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GRAVEL EXTRACTION AND LAND RECLAMATION WITHIN THE AGRICULTURAL LAND RESERVE -POLICIES AND OBJECTIVES-

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ABSTRACT

The paper will be in the form of a slide presentation and discussion and cover the origins, the mandate and will give a brief history of the Agricultural Land Commission Act and the Soil Conservation Act.

The presentation will briefly discuss the application procedure, what the Agricultural Land Commission looks for and the technical information required when considering an application, the conditions of an approval, monitoring and reporting as well as the benefits of aggregate extraction from farmland.

Time permitting, included will be a brief discussion on pipeline installation through agricultural lands. This will cover locating the R/W, site preparation, reclamation and monitoring.

GRAVEL EXTRACTION AND LAND RECLAMATION WITHIN THE AGRICULTURAL LAND RESERVE - POLICIES AND OBJECTIVES

A Brief Background of the Agricultural Land Commission.

In the early 1970's there was a tremendous growth and expansion of municipalities and cities in British Columbia. To provide the necessary services the tax base was expanded. Lands continued to be zoned industrial, commercial and residential. These new zoning or up-zoning usually occurred at the expense of prime agricultural lands. To control the rush of urban uses onto our farmland, the Agricultural Land Commission Act was proclaimed law in 1973. The objectives of the Agricultural Land Commission Act are to:

a.) preserve agricultural land,

b.) encourage the establishment and maintenance of farms and

c.) assist local governments in preparation of land reserve boundaries.

The Agricultural Land Reserve boundaries were initially delineated throughout British Columbia based primarily on two criteria. Firstly, on the Canada Land Inventory (C.L.I.) soil capability for agriculture and secondly land use patterns including parcel size. MOE Manual No. 1, titled Land Capability Classification for Agriculture in British Columbia has since replaced the earlier C.L.I, system. Both provide the parameters to classify agricultural soils from class 1, prime agricultural soil to class 7, non-arable, although MOE Manual No. 1. is much more detailed. The classification system reflects the assumption that, management inputs increase and the range of crops decreases from class 1 to class 7. Class 1 to class 3 are considered prime agricultural lands capable of sustained production of common field crops. Class 4 and class 5 are considered secondary lands capable primarily of forage production and class 6 capable only of native forage.

Less than 5% of the total land base within the province of British Columbia is within the Agricultural Land Reserve. Of that, 1.1% of the province is considered to have a prime soil and climate combination of class 3 or better, the remaining 3.9% comprised of secondary class 4 and class 5 lands, of which 2.7% is class 4 and the remaining 1.2% class 5.

