EXECUTIVE SUMMARY

The Level 1 Data Compilation and Technical Assessment is the first comprehensive compilation and synthesis of water-resource data for Water Resource Inventory Area (WRIA) 54, which is the watershed of the Lower Spokane River. WRIA 54 is one of 62 major watersheds in Washington State delineated for planning purposes under the state's Water Resources Management Program.

The Level 1 assessment was prepared under Phase 2 of the WRIA 54 watershed planning effort, which is being led by Spokane County in cooperation with other private and government agencies and groups that make up the WRIA 54 Planning Unit. The Planning Unit will use the data assembled for the technical assessment to make recommendations for water quantity, in-stream flow, and water quality issues. These recommendations will be outlined in a watershed management plan for WRIA 54, to be completed by 2008.

WATERSHED CHARACTERISTICS

WRIA 54, an 885-square-mile watershed in eastern Washington, encompasses portions of the Cities of Spokane and Medical Lake, Spokane, Stevens and Lincoln Counties, and Fairchild Air Force Base; most of the Spokane Indian Reservation; and the City of Airway Heights (see Figure 1-1). The dry but temperate climate of the area has interacted with local geology to create soils, aquifers, and water bodies that interact in complex ways. The watershed consists of 13 subbasins:

- Airway (81 square miles)
- Camas Valley (90 square miles)
- Coulee Creek (54 square miles)
- Deep Creek, North-South (80 square miles)
- Ford (100 square miles)
- Harker Canyon (60 square miles)
- Little Chamokane (71 square miles)
- Long Lake, North (48 square miles)
- Long Lake, South (66 square miles)
- Orazada (29 square miles)
- Pitney (46 square miles)
- Sand Blue (95 square miles)
- Spring Creek (63 square miles)

Surface Water

The Spokane River enters WRIA 54 at its confluence with Latah (Hangman) Creek and exits WRIA 54 at its confluence with the Columbia River. WRIA 54 includes 75.6 percent of the river's length. Much water-resource information exists for the main stem Spokane River throughout WRIA 54, but very little exists for most of the tributaries, such as Deep and Coulee Creeks, Spring Creek, and Mill Creek. While the main stem Spokane River is by far the largest surface water body in the WRIA and therefore may warrant a primary focus, it will be impossible to comprehensively manage the watershed without better data for the tributary subbasins. This need is particularly acute in the Deep Creek, Coulee Creek, Airway and Long Lake North subbasins, which are experiencing rapid change resulting from development.

