

**SECTION 9 REPORT
AGGREGATE RESOURCES ACT
FERMA - CARDEN QUARRY
FERMA CRUSHED STONE INC.**

JOB NO. 92-8977 O/M

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PREPARED BY

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NOISE IMPACT ANALYSIS
TRAFFIC IMPACT ASSESSMENT



**SECTION 9 REPORT
AGGREGATE RESOURCES ACT
FERMA - CARDEN QUARRY
FERMA CRUSHED STONE INC.**

1.0 INTRODUCTION

1.1 Background

Ferma Crushed Stone Inc. is proposing a quarry development on Lots 7, 8, 9 and Part of Lots 6 and 10, Concession IX, Carden Township in Victoria County.

This proposed Class "A" Quarry Licence Application encompasses the entire 384.5 hectare property owned by Ferma Group Inc. (Part Lot 6, Lot 7, W½ Lot 8, W½ Lot 9 and W½ Lot 10, Conc. IX) and AFFG Properties Investment Inc. (E½ Lot 8 and E½ Lot 9, Conc. IX) which is an arm of the Ferma Group of companies. A total of 205 hectares is to be extracted, in two segments, to an average depth of 32 metres. Details of existing features, site operations, and progressive and final rehabilitation are found in the appended set of site plans.

The licence application is being made on the basis of extracting 1,000,000 tonnes annually. It is anticipated that initially only 250,000 tonnes or less will be extracted annually, increasing gradually to the licensed rate over a ten year start-up period.

1.2 Site Location and Surrounding Land Use

The Ferma site location is shown on Figure 1. Figure 2 identifies property boundaries, proposed limits of extraction, surrounding residences and land use. Site limits are generally described as:



- South - Side Road 5/6 (McNamee Road)
- West - Concession Road IX
- North - Side Road 10/11 (unopened road allowance)
- East - Concession Road X (unopened road allowance)

The site consists of flat to gently undulating limestone bedrock plain with less than 0.3 metres soil coverage over most parts. Agricultural use is limited to unimproved pasture or alvar habitat (52%), and hayfields (8%) found in the southeast quadrant. The remainder of the site consists of forest (35%), and swamp (5%).

Surrounding land uses within a 500 metre radius are predominantly open pasture and swamp/woodlot. Located approximately one kilometre southwest of the property within Lot 4, Concession VIII, Carden Township, is the Preston Quarry operated by Kirkfield Aggregates Limited.

Adjacent to the site are three permanent residences opposite the westerly boundary, three opposite the southwest corner, and one seasonal dwelling opposite the southerly property limit. In addition, seven permanent residences fall between a 1.2 and 1.5 kilometres of the Ferma property.

The nearest settlements include: the hamlet of Kirkfield located on Highway 48 approximately seven kilometres southwest of the site in neighbouring Eldon Township, and the hamlet of Victoria Road located on Highway 505 four kilometres to the southeast on the Carden/Bexley Township Line.

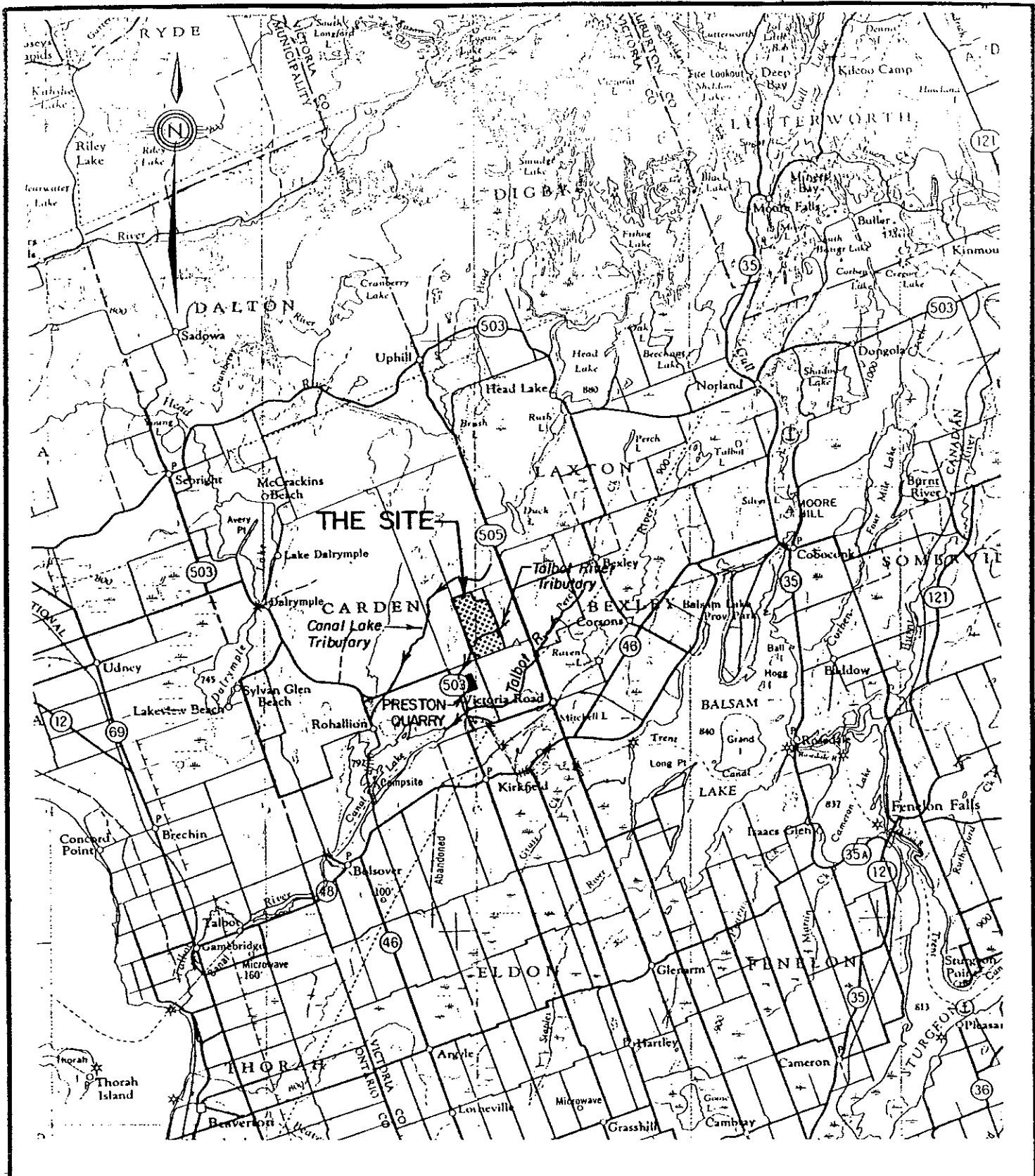


1.3 Section 9 Report

As detailed under Section 9(1) in paragraphs (a) through (i) of the Aggregate Resources Act (ARA), a report must be prepared in support of an Application for a Class "A" Quarry Licence, more specifically, the report must include background documentation with respect to:

- (a) *as to the suitability of the progressive rehabilitation and final rehabilitation plans having regard to the adjacent lands;*
- (b) *the environment that may be expected to be affected by the pit or quarry operation and any proposed remedial measures that are considered necessary;*
- (c) *the social and economic effects that may be expected as a result of the pit or quarry operation;*
- (d) *the quality and quantity of the aggregate on the site;*
- (e) *the main haulage routes and proposed truck traffic to and from the site;*
- (f) *the water table and any existing surface water on and surrounding the site and proposed water diversion, storage and drainage facilities on the site and points of discharge to surface waters;*
- (g) *the location and size of existing and proposed stockpiles of topsoil, subsoil, and overburden and the location and size of proposed aggregate stockpile areas;*
- (h) *planning and land use considerations;*
- (i) *the reasons for any conclusions in the report;*





OLIVER, MANGIONE, McCALLA
& ASSOCIATES LIMITED

CONSULTING ENGINEERS,
HYDROGEOLOGISTS & PLANNERS

DATE
SEPT., 1994

CLIENT

FERMA - CARDEN QUARRY

DWG. No.
92 - 8977-S9-1

SCALE
1:250,000

TITLE

SITE LOCATION

FIG. 1

2.0 SITE REHABILITATION - AGGREGATE RESOURCES ACT - SECTION 9(1)(a)

The suitability of the progressive rehabilitation and final rehabilitation plans having regard to the adjacent lands.

2.1 Progressive Rehabilitation

Physiological and environmental constraints dictate the staging of extraction, progressive rehabilitation and final rehabilitation. Extraction is to occur below the water table, and as such, the final rehabilitated state will result in the formation of two lakes upon the termination of dewatering systems.

Certain measures are to be taken during site development to facilitate final site rehabilitation, these include:

- The conservation of overburden and topsoil for visual and audible screening purposes, and final slope formation.
- Benching the perimeter of the excavation to allow for final slope construction and the eventual creation of shoreline habitat.
- Limiting the extent of extraction to retain lands to support potential future water based recreational development.
- As extraction proceeds, perimeter slopes are to be established using available excess overburden or unmarketable material, and stabilized with topsoil and hydroseeded with crownvetch once final slope gradients have been established.

The site is to be quarried in two separate sections consisting of a North and South Part, with operations commencing in the northerly section. Once aggregate reserves are extracted in the North Part it will receive final rehabilitation



concurrently with relocating operations to the South Part. The South Part is to be rehabilitated upon the completion of extraction within same. The total area to be rehabilitated is approximately 241 hectares. However, only 169 hectares within the North Part and 72 hectares within the South Part will be disturbed at any one time.

2.2 Final Rehabilitation

Final rehabilitation will consist of two lakes with banks sloping between 3:1 to 2:1 (horizontal to vertical). All slopes are to be stabilized with 75 mm of topsoil and hydroseeded with crownvetch prior to cessation of dewatering. Potential uses after rehabilitation include: water oriented recreation, camping, conservation and wildlife preserve, and seasonal or rural residential. Further shoreline enhancing may occur subsequently to delicensing in association with the above potential future uses.

Current surrounding open range and woodlot land use would not be impacted by this type of development. Presently designated Rural, with sections as Environmental Protection, the proposed final Official Plan designation of Shoreline, with sections remaining as Environmental Protection, would not be in conflict with present surrounding land use.

2.3 Agricultural Rehabilitation

The Canada Land Inventory classifies the Ferma site and surrounding area as having a 6R soil agricultural classification. Lands with 6R classification typically have less than three feet of soil depth, may not be worked with farm machinery, and as a result, have very poor agricultural potential.



Most of the site cannot be cultivated due to topography, poor drainage, nonexistent soils (10%) and soil stoniness. Although approximately 30 hectares of existing hayfields would be affected by mining.

Existing poor soil quality and marginal agricultural potential do not justify rehabilitating extracted areas for agricultural use.



3.0 ENVIRONMENTAL CONSIDERATIONS - AGGREGATE RESOURCES ACT SECTION 9(1)(b)

The environment that may be expected to be affected by quarry operations and any proposed remedial measures considered necessary.

