

FINAL REPORT



Regional District of Central Kootenay

Sanca Park Water System Source Assessment

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1.0 EXECUTIVE SUMMARY

The report provides a source assessment of the Sanca Park water system located on the eastern shores of Kootenay Lake. Given the recent events and new information that is available, the RDCK is interested in taking a step back to re-evaluate the present system and potential options for moving this system forward with a sustainable source of water that can be supplied and treated in a cost effective manner. This report was developed to take the previous information available and combine it with some new assessment information to identify a sustainable water source for the Sanca Park Water System.

A comprehensive overview of community options has been undertaken including:

- A regional water system with supply from a central source;
- Kootenay Lake source;
- Groundwater source;
- Alternative sources such as trucked water supply;
- Dissolving the community water system; and
- Utilize the existing Sanca Creek Water Source.

It was concluded that the current water source, Sanca Creek, is the preferred source. Water supplied to the community from Sanca Creek is currently not treated and this contravenes the Drinking Water Protection Act and Regulations.

Four treatment options are presented for the Sanca Creek Source:

1. A new intake and treatment works on Crown Land with access via the Forestry Services Road. These treatment works would consist of basket strainers, two slow sand filtration cells, and chlorine disinfection with a concrete contact tank. This system would be operated without connection to the power grid;
2. Use the existing intake with treatment works at the end of Sanca Road in a below grade structure. These treatment works would consist of basket strainers, coarse cartridge filters for use during freshet only, UV disinfection, and chlorine disinfection with a pressure tank for chlorine contact time for virus and bacteria disinfection.
3. Point of Entry Treatment at the property line with the required appurtenances for sand and gravel control including a new intake and basket strainers as well as chlorine disinfection.
4. Although local well logs indicate that a well source may not be feasible to supply the community demands the RDCK requested that a well option be priced based on certain

assumptions. The RDCK should do additional investigation to confirm ground water quality in the area and the capacity of a well to supply the community if this option is pursued.

Point of Entry Treatment has not been proven to work in Sanca through pilot studies and the revised cost estimates based on recommendations from those pilot studies make the approach the most expensive of the options.

Option 1 has the lowest lifecycle cost but has a higher capital cost than Option 2 and 4. All options are significantly different in approach and we would recommend that these options be reviewed with RDCK staff, the Community and IHA to determine the preferred approach.

Estimated yearly cost per connection based on 29 connections for Option 1 is \$1,069 per connection. Estimated yearly cost per connection based on 29 connections for Option 2 is \$1,503 per connection. Estimated yearly cost per connection based on 29 connections for Option 3 is \$2,798 per connection. Estimated yearly cost per connection based on 29 connections for Option 4 is \$1,450 per connection. This includes amortization for the required borrowing over 20 years, operation and maintenance, and contributions to reserves for infrastructure renewal for the new treatment works but not the renewal of the distribution system. The costs for option four may be reduced to \$683 per connection if Interior Health agrees to defer UV treatment and chlorine contact for the well source and allows operator visits once per week. This would require confirmation that any well drilled is not under the direct influence of surface water.

It is proposed that one year of Turbidity monitoring, UV Transmittance testing and flow recording be undertaken to determine with certainty the treatment requirements and system integrity. This approach could significantly reduce the size of the required infrastructure and reduce costs. In addition the RDCK should confirm that Crown Land and/or Ministry of Transportation and Infrastructure will allow works to be constructed in the proposed locations.

2.0 INTRODUCTION

The Sanca Park Water System is one of the smallest water systems owned and operated by the Regional District of Central Kootenay (RDCK) with 31 accounts and 29 connections. Water is supplied to the community from Sanca Creek which is presently untreated. This mountain creek is subject to turbidity events and sand and gravel currently enters the system creating operational problems at the intake and in the distribution system. Water quality test results for 2008 and 2009 have been included in **Appendix A** for reference and show the presence of coliforms and e-coli bacteria. As a result, the system is on boil water advisory.

Urban Systems Ltd (Urban) completed a Sanca Park Water System Assessment in 2006 that investigated the existing source, water consumption and demand, distribution network, community growth, and fire protection. The 2006 report evaluated some risks and looked at treatment options for the existing source and made some recommendations for moving forward.

More recently the RDCK has examined Point of Entry (POE) treatment technology as an option for bringing the system into compliance with provincial regulations. POE systems are installed on the service connection for each customer prior to water use and can be installed at the property line or inside the house. A pilot test has been completed and a number of problems associated with this particular water system and the technology have been identified such as filter fouling and additional operational attention required for the ultraviolet treatment among others. Costs have been identified by the District to supply and install POE units as well as the operation and maintenance costs for these units. These costs were presented to the community by the RDCK and were deemed to be too expensive to make POE treatment feasible.

Currently the community water system intake and main transmission line are located on private land. There is an existing 1963 easement between property owners for maintaining and repairing the water pipelines (see **Appendix D**). These works were re-located since this easement was established and since that time discussions to acquire the land or to acquire a legal easement or Statutory Right of Way (SROW) have not progressed beyond preliminary discussions. To support these discussions a SROW plan was created (see **Appendix D**). Any proposed SROW plan and agreement would include the ability to construct and maintain any new treatment works. Any costs identified through these negotiations are an important consideration in determining the future of the water system.

Given the recent events and new information that is available, the RDCK is interested in taking a step back to re-evaluate the present system and potential options for moving this system forward with a sustainable source of water that can be supplied and treated in a cost effective manner. This report was developed to take the previous information available and combine it with some new assessment information to identify a sustainable water source for the Sanca Park Water System.

3.0 EXISTING SYSTEM OVERVIEW

Much work has been done in the past to review and evaluate the existing system. This section summarizes key information while avoiding reassessment of previous work. Updates have been provided where new data has become available.

3.1 Water License and Demand

The Licenses to withdraw water from Sanca Creek on the provincial record are as follows:

RDCK #C053792 for 29,038.15 m³/yr.

Stanley M & Theresa E Nowek #C032477 for 2.273 m³/d.

The 1979 Mecman report states that the Water Rights Branch estimate of low flow in Sanca Creek is 140 l/s. The approximate watershed area is 9,000 hectares (90 km²), yielding a low flow runoff of approximately 1.6 L/s per km².

The system has never been metered, and there is no record of daily or annual water consumption. The current system services 29 connections (31 accounts), but only 5 to 10 of those have residents on a year-round basis. Lots are relatively large with only one lot larger than 2.5 acres.

The BC Design Guidelines for Rural Residential Community Water Systems (2004) can be used to estimate water demands. The 2006 Urban Systems report estimated the maximum daily demand (MDD) per single family residential unit as 5,200 l/d. This is made up of allowances for indoor use, system and residential water loss allowances and irrigation demands. With 29 single-family residential connections @ 5,200 L/d = 150,800 L/d (1.75 l/s).

Peak instantaneous rates for small communities can be as high as 3 times the MDD, or, in this case, approximately 5.24 L/s.

In 2006 Urban Systems approximated the yearly consumption as 15,390 cubic meters including consumption from the Elks Resort which is no longer on the system. Subtracting out the Elks Resort we have an estimated consumption that is less than half the licensed quantity.

The guidelines used above make significant allowances for overuse and leakage. It is strongly recommend that one year of metered data be collected on the system so that leakage can be assessed, as well as actual use patterns during the winter and summer.

Metered data may significantly reduce the size of the infrastructure and allow the RDCK to repair leaks prior to designing and constructing costly water treatment infrastructure.

3.2 Sanca Creek Intake

The creek intake was re-constructed in 1980. It utilizes an infiltration gallery as shown on **Figures 3.2a** and **3.2b**.

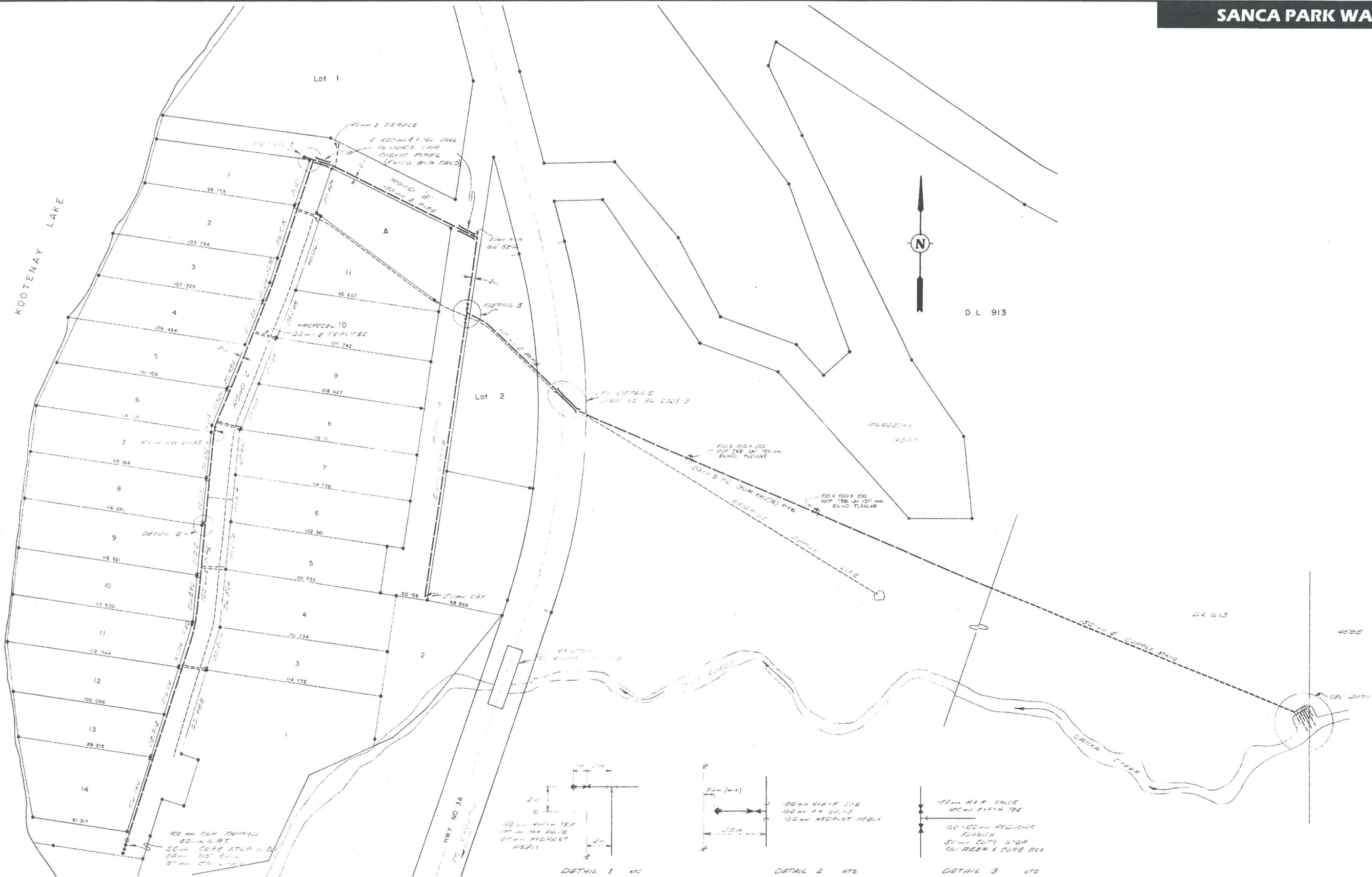
Three perforated pipes are extended to the centre of the creek channel, while four others are constructed in a filter bed beside the channel. All collector pipes are bedded in engineered drain rock material as shown on **Figure 3.2b**. A 25mm nipple is provided on the header to enable connection of high pressure air to backflush any sediment accumulations. In 2010 the RDCK cleaned the intake infiltration gallery.

3.3 Distribution Network

The supply and distribution network was completely rebuilt in 1980. It consists of a 150mm diameter supply main which comes across Highway 3A in a culvert casing. At that point it reduces to 100mm diameter and runs down Road B (connects the highway to Park Road) and Road C (Park Road) in the community. A 50mm diameter line is on Road A (Sanca Road) and a 50mm diameter service supplies the two properties North of the new development on the lands previously used for the Elks Resort.

The network has two 100mm diameter standpipes and a 50mm diameter flushout at the south end of Park Road. The system is depicted on **Figure 3.2a**. The RDCK has also recently performed maintenance on these standpipes.

A shed in the middle of Park Road houses 500 ft. (150m) of fire hose and is available to volunteers in case of fire. There is no fire-fighting truck in the area, and the system is not formally recognized as providing fire protection.



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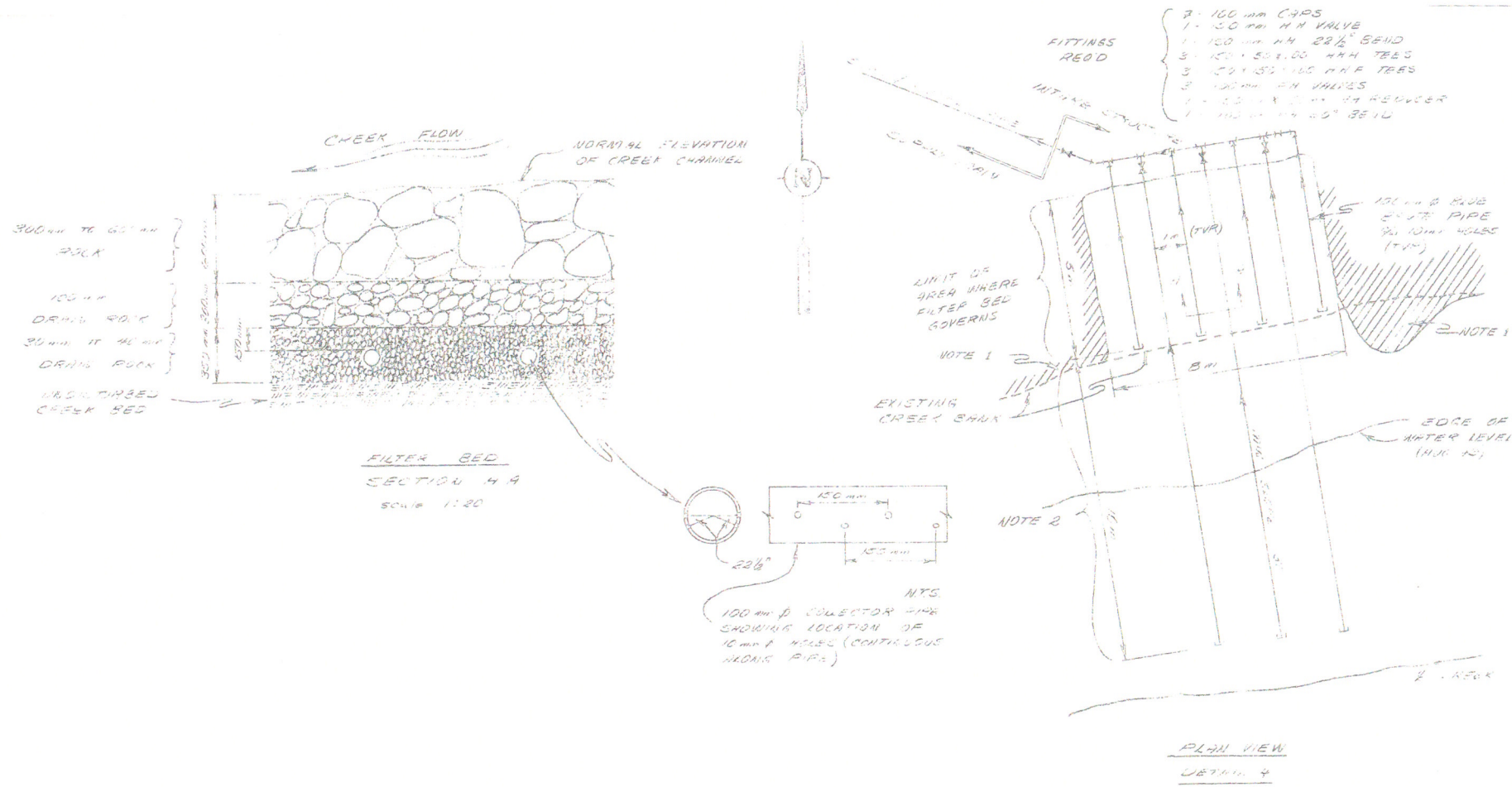
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**SANCA - PARK
 EXISTING WATER SYSTEM**



3.4 Water Quality

Water is supplied to the community from Sanca Creek which is presently untreated. This mountain creek is subject to turbidity events and sand and gravel currently enters the system creating operational problems at the intake and in the distribution system. Water quality test results for 2008 and 2009 have been included in **Appendix A** for reference and show the presence of coliforms and e-coli bacteria. As a result, the system is on boil water advisory.

While this system is generally reported to have low turbidity there has not been any testing during freshet. Based on this anecdotal information this mountain creek may be similar to water quality results obtained on the Ymir system. Ymir's water quality is also reported to be excellent and testing showed that turbidity does rise above 1 ntu during freshet but typically does not go above 3 ntu.

3.5 System Pressures

The relative elevations at the intake and the subdivision produce the following static and dynamic pressures:

	Static (psi)	Dynamic at MDD (psi)
On Sanca Road	47	45
On Park Road	60	57

3.6 Growth Potential

The system designed in 1979 (by Mecman Engineering & Testing Ltd.) was based on the option referred to as Supply System "A".

Supply System "A" included relocating the inlet to a higher elevation (as an infiltration gallery), chlorination, 100mm diameter supply and distribution piping and two standpipes. It was intended to service 27 lots and the Elks Club facility.

The chlorination system was not installed, but the supply pipe was upsized to 150mm diameter.

The Mecman report also provided a Supply System "B", which included a higher intake location, an 81,000 Litre storage reservoir for fire storage, 150mm diameter distribution piping and 2 fire hydrants.

The intent of System “B” was to provide firefighting capacity and potentially service 30 to 60 lots on the east side of Highway 3A (Lot 913), owned by the Wynndel Box and Lumber Company. The report recommended that the extra cost of adopting System “B” over System “A” be assessed to Wynndel Box and Lumber Company if there were a desire to participate in the upgrade.

Recent dialogue with Wynndel Box and Lumber Company indicated that they may still be interested in a 2 to 12 lot subdivision. Discussions regarding this possible subdivision have been ongoing since the late 1970’s and there have been no firm commitments made to the RDCK.

There is capacity to expand the system from a water supply perspective and expansion would reduce the cost per connection paid for upgrades and O&M. However without a firm commitment the additional costs for a larger system without the user base to support it would be too onerous for the community to take on. It should be noted that expansion of the treatment works at a later date could be accommodated at an increased cost. In addition, any cost associated with specifically servicing new development can be borne 100% by the property owners including any pumping systems, water storage, and transmission lines. While Sanca currently does not have a system extension fee other RDCK systems have an extension fee of \$10,000 per service. The same can be applied in Sanca.

3.7 Fire Protection

The community does not have any formalized fire protection system. There are two 100mm diameter standpipes and one 50mm diameter standpipe. There is also 500 feet (150m) of 50mm diameter fire hose located in a shed halfway down Road C for the use of residents in case of fire.

These facilities do not conform to any formal firefighting standard, nor is there any firefighting storage in the system. It is not known if any of the residents have any training in firefighting. The utility is therefore deemed as not providing fire protection and the RDCK has confirmed that fire protection was not to be included as part of this study.

Storage is not required if there is no formal fire protection status except as required for the treatment system to buffer peak hour demands and to meet log removal credits for chlorine contact time.

4.0 WATER SOURCE OPTIONS REVIEW

This water system has been reviewing upgrade options since 1979 and while some work has been done on the system over the years, water treatment has not been implemented in the community. To support the community in the review process it is desirable to take a broad brush approach to reviewing possible water sources to ensure that this report captures all potential options for review. While some of these options may not be appealing for various reasons, consolidating the options in one place allows for a comprehensive review process.

4.1 Regional Water System

The Sanca Water System is located in Area A of the RDCK which has almost 60 small water systems. Many of these are located on the east shore of Kootenay Lake (please see **Appendix B** RDCK Regional Water Maps Page 1 Water Systems for a detailed overview of systems within the RDCK). Based on the beauty of the surrounding area it would not be unexpected to continue to see development on the east shore of Kootenay Lake. It is recognized in BC that small water systems will be challenged to address water quality issues and to treat their water to the new guidelines and standards. Contemplating individual treatment and storage facilities for all the existing small water systems in Area A and the potential for new systems to support development prompts one to question if a regional approach might be more affordable.

Appendix B identifies several issues that should be considered in reviewing a regional system. Page 2 indicates that there are existing systems in the area that are requesting RDCK assistance: Wynndel Irrigation District and Armstrong Bay Water System. There may be others that would be willing participants in a regional approach if it could be demonstrated that the costs were more affordable than remaining independent.

Many of the existing small water systems on the east shore have source water that is dependent on mountain streams. **Appendix B** also has mapping that shows some potential risk items that should be considered. Snow Pack is showing a 10 to 24% decline on that side of the lake (page 5 **Appendix B**) which could impact source waters in addition some systems may be at risk of geological hazards (page 3 of **Appendix B**). A well designed regional system could go a long way to mitigating some of these risks.

The RDCK did a study in May of 2008 called the Arrow Creek Water Treatment and Supply System. This report indicates that there is a surplus of high quality treated water available for other communities if piping infrastructure was put in place. One section of the report examines an option to supply water throughout the Creston Valley. Given that water from Arrow Creek is supplied to the north side of the Town of Creston the same principles could be applied to piping water north along the east shore of Kootenay Lake.

This would allow water treatment operations to be provided at one central location and a greater number of users to support the service.

For Sanca service from Creston would not be a possibility unless all the water systems between Creston and Sanca (as well as others north of Sanca) agreed to be part of the regional approach and agree to support the pipeline as it would require about 35 kilometers of pipe. For example there would be approximately 8 kilometers of pipe to get service to Wynndel and so on down the lake. A conservative estimate for 200 mm watermain in the Kootenays is estimated at \$180 per meter as an all in unit price. It is also important to note that without other users on such a long pipeline, water would become stagnant due to the low winter demands in Sanca.

The other challenge is bringing all parties together and creating an agreeable approach in a reasonable time frame. In addition, communities would likely need to adopt a long term approach and recognize that the lifespan of a PVC pipeline that is installed properly could be greater than 100 years whereas water treatment facilities typically need renewal on much shorter timescales adding unnecessary costs to small community systems.

There may be other centralized regional approaches to providing service but these options are beyond the scope of this report, as they are much more varied and complex. Other communities have adopted the regional long term view and have been successful at securing funding for such an approach.

4.2 Kootenay Lake

Sanca is adjacent to Kootenay Lake and therefore it is difficult to ignore this large body of water as a potential water source. A significant amount of work has been done to study the lake water quality and in general the water quality is good. BC Hydro has reported that the turbidity in the lake has declined since the dams have been installed. However it is a surface water source and in 2010 the Ministry of Environment released the Kootenay Lake Nutrient Restoration Program, Year 16 (North Arm) and Year 4 (South Arm) (2007) Report which states:

In the period 1997-2007, average turbidity values ranged from 0.29-0.99 NTU in the North Arm and 0.25-1.80 NTU in the South Arm (Table 3.4). The increase in turbidity in the spring of 1997 could be attributed to higher discharge from the Kootenay River.... The increase in turbidity during the spring months in the South Arm in 2006 and 2007 could be attributed to additional discharge entering the lake resulting from a change in Libby Dam operations.

Sanca is located in the South Arm and based on this report it would seem that during portions of the year turbidity could be expected to be above 1 NTU. Interior Health notes the following regarding turbidity under their 4-3-2-1-0 Drinking Water Objective:

The Guidelines for Canadian Drinking Water Quality currently specify that the filtered treated water turbidity should have a target of less than 0.1 NTU at all times. Specific filtration technologies may have target turbidity ranges from 0.1 to 1.0 NTU. Exemptions for filtration may be considered for those systems that use two disinfectants plus maintain chlorine residual in the distribution system and can demonstrate compliance with the GCDWQ for exemption for filtration.

If the community chooses to make use of Kootenay Lake instead of their current gravity creek source they would still need to filter the water and in addition they would need to pump the water to a new storage reservoir. New land would also need to be acquired to site the new treatment works. Based on the need for filtration, pumping and new land acquisition this option is not likely to be cost effective for the community unless the current source were determined not to be a sustainable source over the long term.

4.3 Groundwater

Communities have often investigated groundwater as a potential source when filtration is required for their surface water source. This helps keep treatment costs low or in some cases, if the well is in a confined aquifer with good water quality, to eliminate the need for treatment all together. Based on a review of the area the following is noted:

- There are no aquifers mapped in the area (see **Appendix B** page 9);
- The only viable location to drill a well to get the volumes needed in this area is near the lake;
- Any well drilled would likely be hydraulically connected to the lake and may be considered groundwater under the direct influence of surface water (GUDI);
- A GUDI source will still require ultra violet and chlorine disinfection;
- If there are any other water quality issues with the well the water may require additional treatment such as filtration and chemical addition; and
- Well logs in the area show a range of production capacities from 2.5 USgpm to 30 USgpm or 0.16 l/s to 1.89 l/s (see **Appendix C** for local well information).

The 1979 Mecman report states that the Water Rights Branch estimate of low flow in Sanca Creek is 140 l/s demonstrating that there is significantly higher flow available in Sanca Creek than would be available through groundwater pumping in the area. The 2006 Urban report calculated the MDD as 207,500 l/d or 2.4 l/s and this report revised that number based on the current situation to 1.75 l/s. Instantaneous rates for small communities can be as high as 3 times the MDD, or, in this case, approximately 5.25 L/s.

Based on this, if a well were used it would still require treatment, it would require pumping to an elevated storage reservoir, and likely multiple wells would be needed to meet the demand as well as significant storage volumes. The only benefit would be the possibility of eliminating the need for filtration. However, this would be offset by the cost of drilling multiple wells to meet the demand, increased storage, and does not eliminate the risk of other treatment sometimes associated with ground water. In addition operational costs would increase due to pumping water. Based on this information this would not likely be a cost effective option for the community.

Individual wells could be drilled, however each house in the community is currently disposing of wastewater using septic fields. Interior Health requires each parcel to be a minimum size of 2.5 acres to allow a well and septic field on the same lot. All but one lot in this community are smaller than this minimum size restriction. Therefore, individual wells would not be an option with an onsite septic system.

The RDCK has requested that a cost estimate be developed based on the assumption that a single well with sufficient capacity could be drilled near Sanca Creek at the end of Sanca Park Road and the water quality would be good. Under this option pressure tanks would be used instead of a storage reservoir and standby power would be provided to allow water supply during power outages. The RDCK also believes they may initially be able to get agreement from Interior Health to install a treatment system that uses only chlorine for the proposed well source.

4.4 Alternative Sources

In drought stricken places or areas where water is not available, rainwater harvesting has been employed and or trucking in water to each individual house. While there are homes that truck in water in Alberta there do not appear to be any trucked drinking water operations in BC nor would this be a cost effective alternative for this community. The same goes for rainwater harvesting. The community demands are much too high for this to be a viable alternative. Also there do not appear to be any systems like this that have been approved. Rainwater harvesting has been used in communities in BC to supplement outdoor irrigation but not for drinking water.

4.5 Dissolve the Community Water System

There do not appear to have been any circumstances in the Province where a water system owned and operated by a Regional District was permitted to be dissolved. The current regulations are set up to allow improvement districts or community water systems to be dissolved and assets and ownership transferred to a local government. It is unlikely that the RDCK could divest themselves from this system under the current provincial governance structure.

4.6 Existing Sanca Creek Water Source

Sanca Creek, based on the limited information available, has ample water available to supply the community. The water license held by the RDCK also has ample water to supply the community and even expand it to more than twice the current size if it was desired. Water supply is not the issue. If the community were contemplating expansion consideration should be given to climate change scenarios such as declining snow pack and pine beetle infestation and how this may impact the watershed, water supply and water quality.

Water is fed by gravity to the community and pressures within the community meet the minimum standard of 35 psi. However, pressures above Highway 3A do not meet the minimum standard and therefore any development at Highway 3A or above would require a booster pump station or would require moving the intake upstream.

The intake infrastructure and pipeline for this source is located on private property. There is an existing easement over the area to operate and maintain the works. Discussions have taken place over the years regarding securing a statutory right of way that would formalize any agreement for operation, maintenance and installation of the existing and any proposed works. At this time this has not been completed.

4.7 Preferred Source

Based on the options reviewed Sanca Creek remains the preferred source and the options for upgrades should be based on that source. Please note that any upgrades on Lot 913 will likely require the approval of Wynndel Box.

4.8 Do Nothing

The RDCK is concerned about drinking water quality and the ongoing boil water advisory and the liability associated with not meeting current regulations. They faced similar challenges with respect to treatment upgrades in South Slocan. South Slocan was presented with a detailed proposal to move forward that included a summary of costs, as well as user fees and taxes to support the upgrades. The community voted no to the proposal. Subsequently the Interior Health Authority ordered the RDCK to move forward via the Drinking Water Protection Act and the upgrades were implemented and the necessary fees and taxes levied to support the required upgrades. Under this scenario a community loses the flexibility on how to move forward.

It is noteworthy that Interior Health will work with communities to establish longer term plans to bringing the system up to standards prior to taking similar action as in South Slocan.

5.0 WATER QUALITY TARGETS AND CURRENT HEALTH RISKS

The BC DWPA (Drinking Water Protection Act) and the accompanying Regulations provide the required water quality parameters for reduced risks to public health. Interior Health has declared a more comprehensive set of targeted constituents. These are referred to as the 4-3-2-1-0 Drinking Water Objective. Water suppliers will be required to provide long term plans to reach the goals of:

- 4 log inactivation of viruses
- 3 log removal or inactivation of Giardia Lamblia and Cryptosporidium
- 2 refers to two treatment processes for all surface drinking water systems
- 1 for less than 1 NTU of turbidity with a target of 0.1 NTU
- 0 total and fecal coliforms and E. Coli

Interior Health has indicated that they would consider phased plans to meet the 4-3-2-1-0 treatment objective.

An Order-in-Council (No. 879, approved and ordered on December 8, 2005) repeals Section 1 of the Drinking Water Regulation, BC Reg. 200/2003 and replaces it with provisions for “small” systems. Small systems are defined as those that serve up to 500 individuals during any 24 hour period.

Interior Health objectives for water quality apply equally to “small” water systems. The Order-in-Council does allow provisions for achievement of “potable” water with in-house Point-of-Entry or Point-of-Use treatment systems.

The system currently has minimal sand and gravel around the infiltration gallery intake. There is no other protection against viruses, bacteria, and protozoan cysts such as Giardia or Cryptosporidium.

6.0 WATER TREATMENT FACILITY LOCATIONS

In an effort to narrow down the possible scenarios, treatment options are examined first based on suitable locations for a treatment facility using the preferred source Sanca Creek.

6.1 Point of Entry Treatment Systems

The RDCK has done several studies and pilot trials over the years on the use of point of entry (POE) treatment systems. Sanca had a system pilot tested in the community. Sand and gravel, high water demands, water temperature, power surges, brownouts and outages created problems with the operation of this system. This is all documented in the RDCK report Sanca Park Water System of July 23, 2009.

The report does go on to state that:

- *Consistent (raw) water quality is required for POE systems;*
- *Passive pressure membrane filters that require minimal power and provide certified log credits for removals... would reduce operational issues;*
- *Splitting raw water supply from potable water supply would prove beneficial and extend the life span of POE equipment;*
- *Access to equipment 24/7 is important and therefore must be contained in a vault at the property line;*
- *It will likely be necessary to inject chlorine at source in order to maintain the integrity of the distribution system and as well provide a second barrier for disinfection. The chlorine could then be removed using a carbon block filter at the property line.*

The POE cost estimates presented in 2009 were based on the assumption that a well could be drilled to improve water quality making the operation of the POE systems less problematic. A desk top review of the area indicates that a single well source is not capable of supplying enough water for the community. Therefore, if the existing intake were continued to be used instead of a well source, this would require a headworks facility to create a consistent raw water quality prior to treatment with POE systems.

6.2 Centralized Treatment System Options

Two options are presented for consideration. The first involves a new intake structure on Crown Land above lot 913 and the second involves keeping the existing intake. Any upgrades on Lot 913 will likely require the approval of Wynndel Box.

6.2.2 Existing Intake and Treatment Vault

If the RDCK is unable to secure a statutory right of way or permission to make upgrades on Lot 913, another option would be to install a below grade treatment vault at the end of Sanca Road (see Figure 6.2.2).



Figure 6.2.2

There is power available at this location and this area is approximately 30 meters by 30 meters. Under this scenario the following is proposed:

- Below grade treatment vault with stairwell access to eliminate the need for confined space entry;
- The stairwell will need an above grade building cover approximately 1.7 meters by 5.6 meters;
- Single phase power service and telephone line;
- Approximately 160 meters of raw water line;
- Approximately 160 meters of treated water line;
- Manual double basket strainer for sand and gravel removal;
- 50 micron and 10 micron cartridge filters in series to be used only during freshet when Turbidity is above 1 ntu to keep operational costs low;
- UV reactor;
- Chlorine disinfection using Sodium Hypochlorite with in line pressure vessel contact tank; and
- On line SCADA system to measure flows, turbidity, and residual chlorine.

The treatment train is designed to get the required log credits for the pathogens noted in Section 5.0. Note the inline pressure vessel would be designed to kill viruses and

bacteria and not protozoa. Typical 4-log (99.99%) inactivation for virus and bacteria is achieved at CT values of 4 to 8. This is dependent on a number of factors which would be reviewed during design.

6.3 Well Source Option

The RDCK has requested that a well source option be investigated located at the end of Sanca Park Road (see **Figure 6.3**). Based on the well log review a single well may not be able sustain the community water demands and there is no well water quality data to suggest that the water quality will be good.



Figure 6.3

We have assumed that a single well could supply the community and that the water quality will be good. This will need to be confirmed by the RDCK by doing some additional investigation for the existing wells in the area. Under this scenario the following is proposed:

- Single well;
- Below grade treatment vault with stairwell access to eliminate the need for confined space entry;
- The stairwell will need an above grade building cover approximately 1.7 meters by 5.6 meters;
- Single phase power service and telephone line;
- UV reactor;

- Chlorine disinfection using Sodium Hypochlorite with in line pressure vessel contact tank;
- Bladder tanks to sustain system pressure to cycle the well pump;
- Backup power; and
- On line SCADA system to measure flows, turbidity, and residual chlorine.

The treatment train is designed to get the required log credits for the pathogens noted in **Section 5.0**. Note the inline pressure vessel would be designed to kill viruses and bacteria and not protozoa. Typical 4-log (99.99%) inactivation for virus and bacteria is achieved at CT values of 4 to 8. This is dependent on a number of factors which would be reviewed during design.

7.0 COST COMPARISONS

Class D Cost estimates have been provided for a new intake on Crown Land with associated treatment works, keeping the existing intake with a new treatment vault on Sanca Road, and Point of Entry Treatment. A regional approach to water treatment has not been reviewed due to the wide array of possible options. District Lot 17 might be available for a new treatment plant however this would require about 900 meters of new raw water pipe and 900 meters of new treated water pipe making the approach less cost effective than the treatment vault on Sanca Road.

7.1 New Intake on Crown Land and Slow Sand Filter

The filter size is based on a:

- hydraulic loading rate of 0.15 m/hr (3.6 m/day),
- two cell design to allow cleaning,
- MDD of 1.75 l/s or 151 m³/d,
- Peak hour is buffered by some additional capacity in the chlorine contact tank and pipeline,
- Headwater depth of 1 meter above filter sand,
- Initial filter bed depth of 0.9 m,
- Minimum filter bed depth of 0.5 m,
- Gravel bed depth of 0.5 meters, and
- Freeboard of 0.6 meters.

The required filter surface area is approximately 21 m² per cell.

