Basic Requirements for Environmental Assessments of Pits and Quarries

Tanya I. Markvart

March 18, 2012

Photo by Richard and Christa Galloway

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Executive Summary

This report sets out Basic Requirements for Environmental Assessments (EAs) of proposed aggregate pit and quarry developments. These Basic Requirements should be incorporated in a proponent's Terms of Reference for the EA and applied throughout the EA up to final evaluation. The Basic Requirements contain three key components:

Component C1: EA Design Principles

Component C2: EA Content

Component C3: Ministry Evaluation Criteria

Below is an overview of the above key components, which are described in detail in the report.

Component C1: EA Design Principles is a set of high-level principles that must guide the contents of the Terms of Reference (ToR) and EA. They must also guide the quality of the EA decision-making process. Concerned citizens and responsible authorities should apply these criteria to evaluate the adequacy of the proponent's ToR and EA. The following 10 EA Design Principles are described in detail in **Section 2** of the report:

Component C1: EA Design Principles

Principle P1: Betterment for the people of Ontario

Principle P2: Broad, systems-based definition of environment

Principle P3: Long-term effects

Principle P4: Comparative evaluation of alternatives

Principle P5: Recognition of indirect, cumulative, and interactive effects

Principle P6: Precaution

Principle P7: Broad and collaborative public engagement

Principle P8: Positive legacy

Principle P9: Explicit evaluation and decision criteria

Principle P10: Transparent consideration of trade-offs

Component C2: EA Content sets out the stakeholder concerns that proponents must be required to investigate. Two sets of assessment criteria are provided: generic evaluation criteria and trade-off decision-making criteria. The proponent must incorporate these generic criteria in the ToR and then specify them in the comparative evaluation of alternatives in the EA. **Section 3** provides a detailed explanation of the criteria and how they must be specified for particular pit and quarry cases. Below, the generic evaluation criteria are listed.

Generic Criteria for Evaluating Environmental Effects

1. Commitment to betterment
2. Long-term integrity of biophysical systems
3. Long-term integrity of social and built systems
4. Livelihoods and economic development
5. Fair distribution of costs and benefits, opportunities and risks
6. Democratic governance
7. Efficient use of natural resources
8. Inter-systems effects and overall positive legacy
9. Precaution

Trade-Off Decision-Making Criteria

1. Maximum net gains
2. Burden of argument on proponent
3. Avoidance of adverse effects
4. Protection of the future
5. Explicit justification
6. Public participation

The development of the ToR and EA reports represent two main stages of the EA process. The three key components of the Basic Requirements must be incorporated at specific points in these stages. **Component 2: EA Content** sets out the sequential order in which the key components must be applied:

- Statement of broad initial purpose of the undertaking in the ToR and EA,
- Adoption of generic evaluation and decision criteria in the ToR and EA,
- Identification of reasonable alternatives in the ToR and EA,
- Identification of environmental effects of alternatives in the ToR initially and in the EA

more precisely,

- Specification of evaluation and decision criteria in the EA,
- Comparative evaluation of alternatives in the EA,
- Selection and elaboration of the preferred alternative as the proposed project in the EA.

Component C3: Ministry Evaluation Criteria constitutes the evaluation criteria that the Ministry of Environment and/or Environmental Review Tribunal must apply in their evaluations of the acceptability of proposed aggregate pit and quarry developments. These Ministry Evaluation Criteria must also be incorporated in the ToR. They are described in detail in **Section 4**. Below, they are listed for a quick overview.

Component C3: Ministry Evaluation Criteria

1. Betterment to the people of Ontario
2. Demonstration of application of betterment principle
3. Fair distribution of benefits and costs
4. Long-term legacy
5. Views of stakeholders and participants

These Basic Requirements seek to ensure that proponents adopt an integrated and comprehensive approach to decision making and choose an alternative that delivers the most positive benefits to social, economic, and ecological well-being, while avoiding adverse effects.

That said, it is important to note that the most positive alternative identified by the proponent must be acceptable to the public and responsible authorities. Indeed, there may be considerable differences between the proponent's and the public's notions of the most positive option. At a minimum, however, these Basic Requirements cover the essential concerns that must be covered by EAs of aggregate pit and quarry developments.

Proponents, responsible authorities, and the public are encouraged to read through this report in order to better understand the three key components of the Basic Requirements. Proponents should adopt and apply the EA design principles, evaluation criteria, and application steps in order to ensure the adequacy of the ToR and EA. Similarly, responsible authorities should make certain that proponents adopt and apply the principles, criteria, and application steps. Responsible authorities should also adopt and apply the Ministry Evaluation Criteria in order to make certain that the preferred alternative is in the public interest. Finally, the public should request that these principles, criteria, and application steps are adhered to as vigorously as possible in order to ensure a fair and reasonable outcome.

1. Introduction

On September 1st, 2011, then Minister of the Environment for Ontario, John Wilkinson, ordered an environmental assessment (EA) of the Highland Companies' proposed Melancthon mega-quarry in North Dufferin County.

The Melancthon mega-quarry is the first aggregate quarry project to be subject to an EA under Ontario's EA Act. As such, it underscores the need to establish some basic obligations for all EAs of proposed aggregate pit and quarry undertakings. Ontarians require some guidance with respect to the issues and impacts that such EAs must cover, the criteria that must be applied in decision making, and the quality of the EA decision-making process.

This report sets out *Basic Requirements* for all EAs of proposed aggregate pit and quarry developments. The Basic Requirements entail three key components, presented in Box 1, below.

Box 1. Basic Requirements for EAs of Aggregate Pits and Quarries: Three Key Components

Component C1: EA Design Principles
Component C2: EA Content
Component C3: Ministry Evaluation Criteria

Component C1: EA Design Principles is a set of high-level concepts that must guide the contents of the EA as well as the quality of the EA decision-making process. They must also guide the development of the Terms of Reference (ToR). A ToR comprises the proponent's work plan for what is going to be studied in the EA and how. The first formal step in the EA process is the submission of a proposed ToR. It is prepared by the proponent and submitted to the Ministry of Environment for possible adjustment and approval. The EA Act requires public notice of the ToR so citizens can review it and submit comments to the Ministry.

