Ferma-Carden Quarry

Lots 6-9 & West Half of Lot 10, Concession IX, Carden Township

Environmental Impact Assessment

A Report For: Ferma Crushed Stone Inc.
c\o Oliver, Mangione, McCalla & Associates Ltd.

Prepared By: Niblett Environmental Associates Inc.

January 1995

NIBLETT ENVIRONMENTAL ASSOCIATES INC.

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PN 93-032

Ferma Crushed Stone Inc.
c\o Oliver, Mangione, McCalla & Associates Limited
Consulting Engineers, Hydrogeologists & Planners
89 Colborne St. E.
Orillia, Ontario
L3V 1T8

Attention: Mr. Jamieson S. Gourley, P. Eng.
Project Manager

RE: Ferma-Carden Quarry Environmental Impact Assessment

Dear Mr. Gourley

We are pleased to present our Environmental Impact Assessment report on the proposed Ferma-Carden Quarry.

We have conducted a background literature review, a field survey program and reviewed the quarry site operational and rehabilitation plans. Based on this review, we have identified and assessed the potential impacts of the proposed quarry on the biological resources, both on-site and in the site vicinity. We have concluded that there were no biological resources of such especial significance as to preclude development of the quarry. Any potential impacts to the identified significant biological features can be adequately mitigated.

Should you have any questions or require further clarification, we would be pleased to discuss our report in more detail.

Sincerely

David G. Cunningham

David G. Cunningham
Senior Ecologist

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1.0 INTRODUCTION

1.1 General Background

Niblett Environmental Associates Inc. (NEA) was retained in June 1993 by Oliver, Mangione, McCalla & Associates (OMMA) to document the terrestrial and aquatic biological resources on a parcel of land owned by Ferma Crushed Stone Inc. The entire Ferma holdings cover approximately 384.5 hectares of which 240.6 hectares will be developed (OMMA 1994a).

1.2 Study Site Location

The Ferma-Carden Quarry property is located on Lots 6, 7, 8, 9 & West Half of Lot 10, Concession IX in the Township of Carden, County of Victoria. Figure 1 shows the general location of the site in relation to major political boundaries and communities.

The southern and northern boundaries of the property are Carden Line 5/6 (McNamee Road or Side Road 5/6) and Carden Line 10/11. The western and eastern boundaries are Concession Road IX and an unopened road allowance between Concessions IX and X. An intermittent tributary of the Talbot River traverses the property in an east to west direction. Figure 2 shows the location of the site in relation to local topographical features and road systems.

1.3 Proposed Development

The proposed development consists of a limestone quarry operation with a licenced area of 384.5 ha, an area of extraction of 205.2 ha, and a rehabilitation area of 240.6 ha (OMMA 1994a). The quarry would consist of two parts, a north and south extraction area. The south area would be quarried when the aggregate resource has been extracted from the north area. Based on the proposed development plan, the potential impacts to the terrestrial and aquatic natural environment resources were identified and assessed.