This option assumes that the RDCK will be approved to build the treatment works on Crown Land at no cost to the District. It also assumes that there will be cell coverage at the location for alarm dial out. Grid power is not required for this treatment option. The capital costs and O&M costs are summarized below. Please note that it is highly recommended that the RDCK perform at least one year of water quality testing and metering on the system to confirm that the raw water quality meets the required parameters for slow sand filtration. Metering the system will result in a better understanding of water demands and leakage and could lead to downsizing treatment infrastructure with reduced costs.

Capital Cost

Item	Cost
Clearing, site prep and access	\$ 10,000
New diversion structure and piping	\$ 35,000
Manual double basket strainers and vault	\$ 10,000
Slow sand filters (2 cells)	\$ 126,000
Accu-Tab chlorination system and enclosure	\$ 15,000
Chlorine contact chamber	\$ 18,000
Flow meter	\$ 5,000
Chlorine and turbidity monitoring	\$ 5,000
Sub Total	\$ 224,000
Contingency Class D Cost Estimate (35%)	\$ 78,400
Sub Total	\$ 302,400
Engineering (15%)	\$ 45,360
Reserves	\$ (56,000)
Gas Tax Funds	\$ (40,000)
Total	\$ 251,760

Capital Amortization Costs based on 20 years at 4% MFA (per year per connection) \$ 639

O&M Cost

Item	Cost
Power (no grid power in this option)	NA
Telephone (cell \$50/month)	\$ 600
Chemicals and incidentals	\$ 1,500
Filters (sand replacement fund per year)	\$ 1,000
*Operator maintenance \$50 per hour 1 time per week 2 hours per day	\$ 5,200
Snow clearing forestry service road	\$ 1,200
Infrastructure renewal fund	\$ 2,957
Total per year	\$ 12,457

*Note: Suggested requirement by RDCK for this type of system.

O&M cost per connection per year (29 connections) \$ 429.54

Total Cost Per Year Per Connection \$ 1,068.54

7.2 Keep Existing Intake and Add Treatment Vault on Sanca Road

This option assumes that the RDCK will be approved to build the treatment works at the end of Sanca Road. It also assumes that single phase power and telephone are available adjacent to the site. The capital costs and O&M costs are summarized below. Please note that it is highly recommended that the RDCK perform at least one year of water quality testing and metering on the system to confirm that the raw water quality meets the required parameters for the proposed treatment process. This option assumes that turbidity in the water will be similar to water quality in Ymir. Metering the system will

result in a better understanding of water demands and leakage and could lead to downsizing treatment infrastructure with reduced costs.

Capital Cost

Item	Cost
Clearing, site prep and access	\$ 5,000
Below grade treatment vault with stairwell access	\$ 42,000
Single phase power service and telephone line	\$ 10,000
160 meters of 200 mm raw water line	\$ 28,800
160 meters of 200 mm treated water line	\$ 28,800
Manual double basket strainers	\$ 5,000
50 micron and 10 micron cartridge filters	\$ 10,000
UV reactor and appurtenances	\$ 35,000
Chlorine disinfection with in line pressure vessel contact tank	\$ 40,000
On line SCADA system to measure flows, turbidity, and residual chlorine.	\$ 10,000
Sub Total	\$ 214,600
Contingency Class D Cost Estimate (35%)	\$ 75,110
Sub Total	\$ 289,710
Engineering (15%)	\$ 43,457
Reserves	\$ (56,000)
Gas Tax Funds	\$ (40,000)
Total	\$ 237,167

Capital Amortization Costs based on 20 years at 4% MFA (per year per connection) \$ 602

O&M Cost

Item	Cost
Power (heat, light, and UV - average \$200/month)	\$ 2,400
Telephone (landline \$50 per month)	\$ 600
Chemicals and incidentals	\$ 1,500
Cartridge Filters (freshet only)	\$ 800
UV Bulbs	\$ 800
Operator maintenance \$50 per hour 3 times per week 2 hours per day	\$ 15,600
Infrastructure renewal fund	\$ 4,429
Total per year	\$ 26,129

O&M cost per connection per year (29 connections) \$ 901.01

Total Cost Per Year Per Connection \$ 1,503.01

7.3 Point of Entry Treatment Systems

We have reviewed the costs in the RDCK report and note the following:

- Only 16 vaults have been allowed and it is assumed that this is based on properties sharing treatment vaults;

- Solar power cost seems low to run each system and there may be insufficient solar power to run the system without proper battery backup;
- A well system is not feasible to feed the POE systems and therefore a headworks system would be needed to remove sand and gravel;
- Constructing new works in the existing easement has not been authorized and therefore new works would be required on Crown Land with a new intake; and
- The estimate is a Class D Cost Estimate and should have a contingency of 35%

The RDCK original Estimate was \$492,500 for the system outlined in the report July 23, 2009 report. We have updated the capital costs and O&M costs using the POE costs provided in the RDCK report and the revised contingency.

Capital Cost

Item	Cost
Clearing and site access new intake	\$ 10,000
New Intake	\$ 35,000
Manual double basket strainers and vault	\$ 10,000
Accu-Tab chlorination system and enclosure	\$ 15,000
Chlorine contract chamber	\$ 18,000
POE vaults at property line (16)	\$ 73,600
Split Irrigation to reduce flow to POE	\$ 14,500
POE Units	\$ 145,000
Solar power and battery backup	\$ 43,500
Sub Total	\$ 364,600
Contingency Class D Cost Estimate (35%)	\$ 127,610
Sub Total	\$ 492,210
Engineering (15%)	\$ 73,832
Reserves	\$ (56,000)
Gas Tax Funds	\$ (40,000)
Total	\$ 470,042

Capital Amortization Costs based on 20 years at 4% MFA (per year per connection) \$ 1,193

O&M Cost

Item	Cost
Power (not connected to grid power)	NA
Telephone (no alarm dial out)	NA
Chemicals and incidentals	\$ 1,500
Operator maintenance average 2 hours per month per unit \$50 per hour	\$ 34,800
Infrastructure renewal fund	\$ 10,245
Total per year	\$ 46,545

O&M cost per connection per year (29 connections) \$ 1,605.00

Total Cost Per Year Per Connection \$ 2,798.00

7.4 Well Source Option

The RDCK requested that we price the well source option assuming that a single well could be drilled to accommodate the required flows and assuming the water quality would be good. While the cost table below includes the provision for UV treatment and a chlorine contact tank, there may be opportunities to work with Interior Health to monitor the water quality to determine if UV treatment is required and if a chlorine contact chamber is required. Removing these costs and reducing site visits to once per week reduces the total cost per connection to \$683 per connection.

Capital Cost

Item	Cost
Clearing, site prep and access	\$ 5,000
Well drilling, completion, testing, pad and casing	\$ 25,000
Well pump	\$ 10,000
Below grade treatment vault with stairwell access	\$ 42,000
Single phase power service and telephone line	\$ 10,000
UV reactor and appurtenances	\$ 35,000
Chlorine disinfection with in line pressure vessel contact tank	\$ 40,000
Bladder pressure tanks	\$ 10,000
On line SCADA system to measure flows, turbidity, and residual chlorine.	\$ 10,000
Backup power	\$ 15,000
Sub Total	\$ 202,000
Contingency Class D Cost Estimate (35%)	\$ 70,700
Sub Total	\$ 272,700
Engineering (15%)	\$ 40,905
Reserves	\$ (56,000)
Gas Tax Funds	\$ (40,000)
Total	\$ 217,605

Capital Amortization Costs based on 20 years at 4% MFA (per year per connection) \$ 552

O&M Cost

Item	Cost
Power (heat, light, UV and pumping)	\$ 2,700
Telephone (landline \$50 per month)	\$ 600
Chemicals and incidentals	\$ 1,500
UV Bulbs	\$ 800
Operator maintenance \$50 per hour 3 times per week 2 hours per day	\$ 15,600
Infrastructure renewal fund	\$ 4,853
Total per year	\$ 26,053

O&M cost per connection per year (29 connections) \$ 898.39

Total Cost Per Year Per Connection \$ 1,450.39

8.0 WATER CONSERVATION

Serious consideration should be given to water conservation in this community as a green approach to the proposed upgrades. Reducing the volume of water used in the community through the use of water meters, a ban on irrigation with potable water, roof leader and rainwater capture and storage for irrigation, or alternative irrigation supply may result in significant capital and O&M cost reductions. A green approach may also make the project eligible for grants.

9.0 CONCLUSIONS AND RECOMMENDATIONS

9.1 Assessment Summary

9.1.1 Source Water

Sanca Creek is a reliable source of water for this community and the predicted watershed yield surpasses the current consumption rate in moderate drought conditions. It is the preferred source for this community.

The water quality is good and while there are activities in the watershed such as logging and recreation, the risk of source contamination is relatively low.

Although long-term sampling and turbidity monitoring has not been done it is expected that turbidity will exceed 1 ntu during freshet and therefore some form of filtration is required.

9.1.2 Infrastructure

The supply and delivery network was constructed in 1980, using PVC pipe. If this was constructed properly with pipe bedding, the pipe should have a lifespan of 100 years if properly maintained. Routine flushing, cleaning and valve exercising should be undertaken on a regular and consistent basis; risk of service loss is low. Leakage has not been assessed and cannot be determined without centralized flow recording.

The existing infiltration gallery system operates competently, but will require regular back flushing to prevent clogging with sand and gravel.

The system is not intended to provide formal fire protection. Conversion to a fire protection system would require significant changes to pipe sizes, hydrants and storage. This is not envisioned at this time.

9.1.3 Microbial Risks

Microbes and protozoan cysts are endemic in BC Interior surface waters and adequate barriers for inactivation should be provided, as well as for viruses and bacteria.

9.1.4 Operation and Maintenance

The system is currently visited monthly by Erickson system operators. A local qualified operator is preferred to reduce travel time and to support emergency call outs. Once the new system is on line additional operator attention will be required.

9.1.5 Financing

The current user fee of \$520 per connection plus a \$50 parcel tax does not provide sufficient revenue to properly operate and maintain the utility. User fees need to be increased to cover the costs of a proper operating protocol and to allow for the addition of a treatment system. It is our understanding that user fees are expected to increase again in 2013 by 20%.

9.1.6 Lowest Cost Treatment Approach

The RDCK has noted that the New Intake Option will likely need only one visit per week. This approach makes this system the lowest cost option at \$1,069 per connection. If the well source is considered further additional investigation is required as well as discussions with Interior Health on treatment requirements.

Additional water quality data and metering of the system is required to properly size infrastructure and to confirm treatment requirements. A better understanding of these parameters could reduce costs.

9.2 Conclusions

The Sanca Park system is in reasonably good condition and has reliable and good quality source water. It does not provide fire protection and any upgrade to fire protection would be at the choice of the residents. Fire protection infrastructure must be accompanied by a trained fire department and adequate equipment.

In terms of meeting Interior Health standards for microbial protection, the addition of treatment works is required.

Solutions are proposed that will allow the District to move forward without the need for further negotiation with the land owner of DL 913 however it is recommended that this report be reviewed with the land owner prior to moving forward with any upgrades. Additional users on the system would make the addition of treatment works more cost effective. Please note if any upgrades are required on Lot 913 they will likely require the approval of Wynndel Box.

9.3 Recommended Implementation Plan

The recommended implementation plan is as follows:

9.3.1 Year 2013 Activities

1. **Well Investigation, Crown Land and MoTI ROW**

If the RDCK wishes to pursue the well source option additional investigation work should be conducted to determine the water quality to confirm that specialized treatment is not required. Expected well capacity should be confirmed by a hydro geologist to determine if a well can meet community demands. Discussions with Interior Health should also be had to confirm if the UV and chlorine contact tank can be deferred.

The RDCK should also confirm that proposed works for each option could be constructed on Crown Land or in MoTI ROW.

2. **Plan Ratification**

Submit the report to Interior Health for review and approval. At this time the report should also be reviewed with the community and with Wynndel Box and Lumber. Wynndel Box and Lumber should be given an opportunity to be part of the upgrades given that it will be more expensive for them to add on to the system at a later date. Any additional costs for capital upgrades to support the improved pressure required for the development on DL 913 would be incurred by the Owner of that land. If the Owner was open to granting a statutory right of way for treatment works on DL 913 there could be some minor capital cost savings for the RDCK under Option 1 if a new intake was not required on Crown Land provided the hydraulic grade line was sufficient to operate the treatment works without compromising the system pressure. Please note if any upgrades are required on Lot 913 they will likely require the approval of Wynndel Box.

3. **Monitoring Program**

Purchase and install a continuous reading turbidimeter and record turbidity for one year. Sample monthly for UV transmittance (UVT) over the same year. The turbidimeter can be installed in the home of a permanent resident. It can be moved to the treatment facility at a later date. Sample results should be correlated with raw water samples from the creek during freshet with a hand held turbidity meter. Monitoring equipment should be installed prior to freshet 2013.

Purchase and install a flowmeter on the main supply line. This will require power and an access chamber. This unit can also be relocated to the treatment facility at a later date.

During freshet perform a particle size distribution analysis for a single water sample.

4. Operation and Maintenance Plan

Review the operations and maintenance activities of other RDCK systems in the area and integrate Sanca Park in the network. Prepare a sampling and testing program that dovetails with sampling and testing at other utilities.

Estimated 2013 Expenditures:

Turbidimeter, UVT and Flowmeter Installation:	\$10,000
Sampling and Testing:	3,000
Total	\$13,000

9.3.2 Year 2014 Activities

1. Review Monitoring Program Data

- Confirm filtration and UV requirements with Interior Health on the basis of one year's turbidity monitoring and UVT testing.
- Establish design flows from flowmeter recordings.
- Determine if there is significant leakage from flowmeter recordings.
- Identify leaks and repair as required to reduce system demands.

2. Prepare Tender Ready Documents

Complete the design and update the cost estimates for the treatment facility.

3. Apply for Funding Assistance

Prepare and submit the appropriate application if senior government funding assistance is available.

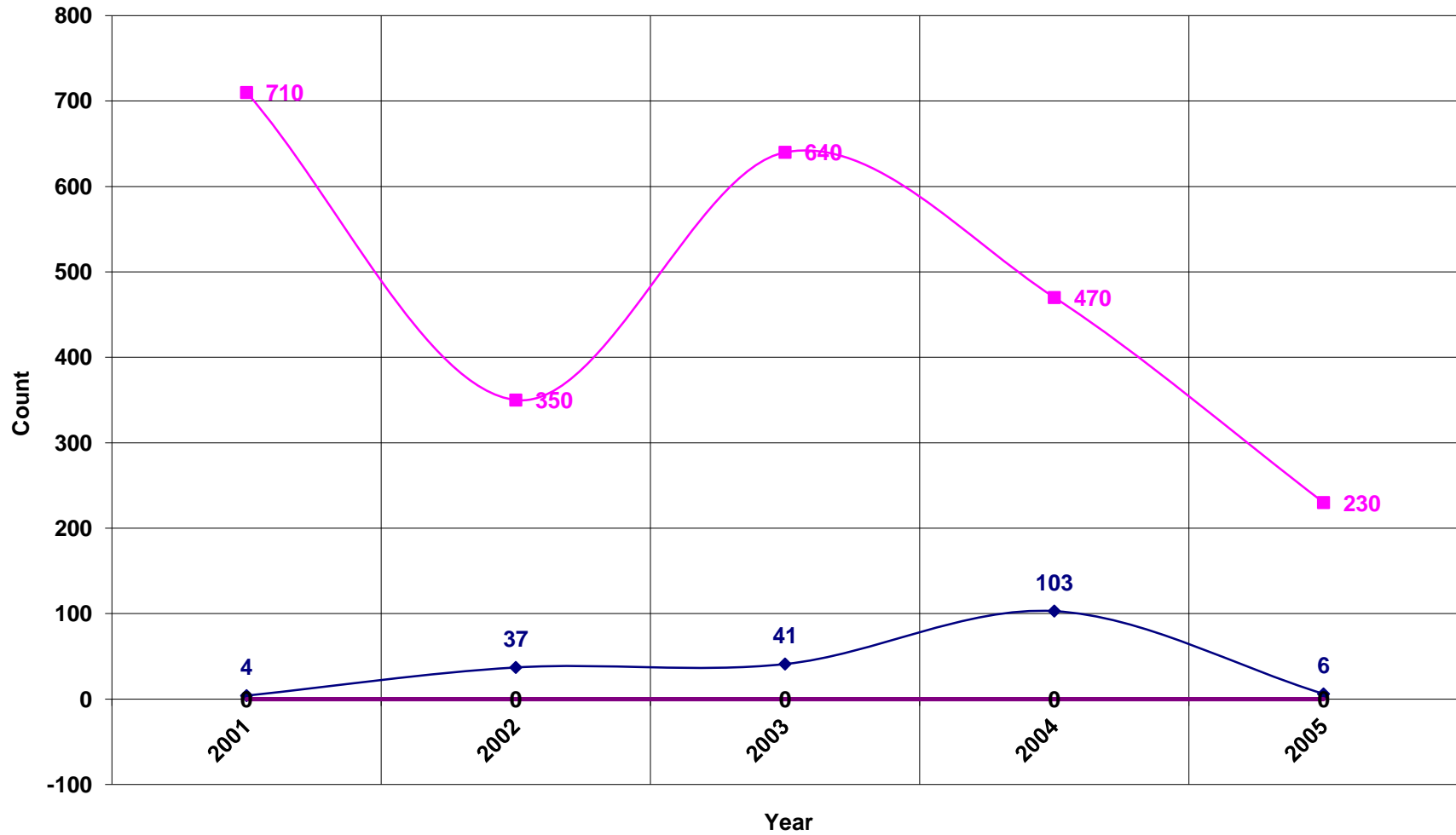
9.3.3 Year 2015 Activities

1. Construct and commission the treatment facility

APPENDIX A

Water Quality Test Results

Coliforms 2001-2005 Sanca Park Water System

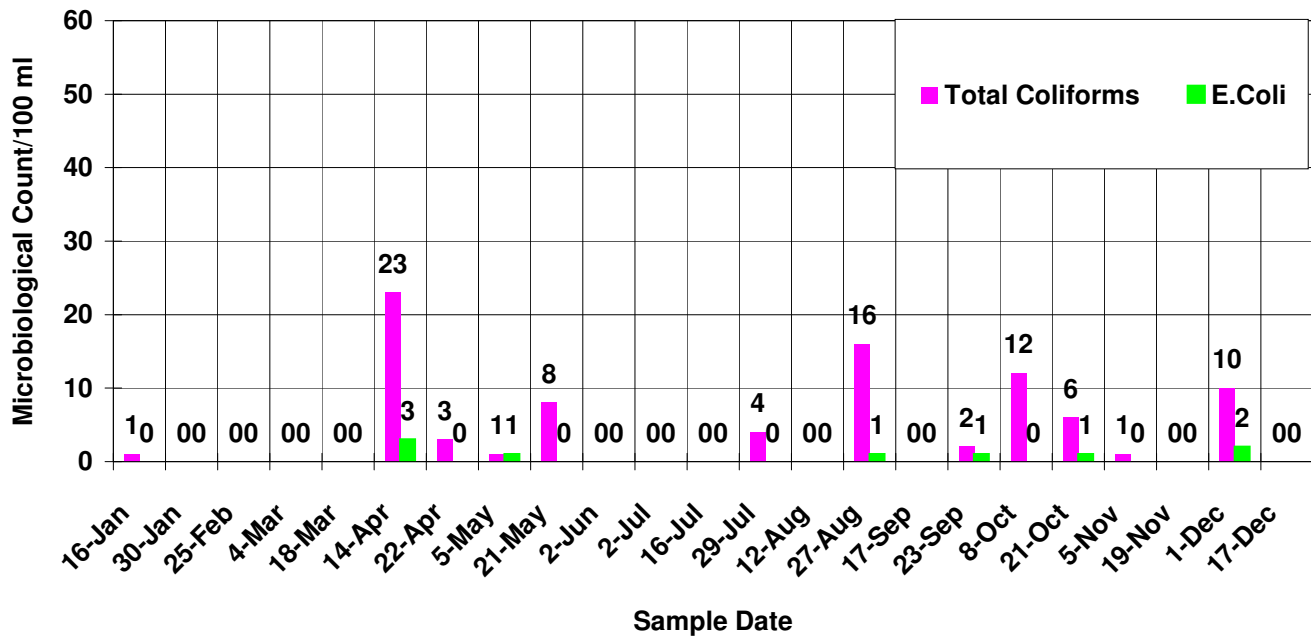


—■— Maximum Total Coliforms —◆— Maximum Fecal —●— BC MAC

Sanca Park Water Quality Data 2008

Sampling date	Total coliforms/100 ml	e. coli/100 ml	MAC/100ml
16-Jan	1	0	0
30-Jan	0	0	0
25-Feb	0	0	0
4-Mar	N/A	N/A	0
18-Mar	0	0	0
14-Apr	23	3	0
22-Apr	3	0	0
5-May	1	1	0
21-May	8	0	0
2-Jun	0	0	0
2-Jul	0	0	0
16-Jul	0	0	0
29-Jul	4	0	0
12-Aug	0	0	0
27-Aug	16	1	0
17-Sep	0	0	0
23-Sep	2	1	0
8-Oct	12	0	0
21-Oct	6	1	0
5-Nov	1	0	0
19-Nov	0	0	0
1-Dec	10	2	0
17-Dec	0	0	0

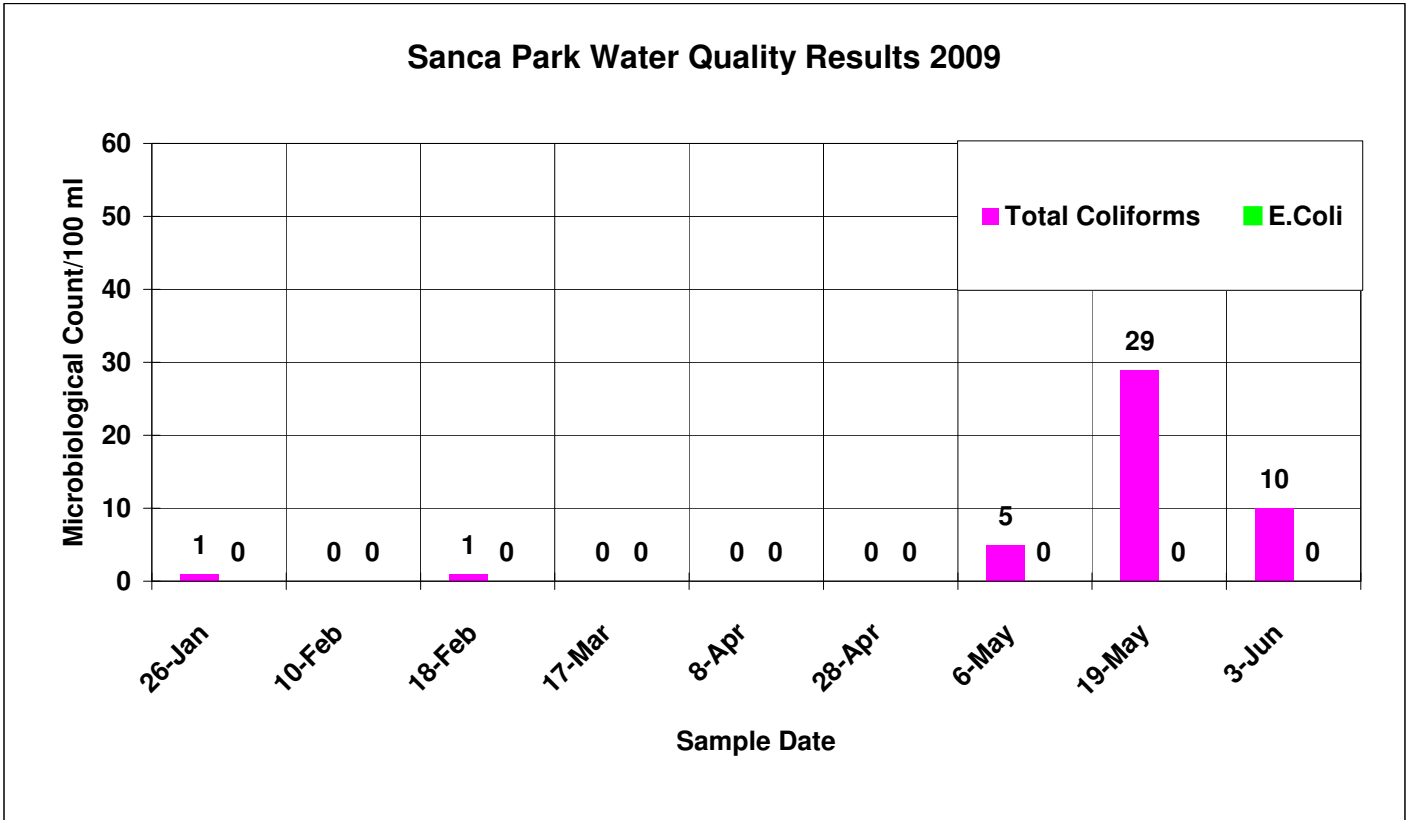
Sanca Park Water Quality Results 2008



Note: MAC (Maximum Acceptable Concentration) = 0
 Where multiple samples are available for the same date, the higher microbiological count is reported.
 Both RAW and TREATED results may be shown.
 Full parameter results not shown.

Sanca Park Water Quality Data 2009

Sampling date	Total coliforms/100 ml	e. coli/100 ml	MAC/100ml
26-Jan	1	0	0
10-Feb	0	0	0
18-Feb	1	0	0
17-Mar	0	0	0
8-Apr	0	0	0
28-Apr	0	0	0
6-May	5	0	0
19-May	29	0	0
3-Jun	10	0	0



Note: MAC (Maximum Acceptable Concentration) = 0
 Where multiple samples are available for the same date, the higher microbiological count is reported.
 Both RAW and TREATED results may be shown.
 Full parameter results not shown.

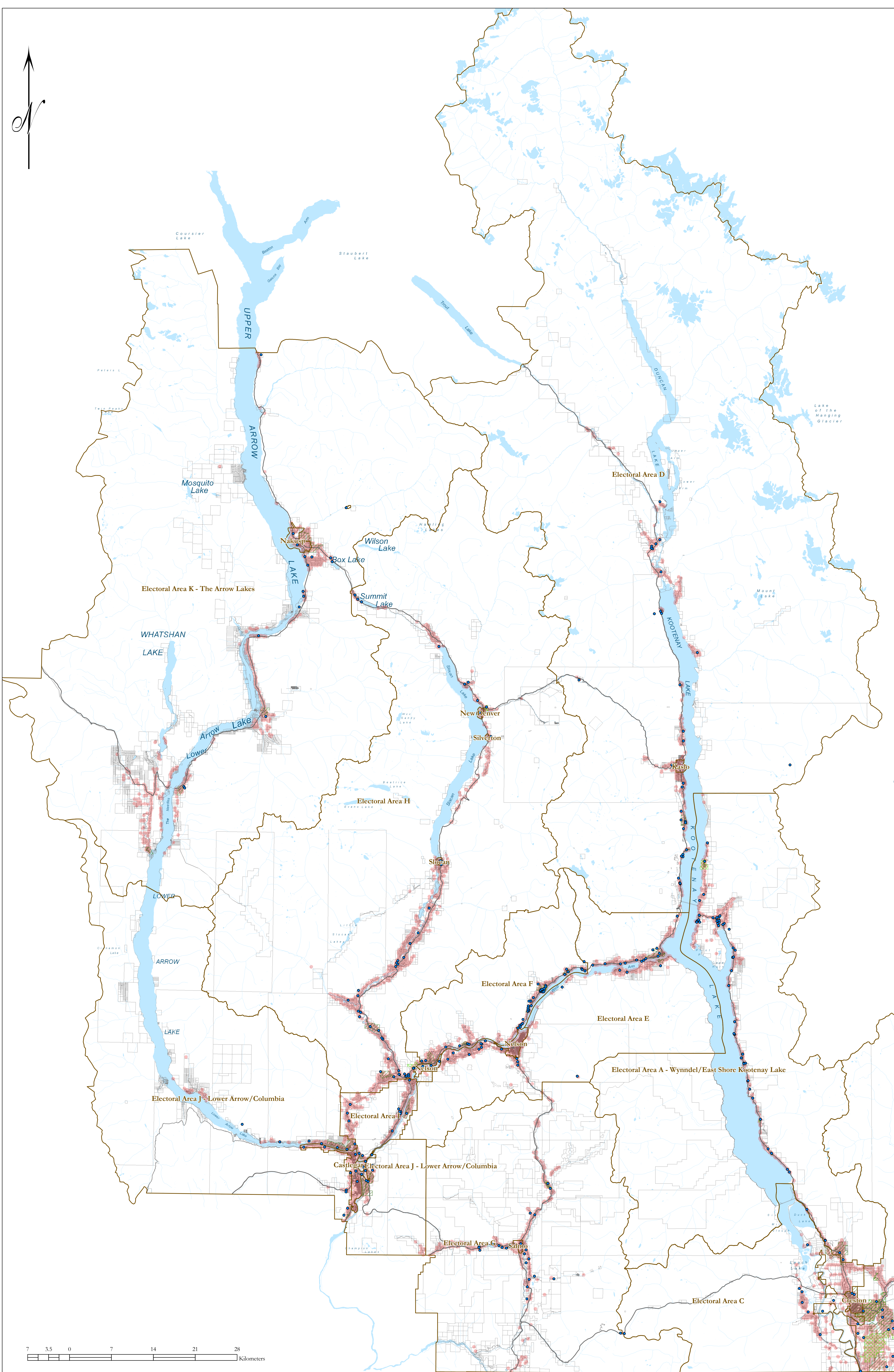
APPENDIX B

RDCK Regional Water Maps

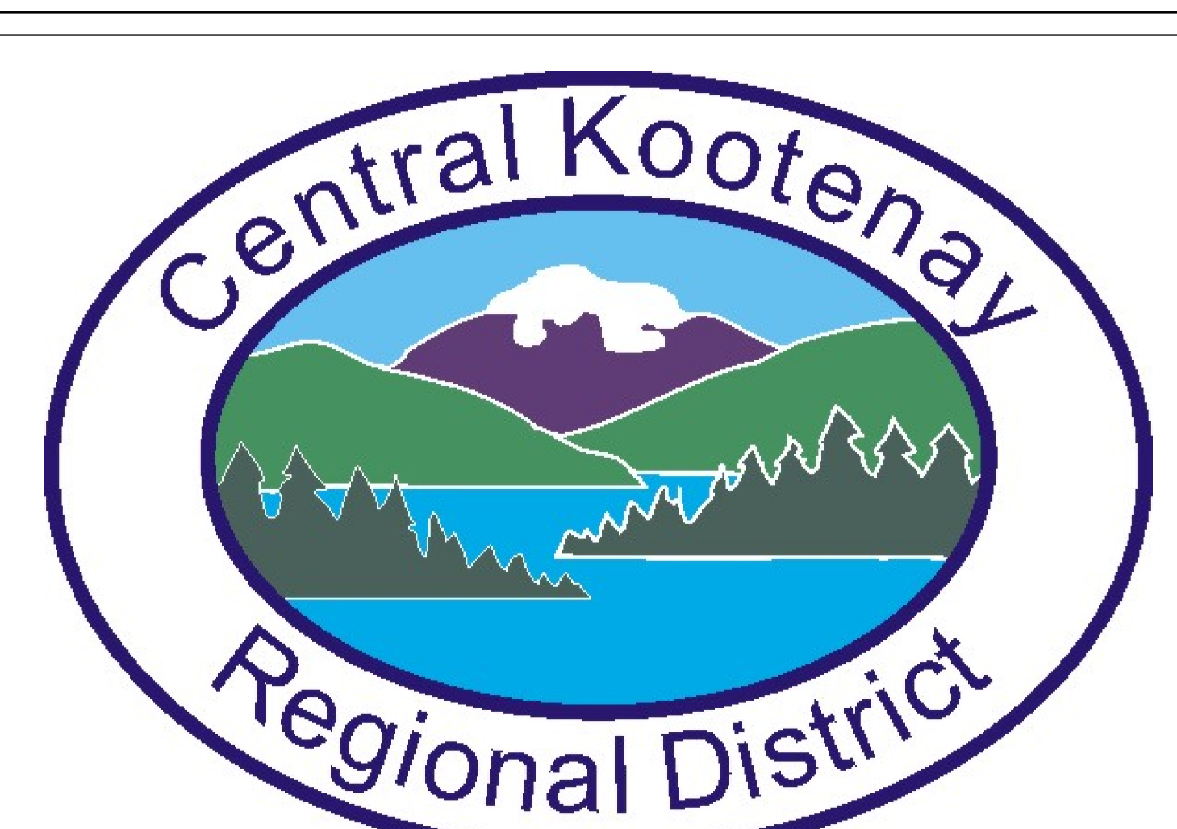
WATER SYSTEMS BY ELECTORAL AREA

There are a total of 341 water systems located in the RDCK.

