aquifer materials and bedrock near the surface that will need to be considered if a groundwater source and wellfield option is pursued.
- Surface soils mapped in the project area include relatively permeable, well-drained areas where infiltration of water may be possible to support aquifer recharge and river baseflows. Site-specific field investigations would be needed to ascertain if infiltration is a feasible option for providing local recharge and associated instream flow enhancement. The alternatives discussed below focus on direct discharge to the Little Spokane River.
- Ecology has not closed the Pend Oreille River to further consumptive appropriations, but has provisioned recent water right decisions with a curtailment flow of 7,700 cfs at the Newport gage (USGS #12395500), based on a Surface Water Source Limitation (SWSL[1]) recommended by the Washington State Department of Fish and Wildlife (WDFW).
- The mainstem of the Little Spokane River has several constituents on the 303(d) list (Category 5), requiring a Total Maximum Daily Load (TMDL) to be established or other water quality improvements to be implemented. These include dissolved oxygen in the upper reaches near Scotia Road, pH, fecal coliform, and temperature further downstream, and PCBs in the lower reaches of the river. The Pend Oreille River has also been listed on the 303(d) list for temperature at Newport. PCBs have been noted as an issue by Ecology, but the listing does not occur at Newport and is further downstream at Usk. Any introduction of Pend Oreille source water into the Little Spokane watershed will need to address TMDL concerns related to the project in both rivers.
- If a groundwater source is pursued as an option, existing groundwater quality will need further evaluation. A cursory review of the potential for existing groundwater contamination was conducted. While the review did not suggest that this would be a major concern, if wellfield investigations move forward, additional investigation can be completed

[1] A SWSL is a permit-specific condition recommended by WDFW and applied by Ecology as a permit condition under the public interest test for issuing a new water right. It is not an instream flow rule. A SWSL on one water right may be applied to another water right, or a separate permit-specific SWSL may be applied, or none at all, depending on whether mitigation of instream flows is provided as a part of the project.

to support an evaluation of groundwater contamination risk based on specific test well locations proposed for further study.

Design Considerations

The feasibility of accommodating the interbasin transfer at the quantities proposed may be limited by a number of factors including:

- Available freeboard in natural downstream conveyance channel (available volume between instantaneous stream flow and ordinary high water);
- Water source-based constraints (water quality, physical water availability);
- Legal availability of water from Pend Oreille River; and
- Maximum conveyance infrastructure limitations.

An objective of this appraisal study has been to identify how these factors may be addressed through existing information, future data collection and analysis, and infrastructure improvements.

Alternatives Analysis

For purposes of evaluating feasibility and developing costs, four concept alternatives were analyzed based on two source water alternatives (a surface water supply or a groundwater supply) and two discharge locations (discharge to a large wetland in the upper headwaters and discharge to the river approximately two miles downstream). These are documented in detail in this memorandum.

Table ES-1. Concept Alternatives

	Alternative 1 (Surface Water Supply)	Alternative 2 (Groundwater Supply)
Discharge Option-A (Headwaters)	**Alternative 1A**	**Alternative 2A**
Discharge Option-B (Headwater Bypass)	**Alternative 1B**	**Alternative 2B**

Several options for source of supply, conveyance and discharge may be feasible to meet project objectives. Estimated capital and annual operations and maintenance costs for the various alternatives are provide in Table ES-2 below.

Table ES-2. Preliminary Estimated Project Cost Summary

	Total Cost		**Unit Cost[1]**	
	Capital Cost	**Annual O&M**	**Capital Cost (per ac-ft)**	**Annual O&M (per acre-foot)**
Alternative 1A	$17,725,000	$220,000	$2,450	$30
Alternative 1B	$21,475,000	$242,000	$2,970	$33
Alternative 2A	$14,965,000	$251,000	$2,070	$35
Alternative 2B	$19,841,000	$277,000	$2,740	$38

1 – Unit costs developed by dividing total costs by annual quantity of 7,240 acre-feet.

The most cost-effective solution (Alternative 2A) includes construction of a groundwater wellfield near the Pend Oreille River with surface water discharge in the uppermost headwaters of the Little Spokane River. It is anticipated that capacity-related improvements to the natural conveyance,

including replacement of several culvert crossings, may be required. These improvements have been included in the analysis. Estimated costs for this alternative are approximately $15 million with $251,000 annual operations, maintenance and replacement costs. These costs translate to roughly $2,070 per acre-foot (capital) with $35 per acre-foot annual O&M.

Other more costly alternatives considered include bypassing the uppermost reaches of the Little Spokane River with additional pipeline conveyance (Alternative 2B), or using direct surface water as source of supply (Alternative 1A), or both (Alternative 2B).

1. Introduction and Project Overview

Project Background

Spokane County (the County), in conjunction with Stevens and Pend Oreille County (Tri-Counties), is considering setting up a water bank to address existing and potential regulatory constraints on existing and new water use in Water Resource Inventory Area (WRIA) 55, the Little Spokane Watershed. A water bank is a mechanism that facilitates transfer of water rights between sellers and buyers. As part of this process, the County convened a Policy Advisory Group (PAG) to allow interagency and stakeholder coordination and evaluation of water banking in the watershed.

One of the options for water bank seeding that has been discussed with the Tri-Counties and other members of the PAG is potential use of a water source from WRIA 62, the Pend Oreille River Watershed. A unique opportunity exists to potentially withdraw groundwater or divert surface water from the Pend Oreille watershed into the upper headwaters of the Little Spokane River, near the town of Newport (Figure 1). A review of water rights decisions and Ecology regulation of the mainstem of the Pend Oreille River indicates that water is potentially available for a project of this nature, as Ecology has not closed the Pend Oreille River to further consumptive appropriations,

The watershed boundary, and the upper headwaters of the Little Spokane River, reaches within approximately three miles of the mainstem of the Pend Oreille River. According to Washington State's WRIA 55 boundary GIS layer, the drainage divide between the Little Spokane Basin and Pend Oreille Basin is approximately 110 feet higher than the Pend Oreille River shoreline, and a pipeline and pumping station would be required to convey either groundwater or surface water. Water thus conveyed could serve as water for bank seeding and instream flow enhancement in WRIA 55 after transfer.

Aspect has conducted an appraisal level evaluation of necessary infrastructure and potential fatal flaws associated with conveying water from the Pend Oreille River to the upper headwaters of the Little Spokane River. An interim project flow criteria has been estimated at a 10 cubic feet per second (cfs) average mitigation flow rate for a combination of bank seeding and additional instream flow mitigation, based on consideration of future water demand and preliminary estimates of stream channel capacity. Both surface water and groundwater supply options in the vicinity of Newport may be feasible, as discussed in this memorandum.

This memorandum will be included as an appendix to the Little Spokane Water Banking Feasibility Study, submitted to the PAG in June 2015.

Appraisal Study Objectives and Approach

This appraisal study involves characterization of permitting, construction, and other project-related considerations associated with a potential transfer of water from the Pend Oreille watershed to the Little Spokane River.

The approach of this appraisal study involved the following:

1.) Review of available maps and data;
2.) Field reconnaissance and coordination with local agencies;
3.) Estimating mitigation flow criteria;
4.) Development of concept alternatives;
5.) Characterizing permitting constraints;
6.) Evaluating water quality; and
7.) Preliminary cost estimating.

This appraisal study is organized under the following headings:

- Study Area and Existing Conditions
- Basis of Planning
- Development of Concept Alternatives
- Project Economics
- Recommendations for Additional Design and Analysis

2. Study Area and Existing Conditions

Data Sources

This study and associated analysis contained herein are based upon readily available information, limited field reconnaissance and discussion with various stakeholders. Background data includes geologic mapping, USGS topographic mapping, USGS hydrogeologic investigations, County Assessor parcel mapping, Ecology watershed boundary mapping, Ecology well log documentation, USGS streamflow information, USDA/SCS soils mapping, and Washington Department of Natural Resources geologic mapping.

Site reconnaissance was conducted in March of 2015 by members of the Aspect Project Team, personnel from Department of Ecology and Spokane County. At that time, various pipeline alignments were considered along with potential water sources locations adjacent to the Pend Oreille River at the City of Newport's waste water treatment facility. Additionally, the headwaters of the Little Spokane River including the uppermost reaches (approximately 2-miles) were observed at various locations. Photographs from site reconnaissance activities are provided in Attachment A.

Geographic Setting

The project location is generally located in the vicinity of the City of Newport (City), Pend Oreille County, Washington State. The City immediately borders the State of Idaho to the East and therefore this political boundary has been considered the eastern geographic limit of infrastructure/project planning. The apparent topographic basin divide between the Pend Oreille River and Little Spokane River is near the southwestern margin of the City (approximately 2-miles

southwest of the Pend Oreille River). Both the BNSF Railway and State Hwy 2 corridors generally bound the southern and eastern limits of the City. Downstream of the Little Spokane River side of the basin divide, these two corridors generally parallel natural drainage courses in the uppermost reaches of the watershed. The general project vicinity is shown in Figure 1.

Property Ownership

Property ownership in the project vicinity include the following:

- City of Newport
- Pend Oreille County
- Burlington Northern Santa Fe (BNSF) Railway
- State of Washington Department of Transportation (WSDOT)
- State of Washington Department of Natural Resources
- Private landowners

Topography

Based upon readily available USGS topographic quad mapping (40-foot contours), elevation differences between the Pend Oreille River and the lowest elevations at the basins divide between the Pend Oreille and Little Spokane River Basins may be as little as 110 feet (vertical) at a location approximately 1 mile southwest of the Pend Oreille River (in the general vicinity of Newport High school).

Topography on either side of the basin divide in the vicinity of the project is relatively flat with topographic gradients along drainage courses approximately 2% or less. Elevated terrain borders the topographic drainage courses along northwest and southeast representing a gradual saddle feature at the basin divide.

The uppermost headwaters of the Little Spokane River are characterized as having extremely flat gradients and are dominated by standing water and wetland complex.

Hydrogeologic and Hydrologic Considerations

Hydrogeology

Groundwater sources in WRIA 55 are derived from a combination of unconsolidated basin fill, and isolated basalt layers overlying crystalline bedrock. Figure 2 presents a surficial geology map of the project area that illustrates the combination of bedrock and unconsolidated deposits in the vicinity of the project site. Of particular note is the bedrock outcrop on the north side of the City, as this would be a preferred location for a potential groundwater wellfield, but would be limited by this occurrence. The City has a wellfield for its municipal water supply on the southeast side of town close to the mapped boarder of the Little Spokane and Pend Oreille watersheds. The City's wellfield produces from alluvial aquifer wells that are approximately 80 to 100 feet deep. Well logs on file at Ecology indicate that the aquifer is sand-dominated, but there is significant heterogeneity, with a mix of sands, clays, and gravels observed during drilling. Production rates

from the wells are on the order one hundred to several hundred gallons per minute. Well logs from Washington State Department of Ecology online database are provided in Attachment B.

Figure 3 shows the distribution of surficial bedrock and the depth of basin fill in the watershed, based on a recent USGS Study: *Hydrogeology of the Little Spokane River Basin, Spokane, Stevens, and Pend Oreille Counties, Washington* (2013). Groundwater movement in the basin generally follows surface topography, moving from high to low elevation areas. The USGS identified several key hydrogeologic units that serve as water sources, including:

- **Upper Aquifer.** This unit is unconsolidated basin fill and serves as a common water source over much of the watershed. Its distribution is widespread in the Little Spokane headwaters. Its distribution generally overlaps with the extent of basin fill on Figure 3. Some of the outlying areas of basin fill were not considered of sufficient production by the USGS to be an 'aquifer', but do, in some cases, produce water sufficient for residential use.

- **Lower Aquifer.** This unit is also unconsolidated basin fill, and is separated in some cases from the Upper Aquifer by a confining unit. The Lower Aquifer occurs in highly localized areas, generally along the mainstem of the Little Spokane River and is not significant in the upper watershed.

- **Isolated basalt units of the Columbia River Basalt Group (Wanapum and Grand Rhonde).** Basalt occurrences are generally limited to the west central portion of the basin, in the Dragoon Creek drainage, outside of the area of interest for this project.

- **Bedrock.** Crystalline bedrock underlies all of the watershed, but tends to be exposed in the upland, outlying areas of WRIA 55. Bedrock in WRIA 55 typically produces small quantities of water, but is relied upon by a number of users as a residential water source.

Basin fill thicknesses (primarily Upper Aquifer) of over several hundred feet are present across significant portions of the watershed, and may allow opportunities for aquifer recharge through surficial infiltration.

Groundwater and surface water in WRIA 55 are assumed to be hydraulically connected, and as such additional groundwater appropriations have not been authorized by Ecology since 1996, based on associated reductions of instream flows expected from newly authorized withdrawals.

A range of surficial soil types have been previously identified, as illustrated in Figure 4. Many of these soils, such as the Orwig sandy loam (Unit 97) located near Surface Discharge Option 1, are well drained, permeable soils which may allow for a surface infiltration option as a component of instream flow mitigation/seeding; however, it is also known from area well logs that clay and silt lenses are present in some areas. Site specific field investigations would be needed to ascertain if infiltration is a feasible option for providing local recharge and associated instream flow enhancement. Further discussions regarding infiltration as a potential option for discharge into the Little Spokane Basin are provided under Section 5 of this memorandum.

Hydrology and River Morphology

A review of water rights decisions and Ecology regulation of the mainstem of the Pend Oreille River indicates that water is potentially available for a project of this nature. Ecology has not closed the Pend Oreille River to further consumptive appropriations, but has provisioned recent water right decisions with a curtailment flow of 7,700 cfs at the Newport gage (USGS #12395500), based on a Surface Water Source Limitation (SWSL[2]) recommended by the Washington State Department of Fish and Wildlife (WDFW). Figure 5 presents average and minimum daily mean discharges at the Newport gage, along with the WDFW recommended Surface Water Source Limitation (SWSL) flow of 7,700 cfs. As the graph indicates, there are periods where the minimum daily discharge has fallen below 7,700 cfs in drier years in spring and late summer to early fall, but there still appears to be opportunity for significant withdrawals or diversions to take place over much of the year, given the scale of flows in the mainstem. Figure 6 provides a comparison of the frequency that the Little Spokane at Dartford and the Pend Oreille River at Newport do not meet baseflows and recommended flows, respectively. As illustrated by the figure, recommend flows are met substantially more often in the Pend Oreille River at Newport versus baseflow at the Dartford gage on the Little Spokane River.

The uppermost headwaters of the Little Spokane River are characterized as very low gradient vegetated wetlands followed by reaches with some defined channel formation coincident with an apparently losing reach of the river, with very limited flow on the order of a few cubic feet per second. Limited information on streamflows in the upper headwaters of the Little Spokane drainage is available, and additional study is recommended as discussed in Section 7 of this memorandum.

The upper reaches of the Little Spokane River likely contain both gaining and losing reaches. Observations made during field reconnaissance as part of this project (Attachment A) suggest that the uppermost headwaters of the Little Spokane may be gaining water from the groundwater system in the upper wetland areas. In contrast, review of aerial photos suggests that there are areas downstream of the initial wetlands where channel definition is diminished suggesting that a short losing reach may be present. This location is generally located approximately 2 miles downstream of the basin divide. Approximately 2.5 to 3 miles downstream of the basin divide, the stream appears to be significantly gaining water. This may be associated with surficial bedrock providing a barrier to groundwater flow that contributes to a strongly gaining reach and well-developed channel formation (Figure 3). This is a consideration for evaluating the capacity of the river to convey water, as discussed later in this memorandum. Little to no channel migration is evident in the aerial photographic record dating back to 1998.

[2] A SWSL is a permit-specific condition recommended by WDFW and applied by Ecology as a permit condition under the public interest test for issuing a new water right. It is not an instream flow rule. A SWSL on one water right may be applied to another water right, or a separate permit-specific SWSL may be applied, or none at all, depending on whether mitigation of instream flows is provided as a part of the project.

Observations made during field reconnaissance as part of this project suggest that the uppermost headwaters of the Little Spokane may be gaining water from the groundwater system in the upper wetland areas; however, the river appears to be losing surface water to groundwater at a point approximately 2 miles downstream of the basin divide. Approximately 2.5 to 3 miles downstream of the basin divide, the stream appears to be strongly gaining in conjunction with surficial bedrock contributing to a strongly gaining reach and well developed channel formation (Figure 3). This is a consideration for evaluating the capacity of the river to convey water, as discussed later in this memorandum. Little to no channel migration is evident in the aerial photographic record dating back to 1998.

Further study is required to characterize the river substrate and the potential for degradation/aggradation, which may lead to any perceptible channel migration based upon increased streamflow as a result of this project.

Water Quality

Surface Water Quality

The mainstem of the Little Spokane River has several constituents on the 303(d) list (Category 5), requiring a Total Maximum Daily Load (TMDL) to be established or other water quality improvements to be implemented. These include dissolved oxygen in the upper reaches near Scotia Road, pH, fecal coliform, and temperature further downstream, and PCBs in the lower reaches of the river. The federal Clean Water Act requires that Ecology set priorities for cleanup 303(d) listed waters by establishing a total maximum daily load (TMDL) for each constituent of concern and/or establishing a Water Quality Improvement plan.

