



Mackenzie Land and Resource Management Plan

Socio-Economic & Environmental Assessment of the “Mackenzie Draft Recommended Land and Resource Management Plan”

prepared by

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October 2000



TO: Mackenzie LRMP Inter-agency Planning Team
FROM: Gord Enemark, Senior Analyst - Ministry of Employment & Investment
RE: Socio-economic & Environmental Impact Assessment of Draft Mackenzie LRMP
DATE: October 2, 2000

Included herein is the assessment of the key socio-economic and environmental implications of the *Mackenzie Draft Recommended Land and Resource Management Plan (June 2000)*. Please note that the methodology attempts to be as consistent as possible with the principles outlined in the provincial government's document *Social and Economic Impact Assessment for Land and Resource Management Planning in BC: Interim Guidelines, 1993*.

The assessment was done in as balanced and value-neutral fashion as possible, by experienced independent consulting resource economists and wildlife biologists. Marvin Shaffer (Marvin Shaffer & Associates Ltd.) undertook the assessment of socio-economic implications for mineral and petroleum resources. Gary Holman (Consulting Economist) is responsible for the Forestry, Tourism, First Nations, and remaining sections in the socio-economic portion (Part I) of the document. As for the environmental component (Part II), Eliot Terry (R.P. Bio., Keystone Wildlife Research) assessed the implications for wildlife/biodiversity and Jim Trask (R.P. Bio., Triton Environmental Consultants) provided the fisheries section.

None of the conclusions reached are meant to imply that the recommended Land Use Plan is preferred over any other particular scenario, including the Base Case. Rather, the goal is to objectively clarify the implications and trade-offs that would occur under the Land Use Plan vs. the Base Case situation. The intent is to provide an impartial assessment for decision-makers, recognizing that the main contribution of is only to more clearly express the choices that are to be made.

It should be noted that significant efforts were made to work with the Ministry of Energy and Mines to estimate resource impacts in order to provide quantified estimates of the *incremental* mineral/petroleum related socio-economic impacts arising from the recommended Land Use Plan. However, this task was exceptionally challenging due to the hidden nature of those resources, the "strategic" or "high-level" LRMP management language for zones outside of Protected Areas, and uncertainties about the extent to which the recommended LRMP direction is already occurring under Base Case current management.

Please contact me directly if there are any questions or comments on the assessment. Written comments can be provided at:

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Summary of Socio-Economic Implications: Base Case vs. Recommended Land Use Plan

ACCOUNT	BASE CASE IMPLICATIONS (includes TSR, FPC & RPAT PAs)	LAND USE PLAN vs. BASE CASE
ECONOMIC IMPACT SUMMARY & COMMUNITY STABILITY	<ul style="list-style-type: none"> • Modest economic growth in Plan area over at least the next 35 years, but lack of economic diversification means vulnerability to resource industry cycles. • 7% of Timber Harvesting Land Base (THLB) in RPAT (Regional Protected Areas Team) candidate Protected Areas • Timber supply impacts can be deferred for 35 yrs, but by yr 41, up to 160 regional forestry & spin-off jobs at risk (5% of Mackenzie jobs) & an additional 240 jobs outside of Plan Area. • By yr 81, up to 2 local sawmills could close due to timber impacts, which would severely impact Mackenzie, but likely not the remainder of the Plan Area. • Future harvest impacts could be further deferred if under-harvesting of Allowable Annual Cut (AAC) & possible increase in operable area taken into account. 	<ul style="list-style-type: none"> • The socio-economic implications of the LRMP relate almost entirely to future potential, not existing jobs or economic activity. Impacts for all sectors likely to occur gradually, over several decades. • Timber supply & related employment impacts similar to Base Case, but slightly lower Long Term Harvest Level (LTHL) after many decades. • Much larger % of Plan Area in PAs, <i>Wildland</i> zones, <i>Special</i> zones & access restrictions, particularly in north of Plan Area, are more supportive of nature-based activities than Base Case. • Land use changes & access restrictions (e.g., NORM-MAC / MK) creates confidence/cost issues for mineral & petroleum sectors, at least in short term, and precludes some development potential. • Plan is more supportive of First Nations concerns & economic diversification than Base Case, especially in northern zones.
SECTOR		
Forestry	<ul style="list-style-type: none"> • 1900 resident & 600 non-resident forestry jobs in Plan Area. • 7% of Timber Harvesting Land Base (THLB) in RPAT (Regional Protected Areas Team) candidate Protected Areas (PAs) • Current AAC of 2.95M m³/yr can be maintained for 35 yrs (45 yrs if no RPAT PAs), & then decline 10%/decade to LTHL of 1.8M m³/yr by yr 81. • 125 forest sector jobs at risk by yr 41, 7% of current Plan Area forestry jobs. Average under-harvest of 370,000 m³ recently, suggests possible deferral of harvest impacts for another 15 yrs. • By yr 81, up to 2 Mackenzie sawmills at risk unless THLB expands. (2 million ha of forested lands currently excluded from THLB.) • Would continue as Plan Area's most important industry. 	<ul style="list-style-type: none"> • 6% of THLB in proposed Protected Areas (PAs) & 2% in <i>Wildland</i> (no commercial logging) zones • Net effects of increase in PAs, <i>Wildland</i>, <i>Special</i> & <i>Enhanced</i> zones results in similar harvest flow & job impacts as Base Case, up to yr 81. • Slight reduction in forecast harvest level by yr 81 of ~40,000 m³/yr, & about 50,000 m³/yr by yr 181, primarily due to new <i>Wildland</i> zones. • NORM-MAC / MK designation & road deactivation for northern Resource Management Zones (RMZs) could increase costs, but only 6% of Plan Area THLB in these RMZs. Cost impacts more than offset by increase in Enhanced zones to 55% of THLB, vs 25% in Base Case. • Otherwise similar to Base Case.
Tourism / Recreation / Guide-Outfitting	<ul style="list-style-type: none"> • Estimated 50-75 nature-based tourism resident jobs in Plan Area & about 125 jobs provincially. • 20% of Plan Area in proposed RPAT PAs & SMZs. • 11% of Undeveloped Watersheds (UWs > 5000 ha) in RPAT PAs & no Visual Quality Objective (VQO) timber constraints. • Some form of access management likely in northern RMZs, constraining motorized recreation. • Long term growth potential in wilderness tourism would be reduced due to resource & related road developments. • Some high end front country growth could also be affected (e.g., reduced visits & length of stay). 	<ul style="list-style-type: none"> • 55% of Plan Area & 81% of UWs in PAs, <i>Wildland</i> & <i>Special</i> zones will better protect recreation & nature-based tourism. • NORM-MAC / MK designation in northern RMZs would improve planning for eco-tourism values • Log-hauling along proposed Germansen Lk. Road upgrade will significantly devalue the recreation experience in this part of the <i>Omineca</i> PA. • Land use changes & recommendations for Scenic Areas & VQO designations will better protect scenic viewscapes. • Nature-based tourism values & visual quality still expected to decline over long term, but to lesser degree than in Base Case. • Possible accommodation of Jackeroo, Ecstall, & Francine/Angel Jade claims in PAs, if developed, could compromise eco-tourism values.

Summary of Socio-Economic Implications: Base Case vs. Recommended Land Use Plan (cont.)

ACCOUNT	BASE CASE IMPLICATIONS	LAND USE PLAN vs. BASE CASE
Mining & Petroleum	<ul style="list-style-type: none"> Historically area has supported significant mineral exploration, but not much activity in recent years. One major mine (Kemess: 350 jobs) & some placer operations, but employment virtually all non-resident. No existing mines or developed prospects in government's RPAT candidate PAs. 2%-3% of BC oil/gas potential volume in Plan Area, but no current oil/gas production. RPAT candidate PAs overlay 0.4% of mineral tenures, 2.3% of placer tenures, & 2% of mineral occurrences; Jackaroo, Francine/Angel Jade, & portion of Nina claims in <i>Omineca</i> RPAT candidate PA. RPAT candidate PAs overlay 1% of Plan Area gas potential volume & 0% of oil potential volume. Potential for new mine development is significant, but whether, when, & to what extent new mines will be developed is unclear. Exploration constrained by uncertainty over development approvals and other factors affecting BC generally. Oil & gas development expected over the medium/long term. BC Hydro has no major projects planned for the Plan Area. 	<ul style="list-style-type: none"> No existing mines or developed prospects in proposed PAs. Four claims (same 3 as Base Case plus Ecstall) could be expropriated or otherwise adversely impacted by PAs. 56% of mineral occurrences, 60% of placer tenures, 56% of mineral tenures, 36% of high metallic potential, & 42% of high industrial mineral potential in <i>Special & Wildland</i>. No oil potential & 2% of gas potential precluded by proposed PAs, but 73% of oil & 33% of gas potential volume in <i>Special & Wildland</i> zones. 4.4% of Plan Area outside of PAs isolated from roaded exploration (<i>Upper Pelly, Braid, Upper Gataga</i> zones) Access constraints & new processes could further discourage investors from exploration/development in those zones, with significant losses in potential employment and in the case of oil/gas, govt. revenues Overall, limited impact on mineral exploration, mining, or oil/gas development from new PAs; impact of Plan will largely depend on clarity, balance, & efficiency of implementation of access constraints and new processes in <i>Special & Wildland</i> zones, within which considerable amounts of the sub-surface resource potential is contained. No identifiable implications for BC Hydro.
Trapping & Botanical Forest Products	<ul style="list-style-type: none"> Plan Area has 72 registered traplines & 162 trappers. Some non-commercial harvesting of botanical forest products, but poor information. Trapping & botanicals are important income supplements & cultural activities, especially for First Nations. Old growth dependent fur-bearers (eg. marten) & botanicals & related incomes at risk in long term due to 80% of Plan Area in <i>General / Enhanced</i> zones & lack of recognition in resource management plans. 	<ul style="list-style-type: none"> Increased % of Plan Area in PAs, <i>Wildland</i>, & <i>Special</i> and some mildly supportive strategies will better protect fur-bearer populations (particularly marten) & botanicals. 73% of THLB mature/old growth volumes still in <i>General & Enhanced</i> zones thus trapping activity & botanical potential still likely to decline over time, particularly in south portion of Plan Area.
Agriculture	<ul style="list-style-type: none"> Some forage/range activity to support cattle & horses in areas such as Germansen Landing. RPAT candidate PAs would have minimal affects on agriculture. Existing activities would likely be grandfathered. Growth potential not high due to soil, climate & market constraints. 	<ul style="list-style-type: none"> No new grazing tenures in new PAs except for <i>Omineca</i>. Plan grand-fathers existing activities. Plan has some supportive management strategies for agriculture (e.g. identification of new grazing opportunities) but also some constraints (e.g., grazing restrictions in high ungulate use areas). Growth constraints & trends similar to Base Case.
FIRST NATIONS CONCERNS	<ul style="list-style-type: none"> First Nations in Plan Area are the Kwadacha (Ft. Ware) & Tsay Keh (Ingenika), & some members of the Noostel Keyoh in Germansen Landing. Some First Nations involvement in resource development activities, but many still have significant concerns about environmental impacts of such development. Resolution of land claims should provide more economic development funds & resource management control for Plan Area First Nations. 	<ul style="list-style-type: none"> Land use changes & Plan strategies provide better protection for nature-based values important to First Nations, but could reduce benefits from extractive resource development in longer term. Much larger <i>Frog-Gataga</i> PA and adjacent proposed <i>Wildland & Special</i> zones are much more supportive of Kwadacha interests. <i>Omineca</i> PA & adjacent <i>Special</i> zones protect key Noostel Keyoh values, similar to Base Case. <i>Ed Bird-Estella & Chase</i> PAs, & <i>Ingenika, Lower Akie & Pesika Special</i> zones help protect Tsay Keh values, but much of their territory is in <i>General / Enhanced</i> zones.

Summary of Socio-Economic Implications: Base Case vs. Recommended Land Use Plan (cont.)

ACCOUNT	BASE CASE IMPLICATIONS	LAND USE PLAN vs. BASE CASE
GOVERNMENT REVENUES	<ul style="list-style-type: none"> • Due to future timber fall-down, decline in BC government timber-related revenues start in year 36 & by year 41 amount to \$3.6-\$6.1 million annually; will increase as fall-down continues between 3rd & 8th decades. • Potential mill closures after 40 years would significantly reduce local property tax base in Mackenzie community. • Resource revenues from mineral development relatively small, but potential revenues from oil/gas quite large: 22% & 26% of value of output for oil & gas respectively. • Development of oil/gas resources in Plan Area not expected to begin for 5-10 years. 	<ul style="list-style-type: none"> • Forestry-related impacts similar to Base Case. • Increase in Plan Area’s tourism-related revenues over time, although not a major source of BC revenue. • If oil/gas development curtailed or delayed, there would be a loss of significant government revenue potential; whether and to what extent there would be such a loss is unclear.
NET RESOURCE VALUE	<ul style="list-style-type: none"> • By yr 41, each BC household would have sacrifice ~\$1.66-\$3.47 per year in forestry “economic rents” to obtain the environmental benefits associated with the Base Case land use regime (e.g., from FPC & RPAT candidate PAs). • Foregone timber value would increase up to 8th decade due to timber supply fall-down. • Timing & magnitude of future Plan Area mineral & energy rents uncertain. • Some eco-tourism potential foregone, but rents low. 	<ul style="list-style-type: none"> • Forestry-related impacts similar to Base Case. • Potential loss of significant rents from mineral and oil & gas resource development; loss depends on Plan implementation. • Eco-tourism activity would increase compared to Base Case, but rents low.

Summary of Environmental Implications: Base Case vs Recommended Land Use Plan

ACCOUNT	BASE CASE IMPLICATIONS	LAND USE PLAN vs. BASE CASE
Ecosystem Representation & Protected Areas	<ul style="list-style-type: none"> • 3.4% of Plan Area in existing parks and government’s “RPAT” proposed Protected Areas (PPAs) provide an additional 6.4%; Base Case thus assumes 9.8% in PAs. • 9 of 15 ecosections and 8 of 16 subzone/variants receive additional representation. • However, sub-boreal spruce (SBS) ecosystems (valley-bottoms) are under represented in the existing and RPAT candidate PAs. 	<ul style="list-style-type: none"> • 13.8% of Plan Area in Protected Areas (additional 10.4% in new parks of which Frog-Gataga comprises 5.3% or 339,012 ha). • 9 of 15 ecosections and 8 of 16 subzone/variants receive additional representation, as in Base Case; <i>Frog-Gataga</i> PPA significantly increases (2.5 times) representation of the KEM ecosection (from 6.2% to 15.6%). • However, other ecosection/subzones receive somewhat less representation (total ha) compared to RPAT PPAs. In particular, SBS ecosystems (valley-bottoms) remain under-represented (i.e., < 5% in PAs) • Relatively large size of <i>Frog-Gataga</i> PPA including its juxtaposition with <i>Denetiah</i> Provincial Park increases natural viability and overall effectiveness of PPA (e.g., maintains natural processes, connectivity).
Biodiversity <ul style="list-style-type: none"> • Old Growth • Connectivity • Red and Blue-Listed Species 	<ul style="list-style-type: none"> • Relatively large percentage (48%) of coniferous old growth occurs on the Timber Harvesting Land Base (THLB). • 29% of old growth (THLB) allocated to <i>Enhanced</i> RMZs; 6% to <i>Special Management</i>. • Natural levels of biodiversity to decline over long term as the amount of mature & old coniferous forest declines and human disturbance increases. • Existing management practices (e.g., implementation of <i>Biodiversity Guidebook</i>, <i>Forest Practices Code</i>, IWMS, <i>Environmental Assessment Act</i>) partly reduce the risks. <p>⇒ Overall Risk: High</p>	<ul style="list-style-type: none"> • More old growth (THLB) allocated to <i>Enhanced</i> RMZs (62%); 1 ESSF & 4 SBS biogeoclimatic subzones exceed 50% in <i>Enhanced</i> (Low Biodiversity) RMZs (inconsistent with current FPC LUPG policy direction). However, more old growth is also allocated to <i>Special Management</i> RMZs (13%) vs. Base Case. • Reduced impact to riparian ecosystems due to <i>Special Management</i> designation for key water bodies contained in Ingenika, Nation Lakes, upper Finlay River (Thutade), Lower Akie and Selywn RMZs/subzones. • Management objectives & strategies reduce risks to some red & blue-listed species including songbirds, arctic grayling, & bull trout. • Overall, reduced risks to components of biodiversity in northern RMZs ; however, increased risks to central & southern RMZs due to concentration of <i>Enhanced</i> RMZs <p>⇒ Risk in northern RMZs: Low-Moderate</p> <p>⇒ Risk in central/southern RMZs: High</p>
WILDLIFE/FISH		
Moose	<ul style="list-style-type: none"> • 55% of <i>High</i> suitability moose habitat in <i>General</i> RMZs and another 27% in <i>Enhanced</i> RMZs; loss of mature forest cover and increased road access suggest moderate to high risks in such RMZs. • Omineca winter range (floodplain plus adjacent forests) captured in RPAT <i>Omineca</i> PPA (low risk). • Overall, increased road access from mineral and forest development increase risks over the long term, particularly in southern portion of Plan Area. <p>⇒ Overall Risk: Moderate-High</p>	<ul style="list-style-type: none"> • 11% of <i>High</i> suitability moose habitat in <i>General</i> RMZs and 50% in <i>Enhanced</i> RMZs. Allocation of habitat to <i>Enhanced</i> RMZs suggest increased risks to moose in central and southern portions of Plan Area. However, <i>Special</i> management subzones (e.g., Ingenika) including the Lower Akie designation as a <i>Known Ungulate Winter Range</i> (FPC), partly reduces risks. • Similar to Base Case, Omineca winter range (floodplain plus adjacent forests) captured in <i>Omineca</i> PPA. • Reduced risks to moose habitat situated in northern RMZs due to <i>Frog-Gataga</i> PPA and NORM-MAC/MK designation. • Overall, risks to moose are higher in the south compared to the northern portions of Plan Area. <p>⇒ Overall Risk: Moderate</p>

Summary of Environmental Implications: Base Case vs Recommended Land Use Plan (cont.)