- | | |
|---|--|
| <p>Electoral Area A</p> <ul style="list-style-type: none"> Armening Bay Water System Bryson Brook Water System Cummings River Water System Grey Creek Campground Water System Grey Creek Community Hall Water System Old Cow Lakeside Resort Water System Raybourn Resort Water System Raybourn State Corporation Blue Point Golf Course Campsite Water System Boccalino Water System Bowling Community Hall Water System Colar Grove Campground Water System Crowfoot Bay Auto Service Water System Crowfoot Bay School Water System Dunbar Bay School Water System Dunbar Bay Store Water System Fire Lake Services Fortis BC - Gara Lake Power Plant Huamona Lake Water Users Community Water System Kootenay Bay Lodge Water System Kootenay Lake Lodge Water System Lakewood Water System Lakewood Water and Campground Water System Lakewood Water Utility Lewis Bay Water Utility Water System Lindhart Road Water Utility Longbeach Medical Clinic Nelson and District Creek Users Water System Rockwood Cafe Water System Rokely-Thomas Water System Society Water System Sunny Woods Farm Water System Tara Sharratt Retreat Centre Water System Taylor Art Gallery Water System The House Baker Water System Woodgrove Manor Water System East Shore Cottage Water System Kokanee Charters RV Park & Campground Mountain Shores Resort Water System Spoke Spring Water System Crowfoot Bay Highways Yard Water System Crowfoot Bay Inn Water System Crowfoot Bay Park Water System Death Harbour Presbyterian Church Camp WS Ed Hill Water Users Community Water System Holloway Park Water System Wynndel Irrigation District Haddock Creek Water System Kulnawok Water System Lakelhar Beach Provincial Campsite Water System Yanoshara Adams Society Water System Gold's Restaurant Water System Kokanee Springs Resort Water System Santa Lucia Water System Ronald's Commission of Management Kootenay Bay Boat Slip Water System North Bowdell Water Users Community | <p>Electoral Area F</p> <ul style="list-style-type: none"> Haystack Resort And Health Spa Jarvis Creek Water Users Mosley Spring Water Users Nasowan Improvement District Ridgwood Improvement District Rocking Spring Water Users 6 Mile Water Users Talbot Spring Water Users A.I. Colburn Elementary School Brewwood Estates Street Development Chalk's Pub Crescent Beach Resort Crested Springs Water Users Dahand Stone & Metal Kimble Stone Kokanee Glacier Resort Leveant Improvement District North Shore Inn Hotel Willow Point Lodge Whitlowen Health Hospital (1993) Water System 21 Pines Manufactured Home Park Haystack Estates Water System Borventanet Trail Park Water System Dahand Water System Georama Road Water Users Community Greenwood Mobile Home Park Water System Kokanee Creek Provincial Park Sikam Creek Improvement District Talbot Improvement District Water System Beasley Hill Water System Beasley Water Users Community Beattie Creek Improvement District Ministry of Forests Water System Shannon Creek Water Users Shannon Point Place Strata Corp. Bonington Improvement District Chapman Creek Improvement District Crescent Beach Resort 2 North Shore Water Utility Whitehead Waterworks District |
| <p>Electoral Area B</p> <ul style="list-style-type: none"> Bonfield Community Kinohew Improvement District North Canyon Improvement District South Canyon Improvement District Canyon Laker School Water System Grey Quail Motel Water System Crescent Golf Course Water System Elizabeth Laporte and Cameron Good Water System J.R. Kootenay Water System Grouse Mountain Veterinary Water System Home Style Cafe Water System Kingsport Dairy Free Store Water System Meadow Creek Campground Kinross Karibaker Wellness Centre Water System Schmidt's Country Court Water System Turk Leggett's Yaki Motel Water System Two Scoop Stevie Water System Yaki Elementary School Water System Yaki Kootenay Community Hall Water System Yaki Water Service Herndon Subdivision Water System Kidd Creek Rest Area Water System Kingsport Waterworks Public Works Canada - Baker Bender Crossing Water System Public Works Canada - Kingsport Bender Crossing Water System WSY Yaki High Scale Water System Yaki General Store Water System Yaki Provincial Campground Water Yaki Water System Onde Creek Improvement District Rokely Irrigation Kidd Creek Rest Area Water System Manimal EK Contracting - Yaki Yard Water System TransCanada Pipelines - Kingsport Station Water System | <p>Electoral Area H</p> <ul style="list-style-type: none"> Cedar Creek Cafe Pinecroft Park Developments Valhalla Lakeside Resort Water System Valley View Golf Club Water System Appleby Children's Centre Grey Ridge Farm Water System Dim Inn Neighbourhood Pub Electoral Energy Evergreen Natural Foods Fern's Bakery Frog Peak Cafe Water System Karbu Park Water System Lagardie Motel Ltd. Lennon Creek Lodge Maple Leaf Store Mt. Sentinel Secondary School Panorama Lodge Revelstoke Terminals Products Sleep Is For Sissies Coffee Bar Water System Sloan Lake Golf Club Water System Snohomish Water Users Society Three Islands Resort Water System Wilkie Elementary School Driver Siding Water Users Brent Kennedy Elementary School Highway Ridge Water Users Society Malheur Creek Water Users Munch More Foods Water System Phyllis Hall Phyllis Valley Community Limited Roosebury Provincial Park Sloan Lake Golf Course Summit Lake Provincial Park Water System The Will Row Water System Valhalla Heritage Hill Water System Valhalla Whole Community Centre Bronson Improvement District Kerovina Improvement District Phyllis Junction Improvement District Sloan Park Improvement District Water System South Slope Water Specified Area Village of Silverton |
| <p>Electoral Area C</p> <ul style="list-style-type: none"> Creston Creek Water System Creston Valley W.L. Management Area intermunicipal centre ws Creston Valley Wildlife Management Area Water System Schmidland Water System West Creston Community Hall Water System Nick's Island Improvement District Yellowhead Road & Bridge Kootenay Water System Creston Diking District Water System | <p>Electoral Area I</p> <ul style="list-style-type: none"> Glack Irrigation District Michael Creek Water Users Community Spaul Hill Water Users Community Upper Pass Creek Water Users Dawdell/Remick Mill & Pumping System Glack Water Improvement Society Russell Auction Thurman Market and Dair Water System Turlock Adventure Inc. Water System West Bullman Water Users Mountainside Mobile Home Park Bullman Improvement District Vogler Improvement District Water System |
| <p>Electoral Area D</p> <ul style="list-style-type: none"> Fletcher Creek Improvement District Water System Greenwood Lake Leas Houses Water Users Johnson's Landing Retreat Centre Lakewood Inn Two Bay Water Users Ainsworth Hot Springs Water System Summersford Motel Blue Ridge Retreat Water System Droff's Restaurant Gold Pan Gourmet Water System J.P. Marine Pub Jewett Elementary School Jesse Boys Marina Merrimall Lodge Woodbury Resort & Marina Colar Bay RV Park MacDonald Creek Water System Parkside Water Utility Society Davis Creek Provincial Park Duncan Dam Office W.I.K. 13 Staff Houses Woodbury Valley Services Society Longford Creek Water Users Community Longford Provincial Park Mountain Trek Fitness Retreat Water System Powder Creek Lodge Water System Retalick Resort Ltd. Water System White Gables Lodge Water System Landside Water Users Mirror Lake Water Users Schwartz Creek Water Society Sillark Wilderness Skiing - Water System | <p>Electoral Area J</p> <ul style="list-style-type: none"> Garbage Golf Club Well Johnson's Grocery Lane's Food Pub Water System Robson School Water System Scottie's Marina Ltd. Water System Selkirk College - Gardage Campus Kootenay River Campground Kootenay River Middle Home Park Lower Ridge Development Water System Ontonchem Improvement District Arrow Lake Generating Station Cariboo Weigh Scale Water System Kootenay Grill Water System Lucas Road Water System Pass Creek Regional Park Campsite Spring Provincial Park Terra Vista Development Water System Garbage RV Park and Campground Prappan Improvement District West Robson Water System |
| <p>Electoral Area E</p> <ul style="list-style-type: none"> Berch Grove Campground Eight Creek Water Users Community Kokanee Lakeside Resort & RV Park Water System Lakeshore Place Mobile Home Park Longbeach Water Users Procter Creek Improvement District Water System Procter Springs Water Users Community Sandy Creek Water Users Community Talbot Water Users Community Balfour Childless Balfour Superette Blewett Elementary School Blewett Fire Department Water System Lakeman Water Works Highway Golf Course In Your Face Foods Water System Kokanee Park Marina Ltd. Pacific Insight Electronics Redfish Elementary School Timberland Lumbermill Toad Rock Water System Whitewave Ski Resort Chautauq Village Water System Colar Gladys Mobile Home Park Camp Koolahne Kokanee Glacier Cabin Nelson Area Wildlife School Village Bakery Water System Balfour Irrigation District Kline's Mobile Home Park Sunshine Estates Utility | <p>Electoral Area K</p> <ul style="list-style-type: none"> Dug Creek Creston Valley Hall Water System Talbot Campground Winn's Well Arrow Lake Caden Water System C.A. Lee Crescent Valley Apartments Halcyon Hot Springs McDonald Creek Provincial Park Burg Creek Dam Water Users Burton Waterworks Franquet Waterworks |



WATER SYSTEMS



- Legend**
- Street Addressing
 - Parcel Boundaries
 - Administrative Boundary
 - Highway
 - Creeks
 - Water System (Spatial extent not defined)
 - ▨ Non-RDCK owned water system
 - ▩ RDCK owned water system

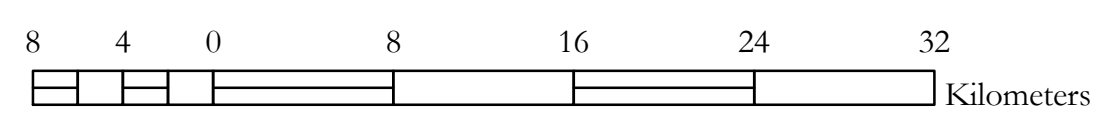
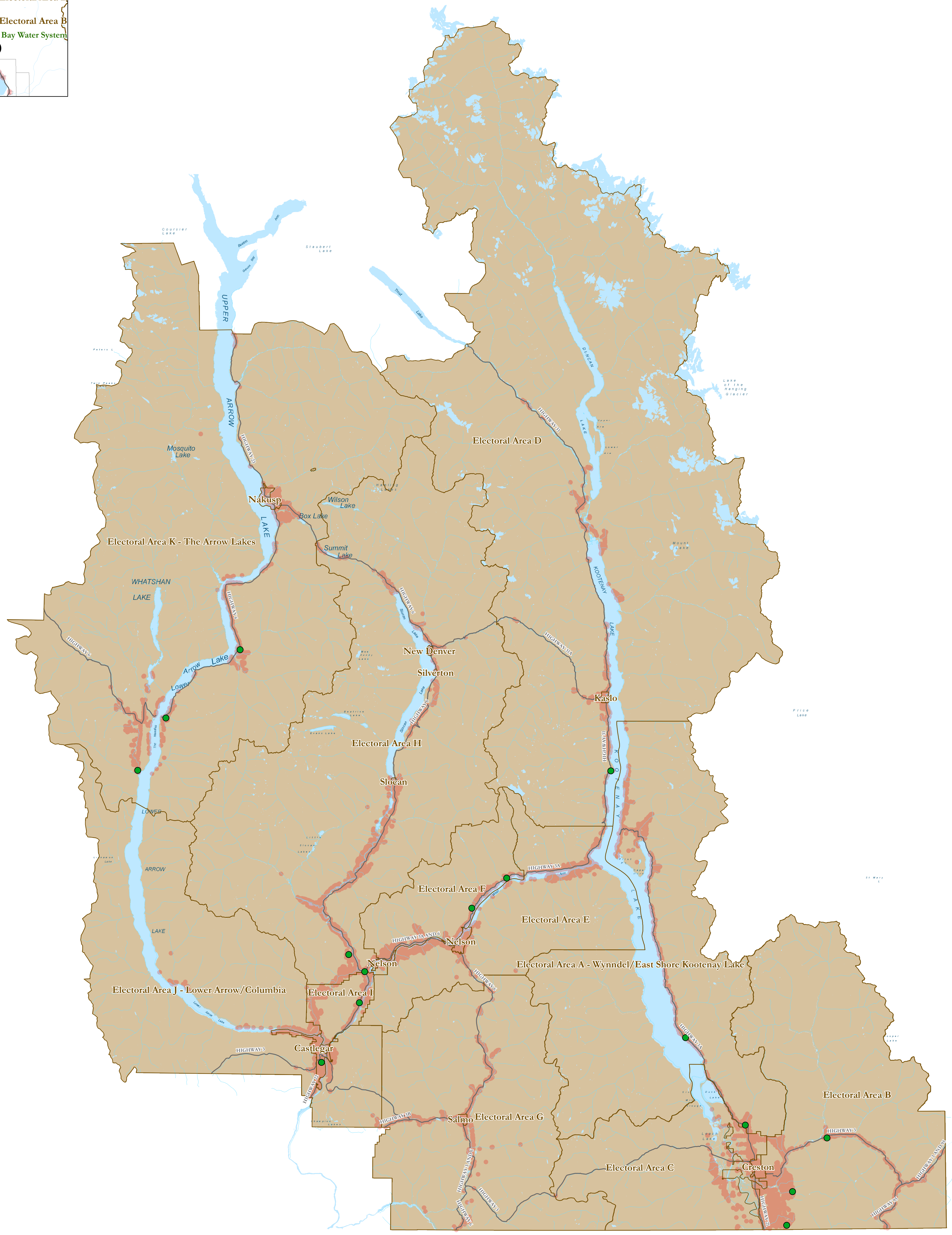
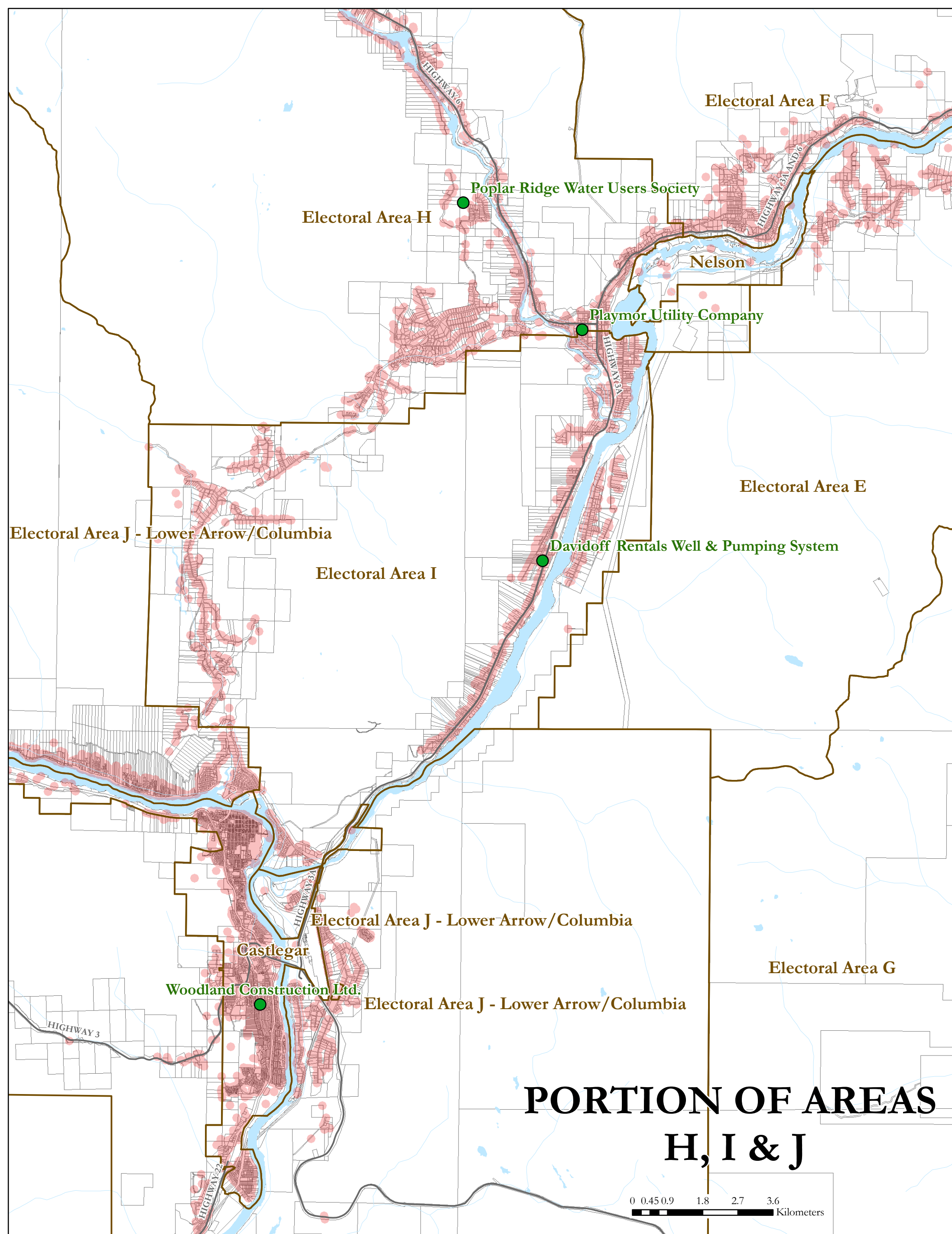
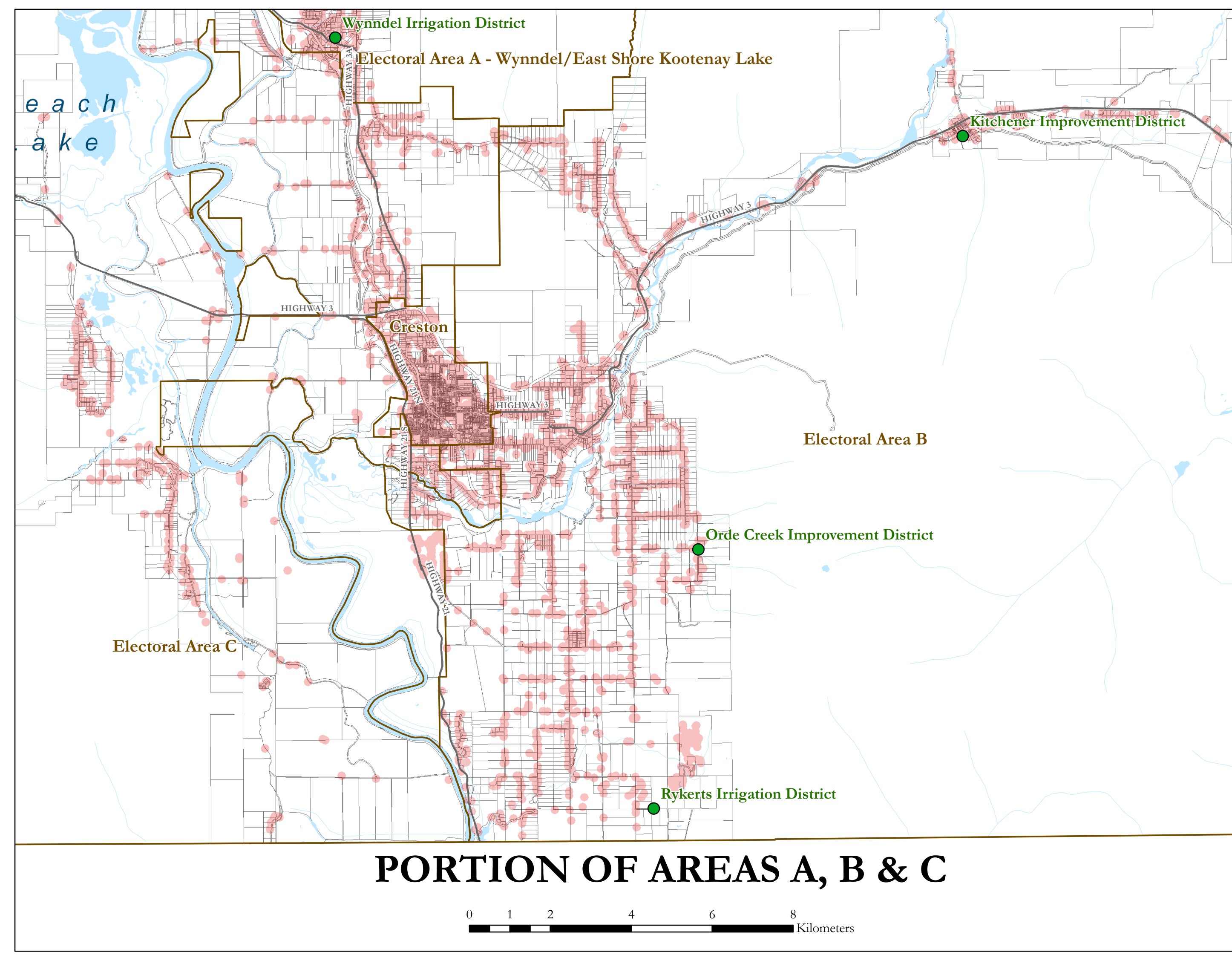
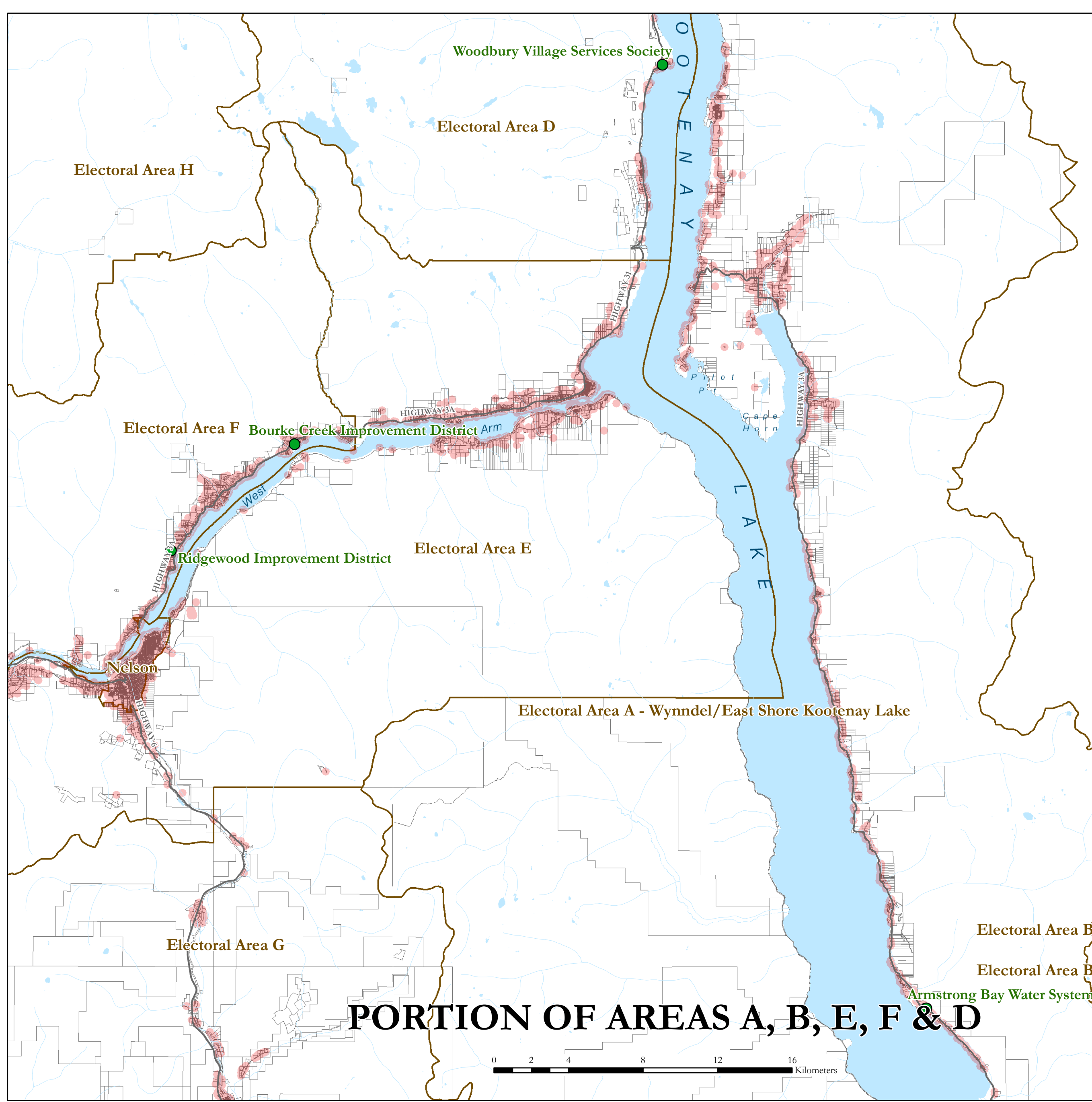
A complete list of the 341 water systems located in the RDCK was provided by Interior Health Authority. Information about these systems included: name, owner, and address. Each system is delineated by point (no spatial extent defined) or known spatial boundary. Excluded systems from the mapping include those where the address was incomplete, inaccurate, or unknown. No spatial coordinates or boundary descriptions were provided by IHA, as such, there is no guarantee to size or spatial accuracy. The spatial extent of water systems under RDCK ownership have been mapped and are based on existing RDCK engineering drawings and first hand knowledge of the area.

Note: See index maps for detailed area information.

DATA SOURCES

Cadastral List - Surveyed lots/parcels of land;
 Sources: Crown Land Registry Services
 and RDCK
 TRIM Data - Planimetry, Unsurveyed Roads,
 and Contours; Source: Ministry of Water,
 Land and Air Protection
 Roads - Road centerline compiled 2003;
 Source: RDCK
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 BC V1L 5R4
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 Fax: (250) 352-9300 Internet: www.sckd.bc.ca

Map Projection: UTM Zone 11
 Map Datum: NAD83
 This map was plotted on 06/25/2008



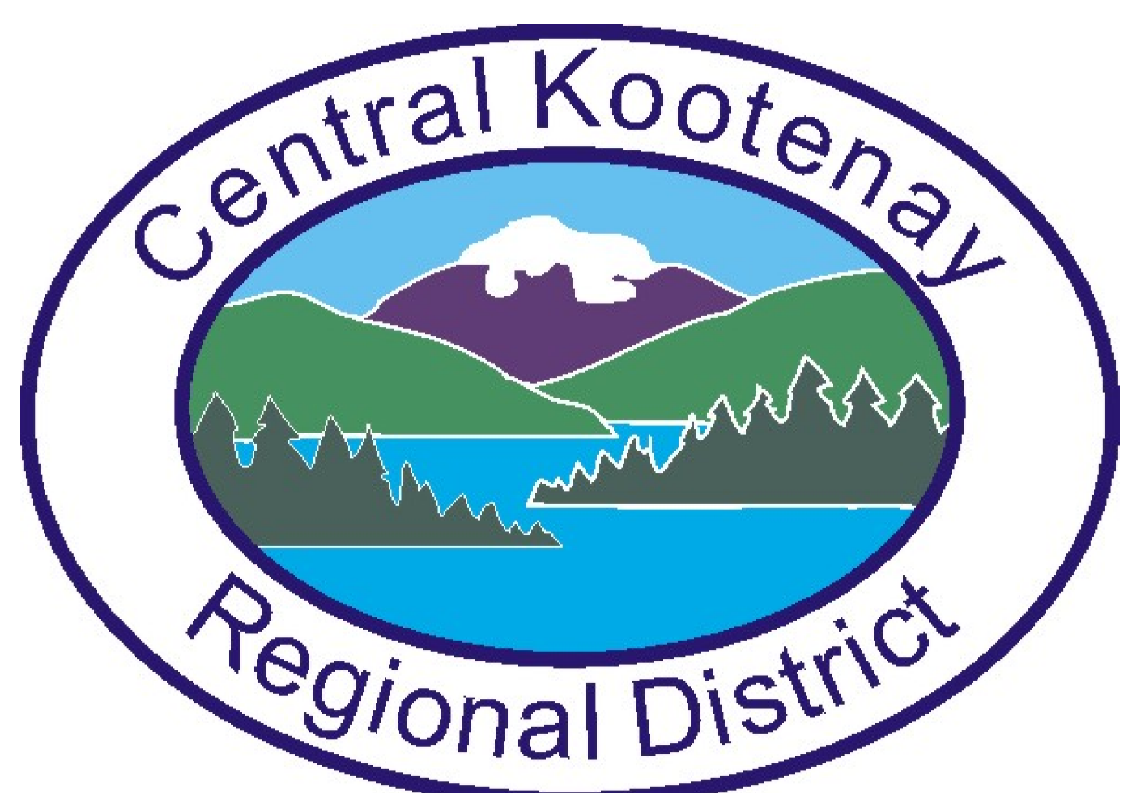
WATER SYSTEMS REQUESTING RDCK ASSISTANCE

Legend

- Street Addressing
- Lake
- Highway
- Assistance Requested
- Creek
- Administrative Boundary

Water Systems requesting RDCK Assistance:

- Armstrong Bay Improvement District
- BC Hydro- Burton, Edgewood, Fauquier, Robinson
- Bourke Creek Improvement District
- Davidoff Rentals
- Kingsgate Water Supply System
- Orde Creek Improvement District
- Playmor Utility Company
- Poplar Ridge Water Users Society
- Ridgewood Road Water Users Service (Shannon's Mobile Home Park)
- Robson-Raspberry Improvement District
- Rykerts Irrigation District
- Woodbury Village Services Society
- Woodland Heights
- Wynndel Irrigation District



REGIONAL DISTRICT OF
CENTRAL KOOTENAY

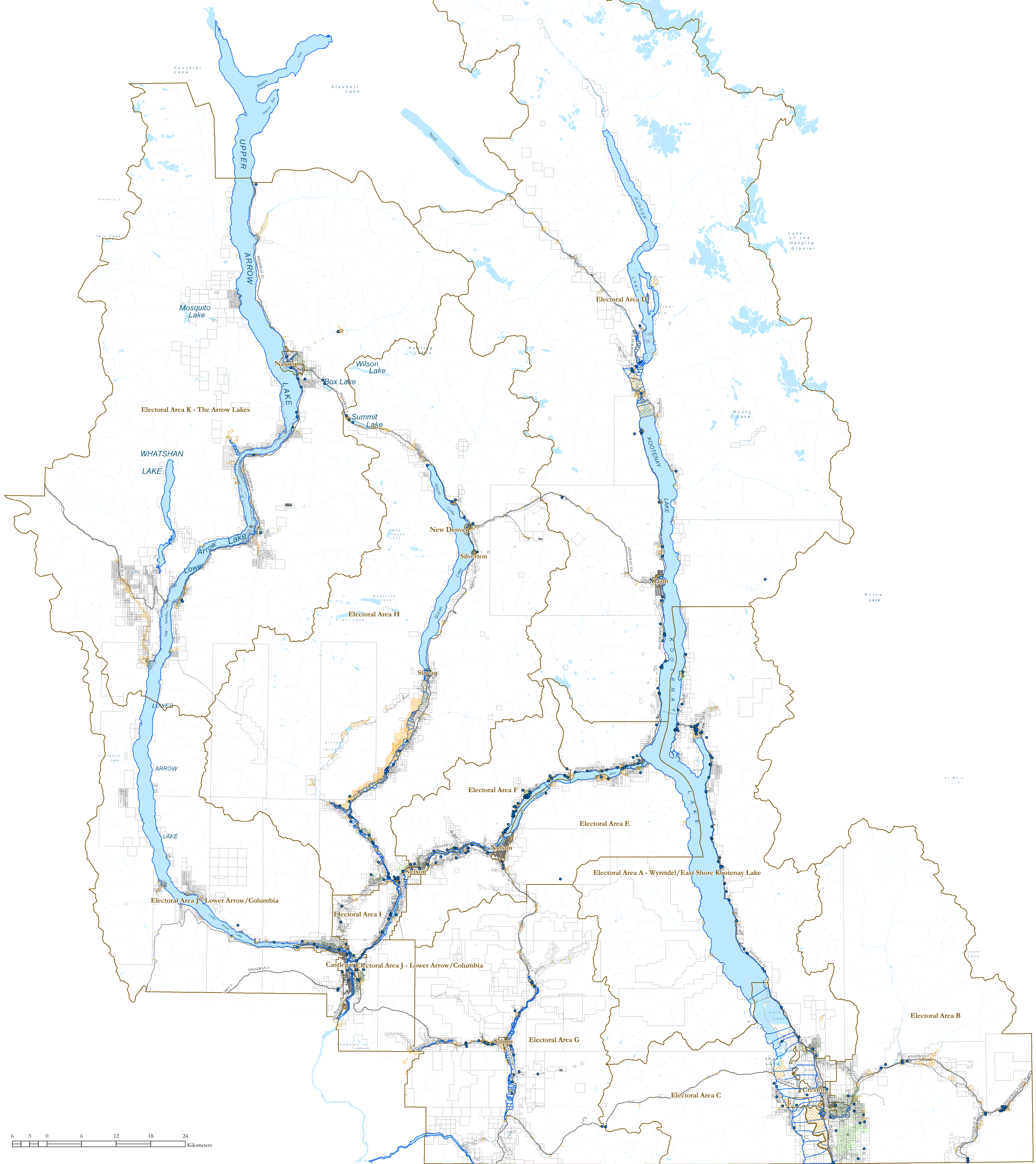
DATA SOURCES

Cadastral List - Surveyed lots/parcels of land;
Sources: Crown Land Registry Services
and RDCK;
WSA Third Order & Greater Waters (1:50k);
Source: Ministry of Environment, ecosystems Branch
Roads - Road centerline compiled 2003;
Source: RDCK.

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Map Projection: UTM Zone 11
Map Datum: NAD83

This map was plotted on: 08/25/2008



6 3 0 6 12 18 24
Kilometers



REGIONAL DISTRICT OF
CENTRAL KOOTENAY

WATER SYSTEMS and HAZARD AREAS

Legend

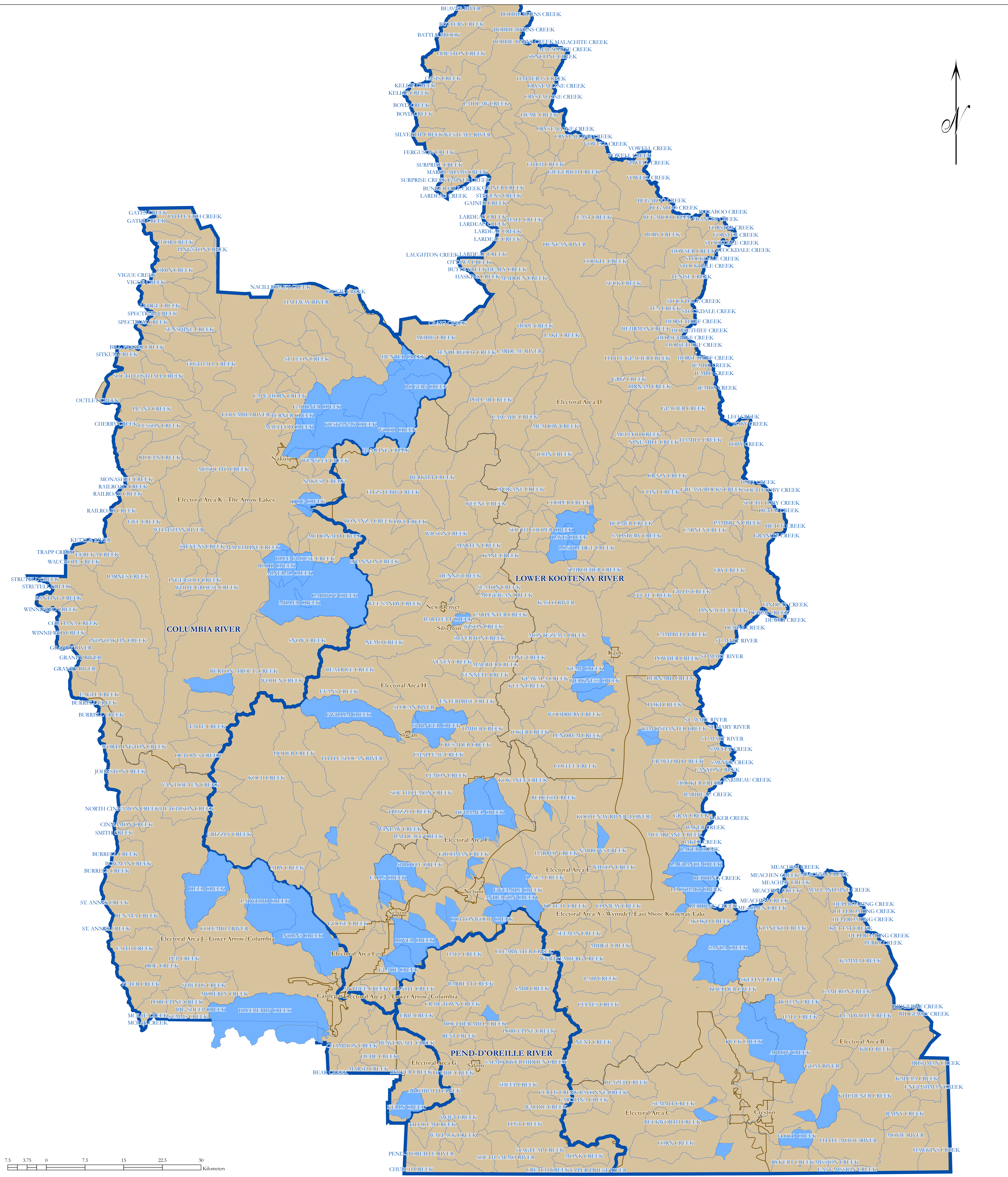
- | | |
|--|---|
| Non-Standard Flooding and Erosion Area | Highway |
| Floodplain | Creek |
| Slide Hazard Area | Water System (Spatial extent not defined) |
| Geo Hazard Area | Non-RDCK owned water system |
| Administrative Boundary | RDCK owned water system |
| | Parcel Boundaries |
| | Lake |

Note: See index maps for detailed area information.