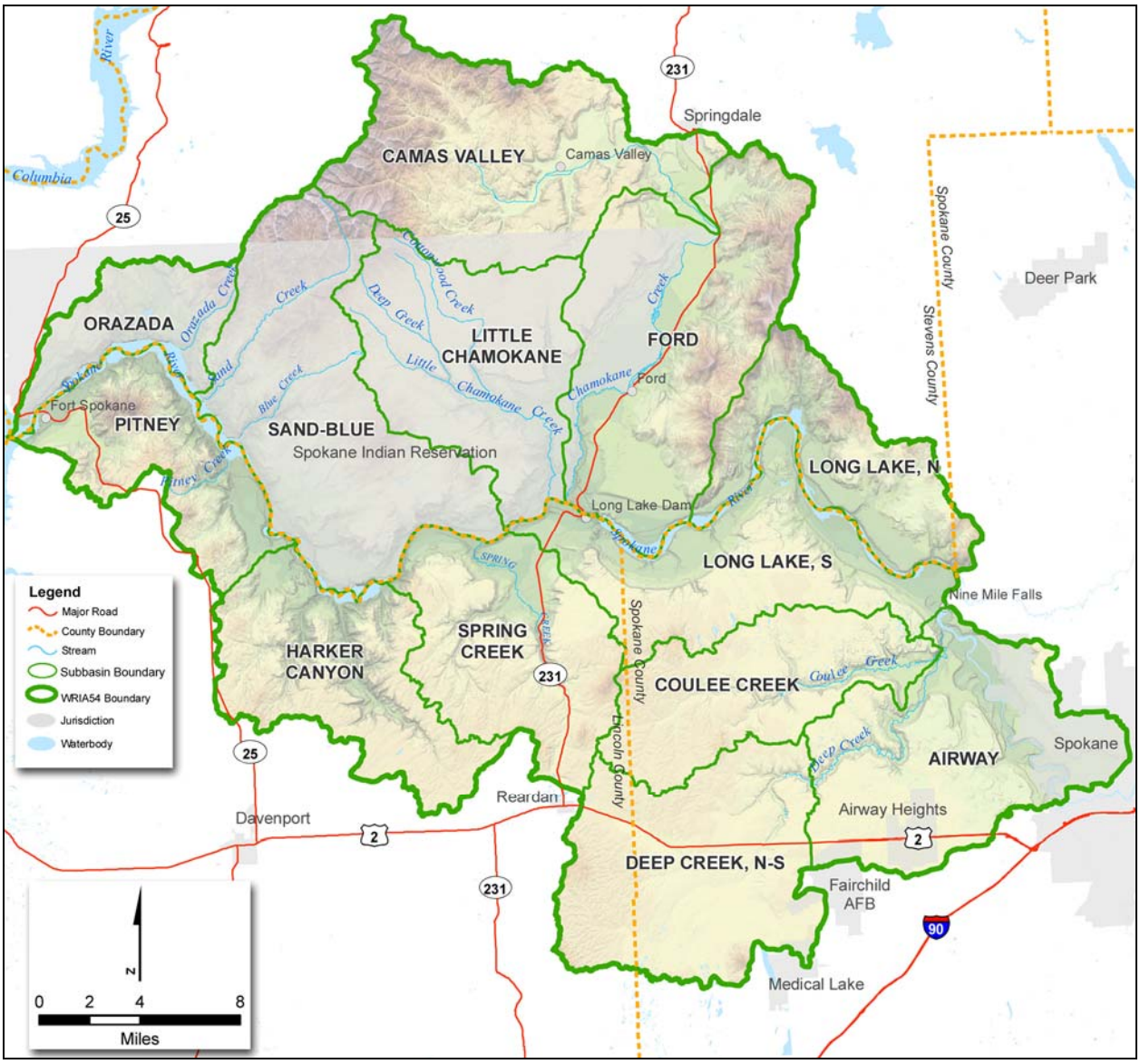

Figure ES-1. WRIA 54 Boundaries and Key Features

Groundwater

The Spokane Valley-Rathdrum Prairie (SVRP) Aquifer discharges water to the Spokane River between Latah (Hangman) Creek and Nine Mile Falls Dam. During low-flow periods, this discharge is a significant component of flow for the Spokane River in WRIA 54, and the WRIA 54 Planning Unit will have a keen interest in the quality and quantity of SVRP water that contributes flow to the Spokane River. Significant groundwater interaction with the Spokane River below Nine Mile Falls Dam has not yet been adequately studied, and warrants further investigation.

A number of other groundwater aquifers whose characteristics are not currently well-known warrant further study as well, as they hold promise for water supply purposes or appear to be already over-utilized in some areas. These include the following:

- The Chamokane Valley Aquifers—These aquifers lie in unconsolidated sand and gravel in the drainage basin of Chamokane Creek (in the Ford subbasin and possibly the Camas Valley

subbasin). An upper aquifer lies in sands and gravels 20 to 100 feet thick. A lower aquifer is below the upper aquifer, separated by a layer of silt and clay; little information about the lower aquifer is currently available.

- Columbia River Basalt Group (CRBG) aquifers that are present in most of the southern portion of the WRIA (south of the Spokane River):
  - Grande Ronde Formation Aquifers—The Grande Ronde Basalt Formation is the most voluminous of the CRBG formations, making up 85 to 88 percent of the total volume of the CRBG. The Grande Ronde has been observed to be up to 514 feet thick in the West Plains area.
  - Wanapum Basalt Formation Aquifers—The Wanapum Basalt Formation is the second-most voluminous of the CRBG formations, making up about 6 percent of the total volume. It overlies the Grande Ronde Basalt and is present throughout much of the study area south of the Spokane River. The Wanapum Basalt has been observed to be up to 292 feet thick in wells in the West Plains area.
  - Paleochannel Aquifers—Some locations in the Wanapum basalt feature "paleochannels," which are channels carved into the basalt by ancient rivers that later filled with glacial sands and gravels. Sediment accumulations in these channels are over 200 feet thick in spots and provide large quantities of usable groundwater.

Groundwater/surface water interaction is a dynamic component of the intra-basin water balance throughout WRIA 54. This exchange of water is not well understood below Lake Spokane (Long Lake) on the Spokane River, and even less well documented in tributary subbasins. Hydraulic continuity between the Upper Chamokane Valley Aquifer and Chamokane Creek is believed to be significant, based on historical observations of water levels, stream flow and water well pumping.

Population and Land Use

The 2000 population of WRIA 54 is estimated to be slightly over 89,000, and the population is projected to grow to slightly over 122,000 by 2025, a 37-percent increase.