The Pend Oreille River has also been listed on the 303(d) list for temperature at Newport. PCBs have been noted as an issue by Ecology, but the listing does not occur at Newport and is further downstream at Usk. Given the comparatively high flow of the Pend Oreille River (24,600 cfs mean flow) relative to the 10 cfs assumed to be appropriate for supporting Little Spokane water bank seeding, it is expected that water quality impacts from a surface water withdrawal or nearby groundwater withdrawal will be negligible. The more significant issue that will need to be addressed through further study focuses on mixing of a Pend Oreille surface or groundwater source with headwaters of the Little Spokane River. Any introduction of Pend Oreille source water into the Little Spokane watershed will need to address TMDL concerns related to the project in both rivers.

The project could also provide benefits in terms of upper watershed temperatures, particularly if a groundwater source is used. In addition, if a surface water source is used, measures to prevent introduction of milfoil or other invasive biota will need to be addressed.

Potential for Groundwater Contamination

If a groundwater source is pursued as an option, existing groundwater quality will need further evaluation. A cursory review of the potential for existing groundwater contamination was conducted through reviews of Ecology's Cleanup Site Search Database, Environmental Information Management (EIM) System Database, and Facility/Site Database for sites of environmental interest to Ecology. Ecology's EIM database did not have any soil or groundwater data for any sites within the City of Newport. Several cleanup sites were noted within the City of Newport. Of these cleanup sites, the Unocal Bulk Plant 0528 and Newport Industrial Park Development were the most noteworthy:

- Unocal Bulk Plant 0528 – Voluntary cleanup completed but Restrictive Covenant in place due to remaining petroleum contaminated soil above cleanup levels. Groundwater not identified as a media of concern.

- Newport Industrial Park Development – Voluntary cleanup completed and No Further Action issued in 2011 for remediation of dioxin/furan, metals, and petroleum in soil. Groundwater not identified as a media of concern.

Other sites listed above were Leaking Underground Storage Tank sites, 6 of which received No Further Actions in 2011. Only soils were identified as media of concern for these sites.

Ecology files were not reviewed for any of these sites as part of this project. Ecology's databases only list those contaminated sites that are known to Ecology and does not list those that have yet to be investigated or have not been reported to Ecology. While this review did not suggest that existing groundwater contamination would be a major concern for a new groundwater source, if wellfield investigations move forward as part of this project, additional investigation can be completed to support an evaluation of groundwater contamination risk based on specific test well locations proposed for further study.

Natural Resources

Environmental natural resources in the vicinity of the project include wildlife, fish and wildlife habitat, riparian areas and palustrine areas (wetlands). The Pend Oreille River in vicinity of Newport is listed as Critical Habitat under Endangered Species Act for Slavenlinus confluentus (bull trout), no other Critical ESA Habitat is listed in other areas of the project. Furthermore, WDFW manages Priority Habitat and Species designations which are mapped in the vicinity of much of the project improvements. This includes priority areas for regular waterfowl concentrations on the Pend Oreille River as well as for both Kokanee and Rainbow trout in the Little Spokane River. Much of the upper headwaters of the Little Spokane river is mapped as palustrine (wetlands) aquatic habitat.

3. Basis of Planning

Flow Demand Criteria

The intent of the project is to provide water supply from the Pend Oreille River into the Little Spokane River to offset consumptive beneficial uses associated with potential Little Spokane Water Bank appropriations. Based upon a water demand analysis conducted as part of the Little Spokane Water Banking Feasibility Study (Aspect, 2015), 7,240 acre feet of supply (10 cfs continuous) may be needed to facilitate water banking goals. While final water banking mitigation quantities may be subject to change during subsequent phases of study, this quantity has been used as the basis of planning for this Appraisal Study.

The feasibility of accommodating the interbasin transfer at the quantities proposed may be limited by a number of factors including:

- Available freeboard in natural downstream conveyance channel (available volume between instantaneous stream flow and ordinary high water);

- Water source-based constraints (water quality, physical water availability);

- Legal availability of water from Pend Oreille River; and
- Maximum conveyance infrastructure limitations.
- An objective of this study has been to identify how these factors may be addressed through existing information, future data collection and analysis, and infrastructure improvements.

Infrastructure Criteria

Sources of Supply

Potential sources of water supply for the project include both direct surface water from and groundwater in continuity with the Pend Oreille River. Advantages of surface water supply include relative certainty of water availability and lower pumping costs, while disadvantages may include greater consideration of water quality impacts. In contrast, groundwater supply may provide for greater certainty of high water quality and would likely be easier to permit. Relative uncertainty exists with respect to proven aquifer targets that would need to be evaluated through future study as described in Section 7 of this memorandum. Groundwater supplies would also likely require additional annual operations and maintenance costs due to the higher pumping lift (associated power cost) required to bring water to the surface.

Because the source of supply for this project is intended to mitigate for continuous beneficial uses, reliability criteria is relatively high—meaning that continuous pumping ability should be generally assured with limited interruption. Therefore it is assumed that at least one measure of redundancy (e.g., standby pump) be provided to accommodate repair/maintenance while the system is continually operating.

Groundwater

The general planning criteria for a groundwater source location includes identification of high yield alluvial aquifer targets (ideally sand and gravel deposits) in close proximity to the Pend Oreille River. A suitable groundwater source would ideally be located northeast of the basin divide and west of the Washington-Idaho border. A possible configuration for groundwater supply based upon flow and reliability criteria would likely be a wellfield consisting of three (or more) groundwater wells, each sized for roughly 1/2 the proposed project flow of 10 cfs [approximately 4,500 gallons per minute (gpm)] to provide a measure of redundancy and flexibility. It is also possible that a wellfield with more numerous, smaller capacity wells would be needed based on aquifer conditions, and this is accounted for in project contingency costs.

Surface water

The planning criteria for a suitable surface water source location includes areas within Washington along the southern bank of the Pend Oreille River. Furthermore, any surface water source must be located on shorefront properties that may ultimately be amenable to such as facility. In order to reduce pipeline conveyance and reduce costs, a surface water pumping station should be located as close to the basin divide as possible.

Because the Pend Oreille River is situated upstream of Chief Joseph Dam, fish passage to a potential point of diversion by anadromous salmonid species is not possible; however the project area is designated critical habitat for ESA-listed bull trout. While infrastructure criteria is not subject to National Marine Fisheries Services (NMFS) requirements for anadromous salmon

species, screening of surface water intake pipe would be required based upon RCW 77.57.010, and would therefore need to be designed to meet the requirements of the Washington Department of Fish and Wildlife (WDFW).

Pipeline Conveyance

Pipeline conveyance will be required from the water supply facility (either surface water or groundwater) to the proposed discharge location downstream of the basin divide.

The general criteria and considerations for pipeline alignment include consideration of:

1. Available corridors including preference for existing publicly owned right of ways or easements; and

2. Pipeline / pump station economics.

Generally, the shortest path may yield the most favorable economics; however, existing surface conditions (paved/unpaved) may yield an overriding consideration for a longer route. Furthermore, existing site encumbrances, and legal considerations such as right-of-way or easement use permits provisions are important considerations for selection of a pipeline alignment. Furthermore, limiting crossings of major developed corridors such as state highway routes, railways and surface water courses is important to optimizing economics.

Pipelines would be sized to optimize pipeline diameter and flow velocities. Generally, pipelines would be sized to limit velocities to less than 5 feet per second (fps) to limit head-loss (friction loss) and limit pipe wear.

Available pipeline materials may consist of metal (steel or ductile-iron), or plastic (PVC or HDPE). Because the pipeline would be subjected to relatively high pressures and likely be constructed through primarily urban corridor, the construction would most likely be of ductile iron which is a generally accepted standard for water distribution pipeline.

Depth of cover over pipe facilities may vary, but would likely be 4-feet minimum, which is customary for water supply pipelines in areas potentially subject to freezing. Special considerations related to increasing depth must be made within public rights of way (e.g., City of Newport (City)) in order to avoid the need for future relocation to accommodate City-owned utilities such as municipal water supply or sanitary sewer.

Discharge Location

Two major categories of discharge location exist for this project including:

1. Surface water discharge; and

2. Subsurface infiltration (or combination of the two).

Surface water discharge may include discharging into an energy dissipation structure (stilling well) with low energy overflow into the highest reaches of the basin as possible. Because the existing natural conveyance channel of the Little Spokane River may have limited conveyance capacity relative to the planned project flow criteria, considerations related to either improving existing

natural conveyance or bypassing the uppermost reaches with additional pipeline should be considered for project planning. Future study related to characterizing the conveyance capacity of natural systems associated with the Little Spokane River would be needed if this approach is pursued.

Potential impacts related to direct surface water discharge quantities may be mitigated to some extent if subsurface infiltration of a portion or all of the discharge quantity is deemed feasible through further study.

System Operation Criteria

Several system operations schemes may be employed for this project including:

1. Constant rate pumping flow regime; or
2. Variable rate pumping/adaptive management.

Under a constant flow regime, water would be pumped from the Pend Oreille River at a constant flow rate of 10 cfs. Because the natural hydrology of the system may fluctuate on a seasonal or annual basis, there may be a need for flow buffering, storage and/or infiltration in order to accommodate continuous inflow. This may potentially be accommodated in existing series of wetlands in the uppermost headwaters of the Little Spokane.

Alternatively, flow supplied to the system may be variable based on interuptiblility associated with WDFW flow recommendations for the Pend Oreille River and/or to provide variable flow to maintain Little Spokane River flow targets to potentially be established at various control points within the system.

4. Concept Alternatives

Development of Concept Alternatives

Several concept alternatives have been evaluated for purposes of evaluating feasibility, estimating costs and identification of applicable permits. Concept alternatives for this project are composed of a combination of:

1. Source of supply options; and
2. Conveyance and discharge options.

Concept alternative locations are shown on Figure 7.

Source of Supply Options

Surface Water Source

Potential sites for a surface water pump station on the Pend Oreille River within reasonable proximity to the basin divide, and within the Washington State are relatively limited. The most economical and favorable locations for surface water pumping station exist across state boundaries (in State of Idaho) and therefore were excluded from consideration. Relatively few shoreline parcels exist within reasonably close proximity to the basin divide, within Washington State; however, a shoreline parcel owned by City of Newport for their wastewater treatment facility

appears to be the most feasible location. This has been included in this appraisal analysis following discussions with the City.

For the purposes of project planning/costing, a conceptualized surface water pump station at this location was considered consisting of a single 30-foot deep wet well (sump) with submerged stainless cylindrical end of pipe intake screen extruding into the Pend Oreille River. To provide redundancy and operational flexibility, it was assumed that pumping from the wet well would be accommodated with three vertical turbine pumps each capable of providing approximately 5-cfs (2,250 gpm) at 136-feet total dynamic head (TDH). Typical operation would consist of cycling through any combination of up to two of the three pumps, alternating in sequence.

The pump station would be equipped with automated motor controls including SCADA/telemetry. Additional standard pump station appurtenances include isolation valves, check valves, flow meter, pressure switches, pressure transmitters, surge anticipation equipment, and access/maintenance provisions would be included. Depending on final system operational scheme, the pumps may be equipped with variable frequency drives to provide for matching flows in response to demands expressed by available stream flow in the Little Spokane.

Due to seasonally adverse weather (hot/cold) it is assumed that pumps/motors, electrical control equipment and other sensitive components will be housed within an insulated building structure with heating, ventilation and cooling systems.

Groundwater Source

Geologic mapping and limited well log information indicate that bedrock (granite) may be present in the immediate vicinity of City of Newport Wastewater Treatment Facility (Figure 2). However, it is known that existing production wells are utilized by City of Newport, which are located further to the south and east, as shown on Figure 2. While identification of an exact well site is outside the scope of this study, it is assumed that high yield alluvial aquifer targets consisting of sands and gravels in continuity with the Pend Oreille River may be found. For the purposes of this study, it is assumed that these are south of the City of Newport's treatment facility along a similar pipeline alignment(s) considered for surface water pump station options. Therefore, potential advantages related to pipeline economics may exist with the groundwater source option relative to surface water source option.

A groundwater source alternative for this project would include similar improvements to the surface water pump station with the exception that wet-well/sump, surface water intake and screening would be replaced with a series of three groundwater wells. It is anticipated that pumped water level may be approximately 200+ feet below ground surface at available sites. Therefore, additional pump stages including increased horsepower would be required for the groundwater source option.

Pipeline Conveyance Options

Many conveyance pipeline alignment routing options may ultimately be feasible for the project, and several specific variations were considered as part of this study including options proposed by City of Newport Staff, as well as alignments that may follow "best case" scenarios such as along BNSF railway corridors. While the identification of preferred alignment is outside the scope of this study, one pipeline alignment explored during field reconnaissance was ultimately selected for

evaluation that is relatively direct, primarily follows sparsely developed right-of-ways and represents generally the most direct route. The potential cost advantages/disadvantages to other alignments were quantified and found to be comparable in cost and within margin of error of estimating at this time. It is believed that further study including more detailed consideration of existing utilities, property ownership and topography would be required in order to better refine potential pipeline conveyance routing.

Discharge Options

Discharge options include either subsurface (infiltration) or surface discharge. Furthermore, surface discharge may occur at the uppermost reaches of the Little Spokane or several miles downstream at a point at which the natural conveyance channel may better accommodate the additional flow.

Infiltration

Infiltration within the Little Spokane drainage has the potential advantages of providing a level of flow buffering in conjunction with water quality treatment. Options for infiltration include 1) surface infiltration, 2) shallow subsurface infiltration (trenches), and 3) shallow subsurface infiltration wells (drywells). Considerations related to planning for infiltration of surface water include 1) injection water quality and potential pre-treatment needs, 2) hydraulic conductivity of receiving soils, and 3) proximity of restrictive layers such as bedrock, fine grain soils and groundwater table. Furthermore, considerations related to the location and timing of return flow into the Little Spokane River is critical to gaging the value of infiltration for this project.

Four mapped data sources were used to evaluate feasibility including topographic mapping (USGS), surficial geology (Figure 2), basin fill mapping (Figure 3), and soils mapping from USDA/NRCS (Figure 4). Also, some limited well log information was located from Department of Ecology's well log database.

Both the surficial geologic mapping and the basin fill mapping indicate that near the basin divide, there may be 100 to 300 feet of basin fill with little evidence of shallow bedrock at or near the surface. Approximately 3-miles downstream of the upper headwaters of the little Spokane River, surface water flows appear to be gaining substantially due to the presence of shallow bedrock. This potentially indicates that return flow related to infiltration may discharge to the river no further down than this location. Siting of a potential infiltration facility would need to be done in a way that ensures that return flow would not flow towards the northwest (towards the Pend Oreille River). Further study is required to establish the subsurface flow regime, as recommended later in this memorandum.

Mapped soils within reasonable proximity to the basin divide are predominantly silts and sands with some gravel. There is evidence of some relatively shallow clay layers as well as peat in some areas. Based on this information preliminary estimates of long term infiltration rates may be on the order of 1 inch per hour, provided soils with sands/gravels may be targets and clays/peats may be avoided. This estimated infiltration rate would need to be refined based on further study.

Furthermore, a planning criteria for pre-treatment may include detention of surface water for up to 40 hours to remove as much sediment as possible prior to infiltration (applicable to surface water

source option only). Based on these coarse scale assumptions, an infiltration facility may require 10 to 15-acres (or more) surface area to accommodate along with a pre-treatment wet pond with a capacity of 30 acre-feet (or more). In planning for a potential infiltration facility, it would be prudent to allow space for redundant infiltration galleries in the event of failure of such facility. Therefore, it is estimated that a site on the order of 30 to 40 acres may be required. While no specific site has been identified for an infiltration facility such as this, there are several undeveloped parcels in the upper limits of the Little Spokane that are either in private or corporate ownership that could be potential candidates for infiltration. These sites would need to be explored during subsequent study.

Surface Water Discharge Option-1 (At Little Spokane River Headwaters)

One option for surface water discharge is near the uppermost reaches of the little Spokane drainage at a series of wetlands adjacent to the SR 2 Hwy corridor. This alternative could allow for the shortest distances of pipeline improvement and may also provide additional storage related benefit to accommodate a level of flow buffering. Qualitative visual observations (not measured) of natural conveyance during site reconnaissance indicate that flows up to 10 cfs may not be accommodated in the uppermost drainage without modifications to culverts and dredging of existing channels. Therefore, in order to accommodate discharge this high in the basin, it is likely that in-channel conveyance improvements will be necessary to avoid inundation of land beyond the ordinary high water mark.

Surface Water Discharge Option-2 (Approximately 2-Miles Downstream of Headwaters)

An alternative to discharging at the immediate headwaters of the Little Spokane River basin would be to convey water further downstream into the Little Spokane River drainage in order to bypass potentially constraining reaches. A cursory overview of the natural conveyance indicates that the Little Spokane River expands dramatically approximately 3-miles downstream of the basin divide. Therefore, discharge Option-2 involves construction of additional 24" diameter conveyance pipeline along existing corridors including SR2, Scotia Road, and a vacated BNSF right of way.

