Fort Nelson Forest District

Vegetation Resources Inventory Project Implementation Plan (VPIP) 2006-2010

Prepared by:

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Executive Summary

On behalf of the Ministry of Forests and Range (MoFR), Canadian Forest Products Ltd. (Canfor) is planning to complete a Vegetation Resources Inventory (VRI) on approximately 3,189,547 hectares or approximately 34% of the Fort Nelson TSA between 2006 and 2010. The objective of this new inventory is to update the existing inventory to VRI standards and improve the inventory data in the eastern and northern portions of the TSA along the Alberta and Northwest Territories (NWT) borders, respectively.

The current inventory for the project area was conducted more than 30 years ago in the early 1970's. It is outdated and does not meet current forest planning needs and creates significant uncertainty in many of the forest management decisions for the Fort Nelson TSA; this is particularly the case with the determination of Fort Nelson Allowable Annual Cut. The VRI Strategic Inventory Plan (November 2006) provides background information on the VRI process and the factors that have lead to MoFR and Canfor embarking on this initiative.

The program will begin in the southeast portion of the TSA in the 094I BCGS letter block, and progress to the north through the 094P letter block, to the NWT border then west along the border covering the area through the 094O, 094N and 094M letter blocks. The following project areas, by priority, have been identified for this inventory program:

- Hay River
- Kwokullie
- Petitot
- Maxhamish
- Crow
- Hot Springs
- Coal River

The following table provides a list of the photo interpretation activities by year that planned for the project area:

Inventory Activity	Fiscal Year ($)				
	'06/07	'07/08	'08/09	'09/10	Total
VSIP & VPIP Photo	15,900.00	0.00	0.00	0.00	**15,900.00**
Air photo acquisition, Scanning and aerial triangulation	391,356.04	195,816.16	0.00	0.00	**587,172.20**
Delineation	202,004.69	0.00	202,004.69	202,004.69	**606,014.07**
Fieldwork & Estimation	0.00	1,414,032.81	1,414,032.81	1,414,032.81	**4,242,098.43**
3rd Party Quality Control	5,000.00	48,159.13	53,159.13	53,159.13	**159,477.39**
Total	**614,260.73**	**1,658,008.10**	**1,669,196.63**	**1,669,196.63**	**$ 5,610,662.09**

Photo acquisition began in the summer of 2006 with approximately 66% of the project area collected and the remaining 33% of the area scheduled for the summer of 2007. Delineation will begin in January 2007 on approximately 1,063,000 ha followed by field calibration and photo interpretation in the 2007/08 fiscal year. In 2008/09 and 2009/10, delineation, field work and estimation are planned for approximately 2,126,000 ha. Cost per activity and year are provided in the table above. The entire photo interpretation budget is estimated at $5,610,662.10.

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1.0 INTRODUCTION

1.1 Background

On behalf of the Ministry of Forests and Range (MoFR), Canadian Forest Products Ltd. (Canfor) is planning to complete a Vegetation Resources Inventory (VRI) on approximately 3,189,547 hectares or approximately 34% of the almost 9.9 million hectares in the Fort Nelson TSA[1]. The objective of this new inventory is to update the existing inventory to VRI standards and improve the inventory data in the eastern and northern portions of the TSA along the Alberta and Northwest Territories borders, respectively. The project will be implemented from 2006/07 to the 2010/11 provincial government fiscal year with the photo interpretation phase completed in the 2009/10 fiscal year.

The current inventory for the project area was conducted more than 30 years ago in the early 1970's. It is now outdated and does not meet current forest planning needs and creates significant uncertainty in many of the forest management decisions for the Fort Nelson TSA; this is particularly the case with the determination of the Allowable Annual Cut. The VRI Strategic Inventory Plan (VSIP) prepared for the Fort Nelson TSA in November 2006 provides the background information on the VRI process and the factors provided by various stakeholders that has lead to MoFR and Canfor embarking on this inventory initiative.

The first step of the VRI program is implementing the photo interpretation phase. To initiate this phase, a VRI Photo Interpretation Project Implementation Plan (VPIP) based upon the higher level strategic direction provided in the VSIP is required. IRC Spatial Data Group Inc. (IRC) through a collaborative process with MoFR and Canfor staff prepared this VPIP. The MoFR is responsible for approving this plan.

This VPIP document has five main sections. The first section, referenced from the VSIP, provides the background information on the VRI process and planning requirements, the current state of the current inventory and a description of the landbase. The second section details the photo interpretation plan. The third and fourth sections of the document provide the project implementation details and a listing of source reference materials. The VPIP concludes with the approval and sign-off by the licensee and the MoFR VRI Section of the Forest Analysis and Inventory Branch.

1.2 The Vegetation Resources Inventory Process

VRI was developed and implemented following the recommendations of the 1991 report *The Future of Our Forests* produced by the Forest Resources Commission. Development and implementation of the VRI was conducted by a group of specialists, representing government, industry, and academia as well as the consulting community.

[1] Fort Nelson VRI Strategic Inventory Plan, November 2006

The Vegetation Resources Inventory is designed to answer two questions:

1. Where is the resource located?
2. How much of a given vegetation resource (for example, timber or coarse woody debris) is within an inventory unit?

The VRI is a vegetation (forest) inventory process that has been approved by the Resources Inventory Standards Committee (RISC) to assess the quantity and quality of BC's timber and vegetation resources. The VRI estimates overall population totals and averages, as well as individual polygon attributes for timber and non-timber resources. Its design is simple, reasonably efficient, statistically defensible, and addresses issues raised by the Forest Resources Commission in its 1991 report, *The Future of Our Forests*.

The VRI consists of several components:

1. BC Land Cover Classification Scheme (BCLCS)
2. Photo Interpreted Estimates (Phase I)
3. Ground Sampling (Phase II) – timber emphasis, ecology, coarse woody debris
4. Net Volume Adjustment Factor (NVAF) sampling
6. Statistical Adjustment
7. Spatial products including line work (polygon boundaries) and a VRI file database

One or more of these components can address specific forest management or inventory issues. For more information, VRI manuals are available through the internet at:

http://ilmbwww.gov.bc.ca./risc/index.htm

This VPIP focuses only on the Photo Interpreted Estimates (Phase I) component.

