



**PEEL WATERSHED PLANNING COMMISSION**

## **LAND USE SCENARIO METHODS REPORT**

**Prepared by the  
Peel Watershed Planning Commission**

**November 2008**

**Edited by  
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## **LAND-USE SCENARIO METHODS REPORT<sup>1</sup>**

### **(A) Background**

Under the mandate of Chapter 11 of the Umbrella Final Agreement (UFA), the Peel Watershed Planning Commission (PWPC) is responsible for developing and recommending a regional land use plan for the Peel Watershed Planning Region. The PWPC is an arms-length commission with members who are jointly nominated by the Yukon Government, Na-Cho Nyak Dun, Tr'ondëk Hwëch'in, Gwich'in Tribal Council and Vuntut Gwitchin governments. The recommended regional land use plan will apply to all Settlement and Non-settlement lands in the planning region. Its target period of application is approximately 10-15 years, including at least one opportunity for review during this period.

The Commission has drafted a *Statement of Intent*, and has *Plan Objectives* which link to the Umbrella Final Agreement (UFA) – See Appendix A. The *Planning Principles* will also guide its recommendations (see Appendix B). These principles are rooted in the UFA and GTOR goals and objectives and the comments received during the Issues and Interests Gathering exercise, along with further advice received from the Parties. These guiding documents (Statement of Intent, GTOR, and Plan Principles, therefore serve as the first level or coarse filter through which land-use scenarios will be analyzed.

With the completion of the *Interests and Issues Report (IIR)*, *Conservation Priorities Assessment Report (CPAR)*, the *Resource Assessment Report (RAR)*(PWPC 2005, 2008a, 2008b, respectively), the Commission now has the best available information to enter into the next phase of its mandate. These documents (available or soon to be posted on [www.peel.plan yukon.ca](http://www.peel.plan yukon.ca)) address the following:

- assessment of all known land use interests in the region (IIR)
- consideration of existing and potential land-use interests (RAR)
- conservation values and priorities (CPAR)

This document - the *Scenarios Methods & Criteria Report (SMCR)*, outlines the methods the Commission will follow to evaluate land use planning and management scenarios for the Peel Watershed Planning Region.

### **(B) The Building Blocks to Scenarios Analysis**

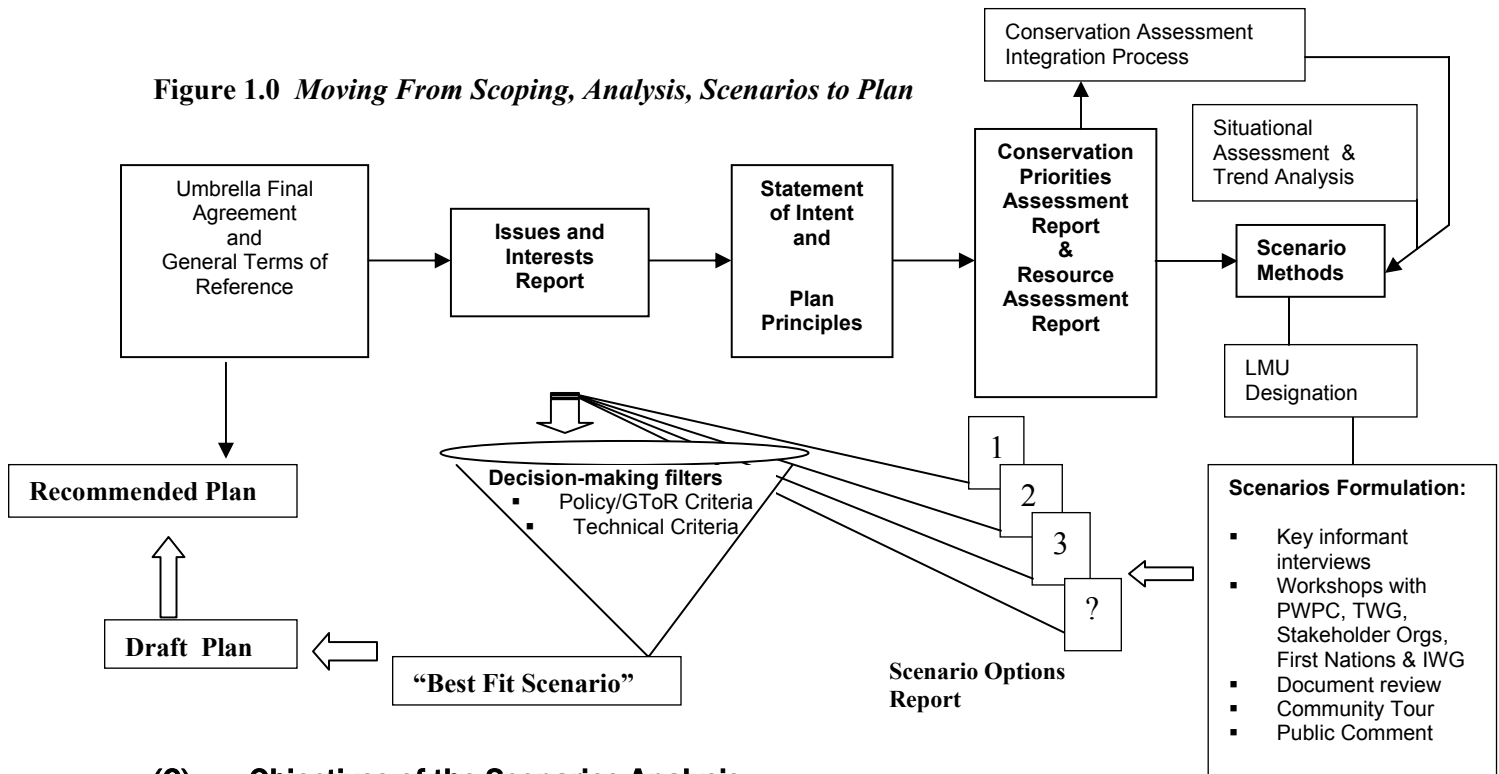
The criteria, methodology and results of the scenarios analysis will be consistent with current legislation (UFA); the Commission's guiding document (General Terms of Reference); the public's issues and interests, as gathered by the PWPC; and the Commission's Statement of Intent and Plan Principles (see *Figure 1.0*). These documents guide the Commission in its subsequent planning phases, provide consistency and allow the public to see the rationale upon which the Commission's ultimate recommendations are based. The Conservation Priorities Assessment Report (PWPC 2008a) and the Resource Assessment Report (PWPC 2008b) represent the summary of information that will be the basis for the scenarios analysis. As also shown in *Figure 1.0*, this included in-house workshops (Conservation Assessment Integration Process) to analyze scientific and

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<sup>1</sup> This "Scenario Methods" has been the result of internal review by PWPC staff and Board, and may be subject to further refinement based upon external public review.

traditional knowledge information, as well as a Strategic Trends analysis to appreciate key driving forces (political, economic, institutional, ecological, and technological) that are likely to have impact on development of the land-use Plan (Situational Assessment & Trend Analysis). This analysis also includes i) an understanding of current government policy and regulatory regimes affecting various resource sectors, and ii) a review of the current legal context provided by UFA implementation as they pertain to all relevant chapters.

