Report to
Spokane County and the
WRIA 55 and 57 Planning Unit
Spokane, WA

Little Spokane (WRIA 55) and Middle Spokane (WRIA 57) Watershed Planning
Phase II - Level 1 Assessment
Data Compilation and Preliminary Analysis

June 2003

Submitted by

Golder Associates

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December 30, 2003

Spokane County ref: P2960
Golder ref: 013-1372

Spokane County Utilities Division
Mail Stop PWB-4
1116 W Broadway
Spokane, WA 99260

ATTENTION: Stan Miller, Program Manager, WQMP

RE: WRIA 55 AND 57 WATERSHED LEVEL 1 TECHNICAL ASSESSMENT

Dear Stan:

Enclosed are twelve copies of the Level 1 Technical Assessment for the Little and Middle Spokane watersheds (Water Resource Inventory Areas [WRIAs] 55 and 57). We believe that this Level 1 Assessment is the most comprehensive conducted in this state to date and was developed with the assistance of the WRIA 55/57 Planning Unit, and in particular, with significant assistance from yourself and Reanette Boese of Spokane County.

Although there are water resource management issues in need of solutions in these watersheds, members of the Planning Unit have individually demonstrated their willingness to work hard and cooperatively toward resolving them. It has been a pleasure to work with such a good Planning Unit, and we very much appreciate the opportunity to have conducted this work with you.

Sincerely,

GOLDER ASSOCIATES INC.

Chris V. Pitre, P.G.
Associate, Water Resources

cc: Bryony Stasney

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LITTLE SPOKANE (WRIA 55) AND MIDDLE SPOKANE (WRIA 57) WATERSHEDS

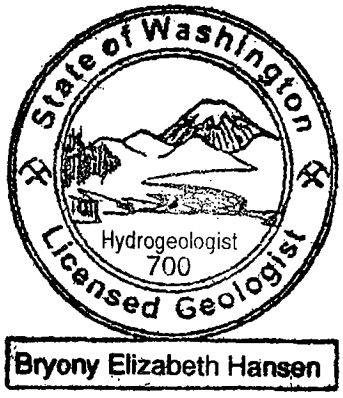
PHASE II – LEVEL 1 ASSESSMENT

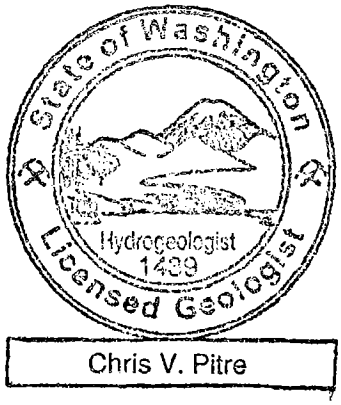
DATA COMPLIATION AND PRELIMINARY ANALYSIS

Prepared under grant # 9800300
from the Washington Department of Ecology

Prepared for:
The WRIA 55 and 57 Planning Unit
Spokane, WA

www.spokanewatershed.org





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EXECUTIVE SUMMARY

Watershed planning under RCW 90.88 is being jointly conducted in the Little and Middle Spokane River Basins. These basins are part of the Spokane River System that is tributary to the Columbia River. Water Resource Inventory Area (WRIA) 55 is comprised of the drainage basin of the Little Spokane River. WRIA 57 is comprised of the portion of the drainage basin of the Spokane River from the Washington-Idaho border to its confluence with Hangman Creek. Watershed planning for WRIAs 55 and 57 were combined because of the significant movement of groundwater from WRIA 57 into WRIA 55.

This report presents a compilation of data for WRIA 55 and WRIA 57 for Level 1 of Phase II of the watershed planning process. Spokane County and Golder Associates Inc. (Golder) coordinated the compilation of this data, much of which already existed. Spokane County acted as a clearinghouse for the transfer of information from the watershed Planning Unit members to Golder. The information was compiled in one of four formats: hardcopy; bibliography; GIS data layers; or other electronic data (e.g., spreadsheets, databases, etc.). A listing of the information compiled is presented in Appendix A.

The hydrologic processes in the basins are well understood. The Planning Unit has decided to proceed in Level 2 of Phase II (data analysis) with the development of a computer simulation model of the hydrologic processes. With this in mind, the Level 1 compilation was conducted such that the data is formatted for incorporation into such a model and that parameters needed for model development are addressed. This model will be used to support development of the watershed plan in Phase III.