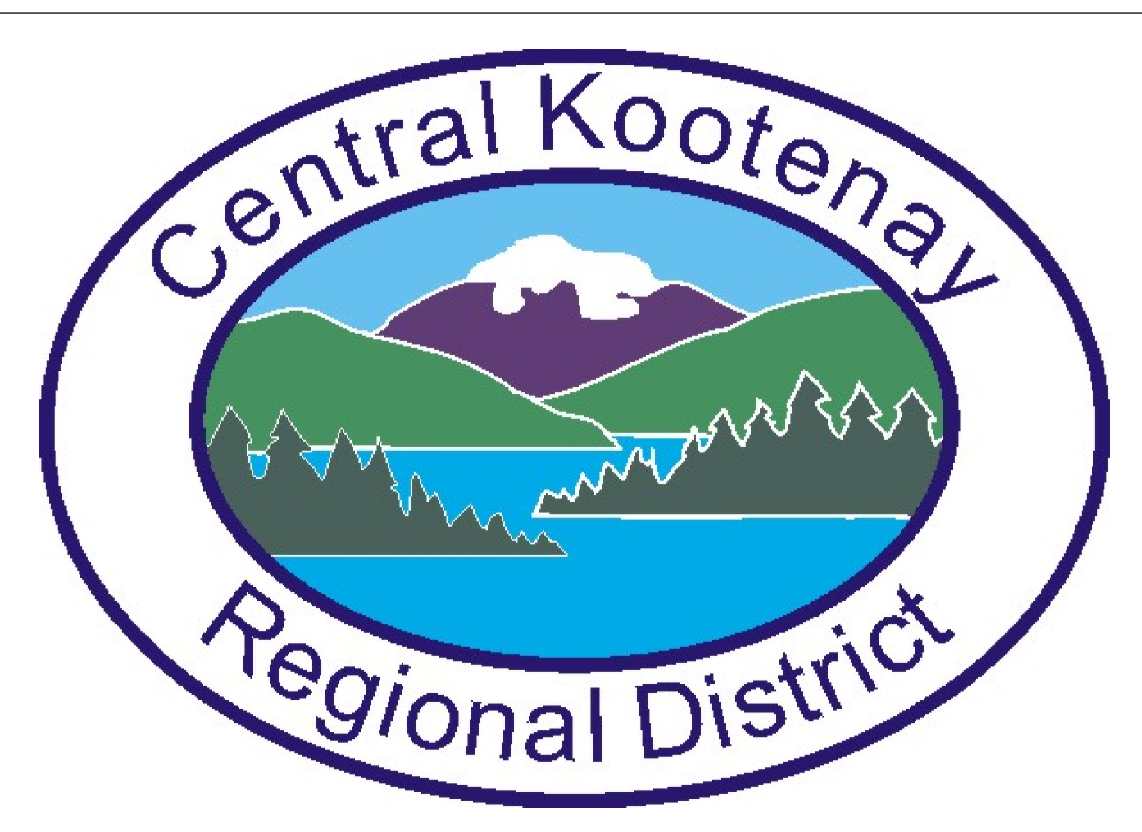
DATA SOURCES

Cadastral Lot - Surveyed lots/parcels of land;
Sources: Crown Land Registry Services
and RDCK
TRIM Data - Planimetry, Unsurveyed Roads,
and Contours; Source: Ministry of Water,
Land and Air Protection
Roads - Road centreline compiled 2003;
Source: RDCK
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Map Projection: UTM Zone 11
Map Datum: NAD83
This map was plotted on: 08/25/2008



7.5 3.75 0 7.5 15 22.5 30
Kilometers



REGIONAL DISTRICT OF
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WATERSHED BOUNDARIES

- Legend**
- 3rd Order Watershed
 - Community Watershed
 - Major Watershed
 - Administrative Boundary

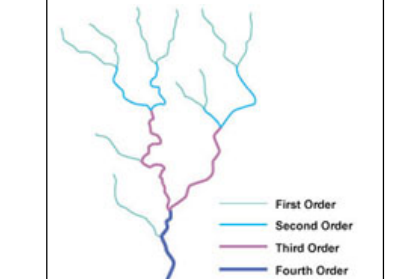
The watershed boundaries delineate the location of watersheds that supply communities with domestic water. Since passage of the Forest Practices Code of British Columbia Act, community watershed designations fall under the authority of the Ministry of Forests and the Ministry of Water, Land and Air Protection (as of June 2005, Ministry of Environment).

The definition of a community watershed given in Bill 18-1995, Forest Practices Code of B.C. Amendment Act (June 1995) which amends section 41(8) of Bill 40, is as follows: the drainage area above the most down stream point of diversion on a stream for a water use that is for human consumption and that is licensed under the Water Act for (f) a waterworks purpose, or (g) a domestic purpose if the license is held by or is subject to the control of a water users community incorporated under the Water Act if the drainage area is not more than 500 km² and the water license was issued before June 15, 1995.

Major watershed boundary lines are designated by the Ministry of Environment, Land and Parks, Fisheries Branch.

Definition of a Third Order Watershed
The streams occupying a drainage basin form a hierarchical network of channels that, in humid areas, hold increasingly larger volumes of water as you move toward the mouth of the basin. A stream's order is its rank, or relative position, within the network. A first-order stream is a channel with no tributaries - that is, a channel at its upper reaches and near its source. A second-order stream is a channel fed by at least two first-order tributaries. The joining of two second-order streams forms a third-order stream. Stream ranking continues in this manner until the highest-ordered channel is reached. First and second-order streams are located in the headwater areas of watersheds and typically convey small volumes of water. These lower-order streams are vulnerable to pollution because they are unable to dilute contaminants, assimilate much organic waste, or remove sediments deposited on channel bottoms.

- Source: "CGIS AT TOWSON UNIVERSITY," Retrieved July 17 2008, from http://chesapeake.towson.edu/landscape/impervious/all_watersheds.asp



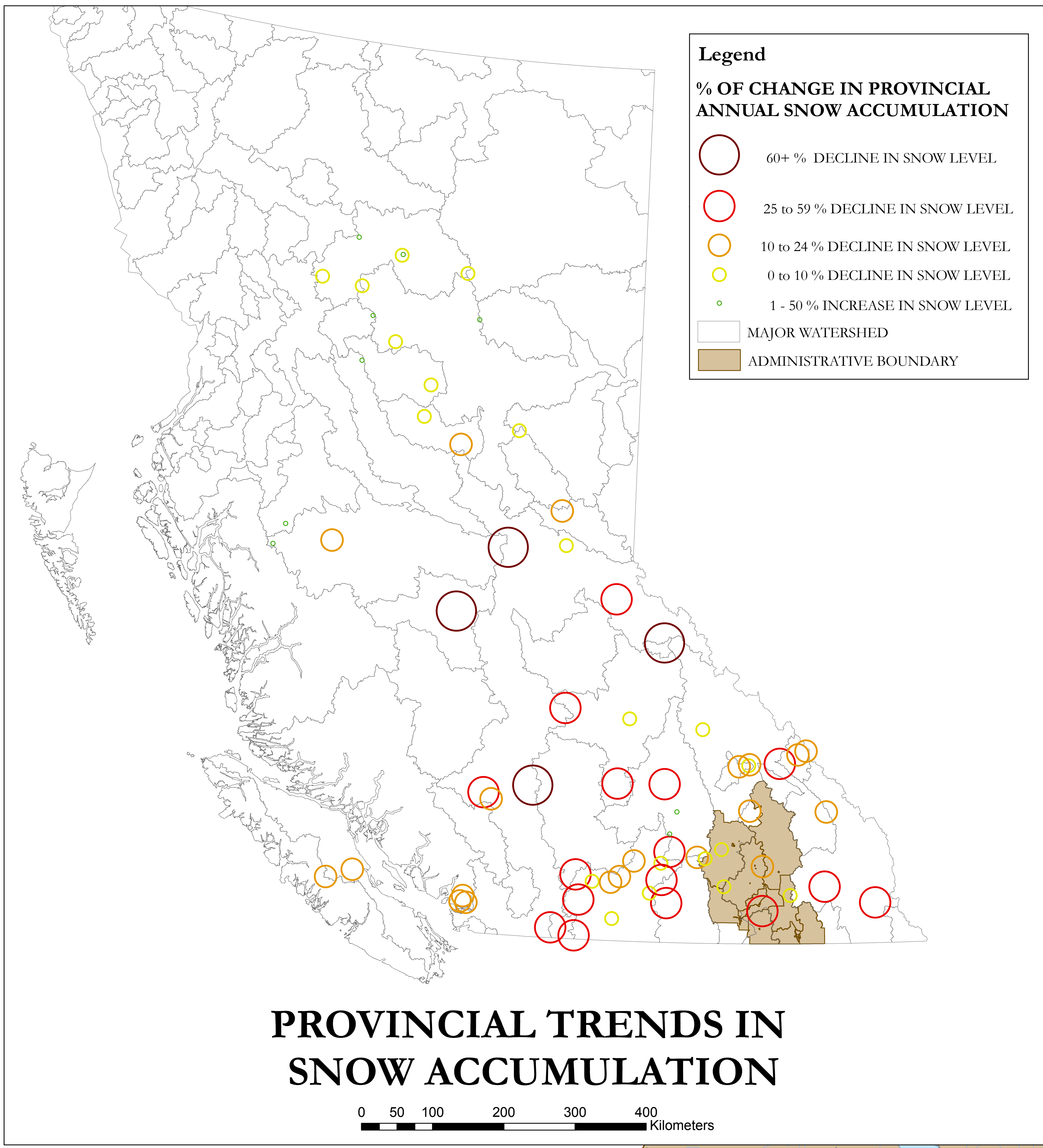
Stream order classification based on system developed by Stralzer, Source: March 1998, 109.

DATA SOURCES

BC Major Watersheds- Major Watersheds of BC; Source: Base mapping and Geomatics Services Branch, HMB
Third-Order and Greater Watersheds - spatial view of BC Watershed Atlas 50K; Source: Ecosystems Branch, Ministry of Environment

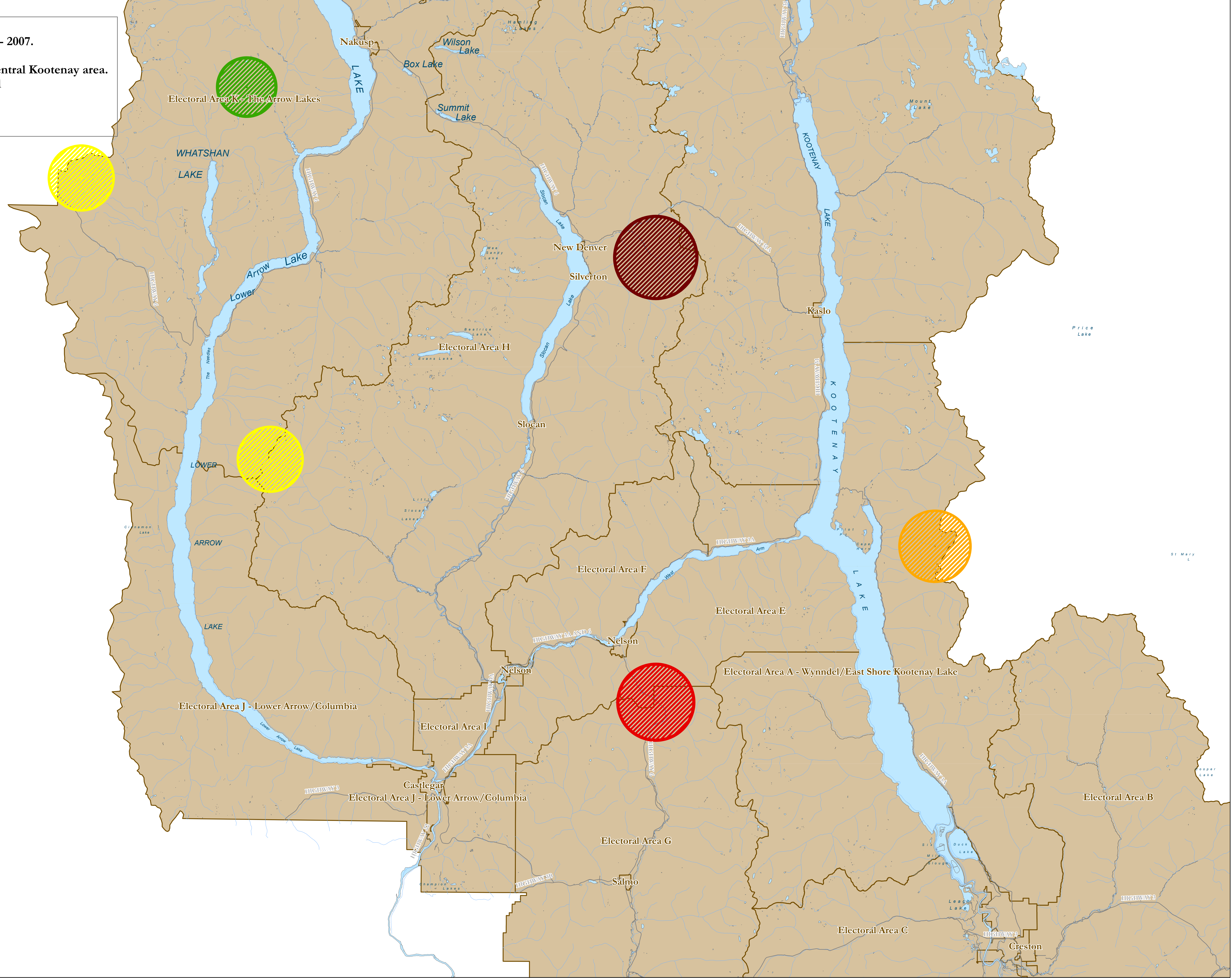
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Fax: (250) 352-9300 Internet: www.rdkc.bc.ca

Map Projection: UTM Zone 11
Map Datum: NAD83
This map was plotted on: 08/25/2008

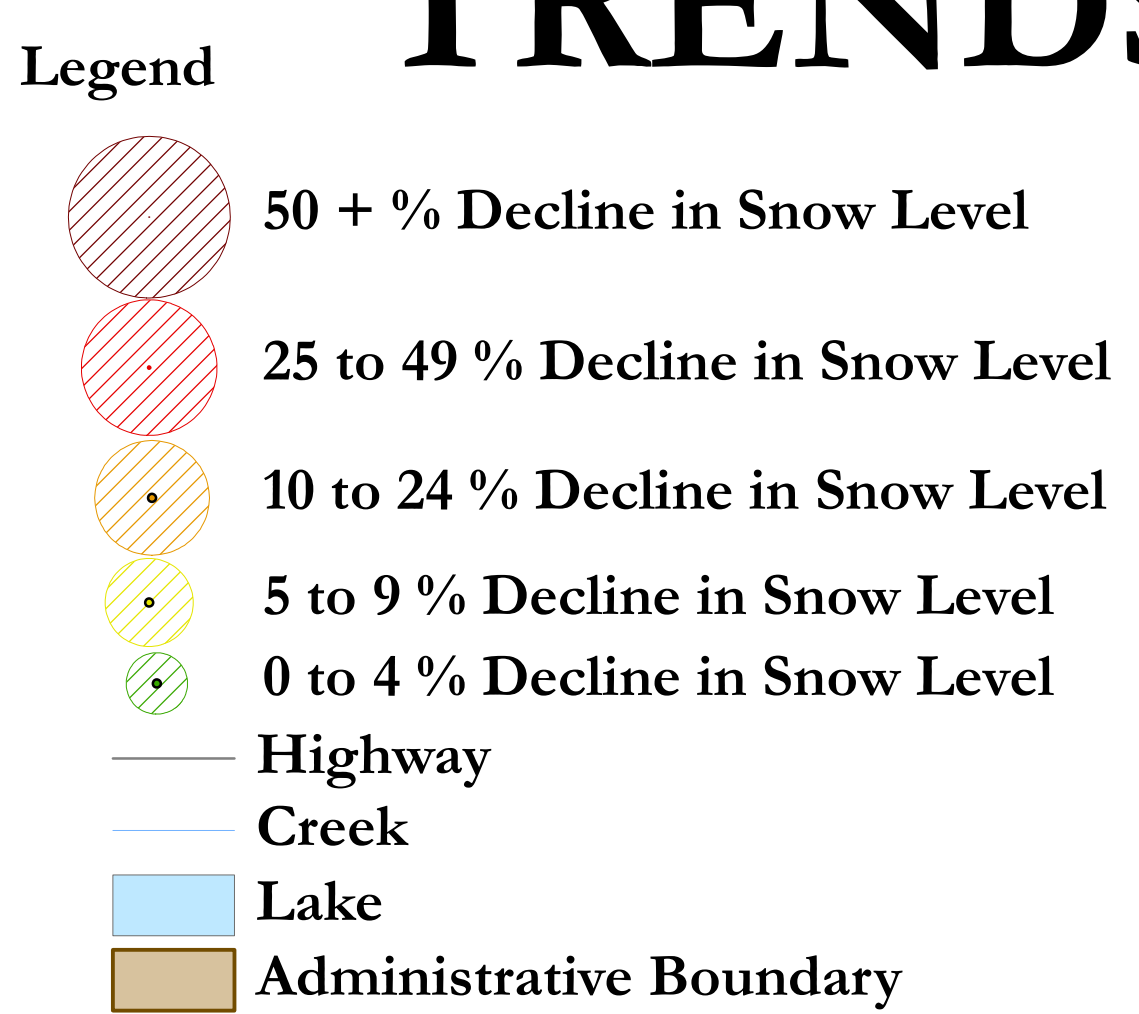


The peak winter snow levels in the Central Kootenay region declined an average of 23 percent between the years of 1956 - 2007.

There are a total of 12 snow survey stations located in the Central Kootenay area. 6 of these stations have incomplete data and peak snow level analysis could not be completed without further data. Data collection is undertaken by the River Forecast Centre, Ministry of Environment.



REGIONAL DISTRICT OF CENTRAL KOOTENAY



TRENDS IN SNOW ACCUMULATION

Framework
 The British Columbia Ministry of Environment operates a network of approximately 200 manual snow courses and 50 automated snow pillows. The snow survey program began in 1936, with a few stations in the Okanagan, Kootenay and Greater Vancouver area. Since then, the network has intermittently expanded and contracted over time. Many of the manual snow courses in the current active program have been surveyed since at least the 1950s, and are useful for the examination of long-term trends in snow conditions.

Methodology
 The April 1st snow survey data, for the 50-year period between 1956-2005 have been analyzed. In general, the April 1st data represent the peak snow water of the Spring, produced by the weather patterns of the preceding Winter.

Results
 Peak winter snow accumulation in British Columbia experienced substantial reduction between 1956 - 2005. In most major river basins, except the north (Skeena, Peace, Liard, Yukon), April 1st SWA has reduced between 14 and 47%.

The arid portions of the central interior (Chilcotin plateau, Bonaparte, lower Thompson, Nicola, etc) are moving towards a condition of substantially reduced winter snow accumulation, and increased frequency and spatial extent of periods with no snow. This has the potential to result in negative effects on community water supplies, in-stream flows for fish and other aquatic organisms, and other things.

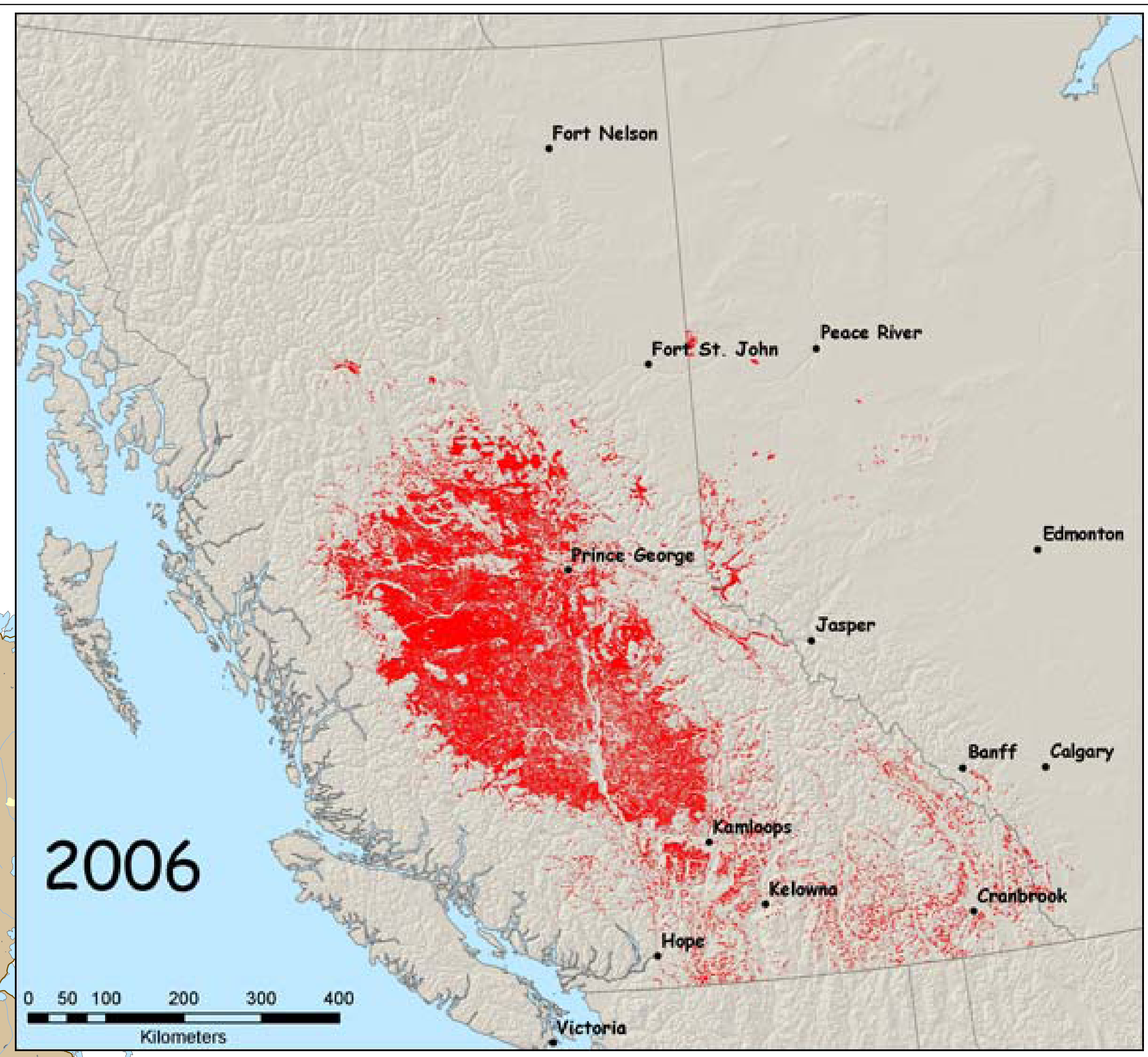
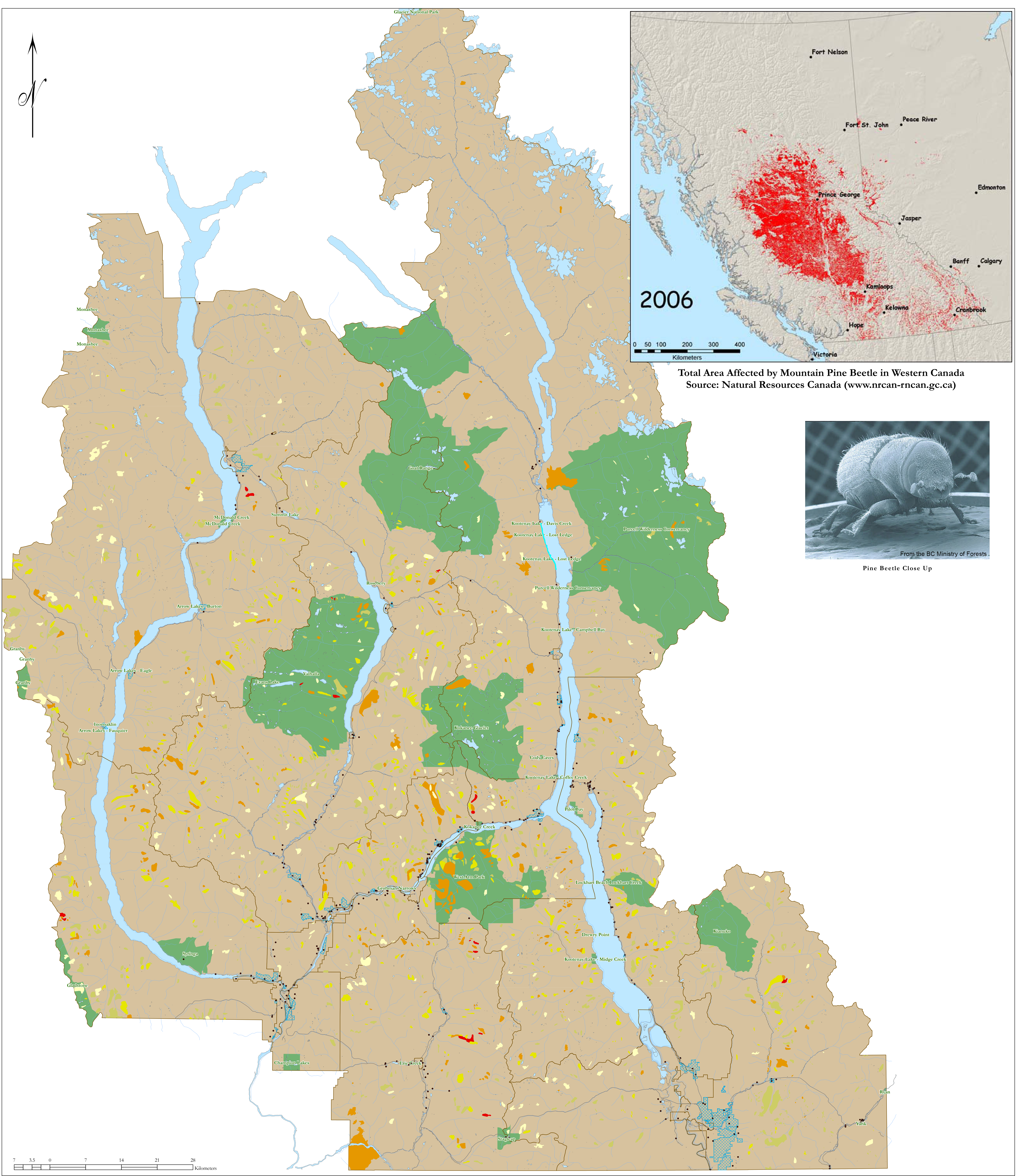
Source: River Forecast Centre, Ministry of Environment, 2007

DATA SOURCES

Snow Course Locations - Manual snow courses actively surveyed as part of the BC Snow survey program. Source: River Forecast Centre, Ministry of Environment
 TRIM Data - Planimetry, Unsurveyed Roads, and Contours. Source: Ministry of Water, Land and Air Protection
 Roads - Road centreline compiled 2003; Source: BDK

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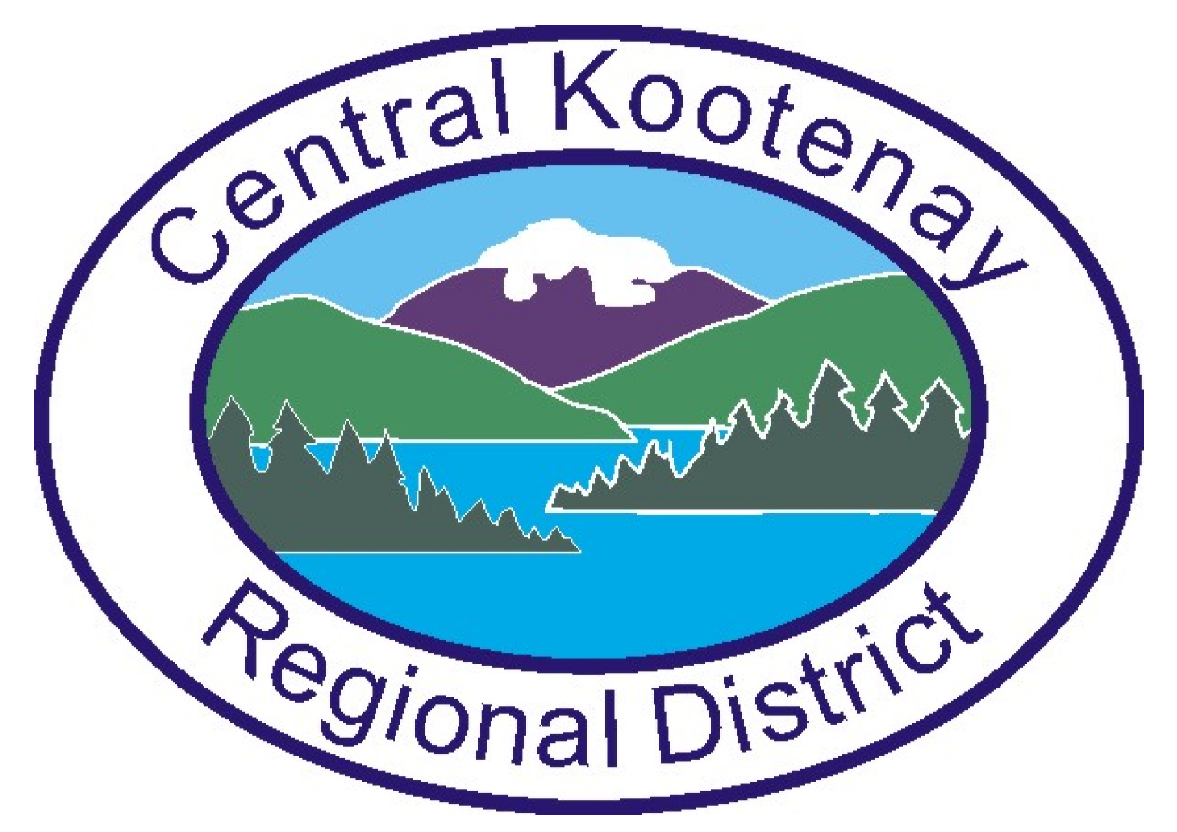
Map Projection: UTM Zone 11
 Map Datum: NAD83
 This map was plotted on: 08/25/2008



Total Area Affected by Mountain Pine Beetle in Western Canada
Source: Natural Resources Canada (www.nrcan-rncan.gc.ca)



Pine Beetle Close Up
From the BC Ministry of Forests



REGIONAL DISTRICT OF
CENTRAL KOOTENAY

PINE BEETLE SEVERITY - 2007

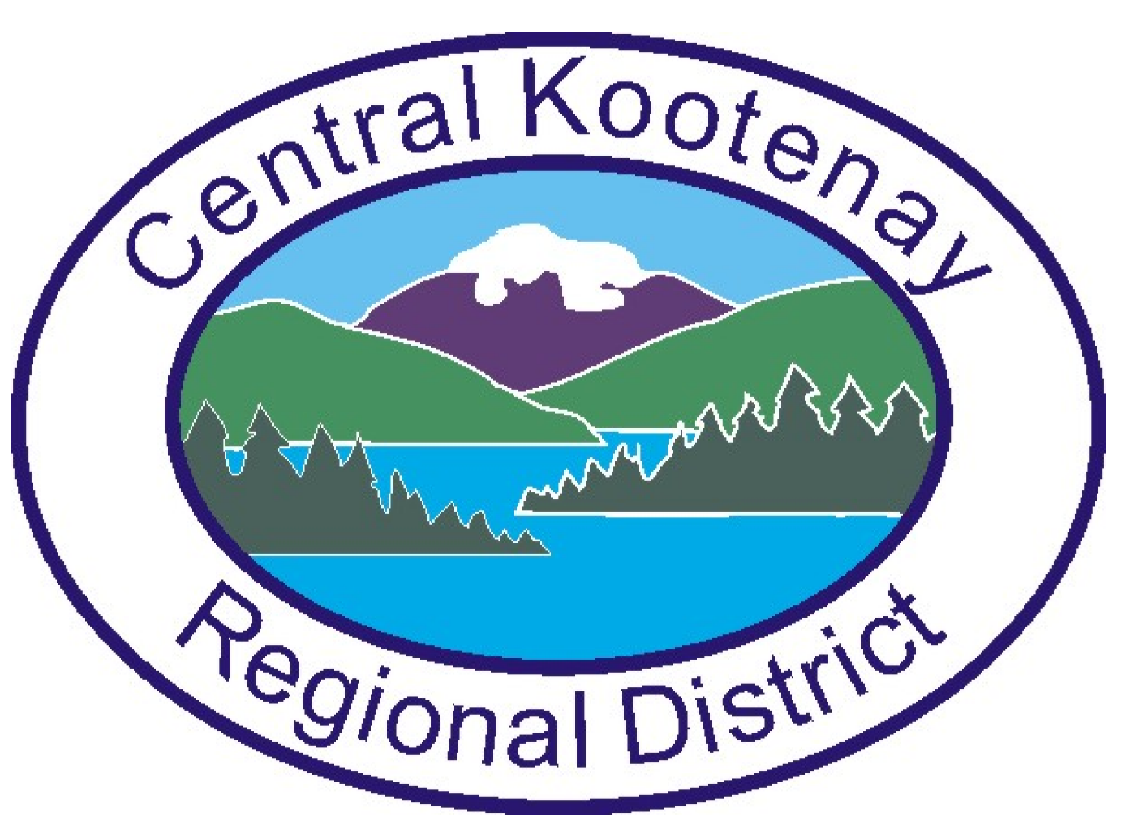
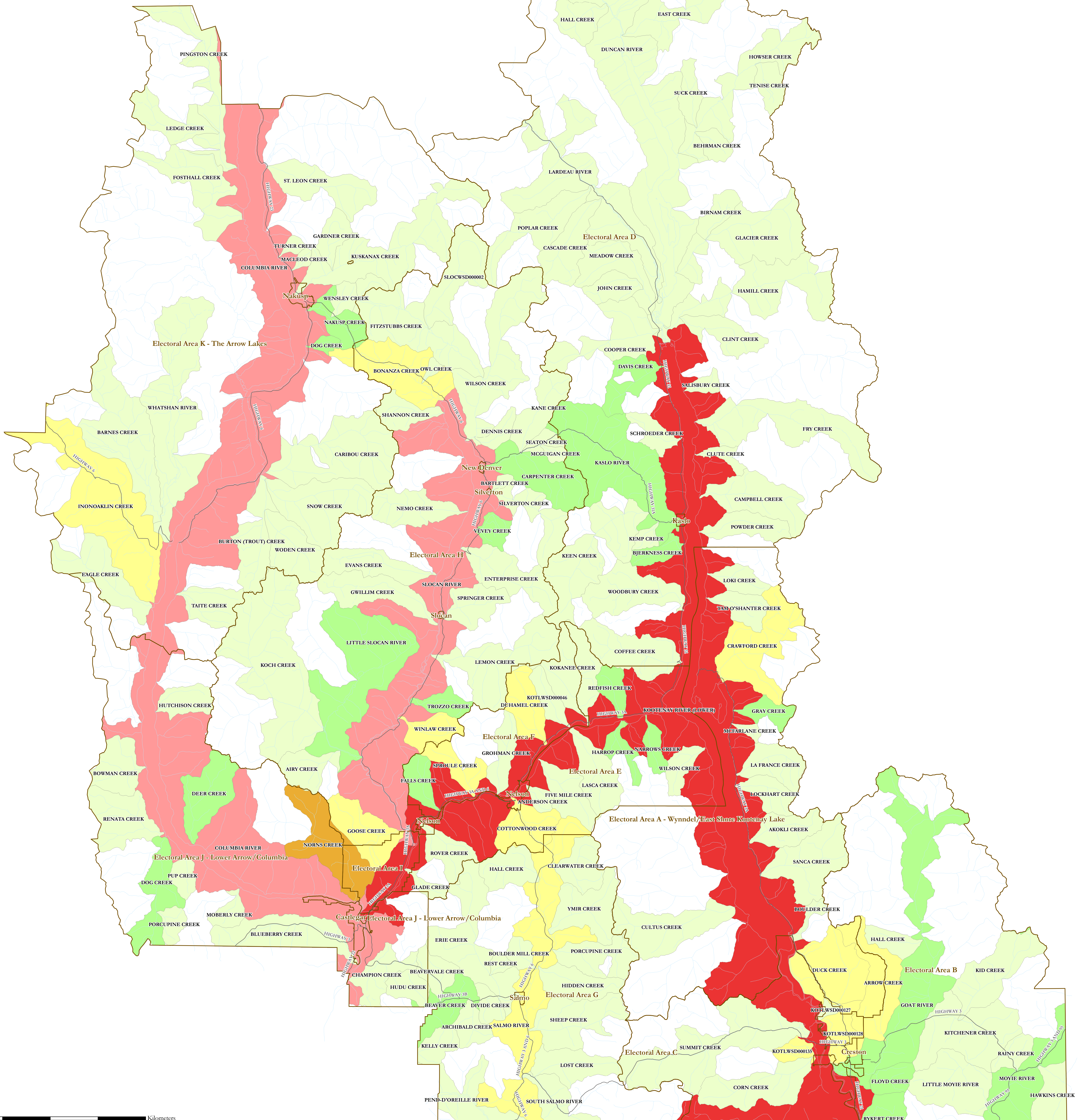
- Legend**
- | | |
|-------------|--|
| Trace | Creek |
| Light | Highway |
| Moderate | Administrative Boundary |
| Severe | Water System (Spatial extent defined) |
| Very Severe | Water System (No spatial extent defined) |
| | Provincial Park |
| | Lake |

Note: See index maps for detailed area information.