Possible environmental effects of the proposed quarry are the subject of six appended reports prepared to address ecology, noise, blasting, dust, traffic, and surface water and hydrogeology. Traffic, and surface water/groundwater issues are addressed in subsequent report Sections 6 and 7, respectively. The remaining environmental considerations are discussed as follows:

3.1 Ecology

An environmental impact assessment of the site and surrounding lands was conducted by Niblett Environmental Associates Inc. The conclusions extracted from this report are presented below:

- No adverse impacts were identified or predicted to the terrestrial or aquatic biological resources either on-site or in the site vicinity which were of such significance as to prohibit the quarry development.
- By its nature and the need for site clearing of the vegetation cover and overburden, the proposed quarry will entail some loss of habitat for a variety of common flora and fauna which presently occupy or use the property.



- With the exception of an endangered bird species, the loggerhead shrike, and the presence of wetland and fisheries habitat along the Talbot River tributary, a thorough analysis of the potential impacts failed to identify any biological resources of such special significance as to warrant extreme environmental protection measures such as large setbacks, above and beyond what is required in the Aggregates Resources Act.
- A 400 metre setback is recommended from the 1994 loggerhead shrike nesting site. However, given that the life span of this quarry may be in excess of 50 years, it is recommended that the nesting location(s) of this endangered bird species be reviewed on an annual basis.

The report suggests the quarry may proceed without adversely affecting the ecology, provided a 400 metre set back is observed from the loggerhead shrike nesting area. The shrike's present nesting area is approximately 400 metres outside of the proposed final limit of extraction. Should the nesting location move to within 400 metres of extraction operations, extraction in the direction of the nesting site would be discontinued until the nest site has been abandoned for at least two consecutive years.

3.2 Noise

Valcoustic Canada Ltd. evaluated sound levels that would be generated by quarry operations and their impact on the existing ambient noise environment in accordance with Ministry of Environment and Energy (MOEE) guidelines. The conclusions extracted from the noise impact assessment are listed below:

- As the operation moves over the site, changing in elevation and distance, the sound exposures will vary relative to off-site receptors of concern. Thus, the noise analysis has been approached on the basis of determining worst case conditions, to ensure that the data presented does not underpredict the potential off-site sound exposures. The interpretation of



the sound exposure predictions must take this into account, especially since the worst case conditions would apply to limited time periods compared to the life of the site.

- Excesses over the MOEE guideline of up to 3 dBA could result at the receptors of concern. This is not considered significant, especially in view of the conservative assumptions in the analysis.
- Noise control features have been incorporated in the operational design. These include interim and perimeter berms, direction of quarrying, location of noisy pieces of equipment and design of permanent processing plant. These noise control features are accounted for in the analysis and are outlined on the operational plans.
- The assessment assumes the full complement of mining equipment is operating at maximum sound emission levels all of the time, and clustered together on the site. This is clearly conservative.
- Major pieces of processing equipment (screens and crushers) in the permanent plant should be enclosed in a building designed to attenuate sound. Loading of trucks for shipping aggregate off-site should occur from within a predefined plant area to take advantage of screening from stockpile and buildings.
- Residents along Sideroad 5/6, adjacent to the off-site haul route should be notified in writing about the haul route and be made aware of the potential noise situation.



Specific noise control features incorporated into the operational plan include:

- The working face will generally progress from east to west, towards the receptors of concern.
- Until adequate room is available on the quarry floor to accommodate a permanent plant, a portable processing plant, located within 30 to 50 metres of the working face, will be used.
- 9 metre high interim berms will be constructed to provide increased sound attenuation when the portable processing plant will be used.
- Once adequate area is available on the quarry floor, a permanent processing plant will be installed with noisy pieces of equipment (i.e. crushers, screens, washers, etc.) housed in buildings designed to provide adequate noise attenuation. (Details of the proposed building construction are contained in Appendix "E" of the Noise Impact Analysis.) The panels should provide at least 20 dB of sound isolation.
- Once the permanent processing plant has been established and the interim berms are not longer effective, perimeter berms ranging from 10 to 12 metres in height will be constructed.

3.3 Blasting

A Blasting Impact Analysis was completed by Explotech Engineering Ltd., specialists in explosives and blasting, which concludes:

- Residences are well protected by the stand-off distances and berm proposed in the Operations Plan, and this site is an excellent location for a proposed quarry. Modern blasting techniques will permit blasting to take place with explosives charges well below allowable charge weights ensuring that blast



vibrations and overpressure will be well below Ministry of Environment and Energy (MOEE) guidelines.

To meet MOEE guidelines and ensure blasting operations in all phases of the project are carried out in a safe manner the following mitigating measures are recommended:

- The buildings to the south of the proposed quarry and the residences and buildings to the South and West of Part 1 should be pre-blast surveyed prior to the start up of the quarry and all blasts monitored for at least the first year of operation. (Site plan notes state that all buildings surrounding the perimeter of the site are to be pre-blast surveyed.) Blast monitoring after the first year of operations may or may not be required, depending on the results obtained from the first year of drilling and blasting.
- During the start up phase, 190.8 kg of explosives can be detonated per period while maintaining blast vibrations and overpressure at or below MOEE guidelines for blasting in mines and quarries.
- As extraction proceeds to the westerly limits, the allowable kilograms of explosives per period are to be reduced to 122 kg per period. Careful blast monitoring and continued recording of all blast parameters could confirm that higher explosives charges can be used while still conforming to MOEE guidelines.
- The first lift be limited to 10 metres in depth. This is a practical depth for an initial sinking cut and will provide an opportunity to obtain site specific blast vibration and overpressure data which can be used to control subsequent blasting on site. Most quarries in the region use 100 mm diameter blast holes which in this operation would amount to 62 kg of explosives per hole for a 10 metre lift.



The amount of explosives per period to be used on subsequent lifts will be governed by production requirements as well as blast vibration and blast overpressure data obtained during initial blasting operations.

- Non-electric initiating systems for detonating blasts should be used as a precautionary measure due to the proximity of the adjacent Bell relay tower.

3.4 Air Quality

An Air Quality Impact assessment completed by Oliver, Mangione, McCalla & Associates Limited, concluded:

- Provided dust suppressants are used for material processing, and on haul roads in the vicinity of the processing and stockpiling area, permanent plant related quarry activities will meet MOEE Ambient Air Quality Concentration (AAQC) objectives at the easterly property line.
- Although temporary, during the initial start-up of the southerly and northerly parts of the quarry, dust emissions will exceed AAQC objectives at the easterly property line, but will meet same within 300 metres of the property limit. The lands affected are uninhabited and consist of scrub pasture, swamp and woodlot.
- Reductions in dust concentrations due to gravitational settling have not been taken into consideration. If considered, predicted concentrations values would be reduced.

To meet MOEE AAQC, the following mitigating measures are recommended:

- The above limits of impingement are based on using water sprays at crushing, and conveyor transfer points to achieve a material moisture content of 1.5%. In addition, water should be applied during periods of



dry weather at 1 L/m² to all areas of vehicular travel once every eight hours minimum to obtain a 75% reduction in dust emissions.

- All internal haul routes outside of the plant area should be constructed of crushed limestone and wetted as noted above. Other dust suppressants such as calcium chloride may be used in place of water, oil based products are not recommended.
- Should dust generated at access/egress points become a nuisance, the first 200 metres of on-site haul road should be surfaced with surface treatment, or asphalt.
- All off-site haul routes to the Provincial Highway system should be surfaced with surface treatment or asphalt to reduce dust emissions from haulage vehicles.

A Certificate of Approval from MOEE in compliance with Regulation 346 of the Environmental Protection Act will be required prior to commencing blasting and processing operations.



4.0 SOCIAL AND ECONOMIC IMPACTS - AGGREGATE RESOURCES ACT SECTION 9(1)(c)

The social and economic effects that may be expected as a result of the quarry operation.

4.1 Social Impacts - Nuisances

The area in the immediate vicinity of the quarry is rural with a total of 13 permanent residences within 1.5 kilometres surrounding the site. Most resident's occupations relate to the rural setting such as ranching and firewood production, while some commute to their respective places of employment.

There are no tourist or commercial establishments within 1.5 kilometres of the quarry.

More removed from the site is the Village of Kirkfield (population ± 300), the hamlet of Victoria Road (population ± 100), and the Kirkfield Lift Locks. All have tourist related amenities, and depending on operating schedules, could present a potential conflict with off-site quarry activities such as truck traffic.

The magnitude of social nuisances are reduced at the outset due to the following:

- The remote location of the quarry.
- Increased setback distances to beyond regulation requirements where residences abut property boundaries.
- Limiting operating hours to between 6:00 and 19:00 Monday to Friday, and 6:00 and 12:00 on Saturdays; and restricting rock drilling to between 7:00 and 17:00 Monday to Friday.



Specific nuisances include:

4.1.1 Noise

The expected noise increase above ambient levels from quarry operations is 3.0 dBA at the closest residences assuming a worse case scenario of all machines operating simultaneously clustered together, and with no ambient noise contribution from the nearby Preston Quarry operations. This predicted noise increase is considered a conservative estimate and will not impact neighbouring residents significantly.

4.1.2 Blasting

Noise and vibrations from blasting can be physically damaging to nearby structures and a nuisance to residents in general. These impacts will be minimized by:

- Limiting the depth of the initial lift to 10 metres to reduce the size and potential impacts of surface blasts.
- Setting off blasts at a specific time of the day such one o'clock in the afternoon to eliminate unexpected disturbances.
- Utilizing the face of the first 10 metre lift to buffer blasts during extraction of subsequent lifts.
- Monitoring of blast parameters to ensure compliance with MOEE guidelines.

4.1.3 Air Quality

Dust is the primary air pollutant generated by quarry operations. Although dust is generally not a health concern, it can be aesthetically displeasing and can soil objects upon which it settles.



Adjacent residences are upwind of prevailing winds and will not be affected by dust fall or dispersion originating from the quarry. Downwind of the prevailing northwest winds, the closest residence is 1.2 kilometres away and also would not be affected.

4.1.4 Traffic

The primary concern of increased truck traffic is safety, followed by related increases in noise and dust. These concerns may be addressed by: imposing speed limits, limiting the time of day and days of the week of haulage, and making improvements to intersections, road geometrics and surface treatment. In addition, haul route selection must consider:

- Those routes where there is least exposure to roadside residences.
- Available road capacity for anticipated increases in traffic volume.
- Structural limitations on roads or bridges.
- Product destination.

At operating capacity, the anticipated increase in truck traffic will be an average of 210 trips per day. Using predicted market distribution of aggregate produce, 60% of this traffic will be destined for greater Toronto via Side Road 5/6 (between Concession Road X and Highway 503), Highway 503, Highway 48, and Highway 12. The remaining 40% of quarry product will be destined for markets to the southeast via Side Road 5/6 (between Concession Road X and Highway 505), Highway 505, Victoria County Roads 35, 8, 21, and Highway 35. These routes will distribute truck traffic minimizing potential haul vehicle exposure locally.



