



Mackenzie Valley
Environmental Impact
Review Board

***Terms of Reference
for the
Environmental Assessment
of
Tamerlane Ventures Inc.'s
Pine Point Pilot Project
EA 0607 - 002***

October 5, 2006

Mackenzie Valley Environmental Impact Review Board

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Glossary of Acronyms

EA – Environmental assessment

DAR- Developer's assessment report

DFO – Department of Fisheries and Oceans

DMS – Dense Media Separation circuit (used to separate mineral bearing ore from waste rock)

GNWT – Government of the Northwest Territories

INAC – Indian and Northern Affairs Canada

MVEIRB – Mackenzie Valley Environmental Impact Review Board

MVRMA – Mackenzie Valley Resource Management Act

NWT – Northwest Territories

PPPP – Pine Point Pilot Project

SARA – *Species at Risk Act*

ToR – Terms of Reference and Work Plan

VC – Valued Component

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Overview

This document outlines the process and the information required for the environmental assessment of a test mine proposed in the South Slave region of the Northwest Territories by Tamerlane Ventures Inc. It is divided into the following sections:

- Section 1 – Introduction, including the reasons for EA referral, as well as the legal context;
- Section 2 – The Scope of Development that is being proposed;
- Section 3 – The Scope of the Assessment, i.e. the issues that will be addressed in the EA;
- Section 4 – The Terms of Reference (ToR) that will direct the production of a *Developer's Assessment Report* (DAR); and

I Referral to Environmental Assessment

On June 1, 2006, Tamerlane Ventures Inc. ("Tamerlane" or "the Developer") applied to the Mackenzie Valley Land and Water Board for a Type B Water License (MV2006L2-0003) and Land Use Permit (MV2006C0014) for the purpose of constructing an underground mining operation to extract and initially process a 1,000,000 tonne ore deposit at a rate of 2800 tonnes per day from their R-190 property in the Pine Point area, 48 km east of Hay River. A *Project Description Report* and supporting appendices for this Pine Point Pilot Project (PPPP) were filed by Tamerlane as part of its application¹. The Mackenzie Valley Land and Water Board initiated a preliminary screening of the PPPP according to Section 124 of the *Mackenzie Valley Resource Management Act* (MVRMA).

Environment Canada referred the PPPP to Environmental Assessment (EA) on June 27, 2006, citing that the PPPP "might have significant adverse impacts on the environment". Their specific concerns included, but were not limited to:

- the use of new technology to establish a frozen core perimeter around the underground works,
- potential for groundwater contamination, and
- the existence of SARA-listed species in the area that merit consideration.

The Review Board notified Tamerlane on June 28, 2006, that the PPPP had been referred to EA.

I.1 Legal Context and the Terms of Reference Development Process

This EA is subject to the requirements of Part 5 of the MVRMA. It will be conducted in accordance with the Review Board's *Rules of Procedure*. Guidance documents on the Review Board's EA process and content expectations are also available as reference material. Those Guidelines documents, developed under the authority of Section 120 of the MVRMA, can be accessed on the MVEIRB web site (www.mveirb.nt.ca) or by contacting the MVEIRB office for further information.

The Review Board has developed these *Terms of Reference* based on an examination of information from the following sources:

¹ Copies of the *Project Description Report* have been distributed to all parties who requested them. Electronic copies are available; contact the Review Board for more information.

- The public record of the Preliminary Screening process;
- All submissions by parties to the public registry of the ongoing EA process;
- Issues highlighted and the information provided during scoping sessions held in Hay River on August 16, 2006 and Fort Resolution on August 17, 2006; and
- Review Board members' and staff experience in the conduct of EA.

2 Scope of Development

Tamerlane has applied to develop a test underground mine approximately 48 kilometers east of Hay River on its R-190 property in the Pine Point area, west of the Buffalo River. Pursuant to section 117(1) of the *MVRMA*, the Review Board determined that the Scope of Development is that described in the *Project Description Report* submitted by Tamerlane to the Mackenzie Valley Land and Water Board, unless otherwise specified in this document. It consists of all the physical works and activities required to extract, initially concentrate, and ship the economically valuable portion of a 1,000,000 tonne ore deposit. Development activities associated with other potential deposits requiring future licenses and permits are not under consideration in this EA, except where specifically noted. Alternatives identified in the ToR are also to be included as part of the Scope of Development and must be considered by the Developer. The Review Board may amend the Scope of Development at any time during the EA if the Development Description changes.

The MVEIRB has defined the Scope of Development to consist, at minimum, of the following physical works or activities that will occur during the construction, operation and closure phases:

Mining Process

- Construction and maintenance of a frozen perimeter around the mine shaft and R-190 orebody, using "freezewall" technology and an active refrigeration unit;
- Development of underground workings, portals, adits, raises, drifts, stopes and all other mine workings, including a main vertical shaft and a main ventilation shaft;
- Extraction and crushing of ore-bearing rock;
- Management of waste rock and aggregate stockpiles, including associated water treatment and management;
- Management of ore stockpiles, including associated water treatment and management;
- Transport, storage and use of explosives;
- Mine dewatering and the management and treatment of mine water; and
- Mining equipment operation, including the vertical conveyance system.

Milling Process

- Construction and operation of a Dense Media Separation (DMS) circuit;
- Consumption of water extracted from the mine workings by the DMS circuit and other on-site activities;
- Storage, handling, use and disposal of DMS process additives and chemicals;
- Construction and operation of an Infiltration Basin; and
- Transport, recycling and disposal of process water, as well as its treatment and discharge to the

receiving environment.

Support/Ancillary Facilities and Activities

- “Direct ship” transport of ore from the R-190 site to the railhead at Hay River, temporary storage, and rail transportation south to a lead-zinc refinery;
- Transportation activities that support the PPPP’s operation, including transportation of goods, contractors and employees from nearby communities;
- Any required structural and/or geometric upgrades to Territorial Highway 5 for the specific purpose of supporting PPPP operations;
- Construction and/or upgrading of spur and connecting roads between project components on the R-190 property, including any potential stream crossings;
- Construction and use of drainage control structures and process/waste water pipelines from the mine to the surface, and from the DMS circuit to the Infiltration Basin, including pumping systems;
- Development and use of borrow sources for aggregate production, or contracting out of same;
- Construction and operation of power plant, substation and power transmission infrastructure;
- Construction and operation of the change house, compressor house, refrigeration unit, offices, lunchrooms, warehouses, storage yards, maintenance shops, laboratory and all support buildings;
- Construction and operation of hydrocarbon storage and handling facilities;
- Treatment facilities (and/or transportation to another site for treatment) for wastewater; and
- Solid and hazardous waste management and construction and operation of containment areas.

Closure and Reclamation Activities

- Removal of structures and equipment;
- Reclamation of the Infiltration Basin;
- Reclamation of the road network;
- Reclamation of infrastructure foundations;
- Re-vegetation of areas affected by mining or support activities;
- Reclamation of waste rock and aggregate stockpile locations; and
- Backfilling and capping of the underground works, including backfilling during the operating phase.

3 Scope of Assessment

The Scope of Assessment is the determination of which issues and items will be examined in the EA as described in the ToR. The Review Board, after having reviewed Tamerlane’s *Project Description Report* and supporting appendices, consultation of the Public Records of the Preliminary Screening and ongoing EA, and hosting scoping sessions, has determined that it requires more information on the potential social, economic, cultural and biophysical effects of the PPPP. Material from the *Project Description Report* can be used where applicable in the required *Developer’s Assessment Report (DAR)*, but must be in the format required in these *Terms of Reference* and include any supplementary material analyses and evaluations set out herein. The DAR should be submitted as a separate and complete document. Referring the reader back to sections of the *Project Description Report* is not acceptable.

The Review Board has determined the minimum geographical scope of this EA to include Tamerlane’s

mineral leases, mining claims, the “Local Study Area”², and all of the lands west of the Buffalo River that are considered as part of the “Tamerlane Study Area”³. It will also consider project effects on all areas that may be affected in some identifiable way by the PPPP, including the Buffalo River downstream of the PPPP, nearshore Great Slave Lake wherever groundwater or runoff potentially impacted by the PPPP enters it. The ranges of wildlife using the area, and the areas potentially-affected by transportation activities, particularly the Territorial Highway 5 and municipal truck routes to the Hay River railhead are also to be considered. All of these areas together will be considered the “EA Study Area”. The geographical scope for assessing effects to the human environment shall include, but not necessarily be limited to, the communities of Hay River (including the Hay River Reserve), Fort Resolution, Fort Smith and Enterprise. The concerns of culturally-defined communities who use the land in the Study Area also merit consideration.