1.3 VRI Planning

The intent of the VRI planning process is to ensure the inventory baseline products meet a range of applications that are efficiently implemented. A VRI strategic inventory plan (VSIP) is first prepared and then the stakeholders in the District use the VSIP to prepare a coordinated VRI Project Implementation Plans (VPIP's). The VPIP is a working document that details the specific operational activities associated with implementing and documenting the inventory activities identified in the VSIP. A VPIP is required for the photo interpretation and ground sampling phases.

The VSIP and VPIP provide the framework for coordinating the implementation of the provincial VRI over the District and management of inventories over priority areas. The VSIP and VPIP's seek to ensure that VRI products address important issues in priority areas, and support resource-specific management interpretations that address forest management issues. This planning process defines the baseline inventory product needs, ensures the right baseline products are selected to meet a range of applications, and achieves efficiencies in the delivery of the desired inventory products. Coordinated inventory planning also maximizes the value of the inventory data produced by ensuring VRI products are useful for addressing more than one resource issue.

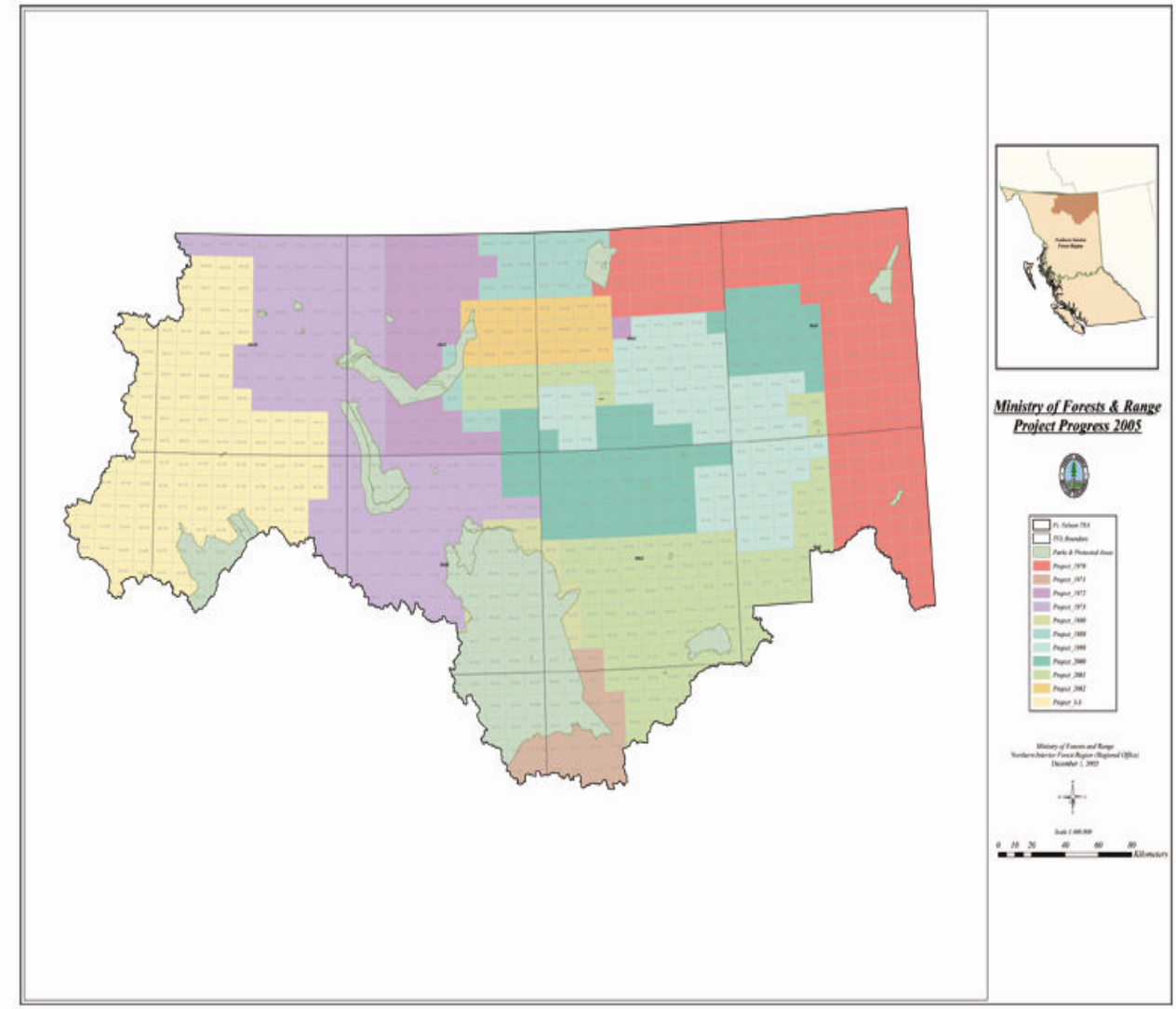
1.4 State of the Current Inventory

The existing forest inventory for the Fort Nelson TSA was completed between 1970 and 2002 with at least two thirds of the inventories completed prior to 1990. Due to the long period over

which the projects were completed and changing methods for data collection, the data is of inconsistent content and accuracy. Although the older data has been "rolled over" from its original format to the new VRI format, there are "holes" in many of the VRI specific attributes as these attributes were not collected in the older inventories. A table detailing the current status of the existing inventories within the Fort Nelson TSA can be found in Section 2.3 "Inventory Documentation and Archive".

In their submissions to the MoFR for the TSR 2, the B.C. Ministry of Environment Lands and Parks (MELP), Fort Nelson Regional Economic Task Force, Slocan Forest Products, Northern Rockies Regional District and Town of Fort Nelson all emphasized the importance of updating and upgrading current inventories for the Fort Nelson TSA. The chief forester states in his AAC determination that an improved inventory is critical in reducing uncertainty in future determinations. Figure 1 provides a map showing the current inventory status for the Fort Nelson TSA[2].

Figure 1 Fort Nelson TSA – Current inventory Status



[2] MoFR The Fort Nelson TSA TSR2 *Rationale for AAC Determination* 2001

1.5 Document Objectives

The objective of this VPIP is to outline and describe the VRI photo interpretation activities scheduled in the Fort Nelson TSA for the period from 2006 to 2010. It provides basic land base and background information based on the ***Fort Nelson TSA TSR 2 Rationale for AAC Determination document (2001)***. A description of the individual phases of the inventory plan including polygon delineation, field sampling, final attributing and digital mapping is provided in this document as well as a description of the quality control and assurance requirements to ensure all work is completed to provincial VRI standards.