ACCOUNT	BASE CASE IMPLICATIONS	LAND USE PLAN vs. BASE CASE
<p>Grizzly Bear (Blue-listed Identified Wildlife)</p>	<ul style="list-style-type: none"> • 6.2% of high suitability grizzly bear habitat in PAs; another 8.2% in <i>Special</i> RMZs; 82% in <i>General</i> RMZs; 4% in <i>Enhanced</i>. • Although some stand-level management is expected (e.g., WHAs, buffering of avalanche chutes), lack of management direction (e.g., seral stage distributions/road access) from a FPC <i>Higher Level Plan</i> increases risks to grizzly bears over the long term. <p>⇒ Overall Risk: High</p>	<ul style="list-style-type: none"> • 12.3% of high suitability grizzly bear habitat in PAs; another 44% in relatively low risk RMZs (<i>Wildland/Special</i>); 18% in <i>Enhanced</i> RMZs. • Relatively low risk RMZs (<i>PAs/Wildland/Special</i>) as well as proposed <i>Grizzly Bear Management Strategy</i> provides enhanced protection and reduces risks to grizzly bears, particularly in northern RMZs. However, grizzly bear habitat remains at higher risk in southern portion of Plan Area where <i>Enhanced</i> RMZs are concentrated. <p>⇒ Overall Risk: Moderate</p>
<p>Woodland Caribou</p>	<ul style="list-style-type: none"> • 25% of high suitability caribou habitat in low risk RMZs (<i>Special/PAs</i>); 75% in higher risk RMZs (<i>General/Enhanced</i>). • 59% of caribou habitat that occurs on the THLB is within <i>General/Enhanced</i> RMZs. • <i>Omineca</i> and <i>Chase</i> RPAT PAs provide core protection for Wolverine & Chase Herds, however, low elevation winter ranges remain vulnerable primarily due to lack of management direction from a <i>Higher Level Plan</i>. <p>⇒ Overall Risk: High-Very High</p>	<ul style="list-style-type: none"> • 65% of high suitability caribou habitat in low risk RMZs (<i>PAs/Special/Caribou Management</i>); 35% in higher risk RMZs (<i>General/Enhanced</i>). • 54% of caribou habitat that occurs on the THLB allocated to <i>General/Enhanced</i> RMZs. • Less full protection for Chase and Wolverine Caribou Herds than RPAT PAs. • <i>Caribou Management Strategy</i> (CMS) and area-specific strategies #2 and #3 provide enhanced protection for caribou calving areas and mountain caribou habitat; however, lack of explicit age class objectives for low elevation pine-lichen forests (Strategy #1) suggest terrestrial lichen feeding caribou remain vulnerable to forest development activities, particularly in <i>Klawli</i> RMZ. <p>⇒ Overall Risk: Moderate-High</p>
<p>Fisheries</p>	<ul style="list-style-type: none"> • 8 of 57 Fish Units at risk due to large proportion of watershed allocated to <i>Enhanced</i> RMZs. Most Fish Units expected to have moderate to low impacts. • lacks access management direction <p>⇒ Overall Risk: Moderate</p>	<ul style="list-style-type: none"> • 17 of 57 Fish Units at risk due to large proportion of watershed allocated to <i>Enhanced</i> RMZs. Remaining Units expected to have low-moderate impacts. • Access management strategies beneficial but limited. • Objectives for red & blue listed species (bull trout, Arctic grayling) are beneficial, but concerns remain regarding high amount of <i>Enhanced</i> RMZs in south part of Plan Area. • Significantly greater risks to fisheries values if <i>Omineca</i> and <i>Frog-Gataga</i> PAs are subject to future mining activities (i.e., Jackaroo and Ecstall) • Some potential adverse impacts due to <i>ELUA</i> corridors within proposed PAs if roads are eventually built. • <i>Frog-Gataga PA, Wildland, & Special Management</i> RMZs provide enhanced protection in north portion of Plan Area, which reduces risks vs. the Base Case • Concentration of <i>Enhanced</i> RMZs in central/south portion of Plan Area increases risks vs. the Base Case <p>⇒ Overall Risk: Moderate</p>

Part I:

Socio-Economic Assessment

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October 2000

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1.0 Introduction and Description of Recommended LRMP Plan

This report evaluates the socio-economic and environmental implications of the *Mackenzie Recommended Land and Resource Management Plan* (June, 2000) developed for the Mackenzie Forest District (i.e, the “Plan Area”- see Map 1) by the Mackenzie LRMP process. The Plan is a proposed “strategic Crown land use Plan” that provides broad direction to lower level and operational planning. This report evaluates the key differences between the recommended Plan and the “Base Case” land use regime based on interpretations about the intent of LRMP strategies in the various “Resource Management Zones” (RMZs) that comprise the Plan Area. The assessment also utilizes the Land Use Coordination Office’s (Prince George) Geographic Information System (GIS) area analysis and technical input from the LRMP’s Inter-Agency planning Team (IPT) and other government agencies.

1.1 The Base Case (without LRMP Plan)

In order to have a meaningful “benchmark” against which to compare the LRMP-recommended Plan, it is necessary to define the “Base Case” land use scenario, i.e. the default land use regime likely to occur without an LRMP. That management regime, along with its anticipated socio-economic and environmental implications, is described in a previous report done for the LRMP. The Base Case includes the *Timber Supply Review* (TSR) management regime, the *Forest Practices Code* (FPC), the *Protected Areas Strategy* (PAS) as per the recommendations of government’s Regional Protected Areas Team (RPAT), and other current management initiatives of government (e.g., the *Mining Rights Amendment Act*, *Mineral Exploration Code*, etc.).

Standard practice in strategic Crown land use planning in BC is for an LRMP to recommend various land use “Resource Management Zones” (RMZs) that range from the most restrictive for resource development, such as “*Protected Areas*” and “*Special Management*,” to less restrictive zones such as “*General*” or “*Enhanced*” Management. In order to make a comparison between the LRMP Plan and the Base Case, the study team requested the Inter-Agency planning Team (IPT) to judge how the Plan Area would be “zoned” under Base Case management using the above categories or labels. To illustrate, the IPT assumed that key portions of the *Obo Lake* (high recreation values), *Pelly* (wildlife values), *Ospika / McCusker / Denkman* (soils and wetlands), *Klawli* (high caribou habitat), *Selwyn* (visual quality), and *Morfee* (community watershed) RMZs would be sensitively managed in the Base Case. This results in a more realistic comparison between the LRMP Plan and the Base Case, than would be the case if all areas outside Protected Areas were assumed to be “Integrated Resource Management.” The Base Case and the LRMP recommended Plan are shown as Maps 2 and 3, respectively.

The PA target set by government for the Plan Area is about 7.4% (471,174 ha) for new PAs. Adding the 3.4% (220,000 ha) of existing PAs (excluding the *Kwadacha Recreation Area*), the cumulative target for PAs is 10.8% (691,000 ha). However, the PAs identified by RPAT only comprise 6.4% (406,000 ha) of the Plan Area rather than the actual target amount of about 7.4%. The “underestimate” of PAs in the Base Case means that the environmental and economic impacts of Protected Areas in the recommended Plan will be somewhat overstated.

In order to quantify the impacts of Base Case management on timber supply, the Ministry of Forests (MoF) utilized the “Interim Biodiversity Emphasis Options” for the Mackenzie Forest District (among other assumptions - see Appendix 1) as its best estimate of the land use regime that would prevail without an LRMP. Although visual quality constraints are implied in the *Mackenzie TSA Timber Supply Review* (1995), it is assumed that no Visual Quality Objectives would be designated in the Base Case due to MoF’s judgment that forest practices within known Scenic Areas are not expected to create explicit timber supply constraints in the absence of LRMP direction. It was also assumed by the IPT that for the Base Case, a road would be allowed (extension of the Thutade-Omineca Forest Service Road) through the *Omineca* RPAT PA to enable timber harvesting in the adjacent *Twenty Mile* RMZ. This would be accomplished by use of an *Environment and Land Use Act* (ELUA) designated corridor. Note that current government policy is that access should not be denied to lands outside of new PAs.

1.2 Description of the LRMP Recommended Plan

Some of the key elements of the recommended Plan are as follows:

- **Ten New PAs** – In addition to 9 existing parks and ecological reserves, the Plan recommends the following new PAs: Goal 1: *Dune Za Keyih (Frog-Gataga), Finlay-Russel, Kwadacha Park Addition, Muscovite Lakes, Pine Pass, Chase, Omineca*; Goal 2: *Heather-Dina Lakes, Ed Bird-Estella Lakes, and Ospika Cones*.
- **Wildland RMZs** – The 9 RMZs designated as *Wildland* prohibit commercial timber harvesting but permit mineral / energy exploration and development subject to access and other constraints aimed at protecting environmental and wilderness values.
- **Environment and Land Use Act (ELUA) Corridors** – The Plan specifies 8 options for 7 ELUA access corridors within 3 proposed PAs (*Omineca, Finlay-Russel, and Frog-Gataga*) to ensure that lands outside of PAs are not isolated from resource development. In most cases, the building of a road through these corridors could be triggered for any appropriate reason, subject to government agency review. All corridors in the proposed *Frog-Gataga* PA and one in the *Finlay- Russel* PAs would only be considered for mining or petroleum projects (outside of the PA) large enough to merit review under the *BC Environmental Assessment* process.¹
- **Area Specific Caribou Management Strategies** – There are four Caribou management strategies that are all incremental to the Base Case. However, only Strategies #2 and #3 create incremental constraints for timber harvesting. These strategies take precedence over whatever designation has been assigned to an RMZ (i.e., *Special, General, or Enhanced*). Strategy #2 applies to much smaller areas than are indicated on the draft Caribou Strategy map (January 19, 1999), specifically to upper elevation/low productivity balsam stands.

¹ The LRMP made no recommendations regarding a potential future highway corridor through the Rocky Mountain Trench, leaving this issue for future consideration in another public forum or process.

- **Scenic Areas and Visual Quality Objectives** - The LRMP recommends a number of areas for consideration by the MoF District Manager as “Scenic Areas,” for which timber supply constraints are at the discretion of the licensee. The LRMP also recommends that for some of these Scenic Areas, “Visual Quality Objectives” (VQOs) be established, in which harvesting constraints, such as Partial Retention, Retention, and Preservation, are imposed by MoF.
- **Access Management in Northern RMZs** - Referred to as “NORM-MAC” (Northern Rocky Mountains – Mackenzie Advisory Committee), access management would be similar to what the current Muskwa-Kechika Access Management Area. The intent of this designation in the 2 SMZs, 7 *Wildland Zones* and 6 existing/proposed PAs to which it applies is to minimize road access (e.g. by encouraging air access), not to prevent road access.
- **Enhanced Forestry Management** - There are several forest management strategies in the *Enhanced* and *General* RMZs that vary from the *Forest Practices Code* and *Biodiversity Guidebook* and Landscape Unit planning direction aimed at increasing timber productivity.

As shown in Table 1, the recommended Plan places a much higher proportion of the Plan Area in *Wildland* and *Special Management Zones*, and a much smaller proportion in *General* zones compared to the Base Case. The recommended Plan also places a higher proportion of the Plan Area in PAs than the Base Case. As noted above, while the *Wildland* designation in the Plan precludes commercial logging, it permits other resource development. Somewhat offsetting these shifts in management emphasis, is the increase in *Enhanced Management* zones compared to the Base Case. Although not explicitly reflected in the GIS area statistics (see Appendix 2 for more detailed statistics), the management emphasis in the south of the Plan Area is much more resource development-oriented, whereas in the north it is much more supportive of wilderness and environmental values.

Table 1: Land Use Zones as % of the Mackenzie LRMP Plan Area^a

	<i>Wildland / No Logging^b</i>	<i>Special Management^c</i>	<i>General Management^d</i>	<i>Enhanced / Settlement^e</i>	<i>Protected Areas^f</i>	
					Existing	Total
Base Case	0%	10.0%	60.1%	20.1%^e	3.4%	9.8%
Recommended Plan	17.5%	23.7%	15.4%	29.6%	3.4%	13.8%

Notes:

(a) The Gross Land Base (GLB) of Plan Area is 6.4 million ha, including Williston Reservoir. The post-FPC Timber Harvesting Land Base (THLB), as estimated by MoF is about 1.1 million ha.

(b) Allows mineral, oil and gas and other activities but no commercial logging. The IPT assumed that about 80% of the existing *Kwadacha Recreation Area* would be in SMZ and about 20% in PA, in the Base Case.

(c) Includes *Obo River*, *Pelly*, *Ospika / McCusker* and *Klawli* RMZs, and the *Morfee* community watershed in the Base Case. The Plan includes these areas (except for *Klawli*), Caribou Management and other SMZs. VQOs are not included in the Base Case, and are not reflected in the area statistics for the Plan since they are not a separate zone, but rather are additional constraints within RMZs.

(d) *General Management* zones in the Plan have more development / access constraints than the Base Case.

(e) Includes ALR, Indian Reserves and water.

(f) The Base Case includes existing PAs (3.4% of the GLB) plus RPAT-proposed PAs comprising 6.4% of GLB; Base Case PAs do not include the *Kwadacha Recreation Area*. The PA target for the LRMP is 10.8% of GLB.

2.0 Forestry

2.1 Base Case (without LRMP Plan)

According to the 1996 Ministry of Finance and Corporate Relations (MFCR) economic dependency analysis, about 67% of Plan Area employment and 54% of personal income is accounted for by direct and indirect employment in timber harvesting and processing, almost all of which is in the community of Mackenzie. This is one of the highest single sector dependencies for any area of BC.

The coniferous Allowable Annual Cut (AAC) for the Mackenzie TSA is about 2.95 million m³ per year, and the deciduous AAC is an additional 50,000 m³/yr. The AAC has remained essentially unchanged since 1989 and was most recently re-established by the Province's Chief Forester on September 1, 1996. The two large licensees in the Plan Area (Slocan Forest Products and Abitibi Consolidated, formerly Finlay Forest Industries) are apportioned about 2.7 million m³/yr., the Small Business Forest Enterprise Program (Sec. 16.1) is allocated almost 200,000 m³/yr., and woodlot licenses, non-replaceable licences, and the Forest Service Reserve account for the remainder. Generally, the annual licensee harvest is supposed to be within 10% of the AAC over a five-year period, although the AAC has been "undercut" by about 13% over the 1996-99 period.

Most of the direct forest employment is with the two large forest licensees, centred in Mackenzie. Slocan Forest Products owns two sawmills (with a combined capacity of about 1.5 million m³/yr.) Abitibi Consolidated also owns two sawmills, (with a total capacity of 1.2 million m³/yr.), as well as a recently refurbished newsprint/Specialty paper mill, with an annual capacity of 183,000 tonnes utilizing 570,000 m³/yr. of fibre. The remaining major facility is Fletcher Challenge's pulp mill, which can produce 230,000 tonnes annually out of 1,569,000 m³/yr. of fibre. The most recent forestry employment estimates are presented in Table 2. While the TSA is essentially self-sufficient in terms of sawlogs, net imports of fibre for the pulp/paper mills are estimated at about 12% of overall fibre requirements.²

Table 2: Estimated 1999 Plan Area Direct Forestry Employment in Person-Years

Forestry Sub-Sector	Mackenzie Plan Area	Other Forest Districts	Total Resident + Non-Resident
Harvesting & Trucking	206	530*	736
Large Primary Wood Processors	866*	-	866
Smaller Wood Processors	143	-	143
Pulp & Paper	583	-	583
Silviculture	19	80*	99
Miscellaneous Contractors	92	-	92
Total	1909	610	2,519

Source: Slocan Forest Products, *Mackenzie TSA Forest Sector Employment*, May 1999.