Background

The current watershed planning effort was initiated in 1998 when funding was made available from the Washington State Department of Ecology (Ecology). Spokane County is the lead agency for this effort and is one of the initiating governments. Members of the watershed Planning Unit include broad representation of interests within the basins and hold monthly meetings that are open to the public. Although there are no tribal reservations within WRIAs 55 and 57, most of WRIA 55 and the lower reach of WRIA 57 are contained within the ancestral lands of the Spokane Indian Tribe, who were invited to participate. The initiating agencies for WRIA 55 and 57 chose to address water quality as it relates to flow in addition to addressing quantity issues. In addition, application for additional funds to study instream flows was submitted to Ecology in October 2001.

WRIA 55 (the Little Spokane River basin) and WRIA 57 (the Middle Spokane River Basin) are located on the eastern boundary of Washington State where the climate is affected by both the Cascade and Rocky mountain ranges. In both basins, precipitation is relatively low, particularly during the summer months. The basins rely on spring snowmelt from the upland areas and groundwater discharge to the rivers to maintain stream flows during the drier months. Water is needed to supply a growing population, agriculture,

industry, power generation, wildlife and recreation. Watershed planning offers a tool for citizens, businesses, and local governments, as well as state and federal agencies, to come together to make water resource management decisions.

Watershed-related work has been conducted for many years in both WRIA 55 and WRIA 57. The first basin-wide WRIA 55 was completed by Ecology to assess the availability of water for further appropriation (Chung, 1975). As a result of this study, an instream flow rule was adopted for the Little Spokane River and the tributaries to the Little Spokane River were closed to further appropriation. In 1995, a draft Initial Watershed Assessment of the Little Spokane River Basin was completed for Ecology (Dames and Moore and Cosmopolitan, 1995). The primary purpose of the assessment was to evaluate the status of surface and groundwater resources within WRIA 55. The conclusions of the 1995 study included:

(1) Flows in the Little Spokane River did not meet regulatory minimum instream flow requirements (established by rule in 1978 in WAC 173-555) 53 days per year on average between 1970 and 1991, and went below the MISF at least one day in 16 of 21 years between 1970 and 1991;

(2) Non-point pollution is increasingly affecting water quality; and,

(3) Development and population growth in the lower part of the watershed are steadily increasing the demand for water.

Additional watershed related work that has been completed within WRIA 55 includes a hydrogeologic characterization of the Deer Park Basin (EMCON, 1992) and an aquifer delineation and groundwater quality investigation of a portion of north Spokane County (Boese and Buchanan, 1996). The Pend Oreille Conservation District completed a water quality assessment throughout all of WRIA 55 in 2000. This assessment indicated that water temperatures on the Little Spokane River in the West Branch and below Chattaroy are higher than anticipated for a system so highly dependant on groundwater discharge to the stream (POCD, 2000). The Spokane County Conservation District is continuing this study with on-going water quality monitoring and stream gaging within WRIA 55.

This Level 1, Phase II assessment represents the first integrated basin-scale study of WRIA 57. In 1978 the United States Environmental Protection Agency (EPA) designated the Spokane Valley Rathdrum Prairie (SVRP) Aquifer a "Sole Source Aquifer". Currently, the SVRP Aquifer is the drinking water source for more than 400,000 people living in Spokane County, Washington and Kootenai County, Idaho. Due to the unique characteristics of the SVRP Aquifer, most of the previous work within WRIA 57 has focused on this aquifer. The important categories of work include:

- Research level studies and papers on the formation of the SVRP Aquifer (Bretz, 1930; Bretz, 1959; Purves, 1969; Baker, 1973; Kiver and Stradling, 1985; and, Jensen and Eckart, 1987);
- A series of sequential groundwater flow modeling studies (Pluhowski and Thomas, 1968; Drost and Seitz, 1978; Bolke and Vaccaro, 1979; Bolke and Vaccaro, 1981;

Vaccaro and Bolke, 1983; Buchanan and Olness, 1994; CH2M Hill, 1998; and, CH2M Hill, 2000);

- Aquifer sensitivity and wellhead protection studies (MacInnis and others, 2000; CH2M Hill, 1998; and, CH2M Hill, 2000); and,
- Hydraulic continuity studies (McDonald and Broom, 1951; Broom, 1951; Miller, 1996; and, Gearhart and Buchanan, 2000).