In addition, the VPIP provides a project implementation plan that describes scheduling, air photo type and scale, and project personnel. The VPIP serves as the linkage from operational planning to higher level plans and provides direction and considerations for implementing various photo interpretation activities with contractors.

1.6 Description of the Landbase [3]

The Fort Nelson TSA is located in the north-eastern corner of British Columbia and is the second largest timber supply area in the province, covering nearly 9.9 million hectares. The TSA is bordered to the east by Alberta, to the north by the Northwest and Yukon Territories, to the west by the Cassiar TSA and on the south by the Fort St. John and Mackenzie TSA's. The entire region is within the Arctic watershed and is largely drained by the Liard River and its major tributaries including the Fort Nelson, Prophet, Muskwa, Toad, Kechika and Petitot rivers. A smaller area in the eastern portion of the TSA is drained by the Hay River system.

The topography forms a gradient of increasing relief as the landscape changes from boreal forests from the east to the mountainous terrain of the Rocky Mountains in the west. The TSA is characterized with large burned areas and significant mixed wood types.

The TSA contains three biogeoclimatic zones including the Boreal White and Black Spruce (BWBS), Spruce Willow Birch (SWB) and Alpine Tundra (AT). The dominant biogeoclimatic zone is the BWBS zone which covers about two-thirds of the TSA.

The Fort Nelson TSA contains a large portion (42%) of non-productive, non-forest and/or non-crown land. The remaining 58% of the land base is considered productive forest. The majority of the stands in the TSA are dominated by aspen which covers about 40% of the Timber Harvesting Land Base (THLB) and spruce dominates about 33% of the THLB. Pine, cottonwood, and balsam dominate in 23.5 %, 3 %and 0.5% of the THLB, respectively.

Currently, 84% of the forests in the Crown Forest Land Base (CFLB) are between 31 and 160 years of age.

A summary of the Timber harvesting land base determination for the Fort Nelson TSA is found in table 1.

[3] Fort Nelson TSA VSIP – November 2006

Table 1 Fort Nelson TSA – Area Summary[4]

Classification	Net Area Removed (ha)	Percentage of TSA	Percentage of Productive Forest Area (CFLB)
Total TSA Area	9,868,067		
Private land, federal land, woodlots	29,927		
Area Managed by the MoFR	9,838,140	100	
Non-forest, non-productive, no typing	3,705,856	37.67	
Alpine	3,006	0.03	
Non-commercial cover	350,671	3.56	
Existing roads, trails and landings	46,686	0.38	
Total Productive Crown Forest land Base (CFLB)	**5,741,212**	**58.3**	**100**
Parks, UREPS and Ecological Reserves	371,322	3.77	6.87
NSR from wildfire, non-productive or misclassified	76,632	0.78	1.33
Non-merchantable	250,253	2.54	4.36
Low timber productivity	2,729,564	27.74	47.54
Riparian reserve	190,667	1.94	3.32
Environmentally sensitive areas	122,878	1.25	2.14
Unstable terrain	9,197	0.09	0.16
Wildlife range burns	27,109	0.28	0.47
Stand-level biodiversity	367	0.00	0.01
Seismic areas	26,026	0.26	0.45
Inoperable areas	361,670	3.68	6.30
Black spruce leading stands	143,258	1.46	2.50
Total Reductions to CFLB	**4,308,943**	**43.80**	**75.05**
Current Timber Harvesting Land Base	**1,432,269**	**14.56**	**24.95**
Future roads, trails and landings	29,285	0,30	0.52
Future stand-level biodiversity (WTP)	6,272	0.06	0.11
Future Timber Harvesting Land Base	**1,396,172**	**14.15**	**24.32**

[4] MoFR Fort Nelson Timber Supply Area Timber Supply Review 3 Analysis Report Nov. 2005

2.0 Photo Interpretation Plan

2.1 Project Objectives

The overall purpose of the VRI program is to complete a VRI on approximately 3,189,547 hectares or about one third of the TSA to current VRI standards between 2006 and 2010. The inventory will provide improved information required to address the forest management and inventory issues as detailed in the VRI Strategic Inventory Plan.

The specific objectives of the photo interpretation phase are to produce a spatial database consisting of VRI photo interpreted estimates that will:

- Provide the basis for the VRI ground sampling and final statistical analysis and adjustment phases; and

- Improve the inventory to adequately address forest management issues in the District.

The main areas of concerns as documented in the VSIP related to the existing older forest inventory are:

- **Broad Typing** – The VRI standards for polygon delineation are much finer than with the previous forest inventory. Techniques for completing VRI inventories are also improved with the utilization of softcopy photogrammetry. This technique provides higher resolution optics for stereo-viewing compared to the methodology of stereo-viewing photographs in 1970's inventory. With these two improvements over the previous inventory, the VRI will address the issues of broad typing. Average polygon size will be targeted to approximately 11 hectares.

- **Incorrect Species** - Incorrect species is a result of variability within the polygon due to broad stand typing and species conversion resulting from succession. The new inventory will reduce stand species variability through finer typing and will also capture successional changes as climax species in many stands will now be detectable on the photography as they have grown into the main stand canopy.

- **Incorrect Estimate of Site Productivity** – Incorrect estimate of site productivity is also largely because of the broad typing. With finer typing resulting from the VRI inventory, estimates of species, age and height (parameters required for estimating stand site productivity) will be improved that will lead to improved estimates of site productivity.

- **Poor Positional Accuracy of Polygon Boundaries**[5]- Poor positional accuracy of polygon boundaries is a result of using instruments with lower accuracy for mapping in the past. In addition, with the shift of this lower accuracy data ("rubber-sheeted") from the North American Datum (NAD) 27 to a NAD 83, further inaccuracies were created. The VRI, through softcopy photogrammetry and improved mapping techniques will increase the accuracy of spatial location of polygon lines.

- **Poor Estimate of Understorey Spruce** - Understory spruce is difficult to estimate as it can not be readily identified or detected on the photos/images as it is obscured by the main canopy. However, the phase II ground samples will assist in quantifying the amount

[5] Email correspondence between Warren Eng, Dick Nakatsu, Bob Krahn and Gary Johansen. December 2006

of understory spruce for the project area although the exact location of the stands will not be identified.

- **Poor Distinction between Genuses:** Past Inventory standards did not require the distinction between key species at the Genus level. Specifically, Black Spruce vs. White spruce, Native Black Cottonwood vs. Balsam Black Cottonwood and Paper Birch vs. Alaska Birch. Distinction of these species will be required in this program to improve the inventory.

