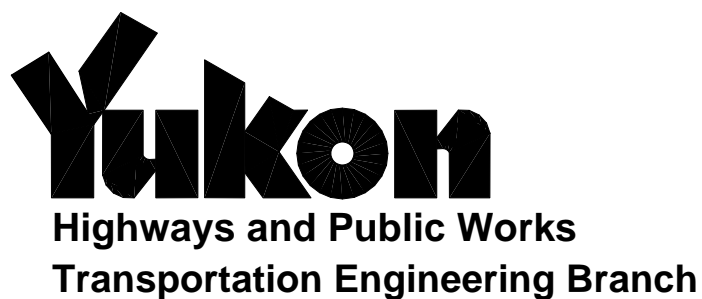




Granular Resource Management Plan

EDITION 3

Prepared By:



April 2007

TABLE OF CONTENTS

1. INTRODUCTION	1
1.1 Background	1
1.2 Objectives of the Plan	3
 2. PIT DEVELOPMENT PROCEDURE.....	 4
2.1 Consultation – Geotechnical Testing	7
2.2 Application for Geotechnical Testing	8
2.3 Geotechnical Testing.....	8
2.4 Consultation – Pit Development	8
2.5 Pit Development Plan.....	10
2.6 Application for Pit Development	10
2.7 Pit Operation	10
2.8 Reclamation	11
 3. ENVIRONMENTAL CONSIDERATIONS.....	 11
3.1 Testing.....	11
3.2 Screens	13
3.3 Sight Lines	14
3.4 Size and Shape	15
3.5 Buffers.....	16
3.6 Access	17
3.7 End Use	17
3.8 Drainage.....	18
3.9 Operational Considerations	18
3.9.1 Wildlife.....	18
3.9.2 Fisheries.....	19
3.9.3 Archaeology/Heritage.....	19
3.9.4 Other Users.....	19
3.9.5 Camps	20
3.9.6 Fuel Storage.....	21
3.9.7 Clearing	21
3.9.8 Grubbing.....	22
3.9.9 Stripping	23
3.9.10 Excavation and Crushing.....	23
3.9.11 Pit Dewatering	23
3.9.12 Excavation in Stream Channels	24
3.9.13 Abandonment and Reclamation.....	24
 4. PIT DEVELOPMENT PLAN	 26
4.1 Development Plan Format.....	27

4.2 Project Description.....	28
4.3 Project Alternatives.....	28
4.4 Area Description	28
4.5 Location	29
4.6 Physical Description.....	29
4.7 Deposit Description.....	30
4.8 Proposed Pit Development.....	30
4.9 Type Of Development.....	30
4.10 Physical Layout.....	31
4.11 Operational.....	31
4.12 Schedule.....	32
4.13 Mapping	32
4.14 Environmental Concerns & Proposed Mitigation	32
4.15 Reclamation Plan	33
4.16 Reference/Contacts	34
5. MONITORING	34

LIST OF FIGURES

Figure 1 – H&PW Pit Development Procedure.....	6
Figure 2 – Plan View of a Typical Sand And Gravel Operation Layout.....	14
Figure 3 – Irregular Shaped Edges Vs. Straight Edges.....	15
Figure 4 – Site Plan With Wetland and Buffer.....	16
Figure 5 – Before and After Reclamation	25
Figure 6 – Plan View of Existing Conditions Prior to Development.....	26

GRANULAR RESOURCE MANAGEMENT PLAN

1. INTRODUCTION

Quality granular material for highway construction and maintenance is required in the Yukon as it is throughout Canada and the rest of the world. The development of granular sources has the potential to impact the environment. These environmental impacts can be mitigated by incorporating environmental concerns in the planning stages. Balancing the need for accessible, affordable, granular material with the need for environmental protection is the objective of the planning process. This plan presents a starting point to balance these needs.

The plan requires updates from time to time to adapt to legislative and organizational changes. The latest updates have been done to reflect the completion of the Devolution Transfer Agreement and the introduction of new environmental assessment legislation in the Yukon.

This plan applies to pit developments and operations conducted by the Department of Highways and Public Works. All discussion within this plan will start from the assumption that the need for the granular material has been established.

1.1 Background

This plan was originally developed in response to concerns over the management of Highways and Public Works (H&PW) granular developments. Concerns were raised by Yukon First Nations, Yukon communities (incorporated and unincorporated), the public and various regulatory agencies. These concerns related to practices when developing, operating and closing granular pits. There is also an increasing public awareness regarding environmental issues and a corresponding increase in public expectations regarding environmental protection. Within government agencies and industry there is also an acknowledgement that some of the practices of the past are no longer acceptable or applicable.

Prior to devolution, the responsibility for land management on crown lands in the Yukon rested with the Federal Department of Indian Affairs and Northern Development (DIAND) Land Use Section. That branch was responsible for the administration of the *Territorial Lands Act* and associated Land Use regulations. All applications for activities on crown land including gravel pits used to be submitted to DIAND for approval. Upon favorable review of applications, DIAND issued land use permits with conditions allowing the activity. DIAND also issued Quarry permits allowing for the extraction and use of the granular material.

Following devolution, the department charged with the administration of the new *Territorial Lands (Yukon) Act*, which includes land formerly known as commissioner's land, is the Yukon Department of Energy Mines and Resources (EMR). While environmental assessment legislation requires H&PW to ensure an environmental assessment is conducted for all its projects, land use

permits for government departments like H&PW are no longer required.

One of the most significant processes affecting development in the Yukon is the ongoing settlement of the Yukon First Nations' land claims. The settlements not only give the First Nations' responsibility for management of settlement lands it also establishes procedures to ensure First Nations' concerns are addressed prior to development proceeding outside of settlement lands. Provisions in the Land Claims Umbrella Final Agreement set forth the requirement for establishing Development Assessment Process (DAP) which became the *Yukon Environmental and Socio-economic Assessment Act* (YESAA). YESAA is similar to federal environmental legislation such as the *Canadian Environmental Assessment Act*. Some of the main objectives of the YESAA are to: recognize and enhance the traditional economy of the Yukon First Nations and their special relationship with the environment, to provide a guaranteed participation by Yukon First Nations in the assessment process, and to protect and maintain environmental quality and ensure projects are conducted within the concept of sustainable development. YESAA also requires proponents to consider environmental and socioeconomic effects of their projects and to incorporate appropriate mitigative measures in the design of their projects. Other sections of the Umbrella Final Agreement such as those regarding Land Use Planning could also have an impact on the planning and operation of granular pits and quarries.

Chapter 18 of the Umbrella Final Agreement deals specifically with granular pits and quarries. Provisions within this chapter require the government to endeavor to identify any quarry required for public purposes within settlement lands, prior to the final land selections by the affected First Nation. Wherever possible the government is to attempt to locate quarries on non-settlement land. This process is well underway. If these areas have not been identified prior to final land selections, the government shall have two years, unless otherwise agreed upon, after the effective date of the final agreement to identify quarries on settlement land. There is also a requirement for the establishment of a process for consultation with the First Nation in the identification of further quarries on settlement land.

Chapter 18 also requires, that when operating any quarry on settlement land, the government shall use the best land use practices, minimize interference with other uses, and upon ending the use of the quarry conduct adequate restoration.

In order to meet the requirements to identify granular sources outlined in Chapter 18 of the Umbrella Final Agreement, H&PW has applied for reserves to cover suitable existing, or new sources of granular material. The reserve notation does not give tenure to the land but rather establishes an interest in the area. This interest does not preclude other use of the area by groups other than the reserve holder. There is still a requirement to obtain environmental assessments and regulatory approvals prior to any development within the reserve. This plan will not deal any further with the reserve process but will concentrate on existing operational requirements. Environmental legislation and recent regulatory changes require a coordinated and comprehensive approach to granular pit development. Some of the main pieces of legislation governing pit development include but are not limited to; Territorial legislation such as the *Waters Act*, *Environment Act* and *Historic Resources Act*; as well as federal legislation such as the *Fisheries Act*, *Navigable Waters Act* and the *Yukon Environmental and Socio-economic Assessment Act* (YESAA).

The environmental assessment process under YESSA is designed to be at arms length where an independent board conducts the assessments. Government departments no longer conduct assessments but are Decision Bodies (DBs) at the end of the new process.

The proponents of developments are being required to provide more information and conduct more consultation as part of the present approval process. This requirement will continue and likely be expanded upon as new procedures are established after final land claims agreements are signed and proposed regulatory changes take effect. All of these factors indicate a need for the establishment of a process to ensure all legitimate concerns are addressed during the planning of granular developments and that all required information is provided in development plans.

1.2 Objectives of the Plan

The goal of this plan is to provide a process, and identify the information required to complete this process, to allow for the acceptable development of new granular pits, expansion of existing pits, or reclamation of exhausted pits. The specific objectives of this plan are as follows:

- 1) Outline the process for information exchange and consultation with affected groups as part of the gravel pit development process.
- 2) Identify potential environmental effects at each stage of the pit development and provide methods to mitigate or reduce these effects.
- 3) Establish a format for pit development plans to ensure the regulatory requirements are met and applicable environmental concerns are addressed. Also to ensure that final use and reclamation of the pit area is considered at the beginning of the development and throughout the development process.
- 4) Outline procedures to monitor pit development activities to ensure the pit development plan is being adhered to.

2. PIT DEVELOPMENT PROCEDURE

The first step in the pit development process is the identification of the source area. This is accomplished through air photo or satellite imagery interpretation combined with a review of available testing and past usage data. The potential gravel bearing formations are delineated on mapping. At this point, geotechnical staff may conduct a field reconnaissance to confirm the potential deposit on the ground. This is not always necessary as staff may already be quite familiar with the area due to past developments. Significant environmental concerns are identified prior to application for testing. Contact with affected groups is initiated. If there are significant issues where no mitigation is possible an alternative site may be selected.