**Figure 1.0 Moving From Scoping, Analysis, Scenarios to Plan**



**(C) Objectives of the Scenarios Analysis**

The Scenarios Phase of the planning process will address four objectives:

1. **Development of land management units.** In order to apply land-use planning and management tools) it is necessary to divide the planning region into manageable units, which are called land management units (LMUs). These units are distinguished by their patterns of hydrology, topography, ecology and land-uses;
2. **Development of land use designation system.** The land use designation system is another term for a “zoning system” which will guide the management of land use activities within different areas of the region based on the results of our research and planning process. It consists of different categories that describe either the type or intensity of land uses that are allowed or recommended for each specific LMU<sup>2</sup>.

<sup>2</sup> This framework can also include decision-making tools (such as general resource management directions, timing windows, activity thresholds, best management practices, communication protocols, etc) to guide land-use in the future with the consideration of new information (i.e. ecological, economic, social, cultural, resource management practices, technology and societal objectives).

3. **Scenario options.** “Scenario” refers to a desired land-use designation & management configuration (principally Zoning), and “Options” refers to alternative configurations that allow comparison on achievement of Plan goals and objectives;
4. **Scenario Selection:** Once alternative land-use scenarios have been presented, and vetted through our consultation process, it will then be necessary to process these options into a “best fit scenario” using a filter analysis that will consider first the “coarse level decision-making” policy criteria then more technical criteria. To do so, the planning team with the help of its Technical Working Group will provide the Commission members with a foundation for this scenario selection

#### **(D) Methods**

##### **Land Management Units**

The planning region’s land management units will be finalized early in the Scenarios Analysis phase based upon preliminary analysis by planning staff and recommendations of the PWPC and expert advisors. Technical staff will provide initial boundaries which will be reviewed and revised by the Commission. Initial testing of LMU designs will be based on a combination of ecodistricts and sub-watersheds. The LMU boundaries will be fine-tuned by assessing their correlation with ecological, cultural and/or economic resource values. This could result in boundaries being revised to reduce potential land use conflicts within individual LMU(s).

#### **(E) Land Use Designation System**

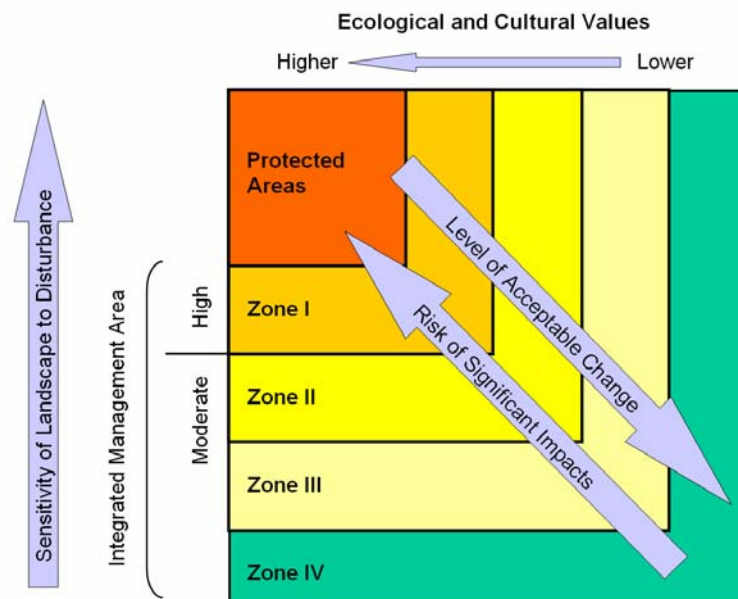
The land use designation system will be finalized later in the Scenarios phase, once the Commission has a clearer notion of the appropriate stratification of zoning based upon available research, and consultation. The Commission will determine the land management objectives for each LMU before defining the zoning categories. PWPC’s land use designation system will endeavor to achieve consistency with the planning systems of the North Yukon Planning Commission’s and the Gwichin Land-Use Planning Council. The NYPC model includes three major land use categories – Protected Areas, Integrated Management Areas and Community Areas, whereby the Integrated Management Areas are stratified into four types of zones of varying conservation or development emphasis (See Figure 2 below). The Peel Watershed Planning Region will not have a “Community Areas” category since there are no communities that fall within the boundaries of the planning region, there may be other designations to reflect First Nations resource use. The PWPC will also have to determine the number of types of zones within the Integrated Management Area category.

The NYPC zoning concept is illustrated in Figure 2. Areas with highest ecological and cultural values and higher sensitivity to disturbance are deemed to be at a higher risk to significant impacts, and are therefore, identified as being most valuable for conservation in their natural state. Conversely, areas zoned for high economic development value are at lower risk to significant environmental impact, whether by having lower ecological or cultural values by having lower sensitivities to disturbance, or by having both.

The advantage of PWPC adopting a similar land use designation system as NYPC is greater consistency achieved for resource management/land-use decision-making within

the regional context of completed land-use plans of adjacent planning regions and potentially extending to the remaining planning regions of the Yukon Territory.

**Figure 2 Potential Zoning Framework for the Peel Watershed Planning Region**



As identified above, there are numerous land use interests in the Peel watershed. It will be the job of the PWPC to review these various interests, assess their distribution, potential compatibility or incompatibility with other land use interests in the region, and assess priority land use interests in given areas. The Commission's recommended land use plan will seek to mitigate conflict through general management direction, best management practices, and zoning. Whenever possible, LMU zoning will be assigned according to what is the desired state of the landscape (levels of acceptable change), but under certain circumstances the Commission may need to provide prescriptive zoning in order to ensure a particular resource is given priority.

## **(F) Scenarios Development**

The development of scenario options is achieved through analysis, negotiation and mitigation planning of *all* resource values and land-use interests including tourism & recreation, big-game outfitting, subsistence harvesting, culture and heritage, minerals, oil & gas, transportation and access, and conservation.

Areas of high conservation value are based on the results of The Conservation Priorities Assessment. These findings and seven other themes (Minerals, Oil & Gas, Transportation & Access, Tourism & Recreation, Heritage and Culture, Big Game Outfitting, and Native Subsistence) will be compared to one another to derive scenario options. These options must consider all values in a balanced way to achieve ecological, economic and social goals. Figure 3 outlines the integration of all of the resource values, and the subsequent process to develop scenario options.