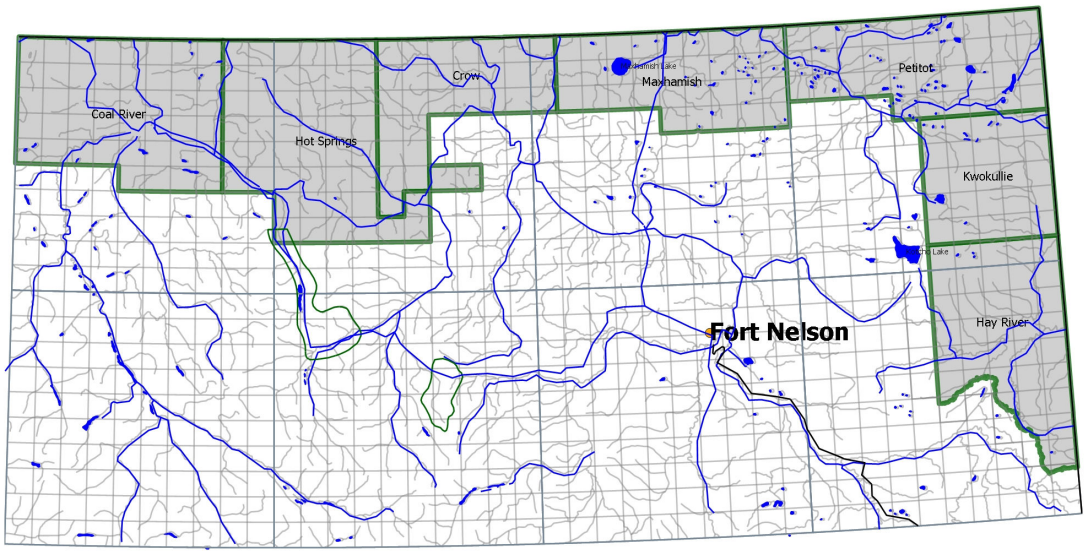
For more details on the forest management issues and inventory product needs identified by the stakeholders, refer to the Fort Nelson TSA December 1998 and November 2006 VSIP documents.

2.2 Target Area

The target area for this VPIP is the eastern and northern portion of the Fort Nelson TSA as shown in Figure 2. The target area comprises a total of 253 mapsheets, covering approximately 3,189,547 hectares. A detailed listing of each mapsheet with their respective area, current number of polygons and in which project area they are located in is found in Appendix 1.

Figure 2

Fort Nelson VRI Program - Remaining VRI Project Areas



All land within the target project area including parks, protected areas, woodlots, and all other parcels of land will be photo interpreted and updated to VRI standards. New VRI delineation and attribution will be tied to the VRI work on the adjacent mapsheet(s) that have been completed in Fort St. John and other projects previously completed in the Fort Nelson TSA.

2.3 Inventory Documentation and Archive [6]

The current forest inventory for the Fort Nelson TSA ranges in vintage from 1970 to 2002 with about two thirds completed prior to 1990. There are 835 mapsheets covering the entire TSA of which 32.7% or 273 have been completed to VRI phase I standards during the 1999 to 2002 time period. Ground and Net Volume Adjustment Factoring (NVAF) sampling was conducted on 249 of the 273 mapsheets followed by attribute adjustments being completed between 2003 and 2004.

The remaining two thirds of the TSA was completed to "traditional" inventory standards and "rolled over" into VRI format. Although the data is in a VRI format, many of the VRI data attributes fields are blank as no information was available from the traditional inventory databases nor new data been gathered. Table 2 provides a list of the major inventory dates, the type of inventory, general location and approximate coverage of the TSA and is shown on a map in figure 1.

Table 2 – Fort Nelson TSA – Current Inventory Status

Year of Inventory	Type of inventory	General location	Approximate Percent of TSA completed
1971 & 1972	Traditional	Eastern portion of TSA along the Alberta and Northwest Territories border	16
1973 & 1974	Traditional	Western portion of TSA	16
1980	Traditional	Central southeastern portion of TSA	13
1989	Traditional	North Central portion of TSA	2
1999 – 2004	VRI with 30% completed with Phase II combined with NVAF and adjustment	Central portion of TSA	33
Unknown	Traditional	Western portion of TSA	20
	Total		**100**

In 1996, the inventory standards in BC changed significantly to meet current forest planning requirements. The older inventory information for the Fort Nelson TSA collected prior to 1996 used methods that are below the current acceptable standard. For example, the NAD 27 base maps that were used for the earlier inventory were not completed to TRIM I or TRIM II standards. Boundaries of forest stands we collected using low-order collection instruments such as the Kail plotter and epidiascope and do not meet today's TRIM controlled mapping standards of 1mm.

During the old unit survey inventories a considerable amount of fieldwork was carried out. It is unknown at the time of writing whether the original 1:15,840 document photos along with information from the old ground and air calls are still available. It should be noted that in many

[6] Fort Nelson TSA VSIP November 2006

cases, the photos used as the basis for preparing the current inventory are even older than the inventory year and their quality not acceptable for today's current practice.

In contrast, the recent vegetation inventories completed for the Kotcho, Nelson Forks, Sahtenah North, Sahtenah South, Kiwigana, Stanolind, Patry Lake, Etane, Kledo/Dunedin, Muskwa, Hoffard, Prophet North, and Prophet South project areas, have been done to current VRI standards. For most of these projects photointerpretation was done using 1:15K color photographs. In a few of the projects 1:40 000 black and white, TRIM II aerial photography was used as a basis for photo interpretation and mapping within the softcopy environment using TRIM II as a base. A further deliverable, of the Nelson Forks project only, was the release of separate bio-terrain mapping in a seamless format to facilitate the development of additional inventory products such as PEM and wildlife modeling.

2.4 Calibration Data Sources

Calibration data sources are field data reference points established across the land where field measurements or estimates on various attributes are gathered. These data sources are used to assist in the delineation and interpretation of forest vegetation types. Some examples of the more common data sources include ground calls, air calls, ground observations and ground samples.

Previous or historical calibration data sources will be reviewed and considered by the photo interpreters, if available, for their potential to be added to the project reference points. All pertinent historical data sources must be considered during the fieldwork planning stage to facilitate the most efficient use of new fieldwork.