The scope of this EA will also include an examination of the cumulative impacts of past, present and reasonably foreseeable future developments. The Review Board recognizes that the determination of baseline conditions for this EA is complicated by the history of heavy industrial activity in the Tamerlane Study Area, especially the Pine Point lead-zinc mine run by Cominco Ltd. from 1964 to 1987. The R-190 area has seen fewer disturbances from past industrial activity, but nonetheless may also have been affected in a quantifiable way by exploration, railroad, highway and quarrying activities. The Review Board recognizes that it may be difficult to use quantitative methods to assess the effects of developments or activities that occurred in the distant past, particularly as it applies to establishing “baseline conditions”. Older developments, for which insufficient data are available, may be treated in a more qualitative fashion where best professional judgment or expert opinion is used, from either traditional knowledge or scientific sources. Such cumulative impacts will be assessed at a geographic and temporal scale appropriate to the particular environmental component under consideration. Further instructions are included in Section K, Cumulative Effects.

Temporal boundaries for this EA must be set according to potential long-term effects, rather than just the duration of PPPP operations. Therefore the temporal scope is determined to include all phases of the PPPP, from construction to post-closure, until such time that no potential significant adverse impacts, attributable to the PPPP, are predicted to occur. The Developer is responsible for determining appropriate timelines to address this requirement and must report and justify them in the DAR (see Section G for specific geographic and temporal reporting requirements).

While in this part the Review Board has established the general extent of the assessment boundaries, the Developer in Section G of the ToR will have the opportunity to define the specific spatial and temporal boundaries that will be used to examine the potential impacts on each of the various VCs considered in the EA.

The scope of assessment set out in these terms of reference may be re-examined at any time by the Review

2 The Local Study Area as identified in Figure 4.5-1 (Page 45) of the *Project Description Report*.

3 The Tamerlane Study Area is identified by the shaded area in Figure 1 of Appendix B of the *Project Description Report*.

Board and amended based on new information deemed to be important to the determination of whether significant adverse impacts on the environment or significant public concern will be likely to occur.

4 Terms of Reference

4.1 General Considerations

Tamerlane is to provide the Review Board with the information requested in Section 4.2.

Incorporation of Traditional Knowledge

As a general consideration, Tamerlane is reminded that the Review Board gives Traditional Knowledge equal weight to scientific knowledge in its deliberations. Tamerlane therefore shall make all reasonable effort to collect Traditional Knowledge relevant to the PPPP. Traditional Knowledge, where it is applicable, is to be used as a tool to evaluate the specific items required in Section 4.2 (see A-4 below). The Developer is advised to refer to the Review Board's *Guidelines for Incorporating Traditional Knowledge into the Environmental Impact Assessment Process* when preparing its DAR. The guidelines are located on the MVEIRB's website at <http://www.mveirb.nt.ca/HTML/MVGuides/MVdocs.asp>.

Assessing the Impacts of the Environment on the Development

In both the planning of the PPPP, as well as for the assessment of potential effects, the effects of the physical environment on the development, such as climate change or extreme precipitation or climatic events must be considered in each of the applicable items of Section 4.2, including the Alternatives section. *Any changes or modifications to the PPPP as a result of the effects of the environment should be noted in the relevant sections.*

Utilization of Appropriate Media

Tamerlane should produce materials, such as Geographic Information Systems data, for parties in a format that is utilizable for their purposes. Tamerlane is encouraged to enter into discussions with parties who are seeking such information, in order to identify appropriate data analysis tools available to the parties.

Expected Level of Effort

Tamerlane will give consideration to all of the items described in Section 4.2. However, some merit greater consideration than others, in particular relation to the high level of concerns identified during Preliminary Screening or scoping. The following items shall be given special consideration by Tamerlane in the DAR:

- All water quality and quantity issues related to the Development, particularly in relation to the use of the infiltration basin;
- Impacts on transportation infrastructure and public safety of increasing truck traffic;
- Factors affecting the successful establishment and maintenance of the "freeze wall curtain";
- Impacts on *Species at Risk Act* (SARA)-listed species frequenting the area; and
- Employment, training and business opportunities for local residents and aboriginal groups.

4.2 Specific Requirements

A Summary

- 1) Provide English, South Slavey and Chipewyan plain language, non-technical summaries of the DAR;
- 2) Provide an audio translation of the plain language summary in the South Slavey and Chipewyan languages; and
- 3) Provide a concordance table that cross references the items in the ToR with relevant sections of the DAR.
- 4) Provide a summary table indicating for each subsequent section (B through L) whether scientific knowledge, traditional knowledge, or both, was used in the information collection and analysis.
NOTE: In subsequent assessments of each environmental component, Tamerlane shall identify all areas where it has attempted to engage with communities in the collection and/or sharing of Traditional Knowledge. Where Traditional Knowledge is determined by Tamerlane to be not applicable, a rationale will be given for this determination. Where Traditional Knowledge is not available or not provided to Tamerlane in a timely manner, Tamerlane shall provide evidence of efforts taken to obtain it.

B Developer

Provide the following information regarding Tamerlane Ventures Inc.:

- a. A summary of the company's corporate history in Canada and the Northwest Territories (NWT);
- b. A summary of previous experience of the Project Management Team working in the NWT or other Northern environments;
- c. A discussion of Tamerlane's capacity to provide financial security for reclamation liabilities in the event of bankruptcy or other unforeseen failure to complete and reclaim the project, as well as a description of who is ultimately legally responsible for the property in case such a failure occurs. The Developer will provide evidence that it has the capacity to provide the necessary financial security and describe plans to ensure that reclamation is undertaken;
- d. A description of corporate and directors' responsibilities for the PPPP and associated operations, including the an explanation of any relationships between Tamerlane and any other public or private company in relation to the PPPP;
- e. A discussion describing the relationship between Tamerlane and its contractors and subcontractors and details as to how the Tamerlane will ensure that the contractors and subcontractors will be responsible for, and honour commitments made by, Tamerlane; in the course of this EA;
- f. A detailed record of Tamerlane's environmental performance record and that of its major contractors during exploratory work in support of the PPPP. This should include a discussion of regulatory compliance and methods of dealing environmental impacts;

- g. A description of Tamerlane's environmental performance on other similar mining projects; and
- h. Any policy, directives or terms of reference concerning Tamerlane's environmental, sustainable development, community engagement and/or workplace health and safety commitments.

C Description of the Existing Environment

Preamble: *The Review Board will require a clear description of the baseline environmental conditions in which the proposed PPPP will be situated. In particular, there were concerns expressed by parties during the Preliminary Screening and scoping sessions that more detail on the biophysical environment is required. In order to understand any impacts that might be expected as a result of the PPPP, Tamerlane shall provide a written and graphic depiction of the existing environment. The existing environment also includes contemporary/past land use and occupancy in the region. Include a discussion of any effects caused by past human activities which may have altered the background environmental conditions; identify their sources and provide, where available, any data on the degree of impact from such activities. The Developer will also identify and provide maps in the DAR of any areas of "special sensitivity" in the existing environment that merit special attention because of the presence of*

- a. *The presence of SARA-listed species in the area;*
- b. *Unique landforms, topography, or geological foundations;*
- c. *Heritage resources or areas of high potential heritage resources;*
- d. *Alternative recreational/aesthetic values; or*
- e. *Traditional harvesting sites, trap lines and/or trails.*

The Description of the Existing Environment shall include, but not be limited to the following elements (in the appropriate geographic areas described in the Scope of Assessment):

- 1) Ambient air quality, background noise levels and climate;
- 2) Site hydrology, including surface water, shallow subsurface water and groundwater amounts, direction of flow, and a description of associated watersheds;
- 3) Existing and historic data on surface and ground water quality and quantity and flow regimes;
- 4) Aquatic organisms (especially fish) and aquatic habitat of all lakes, streams and rivers in the Study Area (including the Buffalo River);
- 5) Wildlife (including migratory birds) and wildlife habitat and migration corridors (including current use and long-term variations). Special emphasis needs to be place on identifying "Species at Risk", as defined under the *Species at Risk Act*, that use local habitat;
- 6) Vegetation and plant communities;
- 7) Terrain, surficial geology, structural geology, mineralogy, bedrock geology, seismicity, permafrost locations and types, especially of the Local Study Area, but also of any areas where water passing

through the PPPP flows. In particular, identify particularities of the karst environment that need to be considered during the impact assessment, as well as the ground composition under and around the infiltration basin;

- 8) Physical and chemical makeup of soils, lake and river sediments, including nearby portions of nearshore Great Slave Lake, Buffalo River and other waterbodies within the scope of assessment;
- 9) Physical infrastructure present in the nearby areas, including roads, railways, buildings, quarries, power lines and other industrial works.
- 10) An in-depth analysis of Territorial Highway 5 from Hay River to the PPPP site, although Territorial Highway 6 from the Territorial Highway 5 turnoff to Fort Resolution and Town of Hay River roads along which ore would be trucked must also be considered. This analysis should indicate the daily truckloads currently traveling these corridors;
- 11) Regional power infrastructure, generation capacity, and usage levels by season should Tamerlane intend to draw electricity from the existing power grid;
- 12) Socio-economic conditions, including social services provision capacity among the communities identified in the scope of assessment;
- 13) Historic and present past land use, with the identification of traditional land use groups and areas of overlapping land usage; and
- 14) Cultural and heritage resources, with the identification of the cultural groups who associate with these resources.