DATA SOURCES

FFB Pine Beetle Coverage - 2007 summary of forest health conditions in BC; Source: Forest Practices Branch, Ministry of Forests & Range
 Cadastral Lot - Surveyed lots/parcels of land; Source: Crown Land Registry Services and RDCK
 TRIM Data - Planning, Unsurveyed Roads, and Costumes; Source: Ministry of Water, Land and Air Protection
 Roads - Road centerline compiled 2005; Source: RDCK
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 Map Projection: UTM Zone 11
 Map Datum: NAD83
 This map was plotted on: 08/25/2008

NOTE:
Water withdrawn per watershed is measured in cubic meters per day, and was determined by calculating the sum of all water licenses within each watershed. Watersheds not included in the color ramp symbology indicate a lack of data due to limited development in the region.



**REGIONAL DISTRICT OF
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WATER QUANTITY LICENSED FOR WITHDRAWAL

Legend

Water Licensed For Withdrawal

- 0.00 - 56.83 Cubic Metres Per Day
- 56.84 - 168.20 Cubic Metres Per Day
- 168.21 - 343.23 Cubic Metres Per Day
- 343.24 - 716.57 Cubic Metres Per Day
- 716.58 - 2121.65 Cubic Metres Per Day
- 2121.66 - 7282.75 Cubic Metres Per Day
- No Data Available

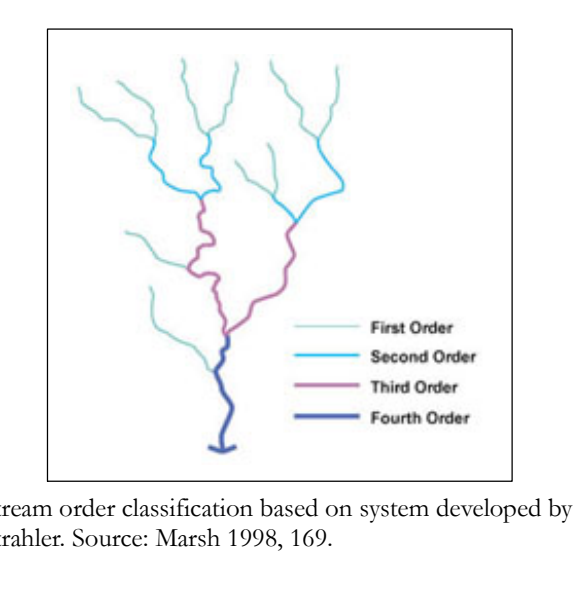
Creek
 Highway
 Administrative Boundary

Third Order Watershed:
The streams occupying a drainage basin form a hierarchical network of channels that, in humid areas, hold increasingly larger volumes of water as you move toward the mouth of the basin. A stream's order is its rank, or relative position, within the network.

A first-order stream is a channel with no tributaries - that is, a channel at its upper reaches and near its source. A second-order stream is a channel fed by at least two first-order tributaries. The joining of two second-order streams forms a third-order stream. Stream ranking continues in this manner until the highest-ordered channel is reached.

First and second-order streams are located in the headwater areas of watersheds and typically convey small volumes of water. These lower-order streams are vulnerable to pollution because they are unable to dilute contaminants, assimilate much organic waste, or remove sediments deposited on channel bottoms.

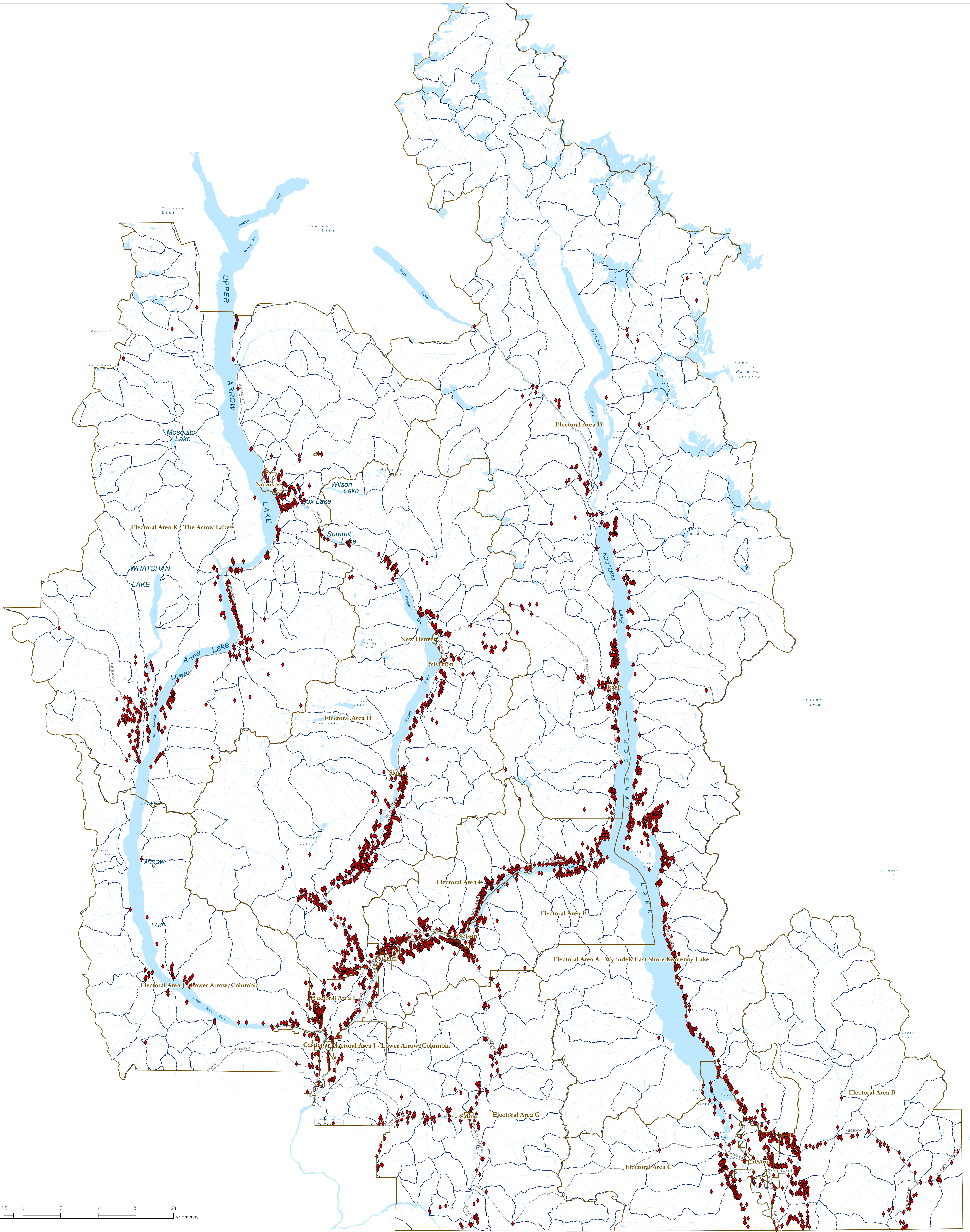
Source: "CGIS AT TOWSON UNIVERSITY," Retrieved July 17 2008, from http://chesapeake.towson.edu/landscape/impervious/all_watersheds.asp



DATA SOURCES

Cadastral Lot - Surveyed lots/parcels of land;
Sources: Crown Land Registry Services and RDCK
WSA - Third Order & Greater Waters (1:50k);
Source: Ministry of Environment, ecosystems Branch
Roads - Road centreline compiled 2003;
Source: RDCK
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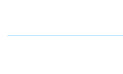

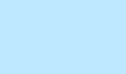

7 3.5 0 7 14 21 28
Kilometers



REGIONAL DISTRICT OF
CENTRAL KOOTENAY

EXISTING WATER LICENSES & POINTS OF DIVERSION

Legend

-  Existing Water Licenses/Points of Diversion (10,358 total; excluding refused licenses)
-  3RD Order Watershed
-  Creek
-  Highway
-  Lake
-  Administrative Boundaries

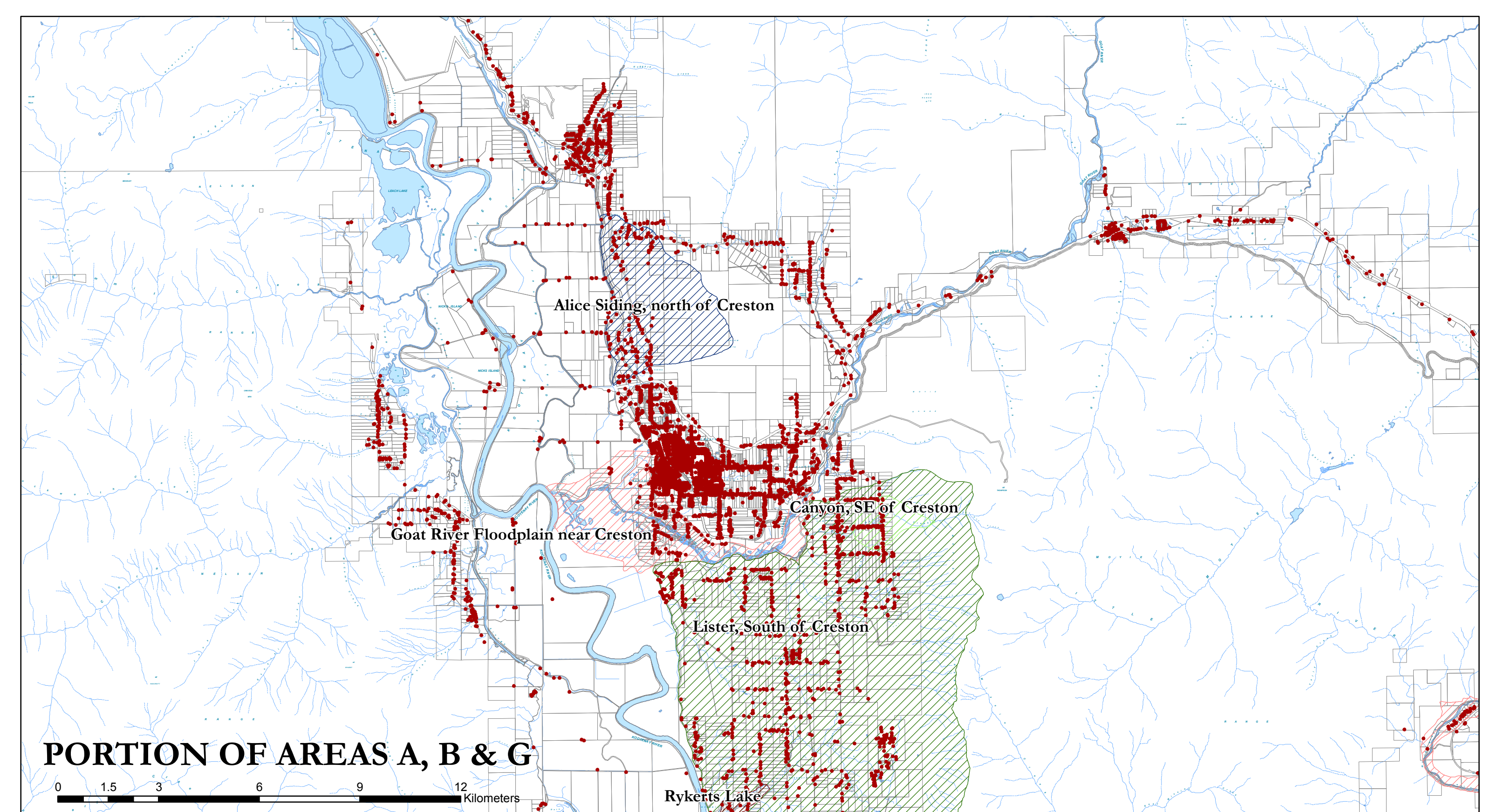
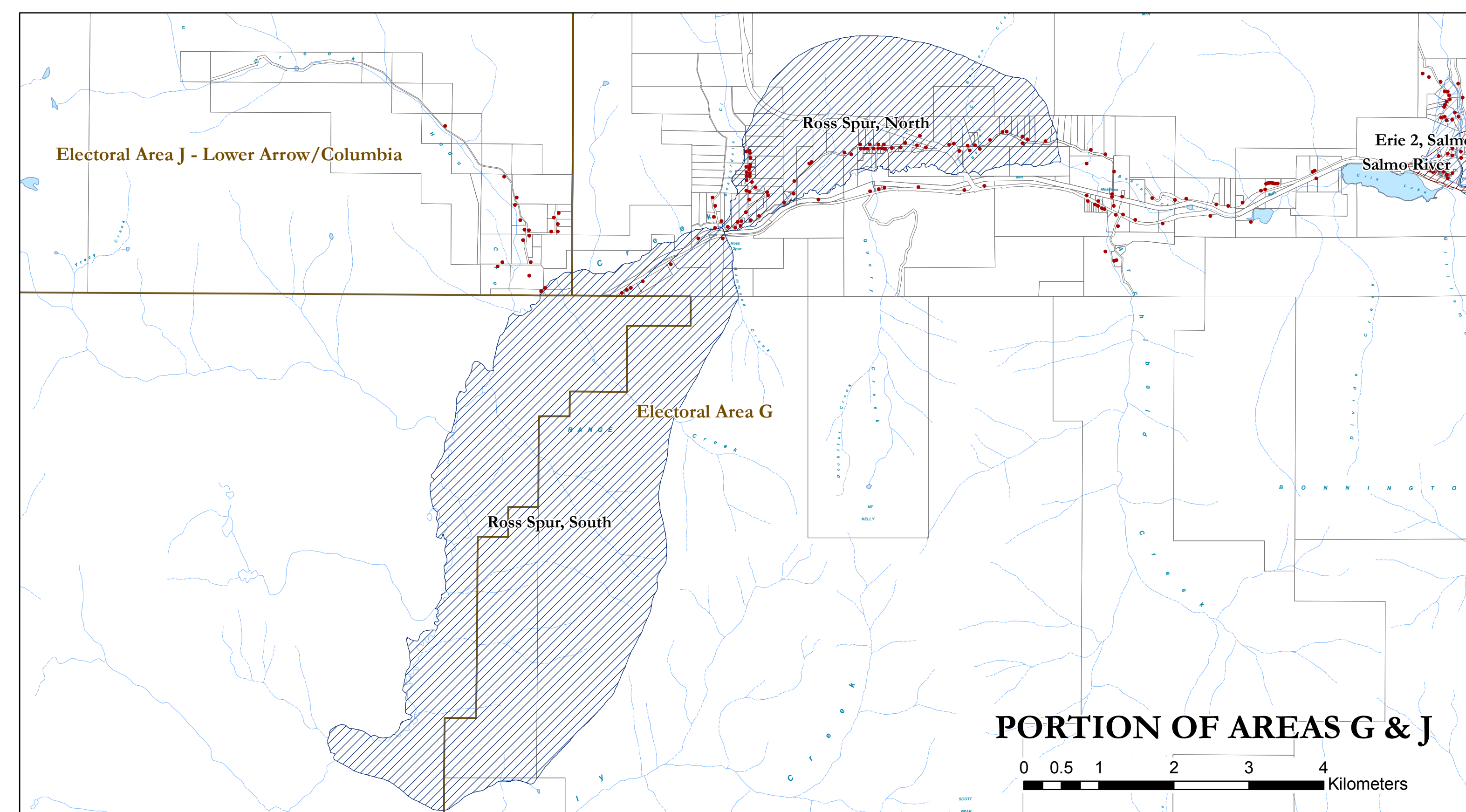
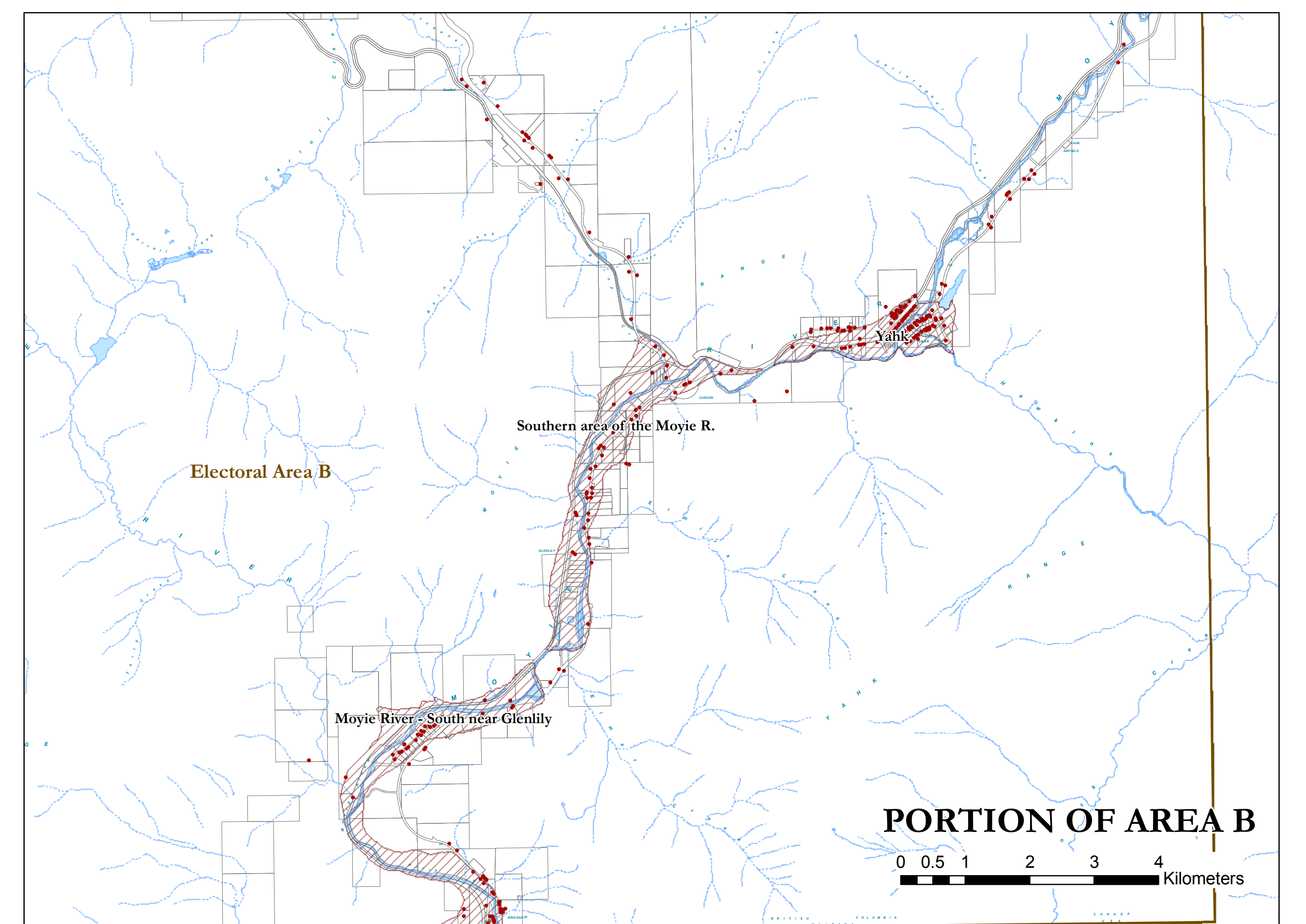
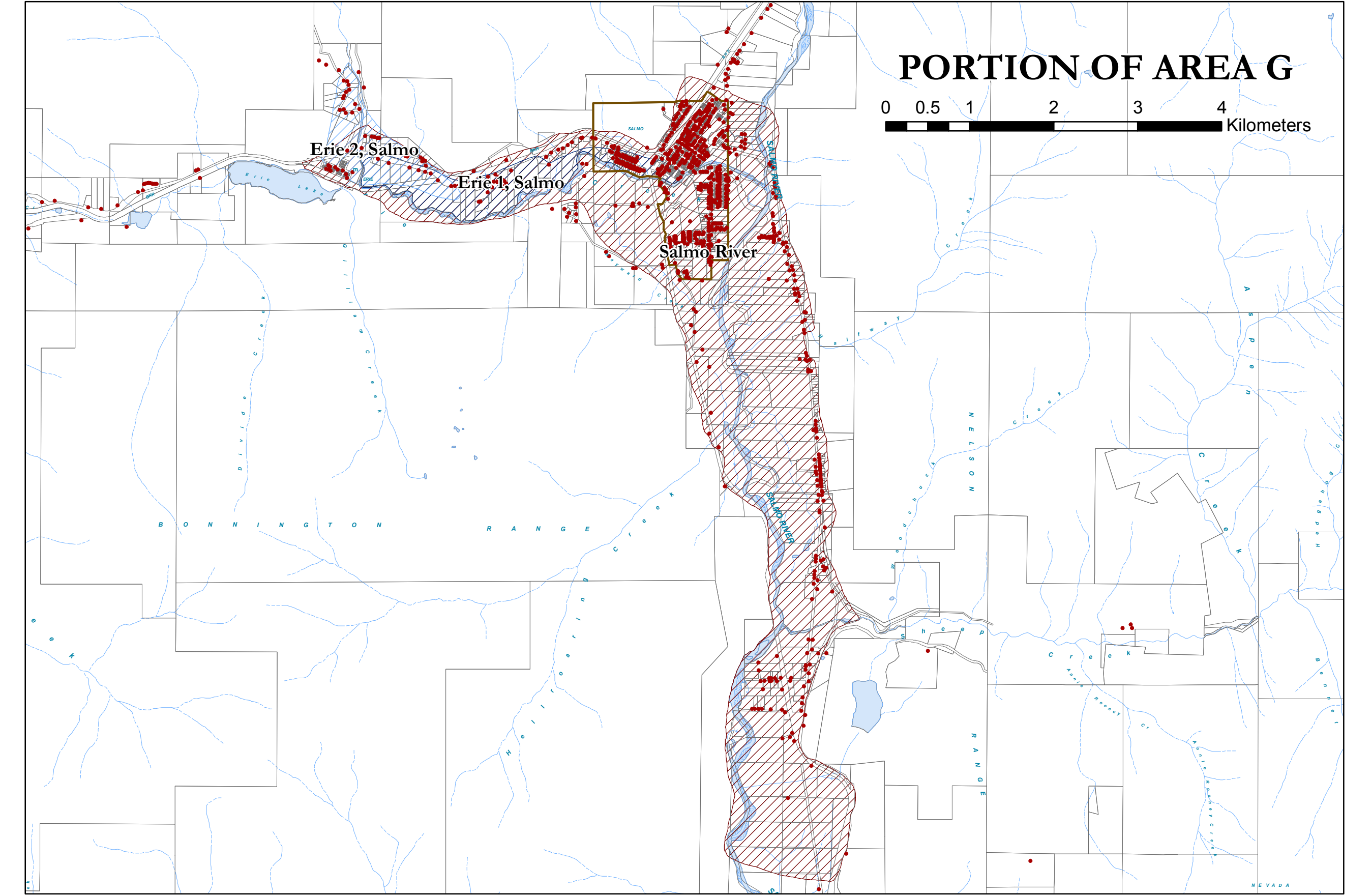
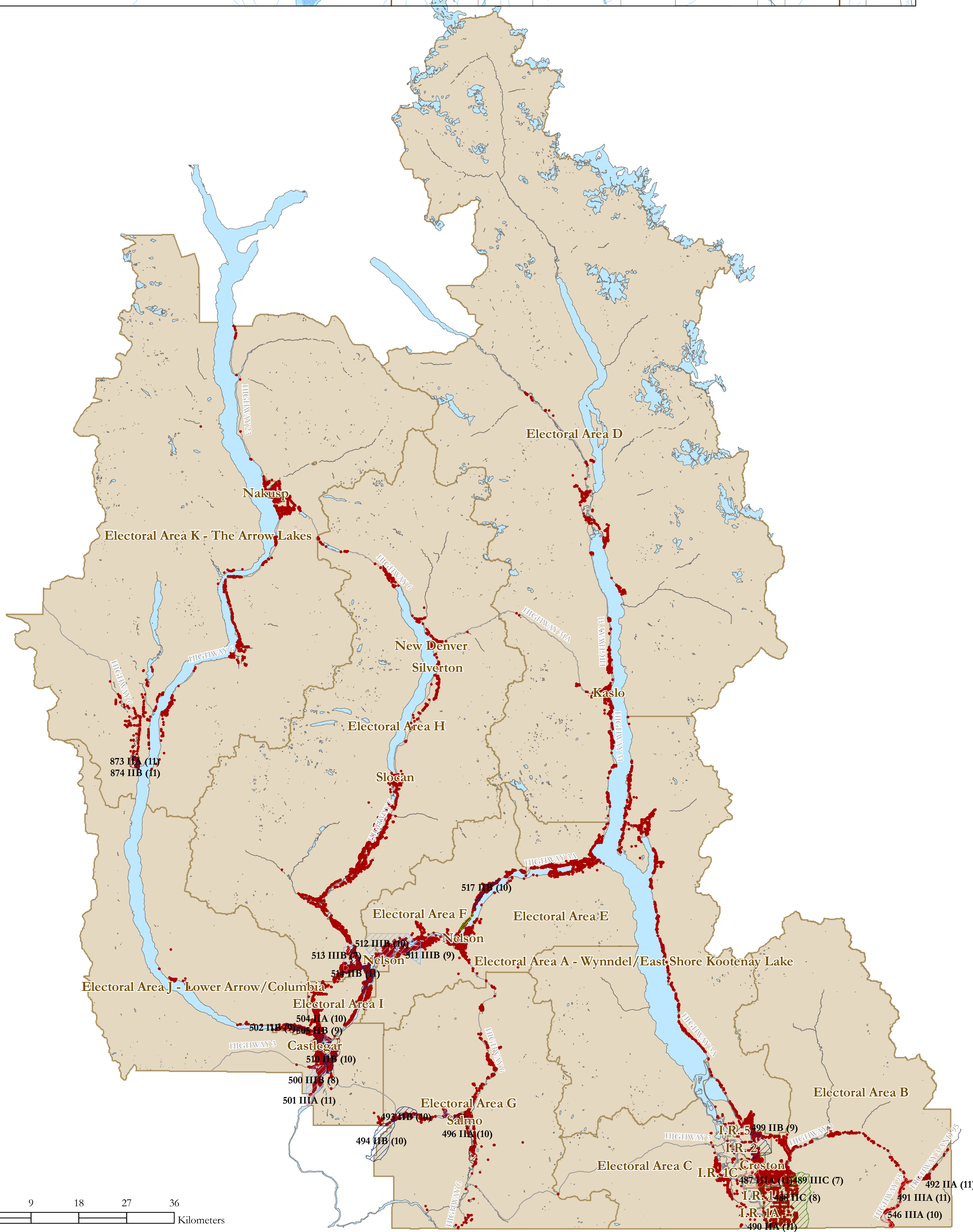
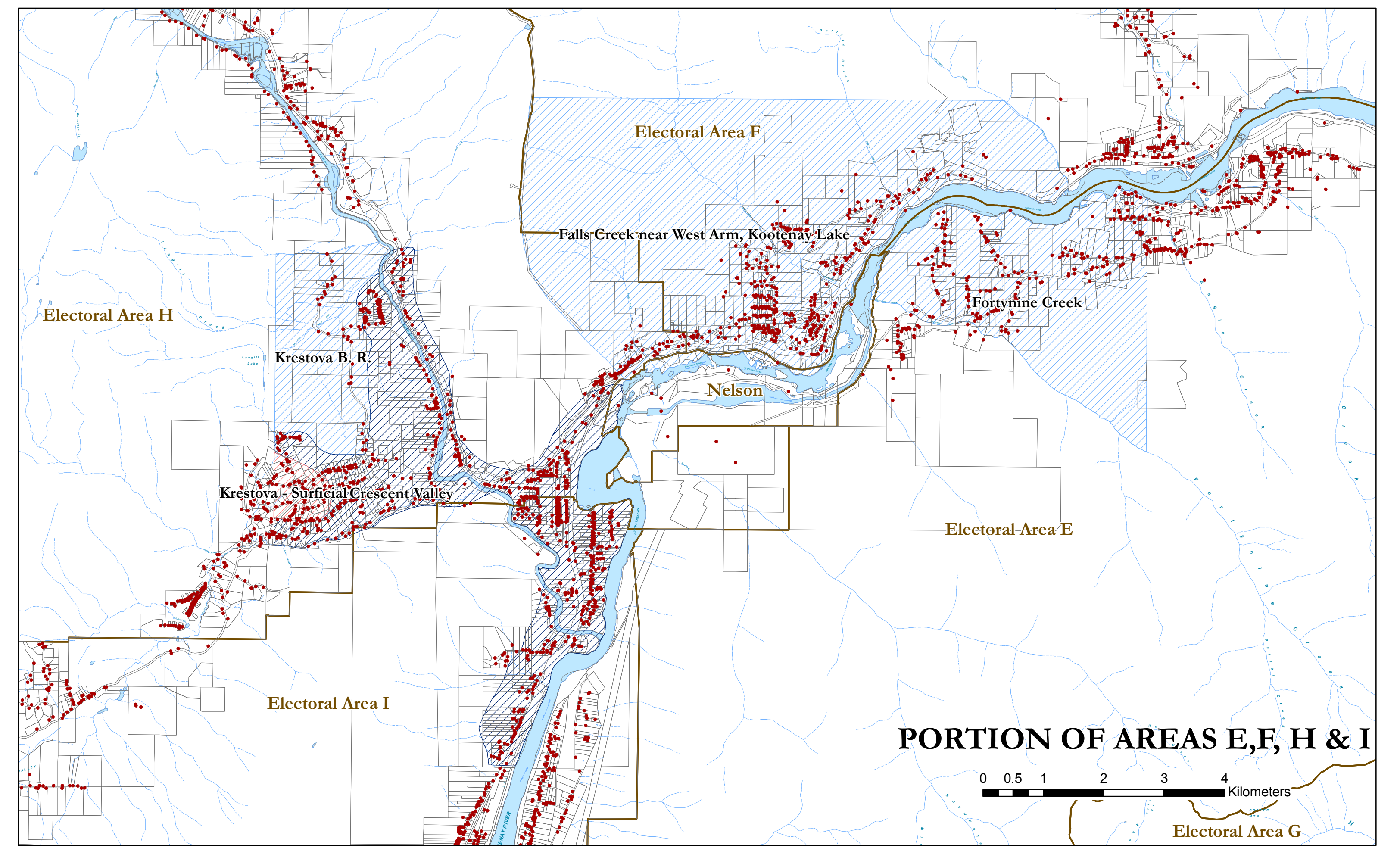
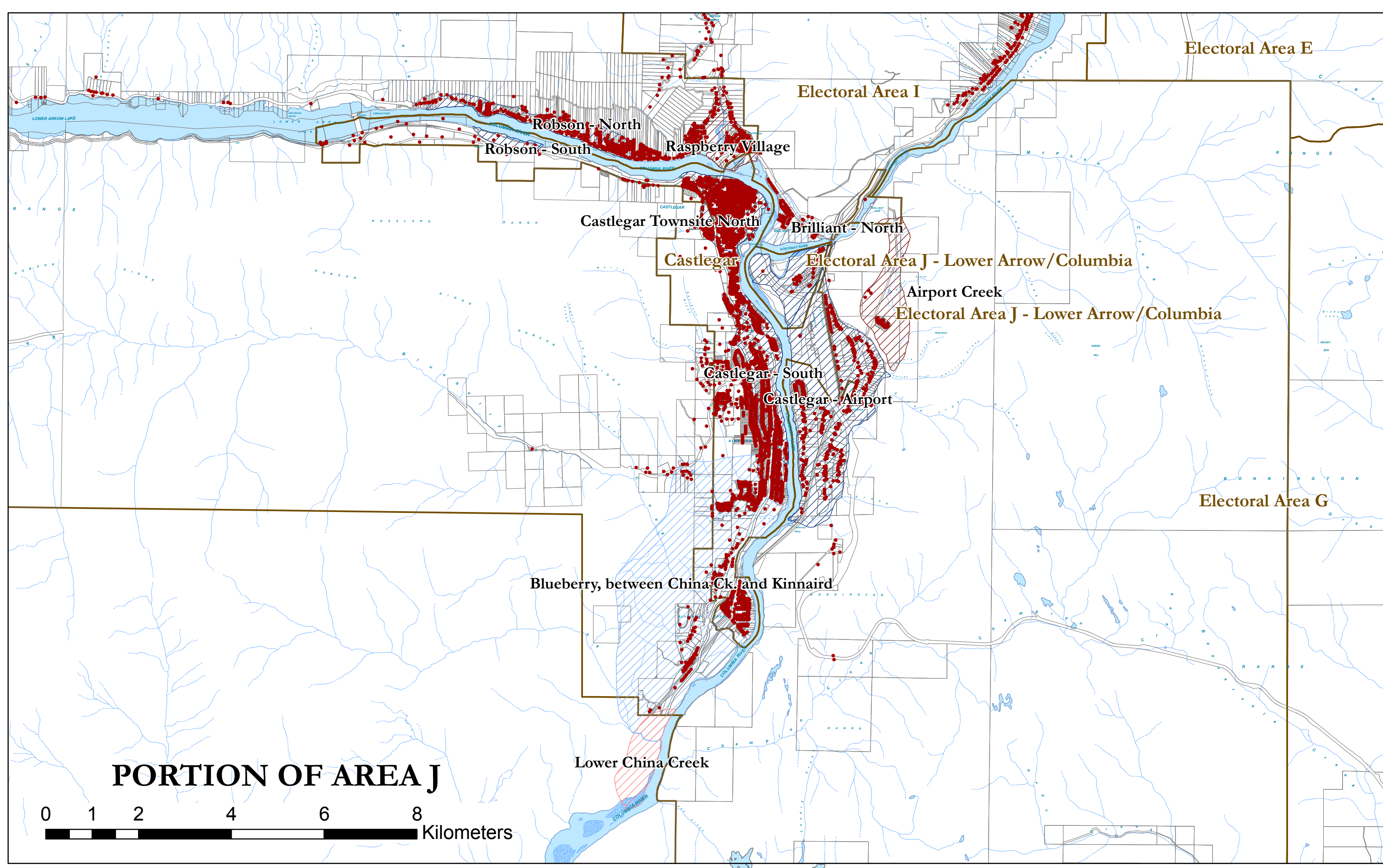
Note: See index maps for detailed area information.