WHY IS THERE A SOIL CONSERVATION ACT

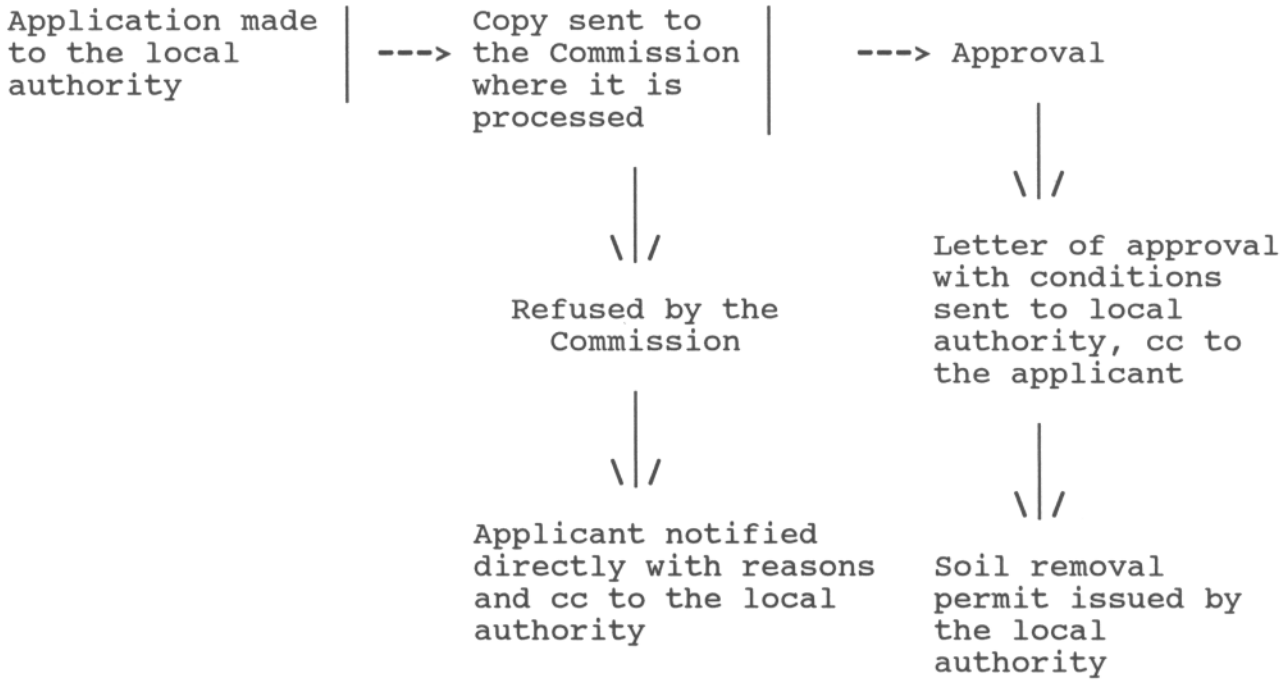
Purpose and Definition

The purpose of Soil Conservation Act is to control the removal of soil from, or the placement of fill on lands within the Agricultural Land Reserve to maintain the agricultural integrity of the soil resource.

Soon after the Agricultural Land Commission was proclaimed law, some landowners attempted debilitating their farmland by depositing fill or demolition material on, or removing the topsoil from their farmland. These were attempts to have their land excluded from the Agricultural Land Reserve, on the basis that the land could no longer be farmed.

As a result of these activities, the Soil Conservation Act was introduced and proclaimed law in 1977. Any soil being removed from, or fill being deposited on lands within an Agricultural Land Reserve requires approval in writing from the Agricultural Land Commission and a soil removal - fill placement permit issued by the local authority. Under the Soil Conservation Act, soil is described as "the entire mantle of unconsolidated material above bedrock other than minerals as defined in the Mineral Tenure Act" and fill is described as "any material brought on land in an agricultural land reserve". Gravel is considered "Soil" under the Soil Conservation Act and its removal is regulated.

Application Procedure



APPROVAL OBJECTIVES AND CRITERIA

Agricultural Enhancement

Before the Commission will approve an application to extract gravel, the applicant must demonstrate the benefits the proposal has to agriculture. The proposal must have a clear agricultural direction or goal and clearly demonstrate that the proposal will either enhance or maintain the agricultural integrity of the soil, or increase the agricultural opportunities or agricultural potential of the properties involved.

Professional Reporting and Monitoring

The Commission usually reguires a gravel extraction - land reclamation plan describing all aspects of a proposed operation from conception to completion of reclamation. The plan is to have a clear agricultural direction, showing the benefits the proposal will have to agriculture. The plan, if not submitted with the application, will likely be required prior to any consideration being given to the proposal. The plan required by the Commission is to be prepared by a Land Reclamation Specialist, or a Reclamation Agrologist. The Land Reclamation Specialist or Reclamation Agrologist is to have academic credits in geomorphology, soil genesis, soil classification, soil physics, drainage, irrigation and have a good understanding of forage crops and gravel extraction operations and should be a member in good standing with the B. C. Institute of Agrologists. In addition to preparing the report and monitoring all aspects of the operation, this individual will also act as a liaison with the Commission Staff Agrologist on technical matters concerning your application.