Component C2: EA Content encompasses the particular stakeholder concerns that all EAs of aggregate pits and quarries must be required to investigate. It also contains the evaluation criteria that the proponent must adopt in analysis and decision making. These are generic criteria designed to be applicable to all aggregate mining EA cases. They will need to be specified to recognize the issues in particular settings. The EA Content requirements must be incorporated in the ToR for all EAs of proposed pit and quarry developments.

Component C3: Ministry Evaluation Criteria must also be incorporated in the ToR. The Ministry of Environment and/or Environmental Review Tribunal must apply these evaluation criteria in their evaluations of the acceptability of proposed aggregate pit or quarry developments.

Section 2, below, describes Component C1: EA Design Principles. Section 3 describes

Component C2: EA Content. Finally, Section 4 discusses Component C3: Ministry of Environment Evaluation Criteria.

2. Component C1: EA Design Principles

This Section focuses on the first component (Component C1: EA Design Principles) of the Basic Requirements for EAs of aggregate pits and quarries.

The EA Design Principles must guide

- the contents of the ToR,
- the identification of issues and impacts to be covered in the EA,
- the criteria applied by the proponent in decision making and analysis,
- the criteria applied by the Ministry and/or Tribunal in evaluating the acceptability of a proposed aggregate pit or quarry undertaking, and
- the quality of the EA decision-making process.

Concerned citizens and responsible authorities should apply the EA Design Principles in their reviews of the ToR and EA in order to evaluate their adequacy.

Before the EA Design Principles are defined in detail, it is important to discuss their practical and legislative basis. With respect to their practical basis, they are rooted in the best practices of sustainability-based EA (see Sub-section 2.1). With respect to their legislative basis, they are rooted in relevant provincial laws and policies, notably the Ontario Planning Act, Provincial Policy Statement, Ontario EA Act, and Aggregate Resources Act (See Sub-section 2.2).

2.1 Practical Basis for Component C1: EA Design Principles

Component C1, EA Design Principles ,are rooted in the best practices of sustainability-based EA, which have been established by scholars and practitioners around the world (see Partidario & Clarke, 2000; Dalal-Clayton & Sadler, 2005; Pope et al., 2005; Gibson 2006). First and foremost, sustainability-based EA aims for positive contributions to overall social, economic and ecological betterment. This kind of EA stands in contrast to EAs that aim only at mitigation of environmental effects.

There is now general agreement that sustainability-based EA must be explicitly driven by sustainability objectives (George, 1999; Pope et al., 2004; Gibson et al., 2005; Hacking & Guthrie, 2006; Hermans and Knippenberg, 2006; Sheate et al., 2008). Sustainability objectives set out basic requirements for the contents of all EAs as well as the quality of the processes adopted in decision making. With respect to EA contents, sustainability objectives require practitioners to adopt a particular perspective and consider things that are essential to community well being, including

- a systems perspective in order to recognize the links within and between social,

economic, and ecological realms,
- all relevant social, economic, cultural and ecological/biophysical interests, issues, and impacts,
- the community context with respect to identification of interests, issues, and impacts,
- present and future generations,
- enhancement as opposed to just mere mitigation,
- multiple scales, including cumulative impacts and interactive effects,
- direct and indirect effects,
- precaution in the face of complexity and uncertainty,
- citizen engagement and learning, and
- how the project contributes positively to long-term community well being.

With respect to EA decision-making processes, sustainability objectives oblige practitioners to adopt decision-making models that involve

- representation from all interested and affected stakeholders,
- participation by all interested and affected stakeholders throughout the EA process,
- collaborative decision-making processes,
- clear links between public input and decision making, and
- transparency with respect to the steps in the EA process as well as how the proponent arrived at certain decisions.

The above lists are based on the academic and practitioner literature on the best practices of sustainability-based EA (see Partidario & Clark, 2000; Dalal-Clayton & Sadler, 2005; Pope et al., 2005; Gibson 2006). The EA Design Principles provided in Subsection 2.3 cover the above sustainability objectives for EA contents and processes.

2.2 Legislative Basis for Component C1: EA Design Principles

Aside from the above described best practices of sustainability-based EA, the EA Design Principles are based on key laws and policies that govern land use planning and natural resource management in Ontario.

Before I discuss the particular laws and policies, it is important to note that the legislative framework governing aggregate resource management in Ontario has been widely criticized. Gravel Watch, for example, has recognized the shortcomings of the current regulatory regime that governs aggregate resource management, notably with respect to conservation, land use planning, rehabilitation, transparency and accountability, cumulative effects, demand management, and monitoring and enforcement (see Gravel Watch, 2011). Thus, by resting the EA Design Principles on current laws and policies, I am not admitting to their adequacy. Rather, my intention is to highlight their legislative basis.

Boxes 2 to 5, below, summarize key aspects of the laws and policies that underpin the EA Design Principles. Box 2 focuses on key aspects of the Ontario Planning Act. Box 3 focuses on

the Provincial Policy Statement. Box 4 concentrates on the EA Act. Finally, Box 5 concentrates on the Aggregate Resources Act.

Box 2. Key Aspects of the Ontario Planning Act

A key purpose of the Planning Act is to integrate matters of provincial interest in provincial and municipal planning decisions. The Act defines "matters of provincial interest" broadly, referring explicitly to social, economic, cultural, ecological, and built systems concerns, including, among others

- the supply, efficient use and conservation of energy and water;
- the protection of ecological systems, including natural areas, features and functions;
- the protection of the agricultural resources of the Province;
- the conservation and management of natural resources and the mineral resource base;
- the minimization of waste;
- the protection of the financial and economic well-being of the Province and its municipalities;
- the protection of public health and safety;
- the appropriate location of growth and development; and
- the promotion of development that is designed to be sustainable, to support public transit and to be oriented to pedestrians.