The Commission under the guidance of the Planning Team, and Technical Working Group will work to formulate multiple scenario options for the Parties (government agencies/First Nations) and public to consider based upon the best available data, consultation and analysis. This also includes summary information derived from the Issues and Interests Report (PWPC 2005), consultation exercises and Situational Assessment & Trend Analysis<sup>3</sup> that will help to frame the range of potential scenarios and zoning possibilities. The Scenario development work will proceed in workshop format in the following order to ensure a balanced perspective and possible new information: 1) Commission members, 2) Stakeholder organizations, 3) First Nations. A synthesis exercise will then be conducted again with the PWPC to derive a few key scenarios for consideration by the Parties and the general public using a Scenarios Option Report. This progressive, but iterative process will allow the planning team to be guided by policy, principle and technical review.

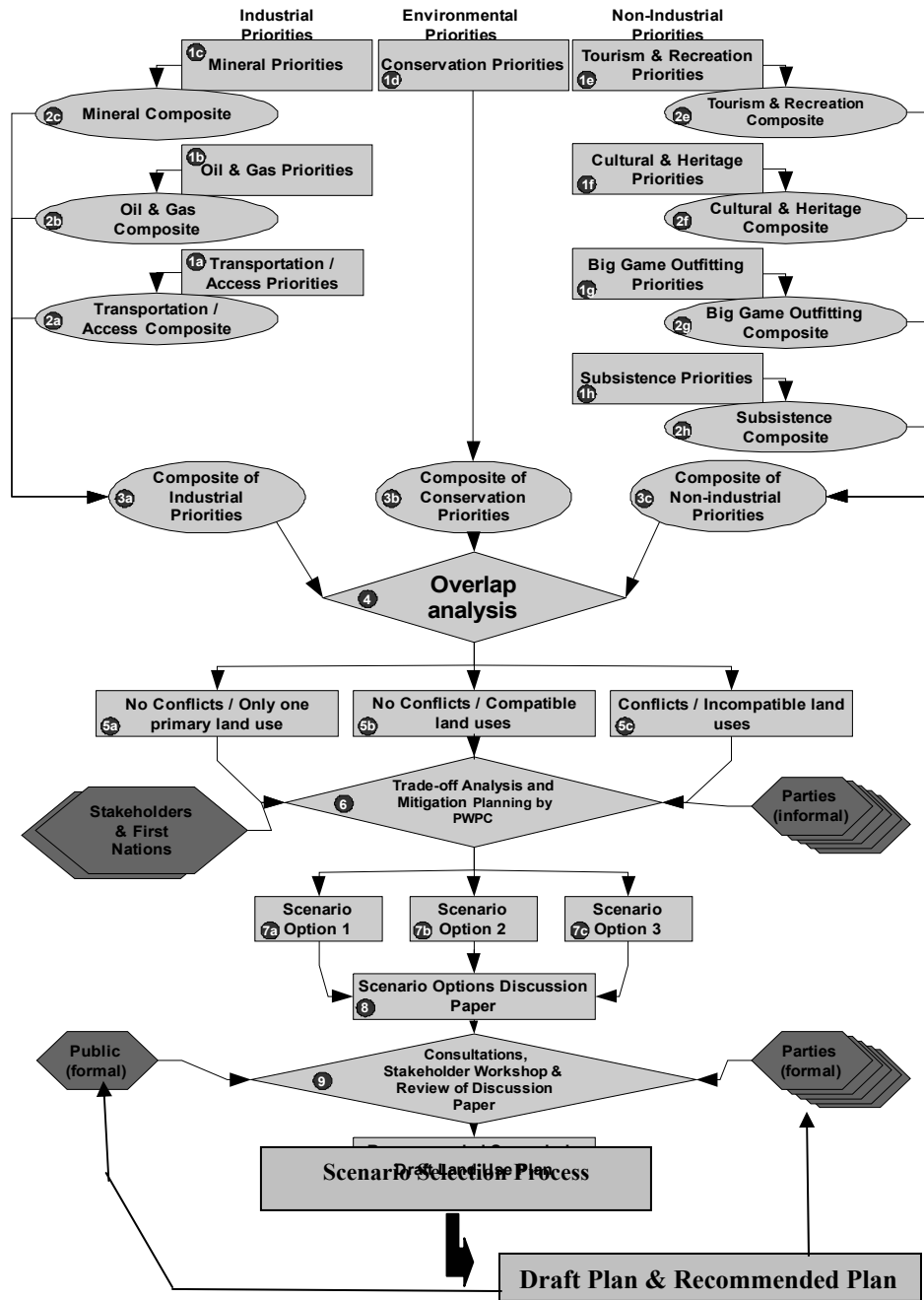
All resource and conservation themes will be compared and synthesized according to their land use intensity and general compatibility using Geographic Information Systems (GIS) – see Appendix D. Intensity in this case refers to human footprint resulting from the activities of humans and presence of human structures. This involves several steps and the methodology for which is summarized below and in Appendix C :

1. Ranking input layers - assigning a numerical rank (1-3) – see App C, Table 2
2. Overlaying input layers into a theme – see Appendix C
3. Standardizing the ranking scale of themes (1-10) - see Appendix C
4. Building composite maps of low and high intensity and conservation values
5. Conflict analysis – overlay of composite maps

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<sup>3</sup> As we consider factors with both the internal (Yukon) and external environment (Canada, International) an effort will be made to highlight key driving forces affecting future land-use in the Peel watershed. These typically include social, economic, environmental, political, institutional and technological trends. While such trends are always subject to change, they can provide a certain level of direction to shape the creation of land-use planning zones and management approaches.