D Development Description

Preamble: *The Review Board requires a description of the PPPP. In this section, Tamerlane is only asked to provide details on the PPPP itself, not to comment on potential effects from the development. It should be noted that a lack of detail concerning certain development component of the PPPP was identified both in the review of the Project Description Report during Preliminary Screening, as well as in the scoping sessions. Tamerlane will ensure that an adequate description of all its planned activities is included in the DAR. The use of detailed maps or other visual tools in the depiction of the proposed development components is encouraged. Where applicable, please provide reference to research that identifies the successful use of the specific technologies being proposed, and their relevance for this environmental setting.*

The Development Description shall include, but not be limited to descriptions of the following:

- 1) The physical footprint of the PPPP, with locations and descriptions of buildings, concrete foundations, boreholes and mine shafts, aboveground infrastructure (e.g., power lines), water pipes, etc.;
- 2) All existing or proposed access roads in the project area that Tamerlane requires for the PPPP, including analysis of necessary improvements and how extensive they may be;
- 3) The exact route by which ore will be transported from the PPPP to Hay River, the expected

number of trips per day to and from the PPPP by truck type and weight of load, and where and how it will be stored and handled in Hay River. The duration of the hauling with expected start and end dates and time of the week when hauling is expected to occur should be also described;

- 4) A discussion of how lead/zinc concentrate dust from truck transport and transfer to railcar will be controlled;
- 5) A discussion of how truck weights will be controlled and how the tracking of mud and potentially deleterious materials by trucks entering the highway will be controlled;
- 6) The physical works and activities required to put in place and maintain the required “freezeway” technology – a refrigeration plant, generator or substation facility, above ground piping and subterranean piping systems;
- 7) The ore stockpile, temporary waste rock and aggregate storage facilities, any required soil and overburden storage facilities or disposal methods and locations, including water runoff expectations, management and treatment considerations for each location;
- 8) All hazardous materials, process and other chemicals likely to be used on site, including fuels, process additives, oils, and batteries (please provide Material Safety Data Sheets in an Appendix);
- 9) Aggregate amounts and sources that Tamerlane intends to utilize for construction, operational and reclamation purposes. The description should provide information on the timing of use and predicted amounts of aggregate material required over the life of the PPPP;
- 10) Solid and hazardous waste facilities and their location, conceptual designs of the facilities and an estimate of the volume of material and whether that volume can reasonably be deposited in the Town of Hay River solid waste site, as proposed. If all materials are to be transported, indicate where to, how they will be transported, and how they will be treated/disposed of at these facilities, and who will be responsible for these activities;
- 11) The proposed Infiltration Basin, including all applicable environmental considerations, any designs for infrastructure additions to the site including control structures, a description of the pathways and materials used to pump and transport water to the Infiltration Basin, and a description of water quality and quantity monitoring proposed for this site;
- 12) The total amount of water, in cubic metres, to be pumped into the Infiltration Basin, with indications of changes during the course of the PPPP, and seasonal fluctuations;
- 13) All the underground facilities, including infrastructure and machinery requirements, explosive storage area, emergency escape routes, ventilation plans, and water management facilities;
- 14) The mining and backfilling methods to be used in the underground works;
- 15) The primary and secondary crushing process, transport to the surface, storage of ore and the operational requirements of the DMS facility and its support infrastructure;
- 16) All explosives storage facilities to be used during the project life cycle, along with a description of the types of explosive to be used, their storage, handling and application;

- 17) All other infrastructure proposed for the PPPP, including all buildings on site, diesel storage facility and generator locations (and energy requirements and sources for the PPPP), perimeter fencing and water treatment considerations;
- 18) Water sources for the DMS circuit, dust control, and other PPPP activities, including a plan for the location of pipelines and other related infrastructure; and
- 19) Water management structures, including preliminary plans of diversion and water treatment structures, if applicable.
- 20) Expected capital costs associated with constructing the PPPP;
- 21) Estimated operating costs during the life of the PPPP;
- 22) The estimated lifespan of the PPPP broken down into construction, operation and post-mining closure and reclamation phases.
- 23) The number of person years of work associated with the PPPP, broken down by life cycle stage;
- 24) Worker housing situations, transportation to work, and proposed work scheduling; and
- 25) A list of required ancillary developments that need to be constructed or improved in order for the PPPP to go ahead.

E Alternatives

Preamble: *The Review Board requires that alternative approaches to planning, developing, operating and closing the PPPP be considered in the DAR. The Review Board has listed a number of areas where it believes alternatives should be considered. Where alternatives that would mitigate adverse impacts on the environment and/or enhance the socio-economic performance of the proposed mine are deemed not feasible, economically or otherwise, the engineering and economic analysis to determine feasibility shall be summarized and presented. Where uncertainty exists about the merits of competing alternatives, an assessment of the potential effects on the environment of each alternative will be included in this section. Indicate where, in the course of community consultation, the PPPP design has been altered to incorporate community values or concerns. Where alternatives to the current approach have been requested but not acted upon, indicate who made the suggestion and why it was not considered the preferable option.*

The following project components merit inclusion in a discussion of alternatives

- 1) Methods and locations of mine- and waste-water release back into the environment. Provide a detailed evaluation and comparison of alternatives to pumping waste water into the proposed Infiltration Basin (e.g., a polishing pond or sump), as well as comparison of alternative locations for siting of the Infiltration Basin;
- 2) Evaluate alternatives to transporting ore from the PPPP to the Hay River railhead other than by Territorial Highway #5, and alternative transportation timing to minimize impacts on highway users and Hay River residents. This should include the possibility of loading ore on to railcars at a location south of Hay River near the Highway 2 and 5 intersection;
- 3) Evaluate alternative power generation methods ("grid" hydroelectric vs. on-site diesel) and suppliers (Power Corp., Tamerlane in-house, or contractor), with particular consideration to

potential impacts on regional power supply from tapping in to the existing hydro-electric power grid versus using diesel generators, or a mixture of both. Also consider the capacity of the Taltson Hydro Dam to increase its power generation to meet PPPP needs;

- 4) Discuss the alternative of having a camp on site as opposed to daily transportation of workers to and from communities, and how work schedules would be affected;
- 5) Sewage treatment options - onsite management vs. removal to a remote location. Identify the location and capacities of chosen locations, and a comparative assessment of water requirements on-site from each option;
- 6) A discussion of how Tamerlane selected its proposed mining method and the reasoning behind not choosing alternate mining methods, including open pit, underwater, decline and underground shaft mining methods;
- 7) Alternative freezing system components – brine versus liquid nitrogen-based;
- 8) Disposal of hazardous and non-hazardous wastes - Town of Hay River facilities vs. other facilities; and
- 9) Type of explosives used - ANFO vs. emulsion.