DATA SOURCES

POD - Province-wide SDE spatial layer displaying water license points of diversion joined with license information; Source: Management & Standards Branch (MSB); TRIM Data - Planimetry, Unsurveyed Roads, and Contours; Source: Ministry of Water, Land and Air Protection; Roads - Road centerline compiled 2003; Source: RDCK

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Map Projection: UTM Zone 11
Map Datum: NAD83
This map was plotted on: 08/25/2008



REGIONAL DISTRICT OF CENTRAL KOOTENAY

Legend

Aquifer Class

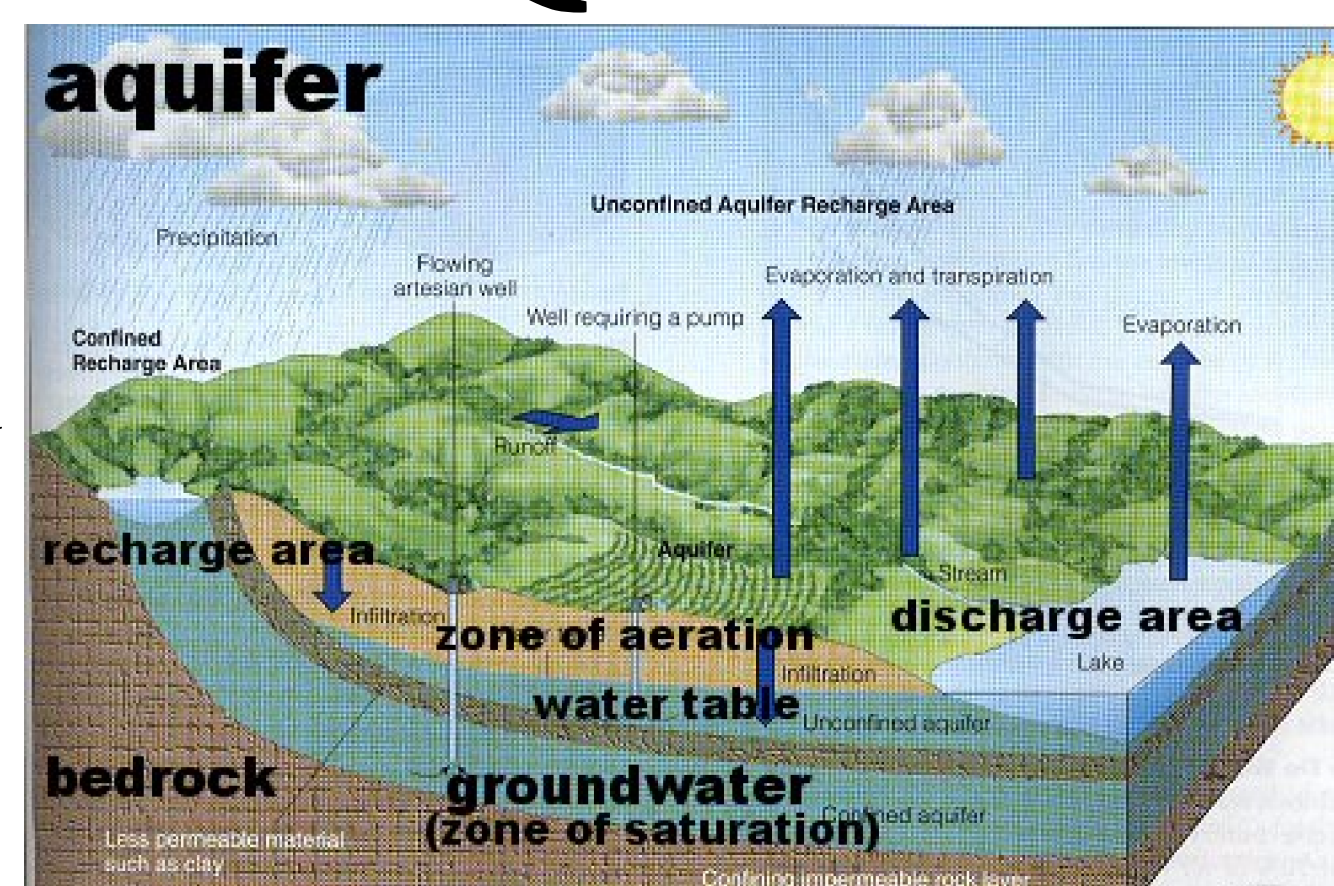
- Medium Development, High Vulnerability
- Medium Development, Medium Vulnerability
- Medium Development, Low Vulnerability
- Low Development, High Vulnerability
- Low Development, High Vulnerability

Street Addressing

- Highway
- Creek
- Administrative Boundary
- Lake

* Vulnerability level refers to risk of surface contamination
Note: See index maps for detailed area information.

DEVELOPED AQUIFERS



The level of development of an aquifer is determined by subjectively assessing demand versus the aquifer yield or productivity. A high (I), moderate (II), or low (III) level of development can be designated. The vulnerability of an aquifer to contamination from surface sources, or equivalently to potential climate change, is assessed based on: type, thickness and extent of geologic materials overlying the aquifer, depth to water (or top of confined aquifers), and the type of aquifer materials. A high (A), moderate (B), or low (C) vulnerability can be designated. The combination of the three development and three vulnerability categories results in nine aquifer classes. In the RDCK since there are no high development levels, only six of these classes are represented.

~Source: Science and Information Branch, Ministry of Environment, 2008.

Not all aquifers are in the dataset. This is an ongoing process. Only developed aquifers are identified, mapped and classified. Undeveloped aquifers are not identified.

For the aquifer classification database: Attribute data derived from analysis and interpretation of water well record lithology, Delineations, classifications and rankings may change over time as more data becomes available or land and aquifer use conditions change.

DATA SOURCES

GW_WTR_AQUIFERS - Developed Ground Water Aquifers in BC; Source: Science & Information Branch, Ministry of Environment
Cadastral Lot - Surveyed lots/parcels of land; Source: Crown Land Registry Services and RDCK
TRIM Data - Planimetry, Unsurveyed Roads, and Contours; Source: Ministry of Water, Land and Air Protection
Roads - Road centerline compiled 2003; Source: RDCK

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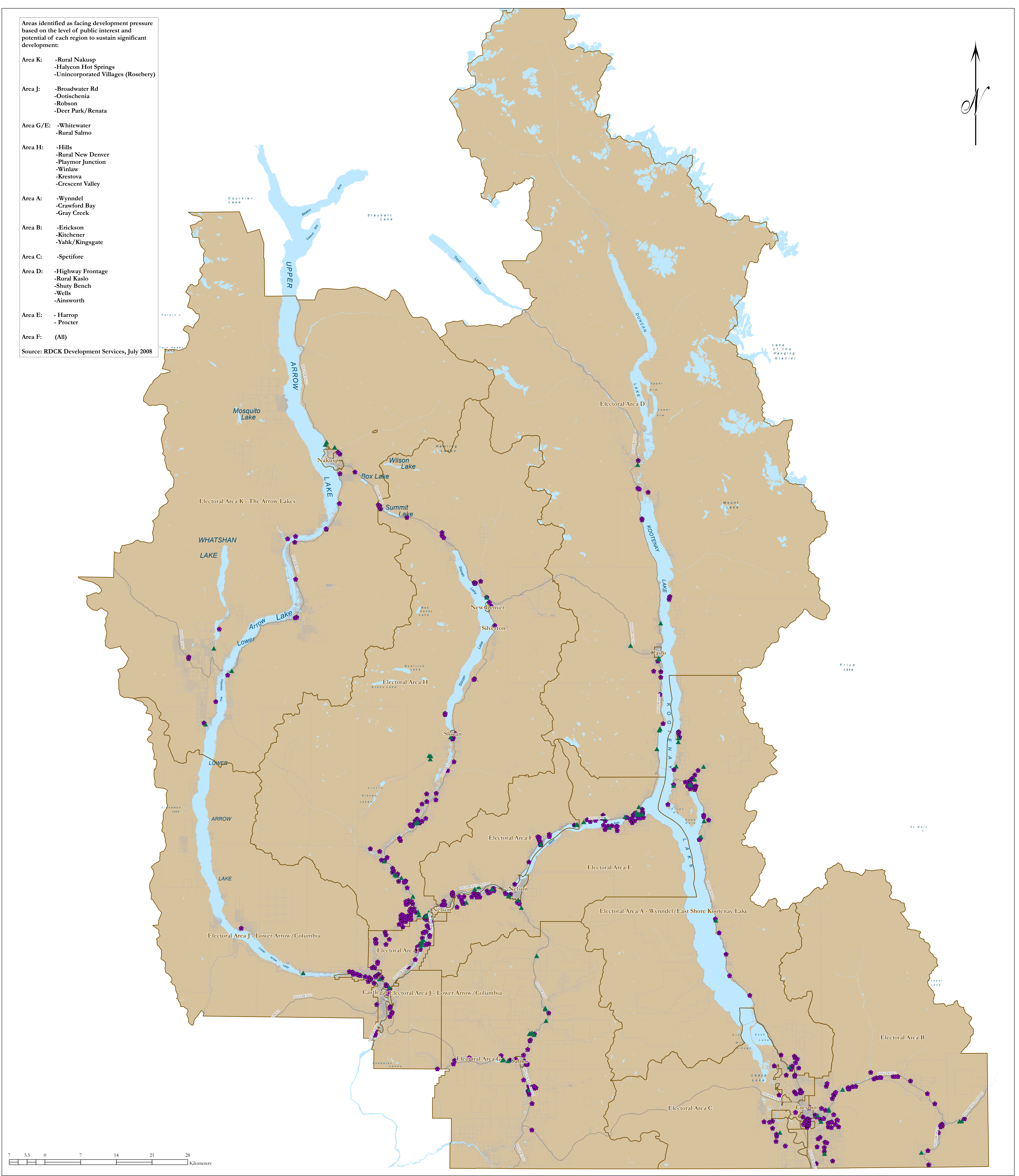
Map Projection: UTM Zone 11
Map Datum: NAD83

This map was plotted on 8/25/2008

Areas identified as facing development pressure based on the level of public interest and potential of each region to sustain significant development:

- Area K: -Rural Nakusp
-Halycon Hot Springs
-Unincorporated Villages (Rosebery)
- Area J: -Broadwater Rd
-Ootischena
-Robson
-Deer Park/Renata
- Area G/E: -Whitewater
-Rural Salmo
- Area H: -Hills
-Rural New Denver
-Playmor Junction
-Winlaw
-Krestova
-Crescent Valley
- Area A: -Wynndel
-Crawford Bay
-Gray Creek
- Area B: -Erickson
-Kitchener
-Yahk/Kingsgate
- Area C: -Spetifore
- Area D: -Highway Frontage
-Rural Kaslo
-Shuty Bench
-Wells
-Ainsworth
- Area E: -Harrop
-Procter
- Area F: (All)

Source: RDCK Development Services, July 2008



REGIONAL DISTRICT OF
CENTRAL KOOTENAY

AREAS EXPERIENCING GROWTH & DEVELOPMENT

- Legend**
- ▲ Recent Commercial Development
 - Recent Residential Development
 - Highway
 - ▭ Parcel Boundary
 - ▭ Lake
 - ▭ Administrative Boundaries

Note: See index maps for detailed area information.

Recent residential development includes permits issued for construction of single family dwellings, including cabins and guest houses, manufactured homes, and mobile homes (single and double-wide since 2001. There have been a total of 488 permits issued for residential development since 2001.

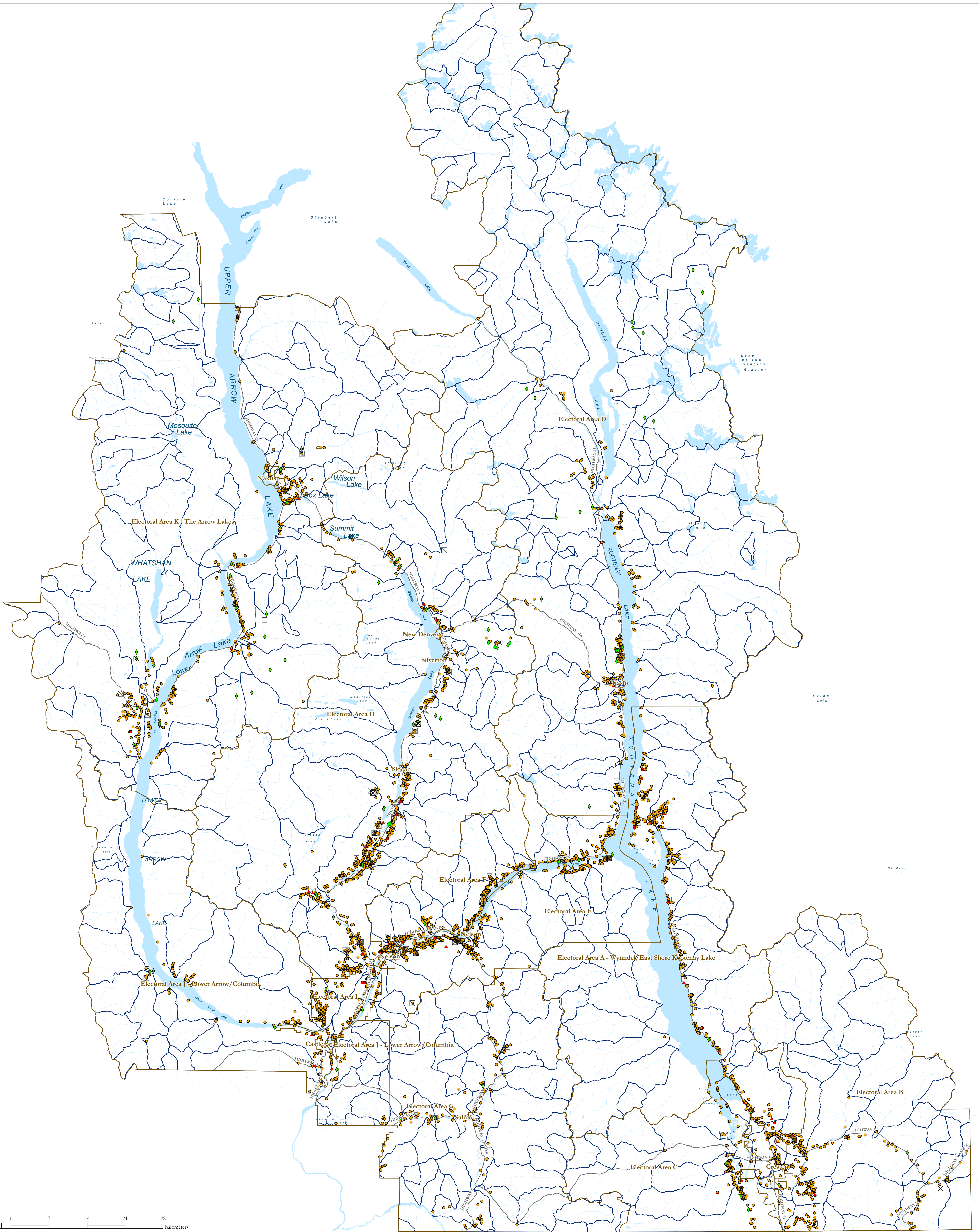
Recent commercial development includes permits issued for commercial buildings, commercial building additions, industrial buildings, lodge/hostel, and tourist accommodation since 2001. There have been a total of 115 commercial building permits issued since 2001.

Source: RDCK Development Services, July 2008

DATA SOURCES






Building Permit Data - Residential and commercial building permits issued; Source: Regional District of Central Kootenay
 Cadastral Lot - Surveyed lots/parcels of land; Source: Crown Land Registry Services and RDCK
 TRIM Data - Planimetry, Unsurveyed Roads, and Contours; Source: Ministry of Water, Land and Air Protection
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Map Projection: UTM Zone 11
 Map Datum: NAD83
 This map was plotted on: 8/25/2008



EXISTING WATER LICENSES & APPLICATIONS IN PROGRESS

Legend

-  Creek
-  Lake
-  Highway
-  3RD Order Watersheds
-  Administrative Boundary
-  Other Licenses
-  Active Applications
-  Current Licenses
-  Refused Applications

Note: See index maps for detailed area information.

Other Licenses include licenses which have a status of pending, or are considered an un-cleared application. There are 130 water licenses in the RDCK included in this category.

Refused applications include those which have been refused (often for 'no water'). There are 184 licenses within the RDCK that have been refused.

Currently there are a total of 10,013 active water licenses, and 215 applications in progress. Applications in progress are those which are classified as an active application or those which are awaiting signing.

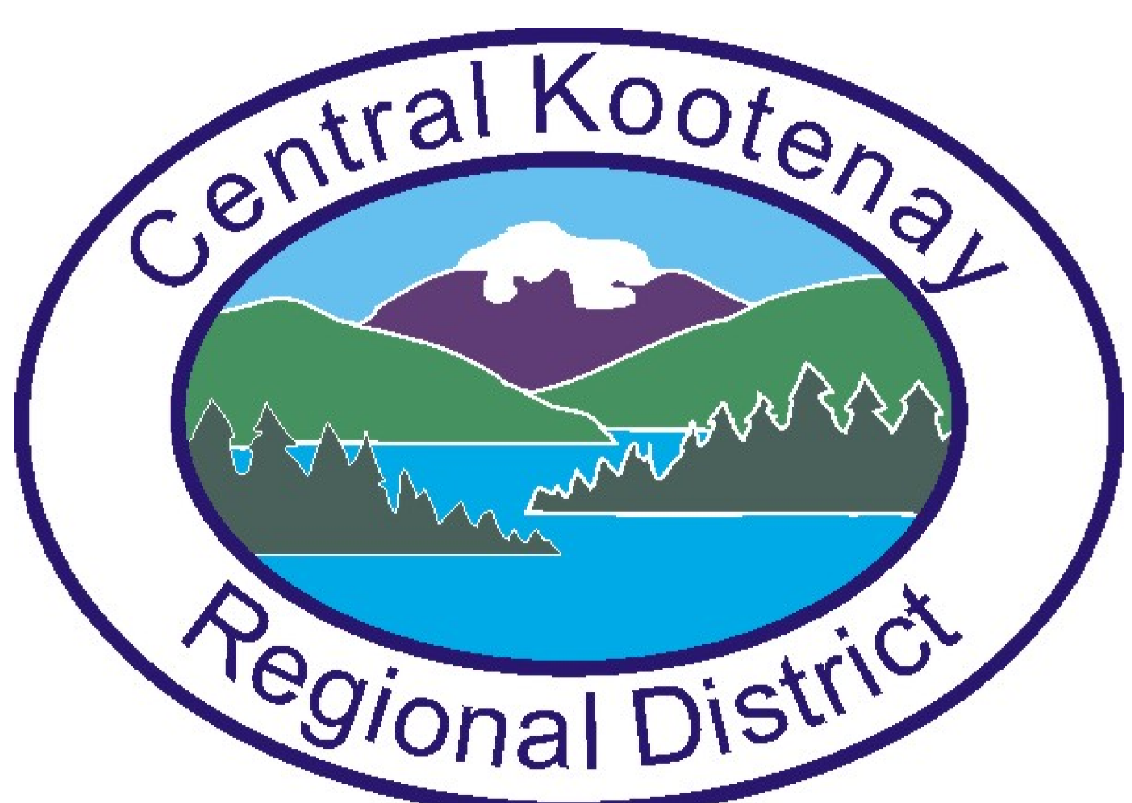
DATA SOURCES

POD - Province-wide SDI spatial layer displaying water license points of diversion joined with water license information; Source: Management & Standards Branch (M&S)
TRIM Data - Planimetry, Unsurveyed Roads, and Contours; Source: Ministry of Water, Land and Air Protection
Roads - Road centerline compiled 2003; Source: RDCK

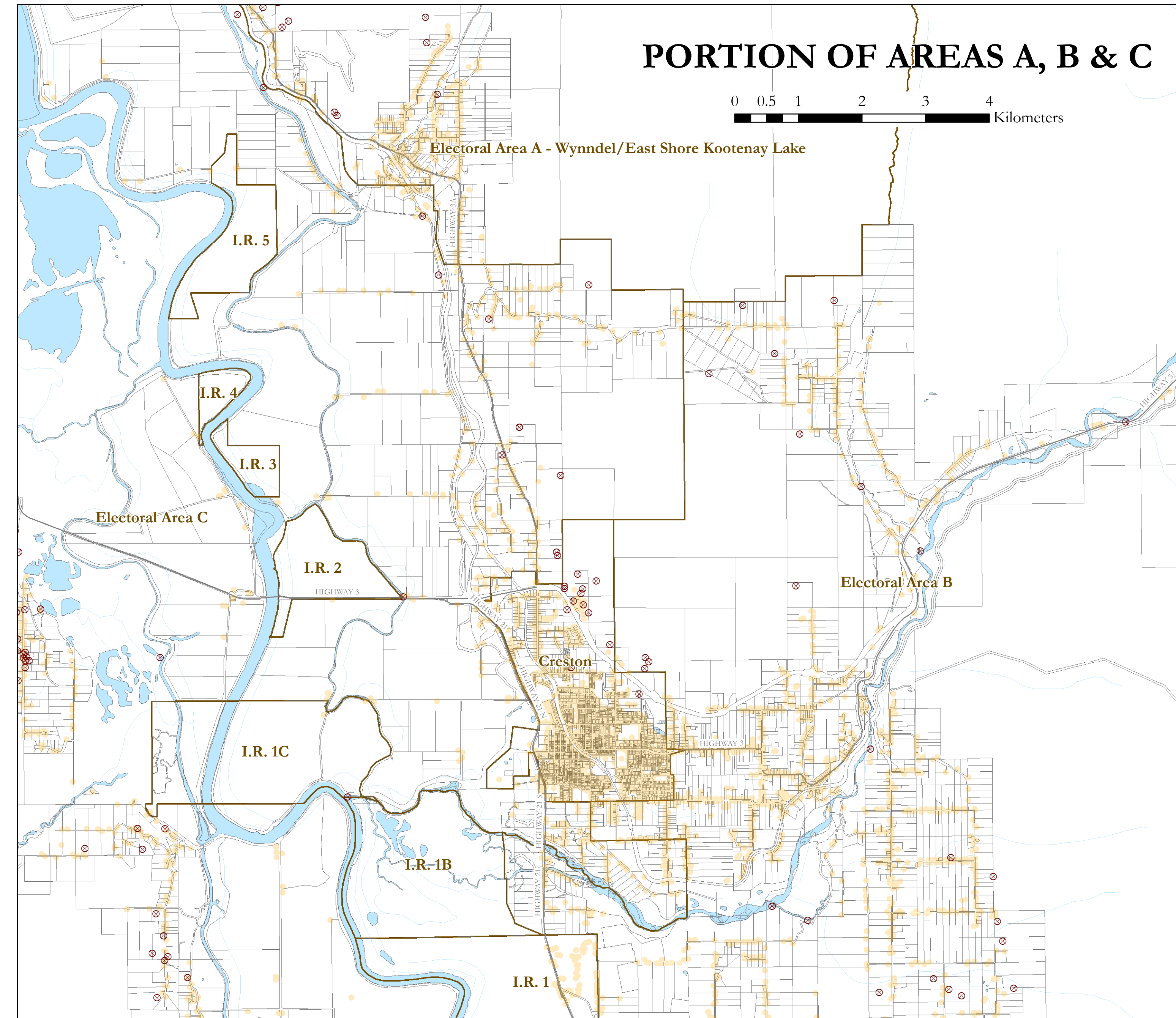
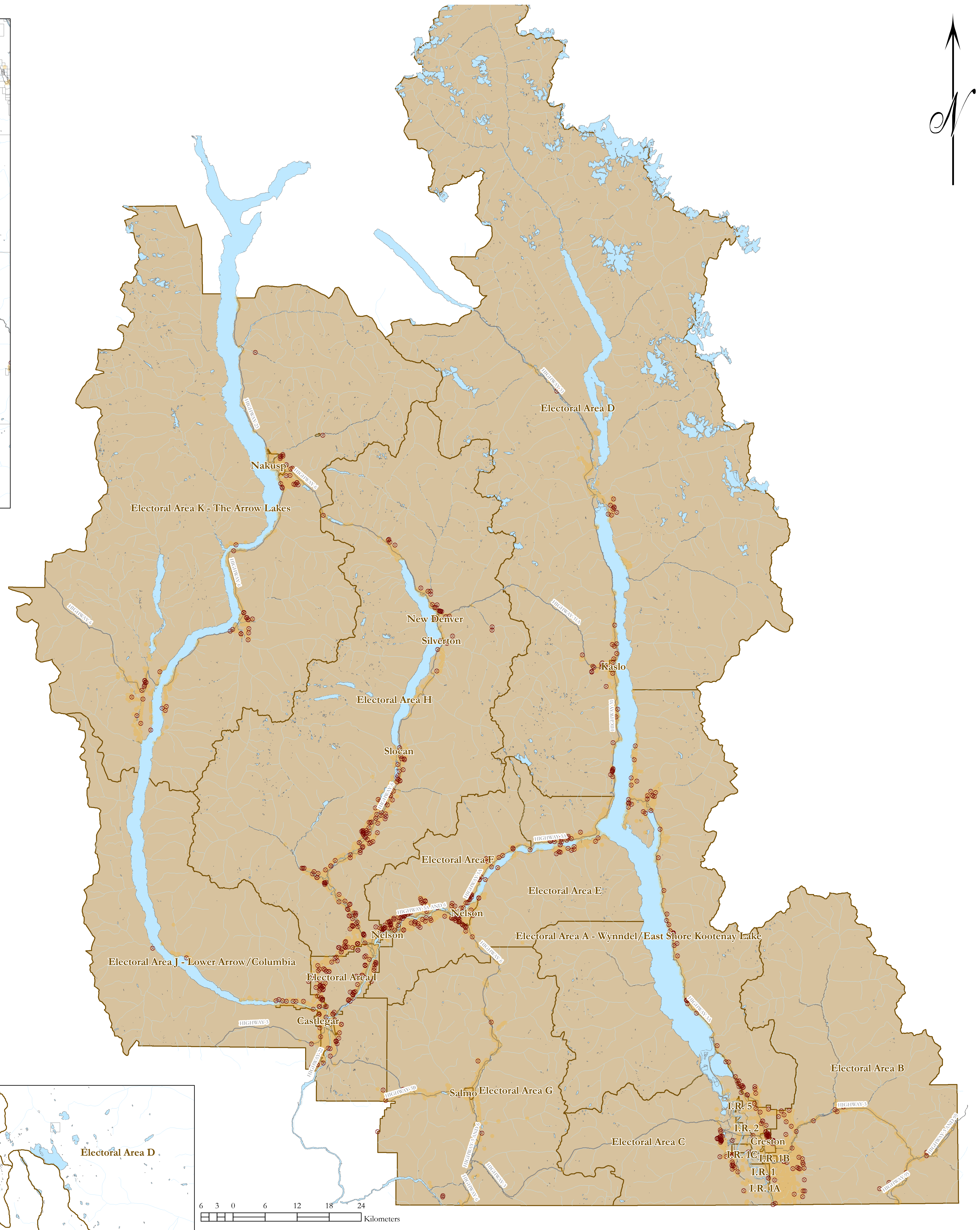
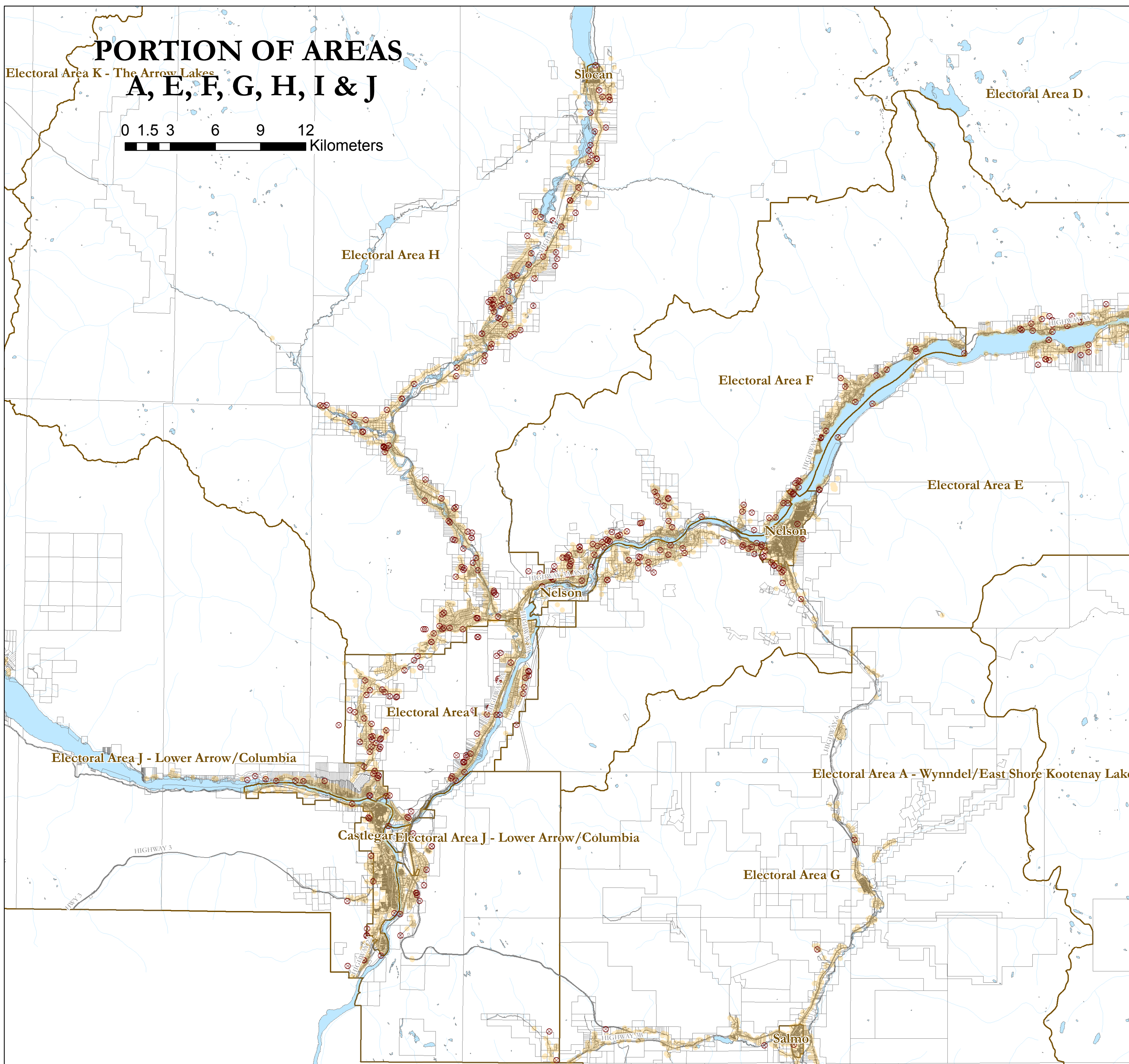
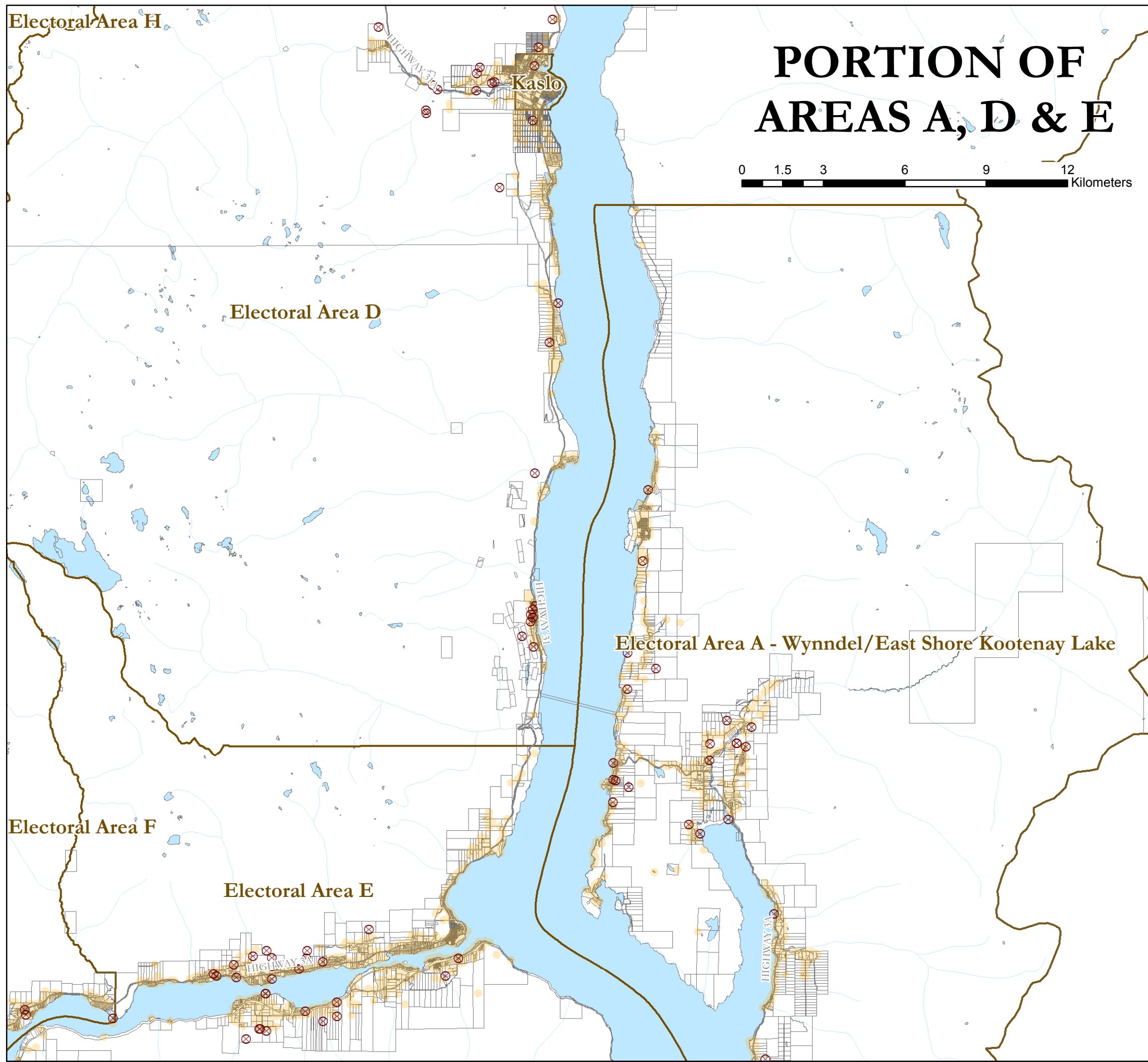
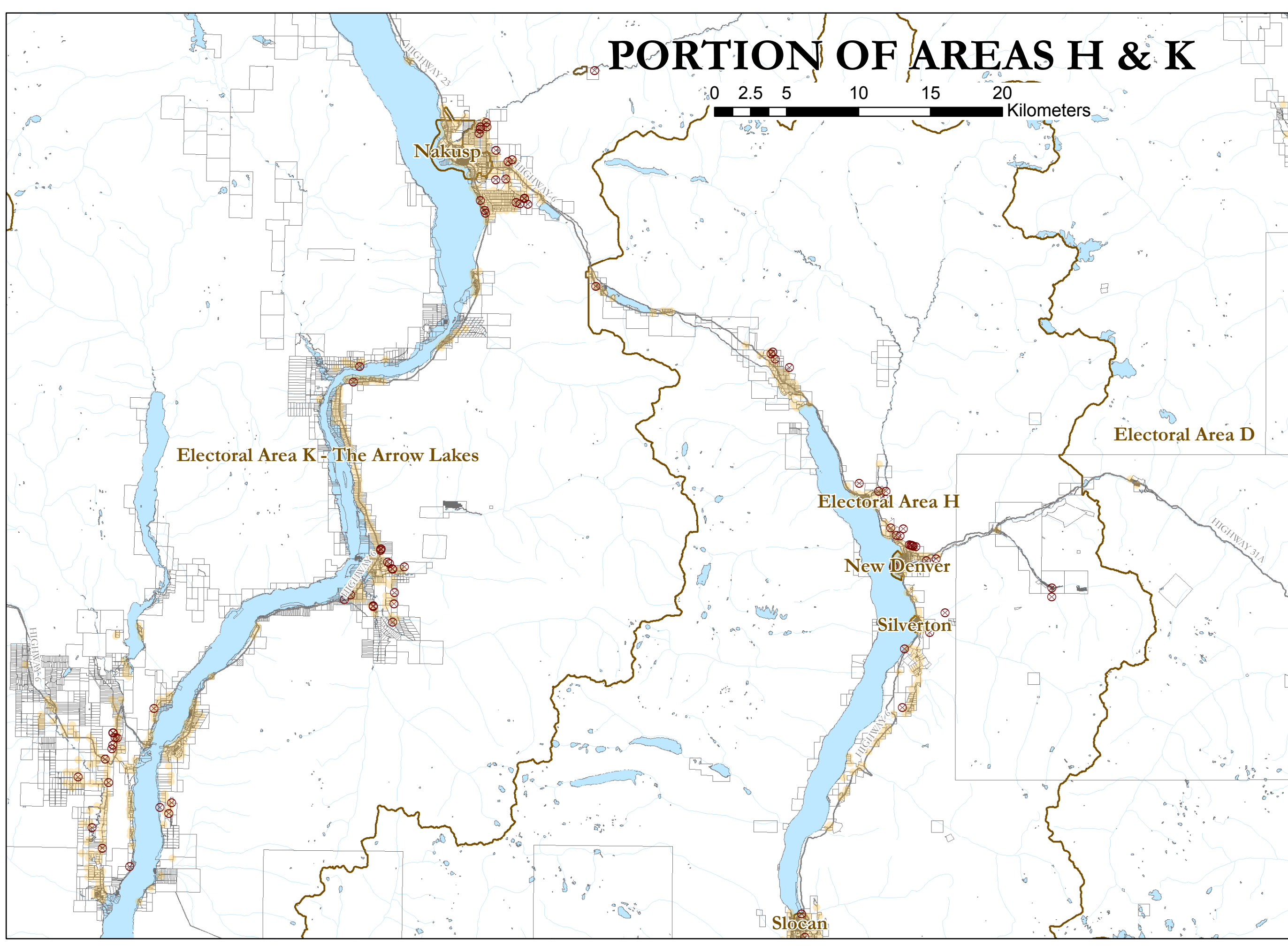
Regional District of Central Kootenay
Box 590, 202 Lakeside Drive, Nelson, BC V1L 5K4
Phone: (250) 352-6665
Toll Free: 1-800-268-7325 (BC)
Fax: (250) 352-9900 Internet: www.rdck.bc.ca

Map Projection: UTM Zone 11
Map Datum: NAD83

This map was printed on: 08/25/2008



REGIONAL DISTRICT OF
CENTRAL KOOTENAY



WATER ALLOCATION RESTRICTIONS

Legend

- Street Addressing
- Administrative Boundary
- Allocation Restrictions
- Highway
- Creek
- Lake

Note: See index maps for detailed area information.