Evaluation of Concept Alternatives

For purposes of evaluating feasibility and developing costs, four concept alternatives based on two source water alternatives (a surface water supply or a groundwater supply) and two discharge locations (discharge to a large wetland in the upper headwaters and discharge to the river approximately two miles downstream). The alternatives are shown in Table 1:

Table 1. Concept Alternatives

	Alternative 1 (Surface Water Supply)	Alternative 2 (Groundwater Supply)
Discharge Option-A (Headwaters)	**Alternative 1A**	**Alternative 2A**
Discharge Option-B (Headwater Bypass)	**Alternative 1B**	**Alternative 2B**

Hydraulics Analysis

Hydraulic analysis was performed to evaluate pipe size and to calculate pump horsepower. The Hazen-Williams formula was used to estimate friction loss using a roughness coefficient "C" of 120 to represent cement-lined ductile iron pipe. Based upon 24" pipe (nominal) diameter sizing, approximately 22-feet (water) head-loss would occur due to dynamic forces at proposed flow rate of 10 cfs (4,500 gpm). Coupled with an estimated static lift of 110 feet and an additional 4-feet of losses at the pump station, a total dynamic head (tdh) of 136 feet is calculated for the surface water pumping option. To accomplish pumping at this flow rate/pressure, approximately 190 brake horsepower (pump horsepower) is required (assuming pump efficiencies of approximately 80%).

In contrast, it is estimated that pumping head for the groundwater option may be significantly higher than for the surface water option due to well drawdown at proposed pumping rates. Assuming a pumped drawdown of 100 feet below Pend Oreille river static water levels, total dynamic head for groundwater source option may increase to 236 feet. Therefore approximately 330 brake horsepower is required using similar assumptions. This is a significant consideration, as the power costs for the groundwater source may be roughly double those of the surface water source option.

System performance curves related to both surface water and groundwater supply (variable speed operation scenario) options are provide as Figures 8 and 9.

Project Alignments, Property Ownership and Right of Way

While various options exist for pipeline alignments the alignment chosen for evaluation is the shortest and most direct (Figure 7). This alignment generates at or near the City of Newport (City) wastewater treatment facility. The City has expressed a willingness to support the project and may be a proponent of citing a surface water pump station on City property. The pipeline would most likely cross a BNSF railway right of way upon existing City of Newport's property and therefore a railway crossing permit would be required. At this point, project improvements would enter City of Newport public roadway right of way in northern extent of City Limits. Near the western/central portions of the alignment, the pipeline would ideally transect a series of public and private properties that are currently in use as parkland or otherwise sparsely developed land. A range from 15- to 20-foot wide easements from these landowners would be required, although the acquisition of these easements is not necessary for project success as alternative routes entirely on public right of way are available. The final portion of the alignment may parallel SR2 which is owned and managed by Washington State Department of Transportation.

The proposed discharge location for Alternatives 1A and 2A is at a wetland complex in the upper headwaters of the Little Spokane River. While modification of the wetland complex is not necessary for project success, there may be benefit to modification of the surface water outlet control in order to provide operational flexibility and storage which would require landowner permission/easements as well as consideration of potential biological impacts. Approximately 1-mile southwest of the discharge location for Alternatives 1A/2A the natural conveyances crosses SR2 in a culvert. This culvert is likely undersized for proposed flows and may need to be replaced necessitating coordination and permitting from WSDOT. The balance of natural conveyance downstream of this point is on private property with the exception of crossing Scotia Road which is owned by Pend Oreille County. To the extent that channel improvements are required to ensure

conveyance capacity and/or driveway culvert replacements are necessary, private landowner easements would be required.

In contrast, Alternative 1B and 2B would pipe the alignment with gravity conveyance several miles downstream of the basin divide in order to bypass flow restricting channel segments. At least one mile of this pipeline would parallel SR 2, therefore a significant utility franchise permit from WSDOT could be required. The balance of pipeline for these alternatives may follow either Pend Oreille County-owned public right of way (Scotia Road) or abandoned railway right of way.

A summary of property ownership including ownership type (right of way/parcel), brief description of improvement and magnitude (length) is provided in Tables 2 through 4 below.

Table 2. Property Ownership, Pump Station and Pipeline Improvements

Ownership	Type	Notes	Improvement	Length (ft)
City of Newport	Parcel	Wastewater Treatment Plant	Pipeline and Pump Station	1,150
BNSF	Right-of-Way/Parcel	Active Railway	Pipeline Crossing	120
City of Newport	Right-of-Way	Spokane Avenue and 2nd Street	Pipeline	4,900
City of Newport	Parcel	City Park	Pipeline	1,350
City of Newport	Right-of-Way	S. Garden Ave	Pipeline	300
Pend Oreille County	Parcel	Developed Parcel	Pipeline	640
City of Newport	Right of Way	Circle Dr. W	Pipeline	400
Private Property	Parcel	Developed Parcel	Pipeline	150
Newport School District	Parcel	Newport High School	Pipeline	1,600
Private Property	Parcel	Developed Parcel	Pipeline	350
WSDOT	Right-of-Way	State Route 2	Pipeline	1,600

Table 3. Property Ownership, Discharge Improvements (Option-1)

Ownership	Type	Notes	Improvement	Approximate Length
Private Property	Parcel	Wetland/Aquatic Land	Improved Natural Conveyance	5,280
WSDOT	Right-of-Way	State Route 2	Culvert Replacement	200
BNSF Railway	Right-of-Way/Parcel	Abandoned Railway	Improved Natural Conveyance	3,600
Pend Oreille County	Right-of-Way	Scotia Road Crossing	Culvert Replacement	100
Private Property	Parcel	Wetland/Aquatic Land	Improved Natural Conveyance	1,000
Pend Oreille County	Right-of-Way	Gray Road Crossing	Culvert Replacement	60
Private Property	Parcel	Wetland/Aquatic Land	Improved Natural Conveyance	430
Pend Oreille County	Parcel	Wetland/Aquatic Land	Improved Natural Conveyance	600
Private Property	Parcel	Wetland/Aquatic Land	Improved Natural Conveyance	4,000

Table 4. Property Ownership, Discharge Improvements (Option-2)

Ownership	Type	Notes	Improvement	Approximate Length
WSDOT	Right-of-Way	State Route 2	Pipeline	5,280
BNSF Railway	Right-of-Way/Parcel	Abandoned Railway	Pipeline	2,300
Pend Oreille County	Right-of-Way	Scotia Road Crossing	Pipeline	5,700
BNSF Railway	Right-of-Way/Parcel	Abandoned Railway	Pipeline	2,200

Environmental Review and Permitting Considerations

Permitting Framework

Permitting of the project may occur at federal, state, county local and private levels. Regulatory permitting framework has been explored for this project and the following permits may applicable to various project alternatives.

Army Corps Section 10

Under Section 10 of the Rivers and Harbors Act of 1889, 33 U.S.C. 403, restrictions on the alternation of navigable waters exist and are regulated at the Federal Level through the Army Corps of Engineers. Infrastructure improvements including construction of a surface water pumping station on the Pend Oreille River which is a navigable water and will be subject to this jurisdiction. The Little Spokane River has been adjudicated as a "non-navigable" waterway by Washington State Court decisions. Additional research is necessary to determine how this determination impacts federal jurisdiction of the Little Spokane River..

Army Corps Section 404

Section 404 of the Clean Water Act places restrictions on discharge of dredged or fill material within the limits of navigable waters. Permitting such actives are regulated by Army Corps of Engineers. Improvements related to work in either the Pend Oreille or Little Spokane River(s) may trigger this permit.

Ecology 401 WQ Certification

Section 401 of the Clean Water Act allows states to place restrictions or conditions on federal permits or licenses that may impact water quality. A 401 certification may be associated with federal permits required for this project.

WSDOT – Utility Franchise Permit

RCW 47.44 and WAC 468-34 of Washington State Law allows the Washington State Department of Transportation to issue permits and franchises to occupy state owned land with utilities such as water conveyance pipelines. Utility runs (within WSDOT right of way) shorter than 300 feet are typically issued permits, while utility runs longer than 300 feet are issued franchises. Either permits or franchise from WSDOT may be required for this project.

Washington State Department of Fish and Wildlife, Hydraulic Project Approval (HPA)

Under Chapter 77.55 RCW of Washington State Law (Hydraulic Code), the Washington State Department of Fish and Wildlife administers Hydraulic Project Approval, which serves as a permit related to most construction work within waters of the State. Any in-water work will require an HPA.

Washington State Department of Natural Resources, Aquatic Use Authorization

Washington State Department of Natural Resources (WDNR) is charged with managing uses on State owned aquatics land (e.g. stream and lake beds) consistent with RCW 79.105. Typically, use of State owned aquatics land requires a lease from the State; however, based on a Washington State Supreme Court case dating back to 1900 (Griffith v. Holman), the Little Spokane riverbed was considered non-navigable, and in addition held in private ownership. Given this, WDNR Aquatic

Use Authorizations may not apply to this waterbody. DNR Aquatic Use Authorization is clearly required however, for improvements related to work within Pend Oreille River.

ESA Section 7 Concurrence

Section 7(a)(2) of Endangered Species Act requires consultation with National Marine Fisheries regarding projects that may affect ESA listed species. Due to the presence of bull trout critical habitat on the Pend Oreille River, it is anticipated that improvements related to a surface water improvement in this waterbody would trigger ESA Section 7 concurrence from NOAA Fisheries/NMFS. Work within the Little Spokane River would not be subject to ESA Section 7 concurrence.

Tribal Reserved Water Rights

The Kalispel Tribe has unquantified water rights in the Pend Oreille watershed, as reserved by the Winters Doctrine, stemming from a 1908 U.S. Supreme Court decision (Winters v. United States). These rights are expected to be senior to most or all of the other water rights in the watershed, and would have senior priority to any water rights from the Pend Oreille permitted by Ecology to support Little Spokane water bank seeding.

County Shoreline Substantial Development Permit

Development within 200 feet of shorelines will trigger consideration of shorelines permitting per Pend Oreille County's Shoreline Management Plan. Shorelines permitting may include Shoreline Substantial Development Permit, Conditional Use Permit or Possible Exemptions.

County Floodplain Permit

Development within 100 feet of floodplains will trigger floodplain permitting through Pend Oreille County. FEMA regulations further dictate activities that may occur inside floodplain and floodway.

SEPA/NEPA

State Environmental Policy Act (SEPA), enacted by Washington State Legislature 1971 requires agencies at all levels of government (State or lower) to consider environmental impacts of projects or proposals.

National Environmental Policy Act (NEPA), enacted by US Federal Government in 1970 requires federal government agencies consider environmental impacts of proposals or actions as well as any reasonable alternatives to those action.

Water Rights Permitting

A water right(s) for either the surface or groundwater option will need to be obtained to allow beneficial use of a Pend Oreille water source. The Tri-Counties are in discussions to determine the best course of action for submitting both groundwater and surface water applications to Ecology to seek appropriate water right permits. It is anticipated that the applications would be submitted for a range of 10 to 20 cfs, equivalent to allow some flexibility in project design as detailed analysis progresses. Additionally, depending on the funding source, some flow contribution may be required to be dedicated for instream flow purposes.

Although a SWSL exists on other water right permits from the Pend Oreille River, this project would have the greatest opportunity to provide a firm supply for a WRIA 55 water bank if it were not interruptible to any Pend Oreille flow target. Since a SWSL is not the same as an instream flow rule, it is not (and cannot be) applied uniformly without jeopardy under the Administrative Procedures Act. A case specific SWSL for this project that recognizes instream flow benefit in WRIA 55 could increase the reliability of this project. Alternatively, other mitigation could be added in the Pend Oreille that addresses other limiting factors to provide mitigation, potentially eliminating the need for a SWSL.

As part of water right processing, Ecology will need to consider the Bureau of Reclamation's withdrawal of unappropriated waters of the Columbia River and its tributaries above Priest Rapids Dam, located on the Columbia River approximately 50 miles upstream of Richland (RCW 90.40.030). This withdrawal expired on December 23, 2014, but an extension request was filed with Ecology prior to expiration, and Ecology considers the withdrawal to remain in effect until the extension request is processed.

National Pollution Discharge Elimination System (NPDES)

All point source discharges into waters of the United States are controlled through the NPDES system. In Washington State, the Department of Ecology is a delegated state water pollution control agency by US Environmental Protection Agency. The project concept involves a point discharge to the Little Spokane River, which could be subject to NPDES requirements. Construction stormwater is also regulated under the NPDES program and coverage under NPDES construction general permit will be required as part of this project due to more than 1-acre of disturbance.

Cultural Resources

Washington State Governors Executive Order 05-05 requires that any Washington State funded project integrate the Department of Archaeology and Historic Preservation (DAHP) into the project planning process. Furthermore, if federally funded, National Historical Preservation Act, Section 106 permitting is required.

BNSF Railway

BNSF often accommodates utilities for crossing as well as use of their right of way corridors (for a substantive fee). BNSF issues permits, franchises and licenses for use of their right of way depending on location and use classification.

Private Landowner Easement

To the extent project improvements or uses extend beyond the limits of permitted uses within public right of ways or state owned lands, individual easements from private landowners may be necessary. Based on a Washington State Supreme Court case dating back to 1900 (Griffith v. Holman), the Little Spokane riverbed was considered non-navigable, and in addition held in private ownership. Access to conduct work on private property will require permission from landowners. Actual conveyance of any water introduced into the Little Spokane as part of this project, however, does not require easements from property owners based on RCW 90.03.030, which states in part:

> *Any person may convey any water which he or she may have a right to use along **any** of the natural streams or lakes of this state, but not so as to raise the water thereof above ordinary highwater mark, without making just compensation to persons injured thereby; but due allowance shall be made for evaporation and seepage, the amount of such seepage to be determined by the department, upon the application of any person interested.*

Given this, it does not appear that private ownership of the Little Spokane streambed, should it continue to be the case, is a fatal flaw in evaluating potential instream flow enhancement and mitigation in the river.

City of Newport Right/Pend Oreille County, Right of Way Permits

City of Newport and Pend Oreille County accommodate private and public utilities within their rights-of-way through issuance of utility franchise. These use authorizations come with special restrictions including location, depth of cover and requirements for maintenance.

Local Building, Filling and Grading Permits

Construction of structural improvements and grading within limits of City of Newport will likely trigger local building, filling and grading permits.

Environmental Approvals and Permitting Approach

Construction of project improvements and ongoing project operation represent impacts to natural resources both in the short term and long term. Short term impacts include in-water work such as dredging and filling for pump station and screening improvements in the Pend Oreille River as well as potential in-channel conveyance improvements in the Little Spokane River. Longer term impacts associated with project operation include potential impacts to wetlands and other aquatic habitat such as instream channels associated with the upper headwaters of the Little Spokane.

During construction and operation, mitigation for potential impacts must be considered including mitigation for potential water quality concerns, installation and maintenance of fish screens, re-establishment of aquatic vegetation and fish habitat and consideration of construction windows that are compatible with fisheries windows (if applicable). Furthermore, ongoing maintenance of in-channel conveyance of the upper headwaters may be required to ensure flow regime is maintained at or below ordinary high water, in conjunction with maintaining current ecological function.

All project alternatives will involve a rigorous permitting process due to the multifaceted nature of the project, spanning several major waters of the State and numerous landownerships. It is anticipated that because of potential water quality considerations, Alternatives 1A and 1B would likely represent the highest overall permitting complexity, including all permits previously mentioned including Army Corps, Section 10 (navigable waters) as well as ESA Section 7 concurrence through NOAA fisheries due to the presence of critical habitat for Bull Trout in the project vicinity at the Pend Oreille River.

Alternative 2A and 2B may potentially avoid permitting nexus associated with ESA listed species and Army Corps Section 10 due to the avoidance of in-water work associated with the Pend Oreille River. Alternative 2B is likely the simplest project to permit as this alternative is associated with the least possible impact to existing aquatic natural resources.

5. Project Economics

Opinion of Probable Cost

Project life cycle costs (opinion of probable cost) consisting of initial capital and ongoing operations and maintenance costs were developed for each of the two alternatives (1 and 2) as well as for each subset alternative (A and B).

Assumptions

The following assumptions were used in development of capital cost estimates:

- Mobilization/demobilization 10% construction subtotal;
- 25% contingency;
- 20% design engineering, surveying;
- 5% to 7% allowance for permitting (depending on complexity);
- Rock excavation assumed for 25% of excavations;
- Pipeline construction of ductile iron or steel;
- Washington State Sales Tax of 7.6% (City of Newport);
- 3% owner related management/oversight;
- 10% construction management/oversight;
- 1% allowance for property (easement) acquisition;
- Construction labor subject to Washington State Prevailing Wage; and
- 5% allowance for habitat mitigation projects.

The following assumptions were used in development of ongoing operations, maintenance and replacement costs:

- Annual Operations and Maintenance Cost for Pumps, Mechanical and Electrical Equipment assumed at 5% of capital cost per year.
- Annual Operations and Maintenance Cost for Fixed infrastructure (pipes, structures - all other construction) assumed at 1% of capital cost per year.
- Pumping power costs of $0.043 per kWh are based on Pend Oreille Public Utility District No. 1 Rate Schedule for 3-phase commercial services and are estimated based on continuous pumping.

Capital Cost

Capital cost estimates (direct and indirect costs) for two project alternatives including two variants per project alternative were developed as part of this study.