To date, an instream flow rule has not been set for the Spokane River in WRIA 57. However, a recommended minimum flow target for the Spokane River was set by Ecology at 2,000 cfs in 1999 at the United States Geologic Survey (USGS) gage 12422500 (Spokane River at Spokane). This flow target was recommended by the Washington Department of Fish and Wildlife (WDFW) based on the 50% exceedance flow for the period of record pre-installation of the Post Falls Dam (i.e., 1891 to 1906).

Although Ecology has not completed a basin-scale study of WRIA 57, the WRIA 55/57 Planning Unit has identified a number of issues based on its understanding of the area:

1) The 2,000 cfs Spokane River target flow is met only 86% of the time and only 55% of the time in the summer (June through October) and the target flow was met every day in only five years in the period of record;
2) Interactions between the SVRP Aquifer and the Spokane River are important seasonally and spatially to maintain flows and good water quality in the Spokane River; and,
3) A better understanding of how Spokane River flows are impacted by human activities (e.g., land use changes, pumping wells, and dam operations) is required to plan the future of water management in WRIA 57.

Regional Setting

The Little and Middle Spokane Basins are located in Northeastern Washington on the border with Idaho. The natural drainage of the Little Spokane River Basin is almost entirely within the WRIA 55 boundary. WRIA 57 contains less than 10% of the contributing natural drainage of the Middle Spokane Basin, most of which lies in Idaho. The two basins are located on the eastern edge of the Columbia River Basalt Plateau, in the foothills of the Rocky Mountain Range. Annual precipitation ranges from about 15 inches per year in the lower elevations of the basins to over 45 inches in the mountainous parts of the basins. Approximately 25-40% of the precipitation falls as snow, depending on elevation, with accumulations on the order of 18 inches around the City of Spokane.

The subsurface geology is comprised of crystalline basement rocks of granite and gneiss, which outcrop on the uplands surrounding the basins. Columbia River Basalt rocks cover parts of the lower elevations of the basins. Rivers eroded valleys in these deposits,

and filled them with unconsolidated sediments. These sediments form the primary aquifers, but the basalts are also tapped as productive aquifers.

Land use and land cover vary in the two basins. In WRIA 55, the dominant land uses are forest (70%), agriculture (25%) and urban/suburban development (5%). In WRIA 57, the dominant land uses are forest (60%), urban/suburban development (23%), and agriculture (16%; USGS Land Use and Land Cover). Land use changes in the future are expected to result in the conversion of agricultural land to urban land use in both WRIAs.

Surface Water

The major drainage in WRIA 55 is the Little Spokane River. The headwaters of the Little Spokane River are split approximately evenly between the West Branch of the Little Spokane River and the mainstem. Dames and Moore and Cosmopolitan (1995) hypothesized that the mainstem receives baseflow from the Pend Oreille River system in the form of inter-basin underflow. The West Branch includes several large shallow lakes (i.e., Eloika, Sacheen and Diamond Lakes). The upper reaches of the Little Spokane River are relatively undeveloped and provide good wildlife habitat.

Flow in the upper reaches of the Little Spokane River increases primarily through the contribution of tributaries such as Deadman and Dragoon Creeks. In the lower reaches, flow increases significantly as a result of groundwater discharge from WRIA 57. The river is dominantly gaining throughout its length. Although annual variations and long-term streamflow trends are affected by water diversions and withdrawals, large-scale weather patterns (e.g., decadal patterns affected by the Pacific Decadal Oscillation [PDO]) are believed to be the dominant influence affecting streamflows. The Little Spokane River has few artificial controls on its flow and the hydrograph shows sharp responses to seasonal effects such as snow pack melt. Minimum instream flows were established in 1976 at four points on the Little Spokane River (Ch. 173-555 WAC). The minimum flows were set at the 20% exceedance level based on the historical record. As part of the current watershed planning process, an instream flow needs study on the Little Spokane River is being completed in 2003, in part to review the applicability of the established minimum instream flows to aquatic biota needs.