**Figure 3: Land-Use Scenario Selection Methodology**



## **(G) Choosing the Recommended Land-Use Scenario**

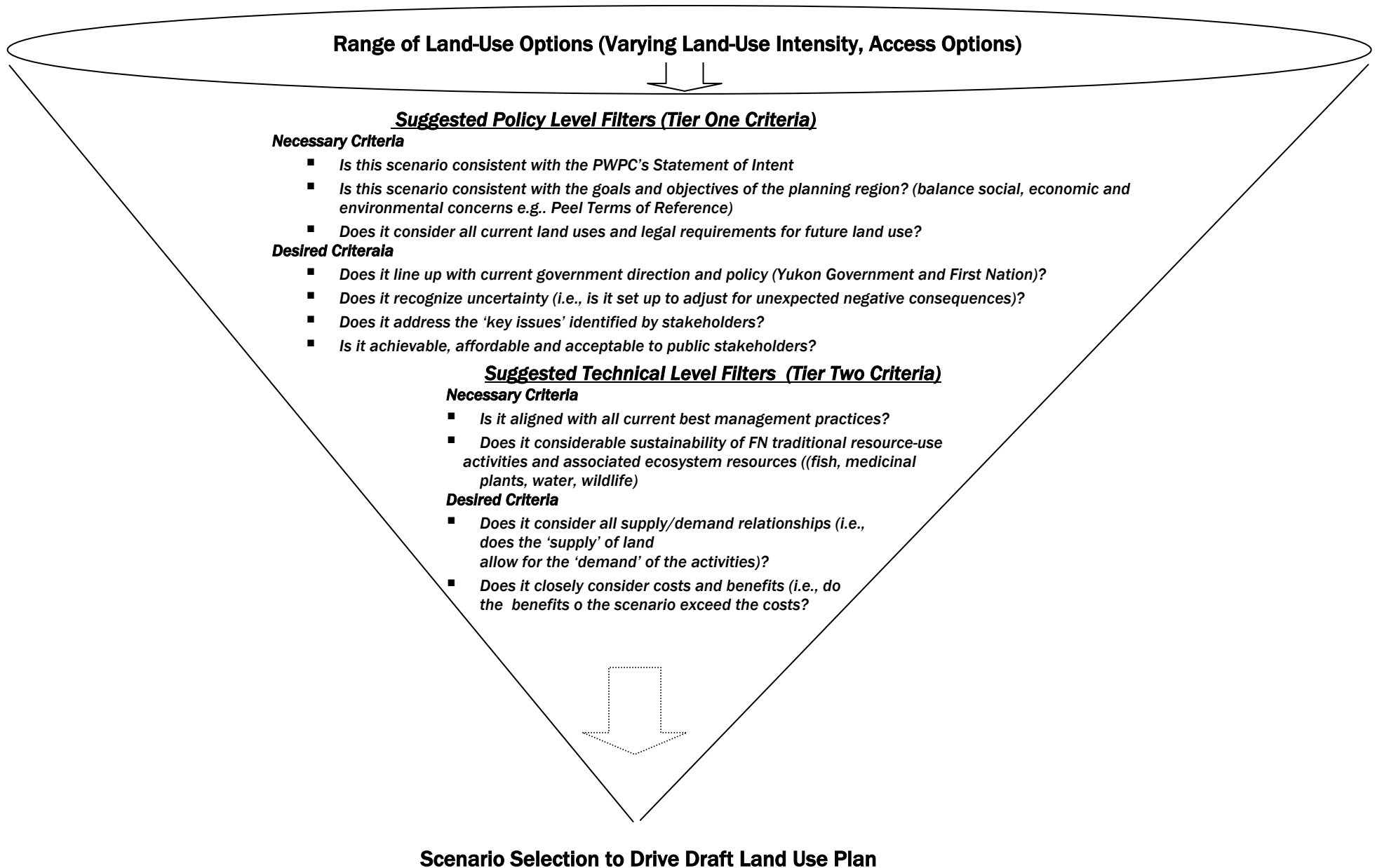
As we can see from the foregoing discussion, the process of developing an appropriate land-use scenario to drive preparation of the Peel Draft Land-Use plan requires consideration of several factors:

- Adherence to Plan Statement of Intent, Principles and Terms of Reference: (is the selected land-use scenario consistent with the guiding policy documents for the Plan?)
- Creation and verification of baseline bio-physical, and land-use information (what is known about the area? what are the ecological sensitivities that support ecosystem functions?)
- Review of public stakeholder and First Nation interests, objectives and projected needs (why is the area important to a range of land users?)
- Potential new land-use opportunities, resources to address future needs (does the scenario keep options open to use and conserve resources into the foreseeable future?)
- Analysis of key driving forces (political, economic, ecological, social and technological) trends that are likely to have future impact on the area (does the scenario adequately consider trends, and provide flexibility for change?)
- What is the framework for decision-making (legal, public-interest, political, regulatory?) (can the scenario meet the Plan terms of reference, and remain a relevant, practical document to guide future decision-making?)

In the final Figure 4 of our methodology, we can see a range of both policy and technical questions that the PWPC will need to consider in selecting the most appropriate land-use scenario. These “criteria” will be reviewed for public comment, and confirmed by the PWPC as it moves through the public review of the Scenario Options phase. Certain policy and technical criteria will be designated as “necessary” to enable the proposed land-use scenario to proceed for further consideration, while other criteria will be “desired”. The “best fit” scenario, will therefore, be the one that the Commission believes meets all the necessary criteria and the most number of desired criteria to serve as the foundation for the Draft Land Use Plan.



**Figure 4 – Land-Use Scenario Selection**



### **The Commission's Mandate**

Under the mandate of Chapter 11 of the Umbrella Final Agreement (UFA), the Peel Watershed Planning Commission (PWPC) is responsible for developing and recommending a regional land use plan for the Peel Watershed Planning Region. The PWPC is an arms length commission with members that are jointly nominated by the Yukon, Na-Cho Nyak Dun, Tr'ondëk Hwëch'in, Gwich'in and Vuntut Gwitchin governments. The recommended regional land use plan will apply to all Settlement and Non-settlement lands in the planning region.

### **The Commission's Statement of Intent**

The goal of the Peel Watershed Regional Land Use Plan is to ensure wilderness\* characteristics, wildlife and their habitats, cultural resources, and waters are maintained over time while managing resource use. These uses include, but are not limited to, traditional use, trapping, recreation, outfitting, wilderness tourism, subsistence harvesting, and the exploration and development of non-renewable resources.

Achieving this goal requires managing development at a pace and scale that maintains ecological integrity\*\*. The long-term objective is to return all lands to their natural state.