* Residency assumptions from *Mackenzie TSA Socio-Economic Analysis (TSR)*, Bull & Williams, 1995.

² Fibre supply information from Slocan and Hanam Canada Corporation/G.E Bridges.

MoF (Prince George Forest Region) retained independent forestry consultants (McGregor Resource Analysis Group) to undertake timber analysis of the Base Case and several land use scenarios in 1999. These results are used by MoF to develop harvest flows for the recommended Plan, as presented in Appendix 1. The Base Case land use regime essentially consists of “current management” as described in the Timber Supply Review (TSR), in addition to the FPC and the 6.4% RPAT proposed Protected Areas. Of the total 6.4 million ha Plan Area, prior to FPC net-downs, an estimated 1,224,000 ha were included in the TSR’s “Timber Harvesting Land Base” (THLB), that is, available and economically feasible for timber harvesting. FPC riparian and other netdowns reduce the THLB area by 9% to 1,114,000 ha. The FPC also reduces the available volumes in the THLB by 9% (about 14,581,000 m³) from 163,661,000 to 149,080,000 m³. Finally, the RPAT-proposed PAs (which understate the Government target for the LRMP) reduce the THLB by a further 7.2% (80,116 ha) and available mature/old growth volumes by 8.6% (12,758,087 m³). Most of the THLB and available mature/old growth volumes are in the south portion of the Plan Area (see Map 4).

The McGregor results indicate that the current AAC of 2.95 million m³/yr in the Plan Area can be maintained for up to 35 years, depending on AAC decisions by the Chief Forester. The analysis also indicates that the falldown could be delayed to about 45 years without the RPAT PAs.

As summarized in Table 3, harvest reductions by year 41 in the Base Case could potentially place at risk an estimated 110-125 forestry jobs and up to 20-35 spin-off jobs in Mackenzie. This total of 125-160 jobs potentially placed at risk represent about 3.5%-4.4% of current employment in the Plan Area. After 40 years, these jobs at risk would comprise a lower proportion of total employment.³ Potential forestry job impacts would be even lower as a proportion of total local employment if employment per m³ declined due to factors other than timber supply (e.g. technological change or rationalization). As shown in the Table, the RPAT-proposed PAs accounted for all of the timber harvesting impacts in the Base Case.

Due to log harvesting/hauling jobs held by non-Plan Area residents and “spin-off” spending by the Mackenzie forest industry and its workers outside of the Plan Area, up to 240 additional jobs are at risk elsewhere in BC by year 41 in the Base Case, including about 60 direct forestry jobs in Prince George.

The above analysis does not take into account the fact that current forestry employment (Plan Area plus non-resident) of about 2,500 has been supported by an actual average harvest of just under 2.6 million m³ over the 1996-99 period, about 370,000 m³ less than the current AAC.⁴ This suggests that the AAC could be reduced to 2.6 million m³ before loss of existing jobs (compared to the current 2,500 jobs) would be incurred. The timber supply modeling indicates

³ For example, after 40 years, assuming historical growth of about 1% per year, and no change in employment per m³, the jobs at risk would be about 3% of total area employment.

⁴ The actual, average TSA harvest in recent years was used to calculate person-year coefficients for purposes of job impact estimates. This results in higher PY coefficients than if the AAC of 2.95 million were used.

*that harvest levels in the Base Case do not decline to 2.6 million m³ until after year 50, which means that job losses could possibly be deferred until then.*⁵

After 35 years, the Plan Area harvest is projected to fall 5% every 5 years, or roughly 10% per decade. At year 81, the “Long Term Harvest Level” (LTHL) reaches an estimated 1.8 million m³/yr in the Base Case, or some 1,145,000 m³/yr lower than the current level.⁶ The potential socio-economic impacts associated with the LTHL are not assessed in detail given the variety of uncertainties in the longer term. For example, due to the “under-harvesting” in the Plan Area discussed previously, it appears that immediate reductions of up to 370,000 m³/yr in the current AAC could be implemented without loss of existing employment. By reducing the AAC before year 35, it may be possible to mitigate the fall-down that occurs after year 35 in the Base Case. Another major mitigating factor in the Mackenzie Plan Area, given that it has over 2 million hectares of forested exclusions, would be a possible increase in operable area, due to factors such as changes in technology and higher wood product prices in the future.⁷

Nevertheless, a fall-down of the magnitude indicated by the current timber supply analysis could result in up to two Mackenzie area sawmills gradually ceasing operations at various points after the initial 35-50 year period, with further negative implications for the Mackenzie pulp/paper sector.⁸ Since there are only four major sawmills in Mackenzie, the negative implications for the community would be significant and would likely result in population outflows. However, impacts on the remainder of the Plan Area (the Germansen/Manson area, Tsay Key, Ft. Ware, etc.) would be much less significant since they are far less dependent economically on timber harvesting and processing.

At approximately year 181, the timber supply in the Plan Area is expected to increase to “Non-Declining Yield” (NDY) levels due to the longer term effects of pro-active silvicultural treatments being undertaken under current management. In the Base Case, this level is expected to be about 2.1 million m³/yr, or about 850,000 m³/yr less than the current AAC.

Table 3: Potential Forest Sector Socio-Economic Implications of the Base Case

⁵ Historically, harvest levels in the TSA have fluctuated with market conditions. However, due to cut control regulations (which would allow for a 50% variation in actual harvest in any one year, and a 10% variation over a 5 year period) an AAC of 2.5 million would still allow for significantly higher harvest levels, at least temporarily, if market conditions warranted.

⁶ This LTHL is less than the MoF forecast of long term sustainable harvest level in the *Mackenzie TSA Timber Supply Review* (1995) due to a combination of the FPC, the RPAT areas, and new forest inventory data.

⁷ Other factors affecting future wood supplies include increased use of problem and underutilized forest types, industry rationalization, and higher growth rates resulting from intensive silviculture. For a discussion of some of these factors, see *The Truth is Out There*, L. Pedersen address to Northern Forest Products Association, April 1997. This document suggests that the harvest in the PG Forest Region could be increased from its present level of about 19 million m³/yr to approximately 25 million m³/yr over the next 100 years.

⁸ This possible fall-down of 1.15 million m³/yr by year 81 represents about 40% of the current Mackenzie TSA AAC and total solid wood processing mill capacity in the District, and about 54% (solid wood equivalent) of the capacity of Mackenzie’s pulp/paper mills, based on data supplied by Slocan Forest Products.

	Base Case Scenario Impacts (vs. Current AAC)^a		
	Current Mgt. (incl. FPC)	RPAT PAs	Total
Harvest Impact: Yrs 0-35 ('000 m3/yr) ^b	0	0	0
Harvest Impact by Yr 41 ('000 m3/yr)	0	256	256
% Decline per Decade to Long Term Harvest Level	5% / 5 year period		
Harvest Impact by Yr 81 ('000 m3/yr)	949	196	1,145
Potential Socio-Economic Impacts by Yr 41*			
Mackenzie Forest District (Plan Area)			
Direct Jobs at Risk (Person-Years/yr) ^c	0	108-125	108-125
Indirect / Induced Jobs at Risk (PYs/yr) ^d	0	19-33	19-33
Total Jobs at Risk (PYs/yr)	0	127-158	127-158
Total Wage Income at Risk (\$million/yr) ^{e**}	0	5.4-6.5	5.4-6.5
Total Jobs at Risk as % of Plan Area Total ^f	0	4.1-4.9	4.1-4.9
Income at Risk as % of Plan Area Total ^f	0	3.1-3.7	3.1-3.7
Provincial (including Mackenzie Plan Area)^g			
Direct Jobs at Risk (PYs/yr)	0	161-187	161-187
Indirect / Induced Jobs at Risk (PYs/yr)	0	122-211	122-211
Total Jobs at Risk (PYs/yr)	0	283-398	283-398
Total Wage Income at Risk (\$million/yr) ^{**}	0	10.4-13.8	10.4-13.8
Potential BC Gov't Revenues (\$million/yr) ^{h**}	0	3.6-6.1	3.6-6.1
Net Resource Value (\$/household/yr) ^{i**}	0	1.66-3.47	1.66-3.47

* Harvest reductions & associated impacts begin in Year #36 for the Base Case.

** Annual dollar impacts in year 41 would be divided by 10.3 to estimate their "Net Present Value" at a real discount rate of 6%.

Footnotes to Table 3:

(a) Base Case impacts are estimated relative to the current AAC of 2.95 million m³/yr. The Base Case includes the *Timber Supply Review, Forest Practices Code & RPAT* recommended Protected Areas.

(b) Timber supply analysis indicates that the current AAC of 2.95 million m³/yr can be held for up to 35 years in the Base Case, subject to Chief Forester AAC decisions. Impact estimates do not take into account the fact that the AAC has been “under-harvested” by an average of 370,000 m³ over the 1996-99 period. The “under-harvesting” situation in the TSA means that fall-down and related employment impacts could be deferred in the Base Case by a further 15 years. However, timber supply models may not adequately reflect the cost of accessing & transporting timber which would likely increase sooner & could affect the viability of timber harvesting.

(c) Direct Person-Years (PYs) of employment at risk in the Plan Area based on ratios in logging / hauling / silviculture of 0.08-0.09 PY/000 m³ & in sawmilling of 0.34-0.40 PY/000 m³. Range of estimates based on with/without silviculture & value-added processing, which may not be strongly linked to incremental changes in timber harvest levels. It is assumed that forestry services (e.g. consulting) & pulp/paper employment are not linked to incremental harvest impacts. Current private forestry sector PYs (resident & non-resident) in the District estimated at 2,520. (Source: Slocan Forest Products, op. cit.) Employment coefficients are calculated on the basis of the average actual harvest level of about 2.5 million m³ over 3 years during the 1996-98 period.

(d) Plan Area indirect & induced impacts derived with economic base employment multipliers for the Mackenzie TSA (i.e. total indirect + induced employment divided by direct employment) of 0.21-0.30 for woodlands & 0.17-0.25 for processing. Range reflects differing assumptions regarding worker migration. Total District employment estimated at 3,580 in 1996. [Source: Ministry of Finance & Corporate Relations (MFCR), unpublished estimates of BC local area economic dependencies & impact ratios by Forest District, 1999.]

(e) Average after tax wages & salaries for forestry estimated at \$45,800/job (including benefits). Indirect & induced income impacts based on average after tax wages & salaries of \$24,600/PY. (Source: *Prince George LRMP Socio-Economic & Environmental Assessment*). Total current after tax income (with benefits) in Plan Area estimated at \$133 million. (Source: MFCR unpublished estimates, adjusted upward to include benefits & post-1996 growth in regional income).

(f) Jobs and income at risk in the Base Case would comprise a smaller proportion of total regional jobs and income by year 41 due to growth in the regional economy.

(g) Provincial impacts include direct employment & income of Plan Area residents, plus employment & income of non-resident logging, trucking & silviculture workers, plus provincial multiplier impacts. Direct PYs at risk in BC based on coefficients in logging / hauling / silviculture of 0.29-0.33 PY/000 m³ & in sawmilling of 0.34-0.40 PY/000 m³. Range of estimates based on with & without silviculture & value-added processing. Provincial indirect & induced impacts based on BC Input-Output Model employment multipliers of 0.67 - 0.94 for logging & 0.83-1.29 for sawmilling. Provincial multipliers adjusted by MEI for log hauling/ road building & to reflect range of assumptions re worker migration. (Source: MFCR BC Input-Output Model.). See footnote (e) for assumptions re income impacts.

(h) Potential BC revenue impacts include: average target stumpage for the Interior ranging from \$11.65/m³ without FRBC, to \$21.50/ m³ with FRBC (MoF Valuation Branch, 1990-94 without FRBC, 1995-99 without FRBC); \$2.46/m³ for provincial corporate/ logging income taxes (Price Waterhouse, *The Forest Industry in BC*, 1992-96). Stumpage revenue estimates with FRBC include adjustment for reduction in stumpage in 1998. Range reflects different assumptions about whether FRBC share of stumpage represents net Provincial revenue. Corporate/logging income taxes based on years chosen to reflect full cycle of wood product prices. Revenue estimates do not include personal income tax impacts based on assumption that workers find alternative employment within BC.

(i) Estimated as the annual timber harvest loss multiplied by indicated stumpage revenue of \$10.15/m³-\$21.22/m³ (MoF Valuation Branch, 1990-94 without FRBC, 1995-99 with FRBC, including adjustment for reduction in stumpage in 1998) divided by 1,564,000 households in BC as of 1999 (BC STATS). Range reflects different assumptions about whether FRBC share of stumpage represents net resource value (i.e. rents). This indicator is a rough proxy of the opportunity cost of foregone timber harvests, i.e. the additional amount each household in BC would have to be willing to pay annually by year 40 to achieve the environmental & other non-commercial benefits associated with timber harvesting constraints in the Base Case. This estimate excludes any rents associated with LRMP impacts on mining, tourism & agriculture.

2.2 Impacts of the Recommended Plan

The recommended Plan precludes about 9.2% (13.75 million m³) of mature/old growth THLB timber volumes in PAs and *Wildland* (no logging) Zones, which is slightly more than for the Base Case RPAT PAs (8.6% or 12.76 million m³).⁹ There is also significantly more mature/old growth THLB volume in *Special* RMZs in the recommended Plan (20%) compared to the Base Case (7%), as shown in Table 4. Consistent with the LRMP direction and based on advice from MoF, PG Region, it was assumed that SMZs are equivalent to areas with FPC-defined *High Biodiversity Emphasis* Option ratings, *General* RMZs = *Intermediate Biodiversity*, and *Enhanced* RMZs = Low Biodiversity, depending on the extent of logging history.¹⁰ Other constraints in the Plan that are incremental to the FPC include the Grizzly Bear Strategy, Caribou Strategy, and VQOs.¹¹

Table 4: THLB and Mature/Old Growth Coniferous Volumes by Zone Category*

Zone Category	Base Case	Recommended Plan
	<i>Post-FPC Timber Harvesting Land Base by Zone</i>	
Existing PAs	0%	0%
Proposed PAs	7%	6%
<i>Wildland</i> RMZs	0%	2%
<i>Special</i> RMZs	8%	16%
<i>General</i> RMZs	60%	21%
<i>Enhanced</i> RMZs	25%	55%
Total (ha)	1,114,000	1,114,000
	<i>Post-FPC Mature/Old Growth Volumes in THLB by Zone</i>	
Existing PAs**	0%	0%
Proposed PAs	9%	7%
<i>Wildland</i> RMZs	0%	2%
<i>Special</i> RMZs	7%	17%
<i>General</i> RMZs	62%	19%
<i>Enhanced</i> RMZs	22%	54%
Total (million m³)	149	149

* Percentages may not add due to rounding.

The timber supply analysis (see Appendix 1) indicates that the recommended Plan’s management strategies do not accelerate or significantly increase the harvest fall-down compared to the Base Case. Therefore, harvest reductions, and the employment and other economic impacts associated with these reductions, begin to occur after year 35 and by about the

⁹ This analysis focuses on impacts to mature/old growth timber volumes in the THLB since they are more strongly correlated to short term harvest levels than THLB area. Note that the mature/old growth timber volumes in the RPAT PAs exceed the PA volumes in the recommended Plan.

¹⁰ A direct translation between RMZ labels and BEOs is difficult, but the IPT and the forest licensees agreed this was a reasonable assumption for analysis, and the LRMP has recommended that such an approach be adopted for lower level, landscape unit planning.

¹¹ All of these additional constraints are reflected in the timber supply analysis, but only the Caribou strategy is reflected in the GIS area statistics. This is because Grizzly Bear Management and VQOs are not mapped as zones per se, but as additional constraints that apply in various RMZs.

same magnitude, as in the Base Case.¹² This does not take into account the “under-harvesting” situation which could result in the deferral of harvest impacts in the Plan, as in the Base Case, until years 46-50 or later.

From year 36, the fall-down to the LTHL (as well as any associated socio-economic impacts) in the Plan would be the same as the roughly 5% every five years occurring in the Base Case. The timber supply estimates indicate that the Plan decline would reach the LTHL at the same year as in the Base Case (year 81), but at a level about 43,000 m³/yr lower than the Base Case LTHL. The socio-economic implications of this transition to the LTHL are very similar to those of the Base Case. After year 180, the LRMP results in an NDY of about 2.0 million m³/yr, about 50,000 m³/yr lower than the Base Case.