The major drainage of WRIA 57 is the Spokane River. The Post Falls Dam, located nine miles downstream from the outlet of Lake Coeur d'Alene, a natural lake, regulates flow in the Spokane River about half the year. In the fall, the lake is drawn down to provide capacity for runoff from the upper watershed. Peak flows in the mainstem Spokane River are not as sharp as for the Little Spokane River and are attenuated as a result of the larger drainage basin size (i.e., a dampened response of the system overall) as well as having storage that buffers changes in flow. Several run-of-the-river dams along the mainstem have minor effects on the Spokane River hydrograph. There is a high degree of hydraulic continuity between the Spokane River and groundwater of the SVRP Aquifer that strongly affects seasonal and annual flows. Between the Idaho-Washington border and the river's confluence with Hangman Creek, there are several defined

gaining or losing reaches. Water flowing through the Spokane River Valley flows out of the WRIA through the Spokane River and as groundwater through the Hillyard and Trinity Troughs. The SVRP Aquifer and its overlying soils are permeable to the extent that streams running off of the adjacent uplands completely infiltrate into the sub-surface at the margins of the aquifer. As a result, there are no perennial tributaries to the Spokane River in WRIA 57 between the state line and Latah (Hangman) Creek, west of downtown Spokane.

An instream flow target of 2,000 cfs at Spokane Falls was agreed to by Ecology and the Washington Department of Fish and Wildlife in 1999. This target was based on 50% of natural flows using flow data from before the installation of the Post Falls Dam (1891-1906). The seven-day low flow fails to meet the instream flow target most every year. The frequency and duration of non-attainment of these target flows correlates to wet and dry PDO periods. Recent studies suggest that the 1891-1906 period may have been within a wet PDO period. If so, the instream flow target may not be representative of 50% of natural flows on average over different climatic periods.

Groundwater

Important groundwater resource aquifers occur primarily within the unconsolidated sediments that include glacial flood deposits and recent alluvium. Important local sources of domestic water supply are also found within glacial lake deposits, fractured and weathered basalt, and crystalline basement rocks. Dense and unweathered crystalline basement rocks as well as glacial lake clays act as important local aquitards, restricting vertical and lateral groundwater movement. The crystalline basement aquitard represents the lower hydrogeologic boundary of the region.

There are eight principal aquifer areas delineated in WRIAs 55 and 57. Three of these areas (Five Mile Prairie, Orchard Prairie and Green Bluff) contain basalt aquifers. Four of these areas (the SVRP Aquifer, the Little Spokane River aquifer area, Peone Prairie, and the Diamond Lake aquifer area) are unconsolidated sediment aquifers. One of these areas (the Deer Park Basin) is comprised of an upper unconsolidated sediment aquifer and a lower basalt aquifer. The Diamond Lake Aquifer area, in the northeast corner of WRIA 55, may be a conduit for groundwater flow from the Pend Oreille Basin into the headwaters of the Little Spokane River, though this has not been substantiated. The SVRP Aquifer, which occurs within the central portion of WRIA 57 and the southern portion of WRIA 55 as well as extending into Idaho, is one of the most productive aquifers in the United States and serves as the primary water source for more than 400,000 people in Washington and Idaho. The SVRP Aquifer acts a conduit for flow from the Spokane River through the Hillyard Trough to the Little Spokane River, and to a lesser extent through the Trinity Trough to lower reaches of the Spokane River.

Information on groundwater monitoring was compiled and reviewed to determine the spatial distribution of groundwater elevation data for WRIA 55 and WRIA 57. Two types of data were compiled: groundwater elevations for well networks monitored over one time period (i.e., snapshot data); and, groundwater elevations monitored at single well

locations over a continuous time period (i.e., hydrograph data). The majority of the groundwater data compiled is for the SVRP Aquifer. Some data (predominantly snapshot data) was also available for the Deer Park Basin and the Little Spokane Aquifer area.

Three types of groundwater level fluctuations were observed in hydrograph data from WRIA 55 and WRIA 57:

1) Groundwater levels in close hydraulic continuity with surface water exhibit quick response (e.g., hours or days) to river stage fluctuations, with the response becoming more muted and the time lag becoming longer with increasing distance from surface water bodies;
2) Seasonal fluctuations in response to rainy and dry seasons; and,
3) Long-term (decadal) fluctuations as a result of extended periods of below or above average precipitation.