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*\* Wilderness is defined as: any area in a largely natural condition in which ecosystem processes are largely unaltered by human activity or in which human activity has been limited to developments or activities that do not significantly modify the environment, and includes an area restored to a largely natural condition. (Yukon Environment Act)*

*\*\* Ecological integrity is defined as: a concept that expresses the degree to which the physical, chemical, and biological components (including composition, structure, and process) of an ecosystem and their relationships are present, functioning, and capable of self-renewal. Ecological integrity implies the presence of appropriate species, populations and communities and the occurrence of ecological processes at appropriate rates and scales as well as the environmental conditions that support these taxa and processes. (U.S. National Park Service)*

**Source: PWPC WebSite: [www.peel.planyukon.ca](http://www.peel.planyukon.ca)**

## **General Goals for the Regional Land Use Plan**

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The Commission will work towards the development of a plan for Settlement Land, Non-Settlement Land and Tetlit Gwich'in Yukon land that is consistent with, and achieves the objectives of Chapter 11 of Yukon First Nation Final Agreements, and:

- 4.1 Promotes the well being of the affected First Nations, other residents of the planning region, the communities and the Yukon as a whole, while having regard to the interest of other Canadians (reference 11.4.5.7);
- 4.2 Recommends measures to minimize actual or potential land use conflicts throughout the planning region (reference 11.4.5.4);
- 4.3 Recognizes and promotes the cultural values of the affected First Nations and other affected Yukon Indian People (reference 11.1.1.3);
- 4.4 Ensures that social, cultural, economic and environmental policies are applied to the management, protection and use of land, water and resources in an integrated and co-ordinated manner so as to ensure sustainable development (reference 11.1.1.6);
- 4.5 Promotes sustainable development (reference 11.4.5.9);
- 4.6 Takes into account that the management of land, water and resources, including fish, wildlife, and their habitats, is to be integrated (reference 11.4.5.8);
- 4.7 Recognize all economic potential of the planning region, including, but not limited to sub-surface resources;
- 4.8 Provides for enhanced opportunities to have ongoing cooperative land use planning activities between the Peel Watershed Planning Commission and the Gwich'in Land Use Planning Board. (7.1.3, GCLCA). Any Regional Land Use Planning Commission, or other planning agency described in (7.1.1, GCLCA), shall consult with the Gwich'in Land Use Planning Board in order to make use of planning that has been done with respect to the Peel River watershed by the Mackenzie Delta Beaufort Sea Land Use Planning Commission, and to discuss ongoing co-operative land use planning activities.

## **Appendix B: Plan Principles That Underlie the Peel Watershed Land Use Plan**

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The Land Use Plan for the Peel Watershed region is intended to be implemented using guiding principles that follow the planning direction given in the Umbrella Final Agreement, the Plan General Terms of Reference and the Plan Statement of Intent documents. There are five guiding principles that underlie development and recommendation of the Peel Watershed Land Use Plan.

### **Independence and Impartiality**

As an independent, public agency appointed to represent the best interests of Yukon people, the Planning Commission will carefully consider any and all information, advice or recommendations provided to it by any government, agency or the public in a balanced and neutral manner for preparation and recommendation of this Land Use Plan consistent with its Terms of Reference and expectations of the UFA (11.4.0 to 11.7.0 incl)

### **Sustainable Development**

The core principle that guides the Plan is sustainable development, as defined in the UFA

“Beneficial socio-economic change that does not undermine the ecological and social systems upon which communities and societies are dependent.” (UFA, p.7, 11.4.5.9 ). This includes a commitment to the practice of integrated resource management (UFA, 11.4.5.8, 11.2.1.2), so that the Plan:

*“..Ensures that social, cultural, economic and environmental policies are applied to the management, protection and use of land, water and resources in an integrated and coordinated manner so as to ensure sustainable development” (UFA, 11.1.1.6);*

### **First Nations Traditional and Community Resource Use**

The plan will promote the interests, rights and responsibilities of The Tettit Gwich'in, Nacho Nyak Dun, Tr'ondëk Hwëch'in and Vuntut Gwitchin with respect to the conservation and use of their traditional territories for both country food harvest, promotion of a renewable resource economy or other purpose as they may decide for Settlement lands (UFA, 16.1.1.1, 5.4.9, 12.1.1.1)

### **Conservation**

The plan proposes to manage fish and wildlife habitats and water resources using the conservation principle as defined and specified in the Umbrella Final Agreement (p.2 Definitions, 16.1..1.1, “*The management of Fish and Wildlife populations and habitats and the regulation of users to ensure the quality, diversity and Long Term Optimum Productivity of Fish and Wildlife populations, with the primary goal of ensuring a sustainable harvest and its proper utilization.*” (UFA, p.1)

## **Adaptive Management**

The Plan is a living document. In accordance with the intent of UFA 11,2.1.3 – 11.2.1.5, the Plan will be reviewed, monitored and updated in response to changing land use and/or environmental conditions, or as better information becomes available. Adaptive Management means we must: “Look, learn and adjust as required.” It requires that those implementing the plan learn and adapt as their information improves.

## **Precautionary Principle**

The Plan shall recognize that the Peel Watershed is an intact ecosystem, and the need to consider potential impacts before making resource decisions, and in particular, the need to recognize and enhance, to the extent practicable, the livelihood and First Nation’s relationship to the wilderness environment (12.1.1.1). A lack of conclusive scientific evidence does not justify inaction on managing the environment, particularly when the consequences of inaction may be undesirable, or when the costs of action are negligible” (International Institute for Sustainable Development).

Sustainable development is the guiding principle for the Plan.



## **Appendix C: Thematic Information Analysis**

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The next section describes how the resource-information themes are defined and integrated into low intensity, high intensity, and conservation composite maps in the scenarios development phase.

### **Ranking Input Layers**

Features of each GIS resource-information layer (i.e. buffered points and lines and, polygons) that were collected and described in the Resource Assessment Report were ranked 1 - 3 according to its perceived level of importance to the stakeholders. Table 2 shows the input layers for each theme, buffer distance and ranking schema used. Unlike other resource-information layers, two layers in the theme “Cultural and Heritage Priorities” and three layers in the theme “Subsistence Priorities” had features collected from several people, and therefore some features were identified several times. Within each of these layers, all features were ranked equally, regardless of the number of people who identified them.

### **Land Use Values Integration: Overlaying input layers to create themes and categories of land use intensity**

Layers of land use data were grouped into themes based on their common: influence on the landscape, similarity of the footprint created, societal values and market place drivers. In some instances data layers contained features that could be represented in different themes. In such cases, the appropriate features were placed into the most suitable theme (see footnotes for Table 2). The themes were then placed into two categories of general compatibility and impact: “high intensity,” and “low intensity”. High intensity themes were: Mineral (current and future); Oil and Gas (current and future) and; Transportation and Access (current and future). Low intensity themes were Tourism and Recreation (current and future); Cultural and Heritage; Big Game Outfitting and; Subsistence Use. Table 2 shows the layers grouped by theme.

