MEMO

To: Tim Luke & Michele Edl

From: Mat Weaver MW

Date: February 10, 2011

Cc: Rex Barrie, Tom Arkoosh

RE: Riverside Village Subdivision, Garden City, ID - Water Right and Water Measurement Device Review and Recommendations

Introduction

This memo is response to a request by Tim Luke to review the existing Riverside Village Subdivision water rights and irrigation and aesthetic pond system and present design recommendations regarding lockable diversion control devices and water measurement devices.

Water Rights

In discussions with Michele Edl and my own review of the water right records I have identified two water rights in association with the Riverside Village Subdivision. The first water right, 63-9718, is for irrigation (0.44 CFS (cubic feet per second)), aesthetic storage (78 AF (acre feet)), and diversion to storage (3.21 CFS)[1]. The point of diversion (POD) for this water right is located at the west end of Glenwood Lake. This water right (WR) currently has a place of use (POU) that encompasses Glenwood Lake and a region of riparian habitat that skirts the north shore of the Boise River from the Glenwood Bridge west to the western end (downstream end) of Long Lake[2]. Refer to Figure 1 for a depiction of this water right. This water right was partially decreed in the Snake River Basin Adjudication (SRBA) on February 16, 2007.

The second water right, 63-9751, is for aesthetic flow (3.21 CFS). The POD for this WR is located at the east end of Westmorland Park approximately 0.2 miles upstream of the Glenwood Bridge. This water right currently has a place of use that encompasses Glenwood Lake and six of the 12 ponds located within the Riverside Village Subdivision (RSV). Refer to Figure 1 for a depiction of this water right. This water right was partially decreed in the SRBA on January 27, 2010.

[1] The diversion rate of 3.21 cfs associated with the diversion to storage component is solely to support an annual filling or topping-off of the pond system. Assuming the ponds were empty a rate of 3.21 cfs can fill a volume of 78 AF in approximately 294 hours or 12.25 days.

[2] The region of riparian habitat identified as an irrigated area is more than likely derived from the Beneficial Use Field Report dated July 28, 1988 conducted by Department staff in association with WR 63-9718. However, the verbal description from the field report of the irrigated area ("strip of land about 20 feet wide around each lake") does not match either the graphical depiction in the Field Report or the current POU shape file.

Analysis of System

Water is initially diverted into the system at a POD, consisting of a 30-inch diameter pipe and headwall, located at the east end of Westmorland Park approximately 0.2 miles upstream of the Glenwood Bridge (Point 1 on Figure 2). There is no control device on the existing head works. The 30-inch diameter pipe traverses approximately 630 feet to the west before discharging into the east end of Westmorland Lake. Between the POD and the discharge into Westmorland Lake the gravity irrigation line passes through three concrete junction structures (approximately 4 ft x 4 ft). Backwater analysis of this system at minimum design flow indicates that the only section of pipe flowing full was the downstream-most section. This analysis was consistent with observed field conditions during the site visit. Water discharges from Westmorland Lake via a square concrete structure located on the west end of the lake (Point 2 on Figure 2). Three sides of the structure have screened rectangular openings that pass water into the downstream diversion pipe. The elevation of the rectangular openings dictates the maximum water surface elevation (WSE) of Westmorland Lake.

From the outlet box on Westmorland Lake approximately 415 linear feet (LF) of 30-inch diameter pipe conveys water to an overflow structure located near the paved greenbelt path on the west side of Glenwood Bridge (Point 3 on Figure 2). This overflow structure is in approximately the same location as the original POD of water from the Boise River into Glenwood Lake. Discharging into the overflow structure is the 30-inch diameter pipe that drains Westmorland Lake. Discharging out of the overflow structure is 24-inch diameter pipe, which supplies water to the east end of Glenwood Lake. A screened rectangular opening is located in the west face of the overflow structure that allows water to overflow out of the device and back into the Boise River. The elevation of this rectangular opening dictates the maximum WSE of Glenwood Lake. At the time of the site visit the conveyance line from Westmorland Lake to Glenwood Lake was flowing full under modest head. An outlet out of Glenwood Lake is located at the west end of the lake (Point 4 on Figure 2). This outlet consists of a head wall and lockable canal gate that allows for the regulation and control of discharges out of Glenwood Lake and into the RSV Subdivision pond system.