Addressing these concerns requires a long-term perspective, consideration of multiple scales of impacts, present and future generations, cumulative impacts, and alternatives.

Box 3. Key Aspects of the Ontario Provincial Policy Statement

The Provincial Policy Statement (PPS) explicitly recognizes that Ontario's long-term prosperity, environmental health, and social well-being depend on protecting natural heritage, water, agricultural, mineral and cultural heritage and archaeological resources.

Moreover, the PPS adopts a systems perspective that seeks to maintain the long-term ecological function and biodiversity of natural heritage systems; and, where possible, improve the linkages within and between natural heritage features and areas, surface water features, and ground water features.

Additionally, the PPS states that Ontario's long-term prosperity, environmental health and social well-being depend on reducing the potential for public cost or risk to Ontario's residents from natural or human-made hazards.

Box 4. Key Aspects of the Ontario EA Act

Similar to the Ontario Planning Act, Ontario's EA Act defines "environment" broadly to include social, economic, cultural, ecological, and built systems.

Additionally, the EA Act explicitly allows for consideration of the interrelationships between social, economic, ecological, and built systems.

Furthermore, the purpose of the EA Act is the betterment of the people of Ontario by providing for the protection, conservation and wise management in of the environment.

Finally, the EA Act requires EAs to consist of, among other things, an evaluation of the advantages and disadvantages to the environment of the undertaking, the alternatives to the undertaking, and the alternative methods of carrying out the undertaking.

Box 5. Key Aspects of the Aggregate Resources Act

The purposes of the *Aggregate Resources Act* provide some basis for considering sustainability or betterment for the people of Ontario in aggregate resource management, including

- the requirement for (progressive) rehabilitation of land from which aggregate has been excavated; and
- the obligation to minimize adverse impact on the environment in respect of aggregate operations.

On the same note, the Act sets out a list of things that the Minister shall consider in determining whether a licence should be issued or refused including, among others

- the effect of the operation of the pit or quarry on the environment;
- the effect of the operation of the pit or quarry on nearby communities;
- the suitability of the progressive rehabilitation and final rehabilitation plans;
- any possible effects on ground and surface water resources;
- any possible effects of the operation of the pit or quarry on agricultural resources; and
- any planning and land use considerations.

The above described laws and policies reinforce the orientation of the EA Design Principles towards the following basics:

- betterment for the people of Ontario,
- a long-term, systems perspective,
- integrated consideration of social, economic, cultural and ecological issues and

interests,
- comparative evaluation of alternatives,
- recognition of indirect, cumulative, and interactive effects,
- precaution, learning, and adaptation,
- collaborative public engagement,
- appropriate evaluation criteria, and
- consideration of trade-offs.

Subsection 2.3, below, presents a detailed description of Component C1: EA Design Principles. Then, I set out the rest of the key components. Section 3 presents Component C2: EA Content. Finally, Section 4 describes Component C3: Ministry Evaluation Criteria.

2.3 Detailed Description of Component C1: EA Design Principles

This Subsection provides a detailed description of the EA Design Principles. Altogether, there are10 principles. Below, each principle is discussed, in turn.

2.3.1 Principle P1: Betterment for the people of Ontario

The proponent must be required to demonstrate how the proposed aggregate pit or quarry will contribute positive, lasting social, economic, and ecological benefits to community well-being, while avoiding adverse effects. These benefits must be acceptable and tangible to the community and/or communities affected by the undertaking, as well as the people of Ontario more generally. The interested and affected public and the proponent must determine the benefits in relation to the social, economic, and ecological costs of the project. Moreover, the benefits must be integrated so that a gain in one aspect of community life will reinforce other aspects of community life (e.g., enhancement of groundwater quality will benefit the local community because it will not have to raise money for a filtration plant). This means that the comparative evaluation of alternatives must identify the option that provides the most positive lasting social, economic and ecological gains to the people of Ontario, considering the social, economic and ecological cost of the project.

2.3.2 Principle P2: Broad, systems-based definition of environment

The proponent must adopt a broad definition of the environment in order to include social, economic, cultural and ecological/biophysical systems and their interrelations. Furthermore, proponents must adopt a systems perspective in their analyses of impacts, alternatives, etc. A systems perspective recognizes the linkages within and between social, economic, and ecological realms, present and future generations, immediate and long-term impacts, and multiple scales.

2.3.3 Principle P3: Long-term effects

The proponent must adopt a long-term timeframe in order to consider the effects of aggregate extraction developments as well as post-extraction site condition/use. A long-term timeframe must encompass the entire life-cycle of a particular aggregate pit or quarry operation, from land

use designation to extraction to post-rehabilitation.

2.3.4 Principle P4: Comparative evaluation of alternatives

The proponent must undertake a comparative evaluation of all reasonable options *before* determining which is the preferred alternative and which method of carrying out the project is the preferred method. The most desirable alternative must be identified in light of explicit evaluation criteria consistent with the principles set out here. Component 2: EA Content provides adequate evaluation criteria for this purpose.

2.3.5 Principle P5: Recognition of indirect, cumulative, and interactive effects

The proponent must identify and evaluate indirect, cumulative, and interactive effects. Indirect effects include social, economic, or ecological impacts that are not a direct result of the undertaking, e.g., local economic development effects that result from impacts on farmland.

Cumulative effects include the combined social, economic, and ecological effects of individual impacts associated with a particular undertaking, e.g., the combined effect of noise, dust, and visual impacts. Cumulative effects are also the combined changes caused by the current undertaking along with other past, present and reasonably foreseeable future projects and activities.

Interactive effects include the reactions between or among the impacts of one or more projects in the area, e.g., a chemical plant producing two streams of waste that together produce a highly toxic substance. Consideration of interactive effects must also involve investigating the implications of local undertakings for broader regional and provincial initiatives.