F Public Consultation

Preamble: *The purpose of public consultation is to provide those who might be potentially affected by the proposed PPPP with the opportunity to participate in the EA. Scoping sessions identified lack of public consultation as a public concern related to the PPPP. Consultation with any community, aboriginal group, level of government, or other organization with interests related to areas that might be affected by the PPPP should be considered in this section. The Developer is advised that in addition to Aboriginal groups, different government agencies and regulators have information vital to the conduct of the environmental assessment. Reasonable effort must be made and the results shown for all consultation efforts.*

The following items are required for consideration of Public Consultation:

- 1) In addition to identifying consultation dates, individuals and organizations consulted with, the mode of communication, and discussion topics, as noted in Section 3 of Tamerlane's *Project Description Report*, identify and reference the following:
 - a. All public methods used to identify, inform and solicit input from potentially-interested parties;
 - b. All commitments and agreements made in response to issues raised by the public during these consultations, and how these commitments altered the planning of the proposed PPPP; and
 - c. All issues that remain unresolved, and document any further efforts envisioned by the parties to resolve them.
- 2) Identification of any plans, strategies or commitments of Tamerlane, alone or in combination with any other group, to maintain consultation ties in a set forum during the EA process and

throughout the life of the PPPP;

- 3) A discussion of Tamerlane's consultation plan that specifically focuses upon the holders of aboriginal and Treaty rights in project area. This should consider how the concerns and issues of such rights holders will be accommodated; and
- 4) A discussion as to how Tamerlane intends to engage traditional knowledge holders in order to collect relevant information for the establishment of baseline conditions, the prediction of possible impacts, as well as the development of mitigation methods, adaptive management plans and monitoring program planning.⁴

G Assessment Boundaries

Preamble: *The spatial boundaries for this EA should be set according to appropriate boundaries for the valued component (VC) being assessed, rather than solely using the Local Study Area established in the Project Description Report or the wider geographic parameters determined by the Review Board as the Scope of Assessment. For example, the spatial boundaries for the social, economic and cultural impact assessment should include those communities where a discernable effect may be expected (these will be considered the "potentially-affected communities" for the EA). This section allows the Developer to provide both a description and rationale for all of the chosen geographic and temporal boundaries chosen during its environmental impact assessment. The Review Board and other Parties will then be able to compare the chosen boundaries with the Scope of Assessment and determine their appropriateness.*

Provide in a Table the following information regarding Assessment Boundaries:

- 1) A rationale for Tamerlane's establishment of spatial boundaries for the assessment of potential effects noted in the following sub-sections. The spatial boundary should be appropriate to the nature of each VC being assessed. Where the spatial assessment boundaries differ from the Scope of Assessment established in this ToR, please provide a rationale to explain the difference.
- 2) A rationale for setting temporal boundaries for the assessment of effects noted in the following sub-sections. The temporal boundary should be appropriate to the nature of the VC assessed.

H Human Environment

Preamble: *Assessment of the human environment (social, economic and cultural impact assessment – also called "socio-economic impact assessment") is an important part of any EA in the Mackenzie Valley, in relation to the identification of both potential significant adverse impacts on the environment and significant public concern. The Review Board takes into consideration the assessment of the social, economic and cultural environment, and the impact assessment process should follow procedures as rigorous as those used in the assessment of biophysical environment. Experience has shown the determination of social, economic and cultural effects is most effective when the Developer works with potentially-affected communities in an iterative way through each step of the environmental assessment, from issues scoping through to significance prediction and impact mitigation. The Developer will make*

⁴ Suggestions for working with communities to obtain traditional knowledge are described in Section 4 of the Review Board's *Guidelines for Incorporating Traditional Knowledge in Environmental Impact Assessment*

reasonable effort to include potentially-affected communities in the assessment of potential social, economic and cultural effects, and document those efforts. The DAR will examine all components of the human environment that might be affected by the PPPP, regardless of whether the potential impacts are beneficial or adverse.

In addition to considering the specific questions posed in this section, the Developer is required to consider the following impact assessment steps for each of the subsections herein. In assessing the different effects on the human environment, the DAR will, in each subsection, at minimum:

- Identify any valued social, economic or cultural components used, how they were determined and how they will be carried forward into the various ongoing monitoring programs;
- For each VC, identify and provide a rationale for the criteria and indicators used to measure any historical and current baseline conditions;
- Identify the sources, timelines and methods used in data collection;
- Clearly identify the baseline conditions, both historic and current, including analysis of any discernible trends;
- Identify any potential direct or indirect beneficial or adverse effects on the VCs that may occur or be accentuated because of the PPPP, along with a description of all assumptions used in this analysis;
- Predict the likelihood of each effect occurring, prior to mitigation measures being implemented;
- Describe any plans, strategies or commitments to avoid, mitigate or manage identified potential adverse effects; and
- Assess the significance of any residual adverse impacts estimated to remain after the imposition of mitigation measures.

When describing impacts and assessing their significance, Tamerlane must characterize the impact by:

- The nature or type of the impact;
- The direction of the impact (i.e., beneficial vs. adverse);
- The magnitude of the impact, taking into consideration any tradeoffs between beneficial and adverse impacts;
- The geographic range of the impact and a list of impacted groups/individuals;
- The identification of any communities, locations or groups especially sensitive to impacts on the particular VC;
- The duration and frequency of the impact occurring;
- The likelihood of the impact occurring; and
- The capacity of potentially-impacted groups, responsible authorities and/or Developer to manage the impact.

Together, these eight criteria shall be used by the Developer as a basis for *its opinions* on the significance of impacts on the human environment. (For information on the MVEIRB's own ultimate determination of significance, consult MVEIRB's *Environmental Impact Assessment Guidelines* p.30, available at www.mveirb.nt.ca)

H-1 Economy:

Preamble: *The Review Board is required under the Guiding Principles of the MVRMA (Section 115) to, among other things, have regard for the economic well-being of the residents and communities of the Mackenzie Valley. Understanding the effects of a development on economic well-being requires in-depth analysis of what sorts of effects will occur, how they will be distributed geographically and among populations, and how adverse impacts can be mitigated. Tamerlane will assess the potential effects of the PPPP on the economies of the South Slave region and each of the identified potentially-affected communities. Where the Review Board feels that smaller and/or more*

vulnerable potentially-affected communities merit additional consideration, it is noted in the requirements herein.

While conducting an assessment on identified VCs, specific consideration shall be given, but not limited, to:

Direct and Indirect Employment

- 1) Providing an updated listing of all employment requirements by skills category over the life of the PPPP, based on the most current mine feasibility work;
- 2) Identifying which employees will be Tamerlane versus contractor employees, and describe whether and how Tamerlane will require its contractors to have similar commitments to maximizing regional and aboriginal employment at the PPPP;
- 3) Conducting an assessment of the available labour pool, at varying geographic scales, to meet the direct mine labour requirements, including: Fort Resolution, Fort Smith, Hay River (town and Hay River Reserve), the South Slave region, territorial, and extra-territorial;
- 4) Providing information on any identified barriers to employment, advancement and retention for Northern workers (with particular emphasis on residents of smaller potentially-affected communities and aboriginals), including minimum skill requirements, hiring policies related to criminal records or substance addictions, availability of willing employees, and lack of training opportunities for community members;
- 5) Assessing the requirements for any training, education, and other improvements necessary to maximize employment of residents of potentially-affected communities in the workforce of the mine, and compare this to existing training initiatives available in the NWT;
- 6) Discussing Tamerlane's strategies, plans or commitments with respect to maximizing the proportion of direct mine employees that are NWT residents, aboriginal persons, and residents of potentially-affected communities (e.g., through hiring policies, training initiatives, etc.); and
- 7) Discussing Tamerlane's strategies to retain northern and aboriginal employees and to assist in the transition of employees into other areas if this short term pilot project does not proceed any further into full scale mining.

Business Opportunities

- 1) Providing an estimate of required contractor and subcontractor goods and services required through the different stages of the project life cycle, and associated direct and indirect economic effects (e.g., local and regional income multipliers);
- 2) Identifying and assessing the opportunities for - and capacities of - local, regional and territorial businesses to compete for the right to supply required goods and services, both directly to the proposed PPPP, as well as to meet new demand created by economic growth spurred by the PPPP. Include estimates of what percentage of goods and services might feasibly be provided by northern businesses, and discuss any plans, commitments or strategies Tamerlane has for maximizing this percentage;
- 3) Assessing the requirements for any training, education or other improvements necessary to maximize engagement of businesses of each potentially-affected community in the economic

benefits accruable from the PPPP;

- 4) Assessing how the PPPP will contribute to opportunities to diversify the economic base at the local, regional and territorial level. New local and regional economic development associated with the PPPP, including the production and supply of new goods and services, should be included in this assessment.