Potential conflicts with tourist traffic (Kirkfield, Kirkfield Lift Locks, and possibly Victoria Road) will be minimized as there will be no hauling during peak tourist visitation periods which typically occur on summer Saturday afternoons and Sundays. In addition, haulage will be curtailed on summer Friday afternoons and Saturday mornings, as demand (i.e. construction activity) typically dissipates as summer weekends approach.

4.1.5 Groundwater Supply

Local residents rely on groundwater as a source of drinking water. Quarry dewatering can drop surrounding groundwater levels to a point where nearby wells may be affected. It is proposed that operations commence in the northeast corner of the site where there will be the least likelihood of impacting existing domestic water supplies. Proposed monthly monitoring of groundwater water levels and annual evaluation of actual drawdown occurrence is to be implemented concurrently with commencement of quarry dewatering. This ongoing reassessment will allow, if necessary, the implementation of contingency measures prior to domestic wells being adversely impacted.

4.2 Social Impacts - Economic

Local employment opportunities for residents include: ranching, firewood cutting, aggregate related jobs provided by vicinity pits and quarries, tourism, and service industries which support the surrounding rural area.

There are no adjacent income generating land uses that would be affected by quarry development.



The creation of jobs and subsequent financial security have pronounced social benefits. Local employment opportunities will be created through the procurement of: blasting technicians, equipment operators, weigh scale operators, clerical staff, mechanical and electrical trades, sales staff, general labourers, and quality control technicians.

In addition, the following table demonstrates the number of haulage vehicle drivers needed for product delivery based on three round trips per day per truck:

Table 1
Daily Truck Traffic and Driver Requirements
Ferma-Carden Quarry

Base Year	Tonnes per Year	Total Generated Trips		Number of Drivers	
		Average	Summer	Average	Summer
1995	250,000	53	80	9	13
2005	1,000,000	210	315	35	53

The total number of persons to be directly employed by quarry operations will be between 20 and 25 in the initial year of operation, and between 55 to 60 at full operating capacity. This would have a large impact on local employment opportunities in relative terms.

There will also be spin-off employment created locally in service industries which provide food, hardware, fuel and other supplies.

Wages would also inject a new source of funds into the local economy, as would the acquisition of local goods by employees and quarry operators.



On a broader scale, there will be employment created through the utilization of quarry products in related construction and manufacturing sections. In addition, technical consultants would be engaged in various capacities throughout the life of the quarry.

4.3 Municipal Impacts - Economic

The Aggregate Resources Act provides for the disbursement of funds generated by licence fees to local governments. A licence fee of 6 cents per tonne is collected and then distributed as follows: 4 cents to Carden Township; 1.5 cents to the Province of Ontario; 0.5 cents to Victoria County. To illustrate the impacts of the licence fees, values for the first and tenth year of operations are summarized in Table 2.

Table 2
Licence Fees Collected Annually
Ferma - Carden Quarry

Year	Tonnage	Carden Township	Victoria County	Province of Ontario
1	250,000	\$10,000	\$1,250	\$3,750
10	1,000,000	\$40,000	\$5,000	\$15,000

In addition to the licence fees, taxation revenue to local governments would also increase.



5.0 AGGREGATE QUALITY AND QUANTITY - AGGREGATE RESOURCES ACT SECTION 9(1)(d)

The quality and quantity of the aggregate on the site.

5.1 Area and Site Geology

Information with respect to local geology was obtained from borehole analysis and a review of existing literature.

The regional geology consists of flat lying, horizontal beds of predominantly ordovician aged limestone, sediments unconformably overlying precambrian granite. The Aggregate Resources Inventory Paper of Carden Township (ARIP 48) provides a general description of the bedrock geology within the Township.

The Gull River and Bobcaygeon Limestone Formations present lead to the classification of a majority of Carden Township, including the proposed quarry site, as a "selected bedrock resource area".

On-site boreholes revealed the precambrian granite surface to be at elevations ranging from 223 to 229 m.a.s.l., or approximately 45 metres below present ground level.

Test pits, borehole and well logs show the depth of overburden to be generally less than 0.3 metres, which permits easy and economical access to the underlying bedrock resource.



5.2 Bedrock Lithology

Bedrock lithology was determined from laboratory analysis of core samples extracted from BH1 (Terraprobe Limited) and BH4 (Ministry of Transportation - Geotechnical Section). Borehole locations are shown on Figure 2.

Shadow Lake Formation

The Shadow Lake Formation is between two and four metres thick lying unconformably upon Precambrian rock. It consists of quartz sandstone (lower member), and dolomitic limestone with shale partings (upper member).

Gull River Formation - Lower Member

Above the Shadow Lake Formation is the lower member of the Gull River Formation. This formation is between eight to ten metres thick consisting of calcitic dolostone, dolomitic limestone, and shale partings with less than 1% shale/mudstone.

Gull River Formation - Middle Member

The middle member of the Gull River Formation is one metre thick at BH1, and consists of a fine grained limestone with shale/mudstone beds. This member is considered to be discontinuous across the site as it was not noted at BH4.

Gull River Formation - Upper Member

The upper member of the Gull River Formation is between four and six metres thick consisting of fine to medium grained limestone with interbeds of shale/mudstone representing 2% to 4% content.



Bobcaygeon Formation - Lower Member

Above the Gull River Formation is the Bobcaygeon Formation lower (lower) member, consisting of three metres of light grey to brownish grey limestone. Above this is the lower (upper) member consisting of nine metres of medium to fine grained limestone. Both members have interbeds of dark grey shale/mudstone partings representing 4% to 6%, with the lower (upper) section described as fossiliferous.

Bobcaygeon Formation - Middle Member

The middle member of the Bobcaygeon Formation is six to seven metres thick consisting of grey to light grey, fine to medium grained fossiliferous limestone with minor highly calcareous limestone zones with shale/limestone beds having an estimated shale/mudstone content of 3%.

Bobcaygeon Formation - Upper Member

The upper member of the bobcaygeon is three metres thick and is at, or close to the ground surface. It consists of medium dark to medium light grey, medium to fine grained, fossiliferous friable limestone with interbeds of shale representing less than 1%.

5.3 Material Quality

Material quality, and potential product uses, are summarized in Table 3.



Bobcaygeon Formation - Lower Member

Above the Gull River Formation is the Bobcaygeon Formation lower (lower) member, consisting of three metres of light grey to brownish grey limestone. Above this is the lower (upper) member consisting of nine metres of medium to fine grained limestone. Both members have interbeds of dark grey shale/mudstone partings representing 4% to 6%, with the lower (upper) section described as fossiliferous.

Bobcaygeon Formation - Middle Member

The middle member of the Bobcaygeon Formation is six to seven metres thick consisting of grey to light grey, fine to medium grained fossiliferous limestone with minor highly calcareous limestone zones with shale/limestone beds having an estimated shale/mudstone content of 3%.

Bobcaygeon Formation - Upper Member

The upper member of the bobcaygeon is three metres thick and is at, or close to the ground surface. It consists of medium dark to medium light grey, medium to fine grained, fossiliferous friable limestone with interbeds of shale representing less than 1%.

5.3 Material Quality

Material quality, and potential product uses, are summarized in Table 3.



Table 3
Core Analysis of BH1 and BH4
Ferma - Carden Quarry

		MTO BH 4		Terraprobe BH 1	
Formation	Member	Thickness (m)	Best use	Thickness (m)	Best use
Overburden & Fractured Rock		1.6	not tested	1.4	not tested
Bobcaygeon	Upper	2.5	HL4	16.5	Portland Cement & HL3
	Middle	6.7	HL4		
	Lower	9.6	Portland Cement & HL3		
Gull River	Upper	8.0	Portland Cement & HL3	12.7	HL3
	Middle	0.0		2.2	HL4
	Lower (Upper)	6.8	HL4	8.2	HL4
	Lower (Lower)	4.7	Road Base		
Shadow Lake		2.2	Not Tested	4.8	Not Tested

Core samples from BH2, BH3 and BH5 displayed similar lithology. It is expected that there will be variations in rock quality aerially and in depth throughout the site.

All Table 3 products will require processing, i.e. crushing, screening, and possibly washing. Products requiring minimal processing include armorstone and large rip-rap.

5.4 Material Quantity

The total aggregate resource available on the Ferma site is approximately 410 million tonnes. This is estimated by multiplying the areal extent of the property (384.5 hectares) by the average depth of limestone measured from borehole logs (41 metres) by the bulk density of limestone (2.6 tonnes/m³). However, due to



setbacks, ramps, slopes, and undesirable aggregate, only 150 million tonnes is to be removed.

Extraction will occur in two distinct parts, comprising of five phases. The following table summarizes the estimated volume and tonnage of aggregate available, and the lifespan of each source. Details of proposed limits of extraction, and extraction sequence, are shown on the Operations Plan, and Progressive Rehabilitation and Final Rehabilitation Plan.

Table 4
Extraction Volumes, Tonnage, and Life Span
Ferma - Carden Quarry

Part	Phase	Volume (x 10 ⁶ m ³)	Tonnes (x 10 ⁶)	Lifespan (at 10 ⁶ tonnes per year)
North	1	17	44	44
	2	17	44	44
	3	8	21	21
Subtotal		42	109	109
South	4	9	23	23
	5	7	18	18
Subtotal		16	41	41
TOTAL		58	150	150

Actual site lifespan will be longer due to less than optimum extraction rates during the first few years of start-up, and in periods of low market demand.



5.5 Market Demand

The proponent is part of the Ferma group of construction and ready-mix companies active in south central Ontario between Mississauga, Trenton, and Lindsay/Peterborough. The intention of this quarry development is to secure aggregate supplies for construction contracts which typically include municipal infrastructure improvement projects valued at \$40,000,000 annually.

Coarse aggregate supplies closer to greater Toronto area are being depleted, or are not accessible. Planning restrictions imposed on resource reserves within the Niagara Escarpment, Oak Ridges Moraine, and prime agricultural lands have reduced potential areas of new resource development. A reduction in these more convenient sources of supply has put a greater demand on aggregate reserves located in Victoria County to meet growth in the greater Toronto area.



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6.0 TRUCK TRAFFIC - AGGREGATE RESOURCES ACT SECTION 9(1)(e)

Main haulage routes and proposed truck traffic to and from the site.

The implications of traffic generated by the proposed quarry were evaluated by the Traffic Impact Assessment report prepared by Oliver, Mangione, McCalla & Associates Limited.

6.1 Site Entrance

Site development will occur in two separate parts requiring an entrance for each part, however, only one entrance will be used for material haulage at any one time. The proposed entrances will be from Concession Road X, which is presently unopened. A new road constructed within the Concession right-of-way to municipal standards is required from Side Road 5/6 to the most northerly entrance, or approximately 1,350 metres.