Alternative 1 consists of surface water pump station with approximately 12,600 linear feet of 24" diameter conveyance pipeline to convey surface water from the Pend Oreille River to the Little Spokane River. Surface water pump station is assumed to be located at or near City of Newport's waste water treatment facility. Alternative 1A includes discharge at the Little Spokane River headwaters in conjunction with improvement to natural surface conveyance approximately 2-miles downstream. Alternative 1B includes approximately 14,000 linear feet of additional gravity conveyance pipeline to bypass the reaches of natural channel. Opinion of probable cost estimates for alternatives 1A and 1B are $17.7M and $21.5M respectively (2015 dollars). General breakdown of capital cost estimates are provided in Table 5, and detailed breakdown is provided in Attachment C.

Table 5. Preliminary Project Cost Estimate, Alternatives 1A and 1B

		Alternative 1A	**Alternative 1B**
Item	**Description**	**Total Cost**	**Total Cost**
1.0	General	$1,190,000	$1,267,000
2.0	Site Preparation / Demo	$100,000	$15,000
3.0	Surface Water Pump Station	$1,782,000	$1,782,000
4.0	Pipeline	$3,980,000	$7,760,000
5.0	Little Spokane Channel Improvement	$1,650,000	$0
6.0	Environmental Mitigation	$450,000	$500,000
	Direct Cost		
	Construction Subtotal	$9,152,000	$11,324,000
	Contingency	$2,288,000	$2,831,000
	Washington State Sales Tax	$869,000	$1,076,000
	Direct Cost Total	$12,309,000	$15,231,000
	Indirect Cost		
	Allowance for Easement / Property Acquisition	$123,000	$152,000
	Design Engineering, Project Survey	$2,462,000	$3,046,000
	Permitting	$1,231,000	$1,066,000
	Management / Administration	$369,000	$457,000
	Construction Oversight	$1,231,000	$1,523,000
	Indirect Cost Total	$5,416,000	$6,244,000
	Total Project Capital Costs	**$17,725,000**	**$21,475,000**

Alternative 2 consist of groundwater wellfield with approximately 11,200 linear feet of 24" diameter conveyance pipeline to convey groundwater in continuity with surface water from the Pend Oreille River to the Little Spokane River. The groundwater wellfield is assumed to be located at or near City of Newport's property situated south of the waste water treatment facility. Alternative 2A includes discharge at the upper headwaters in conjunction with improvement to natural surface conveyance approximately 2-miles downstream. Alternative 2B includes

approximately 14,000 linear feet of additional gravity conveyance pipeline to bypass the upper reaches of natural channel. Opinion of probable cost estimates for alternatives 2A and 2B are $15M and $19.8M respectively (2015 dollars). General breakdown of capital cost estimates are provided in Table 6, and detailed breakdown is provided in Attachment C.

Table 6. Preliminary Project Cost Estimate, Alternatives 2A and 2B

		Alternative 2A	**Alternative 2B**
Item	**Description**	**Total Cost**	**Total Cost**
1.0	General	$934,000	$1,146,000
2.0	Site Preparation / Demo	$100,000	$5,000
3.0	Groundwater Well Source	$1,562,000	$1,562,000
4.0	Pipeline	$3,620,000	$7,400,000
5.0	Little Spokane Channel Improvement	$1,300,000	$0
6.0	Environmental Mitigation	$375,000	$500,000
	Direct Cost		
	Construction Subtotal	$7,891,000	$10,613,000
	Contingency	$1,973,000	$2,653,000
	Washington State Sales Tax	$750,000	$1,008,000
	Direct Cost Total	$10,614,000	$14,274,000
	Indirect Cost		
	Allowance for Easement / Property Acquisition	$106,000	$143,000
	Design Engineering, Project Survey	$2,123,000	$2,855,000
	Permitting	$743,000	$714,000
	Management / Administration	$318,000	$428,000
	Construction Oversight	$1,061,000	$1,427,000
	Indirect Cost Total	$4,351,000	$5,567,000
	Total Project Capital Costs	**$14,965,000**	**$19,841,000**

Operations and Maintenance Cost

Operations and Maintenance (O&M) costs consist of annual costs operating equipment, monitoring and periodic maintenance and replacement of deteriorating components throughout the life of the project. A major component of O&M cost are power consumption costs associated with water pumping. Table 7 provides a summary of estimated annual O&M costs for various project alternatives.

Table 7. Preliminary Operations and Maintenance Cost Estimate

	Mechanical / Electrical Improvements	Fixed Improvements	Electrical Costs	Total Annual O&M
Alternative 1A	$89,000	$61,000	$70,000	$220,000
Alternative 1B	$89,000	$83,000	$70,000	$242,000
Alternative 2A	$78,000	$53,000	$120,000	$251,000
Alternative 2B	$78,000	$79,000	$120,000	$277,000

Water Banking Unit Costs

It is likely that a WRIA 55 water bank will include some form of cost recovery for users relying on mitigation credits from the bank. Demand from the water bank may vary depending on the types of mitigation certificates offered (e.g. indoor use only, indoor and outdoor use), and whether mitigation is based on total use or consumptive use. Cost recovery impacts can be estimated through the following example.

Consider mitigation certificates that are based on offsetting 250 gpd of total water use (0.28 acre-feet/year). This accounts for approximately 0.0039% of the 7,240 acre-feet supplied by the project. At a cost range of $15 to $20 million for the project, a capital cost recovery on the order of $580 to $775 / house would be required. Primary factors that could lead this cost to increase include higher total water use/house, and including cost recovery for operation and maintenance. Primary factors that could lead to decreased costs include mitigation for consumptive use only (which would decrease the per home mitigation requirement) and potential state subsidy for public benefits, such as instream flows.

As criteria are established for water bank management, costs per home can be more accurately estimated. However, the costs on the order of hundreds of dollars (or even a few thousands of dollars) per home are likely affordable given the experience of water banks in other areas.

Cost Considerations/Data Gaps

Capital and O&M costs considered have been developed without the benefit of detailed design and various levels of environmental study/review. Further subsequent feasibility study will be required to refine costs based on evaluation of project elements in greater detail. Factors which may tend to dramatically impact cost include the following:

- **Little Spokane Conveyance Capacity.** The input of 10 cfs into the uppermost reaches of the natural conveyance of Little Spokane River presents a project challenge that must be addressed with further scientific study and engineering evaluation. The project flow must be accommodated below ordinary high water or otherwise within limits agreed to by various impacted landowners. Some assumption has been made as to the limit of natural conveyance that may readily handle project flows, however this limit may need to be refined, which could greatly impact cost.
- **Groundwater Well Source Option.** The siting/configuration of a potential groundwater source may have dramatic impact on cost estimates. To provide a level of conservatism, it was assumed that a groundwater source may be cited in the northern extents of City of Newport; however, locations further south may be feasible which could reduce required

pipeline lengths and reduce cost. Well construction costs may increase depending on potential well depth required. Furthermore, it is assumed that high yielding aquifer targets may be found with production capacities suitable for a wellfield configuration as described herein. It may be possible that a wellfield with more numerous quantity of smaller wells is required. However, it is anticipated that alternative configurations may be similar in aggregate cost.

- **Power Infrastructure.** Power supply to proposed water supply options has not been explored in detail. Should extensive power extension be required, cost may be impacted. Furthermore, it is assumed that reliability criteria do not dictate the need for emergency backup power supply through installation of permanent standby generator.
- **Existing Utilities.** Piped conveyance improvements with pipeline diameters on the range of 24" pose significant technical challenges with respect to installation in urban/suburban settings. Limited flexibility is available to negotiate and avoid other utilities therefore extensive relocation of existing utilities and/or deep installation of pipeline improvements may be required.
- **Surface Water Pump Station.** It is assumed that the surface water pump station may both 1) be installed on City of Newport property in the vicinity of the Waste Water Treatment Facility and 2) surface water pump station may be configured with a wetwell/piped intake with cylindrical end of pipe fish screen. Should the pump station be located on alternative property sites, estimated costs would likely increase. Furthermore, should the need arise for a platform/pump deck style pump station, costs would likely increase due to the height and distance required.

In summary, estimated capital and annual O&M costs for the various alternatives are provided in Table 8 below.

Table 8. Preliminary Estimated Project Cost Summary

	Total Cost		Unit Cost[1]	
	Capital Cost	Annual O&M	Capital Cost (per ac-ft)	Annual O&M (per acre-foot)
Alternative 1A	$17,725,000	$220,000	$2,450	$30
Alternative 1B	$21,475,000	$242,000	$2,970	$33
Alternative 2A	$14,965,000	$251,000	$2,070	$35
Alternative 2B	$19,841,000	$277,000	$2,740	$38

1 – Unit costs developed by dividing total costs by annual quantity of 7,240 acre-feet.

6. Recommendations for Additional Design and Analysis

Additional detailed engineering and environmental analysis is needed to further develop and potentially implement this work, as recommended below. Aspect and the County have worked together to develop an Implementation Plan for continued water bank development. This Implementation Plan has been incorporated into a Watershed Plan Implementation and Flow Achievement Grant application to seek funding for completion of water bank development. The grant application was submitted to Ecology on April 30, 2015 and is pending review. Additional detailed engineering and environmental analysis is needed to further develop and potentially implement use of Pend Oreille source water for bank seeding, as recommended below:

Little Spokane Headwaters

This work is intended to provide data and analysis focused on engineering and environmental issues specific to the Little Spokane headwaters. Recommended data gathering and analysis includes:

- Establishment of gaging stations;
- Stream geomorphology/hydrology/flood plain assessment, including road crossings;
- Evaluation of wetland and stream habitat enhancement opportunities;
- Water quality data review, sampling, and analysis;
- Evaluation groundwater/surface water interaction;
- Streamflow flow and temperature measurements/seepage runs;
- Installation and monitoring of near stream piezometers;
- Private/public well water level measurements;
- Isotope comparison of surface water and groundwater to evaluate hydraulic connection;
- Evaluation of surface aquifer recharge (SAR) as a mechanism to enhance stream flow; and
- Limited numerical groundwater/surface water flow modeling if deemed appropriate following further study (would also include portions of the Pend Oreille Watershed).

Pend Oreille Watershed

This work is intended to provide data and analysis focused on engineering and environmental issues specific to the Pend Oreille watershed. Recommended data gathering and analysis includes:

- Installation of a test well(s) and associated aquifer testing;
- Water quality data review, sampling, and analysis, to include development of a Quality Assurance Project Plan (QAPP);
- Evaluation groundwater/surface water interaction;
- Monitoring/water quality testing during aquifer testing;
- Review of existing well data;
- Development of a conceptual hydrogeologic model of Pend Oreille River and adjacent aquifer; and
- Limited numerical groundwater/surface water flow modeling if appropriate.

Pre-Design Evaluations

These investigations and data analyses are recommend to support an assessment of the viability and if viable, engineering design for development and use of a suitable water source and operational

system to obtain and convey water to the upper headwaters of the Little Spokane River. Recommended evaluations include:

- Update of the existing data review and data gap analysis;
- Evaluation of land access options (contact with property owners, physical limitations, right-of-way issues);
- Coordination with City of Newport and other entities as required;
- Evaluation of reclaimed water options;
- Evaluation of potential water quality impacts;
- Evaluation of potential impacts on future water allocations from the Pend Oreille River;
- Preparation of a final assessment of preferred alternative (groundwater or surface water source);
- Establishment of a conveyance approach; and
- Development of additional mitigation options (wetland enhancement, instream flow augmentation, SAR).

Preliminary Engineering Design

Recommendations for preliminary design support the assessment of the project's viability. If determined viable, future detailed engineering design for the development of a suitable Pend Oreille water source and associated operational system will be performed. Recommended preliminary design tasks include:

- Conveyance system, road crossing modifications and associated field work (surveying);
- Stream channel modifications;
- Wetland/habitat enhancement;
- Wellfield (or pump station) design; and
- Detailed cost estimates.

If preliminary design continues to support the viability of the Pend Oreille source for WRIA 55, additional detailed design and implementation approaches should be developed as part of completing preliminary design work.

Attachments

Figure 1 – Little Spokane and Pend Oreille Drainage Divide
Figure 2 – Surficial Geology
Figure 3 – Depth of Basin Fill
Figure 4 – Soils Mapping
Figure 5 – WDFW Recommended Flow vs. Gage Data (2002-2012) Pend Oreille River at Newport
Figure 6 – Frequency Below Base / Recommended Flows – Dartford and Newport

Figure 7 – Conceptual Improvements Plan
Figure 8 – System Performance Curves, Surface Water Alternatives
Figure 9 – System Performance Curves, Groundwater Alternatives

Attachment A – Photos from Site Reconnaissance
Attachment B – Well Logs
Attachment C – Detailed Cost Estimates

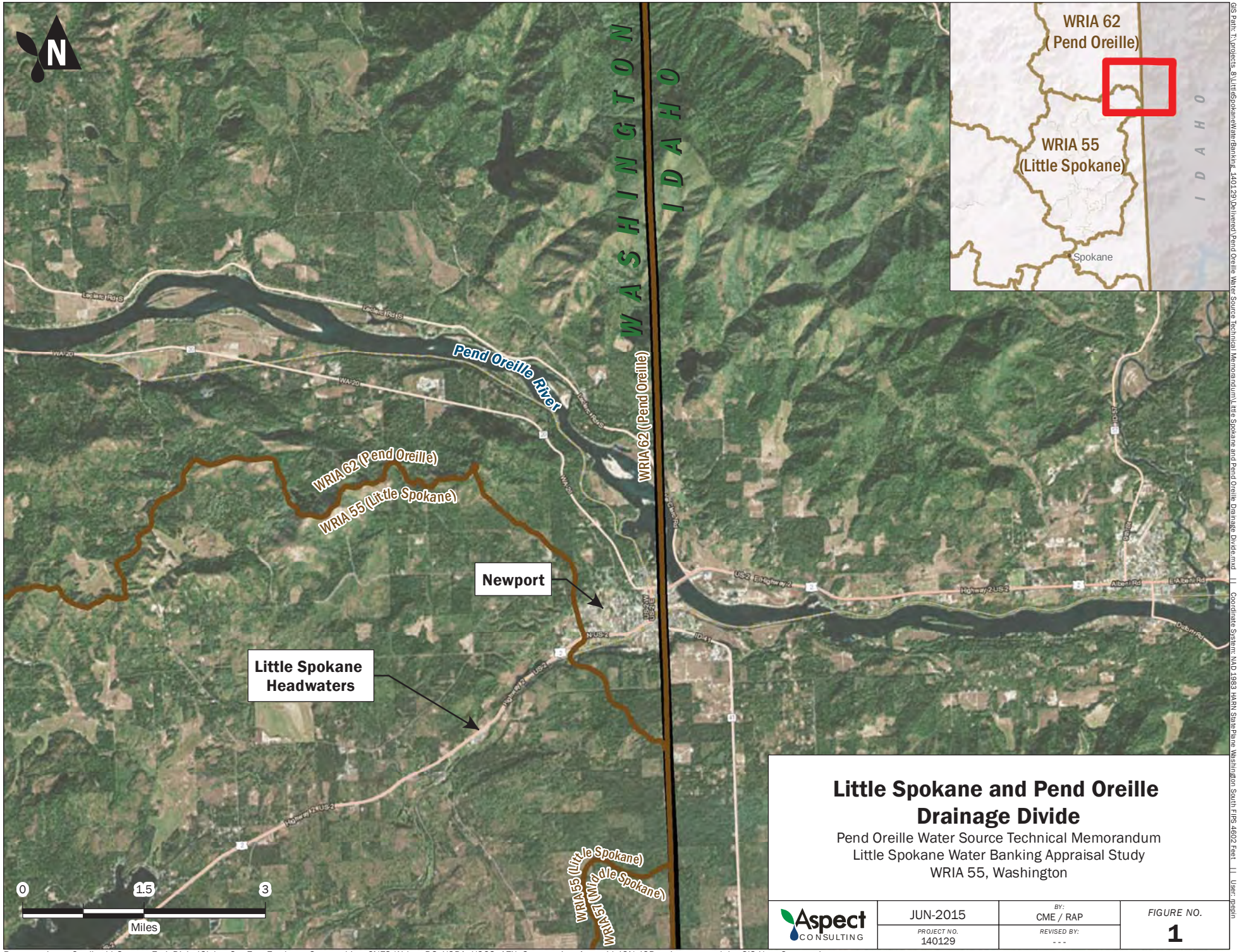
Limitations

Work for this project was performed for the Spokane County Utilities (Client), and this memorandum was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This memorandum does not represent a legal opinion. No other warranty, expressed or implied, is made.