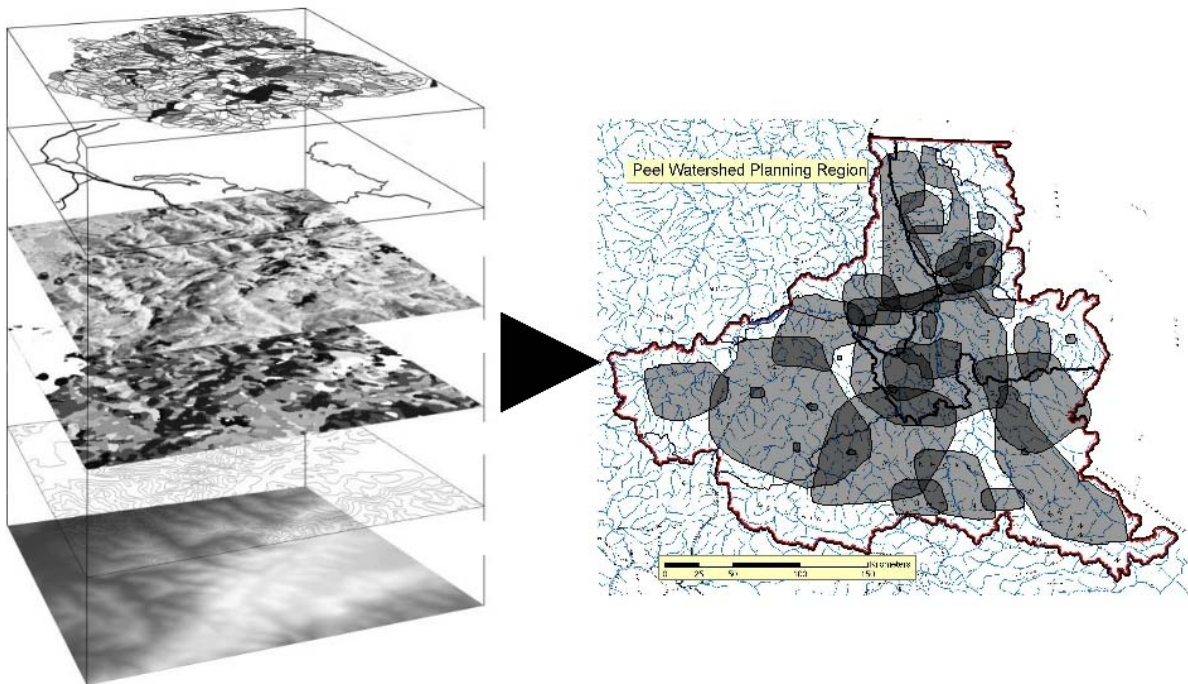
With all the the information layers ranked and buffered (if needed), we made an assumption that where layers overlapped, the ranking should be higher – as opposed to giving the entire area an equal weighting. It was thought the more times a feature was reported as being important by different land users and stakeholders the higher the relative importance of that feature to the planning region as a whole. As such the ranking was based on the number of overlapping polygons (point and line features were buffered) in the layer. As the frequency of overlapping polygons has no real limit – there can be any number of overlaps – we adjusted (or standardized) the range of frequency values to a range of 0 – 10. In this way, we created composite maps, or maps that combined data from different sources, for each theme (see boxes 2a – h, Figure 3). Similarly, we created composite maps for each category of land use intensity (see boxes 3a and 3 c, Figure 3).

### **Conservation Values Integration: Creating maps of general conservation value**

The Conservation Priorities Assessment Report (PWPC 2008a) discussed numerous indicators of conservation values, and depicted them on 31 maps. Conservation planning with this large array of information (box 1d, Figure 3) is difficult without the creation of composite maps (see box 3b, Figure 3) The Commission decided early on that the only

information that should be used to create these composites should be information that covers the entire planning region, more-or-less uniformly. Incomplete information could lead to a bias against conservation in data-poor areas. For example, if considering existing fish presence information, one may be led to believe that there are no fish in the Hart River drainage, whereas in reality, the Hart River in all likelihood contains great fish habitat, but has not been studied.

Many layers of conservation information passed this criterion (see Appendix D, Table 3). A simple overlay process similar to the one described above (see also Figure 4) yielded an index of conservation value. The downside of using this index alone to guide conservation area planning is that some important indicators that don't overlap with many others will not be adequately represented. This index showed, for example, high conservation values along the major rivers in the mountains, but little conservation value in the mountains themselves. In this example, sheep habitat would not be represented if the index alone were to drive planning. To get around this problem, specialized conservation planning software was used to identify areas with high conservation value that represent all indicators are represented. This process generated a detailed/fine scaled (aka “non-clumpy”) and a general subregional (aka “clumpy”) maps of conservation values. None of these results considered other aspects of conservation network design such as climate change, connectivity, or intact watersheds.



**Figure 4 Example of Overlay of Conservation Indicators\***

**Note:** Map is only hypothetical

## **Looking at Trade-Offs: Land-Use Compatibility and Overlap Analysis**

Composite maps were created for conservation values and for land uses in four categories: “high intensity – current”, “high intensity – future”, “low intensity – current”, and “low intensity – future”. These composite maps were compared to each other to identify areas of overlapping value. Overlapping areas within each composite with a low rank (0-3) are assumed to have low potential for conflict with the other. However, ranked values greater than three in either or both composites are considered to have higher potential for conflict. Where either or both values were  $> 7$ , an extremely high potential for conflict is possible. Potential conflicts between the composites can be spatially distinguishable. Those areas with extremely high potential for conflict should be visually obvious along river corridors, and overland travel routes. Some areas, however, are so small they cannot be assessed visually. Such small areas need to be examined at a larger spatial scale. To give the commission more information on the nature of these overlaps, overlaps between each individual low intensity theme or conservation composite with each individual high intensity theme were identified.

The Commission will assess the compatibility and potential for conflicts among the various identified land use interests. Inevitably, some areas of the planning region will have no conflicts or incompatible interests, while others – for example between areas of high conservation value and mineral or oil & gas interests or their access – are likely to be contentious.

This overlap analysis approach frames the Land Management Unit designation. Zoning designations for each LMU will be determined according to what the Commission deems to be most appropriate within a spectrum of land use emphases while respecting the objectives of the Plan Terms of Reference. Uses range from possible protected areas, to integrated multi-use areas, to development-focused areas with less focus on conservation goals. The definitions of each land use zone have yet to be determined.

Our process will begin with direction from the PWPC, followed by consultation of stakeholders, First Nations and the Plan Parties. The Technical Working Group members will also be invited to attend all PWPC workshops as the PWPC conducts its Scenario development and selection analysis. Although the principle decision-making responsibility on selection of the Draft Plan scenarios rests with the PWPC members, the TWG will be encouraged to provide insights, or convey the opinions of their respective organizations. The Parties will have the opportunity for formal input once the discussion paper is drafted, and prior to its release to the public. As time permits, this will also include presentation for discussion and feedback with the Internal Working Group of the Yukon Government.



## **Land-Use Designation, Negotiation and Mitigation Planning**

From the overlays of the various land use interests, the Commission will be:

- examining the overlaps between compatible and non-compatible priorities
- defining zoning system classes
- refining land management unit boundaries
- developing scenario options – or zoning configurations – that adhere to the Commission’s Statement of Intent, Planning Principles, the goals and objectives of the Umbrella Final Agreement and PWPC General Terms of Reference.