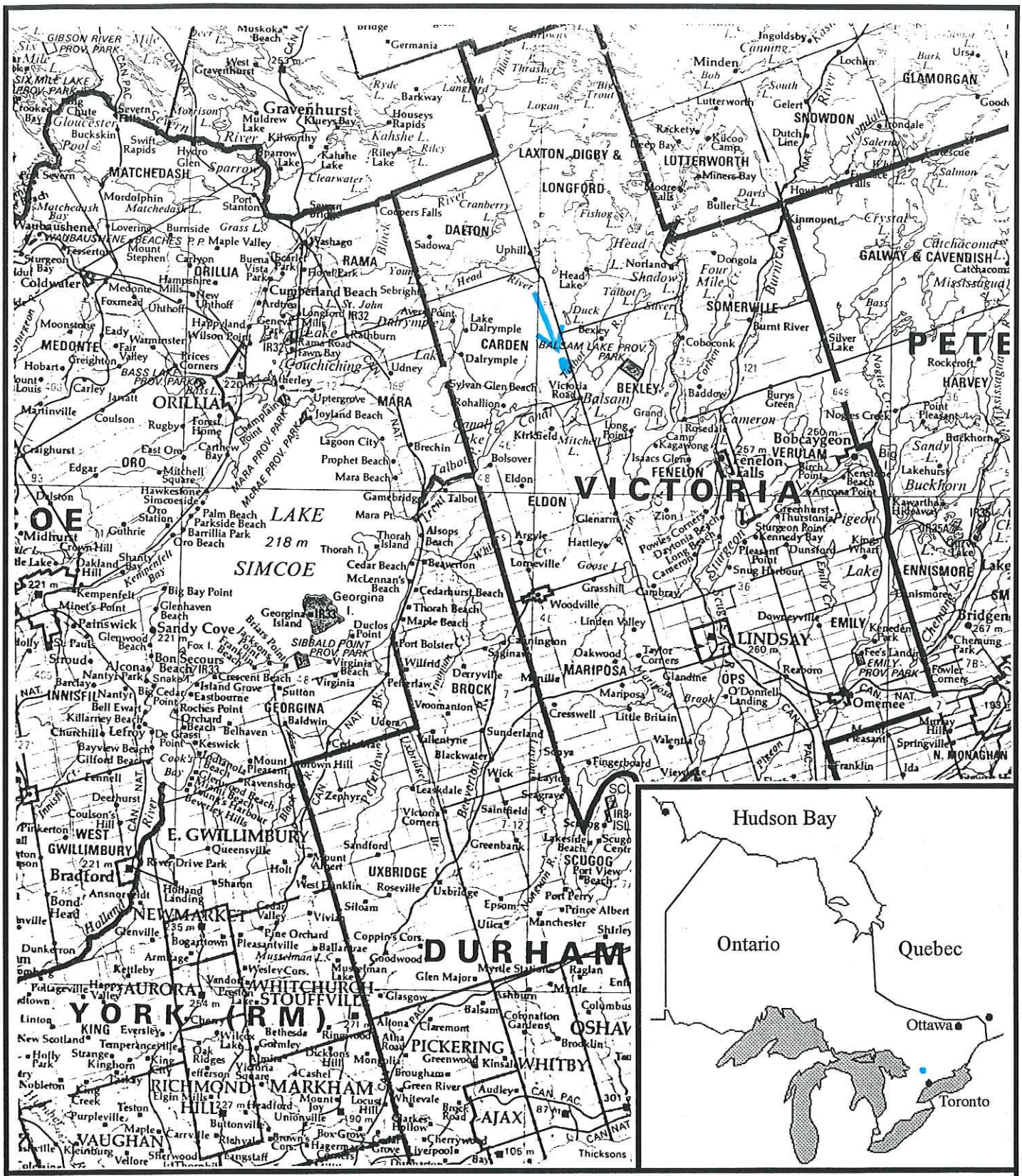

Figure 1: Study Site Location

Ferma-Carden Quarry

Lot 6,7,8,9 & West Half Lot 10, Concession IX, Township of Carden

Niblett Environmental Associates Inc. January 1995 1:600,000

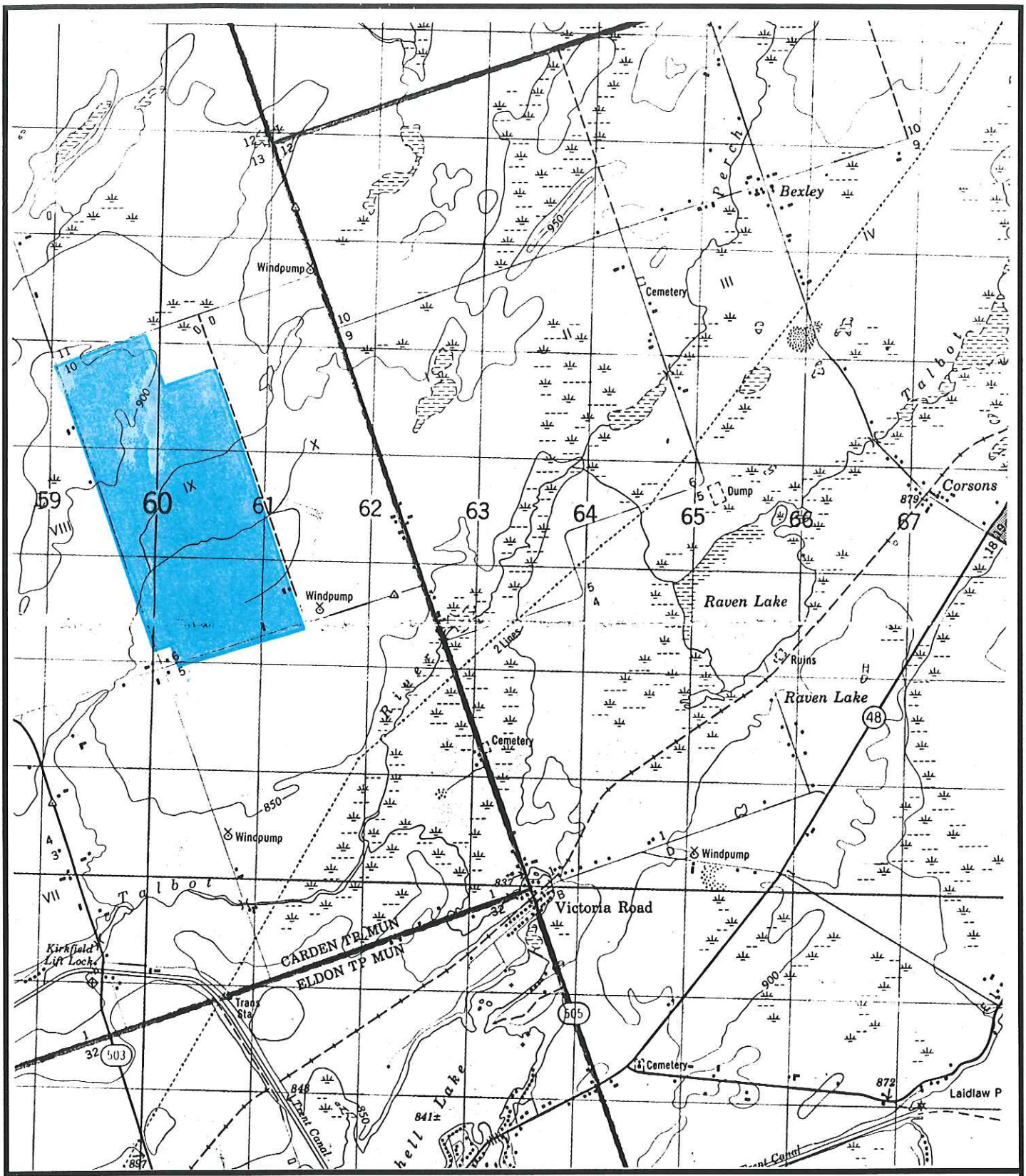

Figure 2: Study Area Location

Ferma-Carden Quarry

Lot 6,7,8,9 & West Half Lot 10, Concession IX, Township of Carden

Niblett Environmental Associates Inc. January 1995 1:50,000

1.4 Land Use Designations

The main land use designation on the property is Rural with an Environmental Protection designation along the intermittent tributary of the Talbot River (County of Victoria 1990 - Schedule A Land Use Designations). Zoning categories include Agricultural (A1) and an Open Space (O1) zoning along the edges of the tributary.

1.5 Study Rationale

The overall objective of the environmental impact assessment study was to document the existing terrestrial and aquatic biological resources on-site and on the site vicinity lands within 500 metres of the proposed licenced area. Based on the proposed development plan for the quarry and other technical reports, the potential impacts to the study area biological resources were identified and assessed. Mitigation measures and recommendations are proposed to help avoid or reduce short-term and long-term residual impacts to the identified biological resources.

Four basic phases were followed to address the natural environment concerns:

1. Collect existing background literature and files on the biological resources of the property and site vicinity lands within 500 metres of the property.

2. Provide a description of the existing terrestrial and aquatic biological resources on-site and in the site vicinity.

3. Identify any significant vegetation, wildlife and\or fisheries resources which could be affected by the proposed quarry.

4. Identify and assess the potential environmental effects or impacts on the identified biological resources and propose mitigation measures and recommendations where appropriate.

The environmental impact assessement will form part of the overall documentation in support of a licence application under the Aggregate Resources Act and required planning amendments to the Official Plan.

2.0 METHODS

The two main components of the environmental evaluation for the proposed quarry included the terrestrial and aquatic resources in a pre-defined study area. The study area included the entire property and adjacent site vicinity lands within 500 metres of the property boundary. Vegetation, wildlife, fisheries and surface water quality were inventoried during the spring, summer and fall months of 1993.

Prior to the initial site visits, data and information on the existing terrestrial and aquatic natural environment features was obtained from aerial photographs, background literature and the files of resource management agencies. Literature sources included but were not restricted to Bowles (1991), Catling et al (1975), Belcher et al (1992), Belcher (1992), Pittaway (1991a), Pittaway (1991b), Risley (1984), Cadman (1991) and Riley (1989).

2.1 TERRESTRIAL ENVIRONMENT

Inventories for the terrestrial environment component were restricted to the proposed licenced area and the remainder of the property. An overview of the site vicinity lands within 500 metres was obtained through aerial photographs, Forest Resource Inventory (FRI) maps and visual observations along opened and unopened county roads. Field visits were undertaken in June, July, August, September and early October of 1993.

Data was collected on the areal extent and composition of the major vegetation communities. The inventories of the flora and fauna for each community were recorded on audio tape and\or standard field checklists. A master species list for plants, birds, mammals, amphibians and reptiles was compiled from each of the individual checklists.

2.1.1 Habitat Mapping

Prior to the field visits, the major vegetation communities were characterized and mapped using individual black and white aerial photographs (1987, scale 1:16,000) a base aerial photograph mosaic, and FRI maps (OMNR 1980).

The major vegetation communities included forested stands, scrubland, grassed field, wetlands, riverine floodplain, pastureland and cropland. The extent and composition of these community types were refined by ground-truthing and then mapped on an aerial photo mosaic at a scale of 1:5,000. The field data was supplemented with information from the OMNR Minden Area office and other technical reports by OMMA.