All reports prepared by Aspect Consulting for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect Consulting. Aspect Consulting's original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

V:\140129 Little Spokane River Basin\Deliverables\Phase III Final FS\Appendices\Pend Oreille Interbasin Transfer Memo\Pend Oreille Inter Basin Transfer 063015.docx

FIGURES

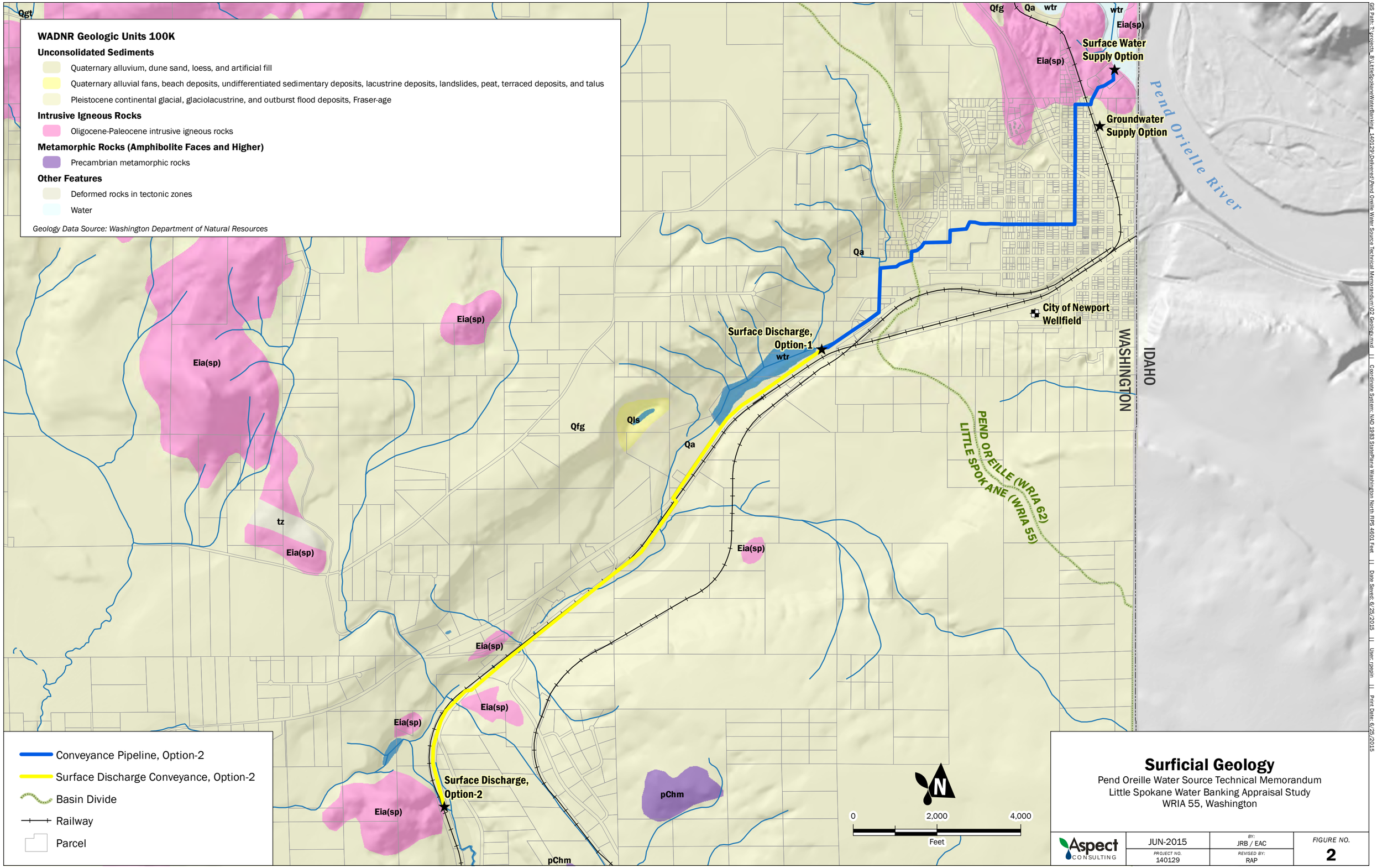


Little Spokane and Pend Oreille Drainage Divide

Pend Oreille Water Source Technical Memorandum
Little Spokane Water Banking Appraisal Study
WRIA 55, Washington

Aspect CONSULTING	JUN-2015	BY: CME / RAP	FIGURE NO. 1
	PROJECT NO. 140129	REVISED BY: ---	

GIS Path: T:\projects_8\LittleSpokaneWaterBanking_140129\Delivered\Pend Oreille Water Source Technical Memorandum\Little Spokane and Pend Oreille Drainage Divide.mxd || Coordinate System: NAD 1983 HARN StatePlane Washington South FIPS 4602 Feet || User: pepin



Surficial Geology

Pend Oreille Water Source Technical Memorandum
Little Spokane Water Banking Appraisal Study
WRIA 55, Washington

Aspect Consulting	JUN-2015	BY: JRB / EAC	FIGURE NO. 2
	PROJECT NO. 140129	REVISED BY: RAP	

GIS Path: T:\projects_8\LittleSpokaneWaterBanking_140129\Deliverect\Pend Oreille Water Source Technical Memorandum\02 Geology.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 6/25/2015 || User: rpeplin || Print Date: 6/25/2015

Extent and Thickness of Basin Fill (ft)

- 0 to 100
- 100.1 to 300
- 300.1 to 500
- 500.1 to 828
- Surficial Bedrock

Basin Fill and Bedrock Data Source: USGS Scientific Investigations Report 2013-5124

Surface Water Supply Option

Groundwater Supply Option

Pend Orielle River

City of Newport Wellfield

Surface Discharge, Option-1

PEND OREILLE (WRIA 62)
LITTLE SPOKANE (WRIA 55)

WASHINGTON

IDAHO

Surface Discharge, Option-2

- Conveyance Pipeline, Option-2
- Surface Discharge Conveyance, Option-2
- Basin Divide
- Railway
- Parcel

N

0 2,000 4,000
Feet

Depth of Basin Fill

Pend Oreille Water Source Technical Memorandum
Little Spokane Water Banking Appraisal Study
WRIA 55, Washington

Aspect Consulting	JUN-2015	BY: JRB / EAC	FIGURE NO. 3
	PROJECT NO. 140129	REVISED BY: RAP	

GIS Path: T:\projects_8\LittleSpokaneWaterBanking_140129\Delivered\Pend Oreille Water Source Technical Memorandum\03_BasinFill.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 6/25/2015 || User: mepin || Print Date: 6/25/2015

Soils (SSURGO)

- 19 *Blueslide silt loam*
- 20 *Bonner silt loam, 0 to 10 percent slopes*
- 21 *Bonner gravelly silt loam, 0 to 10 percent slopes*
- 22 *Borosaprists, ponded*
- 43 *Dufort silt loam, 0 to 15 percent slopes*
- 44 *Dufort very stony silt loam, 0 to 40 percent slopes*
- 51 *Hoodoo silt loam*
- 60 *Kaniksu sandy loam, 0 to 15 percent slopes*
- 61 *Kaniksu sandy loam, 15 to 40 percent slopes*
- 62 *Kegel loam*
- 77 *Mobate-Rock outcrop complex, 0 to 40 percent slopes*
- 78 *Mobate-Rock outcrop complex, 40 to 65 percent slopes*
- 79 *Moscow silt loam, 0 to 25 percent slopes*
- 80 *Moscow silt loam, 25 to 40 percent slopes*
- 81 *Moscow silt loam, 40 to 65 percent slopes*
- 83 *Moscow-Rock outcrop complex, 40 to 65 percent slopes*
- 97 *Orwig sandy loam, 0 to 20 percent slopes*
- 98 *Orwig sandy loam, 20 to 65 percent slopes*
- 99 *Pits*
- 109 *Rathdrum very fine sandy loam*
- 121 *Rock outcrop-Usk complex, 30 to 65 percent slopes*
- 125 *Sacheen loamy fine sand, 5 to 15 percent slopes*
- 126 *Sacheen loamy fine sand, 15 to 25 percent slopes*
- 129 *Scotia fine sandy loam, 7 to 15 percent slopes*
- 130 *Scotia fine sandy loam, 15 to 25 percent slopes*
- 134 *Skanid-Rock outcrop complex, 0 to 40 percent slopes*
- 145 *Typic Xerorthents, 30 to 65 percent slopes*
- 146 *Uncas muck*
- 148 *Usk loam, 0 to 20 percent slopes*
- 149 *Usk loam, 20 to 40 percent slopes*
- 151 *Usk stony loam, 0 to 40 percent slopes*
- 152 *Usk-Rock outcrop complex, 0 to 40 percent slopes*
- 163 *Water*

Soil Data Source: Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey Accessed June 2015.

Surface Water Supply Option

Groundwater Supply Option

Surface Discharge, Option-1

Surface Discharge, Option-2

City of Newport Wellfield

Pend Orielle River

PEND OREILLE (WRIA 62)

LITTLE SPOKANE (WRIA 55)

WASHINGTON

IDAHO

- Conveyance Pipeline, Option-2
- Surface Discharge Conveyance, Option-2
- Basin Divide
- Railway
- Parcel

N

0 2,000 4,000

Feet

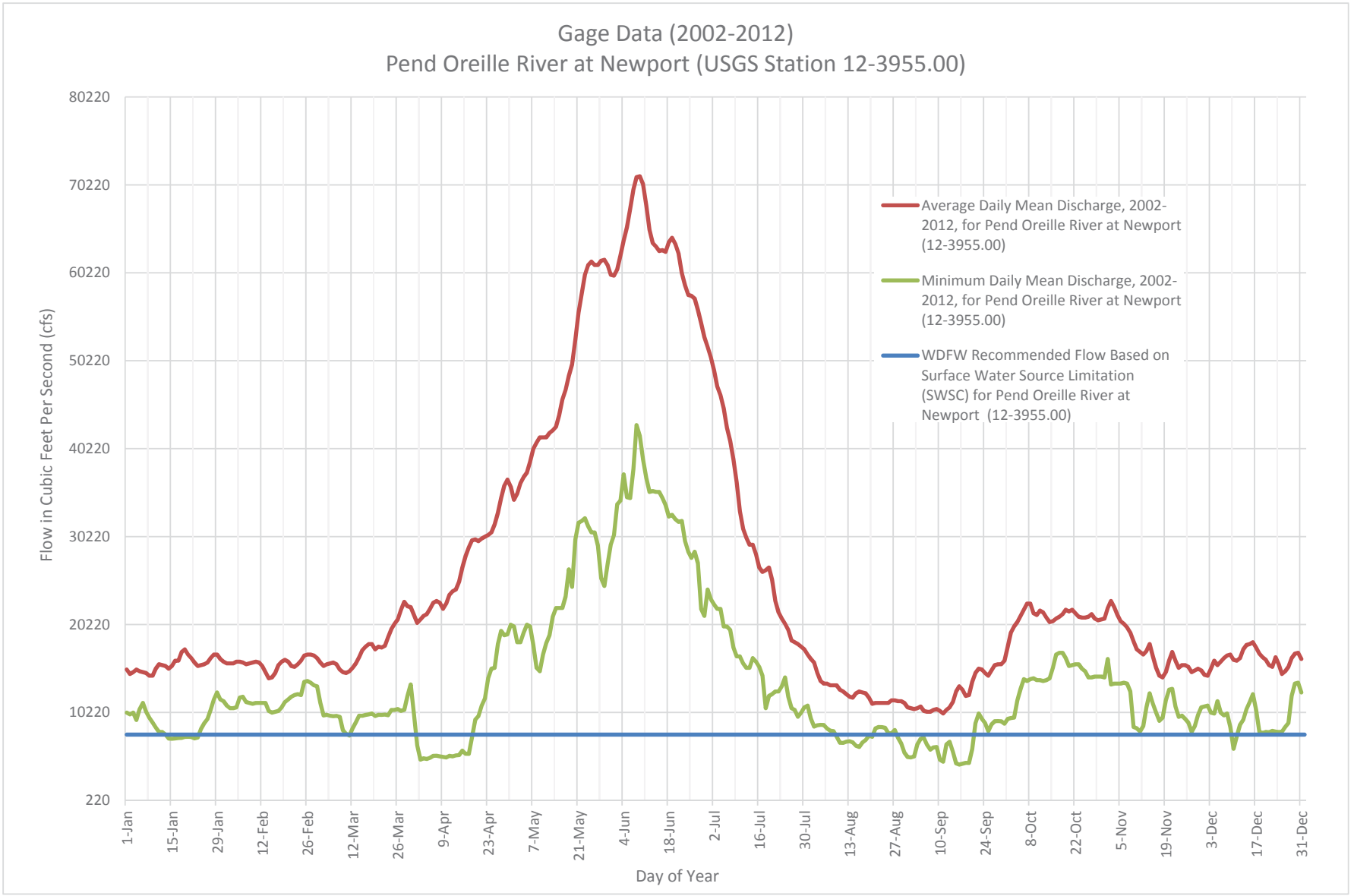
Soils

Pend Oreille Water Source Technical Memorandum
Little Spokane Water Banking Appraisal Study
WRIA 55, Washington

Aspect CONSULTING

JUN-2015	BY: JRB / EAC	FIGURE NO. 4
PROJECT NO. 140129	REVISED BY: RAP	

GIS Path: T:\projects_8\LittleSpokaneWaterBanking_140129\Delivered\Pend Oreille Water Source Technical Memorandum\04_Soils.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 6/25/2015 || User: rpeplin || Print Date: 6/25/2015

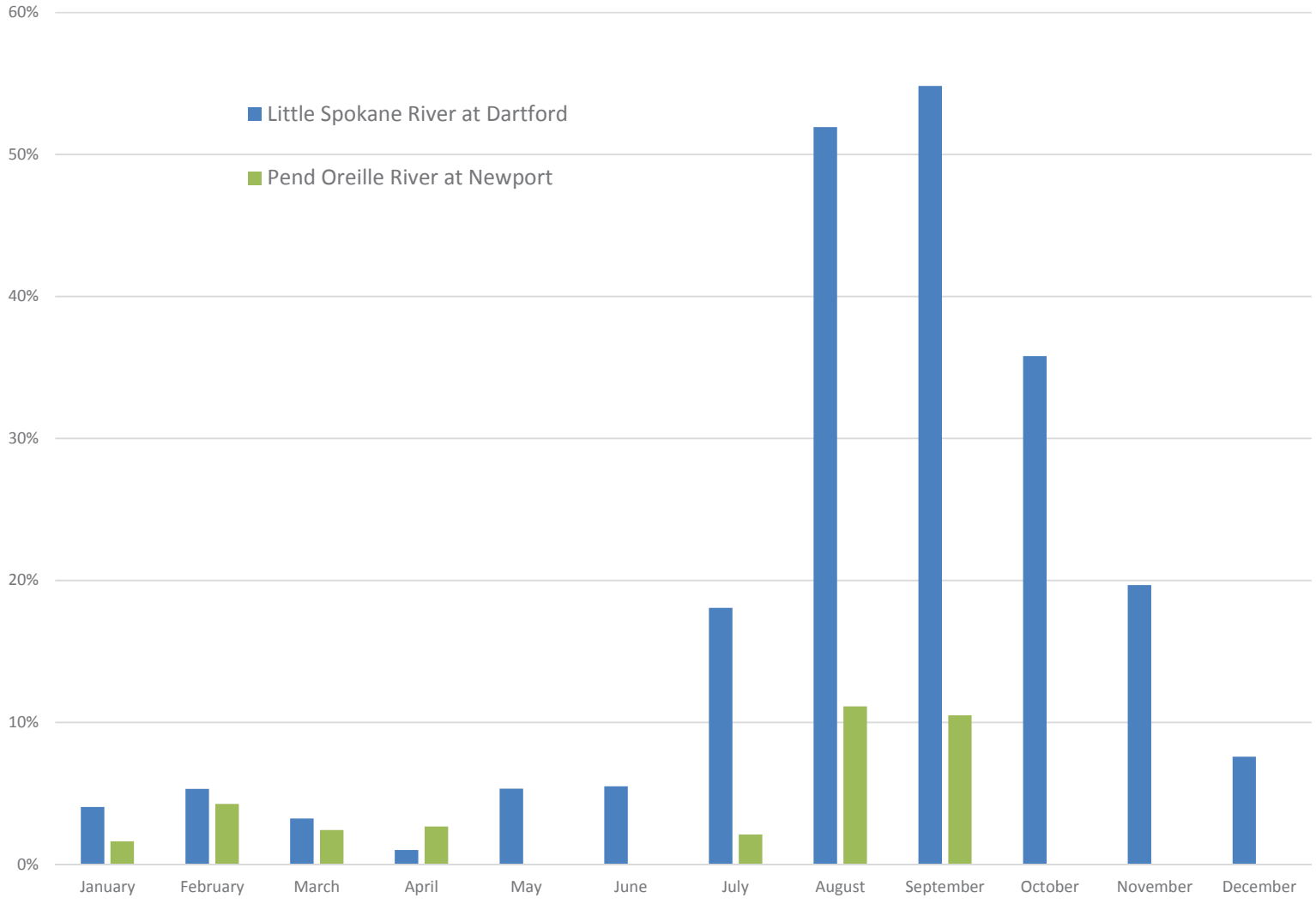


WDFW Recommended Flow vs. Gage Data (2002-2012)
Pend Oreille River at Newport

Pend Oreille Water Source Technical Memorandum
Little Spokane Water Banking Appraisal Study
WRIA 55, Washington