As shown in Table 3, the PAs in the Plan preclude less THLB and mature/old growth timber volume than do the RPAT PAs in the Base Case. The slightly lower long term harvest levels vs. the Base Case are primarily due to the *Wildland* (no logging) Zones proposed by the Plan outside of PAs. The SMZs, modeled as *High Biodiversity Emphasis*, do not result in timber impacts since the BEO targets can be met with timber in inoperable areas outside the THLB. Timber supply analysis done for the previous 1999 scenarios considered by the LRMP also indicates that the Plan’s VQOs and Caribou and Grizzly Bear Management Strategies affect only very small proportions of the THLB and mature/old growth volumes, and therefore have negligible harvest impacts on a Plan Area-wide basis in the short and long term. The Plan’s increase in EMZs and relaxation of some FPC and other constraints in EMZs/GMZs may have some positive effects on future timber harvest levels that were not fully captured in the timber supply analysis.

The increase in the proportion of the Plan Area in SMZs to about 12% of the THLB (from 8% in the Base Case), may increase harvesting costs directly in these areas as a result of management strategies and additional timber supply constraints. Harvesting costs may also be increased indirectly by forcing a greater proportion of the harvest to less accessible, lower value stands of timber (e.g., in the more northern portions of the District). The cost of harvesting is already a concern in the Base Case,¹³ although the provincial government has taken steps in recent years to reduce FPC and stumpage costs. However, any cost impacts of the Plan will likely be more than offset by the significant increase in the proportion of the THLB that is in EMZs, from about 25% in the Base Case to 55% in the recommended Plan.

As noted previously, the Plan proposes that two SMZs be placed in a Northern Rocky Mountains – Mackenzie Advisory Committee (NORM-MAC) area under a legislative designation similar to the *Muskwa-Kechika Management Area Act* (1998) that now exists for parts of the Ft. Nelson and Ft. St. John Forest Districts. The timber in these two NORM-MAC SMZs, would still be available, but this type of designation means that, by law, the LRMP objectives/strategies would have to be followed. Also, landscape unit objectives would generally have to be established prior to timber harvesting, and such objectives would have to be approved by BC Environment

¹² The analysis is based on timber supply modeling for previous LRMP Scenarios, in particular Scenario 3a, with adjustments by MoF to address differences between this Scenario and the recommended Plan.

¹³ For example, see *Financial State of the Forest Industry and Delivered Wood Cost Drivers*, KPMG, for MoF, April, 1997.

and Ministry of Energy and Mines. However, if appropriate forest resource objectives in the LRMP became a *Higher Level Plan* (HLP) under the FPC anyway, the NORM-MAC designation may not have significant incremental implications to those of the Base Case.

The key exception for which NORM-MAC may have an impact incremental to the FPC is if BC Environment approval is required for road construction components of forest development Plans. However, given that only two SMZs area affected, and due to access costs and the relatively poor quality of timber in the northern part of the Plan Area, little forestry development is expected in the foreseeable future regardless of the land use designation. Therefore, there is ample time for landscape unit planning to proceed well in advance of future timber harvesting. Also, the impacts of any additional costs (e.g. for access) may be mitigated if future timber and related product prices are higher in real terms.

3.0 Tourism / Recreation and Guide-Outfitting

3.1 Base Case (without LRMP Plan)

The Ministry of Finance and Corporate Relations (MFCR) analysis indicates that about 7% of basic employment (about 215 jobs, with probably 150-200 residing in the Mackenzie community) and 3% of basic after-tax personal incomes in the Plan Area are generated by the “travel industry.” Business travel (primarily related to the forest industry) is the most significant component of this sector of the Mackenzie community economy. Guide-outfitting is probably the most locally significant back-country tourism activity and 83% of the Plan Area is overlain by 21 guide-outfitter tenures. Based on a survey undertaken for the *Mackenzie LRMP Socio-Economic & Environmental Base Case: Final Report* (September, 1999), it is estimated that almost 100 jobs and 50 person-years are generated by the guide-outfitting sector. Of these, approximately half are local residents. Species hunted by guide-outfitters are mainly moose, black bear, caribou, goat, grizzly and mountain sheep, in roughly that order of importance.

Several lodges/camps exist, often operated by guide-outfitters or fishing guides, e.g., Ft. Graham Lodge at the mouth of the Davis River, and others on Pelly Lake, Wasi Lake, Thutade Lake, etc.). Based on discussions with LRMP and IPT members, up to 20 or more seasonal workers are employed by other wilderness tourism operators that are at least partly reliant on utilization of the northern portion of the Plan Area. In addition, some river-guiding, air tours, and other nature-based activities occur in the Gataga and Kechika areas, that are accessed mainly from just outside the northern portion of the Plan Area. For example, the 40-unit Northern Rockies Lodge in Muncho Lake, which also has a cabin on the South Gataga Lakes, employs 20 in the summer and 6 in winter. Therefore, while these operators rely in part on the Plan Area for their activities, their economic linkages are more oriented to communities outside the Plan Area such as Ft. Nelson.¹⁴

¹⁴ Johnny Mikes, Canadian River Expeditions Ltd., *personal communication*.

In many areas of BC, adverse impacts on visual quality from resource extraction (mainly timber harvesting) are a significant concern for the tourism sector.¹⁵ MoF has identified approximately 31,000 ha of (post-FPC) THLB that it considers to be of “High Visual Sensitivity,” about 0.5% of the Plan Area and about 2.8% of the THLB. The *Mackenzie TSA Timber Supply Review* (1995) assumed that about 16,000 ha (1.4%) of the (pre-FPC) THLB would be managed for “Retention” and “Partial Retention” Visual Quality Objectives (VQOs).¹⁶ However, for purposes of assessment, it is assumed that these VQOs are not likely to be established in the absence of an LRMP.¹⁷ The implementation of the RPAT PAs would preserve visual quality for about 18% of the high visually sensitive areas in the THLB, with another 18% partially protected in SMZs. However, the rest (about two-thirds) of the Plan Area would be in *General Management* and *Enhanced Zones* at high risk of visual impacts.

In the Base Case, 4 of 21 guide-outfitters have over 25% of their territories in SMZs and 3 of 21 have over 25% in existing/RPAT PAs – designations that are more supportive of the wilderness experience and fish and wildlife populations¹⁸ that are highly valued by the clients of these operators. The Base Case regime also has no documented management objectives and strategies. Therefore, over time, most guide territories would be subject to increasing resource development (particularly timber harvesting) and related road access. This would increasingly compromise the wilderness characteristics and the fish and wildlife populations upon which their businesses depend. These impacts would likely occur gradually, over the longer term. Based on the survey of guide-outfitters undertaken for the Base Case report (September, 1999), most guides felt that their businesses would continue to grow in the short term.

As noted above, a key concern of back-country recreationists and nature-based tourism operators is the amount of available “wilderness” and how that wilderness is managed. MoF has developed an indicator of wilderness¹⁹, “Undeveloped Watersheds over 5000 hectares” (UWs). This 10-year old inventory indicates about 3.1 million ha of such watersheds in the Plan Area (see Map 5), but is likely lower now, between 2-3 million ha, due to road building for timber harvesting that has occurred in the past decade. In the Base Case, almost 90% of the Plan Area (i.e. outside of existing and RPAT-proposed PAs) could eventually become roaded as resource development progresses. Most of the remaining unroaded areas are in the northern one-third of the Plan Area. Existing and RPAT PAs protect only about 11% of UWs.²⁰

¹⁵ For example, see *Clearcutting and Visual Quality: A Public Perception Study*, Ministry of Forests, 1996. Based on survey data, the study concludes that alterations of a visual landform unit (e.g., a hillside) via clearcutting of more than 6% to be slightly, moderately, or very unacceptable to the public.

¹⁶ See *Mackenzie TSA Timber Supply Review*, 1995, p. 14. A further 10,000 ha is assumed to be under a Modification VQO, which does not significantly restrict timber harvesting.

¹⁷ This assumption is somewhat arbitrary, and may overestimate the contribution and impacts of the Plan with respect to visual quality in the Plan Area.

¹⁸ Some species such as moose and deer do benefit from early seral forests, but over the long term the diminishing amounts of mature/old growth (with correspondingly higher amounts of mid-seral forests) presents increasing risks for these species. (see *Environmental Base Case*)

¹⁹ The Ministry of Forests uses another indicator, the “Recreation Opportunities Spectrum” (ROS), but ROS mapping for the Plan Area is not complete at this time.

²⁰ This estimate excludes 25,000 ha of the existing Kwadacha Park located in the Ft. Nelson Forest District.

Overall, approximately 20% of the Plan Area would be placed in PAs²¹ or SMZs in the Base Case. These designations would provide greater protection for viewsapes, recreation features, and fish and wildlife habitat that are important to wilderness tourism operators, and that can attract other visitors. There is only one *ELUA* corridor through a PA assumed in the Base Case, the Thutade-Omineca FSR extension to access timber in the *Twenty Mile* RMZ.²² However, the remaining 80% of the Plan Area is in *General* and *Enhanced* zones, in which there is more management emphasis on resource development than wilderness tourism. Over time, the environmental and scenic values upon which this sector depends, would be gradually eroded, resulting in increasing investor certainty and a loss of development potential in the industry.

3.2 Impacts of the Recommended Plan

The nature-based portion of the tourism / recreation sector is dependent on relatively pristine Crown land and resources, e.g., activities such as guide-outfitting, wildlife viewing, river rafting and angling in remote lakes. The business travel / front country / highway-community tourism component of the travel industry is less strongly linked to incremental changes in land use as recommended by the LRMP. However, attributes such as visual quality and availability of a variety of outdoor recreation experiences could affect the willingness of travelers to detour from the Alaska Highway to visit the area, as well as the duration of visitor stays, including visitors using commercial / front country facilities. Constraints on extractive resource development could also affect the frequency and duration of business travel. It is likely that the impacts of the recommended Plan compared to the Base Case will occur over the long term.

In very general terms, the Plan places over half (about 55%) of the Plan Area in Protected Areas, *Wildland* zones (no logging), and *Special* zones, compared to about 20% in these designations in the Base Case. Also mirroring this land use change is that the proportion of the Plan Area zoned as *General Management* has been reduced to about 15% in the recommended Plan compared to about 62% in the Base Case. The Plan also establishes Visual Quality Objectives for a number of visually sensitive areas and recommends a number of strategies that should reduce resource-related road development impacts on undeveloped wilderness areas, fish and wildlife populations and wilderness tourism activities that depend on these values. Therefore, the Plan results in a significant shift to a resource management regime that is more supportive of tourism activities dependent on preservation of wilderness, visual quality, fish and wildlife and other environmental values, primarily in the northern RMZs.

This shift in management emphasis is offset somewhat by the increase in the proportion of the Plan Area Gross Land Base (GLB) under *Enhanced Management Zones*, from 22% to 30%. This shift to *Enhanced Management* is particularly evident in the southern portion of the Plan Area, where most of the THLB is located. In fact, 55% of the THLB is in the *Enhanced* category, an increase from 25% in the Base Case. Another offsetting factor is that the Plan recommends a number of *ELUA* corridors in PAs which would reduce the number of

²¹ As noted previously, the RPAT proposals slightly understate Government's target for the LRMP and therefore the PAs that would occur in the Base Case.

²² If any RPAT PAs would block access to resource development, it is probable that additional *ELUA* corridors would occur in the Base Case in light of government policy to avoid isolation of resources.

undeveloped watersheds and related wilderness attributes, although Base Case government policy is that PAs will not be allowed to isolate resource development. Therefore, in very general terms, the recommended Plan will permit greater resource development in the southern portion of the Plan Area, while it better preserves wilderness attributes of the northern part of the Plan Area.

The Plan increases the size of PAs to about 886,000 ha (13.8% of the Plan Area) from about 625,000 ha in existing and RPAT-proposed PAs (9.8% of the Plan Area) in the Base Case. The increase in PAs is overstated since the RPAT PAs do not meet the 10.8% target for the Plan Area. However, the Plan still results in a significant increase in Protected Areas, due primarily to the larger size of the *Frog-Gataga* PA at the north end of the Plan Area. The recommended Plan also places an additional 1.1 million ha (18%) of the Plan Area in the *Wildland* zone designation which prohibits commercial logging, but allows mineral and energy exploration and development. The significant increase in management zones that preclude resource development and related road access will better protect the wilderness and scenic attributes, recreation features and fish and wildlife populations that support the wilderness tourism sector in the Plan Area.

A number of key tourism values are protected by PAs in both the Base Case and the recommended Plan. The Plan's most significant change is the substantial increase in the size of the *Frog-Gataga* PA which has high existing and potential value for backcountry recreation, especially river rafting, canoeing, guided tours and hunting. Protection is increased for a number of other important features, including: South Gataga Lakes (a high quality wilderness fishing destination); significant portions of the Kechika (highly rated for river recreation²³); and the *Frog-Gataga* portion of the historic Davie Trail. Along with the proposed *Kwadacha* and *Finlay-Russel* PAs, the *Frog-Gataga* PA is particularly important for tourism activities and Plans of the Kwadacha First Nation. The proposed *Pine Pass* PA also offers very accessible back-country hiking and snowmobiling opportunities given its proximity to Highway 97, and also protects important views for the Powder King ski facility.

The large *Omineca* PA protects a number of key recreation and fish and wildlife values that are very important to the Noostel Keyoh people and Germansen Landing, and is also within 3-4 hours of Highways #16 and #97. However, a somewhat larger area is covered by the RPAT-proposed *Omineca* PA in the Base Case, which provides better protection for caribou and related guide-outfitting activities. Some other key values that are not as fully protected in the recommended Plan as in the Base Case RPAT areas include:

- The somewhat smaller *Kennedy* PA (designated SMZ in the Plan) lessens protection for caribou and related guide-outfitting activities.
- The smaller *Chase* PA results in less protection for high value caribou habitat and good hunting / wildlife viewing potential.
- The re-configured *Finlay-Russel* PA results in less protection for Stone's sheep.
- Weissner Lake (high angling values), of particular importance to the Kwadacha Band, is omitted from the *Finlay-Russel* PA.

²³ Preliminary List of Significant Rivers, 1995.

As noted before, there are 7 *ELUA* corridors proposed for 3 PAs: the *Frog-Gataga*, the *Omineca* and *Finlay-Russel*. If roads were built in these corridors, it would likely increase recreation use in these areas, but could negatively affect the quality of the experience in these PAs (e.g. along the highly rated Kechika, South Gataga and Finlay Rivers). The proposed corridor and forest road upgrade along the north shore of Germansen Lake (a regionally significant recreation lake) will significantly reduce the value of the experience in that portion of the *Omineca* PA (see Map 14). Given government policy to avoid isolation of resources, similar impacts would be possible regardless of LRMP recommendations. For example, in the case of the *Omineca* PA, the access route in the Base Case would have been along the Omineca River, south of Germansen Landing, creating adverse community and some tourism impacts.²⁴ Note that roads in all of the *Frog-Gataga* PA and one of the *Finlay-Russel* PA *ELUA* corridors could only be triggered by a large mine or oil/gas development, the probability/timing of which is uncertain.

Some new PAs would restrict, to varying degrees, motorized or commercial tourism operations, in order to protect sensitive values. For example, the *Ospika-Cones* PA does not allow lodges, snowmobiling, heli-skiing and hiking or aircraft. The *Heather-Dina* PA also precludes heli-skiing and hiking and aircraft. While there will still be opportunities for growth in these activities, the potential could be reduced by the Plan. However, such restrictions could also occur in the Base Case RPAT-proposed PAs. Also, even long term potential may not be reduced if operators adjust the nature of activities so they are compatible with the management direction in the PAs or shift them to areas outside of PAs, such as adjacent *Wildland* or *Special* zones.

Visual Quality

The significant increase in the proportion of the Plan Area in PAs / *Wildland* / *Special* zones will better protect the scenic viewscapes. As shown in Table 5, the Plan places 65% of the visually sensitive areas within the THLB (the area at greatest risk of disturbance, at least in the short term) in these zones, compared to about 36% in the Base Case. Therefore, the land use changes in the Plan will increase protection for the wilderness viewscapes that are important to tourism.