The extraction - rehabilitation plan is to include:

A. A Written Report

The report is to describe the overall operation and how the extraction of gravel will enhance the property for agriculture. The report is to include a description of:

a.) proven gravel reserves (drill logs with their locations identified on an attached map),
b.) location of the water table,
c.) volumes and depths of gravel to be removed,
d.) final elevations,
e.) the surface landform and soil type, complete with soil profile descriptions,
f.) the initial and final agricultural capability, compete with a potential of crop or agricultural options,
g.) size, location and order gravel will be extracted, where extraction is to be in phased,

h.) timetable for extraction,
i.) drainage control during the operation and upon completion of rehabilitation;
i.) soil management methods including:
-stripping each soil horizon,
-transport of soil to the storage areas,
-soil storage,
-screening of topsoil prior to placement;

B. Site description plans and maps showing:

a.) present and projected agricultural capability;
b.) initial and final contours;
c.) a series of north/south and east/west cross-sectional profiles, showing initial and final elevations identifying volumes or area of gravel extraction,
d.) location and size of each extraction phase and if applicable, the order in which each phase, is to be opened up and rehabilitated;
e.) the location of permanent processing and aggregate storage areas etc.;
f.) the location of soil storage areas;
g.) the identification of each soil horizon (including overburden) stored in berms within the soil storage areas,
h.) drainage control during the extraction and upon completion of the operation.

If approved, conditions of the approval will be based on the extraction - rehabilitation plan and be subject to on-going monitoring and bonding. The plan may be modified, by the Commission depending on site circumstances.

SITE PREPARATION TO REHABILITATION

Site Preparation and Extraction

Once the extraction - reclamation plan is approved, permits in place and bonds posted, site preparation commences.

The most important aspect to any operation is site preparation and the orderly stripping and storage of the soil. If site preparation does not occur properly, it likely means that the site can not be properly rehabilitated. Little additional effort is required to carry out site preparation procedures properly, however once done improperly it is costly to repair the

damage, assuming the damage can be corrected. A common requirement is there be a qualified soil technician on-site to identify the soil horizons and direct the equipment operators accordingly during this critical phase.

The use of the appropriate machinery is critical. In the past the use of bulldozers traditionally have been considered the the acceptable piece of equipment to use for stripping. The effectiveness of this equipment, is to say the least, questionable. It is very difficult to strip uniformly along a soil horizon boundary. Pushing the layers of soil results in mixing of the horizons and spillage around the end of the blade. Frequent contamination of the topsoil horizons with the underlying gravel deposit occurs, as well as a loss of topsoil, particularly on sites where the the topsoil has a high coarse fragment content.

The best alternative for stripping topsoil, particularly the A horizon and the B horizon, is the use of an excavator with a clean-out bucket. The excavator is extremely accurate when pealing the surface soil horizons. Each soil horizon is stripped in windrows and transported to the storage site by either truck or a loader and deposited on a predetermined, prepared soil storage site. The soil storage site is covered with a blanket of wood chips or shavings, 150 mm in depth. The use of shavings acts both as a marker to the equipment operator during reclamation and as a buffer, separating the topsoil from the prepared storage surface preventing contamination when being removed. It has been estimated the use of an excavator, operating under the appropriate soil moisture conditions, is likely to recovery 95% of the topsoil. Each soil horizon is stored in berm with a maximum slope of 2:1 and as a method of weed and erosion control is seeded with an appropriate certified cereal or forage mix. (The cover also assists in identifying if an operator has been removing topsoil from the stockpile, for whatever reason.) Drainage must also be controlled around the storage berms to prevent any erosion from the site and siltation of adjacent waterways.