Once the source has been identified applications for any required geotechnical testing are submitted to District Offices (DOs) of Yukon Environmental and Socio-Economic Assessment Board (YESAB) and other regulators if required to allow for the geotechnical testing of the deposit. The applications are forwarded for further review and comment to advisory groups made up of representatives of other government agencies, interested parties, municipalities, and First Nations. Throughout the YESAB review process, H&PW is, for the most part, an observer. It is our responsibility to provide sufficient information to allow review of the application, however once the application has been accepted our role in the process is usually limited to providing additional information if required. In some instances, there is direct consultation between H&PW and the affected groups as part of the approval process.

If it is determined potential environmental effects arising from the work are acceptable or can be mitigated, DOs recommend approval with a set of conditions governing the work to the applicable Decision Body (DB) or bodies. The DB drafts a Decision Document for the project and following internal Yukon Government review the final Decision Document is signed off and the project can proceed to permitting where required.

If strong objections to the project are raised, or if the environmental effects are deemed to be unknown without additional information being provided, DOs may recommend the application not be approved or referred to a committee level environmental assessment.

After favorable conclusion to the environmental assessment process, testing is carried out involving drilling and/or excavation. If the testing program disproves the source an alternate area will have to be identified. If the quality and quantity of the gravel is acceptable, a second application is made to allow for the development of the granular source. The application for pit development is more detailed than the testing application and goes through the same consultation and approval process. A successful geotechnical investigation does not ensure approval for pit development.

The life span of the pit will depend on the quantity of material required and the activity in the area. Some pits are developed for short term construction needs while others are for long term maintenance, or future capital requirements. Restoration of the pits upon completion of the work is a requirement of the environmental assessment process.

The process for obtaining a water license, when required, remains largely unchanged. If the pit development will entail any in stream work such as culvert installation, waste deposit, or gravel washing, a water licence may be required and is obtained from the Yukon Water Board. If a culvert is to be installed in fish bearing waters, an authorization or approval is required from the Department of Fisheries and Oceans. It has been unusual for granular developments to require either of these approvals in the past except in the case of gravel mining within a stream. As a proponent, H&PW trusts that the assessment process and the water licensing will be parallel and avoid duplication. In navigable waters this activity would also require approval from the Coast Guard.

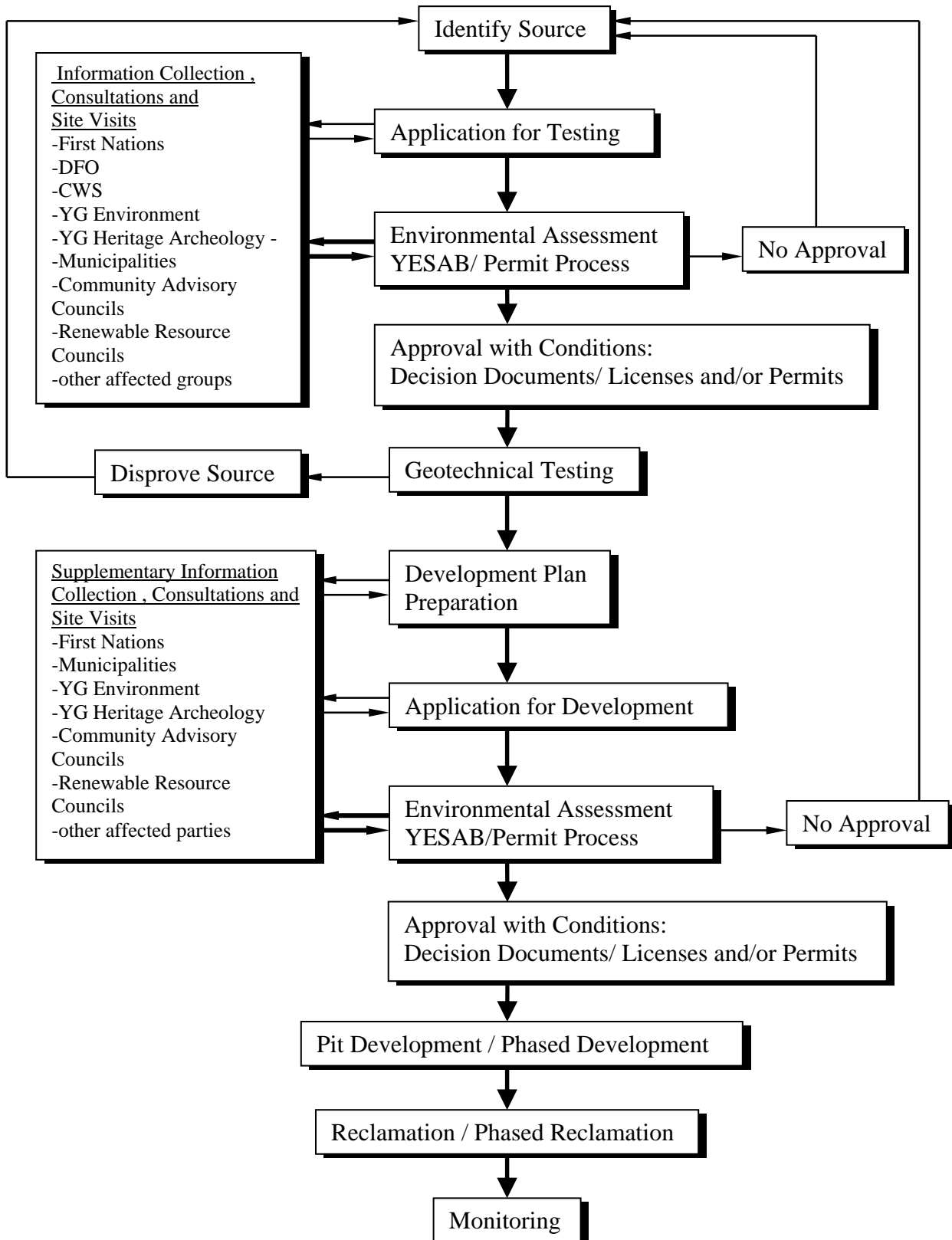
Pit developments within municipalities are reviewed by the municipality to ensure compliance with the Official Community Plan and Zoning Bylaws. Permitting for all stages of the development is issued by the municipality.

The process outlined in this Granular Resource management Plan ensures that over time all pit developments, whether new or expansions of existing pits, will have acceptable development and reclamation plans prepared for them. This process will not replace the consultation done under other permitting or municipal review processes but is intended to enhance it.

By seeking local knowledge of an area early in the process, and by keeping interested parties informed of proposed activities throughout the development, it is believed costly delays in the approval process or unexpected conflicts in the pit development can, for the most part, be minimized. If there are significant concerns with a proposed development that may prevent the development from proceeding as planned, these can be identified before testing and design is into an advanced stage.

There are existing pits where extensive testing has already been completed in the surrounding area. As such, additional testing may not be required for an expansion of the pit. In these instances, the process would start with the pit development plan when it was decided expansion was required. On exhausted pits the process would start with the development of a reclamation plan. The H&PW pit development process is outlined in Figure 1.

Figure 1: H&PW Pit Development Procedure



2.1 Consultation - Geotechnical Testing

The objective of this step in the process is to identify potentially significant environmental affects of testing in an area.

Where the proposed development falls within settlement lands of a self governing FN, consultation with the affected First Nation regarding the development will be a requirement and the FN will be a DB under YESAA. However, where the development falls outside settlement lands and is within traditional territory, contact may still be initiated with the appropriate First Nation to explain the proposed testing program. To ensure consistency in the process contacts should always be made with designated land use authorities within the First Nation. Following is a web site containing a map of FN traditional territories and contacts: [www.environmentyukon.gov.yk.ca/pdf/FN Trad Terr map.pdf](http://www.environmentyukon.gov.yk.ca/pdf/FN_Trad_Terr_map.pdf)

Where necessary, the First Nation will be asked to identify significant concerns. If this information exchange highlights significant concerns for which no mitigation may be possible (i.e. grave sites) H&PW would revise the testing program or, if possible, identify a new source. The process is designed to ensure that environmental concerns are brought forward so that impacts may be mitigated or avoided.

As much lead time as possible should be given to affected agencies and First Nations to gather environmental information, however it cannot be left open ended, and an acceptable deadline for reply will have to be agreed upon.

Contact is normally initiated with the YG Department of Environment, and the Department Tourism - Heritage Archaeology. As with the First Nation, these departments will be asked to identify significant concerns that may have an impact on testing or future development. This would include an identification of critical wildlife habitat, archaeological sites, or recreational areas. It is proposed that designated contacts within each department be established.

Where the proposed testing program is within or in close proximity to one of the eight Yukon Municipalities, (Whitehorse, Dawson, Haines Junction, Mayo, Carmacks, Teslin, Faro and Watson Lake), the Chief Administrative Officer will need to be contacted. Municipalities have Official Community Plans (OCP) and Zoning Bylaws that regulate and control all development and land uses within their municipal boundaries. H&PW will need to comply with the respective municipal bylaws. Prior to development of a granular resource the OCP and zoning bylaw may require amendment. Amending the OCP or Zoning Bylaw is a public process which usually takes 3 to 6 months.

Hamlets are another level of community government that may need to be consulted if developments are proposed within their boundaries. At present there are two Hamlets in the Yukon, Ibex Valley and Mount Lorne. The Hamlets have elected Councils that are advisory to the Minister of H&PW.

Throughout the Yukon the Area Development Act provides the legislation to enact Development Area Regulations. Regulations are similar to zoning and regulate the type and intensity of development and land use. Prior to a testing program the Transportation Branch should contact the Community Services Branch to ensure that any proposed development is not in conflict with the Development Area Regulations. Currently the only regulation is the West Dawson Development Area.

If necessary, a site visit will be conducted by H&PW, geotechnical and environmental staff to go over the proposed testing and identify any extra mitigative measures to minimize the impact from the testing. A more detailed site visit may be required as part of a pit development plan, however an initial visit can be used to start gathering the information required for the preparation of that plan. Representatives of the affected groups will be encouraged to participate in site visits.