Currently, 49 percent of the area of WRIA 54 is forested, 25 percent is used for agriculture, and 18 percent is open land. The remaining 8 percent is a mix of residential, commercial and industrial development, open water, wetlands and barren land. At buildout (full development allowed by current zoning), the area of the watershed could be 47 percent agricultural, 33 percent low-intensity residential and 11 percent forest, with all other uses making up the remaining 9 percent of the area. These percentages indicate allowed development under current zoning, not actual growth projections.

WATER RIGHTS

Water right claims, which are assertions of vested water rights established through beneficial use that began prior to state regulation of water rights, dominate the recorded water documents in WRIA 54. More than 1,700 claims are included in state records, with a total estimated claim to almost 38,000 acre-feet of water annually, based on standard quantity assumptions recommended by the Department of Ecology (Ecology). This annual volume is about evenly divided between surface water claims and groundwater claims. Water rights authorized by state-approved certificates or temporarily authorized by state-approved permits amount to a total annual allocation of 78,500 acre-feet of water—about 80 percent from groundwater sources and 20 percent from surface water sources. The Spokane Tribe holds quantified irrigation rights to Chamokane Creek totaling more than 25,000 acre-feet; these rights were affirmed in a 1979 federal court order. It is estimated that permit-exempt rights, which require no permit based on their

size or intended use, account for an additional allocation of about 5,800 acre-feet per year. Figure ES-2 summarizes available records on claims, permits and certificates, and permit-exempt rights.

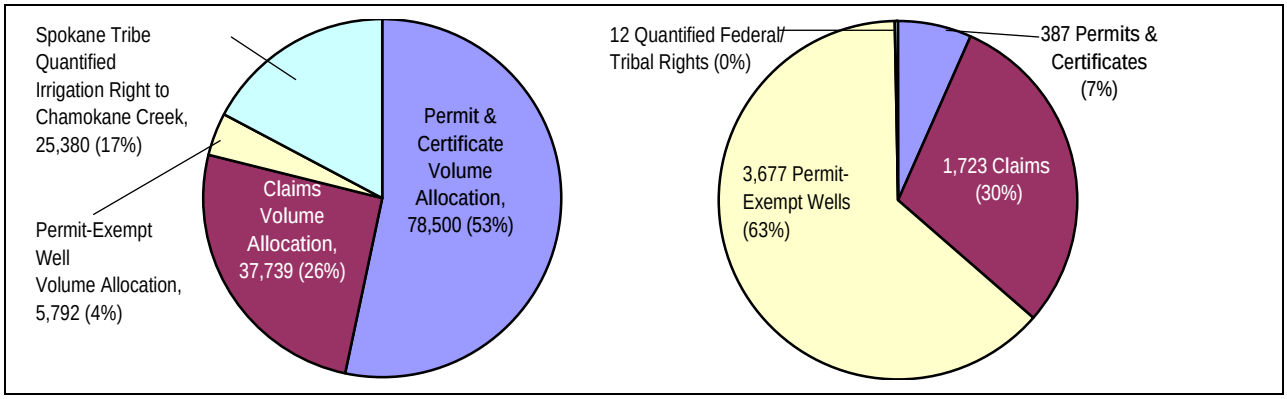

Figure ES-2. Summary of Water Rights by Allocated Annual Volume in Acre-Feet (left) and Number of Rights (right)

Uncertainty about the true quantity of water appropriated through claims restricts the ability to effectively manage water resources in WRIA 54. The understanding of the probable appropriation could be refined through additional targeted studies, but only an adjudication can actually validate these potential appropriations. The first targeted studies we recommend are the following:

- Investigate the largest claims to evaluate the likelihood that they are actively being used, and if so, the nature of the use.
- Further investigate potential duplicate claims to establish greater confidence that they can be removed from water-rights calculations.
- Because so many of the claims are to groundwater for small quantities, it is likely that many of these serve single domestic needs. The estimates for permit-exempt wells in this document may overlap significantly with this category of claims. A study to evaluate the magnitude of this overlap would help refine the understanding of this potential appropriation.

Significant tribal reserved water rights exist in WRIA 54, owned by the Spokane Tribe. These rights pre-date Washington State's water code, and are partially quantified for the Tribe's use of Chamokane Creek. Other tribal and federal reserved water rights in WRIA 54 are not quantified; rather, they are described qualitatively as water needed to serve the purposes of the reservation or other land holding. For instance, if an Indian reservation is set aside in a treaty for "farming and fishing purposes," the measure of the water rights reserved is not a specific amount of water appropriated at some historical time, but the amount of water that is necessary now or in the future for the reservation's use in farming and fishing. Federal and Indian reserved water rights are not subject to state law provisions requiring continuous beneficial use of water to retain a water right. (Pharris et al, 2002) .