The minimum sampling intensity will be 12 ground calls and 12 aircalls with 12 observations per mapsheet[7]. The number of calibration points to be established is based upon preliminary estimates of existing data sources per mapsheet and the relatively small variation in vegetation types within the project area. The final number of calibration points may vary depending upon funding and specific project requirements. The ratio of ground and air calibration points may vary due inaccessibility resulting from potential limited helicopter landing spots[8].

2.5 Polygon Delineation

Each BGC mapsheet included in the project is estimated to have approximately 1200 delineated VRI polygons based upon an 11 hectare average polygon size and will be edge tied to all adjacent mapsheets or TSA or adjacent inventory project boundaries. Final VRI delineation will adhere to the BC Land Cover Classification Scheme and will comply with current VRI standards. Delineation will be completed using softcopy technology in accordance to the most current VRI standards.

For silviculture openings, external boundaries will be delineated from the new photos for vegetation. Internal boundaries and silviculture opening numbers will be maintained for openings that have not been declared free to grow. For new openings or if opening numbers are not in the VRI source file, then numbers will be obtained from the RESULTS spatial file. MoFR VRI Update section can provide access to RESULTS data as required. Silviculture information provided by Canfor or MoFR will be used as reference material to assigning the most appropriate polygon attributes.

[7] Laurence Bowdige**,** 2006. Ministry of Forests and Range. Personal Communication.
[8] Dick Nakatsu, 2006 Ministry of Forests and Range. Personal Communication.

Canfor and MoFR will provide a list of free growing polygons and these areas will be re-delineated with the free growing information utilized as reference material for polygon descriptions.

All new roads and landings will be digitized and kept on a separate layer and provided to BMGS for updating the TRIM II base.

All delineation will be quality control checked and audited to ensure adherence to project objectives and MoFR Standards.

2.6 New Field Calibration

Field calibration will be completed with ground calls, air calls and both air and ground observations. Priority areas for calibration fieldwork are:

- stands with complex species composition
- second growth types
- deciduous-coniferous mixes
- deciduous stands with possible coniferous in-growth
- stands not previously sampled
- polygons larger than 20 ha in size
- a cross-section of stand stages of development
- some vegetated treed and non-treed wetland types

No field work is to be completed in protected areas, parks, woodlots or private land without prior consent of the land owner. Any work in these areas will involve no marking of the calibration point. With the exception of field marking, all work will be completed to current VRI standards.

Prior to the commencement of a field calibration program, a Sampling Plan must be submitted to the project coordinator for approval.

For more information on VRI air call and ground call procedures refer to:

- Ground Call (Ground Calibration) Data Collection Procedures and Standards (version 3.0, March 2004).
- Air Call (Air Calibration) Data Collection Procedures and Standards (version 2.0, March 2003).

Classifiers completing the delineation, fieldwork and final attributing of the mapsheets assigned to them must participate in collecting at least 50% of the field data in the portion of the area they have been assigned responsibility.

2.7 Attribute Estimation

All attribute estimation will be to MoFR VRI standards and it is recommended that the same interpreters responsible for a particular set of mapsheets are involved in the field work component of those mapsheets. Initial delineation will be re-assessed during the final attribute estimation phase to ensure consistency and that VRI standards are met.

The use of softcopy technology facilitates the measurement of tree heights from the scanned photos. Tree heights will be measured in 10% of the polygons to assist in the interpretation of

stand height. In polygons where there is a significant difference in height (3+ m) between the first and second species, a second height on the next leading species will be taken.

All VRI attribute files will be validated through VEGCAPS and delivered to Canfor and MoFR in a format consistent with Ministry standards.

2.8 Mapping

All components of the VRI mapping activities will be completed to provincial mapping standards and specifications. The data will undergo a series of quality control procedures to ensure that it is topologically correct and that the content and structure is in accordance with MoFR standards. Quality control documentation is recommended at the completion of the project. The spatial IGDS data will be checked against the attribute data in the access file to ensure that there is a 1:1 match.

Completed VRI digital graphic files will be submitted to Canfor and MoFR in standard IGDS format and all digitizing must be done to TRIM digitizing standards.

3.0 Project Implementation

3.1 Scheduling

Photo acquisition for the project area(s) was initiated in the summer of 2006 with aerial triangulation and scanning scheduled for completion in December 2006 to provincial specification. VRI photo interpretation and final map product preparation are scheduled for completion in March of 2010. Activities will generally occur on an annual basis as outlined in Table 3.

Table 3 – General Annual Scheduling of Photo Interpretation Activities

Photo Interpretation Activity	Time of year Implemented
Data source Transfer & Polygon delineation	January – March
Field Sample Plan	April
Field Calibration	Late May to end of September
Attribute Estimation	October to March
Digital Mapping	October to March

The following inventory units, by priority will be inventoried:

- Hay River
- Kwokullie
- Petitot
- Maxhamish
- Crow
- Hot Springs
- Coal River

The Interpretation will begin in the southeast portion of the TSA in the 094I BCGS letter block, and progress to the north through the 094P letter block, to the NWT border and west along the NWT border through the 094O, 094N and 094M letter blocks. The anticipated activity and delivery schedule, by project area is listed in Table 4.

Table 4 – Activity and Delivery Schedule*

Project Area	Number of BCGS Mapsheets	Photo Acquisition	Scanning, Aerial Triangulation & Model set-ups	Polygon Delineation	Sample Design	Field Data Collection	Polygon Descriptions	Digital Map Production & Deliverables	Quality Control
Hay River	39	Summer 2006	Fall 2006	Jan-March 2007	Spring 2007	Summer 2007	Oct 2007-March 2008	Oct 2007-March 2008	On going
Kwokullie	25	Summer 2006	Fall 2006	Jan-March 2007	Spring 2007	Summer 2007	Oct 2007-March 2008	Oct 2007-March 2008	On going
Petitot	36	Summer 2006	Fall 2006	Jan-March 2007	Spring 2007	Summer 2007	Oct 2007 - March 2008	Oct 2007-March 2008	On going

Maxhamish	32	Summer 2006	Fall 2006	Spring 2008	Spring 2008	Summer 2008	Oct 2008 - March 2009	Oct 2008 - March 2009	On going
Crow	28	Summer 2006 & 2007	Fall 2006 & 2007	Spring 2008	Spring 2008	Summer 2008	Oct 2008 - March 2009	Oct 2008 - March 2009	On going
Hot Springs	49	Summer 2007	Fall 2007	Spring 2009	Spring 2009	Summer 2009	Oct 2009 - March 2010	Oct 2009 - March 2010	On going
Coal River	44	Summer 2007	Fall 2007	Spring 2009	Spring 2009	Summer 2009	Oct 2009 - March 2010	Oct 2009 - March 2010	On going

*Actual schedule subject to FIA funding.