2.2 Application for Geotechnical Testing

On all lands an application for testing will be made to the YESAB. The testing application will be assessed as per the existing process and H&PW will follow the conditions attached to Decision Documents. Testing within municipalities will be subject to local bylaws and regulations will be conducted to the same or higher standards as required under the environmental assessment process.

2.3 Geotechnical Testing

If the testing is approved it is carried out to delineate the deposit and to determine the quality of the material. Initial drill testing may be followed by backhoe testing. If the testing determines the material is not suitable or the deposit is not large enough, a new source will have to be identified, approval obtained, and additional testing conducted. In all cases, surface clean up and test hole/pit restoration is done in the area disturbed by the testing program. Environmental issues that should be considered during testing are detailed later in Section 3.

2.4 Consultation -Pit Development

Contact will be maintained with the appropriate agencies, First Nations and Municipalities throughout all stages of the development of the pit. During this stage a preliminary Site Plan must be available showing the proposed pit boundaries and other features. In order to ensure as much local knowledge of the environment as possible is incorporated into the operation of the pit, affected First Nations, municipalities and unincorporated communities are requested to provide input regarding the environment of the area including but not limited to, fisheries, wildlife, vegetation, and recreational uses in the area.

Specific information regarding traditional use of the area and known heritage sites, if any, within the area may also be appropriate. Knowledge of any other land users, if any, in the area would also be sought. The information may be used to develop mitigative measures and reclamation plans.

If there are specific issues or concerns including community and local area plans that may require the adjustment of the pit design or changes in the proposed operation, these can be identified and dealt with before the final design and development plan is prepared.

The intent of this step in the process is to ensure that as many environmental and community concerns as possible are addressed in the planning process. There may be times when no agreement can be reached on specific issues brought forward during this consultation. In these cases, H&PW will incorporate all concerns and suggestions to the extent possible and practical before submitting the plan for regulatory approval. For developments on First Nation settlement lands, not previously identified under the Chapter 18 requirements, additional negotiation will be required to reach a solution acceptable to all parties.

YG Departments such as Environment, and the Heritage Archaeology Branch may again be requested to comment on the potential environmental effects from the proposed development. Specific information on fisheries, wildlife, waterfowl, heritage, archaeological, and recreation resources in the affected area may be required. If there are specific issues or concerns that will affect the pit design or operation, these can be identified and appropriate mitigation proposed during application for regulatory approval.

Where known, other affected parties with adjacent land interests will be contacted and given the opportunity to comment on the preliminary pit design. As much lead time as possible must be given to ensure all parties have adequate opportunity to comment on the proposed development, however, reasonable deadlines for comments must be established.

A detailed field inspection of the proposed development may be undertaken to collect additional information required for the development plan. Such inspections, when required, will be carried out by H&PW geotechnical and environmental staff. Representatives of the affected First Nation and regulatory agencies may participate in field visits although time constraints and scheduling problems may not always make their participation possible.

The main purpose of field visits will be to obtain the information necessary to prepare the pit development plan. In addition to collecting site information the visit can also be used to start developing the reclamation plan. If other interested parties are able to participate in the field visit, particular concerns they may have with the site can be addressed. As well any suggestions they may have for modification of the design can be discussed.

There may be instances (i.e. emergency road washouts) where approvals for a pit expansion or development may be needed on short notice. This time constraint may not allow for extensive information exchange other than that provided through the existing regulatory process. Apart from emergency situations, it is believed that adequate time for consultation on pit developments will be possible.

2.5 Pit Development Plan

Following consultation work starts on the Pit Development Plan. The specific information to be included in the development plan is detailed later in Section 4. The pit development plan will be prepared in order to meet all the regulatory requirements.

The development plan will compile all the applicable information from field investigations and the contact with the affected groups. Known potential environmental effects and measures to mitigate these effects will be presented.

A preliminary reclamation plan will be part of the development plan. The intent is to make the reclamation an integral part of the development plan and the operation of the pit. The plan will outline suggested methods for reclaiming the pit and possible end uses. Possible proposed end use will be considered when designing the operation of the pit. This plan will be preliminary on long term pits since the planned end use and site conditions may change as extraction from the pit nears completion. This is also true on phased developments where the proposed end use and conditions could change over time. Where the pit will be used for short term construction needs the reclamation plan will be more specific.

2.6 Application for Pit Development

Application to the YESAB will be made to allow for the development of the pit. The pit development plan will form the basis of the application and will constitute H&PW commitment to follow the plan. All pit developments are subject to YESAA and the YESAB application process.

Within municipalities H&PW may be required to submit Official Community Plan and Zoning Bylaw amendments. Municipalities may ask H&PW to prepare an Area Development Scheme and /or provide background reports. Outside of municipalities, amendments to the Development Area Regulations may be required. Both these processes are public with public hearings being held.

Some municipalities may require survey and subdivision of the land, development permits, and/or development agreements for quarry operations. Operational considerations such as hours of crushing and hauling times, screening and noise buffers may form part of the approval. The municipality will need to approve the final pit development and reclamation plan.

2.7 Pit Operation

The pit will be developed and operated as described in the pit development plan. To ensure this, the plan will be appended to all contract documents dealing with the pit to ensure contractors are

aware of the plan and their responsibility to follow it.

In recognition of the fact that circumstances may change over time, the plan should be updated periodically to ensure it is still relevant. Where significant amendments to the plan are proposed, the affected parties will be consulted prior to the request for amendment going to the appropriate regulatory agency. Progressive reclamation will be done on all phased developments.

2.8 Reclamation

A final reclamation plan will be prepared as pit extraction nears completion. This will involve updating of the original reclamation plan to ensure it is still relevant. Soil samples should be taken to determine fertilizer requirements and to help formulate seed mixtures if required. Final reclamation of the pit will then be carried out as described in the plan.

Once reclamation is complete and regulatory clearance has been given for the project, monitoring of the site should be conducted. This informal monitoring program is necessary to further evaluate which reclamation methods work and to determine the long-term success of the reclamation effort.

3. ENVIRONMENTAL CONSIDERATIONS

With any development, there will be the potential for impact on the environment. Each development will also be different and concerns that were evident at one pit, may not be at another. Each stage of the development will have different environmental considerations associated with it as the operation becomes more intrusive. Other considerations such as camp procedures, sewage and garbage disposal, and fuel storage and handling will be applicable to all stages of the operation. The following section will detail environmental considerations that should be addressed at each stage of the pit development, and will suggest methods to mitigate potential effects.

3.1 Testing

Testing is done by drilling and/or excavation. The machinery may move through the area on a grid pattern or the testing may be done randomly. In most cases, apart from short term disturbance, no long term effects should occur to the environment as a result of the testing program since the equipment is in a location for a short period of time and the area of land disturbed is minimal. There are, however, potential effects from the testing program that must be addressed. Most of the mitigation measures presented here will be standard operating conditions of an approval to test.

The mobile nature of the testing program means fuel must be hauled with the machinery or brought to it. Care must be taken to ensure the fuel is secured at all times and spillage does not occur either during transport or refuelling. Equipment must be refuelled well back from any watercourse and fuel containers must not be stored in close proximity to any watercourse. Where camps and fuel caches are established, the fuel storage containers must be secured and stored in an area where leakage cannot enter any stream or watercourse. If any one container is over 4,000 litres the land use regulations will require the construction of an impermeable fuel dike around the container. Waste oil must be disposed of by transport to an acceptable disposal site and at no time is to be deposited directly onto the ground or buried. Disposal and transport of waste oil will require a permit under the Yukon Special Waste Regulations. The contractor will be required to have a fuel spill contingency plan in place to deal with accidental spills and contaminated soils in accordance with the Contaminated Site Regulations. Garbage must be collected and disposed of in approved locations.

Wherever possible, existing lines and trails should be used for access. Any new access should be doglegged from the highway to reduce visibility. At all times, an effort should be made to move around standing timber to minimize the amount that is knocked down during the operation. Where trees have to be cleared, they should be bucked into lengths and made to lay flat on the ground. Walking over the debris with the machinery may help accomplish this. All leaning trees and trees significantly scarred by the operation must also be cut down and made to lay flat on the ground. All drill holes must be plugged and all test pits must be backfilled after testing.

The disruption of the organic layer must be minimized to the extent possible. This is especially important in permafrost areas where removal of this layer can cause melting and erosion problems. In areas where permafrost is likely, consideration should be given to hand slashing the access lines to prevent the root systems from being pulled up as the tree is knocked over. Where the organic layer is removed during line clearing it should be replaced during clean up of the line. This is not as effective as retaining the organic layer in the first place but may help reduce the impact.

There may be instances where access down a streambed is acceptable and may mean less clearing and disruption of vegetation is required. These would include dry streambeds or streams with sufficient ice cover to allow machinery to move along them. As a rule however, streambeds should not be used for general access and never without authorization from the regulatory agencies. Fording of streams will also be required at times and should be done at a location where impacts to the stream banks will be minimized. Fuel containers must be secured and sealed when fording streams. The number of fords required should be minimized to the extent possible.

Known archaeological and historic sites will have been identified prior to the program starting and must be avoided. There is still the possibility that new sites will be discovered during the program. If this occurs, work in the immediate vicinity must stop and the Yukon Heritage Branch must be notified. Likewise, cabins and traplines should have been identified prior to the program starting. In these instances, where additional cabins or traps are discovered, they must be left alone and not damaged.

There will be no harassment or feeding of wildlife permitted during the testing program. Where animals are encountered they are to be left alone unless they pose a threat to the safety of the crew.

3.2 Screens

Tree screens are an effective way of limiting the visibility of pits and minimizing the associated visual impacts. Whenever possible, tree screens must be left in place on all pits along highways or navigable waterways. The width of the tree screen can vary depending on the species and density of the vegetation in the area. For example, a dense stand of spruce with limbs along the length of the tree may provide a more effective screen than a stand of pine where limbs along the bole of the tree are not as prevalent. As a rule, tree screens should be no less than 30 metres. To ensure an adequate visual barrier, as large a screen as possible should be left.