Aspect CONSULTING	JUN-2015	BY: CME / RAP	FIGURE NO. 5
	PROJECT NO. 140129	REVISED BY: ---	

GIS Path: T:\projects_8\Little&SpokaneWaterBanking_140129\Delivered\Pend Oreille Water Source Technical Memorandum\5 Curtailment Flow vs Gage Data.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || User: rpepin



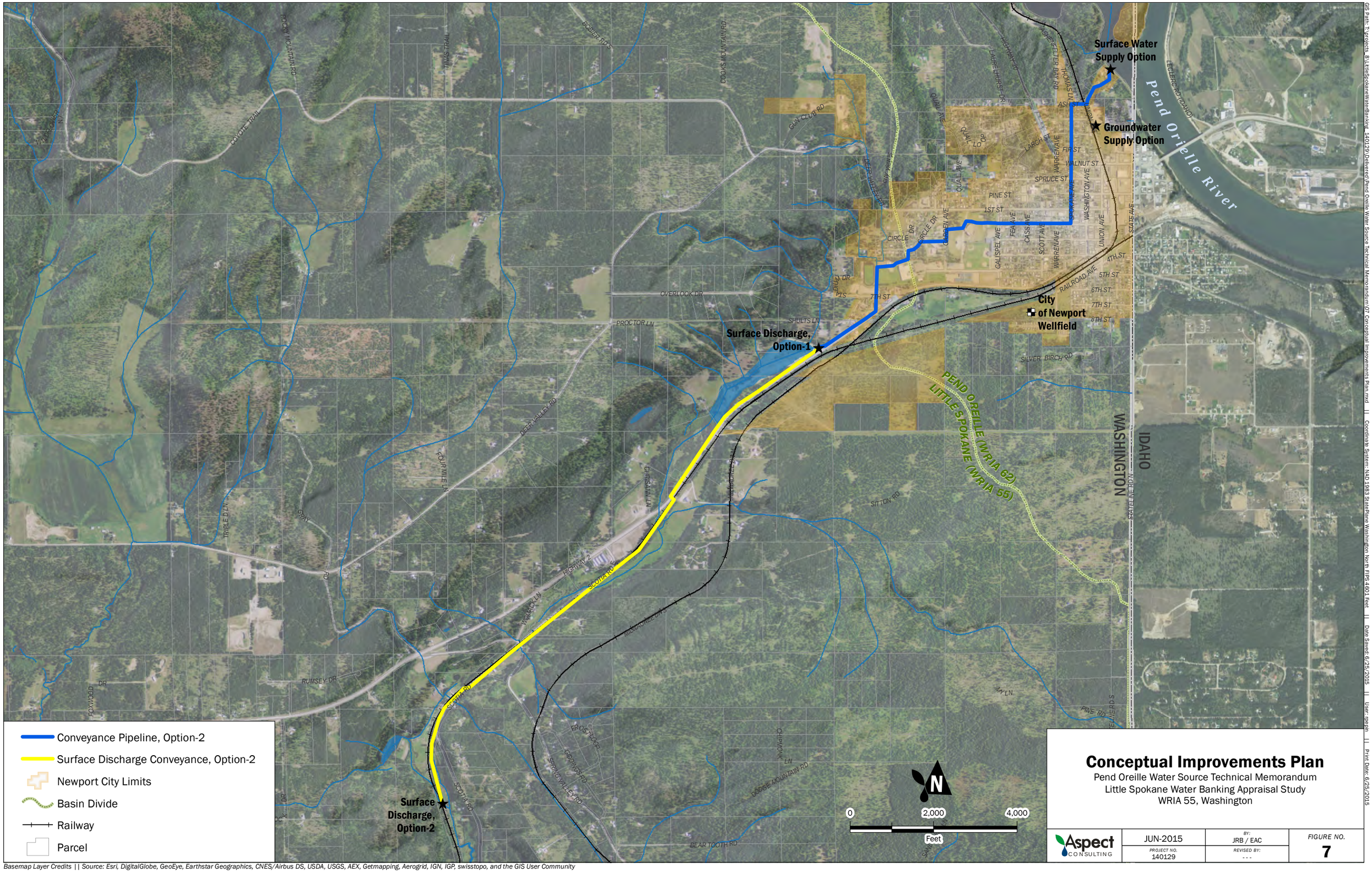
-Minimum instream flow range Little Spokane at Dartford = 115 to 250 cfs
-WDFW recommendation (SWSL) for Pend Oreille at Newport = 7,700 cfs

Note: Graph shows percentage of days in which a 7-day moving average of mean daily flow did not meet base flow/curtailment flow, 1993-2013

Frequency Below Base/Recommended Flows - Dartford and Newport

Pend Oreille Water Source Technical Memorandum
Little Spokane Water Banking Appraisal Study
WRIA 55, Washington

Aspect CONSULTING	JUN-2015	BY: CME / RAP	FIGURE NO. 6
	PROJECT NO. 140129	REVISED BY: ---	



Conceptual Improvements Plan

Pend Oreille Water Source Technical Memorandum
Little Spokane Water Banking Appraisal Study
WRIA 55, Washington

Aspect Consulting	JUN-2015	BY: JRB / EAC	FIGURE NO. 7
	PROJECT NO. 140129	REVISED BY: ---	

Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

GIS Path: T:\projects_8\LittleSpokaneWaterBanking_140129\Deliverech\Pend Oreille Water Source Technical Memorandum\07 Conceptual Improvements Plan.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 6/25/2015 || User: rjeglin || Print Date: 6/25/2015

Figure 8 - System Performance Curves, Surface Water Alternatives

Project No. 140129, Pend Oreille Appraisal Study

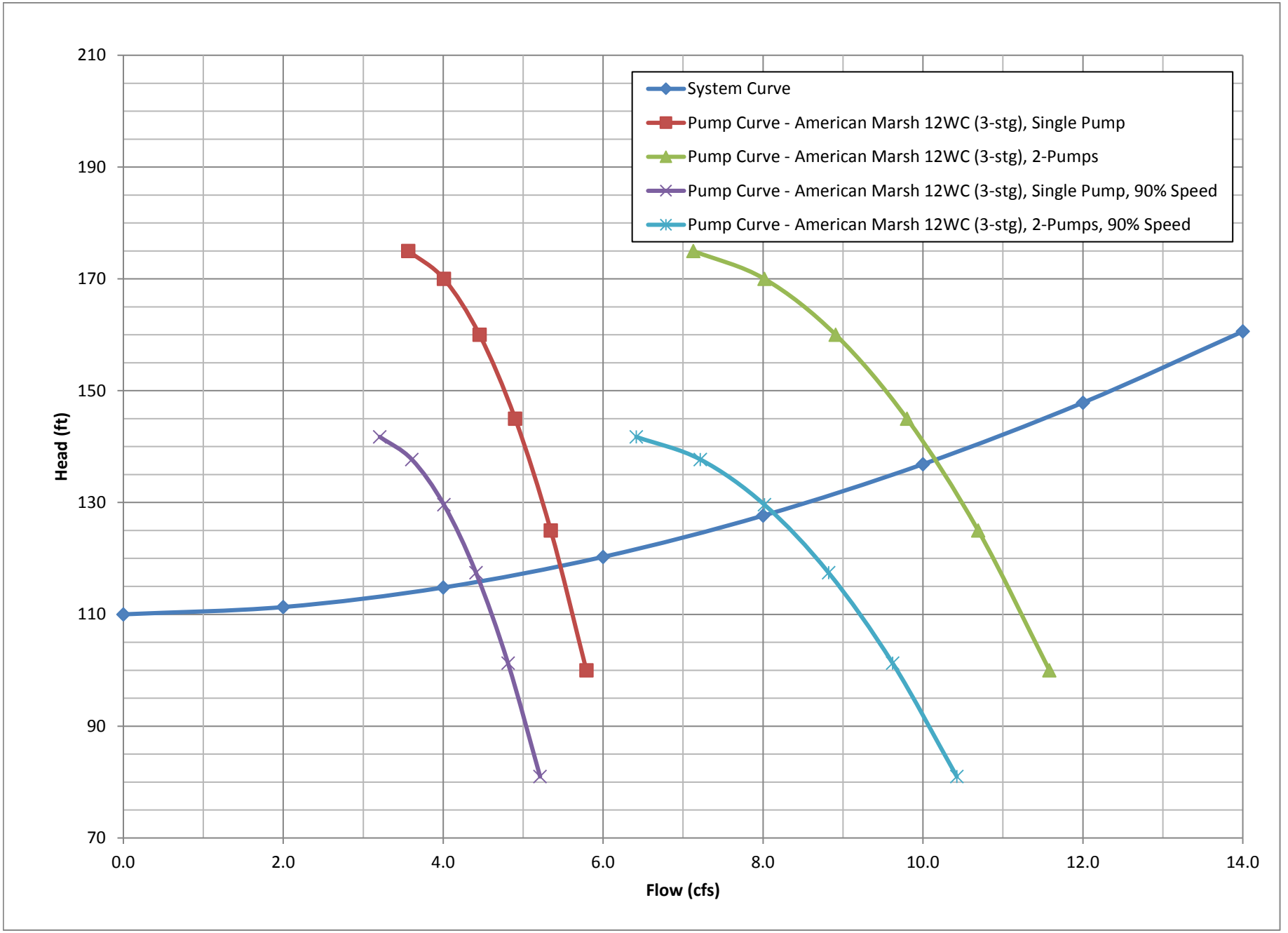
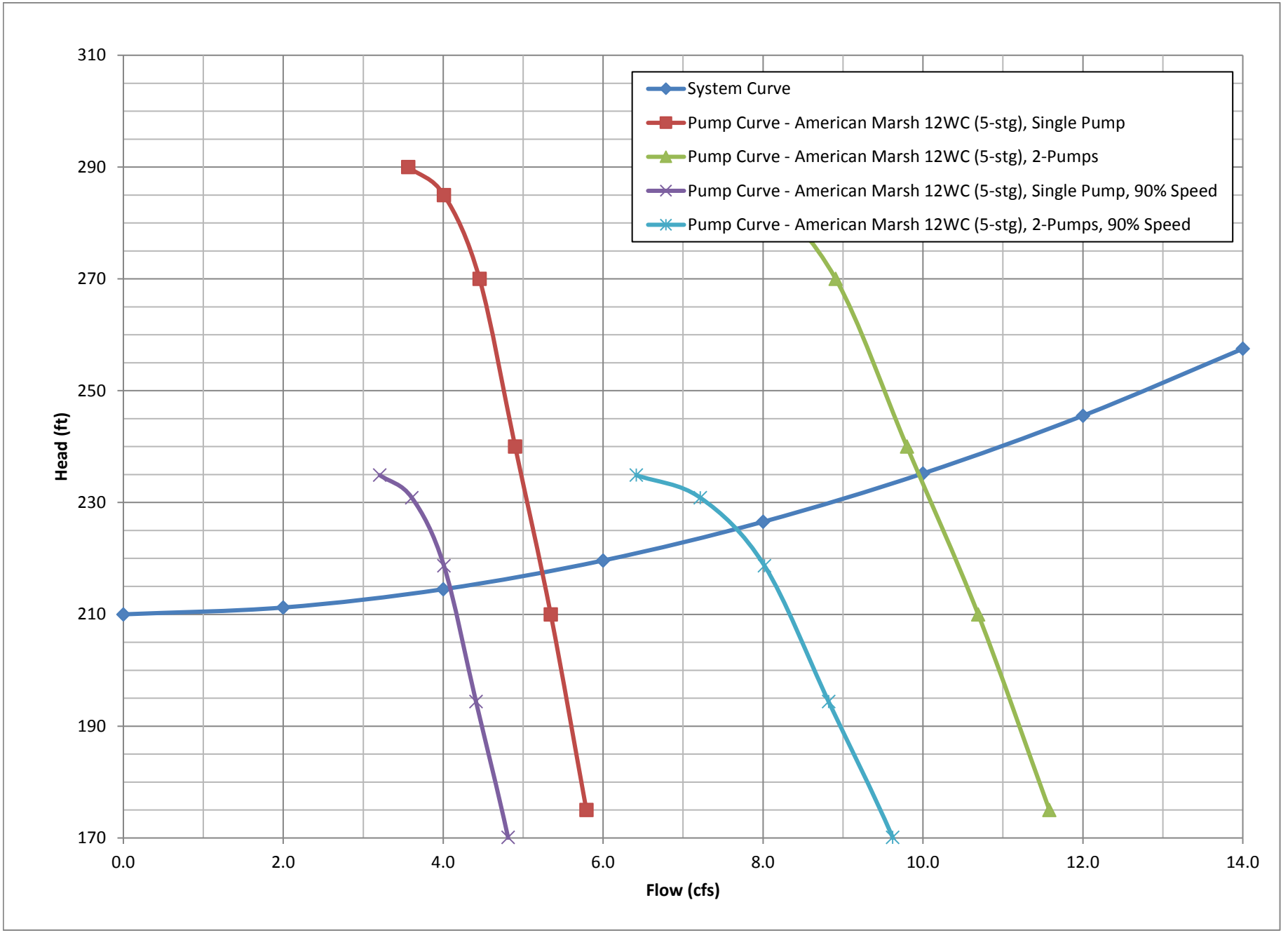


Figure 9 - System Performance Curves, Groundwater Alternatives

Project No. 140129, Pend Oreille Appraisal Study



Aspect Consulting

06/15/15

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Figure 9

System Performance Curves, Groundwater Alternatives

Attachment A

Site Photographs

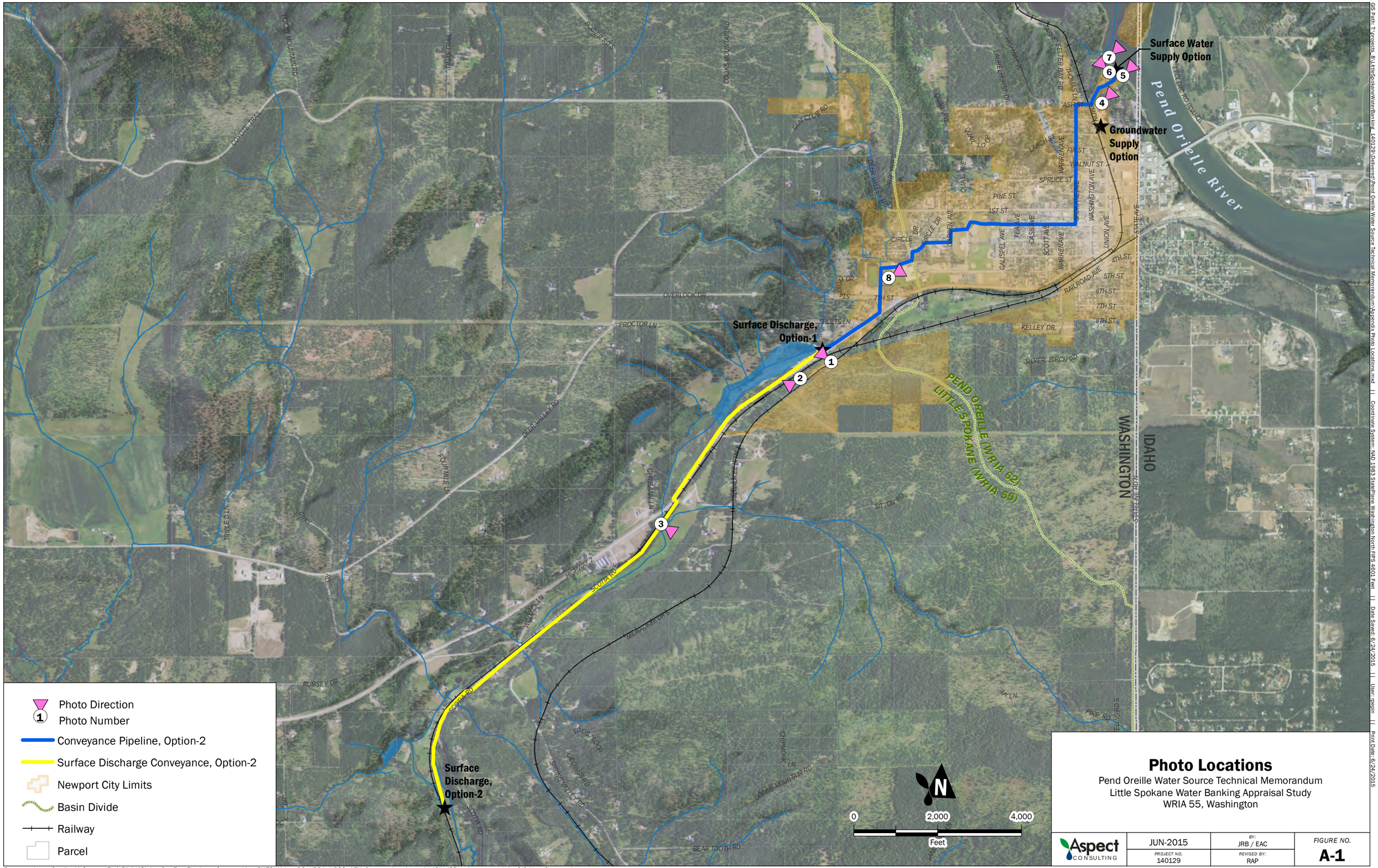


Photo Direction
Photo Number
Conveyance Pipeline, Option-2
Surface Discharge Conveyance, Option-2
Newport City Limits
Basin Divide
Railway
Parcel

Photo Locations

Pend Oreille Water Source Technical Memorandum
Little Spokane Water Banking Appraisal Study
WRIA 55, Washington

Aspect Consulting	JUN-2015	BY: JRB / EAC	FIGURE NO. A-1
	PROJECT NO. 140129	REVISED BY: RAP	

Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

GIS Path: T:\projects_8\LittleSpokaneWaterBanking_140129\Delivered\Pend Oreille Water Source Technical Memorandum\Appendix Photo Locations.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 6/24/2015 || User: mepjn || Print Date: 6/24/2015

Photo 1- Wetland near Headwaters of Little Spokane River

Photo 2- View Looking Southwest along SR2 near Little Spokane Headwaters

Photo 3- Little Spokane River, South of US2 near Headwaters

Photo 4- City of Newport Wastewater Treatment Facility

Photo 5- Pend Oreille River at Proposed Surface Water Pump Station (Option)

Photo 6- Pend Oreille River at Proposed Surface Water Pump Station (View Looking Northwest)

Photo 7- Pend Oreille River at Proposed Surface Water Pump Station (View Looking Northwest)

Photo 8- View along Proposed Pipeline Alignment Near City of Newport Fairgrounds / Park

ATTACHMENT B

Ecology Well Logs

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No
Permit No.