3.2 Photo Scale

Mid-scale 1:20000 scale aerial photograph will be acquired in 2006 and 2007. At the time of writing, approximately 66% of the area has photography captured in the summer of 2006 with Base Mapping and Geomatic Services (BMGS) currently completing the Aerial Triangulation and scanning. These images are scheduled for completion in December. Photo acquisition of the remaining area is scheduled for the summer of 2007, subject to funding.

As the project covers a significant area and imagery is generally acceptable for 5 years, consideration should be made to whether the remaining 33% of the area should have imagery collected during the summer of 2007. This consideration would be based upon the available funding expected over the next five years and how long it will take to complete the photo interpretation phase for the area covered with the existing imagery.

3.3 Project Coordinator

The project coordinator for the upcoming VRI projects will be Darrell Regimbald of Canadian Forest Product Ltd., Fort Nelson Division. Contact information:

Darrell Regimbald
Canadian Forest Products Ltd.
Fort Nelson, BC
(250)-233-6622

The project coordinator will be responsible for the overall project coordination and will ensure the required final deliverables are to VRI standards and provided to the appropriate agencies upon completion of the project.

3.4 Project Personnel

Provincially certified photo interpreters will be required to complete the delineation and estimation of attributes using softcopy methodology in accordance to the most current VRI standards. All VRI Photo interpreted attributes will require collection to VRI standards and specifications. The certified photo interpreter supervisor will be responsible for any work completed by non-certified individuals.

At least 50% of the photo interpreters must be VRI certified and all non-certified individuals must have successfully completed the Basic VRI Photo Interpretation Course. Non-certified interpreters must work directly under the supervision of a certified interpreter for training and quality control. All supervising certified interpreters are responsible for the quality of work

completed under their certification. Preference will be given to those with more than 2 years experience photo interpreting in north eastern BC.

Given the current demand for VRI photo interpreters, it is important that prior to awarding of the project(s), the contractor must demonstrate capacity to complete the project(s).

3.5 Quality Assurance

All project work must be completed to provincial VRI standards and have been approved by Quality Assurance performed by an independent third party. Quality assurance will be completed for the delineation, ground and air calls calibration data collection and attribution activities. Quality assurance will be completed in accordance to the latest standards.

The selected quality assurance photo interpreter must be certified and possess at least 5 years of photo interpretation experience in BC and 3 years of softcopy experience. Quality assurance will be completed on 2 to 5% of each phase of the project.

- Delineation – approximately 2% of the polygons
- Fieldwork – approximately 5% of the field samples
- Final Attribute Estimation - approximately 2% of the polygons

Documentation of all quality assurance checks will be maintained in acceptable MoFR format and provided to the Project Coordinator and MoFR.

As part of the quality assurance program, the VRI contractor will hold a field data collection pre-work meeting in the project area at the commencement of the fieldwork program. The purpose of the pre-work meeting is to ensure that all individuals involved in the field data collection, monitoring and/or evaluation have a common understanding of the standards, specifications, and procedures that will be employed. It will also ensure that all attributes are collected in a consistent and accurate manner.

Participants for the pre-work meeting will include:

- Project Manager and Project Supervisors
- VRI interpreters
- Canfor Project Coordinator or representative
- Quality Assurance Contractor
- MoFR VRI specialists

All air calls will be flown with two certified photo interpreters in the helicopter as a means for quality assurance. Photo interpreters will complete air calls on the mapsheets they have been assigned.

To ensure accuracy of air and ground calibration locations, GPS coordinates will be required for all fieldwork calibration points.

The project coordinator will ensure the inventory contractor(s) conducting the inventory provides adequate and ongoing internal quality assurance (QA) of all deliverables. The results of all

quality assurance will be recorded on approved QA forms, as a record for both the individuals performing the work and for Canfor and the Ministry.

3.6 Deliverables

The final deliverables for this VRI photo interpretation project include:

- Digital Spatial and Attribute data in a format consistent with provincial standards.
- Final Vegcap reports
- Quality Assurance reports.
- Project Completion Report including but not limited to:

  a) identifying photo interpreters completing polygon delineation and attribute estimation,
  b) listing of the approximate percentage of the mapsheet completed,
  c) identifying certified interpreter responsible for internal quality assurance,
  d) containing a copy of the contractors internal quality control reports,
  e) providing the name of the third party quality assurance photo interpreter,
  f) containing a copy of the quality assurance reports, and
  g) detailing the total cost to complete the project

3.7 Reference Materials

The following reference material is readily available for the project:

- Fort Nelson TSA VRI Request for Proposal
- Fort Nelson VRI Strategic Inventory Plan
- Fort Nelson VRI Project Implementation Plan
- VRI BC Land Cover Classification Scheme
- VRI Photo Interpretation Procedures
- VRI Quality Assurance Procedures and Standards
- VRI Ground Calibration Data Collection Procedures and Standards
- VRI Air Call Data Collection Procedures and Standards
- ILMB Vector Cleaning Specifications
- MOFR Forest Inventory Manual
- MOFR Color Stereogram, Handbook
- MOFR Black and White Stereogram Handbook
- Several tree and plant field guide books

The current version of these reference materials should be utilized.

4.0 COSTS

A summary of the cost for completing the various VRI activities for the 3,189,547 hectares is provided in Table 6.

Table 5 provides associated costs for each inventory activities, by fiscal year.

Table 5 – Cost Schedule*

Inventory Activity	Fiscal Year ($) '06/07	'07/08	'08/09	'09/10	Total
VSIP & VPIP Photo	15,900.00	0.00	0.00	0.00	**15,900.00**
Air photo acquisition, scanning and aerial triangulation	391,356.04	195,816.16	0.00	0.00	**587,172.20**
Budget Delineation	202,004.69	0.00	202,004.69	202,004.69	**606,014.07**
Budget Fieldwork & Estimation	0.00	1,414,032.81	1,414,032.81	1,414,032.81	**4,242,098.43**
3rd Party Quality Control	5,000.00	48,159.13	53,159.13	53,159.13	**159,477.39**
Totals	**$ 614,260.73**	**$ 1,658,008.10**	**$ 1,669,196.63**	**$ 1,669,196.63**	**$ 5,610,662.09**

*Subject to FIA funding.