These variations of response may be important for developing water resource management options. For instance, the lag time of influence between surface water and groundwater may allow for development of groundwater extractions in areas of the aquifer system such that impacts to surface water occur during times of the year with higher flows.

A series of groundwater flow models for the SVRP Aquifer have been constructed over the last 30 years. These models have been developed primarily in support of land development (i.e., groundwater supply), to designate groundwater quality protection areas over aquifer zones that provide water to large water supply wells (i.e., wellhead protection), and academic research purposes. The development of these models has prompted studies that have resulted in improved understanding of the SVRP Aquifer.

Water Quality

The lower reaches of the Little Spokane River are listed under Section 303(d) of the Clean Water Act, including the area around the confluence with Deadman Creek (temperature [T], pH, and coliform) and near the confluence with the Spokane River (polychlorinated biphenyls [PCBs] and coliform). The largest contributing sub-basin to the Little Spokane River is Dragoon Creek, where the City of Deer Park is located. The Dragoon Creek sub-basin has several reaches that are water quality impaired (dissolved oxygen [DO], coliform) and listed under Section 303(d) of the Clean Water Act. The water quality problems in the Little Spokane system are probably related to agricultural activities (dissolved oxygen [DO] and coliform), maintenance of residential lawns (DO and T), loss of riparian vegetation (T), and industrial activities (PCBs), among other potential factors.

Groundwater quality is generally good to excellent throughout WRIA 55. However, localized areas with elevated nitrate concentrations exist and are thought to be related primarily to agricultural activities. Groundwater discharge to Dragoon Creek during low flow periods is believed to contribute nitrate to surface water (Anderson, 1986; and,

EMCON, 1992). Significant groundwater discharge from the SVRP Aquifer in the lower reaches of the Little Spokane River is important in maintaining flows and maintaining good surface water quality, which in turn supports aquatic habitat.

In WRIA 57, Newman Lake is listed under Section 303(d) of the Clean Water Act for high total phosphorus concentrations. The Spokane River is on the 303(d) list for high levels of PCBs, heavy metals, DO, pH, and sediment. Heavy metal concentrations are related to the influx of heavy metals from mining activities in Idaho's Coeur d'Alene River Basin. Metals are in the river both bound with sediments and in a dissolved form. Concentrations of both total and dissolved metals generally correlate directly with river flow. Suspended sediment load and associated total metals concentrations are larger at high flows. Groundwater quality has a higher hardness, which decreases the solubility of metals. Therefore, dissolved metal concentrations are decreased during low flow conditions as a result of both less suspended sediment and lower metal solubilities where there is groundwater seepage to the river. The remaining water quality issues may be related to waste water treatment plant effluents (DO), industrial activities (PCBs), land use activities, and possibly other factors.

Water quality in the SVRP Aquifer (the dominant aquifer in WRIA 57) is good to excellent. However, water quality trends from the 1970s and 1980s indicate a gradual increase in nitrate concentrations within the aquifer. The SVRP Aquifer is highly susceptible to contamination because it is unconfined and the aquifer materials overlying sediments are very permeable. The high potential for contamination to this Sole Source Aquifer is perhaps the most critical groundwater quality issue in the basin.

Water Rights

A version of Ecology's Water Rights Application Tracking System (WRATS) database was queried to provide a synoptic assessment of the current status of water allocation. The results of this assessment are summarized in the tables below. The database is incomplete with respect to the quantities associated with all permits and certificates and no quantities are given for claims. Therefore, a number of assumptions were made to quantify all rights. Water rights where the purposes of use are listed as fish propagation, fire suppression and power are excluded because they are generally non-consumptive, or, in the case of fire suppression, rarely used.

It is likely that some of the rights registered in the WRATS database are not valid and may be subject to relinquishment due to non-use. There have been three periods since the water code was implemented for users of surface water (1917) and groundwater (1945) to register claims to water rights. The methodology used to quantify water rights and claims indicates that claims may constitute approximately 15% of the total amount. A review of the claim records reveals apparent duplicate and triplicate records for similar claims. These apparent replications are probably due to individuals registering the same claim during each claim registry period and likely do not actually represent unique claims. Therefore, the number of valid claims may be significantly less than indicated. An adjudication of surface water rights in the Deadman Creek sub-basin (the only legal

way to determine validity of water rights and claims) validated only about 40% of the rights and claims previously registered.

