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RAFT RIVER

LEVEL 1
WATERSHED ASSESSMENT

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EXECUTIVE SUMMARY

The objective of the Raft River Level 1 Watershed Assessment was to assist forestry managers in understanding the type and extent of current water-related problems that exist in the watershed and to recognize the possible hydrologic implications of proposed forestry-related development in that watershed. Slocan Forest Products Limited, Vavenby Division initiated the Interior Watershed Assessment Procedure (IWAP) with financial assistance provided by Forest Renewal British Columbia.

The IWAP required the Raft River Watershed to be divided into the Lower, Upper and West Raft sub-basins for the assessment. The analysis of the different sub-basins resulted in recommendations for each sub-basin and the overall watershed that include the following.

For the Residual (Lower Raft) Sub-basin the recommendations as implied by the Forest Practices Code of British Columbia IWAP Guidebook September 1995 were to:

- Initiate an assessment of sediment sources (refer to Moore 1994),
- do not allow additional logging above and around sensitive soils,
- rehabilitate roads near streams, and avoid construction of more roads on sensitive soils or adjacent to riparian management areas. Minimize additional stream crossings.
- a detailed site assessment is required on any potentially unstable slopes, and
- assess roads as sources of landslides and initiate a road deactivation and landslide rehabilitation program as required.

For the Upper Raft Sub-basin the recommendations as implied by the Forest Practices Code of British Columbia IWAP Guidebook September 1995 were to:

- Initiate an assessment of sediment sources (refer to Moore 1994),
- do not allow additional logging above and around sensitive soils, and
- rehabilitate roads near streams, and avoid construction of more roads on sensitive soils or adjacent to riparian management areas. Minimize additional stream crossings.

For the West Raft Sub-basin the recommendations as implied by the Forest Practices Code of British Columbia IWAP Guidebook September 1995 were to:

- conduct a detailed site assessment as required on any potentially unstable slopes,
- initiate an assessment of sediment sources (refer to Moore 1994), and
- assess roads as sources of landslides and initiate a road deactivation and landslide rehabilitation program as required.

For the Overall Sub-basin the recommendations were to:

- organize a round table meeting to determine the implications of the recommendations for the sub-basins,
- to assist the round-table in making decisions and fulfill the recommendations for the sub-basins a terrain classification and terrain stability assessment, sediment source survey and riparian assessment should be completed,
- address the fisheries concerns in regards to the water temperatures in the Raft River, and
- finally an access management strategy should be completed prior to preparing prescriptions for restoration activites.

1.0. INTRODUCTION

The Raft River Watershed Assessment is one phase of a multi-phase project which is currently being undertaken within the Raft River Watershed. Other phases of this project include a Fish and Fish Habitat Assessment and a Level 1 Road Condition Assessment. All of these assessments are part of the Integrated Watershed Restoration Plan.

The primary objectives of this phase were to:

- Assess the condition of the watershed using the Interior Watershed Assessment Procedure (IWAP) and develop constraints or recommendations which will repair existing damage to the watershed and prevent further damage from occuring,
- Increase the participation of local First Nations in forest and environmental management, and
- Increase the pool of locally available, trained staff for work in the emerging field of watershed planning and assessment.

The Interior Watershed Assessment Procedure was designed to assist forest managers in determining the type and extent of hydrologically related problems within a watershed, and to identify any water related concerns with respect to planned and future forest developments.

This assessment of hydrologic impacts focused on:

- The potential for change to peak flows,
- The potential for landslides,
- The potential for accelerated surface erosion, and
- The anticipated changes to the channel riparian buffer.

To assess these impacts the Interior Watershed Assessment Procedure Guidebook (IWAP) Level 1 Analysis, September 1995 was followed. Technical questions were addressed at the Kamloops Forest Region by Rita Winkler (Regional Hydrologist), Tim Giles (Regional Terrain Analyst), and Graham Hope (Regional Pedologist).

The funds for this project were provided by Forest Renewal British Columbia (FRBC). The other parties which were involved in this project include:

- Slocan Forest Products Ltd. (Slocan), the lead proponent for the project, is the holder of a major forest licence (FL #A18688)which encompasses the majority of the Raft River Watershed.
- The North Thompson Indian Band (NTIB) is a partner within the project as the Raft River watershed falls within their traditional lands. They have also had a great deal of involvement in the implementation of the various assessments. They completed the GIS requirements of this report and were the recipients of the Fish and Fish Habitat Assessment contract from Slocan.
- The Ministry of Forests (MoF) is the partner which has jurisdiction over the forest, range, and recreation resources within the Raft River Watershed. They also operate the Small Business Forest Enterprise Program (SBFEP).
- Weyerhaeuser Canada Ltd (Weyerhaeuser) is a partner as their Vavenby Division is the holder of a major forest licence (FL #18694) which encompasses a significant portion of the Raft River Watershed (Appendix A).
- The Department of Fisheries and Oceans (DFO) is a partner as they are concerned with the anadromous fisheries values in the lower 4 km of the Raft River and downstream in the North Thompson River System.
- The supervising ministry is the Ministry of Environment, Lands, and Parks (MoELP). Their main concern is with the condition of the watershed as a whole and how problems in the watershed could impact on downstream resource values.
- The Ministry of Energy, Mines and Petroleum (MoEMP) is the partner responsible for all mining resource activities within the Raft River Drainage.

2.0. STUDY AREA DESCRIPTION

The confluence of the Raft and North Thompson Rivers is about 2 km east of the Town of Clearwater and has been designated as the Point of Interest (POI). The lower 3 km of the Raft River meanders through private land on gently sloping terrain. However, beyond here and for the next 7 km's the river progresses through a steeply incised 'V' shaped gully. The valley of the Raft River continues upstream with slopes decreasing and it begins mild meandering with braiding

where the river velocity slows enough to permit deposition of fine sediment. The shape of the river valley remains 'U' shaped and the river meanders with the occasional oxbow and log jam until a brief climb up a steeply incised 'V' shaped valley puts the rivers headwaters on the gently sloping interior plateau. The terrain at the Raft headwaters displays remnants of past glaciation with kettle holes and a deranged drainage pattern.

The Raft River Watershed is located in Hydrologic Zone 22 (West Cariboo Mountains) and is comprised of some 760.57 km^2. The overall length of the main river stem is 73.7 km(Rublee,1996). The mean annual discharge is 15.2 m^3/s (WSC, 1991). Crown land makes up 97% of this area with the rest privately owned. About 10% of the crown land is within Wells Grey Provincial Park. The H_{60} line[1] of the watershed is at 1340 m and the minimum and maximum elevations within the watershed are 451 m and 2577 m respectively. The treeline ends at approximately 1980 m with 45% of the forest being located in the Englemann Spruce-Subalpine Fir (ESSF) biogeoclimatic zone, 40% in the Interior Cedar-Hemlock (ICH) zone, 5% in the Alpine-Tundra (AT) zone, 5% in the Sub-Boreal-Spruce (SBS) zone, and 5% in the Interior Douglas Fir (IDF) zone

The Raft River is a 5th order stream with varying fish populations along its length. According to the Fish and Fish Habitat Assessment which was completed late in the Autumn of 1996, the Raft River anadromous fishery is limited to salmon due to an unpassable falls located 4km upstream from the rivers confluence with the North Thompson River (location identified on 1:50,000 map attached). The Raft River above these falls displays minimal species diversity consisting of rainbow trout and long nosed dace in the river and suckers in some lakes, such as Silence Lake.

There has been logging activity in the Raft River Watershed since the 1960's with the main access road (Road 9) being built in 1972 (Wadlegger, 1996). All sub-basins, as defined by the IWAP procedure, have been developed by either Slocan, Weyerhaeuser, or the Small Business Forest Enterprise Program. Restocking of any non-satisfactorily restocked areas have been aggressively managed by the Major forest licensees.

Other resources in the Raft River drainage include agriculture, ranching, recreation, mining and Native fishery. Agriculture is primarily located on the private land near the confluence of the Raft

[1] The H_{60} line is an isoline at which 60% of the watershed area is above.

River with the North Thompson River. Ranching is evident along the Raft mainstem and is shown on the maps as grazing leases. Recreation is scattered throughout the watershed in the form of hiking, horseback riding, hunting, angling, and All Terrain Vehicle (ATV) use. There are also numerous mining claims staked within the watershed and there has been one active mine, which is no longer operating. Although there is no commercial fishery in the watershed there is a small Native fishery around the mouth of the river which was just recently revisited.

The forests within the Raft River Watershed have also been disturbed by wildfires. One of the most obvious examples of a damaging fire, hydrologically speaking, took place in 1971 on the steep slopes overlooking 12 km on Road 9. This fire significantly reduced the vegetative cover and exposed the underlying soils to erosion. This erosion is visible on the aerial photographs and has been shown on the maps as landslide tracks.

The road systems within the Raft River Watershed were inventoried by the MoF in March, 1996 with participation from members involved in the IWAP. The completion of the Road Condition Assessment phase of the contract will facilitate a priority listing and summary of road and landing conditions in the watershed.

There are currently eight water licenses issued for the Raft River by the MoELP. These water licenses were issued for either domestic use, business use, or irrigation with the amount of water permitted varying for each permit (Appendix B).

3.0. QUATERNARY HISTORY

Geological information gathered in the Raft River watershed can be fitted into the Quaternary framework developed from other studies in the Southern Interior of British Columbia (Fulton, 1986). As was the case with most of British Columbia, the Raft Watershed was covered by the Cordilleran glacial ice sheet with the exception of the high peaks such as Raft and Trophy Mountain which probably remain as nunatuks[2]. Mountain glaciers persisted in this area into the Holocene epoch (within the last 10,000 years). It's been suggested by Duford and Osborn 1978

[2] Nunatuks are the mountain peaks that were not covered by glacial ice. Can be recognised by their sharp, pointed edges and their relatively unrounded profiles.

(Fulton, 1986) that the Raft Mountain moraines were formed during the last 240 years. Further indications that glaciation is in the not too distant past is the presence of several glaciers in the Monashee Mountains less than 80 km from the Raft River Watershed.

During deglaciation, the retreat of the glaciers, they would have first melted down (downwasted and ablated), and then retreated up the valley through further ablation melting. The flow of the glacier was in the southerly direction as indicated by the glacial remnants in the area. These remnants included: Cirques and arretes on the mountain peaks, minor moraine ridges at the north end of Ritchie Creek in addition to abandon small channels and eskers distributed in the upper elevations of the watershed.

4.0. HISTORY OF PAST DEVELOPMENT

4.1. Forestry

The earliest documented harvesting within the Raft River Watershed occurred near Martin Creek in the 1960's. The main access to this timber was through the 'Hole-in-the-Wall' which was a road built by the Ministry of Forests for fire access purposes. This road was the only way into the watershed until 1971 when the Ministry of Forests built the Raft Main Road (Road 9) to access three forest fires (Wadlegger, 1996). Clearwater Timber Products (CTP), now known as Slocan Forest Products - Vavenby Division, extended this road in 1972 to salvage the timber from the 1971 fires.

4.2. Mining

There have been numerous claims marked within the watershed, with the most extensive recent exploration being on the CK mining property (Refer to 1:50,000 map - attached). The only active mining within the watershed took place in the early 80's northeast of Silence Lake. This tungsten mine was operated by the DIMAC Resource Corporation and only removed a couple of tons of ore. The tailings pond is now empty and the mine site has been reclaimed. There is currently no active placer mining within the Raft River.

4.3. Agriculture

As mentioned earlier, the agriculture within the Raft River drainage is primarily located at it's confluence with the North Thompson River. There is historical evidence of an old homestead above the 'Hole-in-the -wall' but it was abandoned and the land has reverted back to the Crown.

4.4. Secondary Development

The residential development within the Raft watershed occurs primarily around the POI of the Raft Watershed, although there are some private lots around Silence Lake and on the old ranch sites.

5.0. METHODS

5.1. Planning

The digital information available for the Raft River was the North American Datum 1983 (NAD83) forest cover files and the Terrain Resource Information Mapping (TRIM). These two maps were then joined to make up the base maps. The first step in this IWAP process was to translate the base maps into the PC Arc/info format, gather all the non-digital information, and then digitize this information onto the base maps. Once all of the required data was on the Arc/info base maps, then the Geographical Information Systems (GIS) queries , step two, could begin. The third step in this process was the analysis of the results, the writing of the report, and the printing of the maps.

The aerial photographs were acquired from Regional Offices of the MoELP and the MOF. The water licence maps were acquired from the MoELP. The TRIM maps, forest cover maps, soils maps ,and surficial geology maps were all acquired from Maps BC. The mineral claim maps and NTS Topographic maps were acquired from the local British Columbia Government Agent. As the Level 1 IWAP was primarily a mapping and GIS exercise, there was only a limited amount of time required for field verification.

5.2. Identification of Sub-basins

The sub-basins were delineated on a 1:50,000 NTS topographic map according to the directions given in the IWAP guidebook. The Raft River becomes a 5th order stream when it is joined by the West Raft River (4th order). The two 4th order streams (Main Raft and West Raft) above the

Rafts confluence with the West Raft are the sub-basins in the watershed hereafter known as the West Raft Sub-basin and the Upper Raft Sub-basin. The Raft River below the confluence of the West Raft River will be known as the Residual Sub-basin.

5.3. Base Maps

The base maps contain NAD83 forest cover topology with TRIM contours screened to 50%. The translation into Arc/info and the joining of the maps was done by Hugh Hamilton Ltd., a forestry consulting company based in the City of Vancouver, British Columbia. Any cutblocks and roads not in the NAD83 database were either digitised off of hardcopies of Slocan's digital files or transferred from the digital files of Weyerhaeuser. All SBFEP roads and cutblocks were also added from the Clearwater Ministry of Forests SBFEP 5 Yr Development plan (1995).

5.4. Erodible Soils

Erodible soils were digitised directly off of the 1:50,000 soils maps which were available for the portion of the Raft River which was covered by mapsheets (UTM) 82M012, 82M013, and 82M014. As the amount of road within each polygon had to be pro-rated against the amount of erodible soil (ie. 30% erodible soil = 30% of the roads within the polygon are on erodible soil), the percentage of erodible soil in each soils polygon was also included in the GIS database.

The only part of the Raft River watershed that did not have any soils or terrain mapping available was within mapsheet 83D003. The IWAP guidebook suggested for areas without terrain mapping, that all terrain types (except rock) on slopes greater than 60% should be considered as potentially high surface erosion hazard; and on slopes <60%, the only landforms that should be considered are those identified as lacustrine, glaciolacustrine, or glaciofluvial. Using aerial photographs and TRIM contour information, it was determined that there were no areas of potentially high erosion hazard. The TRIM contour information confirmed that there were no slopes greater than 60% and the landforms within the area in question (kettle holes and a deranged drainage pattern) tended to suggest a glacial till base.

5-.5. Potentially Unstable Terrain

As there is no terrain stability mapping available for the Raft River, areas with a slope greater than 60% were designated as potentially unstable terrain and were digitised onto the base maps.

5.6. Identification of Landslides

Methods in the IWAP level 1 Guidebook (September, 1995) suggest that any scar visible on an aerial photograph (1:15,000) was to be considered a landslide track. These landslide scars were then transferred onto the base maps. This procedure was followed in typing out the landslides within the Raft River except for the mining exploration scars in mapsheet 82M061 (polygon 518).

5.7. Raft River Temperature Data

Water temperature is critical to the life cycle of various fish, and a small rise in temperature could have a detrimental effect on the fish populations (IWAP, September 1995). To help establish whether or not the Raft River was sensitive to changes in stream temperature, Tim Panko, of the Clearwater Branch of the DFO was contacted.

5.8. Helicopter Overflight

A helicopter overflight was done in conjunction with the Senior Biologist (Bill Rublee) conducting the Fish and Fish Habitat Assessment. The overflight was used to get an overview of the Raft River Watershed and identify recent impacts that would not be visible on the aerial photographs. Photographs and a video used to document these impacts.

5.9. Field Assessments

Field assessments were completed to confirm the height of regeneration on some blocks, as well as the location of mass wasting sites, cutblocks, and roads. As the contract was not issued until the late fall, there was a time constraint with respect to completing the field assessments prior to snow fall. To work around these constraints, the field assessments were conducted before the base maps were completed, which is not the ideal sequence.

5.10. ECA Calculations

The Equivalent Clearcut Area (ECA)[3] was calculated using the Forest Inventory Planning Data Exchange Files (FIPDEF) to obtain the activity, area, and projected tree height. The tree heights in the FIPDEF files were only projected to 1994, therefore, after a consultation with Greg Yeomans

[3] The Equivalent Clearcut Area (ECA) is defined as the area of a forest disturbed by both harvesting and wildfires with a reduction factor to account for the hydrological recovery from forest regeneration.

(Silviculture Forester, Slocan Forest Products Ltd-Vavenby), it was decided to add a conservative 30cm of tree growth for each of 1995 and 1996.

All cutblocks not in the NAD83 database were also included in the calculation. In order for this to be undertaken we requested the digital files or hardcopies of the digital files of both Slocan and Weyerhaeuser, and we also transferred the cutblocks off of the MOF SBFEP 5-Year development plan maps. Since these cutblocks are all less than 7 years old, it could be assumed that the only ones that had any hydrologic recovery were the partial cuts that had less than 60% basal area removal. Upon conversation with Abbey Bates (MoF-SBFEP), Dave Poole (Slocan), and Kevin Bonnett (Weyerhaeuser), it was determined that only some cutblocks in Weyerhaeuser's development area had partial cuts with less than 60% basal area removal. After gathering the information for all additional openings, their ECA was calculated and added to the results of the ECA calculated on the FIPDEF files.

5.11 Grazing Permits

The location of Grazing permits were referenced from the respective Grazing Permit Form A's, which were acquired from the Clearwater District Office of the Ministry of Forests and digitised onto the digital maps.

5.12. GIS Queries

All GIS queries were done by the North Thompson Indian Band using PC Arc/info. The output of the GIS queries (in km or km^2) was the information required to calculate the thirteen impact indicators (Appendix C). The SML's and all batch files used to complete the GIS queries are included with the report on 4mm tape media.

5.13. Errors and Problems Encountered

The first problem that was encountered was with the digital data supplied. There is an allowable digitising error of 20 m in the forest cover maps. This did not appear to affect the results as the only place it had any significance was during the query for streams without a riparian buffer (ie. a 20m riparian buffer may not be accurate on the maps).