5.0 VRI Photo Interpretation Project Implementation Plan Approval

I have read and concur that the Fort Nelson TSA Vegetation Resources Inventory Project Implementation Plan for photo interpretation, prepared by IRC Spatial Data Group and dated December 2006, meets current Vegetation Resources Inventory Standards, business needs and considerations.

_____
Manager, VRI
Ministry of Forests and Range,
Forest Analysis and Inventory Branch

_____
Date

I acknowledge that the Fort Nelson TSA Vegetation Resources Inventory Project Implementation Plan for photo interpretation, prepared by IRC Spatial Data Group dated December 2006, has been approved by the Ministry of Forest and Range. I further acknowledge that Canfor Fort Nelson Division on behalf of Ministry of Forest and Range will implement the VRI program with funding provided by the Provincial government.

_____
Woodlands Manager,
Canfor,
Fort Nelson Division

_____
Date

Appendix 1 – Area, Current Number of Polygons, Project Area and Priority by Mapsheet.

Mapsheet	Polygons	Area	Project Area	Priority
94I029	475	13082.2	Hay River	1
94I030	419	13083.7	Hay River	1
94I038	316	13043.2	Hay River	1
94I039	569	13046.1	Hay River	1
94I040	475	13047.8	Hay River	1
94I046	476	13005.1	Hay River	1
94I048	318	13007.4	Hay River	1
94I049	376	13009.5	Hay River	1
94I050	296	13008.1	Hay River	1
94I056	489	12969.5	Hay River	1
94I057	405	12971.3	Hay River	1
94I058	379	12970.7	Hay River	1
94I059	135	12968.9	Hay River	1
94I060	330	12972.2	Hay River	1
94I066	403	12932.2	Hay River	1
94I067	561	12932.5	Hay River	1
94I068	522	12934.1	Hay River	1
94I069	212	12933.1	Hay River	1
94I070	247	12936.3	Hay River	1
94I076	616	12897.2	Hay River	1
94I077	568	12896.5	Hay River	1
94I078	549	12900.4	Hay River	1
94I079	435	12898.5	Hay River	1
94I080	417	12898.7	Hay River	1
94I086	643	12859.4	Hay River	1
94I087	511	12861.1	Hay River	1
94I088	370	12859.4	Hay River	1
94I089	256	12860.6	Hay River	1
94I090	319	12863.5	Hay River	1
94I096	337	12820.8	Hay River	1
94I097	403	12822.3	Hay River	1
94I098	304	12824.1	Hay River	1
94I099	396	12824.4	Hay River	1
94I100	370	12824.1	Hay River	1
94M045	92	12633.3	Coal River	4
94M046	123	12634.5	Coal River	4
94M047	129	12634.3	Coal River	4
94M048	139	12636.8	Coal River	4
94M049	125	12637.6	Hot Springs	4
94M050	98	12637.4	Hot Springs	4
94M051	228	12594.6	Coal River	4
94M052	234	12595.2	Coal River	4
94M053	204	12596.8	Coal River	4

94M054	158	12596.8	Coal River	4
94M055	131	12597.1	Coal River	4
94M056	146	12597.9	Coal River	4
94M057	109	12596.6	Coal River	4
94M058	144	12599.2	Coal River	4
94M059	110	12601.1	Hot Springs	4
94M060	81	12601.5	Hot Springs	4
94M061	207	12557.6	Coal River	4
94M062	152	12559.6	Coal River	4
94M063	157	12558.3	Coal River	4
94M064	153	12559.1	Coal River	4
94M065	137	12561.3	Coal River	4
94M066	145	12562.0	Coal River	4
94M067	118	12560.7	Coal River	4
94M068	127	12561.6	Coal River	4
94M069	142	12563.4	Hot Springs	4
94M070	106	12564.1	Hot Springs	4
94M071	177	12518.6	Coal River	4
94M072	177	12519.5	Coal River	4
94M073	119	12521.8	Coal River	4
94M074	171	12521.3	Coal River	4
94M075	166	12523.9	Coal River	4
94M076	92	12522.4	Coal River	4
94M077	80	12523.6	Coal River	4
94M078	97	12524.4	Coal River	4
94M079	106	12525.6	Hot Springs	4
94M080	147	12526.5	Hot Springs	4
94M081	183	12483.2	Coal River	4
94M082	209	12485.2	Coal River	4
94M083	130	12483.5	Coal River	4
94M084	129	12484.9	Coal River	4
94M085	148	12484.7	Coal River	4
94M086	81	12485.3	Coal River	4
94M087	96	12486.5	Coal River	4
94M088	122	12487.3	Coal River	4
94M089	146	12489.2	Hot Springs	4
94M090	111	12489.5	Hot Springs	4
94M091	217	12550.9	Coal River	4
94M092	142	12570.2	Coal River	4
94M093	148	12573.6	Coal River	4
94M094	110	12558.4	Coal River	4
94M095	108	12562.6	Coal River	4
94M096	84	12550.7	Coal River	4
94M097	127	12448.9	Coal River	4
94M098	104	12450.1	Coal River	4
94M099	149	12450.8	Hot Springs	4
94M100	132	12452.4	Hot Springs	4
94N021	131	12713.6	Hot Springs	3

94N022	128	12712.1	Hot Springs	3
94N023	96	12710.6	Hot Springs	3
94N024	96	12708.2	Hot Springs	3
94N025	66	12708.7	Hot Springs	3
94N026	146	12707.6	Hot Springs	3
94N031	96	12675.0	Hot Springs	3
94N032	126	12673.8	Hot Springs	3
94N033	111	12673.5	Hot Springs	3
94N034	120	12672.7	Hot Springs	3
94N035	150	12671.8	Crow	3
94N036	529	12674.5	Hot Springs	3
94N041	104	12637.8	Hot Springs	3
94N042	101	12637.3	Hot Springs	3
94N043	71	12636.6	Hot Springs	3
94N044	98	12635.8	Hot Springs	3
94N045	109	12633.6	Crow	3
94N046	435	12635.6	Crow	3
94N047	616	12636.7	Hot Springs	3
94N048	565	12637.2	Hot Springs	3
94N051	66	12600.6	Hot Springs	3
94N052	120	12600.1	Hot Springs	3
94N053	80	12598.4	Hot Springs	3
94N054	110	12598.6	Hot Springs	3
94N055	90	12596.1	Crow	3
94N056	108	12595.6	Crow	3
94N061	100	12563.7	Hot Springs	3
94N062	106	12564.1	Hot Springs	3
94N063	91	12561.2	Hot Springs	3
94N064	81	12560.5	Hot Springs	3
94N065	125	12560.2	Crow	3
94N066	117	12560.4	Crow	3
94N071	146	12526.5	Hot Springs	3
94N072	117	12524.5	Hot Springs	3
94N073	35	12523.4	Hot Springs	3
94N074	21	12522.8	Hot Springs	3
94N075	48	12521.5	Crow	3
94N076	58	12521.4	Crow	3
94N077	94	12521.8	Crow	3
94N078	379	12521.7	Crow	3
94N079	601	12524.4	Crow	3
94N080	555	12523.4	Crow	3
94N081	110	12488.9	Hot Springs	3
94N082	126	12489.0	Hot Springs	3
94N083	40	12487.1	Hot Springs	3
94N084	9	12485.3	Hot Springs	3
94N085	65	12484.8	Crow	3
94N086	48	12483.6	Crow	3
94N087	81	12483.2	Crow	3