Estimated Allocation of Water Rights by Type
(1,000s of AF/yr; excluding rights for fish propagation, fire suppression and power purposes of use)

		WRIA 55	WRIA 57	Total
Certificates & Permits				
	Groundwater	128	472	600
	Surface Water	15	16	31
	Subtotal:	**143**	**488**	**631**
Claims				
	Groundwater	21	14	35
	Surface Water	23	11	34
	Subtotal:	**44**	**25**	**69**
	TOTAL:	**187**	**513**	**700**

The distribution of water rights among various purposes of use is shown below. The amount estimated for exempt wells based on per capita use in water districts outside of the City of Spokane, the Spokane County Comprehensive Plan and census population outside of purveyor service areas.

There are 23 applications in WRIA 55 for new water rights, 16 of these for groundwater, and 16 change applications. In WRIA 57, there are 37 applications for new water rights, 27 of these for groundwater, and 46 change applications. The average size of applications for new groundwater rights is approximately 1,370 gpm in WRIA 55 and 1,270 in WRIA 57. The average size of applications for new surface water rights is approximately 117 gpm (0.26 cfs) in WRIA 55 and 9 gpm (0.02 cfs) in WRIA 57.

Spokane County recently established a Water Conservancy Board as an available avenue for processing change applications. The board can consider change applications to valid water rights. Changes may not result in an enlargement of the water right or impairment of other water rights including streamflows. Therefore these proposed changes are not anticipated to have a significant impact on water resource management.

Estimated Allocation of Water Rights by Purpose of Use
(1,000s of AF/yr)

	WRIA 55	WRIA 57	Total
Municipal & Domestic			
Permits & Certificates	81	404	485
Claims	8	2	10
Subtotal:	**89**	**406**	**495**
Irrigation			
Permits & Certificates	39	28	67
Claims	34	23	57
Subtotal:	**73**	**51**	**124**
Commercial/Industrial			
Permits & Certificates	**21**	**51**	**72**
Other	**4**	**5**	**9**
Exempt Wells			**~10**
Total:	**187**	**513**	**700**

Water Use

Actual water use estimated for the categories of agricultural irrigation, water systems, commercial/industrial use, and exempt wells is presented in the following summary table. The largest uses of water for the combined WRIAs 55 and 57 are: municipal/domestic (~128,500 AF/yr); commercial/industrial (~38,000 AF/yr); exempt wells (~16,600 AF/yr); and, agricultural irrigation (~7,500 AF/yr).

Municipal and domestic use and commercial/industrial use data was compiled by Spokane County and includes the major water distribution systems. Exempt well use is estimated based on water system data provided by Spokane County, 2000 census data, and per capita use provided by Spokane County.

The estimate of agricultural irrigation use is based on United States Department of Agriculture land use census Natural Resource Conservation Service data and USGS land

use mapping. The estimate of actual use incorporates only the crop irrigation requirement.

Summary Comparison of Estimated Allocated Water and Actual Use
(excluding fire, fish and power uses; all quantities in AF/yr)

Purpose of Use	Allocated	Actual Withdrawal	Unused Allocation
WRIA 55			
Agricultural Irrigation	73,337	6,398	66,939
Municipal and Domestic	88,996	24,553	64,443
Commercial / Industrial	21,428	3,929	17,499
Exempt Wells	-	11,000	-
Subtotal	183,761	45,880	148,881
WRIA 57			
Agricultural Irrigation	51,151	1,278	49,873
Municipal and Domestic	405,703	103,962	301,741
Commercial / Industrial	50,996	34,254	16,742
Exempt Wells	-	5,600	-
Subtotal	426,103	145,094	368,356
Total	**609,864**	**190,974**	**517,237**

[a] Allocated use based on a duty of 3-4 feet/acre/year. Actual use based on a duty of 1.6 feet/acre/year. Application efficiencies, conveyance losses and stock watering are not included and may result in higher actual use estimate.