The estimates for permit-exempt wells were developed using standard methodologies. However, because there is almost no information to verify the location and use of these wells, it is impossible to accurately evaluate the impacts of permit-exempt wells. For exempt wells that are simply providing water to one home, the individual impact is not likely to be significant. Significant impacts may be occurring where exempt wells provide significant water for agricultural or industrial purposes, for multiple homes, or where there is a high density of permit-exempt wells.

WATER USE

Actual current water use in WRIA 54 was estimated for several types of uses as follows:

- Irrigation—27,223 acre-feet per year
- Large public water systems (Group A systems)—22,404 acre-feet per year
- Permit-exempt wells—5,792 acre-feet per year
- Small public water systems (Group B systems)—39 acre-feet per year
- Stock watering—259 acre-feet per year
- Other uses—524 acre-feet per year

Although the total estimated current use in WRIA 54 (56,639 acre-feet per year) is well below the amount allocated by potential water rights (147,411 acre-feet per year), the estimated actual use exceeds potential water right appropriations in three subbasins: Harker Canyon, Little Chamokane, and Pitney. This may be the result of transfer of water between subbasins (a water right in one subbasin with actual use in a different subbasin). In some heavily populated subbasins, actual current water use that exceeds current allocated withdrawals may not be identified in this analysis if the estimates of allocated withdrawal include inchoate water rights (currently unused portions of water rights) held by municipal water purveyors in those subbasins. Illegal water use—not covered by a water right permit, certificate, claim, or permit-exempt well—is not addressed in this assessment.

WATER BALANCE

A water balance provides an understanding of the magnitude of each component of water entering and leaving the watershed (precipitation, surface water inflow, consumptive use, etc.) and identifies where surpluses and deficits exist, both spatially throughout the watershed, and seasonally throughout the year. A water balance over such a large planning area as WRIA 54 has limited direct connection to water-resource allocation management, but it does provide useful information for general planning, education, and targeting further detailed work efforts. Table ES-1 summarizes the estimated annual water volumes for the water balance components evaluated for this technical assessment.

The Spokane River accounts for 4,845,000 acre-feet of the total annual inflow to WRIA 54 and 5,278,000 acre-feet of the annual outflow from the watershed. Although the river dominates the water balance to such a large extent that other components of the water balance appear insignificant, the other water balance components are significant with respect to water resource management. For example, water balance components such as groundwater flow and net demand could be critical factors in water resource management at the basin and particularly subbasin level. These components are among the least understood at this time.

FUTURE WATER NEEDS

Future water needs, which are anticipated to be primarily for municipal and domestic supply (this includes associated commercial/industrial uses), are expected to increase by approximately 57 percent by 2025, based on WRIA 54 growth projections. This increase will likely be focused in two areas—the West Plains region of Spokane County and near the Spokane River downstream from the City of Spokane—and the increase may exceed 57 percent in those areas. Some of the new demand will be within established water service areas, but existing purveyors' systems may not be fully built at this point. Other growth areas will be outside of established water service areas.

TABLE ES-1.
WRIA 54 WATER BALANCE SUMMARY

Component	Average Annual Volume (acre-feet)	% of Total
Inflows		
Surface Water Inflow	5,502,871	91.6%
Groundwater Inflow	130,340	2.2%
Precipitation	333,972	5.5%
Imported Water[a]	40,825	0.7%
Total Inflow	**6,008,006**	**100%**
Outflows		
Surface Water Outflow	5,280,479	84.5%
Groundwater Outflow	15,922	0.3%
Evapotranspiration[b]	923,212	14.8%
Exported Water	267	0.0%
Net Demand[c]	25,970	0.4%
Total Outflow	**6,245,849**	**100%**
Difference Between Outflow and Inflow	237,843	
% Difference Between Outflow and Inflow	4.0%	

a. Discharge of treated wastewater effluent from sources outside the watershed
b. Loss of water through evaporation to the atmosphere and uptake by plants
c. Municipal, domestic, commercial, industrial and agricultural water consumption

Municipal purveyors' inchoate water rights will help meet this future demand. The magnitude of inchoate rights differs among purveyors, however, and may not be matched to where actual growth in water demand will occur. This should be approached as a regional issue through a coordinated planning effort.