The second problem encountered was with the digitising of the soils maps at a scale of 1:50,000. The soils maps were NAD27 based while the map base used in the watershed assessment was NAD83. To correct this problem we used the National Transformational Software to shift the NAD27 information to fit the NAD83 datum. In addition there is an inherent error in transforming data from 1:50,000 to 1:20,000.

A third problem was with the FIPDEF files and how the ownership percentages do not add up to 100%. Through a conversation with Doug Keller (Inventory Forester - Clearwater Forest District) it was determined that the missing percentages were attributed to small polygons that were created due to poor quality control during mapsheet updates.

There was also a problem encountered with the GIS calculations of the ECA. The FIPDEF files that supplied the average height of the main canopy had inconsistent and often outdated reference dates particularly for wildfires. As a result the ECA calculation used many canopy heights that are underestimated which results in the ECA being a conservative estimate.

Another problem was that there was no NAD83 forest cover data or TRIM contour information available for the portion of the watershed within mapsheets 82M.091 and 83D.003 (0.5% and 0.03% of the watershed area). The limited information was not felt to be detrimental to the results of the IWAP and the extent of hydrologically related problems within were considered insignificant as these areas are undeveloped and in Wells Grey Provincial Park.

6.0. RESULTS

6.1. Overall watershed

6.1.1. General Data

The dominant bedrock geology, the Shuswap Metamorphic Complex (GSC, 1963), is made up primarily of a metamorphic gneiss to which the IWAP guidebook gives a value of 3. These rock types are generally resistant to erosion and the soils and tills derived from these rock types are likely to be sandy to silty in texture with abundant coarse fragments (GSC, 1963).

6.1.2. Other Resources

As there is no active mining or organised ATV recreation within the watershed, the only other resource impact upon water quality besides forestry development is ranching. Through a discussion with Geoff Ellen (R/O Range - Clearwater Forest District) it was determined that there was extensive overgrazing along the Raft River, as evidenced by the presence of numerous livestock trails, spoor, and clubbing[4]. This congregation of cattle is likely having a detrimental effect on the quality of water for downstream users and attempts are being implemented to correct this problem.

6.1.3. Raft River Temperature Concerns

Tim Panko, Department of Fisheries and Oceans - Clearwater, supplied recent temperature data recorded at the base of the Raft River (Appendix D). According to Tim Panko, the temperature threshold to maintain a healthy fish stock in the Raft River is 20° Celsius. Since the temperature data indicated scores as high as 19°C, it can be assumed that any further increase in water temperature could have a detrimental effect on fish populations.

6.1.4. Helicopter Overflight

The helicopter overflight was conducted prior to the completion of the preliminary mapping; however, it was scheduled to also allow for the Fish and Fish Habitat Assessments Video Overflight. The weather for the flight was clear and sunny and provided excellent conditions for the viewing of the watershed. The Raft River was flown from it's confluence with the North Thompson River to it's headwaters. The West Raft River and the lower reach of Stratton Creek were also flown on the same day. Identified in this flight were: 1) the extent of the damage of the West Raft River eroding back into a cutblock at 31 km on Road 9 (Figure 1); 2) the confirmation of erosion that was identified on the aerial photographs and digitised on the base maps as landslides (Figure 2); 3) and extensive cobbling and deposition within a cutblock at 60 km on Road 9 (Figure 3).

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[4] Clubbing occurs when an animal continuously grazes on the terminal buds of a plant, causing it's lateral buds to take over the verticle growth. Eventually, as these new terminal buds are grazed, the plant begins to take on a clublike appearance.

6.1.5. Field Assessments

Since the contract for this project was not issued until the late fall, the field assessments had to be conducted before the base maps were completed. Approximately 250 km of roads within the watershed were driven which enabled the identification of a mass wasting site (Figure 4), the confirmation of landslides which were identified using aerial photographs (Figure 5), and the confirmation of tree heights on cutblocks. Areas of concern including Moilliet Creek slide were photographed (Appendix E).

Figure 1. The West Raft River eroding into a cutblock .

Figure 2. Erosion on a hillside along Raft River Road 9.

Figure 3. Extensive slumping and erosion within a cutblock.

Figure 4 Mass wasting site on upper side of road at approximately 61 km on Raft Road 9.

Figure 5. Landslide on opposite side of valley. Picture was taken from 2-3 km on Raft Park Road.

6.2. Sub-basin Information and Thirteen Impact Indicators and Hazard Indices

A hazard index by itself does not provide the optimum information required for analysis and because the indices are inter-related a matrix was used for analysis. The IWAP guidebook groups the hazard indices into hazard categories based on the following criteria:

Hazard Category	Hazard Index
Low	< 0.5
Medium	0.5-0.7
High	> 0.7

The indices are then compared in a matrix from which a value between 1and 4 was derived (a value of 1 is the lowest hazard rating). The IWAP Guidebook also listed recommendations which differed depending on the score received for each interaction. The results of these matrices for each sub-basin were then grouped together in the Interpretation Worksheet (Table, 4) and the recommendations were then made.

6.2.1. Residual Sub-basin

The Residual Sub-basin is comprised of some 236.58 km^2 and 96.2% of this area is owned by the Crown and the remaining 3.2% of the area is privately owned. The ownership percentiles do not add up to 100% due to errors within the FIPDEF files (Doug Keller, 1996). The disturbance in the sub-basin includes 80.48 km of road, 134 active stream crossings, and an ECA of 46.85 km^2. Only 9.4% of the sub-basin is on unstable soils while 63.8% of the watershed has erodible soils. The majority of landslides (65%) in this sub-basin were concentrated in an old burn near 12 km of Road 9. Table 1 (below) displays the thirteen hazard indicators and the hazard indices for the Residual Sub-basin.

Table 1. Thirteen impact indicators and the hazard indices.

	INDICATOR	SCORE	HAZARD INDEX
PEAK FLOW			
Index above H_{60}	0.13		
Index below H_{60}	0.11		
1 Total Peak Flow Index	0.24	0.40	
2 Road Density above H_{60}	0.29	0.29	
3 Total Road Density	0.95	0.32	**0.4**
SURFACE EROSION			
4 Roads on erodible soil	0.34	0.6	
5 Roads within 100m of a stream	0.24	0.58	
6 Roads on both of above	0.05	0.26	
7 Active stream crossings	0.57	0.67	
8 Total road density	0.95	0.32	**0.63**
RIPARIAN BUFFER (Channel Instability)			
9 Portion of stream logged	0.13	0.45	
10 portion of fish bearing streams logged	0.13	0.27	**0.45**
LANDSLIDES (Mass Wasting)			
11 Landslide density	0.19	0.66	
12 Roads on unstable slopes	0.03	0.1	
13 Streams > 60% and banks logged	0.00	0.01	**0.66**

6.2.2. Upper Raft Sub-basin

The Upper Raft Sub-basin is comprised of some 386.00 km^2 and 96.4% of this area is owned by the crown and 1% of the area is privately owned. The disturbance in the sub-basin includes 363.68 km of road, 359 active stream crossings, and an ECA of 79.087 km^2. The moderate hazard rating for the ECA was in a large part due to several wildfires which contributed 45% to the calculation, although Weyerhaeuser's partially logged blocks were not included in the calculation. Only 7% of the sub-basin area is classified as unstable terrain while 58.6% of the sub-basin has erodible soils. Table 2 (below) displays the thirteen hazard indicators and the hazard indices for the Upper Raft Sub-basin.

Table 2. Thirteen impact indicators and the hazard indices.

	INDICATOR	SCORE	HAZARD INDEX
PEAK FLOW			
Index above H_{60}	0.29		
Index below H_{60}	0.03		
1 Total Peak Flow Index	0.29	0.49	
2 Road Density above H_{60}	0.67 km/km^2	0.67	
3 Total Road Density	0.94 km/km^2	0.31	**0.49**
SURFACE EROSION			
4 Roads on erodible soil	0.33 km/km^2	0.59	
5 Roads within 100m of a stream	0.44 km/km^2	0.99	
6 Roads on both of above	0.18 km/km^2	0.77	
7 Active stream crossings	0.93 no./km^2	1.0	
8 Total road density	0.94 km/km^2	0.31	**0.99**
RIPARIAN BUFFER (Channel Instability)			
9 Portion of stream logged	0.19 km/km	0.63	
10 portion of fish bearing streams logged	0.19 km/km	0.38	**0.63**
LANDSLIDES (Mass Wasting)			
11 Landslide density	0.02 no./km^2	0.08	
12 Roads on unstable slopes	0.04 km/km^2	0.12	
13 Streams > 60% and banks logged	0.00 km/km^2	0.01	**0.08**

6.2.3. West Raft Sub-basin

The West Raft Sub-basin is comprised of some 137.99 km^2 and 97.3% of this area is owned by the crown and there is no private ownership in the West Raft Sub-basin. The disturbance in this sub-basin includes 25.04 km of road, 73 active stream crossings, and an ECA of 9.35km^2. There are relatively high percentages of unstable slopes and erodible soils within this sub-basin when compared to the other sub-basins. Table 3 (below) displays the thirteen hazard indicators and the hazard indices for the West Raft Sub-basin.

Table 3. Thirteen impact indicators and the hazard indices.

	INDICATOR	SCORE	HAZARD INDEX
PEAK FLOW			
Index above H_{60}	0.06		
Index below H_{60}	0.03		
1 Total Peak Flow Index	0.09	0.15	
2 Road Density above H_{60}	0.12	0.12	
3 Total Road Density	0.28	0.09	**0.15**
SURFACE EROSION			
4 Roads on erodible soil	0.19	0.37	
5 Roads within 100m of a stream	0.14	0.35	
6 Roads on both of above	0.07	0.37	
7 Active stream crossings	0.54	0.64	
8 Total road density	0.28	0.09	**0.50**
RIPARIAN BUFFER (Channel Instability)			
9 Portion of stream logged	0.11	0.38	
10 portion of fish bearing streams logged	0.11	0.23	**0.38**
LANDSLIDES (Mass Wasting)			
11 Landslide density	0.18	0.63	
12 Roads on unstable slopes	0.06	0.21	
13 Streams > 60% and banks logged	0.03	0.08	**0.62**

6.3. Interpretation Worksheet

The interpretation worksheet (Table 4) was the method used for analysing the hazard indices (Tables 1, 2, and 3). The chart below summarizes all of the sub-basins within the watershed and each sub-basin is identified by color, with dark green representing the Residual Sub-basin, blue representing the Upper Raft Sub-basin, and red representing the West Raft Sub-basin. The interpretation worksheet is incomplete due to the fact that we have no values to insert in the

channel stability columns. These values are acquired through the Level 2 - Channel Assessment Procedure, which was not required at this time.

Table 4. Interpretation Worksheet

Watershed name: Raft River Watershed — **Watershed area: 760.57 km²**
Sub-basin name: Residual Sub-basin — **Sub-basin area: 236.58 km²**
Sub-basin name: Upper Raft Sub-basin — **Sub-basin area: 386.00 km²**
Sub-basin name: West Raft Sub-basin — **Sub-basin area: 137.99 km²**

Interaction	Hazard categories for interaction variables (low, medium or high)		Value (1,2,3 or 4)
1 Peak flow vs channel instability	(Peak flow) Low Medium Low	(Channels)	Require Level 2, IWAP Results
2 Peak flow vs surface erosion	(Peak flow) Low Low Low	(Surface erosion) Medium High Medium	2 2 1
3 Peak flow vs landslides	(Peak flow) Low Low Low	(Landslide) Medium Low Medium	2 1 2
4 Mass wasting vs channel instability	(Landslide) Medium Low Medium	(Channels)	Require Level 2, IWAP Results
5 Riparian buffers vs channel instability	(Riparian) Low Medium Low	(Channels)	Require Level 2, IWAP Results

7.0. Recommendations and Conclusions

The recommendations and conclusions for the individual sub-basins will be listed first and then followed by the ones for the overall watershed that will conclude the report.

7.1 Residual Sub-basin

The Residual Sub-basin has a score of 2 for interaction number two (Peak Flow vs Surface Erosion) and a score of 2 for interaction number three (Peak Flow vs Landslides). The

implications of the score for interaction number two, as recommended in the Forest Practices Code of British Columbia IWAP Guidebook September 1995, are the following:

- initiate an assessment of sediment sources (refer to Moore 1994),
- do not allow additional logging above and around sensitive soils, and
- rehabilitate roads near streams, and avoid construction of more roads on sensitive soils or adjacent to riparian management areas. Minimize additional stream crossings.

As constraints are recommended on sensitive soils we recommend that the soils mapping of the Raft River Watershed be updated. The soil maps used for the IWAP were produced in 1977 at a 1:50,000 scale and then transferred to fit the 1:20,000 maps. A more ideal situation would be to have a terrain classification and terrain stability assessment completed for the sub-basin at a 1:20,000 or 1:15,000 scale to more accurately identify sensitive soils.

The implications of the score for interaction number three, as recommended in the Forest Practices Code of British Columbia IWAP Guidebook September 1995, are the following:

- A detailed site assessment is required on any potentially unstable slopes,
- initiate an assessment of sediment sources (refer to Moore 1994), and
- assess roads as sources of landslides and initiate a road deactivation and landslide rehabilitation program as required.

The hazard rating and the recommendations from the IWAP Guidebook for interaction number three should be viewed with the knowledge that the majority (65%) of the landslides in this sub-basin are concentrated where the 1971 wildfire was on Road 9 (near 12 km) and have resulted in the hazard rating. Without the concentration of landslides in the wildfire, interaction number three would have a low score which would have resulted in no further implications.

7.2 Upper Raft Sub-basin

The Upper Raft Sub-basin has a score of 2 for interaction number two and a score of 1 for number interaction number three. There are no implications as a result of the low score for interaction number three; however, the implications of the score for interaction number two, as recommended in the Forest Practices Code of British Columbia, IWAP Guidebook September 1995, are the following:

- Initiate an assessment of sediment sources (refer to Moore 1994),
- do not allow additional logging above and around sensitive soils, and
- rehabilitate roads near streams, and avoid construction of more roads on sensitive soils or adjacent to riparian management areas. Minimize additional stream crossings.

As constraints are recommended on sensitive soils we recommend that the soils mapping of the Raft River Watershed be updated. The soil maps used for the IWAP were produced in 1977 at a 1:50,000 scale and then transferred to fit the 1:20,000 maps. A more ideal situation would be to have a terrain classification and terrain stability assessment completed for the sub-basin at a 1:20,000 or 1:15,000 scale to more accurately identify sensitive soils.

7.3 West Raft Sub-basin

The West Raft Sub-basin has a low score for interaction number two and a moderate score for number three. There are no implications for interaction number two; however, the implications for interaction number three, as recommended in the Forest Practices Code of British Columbia, IWAP Guidebook September 1995, are the following:

- A detailed site assessment is required on any potentially unstable slopes,
- initiate an assessment of sediment sources (refer to Moore 1994), and
- assess roads as sources of landslides and initiate a road deactivation and landslide rehabilitation program as required.

As detailed site assessments are required on any potentially unstable slopes, we recommend that the unstable terrain mapping of the Raft River Watershed be updated. The criteria used to classify unstable terrain in this IWAP were any slopes > 60%. In most cases, using a slope angle classification alone will largely overestimate the area of potentially unstable terrain (IWAP, 1995). A more ideal situation would be to have a terrain classification and terrain stability assessment completed for the sub-basin at a 1:20,000 or 1:15,000 scale to more accurately identify unstable terrain.

7.4 Overall Raft River Watershed

If further development of an Integrated Watershed Restoration Plan for the Raft River is desired, a Round Table Meeting needs to be organized that will include all the stakeholders in the Watershed.

The Round Table should determine the implications of the recommendations for the sub-basins with particular attention to defining a sensitive soil and an unstable slope.

To assist the Round Table participants in making decisions and fulfil the recommendations from the Forest Practices Code of British Columbia, IWAP Guidebook there is further work that should be completed in the watershed including: a Terrain Classification and Terrain Stability Assessment (previously mentioned), a sediment source survey, and a riparian assessment. A Terrain Classification and Terrain Stability Assessment could more accurately identify unstable slopes and sensitive soils that need to be defined by the Round Table. Fortunately, Slocan Forest Products already submitted a FRBC Proposal in January 1996 to complete a Terrain Classification and Terrain Stability Assessment for the Raft River Watershed.

A sediment source survey could provide the required information to identify and prioritize initial project scope, objectives and restorations strategies for future use in the preparation of the Integrated Watershed Restoration Plan. Currently, *Integrated* Woods Services Ltd, holds a contract with the Ministry of Environment Lands and Parks to complete a Level 1, Road Condition Assessment that should be amended to include a sediment source survey to meet the requirements in the 1996/97 Watershed Restoration Program, Request for Detailed Proposal Package Book 1.

A riparian assessment should be completed to assess riparian conditions along the Raft River and its tributaries to recommend treatments which will restore stream bank integrity in areas where bank instability is contributing to sediment impacts. Furthermore, in a riparian assessment the Department of Fisheries and Oceans water temperature concerns can be addressed and recommendations can be made to resolve the problem.

Apparent errors in digital files with road and contour information should be corrected. The road information needs to be updated through a co-ordinated effort between the MoF, Slocan and Weyerhaeuser. As well the contour data on mapsheets 82M.072, 82M.081 and 82M.092 contained errors that should be corrected where duplicate but contradictory copies of similiar contours exists.

This watershed assessment supports Slocan's watershed restoration activities proposed for the continued rehabilitation of the Mollie Creek Slide.

A recommendation to review a SBFEP proposed cutblock was viewed as an immediate concern and a letter was sent to Abbey Bates (SBFEP, Clearwater, Ministry of Forests) prior to the completion of this report. The correspondence is attached in Appendix F.

Finally, an access management strategy has be completed for the Raft River Watershed prior to preparing prescriptions for any further restoration activities. This will establish whether areas identified for restoration activities should have access maintained, temporarily de-activated, semi-permanently de-activated, or permanently de-activated.

8.0 REFERENCES

GSC, 1963, *Geological Survey of Canada*, Map 48, Geology Map, Adams Lake, British Columbia, scale 1:253,440.

Fulton, R.J., Alley, N.F., and Achard, R.A., 1986, *Surficial Geology, Seymour Arm*, British Columbia; Geological Survey of Canada, Map 1609A, scale 1:250,000.

IWAP, September 1995, *Interior Watershed Assessment Procedure*, Authority of Forest Practices Code of British Columbia Act, British Columbia Ministry of Environment Lands and Parks, and Ministry of Forests.