2.1.2 Flora

Most of the vegetation communities that were inventoried for species composition, were visited in the late spring and summer months. All plant species encountered in each vegetation community were identified and recorded on standard field checklists. These checklists were later combined into one master species list for the entire study area. Species that were difficult to identify in the field were collected and retained for further identification. All of the property was traversed on foot and representative photographs of selected communities were compiled. As the botanical field work covered the period from late June to early October, some of the earlier flowering plant species may have been missed.

Locations of any rare, significant or unusual plant species or unique vegetation communities were mapped. The determination of level of rarity included a national, provincial, regional and local perspective. Rarity was based on a variety of standard status lists and published literature. Sources included COSEWIC (1994), Endangered Species Act (1990 with amendments), Argus and Pryer (1990), Argus et al (1982-1987), OMNR (1994), NHIC (1994) and Riley (1989). The designation of unique vegetation communties was based on the cummulative presence of indicators such as maturity, species richness, species composition, health, abundance and a lack of disturbance factors (i.e. cattle grazing, beaver activity, logging, windthrow, disease).

2.1.3 Fauna

All observations of wildlife were recorded during the vegetation and fisheries site visits. The species were recorded on standard checklists and\or on audio cassette. The data obtained was qualitative in nature and included birds, mammals, amphibians and reptiles. Evidence of breeding habitats or use of the property was determined and was supplemented through discussions with OMNR staff and the Ontario Breeding Bird Atlas (Cadman et al 1987). Additional data was obtained from background literature and the OMNR Minden Area Office.

For this environmental evaluation, rarity or significance was determined at the individual species level and also for assemblages of species which are indicative of quality wildlife habitat. The level of rarity included a national, provincial, regional and local perspective. Rarity for individual species was based on status lists and published literature. Sources included COSEWIC (1994), Endangered Species Act (1990 with amendments), OMNR (1994a), Austen et al (1994), Dobbyn (1994), Cadman et al (1987), James 1991, Eagles and McCauley (1982), Riley and Gould (1989), Oldham and Weller (1989), Oldham (1988), Weller and Oldham (1988), Oldham and Sutherland (1986) and Plourde et al (1989).

2.2 AQUATIC ENVIRONMENT

2.2.1 Aquatic Habitat Descriptions

The study area for the fisheries inventory included the Talbot River tributary on the Ferma property as well as off-site sections upstream and downstream. Detailed biophysical descriptions were compiled and a fisheries inventory was undertaken using a backpack electroshocker.

Biophysical habitat characteristics were initially assessed through aerial photographs and confirmed through ground-truthing. Major biophysical characteristics were mapped, recorded on site cards and photographed. All habitat characteristics were made visually and followed techniques outlined in Dodge et al (1987).

2.2.2 Fish Sampling

Fish collections were made with a Smith-Root backpack electroshocker. The field crew travelled in an upstream direction, while shocking all areas of fish habitat. The sampling method followed techniques outlined in Dodge et al (1987). Small fish were identified, counted and released. Some specimens were retained for species verification.

2.2.3 Surface Water Quality

Water quality was measured in the field using various meters and a HACH Ecological Combination Test Kit Model AL 36DT. Dissolved oxygen and temperature were measured with a YSI meter (Model 58). A portable HACH One pH meter (Model 43800-00) was used to measure pH. Alkalinity, acidity and hardness were analyzed with the HACH Ecological Combination Test Kit.

3.0 EXISTING CONDITIONS

3.1 SITE - TERRESTRIAL ENVIRONMENT

3.1.1 Vegetation Communities

During the site visits in 1993, the majority of the vegetation cover in the proposed licenced area consisted of open short-grassed fields interspersed with scattered pockets of immature deciduous and coniferous trees and shrubs. The southwest quadrant of the property contained stands of mixed and deciduous trees. The southeast quadrant contained cash crops such as hay. With the exception of the cash crop area, cattle had access to all parts of the property, particularly the open short-grassed fields and along the Talbot River tributary.

Table 1 contains summary descriptions of the 15 vegetation communities delineated and inventoried on the property. The following section contains detailed qualitative descriptions of these communties, including the dominant canopy species and representative groundflora (Figure 3).

Vegetation Community No. 1

This unit covered an extensive portion of the property (Figure 3). Based on the existing vegetation cover, topography, soils, exposed limestone outcrops and a review of the literature, it was classified as alvar habitat. Alvars as described by Beschel (1969) are areas of thin soil over essentially flat limestone rock with scant, but rather unusual vegetation (Catling et al 1975, Belcher et al 1992). This vegetation unit contained a combination of alvar meadows with complete vegetation cover and exposed rock flats with incomplete vegetation cover over limestone.

Scattered throughout this community were individual and small clumps of common trees and shrubs. Typical species included hawthorn (*Crataegus spp.*), meadowsweets (*Spiraea alba, S. latifolia*), common juniper (*Juniperus communis*), white birch (*Betula papyrifera*), baslam poplar (*Populus balsamifera*), basswood (*Tilia americana*) and white elm (*Ulmus americana*).

Table 1. Summary Descriptions of Vegetation Communities

Community	Area (ha)	Summary Descriptions
1	224.5	Alvar habitat with common graminoids with scattered hawthorns, prairie smoke, slender gerardia, Indian paint brush, hawkweeds and asters
2	13.0	Treed upland ridge with exposed bedrock, white spruce, white pine, white birch, poplars and hawthorns
3	28.0	Mixed uplands treed stand of eastern white cedar, white spruce, balsam poplar, white birch, white ash and balsam fir
4	14.7	Tributary edge stand of eastern white cedar, white pine, white spruce, white elm and white ash
5	3.0	Mixed upland stand of eastern white cedar, white birch, poplars and scattered white pine along edge of wetland
6	1.5	Treed and shrub thicket swamp wetland of dead eastern white cedar, black ash, red maple, silver maple, willows, dogwoods and speckled alder
7	33.0	Cropland and farmstead with hay fields and buildlings
8	4.0	Narrow, ribbon band of poplars, willows and soft maples
9	a - 15.0 b - 5.0 c - 7.5	Sub-unit 9a with hard maple, white birch, white ash, basswood, hop hornbeam and poplars; sub-unit 9b with poplars, white birch and basswood; sub-unit 9c with poplars, white birch, soft maples, white pine, white spruce and eastern white cedar
10	6.8	Scrubland habitat dominated by eastern white cedar and hawthorn with minor components of white spruce, white elm and willows
11	2.0	Small stand of mixed trees comprised of white pine, white birch, hard maples and poplars on a rocky outcrop
12	2.6	Upland stand of white pine with minor components of white elm, hard maple and eastern white cedar
13	2.0	Lowland stand of eastern white cedar along with poplars, soft maples and white birch
14	2.9	Treed swamp of dead hardwoods and conifers such as black ash, eastern white cedar, poplars and white elm
15	19.0	Old field habitat with remnant alvar and prairie affinities. Species included common graminoids, hawkweeds, common buttercup, goldenrods and asters

Characteristic groundcover forbs found on the alvar meadow sections included prairie smoke (*Geum triflorum*), hairy beardtongue (*Penstemon hirsutus*), four-seeded vetch (*Vicia tetrasperma*), balsam ragwort (*Senecio pauperculus*), wild bergamot (*Monarda fistulosa*), Indian paint brush (*Castellija coccinea*), slender gerardia (*Gerardia tenuifolia*), fringed gentian (*Gentiana crinita*), King devil (*Hieracium florentinum*), ox-eye daisy (*Chrysanthemum leucanthemum*) and red clover (*Trifolium pratense*).