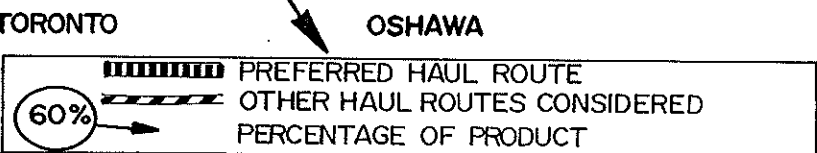
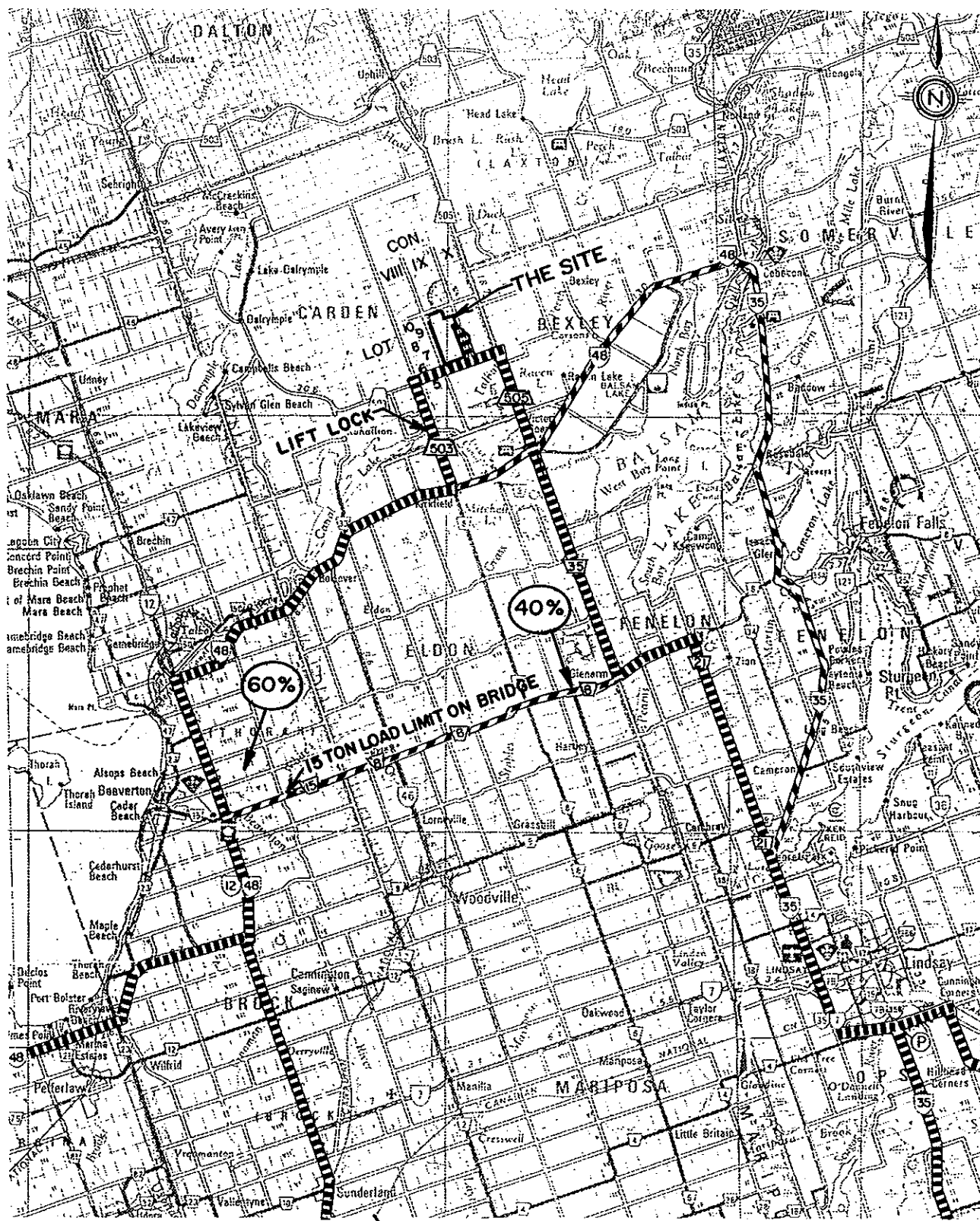
6.2 Haul Routes

Alternative haul routes were examined. Preference was given to routes which are superior structurally, were most efficient in terms of reaching market destinations, and which would result in the least exposure to roadside residences. The suggested haul routes are shown on Figure 3, and summarized in Table 5.

Table 5
Proposed Haul Routes
Ferma - Carden Quarry

Destination	Route	Percentage of Quarry Product	Average Daily Trips	
			1995	2005
Local	Scattered	Minimal	Minimal	Minimal
Southwest (Toronto and area)	Hwy 503↔VRd 48↔Hwy 12	60%	32	126
Southeast (Lindsay/Peterborough and south)	Hwy 505↔VRd 35↔VRd 8 ↔VRd 21↔Hwy 35	40%	21	84





DATE JUNE 1994	 OLIVER, MANGIONE, McCALLA & ASSOCIATES LIMITED CONSULTING ENGINEERS, HYDROGEOLOGISTS & PLANNERS		DWG. No. 92-8977-S9
SCALE 1:250 000	TITLE HAUL ROUTES	—	FERMA-CARDEN QUARRY
			FIG. 3

6.3 Traffic Impact Analysis

Table 6 illustrates the projected impact of quarry traffic on the selected haul routes during the first and tenth years of operation.

Table 6
Summer Average Week Day Traffic Volumes (SAWDT)
Ferma - Carden Quarry

Road	Section	1991 SAWDT	Annual % Growth Assumed	Projected SAWDT		Quarry SAWDT	
				1995	2005	1995	2005
Township Roads							
SR 5/6	Site - Hwy 503	<50		<100	<100	48	189
SR 5/6	Site - Hwy 505	<50		<100	<100	32	126
Victoria County Roads							
VRd 35	Hwy 48 - VRd 8	1,950	5.0	2,400	3,900	32	126
VRd 8	VRd 35 - VRd 21	3,450	5.0	4,200	6,800	32	126
VRd 21	VRd 8 - Hwy 35	2,340	5.0	2,800	4,600	32	126
Provincial Highways							
Hwy 503	SR 5/6 - Hwy 48	1,350	4.0	1,600	2,300	48	189
Hwy 48	Hwy 503 - Hwy 12	5,000	3.5	5,700	8,100	48	189
Hwy 505	SR 5/6 - Hwy 48	610	1.0	640	700	32	126

SR - Side Road
VRd - Victoria County Road

The following are the conclusions and recommendations of the Traffic Impact Assessment Report:

Road Capacities

- The capacity of a two lane highway on flat terrain is in excess of 9,000 vehicles per day before an appreciable impact is felt. From Table 6, quarry generated truck traffic will not impact existing highway capacity.



- Quarry truck traffic will occur during weekdays between 6:00 am and 7:00 pm, with a significant reduction in traffic on Friday afternoons, and Saturday mornings between 6:00 am and 12:00 noon. No hauling will occur on Saturday afternoons, and Sundays. This schedule should not conflict with summer weekend traffic, and more specifically, peak tourist periods at the Kirkfield lift locks.
- No analysis of the broader spectrum of the provincial highway system is undertaken due to variability with respect to specific destinations, and relative volume of quarry generated traffic travelling to those destinations via various transportation routes.
- Side Road 5/6 should be upgraded to applicable municipal standards to accommodate higher traffic volumes, and width of haulage vehicles. Similarly, the unopened road allowance between Concessions IX and X must be constructed to an acceptable standard from Side Road 5/6 to the proposed site entrance(s).

Intersections

- Concession X and Side Road 5/6
There are no site distance limitations on Side Road 5/6 at this location. The new intersection should be constructed with adequate turning radii, and a stop sign on the concession road.
- Side Road 5/6 and Highway 503
Good distances in both directions, and low traffic volumes do not necessitate turning lanes.
- Side Road 5/6 and Highway 505
Same as above, although turning radii should be improved when Side Road 5/6 is reconstructed.



- Highways 48 and 503
Located in a built-up area, speed limits are reduced to 50 km/h in all directions. Intersection improvements are not required due to low travel speeds. Traffic signals may be considered in the future depending on Highway 48 traffic growth.
- Highways 48 and 12
Signal lights and turning lanes are in place.
- Highway 48 and Highway 505/Victoria Road 35
Anticipated quarry traffic flow will be straight through this intersection in a north-south direction on Highway 505 and Victoria Road 35.

East and west site distances on Highway 48 are adequate. Although turning movement is not expected, there are deceleration lanes on Highway 48 in both directions.

A knoll on Highway 505 just north of the intersection reduces approach site distance from the north. In addition, a downward gradient travelling towards the intersection increases required stopping distance.

As a minimum, a flashing stoplight visible from beyond the brow of the knoll warning southbound vehicles on Highway 505 of the approaching stop, should be erected. However a four-way flashing light with red north-south bound stop, and amber east-west bound warning, would increase the factor of safety to motorists travelling in all directions. Approaching stop warning signs for southbound traffic on Highway 505 are in place.



- Victoria County Roads 35, and 8, and Roads 8 and 21
Traffic volumes on these roads are relatively low in terms of road capacity, and sight distances are adequate. Adjustments to both intersections should be determined in consultation with the County of Victoria.
- Highway 35 and Victoria County Road 21
Intersection improvements at Highway 35 and County Road 21 should be determined in consultation with the Ministry of Transportation and County of Victoria.

Further to the above, it was recommended by the Noise Impact Assessment that residents fronting onto Side Road 5/6 be advised in writing of proposed increases in truck traffic.



7.0 GROUNDWATER AND SURFACE WATER MOVEMENT - AGGREGATE RESOURCES ACT SECTION 9(1)(f)

The water table and any existing surface water on and surrounding the site and proposed water diversion, storage and drainage facilities on the site and points of discharge to surface water.

The proposed depth of extraction will occur to an average elevation of 235 m.a.s.l., or below the static groundwater level which ranges between 262 and 272 m.a.s.l. The impacts of dewatering on groundwater and surface water regimes were assessed in the Hydrotechnical Report prepared by Oliver, Mangione, McCalla & Associates Limited. Applicable excerpts from this report follow:

7.1 Existing Wells, Water Table Elevation and Drainage

Table 7 summarizes all existing wells and piezometers within 1.2 kilometres of the Ferma site. Figure 4 identifies the location of each well while Figures 5 and 6, identify the potentiometric groundwater surface elevations on both plan and cross-section. Surface drainage characteristics are shown on Figure 7.

7.2 Dewatering

Surface run-off into the quarry excavation will be diverted by earth berm screens, and the construction of an interceptor ditch along the east perimeter of the North Part. The interceptor ditch (Figure 4) will divert upstream drainage from the intermittent northerly branch tributary to the main Talbot River tributary.

Quarry dewatering will be accomplished by pumping water collected within sumps to constructed ditches discharging to the Talbot River tributary. Proposed sump locations are shown on Figure 4.