Progressive Reclamation

The Commission prefers to limit the size of excavation and break the operation down into relatively equal sized phases. Four hectares is usually the optimum size for a phase. Different sizes will be considered depending on the size of the overall operation. Progressing reclamation allows extraction and reclamation to be carried out on an ongoing basis and avoids large expanses being left open at any one time. Site preparation may be conducted on a new phase, while extraction is under way on the present phase and reclamation is being completed on a previous phase. This method

allows for topsoil being stripped from a new phase to be used immediately in the reclamation of a previous phase. Flipping the topsoil directly onto a phase being reclaimed avoids double moves of topsoil as well as allocating additional area for storage sites within the pit. When extraction is complete, soil stockpiled from the first phase would then be used to reclaim the final phase.

It has been the Commissions observation that leaving reclamation of large operations to the completion of extraction is, for the most part, ineffective and inefficient. There is usually a relatively long time lag between the initial site preparation and final reclamation. In this time frame, topsoil frequently disappears, the identification of storage stockpiles is forgotten and distances to haul the topsoil become extensive. In summary, employing progressive reclamation maintains much more control on an operation and at the same time, the final product becomes apparent much sooner.

Back-filling and Over-excavation

Over excavation is a concept that the Commission has recently adopted. The objective is to allow for the maximum volume of gravel to be extracted from a given area. By going vertically rather than laterally, reduces the area which is to be opened up at any one time, minimizing the temporary loss of productive agricultural farmland. Over excavation also extends the life of an operation which, indirectly reduces the pressure on farmland as demand for gravel increases.

Of primary concern is the location of the permanent watertable. The Commission requires a minimum of 60 cm of freeboard above the mean winter table.

When the final elevation has been reached, the excavation is back filled with medium textured glacial till, in one meter lifts, to within approximately 1.5 meter of the final elevation. The placement of the fill material in 1 meter lifts allows for uniform settling. Once filling is complete, the fill is then capped with 1 meter of porous gravel or similar pervious material. The processed topsoil is then replaced in reverse order it was stripped.

Crucial to the practice of over excavation is the installation of a subsurface drainage system. The glacial till fill material produces an impervious layer which perches the water table, which if not corrected, can result in soil saturation and surface ponding. Once installed, the drainage system removes water from the soil profile, maintaining the soil at or below field capacity.

Final Reclamation

As a result of the extraction and processing operations, the pitfloor commonly becomes extremely compact. Once the subgrade has been established to required grades, the pitfloor or final subgrade is subsoiled by ripping to a depth of 60 cm. in two directions maintaining shank spacings also at 60 cm. It is recommended that this procedure be carried out late August to mid September. The soil at this time of the year is dryer than at any other time, allowing for maximum fracturing of the soil. Drainage and subsoiling complement each other. The drainage system improves the trafficability of the soil, while subsoiling improves the perviousness of the soil. The increased perviousness allows easier access of water to the drain lines.

Once the subgrade has been established and prepared, the topsoil is replaced in reverse order it was stripped. Where the percentage coarse fragment content of the soil is greater than 5%, there is a requirement that at least the A horizon and frequently the B horizon be screened through a 2.5 cm mesh.

To reclaim sideslopes, it is only necessary to provide a soil medium with sufficient available water storage capacity and a moderate soil structure to establish and maintain a forage cover. To this end, the use of the processed topsoil to reclaim sideslopes is prohibited. The use of unscreened B horizon, glacial till, or imported soil are the best alternatives to providing a soil medium for the side slopes. The processed topsoil is to be maintained for the reclamation of the pit floor only.

Another aspect to replacing topsoil, which is being considered, is the use of the washings from the silt ponds. The texture of this material ranges from silt to very fine sandyloam. Proposals for the use of this material include its use as a soil additive , mixing it directly into the soil, as a either a subsoil or topsoil with the addition of poultry manure to supplement the organic matter and fertility. As an experiment, this material will be used to reclaim a portion of the Valley-Rite Ltd. operation in Matsqui on the northwest corner Hundington and Bradner Roads.