Other groundflora in the meadow sections included grasses and sedges such as red fescue (*Festuca rubra*), timothy (*Phleum pratense*), poverty oat grass (*Danthonia spicata*), redtop (*Agrostis gigantea*), awnless brome grass (*Bromus inermis*), golden sedge (*Carex aurea*), woolly sedge (*Carex lasiocarpa*) and Sprengel's sedge (*Carex sprengelli*).

The drier sections of this unit had exposed limestone flat rock and low rocky ridges. The flat, exposed limestone bedrock sections were inundated with water in late spring and dry during the summer months. Typical plant species found in these sections included silvery cinquefoil (*Potentilla argentea*), mossy stonecrop (*Sedum acre*), wild columbine (*Aquilegia canadensis*), common mullein (*Verbascum thapsus*), pearly everlasting (*Anaphalis margaritacea*), Bicknell's crane's-bill (*Geranium bicknellii*), blue-eyed grass (*Sisyrinchium montanum*), Deptford pink (*Dianthus armeria*) and mosses.

Vegetation Community No. 2

This community was a mixed stand of trees and shrubs located along a ridge in the north central portion of the property (Figure 3). Characteristic species were white birch, white pine (*Pinus strobus*), white spruce (*Picea glauca*), balsam poplar, largetooth aspen (*Populus grandidentata*), sugar maple (*Acer saccharum*) and white ash *(Fraxinus americana*).

The groundflora was comprised of weedy species and common grasses. Typical species were gray goldenrod (*Solidago nemoralis*), Canada goldenrod (*Solidago canadensis*), Kentucky bluegrass (*Poa pratensis*), poverty oat grass, common mullein, and asters (*Aster puniceus, Virigulus novae-angliae*).

Vegetation Community No. 3

This community was an extensive mixed stand of eastern white cedar (*Thuja occidentalis*), white spruce, balsam poplar, white birch, white ash and balsam fir (*Abies balsamea*) situated along the west central edge of the property (Figure 3). Shrub species included choke cherry (*Prunus virginiana*), high-bush cranberry (*Virburnum trilobum*), tartarian honeysuckle (*Lonicera tatarica*), poison ivy (*Toxicodendron radicans*) and northern bush-honeysuckle (*Diervilla lonicera*).

The mesic, mucky soils provided habitat for common forbs, weeds, sedges, grasses and ferns. Common forbs included helleborine (*Epipactis helleborine*), barren strawberry (*Waldsteinia fragarioides*), false Solomon's-seal (*Smilacina racemosa*), wild sarsaparilla (*Aralia nudicaulis*) and Canada goldenrod. Sedges and grasses included fringed sedge (*Carex gracillima*), hop sedge (*Carex lupulina*), bladder sedge (*Carex intumescens*), bottle-brush grass (*Hystrix patula*), bearded shorthusk (*Brachyelytrum erectum*). Sensitive fern (*Onoclea sensibilis*), bracken fern (*Pteridium aquilinum*), ladys fern (*Athyrium filix-femina*), bulblet fern (*Cystopteris bulbifera*), spinulose wood-fern (*Dryopteris carthusiana*) and evergreen wood-fern (*Dryopteris intermedia*) were the common ferns.

Vegetation Community No. 4

This community was a semi-open and barren-scattered stand of coniferous and deciduous trees bordering the Talbot River tributary (Figure 3). Eastern white cedar, white pine, white spruce, balsam poplar, white elm, white birch and white ash were dominant. Shrub species included hawthorn, common buckthorn (*Rhamnus cathartica*), choke cherry, high-bush cranberry and honeysuckles (*Lonicera tatarica, L. canadensis*).

The sparse groundflora contained a variety of common weeds, grasses and sedges. Examples included timothy, Canada goldenrod, asters, enchanters nightshade (*Circaea quadrisulcata*), helleborine, daisy fleabane (*Erigeron annuus*), bladder sedge and filiform sedge.

Associated with this unit was wetland habitat along the edges of the Talbot River tributary, in the form of remnant beaver ponds. This habitat type contained common grasses, sedges, ferns and hydrophytes. It is part of an expansive wetland that extends off of the property to the east (Figure 3).

Vegetation Community No. 5

This unit was essentially a mixed stand of trees situated along the southeast central edge of the property and was contiguous with an extensive marsh\swamp habitat off-site to the east (Figure 3). Typical overstorey species included eastern white cedar, white birch, poplars and scattered white pine.

The sparse groundcover contained a mix of common forbs, weeds and ferns. Species included goldenrods, enchanters nightshade (*Circaea quadrisulcata*), helleborine (*Epipactis helleborine*) and spinulose wood-fern (*Dryopteris carthusiana*).

Vegetation Community No. 6

This small vegetation community was a pocket of wetland habitat situated on the south side of Talbot River tributary between communities 9 and 10 (Figure 3). It was characterized as treed and shrub thicket swamp with open patches of grasses and sedges.

Tree species included dead or dying eastern white cedar, dead black ash, red maple (*Acer rubrum*), silver maple (*Acer saccharinum*), a hybrid maple (*Acer rubrum x saccharinum*) and white elm. Bebb's willow (*Salix bebbiana*), slender willow (*Salix petiolaris*), speckled alder (*Alnus rugosa*), red-osier dogwood (*Cornus stolonifera*) and narrow-leaved meadowsweet (*Spiraea alba*) were common shrubs.

The groundflora was a combination of common grasses, ferns, sedges and hydrophytes typical of a treed\shrub thicket swamp. Common grasses and sedges were reed canary grass (*Phalaris arundinacea*), Canada bluejoint grass (*Calmagrostis canadensis*), swamp meadow grass (*Poa palustris*), short-awn foxtail (*Alopecurus aequalis*), filiform sedge, porcupine sedge (*Carex hystericina*), hop sedge (*Carex lupulina*) and stellate sedge (*Carex convoluta*).

Typical ferns were crested fern (*Dryopteris cristata*), marsh fern, royal fern, cinnamon fern (*Osmunda cinnamonea*) and silvery spleenwort (*Athyrium thelypterioides*). Water hemlock (*Cicuta maculata*), jewelweed (*Impatiens capensis*), water parsnip (*Sium sauve*), blue flag (*Iris versicolor*) and small-fruited bur-reed (*Sparganium chlorocarpum*) were common hydrophytes.

Vegetation Community No. 7

This community consisted of cash crop (hay) near an abandoned farmstead (Figure 3). Traversing this community in a west to east directions was a mesic to wet stand of willows, poplars and soft maples (vegetation community no. 8). Deciduous trees were scattered along the fencelines.

Vegetation Community No. 8

This narrow, ribbon band of trees was composed mainly of poplars, willows and soft maples. This wet to mesic stand of trees and shrubs supported a groundflora of grasses, sedges and various common hydrophytes similar to those found in vegetation community no. 6.