Table 7
Well Summary
Ferma - Carden Quarry

Well No.	MOEE Well No.	Type	Use	Ground Elev. (masl)	Well Depth (masl/m)	Static Level/Depth (masl/m)	Water Found (masl/m)	Comments	Source of Data
W1		drilled	domestic	274		272/2		sealed	tenant
W2	64-5891	drilled	domestic	271	261/10	267/4	261/10	sealed	MOE log
W3	64-5890	drilled	domestic	266	251/14	264/2	261/5	sealed	MOE log
W4		drilled	domestic	264	254/10	260/4		sealed	owner
W5	64-5096	drilled	domestic	265	257/8	261/4	257/8	sealed	MOE log
W6	64-3691	drilled	domestic	264	256/8	261/3	256/8	sealed	MOE log
W7		drilled	obstructed	266				hand pump	MOEE log
W8		dug	none	270.0	264/6	268.0/2.0		hand pump	survey
W9		drilled	domestic	269.8	255/9	266.5/3.3		open casing	survey
W10		drilled	none	268.3	263/5	267.6/0.7		hand pump	survey
W11		dug	none	271.9	265/7	268.8/3.1		hand pump	survey
W12		dug	none	272.0	267/5	269.1/2.9		hand pump	survey
W13		drilled	obstructed					wind pump	survey
W14		drilled	none	268.7	267/2	268.1/0.6		wind pump	survey
W15		drilled	obstructed					wind pump	survey
W16		drilled	obstructed	266.1		265.7/0.4		wind pump	survey
W17		drilled	obstructed					open casing	survey
W18		dug	livestock	264.2	263/2	263.4/0.8		sometimes dry	survey
W19		drilled	none	269.0	260/9	265.8/3.2		open casing	survey
W20		drilled	obstructed					open casing	survey
W21		drilled	test well	270.9	256/15	267.0/3.9	dry	poor supply	survey&log
W22		drilled	test well	271.1	228/43	267.5/3.6	251/20	good supply	survey&log
W23	64-514	drilled	livestock	268	254/14	265/3	262/6	not inspected	MOE log
W24	64-515	drilled	livestock	271	253/18	266/5	253/18	not inspected	MOE log
W25	64-4295	drilled	domestic	271	258/13	266/5	259/12	not inspected	MOE log

masl:

metres above sea level

Static Levels:

W8, W9, W10, W11, W12, W14, W16, W18, W19, W21, and W22 - June 1993 to June 1994 average measurements. W2, W3, W5, W6, W23, W24, and W25 - MOEE well records. W1 and W4 - tenant/owner conversation.

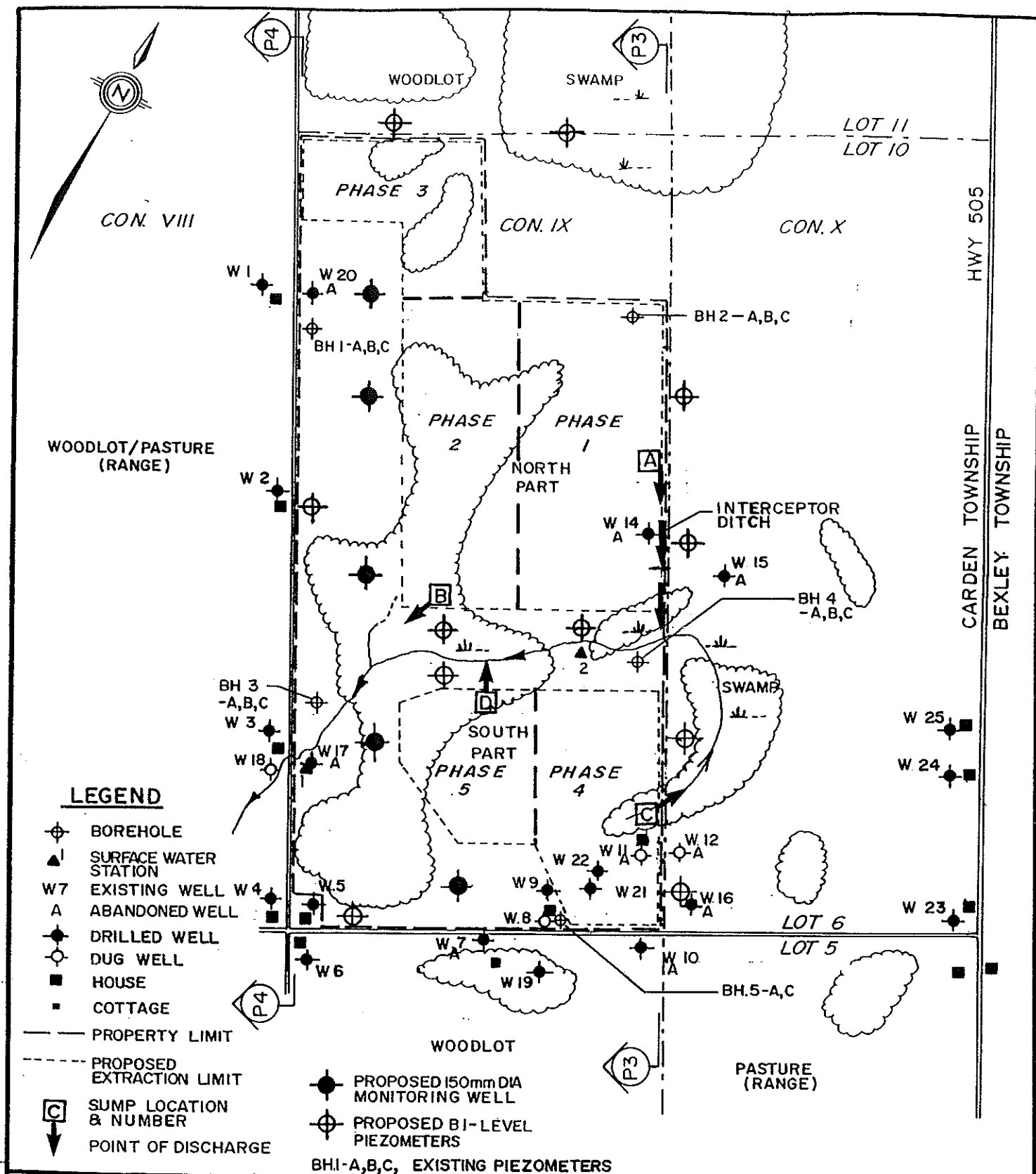


Table 7 (cont'd)
Piezometer Summary
Ferna - Carden Quarry

Borehole No.	Piezometer	Ground Elev. (masl)	Well Depth (masl/m)	Static Level/Depth (masl/m)	Comments
1	A	273.2	261.0/12.2	272.4/0.8	
	B	273.2	249.0/24.2	263.3/9.9	
	C	273.2	228.7/44.5	263.2/10.0	
2	A	271.3	262.1/9.2	270.6/0.7	
	B	271.3	247.0/24.3	266.8/4.5	
	C	271.3	229.8/41.5	266.7/4.6	
3	A	264.6	251.5/13.1	262.6/2.0	
	B	264.6	235.6/29.0	262.5/2.1	
	C	264.6	223.1/41.5	262.4/2.2	
4	A	267.4	258.1/9.3	266.6/0.8	
	B	267.4	243.1/24.3	266.7/0.7	
	C	267.4	225.9/41.5	266.8/0.6	
5	A	279.6	256.6/13.0	266.0/3.6	Obstructed
	B	279.6	242.2/27.4		
	C	279.6	225.1/44.5	263.5/6.1	

Static Levels: BH2A - May/June 1994 average measurements.
Remaining boreholes - June 1993 to June 1994 average measurements.

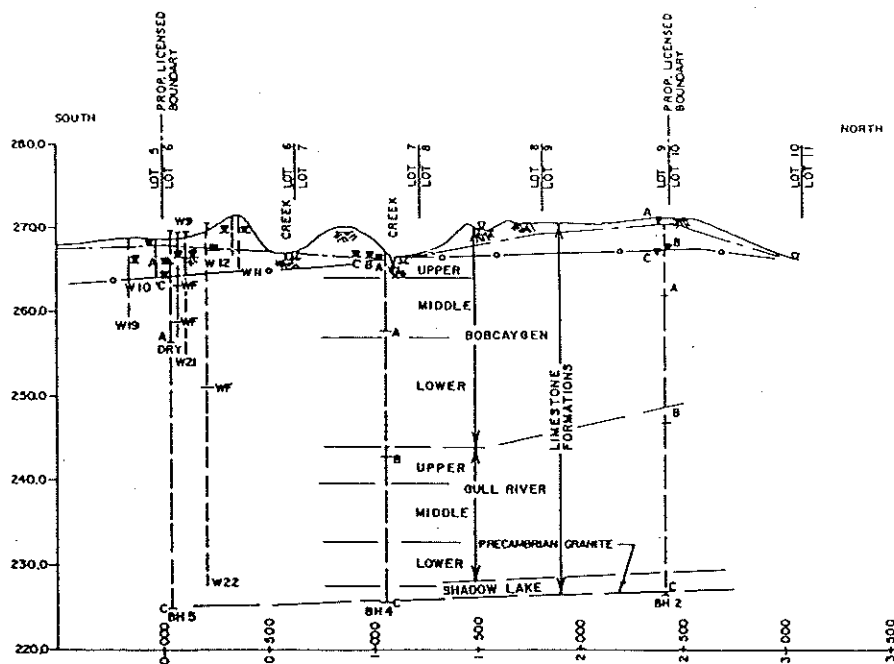




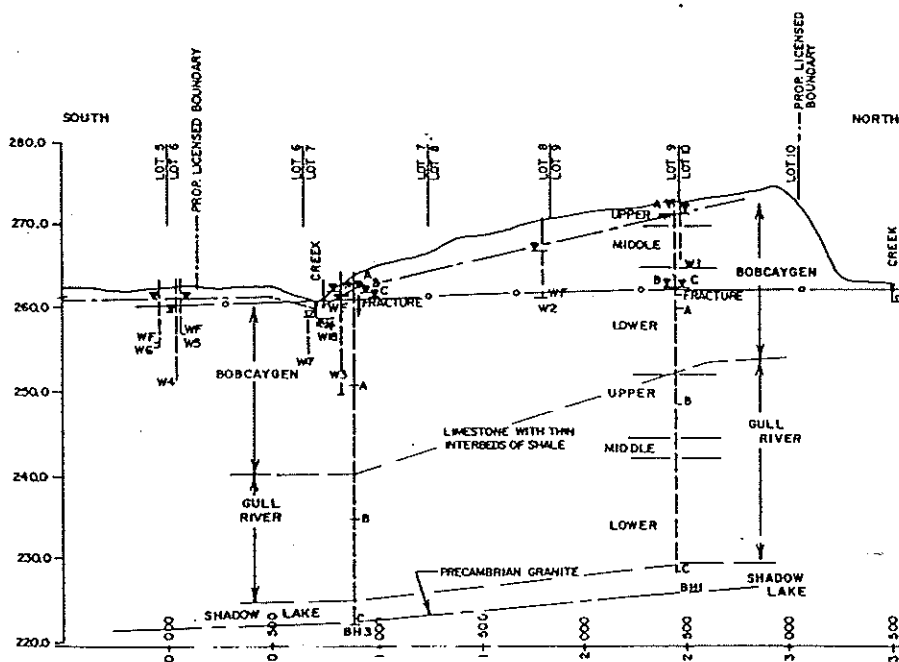
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DATE AUG., 1994	CLIENT FERMA - CARDEN QUARRY	DWG. No. 92 - 8977-S9
SCALE 1:20000	TITLE PROPOSED DEVELOPMENT	FIG. 4



P3 PROFILE - CONCESSION ROAD X



P4 PROFILE - CONCESSION ROAD IX

LEGEND FOR PROFILES

- TOP OF LIMESTONE
- STATIC WATER LEVEL
- WATER TABLE UPPER BEDROCK
- POTENTIOMETRIC SURFACE LOWER BEDROCK
- W2 WELL NUMBER
- BH3 BOREHOLE NUMBER
- BX PIEZOMETER NUMBER & STATIC WATER LEVEL
- SURFACE WATER LEVEL
- BASE OF PIEZOMETER WATER FOUND
- APPROXIMATE DIVISION BETWEEN GEOLOGIC ZONES
- UPPER, MIDDLE, LOWER MEMBERS OF GEOLOGIC FORMATIONS

NOTE: LIMESTONE GEOLOGIC PROFILES COMPILED FROM LABORATORY ANALYSIS OF CORE SAMPLES FROM BOREHOLES NUMBERS 1 & 4.