Distribution of Beneficial and Adverse Economic Impacts

- 1) Particular emphasis shall be placed on identifying public safety and economic impacts of increased usage of Territorial Highway 5 west of the PPPP. The Developer shall describe the estimated number of trips per day, the type of loads, the costs of increased road maintenance and responsibility for same (if applicable), the current and likely traffic loads during different times of day on the Highway, the time of day and time of year that the trucks are expecting to be hauling and provide any proposed mitigation strategies, policies, or commitments to reduce costs and minimize public safety concerns.
- 2) Tamerlane shall list estimates of all predicted economic impacts, both beneficial and adverse, stemming from the PPPP, including but not necessarily limited to impacts caused by:
 - a. Increased employment numbers, including a prediction of employment multipliers, and the PPPP's estimated effects on employment levels in potentially-impacted communities;
 - b. Predicted increases in local income and disposable income levels (identify income multipliers where possible);
 - c. An assessment of the costs and who will bear them of any increases in physical infrastructure predicted to be required as a result of pressures or requirements of the PPPP (NOTE: this *must* include Territorial Highway 5 and Hay River railspur access roads used by the Developer); and
- 3) Estimating, for each of the items listed above, how the economic effects identified will be distributed among potentially-affected communities. An estimate is required of how much of the economic benefit of the PPPP will accrue to aboriginal groups, individual South Slave communities, the South Slave as a region, other areas of the NWT, and other Canadian jurisdictions;
- 4) Including, for each of the above, any plans, strategies or commitments designed to mitigate the identified adverse impacts.

In addition, the Developer will describe how the PPPP will contribute to local, regional and territorial sustainable development.

H-2 Society and Culture

Preamble: *The MVRMA requires the identification and mitigation of adverse impacts on the social and cultural environments as part of the EA process. This includes direct and indirect effects of the PPPP itself, including the relationship between PPPP-related economic changes and social and cultural outcomes. Tamerlane will use recognized social science methods, community input and Traditional Knowledge to undertake this assessment.*

While conducting an impact assessment based on identified VCs, specific consideration shall be given, but not be limited to, the following, broken down into appropriate geographic and demographic units of analysis. For each chosen component or indicator, the Developer is required to identify any PPPP-related changes that may impact on it.

- 1) Community/population health and associated indicators such as, but not limited to:
 - a. Population in- and out-migration;
 - b. Alcohol and drug access and use;
 - c. Access to health care;
 - d. Housing pressures;
 - e. Crime rates;
 - f. Access to child care;
 - g. Increased divisions within or between communities;
 - h. Public safety, especially in regards to the use of Territorial Highway 5 west of the PPPP; and
 - i. Educational access and education completion levels.
- 2) The physical, mental, and cultural health of mine workers and mine workers' families;
- 3) Existing and required social service networks to support community health and wellness;
- 4) The effect of this and other past, present and reasonably foreseeable developments on political and social development, cultural values, traditions and language in potentially-affected communities;
- 5) A description, for each identified potential effect, as to how the PPPP may affect valued social and cultural components:
 - a. At the regional level;
 - b. At the local level for each potential-affected community; and
 - c. Among particularly vulnerable sub-populations within potentially-impacted communities, such as women, children and elders.
- 6) An identification of lessons learned from social and cultural impacts of previous mine developments in the NWT and the North, and how they have been incorporated into the impact identification, prediction and mitigation for the PPPP;
- 7) A discussion concerning the development of a Human Resources Management Plan and any programs that will be offered at the mine site to identify and mitigate social problems; and
- 8) A comparison of the likely relative distribution of beneficial and adverse cultural and social impacts among the different potentially-affected communities.

H-3 Heritage Resources

Preamble: *The protection of known or potential heritage resources is an essential element of EA in the Mackenzie Valley. The MVRMA definition of “impact on the environment” expressly recognizes effects on heritage resources. It is of particular importance to engage both the Prince of Wales Northern Heritage Centre and local Traditional Knowledge holders when determining the location of heritage resources and mitigation of impacts on them.*

While conducting an impact assessment of how the PPPP will potentially impact heritage resources, specific consideration shall be given to, but not be limited to:

- 1) Identifying all known archaeological and heritage resources, as well as sites or areas of cultural significance in or near the required EA Study Area. To protect these resources, their exact locations should NOT be included in the DAR;
- 2) Identifying any areas within the required EA Study Area that have medium to high probability of containing currently unknown cultural and/or heritage resources; and
- 3) Listing all correspondence and consultation with experts (traditional knowledge holders, archaeologists, and anthropologists) used to make the above assessments.
- 4) Listing all recommended mitigation measures identified for the protection of local known and high potential areas of cultural and heritage resources.

H-4 Traditional and Contemporary Land Use and Wildlife Harvesting

Preamble: *Effects on wildlife harvesting are recognized by the MVRMA as an “impact on the environment” that must be considered by the Review Board during an EA. In addition, the capacity to access renewable resources and “the importance of conservation to the well-being and way of life of the aboriginal peoples... who use an area of the Mackenzie Valley” (Section 115(c),) are both discussed in the MVRMA. Concerns about access to land and harvesting success were highlighted by aboriginal groups during the scoping sessions. Given the essential role of communal land use and associated wildlife harvesting as the engine of the traditional economy, consideration must be given to any potential effects the PPPP will have on land use and traditional economic harvesting activities. In addition, contemporary land usage is an important element of the social, economic and cultural well-being of area users.*

While conducting an impact assessment of how the PPPP will potentially affect traditional and contemporary land use and wildlife harvesting, specific consideration shall be given to, but not be limited to:

- 1) Utilizing local and traditional knowledge, identifying the historic and current relative value and usage levels of the EA Study Area by wildlife harvesters;
- 2) Describing any potential direct and indirect effects that the PPPP may, on its own or in combination with other developments, have on hunting, fishing, trapping and other activities for persons and organizations from the potentially-affected communities, including but not limited to
 - a. Loss of use of the immediate area for wildlife harvesters (including hunting, trapping, fishing, berry picking and medicinal plant collection);
 - b. Loss of harvesting success and quality of harvested materials due to any PPPP activities;
 - c. Loss of the use of the area for any leisure activities; and

- d. Identifying all measures required, and commitments made, by Tamerlane to mitigate against adverse effects on both traditional land use and resource harvesting from the land, or compensate for losses that cannot be avoided. Include a discussion of Tamerlane's general approach, if any, toward negotiating such agreements.

H-5 Protected and Withdrawn Areas

- 1) Identify any locations within, proximate to, or potentially affected by PPPP operations, that are currently protected by law, subject to special management rules and regulations, are identified in the NWT Protected Areas Strategy. These areas can be identified through consultation with community leaders, land use planners, and staff of the NWT Protected Areas Strategy. Describe any potential impacts of the PPPP on these lands in detail.
- 2) Identify any locations within, proximate to, or potentially affected by PPPP operations been identified as land proposed to be withdrawn in the future. These areas can be identified through consultation with community leaders, land use planners, and staff of the NWT Protected Areas Strategy. Describe any potential impacts of the PPPP on these lands in detail.
- 3) Discuss any potential impacts the development may have on the Polar Lake recreational area.

H-6 Aesthetic Resources and Wilderness Values

- 1) Identify any particular landforms, locations of special interest, or other unique environments that merit special attention in areas potentially affected by the PPPP and discuss any mitigation measures proposed to reduce potential adverse impacts to them. Analysis of the wilderness values of Twin Creek, Polar Lake, the Buffalo River, and the portion of Great Slave Lake in proximity to the PPPP is required.
- 2) Discuss the aesthetic changes the PPPP will have that might impact other users; and
- 3) Identify any other area users who may be economically, socially or culturally affected by potential effects of the PPPP on aesthetic and/or wilderness values.

H-7 Human Environment Monitoring

The assessment, monitoring and adaptive management of social, economic and cultural effects related to the development is an essential EA consideration. Include descriptions of any commitments, plans and strategies that are proposed to monitor the following:

- Access of local and regional contractors to PPPP-related business opportunities;
- Employment, continued education and training;
- Mitigation of adverse social impacts;
- Impacts on the land and animals and by extension, traditional harvesting success rates and costs; and
- Worker and community health and wellness.

In addition, include any plans, commitments or strategies on how/whether human environment monitoring results will be reported to regulators and potentially-affected communities.

Where there are no commitments, plans or strategies to monitor these or other *identified* impacts/issues, give an explanation for their absence. Additionally, report on any discussions with communities, federal and territorial governments related to the development of Impact Benefit or Socio-economic Agreements, or similar collaborative tools to monitor and mitigate any of the above. Include a discussion of Tamerlane's general approach, if any, toward negotiating such agreements.