Table 5: MoF’s High Visually Sensitive Areas by RMZ Category
 (% of Area in Post-FPC Timber Harvesting Land Base)

Zone Category	Base Case	Recommended Plan*
Existing PAs	-	-
Proposed PAs	18%	19%
<i>Wildland</i> RMZs	-	1%
<i>Special</i> RMZs (incl. Caribou Mgt.)	18%	45%
<i>General/Enhanced</i> RMZs	64%	35%
Total	31,307 ha	31,307 ha
Total (net of PAs)	25,400 ha	24,600 ha

²⁴ Some strategies to partly mitigate the impacts of the Germansen Lake haul road were discussed by the LRMP, but were not formally adopted. An alternative option is to access to the *Twenty Mile* RMZ from the Ft. St. James Forest District, which would eliminate the need for either the upgraded Germansen Lake or a new Omineca road.

In addition, the Plan recommends a number of areas for “Scenic Area” designation and some of these areas for VQO protection, including: Ft. Ware, Tsay Keh/ Estella-Ed Bird Lakes (viewpoints in the PA and the viewshed outside of the PA), Obo Lake & unnamed lake west of Obo Lake, Mackenzie viewshed, Highway 97, Finlay Bay, Cut Thumb Bay/Dina Lake #1/Heather Lake viewshed, and Shadow Lakes area. Note that the Plan document states that most of the recommended VQOs are only to be “considered” for establishment by MoF, which leaves uncertainty as to the likelihood of designation or the degree of protection.²⁵ The recommended Scenic Areas and VQO designations also comprise only a very small proportion of the Plan Area THLB and GLB.

The additional lower-level planning (i.e., landscape unit objectives for forest development, oil and gas pre-tenure Plans, approval of BC Environment on road location/design, etc.) that would be required in the Plan for the NORM-MAC area is also likely to better preserve visual values in these RMZs than in the Base Case.

The 7 *ELUA* corridors recommended by the Plan could negatively affect wilderness viewscales in several of the new Protected Areas, if roads were eventually built. Also, in light of current government policy, access corridors could occur and impact visual quality in the Base Case. As noted above, a high speed Forest Service road to be constructed along the north shore of Germansen Lake, which will significantly affect visual quality in the area. However, this road would otherwise be constructed along the Omineca River near Germansen Landing, which would have visual impacts on local residents and some visitors.

In summary, the land use changes and Scenic Area / VQO recommendations of the LRMP will better protect the wilderness viewscales and some key scenic areas. However, visual quality will continue to gradually deteriorate over time, particularly in the valleys in the southern portion of the Plan Area which make up most of the THLB.

Guide-Outfitting

Overall, the recommended Plan places 55% of the Plan Area and a similar proportion of guide-outfitter areas in PAs, *Wildland*, and *Special* zones compared to about 20% in the Base Case. As noted above, the shift in management emphasis versus the Base Case is especially significant in the northern RMZs. The Plan also places about 52% of undeveloped watersheds (greater than 5,000 ha) in PAs or *Wildland* Zones, compared to about 11% in the Base Case. These land use changes, the recommendations regarding designation of scenic areas and VQOs, and management policies such as access restrictions and the Grizzly and Caribou Management Strategies, are all more supportive of the fish and wildlife populations and the pristine viewscales upon which guide-outfitters depend, compared to the Base Case.

²⁵ The LRMP Plan does not clearly indicate the area of the LRMP’s recommended Scenic Areas and VQOs.

In addition to the above land and resource management changes, other, more specific objectives of the Plan are to maintain guide-outfitting opportunities by:

- recognizing the importance of foreground views near permanent, main facilities
- encouraging guide-outfitters to provide mapping, on a confidential basis, of key resources and facilities to resource developers for integration in their planning

For outdoor recreation in general, the Plan recommends that known high value recreation features will be addressed in all resource development Plans. While an improvement over the Base Case, this language provides only broad direction for lower-level planning, and does not commit government or resource developers to any specific action.

In addition to wildlife populations, access management is a key concern for nature-based tourism operators. Supplementing the Plan's general direction on access management, the NORM-MAC conditions (assumed to be similar to the existing *Muskwa-Kechika Management Area Act* existing in the Ft. Nelson and Ft. St. John Forest Districts) apply to 9 northern (non-PA) RMZs. Because of the increase in local strategic and/or pre-tenure planning that would occur, and the required BC Environment sign-off for such Plans, as well as for design of mine exploration roads, it is likely that guide-outfitter and other wilderness tourism interests would receive a higher priority during extractive resource development in these RMZs than in the Base Case.

Summary of Overall Estimated Tourism / Recreation Impacts

The wilderness or adventure tourism sector (not including business travel) is currently a modest contributor to the Plan Area economy, but is likely to continue to grow strongly as it has elsewhere in BC.²⁶ The recommended Plan will support more rapid growth in eco-tourism, and to a higher potential level of activity compared to the Base Case.

Although wilderness values will be better protected in the Plan than the Base Case, they will continue to be gradually compromised as resource development progresses. Given the relatively slow rate at which roaded resource development will proceed, nature-based tourism will continue to grow into the foreseeable future. However, after several decades it is likely that incomes of guide-outfitters and other nature-based tourism operators will be increasingly at risk, particularly in the south portion of the Plan Area, as clients for high-end guided packages begin to avoid areas not considered sufficiently "pristine".

The Plan will result in some restrictions on commercial tourism opportunities in new PAs (although this would also occur in RPAT-proposed PAs in the Base Case) and in future roaded opportunities in the NORM-MAC RMZs. However, this will likely result in a shifting of tourism activity (e.g. to non-motorized activities versus motorized, and from PAs to SMZs) rather than a reduction in tourism growth. Front-country and roaded recreation opportunities will continue to increase and be largely unaffected by the LRMP.

²⁶ As noted in the *Mackenzie LRMP Socio-Economic & Environmental Base Case* report, according to Tourism BC, job growth in adventure tourism was 11% in 1997, much higher than for the tourism industry as a whole. (Tourism BC, *The Value of Tourism to BC's Provincial Economy*, 1998.)

The overall impacts of the Plan on the tourism sector are difficult to quantify, particularly in light of potentially offsetting effects and adjustments by the industry to Plan constraints and resource and related road development. Plan impacts on wilderness tourism will occur over time, in the form of more rapid growth. For example, to illustrate the implications of the potential positive impacts of the Plan on the wilderness tourism sector, if the growth in current, nature-based tourism employment of about 125 were assumed to increase at 5% per year, compared to 3% in the Base Case, after 20 years, approximately 65 new, seasonal jobs could be attributed, at least in part, by the Plan. After 40 years, 285 additional jobs could be attributed to the Plan.²⁷ The person-year equivalents would be roughly half of these estimates, and only a portion (perhaps 50%) of these jobs would be held by local residents.

4.0 Minerals / Oil and Gas²⁸

4.1 Base Case (without LRMP Plan)

Mining

The northern portion of the Mackenzie Plan Area is ranked as one of the higher metallic mineral potential areas in the province (see Map 6). It contains two significant mineral belts—the North American lead-zinc-silver belt, in which such major mines as Sullivan (Kootenays), Faro (Yukon) and Red Dog (Alaska) have already been developed, and the Omineca gold-copper belt. Known deposits in the lead-zinc-silver belt within the Plan Area include the Cirque/Stronsay proposed development, Akie and Driftpile Creek. The one major operating mine within the Plan Area, Kemess South (350 employees²⁹), is in the Omineca gold-copper belt. There is also the intermittently operating Baker mine, with 6 employees. Other known deposits in the gold-copper belt within the Plan Area include a number of past producing sites (Cheni/Lawyers, Moosehorn Creek and Shasta) and the proposed Mt Milligan mine. There is also placer activity in the Manson Creek area.

In terms of identified deposits, there are 617 reported mineral occurrences in the Plan Area (Map 7), approximately 5% of the provincial total. These include: 24 past producers (80% of which were placer mines), 26 proven deposits (Map 8), 118 prospects and 449 showings.³⁰ MEM has

²⁷ Current number of jobs estimated as about 100 in guide-outfitting and 25 in other eco-tourism and related activities. It is likely that growth in eco-tourism employment is likely to decline over time, in both the Base Case and the Plan scenarios, due to conflicts with extractive resource development and as sustainability limits are reached. However, the point illustrated here, that the incremental employment impacts of the Plan versus the Base Case are likely to increase over time, is still valid.

²⁸ BC Hydro has indicated that it has no significant concerns regarding the recommended LRMP Plan, and in particular, has no Plans for transmission lines up the Rocky Mountain Trench at this time.

²⁹ According to BC Stats and 1996 Census data, there is no recorded local direct mining employment in the Plan Area, and the Kemess mine, which began operations in 1998, is a fly-in/fly-out operation with virtually all workers residing outside the Plan Area.

³⁰ Developed prospects are occurrences with enough information to allow reasonable estimates of ore grade and tonnages; prospects are occurrences with some indication of dimension; showings are occurrences with insufficient information to permit any estimation of dimension.

identified over 2.2 million hectares of land (one-third of the Plan Area land base) with high metallic mineral potential and some 750,000 hectares (12% of the Plan Area land base) with high industrial mineral potential.

The Plan Area has not been explored to the same extent as other mineral-rich areas of the province, primarily because of limited road access. MEM Assessment Report (ARIS) data indicate exploration expenditures in the Mackenzie Plan Area have averaged approximately \$1.8 million per year over the past 20 years (1979-1998). These data reflect expenditures reported for purposes of maintaining tenures. Total actual expenditures, including those associated with advanced programs or otherwise exceeding minimum tenure requirements are estimated to be, on average, three times the ARIS figures. This suggests that total exploration expenditures may have averaged over \$5 million per year. In the past few years, however, expenditures in the Mackenzie area, like other areas of the province, have been much less. In 1998, ARIS expenditures in the Plan Area were only \$171,000.

It is very difficult to estimate what levels of mining activity could be expected without the Plan, particularly over the longer term. The extent and quality of the deposits, future prices, costs, regulatory provisions and the competitiveness of British Columbia-sourced supply relative to other jurisdictions are all critically important but uncertain in the Base Case. MEM has analyzed the potential for new mines based on estimated ore grades and tonnages associated with known and potential mineral occurrences in the Plan Area. With respect to known deposits (developed prospects), MEM's analysis indicates that as many as 29 new mines could be developed over the next 70 years, including the two EA certified proposed mines in the Plan Area (Mt Milligan and Cirque), and others such as Driftpile Creek and Kemess North. With respect to all potential deposits, MEM's analysis indicates that, at a 50% confidence level,³¹ there may be as many as 93 deposits that could prove to be economically mineable over the next 100 years. At a 10% confidence level, MEM estimates that there could prove to be as many as 293 mineable deposits.

Oil and Gas

There are two oil and gas basins which extend into the Mackenzie Plan Area: the Western Sedimentary Basin in the foothills on the east with significant gas potential and the Bowser Basin on the west with significant oil potential (Map 9). MEM has estimated potential marketable gas reserves in the Plan Area at 3.1 trillion cubic feet (Tcf), or 3.1% of the total potential for the province as a whole (98.6 Tcf). It also estimated potential recoverable oil reserves in the Plan Area at 17.7 million cubic metres, or 1.8% of the BC total (1.004 billion cubic meters). See Maps 10 to 12 for an indication of the geographic distribution of these resources in the Plan Area.

There is currently no production in either of these basins within the Plan Area and only limited exploration to date. However, there is interest in these areas and they could be expected to be explored more intensively in the medium to long term as producers look to new areas within the already developed Western Sedimentary basin and new basins like Bowser.

³¹ MEM states that this means there is a 50% chance there could be more mineable deposits and 50% chance there could be fewer.

4.2 Impacts of the Recommended Plan

The assessment is based primarily on the resource inventory and impact estimates developed by Ministry of Energy and Mines (MEM) analysts. In accordance with the terms of reference, the assessment focusses on the regional and provincial economic development accounts and the provincial government financial account as described in LRMP assessment *Guidelines*.³²

The regional and provincial economic development accounts serve to indicate how the provisions in the Plan are expected to affect economic activity within the Mackenzie Plan Area and in the province as a whole. The primary indicators of impact are changes in: (i) the level of activity (exploration expenditures, development expenditures, the value of mining and oil and gas output), and (ii) direct and indirect employment, due to the Plan.

The provincial government revenue account is intended to indicate how the Plan is expected to affect government revenues and expenditures. As explained in the *Guidelines*, government revenues and expenditures can be affected by impacts on resource use and resource-related taxes or royalties, and by general economic and demographic effects (changes in investment, population, employment and related income or other taxes). Because the latter are difficult to estimate (particularly incremental effects) and because incremental revenues can often be offset by incremental expenditures to support a larger population base, they are not included in this account. The impact on government revenues are indicated by changes in resource-related royalties and other taxes (including bonus bids). The account in effect measures the financial impact on government as resource owner. The other revenue and potential expenditure impacts can be generally inferred from the provincial economic development account.

The draft Mackenzie LRMP sets out proposed Protected Areas; provisions for seven *Environment and Land Use Act (ELUA)* corridors through Protected Areas as may be required to develop resources in non-Protected Areas (Maps 14 and 15); *General Management Direction* for the Plan Area; objectives and strategies for the different types of resource management zones defined in the Plan; and, for some areas, new administrative or monitoring mechanisms to be applied.

Land and resource use in the Protected Areas is relatively clear in the Plan. Except for the grandfathering of existing approved activity compatible with Protected Area objectives, no industrial resource extraction or development is permitted. Hydro-electric, mining and oil and gas development are explicitly precluded.

The Plan is not likely to have significant impacts in the *General, Enhanced or Settlement* zones. While there are some road design and access recommendations for these areas, and some differences and possible ambiguity in the proposed management directions, they would not appear to entail significant incremental considerations or effects relative to the Base Case. It is impacts on resource use in the other management zones, specifically the proposed *Special* and

³² Province of British Columbia, *Social and Economic Impact Assessment for Land and Resource Management planning in British Columbia, Interim Guidelines*, August 1993.

Wildland zones, where the Plan can have its greatest effect.

The proposed *Special* and *Wildland* zones account for over 50% of the mineral/placer tenures and mineral occurrences, over 30% of the estimated volume of potential gas reserves and over 70% of the estimated volume of potential oil reserves in the Mackenzie Plan Area. The Plan confirms that exploration, mining and oil and gas development are acceptable uses of the land, and includes objectives to maintain opportunities for such activity. However, other objectives, particularly with respect to access management, and proposed implementation strategies can conflict with or impede exploration and development in the mining or oil and gas sectors. In general, “all resource-specific development Plans or permits will take guidance from the resource management zone objectives and strategies described in the Plan.”³³ How conflicting objectives will be managed and various strategies implemented is not clear.

Some of the major concerns cited by industry representatives regarding the recommended Plan include the following:

- Development approval in *Special/Wildland* zones adjacent to Protected Areas will be more difficult, at a minimum more uncertain, given the Plan’s call for consideration of Protected Area objectives in adjacent lands and the experience of other proposals near park boundaries.
- The zone nomenclature itself, in particular the new *Wildland* designation, will increase uncertainty about development approvals, because of the other priorities and objectives in those zones and the public expectations that can raise.
- Corridors through Protected Areas, not only for access but also utility and possible future pipeline requirements, are not adequately guaranteed nor optimally routed. Also, four of the seven corridors would not appear to be available for pre-development advanced exploration purposes if roads are required.³⁴
- There is no provision for a corridor through the proposed *Frog-Gataga* PA within the Rocky Mountain trench, which could facilitate exploration in the southern Kechika trough and utility and pipeline infrastructure if and when required.
- The emphasis on non-roaded access will raise costs and in some instances safety issues. Requirements for road deactivation will also raise costs.
- Road design and planning requirements will entail delays and added costs. New joint sign-off and review provisions will have similar effect.

MEM has similar concerns about the implications of the Plan. In a detailed review of the access management objectives and related provisions,³⁵ MEM analysts concluded that the Plan will significantly add to operating costs and administrative requirements for new off-tenure access in

³³ *Mackenzie Draft Recommended Land and Resource Management Plan*, June 2000, p.15.

³⁴ Ministry of Forests engineering staff (Prince George) have estimated that some 280,000 ha. of land in the Upper Pelly, Braid and Upper Gataga zones (4.4% of the Mackenzie Plan Area) would be isolated from roaded access for exploration if the Finlay Russel “Cut-Off Creek” and all of the Frog Gataga *ELUA* corridors were only allowed to be developed after Environmental Assessment review of specific development projects, as is proposed in the Plan. No other areas either inside or outside the Plan Area are physically isolated from development. (E. Hoffman, MoF; see also Appendix 3 and Map 13).