Moore, G.D., 1994, *Resource Rehabilitation Handbook: Planning and Implementation Guidelines*, Watershed Restoration Technical Circular No.3, Watershed Restoration Program, BC.

Rublee, B., 1996, *Raft River Fish and Fish Habitat Assessment*, Submitted to Ministry of Environment Lands and Parks, Kamloops Region.

WSC, Water Survey of Canada, 1991, *Historical Streamflow Summary*, BC Environment Canada, Inland Waters, Ottawa.

9.0 PERSONAL COMMUNICATIONS

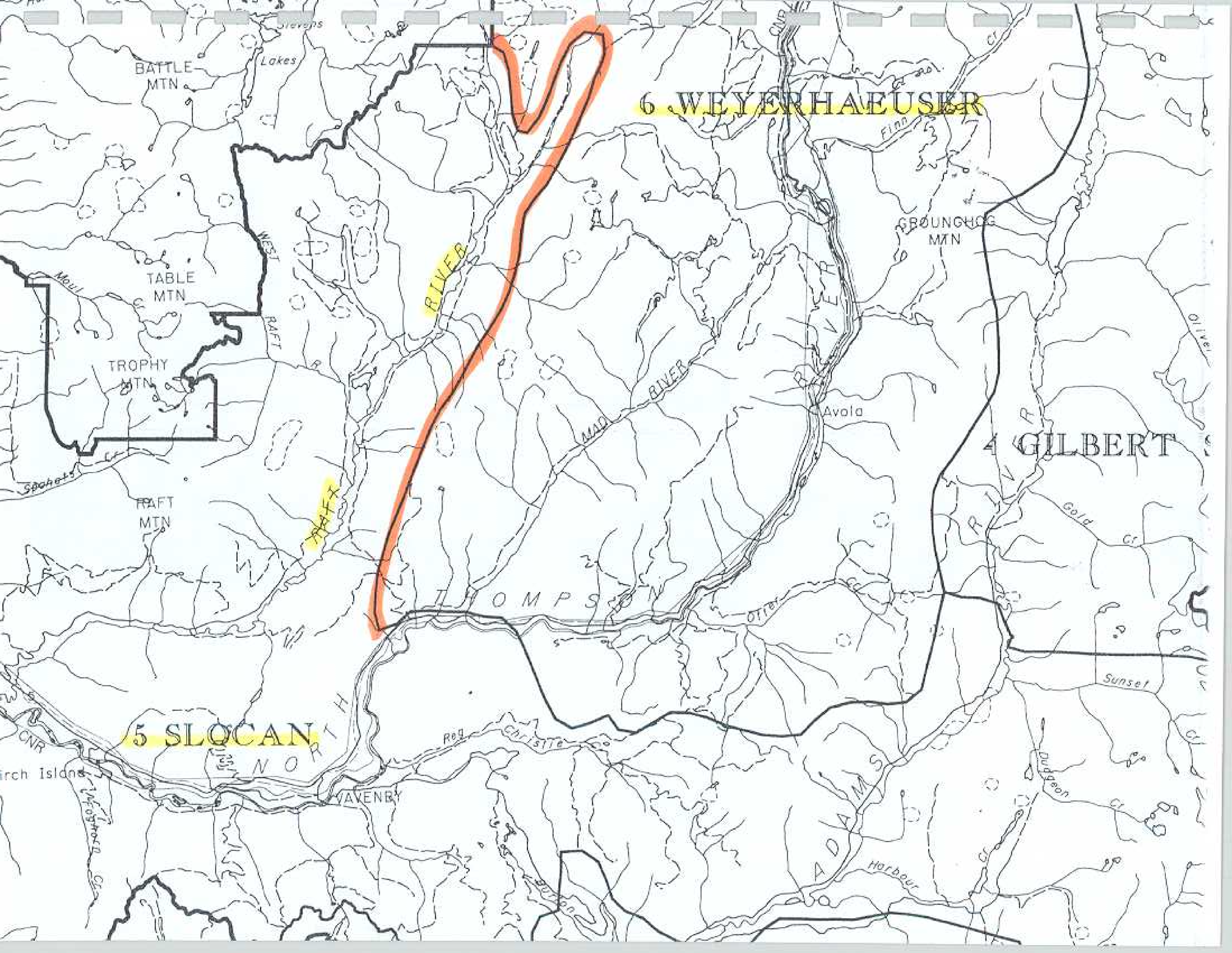
Keller, D., March, 1996, Resource Officer Inventory, Clearwater District Ministry of Forests.

Ellen,G., March 1996, Resource Officer Range, Clearwater District, Ministry of Forests.

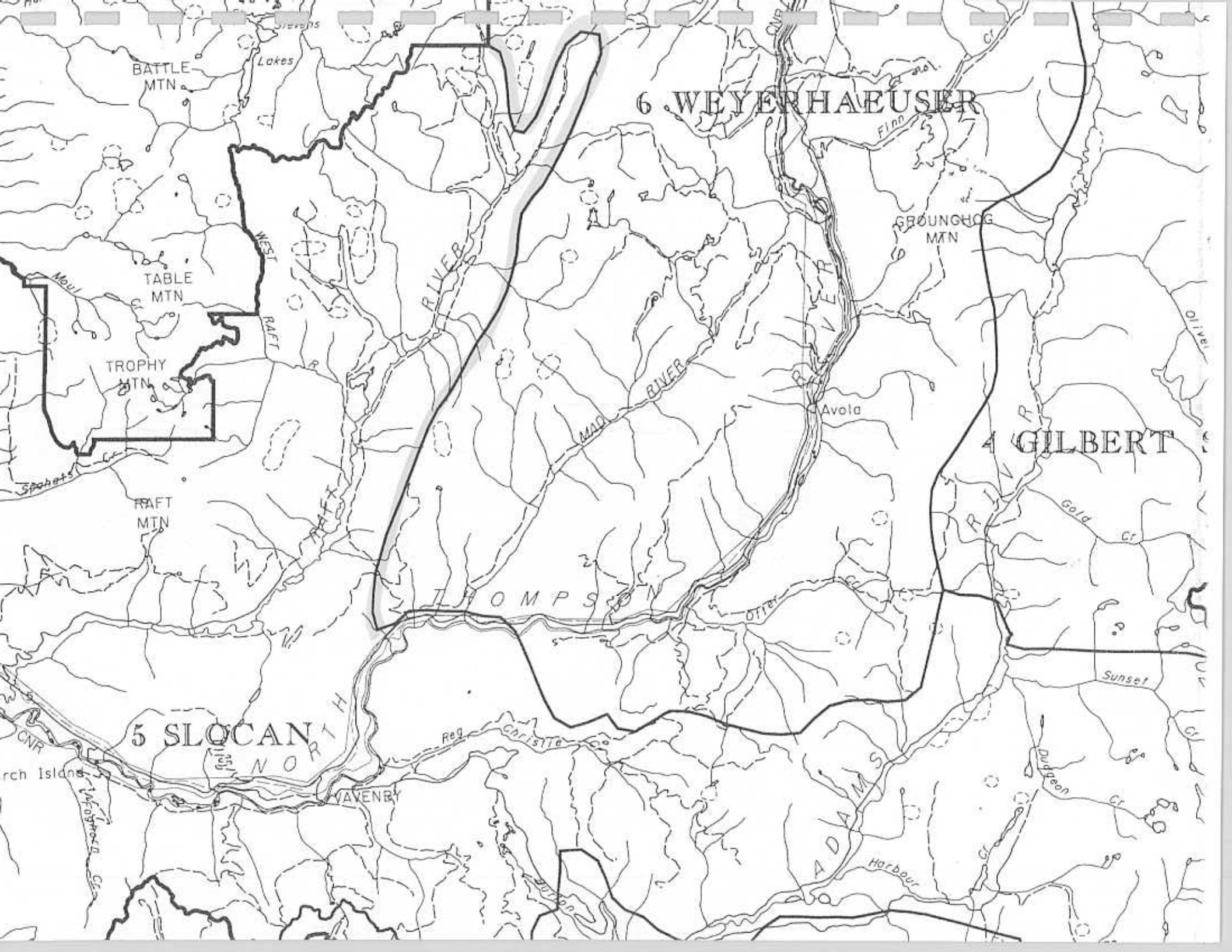
Wadlegger, J., March 27, 1996, landowner on Road 9 in the Raft River Watershed.

APPENDIX A

MAP OF LICENSEE BOUNDARIES



6 WEYERHAEUSER
4 GILBERT
5 SLOCAN
BATTLE MTN
TABLE MTN
TROPHY MTN
RAFT MTN
GROUNDHOG MTN
Lakes
WEST RAFT R
RIVER
RAFT
MAD RIVER
THOMPSON
NORTH
Avola
VAVENBY
CNR
Birch Island
Spahats Cr
Otter Cr
Gold Cr
Sunset
Christie
Dudgeon Cr
Harbour
ADAMS
Finn
Olive


BATTLE MTN
Lakes
6 WEYERHAEUSER
Finn
GROUNDHOG MTN
TABLE MTN
Moul Cr
WEST RAFT R
RIVER
TROPHY MTN
MAD RIVER
Avola
4 GILBERT
Spohats Cr
RAFT MTN
Gold Cr
THOMPSON
Otter Cr
Sunset
5 SLOCAN
NORTH
Reg Christie Cr
CNR
VAVENBY
Dudgeon Cr
ADAMS
Harbour
Barton

APPENDIX B

WATER LICENCES ON THE RAFT RIVER

Select Next Previous Find Pick Options Print Help Exit

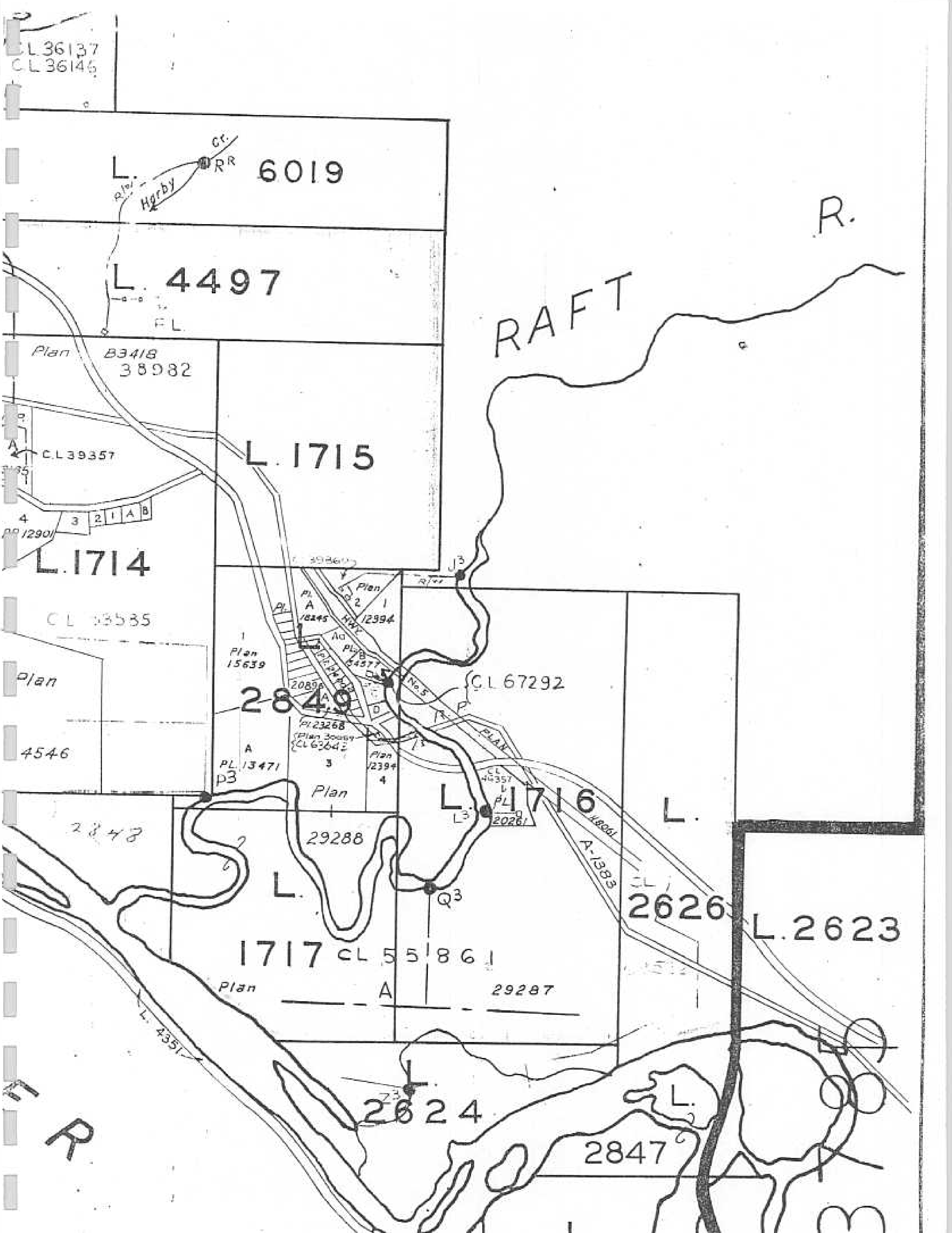
DWELLS Licence Summary by POD/Source WLIS1200 PROD

Point: Raft River right of North Thompson River

Code: SO11785

Total Number of Licences Found: 6

	Priority Date	Licence Number		File Number	PUC	Quantity/Units	Licensee/Applicant
01	19681021	C067292	C	0281963	DOM	500.000 GD	WILSON TAMMY C
02	19720508	C039860	C	0310051	DOM	500.000 GD	WADLEGGER JOSEPH
03	19720508	C039860	C	0310051	ENTPR	1500.000 GD	WADLEGGER JOSEPH
04	19750806	C046357	C	0329278	DOM	1000.000 GD	SLOAN TODD S & MARGA
05	19750806	C046357	C	0329278	IRR	14.000 AF	SLOAN TODD S & MARGA
06	19790910	C053585	C	0355311	IRR	300.000 AF	MCMAHON ENTERPRISES
07	19800305	C055861	C	0366128	IRR	240.000 AF	MACLENNAN WARREN & H
08	19850215	C063643	C	3000719	DOM	500.000 GD	BRADFORD JAMES E
09							
10							
11							
12							



CL 36137
CL 36146
L. 6019
Harby Cr.
RR
L. 4497
PL.
RAFT
R.
Plan B3418
38982
CL 39357
L. 1715
4
3
2
1
A
B
PP 12901
L. 1714
CL 33585
Plan
4546
Plan 15639
PL. A 18245
12994
HWY
No. 5
CL 67292
2849
PL. 23268
Plan 30089
CL 63643
PL. 13471
P3
Plan 12394
Plan
J3
L. 1716
L3
CL 46357
20261
A-1383
L.
2626
L. 2623
2848
29288
L.
Q3
1717 CL 55861
Plan
A
29287
L. 4351
L.
Z3
2624
L.
2847
R

APPENDIX C

GIS QUERY RESULTS

Data Entry Sheet - IWAP Version 1.02 - October 1995

Enter watershed data in column 1.
Read scores and hazard indices in columns 5 and 6 on next page.

	(1)	(2)	(3)	(4)
Watershed Name?	Residual(Lower)			
Map units are in: (1 = km. and sq.km.; 2 = m. and ha.)	1			
Watershed area?	236.58	sq.km.	*	
Peak Flow and Surface Erosion				
Elevation of H60?	1340	m.		
ECA above H60?	21.01	sq.km.	*	
ECA below H60?	25.84	sq.km.	*	
Road length above H60?	68.23	km.	*	
Road length below H60?	155.87	km.	*	
Surface Erosion				
Length of road on erodable soils?	80.48	km.	*	
Length of road within 100 m. of stream?	56.44	km.	*	
Length of road on erodable soils within 100 m. of stream?	12.44	km.	*	
Number of active stream crossings?	134		*	
Riparian Buffer				
Total stream length?	382.47	km.	*	
Length of stream logged?	51.19	km.	*	
Total length of fish bearing streams?	382.47	km.	*	
Length of fish bearing streams logged?	51.19	km.	*	
Landslides				
Number of landslides?	46		*	
Length of road on unstable slopes?	6.84	km.	*	
Length of stream with logged banks and on slopes > 60%	0.82	km.	*	
Other Land Use and Watershed Characteristics				
Is there range use next to streams?	y			
Is there mining close to streams?	n			
Is there ATV use close to streams?	n			
Hydrologic zone?	22			
Percent area of crown land?	96.2			
Percent area of private land?	3.2			
Percent area with unstable slopes?	9.4			
Percent area with erodable soils?	63.8			
Dominant bedrock geology?	3			
Is there a fisheries (DFO or MoE) thermal concern?	y			

Notes:
(2) Enter data in units shown in this column.
(3) An asterisk in this column indicates essential data for calculations.
(4) "err" message in this column indicates an inconsistency in the data.

All cells except B6..B44 are protected.

Calculation Sheet

Residual(Lower)
Map units were identified as: km. and sq.km.

		Indicator		Score	Hazard Index
Peak Flow					
	Index above H60	0.13			
	Index below H60	0.11			
1	Total Peak Flow Index	0.24		0.40	
2	Road density above H60	0.29	km/sq.km.	0.29	
3	Total road density (See note below)	0.95	km/sq.km.	0.32	**0.40**
Surface Erosion					
4	Roads on erodable soils	0.34	km/sq.km.	0.60	
5	Roads within 100 m of a stream	0.24	km/sq.km.	0.58	
6	Roads that are both of the above	0.05	km/sq.km.	0.26	
7	Active stream crossings	0.57	no./sq.km.	0.67	
8	Total road density (See note below)	0.95	km/sq.km.	0.32	**0.63**
Riparian Buffer					
9	Portion of stream logged?	0.13	km/km.	0.45	
10	Portion of fish bearing streams logged?	0.13	km/km.	0.27	**0.45**
Landslides					
11	Landslide density	0.19	no./sq.km.	0.66	
12	Roads on unstable slopes	0.03	km/sq.km.	0.10	
13	Streams >60% and banks logged	0.00	km/sq.km.	0.01	**0.66**

Notes:
The calculations of scores for #3 and #8 above are slightly different.
This spreadsheet is based on the IWAP Guidebook dated September 1995.
However, the spreadsheet is subject to change. Please contact a Forest Service regional hydrologist to ensure that you are using the latest version.