This Inferred Geological Section has been prepared for the purpose and context of this Report only and it should not be used by anyone as an indication of the true conditions that may exist.

NOTE: REFER TO FIG.4 FOR SECTION LOCATIONS.



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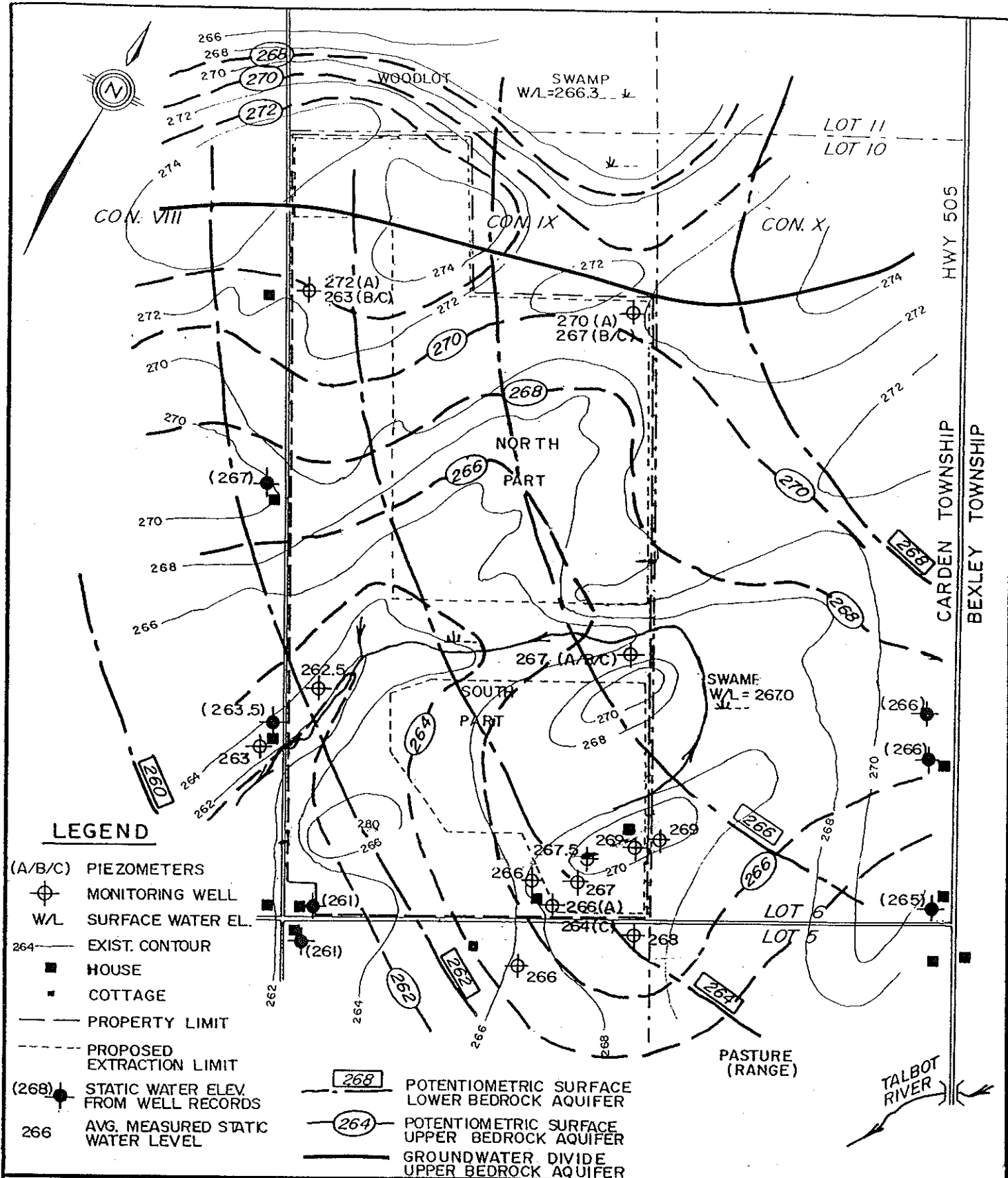
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TITLE

GEOLOGIC PROFILES

DWG. No.
92 - 8977 - S9

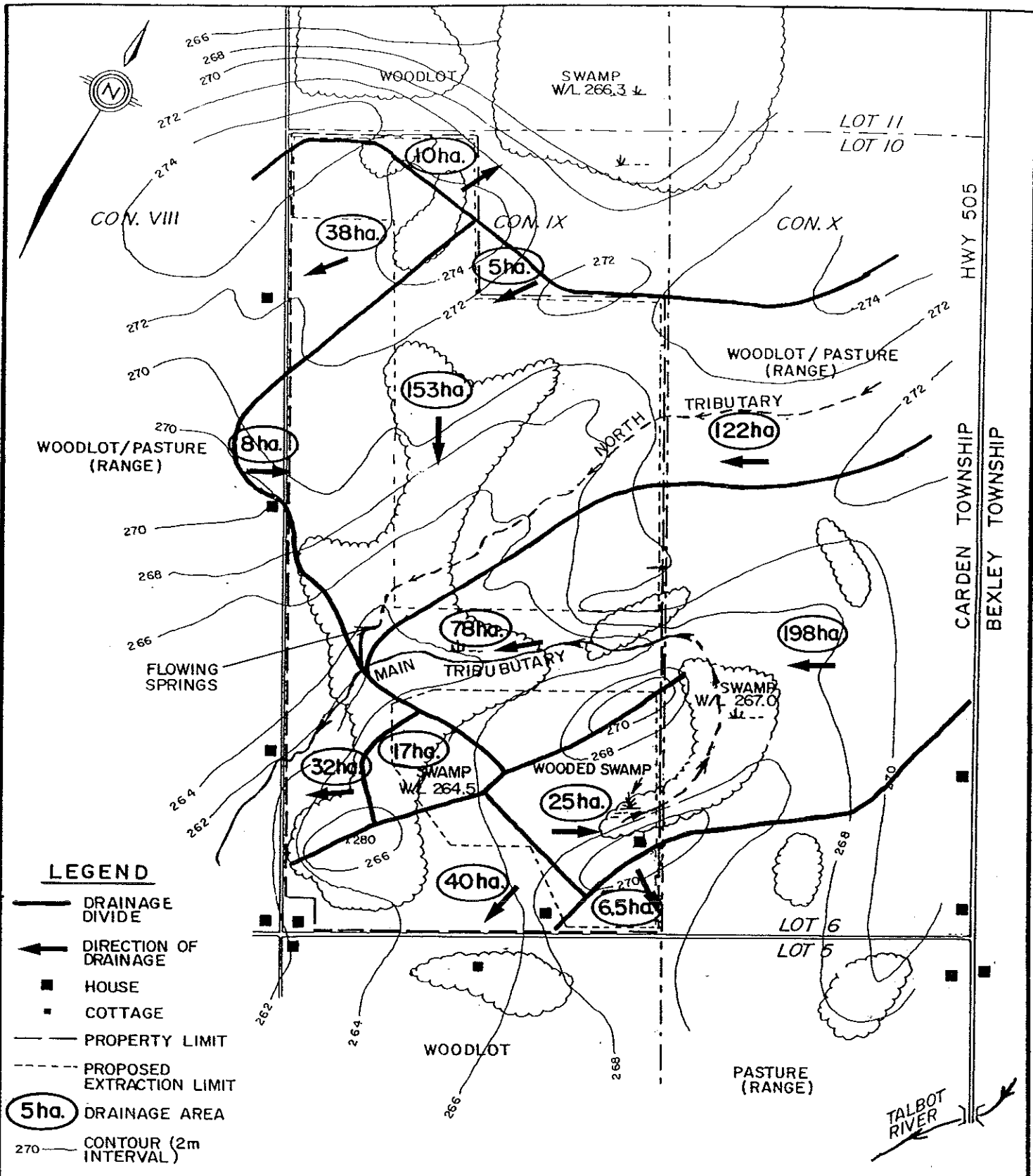
FIG. 6



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DATE AUG., 1994	CLIENT FERMA - CARDEN QUARRY	DWG. No. 92 - 8977 - \$9
SCALE 1 : 20000	TITLE MEASURED POTENTIOMETRIC SURFACE	FIG. 5



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92 - 8977-S9

SCALE
1 : 20000

TITLE

SITE DRAINAGE

FIG. 7

The vertical limit of excavation will extend through the upper bedrock aquifer and into the upper half of the lower bedrock aquifer. Estimated groundwater dewatering discharge requirements are based on values generated from drawdown simulations.

Maximum dewatering will occur during the months of April and November when mean monthly precipitation (rainfall) is maximum, and evapotranspiration losses are minimum. Using average April/November mean monthly rainfalls recorded at Peterborough and Orillia climatic stations of approximately 75 mm/month, the following (Table 8) are estimated dewatering requirements:

Table 8
Approximate Dewatering Requirements
at Full Site Development
Ferma - Carden Quarry

Sump/Quarry Section	Drainage Area (ha)	Maximum Average Day Flow (L/min)		
		Groundwater	Surface Water	Total
Sump A	44	120	760	880
Sump B	108	280	1,880	2,160
North Total	152	400	2,640	3,040
Sump C	26	270	450	720
Sump D	32	330	560	890
South Total	58	600	1,010	1,610

The above does not take into consideration internal water consumption.



To accommodate occurrences of instantaneous run-off, sump volumes should be designed to store 25 mm of precipitation. Peak pumping rates and detention times are summarized in Table 9 assuming no run-off losses due to evapotranspiration, depression storage, or infiltration.