Two forums will be held, one with representatives of stakeholders and one with those of affected First Nations, where early conclusions and informal results of early commission workshops will be presented. Attendees will be given the opportunity to state (or restate) their vision of a Peel Watershed land use plan, and to comment on the preliminary commission findings and conclusions. Ideas and opinions expressed at these forums, and by prior adjacent and overlapping land use planning efforts (e.g. Mackenzie Delta-Beaufort Sea Land Use Planning Council , Gwich’in Land Use Planning Council and Peel Watershed Advisory Committee) will be considered by the Commission when refining the Scenarios Options Discussion Paper.

The Scenarios Options Discussion Paper will outline some of the results of the processes outlined in this report, and will describe a small number of scenarios that the Commission may consider for the development of a full draft land use plan. These scenarios will not have the depth of detail expected in a full land use plan, but will hopefully show general patterns of land use direction across the planning region, as well as some more general management directions.

## **Appendix D – Spatial Information Analysis Method**

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The follow sections describe rational behind assignment of the various layers to a theme and how the content of the data layer was treated. For further detail please refer to Table 2 and relevant footnotes.

### **Mineral Priorities – Current**

Current mineral priorities were classified as active Quartz claims and Coal licenses. Note that activity of a Quartz claim or coal license may change as the land use plan is written. The data layers were chosen not because they necessarily represent the best mineral deposits but because they have the highest potential for development – in fact other areas yet to be explored may prove to be larger deposits. To date there are no active mines or plans for production or land dispositions for a mine in the Peel Planning region – exploration is the only activity.

### **Mineral Priorities – Potential**

Potential mineral priorities are the projected potential for development of a mine in the future, and are based on known mineral occurrences and deposits, and the likelihood of deposits based on geological formations. For more information regarding the current state of knowledge about mineral occurrences please refer to Garter Lee Ltd. report, 2006. We identified four distinct mine operations that could be developed in the future: Carbonate hosted Lead-Zinc, Crest iron; Coal; Wernecke Breccias Iron-oxide, and Copper and Gold. We used mineral potential maps representing areas where these mineralizations are most likely to occur, to rank the likelihood of future conflict due to exploration interests.

### **Oil and Gas Priorities – Current**

Current Oil and Gas development priorities were linked to the three active permits (expire within six years), and five Significant Discovery Licenses (SDL) that have no expiratory date. In January 2008, one exploratory Oil and Gas permit was issued to AustroCan Petroleum Corp. Regeneration status is currently unknown for the existing network of seismic lines – legacy of exploration activity in 1960-80.

### **Oil and Gas Priorities – Potential**

Potential for discovery of a viable gas play in the Peel watershed region was based on the delineated basin boundary available at:  
[www.emr.gov.yk.ca/oilandgas/mapsdata.html#Oil\\_and\\_Gas\\_GIS\\_Data](http://www.emr.gov.yk.ca/oilandgas/mapsdata.html#Oil_and_Gas_GIS_Data).

This boundary was modified to identify production potential of each basin relative to all basins that intersect with the Peel Watershed Area (Fekete 2006, Osadetz et al. 2005). Osadetz et al. 2005 subdivided production potential of the Peel Plateau & Plain Basin using the Trevor Fault, and the eastern limit of Cordilleran Deformation. Until data is available, we used the Peel Plateau and MacPherson Plain ecoregion boundary to approximate the eastern limit of Cordilleran Limit.

The highest ranked basin was the Eagle Plain basin, however it was not possible to isolate development potential of the small portion of the basin that is within the Peel plan

boundary from the larger reserve within the North Yukon plan boundary. The lowest ranking was shared between the Peel Plain west of Trevor Fault, Bonnet Plume and Kandik Basins. Although the reserve in Bonnet Plume is smaller than Kandik its proximity to theoretical “coal-bed methane” (“CBM”) resources could increase its potential (Fekete 2006).

The area within the Call for Bids issued by the Lands Branch of Energy, Mines and Resources of Yukon Government from spring 2007 to 2008 were used to predict location of future exploration. We also integrated information about the mostly likely path of gas field development using the sequential development path outlined by Fekete (2006).

**Table 1.0 Rank of oil and gas basins intersecting with Peel Watershed Planning Boundary**

<b>Basin Name</b>	<b>Resource (Tcf)</b>	<b>Ranking</b>
Eagle Plain (a)	5.3925;6.054 (a)	3
Peel Plain (Fort MacPherson Plain) (b)	2.044 (b)	2
Peel Plateau – East of Trevor Fault (c)	0.896 (c)	2
Peel Plateau – West of Trevor Fault (d)	–	1
Bonnet Plume	0.663 (e)	1
Kandik	0.852 (e)	1

a - From Peel Watershed Resource Assessment Report, April 2008, p. 34

b - From Osadetz (2005): Peel Plain east of the Cordilleran Deformation is the “most prospective region”...“In total this region could produce 57.907 x 10<sup>9</sup> m<sup>3</sup> gas, or about 70% of the potential in-place resource.”

c - From Osadetz (2005):The total potential of the Peel Plateau – East of Trevor Fault “to the eastern limit of Cordilleran Limit is about 25.4 x 10<sup>9</sup> m<sup>3</sup> (~0.9 Tcf) gas.”...“This potential is significant, but moderate compared to that of the Peel Plain to the east.”

d -from Osadetz (2005): “Total petroleum potential of the Peel Plateau – West of Trevor Fault is small to negligible.“...”This region is the least attractive for petroleum potential in the assessment area.”

e From Fekete and Associates Inc. and Vector Resource. 2006. Table 1.

#### Transportation/Access and Communications Priorities – Current

Transportation and access into the Peel Watershed planning area is currently limited to the Dempster Highway, Wind River Trail and Hart River Road. Access is also facilitated by a network of historic winter roads and community use trails . Access into the most northern portion of the region is facilitated by a dense network of well pad roads and seismic lines constructed between 1960 and 1979. These linear features are in various stages of regeneration. Airstrips and float-plane landing-sites are also considered part of the access layer although only two airstrips, both located along the Dempster Highway, fall within the jurisdiction of Yukon Government. Boat put-ins and take-outs used by recreationists, travelers, industry and tourism industry are, within this context, considered to be an access feature. Roads, linear features and point locations such as airstrips and put-ins were buffered to represent the zone of influence these features may have on the surrounding landscape.