2.3.6 Principle P6: Precaution

EAs of proposed aggregate pit or quarry developments must be underpinned by the principle of precaution. This principle emphasizes the reality that uncertainty (ignorance, vagueness, and incomplete scientific information) and unanticipated effects are unavoidable in pit and quarry projects. Thus, proponents must adopt a precautionary approach to planning. A precautionary approach involves avoiding uncertain risks of damage and building into the design of the chosen option the ability to adapt to surprises and new information. Monitoring, enhancement and mitigation and other programmes must adopt a flexible approach that ensures that new information and understanding influence ongoing decision making.

2.3.7 Principle P7: Broad and collaborative public engagement

EAs of aggregate pit or quarry developments must be underpinned by the principle of broad and collaborative engagement of stakeholders. This principle requires

- application of local/traditional knowledge as well as scientific/technical knowledge in the identification and evaluation of impacts, alternatives, enhancement and mitigation measures, etc.;

- the presence of the proponent and responsible authorities at all public information and input events;
- a collaborative approach to decision making in which face-to-face, roundtable discussions between the public, responsible authorities, and the proponent are facilitated by independent facilitators in order to identify and address pertinent issues, interests, impacts, etc.;
- an inclusive approach, including all interested and affected stakeholders, with particular effort to include marginal voices and stakeholders who may not otherwise have the capacity to participate effectively;
- transparency with respect to how decisions were made; and
- clear links between stakeholder input, decision-making, and analyses.

2.3.8 Principle P8: Positive legacy

The proponent must be required to demonstrate how the undertaking will be used to maintain, protect and enhance social, economic and ecological well being for the long term.

2.3.9 Principle P9: Explicit evaluation and decision criteria

The proponent must incorporate in the ToR explicit evaluation and decision criteria consistent with the principles set out here. Furthermore, the proponent must be required to demonstrate how the criteria were used throughout decision making in order to influence the EA. Component 2: EA Content provides a generic set of criteria appropriate for this purpose.

Also, the Ministry of Environment and/or Environmental Review Tribunal must adopt evaluation and decision criteria consistent with the principles set out here. These criteria must be applied in their evaluation of the acceptability of the proposed undertaking. Section 4 provides a set of criteria appropriate for this purpose.

2.3.10 Principle P10: Transparent consideration of trade-offs

Trade-offs arise when gains in one area (e.g., protecting environmentally significant land) lead to losses in another area important to community well-being (e.g., development restrictions that inhibit local economic growth). The ToR must require proponents to be explicit about any trade-offs that emerge in decision making, especially in the evaluation of alternatives. Proponents must choose the alternative that contributes the greatest lasting positive benefits to the people of Ontario, while also avoiding adverse effects.

Section 3, below, describes the second component of Basic Requirements, Component C2: EA Content.

3. Component C2: EA Content

This section sets out the content that must be incorporated in the ToR for EAs of proposed aggregate pit or quarry developments. The requirements for content include the particular community concerns that must be addressed by the proponent in the EA. They also contain the evaluation criteria that must be applied by the proponent in decision making and analysis.

Similar to the EA Design Principles, Component C2: EA Content rests, in part, on the steps used in the best practices of sustainability-based EA (see Partidario & Clarke, 2000; Dalal-Clayton & Sadler, 2005; Pope et al., 2005; Gibson 2006). These best practices set out a logical process for proper planning, including the following sequence of steps that must be followed:

- Statement of broad initial purpose of the undertaking in the ToR and EA
- Adoption of generic evaluation and decision criteria in the ToR and EA
- Identification of alternatives in the ToR and EA
- Identification of environmental effects of alternatives in the ToR initially and in the EA more precisely
- Specification of evaluation and decision criteria in the EA
- Comparative evaluation of alternatives in the EA
- Selection and elaboration of the preferred alternative as the proposed project in the EA

These steps emphasize the public interest purpose of the undertaking, development of sustainability-based evaluation and decision criteria that have been carefully specified for the case and context, comparative evaluation of the alternatives, identification of potential environmental effects, and identification of the most positive option. The most positive option should become the proposed undertaking, while the other options should be the less desirable alternatives. It is important to note that the most positive alternative identified by the proponent must be acceptable to the public and responsible authorities. Indeed, there may be considerable differences in the proponent's and the public's notions of the most positive option.

Aside from best practices in sustainability-based EA, Component C2: EA Content is also based on the Ontario EA Act and *Code of Practice for Preparing and Reviewing Terms of Reference for Environmental Assessments in Ontario*, produced by the Ministry of Environment Environmental Assessment and Approvals Branch (Ministry of Environment, 2009). The Code of Practice provides a good description of the steps in the ToR writing process. It also outlines the legislative requirements and the Ministry of Environment's expectations for the preparation and review of a ToR. I do not describe the nuances of the EA Act and Code of Practice. Rather, I describe the requirements for key EA contents that the ToR must cover for proposed aggregate pit or quarry undertakings. Readers must become familiar with the EA Act and Code of Practice in order to gain a thorough understanding of Ministry expectations.

In the Subsections, below, I focus on the following EA Content that must be incorporated in the ToR for proposed aggregate pit or quarry developments:

- Public interest purpose of the undertaking (Subsection 3.1),
- Description of and rationale for the undertaking (Subsection 3.2),
- Description of and rationale for the alternatives (Subsection 3.3),
- Evaluation criteria for the proponent (Subsection 3.4), and
- Description of environment and environmental effects (Subsection 3.5).

3.1 Public Interest Purpose of the Undertaking

The ToR must contain an explanation of the public interest purpose of the undertaking, as required by s. 6.1(2)(a) of the Ontario EA Act. The purposes of pit and quarry undertakings may vary, depending on the particular case and context. The public interest purpose of the Melancthon mega-quarry, for example, should not be narrowly focused on aggregates since one of the relevant alternatives is to retain the land in agricultural use. Thus, the proponent's public interest purpose statement must be broad enough to ensure that the alternatives to the project include all relevant alternatives as opposed to a narrowly conceived list.