Table 9
Sump Volumes, Peak Pumping Rates
and Detention Periods
at Full Site Development
Ferma - Carden Quarry

Sump	Drainage Area (ha)	25 mm run-off Volume (ha-m)	Dimensions (m)			Pump Rate (L/min)	Detention Time (hours)
			Depth	Length	Width		
A	44	1.0	3	65	60	6,800	27
B	108	2.7	3	100	90	9,000	50
C	26	0.65	3	50	45	4,500	24
D	32	0.8	3	60	45	4,500	29

Pump installation within each sump should be capable of meeting normal and peak pumping requirements.

7.3 Conclusions of Hydrotechnical Assessment

The conclusions of the hydrotechnical assessment are as follows:

1. Three aquifers exist above the Precambrian granite which is at 42 to 45 meters depth, they include: a discontinuous unconfined overburden aquifer, a shallow confined and unconfined limestone bedrock aquifer, and a lower confined limestone bedrock aquifer unit. Only the upper 15 metres of the limestone bedrock aquifer is currently exploited as a groundwater supply. Supply rates generated by this aquifer vary between 0.0 and 84 L/min.



2. The horizontal gradient of the upper bedrock aquifer groundwater flow is between 0.004 m/m and 0.008 m/m in a direction corresponding with local surface drainage patterns. Flow within the lower bedrock aquifer has a horizontal gradient of 0.003 m/m from northeast to southwest towards the Talbot River/Trent-Severn Canal corresponding with the regional direction of surface drainage.
3. Potentiometric surfaces of both bedrock aquifers converge at the Talbot River tributary stream which flows from east to west through the site. The stream is an area of both groundwater discharge and recharge, fluctuating on a seasonal basis. Upper plateaus are areas of potential groundwater recharge where vertical hydraulic gradients range between 0.005 and 0.008 m/m downwards.
4. Aquifer hydraulic parameters vary by several orders of magnitude vertically and in aerial extent. Piezometer hydraulic testing results show a decreasing trend in upper bedrock aquifer conductivity from 10^{-5} m/s within the southeast quadrant, to 10^{-7} m/s within the northwest quadrant of the site. The hydraulic conductivity of mid bedrock sections is generally one magnitude lower in upland areas decreasing slightly at the Talbot River tributary. Hydraulic conductivity within lower bedrock unit varies between 10^{-5} to 10^{-8} m/s.
5. Pump tests show a hydraulic connection between the overburden and bedrock aquifer exists at some locations. A hydraulic connection between the upper and lower bedrock aquifer units is likely at the Talbot River tributary stream, while no obvious connection exists at locations removed from the stream. This evaluation of potential hydraulic connection between bedrock aquifers is based on variances/similarities in potentiometric surfaces and relative continuity/discontinuity in upper, middle and lower bedrock permeability.
6. Dewatering will be required on a continuous basis to control groundwater inflow. This is due to the proposed excavation extending through the upper bedrock aquifer and into the upper sections of the lower bedrock



aquifer. Dewatering will also be required on a seasonal basis to deal with excess surface water derived from precipitation accumulating within the excavation.

7. On the basis of numerical simulations using the MODFLOW groundwater model, it is concluded that groundwater dewatering will result in a progressive decrease in water table elevations during quarry development.

Under the worst case scenario, it is predicted that two domestic wells would be affected by dewatering the North Part of the quarry. Using a conservative value of one-half the available head difference between water bearing fractures and the recorded static water level, W2 would not be adversely affected until dewatering is completed in Phase 1. The magnitude of impact cannot be determined on W1 due to an absence of well data, however, it is likely that it would not be adversely affected until dewatering is completed in Phase 2.

It is predicted that several domestic wells would be affected by dewatering within the South Part.

A comprehensive groundwater monitoring program, including the construction of additional monitoring wells, would confirm actual aquifer response to quarry dewatering. This information could be used to provide more precise predictions of future dewatering impacts in undeveloped quarry sections.

8. Numerical simulations predicts no adverse impact on Talbot River tributary baseflow. Discharging quarry groundwater and surface water influx by pumping to the Talbot River tributary would result in a gradual enhancement of stream baseflow, and reduce downstream flooding potential during peak run-off events.
9. A 30 hectare loss in watershed drainage area of the Canal Lake tributary and corresponding increase in watershed area of the Talbot River tributary, which are both tributary to Canal Lake, is considered insignificant.



10. Groundwater quality within the upper bedrock aquifer meets Provincial Drinking Water Objectives.
11. Groundwater quality will not be affected by quarry operational activities due to hydraulic gradients being established towards the excavation as a result of dewatering.
12. Surface water quality samples taken from the Talbot River tributary stream meet Provincial Water Quality Objectives. Although not evident at the time of sampling, the present unrestricted access by cattle to the watercourse would increase nutrient and siltation loadings substantially. This impact on-site will be eliminated with quarry development.
13. The provision of appropriately sized sumps located within the floor of the quarry would reduce suspended sediment particle size within quarry dewatering discharge to below that considered acceptable for cold water fisheries habitat.
14. Dewatering discharge temperature will not adversely impact stream water temperatures.
15. The risk of surface water contamination due to spills may be reduced by locating mobile fuel, oil, and chemical storage tanks within containment zones outside of areas susceptible to flooding; and requiring the refuelling and maintenance of haulage vehicles off-site.
16. Water quality monitoring requirements may be imposed when applications are made relative to the requirements of the Ontario Water Resources Act.

7.4 Recommendations of the Hydrotechnical Assessment

The quarry may proceed according to the proposed operational plans subject to the following conditions:

1. The quarry development commence in the North Part and proceed in an overall direction from east to west.



2. Additional groundwater monitoring wells are constructed around the perimeter of the northerly quarry section prior to installing dewatering works, and sited as follows:
 - One bi-level monitoring well opposite MOE Well No. 64-5891 (W2) on the westerly boundary of the site.
 - Three 150 mm diameter wells evenly spaced setback 250 metres east of the west boundary.
 - Six bi-level monitoring wells evenly spaced outside the limits of extraction; with two along each the north, east, and south limits of the North Part.
3. The South Part of quarry development should not proceed until the northerly section has been completed, decommissioned, and flooding commenced. Prior to dewatering, additional groundwater monitoring wells are to be constructed around the perimeter of the southerly quarry section at the following locations:
 - One bi-level monitoring well adjacent to the northwest limit, and two adjacent to the east limit of extraction.
 - One bi-level monitoring well opposite W5 (MOEE well 64-5096) in the extreme southwest corner of the site.
 - Two 150 mm diameter wells setback 150 metres from the westerly and southerly property limits, respectively.
4. That bi-level monitoring wells consist of a lower piezometer set 5.0 metres below the proposed depth of extraction, and an upper piezometer set approximately 15 metres below the ground surface.



5. That 150 mm diameter monitoring well construction extend to 5.0 metres below the proposed depth of extraction, and comply with Ontario Regulation 903 of the Water Resources Act.
6. That monthly records be maintained and include: water levels in all existing and proposed monitoring wells, pumping rates, sump water levels, and streamflow measurements at upstream and downstream locations.
7. The impacts of dewatering be reassessed on an annual basis.
8. That the following contingency measures be considered should adverse impacts be predicted upon annual reassessment:
 - A modification to the proposed limits of extraction.
 - Groundwater re-injection utilizing constructed supply and injection wells.
 - The drilling of deeper wells with the permission of the affected property owner.
9. If employed, wash plant water should be recycled, or exclusive settling ponds constructed rather than utilizing dewatering sumps for this purpose.
10. That temporary erosion control measures be employed during stripping and berming operations, and that all disturbed overburden areas be seeded as soon as possible. In addition, cattle access to the Talbot River tributary stream should be controlled.
11. Provisions to control spillage from fuel, oil, and chemical storage tanks should be provided; and that a Spill Control Plan be prepared.



7.5 Other Considerations

A Permit to Take Water, and for subsequent discharge to surface waters, will be required prior to dewatering under the Water Resources Act. In addition, the necessity of obtaining approval under the Lakes and Rivers Improvement Act for proposed surface water diversions are to be determined in consultation with the Ministry of Natural Resources.

The implementation of contingency measures such as groundwater re-injection will require consultation with the Ministry of Environment and Energy.



8.0 TOPSOIL, SUBSOIL AND AGGREGATE STOCKPILES - AGGREGATE RESOURCES ACT SECTION 9(1)(g)

The location and size of existing and proposed stockpiles of topsoil, subsoil, and overburden and the location and size of proposed aggregate stockpile areas.

8.1 Current Stockpiles

There are currently no stockpiles on the site.

8.2 Proposed Topsoil, Subsoil and Overburden Stockpiles

Most of the Ferma site has less than 0.3 metres of overburden except in the extreme southeast corner of the site where a maximum of five metres of overburden was measured.

All overburden and the upper layer of fragmented limestone is to be conserved and utilized for berm screen construction. In areas where the topsoil is thick enough to allow separation from the overburden, it will be stripped and stockpiled on top of berm screens once they have been established. Excess topsoil will also be utilized for berm construction should quantities dictate.

The following categories of berm screens are proposed:

- Perimeter 4.0 metre visual berm screens within 30 metre licence boundary set backs located adjacent to Concession Road X, Side Road 5/6, Concession Road IX, and unopened Side Road 10/11.
- Transitional acoustical/excess overburden/topsoil berm screens adjacent to environmental buffer from creek. Berm heights will vary from 3.0 metres at easterly limits to 9.0 and 10.0 metres at their westerly limits.
- North Part 12.0 metre acoustical berm screen along west limit of extraction.



- South Part 12.0 metre acoustical berm screen along west limit of extraction.
- South Part 10.0 metre berm screen along the south limit of extraction.
- North and South Part interim 9.0 metre acoustical berm screen at respective mid sections.
- Perimeter 2.5 metre visual berm screen within 15.0 metre setback projected perpendicular to unopened Side Road 10/11.

Upon completion of each Part, berm material will be used to establish the final slopes around the perimeter of extraction. Topsoil stockpiles within berm screens are to be conserved and re-applied after final slopes have been created using overburden material.

8.3 Proposed Aggregate Stockpiles

Stockpiles of aggregate will be located immediately adjacent to the processing areas to assist in noise attenuation. During early stages of operations a portable processing plant will be used. The movement of the portable plant with advancing operations will cause the stockpiles to move accordingly. Once permanent plants are established aggregate stockpiles will be permanently located adjacent to same.

Aggregate stockpiles will vary in size and number according to market demand and seasonal fluctuations. Stockpiles are to be 15.0 metres high when situated on original grade, 25.0 metres high when located on the floor of the first 10 metre lift, and 30.0 metres high when located on lower lifts.



Aggregate stockpiles are to be relocated to the floor of each sequential lift when space permits. Undesirable material is to be placed on perimeter benches to form final slopes.

8.4 Stump Stockpiles

Stockpiles for stumps and waste brush are designated for each part of quarry development in locations screened visually by existing vegetation and topography.

All other scrap material shall be removed from the site and disposed of at an approved location.



9.0 PLANNING AND LAND USE CONDITIONS - AGGREGATE RESOURCES ACT SECTION 9(1)(h)

Planning and land use considerations.