There are areas in the Yukon where there are simply no trees available to provide a screen. In these cases, other design methods such as constructing a berm between the road and the pit boundary should be employed to reduce the visual impact. This berm can be constructed of overburden and stripping and can be revegetated to aid in reducing the visual impact. Designing the pit to fit into the natural contours of the landscape will also help reduce the visual impact.

Despite the objective of having a screen in place on all pits, there may occasionally be instances where a tree screen is not desirable or possible. If the screen is at right angles to the prevailing wind and can not be left fairly wide, the chance of blowdown will be increased and could create other concerns associated with fire risk or insect infestations. As well, if the trees are in poor condition or shallow rooted, the potential for blowdown will be increased. The visual impact may be just as great from a swath of blown down trees as from a pit development. In areas of limited gravel sources, the deposit configuration may not allow for a tree screen to be left in place. In these instances, pit development will have to occur adjacent to the roadway and should be contoured to blend in with the surrounding landscape and left with an irregular edge.

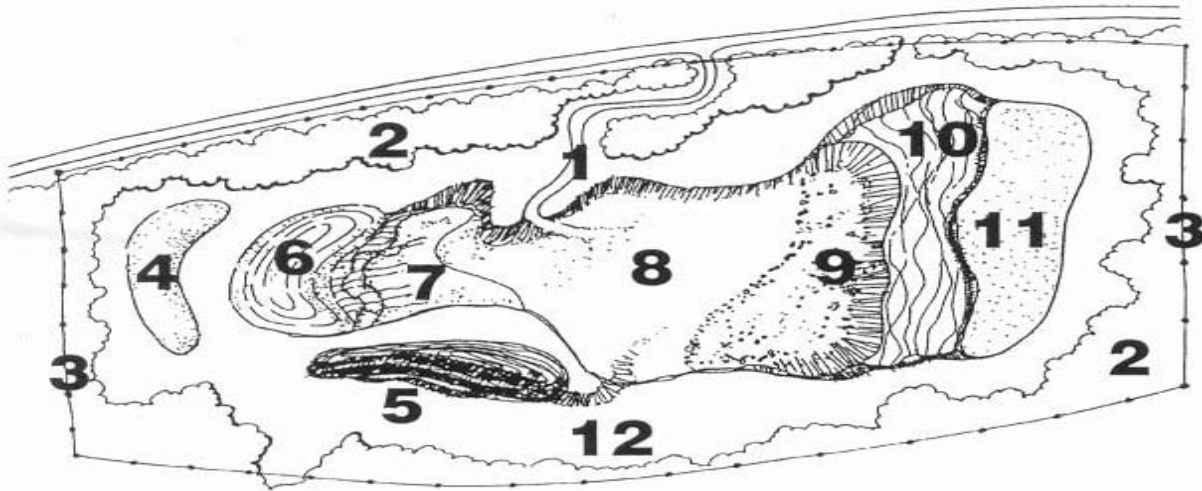
There may also be opportunities to open up views by removing the tree screen thereby increasing the scenic quality of the highway. Where this is the goal, the reclamation of the pit area must be done to ensure the pit in the foreground does not detract from the views you are trying to increase. This option should only be considered on short term borrow pits rather than long term operational pits and will require approval from all affected groups and regulatory agencies..

In cases of expansion of existing pits, the question of tree screens must still be addressed. If the existing screen is adequate and expansion will not impact on that screen, then further consideration from a visual perspective is not necessary. If the screen is not adequate, consideration should be given to screening the expansion from the existing pit. This is especially important where the end use of the existing pit may be recreation or other public use. As well, this additional screening will reduce the amount of disturbed area that is visible from the road and from within the reclaimed section of the old pit.

A side benefit to hiding a pit from view with a tree screen will be to discourage unauthorized use of the pit by R.V.'s for overnight stays. The use of pits as unofficial campgrounds can result in the deposit of garbage or waste in the pits as well as the loss in revenue to commercial and government campgrounds.

Figure 2: Plan View of a Typical Sand and Gravel Operation Layout

- | | |
|-----------------------|---|
| 1. Dogleg Access | 7. Progressive Active Reclamation |
| 2. Tree Screen | 8. Working Space at Pit Floor |
| 3. Fencing | 9. Exposed Gravel at Working Face |
| 4. Topsoil Storage | 10. Overburden goes to Active Reclamation (7) |
| 5. Overburden Storage | 11. Topsoil goes to Topsoil Storage (4) |
| 6. Reclaimed | 12. Cleared Area |



3.3 Sight Lines

Even with tree screens in place there will still be the opportunity for views into the pit from other vantage points. This is especially true where cuts are made into a hillside that may be visible above the screen. Wherever possible hillside cuts should be avoided, but if they can not be, the final grade should be contoured into the existing hillside to the extent possible. Depending on the vegetation present and the final gradient of the backslope, timber may need to be cut back from the top of the slope to reduce the potential for slumping and deadfall.

Consideration must also be given to views from other vantage points such as tourist lookouts, commercial establishments, or recreational areas including campgrounds, lakes and rivers. Where these views could be impacted by pit development additional screening or changes in operational procedures must be considered. For example, changing the pit layout to take advantage of taller trees or natural landscape features may limit views into the pit to an acceptable level. During operation it may be desirable to limit the height of stockpiles so they are not readily visible. This option should be weighed against the need for additional area for the stockpile.

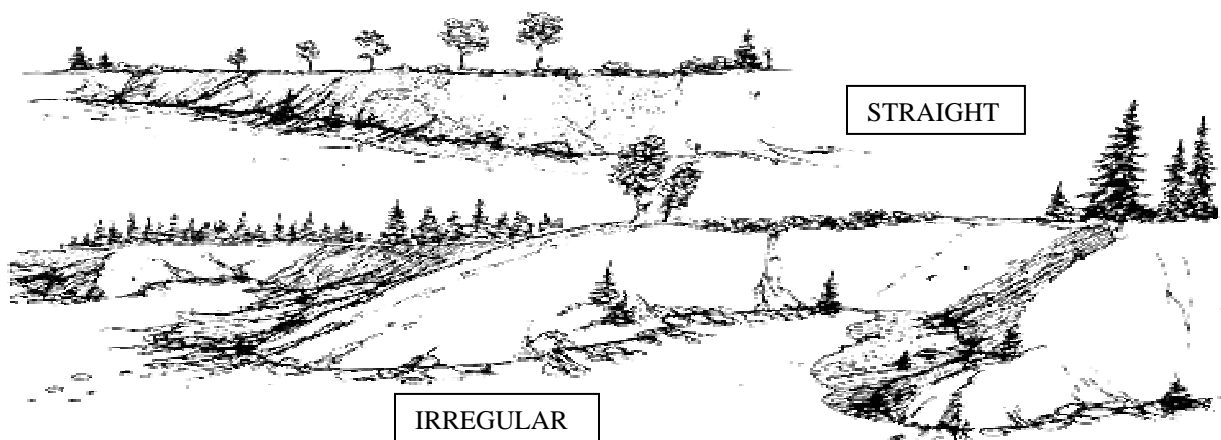
During reconstruction projects, consideration must be given to the visibility of the pit from the new grade and how it will fit into the landscape once the new road is constructed. Wherever possible take advantage of existing vegetation or landscape features which will shield views into the pit after reconstruction. This is more important on pits that will be operated on a long-term basis than for short term borrow pits that will be reclaimed.

3.4 Size and Shape

As a rule, pits should be kept to the minimum size possible and should not be expanded unless absolutely necessary. The size of the pit will, for the most part, be driven by the deposit configuration and volume requirements. The pit must be of adequate size to allow for safe operation and the storage of stripping, overburden and stockpiles. If timber salvage or a camp will be required then room for these must also be considered. The pit should be cleared to the minimum area that will meet the volume requirements and allow for all necessary operations to be conducted safely.

As with size, the shape of the pit is also driven by the deposit configuration and volume requirements. Within this restraint however, the pit can be designed to reduce the impact from the clearing. Wherever possible the overall pit shape should be irregular rather than the standard square or rectangle. Depending on the end use of the pit, it may also be desirable to leave an irregular edge to the extraction area. Pits or quarries with irregularly shaped edges and irregular contours are preferred over straight edged sites for development of wildlife habitat. While these measures may make calculation of the payment for clearing more difficult, it will improve site conditions for reclamation to wildlife or recreational purposes. In most cases it is also possible to create an irregular edge during clean up and restoration. If pits are to be used for other uses such as tree plantations after reclamation, a straight edge to the pit is more desirable. Where pits are constructed along side the road without the benefit of a tree screen it is necessary to contour the pit into the natural landscape to attempt to make it look like a natural opening to the extent possible.