Data Entry Sheet - IWAP Version 1.02 - October 1995

Enter watershed data in column 1.
Read scores and hazard indices in columns 5 and 6 on next page.

	(1)	(2)	(3)	(4)
Watershed Name?	Upper			
Map units are in: (1 = km. and sq.km.; 2 = m. and ha.)	1			
Watershed area?	386	sq.km.	*	
Peak Flow and Surface Erosion				
Elevation of H60?	1340	m.		
ECA above H60?	68.33	sq.km.	*	
ECA below H60?	10.757	sq.km.	*	
Road length above H60?	257.64	km.	*	
Road length below H60?	106.4	km.	*	
Surface Erosion				
Length of road on erodable soils?	128.16	km.	*	
Length of road within 100 m. of stream?	170.86	km.	*	
Length of road on erodable soils within 100 m. of stream?	68.02	km.	*	
Number of active stream crossings?	359		*	
Riparian Buffer				
Total stream length?	833.65	km.	*	
Length of stream logged?	158.63	km.	*	
Total length of fish bearing streams?	833.65	km.	*	
Length of fish bearing streams logged?	158.63	km.	*	
Landslides				
Number of landslides?	6		*	
Length of road on unstable slopes?	13.79	km.	*	
Length of stream with logged banks and on slopes > 60%	0.94	km.	*	
Other Land Use and Watershed Characteristics				
Is there range use next to streams?	y			
Is there mining close to streams?	n			
Is there ATV use close to streams?	n			
Hydrologic zone?	22			
Percent area of crown land?	96.4			
Percent area of private land?	1			
Percent area with unstable slopes?	7			
Percent area with erodable soils?	58.6			
Dominant bedrock geology?	3			
Is there a fisheries (DFO or MoE) thermal concern?	y			

Notes:
(2) Enter data in units shown in this column.
(3) An asterisk in this column indicates essential data for calculations.
(4) "err" message in this column indicates an inconsistency in the data.

All cells except B6..B44 are protected.

Calculation Sheet

Upper
Map units were identified as: km. and sq.km.

	Indicator		Score	(5) Hazard Index	(6)
Peak Flow					
Index above H60	0.27				
Index below H60	0.03				
1 Total Peak Flow Index	0.29		0.49		
2 Road density above H60	0.67	km/sq.km.	0.67		
3 Total road density (See note below)	0.94	km/sq.km.	0.31		**0.49**
Surface Erosion					
4 Roads on erodable soils	0.33	km/sq.km.	0.59		
5 Roads within 100 m of a stream	0.44	km/sq.km.	0.99		
6 Roads that are both of the above	0.18	km/sq.km.	0.77		
7 Active stream crossings	0.93	no./sq.km.	1.00		
8 Total road density (See note below)	0.94	km/sq.km.	0.31		**0.99**
Riparian Buffer					
9 Portion of stream logged?	0.19	km/km.	0.63		
10 Portion of fish bearing streams logged?	0.19	km/km.	0.38		**0.63**
Landslides					
11 Landslide density	0.02	no./sq.km.	0.08		
12 Roads on unstable slopes	0.04	km/sq.km.	0.12		
13 Streams >60% and banks logged	0.00	km/sq.km.	0.01		**0.08**

Notes:
The calculations of scores for #3 and #8 above are slightly different.
This spreadsheet is based on the IWAP Guidebook dated September 1995.
However, the spreadsheet is subject to change. Please contact a Forest Service regional hydrologist to ensure that you are using the latest version.

Data Entry Sheet - IWAP Version 1.02 - October 1995

Enter watershed data in column 1.
Read scores and hazard indices in columns 5 and 6 on next page.

	(1)	(2)	(3)	(4)
Watershed Name?	West Raft			
Map units are in: (1 = km. and sq.km.; 2 = m. and ha.)	1			
Watershed area?	137.99	sq.km.	*	
Peak Flow and Surface Erosion				
Elevation of H60?	1340	m.		
ECA above H60?	5.82	sq.km.	*	
ECA below H60?	3.53	sq.km.	*	
Road length above H60?	16.37	km.	*	
Road length below H60?	21.55	km.	*	
Surface Erosion				
Length of road on erodable soils?	25.04	km.	*	
Length of road within 100 m. of stream?	19.03	km.	*	
Length of road on erodable soils within 100 m. of stream?	9.9	km.	*	
Number of active stream crossings?	73		*	
Riparian Buffer				
Total stream length?	340.29	km.	*	
Length of stream logged?	38.84	km.	*	
Total length of fish bearing streams?	340.29	km.	*	
Length of fish bearing streams logged?	38.84	km.	*	
Landslides				
Number of landslides?	24		*	
Length of road on unstable slopes?	8.47	km.	*	
Length of stream with logged banks and on slopes > 60%	3.4	km.	*	
Other Land Use and Watershed Characteristics				
Is there range use next to streams?	y			
Is there mining close to streams?	n			
Is there ATV use close to streams?	n			
Hydrologic zone?	22			
Percent area of crown land?	97.3			
Percent area of private land?	0			
Percent area with unstable slopes?	28.7			
Percent area with erodable soils?	62.6			
Dominant bedrock geology?	3			
Is there a fisheries (DFO or MoE) thermal concern?	y			

Notes:
(2) Enter data in units shown in this column.
(3) An asterisk in this column indicates essential data for calculations.
(4) "err" message in this column indicates an inconsistency in the data.

All cells except B6..B44 are protected.

Calculation Sheet

West Raft
Map units were identified as: km. and sq.km.

		Indicator		Score	Hazard Index
Peak Flow					
	Index above H60	0.06			
	Index below H60	0.03			
1	Total Peak Flow Index	0.09		0.15	
2	Road density above H60	0.12	km/sq.km.	0.12	
3	Total road density (See note below)	0.27	km/sq.km.	0.09	**0.15**
Surface Erosion					
4	Roads on erodable soils	0.18	km/sq.km.	0.36	
5	Roads within 100 m of a stream	0.14	km/sq.km.	0.34	
6	Roads that are both of the above	0.07	km/sq.km.	0.36	
7	Active stream crossings	0.53	no./sq.km.	0.63	
8	Total road density (See note below)	0.27	km/sq.km.	0.09	**0.50**
Riparian Buffer					
9	Portion of stream logged?	0.11	km/km.	0.38	
10	Portion of fish bearing streams logged?	0.11	km/km.	0.23	**0.38**
Landslides					
11	Landslide density	0.17	no./sq.km.	0.62	
12	Roads on unstable slopes	0.06	km/sq.km.	0.20	
13	Streams >60% and banks logged	0.02	km/sq.km.	0.09	**0.62**

Notes:
The calculations of scores for #3 and #8 above are slightly different.
This spreadsheet is based on the IWAP Guidebook dated September 1995.
However, the spreadsheet is subject to change. Please contact a Forest Service regional hydrologist to ensure that you are using the latest version.

RAFT RIVER ECA CALCULATION

PROJECTED TO 1996

	LOWER RAFT				WEST RAFT				UPPER RAFT			
	Above H60		Below H60		Above H60		Below H60		Above H60		Below H60	
MAPSHEET	Log	Burn	Log	Burn	Log	Burn	Log	Burn	Log	Burn	Log	Burn
82MO61	704.5		798									
82M062	409		1315	6								
82M071	252	27			102	6						
82M072	708		436.3	29	102	21	206				227.2	65.55
82M073									10.2			
82M081						7.1	6.4	14.7				
82M082					300.8	6	125.6	0.36	1674.2	171.32	190.4	78.87
82M083									781	386.01	15	36.21
82M092						36.75			592.24	1615.8	107	78.625
82M093									1232.7	25.7	231.7	45.1
83D003									321.08	22.75		
TOTAL (ha)	2073.5	27	2549.3	35	504.8	76.85	338	15.06	4611.5	2221.6	771.3	304.36
TOTAL (KM	**20.735**	**0.27**	**25.493**	**0.35**	**5.048**	**0.7685**	**3.38**	**0.1506**	**46.115**	**22.216**	**7.713**	**3.0436**

LOWER RAFT	Above H60	21.005	KM^2
	Below H60	25.843	KM^2
WEST RAFT	Above H60	5.8165	KM^2
	Below H60	3.5306	KM^2
UPPER RAFT	Above H60	68.33	KM^2
	Below H60	10.757	KM^2

ECA		82M061							
POLY	HTPROJ96	ACTIVIT	RECOV	AREAPO	H60_N	BOUND_I	NAME	HA	
618	0.6	1	0.00	46.200	0	1	LOWER_RAFT	46.2	
619	0.6	1	0.00	10.000	0	1	LOWER_RAFT	10	
338	28.8	1	0.90	16.000	0	1	LOWER_RAFT	1.6	
337	28.8	1	0.90	7.000	0	1	LOWER_RAFT	0.7	
341	26	1	0.90	17.900	0	1	LOWER_RAFT	1.79	
340	28.3	1	0.90	8.000	0	1	LOWER_RAFT	0.8	
343	28.3	1	0.90	14.000	0	1	LOWER_RAFT	1.4	
344	26	1	0.90	3.000	0	1	LOWER_RAFT	0.3	
353	28.3	1	0.90	3.500	0	1	LOWER_RAFT	0.35	
354	4.7	1	0.25	21.700	0	1	LOWER_RAFT	16.275	
355	2.3	1	0.00	1.600	0	1	LOWER_RAFT	1.6	
373	1.9	1	0.00	7.000	0	1	LOWER_RAFT	7	
202	12	1	0.90	7.400	0	1	LOWER_RAFT	0.74	
195	12	1	0.90	15.600	0	1	LOWER_RAFT	1.56	
182	6	1	0.50	29.100	0	1	LOWER_RAFT	14.55	
183	6	1	0.50	31.600	0	1	LOWER_RAFT	15.8	
171	6	1	0.50	80.200	0	1	LOWER_RAFT	40.1	
173	8.5	1	0.75	25.300	0	1	LOWER_RAFT	6.325	
163	5.7	1	0.50	41.300	0	1	LOWER_RAFT	20.65	
162	7.8	1	0.75	24.400	0	1	LOWER_RAFT	6.1	
154	8	1	0.75	11.300	0	1	LOWER_RAFT	2.825	
160	0.6	1	0.00	8.600	0	1	LOWER_RAFT	8.6	
156	12.5	1	0.90	12.400	0	1	LOWER_RAFT	1.24	
141	4.7	1	0.25	21.800	0	1	LOWER_RAFT	16.35	
146	8.5	1	0.75	13.000	0	1	LOWER_RAFT	3.25	
93	6.1	1	0.50	25.000	0	1	LOWER_RAFT	12.5	
144	16.4	1	0.90	12.800	0	1	LOWER_RAFT	1.28	
136	6.5	1	0.50	14.100	0	1	LOWER_RAFT	7.05	
132	8	1	0.75	16.000	0	1	LOWER_RAFT	4	
130	6.1	1	0.50	64.600	0	1	LOWER_RAFT	32.3	
119	3.4	1	0.25	39.200	0	1	LOWER_RAFT	29.4	
114	0.6	1	0.00	12.000	0	1	LOWER_RAFT	12	
816	2.2	1	0.00	23.100	0	1	LOWER_RAFT	23.1	
363	1	1	0.00	13.600	0	1	LOWER_RAFT	13.6	
380	1.6	1	0.00	34.200	0	1	LOWER_RAFT	34.2	
382	0.6	1	0.00	17.900	0	1	LOWER_RAFT	17.9	
810	0.6	1	0.00	24.100	0	1	LOWER_RAFT	24.1	
395	0.6	1	0.00	38.000	0	1	LOWER_RAFT	38	
403	0.6	1	0.00	18.000	0	1	LOWER_RAFT	18	
549	18.7	1	0.90	14.600	0	1	LOWER_RAFT	1.46	
Slocan	0.6	1	0.00	44.500	0		LOWER_RAFT	44.5	
Slocan	0.6	1	0.00	35.000	0		LOWER_RAFT	35	
Slocan	0.6	1	0.00	28.000	0		LOWER_RAFT	28	
Slocan	0.6	1	0.00	26.000	0		LOWER_RAFT	26	
Slocan	0.6	1	0.00	24.000	0		LOWER_RAFT	24	
Slocan	0.6	1	0.00	52.000	0		LOWER_RAFT	52	
		LOGGING			ABOVE			704.485	ha
36	9.00	1	0.90	10.000	1	1	LOWER_RAFT	1	
45	0.60	1	0.00	5.000	1	1	LOWER_RAFT	5	
48	6.00	1	0.50	49.100	1	1	LOWER_RAFT	24.55	
55	1.90	1	0.00	50.900	1	1	LOWER_RAFT	50.9	
61	3.50	1	0.25	27.900	1	1	LOWER_RAFT	20.925	
66	0.00	1	0.00	117.700	1	1	LOWER_RAFT	117.7	
68	5.20	1	0.50	125.600	1	1	LOWER_RAFT	62.8	
69	20.80	1	0.90	9.200	1	1	LOWER_RAFT	0.92	
81	2.80	1	0.00	11.400	1	1	LOWER_RAFT	11.4	
82	5.40	1	0.50	9.400	1	1	LOWER_RAFT	4.7	
83	5.50	1	0.50	39.400	1	1	LOWER_RAFT	19.7	
85	5.50	1	0.50	56.600	1	1	LOWER_RAFT	28.3	
80	2.80	1	0.00	31.600	1	1	LOWER_RAFT	31.6	
86	2.50	1	0.00	3.900	1	1	LOWER_RAFT	3.9	
84	2.80	1	0.00	44.200	1	1	LOWER_RAFT	44.2	
91	5.50	1	0.50	13.900	1	1	LOWER_RAFT	6.95	
95	0.00	1	0.00	49.300	1	1	LOWER_RAFT	49.3	
183	5.50	1	0.50	5.000	1	1	LOWER_RAFT	2.5	
171	5.50	1	0.50	8.000	1	1	LOWER_RAFT	4	
93	5.50	1	0.50	16.000	1	1	LOWER_RAFT	8	
114	0.60	1	0.00	6.600	1	1	LOWER_RAFT	6.6	
132	7.40	1	0.75	0.500	1	1	LOWER_RAFT	0.125	
549	18.10	1	0.90	82.700	1	1	LOWER_RAFT	8.27	
400	0.00	1	0.00	79.000	1	1	LOWER_RAFT	79	
403	0.00	1	0.00	24.600	1	1	LOWER_RAFT	24.6	
423	0.90	1	0.00	29.800	1	1	LOWER_RAFT	29.8	
481	0.00	1	0.00	69.000	1	1	LOWER_RAFT	69	
745	0.90	1	0.00	7.800	1	1	LOWER_RAFT	7.8	
535	0.40	1	0.00	18.200	1	1	LOWER_RAFT	18.2	
52	2.50	1	0.00	8.500	1	1	LOWER_RAFT	8.5	
59	1.50	1	0.00	3.400	1	1	LOWER_RAFT	3.4	
74	1.50	1	0.00	4.200	1	1	LOWER_RAFT	4.2	
73	0.00	1	0.00	2.100	1	1	LOWER_RAFT	2.1	
79	5.20	1	0.50	11.000	1	1	LOWER_RAFT	5.5	
549	18.10	1	0.90	56.000	1	1	LOWER_RAFT	5.6	
Slocan	0.60	1	0.00	27.000	1	1	LOWER_RAFT	27	
		LOGGING		BELOW			LOWER_RAFT	798.04	ha