## Transportation and Access Priorities – Potential

Prior to ranking themes, each contributing point and line layers to this theme were buffered according to its “zone of influence”. Polygon layers were assumed to identify a suitable zone of influence for the purposes of identifying land use overlap areas. The zone of influence could be related to the influence of the human footprint on the surrounding environment or, the sensitivity of an activity to its surroundings. For example, a general application of a two km buffer was applied to the linear network of permanent roads, whereas the linear network of traditional travel corridors and traplines identified for subsistence use were given a three kilometer buffer to reflect both the importance of the area for First Nations and influence high intensity development could have on the area.

## Big Game Outfitting and Trapping Priorities

Several outfitters contributed sensitive information regarding wildlife movement and hunting areas. We used summer sheep locations, trapper and outfitter cabins and land dispositions to identify values important to this low intensity use of the Peel River Watershed. We have captured only a small proportion of available information on outfitting and trapping in the Peel Watershed region. We are seeking more input in the areas of: cabins and camps, travel routes, and active (within the last 10 years) trapping and outfitting sites. Likely much of the trapping activity in the Peel has been captured in the subsistence priorities layer.

## Cultural and Heritage Priorities

Teetl'it Gwich'in, Tr'ondëk Hwëch'in and Nacho Nyak Dun provided spatial data that reflected important cultural and heritage locations in the Peel Watershed planning area. Clear distinction between what was classified as cultural and heritage and subsistence values was difficult. As a guideline we categorized a feature into the Cultural and heritage camp if it represented a:

- fixed (non-migrating) spatial location (mineral lick) that did not require harvest of a resource;
- use that was transitory in location but was spiritually or culturally significant (area to gather medicinal plants); or
- structure build or maintained by humans (cabins / camps).

## Subsistence Priorities

Teetl'it Gwich'in, Tr'ondëk Hwëch'in and Nacho Nyak Dun provided spatial data that reflected subsistence hunting and gathering locations in the Peel Watershed planning area. Clear distinction between what was classified as subsistence or cultural was difficult. As a guideline we categorized features into the subsistence use theme if it was a:

- Resource that was harvested (hunting area, fishing);
- Trapline;
- Travel Route; or
- Gravel area.

### Tourism and Recreation Priorities – Current

Tourism Yukon provided several key spatial features delineating areas popular for outdoor enthusiasts. A set of points identified general locations of several key activities: hiking, biking, snowmobiling, cross country skiing, driving tour, and horseback riding. The extent of these activities was unknown and as such was buffered by ten kilometres to better represent the true extent. Several activity corridors were identified using a uniform buffer of popular travel routes, and several hiking hot spots were identified.

### Tourism and Recreation Priorities – Potential

A recreation potential map of the entire planning region identified particular areas as having very low, low, high and very high recreation potential.

### **Standardizing the ranking scale of themes**

We “standardized” the themes so that every theme could be ranked along the same scale. This first step is necessary in order to bring all resource values to a “even playing field” – in terms of our scope of understanding of high-value areas – prior to conducting the integration of all resource values and an analysis of their overlap.

Layers were overlaid together and the underlying values added together. The range of values within each composite varied, depending on the number of input themes. For example in the case of mineral priorities potential theme, the number of input layers was seven, therefore the maximum value that an overlaid feature could be assigned was twenty-one ( $7 \times 3$ ). Each theme was standardized so that the range of the ranking was 0 – 10.

We created composite maps for low intensity use and high intensity use, and conservation values. The process of creating the conservation value composite varied from the land use composites and as such are described in detail in the conservation values section below. High intensity use activities and the tourism and recreation theme were further separated into current high intensity use and future high intensity use.

## **Composite Maps**

### **Low Intensity and High Intensity**

A composite for each theme in the categories “High Intensity” and “Low Intensity” were created by overlaying appropriate themes. The themes “mineral priorities”, “oil and gas priorities”, “access/transportation”, and “tourism and recreation” were further separated into current and future composites. Composites were standardized from 0-10 using the same approach as with the themes.

### **Conservation Values**

Layers of conservation information that passed the criterion of more-or-less complete coverage of the planning region are listed in Table 3 below. The simple overlay process that generated the index of conservation value was performed in a GIS. In most cases each layer was weighted so that the maximum value of each layer was equal to three. Exception were as directed by the commission. These weightings are also listed in Table 3. The “clumpy” and “non-clumpy” maps of conservation values were generated using a program called “Zonation” (Moilanen 2008). Weightings uses in Zonation are also listed in Table 3.

**Table 3: Layers of individual conservation values used in generating maps of composite conservation value.**

In most cases each layer was weighted so that the maximum value of each layer was equal to three. Exception were as directed by the commission. The “clumpy” and “non-clumpy” maps of conservation values were generated using a program called “Zonation” (Moilanen 2008.)

<b>Conservation Layers</b>
Likely fish overwintering habitat
Summer fish habitat
Bonnet Plume Caribou Herd: fall key area
Bonnet Plume Caribou Herd: winter key area
Hart River Caribou Herd: fall key area
Hart River Caribou Herd: winter key area
Redstone Caribou Herd: winter key area
Porcupine Caribou Herd: historic winter use
Porcupine Caribou Herd: winter habitat suitability
Bonnet Plume Caribou Herd: winter habitat suitability
Boreal Caribou Herd: general habitat suitability
Hart River Caribou Herd: winter habitat suitability
Peregrine foraging habitat
Peregrine nesting habitat
Birds of conservation concern
Bird species diversity
Waterbird habitat suitability
Grizzly Bear habitat suitability
Marten habitat suitability
Moose late winter habitat suitability
Sheep winter habitat suitability

<b>Conservation Layers</b>	<b>Index Weight</b>	<b>Zonation Weight</b>
Likely fish overwintering habitat	3	1
Summer fish habitat	3	1
Bonnet Plume Caribou Herd: fall key area	1	1
Bonnet Plume Caribou Herd: winter key area	2	1
Hart River Caribou Herd: fall key area	1	1
Hart River Caribou Herd: winter key area	2	1
Redstone Caribou Herd: winter key area	3	1
Porcupine Caribou Herd: historic winter use	1.5	1
Porcupine Caribou Herd: winter habitat suitability	0	1
Bonnet Plume Caribou Herd: winter habitat suitability	0	1
Boreal Caribou Herd: general habitat suitability	0	1
Hart River Caribou Herd: winter habitat suitability	0	1
Caribou winter habitat suitability (all herds)	1	0
Peregrine foraging habitat	1	0.5
Peregrine nesting habitat	2	1
Birds of conservation concern	1	1
Bird species diversity	1	1
Waterbird habitat suitability	1.5	1
Grizzly Bear habitat suitability	1	1
Marten habitat suitability	1	1
Moose late winter habitat suitability	1	1
Sheep winter habitat suitability	1	1

## **References in Scenario Methods Report**

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