3.2 Description of and Rationale (or Need) for the Undertaking

A detailed description of the undertaking must come after the alternatives have been evaluated, the preferred alternative identified and the design completed up to the proposal stage. In the ToR, therefore, the proponent must provide a preliminary description of a range of alternatives to the undertaking.

In the EA, the rationale (or need) for the preferred alternative will be required. A commitment to provide the description and rationale for the preferred undertaking in the EA should be stated in the ToR. The proponent must address

- the purpose of the undertaking, including how the purpose is in the public interest,
- how the preferred alternative will contribute lasting positive benefits to social, economic, and ecological well being,
- need for the material to be extracted,
- need for amount of material to be extracted per year,
- need for extraction to occur on the subject site, and
- other information requested by the public and responsible authorities.

The proponent's rationale for the undertaking must be adequately supported by quantifiable data and other information in order to clearly demonstrate need for the undertaking.

3.3 Description of and Rationale for the Alternatives

The Ontario EA Act requires proponents to undertake a comparative analysis of alternatives. This comparative analysis must assess the advantages and disadvantages of a range of

"reasonable" options, considering best and worst case scenarios for each alternative. This requirement seeks to ensure that the most appropriate means of addressing the identified problem or opportunity is selected. The most appropriate alternative is the one that contributes the greatest lasting social, economic, and ecological benefits, while avoiding adverse impacts.

The proponent must provide in the ToR the statement of the rationale for the alternatives that will be examined in the EA. If the alternatives have not been identified in the ToR, the ToR must make a commitment to provide the rationale for the alternatives in the EA.

Below, I define what a "reasonable" range of alternatives is. Then, I describe the types of alternatives proponents are required by law to consider. Finally, I describe the "do nothing" alternative.

3.3.1 Reasonable range of alternatives

In the ToR, the proponent must set out a reasonable range of alternatives to be examined in the EA. Or, the proponent must describe the process by which a reasonable range of alternatives will be determined in the EA. This must be done early on in consultation with the ministry, other provincial and federal agencies, and the public.

The reasonable range of alternatives must be consistent with the public interest purpose statement. Again, the purpose statement must be broad enough to ensure that the alternatives to the project include all relevant alternatives as opposed to a narrowly conceived list. For proposed aggregate pits and quarries, the range of reasonable alternatives must include other uses of land (e.g., farming, residential housing, commercial development, etc.).

According to the Code of Practice, the range of alternatives that will be considered must (a) address the problem or opportunity, and (b) be within the scope of the proponent's ability to implement. Furthermore, it must be determined by the significance of potential environmental effects of the proposed undertaking, and the circumstances specific to the proposal (e.g., the proponent's situation, financing, timing, etc.).

3.3.2 Types of alternatives

The Ontario EA Act requires proponents to examine 2 types of alternatives: "alternatives to" a proposed undertaking and "alternative methods" of carrying out a proposed undertaking. Alternatives to a proposed undertaking are functionally different ways of approaching and dealing with a problem or opportunity. Alternative methods are different ways of performing the same activity (e.g., where and how, at what pace and scale, etc.).

3.3.3 The "do nothing" alternative

According to the Code of Practice, the do nothing alternative must be considered as the basis for the comparison of alternatives as well as the selection of the preferred alternative as the proposed undertaking. It represents what is expected to happen if none of the other alternatives being considered is carried out. In other words, it is a benchmark against which the effects of the

alternatives can be measured.

Proponents must adopt explicit valuation criteria to assess the undertaking and the alternatives. Subsection 3.4, below, addresses this element of the ToR.

3.4 Evaluation Criteria for the Proponent

This Subsection presents two sets of evaluation criteria that proponents of aggregate pit and quarry developments must incorporate in the ToR and apply in the evaluation of the alternatives. Subsection 3.4.1, below, provides a set of criteria that must be applied by the proponent in the assessment of environmental effects. Then, Subsection 3.4.2 sets out criteria that must be used to guide trade off decision making, especially in the evaluation of alternatives.

3.4.1 Generic criteria for evaluating environmental effects

Proponents must develop criteria to assess the effects of the alternatives on the environment. These criteria must be incorporated in the ToR. The proponent must state in the ToR how the evaluation criteria were developed, including the data sources used.

The generic evaluation criteria are consistent with Component C1: EA Design Principles for EAs of proposed aggregate pit and quarry developments. The evaluation criteria are based on Gibson et al.'s (2005) decision criteria for sustainability (see Appendix A). They were developed especially for EA and other evaluative purposes. EA scholars and practitioners around the world have recognized Gibson's evaluation criteria. For instance, the Ontario Power Authority used them in the preparation of the *Integrated Power System Plan* initiative (see Gibson et al., 2008).

Gibson's criteria cover social, economic, and ecological considerations in an integrated way. They aim for system enhancements as opposed to mere mitigation of adverse impacts. They adopt a long-term, multi-scalar, systems perspective in order to consider linkages, present and future generations, local-to-global impacts, and indirect, direct, interactive, and cumulative effects. Gibson's criteria are generic so they might be applied in any EA of a proposed aggregate pit or quarry development.

I adapt Gibson's original criteria to make them appropriate for application in EAs for proposed aggregate pit and quarry developments. Proponents of proposed aggregate pit and quarry undertakings must incorporate these evaluation criteria in the ToR and apply them throughout decision making in the EA. At a minimum, the evaluation criteria adopted by the proponent must cover these criteria. Table 1, below, presents the evaluation criteria and an explanation of their requirements.