A recent method of preparing residential developments seems to be to strip all of the topsoil from the entire project site and disposed of it. As development continues to grow in the Fraser Valley, large volumes of topsoil becomes available. The Commission encourages the back hauling of this material from these project sites for use in reclamation. The soil material must

however meet the criteria as described in the approval and the use of this material is to be overseen by the reclamation specialist.

One final aspect to the physical aspect of reclamation, is drainage. Drainage was previously discussed as a requirement where the pit has been over excavated and backfilled. From past experience it has been observed that even on areas where over excavation was not exercised, excess soil moisture became a problem after reclamation. Even with subsoiling, the soil structure frequently collapses afterwards once again creating near impermeable conditions. The installation of subsurface drainage systems, with a subsoiling program, remedies any excess soil moisture conditions maintaining soil moisture conditions at or below field capacity. These two management practices complement each other. While the drainage system removes excess moisture from the soil profile, subsoiling increases the efficiency in which the water reaches the drains. This increases the trafficability of the soil, reduces compaction and decreases the time of field entry after a major rainfall event. Other advantages to the installation of a subsurface drainage is that a drainage system increases soil temperature, improves and maintains soil tilth, increases the length of the growing season and in doing so, increases the range of crops and agricultural options of a soil.

Bonding Procedure

To ensure, or create an incentive for land reclamation, bonding may be conditional to an approval and would be required to be posted with the Commission prior to commencement of any works. There is no written policy or adopted table to determine the amount of the bond, rather the amount is set at the discretion of the Commission. The amount of the bond may or may not reflect the actual cost of reclamation, is usually set to reflect about 33% of the cost of reclamation. The bond is intended to be set large enough so not to be considered part of the permit fee and at the same time not being so large it becomes prohibitive. The amounts of bonds vary, reflecting the sensitivity of the site, soil capability and the extent of the operation.

Another bonding procedure employed by the Commission is cross-collateral bonding. This type of bonding is used in areas where there are several operators extracting gravel from several parcels within the same landform and all are working to a common predetermined plan. Each operator will provide their operating bond and then a second, the cross-collateral bond. Where an operator is in default and the main bond is cashed, the pool of cross-colateral bonds is also cashed. The effect is that the operators tend to keep an eye on each other and report any peculiarities.

SUMMARY

The process of aggregate extraction and land reclamation of agricultural lands has been one of a learning process, a process where mistakes were have occurred and lessons learned. Early approvals were conditional to "the land being reclaimed to an acceptable agricultural standard". This type of a conditional approval was rather open ended and led to many problems, such as an acceptable standard to whom? Through the experience gained, approvals have evolved from the early simple single page letter now to where the letter of approval represents a comprehensive conditional extraction and reclamation plan.

Operators, for the most part, have responded in a very positive manner to these changes. The use of reclamation professionals has had many benefits to the operators. The reclamation specialist, not only carrying out the administrative aspects of processing the application, preparing the extraction - reclamation plan and monitoring the operation, have designed a proposals which have actually increased the volumes of gravel to be removed.

The value of land has become too valuable a commodity to extract and not reclaim. Frequently operators prefer to purchase the properties from which they intend to extract gravel, rather than entering into a lease arrangement and operating on a royalty basis, which is usually reviewed annually. Numerous purchases may run into the millions of dollars. Enhancing the agricultural utility of the soil for agriculture, increases the monetary value of the property, making to property more marketable when reclaimed. The cost of the initial purchase is frequently recovered after resale.

In additional to the monitory aspect of reclamation, the industry is very concerned and is making every attempt to improve their public image. There have been numerous problems throughout the Lower Mainland and the rest of the province, which still can be pointed to as examples of bad operations. Well organized environmental organizations attempt to use these bad examples to stereo-type all operations. The message is clear from all sectors, the previous activities and methods of extraction will no longer be tolerated. It should not be said that a flawless system is in place, there is no doubt, major strides between industry and government have been achieved to ensure the responsible management of this very valuable resource.

CROSS-SECTIONAL PROFILE OF OVER-EXCAVATION AND BACKFILLING