Figure 3: Irregular Shaped Edges vs. Straight Edges



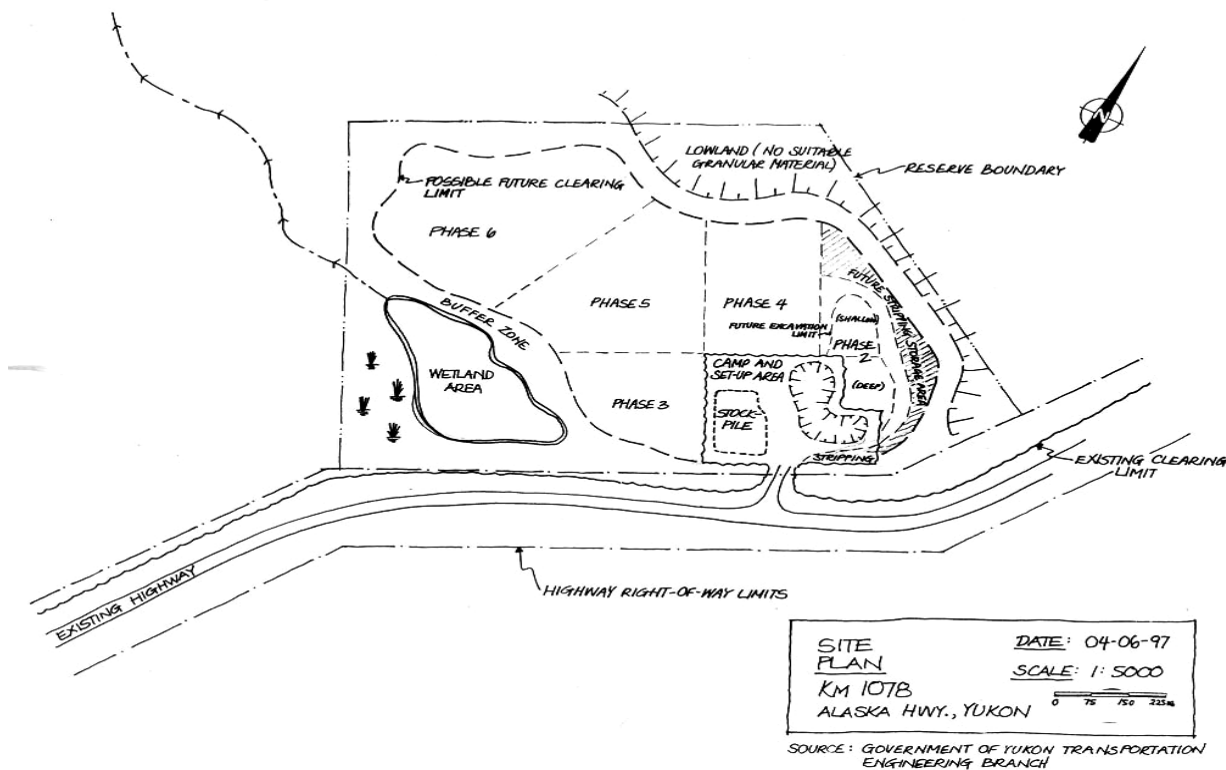
3.5 Buffers

Each pit location may have different features that need to be protected by a buffer strip of untouched vegetation. These strips will be in addition to the tree screens required to minimize the visual impact of the operation. These buffer strips should be left as wide as possible and must not encroach within the minimum recommended width.

When designing a pit in close proximity to a stream or river, a buffer must be left in place to prevent sedimentation of the watercourse during pit operations. If the possibility of flooding exists the buffer can also help keep the water out of the pit area which could result in excessive erosion, contamination from fuel sources, or fish stranding. The buffer strip between all watercourses and the edge of the pit should be a minimum of 30 metres measured from the ordinary high water mark, top of the stream bank, or the top of the slope where the stream is in a valley.

Buffer strips will also be required around lakes or wetlands. The shoreline and the foreshore areas of these sites may be important waterfowl or wildlife habitat and must be maintained. The buffer can also help minimize effects from sedimentation due to run off out of the pit development area. Buffer strips around lakes and wetlands should be a minimum of 30 metres between the ordinary high water mark and the edge of the pit clearing.

Figure 4: Site Plan with Wetland and Buffer (Not to Scale)



Other wildlife features such as nesting or denning sites may also benefit from the inclusion of a buffer zone. The size of these zones will be dependent on the species present and should be determined in consultation with Environment.

Buffer strips must also be left between the pit and traditional use areas such as camps, cabins, or traplines. The buffer should be made as wide as possible in these cases and an acceptable minimum width should be determined with the affected parties.

Buffer strips are also required between the pit development and archaeological or grave sites. There is no recommended minimum width for these sites. As large a buffer as possible should be left and the wishes and concerns of interested parties must be addressed and considered when establishing the width of the buffer strip.

3.6 Access

Wherever possible existing or old overgrown access into a pit should be used rather than creating a new one. In some cases this may mean a dogleg will not be possible and views into the pit will be the result if the overgrown access was cleared. The desirability of restricting views must be weighed against the extra clearing involved in the creation of new access. New access routes must be cleared to the minimum width that will allow safe operation and must be doglegged from the highway to minimize views into the pit. If more than one access is required, they should be spaced far enough apart so as not to create a small island of trees that may be more susceptible to blowdown. Secondary access into pits should be avoided wherever possible.

If any culvert installations are required in streams along the access road they must be adequately sized to prevent ponding on the upstream side of the road. As well, in muskeg areas it is important to maintain adequate cross drainage to ensure water levels and vegetation patterns remain the same on either side of the road. Depending on the size of the stream, a water licence may be required to install the culvert. If the stream is fish bearing, the Department of Fisheries and Oceans (DFO) will establish an in stream work window. The culvert design will have to be reviewed and approved by DFO as well. DFO will normally address their concerns through the water license, however it is advisable to deal directly with DFO prior to applying for the water license so there will be no delays in issuing the license due to questions relating to design. Access roads into the pit must be developed with consideration for the need for buffers.

3.7 End Use

In all cases the proposed end use of the pit must be considered during the pit design. By doing so the pit can be developed in such a way as to reduce the amount of work required to properly reclaim the pit, resulting in less overall disturbance and long term cost savings. For example, if the proposed end use involved the creation of a wetland habitat, excavating below the groundwater level would be acceptable and advisable to create the pools necessary for the

wetland. Planning this into the pit development may save extra clearing costs and result in a superior end product than if the excavation was attempted at the reclamation stage. Each case will have to be assessed on its own.

3.8 Drainage

Pit developments have the potential to alter the quantity and quality of local surface and groundwater resources. The loss of vegetative cover and the compaction of surface areas due to the use of heavy equipment, can reduce the soils ability to absorb moisture. This in turn can increase overland flow and run off from the pit development area. The use of buffer strips can reduce this impact somewhat, however in some cases where seasonally high surface or groundwater levels are suspected it may be necessary to plan for drainage ditches and/or settling ponds. Identifying surface drainage patterns in the area and designing the pit to avoid these will also help reduce potential erosion and sedimentation concerns

In some cases, pits will have to be stripped then left to thaw for a season to allow for excavation. Where it is expected that significant permafrost melt will occur, consideration must be given to potential drainage of water out of the pit and methods established to ensure this drainage does not cause negative impacts to the surrounding land and watercourses.

3.9 Operational Considerations

Environmental constraints can have a significant impact on the operation of a pit whether it is a short-term borrow pit, a long term gravel source, or a rock quarry. These restraints may affect the timing of pit operations or they may affect the operational procedures in the pit. Not all of these issues will be relevant to every pit and if they were, the restrictions may make development of the pit uneconomical given the short construction season available in the Yukon.

3.9.1 Wildlife

Where pit operations will be in close proximity to critical wildlife habitat, restrictions on the timing of some pit operations such as crushing or rock blasting, may be required. The critical period where disturbance is likely to cause the most impact varies between species. For most wildlife the critical periods are usually the spring for migration, nesting and calving and the fall for rutting and migration, although the summer rearing period can also be very important for some species.

Of the wildlife species that are most likely to be encountered, the most sensitive species besides salmon and other fish are raptors (eagles, falcons, osprey), caribou and grizzly bears. In the past, both timing and distance restrictions have been applied to work being conducted in the vicinity

of active raptor nest sites. These restrictions vary between species but can be as restrictive as no work within 3 kilometres from mid March to mid September. Recently there has been some flexibility in the application of these restrictions depending on the operation. Possible mitigation in these cases can include padding blasts to minimize noise disturbance, delaying work as late into the summer as possible, or conducting it in the winter if feasible. Where work is allowed close to an active nest, an informal monitoring program should be conducted by H&PW staff in cooperation with Renewable Resources to observe and record the effect the activity has on the birds.

Regardless of species, where critical wildlife habitat is involved, close cooperation will be required with the Renewable Resources branch to establish procedures that will allow work to proceed without a negative impact to wildlife populations.

3.9.2 Fisheries

If the development of the pit will require any in stream work in fish bearing waters or in tributaries to fish bearing waters there will be timing restrictions applied. This will be most likely to occur where a culvert installation is required on the access into the pit. Timing windows have been established to allow in stream work outside the critical periods for various fish species. These windows vary between species with work allowed in stream from July through March in streams with only spring spawners, to work in summer months where only fall spawners are present. In addition to the timing restrictions, the culvert must be designed to allow for fish passage and must be approved by DFO. Close cooperation with DFO is required to establish timing windows for each stream crossing. A discussion of using streambeds as gravel sources is presented in section.

3.9.3 Archaeology/Heritage

An attempt will have been made to identify all archaeological, historical, and heritage sites prior to work starting in the pit. If any previously unidentified sites are discovered at any stage of the operation, they must be left alone and the Heritage Branch contacted for direction on how to proceed.

3.9.4 Other Users

Where other users have been identified in close proximity to pit developments, consideration must be given to conducting operations in such a way as to minimize disturbance and impacts. Creating adequate buffers between pit operations and other users is likely the most effective way to minimize this disturbance however in certain cases other measures may be appropriate as well.

Where the pit development is close to commercial or government campgrounds, pit operations such as crushing and rock blasting should be planned outside the periods of peak use if at all possible. If this is not an option, consideration should be given to conducting pit operations during the day only so as not to disturb users of the facilities in the evenings. This may mean an increase in costs for any operations that traditionally run a night shift but may be necessary in isolated instances. The possibility of the need for some type of dust control should also be addressed. The majority of H&PW pits are not located in areas where this may be a concern so the need for these restrictions is not expected to be great.

Where traditional hunting or fishing camps are located close to pits, the possibility of conducting operations outside the period the camps are normally used should also be considered.

3.9.5 Camps

Camps may be required at any stage of the pit development. The potential for impact will vary with the size of the camp, however the environmental concerns associated with the camps will remain the same regardless of which stage of the operation is in progress. All contractors should be encouraged to use the same area for a camp location if possible.

Camps should be established within the new pit clearing or an existing clearing and should be located on firm dry ground. Garbage and debris must be disposed of by removal from the site to an approved landfill, or burned and buried. Wherever practical the contractor should be encouraged to remove the garbage from the site. Regardless of which method is used, the garbage must be kept in a secure covered container (preferably metal) until disposal. Garbage that is not contained may attract wildlife into the camp causing harm to workers or the animal itself. Feeding or harassment of any wildlife encountered during pit operations will not be permitted.