Table 1. Generic Criteria for Evaluating Environmental Effects

Generic Criteria	**Requirement**
1. Commitment to betterment	The proponent must adopt at the outset of planning and decision making the commitment to contribute to the betterment of the people of Ontario, present and future. The betterment commitment must be applied throughout all stages of the EA.
2. Long-term integrity of biophysical systems	The undertaking and alternatives must aim to maintain, protect, and enhance the long-term integrity of biophysical systems, including biodiversity.
3. Long-term integrity of social and built systems	The undertaking and alternatives must aim to maintain, protect, and enhance the long-term integrity of social and built systems.
4. Livelihoods and economic development	The undertaking and alternatives must aim to enhance the capacity of individuals and families to earn enough income for a decent life. The undertaking and alternatives must aim to enhance the capacities, rights, and freedoms of individuals and families to seek improvements in their lives.
5. Fair distribution of (social, economic, ecological) costs and benefits, opportunities and risks	The costs and benefits of the undertaking and alternatives must be pursed in ways that reduce gaps between the rich and poor. The undertaking and alternatives must avoid the displacement of costs to future generations in order to protect and enhance the capabilities of future generations to live sustainably.
6. Democratic governance	The undertaking and alternatives must protect and enhance the capacity of responsible authorities to participate in land use decision making and provide democratic decision making processes. The undertaking and alternatives must protect and enhance the capacity of stakeholders from all sectors to collaborate effectively on issues of public concern.
7. Efficient use of natural resources	The undertaking and alternatives must avoid extractive damage and waste, and cut overall material and energy use.

8. Inter-systems effects and overall positive legacy	The proponent must be required to demonstrate how the evaluation of environmental effects considered the interconnections within and between the above criteria. For example, how do the potential impacts on water quantity influence local economic development, efficient use of natural resources, distribution of costs and benefits, livelihoods, etc. The proponent must be required to demonstrate how the preferred alternative will contribute long lasting positive gains to social, economic, and ecological well being, while avoiding adverse effects.
9. Precaution	The proponent must identify the best and worst case scenarios and favour low risk alternatives while designing for capacity to adjust to unanticipated effects and new understanding.

Subsection 3.4.2, below, sets out a second set of criteria that proponents must adopt to guide decision making when trade-offs emerge.

3.4.2 Criteria to guide trade-off decision making

Subsection 2.3, above, defines the notion of trade-offs. The criteria provided to guide trade-off decision making are based on Gibson's (2005) trade-off rules (see Appendix A). I have adapted them in order to make them suitable for EAs of pits and quarries.

It is important to note that trade-offs should not be a necessary or acceptable aspect of EA. Nor should a project be approved on the basis that the proponent has considered trade-offs. Rather, proponents must avoid trade-offs and consider them only as a last resort. Moreover, a decision that considered trade-offs may still be unacceptable, depending on the impacts. In other words, proponents should seek to ensure that the (social, economic, and ecological) advantages to be gained exceed the damages and the sacrifices. However, the net (social, economic, and ecological) benefits of the chosen alternative may not be acceptable – even after a thorough comparison of the alternatives.

Table 2, below, presents the trade-off criteria.

Table 2. Generic Trade-Off Decision-Making Criteria

Generic Criteria	**Requirement**
1. Maximum net gains	An acceptable trade-off must deliver lasting positive contributions to social, economic, and ecological well-being, and favour the most positive feasible outcome, while avoiding adverse effects.
2. Burden of argument on proponent	The burden of justification of a trade-off compromise that involves acceptance of adverse effects must fall on the proponent of the trade-off.
3. Avoidance of adverse effects	No trade-off that involves an adverse effect can be justified unless the alternative is acceptance of a more significant adverse effect.
4. Protection of the future	No displacement of adverse effects from the present to the future can be justified unless the alternative is displacement of an even more significant negative effect.
5. Explicit justification	Trade-offs must be explicitly justified, through open demonstration of use of the criteria that led to the decision.
6. Public participation	Proposed compromises and trade-offs must be addressed and justified through processes that involve all interested and affected stakeholders

Subsection 3.5, below, sets out the environmental concerns that the proponent must address in the ToR and EA for aggregate pit or quarry developments. Then, I move on to present Component C3: Ministry Evaluation Criteria.

3.5 Description of Environment and Environmental Impacts

In the ToR, proponents must provide a description of the environment that will potentially be affected by the alternatives, including a preliminary list of potential environmental impacts. A more detailed description of the environment will be required in the EA. Similarly, the actual determination of environmental effects will be required in the EA.

As previously described, the EA Act defines environment broadly to include social, economic, built, and ecological dimensions. Some effects may be more obvious than others. Concerns about impacts on surface and ground water quality and quantity, for example, are commonplace in aggregate extraction operations. The impacts of the project on other dimensions of the environment, however, may be more difficult to articulate. For example, the effects of aggregate pits and quarries on democratic decision making may be more difficult to describe because the public and proponents may not be accustomed to thinking in those terms about the impacts of extraction operations.

As already explained, the proponent must adopt in the ToR and EA the evaluation criteria (or equivalent) set out in Table 1, above. These evaluation criteria ensure that a comprehensive suite of environmental concerns is addressed in the EA. As already explained, the criteria are initially generic so they must be specified in order to properly address the context-specific issues in particular pit and quarry cases. Table 3, below, demonstrates how the evaluation criteria should be specified for this purpose. Note that the effects listed in Table 3 do not represent all of the effects associated with a particular pit or quarry.

Table 3. Criteria Specification for Case-Specific Environmental Effects

Criteria	**Environmental Effects** (Immediate, long-term, direct, indirect, interactive, cumulative, local, watershed, landscape, regional, provincial, global)
1. Commitment to betterment	-Considering the below and other environmental effects, how does each alternative to the undertaking and method of carrying out the undertaking contribute lasting, positive (social, economic, and ecological) benefits to the people of Ontario, while avoiding adverse effects?
2. Long-term integrity of biophysical systems	-Surface water quality and quantity -Ground water quality and quantity -Hydrology and hydrogeology (interconnectivity of structure and function) -Soil quantity and productivity (especially farmland) -Air quality -Natural habitat quality and quantity -Wildlife corridors -Flora and fauna species
3. Long-term integrity of social, cultural and built systems	-Community character, including aesthetic quality, visual impacts -Enjoyment of personal property -Cultural heritage, including natural and built features of the cultural landscape -Physical infrastructure