³⁵ Rolf Schmitt, Ministry of Energy Mines and Petroleum Resources, *Mackenzie Draft Recommended Land and Resource Management Plan- Analysis of Access Management Direction for Mineral Resource Exploration and Development (with Reference to Oil and Gas)*. September 2000.

the proposed *Special* and *Wildland* zones, particularly where subject to the proposed “Northern Rocky Mountains - Mackenzie Advisory Committee” (NORM-MAC) and *Wildlife Act* Access Management Area provisions. More specifically, the following incremental cost drivers and process requirements for such areas were cited:

- road access design
- public use management and deactivation of access roads
- more extensive stakeholder consultation
- access planning, including wildlife-related seasonal constraints on use
- consideration of adjacent Protected Area objectives
- promotion of non-roaded access
- access permits in the proposed *Wildlife Act* Access Management Area
- joint sign-off with BC Environment for off-tenure mining exploration roads
- pre-tenure planning for oil and gas development.

While industry and MEM’s concerns about process and costs of access are clear, it is important to recognize that many of the considerations and constraints on access would be similar with or without the Plan. The conflicting interests that the Plan is trying to address are not a creation of the Plan, they are a reflection of the competing interests that currently exist and have to be addressed to some degree by resource managers and permitting authorities in any event.

The real issue, therefore, is not how the Plan compares to an idealized alternative of relatively unfettered access for exploration and development. Rather, it is how it articulates and resolves the conflicting objectives as compared to what might otherwise be expected. Since the Plan itself, for the most part, is more of a guide to resource managers and more detailed planning processes, *it is not clear to what extent it will in fact add to uncertainty, costs and time-consuming process*. It no doubt has the potential for that, for reasons cited by MEM analysts and as exemplified by actual experience in other areas (for example, multi-year pre-tenure planning delays for the oil and gas sector in the Besa-Prophet area of the *Muskwa Kechika*). However, it should be recognized that the explicit intent of the Mackenzie Plan is not to add to regulatory cost or delay and the experience in *Muskwa Kechika* does not have to be replicated. *It will be the efficiency and balance brought to bear in its implementation, not the Plan itself, which will mostly govern its effects in Special and Wildland zones as well as the other non-Protected Areas.*

It is also important to recognize the broader context in which the implications of the proposed Mackenzie Plan must be considered. Mineral exploration expenditures in B.C., and Canada as a whole, are at a historic low. Reported expenditures in B.C. totalled \$25 million in 1999, less than 15% of the average level of expenditures a decade earlier. In Canada as a whole, reported expenditures have dropped to about 25% of the average in the late 1980’s. A number of factors underlie the low level of expenditures, including low metal prices through much of the decade and the absence, at least in British Columbia, of major new discoveries attracting new exploration interest. A key policy factor, however, has been regulatory delay and uncertainty surrounding new mine developments. In British Columbia this is a major concern, exacerbated by the Windy Craggy decision, the delays that have occurred with Tulsequah Chief, and the pervasive uncertainty caused by unsettled aboriginal land claims. According to some investment

analysts, these factors are making it very difficult to secure any risk capital for exploration in B.C. Exploration is a very high risk investment, with many more unsuccessful programs than successful ones. If there is a significant chance that successful discoveries will not be approved for development, the overall risk is considered by many to be unacceptable. Investment dollars go to similar geological, but politically more receptive environments like Mexico, Chile or Peru.

The uncertainties that have constrained exploration investment in B.C are largely unrelated to the LRMP process. Indeed, an important objective of the LRMP process has been to provide more clarity and certainty regarding resource use and development in the province—defining where development will be allowed and what should be considered in approvals processes. LRMP-generated land use plans are “strategic” in nature, however, and do not, nor were they intended to, define terms and conditions. They provide guidance on objectives, priorities and to some degree process. A key issue is how they are implemented. If the high level plans lead to detailed lower level plans and procedures that are clear and efficiently implemented, and which do provide increased certainty, the investment climate for mineral exploration and prospects for development can improve relative to the Base Case despite the additional Protected Areas and additional access constraints. Physically very challenging access has not prevented exploration from occurring in the past, nor will regulatory-demanding access preclude it in the future. However, mineral exploration won’t occur to any great degree (certainly not to the level warranted by the geological prospects) if the rewards from successful exploration remain uncertain, or if the added process and planning considerations serve to delay and constrain, as opposed to providing clear guidance regarding where and how exploration and development may take place.

While an attempt has been made below to quantify the impacts of the recommended Plan, the estimates are subject to considerable uncertainty - firstly, because of the difficulty of projecting the Base Case and secondly, because the impact of the Plan is unclear. Except for exclusions clearly defined by Protected Areas, the Plan serves primarily to set out broad objectives and priorities, and in some instances new process requirements. *Exactly how those will be manifested in more detailed lower level plans and specific terms and conditions for access or development approvals, and how such plans and terms and conditions would differ from the Base Case, is not clear.* Therefore, aside from the effect of the uncertainty itself, which is not insignificant, it is not clear how opportunities for and costs of exploration and mine or oil and gas development and operations will be affected. The estimates provided below must therefore be seen as illustrative of what the effects might be given what is known about the resource base and its potential, and what could occur as a result of the provisions of the draft Plan.

Mining

As shown in Table 6, GIS statistics indicate that over 47% of the exploration expenditures in the Mackenzie Plan Area have been in areas proposed to be *Special Management* zones (40% alone in the *Thutade* “Mining/Wildlife” SMZ). Another 8.6% have been in proposed *Wildland* zones and 5.6% in the existing and proposed Protected Areas (2.1% in the proposed *Frog-Gataga* PA).

Table 6: Distribution of Historic Mineral Exploration Expenditures
(% of Total)

	Existing PAs	Proposed PAs	Wildland	Special	Gen./Enh./Oth.
Base Case	0.7	4.6	--	6.8	87.9
Recommended Plan	0.7	4.9	8.6	47.2	38.7

Note: Proposed Protected Areas in the Base Case are those recommended by the government’s Regional Protected Areas Team (RPAT); *Special Management* zones are those that the IPT indicated would require management constraints to protect special resource values.

Source: Data for all GIS area statistics from MEM via Land Use Coordination Office GIS staff, Prince George.

There are only 217 hectares of crown grants in the Plan Area, most of which is for the Kemess mine in the proposed *Thutade* “Mining/Wildlife” *Special* management zone. There are 254,000 hectares of land in mineral tenures and 11,700 hectares in placer tenures. The majority of these are located in proposed *Special* management zones (particularly *Thutade* for the mineral tenures).

Table 7: Distribution of Tenures
(% of Total)

	Existing PAs	Proposed PAs	Wildland	Special	Gen./Enh./Oth.
Base Case					
Crown	-	-	-	-	100.0
Mineral	-	0.4	-	1.9	97.7
Placer	-	2.3	-	0.4	97.3
Recommended Plan					
Crown	-	-	-	76.0	24.0
Mineral	-	0.3	3.4	52.2	44.1
Placer	-	1.0	-	58.8	40.2

While the percentage of mineral tenures in the proposed *Wildland* zones is currently relatively small, in previous years there have been more tenures in these areas. MEM data indicate that tenures in proposed *Wildland* zones have averaged about 15% of the total number of mineral tenures in the Mackenzie Plan Area; tenures in proposed *Special* management zones have averaged 35%. Together the *Wildland* and *Special* zones have historically accounted for some 50% of the mineral tenures in the Plan Area.

A large percentage of the mineral occurrences and potential are located in proposed *Special Management* zones. A relatively small percentage of the occurrences are in the Protected Areas, particularly proposed Protected Areas incremental to the Base Case; for the proposed *Frog-Gataga* PA it is less than 1%.

Table 8: Distribution of Mineral Occurrences and Potential
(% of Total)

	Existing PAs	Proposed PAs	Wildland	Special	Gen./Enh./Oth.
Base Case					
Occurrences	0.1	1.9	-	3.7	94.3
High Metallic Potential	0.1	6.0	-	10.0	84.0
High Industrial Pot.	0.3	10.1	-	13.4	76.2
Recommended Plan					
Occurrences	0.1	3.8	9.2	46.6	40.2
High Metallic Potential	0.1	7.3	3.5	32.7	56.5
High Industrial Pot.	0.3	14.0	8.5	33.5	43.8

The Protected Areas proposed in the Plan do not directly affect a significant proportion of the mineral potential in the Mackenzie Plan Area. They account for less than 1% of the mineral tenures, less than 4% of the mineral occurrences, and no known or developed prospects. While small in proportion to the total number of tenures in the Mackenzie Plan Area, there are nonetheless some tenures that could be precluded from development because of the proposed Protected Areas (see Maps 14 and 15). These consist of:

- Jackaroo, a 637 ha. tenure located inside the proposed *Omineca* PA, with potential for a gold/silver/copper/zinc deposit
- Nina, a 1475 ha. tenure located adjacent to the *Omineca* PA, with potential for a gold/silver/copper/zinc deposit that could possibly extend into the proposed PA, but which in any event might not be developable without a buffer and southern access through the park
- Francine/Angel Jade (Olsen), a 150 ha. placer gold tenure inside the proposed *Omineca* PA
- Ecstall, 350 ha. of which are within the Plan’s version of the proposed *Frog-Gataga* PA and which in any event might not be developable without an additional *ELUA* access corridor through the PA and a buffer from the proposed PA to provide space for mine infrastructure

Jackaroo and Nina are not “developed” prospects, with delineated ore grades/tonnages, but they are considered by MEM officials to be excellent targets for massive sulphide mineral deposits. Ecstall as well, while not a “developed” prospect, shows evidence of barite/lead/zinc/copper in the “Rough” deposit. Preclusion of development of the tenures within Protected Areas would likely raise compensation claims.³⁶ More significantly, it could add to existing industry concerns about uncertainty of mine development in B.C. and exacerbate the difficulty that Ecstall and others have had in raising risk capital for exploration on other properties.

Mineral Exploration: Mineral exploration expenditures have significant employment impacts in the province. Based on an expenditure survey undertaken by Maki and Sunderman, BC Stats

³⁶ According to information provided by the proponents and MEM, the Nina, Jackaroo and Francine/Angel Jade claims were staked in 1996, 1997, and 1998 respectively; these stakings occurred after the RPAT candidate PAs were created and made public in 1995. While timber harvesting is precluded in these “temporary” RPAT areas, it is government policy to allow mineral staking to continue until an LRMP has reached general agreement on PAs.

estimates that for every \$1 million of exploration expenditures (in constant 2000\$), almost 10 PYs of employment (>\$500,000 of income) are directly generated. Another 5 PYs are indirectly generated as a result of the purchase of the goods and services required for exploration. Most of these jobs would not be local because of the limited population base in areas where exploration tends to occur. However, some local service industries are supported by the expenditures.

**Table 9: Mineral Exploration Provincial Employment Coefficients
(Person Years “PYs” of employment per \$1 million of expenditures)**

Direct Employment	9.6
Indirect Employment	5.0
Total Direct plus Indirect	14.6

Note: The direct employment income impact is \$516,000 for each \$1 million in expenditure.

Source: BC Stats

As noted earlier, MEM estimates that annual mineral exploration expenditures have averaged over \$5 million in the Plan Area over the past 20 years. Expenditures in the last few years have been much less. The geological potential could support considerably more. It is not known what future level of expenditures could be expected in the Base Case, nor how much they would be affected by the Plan.

If it could be assumed that exploration expenditures in the Base Case would have returned to historic average levels, and if the Plan simply had the effect of reducing expenditures in proportion to the land with high metal mineral potential excluded by new Protected Areas, the impact would be relatively small—a little over 1%, i.e., a reduction of \$50,000 in spending and under 1 job per year.³⁷ If the Plan also eliminated interest and expenditures in areas without prospect of pre-development road access through Protected Areas, and more generally discouraged exploration in *Wildland/Special* zones, the impact would be some 40%, i.e., an annual reduction of some \$2 million in exploration expenditures and 30 full time equivalent jobs (again on the assumption that without the Plan, exploration expenditures would have returned to historic average levels). On the other hand, if the Plan is implemented in a manner that increases certainty vs. the Base Case, there could be more exploration expenditures/employment with the Plan than in the Base Case.

Mining Development: The Plan is not expected to affect the existing mining operation at Kemess, but could affect new developments that could extend the Kemess mine life or the development of new mines elsewhere in the Plan Area.

The jobs directly generated would vary by mine. Mt. Milligan is estimated to directly generate 480 jobs, Cirque 250, Driftpile Creek 155. For most of the potential mines projected by MEM, the direct jobs would be between 100 and 250 workers for the life of each mine. For each direct job, BC Stats input-output data suggest another 0.4 to 1.2 jobs would be indirectly generated.³⁸

³⁷ Based on the difference in the area with high metal mineral potential in the new PAs in the base and Plan cases (see Table 8). Comparing the area with high metallic mineral potential in new Protected Areas compared to the current situation would suggest an impact of over 7%, or spending of some \$350,000 and about 5 jobs per year.

³⁸ BC Stats estimates total (direct + indirect)/(direct) employment multipliers of 2.2 for gold mines, 1.9 for other

In terms of the revenues government could receive as resource owner, i.e., the amount of mineral taxes it would receive, that would vary depending on the profitability of the mines. Generally, however, the revenues are relatively small, less than 5% of the value of the mine output. For example, mineral tax revenues from all existing metal mine operations are forecast to total \$22 million this year.³⁹ The majority of the potential mines identified by MEM would likely generate less than \$1 million per year per mine.

It is not known how many of these potentially mineable deposits would in fact be developed in the Base Case. Historical experience, with only 24 mines developed in the area to date (80% of which were placer), suggests that the numbers that might actually develop into mines would be considerably less than the potential. In any event, in terms of this assessment, the key question is how the timing or development of any of the potential mines might be affected by the Plan.

The potential mines that are currently “developed prospects” with known deposits that might be developed in the next ten to twenty years are not likely to be affected by the Plan. The two EA-certified proposed mines are in *Enhanced* zones. Except for Driftpile Creek, which is in the *Braid* RMZ (but for which there would likely be strong development support in any event), the other potential mines associated with known deposits that might develop within the next twenty years are either in *General* or *Enhanced* zones or the *Thutade* zone, a proposed *Special Management* zone but explicitly supportive of mining.

Over the longer term, the impacts are less clear. None of the potential mines associated with known deposits and very few of the other MEM-estimated potential mineable deposits (3 of 93 at the 50% confidence level, none of which are in the *Frog-Gataga* PA) are in proposed Protected Areas; MEM’s analysis concludes that two of these deposits would be in the proposed *Omineca* PA, and the third would be in the proposed *Finlay-Russel* PA, both of which were RPAT candidate Protected Areas in the Base Case, although their sizes/configurations have been changed by the Plan. The majority of known deposits are in *Special* and *Wildland* zones. As discussed earlier, the extent of the impacts on mining in these zones, and whether they are in fact positive or negative relative to the Base Case, will depend on how the Plan is implemented, and the clarity and security that the implementation provides to potential investors in B.C.

Oil and Gas

Oil and gas operations have significant provincial employment and government financial impacts. The BC Stats input-output model suggest that for every \$1 million in oil and gas output

metal mines, 1.7 for coal mines and 1.4 for other non-metal mines. The total employment multipliers including induced impacts (the re-spending of wages) would be higher with (direct, indirect + induced)/(direct) employment multipliers of 2.7-3.2 for gold mines, 2.3-2.7 for other metal mines, 2.1-2.5 for coal mines, and 1.6-1.9 for other non-metal mines. The estimates of incremental *induced* (i.e., wage re-spending) impacts are more uncertain than the indirect impacts arising from the purchases of goods and services for the operations.

³⁹ Mining activity generates other tax revenues as well, e.g., income, sales and corporate capital tax. However, the incremental effects, taking government expenditures and other costs effects are not clear. An example is the oft cited government benefit from the water rentals and other taxes embedded in the mining industry’s power purchases. In fact BC Hydro and the province incur a cost in supplying power to industry at BC Hydro’s industrial rate. The revenues received are significantly less than the power’s export value and the cost of new power supply.

(in constant 2000\$), there are almost 6 person-years of employment directly or indirectly generated. The government’s resource-related revenues from royalties and land sales vary depending on prices and geological potential. However, in its analysis of potential impacts in the Plan Area, MEM estimated that royalties and land sales would average 26% of the value of the output of natural gas, and almost 22% of the value of the output of oil.