Garbage must be completely burned before disposal on site. This will normally require some type of forced air or fuel fired incinerator. The burned garbage must be buried in an area that will not be required for excavation. The trench must also be located a minimum of 100 metres away from any watercourse or waterbody and at least 15 metres from standing timber. The garbage disposal area must not be located such that surface run off will enter the trench or flow through it. The trench must be deep enough to allow for a minimum of 1 metre of mineral soil cover.

Sewage and grey water disposal requirements are governed by the public health regulations and designs for sewage disposal must be approved by the Environmental Health Services branch. In smaller camps, alternative methods of disposal may be allowed such as sumps or lagoons. In any larger camps where plumbed water is available or used, an approved septic system will have to be established. Requirements for the sewage system will have to be determined on a site specific basis.

3.9.6 Fuel Storage

Fuel storage of some description will be required in all operations at the pit although there will be significant differences in the volumes required.

Any stationary fuel storage area where one container is in excess of 4000 litres must be surrounded by an impermeable dike that will contain the fuel in the event of a spill preventing any contamination of surface or groundwater. Any other fuel storage containers must be secured and sealed at all times to prevent accidental spillage. No fuel can be stored within 50 metres of the ordinary high water mark of any watercourse or waterbody. All contractors working in the pit will be required to have a spill contingency plan in place that will outline the procedures to be followed in case of a spill.

All equipment working in the pit will have to be serviced at some point in time. In larger operations there may be a designated maintenance area. The maintenance area should be located in an elevated section of the pit where surface drainage will not flow through the area or collect. If the natural lay of the land will direct drainage through the maintenance yard, berms or diversion ditches may be required to ensure water does not flow through the area in heavy rainfall events or during snow melt.

Waste oil from maintenance operations must be collected in containers for disposal. The Yukon Government has enacted Special Waste Regulations under the Yukon Environment Act which govern the disposal of waste oil. These regulations will require the generator of the waste oil to transport it, under permit, to an approved special waste disposal facility. Under no circumstances is waste oil to be deposited on the ground. Where accidental deposits do occur the contaminated soil will have to be collected and treated in an acceptable manner. For small volume spills the standard procedure is scrape the contaminated material up and respread it to allow for aeration and breakdown by the sun. Larger volume spills will require additional treatment which can be determined on a site specific basis. Contractors must be made aware that numerous small volume spills can cumulatively be classified as a large volume and will require the additional treatment. Safe fuel handling practices and proper waste oil disposal is easier and less expensive than clean up at the end of the project.

3.9.7 Clearing

EMR Forest Management Branch has the ability to coordinate pre-logging or salvage of merchantable timber from pit developments in advance of actual pit development. HPW will need to work with EMR to allow them sufficient time to coordinate this activity. In areas of the Yukon where EMR can not find a commercial operator interested in the timber, y H&PW should encourage local residents or operators to salvage timber from the pit prior to development. Clearing contractors should also be encouraged to salvage timber during clearing operations providing it can be removed from the site within a reasonable length of time. Contractors or citizens will be responsible for obtaining the required timber permits from EMR.

Whenever pit developments are in close proximity to communities H&PW should consider salvage of some portion of the timber for a community firewood source. This will mean allowing room for the salvage piles in the pit design. This will be more applicable on long term pits where access will be available over an extended period of time. The problem with salvage of wood in the past has been that no one will come to pick it up and it remains on site, in the way, and eventually can become a fire hazard or source for insect infestations. There is also the concern that H&PW could be seen to be restricting opportunities for commercial woodcutters by salvaging the timber. Although the timber resource in the Yukon should be utilized whenever possible, these issues should be given consideration when the potential for salvage near a community presents itself.

After the required salvage is complete the remaining debris can be disposed of. This can be accomplished by burning, chipping, or mulching. Where burning is the method for disposal, the contractor will be required to obtain the necessary burning permits from EMR if the activity is carried out during fire season (April 1- September 30). All burning must be in accordance with a Fire management Plan submitted to HPW by the Contractor prior to work starting.

If chipping or mulching of the material is the selected disposal method, the material should be spread evenly over the site and mixed in with the organic matter during stripping. In areas with light brush, consideration could be given to windrowing the debris along the side of the pit before stripping is done, then pulling the windrow back over the site during reclamation. If this is done the windrow must be separated from the standing timber. This should only be considered on short term borrow pits where the windrow would not be left in place for an extended period of time.

Any leaning trees or severely scarred trees along the pit edge must be cut down, bucked into lengths and made to lay flat on the ground. This should be completed when the contractor is finished all work in the pit and not left for the next operator. In some instances the clearing contractor will also be responsible for the grubbing and stripping, so this clean up work can be completed after those operations are complete.

Before any clearing starts, the pit boundaries must be clearly laid out in the field to prevent any unnecessary clearing. As outlined in the pit design section, it is desirable to get an irregular edge to the pit after clearing is complete. The pit boundaries should reflect this and this goal must be made clear to the contractor. Inspection will be required to ensure this result is obtained.

3.9.8 Grubbing

Grubbing is sometimes carried out as part of the clearing operation. During reconstruction projects it may be done after clearing as part of the stripping operations. Grubbing should always be conducted in the summer under thawed conditions whenever possible.

Depending on the end use of the pit some of the grubbed stumps and roots can be saved to

provide erosion control on backslopes or to create cover for small wildlife. If the tree cover on the pit was sparse there may not be any need to dispose of the grubbed material and it can be mixed in with the stripping. Excess stumps and root systems can be disposed of in the same manner as clearing debris and the same concerns apply.

3.9.9 Stripping

In the cooler climate of the Yukon, the development of a productive organic/topsoil layer takes a very long time, making it a valuable resource. This layer consists of the organic rich material overlying the mineral soil overburden. From a reclamation perspective one of the most important considerations in the pit development process is the salvage of this material during the stripping operation.

The top soil component of the stripping material should be stockpiled separate from the overburden whenever possible. Unfortunately, in the Yukon there are many areas where this organic layer is thin to non existent making its separate removal very difficult. Wherever testing indicates a well defined organic layer however, the effort must be made to salvage it separately. The entire pit area required for excavation and storage, except that designated for top soil and timber storage, should be stripped. Stripping should be done under thawed conditions whenever possible to make the separation of the organic layer and the overburden easier.

The top soil and overburden stockpiles should be located such that they will not be disturbed by the excavation process and require moving. This extra moving will result in the loss of a percentage of this material each time it is transferred. The stockpiles must also be located so they are easy to retrieve when it is time for respreading and at no time should they be pushed into the standing timber. The possibility of run off out of the stockpile sites as a result of ice melt should also be considered. The piles must be located such that any run off which does occur will not impact on any surrounding watercourses.

3.9.10 Excavation and Crushing

The main environmental concerns with excavation and crushing have already been dealt with in the pit design stage. These include concerns over timing restrictions, noise, visibility of stockpiles, and dust control. Concerns over fuel storage and handling practices are especially important with these operations due to the amount of machinery on site.

3.9.11 Pit Dewatering

Initial testing will have given some indication as to the presence of groundwater and the potential need for pumping. If it is suspected that pit dewatering will be required, pit plans must be

established to ensure these activities do not have a negative impact on the surrounding land or watercourses. The largest potential impact is sedimentation of watercourses with a resulting loss of habitat and productive capacity. If a sump can be created in the low point of the pit, water can be directed to the sump, settled and pumped if necessary. If pumping is going to be used the pump discharge should be dissipated to prevent erosion of the ground at the discharge site then directed into a natural depression with standing vegetation to provide additional filtering.

Where pumping or draining are not feasible due to the volumes of water expected, extraction below water level could be considered if this is consistent with the end use of the pit and there will be no opportunity for sedimentation outside the pit area.

Pumping of volumes in excess of 300 m³ per day will require a Water Licence.

3.9.12 Excavation in Stream Channels

The use of streambeds for gravel extraction should only be considered as a last resort. There are numerous concerns associated with this extraction option from a fisheries, water quality, and hydrology perspectives that make these projects difficult. If extraction from a watercourse is determined to be the preferred option, site specific plans will have to be developed. At the minimum, an environmental assessment and water license will be required to allow extraction. In all likelihood a DFO authorization will also be required.

There are presently several locations in the Yukon where channel excavation is required for river training and maintenance purposes, with the material being stockpiled for later use. This practice is regulated by environmental assessments, water licenses and fisheries' authorizations. Provided the required procedures attached to the approvals are followed there is no reason this practice can not continue.

3.9.13 Abandonment and Reclamation

Abandonment of the pit will usually occur when all the required material has been extracted from the pit area or the supply of material has been exhausted. Temporary abandonment may also occur where the pit material may not be required on a constant basis but rather every few years as is the case with many maintenance pits.

If the pit is to be abandoned temporarily, H&PW will ensure adequate clean up is done. This will include the removal of all garbage and debris from the site. Any soil contaminated with fuel or oil should be scraped up and re-spread to allow for aeration and evaporation of the petroleum products. Any culverts installed on the access road should be cleaned out to ensure they will function properly during the period the pit is shut down. Any erosion or drainage problems within the pit must be addressed prior to temporary abandonment of the pit. If the pit is to remain inactive for an extended period of time, consideration should be given to blocking or removing

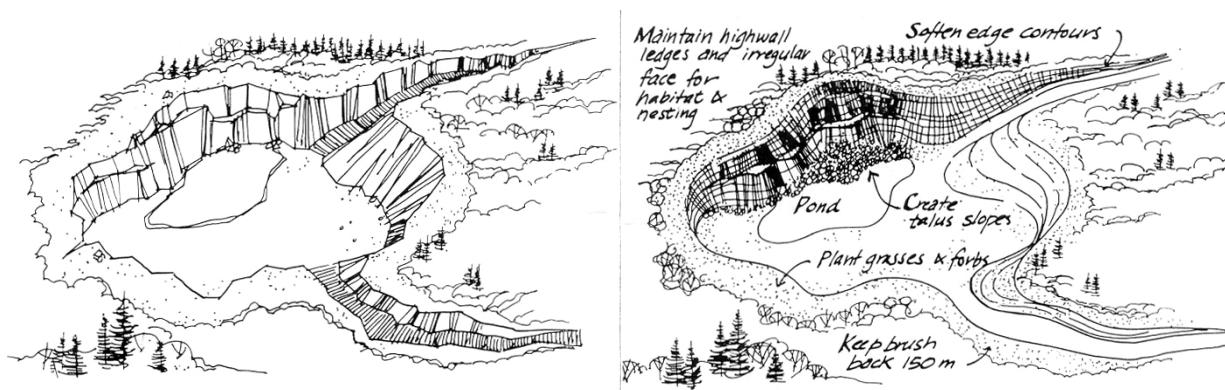
the access to prevent garbage dumping or other unauthorized use of the pit area.