From the outlet of Glenwood Lake water is conveyed via 24-inch gravity irrigation pipe approximately 1,056 LF to the west/southwest where it discharges into the uppermost pond in the RSV Subdivision. At the time of the site visit the conveyance line from Glenwood Lake to the uppermost RSV Subdivision pond was flowing full under modest head. This pond is in hydrologic equilibrium with a second pond located across Riverside Drive to the north. From the uppermost pond(s) water is conveyed downstream, to the west, through a series of ten sequential ponds, bringing the total number of ponds within RSV Subdivision to 12. Each pond is connected to the pond immediately downstream and upstream by a 15-inch diameter concrete culvert. Water discharges from the lowermost pond in the subdivision under Riverside Drive and into another pond located within the Woods at Riverside No. 3 Subdivision (Point 5 on Figure 2).

Two irrigation pump stations divert water from the series of 12 ponds located within the RSV Subdivision. The first pump station (Rivercove PS; Point 6 on Figure 2) diverts water from a 0.8-acre pond located at the head of the system. This pump station was acknowledged in the Beneficial Use Field Report conducted by the Department. Irrigation associated with this pump station was also identified in the Field Report. The second pump station (Lakeview PS; Point 7 on Figure 2) diverts water from another 0.8-acre pond located near the middle of the pond system. This pump station was not constructed at the time the field exam was conducted.

A third irrigation pump station (Long Lake PS; Point 8 on Figure 2) is located near the east end of Long Lake on the south side or river side of the lake. This was the second pump station identified in the Beneficial Use Field Report and the irrigation associated with this pump station was also acknowledged in the report. Water is diverted from the Boise River into Long Lake at an uncontrolled diversion located approximately 0.1 miles upstream of Long Lake (Point 9 on Figure 2). Water is conveyed from the point of diversion via approximately 597 LF of 24-inch diameter PE pipe passing through two irrigation junction structures before discharging into the east end of Long Lake. Water flows out of the west end of Long Lake at two points, one point discharges over a concrete check dam and directly into the Boise River, the second discharge point is into Riverside Creek, which itself eventually drains back into the Boise River.

Analysis of System Losses

A portion of water diverted under WRs 63-9718 and 63-9751 is lost to the Boise River in the form of evaporation from water surfaces and evapotranspiration (ET) associated with irrigation. I have assumed that seepage from any of the ponds or lakes previously described returns in short order to the Boise River and is therefore not lost from the system or responsible for injury to senior WRs on the Boise River.

Annual and monthly evaporation loss can be estimated by utilizing evaporation rates obtained from ETIdaho[3]. Table 1 is a summary of monthly volumetric evaporative losses from the 12 ponds located within the RSV Subdivision, not including Long Lake.

Table 1 - Summary of Monthly Evaporative Losses

Description	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean Actual Evaporation (AF)	0.21	0.44	0.98	1.48	1.92	2.24	2.47	2.13	1.57	1.10	0.40	0.20

Evaporative Rates obtained from ETIdaho for "Open Water - Shallow Systems (ponds, streams) for the NWS - Boise WSFO Airport

The annual evaporative loss from 4.8 acres of pond surface area associated with the diversion of 3.21 cfs continuously under water right 63-9751 is 15.11 AF. If we assume the water right is out of priority by July 1 in the best of water years, as indicated by Watermaster Rex Barrie, the minimum volume of evaporative loss would be 7.27 AF.

ET losses associated with irrigation of RSV Subdivision common areas can be estimated utilizing ET rates obtained from ETIdaho. Table 2 is a summary of monthly volumetric ET losses from 11 acres of irrigated area associated with WR 63-9718.