I Biophysical Environment

Preamble: *The avoidance of impacts on the land, waters, air, and wildlife are all vitally important under the MVRMA. Both Preliminary Screening reviewers and groups attending the scoping sessions identified that Tamerlane has not completed adequate biophysical baseline studies to inform an accurate DAR. The Developer is expected to augment their biophysical analysis as noted in each section herein, through primary and secondary research.*

In addition to considering the specific questions posed in this section, the Developer is required to address the following impact assessment steps for each of the subsections herein. In assessing the different effects on the physical and biological environment, the DAR will in each subsection at a minimum:

- Identify any valued components (VCs) used, and how they were determined and how they will be carried forward into the various ongoing monitoring programs;
- For each valued component, identify and provide a rationale for the criteria and indicators used to measure any historical and current baseline conditions;
- Identify the sources, timelines and methods used for data collection;
- Clearly identify the baseline conditions, both historic and current, including analysis of any discernible trends;
- Identify any potential direct or indirect effects on the VCs that may occur or be accentuated as a result of the proposed Development, along with a description of all assumptions used in this analysis;
- Predict the likelihood of each effect occurring, prior to mitigation measures being implemented;
- Describe any plans, strategies or commitments to avoid, mitigate or manage the identified potential adverse impacts; and
- Assess the significance of any residual adverse impacts estimated to remain after the imposition of mitigation measures.

When describing impacts and assessing their significance, Tamerlane must characterize the impact by:

- The nature or type of the impact
- The direction of the impact (i.e., beneficial vs. adverse);
- The magnitude of the impact;
- The geographic range of the impact, as well as any location of special significance or high local impact intensity;
- The timing of the impact (including duration, frequency and extent);
- The likelihood of the impact occurring; and
- The reversibility of the impact.

Those seven criteria shall be used by the Developer as a basis for *its opinions* on the significance of impacts on the biophysical environment. (For information on the MVEIRB's own ultimate determination of significance, consult the *Environmental Impact Assessment Guidelines* p.30.)

I-1 Water Resources

Preamble: *In both the Preliminary Screening and the Review Board's scoping sessions, the potential effects on water quality, quantity and flow of this underground mine were identified as major issues. In regards to specific concerns, the issue of effects to water occurring due to the use of freezeway technology was identified. The potential effects*

from the discharge without treatment of waste water from the mine and the DMS circuit was also raised. Notable among water quality concerns expressed by parties in scoping sessions have been the PPPP's use of explosives (likely with nitrates, possible adverse impacts to the drinking water of animals, and the cumulative effects on water of a variety of industrial activities (considered further in Section K). Tamerlane is expected to provide more details on water quality and quantity issues (from secondary and primary sources, as applicable) in the DAR.

While conducting an impact assessment based on identified VCs, specific consideration shall be given to, but not be limited to the following:

- 1) A listing of all applicable water resource permits, licences, and authorizations that will be required from federal, territorial regulatory authorities, as well as all water quality requirements;
- 2) A discussion of the mineralogy and any components of waste rock or ore from the underground works, the DMS circuit additives, the explosives being used, or any other PPPP component which may be of concern for wastewater discharged into the receiving environment;
- 3) A description of the flow directions and volume of ground- and surface-water throughout the Study Area, before, during, and after the time period when the freezeway is in place;
- 4) An assessment of the likelihood of success of the freezeway technology, considering the karst environment and the level of salts and solids in groundwater, as well as a prediction of inflows of water into the mine works in both the success and failure case;
- 5) An examination of the potential effects of the PPPP on water quality and quantity throughout the area. This analysis shall include, but not be limited to:
 - a. A prediction of the quality and quantity of wastewater discharged to the receiving environment that shall address all applicable water quality parameters including concentrations of metals (with particular emphasis on lead and zinc), nutrients, major ions, process chemicals and bacteria. This should include a prediction of how the high sulphur counts in the area's water will be exacerbated or attenuated by this activity;
 - b. A detailed water balance table indicating major uses of water, and any predictions of alterations of water quality during each phase of its use in the process lifecycle, from underground capture to release into the Infiltration Basin;
 - c. Mine de-watering effects on the hydrology, groundwater flows and chemistry in the local study area; and
 - d. A discussion regarding the potential effects of the mine working, following closure, on the surrounding ground water regime with specific consideration if paste backfill and concrete capping of the shaft is employed at the site.
 - e. A prediction of contaminant loading and dispersion into the receiving environment, from all PPPP sources, during mine operation and after closure;
 - f. A conceptual discussion of treatment and contingency options for effluent concentrations exceeding standard water licence terms and conditions;
 - g. The potential effect of PPPP operations on increasing contaminant concentrations in the

sediments of Buffalo River, local lakes and Great Slave Lake;

- h. The predicted levels and potential effects from the discharge of nutrients (i.e. ammonia, nitrates & sewage) to the receiving environment, which shall include possible trophic changes in downstream water bodies; and
 - i. A detailed conceptual plan of the management and treatment, if necessary, of wastewater emitted from the underground works and DMS circuit to the Infiltration Basin, including identification of all water monitoring stations and when and how they will be operated;
- 6) Identification of any other potential sources of surface or groundwater contamination that will add to effects from the PPPP (e.g., highways, railbed contamination, etc.);
- 7) An assessment of the potential effects of PPPP operations on promoting erosion and sedimentation via the Infiltration Basin and the potential impacts of sedimentation on the ability of the basin to absorb effluents and contingency plans to deal with sedimentation in the event it becomes a concern;
- 8) The potential effects of PPPP operations on the quality, quantity and behaviour of sub-surface water flows, which must include the underground workings and groundwater throughout the PPPP's physical footprint;
- 9) The potential effects of PPPP operations on the hydrology and water balance of the areas potentially affected by the PPPP, which shall include, but not be limited to:
 - a. Predicted changes in timing, volume and deviation of peak and minimum water flows resulting from the PPPP;
 - b. Water balance effects from the operation of the Infiltration Basin; and
 - c. Water drawdown on volume and quantity of surrounding surface water, including water balance considerations.
 - a. The potential effects, if any, of the PPPP on the promotion of metal leaching and acid rock drainage
- 10) A discussion of the potential effect that PPPP activities will have on Twin Creek and the Buffalo River downstream of the PPPP with particular emphasis on likely effects to water quality in Great Slave Lake, and a description of potential adverse impacts stemming from a worst-case scenario. The possible establishment of remote water quality monitoring points shall be considered in addressing this discussion;
- 11) The sources of all the water requirements for all on-site activities, if there is a need for fresh water withdrawal from any local surface or groundwater sources for mining and camp purposes; in the event that underground mine pumping requirements are minimal; and
- 12) The provision of a conceptual plan for water quality management that shall include, but not be limited to the following aspects:
 - a. The development of a water recycling management plan;

- b. The development of an aquatic effects monitoring program that will consider water quality and quantity, fish and aquatic habitat monitoring (*per Section I-2*);
- c. A discussion around how Traditional Knowledge and other community input was used – e.g., in adopting water quality monitoring practices and parameters that have been identified and supported by potentially-affected communities;
- d. A discussion concerning the implementation of an “Adaptive Management” strategy to address adverse impacts to water quality, quantity, aquatic organisms and aquatic habitat that are identified in the course of PPPP operations; and
- e. A discussion as to whether/how Tamerlane will incorporate NWT residents in environmental monitoring, and report monitoring results to regulators and potentially-affected communities.

I-2 Fish and Aquatic Habitat

Preamble: *Potential effects to aquatic animals and fish and their habitat were identified as issues of concern during the MVEIRB’s scoping exercise. Public concern focused on the PPPP’s potential to contribute to the contamination of local fish stocks; a concern at least partially attributable to the historic Pine Point Mine’s legacy.*

While conducting an impact assessment based on identified VCs, specific consideration shall be given, but not be limited, to:

- 1) The identification of any fish-bearing water bodies within the Study Area that merit consideration, including local lakes, Twin Creek, the Buffalo River, and Great Slave Lake;
- 2) The potential effects of PPPP operations on the Study Area’s aquatic organisms and habitat which shall include, but not be limited to the potential effects of changing water tables on area lakes and rivers, littoral habitat and oxygen concentration.
- 3) The potential downstream effects of all effluents originating from PPPP operations on aquatic organisms and their habitat. This should consider, but not be limited to effluent from the Infiltration Basin, underground mine seepage, and losses of water from the DMS circuit or other onsite activities, roads and borrow areas;
- 4) A discussion of whether and how the DFO’s *No Net Loss Policy* will be implemented during the PPPP’s operation; and
- 5) The potential effects that PPPP operations may have in increasing contaminant concentrations in fish. To accomplish this, secondary data on current levels of contaminants in area fish should be consulted and presented in the DAR, with a discussion of potential additional stresses, if any.

I-3 Vegetation

Preamble: *Discussions held during the scoping sessions concerning the potential effects of the PPPP on vegetation was minimal. The Developer has done some vegetation baseline work, including a rare plant study. The majority of the discussion on this component was related to the identification of the actual physical footprint of the area, to*

determine the amount of clearing of soil and plants necessary. (Section J addresses re-vegetation issues).