ECA	92M062							
POLY	HTPROJ98	ACTIVIT	RECOV	AREAPOL	H60_N	BOUND	NAME	HA
8	2.90	1	0.00	1.330	0	1	LOWER_RAFT	1.33
202	1.40	1	0.00	44.900	0	1	LOWER_RAFT	44.9
204	1.40	1	0.00	51.200	0	1	LOWER_RAFT	51.2
232	4.00	1	0.25	17.600	0	1	LOWER_RAFT	13.2
282	5.20	1	0.25	19.700	0	1	LOWER_RAFT	14.775
316	0.60	1	0.00	104.900	0	1	LOWER_RAFT	104.9
346	0.60	1	0.00	2.900	0	1	LOWER_RAFT	2.9
518	1.20	1	0.00	36.700	0	1	LOWER_RAFT	36.7
552	0.60	1	0.00	5.330	0	1	LOWER_RAFT	5.33
553	0.60	1	0.00	31.200	0	1	LOWER_RAFT	31.2
562	0.00	1	0.00	1.400	0	1	LOWER_RAFT	1.4
568	1.90	1	0.00	37.700	0	1	LOWER_RAFT	37.7
571	0.10	1	0.00	2.100	0	1	LOWER_RAFT	2.1
572	30.00	1	0.90	3.400	0	1	LOWER_RAFT	0.34
588	0.00	1	0.00	3.200	0	1	LOWER_RAFT	3.2
591	0.60	1	0.00	7.900	0	1	LOWER_RAFT	7.9
Slocan	0.60	1	0.00	36.000			LOWER_RAFT	36
Slocan	0.60	1	0.00	7.000			LOWER_RAFT	7
Slocan	0.60	1	0.00	7.000			LOWER_RAFT	7
		LOGGING			ABOVE		LOWER_RAFT	408.075
8	2.90	1	0.00	28.270	1	1	LOWER_RAFT	28.27
9	3.20	1	0.25	5.100	1	1	LOWER_RAFT	3.825
10	2.90	1	0.00	14.400	1	1	LOWER_RAFT	14.4
11	0.10	1	0.00	2.600	1	1	LOWER_RAFT	2.6
51	2.30	1	0.00	22.600	1	1	LOWER_RAFT	22.6
52	0.60	1	0.00	7.200	1	1	LOWER_RAFT	7.2
53	2.50	1	0.00	5.800	1	1	LOWER_RAFT	5.8
54	4.50	1	0.25	18.300	1	1	LOWER_RAFT	13.725
57	3.20	1	0.25	12.400	1	1	LOWER_RAFT	9.3
61	3.50	1	0.25	6.500	1	1	LOWER_RAFT	4.875
62	3.60	1	0.25	6.600	1	1	LOWER_RAFT	4.95
63	2.70	1	0.00	15.400	1	1	LOWER_RAFT	15.4
64	2.70	1	0.00	44.300	1	1	LOWER_RAFT	44.3
65	1.20	1	0.00	4.700	1	1	LOWER_RAFT	4.7
66	2.00	1	0.00	16.900	1	1	LOWER_RAFT	16.9
67	2.80	1	0.00	3.900	1	1	LOWER_RAFT	3.9
68	3.20	1	0.25	1.600	1	1	LOWER_RAFT	1.2
69	2.00	1	0.00	4.700	1	1	LOWER_RAFT	4.7
82	8.30	1	0.75	11.100	1	1	LOWER_RAFT	2.775
86	1.50	1	0.00	37.200	1	1	LOWER_RAFT	37.2
88	2.20	1	0.00	20.900	1	1	LOWER_RAFT	20.9
204	1.40	1	0.00	41.200	1	1	LOWER_RAFT	41.2
205	2.00	1	0.00	16.400	1	1	LOWER_RAFT	16.4
206	1.70	1	0.00	19.200	1	1	LOWER_RAFT	19.2
210	0.20	1	0.00	2.100	1	1	LOWER_RAFT	2.1
212	2.00	1	0.00	30.100	1	1	LOWER_RAFT	30.1
213	2.10	1	0.00	6.800	1	1	LOWER_RAFT	6.8
214	2.00	1	0.00	56.800	1	1	LOWER_RAFT	56.8
215	0.60	1	0.00	74.200	1	1	LOWER_RAFT	74.2
224	0.20	1	0.00	4.000	1	1	LOWER_RAFT	4
225	0.10	1	0.00	20.700	1	1	LOWER_RAFT	20.7
228	1.70	1	0.00	31.700	1	1	LOWER_RAFT	31.7
229	0.60	1	0.00	29.300	1	1	LOWER_RAFT	29.3
230	0.10	1	0.00	21.000	1	1	LOWER_RAFT	21
231	0.10	1	0.00	9.700	1	1	LOWER_RAFT	9.7
232	4.00	1	0.25	17.600	1	1	LOWER_RAFT	13.2
233	1.70	1	0.00	22.800	1	1	LOWER_RAFT	22.8
234	3.20	1	0.25	2.500	1	1	LOWER_RAFT	1.875
246	1.90	1	0.00	19.600	1	1	LOWER_RAFT	19.6
247	1.50	1	0.00	14.300	1	1	LOWER_RAFT	14.3
248	3.00	1	0.25	19.200	1	1	LOWER_RAFT	14.4
251	7.80	1	0.75	23.400	1	1	LOWER_RAFT	5.85
282	5.20	1	0.50	19.700	1	1	LOWER_RAFT	9.85
285	0.20	1	0.00	7.200	1	1	LOWER_RAFT	7.2
301	2.30	1	0.00	11.000	1	1	LOWER_RAFT	11
303	0.80	1	0.00	17.000	1	1	LOWER_RAFT	17
304	0.80	1	0.00	27.600	1	1	LOWER_RAFT	27.6
305	1.10	1	0.00	14.500	1	1	LOWER_RAFT	14.5
313	0.00	1	0.00	62.300	1	1	LOWER_RAFT	62.3
322	29.60	1	0.50	123.800	1	1	LOWER_RAFT	61.9
346	0.60	1	0.00	2.900	1	1	LOWER_RAFT	2.9
518	1.20	1	0.00	42.500	1	1	LOWER_RAFT	42.5
522	0.20	1	0.00	63.400	1	1	LOWER_RAFT	63.4
546	0.10	1	0.00	22.200	1	1	LOWER_RAFT	22.2
552	0.60	1	0.00	71.470	1	1	LOWER_RAFT	71.47
Slocan	0.60	1	0.00	33.500			LOWER_RAFT	33.5
Slocan	0.60	1	0.00	27.000			LOWER_RAFT	27
Slocan	0.60	1	0.00	28.000			LOWER_RAFT	28
Slocan	0.60	1	0.00	27.500			LOWER_RAFT	27.5
Slocan	0.60	1	0.00	33.000			LOWER_RAFT	33
Slocan	0.60	1	0.00	14.000			LOWER_RAFT	14
Slocan	0.60	1	0.00	13.500			LOWER_RAFT	13.5
		LOGGING			BELOW		LOWER_RAFT	1315.07
30	10.60	2	0.90	10.200	1	1	LOWER_RAFT	1.02
80	26.20	2	0.90	17.700	1	1	LOWER_RAFT	1.77
81	8.00	2	0.75	2.100	1	1	LOWER_RAFT	0.525
82	8.30	2	0.75	11.100	1	1	LOWER_RAFT	2.775
		BURNS			BELOW		LOWER_RAFT	6.09

	ECA	82M071						
POLY	HTPROJ96	RECOV	ACTIVITY	AREAPOL	H60_N	BOUND_ID	NAME	Ha
412	1.50	0.00	1	47.300	0	1	LOWER_RAFT	47.3
413	0.60	0.00	1	28.000	0	1	LOWER_RAFT	28
417	1.10	0.00	1	3.500	0	1	LOWER_RAFT	3.5
451	1.50	0.00	1	42.100	0	1	LOWER_RAFT	42.1
453	1.60	0.00	1	15.500	0	1	LOWER_RAFT	15.5
455	1.90	0.00	1	10.800	0	1	LOWER_RAFT	10.8
461	2.50	0.00	1	47.300	0	1	LOWER_RAFT	47.3
480	0.60	0.00	1	28.000	0	1	LOWER_RAFT	28
491	1.90	0.00	1	3.500	0	1	LOWER_RAFT	3.5
Slocan		0.00	1	26.000			LOWER_RAFT	26
			LOGGING		ABOV	1	LOWER_RAFT	252
240	0.60	0.00	1	16.200	0	2	WEST_RAFT	16.2
241	18.00	0.90	1	16.700	0	2	WEST_RAFT	1.67
245	0.60	0.00	1	56.600	0	2	WEST_RAFT	56.6
480	0.60	0.00	1	28.000	0	2	WEST_RAFT	28
			LOGGING		ABOV	2	WEST_RAFT	102.47
427	4.40	0.25	2	20.800	0	1	LOWER_RAFT	15.6
449	10.80	0.90	2	8.400	0	1	LOWER_RAFT	0.84
456	0.60	0.00	2	10.800	0	1	LOWER_RAFT	10.8
			BURNS		ABOV	1	LOWER_RAFT	27.24
33	8.60	0.75	2	24.600	0	2	WEST_RAFT	6.15
			BURNS		ABOVE		WEST_RAFT	6.15

ECA	82M072							
POLY	HTPROJ8	ACTIVITY	RECOV	AREAPOL	H60_N	BOUND_ID	NAME	Ha
14	26.40	1	0.90	16.500	0	1	LOWER_RAFT	1.65
40	0.80	1	0.00	2.800	0	1	LOWER_RAFT	2.80
60	1.40	1	0.00	8.000	0	1	LOWER_RAFT	8.00
80	1.00	1	0.00	4.000	0	1	LOWER_RAFT	4.00
174	17.00	1	0.90	11.000	0	1	LOWER_RAFT	1.10
175	28.00	1	0.90	4.100	0	1	LOWER_RAFT	0.41
176	1.00	1	0.00	45.100	0	1	LOWER_RAFT	45.10
180	1.00	1	0.00	83.300	0	1	LOWER_RAFT	83.30
249	1.50	1	0.00	16.600	0	1	LOWER_RAFT	16.60
252	1.20	1	0.00	24.500	0	1	LOWER_RAFT	24.50
265	1.00	1	0.00	11.800	0	1	LOWER_RAFT	11.80
267	1.00	1	0.00	25.400	0	1	LOWER_RAFT	25.40
270	1.00	1	0.00	51.300	0	1	LOWER_RAFT	51.30
398	1.80	1	0.00	34.800	0	1	LOWER_RAFT	34.80
401	1.20	1	0.00	26.000	0	1	LOWER_RAFT	26.00
405	2.80	1	0.00	37.800	0	1	LOWER_RAFT	37.80
408	2.90	1	0.00	37.300	0	1	LOWER_RAFT	37.30
458	2.60	1	0.00	22.000	0	1	LOWER_RAFT	22.00
471	5.10	1	0.50	37.000	0	1	LOWER_RAFT	18.50
480	1.00	1	0.00	28.000	0	1	LOWER_RAFT	28.00
481	1.00	1	0.00	17.800	0	1	LOWER_RAFT	17.80
504	26.00	1	0.90	1.100	0	1	LOWER_RAFT	0.11
505	2.10	1	0.00	54.800	0	1	LOWER_RAFT	54.80
593	25.00	1	0.90	29.500	0	1	LOWER_RAFT	2.95
594	1.60	1	0.00	32.500	0	1	LOWER_RAFT	32.50
601	1.20	1	0.00	8.000	0	1	LOWER_RAFT	8.00
608	1.40	1	0.00	29.600	0	1	LOWER_RAFT	29.60
688	1.20	1	0.00	3.600	0	1	LOWER_RAFT	3.60
cp159	0.60	1	0.00	12.900			LOWER_RAFT	12.90
cp159	0.60	1	0.00	2.200			LOWER_RAFT	2.20
Sloca	0.60	1	0.00	33.000			LOWER_RAFT	33.00
Sloca	0.60	1	0.00	30.000			LOWER_RAFT	30.00
		LOGGING			ABOVE			707.62
14	24.00	1	0.90	6.000	0	2	WEST_RAFT	0.60
196	0.60	1	0.00	23.500	0	2	WEST_RAFT	23.50
239	0.00	1	0.00	1.300	0	2	WEST_RAFT	1.30
488	0.50	1	0.00	5.600	0	2	WEST_RAFT	5.60
710	0.00	1	0.00	37.700	0	2	WEST_RAFT	37.70
713	0.20	1	0.00	33.400	0	2	WEST_RAFT	33.40
		LOGGING			ABOVE			102.10
47	18.00	1	0.90	2.600	1	1	LOWER_RAFT	0.26
80	1.00	1	0.00	5.800	1	1	LOWER_RAFT	5.80
145	1.70	1	0.00	38.000	1	1	LOWER_RAFT	38.00
447	1.10	1	0.00	23.800	1	1	LOWER_RAFT	23.80
448	1.30	1	0.00	39.800	1	1	LOWER_RAFT	39.80
480	0.60	1	0.00	19.100	1	1	LOWER_RAFT	19.10
506	27.00	1	0.90	29.100	1	1	LOWER_RAFT	2.91
507	27.00	1	0.90	17.000	1	1	LOWER_RAFT	1.70
508	0.60	1	0.00	31.000	1	1	LOWER_RAFT	31.00
516	2.70	1	0.00	6.400	1	1	LOWER_RAFT	6.40
517	2.00	1	0.00	5.900	1	1	LOWER_RAFT	5.90
518	0.60	1	0.00	6.900	1	1	LOWER_RAFT	6.90
520	3.90	1	0.25	33.700	1	1	LOWER_RAFT	25.28
521	3.10	1	0.25	32.300	1	1	LOWER_RAFT	24.23
524	5.00	1	0.50	101.400	1	1	LOWER_RAFT	50.70
528	5.00	1	0.50	7.900	1	1	LOWER_RAFT	3.95
529	3.60	1	0.25	14.300	1	1	LOWER_RAFT	10.73
530	5.00	1	0.50	3.400	1	1	LOWER_RAFT	1.70
531	3.00	1	0.25	18.600	1	1	LOWER_RAFT	13.95
533	2.80	1	0.00	9.000	1	1	LOWER_RAFT	9.00
536	5.10	1	0.50	31.700	1	1	LOWER_RAFT	15.85
538	3.60	1	0.25	2.000	1	1	LOWER_RAFT	1.50
579	26.00	1	0.90	49.800	1	1	LOWER_RAFT	4.98
652	2.00	1	0.00	1.000	1	1	LOWER_RAFT	1.00
654	2.00	1	0.00	0.900	1	1	LOWER_RAFT	0.90
662	3.00	1	0.25	44.500	1	1	LOWER_RAFT	33.38
663	1.80	1	0.00	18.400	1	1	LOWER_RAFT	18.40
680	11.70	1	0.90	4.800	1	1	LOWER_RAFT	0.48
682	2.90	1	0.00	19.400	1	1	LOWER_RAFT	19.40
cp159	0.60	1	0.00	1.300			LOWER_RAFT	1.30
Sloca	0.60	1	0.00	3.000			LOWER_RAFT	3.00
Sloca	0.60	1	0.00	4.000			LOWER_RAFT	4.00
Sloca	0.60	1	0.00	2.000			LOWER_RAFT	2.00
Sloca	0.60	1	0.00	2.000			LOWER_RAFT	2.00
Sloca	0.60	1	0.00	7.000			LOWER_RAFT	7.00
		LOGGING			BELOW			436.28
13	32.00	1	0.90	5.300	1	2	WEST_RAFT	0.53
30	1.40	1	0.00	16.600	1	2	WEST_RAFT	16.60
99	1.00	1	0.00	37.500	1	2	WEST_RAFT	37.50
145	1.70	1	0.00	30.000	1	2	WEST_RAFT	30.00
146	2.70	1	0.00	11.600	1	2	WEST_RAFT	11.60
147	4.50	1	0.25	7.700	1	2	WEST_RAFT	5.78
148	1.30	1	0.00	14.800	1	2	WEST_RAFT	14.80
150	0.20	1	0.00	13.800	1	2	WEST_RAFT	13.80
152	0.30	1	0.00	34.500	1	2	WEST_RAFT	34.50
193	1.30	1	0.00	2.800	1	2	WEST_RAFT	2.80
710	0.60	1	0.00	37.700	1	2	WEST_RAFT	37.70
		LOGGING			BELOW			205.61

55	1.00	1	0.00	22.700	1	3	UPPER_RAFT	22.70
60	1.40	1	0.00	14.800	1	3	UPPER_RAFT	14.80
61	2.40	1	0.00	152.200	1	3	UPPER_RAFT	152.20
99	1.20	1	0.00	37.500	1	3	UPPER_RAFT	37.50
		LOGGING			BELOW			227.20
63	3.00	2	0.25	85.000	0	3	UPPER_RAFT	63.75
70	1.00	2	0.00	1.800	0	3	UPPER_RAFT	1.80
		BURNS			ABOVE			65.55
314	11.20	2	0.90	3.000	0	1	LOWER_RAFT	0.30
568	0.60	2	0.00	7.000	0	1	LOWER_RAFT	7.00
422	14.00	2	0.90	9.400	1	1	LOWER_RAFT	0.94
673	0.00	2	0.00	20.500	1	1	LOWER_RAFT	20.50
		BURNS			ABOVE			28.74

ECA 82M073								
POLY	HTPROJ96	ACTIVITY	RECOV	AREAPOL	H60_N	BOUND_ID	NAME	Ha
1	2.60	1	0.00	6.000	0	3	UPPER_RAFT	6
4	0.60	1	0.00	4.200	0	3	UPPER_RAFT	4.2
		LOGGING			ABOVE			10.2

ECA	82M081							
POLY	HTPROJ9	ACTIVIT	RECOV	AREAPO	H60_N	BOUND_ID	NAME	Ha
200	0.6	2	0	7.1	0	2	WEST_RAFT	7.1
		BURNS			ABOVE		WEST_RAFT	7.1
200	0.6	2	0	14.7	1	2	WEST_RAFT	14.7
		BURNS			BELOW		WEST_RAFT	14.7
197	0.6	1	0	0.7	1	2	WEST_RAFT	0.7
204	1.4	1	0	5.7	1	2	WEST_RAFT	5.7
		LOGGING			BELOW		WEST_RAFT	6.4