Where abandonment of the pit will be permanent the reclamation plan will be followed. The specifics of the plan will vary for each site however the basic steps in the process will remain constant. Whenever possible the reclamation of the pit should be carried out by the final operator in the pit. This will be more applicable to short term borrow pits than areas where material is stockpiled for future use. Regardless of who ends up doing the reclamation, it should be carried out as soon as possible after operations in the pit have ceased.

The first step will be the clean up of the site. This includes the removal of all garbage and debris from the site and the treatment of any contaminated soil. The floor and slopes of the pit can then be graded and re-contoured to the specifications in the reclamation plan. Final slope grading will, in most cases, serve to control erosion in the pit. If this is not the case additional erosion control measures may need to be implemented. Any problems with drainage within or out of the pit must also be corrected at this point. Following grading, the stockpiled overburden can be respread over the pit area followed by the re-spreading of the organic topsoil. Once the organic material has been spread, all leaning trees or severely scarred trees must be felled, bucked, and made to lay flat on the ground.

Following the physical reshaping of the pit area, seeding, planting, fertilizing or any combination thereof can take place. At this time the access road should also be reclaimed and access from the highway removed. If a culvert was installed in a fish bearing stream its' removal may be subject to DFO timing restrictions. Upon removal, the stream bed must be returned to the natural gradient and width.

Figure 5: Before and After Reclamation

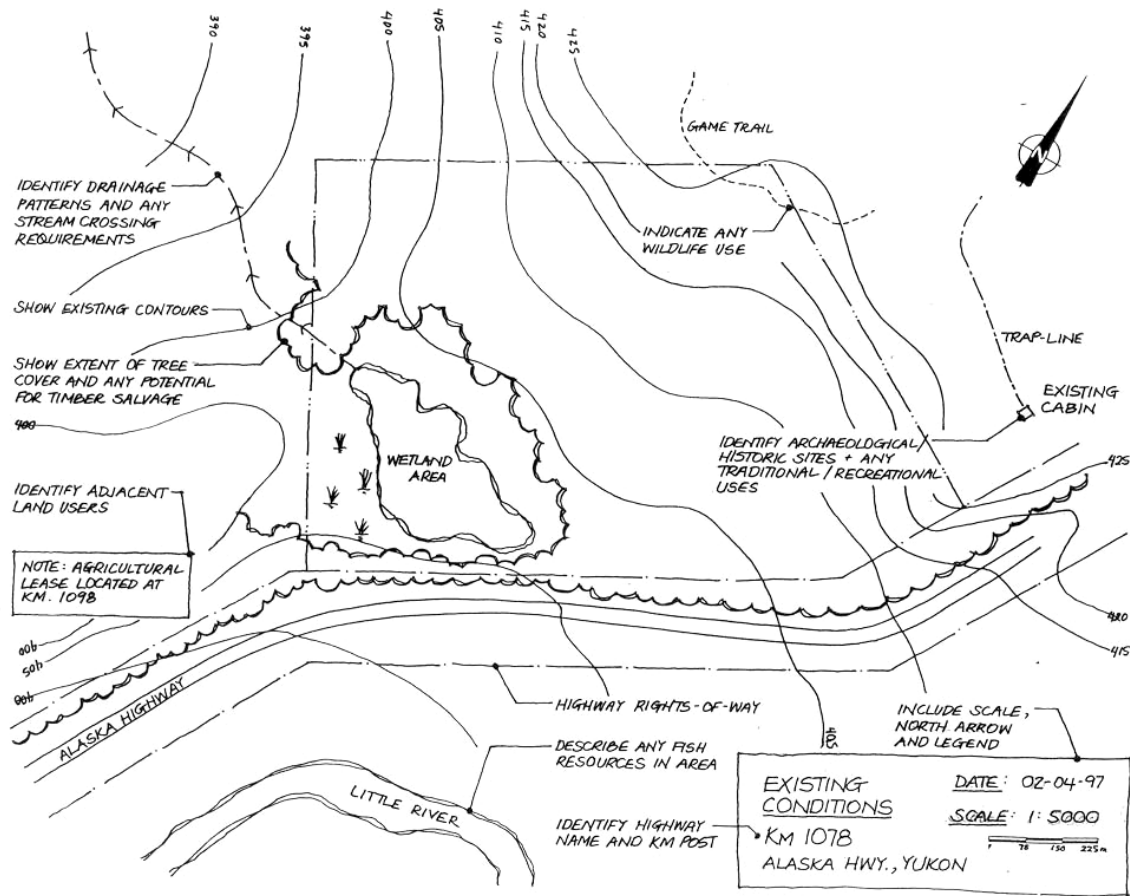


4. PIT DEVELOPMENT PLAN

The pit development plan will form the basis of the YESAB application and will constitute H&PW commitment to follow the components of the plan from initial clearing through to final reclamation. Environmental mitigation measures included in the plan will incorporate knowledge gained on other projects as well as information obtained from affected or interested parties. The concerns raised by other parties will be addressed in the plan. Where disagreement over proposed procedures exist between H&PW and other parties, H&PW will acknowledge this and provide justification for the selected procedure. If the development plan is changed during regulatory review, the revised document will become the one used throughout the pit life.

The plan will be appended to all contract documents dealing with pit operations so all contractors and H&PW personnel are aware of the procedures to be followed during the life span of the pit.

Figure 6: Plan View of Existing Conditions prior to Development (Not to Scale)



4.1 Development Plan Format

The development plan will be presented in such a way as to ensure all information requirements of the regulatory agencies are met. The format will also clearly outline environmental concerns associated with each pit development and suggest mitigation methods to minimize impacts during pit development.

The main sections of the plan will be:

1. PROJECT DESCRIPTION
2. PROJECT ALTERNATIVES
3. AREA DESCRIPTION
 - 3.1 Location
 - 3.2 Environment Description
 - 3.2.1 Topography
 - 3.2.2 Vegetation
 - 3.2.3 Drainage
 - 3.2.4 Wildlife
 - 3.2.5 Fisheries
 - 3.2.6 First Nation
 - 3.2.7 Recreation
 - 3.2.8 Archaeological/Heritage Sites
4. DEPOSIT DESCRIPTION
 - 4.1 Testing
 - 4.2 Size/Volume
 - 4.3 Stripping
 - 4.4 Water
 - 4.5 Permafrost
5. PIT DEVELOPMENT
 - 5.1 Development Type
 - 5.2 Physical Layout
 - 5.2.1 Size
 - 5.2.2 Phased Development
 - 5.2.3 Access
 - 5.2.4 Buffers
 - 5.2.5 Camp Area
 - 5.3 Operations
 - 5.3.1 Clearing
 - 5.3.2 Grubbing and Stripping
 - 5.3.3 Extraction
 - 5.4 Schedule
6. ENVIRONMENTAL MITIGATIONS
7. PIT RECLAMATION
 - 7.1 Objective
 - 7.2 Reclamation Description

7.3 Methodology
7.4 Revegetation
8. REFERENCE/CONTACTS/APPENDICES
8.1 Reference
8.2 Contacts/Correspondence
8.3 Key Plan
8.4 Aerial Plan
8.5 Site Plan
8.6 Pit Report and Development Summary

4.2 Project Description

This section should include a brief description of what the project entails and why it is being undertaken.

4.3 Project Alternatives

A discussion of the alternatives to the project which were considered should be included to explain the rationale for developing the project. Reasons for selecting the source are included.

Gravel resource demand estimates are often given for sections of highway in conjunction with active long-term pits. The pits included in the brief demand analysis are the long-term active pits of the maintenance section. A 50-year demand estimate of 32,500 cubic metres per kilometre is used for almost all Yukon highways except for the North Alaska highway where an estimate of 90,000 cu. m./km is used due to the permafrost conditions which demand greater quantities. Distances to neighbouring active long-term pits are noted. An estimate of available material in the maintenance sections is compared to the 50-year demand estimate. The comparison provides a general idea of the amount and distribution of granular material available.

4.4 Area Description

The information required in this section of the plan will have been obtained through field investigation, contacts with affected groups and regulatory agencies, airphoto review, and geotechnical investigation.

The description of the area will detail all other known uses in the area that could possibly be impacted by the pit development. The location section should include the same information as the Pit Data and Development Summary where applicable. In the cases of new pit developments, especially short term borrow pits, some of the information will not be applicable at the initial stage. The following information should be included where applicable.