While conducting an impact assessment based on identified VCs, specific consideration shall be given, but not limited, to:

- 1) An estimation of the total amount of land clearing required to facilitate PPPP activities, with estimates of losses of trees, other plants, soil and any “overburden” materials. This should include a description of how the materials will be removed and disposed of or stored and the likely effects of loss of soil or compaction on long-term re-growth capacity;
- 2) An assessment on the potential effects of the PPPP on rare plant communities, particularly *Species at Risk Act*-listed species, if applicable, in areas potentially affected by the PPPP;
- 3) The potential effects of PPPP operations on culturally significant species – as identified through traditional or community knowledge;
- 4) The potential effects of vehicle, mine equipment and power plant emissions on vegetation;
- 5) The potential effects of dust emissions on vegetation;
- 6) Local plant life’s vulnerability to invasive species, and the likelihood that invasive species will be introduced;
- 7) A list of all mitigation required and committed to, to avoid significant impacts from the activities described above; and
- 8) A conceptual plan for the adaptive management of effects on vegetation, including any monitoring programs, as well as reporting to regulators and potentially-impacted communities.

I-4 Wildlife and Wildlife Habitat

Preamble: *The referral of this development to EA by Environment Canada was due in part to potential impacts on SARA-listed species). Concern over potential adverse impacts to wildlife and wildlife habitat were also noted in the scoping sessions, as was a lack of confidence that wildlife studies have been extensive enough to properly characterize wildlife and habitat in the area. Specific concerns were related to effects on wildlife distribution due to noise, emissions and changes in water quality and quantity, and lack of consultation with local traditional knowledge holders.*

While conducting an impact assessment based on identified VCs, specific consideration shall be given, but not limited, to:

- 1) The rationale and methodology for the selection of species as VCs, but the mandatory inclusion of the following species in the Developer’s consideration:
 - a. (SARA-species) - Peregrine falcon (subspecies anatum),
 - b. (SARA-species) - Whooping crane;
 - c. (SARA-species) - Woodland caribou (boreal population);
 - d. (SARA-species) - Wood bison;
 - e. Moose; and

- f. Other fur-bearing mammals that frequent the area.

Analysis of each species shall include mapping the known distribution of each species, their likely and preferred range in the area, their habitat usage intensity broken down seasonally, migration corridors and any particularly important habitat sites.

- 2) The effects that each PPPP component may have on wildlife and wildlife habitat VCs, which shall include, but not be limited to:
 - a. Potential direct effects to habitat with a quantification of that effect, “per VC”;
 - b. Potential indirect effects to habitat with a quantification of that loss, “per VC”;
 - c. Historic, current and expected wildlife use of potentially-contaminated water sources, and an assessment of the effects predicted from such activity;
 - d. Potential effects to VCs from PPPP-related vehicle traffic on Territorial Highway 5;
 - e. Potential effects of dusting, originating from PPPP operations, on wildlife habitat;
 - f. Potential effects of odours on wildlife;
 - g. Potential effects of noise on wildlife (include comparisons of background, average PPPP and maximum PPPP decibel level ranges);
 - h. Physical barriers to wildlife resulting from construction and operation of the PPPP;
 - i. Disruption, blockage, impediment and sensory disturbance, of daily or seasonal wildlife movements (e.g., migration, home ranges); and
 - j. How mine site planning has considered potential effects on wildlife and wildlife habitat.
- 3) The potential effects of PPPP operations on rare, threatened or endangered species including
 - The *Species at Risk Act*-listed species noted above, pursuant to s.79 of that Act; and
 - consideration to species listed by the *Committee on the Status of Endangered Wildlife in Canada* and the *General Status Ranks of Wild Species in the NWT*;
- 4) The potential effects of PPPP operations in attracting wildlife and discussion as to how Tamerlane intends to manage wildlife access and attraction to the R-190 site, with particular emphasis on the area inside the freeze perimeter, all underground access points, limiting access to the Infiltration Basin, transportation routes, and on minimizing attractants such as solid waste;
- 5) A conceptual wildlife management plan, including furbearers, migratory birds, waterfowl, large ruminants and large carnivores, in regards to activities occurring at the mine site and in the transportation corridor, including but not limited to:
 - a. Efforts to be undertaken to monitor wildlife in the vicinity of the PPPP and report the presence of species to the appropriate authorities when necessary (e.g., Wood Bison);
 - b. Identification of adaptive management measures to avoid, minimize, and mitigate potential effects to wildlife when detected through wildlife monitoring; and

- c. How monitoring results and mitigation efforts will be reported to regulators and potentially-affected communities.

I-5 Terrain

Preamble: *The scoping sessions noted concerns about the susceptibility to degradation of Territorial Highway 5. In addition, concerns were noted about the potential impacts of a drawdown in the water table from underground mining activities and the long-term potential for subsidence.*

While conducting an impact assessment based on identified VCs, specific consideration shall be given, but not limited, to:

- 1) The potential effects of all PPPP operations on the terrain which shall include:
 - a. Buildings and mining support infrastructure;
 - b. The complete on-site road network;
 - c. Territorial Highway #5 west of the PPPP; and
 - d. The Infiltration Basin and associated infrastructure.
- 2) The potential effect of PPPP operations on terrain due to potentially increased sedimentation, erosion, or lowering of the local water table;
- 3) The potential impact of PPPP operations on land subsidence in the area of the R-190 deposit;
- 4) A discussion of Tamerlane's commitment to minimize the overall footprint of the mine, as well as its consideration for locating its infrastructure on brownfield⁵ sites;
- 5) The identification of - and potential effects of PPPP operations on – any surrounding permafrost conditions in the mining area; and
- 6) An adaptive management plan to monitor and mitigate against impacts on local terrain, including:
 - a. Erosion control measures;
 - b. A conceptual outline of the waste rock and aggregate management plan;
 - c. A conceptual outline of the method to backfill and seal the underground works;
 - d. A discussion of how monitoring results will be reported to regulators and potentially-affected communities.

I-6 Air Quality and Climate

Preamble: *It is acknowledged that in the Northwest Territories there is presently no enforceable regulatory regime for air quality. In the scoping sessions, it was noted that Tamerlane would meet the Guideline for Ambient Air Quality Standards in the Northwest Territories and GNWT Guideline for Dust Suppression, as well as GNWT and Worker's*

⁵ Brownfield land is an area of land previously used or built upon, as opposed to greenfield land which has never been built upon

Compensation Board standards for mine air quality. The EA will assess the PPPP's potential impacts to air quality.

While conducting an impact assessment based on identified VCs, specific consideration shall be given, but not limited, to:

- 1) A description of air flow and likely levels of particulate matter and other emissions on the PPPP site, with a focus on the underground ventilation system's release of CO, SO₂ and NO_x, and other areas of on site emissions;
- 2) The potential effects of PPPP operations on air quality through the atmospheric dispersion of emissions and dust on a local and regional scale. This shall include estimates of:
 - a. Dust from construction activities, roads, mine workings (including blasting), waste rock and ore stockpiles, the Infiltration Basin, any quarries utilized, and DMS activities; and
 - b. Emissions from vehicles and diesel generators.
- 3) Identification of any human health impacts from particulate matter or hydrocarbon burning on site (*animal and plant health issues are examined in I-4*);
- 4) A discussion of the potential effect of PPPP operations in generating greenhouse gas emissions, which shall include but not be limited to the following:
 - a. Predicted total annual atmospheric loading of greenhouse gases in CO₂ equivalent values;
 - b. Comparison of the value determined in a) to the total emission generated in NWT; and
 - c. A discussion of Tamerlane's consideration to minimize greenhouse gas emissions.
- 5) A discussion of the standards, guidelines and regulations that will be applied to the PPPP operation in all areas related to air quality;
- 6) A discussion of the technology that will be utilized in PPPP operations to ensure that significant adverse impacts to air quality are not incurred;
- 7) A conceptual outline of the air quality adaptive management plan, which shall include a discussion of any proposed monitoring programs, as well as how monitoring results will be reported to regulators and impacted communities.

I-7 Biophysical Environmental Monitoring

Report on any discussions with communities, federal and territorial governments related to negotiating collaborative arrangements to manage, monitor and mitigate the project. Include a discussion of Tamerlane's general approach toward negotiating arrangements such as environmental agreements.