Licensed Water Sources with Allocation Restrictions
Restrictions imposed include:

- Refused No Water (RNW) : This indicates that license applications have been refused based on insufficient flows.
 - Possible Water Shortage (PWS) - Creek / river has been identified by water management personnel as potentially having insufficient water during dry periods. Rational for this category is not clearly defined.
 - Fully Recorded (FR) : The creek cannot support any further water licenses without causing conflict to users.
- There are a total of 669 water allocation restrictions within the RDCK.

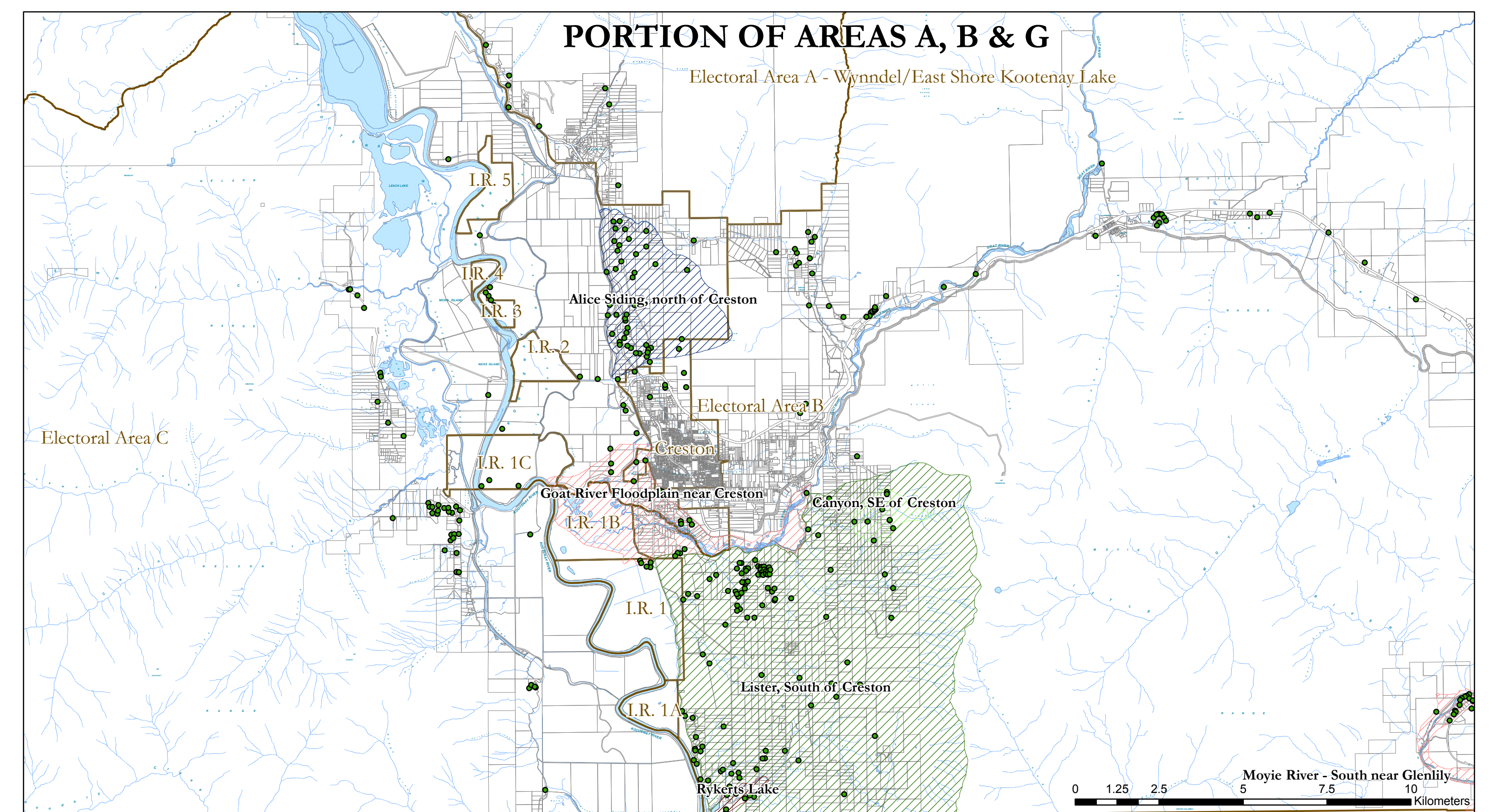
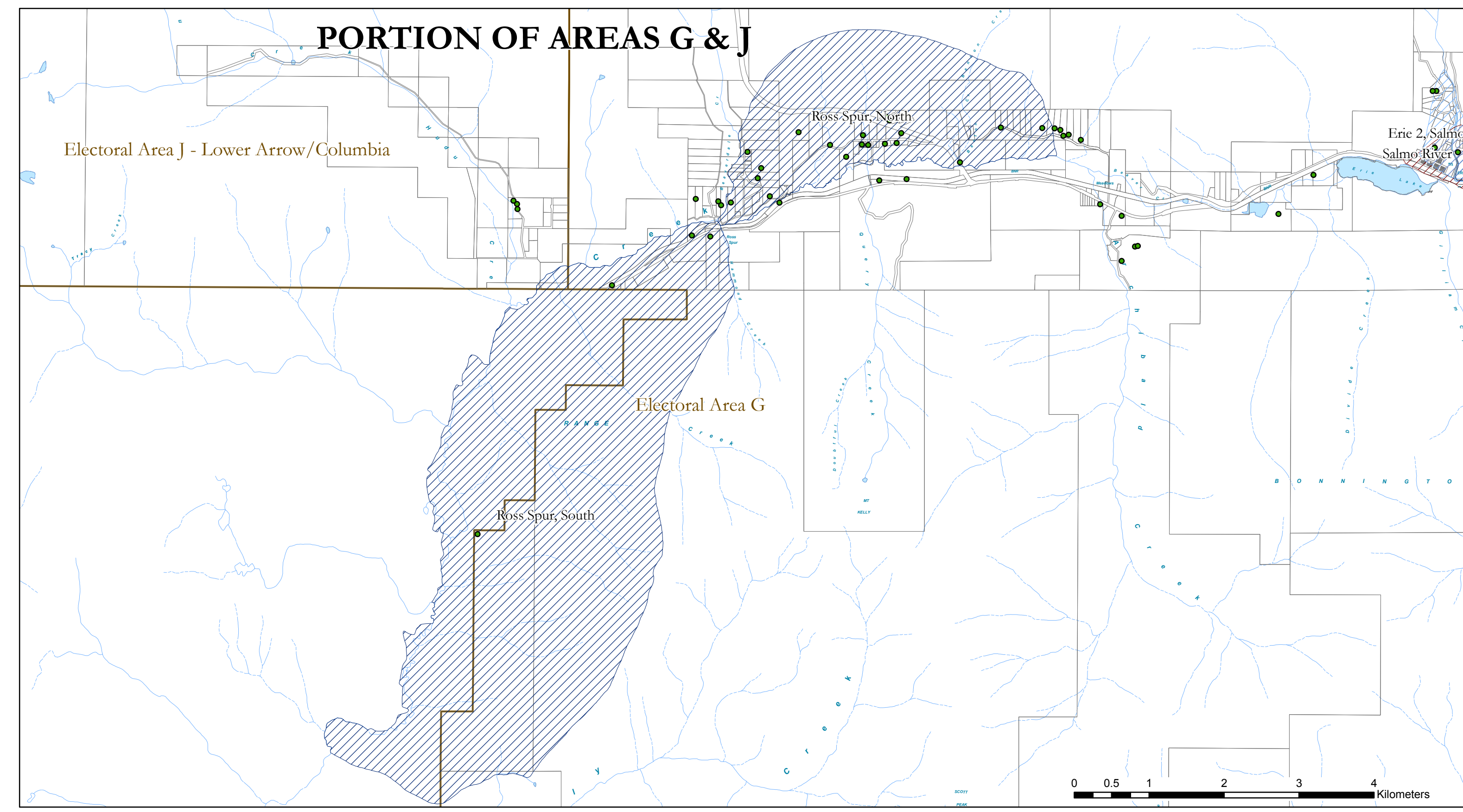
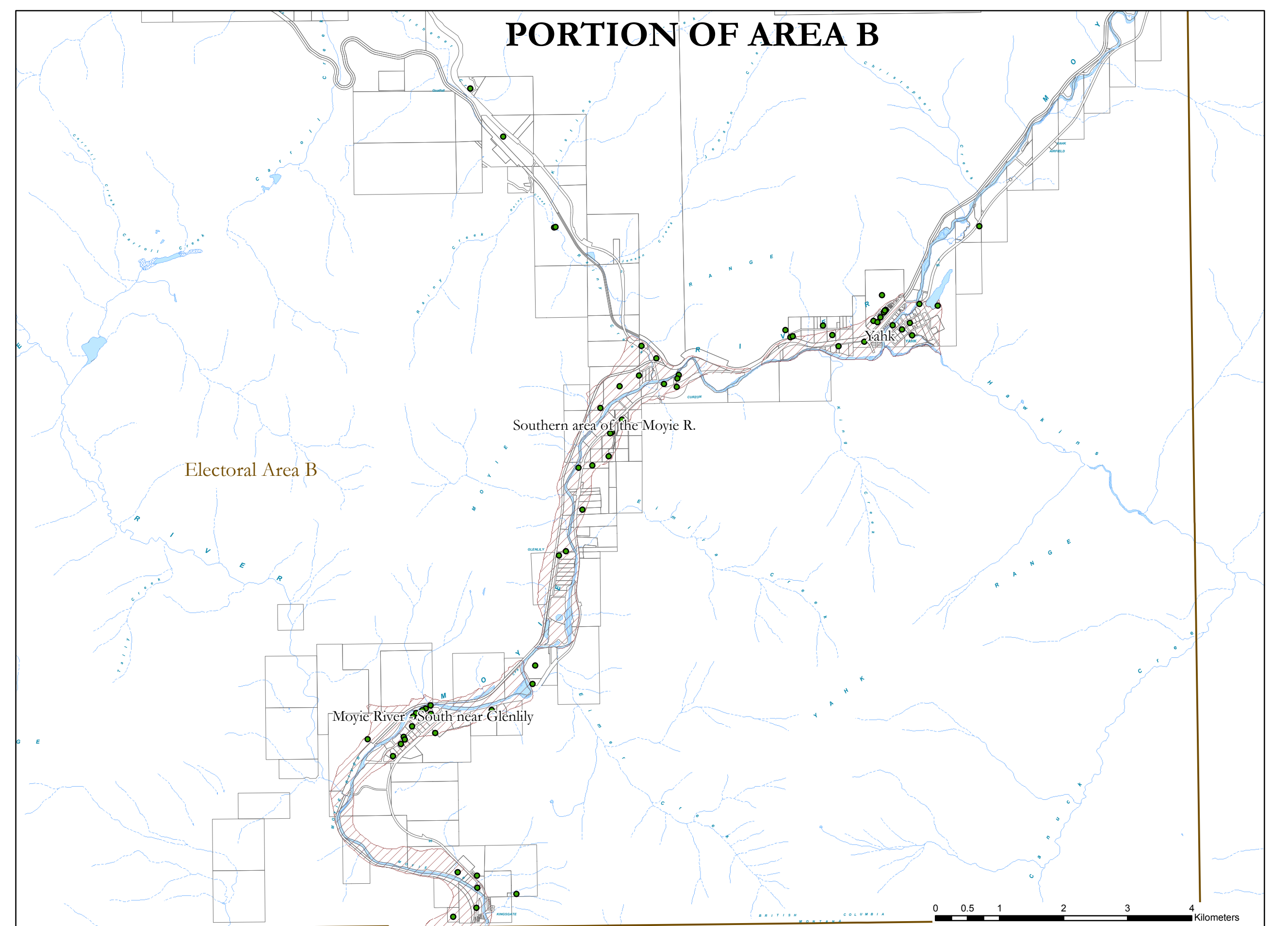
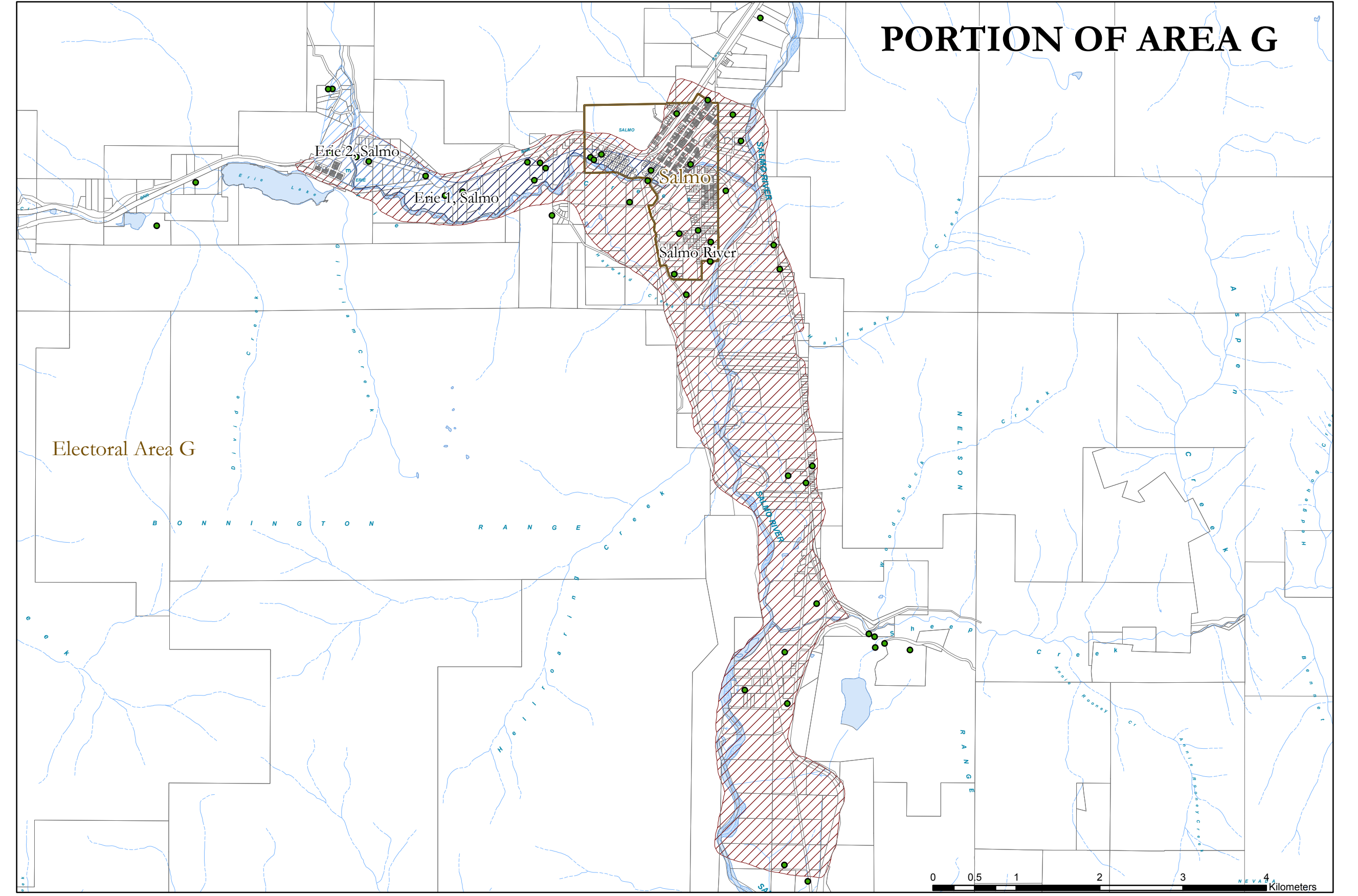
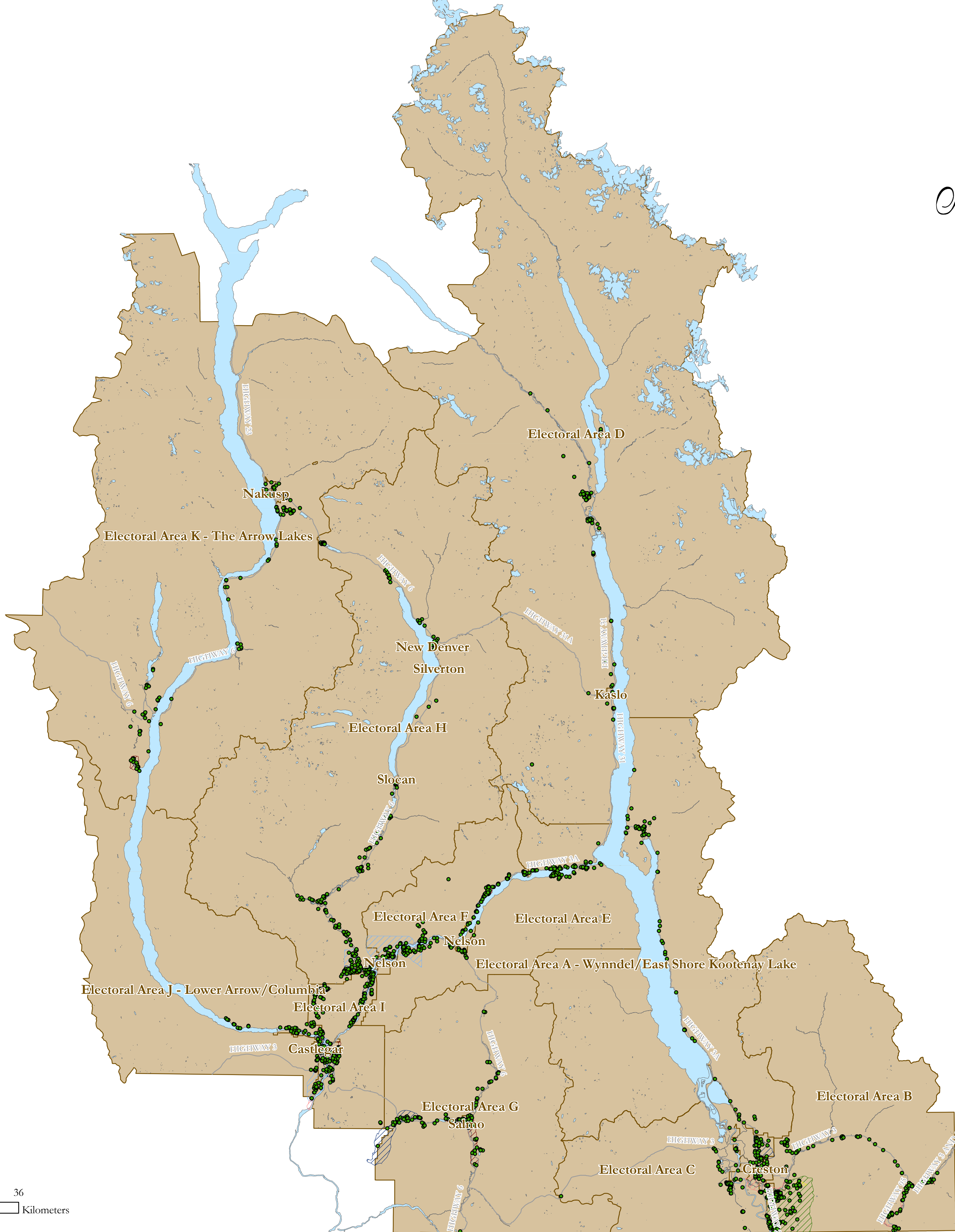
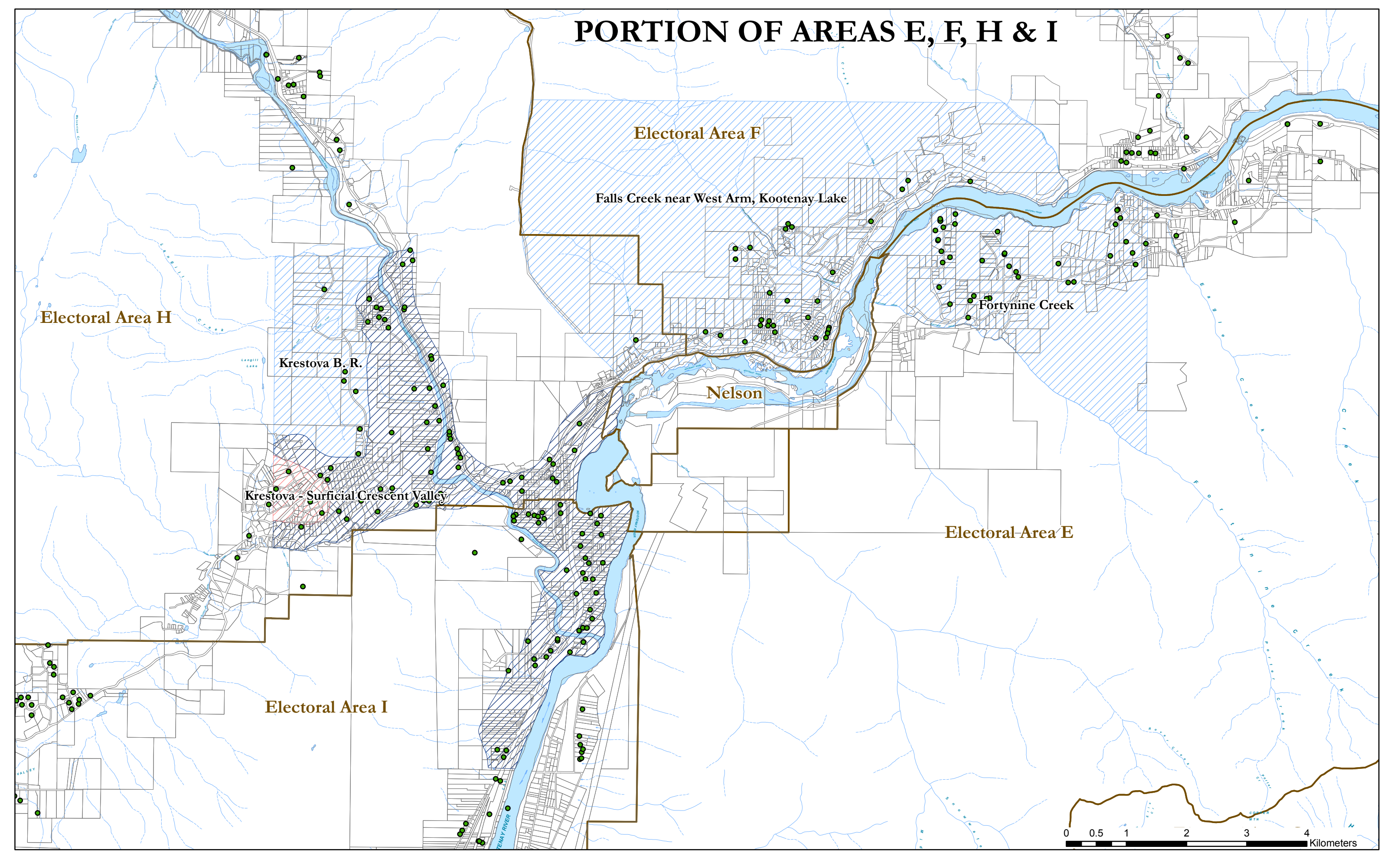
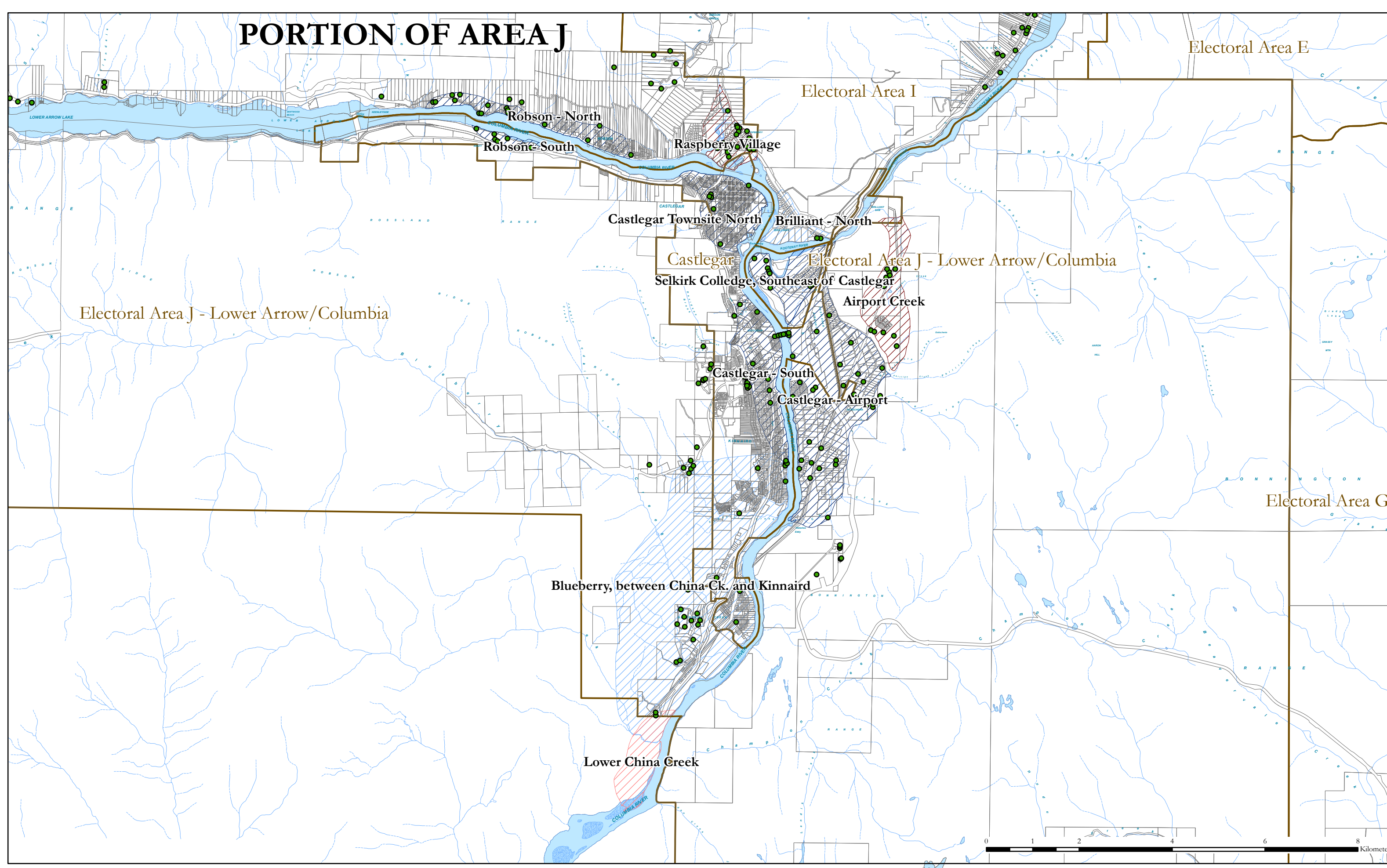
DATA SOURCES

Water Allocation Concerns - Location of water sources designated as having a water allocation restriction. Source: Science and Information Branch (MOI).
Cadastral List - Surveyed lots/parcels of land. Source: Crown Land Registry Services and RDCK.
TRM Data - Planning, Unsurveyed Roads, and Contours; Source: Ministry of Water, Land and Air Protection.
Roads - Road centerline compiled 2003. Source: RDCK.

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Map Projection: UTM Zone 11
Map Datum: NAD83

This map was plotted on: 08/25/2008



REGIONAL DISTRICT OF
CENTRAL KOOTENAY

GROUND WATER EXTRACTION

- Legend**
- Lake
 - Ground Water Well
 - Medium Development, High Vulnerability
 - Medium Development, Medium Vulnerability
 - Medium Development, Low Vulnerability
 - Low Development, High Vulnerability
 - Low Development, High Vulnerability
 - Low Development, High Vulnerability
 - Highway
 - Administrative Boundary

* Vulnerability level refers to the risk of surface contamination
Note: See index maps for detailed area information.

The total number of ground water wells within the RDCK at the time of data acquisition was 1,563. There is no statutory requirement for well drillers to submit these records to the Government of British Columbia, therefore not all ground water wells are represented in this dataset. The percentage of wells represented is unknown, however the best estimate is approximately 50%. The dataset is in a constant state of update and does not remain static for any length of time.

Not all aquifers are in the dataset. Building the inventory is an ongoing process. Only developed aquifers have been identified, mapped and classified. Undeveloped aquifers are not included.

Attribute data was derived from analysis and interpretation of water well record lithology. Delineations, classifications and rankings may change over time as more data becomes available or land and aquifer use conditions change.

~Source: Science and Information Branch, Ministry of Environment, June 2008.

DATA SOURCES

GW_WTR_W1 - Locations of Ground Water Wells within the RDCK; Source: Science & Information Branch, Ministry of Environment
 GW_WTR_AQUIFIERS - Developed Ground Water Aquifers; Source: Science & Information Branch, Ministry of Environment
 Cadastrel Lot - Surveyed lots/parcels of land; Source: Crown Land Registry Services and RDCK
 TRIM Data - Planimetry, Unsurveyed Roads, and Contours; Source: Ministry of Water, Land and Air Protection
 Roads - Road centerline compiled 2003; Source: RDCK
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 Phone: (250) 352-6665
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Map Projection: UTM Zone 11
 Map Datum: NAD83
 This map was plotted on: 08/25/2008

APPENDIX C

Local Well Information



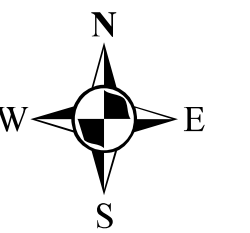
REGIONAL DISTRICT OF CENTRAL KOOTENAY

Legend

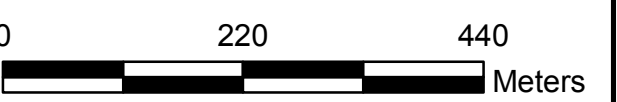
- Ground Water Well
- Property Boundary
- Creek
- Lake

L 10220 (District Lot)
SL 12 (Subsidy Lot)
Blk. 7 (Block Number)
NEP68178 (Survey Plan)
Lot 2 (Lot Number)

NOTE: Legal descriptions will vary and may not contain information as seen in the example.