ECA	82M082							
POLY	HTPROJ96	ACTIVITY	RECOV	AREAPOL	H60_N	BOUN	NAME	ha
242	2.1	1	0	42.2	0	2	WEST_RAFT	42.2
246	2.10	1	0.00	9.300	0	2	WEST_RAFT	9.3
277	1.80	1	0.00	10.100	0	2	WEST_RAFT	10.1
311	2.30	1	0.00	5.500	0	2	WEST_RAFT	5.5
312	1.70	1	0.00	33.800	0	2	WEST_RAFT	33.8
313	1.10	1	0.00	42.300	0	2	WEST_RAFT	42.3
321	1.30	1	0.00	13.700	0	2	WEST_RAFT	13.7
322	1.20	1	0.00	29.900	0	3	WEST_RAFT	29.9
Sloca	0.60	1	0.00	83.000			WEST_RAFT	83
Sloca	0.60	1	0.00	20.000			WEST_RAFT	20
Sloca	0.60	1	0.00	11.000			WEST_RAFT	11
		LOGGING			ABOVE		WEST_RAFT	300.8
18	3.10	1	0.25	33.000	0	3	UPPER_RAFT	24.75
24	0.60	1	0.00	38.300	0	3	UPPER_RAFT	38.3
25	2.90	1	0.00	39.500	0	3	UPPER_RAFT	39.5
27	11.00	1	0.90	28.600	0	3	UPPER_RAFT	2.86
29	0.60	1	0.00	26.700	0	3	UPPER_RAFT	26.7
30	0.60	1	0.00	34.200	0	3	UPPER_RAFT	34.2
31	0.60	1	0.00	34.000	0	3	UPPER_RAFT	34
32	2.40	1	0.00	29.300	0	3	UPPER_RAT	29.3
33	1.90	1	0.00	27.100	0	3	UPPER_RAFT	27.1
34	1.50	1	0.00	5.500	0	3	UPPER_RAFT	5.5
40	1.70	1	0.00	40.000	0	3	UPPER_RAFT	40
52	1.70	1	0.00	45.300	0	3	UPPER_RAFT	45.3
60	1.70	1	0.00	19.500	0	3	UPPER_RAFT	19.5
63	1.80	1	0.00	31.500	0	3	UPPER_RAFT	31.5
66	0.60	1	0.00	28.900	0	3	UPPER_RAFT	28.9
71	0.60	1	0.00	53.200	0	3	UPPER_RAFT	53.2
121	0.60	1	0.00	31.800	0	3	UPPER_RAFT	31.8
122	0.60	1	0.00	12.300	0	3	UPPER_RAFT	12.3
125	0.60	1	0.00	52.700	0	3	UPPER_RAFT	52.7
132	1.90	1	0.00	16.000	0	3	UPPER_RAFT	16
133	2.20	1	0.00	6.800	0	3	UPPER_RAFT	6.8
134	1.90	1	0.00	8.800	0	3	UPPER_RAFT	8.8
135	1.50	1	0.00	10.700	0	3	UPPER_RAFT	10.7
136	1.50	1	0.00	42.200	0	3	UPPER_RAFT	42.2
137	1.90	1	0.00	43.300	0	3	UPPER_RAFT	43.3
139	1.20	1	0.00	50.600	0	3	UPPER_RAFT	50.6
146	1.90	1	0.00	14.300	0	3	UPPER_RAFT	14.3
147	1.90	1	0.00	11.600	0	3	UPPER_RAFT	11.6
148	1.90	1	0.00	7.200	0	3	UPPER_RAFT	7.2
149	5.50	1	0.50	64.400	0	3	UPPER_RAFT	32.2
150	1.90	1	0.00	19.800	0	3	UPPER_RAFT	19.8
156	2.00	1	0.00	55.000	0	3	UPPER_RAFT	55
160	1.40	1	0.00	6.700	0	3	UPPER_RAFT	6.7
178	0.60	1	0.00	11.200	0	3	UPPER_RAFT	11.2
205	1.40	1	0.00	84.100	0	3	UPPER_RAFT	84.1
212	0.60	1	0.00	32.200	0	3	UPPER_RAFT	32.2
213	0.60	1	0.00	2.800	0	3	UPPER_RAFT	2.8
215	0.60	1	0.00	5.900	0	3	UPPER_RAFT	5.9
216	3.50	1	0.00	58.500	0	3	UPPER_RAFT	58.5
218	3.40	1	0.25	42.200	0	3	UPPER_RAFT	31.65
220	1.50	1	0.25	38.000	0	3	UPPER_RAFT	28.5
222	9.80	1	0.90	1.900	0	3	UPPER_RAFT	0.19
223	1.50	1	0.00	37.700	0	3	UPPER_RAFT	37.7
224	1.50	1	0.00	14.200	0	3	UPPER_RAFT	14.2
226	0.60	1	0.00	34.700	0	3	UPPER_RAFT	34.7
227	1.20	1	0.00	32.800	0	3	UPPER_RAFT	32.8
230	1.80	1	0.00	4.600	0	3	UPPER_RAFT	4.6
231	1.80	1	0.00	9.400	0	3	UPPER_RAFT	9.4
232	1.80	1	0.00	5.700	0	3	UPPER_RAFT	5.7
233	1.80	1	0.00	40.100	0	3	UPPER_RAFT	40.1
235	1.80	1	0.00	29.500	0	3	UPPER_RAFT	29.5
236	1.90	1	0.00	53.700	0	3	UPPER_RAFT	53.7
237	0.60	1	0.00	27.700	0	3	UPPER_RAFT	27.7
238	2.10	1	0.00	41.500	0	3	UPPER_RAFT	41.5
239	1.10	1	0.00	27.000	0	3	UPPER_RAFT	27
240	2.10	1	0.00	44.900	0	3	UPPER_RAFT	44.9
247	28.00	1	0.90	9.900	0	3	UPPER_RAFT	0.99
326	0.60	1	0.00	19.700	0	3	UPPER_RAFT	19.7
343	5.20	1	0.50	11.900	0	3	UPPER_RAFT	5.95
441	12.00	1	0.90	11.300	0	3	UPPER_RAFT	1.13
488	2.90	1	0.00	13.700	0	3	UPPER_RAFT	13.7
488	1.40	1	0.00	21.900	0	3	UPPER_RAFT	21.9
595	1.20	1	0.00	4.700	0	3	UPPER_RAFT	4.7
Sloca	0.60	1	0.00	40.000			UPPER_RAFT	40
Sloca	0.60	1	0.00	7.000			UPPER_RAFT	7
		LOGGING			ABOVE		UPPER_RAFT	1674.22
541	1.40	1	0.00	2.800	1	2	WEST_RAFT	2.8
551	3.50	1	0.25	9.200	1	2	WEST_RAFT	6.9
546	1.60	1	0.00	5.700	1	2	WEST_RAFT	5.7
547	1.60	1	0.00	38.000	1	2	WEST_RAFT	38
554	0.60	1	0.00	4.700	1	2	WEST_RAFT	4.7
564	2.00	1	0.00	7.700	1	2	WEST_RAFT	7.7
567	2.40	1	0.00	7.800	1	2	WEST_RAFT	7.8
571	2.00	1	0.00	22.100	1	2	WEST_RAFT	22.1
581	1.40	1	0.00	1.100	1	2	WEST_RAFT	1.1

Sloca	0.60	1	0.00	29.000			WEST_RAFT	29
		LOGGING			BELOW		WEST_RAFT	125.6
102	32.90	1	0.90	16.400	1	3	UPPER_RAFT	1.64
156	2.00	1	0.00	12.200	0	3	UPPER_RAFT	12.2
173	33	1	0.9	3.2	1	3	UPPER_RAFT	0.32
174	0.60	1	0.00	34.200	1	3	UPPER_RAFT	34.2
176	0.60	1	0.00	60.100	1	3	UPPER_RAFT	60.1
192	23	1	0.9	8.9	1	3	UPPER_RAFT	0.89
200	24	1	0.9	6	1	3	UPPER_RAFT	0.6
344	0.00	1	0.00	8.400	1	3	UPPER_RAFT	8.4
357	0.60	1	0.00	5.600	1	3	UPPER_RAFT	5.6
428	1.30	1	0.00	10.800	1	3	UPPER_RAFT	10.8
430	7.00	1	0.50	1.800	1	3	UPPER_RAFT	0.9
510	0.60	1	0.00	4.000	1	3	UPPER_RAFT	4
511	3.20	1	0.25	3.800	1	3	UPPER_RAFT	2.85
513	0.60	1	0.00	2.900	1	3	UPPER_RAFT	2.9
Sloca	0.60	1	0.00	23.000			UPPER_RAFT	23
Sloca	0.60	1	0.00	22.000			UPPER_RAFT	22
		LOGGING			BELOW		UPPER_RAFT	190.4
9	7.80	2	0.75	10.500	0	2	WEST_RAFT	2.625
15	10.40	2	0.90	33.800	0	2	WEST_RAFT	3.38
		BURNS			ABOVE		WEST_RAFT	6.005
15	10.4	2	0.9	4	0	3	UPPER_RAFT	0.4
62	20.8	2	0.9	26.5	0	3	UPPER_RAFT	2.65
72	9.40	2	0.90	200.000	0	3	UPPER_RAFT	20
73	5.00	2	0.50	72.900	0	3	UPPER_RAFT	36.45
96	10.90	2	0.90	30.100	0	3	UPPER_RAFT	3.01
161	2.30	2	0.00	76.300	0	3	UPPER_RAFT	76.3
166	8.10	2	0.75	25.000	0	3	UPPER_RAFT	6.25
180	13.00	2	0.90	7.700	0	3	UPPER_RAFT	0.77
181	11.90	2	0.90	23.300	0	3	UPPER_RAFT	2.33
184	8.10	2	0.75	26.000	0	3	UPPER_RAFT	6.5
364	17.90	2	0.90	15.300	0	3	UPPER_RAFT	1.53
373	10.00	2	0.90	48.500	0	3	UPPER_RAFT	4.85
384	7.10	2	0.75	22.600	0	3	UPPER_RAFT	5.65
385	24.90	2	0.90	16.300	0	3	UPPER_RAFT	1.63
390	11.90	2	0.90	17.700	0	3	UPPER_RAFT	1.77
400	18.00	2	0.90	12.300	0	3	UPPER_RAFT	1.23
		BURNS			ABOVE		UPPER_RAFT	171.32
575	18.80	2	0.90	3.600	1	2	WEST_RAFT	0.36
		BURNS			BELOW		WEST_RAFT	0.36
72	9.40	2	0.90	44.800	1	3	UPPER_RAFT	4.48
88	9.40	2	0.90	4.800	1	3	UPPER_RAFT	0.48
98	10.20	2	0.90	9.100	1	3	UPPER_RAFT	0.91
103	22.10	2	0.90	81.200	1	3	UPPER_RAFT	8.12
104	15.40	2	0.90	3.900	1	3	UPPER_RAFT	0.39
107	16.30	2	0.90	131.900	1	3	UPPER_RAFT	13.19
108	1.10	2	0.00	6.500	1	3	UPPER_RAFT	6.5
162	4.10	2	0.25	7.800	0	3	UPPER_RAFT	5.85
166	8.10	2	0.75	77.800	0	3	UPPER_RAFT	19.45
387	12.40	2	0.90	41.700	1	3	UPPER_RAFT	4.17
388	19.40	2	0.90	64.100	1	3	UPPER_RAFT	6.41
389	16.50	2	0.90	12.400	1	3	UPPER_RAFT	1.24
399	24.30	2	0.90	28.200	1	3	UPPER_RAFT	2.82
412	17.5	2	0.9	64.1	1	3	UPPER_RAFT	6.41
413	18.40	2	0.90	29.300	1	3	UPPER_RAFT	2.93
		BURNS			BELOW		UPPER_RAFT	78.87

ECA 92M093								
POLY	HTPROJB	ACTIVITY	RECO	AREAPO	H60_	BOUND	NAME	HA
337	1.00	1	0.00	12.000	0	3	UPPER_RAFT	12
380	5.70	1	0.50	30.000	0	3	UPPER_RAFT	15
389	6.30	1	0.50	37.700	0	3	UPPER_RAFT	18.85
392	33.60	1	0.90	53.800	0	3	UPPER_RAFT	5.38
405	6.30	1	0.50	25.800	0	3	UPPER_RAFT	12.9
406	14.00	1	0.90	10.300	0	3	UPPER_RAFT	1.03
413	5.70	1	0.50	28.400	0	3	UPPER_RAFT	14.2
422	8.10	1	0.75	12.400	0	3	UPPER_RAFT	3.1
431	6.30	1	0.50	7.000	0	3	UPPER_RAFT	3.5
432	6.30	1	0.50	2.600	0	3	UPPER_RAFT	1.3
435	6.30	1	0.50	6.400	0	3	UPPER_RAFT	3.2
446	3.00	1	0.00	53.900	0	3	UPPER_RAFT	53.9
447	3.00	1	0.00	30.200	0	3	UPPER_RAFT	30.2
614	2.00	1	0.00	12.600	0	3	UPPER_RAFT	12.6
636	19.30	1	0.90	26.400	0	3	UPPER_RAFT	2.64
844	0.00	1	0.00	1.800	0	3	UPPER_RAFT	1.8
866	0.60	1	0.00	17.300	0	3	UPPER_RAFT	17.3
867	1.10	1	0.00	56.400	0	3	UPPER_RAFT	56.4
868	0.60	1	0.00	46.000	0	3	UPPER_RAFT	46
876	0.00	1	0.00	66.600	0	3	UPPER_RAFT	66.6
889	1.50	1	0.00	44.800	0	3	UPPER_RAFT	44.8
902	1.30	1	0.00	26.300	0	3	UPPER_RAFT	26.3
903	0.60	1	0.00	31.100	0	3	UPPER_RAFT	31.1
908	21.00	1	0.90	11.000	0	3	UPPER_RAFT	1.1
909	28.00	1	0.90	2.000	0	3	UPPER_RAFT	0.2
910	3.00	1	0.25	1.200	0	3	UPPER_RAFT	0.8
911	0.60	1	0.00	42.700	0	3	UPPER_RAFT	42.7
924	0.60	1	0.00	29.000	0	3	UPPER_RAFT	29
933	0.20	1	0.00	46.400	0	3	UPPER_RAFT	46.4
935	0.20	1	0.00	32.200	0	3	UPPER_RAFT	32.2
939	0.00	1	0.00	2.000	0	3	UPPER_RAFT	2
941	0.30	1	0.00	2.000	0	3	UPPER_RAFT	2
980	0.30	1	0.00	12.000	0	3	UPPER_RAFT	12
983	1.30	1	0.00	35.700	0	3	UPPER_RAFT	35.7
988	21.00	1	0.90	7.000	0	3	UPPER_RAFT	0.7
19-5	0.60	1	0.00	2.700			UPPER_RAFT	2.7
22-5	0.60	1	0.00	4.900			UPPER_RAFT	4.9
cp124e	0.60	1	0.00	7.800			UPPER_RAFT	7.8
cp112a	0.60	1	0.00	10.700			UPPER_RAFT	10.7
cp112b	0.60	1	0.00	16.900			UPPER_RAFT	16.9
cp112c	0.60	1	0.00	12.400			UPPER_RAFT	12.4
cp112d	0.60	1	0.00	8.900			UPPER_RAFT	8.9
Slocan	0.60	1	0.00	32.000			UPPER_RAFT	32
		LOGGING			ABOVE		UPPER_RAFT	781.1
867	0.50	1	0.00	15.000	1	3	UPPER_RAFT	15
		LOGGING			BELOW		UPPER_RAFT	15
14	22.80	2	0.90	19.700	0	3	UPPER_RAFT	1.97
16	18.80	2	0.90	11.300	0	3	UPPER_RAFT	1.13
18	16.90	2	0.90	41.700	0	3	UPPER_RAFT	4.17
32	12.00	2	0.90	7.000	0	3	UPPER_RAFT	0.7
33	18.00	2	0.90	28.600	0	3	UPPER_RAFT	2.86
36	17.80	2	0.90	10.000	0	3	UPPER_RAFT	1
40	18.00	2	0.90	21.000	0	3	UPPER_RAFT	2.1
44	9.00	2	0.90	50.600	0	3	UPPER_RAFT	5.06
449	25.50	2	0.90	7.600	0	3	UPPER_RAFT	0.76
496	5.00	2	0.50	2.400	0	3	UPPER_RAFT	1.2
497	7.10	2	0.75	2.000	0	3	UPPER_RAFT	0.5
553	13.20	2	0.90	58.200	0	3	UPPER_RAFT	5.82
564	13.20	2	0.90	10.100	0	3	UPPER_RAFT	1.01
581	19.70	2	0.90	9.900	0	3	UPPER_RAFT	0.99
582	21.00	2	0.90	21.200	0	3	UPPER_RAFT	2.12
583	6.80	2	0.50	341.400	0	3	UPPER_RAFT	170.7
584	22.40	2	0.90	9.700	0	3	UPPER_RAFT	0.97
597	0.20	2	0.00	17.500	0	3	UPPER_RAFT	17.5
600	14.00	2	0.90	24.300	0	3	UPPER_RAFT	2.43
633	2.00	2	0.00	1.700	0	3	UPPER_RAFT	1.7
846	26.30	2	0.90	18.200	0	3	UPPER_RAFT	1.82
847	3.80	2	0.25	160.100	0	3	UPPER_RAFT	120.075
852	3.00	2	0.25	16.800	0	3	UPPER_RAFT	12.6
853	9.00	2	0.90	25.400	0	3	UPPER_RAFT	2.54
854	2.00	2	0.00	9.800	0	3	UPPER_RAFT	9.8
861	6.00	2	0.50	13.200	0	3	UPPER_RAFT	6.6
860	25.70	2	0.90	12.600	0	3	UPPER_RAFT	1.26
873	3.80	2	0.25	9.100	0	3	UPPER_RAFT	6.825
		BURNS			ABOVE		UPPER_RAFT	386.01
3	14.80	2	0.90	2.000	1	3	UPPER_RAFT	0.2
4	22.10	2	0.90	10.400	1	3	UPPER_RAFT	1.04
15	14.00	2	0.90	24.500	1	3	UPPER_RAFT	2.45
24	14.60	2	0.90	45.800	1	3	UPPER_RAFT	4.58
29	14.40	2	0.90	1.100	1	3	UPPER_RAFT	0.11
30	22.80	2	0.90	10.100	1	3	UPPER_RAFT	1.01
31	15.80	2	0.90	6.900	1	3	UPPER_RAFT	0.69
32	17.20	2	0.90	15.000	1	3	UPPER_RAFT	1.5
38	13.00	2	0.90	21.800	1	3	UPPER_RAFT	2.18
40	18.00	2	0.90	31.900	1	3	UPPER_RAFT	3.19
42	12.60	2	0.90	12.800	1	3	UPPER_RAFT	1.28
62	9.40	2	0.90	48.500	1	3	UPPER_RAFT	4.85
455	21.00	2	0.90	19.300	1	3	UPPER_RAFT	1.93
457	22.00	2	0.90	23.200	1	3	UPPER_RAFT	2.32
459	13.00	2	0.90	10.600	1	3	UPPER_RAFT	1.06
468	21.00	2	0.90	28.600	1	3	UPPER_RAFT	2.86
852	3.00	2	0.25	3.000	1	3	UPPER_RAFT	2.25
863	12.00	2	0.90	11.800	1	3	UPPER_RAFT	1.18
864	11.60	2	0.90	15.300	1	3	UPPER_RAFT	1.53
		BURNS			BELOW		UPPER_RAFT	38.21