4.5 Location

The location information will help clarify exactly where the development is. Due to changing kilometre designations and local names there has been confusion in the past over which pit was being discussed. Typical location information includes;

- highway name and kilometre post and side offset
- geographical location i.e. 10 kms north White River
- latitude and longitude
- National Topographic System map sheet number
- reserve and/or permit number
- air photo number and year
- First Nation area
- First Nation selection block if applicable

4.6 Physical Description

This will include a description of the area and the known resources which could be affected by the development. Typical descriptions include but are not limited to;

- 1) Topography - General description of the landscape including aspect and slope if applicable.
- 2) Vegetation - A brief description of the tree cover including species and range of sizes and a description of additional significant vegetation on site if known.
- 3) Drainage - Description of the drainage patterns in the area including identification of watercourses and waterbodies in the vicinity of the development.
- 4) Wildlife - General description of potential wildlife use of the area including any specific wildlife features that may have been previously identified.
- 5) Fisheries - General description of fish resources in the area particularly in any watercourse which may require culvert installation.
- 6) Traditional - General description of the traditional use of the area including the proximity of any known camps, cabins, traplines, to the pit development.
- 7) Archaeology - Description of any known archaeological or historic sites within or immediately adjacent to the pit development.
- 8) Recreational - Description of any or public campgrounds in the area including other recreational areas such as lakes, rivers, and hiking trails immediately adjacent to the pit development.
- 9) Other Land Use - Description of other land users immediately adjacent to the pit development including commercial establishments, exploration sites, utility right-of-ways and other facilities.
- 10) Mapping - typically attached are a 1:5,000 Site Plan of the proposed pit development area, a 1:50,000 Key Plan showing the general location and a 1:10,000 Aerial plan showing a satellite or air photo image.

4.7 Deposit Description

The deposit description is intended to provide information relating to the type of material proposed for extraction and to meet the information requirements of the regulatory agencies. The following information should be included in this section where applicable.

- 1) Testing - Brief description of testing method used for the pit, total number of holes and average depth.
- 2) Size/Volume - Estimated total surface area of the deposit and area scheduled for excavation, estimated volume of the deposit and volume estimated for excavation.
- 3) Stripping - Depth of both the organic topsoil and the overburden and estimated volumes of each.
- 4) Water - Whether or not water was encountered during sub surface testing.
- 5) Permafrost - Indicate the presence of permafrost either encountered during testing or suspected.
- 6) Mapping - The Site Plan may show the proposed pit boundaries, access, deposit configuration, and the test hole locations

4.8 Proposed Pit Development

This section will provide details on the proposed pit development. Much of this information can be presented on a pit drawing however a brief narrative for each item should be included. The information required in this section can be separated into two components, physical layout and operational. On long term phased developments, some of this information such as camp location, storage areas, and stockpiles will have to be updated for each development phase.

4.9 Type of Development

There are several different types of pit development, or combinations of various types, which must be identified at the start of the plan. These include;

- 1) New development or extension of an existing pit
- 2) Type of pit
 - a) Borrow for subgrade construction
 - b) High quality surfacing aggregate (crush)
 - c) Low quality surfacing aggregate (pit run)
 - d) Sanding aggregate
 - e) Rock quarry
 - f) Construction and or maintenance use
- 3) Type of development
 - a) Phased development with progressive reclamation
 - b) One time development

4.10 Physical Layout

- 1) Size - A description of the total cleared area required for the pit development. Where this is an expansion of an existing pit include new clearing and resulting total area. Where the development is phased, provide a total size of the entire potential development, size of proposed individual compartments, and total area that is anticipated to be opened up at any given time. This information may need to be updated for each development phase.
- 2) Access - Identify the access required and whether existing or new access will be used. Include the length and width of each proposed access.
- 3) Tree Screens - Describe the composition and width of any proposed screen. On expansions of existing pits describe the screen that is presently in place. If no screen is to be left, provide rationale
- 4) Buffers - Describe the composition and width of any buffers left in place between the pit edge and other resources or users. If no buffer can be left for certain features, provide rationale.
- 5) Camp Area - Identify the recommended camp location, if any, noting that the final location and requirement for a camp will depend on the contractor.
- 6) Storage Areas - Identify the areas that will be required for storage of the organic topsoil and overburden including the estimated volumes of each material. If applicable also describe the area set aside for timber storage.
- 7) Stockpiles - Identify the area that will be required for stockpiles.
- 8) Phased Development - If a phased development is to be used, describe the process indicating which phases will be opened first, how many compartments will be opened at once, and proposed movement of stripping materials for reclamation.

4.11 Operational

- 1) Clearing - Indicate what the method for clearing and disposal will be. Also indicate any plans for timber salvage or note the area has been, or will be, pre logged by other parties if applicable.
- 2) Grubbing - Indicate the proposed disposal method for grubbed stumps and root systems. Also indicate whether it will be done as part of clearing or stripping.
- 3) Stripping - Indicate how the stripping will be done and whether separate stripping of topsoil and overburden is feasible.
- 4) Extraction - Provide a description of the area required for extraction including the proposed depth and estimated volume to be extracted. Include estimated volumes for both pit run material and crushed if applicable.
- 5) Water Control - If water is expected to be a factor in the pit, describe the location of any settling ponds, pumping areas, or drainage ditches that may need to be constructed.

4.12 Schedule

A preliminary schedule should be presented for the pit development and should include the following items where applicable. The intent of this section is to provide some indication as to the expected timing of various operations and the life span of the pit.

- 1) Clearing
- 2) Grubbing
- 3) Stripping
- 4) Excavation
- 5) Crushing
- 6) Reclamation

4.13 Mapping

The 1:5,000 Site Plan drawing should show most of the information outlined in sections 3. Some of the information in these sections can not be presented on a drawing such as clearing and stripping procedures. The scale of the drawing may not allow all of the buffer area to be shown, however an indication of the width of any buffers should be included. On phased developments Site Plans will require updating from time to time until the site is reclaimed.

4.14 Environmental Concerns & Proposed Mitigation

This section of the plan should be used to detail all known potential environmental effects associated with the pit development and provide mitigation measures to minimize these effects to the extent possible. Environmental concerns for each stage of the pit development were outlined in Section 4, however additional concerns may have arisen as a result of contact with affected parties and should be included. Many of these concerns will be dealt with in the design stage but should be included here as a record of which issues were considered. Other concerns will be directly applicable to the operation of the pit. The mitigation measures suggested will form the basis for operational procedures in the pit and all contractors working the pit must be made aware of them and their responsibility to follow them.

The concerns and proposed mitigation should be presented in the following table format for easy reference. Fuel storage is used in the following example. The remainder of the concerns should be detailed for each stage of the development.

Activity/Operation	Potential Environmental Impact	Proposed Mitigation
Fuel Storage	Spilled fuel could impact local streams, lakes, or groundwater. Localized soil contamination possible.	Fuel storage facilities will be surrounded by an impermeable dike as per the requirements of the land use permit. Contractors will be required to have a fuel spill contingency plan in place prior to starting work in the pit area.

4.15 Reclamation Plan

The reclamation plan will be an important component of the development plan and will be used to detail the proposed methods for returning the pit area back to a productive natural state. In cases of older exhausted pits the reclamation plan will stand alone. Pit reclamation will follow guidelines as outlined in Development & Reclamation Standards for Yukon Pits and Quarries.

The following information should be included in the reclamation plan.

- 1) Objective - Clearly state the objective of the reclamation project referencing the intended end use of the pit if applicable.
- 2) Description - Provide a general description of what the pit will look like upon completion of reclamation, whether the slopes will be blended into the existing contours to make it look like a natural opening, or specific waterfowl or wildlife habitats will be developed.
- 3) Methodology - Outline the procedures to be followed to achieve the objective. Depending on the pit, different segments may have different treatments applied to them and these should be detailed for each segment. This will include a description of the contouring and final gradient requirements for each section. A description of the final depth of stripping material that will be replaced in each segment should also be indicated. Areas requiring special treatment for erosion control should be highlighted as should any areas requiring drainage control.
- 4) Revegetation - Describe the preferred revegetation method whether it is natural, seeding, fertilizing, planting or a combination of each. Rationale for the selected method should be given. If seeding and or fertilization is the selected method provide application rates and procedure. If planting is to be considered specify species and proposed density.
- 5) Schedule - Indicate when the stages of reclamation will be done, i.e. the recontouring and respreading of strippings, and the revegetation.
- 6) Mapping - A 1:5000 drawing of the pit area should be included showing the various segments within the pit and the proposed treatments for each.

4.16 Reference/Contacts

The Pit Development Plan should contain the following information where applicable.

- 1) Pit Reference - On existing pits the Pit Data And Development Summary should be included.
- 2) References - List any environmental studies or manuals used to produce the environmental components of the development and reclamation plans.
- 3) Contacts - A list of contacts made during preparation of the pit development plan should be included. Include regulatory, first nations, and other interested parties.

5. MONITORING

The best plans and intentions are ineffective without some type of monitoring to ensure they are being carried out. One complaint over past HPW practices has been that a plan may be presented during the regulatory approval process, but the work in the field does not always follow that plan.

The pit development plan will have been created through consultation with other parties and by recognizing potential environmental concerns before the project started. The plan will be a realistic document with achievable goals and should therefore be able to be followed without major problems.

By making the development plan a part of all contract documents relating to the pit, all parties will be made aware of the required procedures when working in the pit. All contractors must be made aware of their responsibility to follow the plan and the mitigation measures proposed in it. This does not prevent contractors from being proactive toward the environment and proposing improved methods that will achieve the desired results the plan.

To ensure the components of the plan are being followed, H&PW staff will be responsible for monitoring the various stages of the development. The staff responsible for any stage of the development must familiarize themselves with the development plan and make sure they understand the procedures to be followed. Obviously, in many cases there can not be constant supervision of the contractor by H&PW staff. Periodic inspections are, however, carried out to determine progress and confirmation of the development plan requirements should be made on each of these visits. Periodic inspections of various operations should also be made by the H&PW environmental coordinator. This monitoring will be done in addition to the inspections by various regulatory agencies.

After reclamation is complete, a monitoring program should be established for each pit to determine the effectiveness of the reclamation effort. Over time a significant volume of knowledge can be obtained on designs, revegetation techniques, seed and fertilizer mixes, and application rates that are most effective in the Yukon. Detailed wildlife, fisheries, or vegetation

studies are beyond the capability of H&PW therefore other interested parties including, government agencies, First Nations, colleges or universities are encouraged to conduct monitoring programs.