J Closure and Reclamation

Preamble: *Closure and Reclamation issues were noted on a number of occasions in the scoping sessions. Particular concerns related to how to ensure that the Developer will comply with requirements under Section 15 of the Mackenzie Valley Land Use Regulations and expectations of the Mine Site Reclamation Guidelines for the NWT.*

Although Closure and Reclamation is normally dealt with in detail at the regulatory phase of a development, public concern around this issue demands that it be considered in an appropriate manner during this EA.

The following items are required for consideration of this environmental component:

- 1) A description of the policies, regulations and industry standards that will be considered in the development of the Closure and Reclamation plan;
- 2) A conceptual Closure and Reclamation Plan for the purpose of this environmental assessment, which shall include, but not be limited to:
 - a. A list of Closure and Reclamation components and activities;
 - b. A consideration of various reclamation scenarios for the site, including methods and timelines for the completion of mine reclamation based upon the current Development Description;
 - c. The rationale for the selection of proposed activities versus alternatives that have been dismissed;
 - d. Conceptual outline of details of the methods and location for on- and off-site disposal of materials;
 - e. A visual and written depiction of the entire work site at several stages of post-mining regeneration under the closure and reclamation plan proposed:
 - i. immediate post-closure;
 - ii. one year later;
 - iii. five years later; and
 - iv. 15 years later.
 - f. A cost-estimate component of proposed reclamation activities; and
 - g. A conceptual post-closure monitoring plan, for protection of both the biophysical and human environment, which should also include a discussion of how monitoring results will be reported to regulators and potentially-impacted communities.
- 3) A discussion of how the site will be graded, and any physical or chemical hazards removed;
- 4) A discussion concerning the feasibility of establishing a self-sustaining vegetation community on the mine site after closure, if re-vegetation is to be considered, which shall include but not be limited to the following:
 - a. Proposed re-vegetation techniques including a discussion on what species will be considered for this activity; and
 - b. Predicted vegetation re-growth rates.
- 5) A discussion regarding Tamerlane's approach to working with potentially-affected local communities and aboriginal groups to ensure that public values are taken into consideration

during Closure and Reclamation.

K Cumulative Effects

Preamble: Pursuant to Section 117(2)(a) of the MVRMA, the Review Board considers cumulative effects in its determination. During the scoping sessions, major concerns were identified in relation to:

- Potential local cumulative effects of rapid population growth and increased traffic in the Town of Hay River and on Territorial Highway 5, especially if the Mackenzie Gas Project goes ahead; and
- Cumulative biophysical effects from historic and current industrial development on the Pine Point area on both sides of the Buffalo River. In particular, the effects of the Pine Point lead-zinc mine run by Cominco from 1964-1987, and the implications of such effects on water quality, quantity, wildlife habitat and wildlife numbers, and traditional land use by aboriginal peoples.

While it is beyond the scope of this assessment to fully consider all of these issues, Tamerlane will identify the information required below. In addressing this section, Tamerlane is strongly encouraged to refer to Appendix H of the Review Board's Environmental Impact Assessment Guidelines. The incorporation of Traditional Knowledge is recommended alongside scientific analysis. As guidance please refer to Section 3 (Scope of Assessment) that states "...such cumulative impacts will be assessed at a geographic and temporal scale appropriate to the particular environmental component under consideration."

The following items are required for consideration of cumulative effects:

- 1) An analysis of the VCs to be considered in the cumulative effects assessment (NOTE: this must include woodland caribou) and a rationale for VCs for including or not including the VCs in the cumulative effects assessment;
- 2) Consideration of an expanded Cumulative Study Area that includes all of the areas affected by the historic Pine Point Mine in addition to the EA Study Area and all of the geographic areas considered in the Scope of Assessment as is appropriate for the particular VCs under examination;
- 3) Determination of the other past, present and reasonably foreseeable human activities that may affect the same VCs, which should include:
 - a. The rationale for including the developments that are chosen for examination.
 - b. A discussion of developments that were considered, but were not included in the cumulative effects assessment and the rationale for that decision; and
- 4) Inclusion of the following developments, at minimum, in the examination of the cumulative effects:
 - a. The historic Pine Point mine, with an emphasis on cumulative biophysical effects on the Buffalo River watershed, and the lands and waters in the Cumulative Study Area;
 - b. The proposed Mackenzie Gas Project, focusing only on its identifiable impacts on the Town of Hay River and the Hay River Reserve;
 - c. The reasonably foreseeable expansion of the Tamerlane mining development to other

easterly trending identified ore bodies;⁶

- d. Territorial Highway 5, focusing on estimates of past, present and future traffic flows under alternative development scenarios and a determination of its engineering and public safety capacity to deal with potentially increased flows; and
 - e. Any other identified local industrial developments.
- 5) Identification and rationale for the geographic and temporal scale that will be applied to the cumulative effects assessment of the VCs under consideration, in recognition of the minimum geographic parameters set above (*NOTE: temporal studies of future Tamerlane expansion should extend at least as far into the future as the likely minimum length of time it would take to mine the other identified ore bodies, and go back at least as far as the opening of the historic Pine Point Mine*);
- 6) Discussion of the approach and methodologies used to identify and assess cumulative effects. This shall include the provision of explicit documentation of the assumptions, models and information sources used, as well as information limitations and associated levels of uncertainty;
- 7) Cumulative effects predictions, which consider, but are not limited to the following:
- a. Potential effects to the VCs likely to result from the PPPP in combination with past, present or reasonably foreseeable developments;
 - b. Changes (trends) in VC health since the closure of Pine Point Mine in 1987;
 - c. The delineation of effects to the biophysical environmental which are attributable to either other developments or the PPPP; and
 - d. Identification of any locations of special intensity of cumulative effects, with a description of the effects and likely reasons behind them.
- 8) A plan for the monitoring of cumulative effects and the adaptive management of the PPPP's contribution to regional cumulative effects.

L Accidents and Malfunctions

Preamble: Pursuant to Section 117(2)(a) of the MVRMA, the Review Board considers the potential effects of malfunctions or accidents that may occur in connection with the PPPP. While details concerning emergency response plans are normally reviewed in detail at the regulatory phase of a development, certain details concerning accidents and malfunctions must be provided in this EA.

The following items are required for consideration of accidents and malfunctions:

- 1) A discussion regarding company policies, industry standards, guidelines or regulations to be considered in the planning and operation of the PPPP.

⁶ It is understood that the purpose of the PPPP is to confirm the viability and economics for underground mining in the area. The Developer would not consider such a capital intensive investment unless the likelihood of success was high. Therefore, the Review Board considers both success and expansion reasonably foreseeable, making analysis of cumulative impacts accruing from these future activities appropriate.

- 2) Predict the risks and effects of accidents and malfunctions, with particular consideration to a structural failure of the underground mining works; failure (breach) of refrigerant distribution pipes; failure of the freezeway technology to contain water inflows to the mine and associated pressures on the Infiltration Basin, especially considering the karst geology and groundwater quality and quantity; major seismic activity impacts; major fuel spills at the site or on transportation routes; accidents involving the transportation and handling of any hazardous materials.
- 3) Discuss emergency response measures/contingency plans, that shall include, but not be limited, to:
 - a. Storage, transportation and handling system failures of hydrocarbons;
 - b. Storage, transportation and handling system failures of explosives;
 - c. Storage, transportation and handling system failures of process chemicals or other hazardous compounds, including a focus on the refrigerant used in the freezeway;
 - d. Failure of the freezeway to keep groundwater from infiltrating the underground works, and any identifiable drawdown of local water tables as a result (please include an analysis of all the potential causes of failure of the freezeway, which may include, but not be limited to, climate change, local geology, geotechnical and geochemical makeup, volumes of water in the system, seismic activity or explosives vibration);
 - e. Responses to vehicle and industrial accidents;
 - f. A copy of the contractor's fuel handling and spill clean-up procedures, and an explanation of how the proponent has ensured that the contractors is cognizant of, and in adherence to, permit conditions; and
 - g. A description of the measures to be used to prevent, prepare for, respond to and recover from, any accident or malfunctions identified in the environmental emergency response plans should be included. Spill contingency plans should include locations of disposal sites approved to accept wastes and means of storage prior to disposal.
- 4) A discussion as to how Tamerlane will prevent or reduce malfunctions associated with activities conducted by its contractors, with particular consideration to use of Territorial Highway 5 and Town of Hay River roads;
- 5) A discussion as to how site planning and engineering considerations have been undertaken to prevent or reduce the likelihood of malfunctions and accidents during PPPP operations; and
- 6) A conceptual discussion concerning adaptive management measures in the event that Tamerlane is unable to meet any identified water quality parameters at the point of discharge into the Infiltration Basin (as per Water Licence/MMER parameters).