Vegetation Communities No. 9a, 9b and 9c

The extensive stand of trees was located on a rocky knoll in the southwest corner of the property (Figure 3). This stand was a combination of three distinct sub-units of trees with different dominant species in the overstorey. The sub-units ranged from a mesic hard maple bush with a mixed coniferous\deciduous edge (9a) to a dry upland poplar scrub bush (9b), and a lowland poplar\white ash bush (9c) at the base of the knoll.

Sub-unit 9a

Hard maple (*Acer saccharum*), white birch, white ash (*Fraxinus americana*), basswood (*Tilia americana*), hop hornbeam (*Ostrya virginiana*) and poplars (*Populus tremuloides, P. grandidentata*) were dominant on the upper slopes of this mesic knoll.

The east half of this stand has been high graded and regrowths of white ash, hard maple and basswood were evident, including an abundance of staghorn sumac (*Rhus typhina*) and various common deciduous shrubs. The northern edge of the stand contained a mix of conifers and hardwoods in wet to mesic muck soils. Species included balsam fir (*Abies balsamaea*), hemlock (*Tsuga canadensis*), yellow birch (*Betula alleghaniensis*) and poplars.

Shrub species included leatherwood (*Dirca palustris*), fragrant sumac (*Rhus aromatica*), tartarian honeysuckle (*Lonicera tartarica*), Canada honeysuckle (*Lonicera canadensis*), buffaloberry (*Sheperdia canadensis*) and northern arrow-wood (*Viburnum rafinesquianum*).

The groundflora in this stand ranged from sparse to clumps of ferns with common woodland wildflowers and forbs as the dominants. Fern and forbs included oak fern (*Gymnocarpium dryopteris*), marginal wood-fern (*Dryopteris marginalis*), interrupted fern (*Osmunda claytoniana*), rattlesnake fern (*Botrychium virginianum*), foam flower (*Tiarella cordifolius*), herb-robert (*Geranium robertianum*) and starflower (*Trientalis borealis*). Woodland wildflowers were white trillium (*Trillium grandiflorum*), bellwort (*Uvularia grandiflora*), Indian cucumber-root (*Medeola virginiana*) and wild ginger (*Asarum canadense*).

Sub-unit 9b

This unit was a dense stand of immature scrub bush and a pure stand of poplars situated along the western edge of the rocky knoll (Figure 3). Largetooth aspen, trembling aspen, white birch and basswood were the dominants. Edge species included eastern white cedar and white spruce. The more open scrubby sections contained hawthorns and various common deciduous shrubs.

The weedy groundcover was dominated by common grasses, weeds and weedy forbs. Species included goldenrods, aster, poison ivy, poverty oat grass, Kentucky blue grass and wild sarsaparilla (*Aralia nudicaulis*).

Sub-unit 9c

Poplars, white birch, soft maples, white pine, white spruce and eastern white cedar dominated this unit, situated at the base of the rocky knoll (Figure 3). The groundflora contained species similar to those found in unit 3 and sub-unit 9b.

Vegetation Community No. 10

This small community was classified as scrub bush intermixed with old field habitat and was situated along the south edge of the Talbot River tributary (Figure 3). Eastern white cedar was the dominant tree with minor components of white spruce, white elm, basswood, red maple and willows.

The mesic soils supported common meadow grasses, weeds and forbs. Species included reed canary grass, manna grass (*Glyceria grandis, G. striata*), fringed brome grass (*Bromus inermis*), goldenrods, asters and field thistle (*Cirsium arvense*).

Vegetation Community No. 11

This small stand of trees was located in the northwest corner of the site on a rocky outcrop (Figure 3). Species included white pine, white birch, hard maple and poplars. The groundcover was dominated by common grasses, weeds and forbs similar to those found in vegetation community no. 2.

Vegetation Community No. 12

This dense stand of trees was situated along a rocky outcrop in the northwest corner of the property (Figure 3). It was dominated by white pine with sub-components of white elm, hard maple and eastern white cedar. The groundflora was comprised of species similar to those found in vegetation communities nos. 2, 3 and 11.

Vegetation Community No. 13

This small treed stand was situated along the northwest edge of the property and was contiguous with an extensive stand located on the north side of unopened road allowance Side Road 10\11 (Figure 3). Eastern white cedar was dominant with minor components of poplars, soft maples and white birch. Groundflora species were similar to those found in vegetation units 5 and the north edge of 9a.

Vegetation Community No. 14

This vegetation community was classified as treed swamp, the result of beaver dams and a natural intermittent drainage swale through vegetation community no. 3 (Figure 3). The open to semi-open canopy was dominated by dead hardwoods and conifers such as black ash, eastern white cedar, poplars and white elm. Shrub species included willows, red-osier dogwood and winterberry (*Ilex verticillata*).

The groundflora was composed of species similar to those found in vegetation community no. 6. Common grasses and sedges included reed canary grass, Canada bluejoint grass, fowl manna grass, swamp meadow grass, fringed sedge, filiform sedge, porcupine sedge and cyperus-like sedge (*Carex pseudo-cyperus*). Ferns and hydrophytes included crested fern, marsh fern, royal fern, water parsnip, water plantain (*Alisma plantago-aquatica*), water dock (*Rumex verticillatus*), water hemlock and swamp milkweed (*Asclepias incarnata*).

Vegetation Community No. 15

This community was an old field habitat with remnant alvar affinities and associated plant species, situated at the south central edge of the property (Figure 3).

Typical vegetation included common weeds, forbs and grasses. Species were Canada goldenrod, New England aster (*Virigulus novae-angliae*), umbel-like aster (*Aster umbellatus*), common buttercup (*Ranunculus acris*), cow vetch (*Vicia cracca*), ox-eye daisy (*Chrysanthemum leucanthemum*) and hawkweed (*Hieracium auriantiacum*). Forbs were Indian paintbrush (*Castilleja coccinea*), fringed gentian, slender gerardia, prairie smoke, hairy beardtongue and harebell (*Campanula rotundifolia*).

3.1.2 Floristics

A review of the plant list in Appendix 2 indicated that 423 species were found on the property. Some of the species are considered unusual or significant and their status is discussed in Section 4.2.2.

3.1.3 Wildlife

The property provided habitat for a variety of wildlife species, particularly bird species. Most of the resident and migratory wildlife observed on the property was considered common and typical for this section of the Kawartha Lakes and Central Ontario. An endangered bird species, the loggerhead shrike (*Lanius ludovicianus*) was found nesting along the central west edge of the property adjacent to the fenceline (Unit 1). A vulnerable species, eastern bluebird (*Sialia sialis*) utilized the short-grassed and field habitats on the property (Unit 1). It also nests in the area, primarily in nest boxes that line many of the fencelines along the sideroads. The status designations for these two species are discussed in Section 4.1.2.

A total of 116 wildlife species, comprised of 87 bird species, 16 mammal species and 13 amphibian and reptile species was observed on-site. Appendices 3-5 contain lists of the various species.

Birds

Most of the birds observed on-site were considered field-inhabiting species. The majority of the property was covered with either short-grassed field (with exposed bedrock) or mixed woods. Species typical of the short-grassed and field habitats (vegetation communities 1, 7 and 15) included upland sandpiper (*Bartramia longicauda*), vesper sparrow (*Pooecetes gramineus*), eastern meadowlark (*Sturnella magna*), song sparrow (*Melospiza melodia*), savannah sparrow (*Passerculus sandwichensis*), grasshopper sparrow (*Ammodramus savannarum*), American kestrel (*Falco sparverius*), eastern kingbird (*Tyrannus tyrannus*) and bobolink (*Dolichonyx oryzivorus*).