(1) **OWNER:** Name Mr. Bing Bowerman Address Lazy Acres Trailer Court Box 351

(2) **LOCATION OF WELL:** County Pend Creille — NE ¼ SE ¼ Sec. 24 T. 31 N., R 45E W.M.

Bearing and distance from section or subdivision corner

(3) **PROPOSED USE:** Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (if more than one)
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 8 inch inches.
Drilled 64 ft. Depth of completed well 61 ft.

(6) **CONSTRUCTION DETAILS:**

Casing installed: 8 " Diam. from plus2 ft. to 51 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson well screens
Type Stainless steel Model No.
Diam. 8 Slot size .040 from 51 ft. to 61 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal Cement
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) **PUMP:** Manufacturer's Name
Type: H.P.

(8) **WATER LEVELS:** Land-surface elevation above mean sea level 2200 ft.
Static level 12 ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: 150 gal./min. with Unk. ft. drawdown after hrs.
" Air Test " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test 6/12/78
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) **WELL LOG:**

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Top Soil	0	3
Sandy clay W/some gravel & sand	3	19
Very course brown sand w/water	19	64
Alot of water at 35 feet		
200 150 Gallons Per Minute		

RECEIVED
JUL 12 1978
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started June 8, 19 78. Completed June 12, 19 78

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Uhlenkott Well Drilling (Person, firm, or corporation) (Type or print)

Address Route 1, Box 20, Fenn, Idhao 83531

[Signed] Ray Uhlenkott (Well Driller)

License No. (0768) Date July 3, 19 78

7/13/78 Newport 7½

USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No G3 26830

Permit No.

(1) OWNER: Name Mr. Bing Bowerman Address Lazy Acres Trailer Court Box 351

(2) LOCATION OF WELL: County Pend Oreille NE ¼ SE ¼ Sec 24 T 31 N, R 45E W.M.

Bearing and distance from section or subdivision corner WELL SOLD TO CITY BY BOWERMAN

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐
Irrigation XX Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (If more than one)
New well XX Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary XX Jetted ☐

(5) DIMENSIONS: Diameter of well 8 inches.
Drilled 80 ft. Depth of completed well 67 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 8 " Diam. from plus2 ft. to 56 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded XX " Diam. from ft. to ft.

Perforations: Yes ☐ No XX
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes XX No ☐
Manufacturer's Name Johnson Well Screen
Type Stainless Steel Model No
Diam. 8 Slot size .050 from 7.57 ft. to 67 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No XX Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes XX No ☐ To what depth? 20 ft.
Material used in seal Cement
Did any strata contain unusable water? Yes ☐ No XX
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level 2200 ft.
Static level 16 ft. below top of well Date 6/6/78
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No XX If yes, by whom?
Yield: 200 gal./min. with Unk. ft. drawdown after hrs.
" Air test " " "
" " " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test 6/6/78
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No XX

(10) WELL LOG: WELL #d

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Top Soil (soft)	0	3
Sandy clay W/ some gravel	3	24
Grayish rock and sand (soft)	24	28
Very course sand W/some gravel	28	81
alot of water at the depth of 41 feet on. 200 G. P. M.		

RECEIVED
JUL 1 ; 1978
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started June 2, 1978 Completed June 6, 1978

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Uhlenkott Well Drilling (Person, firm, or corporation) (Type or print)

Address Route 1, Box 20 Fenn, Idaho 83533

[Signed] Roy Uhlenkott (Well Driller)

License No. 767 Date July 3, 1978

7/13/78 Newport 7½

(USE ADDITIONAL SHEETS IF NECESSARY)

Well #1 06173 UJ061831

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. [redacted]
UNIQUE WELL I.D. # ACC 601
Water Right Permit No.

(1) OWNER: Name City of Newport Address

(2) LOCATION OF WELL: County Pend Oreille NW 1/4 SE 1/4 Sec 24 T. 31 N., R 45E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address)

(3) PROPOSED USE: ☐ Domestic ☐ Industrial ☐ Municipal ☒ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one)
Abandoned ☐ New well ☒ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☒ Driven ☐ Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 8" inches. Drilled 85' feet. Depth of completed well 85' ft.

(6) CONSTRUCTION DETAILS:
Casing Installed: 8" Diam. from +1 ft. to 85 ft.
Welded ☒ Liner installed ☐ Threaded ☐ " Diam. from ft. to ft.
" Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 19 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Sand Gravel Clay	0	20
Sand clay layers	20	25
Sand clay layers	25	35
Sand + Clay	35	50
Clay + Sand	50	58
brown Sand, clay layers	58	85
No Water		

Work Started 7-2-95 19 Completed 7-7 19 95

WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME [redacted] (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address [redacted]
(Signed) [redacted] (WELL DRILLER) License No. 393
Contractor's Registration No. [redacted] Date 7-22 19 95

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

ECY 050-1-20 (9/93)

11 #2

00156

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W067402

UNIQUE WELL I.D. # ACC602

Water Right Permit No. _____

(1) OWNER: Name City of Newport Address S 2nd Washington

(2) LOCATION OF WELL: County Pend Oreille NE 1/4 SE 1/4 Sec 24 T. 31 N., R. 45 E.W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) _____

(3) PROPOSED USE: ☐ Domestic ☐ Industrial ☐ ☒ Municipal
☐ Irrigation ☐ Test Well ☐ Other ☐
☐ DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one) _____
Abandoned ☐ New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 8" inches.
Drilled 80 feet. Depth of completed well 80 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed: 8" Diam. from +1 ft. to 70' ft.
Welded ☒ _____ Diam. from _____ ft. to _____ ft.
Liner installed ☐ _____ Diam. from _____ ft. to _____ ft.
Threaded ☐

Perforations: Yes ☐ No ☒
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type Telescoping Model No. _____
Diam. 8" Slot size 40 from 70 ft. to 75 ft.
Diam. 8" Slot size 40 from 75 ft. to 80 ft.

Gravel packed: Yes ☐ No ☒ Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 21 ft. below top of well Date 7-18-95
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom? _____
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

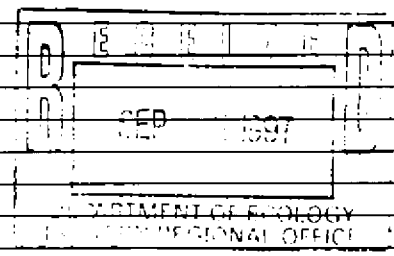
Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest _____ gal./min. with stem set at _____ ft. for _____ hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Sand, boulder	0	20
Sand Grayish Fine	21	28
Sand Brown	28	35
Sand coarse Brown	35	45
Sand Dirty Brown Fine	45	55
Sand brown clean	55	65
Sand Dirty	65	70
Sand Brown - clean	70	75
Sand Brown - Clean	75	80



Work Started 7-7 19. Completed 7-18 19 95

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Cascade Pump & Well (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address P.O. Box 145 Chattaroy Wash.

(Signed) _____ (WELL DRILLER) License No. 0393

Contractor's Registration No. CASCAPS052L Date 7-20 19 95

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

ECY 050-1-20 (9/93) * * 1

Well "F"

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 95635

Water Right Permit No. _____

(1) OWNER: Name City of Newport Address S. 200 Washington Ave Newport WA.

(2) LOCATION OF WELL: County Pend Oreille NE ¼ SE ¼ Sec. 24 T. 31 N. R. 45 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address) _____

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☒ Irrigation ☐ Test Well ☐ Other ☐ DeWater ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) Well "F"
Abandoned ☐ New well ☒ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☒ Driven ☐ Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 8 inches. Drilled 82 feet. Depth of completed well 80 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 8" Diam from +1 ft. to 70 ft.
Welded ☒ Liner installed ☐ Threaded ☐ _____" Diam. from _____ ft. to _____ ft.
_____" Diam. from _____ ft. to _____ ft.

Perforations: Yes ☐ No ☒
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes ☒ No ☐ Manufacturer's Name Johnson
Type Telescope Model No. _____
Diam. 8" Slot size 60 from 70 ft. to 75 ft.
Diam. 8" Slot size 40 from 75 ft. to 80 ft.

Gravel packed: Yes ☐ No ☒ Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes ☒ No ☐ To what depth? 19 ft.
Material used in seal _____
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name Berkley Pump Co.
Type: 733H 2STG Submersible Turbine H.P. 25

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 19 ft. below top of well Date 6-20-90
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? H2O Well Service
Yield: 75 gal./min. with 46.5 ft. drawdown after 4 hrs.
" " " " " " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

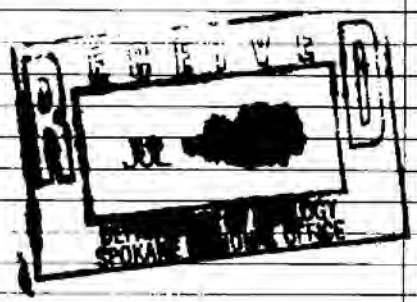
Time	Water Level	Time	Water Level	Time	Water Level
0	65'6"	3 MIN	24'	6 MIN	20'
1 MIN	38'	4 MIN	21'6"	7 MIN	20'
2 MIN	28'	5 MIN	20'	8 MIN	20'

Date of test 6/20/90
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest _____ gal./min. with stem set at _____ ft. for _____ hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water Cold Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Brown Sandy Soil	0	1
Brown Sand	1	20
Brown Sand & Gravel	20	45
Brown Sand Coarse	45	47
Brown Sand & Silt	47	70
Brown Sand Coarse	70	75
Brown Sand	75	80



Work started 6-11-90, 19. Completed 6-22, 1990

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME H2O Well Service Inc. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 582 W Hayden Ave Hayden Id

(Signed) _____ (WELL DRILLER) License No. 0393

Contractor's Registration No. H2OWES158KB Date 6-22, 1990

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 060-1-20 (10/87) -1329-

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 9563

Water Right Permit No. _____

(1) **OWNER:** Name City of Newport Wa Address 5200 Washington St.

(2) **LOCATION OF WELL:** County Pondarille NE ¼ SE ¼ Sec 24 T. 31 N., R. 45 W.M.

(2a) **STREET ADDDRESS OF WELL** (or nearest address) _____

(3) **PROPOSED USE:** ☒ Domestic ☐ Industrial ☐ Municipal ☐ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

(4) **TYPE OF WORK:** Owner's number of well (if more than one) Well "F"

Abandoned ☐ New well ☐ Method: Dug ☐ Bored ☐
Deepened ☒ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 8" inches.
Drilled 120 feet. Depth of completed well 80 ft.

(6) **CONSTRUCTION DETAILS:**

Casing installed: 8" Diam. from +3 ft. to 70 ft.
Welded ☒
Liner installed ☐ _____" Diam. from _____ ft. to _____ ft.
Threaded ☐ _____" Diam. from _____ ft. to _____ ft.

Perforations: Yes ☐ No ☒
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type Telescope Model No. _____
Diam. 8" Slot size 60 from 70 ft. to 75 ft.
Diam. 8" Slot size 40 from 75 ft. to 80 ft.

Gravel packed: Yes ☐ No ☒ Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes ☒ No ☐ To what depth? 19 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) **PUMP:** Manufacturer's Name —
Type: _____ H.P. _____

(8) **WATER LEVELS:** Land-surface elevation above mean sea level _____ ft.
Static level 19 ft. below top of well Date _____
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.))

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom? _____
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest _____ gal./min. with stem set at _____ ft. for _____ hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? Yes ☐ No ☐

(10) **WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION**

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Pulled Screen from	80'	70'
Redrilled 70 to 80		
Brown Sand	80	105
Decomposed Granite	105	120
Casing Pulled back		
to 80' and Screen		
Reset from 70'-80'		

RECEIVED
BY [redacted]
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE
Sept 28, 1990

Work started Aug 25, 1990 completed Aug 31, 1990

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME H2O well Service Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 582 W Hayden ave Hayden Idaho

(Signed) Earl Potts (WELL DRILLER) License No. 0393

Contractor's Registration No. H2OWCS158KB Date 9-20, 1990

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329- 3

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

al and First Copy with
nt of Ecology
Copy — Owner's Copy
Copy — Driller's Copy

#59350 DNS

WATER WELL REPORT

CITY OF NEWPORT STATE OF WASHINGTON

Application No. G3-26830
Permit No. ....

(1) OWNER: Name Mr. Bing Bowerman Address Lazy Acres Trailer Court Box 351

(2) LOCATION OF WELL: County Pend Oreille NE ¼ SE ¼ Sec. 24 T. 31 N., R. 45E W.M.

Bearing and distance from section or subdivision corner WELL SOLD TO CITY BY BOWERMAN

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 8 inches.
Drilled 80 ft. Depth of completed well 67 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 8 " Diam. from plus2 ft. to 56 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson Well Screen
Type Stainless Steel Model No.
Diam. 8 Slot size .050 from 7 57 ft. to 67 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal Cement
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level.... 2200 ft.
Static level 16 ft. below top of well Date 6/6/78
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: 200 gal./min. with Unk. ft. drawdown after hrs.
" Air test " " "
" " " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test 6/6/78
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG: WELL #d

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Top Soil (soft)	0	3
Sandy clay W/ some gravel	3	24
Grayish rock and sand (soft)	24	28
Very course sand W/some gravel	28	81
alot of water at the depth of 41 feet on. 200 G. P. M.		

RECEIVED
JUL 10
DEPT. OF ECOLOGY

NEWPORT, CITY OF PWS: 59350 SRC: 05
PEND OREILLE Long: -117.05234 Lat: 48.173216
Well Tag: AHC030

Work started June 2, 19 78 Completed June 6, 19 78

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Uhlenkott Well Drilling (Person, firm, or corporation) (Type or print)

Address Route 1, Box 20 Fenn, Idaho 83538

[Signed] (Well Driller)

License No. 767 Date July 3, 19 78

7/13/78 Newport T/c

USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 003425

Water Right Permit No. _____

(1) OWNER: Name City of Newport Address 5. 200 Washington Ave

(2) LOCATION OF WELL: County Pend Oreille NE ¼ SE ¼ Sec 24 T. 31 N. R. 45 E. W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address) _____

(3) PROPOSED USE: ☐ Domestic ☐ Irrigation ☐ DeWater ☐ Industrial ☐ Test Well ☑ Municipal ☐ Other

(4) TYPE OF WORK: Owner's number of well (if more than one) _____

Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☒ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 10" inches.
Drilled 110 feet. Depth of completed well 105 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 10 " Diam. from +3 ft. to ~~105~~ 90 ft.
Welded ☒
Liner installed ☐ _____ " Diam. from _____ ft. to _____ ft.
Threaded ☐ _____ " Diam. from _____ ft. to _____ ft.

Perforations: Yes ☐ No ☒
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type Telescope Model No Hi Q
Diam. 10" Slot size 30 from 90 ft. to 105 ft.
Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes ☐ No ☒ Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal Cement + Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name Berkeley
Type: Submersible Turbine H.P. 25

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 21 ft. below top of well Date 1-17-90
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? H20
Yield: 123 gal./min. with 61 ft. drawdown after 5 hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test 1/23/90

Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest _____ gal./min. with stem set at _____ ft. for _____ hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Gravel - Fill	0	1
Gray Clay	1	3
Brown Sand	3	10
Gray Sand & Clay	10	35
Brown Sand	35	110

RECEIVED
MAR - 6 1990
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 1-2-90 Completed 1-17 19 90

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME H20 well Service Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 502 W/ Hayden Ave Hayden Idaho

(Signed) Carl Putta (WELL DRILLER) License No 0393

Contractor's Registration No. H20wes158KB Date 1-22- 19 90

(USE ADDITIONAL SHEETS IF NECESSARY)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report

ECY 050-1-20 (10/87) -1329- 3

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No
Permit No

(1) **OWNER:** Name John R. Posk Address General Delivery, Newport, WA 99156

(2) **LOCATION OF WELL:** County PEND OREILLE W½, E½ NW ¼ SE ¼ Sec. 24 T. 31 N., R. 45E W.M.
Bearing and distance from section or subdivision corner

(3) **PROPOSED USE:** Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (if more than one)....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 6 inches.
Drilled 190 ft. Depth of completed well 165 ft.