	-Traffic quantity and quality -Noise -Air quality
4. Livelihoods and economic development	-Individual and family incomes -Costs of living, including costs of providing safe and abundant drinking water -Property values -Government revenues -Employment opportunities
5. Distribution of costs and benefits	-Costs (social, economic, ecological) incurred by stakeholders: -loss of water quality and quantity -loss of hydrological and hydrogeological features and functions -loss of health due to environmental impacts (water, dust, noise, etc.) -loss of farmland and soil productivity -loss of property values -loss of alternative land uses -loss of natural habitat and biodiversity -loss of cultural landscape -loss of community character -loss of enjoyment of property -physical infrastructure maintenance and upgrades -ongoing site maintenance -Benefits to communities: -employment -government revenue -benefits associated with end use of aggregate -benefits associated with rehabilitated site
6. Democratic governance	-Transparent, inclusive and timely communications between proponent, responsible authorities and public -Adherence to legislative requirements -Accountability of proponent and responsible authorities to the public over the long term -Capacity of community organizations to persist and mobilize -Capacity of local governments to operate and provide services
7. Efficient use of natural resources	-How do the alternatives to the project and methods of carrying out the project make the must efficient use of electricity, water, soil? -Energy requirements of each alternative, including technology specifications, hours of operation and duration of use -Materials recycling and reuse
8. Inter-systems effects and overall positive legacy	-Economic impacts of above effects -Social and cultural impacts of above effects -Ecological impacts of above effects

9. Precaution	-Social, economic, ecological risks associated with proposed alternatives, especially technologies -Uncertainties surrounding the interactions between impacts of alternatives, climate change and water quantity -Uncertainties surrounding long-term social, economic, and ecological impacts, especially considering unanticipated effects -Completeness of understanding of hydrological and hydrogeological systems interactions -Completeness of understanding of interactions within and between social, economic, and ecological systems

This concludes the description of Component C2: EA Content. I highlighted basic considerations that proponents must address in the ToR and EA for aggregate pit or quarry developments, including consideration of need, alternatives, evaluation criteria, trade-off criteria, and concerns that must be addressed in the proponent's description of the environment and environmental impacts. In Section 4, below, I present the last component of the Basic Requirements, Component C3: Ministry Evaluation Criteria.

4. Component C3: Ministry Evaluation Criteria

This Section provides criteria that the Ministry and/or Environmental Review Tribunal must adopt to evaluate the acceptability of proposed aggregate pit and quarry developments. The criteria are consistent with the EA Design Principles. They also build on criteria adopted by previous panels in EAs for industrial projects under the Canadian EA Act.

For example, the joint review panel for the Kemess North copper-gold mine project evaluated the acceptability of the undertaking from five sustainability perspectives, including

- the long-term site management legacy,
- economic benefits and costs,
- social and cultural benefits and costs,
- fair distribution of benefits and costs, and
- displacement of costs to future generations.

Similarly, the joint review panel for the Mackenzie gas project used 5 categories of criteria under which specific issues were listed. The 5 categories were

- cumulative impacts on the biophysical environment,
- cumulative impacts on the human environment,
- equity impacts (fair distribution of benefits and risks),
- legacy and bridging impacts, and
- cumulative impacts management and preparedness (i.e., capacities for managing the risks and opportunities).

Table 4, below, presents the evaluation criteria for the Ministry of Environment and/or Environmental Review Tribunal.

Table 4. Ministry Evaluation Criteria

Criterion	**Explanation**
1. Betterment to the people of Ontario	The review team must be convinced that the undertaking will make a positive overall contribution to social, economic, and ecological well-being, and successfully avoid adverse effects, in comparison with the alternatives.
2. Demonstration of application of betterment principle	The review team must be satisfied that the proponent considered in the planning, selection and design of the project the extent to which the project makes a positive overall contribution to social, economic, and ecological well-being, and avoids adverse effects.
3. Fair distribution of benefits and costs	The review team must be convinced that there will not be significant inequities in the distribution of costs and benefits, especially between those who would ordinarily receive most of the benefits (company shareholders, proponent, workers, suppliers, government revenue coffers) and those who would ordinarily incur most of the costs (locally-based people).
4. Long-term legacy	The review team must be convinced that the undertaking will leave a positive social, economic, cultural and biophysical legacy, and will not involve the displacement of substantial risks and costs (e.g., management and mitigation costs) to future generations.
5. Views of stakeholders and participants	The review team must be convinced that the proponent incorporated stakeholder concerns throughout the EA process, including the planning and design of the project.

5. Summary

This report sets out Basic Requirements for EAs of proposed aggregate pits and quarries. These Basic Requirement involve three key components:

Component C1: EA Design Principles (see Section 2)

Component C2: EA Content (see Section 3)

Component C3: Ministry Evaluation Criteria (see Section 4)

As explained in Section 2, the three key components are rooted in the best practices of sustainability-based EA as well as the major laws and policies that govern land use planning and natural resource management in Ontario. These best practices, laws and policies reinforce the orientation of the key components towards the following basics:

- betterment for the people of Ontario,
- a long-term, systems perspective,
- integrated consideration of social, economic, cultural and ecological issues and interests,
- fair distribution of costs and benefits,
- comparative evaluation of alternatives,
- recognition of indirect, cumulative, and interactive effects,
- precaution, learning, and adaptation,
- collaborative public engagement,
- appropriate evaluation criteria, and
- consideration of trade-offs.

Component C1: EA Design Principles is a set of high-level principles that must guide the contents of the Terms of Reference (ToR) and EA. They must also guide the quality of the EA decision-making process. Concerned citizens and responsible authorities should apply these criteria to evaluate the adequacy of the proponent's ToR and EA.

Component C2: EA Content sets out the stakeholder concerns that proponents must be required to investigate. I provide two sets of assessment criteria: generic evaluation criteria (see Table 1) and trade-off decision-making criteria (see Table 2). The proponent must incorporate these generic criteria in the ToR and then specify them in the comparative evaluation of alternatives. Section 3 provides a detailed explanation of the criteria and how they must be specified for the environmental effects associated with a particular pit or quarry case. Briefly, proponents must use the generic criteria as the broad categories under which context-specific environmental effects are organized. This helps to ensure that important effects are not missed.