9.1 Site Land Use, Zoning and Official Plan Designation

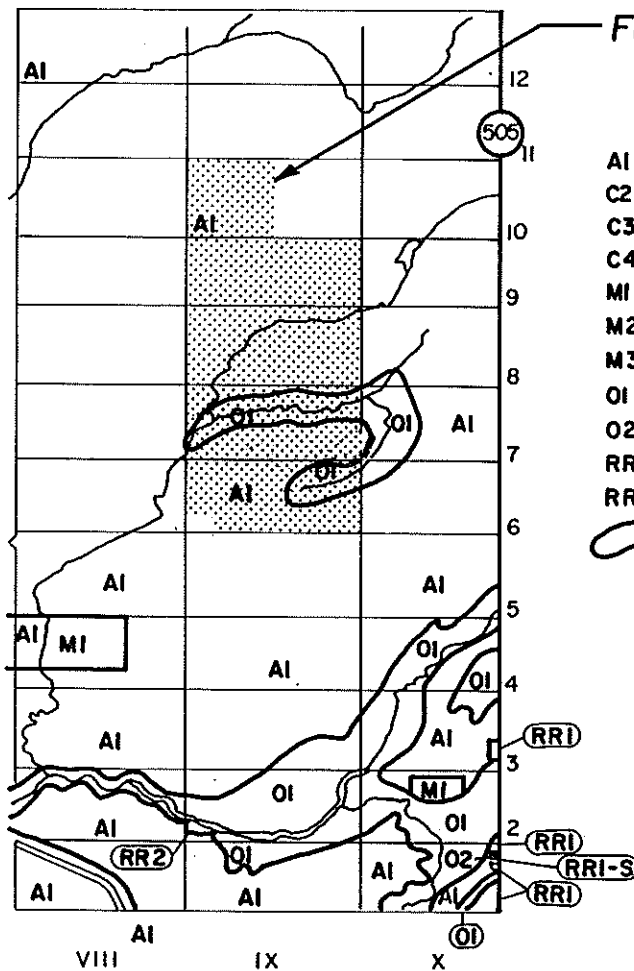
Presently, site uses consist of woodlot, swamp, cattle grazing with some cultivation of hay. The property is currently zoned A1 - Rural General, and O1 - Open Space around a tributary creek of the Talbot River which flows across the site as shown on Figure 8. Corresponding Official Plan designations are Rural and Environmental Protection.

The application for Official Plan amendment consists of redesignating approximately 345.0 hectares of land being all of Lots 8, 9, and part of Lots 6, 7, and 10, Concession IX, Township of Carden, from Rural to Pits and Quarries; and approximately 5.0 hectares of land being part of Lot 6, Concession IX, Township of Carden, from Environmental Protection to Pits and Quarries. The existing O1 zoning in the east part of Lot 6 encompasses a 5.0 hectare wooded swamp partially created by the construction of an old access road within the road allowance between Concessions IX and X.

Lands surrounding a tributary stream of the Talbot River within Lot 7, Concession IX, Carden Township presently designated as Environmental Protection (34.5 hectares) are to be maintained.

The above amendments to the Victoria County Official Plan and Carden Township Zoning By-Law, must be successfully obtained prior to the granting of a Quarry Licence.





FERMA SITE

ZONES

- AI RURAL GENERAL
- C2 HIGHWAY COMMERCIAL
- C3 COMMERCIAL RECREATION
- C4 COMMERCIAL CAMPGROUND
- M1 INDUSTRIAL EXTRACTIVE
- M2 INDUSTRIAL DISPOSAL
- M3 GENERAL INDUSTRIAL
- O1 OPEN SPACE
- O2 OPEN SPACE SPECIAL USE
- RR1 RURAL RESIDENTIAL TYPE ONE
- RR2 RURAL RESIDENTIAL TYPE TWO
- ZONE BOUNDARY



OLIVER, MANGIONE, McCALLA & ASSOCIATES LIMITED
CONSULTING ENGINEERS, HYDROGEOLOGISTS & PLANNERS

DATE MAR 1995	CLIENT FERMA - CARDEN QUARRY	DWG. No. 92 - 8977-S9
SCALE N.T.S.	TITLE CARDEN TOWNSHIP ZONING - SCHEDULE 'A' OF BYLAW 79-2	FIG. 8

9.2 Adjacent Land Use, Zoning and Designation

Adjacent land uses consists of pasture, woodlot, swamp, rural residential and utility infrastructure (Bell Canada communications tower). With the exception of a continuation of the O1 - Open Space zoning within Lot 7, Concession X, surrounding lands are zoned A1 - Rural General.

9.3 Final Subject Site Land Use, Zoning and Designation

The proposed final land use is water oriented recreation and related development. Upon site rehabilitation, the applicable proposed land use designation under the present Official Plan would be Shoreline. Applicable zoning categories would include C3 - Commercial Recreation or C4 - Commercial Campground, or RR2 - Rural Residential Type Two.



10.0 SUMMARY - AGGREGATE RESOURCES ACT SECTION 9(1)(i)

The reasons for the conclusions in the report.

It has been validated through exploratory drilling and core sampling that there is a viable nonrenewable aggregate resource reserve within the Ferma - Carden Quarry site which will meet the contractual demands of the Ferma group of construction and ready-mix companies. In addition, there are economic-social benefits that would be realized locally by the development of this resource, provided environmental constraints/concerns can be satisfactorily addressed. The technical reports prepared to assess various potential impacts resulting from the proposed quarry development have concluded that these concerns may be satisfactorily addressed by the implementation of recommended mitigation measures which include:

Ecology

- The quarry may proceed without adversely affecting the ecology, provided a 400 metre setback is observed from loggerhead shrike nesting areas. The present identified nesting area is approximately 400 metres west of the proposed final limit of extraction. Should the nesting location move to within 400 metres of extraction operations, extraction in the direction of the nest would be discontinued until the nest site has been abandoned for at least two consecutive years.
- Proposed setback distances from the Talbot River tributary stream are much greater than minimum requirements thereby protecting the existing riparian habitat.



Blast Vibration

- Residences will be well protected by stand-off distances and proposed berms.
- Modern blasting techniques will permit blast vibrations and overpressure at below MOEE guidelines.
- Limiting the initial lift to 10.0 metres will result in smaller charges, subsequent blasting of lower lifts will be buffered by depth.
- Charges to be set off at a regular pre-determined time(s).
- Buildings surrounding the proposed quarry are to be pre-blast surveyed prior to start up, all blasts will be monitored for at least the first year of operation.
- The use of non-electric initiating systems.

Noise

- Using conservative assumptions (i.e. the full complement of mining equipment concurrently operating at their respective maximum sound emission levels clustered together, and the absence of ambient noise from the nearby Preston Quarry), would result in certain receptors being exposed to noise levels over the MOEE guideline by up to 3 dBA. This is considered insignificant as it is clearly a worst case condition and would apply to limited time periods.
- Highest sound levels will occur throughout the week when recreational uses are lowest.
- Noise control features have been incorporated into the operational design including setbacks, interim and perimeter berms, direction of quarrying, location of noisy pieces of equipment, equipment specifications and permanent processing plant design.



- Hours of operations are to be restricted to weekdays between 6:00 and 19:00 and Saturdays between 6:00 and 12:00, with drilling operations further restricted to between 7:00 and 17:00 on weekdays only.

Haul Routes

- Haul routes have been selected to minimize local residence by-passes.
- The upgrading of township roads to accommodate truck traffic will be carried out in consultation with Carden Township.
- Haul route intersections improvements to accommodate truck traffic will be carried out in consultation with the Ministry of Transportation, Victoria County, and Carden Township.
- Haulage hours are to be restricted to weekdays between 6:00 and 19:00, and Saturday mornings between 6:00 and 12:00. No hauling will occur on Saturday afternoons, Sundays or statutory holidays.
- Hauling will have minimal conflict with peak tourist traffic.

Air Quality

- Downwind emission concentration estimates are conservatively estimated as no allowance has been made for a reduction in dust particulate concentrations due to gravitational settling of dust particles. Projected dust concentrations are therefore conservatively estimated.
- Although temporary, during the initial start-up of the southerly and northerly parts of the quarry, dust emissions, and dispersion due to prevailing winds will exceed Ambient Air Quality Concentration (AAQC) objectives within 300 metres of the easterly property limit. The lands affected are uninhabited and consist of pasture,



swamp and woodlot. This distance of impact will be reduced as mining activities progress towards the west.

- By using water sprays at crushing, and conveyor transfer points to achieve a material moisture content of 1.5%, and applying 1 L/m² of water to all areas of vehicular travel once every eight hours to obtain a 75% reduction in dust emissions, permanent plant related quarry activities will meet MOEE AAQC objectives at the easterly property line.
- Residences downwind of prevailing winds will be protected by stand-off distances.
- Road improvements include the treating of travelled surfaces with asphalt or surface treatment on haul routes will reduce dust emissions off-site.

Water Resources

- Through a comprehensive monitoring program consisting of monthly records of groundwater levels in existing and proposed monitoring wells, pumping rates, sump levels and stream flow measurements, the impacts of actual groundwater dewatering may be reassessed on an annual basis.
- Should the annual reassessment of groundwater dewatering reveal or predict adverse impacts on surrounding domestic wells, the following contingency measures may be implemented:
 - 1) Modifications to the proposed limits of extraction.
 - 2) Constructing dewatering and re-injection wells to artificially maintain groundwater levels in the vicinity of the affected domestic wells.
 - 3) Replacing affected domestic wells with deeper wells at no cost to the benefitting landowner.



- Dewatering sumps have been appropriately sized to reduce through detention, size to well blow 40 microns. Which meets present guidelines for cold water fisheries habitat.
- If material washing is to occur, recirculating wash plants, or dedicated settling ponds will prevent dewatering sumps from being utilized for this purpose.
- Pumping from sub-sumps within dewatering sumps will produce lower discharge temperatures.
- Watercourse baseflow will be augmented through quarry dewatering. Sump discharge locations will insure baseflows are maintained throughout the stream reach adjacent to the quarry.
- Temporary erosion control measures including rock check dams and siltation control fencing will assist in preventing silt from disturbed areas migrating to receiving watercourses.
- Cattle access to the Talbot River tributary will be restricted resulting in improved stream water quality.
- Fuel storage requirements, and limiting refuelling on-site to certain equipment, and the adoption of contingency spill control program will reduce the potential for groundwater or surface water contamination.
- 30 hectares of the Canal Lake watershed drainage area will be redirected to the Talbot River watershed. This loss represents 0.6% of the Canal Lake watershed and is considered insignificant. Furthermore, since the Talbot River flows into Canal Lake, there will be no net change in watershed drainage area to Canal Lake.



11.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the conclusions and recommendations of the various technical reports summarized herein, the Ferma-Carden Quarry can be operated within legislated requirements to develop a locally significant natural resource.

PREPARED BY:


Jamieson S. Gourley, P(Eng.)

JSG:rb



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