Scrub habitat (vegetation community 10) and hawthorn\conifer clumps in units 1 and 2 provided cover for mourning dove (*Zenaida macroura*), eastern kingbird, yellow warbler (*Dendroica petechia*), chipping sparrow (*Spizella passerina*), song sparrow, black-capped chickadee (*Parus atricapillus*), brown thrasher (*Toxostoma rufum*) and American goldfinch (*Carduelis tristis*).

The forested stands (vegetation communities 3, 4, 5, 8, 9a, 9b, 9c, 11, 12 and 13) provided habitat for species such as red-tailed hawk (*Buteo jamiacensis*), downy woodpecker (*Picoides pubescens*), pileated woodpecker (*Drycopus pileatus*), eastern wood-pewee (*Contopus virens*), wood thrush (*Hylocichla mustelina*), black-and-white warbler (*Mniotilta varia*) and northern oriole (*Icterus galbula*).

Species observed in the wetland habitats (vegetation communites 6 and 14) and edges of the tributary were mallard (*Anas platyrhynchos*), spotted sandpiper (*Actitis macularia*), belted kingfisher (*Ceryle alcyon*), red-headed woodpecker (*Melanerpes erthrocephalus*), tree swallow (*Tachycineta bicolor*), common yellowthroat (*Geothlypis trichas*), swamp sparrow (*Melospiza georgiana*) and red-winged blackbird (*Agelaius phoeniceus*).

Mammals

Appendix 4 contains a list of the 16 mammal species observed on-site. The most frequently observed were eastern cottontail (*Sylvilagus floridanus*), eastern chipmunk (*Tamias striatus*), woodchuck (*Marmota monax*) and American beaver (*Castor canadensis*). Observations included direct sightings and indirect evidence such as scats, nests, burrow, tracks and calls.

Amphibians and Reptiles

Thirteen amphibian and reptile species were observed (Appendix 5). Most were found along the tributary and in the wetland communities. Ponded water within some of the forested stands also provided breeding and feeding habitat. Northern leopard frog (*Rana pipiens*), green frog (*Rana clamitans melanota*) and eastern garter snake (*Thamnophis s. sirtalis*) were commonly seen.

3.2 SITE - AQUATIC ENVIRONMENT

3.2.1 Stream and Tributaries

Biophysical Habitat Descriptions

During the site visit an NEA fisheries biologist walked the entire length of the Talbot River tributary on the Ferma property. During this reconnaissance, all information relating to fish habitat was recorded on site cards (Appendix 6). Information was collected along the creek, upstream and downstream on the site vicinity lands. Representative photographs of the aquatic resources were compiled. The habitat assessment followed procedures outlined by Dodge et al (1987).

The surveyed section of the Talbot River tributary was divided into several reaches of differing habitat types (Figure 3). The following section contains qualitative descriptions of the reaches. More detailed information is provided on reach cards in Appendix 6. To facilitate the field survey program, the reaches were consectively numbered in a west to east direction (downstream to upstream). Consequently Reaches 1 and 8 were off-site and their descriptions are presented in Section 3.4.1.

Reach 2

Reach 2 started at the western boundary of the property and extended approximately 250 metre upstream, in an easterly direction (Figure 3, Reach Card 2 in Appendix 6). The creek averaged 1.0 metre wide and 0.1 metres deep. This reach was composed of several riffles and flat sections.

The substrata consisted of rubble (5 percent), gravel (10 percent), sand (75 percent) and silt (10 percent). The sand and silt were predominant in the flat sections, while the rubble and gravel were restricted to the riffles.

The aquatic plants were represented by duckweed, coontail, watercress and cladophora.

Instream cover was approximately 15 percent. Undercut banks accounted for 5 percent of the instream cover while the remaining 10 percent was submerged logs and trees. Five percent of the reach had dense overhead cover with the remaining 95 percent open.

On average, bank stability was moderate. However, two locations were heavily accessed by cattle, resulting in erosion and siltation.

Reach 3

This reach was approximately 200 metres long (Figure 3, Reach Card 3 in Appendix 6). The difference between this section and reach 1 was related to substrata composition, flow regime and creek width. Reach 3 averaged 0.75 metres in width and 0.25 metres in depth. The flow regime was 100 percent flats.

Sand was the prevalent substratum type, accounting for 90 percent, with gravel (5 percent) and silt (5 percent) in equal amounts.

Sparse clumps of watercress, cladophora and bulrush were the only aquatic plant species..

The instream cover was a combination of fallen logs, macrophytes and undercut banks. Total instream cover was 12 percent and no overhead cover was observed within this reach. Several springs and seeps were noted along this section of the tributary.

Reach 4

Reach 4 was approximately 350 metres long (Figure 3, Reach Card 4 in Appendix 6). This reach was characterized by a remnant beaver dam and pond that was drained. The creek channel averaged 1.0 metre in width and 0.1 metre in depth. The flow regime was 100 percent flats.

The substrata was composed of 50 percent sand and 50 percent muck\organics.

Coontail, cattail, bulrush, watercress and cladophora were the typical macrophytes. Several areas were completely overgrown with thick mats of coontail.

The floodplain of the meandering tributary was flooded as a result of previous beaver activity. During the site visit, the dam was not withholding any water, but the floodplain was covered with vegetation characteristic of saturated soils.

Reach 5

This reach contained a series of remnant beaver dams and ponds (Figure 3, Reach Card 5 in Appendix 6) . This reach was approximately 600 metres long with a variable width and depth dependent upon the proximity to the beaver dams.

The substrata consisted of 100 percent muck\organics and detritus.

The vegetation community was represented primarily by emergents such as cattails and bulrush. Yellow waterlily and duckweed were typical floating plants along with submergents such as coontail and various pondweeds. Portions of the beaver ponds were characterized by dense swards of common grasses and sedges, typical of saturated soils.

Open water in the beaver ponds was only found adjacent to the dams. The remainder of the ponds were densely vegetated with a combination of hydrophytes and graminoids.

Reach 6

This reach was one of the shortest at 100 metres (Figure 3, Reach Card 6 in Appendix 6). The main difference between this reach and others was the presence of bedrock substrata. The tributary averaged 0.5 metres in width and 0.1 metres in depth. The flow regime was 100 percent run.

The substrata was composed of 95 percent bedrock and 5 percent silt.

The only aquatic plant species were large clumps of cladophora, which completely chocked the tributary at some locations.

Cattle had access to the entire length of this reach. Little to no erosion was observed and the sidebanks and bottom of the tributary were predominantly bedrock.

Reach 7

Reach 7 was approximately 150 metres in length (Figure 3, Reach Card 7 in Appendix 6). The eastern edge of the property was the upstream boundary. The creek averaged 1.0 metre wide and 0.1 metres deep.

The substrata was composed of 40 percent sand and 60 percent muck.