Map Projection: UTM Zone 11
Map Datum: NAD83

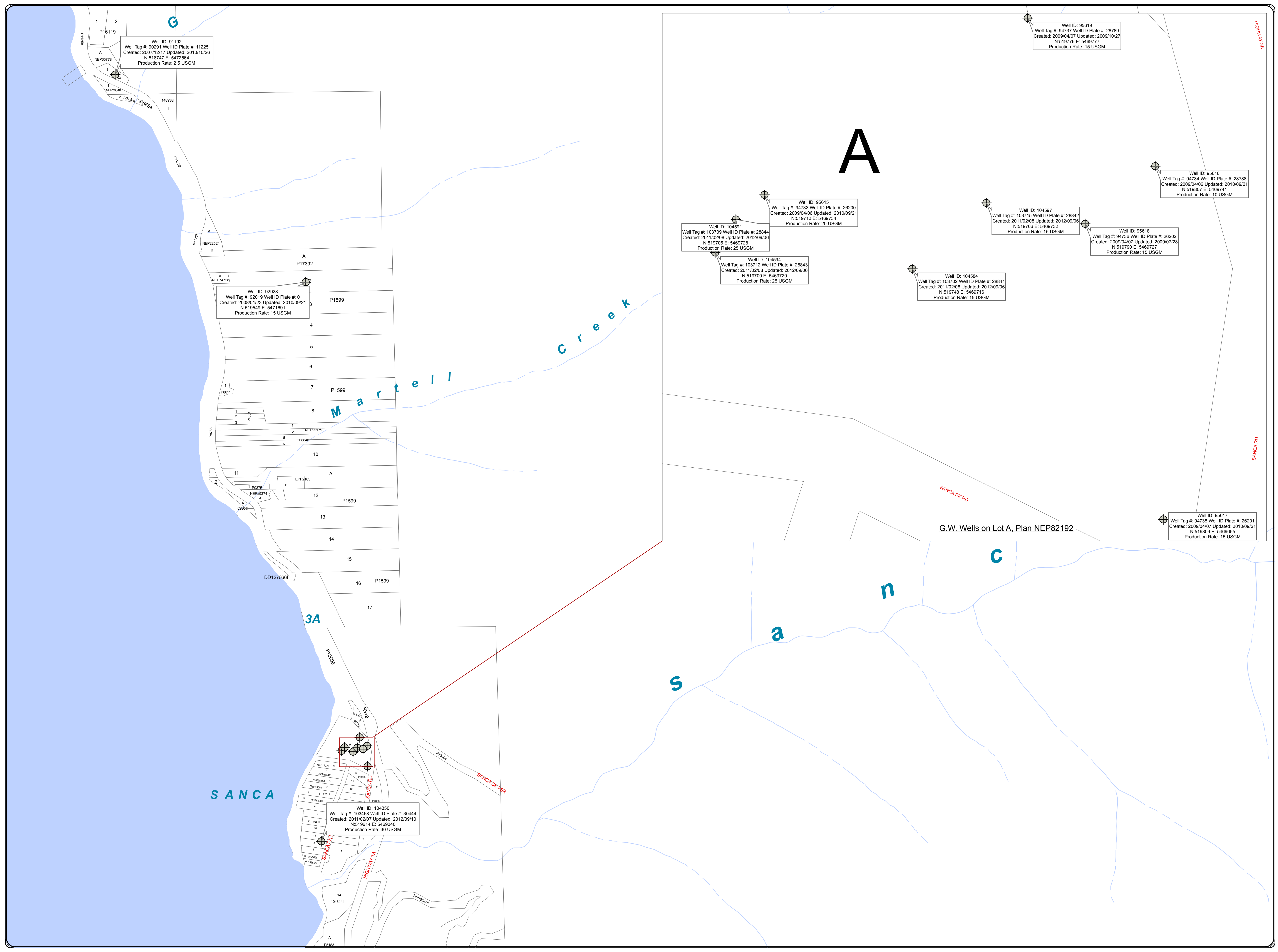


DATA SOURCES

The following sources of data are updated as changes occur:

- Cadastral Lot - Surveyed lots/parcels of land; Sources: Crown Land Registry Services and RDCK
- District Lot; Source: Crown Land Registry Services, Integrated Cadastral Initiative (ICI) and RDCK
- TRIM Data - Planimetry, Unsurveyed Roads, and Contours; Source: Ministry of Water, Land and Air Protection
- ALR - Agricultural Land Reserve; Source: BC Land Reserve Commission
- Zoning - Rural Land Use, Land Use and Zoning Bylaws, where bylaws are in place; Source: RDCK
- Roads - Road centerline compiled 2003; Source: RDCK
- Regional District of Central Kootenay
 Box 590, 202 Lakeside Drive, Nelson, BC V1L 5R4
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Ground Water Wells in Sanca & Area





Report 1 - Detailed Well Record

<p>Well Tag Number: 94733</p> <p>Owner: TIMBERSTONE DEVELOPMENT CORP</p> <p>Address:</p> <p>Area:</p> <p>WELL LOCATION: KOOTENAY Land District District Lot: 913 Plan: NEP 82192 Lot: A Township: Section: Range: Indian Reserve: Meridian: Block: Quarter: Island: BCGS Number (NAD 27): 082F037341 Well:</p> <p>Class of Well: Water supply Subclass of Well: Domestic Orientation of Well: Vertical Status of Well: New Well Use: Private Domestic Observation Well Number: Observation Well Status: Construction Method: Diameter: inches Casing drive shoe: Y Well Depth: 64.5 feet Elevation: feet (ASL) Final Casing Stick Up: 12 inches Well Cap Type: BOLT ON Bedrock Depth: feet Lithology Info Flag: Y File Info Flag: N Sieve Info Flag: N Screen Info Flag: Y</p> <p>Site Info Details: Other Info Flag: Other Info Details:</p>	<p>Construction Date: 2008-11-20 00:00:00.0</p> <p>Driller: Owen's Drilling Ltd. Well Identification Plate Number: 26200 Plate Attached By: TIM HOECHSMANN Where Plate Attached: TOP OF CASING</p> <p>PRODUCTION DATA AT TIME OF DRILLING: Well Yield: 20 (Driller's Estimate) U.S. Gallons per Minute Development Method: Air lifting Pump Test Info Flag: N Artesian Flow: Artesian Pressure (ft): Static Level: 20 feet</p> <p>WATER QUALITY: Character: Colour: Odour: Well Disinfected: N EMS ID: Water Chemistry Info Flag: N Field Chemistry Info Flag: Site Info (SEAM):</p> <p>Water Utility: Water Supply System Name: Water Supply System Well Name:</p> <p>SURFACE SEAL: Flag: Y Material: Bentonite clay Method: Depth (ft): 15 feet Thickness (in): 2 inches Liner from To: feet</p> <p>WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:</p>			
Screen from	to feet	Type	Slot Size	
Casing from	to feet	Diameter	Material	Drive Shoe
0	61.5	6	Steel	Y
GENERAL REMARKS:				
LITHOLOGY INFORMATION:				
From	0 to	5 Ft.	Medium CLAY & GRAVEL	brown
From	5 to	25 Ft.	Medium GRAVEL & SAND	brown
From	25 to	50 Ft.	Medium brown coarse sand	
From	50 to	65 Ft.	Medium 20 U.S. Gallons per Minute A LITTLE GRAVEL	brown coarse sand

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Report 1 - Detailed Well Record

<p>Well Tag Number: 94734</p> <p>Owner: CITW INC</p> <p>Address:</p> <p>Area:</p> <p>WELL LOCATION: KOOTENAY Land District District Lot: 913 Plan: NEP 82192 Lot: A Township: Section: Range: Indian Reserve: Meridian: Block: Quarter: Island: BCGS Number (NAD 27): 082F037341 Well:</p> <p>Class of Well: Water supply Subclass of Well: Domestic Orientation of Well: Vertical Status of Well: New Well Use: Private Domestic Observation Well Number: Observation Well Status: Construction Method: Diameter: inches Casing drive shoe: Y Well Depth: 58 feet Elevation: 1827 feet (ASL) Final Casing Stick Up: 12 inches Well Cap Type: BOLT ON Bedrock Depth: feet Lithology Info Flag: Y File Info Flag: N Sieve Info Flag: N Screen Info Flag: N</p> <p>Site Info Details: Other Info Flag: Other Info Details:</p>	<p>Construction Date: 2008-11-20 00:00:00.0</p> <p>Driller: Owen's Drilling Ltd. Well Identification Plate Number: 28788 Plate Attached By: MIKE CALDWELL Where Plate Attached: TOP OF CASING</p> <p>PRODUCTION DATA AT TIME OF DRILLING: Well Yield: 10 (Driller's Estimate) U.S. Gallons per Minute Development Method: Air lifting Pump Test Info Flag: N Artesian Flow: Artesian Pressure (ft): Static Level: 30 feet</p> <p>WATER QUALITY: Character: Colour: Odour: Well Disinfected: N EMS ID: Water Chemistry Info Flag: N Field Chemistry Info Flag: Site Info (SEAM):</p> <p>Water Utility: Water Supply System Name: Water Supply System Well Name:</p> <p>SURFACE SEAL: Flag: Y Material: Bentonite clay Method: Poured Depth (ft): 15 feet Thickness (in): 2 inches Liner from To: feet</p> <p>WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:</p>			
Screen from	to feet	Type	Slot Size	
Casing from	to feet	Diameter	Material	Drive Shoe
0	58	6	Steel	Y
GENERAL REMARKS:				
LITHOLOGY INFORMATION:				
From	0 to	15 Ft.	Loose SAND & GRAVEL	brown
From	15 to	35 Ft.	Medium GRAVEL & BOULDERS	brown
From	35 to	58 Ft.	Medium SAND & GRAVEL	10 U.S. Gallons per Minute brown

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Report 1 - Detailed Well Record

<p>Well Tag Number: 94735</p> <p>Owner: CITW INC</p> <p>Address:</p> <p>Area:</p> <p>WELL LOCATION: KOOTENAY Land District District Lot: 913 Plan: NEP 82192 Lot: A Township: Section: Range: Indian Reserve: Meridian: Block: Quarter: Island: BCGS Number (NAD 27): 082F037341 Well:</p> <p>Class of Well: Water supply Subclass of Well: Domestic Orientation of Well: Vertical Status of Well: New Well Use: Private Domestic Observation Well Number: Observation Well Status: Construction Method: Diameter: inches Casing drive shoe: Y Well Depth: 55 feet Elevation: 1716 feet (ASL) Final Casing Stick Up: 12 inches Well Cap Type: BOLT ON Bedrock Depth: feet Lithology Info Flag: Y File Info Flag: N Sieve Info Flag: N Screen Info Flag: N</p> <p>Site Info Details: Other Info Flag: Other Info Details:</p>	<p>Construction Date: 2008-11-20 00:00:00.0</p> <p>Driller: Owen's Drilling Ltd. Well Identification Plate Number: 26201 Plate Attached By: TIM HOECHSMANN Where Plate Attached: TOP OF CASING</p> <p>PRODUCTION DATA AT TIME OF DRILLING: Well Yield: 15 (Driller's Estimate) U.S. Gallons per Minute Development Method: Air lifting Pump Test Info Flag: N Artesian Flow: Artesian Pressure (ft): Static Level: 30 feet</p> <p>WATER QUALITY: Character: Colour: Odour: Well Disinfected: N EMS ID: Water Chemistry Info Flag: N Field Chemistry Info Flag: Site Info (SEAM):</p> <p>Water Utility: Water Supply System Name: Water Supply System Well Name:</p> <p>SURFACE SEAL: Flag: Y Material: Bentonite clay Method: Poured Depth (ft): 15 feet Thickness (in): 2 inches Liner from To: feet</p> <p>WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:</p>			
Screen from	to feet	Type	Slot Size	
Casing from	to feet	Diameter	Material	Drive Shoe
0	55	6	Steel	Y
GENERAL REMARKS:				
LITHOLOGY INFORMATION: From 0 to 10 Ft. Medium CLAY & GRAVEL brown From 10 to 55 Ft. Medium SAND & GRAVEL 15 U.S. Gallons per Minute brown				

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Report 1 - Detailed Well Record

<p>Well Tag Number: 94736</p> <p>Owner: TIMBERSTONE DEVELOPMENT CORP & CITW INC</p> <p>Address:</p> <p>Area:</p> <p>WELL LOCATION: KOOTENAY Land District District Lot: 913 Plan: NEP 82192 Lot: A Township: Section: Range: Indian Reserve: Meridian: Block: Quarter: Island: BCGS Number (NAD 27): 082F037341 Well: 4</p> <p>Class of Well: Water supply Subclass of Well: Domestic Orientation of Well: Vertical Status of Well: New Well Use: Private Domestic Observation Well Number: Observation Well Status: Construction Method: Diameter: inches Casing drive shoe: Y Well Depth: 55 feet Elevation: 1716 feet (ASL) Final Casing Stick Up: 12 inches Well Cap Type: BOLT ON Bedrock Depth: feet Lithology Info Flag: Y File Info Flag: N Sieve Info Flag: N Screen Info Flag: N</p> <p>Site Info Details: Other Info Flag: Other Info Details:</p>	<p>Construction Date: 2008-11-21 00:00:00.0</p> <p>Driller: Owen's Drilling Ltd. Well Identification Plate Number: 26202 Plate Attached By: TIM HOECHSMANN Where Plate Attached: TOP OF CASING</p> <p>PRODUCTION DATA AT TIME OF DRILLING: Well Yield: 15 (Driller's Estimate) U.S. Gallons per Minute Development Method: Air lifting Pump Test Info Flag: N Artesian Flow: Artesian Pressure (ft): Static Level: 30 feet</p> <p>WATER QUALITY: Character: Colour: Odour: Well Disinfected: N EMS ID: Water Chemistry Info Flag: N Field Chemistry Info Flag: Site Info (SEAM):</p> <p>Water Utility: Water Supply System Name: Water Supply System Well Name:</p> <p>SURFACE SEAL: Flag: Y Material: Bentonite clay Method: Depth (ft): 15 feet Thickness (in): 2 inches Liner from To: feet</p> <p>WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:</p>			
Screen from	to feet	Type	Slot Size	
Casing from	to feet	Diameter	Material	Drive Shoe
0	55	6	Steel	Y
GENERAL REMARKS:				
LITHOLOGY INFORMATION:				
From	0 to	10 Ft.	Medium CLAY & GRAVEL	brown
From	10 to	55 Ft.	Medium SAND & GRAVEL	15 U.S. Gallons per Minute brown

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Report 1 - Detailed Well Record

<p>Well Tag Number: 94737</p> <p>Owner: VISSER</p> <p>Address:</p> <p>Area:</p> <p>WELL LOCATION: KOOTENAY Land District District Lot: 913 Plan: NEP 82192 Lot: A Township: Section: Range: Indian Reserve: Meridian: Block: Quarter: Island: BCGS Number (NAD 27): 082F037341 Well:</p> <p>Class of Well: Water supply Subclass of Well: Domestic Orientation of Well: Vertical Status of Well: New Well Use: Private Domestic Observation Well Number: Observation Well Status: Construction Method: Diameter: inches Casing drive shoe: Y Well Depth: 54 feet Elevation: 1810 feet (ASL) Final Casing Stick Up: 12 inches Well Cap Type: BOLT ON Bedrock Depth: feet Lithology Info Flag: Y File Info Flag: N Sieve Info Flag: N Screen Info Flag: N</p> <p>Site Info Details: Other Info Flag: Other Info Details:</p>	<p>Construction Date: 2008-11-21 00:00:00.0</p> <p>Driller: Owen's Drilling Ltd. Well Identification Plate Number: 28789 Plate Attached By: MIKE CALDWELL Where Plate Attached: TOP OF CASING</p> <p>PRODUCTION DATA AT TIME OF DRILLING: Well Yield: 15 (Driller's Estimate) U.S. Gallons per Minute Development Method: Air lifting Pump Test Info Flag: N Artesian Flow: Artesian Pressure (ft): Static Level: 30 feet</p> <p>WATER QUALITY: Character: Colour: Odour: Well Disinfected: N EMS ID: Water Chemistry Info Flag: N Field Chemistry Info Flag: Site Info (SEAM):</p> <p>Water Utility: Water Supply System Name: Water Supply System Well Name:</p> <p>SURFACE SEAL: Flag: Y Material: Bentonite clay Method: Poured Depth (ft): 15 feet Thickness (in): 2 inches Liner from To: feet</p> <p>WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:</p>			
Screen from	to feet	Type	Slot Size	
Casing from	to feet	Diameter	Material	Drive Shoe
0	54	6	Steel	Y
GENERAL REMARKS:				
LITHOLOGY INFORMATION:				
From	0 to	15 Ft.	Medium SAND, GRAVEL & BOULDERS	brown
From	15 to	35 Ft.	Medium GRAVEL & BOULDERS	brown
From	35 to	54 Ft.	Medium SAND & GRAVEL	15 U.S. Gallons per Minute brown

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Report 1 - Detailed Well Record

<p>Well Tag Number: 103468</p> <p>Owner: BUCYK</p> <p>Address:</p> <p>Area:</p> <p>WELL LOCATION: Land District District Lot: 913 Plan: 2811 Lot: Township: Section: Range: Indian Reserve: Meridian: Block: 12 Quarter: Island: BCGS Number (NAD 27): 082F037341 Well:</p> <p>Class of Well: Water supply Subclass of Well: Domestic Orientation of Well: Vertical Status of Well: New Well Use: Private Domestic Observation Well Number: Observation Well Status: Construction Method: Diameter: inches Casing drive shoe: N Well Depth: 76 feet Elevation: 1800 feet (ASL) Final Casing Stick Up: 35 inches Well Cap Type: LOCK Bedrock Depth: feet Lithology Info Flag: N File Info Flag: N Sieve Info Flag: N Screen Info Flag: N</p> <p>Site Info Details: Other Info Flag: Other Info Details:</p>	<p>Construction Date: 2010-10-27 00:00:00.0</p> <p>Driller: Wild West Drilling Well Identification Plate Number: 30444 Plate Attached By: CHRIS BARLING Where Plate Attached: ON CAP</p> <p>PRODUCTION DATA AT TIME OF DRILLING: Well Yield: 30 (Driller's Estimate) U.S. Gallons per Minute Development Method: Air lifting Pump Test Info Flag: N Artesian Flow: Artesian Pressure (ft): Static Level: 36.83 feet</p> <p>WATER QUALITY: Character: Colour: Odour: Well Disinfected: Y EMS ID: Water Chemistry Info Flag: Y Field Chemistry Info Flag: Site Info (SEAM):</p> <p>Water Utility: Water Supply System Name: Water Supply System Well Name:</p> <p>SURFACE SEAL: Flag: N Material: Bentonite clay Method: Poured Depth (ft): 20 feet Thickness (in): 1.13 inches Liner from To: feet</p> <p>WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:</p>			
Screen from	to feet	Type	Slot Size	
Casing from	to feet	Diameter	Material	Drive Shoe
0	76	6.63	Steel	N
<p>GENERAL REMARKS: TD @ 76'.</p> <p>LITHOLOGY INFORMATION: From 0 to 9 Ft. Hard grey boulders From 9 to 23 Ft. Medium SAND & GRAVEL grey From 23 to 31 Ft. Soft brown sandy clay From 31 to 76 Ft. Medium 30 Gallons per Minute (U.S./Imperial) tan sand</p>				

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Report 1 - Detailed Well Record

<p>Well Tag Number: 103702</p> <p>Owner: GRAMLICH CONSTRUCTION</p> <p>Address: 10901 HIGHWAY 3A</p> <p>Area: SANCA/BOSWELL</p> <p>WELL LOCATION: KOOTENAY Land District District Lot: 913 Plan: 4808 Lot: 1 Township: Section: Range: Indian Reserve: Meridian: Block: Quarter: Island: BCGS Number (NAD 27): 082F037341 Well:</p> <p>Class of Well: Water supply Subclass of Well: Domestic Orientation of Well: Vertical Status of Well: New Well Use: Private Domestic Observation Well Number: Observation Well Status: Construction Method: Diameter: inches Casing drive shoe: Y Well Depth: 55 feet Elevation: 1796 feet (ASL) Final Casing Stick Up: 12 inches Well Cap Type: BOLT ON Bedrock Depth: feet Lithology Info Flag: N File Info Flag: N Sieve Info Flag: N Screen Info Flag: N</p> <p>Site Info Details: Other Info Flag: Other Info Details:</p>	<p>Construction Date: 2010-05-05 00:00:00.0</p> <p>Driller: Owen's Drilling Ltd. Well Identification Plate Number: 28841 Plate Attached By: TIM HORCHSMANN Where Plate Attached: TOP OF CASING</p> <p>PRODUCTION DATA AT TIME OF DRILLING: Well Yield: 15 (Driller's Estimate) U.S. Gallons per Minute Development Method: Air lifting Pump Test Info Flag: N Artesian Flow: Artesian Pressure (ft): Static Level: 30 feet</p> <p>WATER QUALITY: Character: Colour: Odour: Well Disinfected: N EMS ID: Water Chemistry Info Flag: N Field Chemistry Info Flag: Site Info (SEAM):</p> <p>Water Utility: Water Supply System Name: Water Supply System Well Name:</p> <p>SURFACE SEAL: Flag: N Material: Bentonite clay Method: Depth (ft): 15 feet Thickness (in): 2 inches Liner from To: feet</p> <p>WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:</p>			
Screen from	to feet	Type	Slot Size	
Casing from	to feet	Diameter	Material	Drive Shoe
0	55	6	Steel	Y
GENERAL REMARKS:				
LITHOLOGY INFORMATION:				
From	0 to	15 Ft.	Medium CLAY & BOULDERS	brown
From	15 to	30 Ft.	Medium SAND & BOULDERS	brown
From	30 to	55 Ft.	Medium SAND & GRAVEL	15 U.S. Gallons per Minute brown

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Report 1 - Detailed Well Record

<p>Well Tag Number: 103709</p> <p>Owner: MEHL</p> <p>Address: 10901 HIGHWAY 3A</p> <p>Area: SANCA/BOSWELL</p> <p>WELL LOCATION: KOOTENAY Land District District Lot: 913 Plan: 4808 Lot: 1 Township: Section: Range: Indian Reserve: Meridian: Block: Quarter: Island: BCGS Number (NAD 27): 082F037341 Well:</p> <p>Class of Well: Water supply Subclass of Well: Domestic Orientation of Well: Vertical Status of Well: New Well Use: Private Domestic Observation Well Number: Observation Well Status: Construction Method: Diameter: inches Casing drive shoe: Y Well Depth: 55 feet Elevation: 1740 feet (ASL) Final Casing Stick Up: 12 inches Well Cap Type: BOLT ON Bedrock Depth: feet Lithology Info Flag: N File Info Flag: N Sieve Info Flag: N Screen Info Flag: N</p> <p>Site Info Details: Other Info Flag: Other Info Details:</p>	<p>Construction Date: 2010-05-06 00:00:00.0</p> <p>Driller: Owen's Drilling Ltd. Well Identification Plate Number: 28844 Plate Attached By: TIM HORCHSMANN Where Plate Attached: TOP OF CASING</p> <p>PRODUCTION DATA AT TIME OF DRILLING: Well Yield: 25 (Driller's Estimate) U.S. Gallons per Minute Development Method: Air lifting Pump Test Info Flag: N Artesian Flow: Artesian Pressure (ft): Static Level: 30 feet</p> <p>WATER QUALITY: Character: Colour: Odour: Well Disinfected: N EMS ID: Water Chemistry Info Flag: N Field Chemistry Info Flag: Site Info (SEAM):</p> <p>Water Utility: Water Supply System Name: Water Supply System Well Name:</p> <p>SURFACE SEAL: Flag: N Material: Bentonite clay Method: Poured Depth (ft): 15 feet Thickness (in): 2 inches Liner from To: feet</p> <p>WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:</p>			
Screen from	to feet	Type	Slot Size	
Casing from	to feet	Diameter	Material	Drive Shoe
0	52	6	Steel	Y
GENERAL REMARKS:				
LITHOLOGY INFORMATION:				
From	0 to	10 Ft.	Medium CLAY & BOULDERS	brown
From	10 to	35 Ft.	Medium SAND & GRAVEL	brown
From	35 to	50 Ft.	Medium brown sand	
From	50 to	55 Ft.	Medium SAND & GRAVEL	25 U.S. Gallons per Minute brown

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Report 1 - Detailed Well Record

<p>Well Tag Number: 103712</p> <p>Owner: LEA</p> <p>Address: 10901 HIGHWAY 3A</p> <p>Area: BOSWELL/SANCA</p> <p>WELL LOCATION: KOOTENAY Land District District Lot: 913 Plan: 4808 Lot: 1 Township: Section: Range: Indian Reserve: Meridian: Block: Quarter: Island: BCGS Number (NAD 27): 082F037341 Well:</p> <p>Class of Well: Water supply Subclass of Well: Domestic Orientation of Well: Vertical Status of Well: New Well Use: Private Domestic Observation Well Number: Observation Well Status: Construction Method: Diameter: inches Casing drive shoe: Y Well Depth: 55 feet Elevation: 1768 feet (ASL) Final Casing Stick Up: 12 inches Well Cap Type: BOLT ON Bedrock Depth: feet Lithology Info Flag: N File Info Flag: N Sieve Info Flag: N Screen Info Flag: N</p> <p>Site Info Details: Other Info Flag: Other Info Details:</p>	<p>Construction Date: 2010-05-06 00:00:00.0</p> <p>Driller: Owen's Drilling Ltd. Well Identification Plate Number: 28843 Plate Attached By: TIM HORCHSMANN Where Plate Attached: TOP OF CASING</p> <p>PRODUCTION DATA AT TIME OF DRILLING: Well Yield: 25 (Driller's Estimate) U.S. Gallons per Minute Development Method: Air lifting Pump Test Info Flag: N Artesian Flow: Artesian Pressure (ft): Static Level: 30 feet</p> <p>WATER QUALITY: Character: Colour: Odour: Well Disinfected: N EMS ID: Water Chemistry Info Flag: N Field Chemistry Info Flag: Site Info (SEAM):</p> <p>Water Utility: Water Supply System Name: Water Supply System Well Name:</p> <p>SURFACE SEAL: Flag: N Material: Bentonite clay Method: Poured Depth (ft): 15 feet Thickness (in): 2 inches Liner from To: feet</p> <p>WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:</p>			
Screen from	to feet	Type	Slot Size	
52	55		30	
Casing from	to feet	Diameter	Material	Drive Shoe
null	52	6	Steel	Y
GENERAL REMARKS:				
LITHOLOGY INFORMATION:				
From	0 to	10 Ft.	Medium CLAY & BOULDERS	brown
From	10 to	35 Ft.	Medium SAND & GRAVEL	brown
From	35 to	50 Ft.	Medium brown sand	
From	50 to	55 Ft.	Medium SAND & GRAVEL	25 U.S. Gallons per Minute brown

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Report 1 - Detailed Well Record

<p>Well Tag Number: 103715</p> <p>Owner: 758844 ALBERTA LTD</p> <p>Address: 10901 HIGHWAY 3A</p> <p>Area: SANCA/BOSWELL</p> <p>WELL LOCATION: KOOTENAY Land District District Lot: 913 Plan: 4808 Lot: 1 Township: Section: Range: Indian Reserve: Meridian: Block: Quarter: Island: BCGS Number (NAD 27): 082F037341 Well:</p> <p>Class of Well: Water supply Subclass of Well: Domestic Orientation of Well: Vertical Status of Well: New Well Use: Private Domestic Observation Well Number: Observation Well Status: Construction Method: Diameter: inches Casing drive shoe: Y Well Depth: 55 feet Elevation: 1785 feet (ASL) Final Casing Stick Up: 12 inches Well Cap Type: Bedrock Depth: feet Lithology Info Flag: N File Info Flag: N Sieve Info Flag: N Screen Info Flag: N</p> <p>Site Info Details: Other Info Flag: Other Info Details:</p>	<p>Construction Date: 2010-05-05 00:00:00.0</p> <p>Driller: Owen's Drilling Ltd. Well Identification Plate Number: 28842 Plate Attached By: TIM HORCHSMANN Where Plate Attached: UNKNOWN</p> <p>PRODUCTION DATA AT TIME OF DRILLING: Well Yield: 15 (Driller's Estimate) U.S. Gallons per Minute Development Method: Air lifting Pump Test Info Flag: N Artesian Flow: Artesian Pressure (ft): Static Level: 30 feet</p> <p>WATER QUALITY: Character: Colour: Odour: Well Disinfected: N EMS ID: Water Chemistry Info Flag: N Field Chemistry Info Flag: Site Info (SEAM):</p> <p>Water Utility: Water Supply System Name: Water Supply System Well Name:</p> <p>SURFACE SEAL: Flag: N Material: Bentonite clay Method: Poured Depth (ft): 15 feet Thickness (in): 2 inches Liner from To: feet</p> <p>WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:</p>			
Screen from	to feet	Type	Slot Size	
Casing from	to feet	Diameter	Material	Drive Shoe
0	55	6	Steel	Y
GENERAL REMARKS:				
ESTIMATED WELL YIELD 15-20 USGPM				
LITHOLOGY INFORMATION:				
From	0 to	10 Ft.	Medium CLAY & BOULDERS	brown
From	10 to	55 Ft.	Medium SAND & GRAVEL	15 U.S. Gallons per Minute brown

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APPENDIX D

Easement and Statutory Right of Way

63905

63905

THIS INDENTURE made the *2nd* day of *June*, A.D. 1963.

28

John

BETWEEN:

WYNDEL BOX & LUMBER CO. LTD., a company incorporated under the laws of the Province of British Columbia and having its head office at the Settlement of Wynndel in the said Province.

(Hereinafter called "the Grantor")

AND:

ETHEL MARY WILSON, of the Settlement of Sanca, in the Province of British Columbia, (Widow)

(Hereinafter called "the Grantee")

WHEREAS the Grantor is the owner in fee simple of Lot Nine hundred and Thirteen (913), Kootenay District, SAVE AND EXCEPT THEREOUT those parts shown outlined in red on Reference Plans 45386-I, 50803-I and 104344-I and those parts subdivided by Plans Two thousand Eight hundred and Eleven (2811) and Four thousand Eight hundred and Eight (4808);

533/152942

AND WHEREAS the Grantee is the owner in fee simple of those parts of Lot Nine hundred and Thirteen (913), Kootenay District, subdivided by plans Two thousand Eight hundred and Eleven (2811) and Four thousand Eight hundred and Eight (4808);

*134250 E - 11/1/63
Pl. 2811*

WITNESSETH that in consideration of other good and valuable consideration and the sum of One (\$1.00) Dollar now paid by the said Grantee to the said Grantor (the receipt whereof is hereby acknowledged) it, the said Grantor, doth hereby grant unto the Grantee, her heirs, executors, administrators and assigns, the right to continue at all times hereafter the use of the existing water pipe-lines constructed and installed by the Grantee or her predecessor in title and it now lying upon or below the surface of the said Grantor's lands and premises described as Lot Nine hundred and Thirteen (913), Kootenay District, SAVE AND EXCEPT THEREOUT those parts shown outlined

in red on Reference Plans 45386-I, 50803-I and 104344-I and those parts subdivided by Plans Two thousand Eight hundred and Eleven (2811) and Four thousand Eight hundred and Eight (4808); TOGETHER WITH the right to enter upon said lands and premises for the purpose of repairing and maintaining the said water pipe-lines;

AND THE GRANTOR doth further grant unto the Grantee, her heirs, executors, administrators and assigns, the right at any time until and including the 30th day of June, 1964 to enter upon the said lands and premises of the Grantor and to remove therefrom all merchantable, saw logs now standing or lying on the Grantor's said lands and premises;

AND THE GRANTOR COVENANTS AND AGREES with the Grantee not to be engaged or interested in anyway, directly or indirectly until the 30th day of June, 1964, in the tourist camp, trailer camp, resort area or store business, on the said lands and premises of the Grantor.

IN WITNESS WHEREOF the Grantor has hereunto affixed its corporate seal in the presence of its proper officers the day and year first above mentioned.

THE CORPORATE SEAL OF
WYNDEL BOX & LUMBER CO.
LTD. was hereunto affixed
in the presence of:

Monrad Wiggen
Director

J. Wiggen
Director

Registered the 12th day of July
1963, on application received at the time
written or stamped on the application
63905-D - 64010-D

Director

Registered the 22 day of July
1963, on application received at the time
written or stamped on the application.
63905-D - 64010-D

Form No. 107 - Acknowledgment of Officer of Corporation - 3-62.

The Wilson Stationery Co. Ltd. - Clarke & Stuart Co. Ltd.

Acknowledgment of Officer of a Corporation

63905

I HEREBY CERTIFY that, on the
at Creston
JACK C. WIGEN

2nd

day of March, 1963,
in the Province of British Columbia,
~~whose name has been proved to me by the evidence on~~
~~which~~ personally known to me,
Director of
and that he is the person
Director of the said
and affixed the seal of the

appeared before me and acknowledged to me that he is the
Wynndel Box & Lumber Co. Ltd.
who subscribed his name to the annexed instrument as
Wynndel Box & Lumber Co. Ltd.
Wynndel Box & Lumber Co. Ltd.

to the said Instrument, that he was first duly authorized to subscribe his name as aforesaid, and affix the said seal to
the said Instrument, and that such corporation is legally entitled to hold and dispose of land in the Province of
British Columbia.

IN TESTIMONY whereof I have hereunto set my Hand and Seal of Office,
at Wynndel Creston in the Province of
British Columbia, this 2nd day of March
one thousand nine hundred and sixty-three.

[Signature]
Notary Public in and for the Province of British Columbia.
A Commission for a term of years expires on the 31st day of March 1964.

NOTE—Where the person making the acknowledgment is personally known to the officer taking the same, strike out the words in brackets.

63906

63906 Park Stationers Ltd., Vancouver, B.C.
Law and Commercial Stationers
Form No. 61-64

AGREEMENT FOR SALE OF LAND

This Agreement

PLAN OF STATUTORY RIGHT-OF-WAY THROUGH PART OF DISTRICT LOT 913, KOOTENAY DISTRICT. PLAN

SCALE 1 : 1250

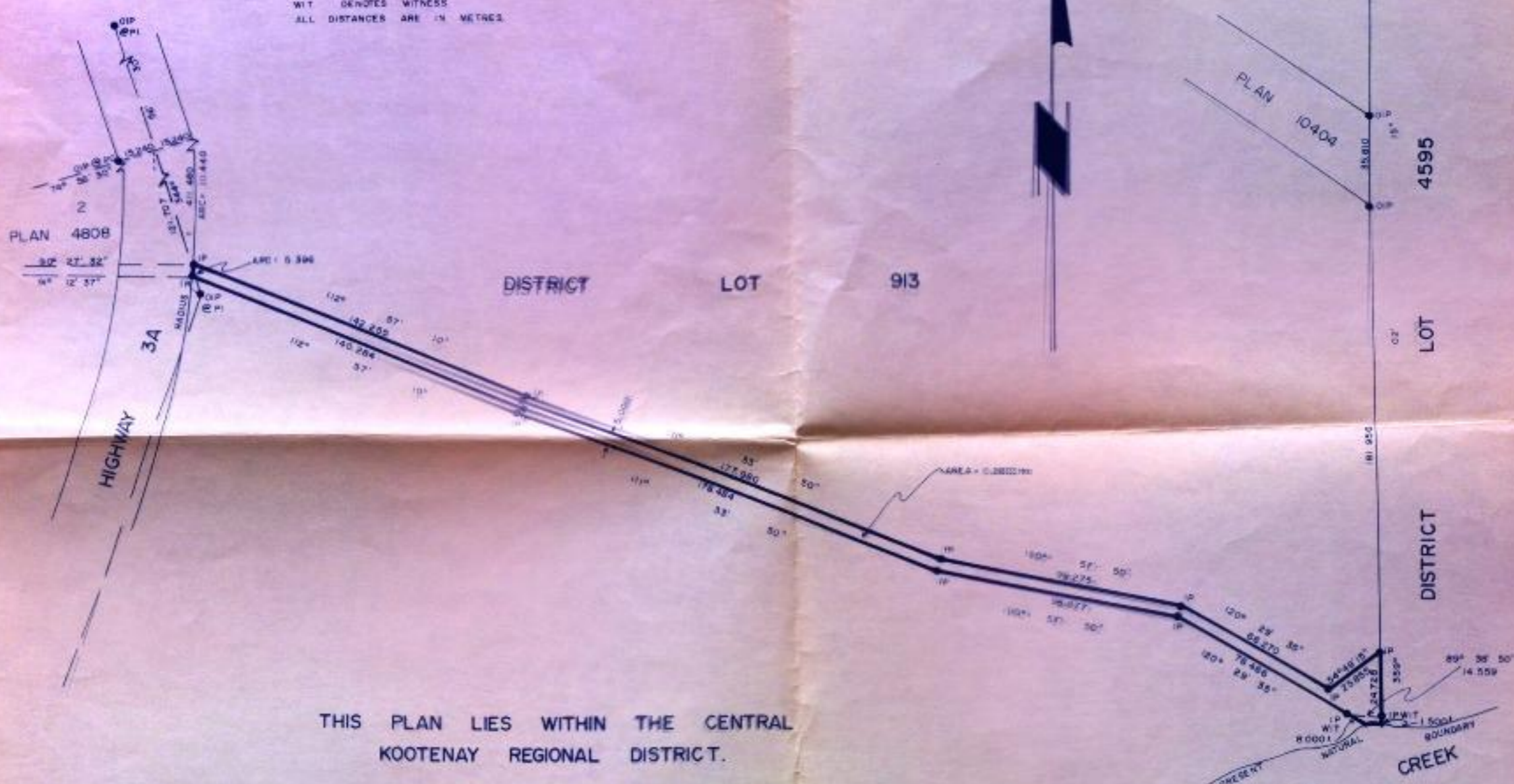


LEGEND

- BEARINGS ARE ASTRONOMIC, DERIVED FROM PLAN 9925
- OIP DENOTES OLD STANDARD IRON POST FOUND
- IP DENOTES STANDARD IRON POST SET
- WIT DENOTES WITNESS
- ALL DISTANCES ARE IN METRES.

DEPOSITED IN THE LAND TITLE OFFICE AT NELSON, B.C., THIS DAY OF 1980.

REGISTRAR



THIS PLAN LIES WITHIN THE CENTRAL KOOTENAY REGIONAL DISTRICT.

Regional District Note:
 This proposed 1980 Statutory Right-of-Way for the existing supply line was never secured by agreement. Figure 3.2a shows the location of the old intake at the time of the 1963 easement agreement and the now existing supply line and intake.

I, ROBERT A. GRIFFITH, A BRITISH COLUMBIA LAND SURVEYOR, OF CRESTON, IN BRITISH COLUMBIA, CERTIFY THAT I WAS PRESENT AT AND PERSONALLY SUPERINTENDED THE SURVEY REPRESENTED BY THIS PLAN, AND THAT THE PLAN AND SURVEY ARE CORRECT. THE SURVEY WAS COMPLETED ON THE 10th DAY OF JUNE, 1980.

Robert A. Griffith

HUBERT A. GRIFFITH
 B. C. LAND SURVEYOR
 BOX 488
 CRESTON, B. C.
 V0R 1R0