Table 2 - Summary of Monthly ET Losses from 11 acres of Irrigated Landscaping

Description	Apr	May	Jun	Jul	Aug	Sep	Oct
Mean Actual Evaporation (AF)	4.31	6.13	7.02	7.70	6.69	4.99	3.22

Evaporative Rates obtained from ETIdaho for "Grass - Turf (lawns) - Irrigated for the NWS - Boise WSFO Airport

[3] ETIdaho by Allen, Richard G. and Clarence W. Robison, 2009. Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho: Supplement updating the Time Technical Completion Report, Kimberly Research and Extension Center, University of Idaho, Moscow, ID.

The total loss of water due to ET from a single irrigation season is 40.06 AF. If we again assume the water right is out of priority by July 1 in the best of water years the minimum volume of ET loss would be 22.6 AF. Therefore, due to the junior priority date associated with these water rights, in order to avoid curtailment, RSV Subdivision will need to find a source of mitigation water to alleviate the combined loss of at least 29.87 AF from the Boise River. In years when the water rights go out of priority prior to the start of July more water will be required.

Recommendations

Water Right 63-9718

1. Keep existing POD location where it is at the west end of Glenwood Lake.
2. Install measurement device on trunk line that discharges water from Glenwood Lake into the RSV Subdivision.
3. Install staff gage in the N. Rivercove Place catch basin.
4. Modify POU
    a. Pond POU: Eliminate Glenwood Lake and include all twelve lakes currently existing in the RSV Subdivision, refer to Figure 2 for graphical depiction of all RSV ponds.
    b. Irrigation POU: Modify irrigation POU to depict irrigation as it actually occurs today. Irrigation has been described as the north and east shores of Long Lake, a 20-foot buffer around all 12 lakes, irrigation of club house lot, and irrigation of subdivision entrance open space lot, refer to figure 2 for graphical depiction. Note this POU should be verified at the time of transfer.
5. Beneficial Use
    a. Eliminate the use of the Long Lake pump station in support of irrigation. Since water is diverted from the Boise River into Long Lake, the Boise River is the source of any irrigation water used by this pump station. However, water right 63-9718 only recognizes Village Lake as a source of water.
    b. Ignore condition on water right that states, "*The place of use for irrigation is a greenbelt*". This is no longer accurate. The greenbelt is now owned by Garden City and it is not clear if it is still irrigated. As of the SRBA partial decree this condition is "explanatory" and therefore is no longer administrable.
6. Mitigation: When this water right is out of priority (typically a minimum of 123 days a year), the irrigation use under this right must be curtailed or mitigated. Consumptive water use associated with the irrigation of 11 acres under this right from 7/1-10/31 is 22.6 AF. Conditional language recognizing the ability to mitigate in association with the right should be included as part of the transfer.
    a. Rather than rely on a theoretical calculation, RSV subdivision could install flow meters on each pump station. The metered volume provides more accurate and perhaps lower determination of irrigation use than the theoretical calculation. This may benefit RSV in determining mitigation or replacement water supply costs.

Water Right 63-9751

1. Keep existing POD location where it is on the Boise River near the east end of Westmorland Park approximately 0.2 miles upstream of Glenwood Bridge.
2. Install measurement device on trunk line that discharges water from Glenwood Lake into the RSV Subdivision.
3. Install staff gage in the N. Rivercove Place catch basin.
4. Modify POU to eliminate Glenwood Lake and include all 12 lakes currently existing in the RSV Subdivision, refer to Figure 2 for graphical depiction of all RSV ponds.
5. Mitigation: When this water right is out of priority (typically a minimum of 123 days a year), the aesthetic use under this right must be curtailed or mitigated. An estimate of the evaporative loss of water associated with the ponds under this right from 7/1-10/31 is 7.3 AF. Conditional language recognizing the ability to mitigate in association with the right should be included as part of the transfer.