Canada waterweed, coontail, pondweeds and broad-leaved arrowhead were typical. Portions of the main channel were completely overgrown with graminoids.

The thick mats of vegetation provided an average instream cover of 30 percent. There was no overhead cover.

3.2.2 Fish Species Composition

During the site investigation, three locations were sampled with a backpack electroshocker (Table 2). Station E3 was situated off-site and is discussed in more detail in Section 3.4.2.

Electroshocking station E1 had the largest catch per unit effort (CUE) of all stations. It was almost 10 times higher than the next most abundant CUE (station E2). Large numbers of fish were captured at this station because it was an isolated pocket of optimal fish habitat; a deep quiet pool with plenty of instream cover. Also, up to 70 percent of the brook stickleback were newly hatched young-of-the-year (YOY). Therefore, an artificially high number of fish was captured at sampling location E1.

Although the CUE at station E2 was lower than at E1 it did have a higher diversity. A total of 6 different species were captured at this station. As with location E1 the brook stickleback was the most abundant species at E2.

Table 2: Electroshocking Catch Records

	Electroshocking Stations			
Species	E1	E2	E3	Total
Hour	1115	1300	1330	
Shocking Time (seconds)	80	241	250	571
Distance shocked (metres)	10	15	15	40
Blacknose dace		12	9	21
Brook stickleback	189	28	15	232
Central mudminnow	2			2
Creek chub		9		9
Fathead minnow	8			8
Finescale dace	13	4		17
Mottled sculpin		3		3
Northern redbelly dace	11	17	1	29
Number of Taxa	5	6	3	8
Total Numbers	223	73	25	321
Catch per Unit Effort	2.79	0.30	0.10	0.56

Refer to Figure 3 for sampling locations

3.2.3 Surface Water Quality

Figure 3 identifies the location where the water quality sampling station was located, with the results summarized in Table 3.

The pH in the tributary was neutral, with a value of 7.05. The high acidity and alkalinity concentrations indicate that this creek has a high capacity to buffer bases as well as acids.

A hardness level 149 mg/l places this creek well within the hard water category (McNeely et al 1979).

The water chemistry sampling occurred at 0900 hours. At this time of day, the water temperature was already 23.5 °C. The samples were taken downstream of the large beaver pond off-site (Reach Card 8 in Appendix 6). The dissolved oxygen concentration was 4.9 ppm, which was only 57.8 percent saturated.

Table 3: Surface Water Quality

Parameter	Station W1 Concentration
Total Acidity (mg/l)	31.0
Total Alkalinity (mg/l)	130.0
Total Hardness (mg/l)	149.0
pH	7.5
Dissolved Oxygen (mg/l)	4.9
Temperature °C	23.5

Refer to Figure 3 for sampling locations

Temperature and dissolved oxygen concentrations were also recorded at the downstream end of the property, at the western boundary. The temperature and dissolved oxygen readings 21.7 °C and 10.1 ppm respectively (1400 hours).

The decrease in water temperature occurred as ground water entered the creek within Reach 3 (Figure 3). The increase in dissolved oxygen (115 percent saturated) could have occurred due to a decrease in water temperature, combined with oxygen production from riffles and benthic algae.

3.3 SITE VICINITY - TERRESTRIAL ENVIRONMENT

3.3.1 Vegetation Communities

The majority of the vegetation cover within 500 metres of the property was very similar to that found on-site. An extensive portion was comprised of open short-grassed habitats interspersed with cedar scrubland and small stands of immature deciduous and coniferous trees and shrubs. The lands to the east and north of the property also contained wetland habitat in the form of treed swamp and shrub thicket swamp. Figure 3 shows the general vegetation types found within 500 metres of the perimeter of the property.

3.3.2 Floristics

Although no detailed plant species inventories were conducted in the vegetation communities adjacent to the property, most of the species observed were similar to those found on-site. These included some of the more unusual or significant species such as fringed gentian, prairie smoke and slender gerardia.

3.3.3 Wildlife

Most of the on site birds, mammals, amphibians and reptiles were also observed off site in similar habitats. No loggerhead shrike were found nesting nor were any individuals observed within the 500 metre zone (OMMA 1994a). Numerous individuals of the eastern bluebird were observed off-site.

3.4 SITE VICINITY - AQUATIC ENVIRONMENT

3.4.1 Stream and Tributaries

Biophysical Habitat Descriptions

Reaches 1 and 8 were located up to 500 metres off-site at the west and east edges of the property (Figure 3).

Reach 1

Reach 1 extended from Carden Line Road 5/6 to the western boundary of the Ferma property (Figure 3, Reach Card 1 in Appendix 6). Within this reach, the tributary averaged 1.5 metres wide and 0.1 metres deep. The flow regime was diverse with a combination of riffles, pools and flats.

The substrata was comprised mainly of sand (70 percent) with equal percentages of rubble (10 percent), gravel (10 percent) and muck (10 percent).

The aquatic vegetation community was represented by cattail, bulrush, broad-leaved arrowhead, watercress, coontail and benthic algae.

Instream cover was highly variable, but averaged about 30 percent. Aquatic hydrophytes were the major instream cover and there was no overhead cover.

Cattle had access to this entire reach, thus, there were several locations with a high rate of erosion and siltation.

Reach 8

Reach 8 extended upstream from the eastern boundary of the property (Figure 3, Reach Card 8 in Appendix 6). This reach was a pond with an extensive section of open water and, therefore, regular stream characteristics were not readily apparent. Beaver activity and a dam were found at the culvert.

The aquatic plant community was both species rich and abundant. The dominant plant species were bulrush, cattail, broadleaved arrowhead, duckweed, coontail, Canada waterweed, pondweeds, chara and cladophora.

The dense mats of hydrophytes provided an average instream cover of at least 30 percent.

The extensive open water surface of the pond, combined with a low flushing rate created high water temperatures and low oxygen concentrations compared to the other reaches. The water flowing out of the beaver pond was 23.5 °C and had a dissolved oxygen concentration of only 4.9 ppm (Time - 0900 hr).

3.4.2 Fish Species Composition

Electroshocking station E3 had the lowest total catch number, as well as diversity (Table 2). This low catch number was probably attributable to the station location, which was downstream of a long open stretch, with low instream and no overhead cover. This section of the tributary also had extensive bank erosion and siltation due to cattle access.

4.0 RESOURCE SIGNIFICANCE

4.1 TERRESTRIAL ENVIRONMENT

4.1.1 Vegetation Communities

Alvar

Some of the vegetation communities identified on the property contained numerous plant species associated with alvar habitats. Alvar habitats are essentially limestone outcrops overlain with thin soils (Catling et al 1975, Belcher et al 1992, Belcher 1992). Associated with these sometimes harsh environs are characteristic plant species. Alvars represent unusual and apparently relict communities, within Ontario (Catling et al 1975). However, notwithstanding its recognized uniqueness in the literature, no status designation and\or preservation requirements have been identified through any resource management agency policies.

In addition, it should be noted that the predicted life span of the quarry is greater than 50 years (OMMA 1994c). At present, the majority of the short-grassed habitat has remained as such due to the influence of cattle grazing. Should this habitat influence be removed, there would be changes in the vegetation cover and eventually concomitant effects to the resident wildlife, particularly bird species.