In terms of land base, MEM estimates that 3,830 hectares of land have high gas potential; 386,608 hectares have moderate gas potential. The majority of this is within proposed *General Management* zones. For oil, an estimated 204,656 hectares are considered to have high potential; an estimated 84,220 hectares are considered to have moderate potential. A large proportion of lands with oil potential is within the existing *Tatlatui Park*, not the proposed protected areas additions. A majority of the high oil potential land is within proposed *Wildland* zones. (Table 10)

**Table 10: Distribution of Lands with Oil and Gas Potential
(% of Total)**

	Existing PAs	Proposed PAs	Wildland	Special	Gen./Enh./Oth.
Base Case					
High Gas Lands	-	-	-	0.2	99.8
Moderate Gas Lands	-	-	-	15.9	84.1
High Oil Lands	23.7	-	-	-	76.3
Moderate Oil Lands	65.3	-	-	-	34.7
Recommended Plan					
High Gas Lands	-	-	-	16.8	83.2
Moderate Gas Lands	-	-	34.1	7.0	58.9
High Oil Lands	23.7	-	52.2	24.1	-
Moderate Oil Lands	65.3	-	34.7	0.1	-

Like the distribution of land area with potential, the majority of the estimated volume of potential gas reserves is in *General* and *Enhanced* zones; a significant percentage, however, is in the proposed *Wildland* zones. (Table 11) The majority of the potential oil reserves is in the proposed *Wildland* and *Special* zones, but a significant percentage is in the existing *Tatlatui Park*.

There are no existing oil or gas operations in the Plan Area, nor are any expected to be developed in the short to medium term. Whatever impacts the Plan may have on such operations would not begin to be manifested for at least 5 to 10 years from now. Exactly what the impacts would be is uncertain, again depending on the implementation of the Plan. Less than 2% of the area’s potential gas resource is in proposed Protected Areas (an increment of less than 1% over what would likely be newly protected by the RPAT areas in the Base Case). None of the potential oil resource is in proposed Protected Areas. However, 33% of the gas resource and all of the potential oil resource outside existing parks is in proposed *Special* or *Wildland* zones. What occurs in those areas will largely determine the extent of the impacts of the Plan.

**Table 11: Distribution of Estimated Volumes Potential Oil and Gas Reserves
(% of Total)**

	Existing PAs	Proposed PAs	Wildland	Special	Gen./Enh./Oth.
Base Case					
Gas Volume	3.5	1.1	-	12.1	83.3
Oil Volume	26.5	-	-	-	73.5
Recommended Plan					
Gas Volume	3.5	1.9	23.2	9.8	61.6
Oil Volume	26.5	-	51.1	22.4	-

Source: MEM staff, Petroleum Lands Branch and Environment & Land Use Branch.

MEM analysts have calculated impacts on the assumption that about 30% of the gas potential resource and all of the oil resource potential outside of proposed Protected Areas would not be developed as a result of management objectives/strategies in the Plan. Under that assumption, and assuming it would virtually all otherwise be developed, some \$3 billion in potential gas reserves and \$2.3 billion in potential oil reserves would be foregone. MEM did not calculate the profile or timing of the production from these reserves. Whatever is foregone, however, would extend out many years from now and the present value of any loss would be considerably less than the dollar figures above, which are simply the product of a quantity of reserves and current prices. Nevertheless, the resource loss would still be significant.

In light of the language of the Plan and the policy of government which is supportive of oil and gas development outside Protected Areas, there is no need for the Plan to have such impacts. Nor is it reasonable to believe they are most likely. As opposed to measuring impact, the numbers serve to indicate the resource potential that may be significantly affected by the Plan if it is implemented in a manner which undermines the threshold investment required for development to take place in new areas. The critical issue again is how the Plan is implemented. The oil and gas sector does not object to land use planning; it generally supports it. Nor does the industry object to the preclusion of areas for parks. What the industry does require, however, is clear and competitive rules for those areas where development is allowed. Establishing and efficiently implementing such rules will avoid the loss of the resource potential in those areas; indeed it may even enhance its development relative to an uncertain Base Case.

5.0 Agriculture and Range

5.1 Base Case (without LRMP Plan)

Agricultural activity in the Mackenzie Plan Area occurs on a very small scale, consisting primarily of caring for horses for the guide-outfitting operations in the area. The MFCR analysis indicates there are about five individuals in the Plan Area reporting agriculture as their primary source of income, with most of this activity located near Germansen Landing. These operations rely on Crown range for at least some of their forage needs, and currently there are 14 grazing tenures in the Plan Area. The GIS area analysis indicates there are 658 ha of Agricultural Land Reserve (ALR) lands in the Plan Area, all of it in the *Selwyn* RMZ. Given the low level of

current agricultural activity, it is unlikely that the RPAT PAs would preclude any future growth in the sector.

Although most of the Plan Area has limited agricultural capability and is difficult to access, it does have some potential for increased range use, particularly in the Kechika area, the latter being tied primarily to growth in back-country tourism horse use activities.⁴⁰ Still, growth in agriculture will continue to be very slow in the foreseeable future due to relatively low quality soils, distance from markets, and climate factors.

5.2 Impacts of the Recommended Plan

There is very little difference between the recommended Plan and the Base Case in terms of implications for agriculture. It does not appear that any grazing tenures are located in proposed PAs (no GIS information was provided), but nine of the ten PAs in the Plan allow existing grazing tenures to continue.

The Plan contains some supportive management objectives for agriculture, such as identifying more lands for new grazing opportunities. However, there will be some higher costs and new restrictions for commercial range users, for example, recommendations that range management Plans be developed and that commercial grazing not be allowed or expanded where there would be unacceptable negative impacts on areas of high use by ungulates. Overall, growth in agriculture in the Plan area is mainly dependent on growth in markets, not incremental land use changes in the Plan. There is likely sufficient Crown land without significant wildlife conflicts and settlement lands near communities to sustain any foreseeable growth in grazing and other agricultural activities.

6.0 Trapping and Botanical Forest Products

6.1 Base Case (without LRMP Plan)

Most recent estimates indicate that the Plan Area has 72 registered traplines and 162 trappers (many traplines are held by several trappers). Trapping is a particularly important activity among the local First Nations communities. Typically, individuals will trap for part of the year and undertake other activities for the remainder. This is consistent with Census data that indicates trapping is not a primary income source for anyone in the Plan Area. According to BC Environment (Victoria), overall trapper net revenues have been about \$500,000 annually in the Plan Area and there are the equivalent of six Person-Years of annual trapping employment.

Among the various fur-bearers harvested in the Plan Area, marten constitutes the majority of the harvest, followed by beaver, weasel, muskrat, and mink. Although fewer in number, relatively high market values also make lynx, fisher, wolverine, and wolf significant species for trappers. Probably the most obvious threat to trapping is the potential for declining marten populations, since that species is quite dependent on mature/old growth forest types. As shown in Table 4, under Base Case management, over 80% of Plan Area mature/old THLB growth volumes are

⁴⁰Ministry of Forests staff, Mackenzie Forest District.

located in *General* and *Enhanced* RMZs, with minimal harvesting constraints beyond the FPC. As harvesting of these older forests proceeds, marten populations are subject to increasingly higher risks, as would be trapping incomes from this particular species. These risks will be mitigated to a certain extent by the fact that the THLB comprises only one-sixth of the Plan Area.

There are an estimated 211 recognized botanical forest products harvested in BC.⁴¹ These products can be grouped into eight categories: wild edible mushrooms, floral/greenery products, medicinal/pharmaceutical products, wild berries/fruits, herb/vegetable products, landscaping products, craft products, and miscellaneous. Currently, several species of wild edible mushrooms (e.g. Pines, Chanterelles and Morels), have generated the greatest commercial interest.

There is some harvesting of botanical forest products in the Plan Area, and while commercially marketable mushroom species are likely present, it has not been identified as a significant harvesting location, in part due to lack of infrastructure, a small population, and distance to markets. There is also traditional use of plants among the local First Nations,⁴² but there is a lack of information as to which varieties are of the most significance to Plan Area aboriginals.

Although MoF in Victoria has been researching the regulatory and management needs of botanical forest products, they are currently unregulated and generally not recognized in forest management planning. Utilization of botanical forest products, particularly mushroom harvesting appears to be growing, and a recent independent study concludes there are major economic opportunities in BC for increased botanical forest product exports.⁴³ According to MoF staff,⁴⁴ the effects of forest practices on botanical forest products will vary depending on the species. For example, some types (e.g., certain berries) prosper in early seral stage forests, others (e.g., pine mushrooms) do better in mid-seral forests, while still others (e.g., some medicinal herbs) require old growth to reach optimum potential.

It is unclear the extent to which the Plan Area could benefit from increased demand for botanicals, nor is there available data upon which to base estimates of potential, sustainable harvests. However, given that botanicals are not formally recognized in forest management planning, and that 80% of the Plan Area is in GMZs and EMZs that place greater emphasis on resource development, it is possible that potential opportunities in this industry may be foregone, particularly over the longer term.

6.2 Impacts of the Recommended Plan

Mapped information on fur-bearer habitat in the Plan Area was not available. However, the recommended Plan is more supportive for marten, the most important trapped species, since it

⁴¹ Ministry of Forests, *Botanical Forest Products in British Columbia: An Overview, 1995.*

⁴² Ministry of Forests staff, Mackenzie Forest District.

⁴³ R. Wills and R. Lipsey, *An Economic Strategy to Develop Non-Timber Forest Products and Services in British Columbia*, Cognetics International Research Ltd., FRBC Project No. PA97538-ORE, March 1999.

⁴⁴ Nelly de Geus, MoF Forest Practices Branch, Victoria, *personal communication*, July/99.

reduces the amount of mature / old growth forests in GMZs and EMZs. The Plan also has as an objective to maintain opportunities for sustained fur harvesting by encouraging resource developers and trappers to cooperate to minimize the impacts on each others' operations and resources, and by protecting cabins and trails from resource development activities.

Although the Plan results in somewhat of an improvement vs. the Base Case, 61% of mature/old growth forests in the GLB and 73% in the THLB will still be in GMZs or EMZs. This suggests that habitat for marten and other fur-bearers that are partly dependent on the characteristics of older forests will continue to be fragmented and degraded, and populations will continue to decline. Trapping incomes will also likely decline from current levels over the long term, but not to the same degree as in the Base Case.

The implications of the recommended Plan for botanical forest products are difficult to assess, given the lack of information on these values, their low commercial significance at this time, and the varying effects of forest practices. The Plan states that opportunities for the sustainable use of botanical forest products should be maintained, and even more specifically, that identified sites for botanical forest products will be considered at landscape and operational planning levels, an improvement over the Base Case. The Plan also provides more certainty that these values would be managed appropriately, given the much higher proportion of the Plan Area in SMZs and *Wildland* zones, and the increased planning likely to occur under the NORM-MAC designation. Commercial harvesting of botanicals will likely be restricted in new PAs, as they would in the RPAT-proposed PAs, although subsistence uses (e.g. by First Nations) would likely be allowed.

7.0 First Nations Concerns

7.1 Base Case (without LRMP Plan)

The Kwadacha (Fort Ware), Tsay Keh (relocated to the north end of Williston Lake Reservoir when their community lands were flooded to create the Reservoir), and part of the much smaller Noostel Keyoh (near Germansen Landing) communities are located in the Plan Area. First Nations have a population of about 600, almost 10% of the Plan Area population. The Kwadacha are members of the Kaska Dena Tribal Council, the Tsay Keh Dene belong to the Carrier Sekani Tribal Council, and the Noostel Keyoh are linked with the Nak'azdli and Takla Lake Bands. The latter two Bands are also part of the Carrier Sekani Tribal Council. The Noostel Keyoh participated in the LRMP process for its duration and the Kwadacha representatives also regularly attended meetings. There was some involvement by the Tsay Keh Dene, but they did not formally participate in the LRMP. All these groups are involved in the BC Treaty Commission land claims process, under the auspices of their respective Tribal Councils.

Logging and silvicultural activities are the most important sources of income, but many First Nations' people also depend extensively on traditional, nature-based activities such as trapping, hunting, fishing, guiding, and harvesting of botanical forest products (e.g., berries, medicinal herbs, etc.) for sustenance or livelihood purposes. Generally, the First Nations are concerned about increasing road access and other resource development pressures on traditional activities

in their territories,⁴⁵ and want more involvement in land and resource use decisions. In fact, recent court decisions (e.g., *Delgamuukw*) will give First Nations greater input into such decisions. These legal decisions and the eventual resolution of land claims in the Plan Area should gradually improve First Nations' socio-economic situation (and perhaps benefit the Mackenzie community as well, due to financial spin-offs from claims settlements) regardless of the LRMP.

However, depending on the eventual degree of control over land and resource use by First Nations after claims are settled, resource and related road development in the Base Case would continue to compromise many nature-based and cultural values important to First Nations. For example, the Tsay Keh have significant levels of historic and current use in the Ingenika River Valley. The Kwadacha's main areas of interest are at the north end of the Plan Area. The RPAT PAs would mitigate some of these impacts (especially the proposed *Russel Range*, *Chase* and *Gataga* RPAT PAs near Ft. Ware and Tsay Keh, due to their high wildlife values) on a portion of the Kwadacha and Tsay Keh Dene traditional territories.

7.2 Impacts of the Recommended Plan

Nothing in the recommended Plan is intended to affect any aboriginal or treaty rights. LRMPs are "without prejudice" to Treaties, and the Province accepts that LRMPs may change as a result of a treaty negotiation. The Plan includes a number of policies that facilitate identification and protection of aboriginal rights and interests. First Nations' input will also be requested through Plan review and lower level planning referral processes. However, such input is already required as a result of existing policies, reinforced by recent court rulings.

No mapping outlining specific aboriginal interests was available in the GIS database provided for this assessment. However, the LRMP was provided information by First Nations, ranging from informal discussions with the IPT to documentation presented to the Table such as the Tsay Keh Dene *Land and Resource Conservation and Management Plan* (January 26, 1999).

The Plan contains a number of recommendations to ensure that resource management planning is to be conducted in a cooperative manner with aboriginal peoples, in recognition of their rights and to address their concerns. For example, known traditional uses will be included in resource development planning to facilitate strategies minimizing impacts of resource developments. As noted above, such cooperation and consultation is required in the Base Case, but the LRMP provides more specific direction in a number of RMZs.

More specifically, the Plan PAs and *Wildland* zones will be more supportive of nature-based activities such as guiding and other wilderness tourism activities, trapping and botanicals. The Plan allows most traditional First Nations activities such as hunting, fishing, trapping, horse use, packing/guiding and subsistence harvesting of botanicals in most PAs. The most significant land use change compared to the Base Case is the significant increase in the size of the *Frog-Gataga* PA and the designation of new *Wildland* and SMZs immediately south of it. These designations better protect a large, intact predator-prey system, a number of high value eco-tourism features,

⁴⁵ *Mackenzie TSA Socio-Economic Analysis*, Bull and Williams, September 1995, pp. 16-21.

including several wilderness rivers, and the Davie Trail, all of which are of particular importance to the Kwadacha. Several other PAs and SMZs in the recommended Plan also protect key values of importance to First Nations, such as:

- the *Finlay-Russel* and *Kwadacha Addition* PAs for the Kwadacha people
- the *Ed Bird-Estella* Lakes and *Chase* PAs, as well as the *Ingenika*, *Lower Akie* and *Pesika* Sub-Zones for the Tsay Keh
- the *Omineca* PA and adjacent SMZs to the south for the Noostel Keyoh

The relatively large amount of the Plan Area in SMZs and the NORM-MAC area in the northern RMZs also suggest that more lower-level planning would occur than in the Base Case, which should better address the concerns of First Nations. The access management strategies for most of the northern RMZs as per the Plan stipulate that, in addition to restricting access for recreational uses to the primary roads and recommending deactivation of temporary secondary roads, industrial proponents are required to develop access route proposals and strategies for the RMZ through consultation with First Nations. Such measures should assist in mitigating at least some First Nations concerns regarding unrestricted roaded access in these areas, primarily for the more northern Kwadacha people but also to some extent for the Tsay Keh community.

First Nations still have concerns regarding inadequate protection for some resource values. For example, the Kwadacha are opposed to *ELUA* corridor #1 providing access through the *Frog-Gataga* PA. Although the corridor and northern half of the Ingenika River are placed in an SMZ, the southern half of the watershed is zoned *General Management*. The Tsay Keh have expressed concerns about the potential impacts of resource development in this part of the Ingenika watershed, as well as a number of other areas of special interest to them around the northern half of Williston Lake, that are placed in GMZs/EMZs.⁴⁶ Some Plan PAs provide less protection for First Nations' values than their RPAT counterparts (i.e. assumed to occur in the Base Case). For example, the RPAT version of the *Chase* PA captured more high value caribou habitat. Also, having the Jackfish area designated as an SMZ rather than part of the *Omineca* PA as in the Base Case, increases the risks to caribou, which are important to the Noostel Keyoh.⁴⁷

To the extent that these First Nations depend on the forest sector, the recommended Plan places slightly more downward pressure on timber harvesting than the Base Case, and therefore could jeopardize some aboriginal forestry employment in the future. However, these very marginal impacts will not occur for several decades and could be more than offset by the beneficial impacts of claims agreements, possible joint forestry ventures with existing licensees, and the greater protection provided in the recommended Plan for nature-based economic activities.