Water conservation can be an important component in meeting current and future water supply needs. All municipal purveyors currently have conservation programs described in their water system plans; implementation of these programs, as well as additional conservation activities, will produce significant water savings. Because outdoor water use (residential, commercial, and agricultural irrigation) is such a large component of water use in WRIA 54, conservation efforts targeted to reducing outdoor water use will be most fruitful. For example, outdoor water use accounts for approximately three-quarters of the water consumed by the Group A and Group B systems alone in WRIA 54. One exception to this is on the Spokane Indian Reservation where few homes maintain lawns.

Water needs for in-stream flow are being evaluated through the WRIA 54/57 Instream Flow Study currently being conducted. Results of the instream flow study will help quantify stream flow requirements for fish in the free-flowing portion of the main stem Spokane River, Deep Creek, Coulee Creek, Little Chamokane Creek, and Lower Spring Creek. These results will be integrated with other instream flow needs and Level 1 Assessment results by the Planning Unit as the WRIA 54 Watershed Plan is developed.

POTENTIAL FUTURE WATER SOURCES

One of the primary goals of watershed planning is to estimate the amount of water available for future allocation in the watershed. In WRIA 54, gaps in the existing data set limit the understanding of watershed hydrology and make a comprehensive determination of water availability difficult. Water availability considerations for WRIA 54 include the following:

- Surface water could be available for future allocation from the Lower Spokane River. This determination will depend upon, among other factors, the in-stream flow analysis currently being performed for the WRIA 54 Planning Unit on the free-flowing reach of the Lower Spokane River.
- Surface water could be available for future allocation from tributaries of the Lower Spokane River if further investigation shows it could be done with acceptable impacts. Stream flow data are currently not available for most of the tributaries and would be necessary before allocations are feasible. Though a number of these tributaries are intermittent (do not flow continuously throughout the year), continuous supply could be achieved by implementing water storage projects. This determination also will depend upon, among other factors, the in-stream flow analysis currently being performed for the WRIA 54 Planning Unit.
- The paleochannel aquifers appear to be a relatively promising source for additional groundwater allocation. Given the relatively low number of wells currently pumping from paleochannel aquifers, well interference issues likely would be less extensive than in CRBG aquifers. Aquifer recharge and recovery may be a component of development of the paleochannel aquifers as water supply sources.
- The CRBG aquifers in the West Plains area appear to have significant existing groundwater mining and well interference issues, suggesting that these aquifers could be over-allocated in the West Plains area. Additional allocation of this resource should be limited until the impact of future allocation is evaluated by groundwater flow modeling. Aquifer recharge and recovery projects may be viable in these aquifers, but this concept has yet to be evaluated.
- Groundwater elevation data associated with CRBG aquifers in the southwest portion of WRIA 54 are limited. However, based on the current distribution of wells in the basin and aquifer hydraulic characteristics, there could be opportunity for significant additional withdrawal in this area.
- The SVRP Aquifer is an important source of water throughout the region. Further use of this resource in WRIA 54 will depend on the results of an ongoing U.S. Geological Survey investigation, possible water right adjudication efforts, and in-stream flow analysis for the free-flowing reach of the Lower Spokane River.

WATER QUALITY

The water quality information provided with this Level 1 Assessment is limited to a brief summary of water quality information related to total maximum daily loads (TMDLs) developed for the Spokane River and Lake Spokane (Long Lake). The TMDLs are associated with the following water quality parameters:

- Dissolved oxygen—Dissolved oxygen levels in the Spokane River and Lake Spokane (Long Lake) have been among the most significant water quality issues in WRIA 54, and the Washington Department of Ecology is preparing TMDL limits for nutrients entering the Spokane River system to help ensure that the river meets state water quality standards.

- Dissolved metals—Upstream mining areas in Idaho are the primary source of metal contamination in the Spokane River. The TMDL implementation plan calls for continued cleanup of these mining areas as well as of beaches along the Spokane River where contaminated sediments have accumulated.
- Polychlorinated biphenyls (PCBs)— Spokane River and Lake Spokane (Long Lake) violate the water quality standards for PCBs in several locations. The TMDL process for the Spokane River is just beginning, with a problem assessment study to examine the levels of PCBs in the Spokane River and to determine possible sources.
- Total phosphorus—The 1992 Lake Spokane (Long Lake) Total Phosphorus TMDL, which placed initial controls on phosphorus loading to the Spokane River system, will be superseded by the TMDL for dissolved oxygen.

The planning unit intends to undertake additional water quality assessment work under a separate project, funded through a supplemental grant from the Department of Ecology.