Control Devices

1. My research indicates no additional control devices are required.
    a. WR 63-9718: The confirmed POD for this water right is on the west end of Glenwood Lake. This POD already has a suitable canal gate in place that offers working control of the diversion and the capability to be locked by the Watermaster.
    b. WR 63-9751: The POD for this water right does not currently have a control device associated with it. However, since any water that is not diverted downstream into the RSV Subdivision returns directly to the Boise River a device is not warranted at this time.
    c. Long Lake: A POD from the Boise River diverts water into Long Lake. This POD does not have a control device associated with it. At this time I have assumed that Long Lake is a relic river channel and therefore a natural extension of the river beneficial to the system for its flood storage capabilities[4]. As such, the control of water into Long Lake by the Watermaster is not warranted at this time.

Measurement Devices

1. From my investigations I have concluded that much of the conveyance system from the POD on the Boise River downstream to the discharge of water into the uppermost RSV pond is flowing full under modest head even at minimum river flow conditions. At high flows the system is likely completely submerged and potentially flowing under a substantial head. For this reason I did not pursue the design of a gravity flow measurement device such as a weir or submerged orifice.
2. Downstream of the POD of WR 63-9718 from Glenwood Lake I recommend installing either an insert-type Doppler flow meter (DFM) or insert-type magnetic flow meter to measure the diversion of water into the RSV Subdivision under both water rights.
    a. I recommend installing the device immediately upstream of the catch basin in N. Rivercove Place in the open space common lot.

[4] This understanding was conveyed to me by Tom Arkoosh and other members of the RSV Subdivision HOA. This understanding is potentially a subject open for further interpretation; however, I did not investigate it in association with this memo.

b. I received a quote of $3,738 dollars from Searle Technologies (telephone: 801.423.2013) for a MACE AgriFlo insert-type Doppler flow meter, complete with batteries, data logger, enclosure, laptop connection, mounting kit, 12 volt/5 watt solar panel, and velocity sensor.
c. I received a quote of $3,199 dollar from Flosonics Inc. (telephone 541.561.5269) for a GF Signet magmeter inert-type flow meter, complete with sensor (model 2552) and digital display (model 8550-1).

3. I recommend installing a staff gage in the storm water runoff catch basin located in the east curb line of N. Rivercove Place. The 24-inch gravity line conveying water from Glenwood Lake to the RSV Subdivision passes through or daylights in this structure. In conjunction with the flow meter a relationship between stage (in the catch basin) and flow rate (in the pipe) might exist, such that in the future, flow rate might be reliably estimated by a visual reading of stage in the catch basin. This would be an inexpensive means of providing measurement redundancy and could serve as a backup in the event of meter failure.
4. I recommend installing 2-inch diameter magnetic flow meters on each irrigation pump station to accurately gage how much water is actually used for irrigation by RSV Subdivision. The volume of actual irrigation is potentially less than a theoretical estimation of consumptive losses thereby leading to a reduction in the volume of water required for mitigation.
    a. I recommend installing the devices on existing free and clear runs of pipe (~24 inches in length) downstream of the filtration devices as observed on both the Rivercove and Lakeview pump stations.
    b. I received a quote of $759 dollars from Searle Technologies (telephone: 801.423.2013) for a single 2" magmeter (WMP101-200) flow meter by Global Water, complete with meter, totalizer, digital read out, external power cable (20 feet), and fitting kit. Note this price is for a system capable of metering one pump station.

<u>Miscellaneous</u>

1. Long Lake has a check dam structure at the outlet that artificially elevates the water surface of the lake. The potential exists that an aesthetic water right should be required to facilitate the current operation of the lake. To my knowledge no existing water rights are associated with Long Lake. This issue was not pursued as a part of the investigations summarized in this memo.
2. While on site in 2010 and 2011 Department staff observed a number of small pump stations located on individual residential lots throughout the subdivision. These small pump station likely serve for the irrigation of individual lots. These pump station are not to be confused with the Rivercove, Lakeview, and Long Lake pump stations discussed in this memo. These additional pump stations on private lots may be considered unauthorized diversions and subject to enforcement action by IDWR.
3. While on site in 2010 and 2011 Department staff observed a number of aesthetic diversions of water from the RSV Subdivision pond system into private water features located on individual residential lots. These features may potentially increase the consumptive use under the water rights and/or may not be consistent with the uses authorized by the rights.