(6) **CONSTRUCTION DETAILS:**
Casing installed: 6 " Diam. from +1 ft. to 162 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type stainless steel Model No.
Diam. 5 Slot size .8 from 160 ft. to 165 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 40 ft.
Material used in seal bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) **PUMP:** Manufacturer's Name
Type: H.P.

(8) **WATER LEVELS:** Land-surface elevation above mean sea level.... ft.
Static level 130 ft. below top of well Date 9/24/85
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: 2½-3 gal./min. with ft. drawdown after hrs.
" ESTIMATED AIRLIFT " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Baller test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) **WELL LOG:**
Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Sand & brown clay	0	35
Sand & cemented gravel	35	79
Clay, gray, hard	79	99
Clay, tan, hard	99	126
Sand, tan clay	126	160
Sand & gravel	160	190
NO PVC Liner Installed		
6" Drive shoe installed		

RECEIVED
OCT 3 1985
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 9/19, 19 85 Completed 9/24/, 19 85

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME PONDEROSA DRILLING & DEVELOPMENT INC.
(Person, firm, or corporation) (Type or print)

Address E. 6010 Broadway, Spokane, WA 99212

[Signed]
W. Scott Barratt (Well Driller)

License No. 0996 Date 9/24/, 19 85

10/3/85

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

WATER WELL REPORT

State of Washington Date Printed: **05-Feb-2007** Log No. **54906**

Construction / Decommission: Original Construction Notice of Intent #: 252943

Construction

PROPOSED USE: **DOMESTIC**

TYPE OF WORK: Owners's Well Number: (If more than one well) **1**

DEEPENED Method: **ROTARY**

DIMENSIONS: Diameter of well: **6** inches

Drilled **220** ft. Depth of completed well **220** ft.

CONSTRUCTION DETAILS:

Liner installed: **CASING**

5 " Dia from **210** ft. to **215** ft.

Casing installed **WELDED**

6 " Dia from **+2** ft. to **215** ft.

" Dia from ft. to ft.

" Dia from ft. to ft.

Perforations: **No** Used In:

Type of perforator used

SIZE of perforations in. by in.

Perforations from ft. to ft.

Perforations from ft. to ft.

Perforations from ft. to ft.

Screens: **Yes** K-Pac Location: 209

Manufacture's Name JOHNSON

Type: **SLOTTED** Model No **STAINLESS**

Diam. **5** slot size: **14** from **215** ft. to **220** ft.

Diam. slot size: from ft. to ft.

Gravel/Filter packed: **No** Size of Gravel

Material placed from ft. to ft.

Surface seal: **No** To what depth ft.

Seal method: Material used in seal **EXISTING**

Did any strata contain unusable water **No**

Type of water Depth of strata

Method of sealing strata off

PUMP: Manufacture's name

Type: H.P. **0**

WATER LEVELS: Land-surface elevation above mean sea level: **0** ft.

Static level **150** ft. below top of well Date **11/14/2006**

Artesian Pressure lbs per square inch Date

Artesian water controlled by

WELL TESTS: Drawdown is amount water level is lowered below static level.

Was a pump test made? **No** If yes, by whom

Yield: gal/min with ft drawdown after

Yield: gal/min with ft drawdown after

Yield: gal/min with ft drawdown after

Recovery data (time taken as zero when pump turned off)(water level measured from well top to water level

Time:	Water Level	Time:	Water Level	Time:	Water Level

Date of test:

Bailer test gal/min ft drawdown after hrs.

Air test **15** gal/min w/ stem set at **210** ft. for **1** hours

Artesian flow gpm Date

Temperature of water Was a chemical analysis made **No**

CURRENT

Notice of Intent No.: **W233950**

Unique Ecology Well I.D. No **APC728**

Water Right Permit Number:

OWNER: **POSK, JOHN**

OWNER ADD **P.O. BOX 556**

NEWPORT, WA 99156

Well Add: **406 SILVERBIRCH RD.**

City: **Newport, WA 99156** County: **Pend Oreille**

Location: **NW** 1/4 **SE** 1/4 Sec **24** T **31** R **45E** EW

Lat/Long: (s, t, r still REQUIRED) Lat Deg Lat Min/Sec

Long Deg Long Min/Se

Tax Parcel No.:

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure. Show thickness of aquifiers and the kind and nature of the material in each stratum penetrated. Show at least one entry for each change in formation.

Material	From	To
EXISTING WELL	**0**	**162**
COARSE SAND W/some GRAVEL W/WATER	**162**	**200**

RECEIVED
FEB 15 2007
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Notes:

Work started **11/07/2006** Complete **11/14/2006**

WELL CONSTRUCTION CERTIFICATION:

I constructed and/or accept responsibility for construction of this well and its compliance with all Washington well construction standards. Materials used and the information reported are true to my best knowledge and belief.

☑ Driller ☐ Engineer ☐ Trainee

Name: **FORREST TENNANT II** License No.: **2687**

Signature: 1933

If trainee, Licensed driller is: License No.:

Licensed Driller Signature

Drilling Company:

NAME: **FOGLE PUMP & SUPPLY, INC.** Shop: **AIRWAY HEI**

ADDRESS: **PO BOX 1450**

Airway Heights, WA 99001

Phone: **(509) 244-0846** Toll Free: **(888) 343-9355**

E-Mail: **andrea@foglepump.com**

FAX: **(509) 244-2875** WEB Site: **WWW.FOGLEPUMP.COM**

Contractor's Registration No.: **FOGLEPS095L4** Date Log Created: **12/20/200**

Attachment C

Detailed Cost Estimates

Table C1 - Preliminary Cost Estimate Summary

Project No 140129, Pend Oreille Diversion Appraisal Study, Newport WA

	Total Cost		Unit Cost	
	Capital Cost	**Annual O&M**	**Capital Cost (per ac-ft)**	**Annual O&M (per acre-foot)**
Alternative 1A	$17,725,000	$220,000	$2,450	$30
Alternative 1B	$21,475,000	$242,000	$2,970	$33
Alternative 2A	$14,965,000	$251,000	$2,070	$35
Alternative 2B	$19,841,000	$277,000	$2,740	$38

Table C2 - Preliminary Cost Estimate, Surface Water Pumping Alternatives

Project No 140129, Pend Oreille Diversion Appraisal Study, Newport WA

				Alternative 1A		Alternative 1B	
Item	**Description**	**Unit**	**Unit Cost**	**QTY**	**Total Cost**	**QTY**	**Total Cost**
1.0	**General**				**$1,190,000**		**$1,267,000**
1.1	Mobilization	LS	(variable)	1	$915,000	1	$1,132,000
1.2	TESC	LS	(variable)	1	$200,000	1	$35,000
1.3	Temporary Traffic Control	LS	$50,000	1	$75,000	1	$100,000
2.0	**Site Preparation / Demo**				**$100,000**		**$15,000**
2.1	Clearing and grubbing	AC	$5,000	20	$100,000	3	$15,000
3.0	**Surface Water Pump Station**				**$1,782,000**		**$1,782,000**
3.1	Structure Excavation, Export Offsite	CY	$50	500	$25,000	500	$25,000
3.2	Structure Excavation, Rock	CY	$100	100	$10,000	100	$10,000
3.3	Structure Excavation, Stockpile Onsite	CY	$40	200	$8,000	200	$8,000
3.4	Shoring / Trench Safety	SF	$20	2500	$50,000	2500	$50,000
3.5	Construction Dewatering	LS	$250,000	1	$250,000	1	$250,000
3.6	Import Bedding Material, Placement and Compaction	CY	$50	50	$2,500	50	$2,500
3.7	Backfill Material, Placement and Compaction	CY	$30	150	$4,500	150	$4,500
3.9	Wetwell Structural Concrete	CY	$1,500	50	$75,000	50	$75,000
3.10	Wetwell Appurtenances (Access Hatch, Ladder)	LS	$15,000	1	$15,000	1	$15,000
3.11	Check Valve	EA	$15,000	3	$45,000	3	$45,000
3.12	Intake Pipe	LF	$400	150	$60,000	150	$60,000
3.13	Screened intake	LS	$200,000	1	$200,000	1	$200,000
3.14	Screen Purge System	LS	$75,000	1	$75,000	1	$75,000
3.15	Internal Piping / Plumbing, Isolation Valves	LS	$120,000	1	$120,000	1	$120,000
3.16	Pumps	LS	$50,000	3	$150,000	3	$150,000
3.17	Floats, Switches, Automated Control	LS	$250,000	1	$250,000	1	$250,000
3.18	Flow Meter	LS	$8,000	1	$8,000	1	$8,000
3.19	Surge anticipator valve station	LS	$50,000	1	$50,000	1	$50,000
3.20	Electrical / Power Supply	LS	$250,000	1	$250,000	1	$250,000
3.21	Building Structure	SF	$250	180	$45,000	180	$45,000
3.22	24" Steel Discharge Pipe	LF	$300	100	$30,000	100	$30,000
3.23	Miscellaneous Appurtenances	LS	$50,000	1	$50,000	1	$50,000
3.24	Surface Restoration - Topsoil	CY	$35	200	$7,000	200	$7,000
3.25	Surface Restoration - Hydroseeding	SY	$1	1000	$1,000	1000	$1,000
3.26	Surface Restoration - Gravel Access	SY	$10	100	$1,000	100	$1,000
4.0	**Pipeline**				**$3,980,000**		**$7,760,000**
4.1	24" DI Pipeline - Unimproved Surface Restoration	LF	$240	5,500	$1,320,000	5,500	$1,320,000
4.2	24" DI Pipeline - Urban Roadway Corridor	LF	$270	6,000	$1,620,000	20,000	$5,400,000
4.3	24" DI Pipeline - Trenchless Construction	LF	$1,500	150	$225,000	150	$225,000
4.4	24" DI Pipeline - Gravel Surface Restoration	LF	$240	1,000	$240,000	1,000	$240,000
4.5	Relocation of Existing Utilities	LS	$500,000	1	$500,000	1	$500,000
4.6	Pipeline Appurtenances (Air-Valves, Blow-Offs, Etc.)	LS	$50,000	1	$50,000	1	$50,000
4.7	Stilling Well - Discharge Structure	LS	$25,000	1	$25,000	1	$25,000
5.0	**Little Spokane Channel Improvement**				**$1,650,000**		**$0**
5.1	Diversion and Care of Water	LS	$200,000	1	$200,000	0	$0
5.2	Culvert Replacement (SR2)	EA	$300,000	1	$300,000	0	$0
5.3	Culvert Replacement (Minor)	EA	$50,000	5	$250,000	0	$0
5.4	Excavate and Stabilize Channel	LF	$40	10,000	$400,000	0	$0
5.5	Project Headwater Flow Control and Automation	LS	$500,000	1	$500,000	0	$0
6.0	**Environmental Mitigation**				**$450,000**		**$500,000**
6.1	Habitat Improvements / Mitigation (5% Construction Cost)	LS	(variable)	1	$450,000	0	$500,000
	Direct Cost						
	Construction Subtotal				$9,152,000		$11,324,000
	Contingency			25%	$2,288,000	25%	$2,831,000
	Washington State Sales Tax			7.6%	$869,000	7.6%	$1,076,000
	Direct Cost Total				**$12,309,000**		**$15,231,000**
	Indirect Cost						
	Allowance for Easement / Property Acquisition			1%	$123,000	1%	$152,000
	Design Engineering, Project Survey			20%	$2,462,000	20%	$3,046,000
	Permitting			10%	$1,231,000	7%	$1,066,000
	Management / Administration			3%	$369,000	3%	$457,000
	Construction Oversight			10%	$1,231,000	10%	$1,523,000
	Indirect Cost Total				**$5,416,000**		**$6,244,000**
	Total Project Capital Costs				**$17,725,000**		**$21,475,000**

Table C3 - Preliminary Cost Estimate, Groundwater Pumping Alternative

Project No 140129, Pend Oreille Diversion Appraisal Study, Newport WA

				Alternative 2A		Alternative 2B	
Item	**Description**	**Unit**	**Unit Cost**	**QTY**	**Total Cost**	**QTY**	**Total Cost**
1.0	**General**				**$934,000**		**$1,146,000**
1.1	Mobilization	LS	(variable)	1	$789,000	1	$1,061,000
1.2	TESC	LS	(variable)	1	$95,000	1	$10,000
1.3	Temporary Traffic Control	LS	$50,000	1	$50,000	1	$75,000
2.0	**Site Preparation / Demo**				**$100,000**		**$5,000**
2.1	Clearing and grubbing	AC	$5,000	20	$100,000	1	$5,000
3.0	**Groundwater Well Source**				**$1,562,000**		**$1,562,000**
3.1	Drill Well (3-Wells, 500 ft each)	LF	$300	1500	$450,000	1500	$450,000
3.2	Well Casing	LF	$80	1500	$120,000	1500	$120,000
3.3	Install Telescoping Screen	LF	$300	300	$90,000	300	$90,000
3.4	Well Development, Disinfection, Pump Testing	LS	$10,000	1	$10,000	1	$10,000
3.5	Check Valve	EA	$15,000	3	$45,000	3	$45,000
3.6	Internal Piping / Plumbing, Isolation Valves	LS	$120,000	1	$120,000	1	$120,000
3.7	Pumps	EA	$45,000	3	$135,000	3	$135,000
3.8	Switches, Automated Control	LS	$250,000	1	$250,000	1	$250,000
3.9	Flow Meter	LS	$8,000	1	$8,000	1	$8,000
3.10	Electrical / Power Supply	LS	$200,000	1	$200,000	1	$200,000
3.11	Building Structure	SF	$250	180	$45,000	180	$45,000
3.12	24" Steel Discharge Pipe	LF	$300	100	$30,000	100	$30,000
3.13	Miscellaneous Appurtenances	LS	$50,000	1	$50,000	1	$50,000
3.14	Surface Restoration - Topsoil	CY	$35	200	$7,000	200	$7,000
3.15	Surface Restoration - Hydroseeding	SY	$1	1000	$1,000	1000	$1,000
3.16	Surface Restoration - Gravel Access	SY	$10	100	$1,000	100	$1,000
4.0	**Pipeline**				**$3,620,000**		**$7,400,000**
4.1	24" DI Pipeline - Unimproved Surface Restoration	LF	$240	4,000	$960,000	4,000	$960,000
4.2	24" DI Pipeline - Urban Roadway Corridor	LF	$270	6,000	$1,620,000	20,000	$5,400,000
4.3	24" DI Pipeline - Trenchless Construction	LF	$1,500	150	$225,000	150	$225,000
4.4	24" DI Pipeline - Gravel Surface Restoration	LF	$240	1,000	$240,000	1,000	$240,000
4.5	Relocation of Existing Utilities	LS	$500,000	1	$500,000	1	$500,000
4.6	Pipeline Appurtenances (Air-Valves, Blow-Offs, Etc.)	LS	$50,000	1	$50,000	1	$50,000
4.7	Stilling Well - Discharge Structure	LS	$25,000	1	$25,000	1	$25,000
5.0	**Little Spokane Channel Improvement**				**$1,300,000**		**$0**
5.1	Diversion and Care of Water	LS	$200,000	1	$200,000	0	$0
5.2	Culvert Replacement (SR2)	EA	$150,000	1	$150,000	0	$0
5.3	Culvert Replacement (Minor)	EA	$50,000	5	$250,000	0	$0
5.4	Excavate and Stabilize Channel	LF	$40	10,000	$400,000	0	$0
5.5	Project Headwater Flow Control and Automation	LS	$300,000	1	$300,000	0	$0
6.0	**Environmental Mitigation**				**$375,000**		**$500,000**
6.1	Habitat Improvements / Mitigation (5% Construction Cost)	LS	(variable)	1	$375,000	0	$500,000
	Direct Cost						
	Construction Subtotal				$7,891,000		$10,613,000
	Contingency			25%	$1,973,000	25%	$2,653,000
	Washington State Sales Tax			7.6%	$750,000	7.6%	$1,008,000
	Direct Cost Total				**$10,614,000**		**$14,274,000**
	Indirect Cost						
	Allowance for Easement / Property Acquisition			1%	$106,000	1%	$143,000
	Design Engineering, Project Survey			20%	$2,123,000	20%	$2,855,000
	Permitting			7%	$743,000	5%	$714,000
	Management / Administration			3%	$318,000	3%	$428,000
	Construction Oversight			10%	$1,061,000	10%	$1,427,000
	Indirect Cost Total				**$4,351,000**		**$5,567,000**
	Total Project Capital Costs				**$14,965,000**		**$19,841,000**

Table C4 - Preliminary Operations and Maintenance Estimate

Project No 140129, Pend Oreille Diversion Appraisal Study, Newport WA

	Mech / Elec Improvements	Fixed Improvements	Electrical Costs	Total Annual O&M
Alternative 1A	$89,000	$61,000	$70,000	$220,000
Alternative 1B	$89,000	$83,000	$70,000	$242,000
Alternative 2A	$78,000	$53,000	$120,000	$251,000
Alternative 2B	$78,000	$79,000	$120,000	$277,000