ECA_BZM092								
POLY	HTPROJ9	ACTVIT	RECOV	AREAPO	H60_N	BOUN	NAME	HA
14	2.50	1	0.00	17.200	0	3	UPPER_RAF	17.2
15	1.50	1	0.00	11.500	0	3	UPPER_RAF	11.5
25	1.70	1	0.00	43.200	0	3	UPPER_RAF	43.2
29	1.80	1	0.00	38.200	0	3	UPPER_RAF	38.2
33	5.20	1	0.50	49.800	0	3	UPPER_RAF	24.9
39	1.90	1	0.00	30.300	0	3	UPPER_RAF	30.3
40	1.90	1	0.00	14.100	0	3	UPPER_RAF	14.1
61	7.30	1	0.75	31.300	0	3	UPPER_RAF	7.825
62	1.40	1	0.00	24.100	0	3	UPPER_RAF	24.1
68	3.00	1	0.25	26.400	0	3	UPPER_RAF	19.8
69	3.10	1	0.25	18.100	0	3	UPPER_RAF	13.575
71	1.40	1	0.00	3.000	0	3	UPPER_RAF	3
72	0.60	1	0.00	11.300	0	3	UPPER_RAF	11.3
74	2.30	1	0.00	18.000	0	3	UPPER_RAF	18
76	19.10	1	0.90	66.000	0	3	UPPER_RAF	6.6
77	19.00	1	0.90	29.400	0	3	UPPER_RAF	2.94
78	3.80	1	0.25	28.800	0	3	UPPER_RAF	21.6
79	1.40	1	0.00	41.400	0	3	UPPER_RAF	41.4
80	1.40	1	0.00	4.400	0	3	UPPER_RAF	4.4
81	1.90	1	0.00	27.300	0	3	UPPER_RAF	27.3
83	1.40	1	0.00	12.700	0	3	UPPER_RAF	12.7
84	0.60	1	0.00	34.200	0	3	UPPER_RAF	34.2
105	1.40	1	0.00	49.600	0	3	UPPER_RAF	49.6
119	0.60	1	0.00	5.400	0	3	UPPER_RAF	5.4
120	1.10	1	0.00	30.700	0	3	UPPER_RAF	30.7
121	1.10	1	0.50	6.500	0	3	UPPER_RAF	3.25
125	0.60	1	0.00	68.300	0	3	UPPER_RAF	68.3
181	0.60	1	0.00	6.100	0	3	UPPER_RAF	6.1
193	4.70	1	0.25	1.000	0	3	UPPER_RAF	0.75
		LOGGING			ABOVE		UPPER_RAF	592.24
89	1.70	1	0.00	4.600	1	3	UPPER_RAF	46.00
91	1.90	1	0.00	6.100	1	3	UPPER_RAF	61.00
		LOGGING			BELOW		UPPER_RAF	107.00
161	6.40	2	0.50	73.500	0	2	WEST_RAFT	36.75
		BURNS			ABOVE		WEST_RAFT	36.75
2	0.60	2	0.00	11.000	0	3	UPPER_RAF	11.00
3	0.60	2	0.00	119.900	0	3	UPPER_RAF	119.90
5	0.60	2	0.00	2.000	0	3	UPPER_RAF	2.00
12	23.30	2	0.50	9.600	0	3	UPPER_RAF	4.80
17	0.60	2	0.00	4.400	0	3	UPPER_RAF	4.40
18	5.20	2	0.50	32.200	0	3	UPPER_RAF	16.10
19	18.90	2	0.00	7.200	0	3	UPPER_RAF	7.20
22	5.20	2	0.50	14.600	0	3	UPPER_RAF	7.30
23	5.20	2	0.50	6.100	0	3	UPPER_RAF	3.05
24	5.20	2	0.50	10.700	0	3	UPPER_RAF	5.35
53	2.90	2	0.00	569.400	0	3	UPPER_RAF	569.40
54	2.90	2	0.00	176.500	0	3	UPPER_RAF	176.5
97	15.40	2	0.90	36.900	0	3	UPPER_RAF	3.69
99	15.40	2	0.90	13.600	0	3	UPPER_RAF	1.36
100	9.40	2	0.90	7.500	0	3	UPPER_RAF	0.75
102	13.90	2	0.90	30.400	0	3	UPPER_RAF	3.04
111	11.90	2	0.90	30.600	0	3	UPPER_RAF	3.06
121	1.10	2	0.00	6.500	0	3	UPPER_RAF	6.50
122	1.10	2	0.00	2.200	0	3	UPPER_RAF	2.20
126	14.30	2	0.90	20.000	0	3	UPPER_RAF	2
134	7.60	2	0.75	2.600	0	3	UPPER_RAF	0.65
136	0.60	2	0.00	90.000	0	3	UPPER_RAF	90.00
137	14.10	2	0.90	42.000	0	3	UPPER_RAF	4.20
144	2.90	2	0.00	252.100	0	3	UPPER_RAF	252.1
157	2.90	2	0.00	83.000	0	3	UPPER_RAF	83
160	11.00	2	0.90	105.600	0	3	UPPER_RAF	10.56
161	6.50	2	0.50	46.000	0	3	UPPER_RAF	23
163	2.90	2	0.00	166.900	0	3	UPPER_RAF	166.9
178	21.10	2	0.50	6.400	0	3	UPPER_RAF	3.2
179	20.80	2	0.50	57.500	0	3	UPPER_RAF	28.75
184	0.60	2	0.00	2.200	0	3	UPPER_RAF	2.2
191	22.10	2	0.90	16.300	0	3	UPPER_RAF	1.63
		BURNS			ABOVE		UPPER_RAF	1615.79
109	11.90	2	0.90	19.000	1	3	UPPER_RAF	1.9
116	8.00	2	0.75	12.900	1	3	UPPER_RAF	3.225
126	14.30	2	0.90	6.600	0	3	UPPER_RAF	0.66
133	9.40	2	0.90	22.300	1	3	UPPER_RAF	2.23
134	7.60	2	0.75	18.600	1	3	UPPER_RAF	4.65
136	0.00	2	0.00	19.800	1	3	UPPER_RAF	19.8
182	1.70	2	0.00	39.700	1	3	UPPER_RAF	39.7
184	0.00	2	0.00	4.200	1	3	UPPER_RAF	4.2
188	1.90	2	0.00	2.200	1	3	UPPER_RAF	2.2
202	22.10	2	0.90	0.600	1	3	UPPER_RAF	0.06
		BURNS			BELOW		UPPER_RAF	78.625

ECA	82M003							
POLY	HTPROJ8	ACTIVIT	RECO	AREAPOL	H60_N	BOUND_I	NAME	HA
41	0.60	1	0.00	15.900	0	3	UPPER_RAFT	15.9
42	1.20	1	0.00	15.900	0	3	UPPER_RAFT	15.9
55	1.20	1	0.00	20.700	0	3	UPPER_RAFT	20.7
60	1.90	1	0.00	28.400	0	3	UPPER_RAFT	28.4
68	1.80	1	0.00	11.800	0	3	UPPER_RAFT	11.8
72	0.60	1	0.00	1.700	0	3	UPPER_RAFT	1.7
76	0.60	1	0.00	7.300	0	3	UPPER_RAFT	7.3
77	0.60	1	0.00	9.400	0	3	UPPER_RAFT	9.4
123	1.20	1	0.00	30.900	0	3	UPPER_RAFT	30.9
136	8.10	1	0.75	36.400	0	3	UPPER_RAFT	6.85
139	0.60	1	0.00	61.600	0	3	UPPER_RAFT	61.6
140	0.60	1	0.90	23.400	0	3	UPPER_RAFT	2.34
141	0.60	1	0.00	35.400	0	3	UPPER_RAFT	35.4
144	0.70	1	0.00	7.200	0	3	UPPER_RAFT	7.2
160	1.10	1	0.00	23.400	0	3	UPPER_RAFT	23.4
161	0.40	1	0.00	10.800	0	3	UPPER_RAFT	10.8
162	0.00	1	0.00	1.800	0	3	UPPER_RAFT	1.8
163	0.00	1	0.00	23.000	0	3	UPPER_RAFT	23
164	1.10	1	0.00	9.500	0	3	UPPER_RAFT	9.5
169	9.00	1	0.90	14.900	0	3	UPPER_RAFT	1.49
220	0.60	1	0.00	159.300	0	3	UPPER_RAFT	159.3
233	4.70	1	0.25	36.400	0	3	UPPER_RAFT	27.3
248	0.60	1	0.00	15.000	0	3	UPPER_RAFT	15
250	0.60	1	0.00	33.000	0	3	UPPER_RAFT	33
258	0.60	1	0.00	14.400	0	3	UPPER_RAFT	14.4
279	0.60	1	0.00	11.800	0	3	UPPER_RAFT	11.8
284	0.60	1	0.00	81.600	0	3	UPPER_RAFT	81.6
290	6.50	1	0.50	12.000	0	3	UPPER_RAFT	6
291	6.50	1	0.50	82.700	0	3	UPPER_RAFT	41.35
308	1.10	1	0.00	13.600	0	3	UPPER_RAFT	13.6
324	1.70	1	0.00	26.300	0	3	UPPER_RAFT	26.3
342	1.10	1	0.00	32.300	0	3	UPPER_RAFT	32.3
365	2.20	1	0.00	31.600	0	3	UPPER_RAFT	31.6
367	3.40	1	0.25	5.400	0	3	UPPER_RAFT	4.05
368	8.30	1	0.75	62.300	0	3	UPPER_RAFT	15.575
381	1.50	1	0.00	24.100	0	3	UPPER_RAFT	24.1
382	2.50	1	0.00	14.500	0	3	UPPER_RAFT	14.5
444	0.00	1	0.00	8.000	0	3	UPPER_RAFT	8
445	4.10	1	0.25	23.600	0	3	UPPER_RAFT	17.7
446	0.60	1	0.00	10.100	0	3	UPPER_RAFT	10.1
448	0.60	1	0.00	22.200	0	3	UPPER_RAFT	22.2
544	2.60	1	0.00	15.500	0	3	UPPER_RAFT	15.5
549	1.90	1	0.00	14.900	0	3	UPPER_RAFT	14.9
567	0.60	1	0.00	11.600	0	3	UPPER_RAFT	11.6
568	2.00	1	0.00	17.500	0	3	UPPER_RAFT	17.5
569	1.00	1	0.00	16.200	0	3	UPPER_RAFT	16.2
573	0.60	1	0.00	40.400	0	3	UPPER_RAFT	40.4
574	30.50	1	0.90	9.600	0	3	UPPER_RAFT	0.96
578	1.10	1	0.00	76.300	0	3	UPPER_RAFT	76.3
582	15.00	1	0.00	3.800	0	3	UPPER_RAFT	3.8
cp136a	9.10	1	0.90	14.600			UPPER_RAFT	0.73
cp136c	9.10	1	0.90	23.000			UPPER_RAFT	1.15
cp136e	9.10	1	0.90	34.500			UPPER_RAFT	1.725
cp136d	0.60	1	0.00	13.400			UPPER_RAFT	6.7
cp136f	9.10	1	0.90	51.900			UPPER_RAFT	2.595
cp154b	9.10	1	0.90	12.000			UPPER_RAFT	0.6
cp154e	9.10	1	0.90	35.500			UPPER_RAFT	1.76
cp119c	9.10	1	0.90	79.000			UPPER_RAFT	3.95
cp117a	9.10	1	0.90	24.000			UPPER_RAFT	1.2
cp117e	9.10	1	0.90	67.000			UPPER_RAFT	3.35
cp117g	9.10	1	0.90	20.600			UPPER_RAFT	1.03
cp117f	9.10	1	0.90	38.000			UPPER_RAFT	1.9
Stocan	0.60	1	0.00	28.000			UPPER_RAFT	28
Stocan	0.60	1	0.00	24.000			UPPER_RAFT	24
		LOGGING			ABOVE		UPPER_RAFT	1232.725
150	0.20	1	0.00	10.000	1	3	UPPER_RAFT	10
158	0.60	1	0.00	34.200	1	3	UPPER_RAFT	34.2
173	0.60	1	0.00	14.900	1	3	UPPER_RAFT	14.9
241	0.30	1	0.00	3.500	1	3	UPPER_RAFT	3.5
272	1.10	1	0.00	60.200	1	3	UPPER_RAFT	60.2
289	0.00	1	0.00	2.700	1	3	UPPER_RAFT	2.7
396	33.00	1	0.90	2.800	1	3	UPPER_RAFT	0.28
402	0.20	1	0.00	1.800	1	3	UPPER_RAFT	1.8
434	0.60	1	0.00	16.900	1	3	UPPER_RAFT	16.9
460	0.60	1	0.00	6.400	1	3	UPPER_RAFT	6.4
473	1.70	1	0.00	9.600	1	3	UPPER_RAFT	9.6
476	1.90	1	0.00	20.600	1	3	UPPER_RAFT	20.6
500	0.60	1	0.00	48.600	1	3	UPPER_RAFT	48.6
		LOGGING			BELOW		UPPER_RAFT	231.88
226	0.60	2	0.00	3.700	0	3	UPPER_RAFT	3.7
393	10.20	2	0.90	32.100	0	3	UPPER_RAFT	3.21
484	12.80	2	0.90	19.700	0	3	UPPER_RAFT	1.97
469	0.60	2	0.00	6.300	0	3	UPPER_RAFT	6.3
504	6.22	2	0.90	62.500	0	3	UPPER_RAFT	6.25
515	14.50	2	0.90	13.500	0	3	UPPER_RAFT	1.35
518	9.00	2	0.90	3.560	0	3	UPPER_RAFT	0.356
702	6.00	2	0.50	1.700	0	3	UPPER_RAFT	0.85
707	14.40	2	0.90	13.300	0	3	UPPER_RAFT	1.33
709	14.40	2	0.90	4.000	0	3	UPPER_RAFT	0.4
		BURNS			ABOVE		UPPER_RAFT	25.716
465	0.60	2	0.00	2.800	1	3	UPPER_RAFT	2.8
487	10.00	2	0.90	45.400	1	3	UPPER_RAFT	4.54
488	12.00	2	0.90	110.900	1	3	UPPER_RAFT	11.09
504	15.00	2	0.90	62.500	1	3	UPPER_RAFT	6.25
505	15.00	2	0.90	4.500	1	3	UPPER_RAFT	0.45
506	15.00	2	0.90	13.600	1	3	UPPER_RAFT	1.36
508	15.00	2	0.90	6.500	1	3	UPPER_RAFT	0.65
509	10.20	2	0.90	3.800	1	3	UPPER_RAFT	0.38
512	22.40	2	0.90	38.100	1	3	UPPER_RAFT	3.81
516	9.00	2	0.90	9.600	1	3	UPPER_RAFT	0.96
517	13.00	2	0.90	48.400	1	3	UPPER_RAFT	4.84
518	9.00	2	0.90	7.600	1	3	UPPER_RAFT	0.76
527	14.60	2	0.90	7.900	1	3	UPPER_RAFT	0.79
529	16.40	2	0.90	13.500	1	3	UPPER_RAFT	1.35
534	18.00	2	0.90	20.400	1	3	UPPER_RAFT	2.04
706	12.00	2	0.90	11.500	1	3	UPPER_RAFT	1.15
709	9.00	2	0.90	4.300	1	3	UPPER_RAFT	0.43
711	18.00	2	0.90	14.500	1	3	UPPER_RAFT	1.45
		BURNS			BELOW	3	UPPER_RAFT	45.1

ECA	83D003							
POLY	HTRPROJ96	ACTIVIT	RECOV	AREAPO	H60_N	BOUND_ID	NAME	HA
404	1.3	1	0	13.3	0	3	UPPER_RAFT	13.3
427	1.2	1	0	48.1	0	3	UPPER_RAFT	48.1
430	1.2	1	0	13.2	0	3	UPPER_RAFT	13.2
434	0.6	1	0	14.7	0	3	UPPER_RAFT	14.7
443	1.1	1	0	21.5	0	3	UPPER_RAFT	21.5
446	1.7	1	0	14.6	0	3	UPPER_RAFT	14.6
447	1.2	1	0	9.8	0	3	UPPER_RAFT	9.8
448	1.2	1	0	6.5	0	3	UPPER_RAFT	6.5
468	30	1	0.9	5.33	0	3	UPPER_RAFT	0.533
473	1.2	1	0	56.6	0	3	UPPER_RAFT	56.6
476	0.6	1	0	6.22	0	3	UPPER_RAFT	6.22
477	0.6	1	0	4.89	0	3	UPPER_RAFT	4.89
481	0.6	1	0	39.6	0	3	UPPER_RAFT	39.6
489	1.4	1	0	21	0	3	UPPER_RAFT	21
490	1.1	1	0	32.7	0	3	UPPER_RAFT	32.7
cp118e	9.1	1	0.9	10.6			UPPER_RAFT	0.53
cp118d	9.1	1	0.9	59.3			UPPER_RAFT	2.965
cp120c	9.1	1	0.9	22.3			UPPER_RAFT	1.115
cp120a	9.1	1	0.9	64.5			UPPER_RAFT	3.225
cp120b	9.1	1	0.9	14			UPPER_RAFT	0.7
cp120d	0.6	1	0	18.6			UPPER_RAFT	9.3
		LOGGING			ABOVE	3	UPPER_RAFT	321.078
323	1.7	2	0	8.44	0	3	UPPER_RAFT	8.44
411	1.2	2	0	7.11	0	3	UPPER_RAFT	7.11
474	1.2	2	0	7.2	0	3	UPPER_RAFT	7.2
		BURNS			ABOVE		UPPER_RAFT	22.75