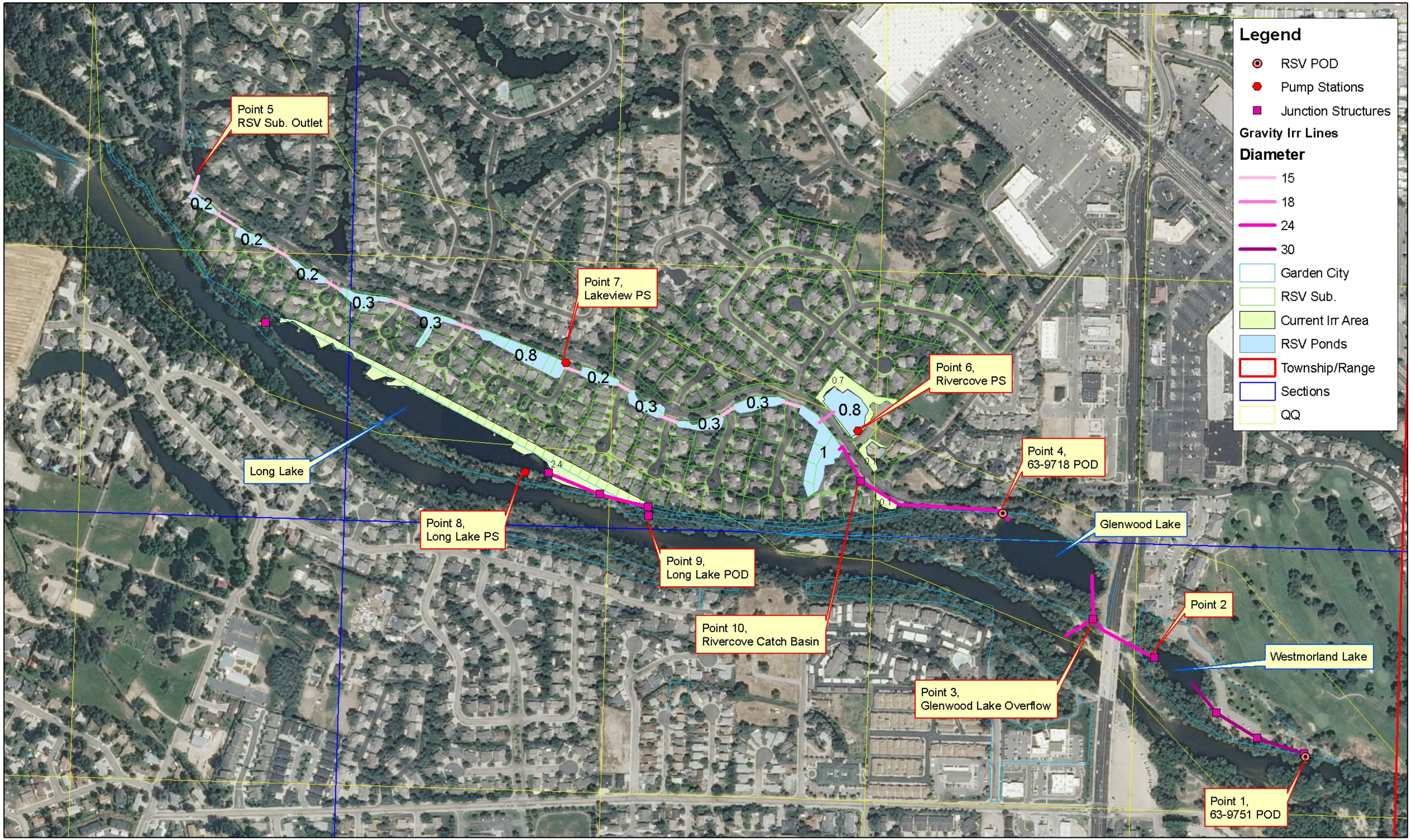
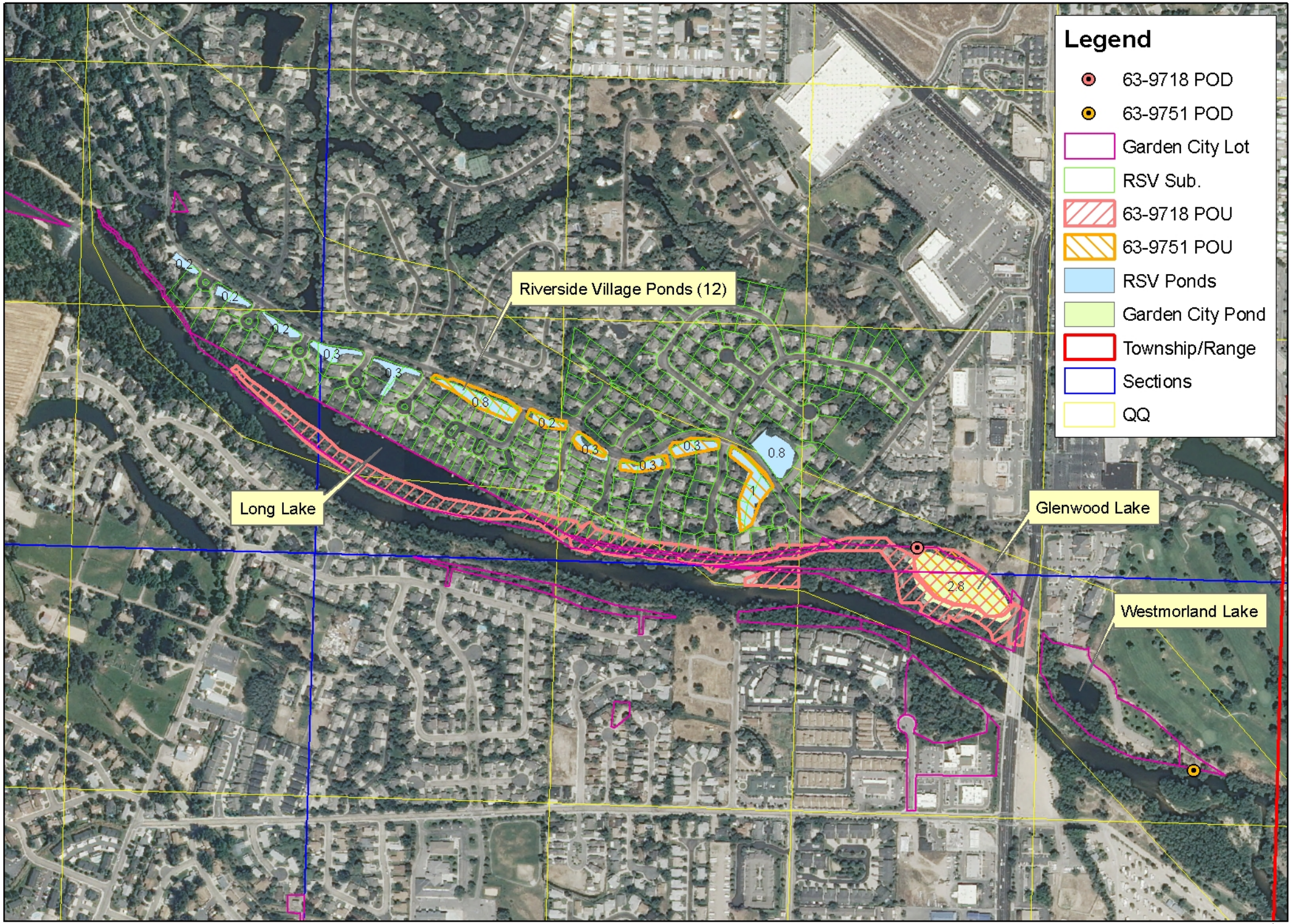


Figure 2 - Detailed Riverside Village Exhibit Map



Riverside Village - Figure 1