Based on these estimates, approximately 6% of water allocated for agricultural irrigation is actually being used. However, this estimate does not account for conveyance losses irrigation or application efficiencies. The distribution of irrigation rights being exercised is expected to vary widely and it is expected that many irrigation rights are being used to the full extent of validity. Approximately 43% of water allocated to municipal and domestic use is being used. However, the availability of allocated water rights is not evenly distributed among purveyors. In fact, there are communities that are considering development moratoriums because there is no available permitted water. The estimate of municipal and domestic actual use does not include small domestic systems that do not need a water right and are included with the exempt wells. Most of the water in WRIA 57 allocated for commercial/industrial applications is being used, while approximately 20% of the water allocated in WRIA 55 for this purpose is being used.

A water balance of actual use is as follows:

Actual withdrawal:	179,974	AF/yr
Irrigation use:	92,327	AF/yr
Waste water discharge:	78,819	AF/yr
Septic system recharge:	12,000	AF/yr
Actual use accounted:	183,146	AF/yr
Actual difference:	(3,172)	AF/yr

There is a discrepancy of approximately 1.8% between the estimated quantity of water pumped and accounting for where that water ends up. Multiple assumptions were used in preparing each component of this tabulation and changes may occur by improving the methods of estimation.

Watershed Modeling

The Planning Unit has decided to develop a computer simulation model in order to evaluate future water resource management options. An objective of watershed planning in the Little and Middle Spokane Basins is to maintain surface water flows for multiple benefits. Because of the high degree of interaction of surface water with the meteorological and groundwater components of the hydrologic cycle, a computer software package that adequately simulates the processes and their interactions is needed. The capabilities of a wide range of available software packages were reviewed and presented to the Planning Unit for consideration. The MIKE suite of software packages was selected to conduct computer simulation in Level 2 of Phase II, primarily because it was considered the best package currently available to simulate hydraulic continuity processes. The model will be calibrated to the 1999 hydrologic year, which is considered to be representative of current average conditions.

The model domain will be selected to conform to natural hydrologic boundaries and will approximate WRIA boundaries. The model domain will extend into Idaho to Post Falls Dam where a historical surface water record is available to be used as a model boundary condition. The model domain will also cover a portion of WRIA 54 (Lower Spokane) including the reach of the Spokane River downstream of WRIA 57 to Long Lake, and the confluences of Hangman (Latah) Creek and the Little Spokane River with the Spokane River. The lake level of Long Lake will be used as a model boundary condition. Southeastern and northeastern portions of WRIA 57 where surface water drains to Idaho will be excluded from the model domain.

Data Gaps

Identification of data gaps focused on the minimum requirements for developing a computer simulation model of the hydrologic system that include:

- Geo-referenced river cross-sections;
- Characterization of dam and stream flow control structures including location, pool and outlet elevation, operating information, stream flow and river stage;
- Geology, soils, hydrogeology and land use information for portions of the model domain within Idaho;

- Distribution of agricultural irrigated acres and representative application efficiencies; and,
- Distribution of irrigated landscaping within purveyors service areas.

Additional data needs may be identified after sensitivity analysis of a calibrated model. Such data will be prioritized on the basis of need to refine analysis to the resolution required to support development of a watershed plan.

Summary and Future Direction

This Level 1 Assessment fulfills all watershed planning technical assessment requirements except estimates of future water need and availability. The technical assessment presented in this report will be further refined through development of a computer simulation model in the Level 2 Analysis. A technical memorandum will be delivered to the Planning Unit in January 2002 addressing estimation of future water needs.

A computer model simulating the hydrology of WRIAs 55 and 57 has been completed and being used by the Planning Unit to evaluate alternative water resource management scenarios. This model is calibrated to the period 1993-1999 that includes relatively wet, dry and average hydrologic years and recent actual water use patterns.

Application has been made to Ecology to obtain additional funding for conducting instream flow studies in both WRIAs 55 and 57. The work has recently been completed for the Little Spokane River, and is being developed for the mainstem Spokane River.

The Planning Unit is initiating the preliminary conceptual framework of a watershed plan. On-going technical work will focus on the technical and geographic areas identified by the Planning Unit as important for making decisions in preparing the plan.

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