In summary, although few LRMP strategies explicitly identify First Nations, and there are concerns that the recommended Plan does not adequately protect some of their specific areas of

⁴⁶ See Letter from Chief Ella Pierre to David Johns, ADM Land Use Coordination Office, July 17, 1999.

⁴⁷ Taken from "Noostel Keyoh Dispute Input" letter, Nov. 13 1998.

interest, the shift in management emphasis in the Plan appears to be more consistent with the values, goals and economic development approach of First Nations peoples in the Plan Area.

APPENDIX 1: Mackenzie LRMP Timber Supply Forecast
(Ministry of Forests, Prince George Forest Region: September 2000)

General Assumptions

Timber supply analysis has been done using recent computer modelling that was done in support of the Mackenzie LRMP process, e.g., see the *Mackenzie LRMP Socio-economic & Environmental Assessment of "Agreement-in-Principle" and Land Use Scenarios: Draft Report*, October 1999). Appendix 1 of that document explains the assumptions and documents the results of these previous analyses. These assumptions are also valid for this assessment. Except for the Base Case, a key assumption for all of the October 1999 LRMP scenarios as well as the current recommended Land Plan, is the modelling of landscape level biodiversity using the LRMP Resource Management Zones (RMZs) rather than Landscape Units. It should be noted that there were no apparent timber supply impacts from the implementation of biodiversity at the RMZ level.

The harvest projections discussed here for the recommended Plan are based on previous timber supply modelling undertaken by McGregor Resource Analysis Group under the direction of the Ministry of Forests. In addition to this modelling, insight was gained from GIS area statistics obtained from the intersection of the Resource Management Zone (RMZ) coverage with the forest inventory file. While no actual timber supply modelling was done for the recommended Plan, this analysis uses as its basis the results from the past analyses, specifically the *Base Case* (including TSR I, RPAT protected areas, and the Forest Practices Code) and the *Alternate Scenario* analyzed in the October 1999 assessment.

Projected Harvest Flows for the Mackenzie Plan Area: Base Case & Land Use Plan

The timber harvesting land base (THLB) is the land that supports harvest under the current allowable annual cut (AAC). The THLB, after taking the Forest Practices Code net-downs into account, is estimated at 1,115,000 ha. The RPAT candidate protected areas result in a reduction from this total of approximately 80,000 ha., leaving 1,035,000 ha. The THLB of 1,017,000 ha. resulting from the Plan is approximately 18,000 ha. less than the THLB for the Base Case, and accounts for the fact that the THLB within the Plan's proposed protected areas is 70,000 ha. (i.e., is less than the amount in the RPAT areas). It is estimated that this THLB loss would not result in a short-term volume (AAC) impact because there is over 200,000,000 cubic meters (m³) of mature standing timber in the Plan Area.

It is expected that this mature timber would allow maintenance of the existing AAC in the Base Case of approximately 3,000,000 m³/year for at least 35 years with the RPAT candidate protected areas netted out, and 45 years if the RPAT areas are not netted out. As for the Land Use Plan, including its recommended Protected Areas and Wildland Zones (no commercial timber harvesting), it is also anticipated that the existing AAC could be maintained for 35 years.

Compared to the Base Case the impact of the loss in THLB is just over 40,000 m³ per year of growing potential based on the growth that is currently occurring in the existing natural stands. This loss of growth is reflected in the timber harvest flow graph between 80 and 175 years from now. It is expected that our current forest management practices will result in second growth stands that will produce higher growth rates than the existing natural stands. As a result, over the long-term (180 years from now) harvests levels would be reduced by about 50,000 cubic metres per year as a result of implementation of the recommended Plan.

Detailed estimates of the foregoing harvest flow projections are included in the table and graphs included in this Appendix.

It is important to understand that even with the use of a timber supply computer model, which produces harvest flow charts and graphs that appear to be very precise, there exists some uncertainty. This uncertainty is attributable to many things including the accuracy of inventory data and management assumptions put into the model. For example, forest inventory information is generally considered to have an accuracy of +/- 10% over a Timber Supply Area (TSA). Future timber supply reviews (TSRs) will reflect the Plan, assuming it is implemented. At that time the consideration of the Mackenzie Land Use Plan will be addressed in the Chief Foresters allowable annual cut (AAC) determination.

APPENDIX 2: GIS Socio-Economic and Environmental Area Statistics

APPENDIX 3: Review of Access Options for *Frog-Gataga* Area

APPENDIX 4: Glossary of Terms used in Socio-Economic Assessment

Agricultural Land Reserve: Land designated and reserved for agricultural purposes under the *Agricultural Land Commission Act* (the reserve covers about 5% of the Province and includes most of B.C.'s high quality agricultural land). It includes both public and private lands, and covers land being farmed and land with agricultural potential. Non-agricultural uses on the ALR are regulated.

Area Analysis: Using a Geographic Information System (GIS), this involves the generation of area-based statistics by overlaying mapped values upon one another within a computer database. This analysis is used in the assessment work to provide the hectarage of each resource value (e.g., Grizzly Habitat, Timber Harvesting Land Base, etc.) in each Resource Management Zone (i.e., Special Management, General, Enhanced, Agriculture-Settlement, and Protected Areas) category.

Base Case Scenario: The over-arching socioeconomic and environmental trends, as well as the implications of the land management regime in a planning unit, that are most likely to occur in the absence of a land use plan. It is the “benchmark” to which a proposed land use plan scenario is compared in order to assess the impacts of the land use plan.

Basic and Non-Basic Income/Employment: Basic income is assumed to flow into a local economy from the outside that economy, and can consist of incomes received from selling goods (e.g. forest products) and services (e.g., tourism) to non-local markets, or can take the form of government expenditures (e.g., civil servant incomes, pensions, social assistance, etc.) and investment income (e.g., bank interest) accruing to community members. Non-Basic Income is paid to individuals in the local economy for the goods/services they provide to other individuals in the community, (e.g., most retail activity). Basic employment consists of the jobs in the Basic Sectors (normally Forestry, Mining, Tourism, Agriculture, Fishing/Trapping, Construction and “Other”) and Non-Basic Employment consists of jobs in the Non-Basic Sector (e.g., most retail, personal services, etc.)

BC Input-Output Model (BCIOM): The Ministry of Finance and Corporate Relations’ detailed set of BC industry/commodity (602 commodity, 216 industry, and 136 final demand accounts) accounting data that attempts to simulate the structure of the BC economy via a set of mathematical equations that describe the relationships among its sectors. A major use of such a model is to provide quantitative estimates at the provincial level of the indirect and induced employment (multiplier) impacts caused by a change in the output of a particular sector, e.g. forestry.

Direct Impacts: The change in income/employment that occurs as a direct result of a change in resource industry activity, e.g. mill jobs affected due to a change in timber processed in that sawmill.

Indirect Impacts: The change in income/employment of workers in businesses that supply goods to the firm or sector that is experiencing the direct impacts, e.g. a change in machine shop employment due a change in sawmill activity.

Induced Impacts: The change in income/employment of workers in businesses that rely on purchases of goods/services from wage-earners in the direct and indirect sectors experiencing the impacts, e.g. variations in motor vehicle sales to workers due to changes sawmill, machine shop, etc. activity.

Long Term: For economic analysis, the time period after which the entrepreneur has the ability to alter the capital stock (i.e., plant and equipment); typically, one enters the long run in 2-3 years, but it does vary. In this socioeconomic analysis, the long run generally implies more than one decade. Note that for environmental values, the long run is typically a much greater period of time.

Long Term Harvest Level (LTHL): The estimated annual harvest projection for unmanaged timber stands that is sustainable for an indefinite time period in a particular management unit, given that management constraints and other assumptions remain unchanged. The LTHL is based on the long term timber productivity of the management unit, and does not normally take into account the positive affects of managed silvicultural treatments on available timber volumes. In this analysis, the LTHL is assumed to occur between approximately year 80 and 180. See also Non-Declining Yield (NDY).

Long Run Sustained Yield (LRSY): See Long Term Harvest Level.

Multiplier: A variable that, when calculated in the form of a numerical estimate, provides a quantitative approximation of the indirect and induced income/employment impact caused by a prior direct change in income/employment. Multipliers are applied to the direct income/employment impacts in resource industries to estimate the total income and employment effects in both the planning area and the province overall. For example, an employment multiplier of 2.0 for forestry means that for each direct forestry job, one additional “spin-off” job is associated with it. Provincial level multipliers are larger than local multipliers because at the local level, a greater proportion of income “leaks” out of the area to purchase non-local goods and services.

Mineral Occurrences: Documented evidence of site-specific mineralization. Occurrences are divided into Producing Mines, Past Producing Mines, Developed Prospects (occurrences with defined grades and tonnages), Prospects (occurrences with some indication of dimension), and Showings (occurrences that are not sufficiently defined to permit resource estimation.)

Mineral Potential: Mapped estimates of the areas of the Gross Land Base that are judged by the Energy and Minerals Division of the Ministry of Employment and Investment to have either High, Medium, or Low capabilities for producing future mineral discoveries.

Mitigation: A measure that reduces the negative impacts of a particular action.

Multiple Accounts Analysis (MAA): An analysis of the nature and socioeconomic / environmental significance of the resource impacts from changes in land use. The analytical framework is separated into various categories or “accounts” so that the reader can make “apples and oranges” comparisons among impacts on different values (i.e, forestry, wildlife, recreation, mining, etc.) within a land use scenario or among various scenarios (e.g., the Base Case vs. the Land Use Plan). This analysis is based primarily on the Area Analysis (see above) and Resource Analysis (see below) provided by government agencies. MAA is sometimes referred to as “Socio-economic & Environmental Assessment.”

Net Present Value (NPV): The value in today’s dollars of a future stream of cash payments, predicated on the concept that a dollar received in the present is worth more than a dollar received in the future, since funds received in the present will begin to earn interest immediately while those received in the future will not. For example, the NPV of a dollar received a year from today is $\$1/1.06 = \0.94 if the interest rate on investments is 6%, the NPV today of a dollar received in 10 years would be $\$1/(1.06)^{10} = \$1/1.79 = \$0.56$, the NPV today of a dollar received in 30 years would be $\$1/(1.06)^{30} = \$1/5.74 = \$0.17$, etc.

Net Resource Value: A provincial level socio-economic account which estimates net benefit in terms of economic rents that are foregone due to changes in land use, expressed as a dollar amount per B.C. household. This account shows the “opportunity cost” of a particular land use scenario, e.g. the annualized dollar amount that each household would have to be willing to sacrifice in order to obtain the non-monetary benefits associated with that scenario. The provincial government’s *Social and Economic Impact Assessment for LRMP, Interim Guidelines* (1993, p. 29) suggests that the indicated stumpage rate is an acceptable proxy for economic rent in the timber sector.

Non Declining Yield (NDY): Similar to Long Term Harvest Level (LTHL), but takes into account the effects of managed silvicultural treatments on timber volumes available in the long term; defined in this analysis as occurring subsequent to the LTHL, i.e., after approximately 180 years.

Person-Year (PY): One year of full-time work, e.g. could be one person working for 12 months, 2 people working 6 months, etc. PY estimates are often used to facilitate comparisons of employment impacts among different sectors where seasonal jobs are an important component, e.g., forestry, tourism, etc. For purposes of the Prince George LRMP socioeconomic impact assessment (as per the Jobs & Timber Accord), a Person-Year (PY) of milling employment is assumed to be equivalent to 1 job, a PY of woodlands harvesting/trucking employment is assumed to be equivalent to 1.2 jobs. Because of their short term and highly seasonal nature, the PY equivalent of silvicultural employment is also assumed to be the total number of “jobs” for this sector.

Person -Year Coefficient or Ratio: The number of PYs of direct forestry employment associated with the timber harvest for a particular area, divided by that harvest. The result provides the ratio of Person-Years of employment associated with each 1000 cubic metres of timber harvest.

Plan Area: Area covered by an LRMP land use plan, normally the same as a Forest District.

Potential Natural Gas Reserves: Estimates of the quantity of natural gas occurring in a particular area, where those quantities have not yet been proven to be economic to extract.

Proven Natural Gas Reserves: Estimates of quantity of natural gas occurring in particular area, where those quantities have been proven to be economic to extract. Note these estimates change every year as new extraction occurs and as new additions of economic resources are added.

Qualitative Assessment: An analysis in which an impact is described in words rather than using numbers, e.g. an unknown change in costs to a sector due to a land use change. Qualitative assessments are used primarily where there is too much uncertainty to have confidence in quantified impacts.

Quantitative Assessment: Where an impact is described by some change in the numerical value of a certain variable, e.g. an estimate of the change in government revenue from a land use change.

Regional Protected Areas Team or “RPAT”: The group of regional resource agency staff who made recommendations to LRMP tables on appropriate candidates for new Protected Areas. In the Omineca-Peace region, this group also had the task of reducing the original RPAT areas to meet the percentage targets provided by government for each LRMP Plan Area.

Rent or Economic Rent: The above-normal financial returns from a commercial activity that occur as a result of the product or service generated by that activity being in relatively fixed supply relative to demand. Rent can accrue to the entrepreneur, or can be captured in the form of taxes by government or as wages by labour.

Resource Analysis: An analysis of the impacts on the physical units of a resource (e.g. m³/yr. of timber, mineral production, wildlife populations, etc.) resulting from changes in land use. This analysis is usually provided by the resource agencies (e.g., Ministry of Forests' timber supply analysis) and is based primarily on the Area Analysis (see above).

Short Term: In economic analysis, that period during which an entrepreneur does not have the time to vary the capital stock (i.e., plant and equipment), e.g. 2-3 years. In this socioeconomic analysis, this term is utilized to describe that period covering the near future, e.g., within a single decade.

Timber Harvesting Land Base (THLB): That portion of the "Gross Land Base" of a defined management unit (e.g., a unit such as a Forest District or Timber Supply Area) considered by the Ministry of Forests to be available for long-term timber supply. Therefore from the Gross Land Base, areas known as "Forested Exclusions" (e.g., non-merchantable timber) and Non-Forested Exclusions (i.e., alpine areas) are "netted out" in arriving at the THLB. It is assumed that Forested Exclusions generally contribute more to non-timber values, such as wildlife habitat, than do Non-Forested Exclusions. Note that the THLB often changes over time.

Timber Supply Model: A computerized analytical tool that, after inputting the appropriate data and assumptions (e.g., Timber Harvesting Land Base, growth rate of timber, etc.), provides forecasts of potential annual short and long term harvest levels over time.

Visual Quality Objective (VQO): A management zone that defines a particular level of landscape alteration from forestry and other activities. The objective for an area can range from Preservation VQO (where up to 1% of the landscape can be visible altered by harvesting) to Modification VQO (where up to 25% of the visible area can be altered).

APPENDIX 5: List of Acronyms used in Assessment

AAC: Allowable Annual Cut
ALR: Agricultural Land Reserve
AMA: Access Management Area (under the *Wildlife Act*)
ARIS: MEM's Assessment Report Indexing System
BEO: Biodiversity Emphasis Option
CMS: Caribou Management Strategy
ELUA: Environment & Land Use Act
EMZ: Enhanced Resource Management Zone
FPC: Forest Practices Code
FRBC: Forest Renewal BC
FSR: Forest Service Road
GBMS: Grizzly Bear Management Strategy
GLB: Gross Land Base
GMD: General Management Direction (in land use plan)
GMZ: General Resource Management Zone
GIS: Geographic Information System
HLP: Higher Level Plan (under the FPC)
IPT: Inter-agency Planning Team
IWMS: Identified Wildlife Management Strategy (under the FPC)
LRMP: Land and Resource Management Plan
LTHL: Long Term Harvest Level
LUPG: Landscape Unit Planning Guide (under the FPC)
MEI: Ministry of Employment & Investment
MEM: Ministry of Energy & Mines
MFCR: Ministry of Finance and Corporate Relations
MK: Muskwa-Kechika
MSBTC: Ministry of Small Business, Tourism & Culture
MoF: Ministry of Forests
m³/yr: cubic metres per year
NDY: Non-Declining Yield
NMAMA: Northern Mackenzie Access Management Area
NORM-MAC: Northern Rocky Mountains - Mackenzie Advisory Committee
PAS: Protected Areas Strategy
PA: Protected Area
PPA: Proposed Protected Area
RMZ: Resource Management Zone
PY: Person-Year (of employment)
RPAT: Regional Protected Areas Team
SEA: Socio-Economic Analysis
SMZ: Special Resource Management Zone
Tcf: Trillion cubic feet
THLB: Timber Harvesting Land Base
TSA: Timber Supply Area
TSR: Timber Supply Review
VQO: Visual Quality Objective