94N088	155	12483.2	Crow	3
94N089	678	12486.7	Crow	3
94N090	548	12485.6	Crow	3
94N091	90	12451.9	Hot Springs	3
94N092	95	12450.3	Hot Springs	3
94N093	48	12449.3	Hot Springs	3
94N094	44	12448.9	Hot Springs	3
94N095	26	12700.8	Crow	3
94N096	62	12446.4	Crow	3
94N097	76	12446.1	Crow	3
94N098	387	12448.0	Crow	3
94N099	750	12450.7	Crow	3
94N100	575	12446.8	Crow	3
94O066	114	12555.6	Maxhamish	2
94O067	112	12554.6	Maxhamish	2
94O068	91	12555.0	Maxhamish	2
94O069	84	12555.2	Maxhamish	2
94O070	56	12555.2	Maxhamish	2
94O071	608	12521.6	Crow	2
94O072	548	12522.0	Maxhamish	2
94O073	318	12519.1	Maxhamish	2
94O074	92	12518.1	Maxhamish	2
94O075	120	12517.4	Maxhamish	2
94O076	96	12517.6	Maxhamish	2
94O077	136	12518.7	Maxhamish	2
94O078	73	12518.4	Maxhamish	2
94O079	86	12518.3	Maxhamish	2
94O080	122	12519.0	Maxhamish	2
94O081	520	12484.9	Crow	2
94O082	547	12485.3	Maxhamish	2
94O083	478	12485.4	Maxhamish	2
94O084	129	12481.9	Maxhamish	2
94O085	77	12481.5	Maxhamish	2
94O086	124	12481.6	Maxhamish	2
94O087	100	12482.4	Maxhamish	2
94O088	43	12480.2	Maxhamish	2
94O089	88	12481.3	Maxhamish	2
94O090	169	12481.6	Maxhamish	2
94O091	419	12446.0	Crow	2
94O092	316	12447.4	Maxhamish	2
94O093	276	12445.1	Maxhamish	2
94O094	93	12444.4	Maxhamish	2
94O095	105	12443.1	Maxhamish	2
94O096	172	12444.4	Maxhamish	2
94O097	76	12443.2	Maxhamish	2
94O098	99	12443.8	Maxhamish	2
94O099	103	12442.9	Maxhamish	2
94O100	106	12444.5	Maxhamish	2

94P006	225	12784.3	Hay River	1
94P007	395	12785.2	Hay River	1
94P008	265	12785.8	Hay River	1
94P009	138	12785.1	Hay River	1
94P010	335	12789.0	Hay River	1
94P016	222	12746.7	Kwokullie	1
94P017	252	12747.6	Kwokullie	1
94P018	260	12748.5	Kwokullie	1
94P019	357	12749.6	Kwokullie	1
94P020	449	12751.7	Kwokullie	1
94P026	157	12709.4	Kwokullie	1
94P027	102	12709.2	Kwokullie	1
94P028	179	12710.9	Kwokullie	1
94P029	368	12713.1	Kwokullie	1
94P030	478	12714.8	Kwokullie	1
94P036	117	12672.1	Kwokullie	1
94P037	127	12672.8	Kwokullie	1
94P038	160	12674.2	Kwokullie	1
94P039	129	12673.5	Kwokullie	1
94P040	225	12676.7	Kwokullie	1
94P046	168	12634.6	Kwokullie	1
94P047	177	12635.5	Kwokullie	1
94P048	147	12635.3	Kwokullie	1
94P049	129	12638.2	Kwokullie	1
94P050	218	12637.4	Kwokullie	1
94P056	201	12598.4	Kwokullie	1
94P057	215	12599.1	Kwokullie	1
94P058	110	12598.5	Kwokullie	1
94P059	133	12599.8	Kwokullie	1
94P060	147	12600.7	Kwokullie	1
94P065	171	12559.3	Petitot	1
94P066	160	12560.2	Petitot	1
94P067	163	12561.6	Petitot	1
94P068	105	12562.5	Petitot	1
94P069	128	12563.9	Petitot	1
94P070	134	12563.2	Petitot	1
94P071	163	12520.1	Petitot	1
94P072	143	12520.4	Petitot	1
94P073	141	12520.3	Petitot	1
94P074	120	12521.6	Petitot	1
94P075	97	12522.6	Petitot	1
94P076	150	12523.0	Petitot	1
94P077	130	12524.3	Petitot	1
94P078	89	12524.3	Petitot	1
94P079	123	12525.7	Petitot	1
94P080	133	12526.7	Petitot	1
94P081	220	12484.3	Petitot	1
94P082	150	12483.9	Petitot	1

94P083	129	12484.2	Petitot	1
94P084	77	12483.7	Petitot	1
94P085	53	12483.8	Petitot	1
94P086	99	12485.3	Petitot	1
94P087	129	12486.6	Petitot	1
94P088	73	12486.7	Petitot	1
94P089	126	12488.7	Petitot	1
94P090	144	12490.1	Petitot	1
94P091	92	12445.5	Petitot	1
94P092	88	12445.6	Petitot	1
94P093	105	12445.3	Petitot	1
94P094	91	12445.6	Petitot	1
94P095	103	12447.5	Petitot	1
94P096	96	12448.5	Petitot	1
94P097	76	12448.4	Petitot	1
94P098	74	12448.8	Petitot	1
94P099	64	12450.8	Petitot	1
94P100	75	12451.3	Petitot	1
Total	50250	3189547.7		