Finally, **Component C3: Ministry Evaluation Criteria** constitutes the evaluation criteria that the Ministry of Environment and/or Environmental Review Tribunal must apply in their evaluations of the acceptability of proposed aggregate pit and quarry developments. These Ministry Evaluation Criteria must also be incorporated in the ToR.

The development of the ToR and EA reports represent two main stages of the EA process. The three key components of the Basic Requirements must be incorporated at specific points in these stages. Thus, **Component 2: EA Content** emphasizes the following particular order in which the key components must be applied:

- Statement of broad initial purpose of the undertaking in the ToR and EA
- Adoption of generic evaluation and decision criteria in the ToR and EA
- Identification of reasonable alternatives in the ToR and EA
- Identification of environmental effects of alternatives in the ToR initially and in the EA more precisely
- Specification of evaluation and decision criteria in the EA
- Comparative evaluation of alternatives in the EA
- Selection and elaboration of the preferred alternative as the proposed project in the EA

These Basic Requirements seek to ensure that proponents adopt an integrated and comprehensive approach to decision making and choose the alternative that delivers the most positive, lasting benefits to social, economic, and ecological well-being.

Proponents should apply the EA Design Principles, Evaluation Criteria, Trade-Off Decision-Making Criteria and application steps in order to ensure the adequacy of the ToR and EA.

Responsible authorities should make certain that proponents apply the principles, criteria, and application steps. Responsible authorities should also apply the Ministry Evaluation Criteria in order to make certain that the preferred alternative is in the public interest, as defined by the EA Design Principles and Evaluation Criteria.

Finally, the public should request that these principles, criteria, and application steps are adhered to as vigorously as possible in order to ensure a fair and reasonable outcome in EAs of proposed aggregate pits and quarries.

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Appendix A

Core Decision-Making Criteria for Sustainability (Gibson et al., 2005, p.116)

Socio-ecological system integrity:
Build human-ecological relations to establish and maintain the long-term integrity of socio-biophysical systems and protect the irreplaceable life support functions upon which human as well as ecological well-being depends.

Livelihood sufficiency and opportunity:
Ensure that everyone and every community has enough for a decent life and that everyone has opportunities to seek improvements in ways that do not compromise future generations' possibilities for sufficiency and opportunity.

Intragenerational equity:
Ensure that sufficiency and effective choices for all are pursued in ways that reduce dangerous gaps in sufficiency and opportunity (and health, security, social recognition, political influence, etc.) between the rich and the poor.

Intergenerational equity:
Favour present options and actions that are most likely to preserve or enhance the opportunities and capabilities of future generations to live sustainably.

Resource maintenance and efficiency:
Provide a larger base for ensuring sustainable livelihoods for all while reducing threats to the long-term integrity of socio-ecological systems by reducing extractive damage, avoiding waste and cutting overall material and energy use per unit of benefit.

Socio-ecological civility and democratic governance:
Build the capacity, motivation and habitual inclination of individuals, communities and other collective decision making bodies to apply sustainability requirements through more open and better informed deliberations, greater attention to fostering reciprocal awareness and collective responsibility, and more integrated use of administrative, market, customary and personal decision making practices.

Precaution and adaptation:
Respect uncertainty, avoid even poorly understood risks of serious or irreversible damage to the foundations for sustainability, plan to learn, design for surprise and manage for adaptation.

Immediate and long-term integration:
Apply all principles of sustainability at once, seeking mutually supportive benefits and multiple gains.

Trade-Off Decision-Making Criteria (Gibson et al., 2006, p. 139)

Maximum net gains:
Any acceptable trade-off or set of trade-offs must deliver net progress towards meeting the requirements for sustainability; it must seek mutually reinforcing, cumulative and lasting contributions and must favour achievement of the most positive feasible overall result, while avoiding significant adverse effects.

Burden of argument on trade-off proponent:
Trade-off compromises that involve acceptance of adverse effects in sustainability-related areas are undesirable unless proven (or reasonably established) otherwise; the burden of justification falls on the proponent of the trade-off.

Avoidance of significant adverse effects:
No trade-off that involves a significant adverse effect on any sustainability requirement area (for example, any effect that might undermine the integrity of a viable socio-ecological system) can be justified unless the alternative is acceptance of an even more significant adverse effect.

Generally, then, no compromise or trade-off is acceptable if it entails further decline or risk of decline in a major area of existing concern (for example, as set out in official international, national or other sustainability strategies or accords or as identified in open public processes at the local level), or if it endangers prospects for resolving problems properly identified as global, national and/or local priorities.

Similarly, no trade-off is acceptable if it deepens problems in any requirement area (integrity, equity, etc.) where further decline in the existing situation may imperil the long term viability of the whole, even if compensations of other kinds, or in other places are offered (for example, if inequities are already deep, there may be no ecological rehabilitation or efficiency compensation for introduction of significantly greater inequities).

No enhancement can be permitted as an acceptable trade-off against incomplete mitigation of significant adverse effects if stronger mitigation efforts are feasible.

Protection of the future:
No displacement of a significant adverse effect from the present to the future can be justified unless the alternative is displacement of an even more significant negative effect from the present to the future.

Explicit justification:
All trade-offs must be accompanied by an explicit justification based on openly identified, context specific priorities as well as the sustainability decision criteria and the general tradeoff rules. Justifications will be assisted by the presence of clarifying guides (sustainability policies, priority statements, plans based on analyses of existing stresses and desirable futures, guides to the evaluation of "significance", etc.) that have been developed in processes as open and participative as those expected for sustainability assessments.

Open process:
Proposed compromises and trade-offs must be addressed and justified through processes that include open and effective involvement of all stakeholders.

Relevant stakeholders include those representing sustainability-relevant positions (for example, community elders speaking for future generations) as well as those directly affected.

While application of specialized expertise and technical tools can be very helpful, the decisions to be made are essentially and unavoidably value-laden and a public role is crucial.