APPENDIX D

TEMPERATURE DATA FOR THE RAFT RIVER

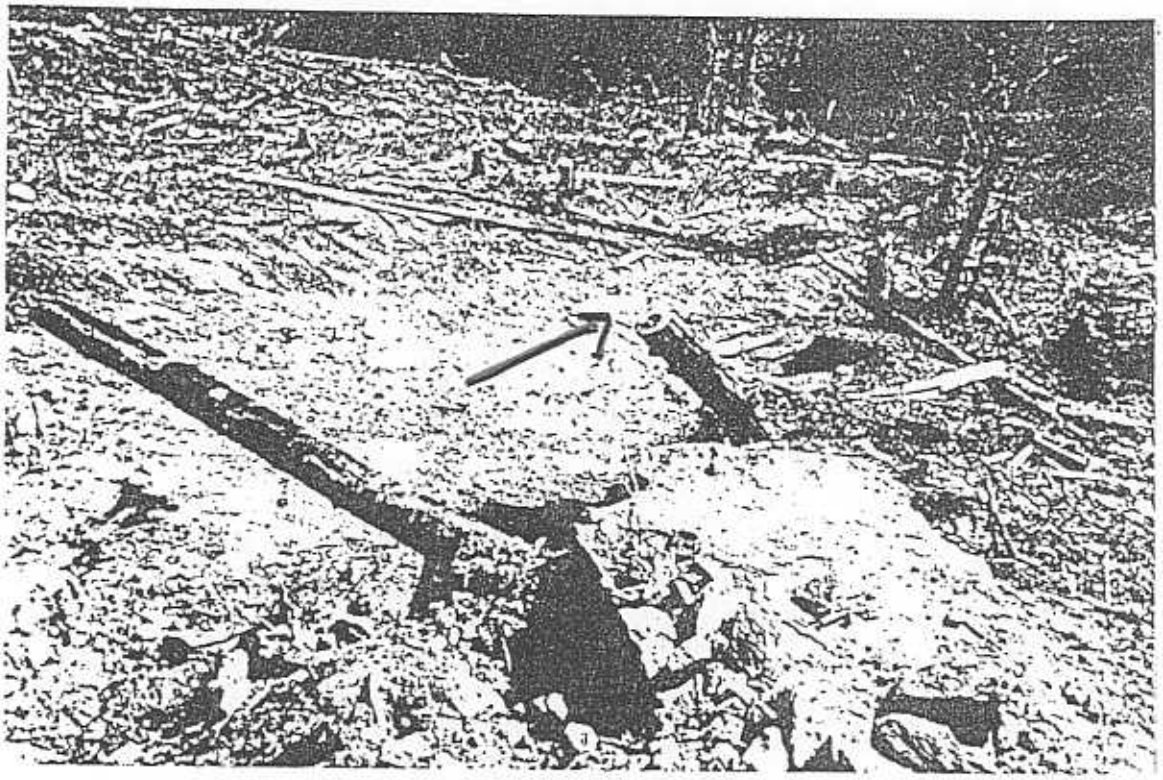
Date: 3/1/96 12:05:30 PM
From: BROWNTJ
Subject: raft river temperature
To: Cathy Cavan (CAVANC@AM@VANHQ1)

wdate	max (	min (	avg (
07/09/93	14.91	14.21	14.74
07/10/93	14.91	13.53	14.18
07/11/93	15.14	13.31	13.9
07/12/93	14.44	13.09	13.82
07/13/93	13.31	12.43	12.78
07/14/93	13.76	12.	12.72
07/15/93	13.76	11.78	12.87
07/16/93	13.09	11.78	12.42
07/17/93	13.53	12.	12.92
07/18/93	14.21	12.43	13.42
07/19/93	14.44	12.43	13.64
07/20/93	14.44	13.53	14.11
07/21/93	15.62	14.21	14.83
07/22/93	15.38	13.76	14.37
07/23/93	15.14	13.53	14.32
07/24/93	15.38	14.21	14.89
07/25/93	15.86	13.53	14.9
07/26/93	17.33	14.67	15.87
07/27/93	16.59	15.38	16.02
07/28/93	15.62	14.67	15.28
07/29/93	15.62	13.99	14.62
07/30/93	14.67	13.31	14.17
07/31/93	14.91	13.09	14.01
08/01/93	15.86	12.65	14.14
08/02/93	16.83	13.99	15.26
08/03/93	17.84	14.91	16.26
08/04/93	18.88	15.62	16.95
08/05/93	18.36	15.86	17.11
08/06/93	18.36	16.59	17.39
08/07/93	17.59	15.38	16.54
08/08/93	17.84	15.14	16.49
08/09/93	17.08	15.62	16.07
08/10/93	16.34	14.44	15.31
08/11/93	16.1	13.99	14.98
08/12/93	16.34	13.53	14.97
08/13/93	16.59	14.67	15.7
08/14/93	17.08	14.91	16.04
08/15/93	17.33	14.67	15.98
08/16/93	18.1	15.86	16.96
08/17/93	19.15	16.59	17.91
08/18/93	18.36	15.86	17.1
08/19/93	18.62	15.62	17.11
08/20/93	18.88	15.86	17.38
08/21/93	18.36	16.83	17.78
08/22/93	18.1	16.34	16.99
08/23/93	16.83	14.67	15.7
08/24/93	14.67	12.43	13.07
08/25/93	12.65	11.57	12.17
08/26/93	13.31	12.21	12.76
08/27/93	13.09	12.65	12.88
08/28/93	12.87	11.36	12.18
08/29/93	13.09	11.36	12.36
08/30/93	13.09	11.15	12.18
08/31/93	12.65	11.57	12.3
09/01/93	13.99	11.78	12.86
09/02/93	14.44	13.09	13.79
09/03/93	14.91	13.76	14.25
09/04/93	14.67	13.31	14.03
09/05/93	14.21	12.65	13.58
09/06/93	14.21	12.65	13.51
09/07/93	14.44	12.65	13.65
09/08/93	14.67	12.87	13.89
09/09/93	14.67	12.65	13.79
09/10/93	15.14	13.09	14.2
09/11/93	14.91	13.53	14.24
09/12/93	13.31	11.36	12.19

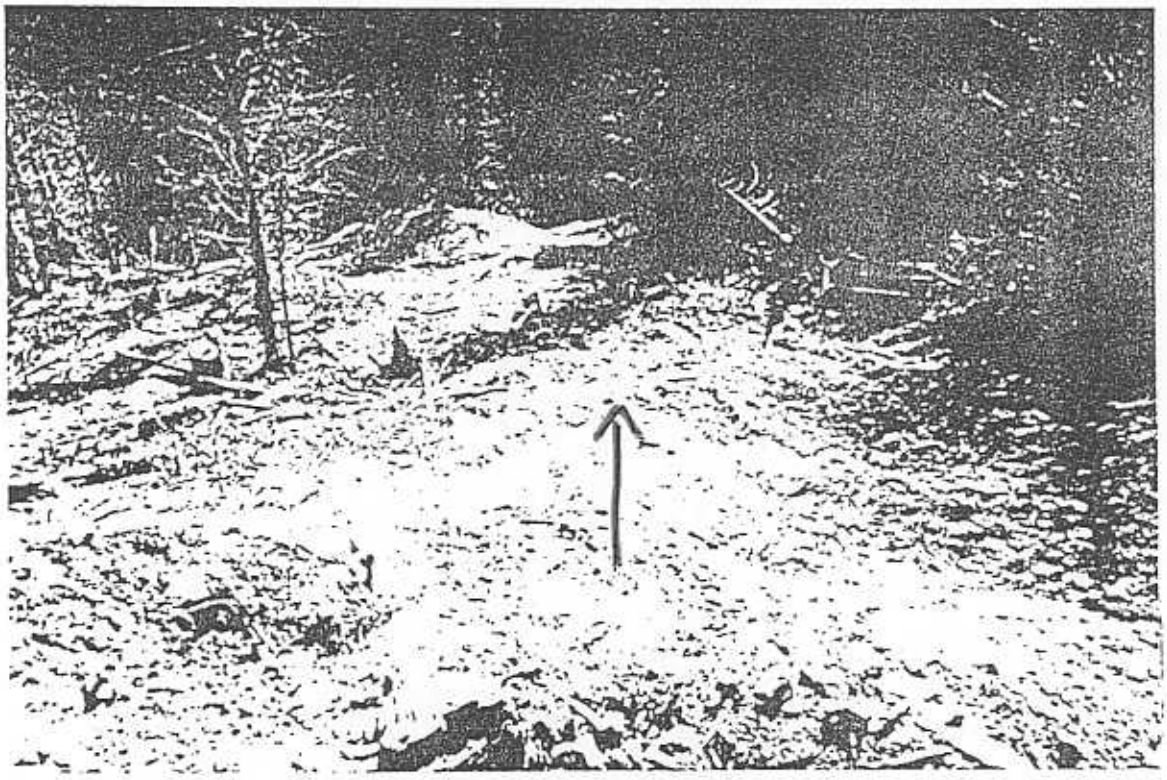
09/13/93	11.78	9.91	10.95
09/14/93	12.43	10.94	11.62
09/15/93	12.21	10.32	11.42
09/16/93	11.78	9.509	10.72
09/17/93	10.94	8.91	10.08
09/18/93	10.94	8.91	10.04
09/19/93	11.36	10.11	10.79
09/20/93	11.15	9.71	10.45
09/21/93	10.32	8.319	9.177
09/22/93	9.109	7.74	8.533
09/23/93	9.109	7.74	8.615
09/24/93	9.91	8.509	9.168
09/25/93	10.94	9.71	10.2
09/26/93	11.57	10.32	10.64

APPENDIX E

MOLLIET CREEK
LANDSLIDE PHOTOGRAPHS



The Landslide
The coloured arrow shows the direction of debris movement.



The Landslide
The coloured arrow shows the direction of debris movement.

APPENDIX F

LETTER TO SMALL BUSINESS FOREST ENTERPRISE PROGRAM

Integrated
Woods Services Ltd.

402 - 1450 Pearson Place, Kamloops, B.C.
Canada V1S 1J9
Phone: (604) 828-7977
Fax: (604) 828-2183

January 11, 1996

Abby Bates
R/O Small Business
Box 4501, R.R. #2
Clearwater, B.C.
V0E 1N0

Re: Opening 091- Mapsheet 82M-082

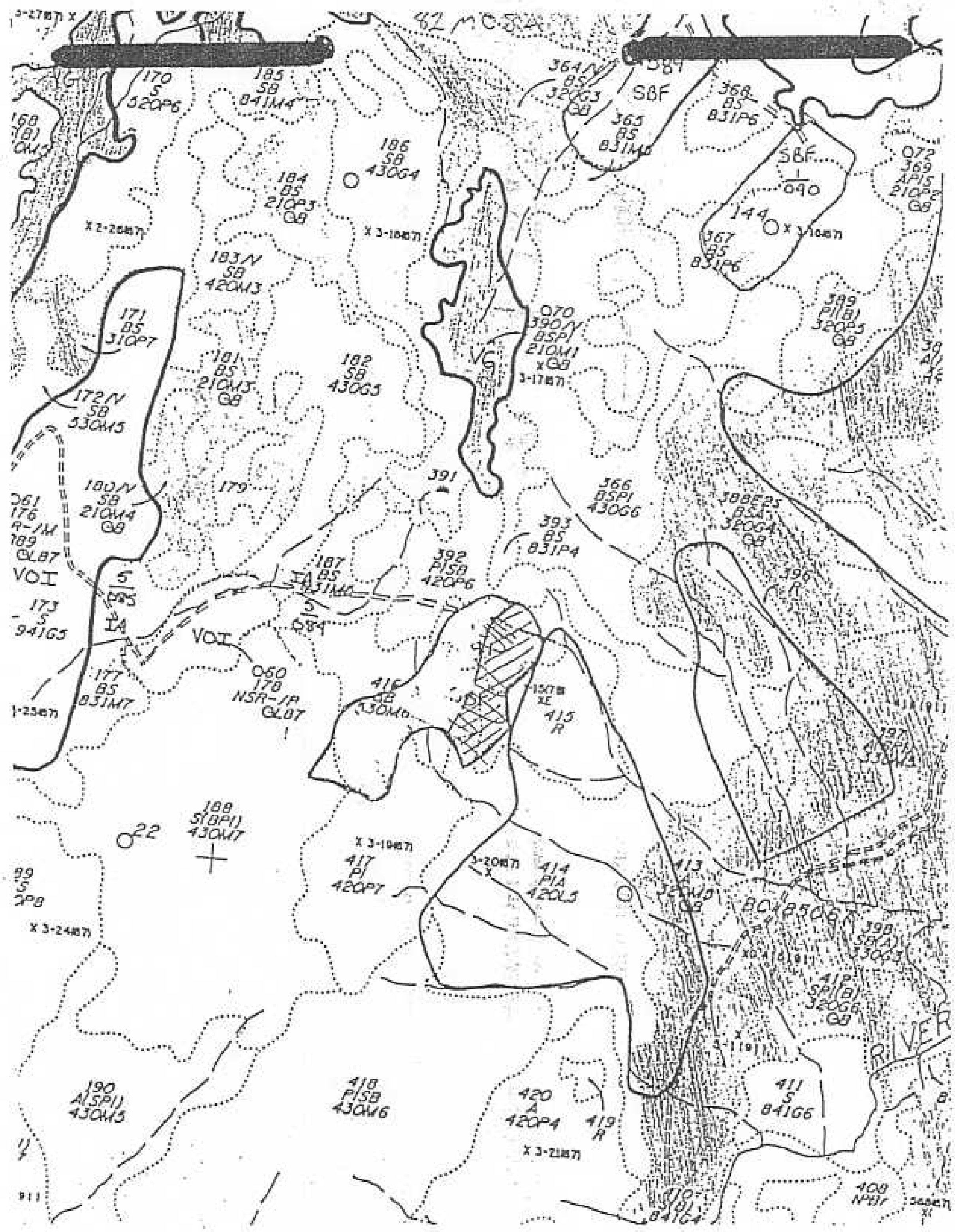
Dear Abbey:

In the course of completing the watershed assessment of the Raft River it came to my attention that Small Business is in the process of developing opening 091. Part of the Interior Watershed Assessment Procedure (IWAP) includes the mapping of potentially unstable terrain and to identify, using airphotos, landslide scars or other indicators of mass wasting. I noticed, when reviewing the area in question with airphotos, that there was extensive dry raveling in the lower portion of the cutblock. I recommend viewing the site in snow free conditions to ensure that all post-harvest requirements can be achieved.

The cutblock is at 318000/5748000 and a copy of the map is attached. The highlighted area was identified in the IWAP process as being potentially unstable.

Sincerely
Integrated Woods Services Ltd.

per Murray Speed, BSF, FIT


[redacted]
[redacted]
SBF
SBF
VG
VOI
IA
186
SB
430G4
182
SB
430G5
188
S(BPI)
430M7
190
A(SPI)
430M5
418
PISB
430M6
366
BSPI
430G6
RIVER

Province of
British Columbia

Ministry of
Forests

Clearwater Forest District
Box 4501, R.R. #2
Clearwater, British Columbia
V0E 1N0

January 23, 1996

File: 19620-20/43211

Murray Speed
Integrated Woods Services Ltd.
402-1450 Pearson Place
Kamloops, British Columbia
V1S 1J9

Dear Murray Speed,

Thankyou for your letter dated January 11, 1996 regarding the watershed assessment of the Raft River area and in particular TSL A43211.

I have reviewed the silviculture prescription for this timber sale and can find no reference to potential terrain instability. Your letter mentioned there may be potentially unstable terrain on the east side of this block. The map and prescription indicate that the east side of the block is on a bench above a type labled Es but the block does not go over the break into this type. The map indicates slopes of 35% or less. I have included a copy of the prescription map that will show the block layout more clearly.

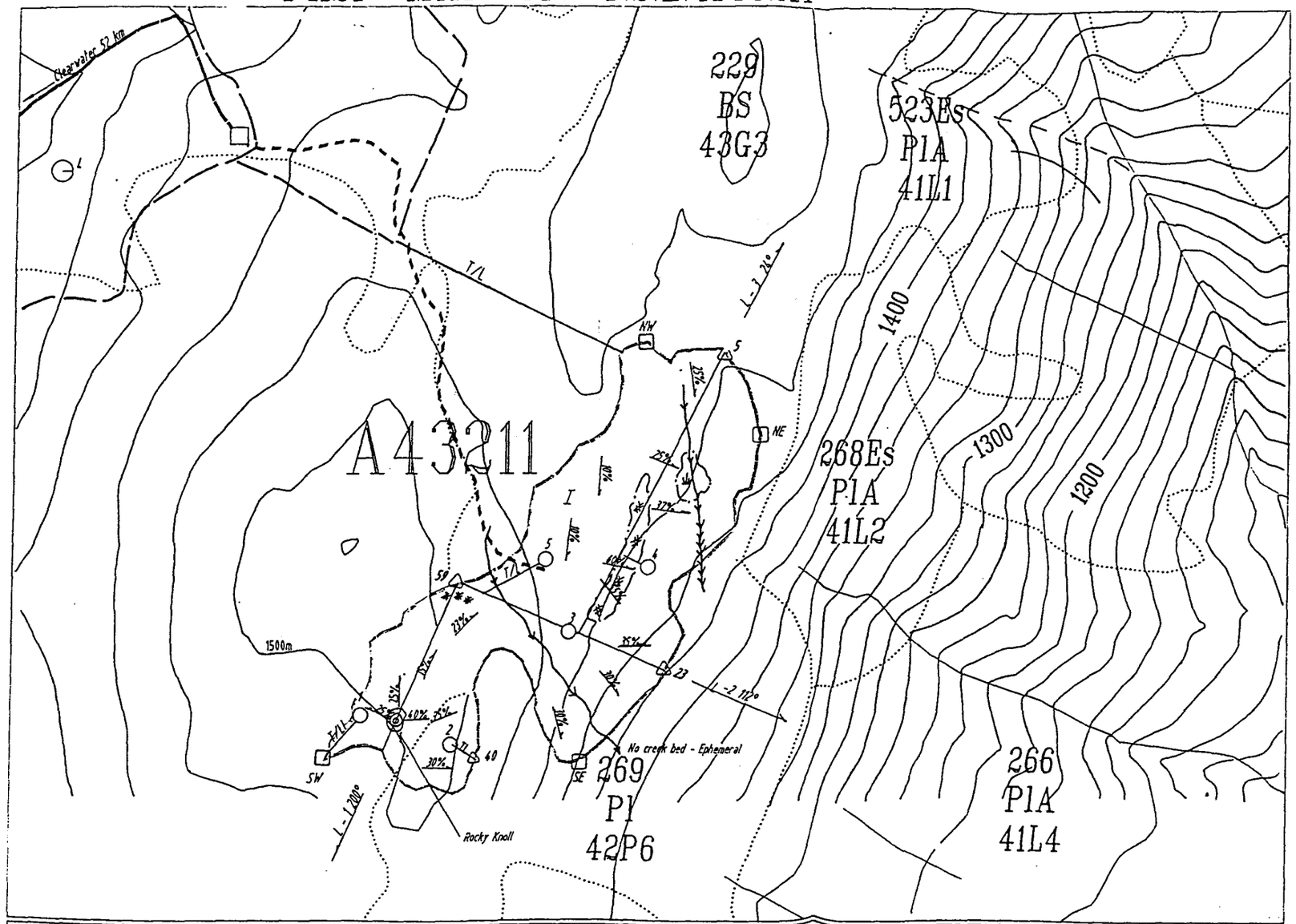
You indicated on the phone that you used the development plan maps that use a much smaller scale to do the airphoto interpretation to determine if this block was in potentially unstable terrain. I think the larger scale prescription map will be more accurate as to the block location. I feel there is no concern about logging this block as prescribed.

If you have any further questions please call me at (604) 587-6700.

Yours truly,

Abbey Bates, R.P.F.
Small Business Officer

PHSP MAP OF: T.S.L. A43211



MAP STRATA	T.U.	SITE UNITS	SLOPE	TREATMENT	PROD. AREA	N.P. ROADS	N.P. NAT.	TOTAL HA.: 11.1
1	A	ESSF wc2(01,03)	5 - 55%	CC/Ground/No SP/Plant Pl/NoB&W	10.6	0.25 ha		
						N.P. Ldg.		
				Totals	10.6	0.25 ha		11.1 ha

LEGEND

- Existing Road
- Proposed Road
- Proposed Landing
- Proposed Boundary
- PHSP Plot Location
- Harv. Meth. Splitline
- Contour (20m)
- Contour (100m)
- Creek
- Type Line (existing)
- PHSP Stratum Bdy

SITE INFORMATION

Location: Richie Creek.
BGC Subzone: ESSFwc2
F.D.: Clearwater
Map Reference: 82M 082
Opening #
REG/COMP: 57/24
Elevation Range: 1420-1500

FOREST MANAGEMENT SERVICES

Rock
Swamp

N

Decl. 20.25° E

DATE: Feb 23, 1994
SCALE - 1: 5000