Wetland

The environmental sensitivity of the wetland habitats along the creek and upstream on site vicinity lands has been assessed by the OMNR Minden Area office. It was determined that these wetland habitats were probably not provincially significant and that the proposed mitigation measures as outlined in Section 6.0 would adequately protect this resource and associated biota (Haxton pers. comm. 1994).

4.1.2 Floristics

A review of the 423 plant species listed in Appendix 2, indicated that none were considered rare or endangered on either an national or provincial level. Five of the species were considered rare on a regional level based on Riley (1989). The annotation "R" in the list, "*indicates a native species considered regionally rare in Central Region, based on consideration of the data on this list and the solicited opinions of experts in the flora.*"

The species were fragrant sumac (*Rhus aromatica*), slender gerardia (*Agalinus tenuifolia*), prairie smoke (*Geum triflorum*), fringed gentian (*Gentiana crinita*) and umbel-like sedge (*Carex umbellata*). The numerous locations of these species are illustrated on Figure 3. The Riley (1989) distribution and status list applies to the OMNR adminstrative boundary known as Central Region. However, as the OMNR Central Region administration area no longer exists, the rarity status designation of these species remains unclear.

4.1.3 Wildlife

The majority of the wildlife species observed on the property were considered common and typical for this section of the Kawarthas (Carden Plains area) and Central Ontario. Most of the bird species observed were resident and typical for the habitats found on-site and in the site vicinity. The open short-grassed field overlying exposed limestone bedrock is typical of alvar habitats in the Carden Plains area (Catling et al 1975, Belcher et al 1992). Associated with the alvar habitat and short-grassed fields are certain characteristic wildlife species, particularly birds (Pittaway 1991a). All of the remaining mammals, amphibians and reptiles observed on-site and in the site vicinty were considered common and typical of the existing habitats.

Birds

One bird species, the loggerhead shrike, has been given the status of endangered on both a national and provincial level (Cadman 1991, COSEWIC 1994, Endangered Species Act 1990). This species was nesting in a hawthorn tree along the west central portion of the property, immediately adjacent to the property fenceline (Figure 3).

Three fledged young were observed on and near the nesting site during the course of the spring and summer of 1993. This nesting site was abandoned in 1994. A shrike nest with fledged young was found in 1994 in another hawthorn tree at the same location (Haxton pers. comm. 1994). Proposed mitigation measures as outlined in Section 5.1.2 were deemed adequate by the Ministry at this time, to protect this resource.

The eastern bluebird has been designated as vulnerable by COSEWIC (1994), based on a status report by Risley (1984). It is also considered provincially rare based on the OMNR Wildlife Branch status list (OMNR 1994a). The eastern bluebird was observed during the summer and more frequently during the fall months. However, no nests and no strong evidence of breeding activity were noted on-site. The presence of numerous off-site nesting boxes would appear to account for the abundance of this species on-site, in the site vicinity and the Carden Plains area. The status of this species is currently being re-assessed and will likely be downgraded or removed from these status lists.

The remainder of the bird species found on-site were typical for the existing habitats and were considered common for this region of the Kawarthas and Central Ontario (Cadman et al 1987).

Most of the common bird species observed on the property were also observed within the 500 metre perimeter site vicinity lands. Loggerhead shrike has been reported nesting in other sections of the Carden Plain area (Pittaway 1991b). Although suitable breeding habitat exists on the site vicinity lands, no other nest locations were found or have been reported within 500 metres of the property (Pittaway 1991b, Haxton pers. comm. 1994).

Mammals

A review of the 16 species listed in Appendix 4 indicated that none were designated as rare or endangered on a national, provincial, regional or local level.

Amphibians and Reptiles

None of the 13 species listed in Appendix 5 were designated as rare or endangered on either a national, provincial, regional or local level.

4.2 AQUATIC ENVIRONMENT

4.2.1 Stream and Tributaries

The Talbot River tributary that traverses the property in an east to west direction provides habitat for various cyprinids and coarse fish. The habitat was comprised of a series of beaver ponds and open sections meandering through cattle pastureland. The beaver ponds created conditions of high water temperatures and low oxygen concentrations. Cattle access to the creek bed has resulted in several locations of extensive erosion, siltation and nutrient loading. This combination of disturbance factors resulted in the presence of only tolerant warm-water fish species.

4.2.2 Fish Species Composition

Table 4 provides a species list of all fish captured both on and off-site. None are considered rare or endangered (COSEWIC 1994). All captured species have population ranges in this section of the Kawarthas and the province (Scott and Crossman 1973).

Table 4: List of Fish Species Caught On-Site and\or Off-Site

Common Name	Scientific Name
Blacknose dace	*Rhinichthys atratulus*
Brook stickleback	*Culaea inconstans*
Central mudminnow	*Umbra limi*
Creek chub	*Semotilus atromaculatus*
Fathead minnow	*Pimephales promelas*
Finescale dace	*Phoxinus neogaeus*
Mottled sculpin	*Cottus bairdi*
Northern redbelly dace	*Phoxinus eos*

5.0 IMPACT ASSESSMENT AND MITIGATION

This section provides an assessment of the potential impacts to the site and site vicinity biological resources associated with the proposed quarry operation. The assessment involved a determination of the sources, types and significance of each impact. The main effects to the terrestrial and aquatic biological resources would result primarily from site clearing (vegetation and overburden removal), dust, noise, and water usage.

To assist in the impact assessment to the biological resources, the quarry site plan and technical reports dealing with air quality, hydrogeology and transportation, blasting and noise were reviewed (OMMA 1994a, 1994b, 1994c, 1994d, Explotech 1994, Valcoustics 1995). In general, all of the mitigation measures and recommendations proposed in these reports would adequately protect the existing biological resources both on-site and in the site vicinity. A summary of the mitigation measures and recommendations from these technical reports are outlined in the quarry operations site plan (OMMA 1994a).

The only exceptions to this general assessment, would be the loss of vegetation cover and some minor and undeterminable impacts to the resident wildlife. The existing vegetation cover within the extraction area would not be replaced and the loss would only be partially mitigated. Additional cover would be established only along the roadside edges of the perimeter berms. Most of the existing vegetation cover would be converted to two open water lakes, which would be the end product of the resource extraction.

Potential dust and noise impacts would occur primarily during the operational stage of the proposed aggregate extraction, and would result from a variety of sources. Identified sources included the drilling, blasting, transporting, crushing, screening, conveying, stockpiling, loading of trucks, truck traffic and wind erosion (OMMA 1994b, Explotech 1994, Valcoustics 1995).

5.1 TERRESTRIAL ENVIRONMENT

5.1.1 Vegetation

Site Clearing

The most direct effect of the proposed quarry operation to the on-site terrestrial biological resources would be the loss of existing vegetation cover within the extraction area and other minor portions of the licenced area. Site clearing of the vegetation and overburden in the extraction area would be in the form of short-grassed field or alvar, cropland and mixed woods. Vegetation communities no's. 1, 2, 3, 7, 8, 11, 12 and 13 would be affected either in whole or in part (OMMA 1994a). The most significant of these affected communities on an individual basis would be unit 1, the alvar habitat. The significance of this loss remains undetermined. The remaining communities (2, 3, 7, 8 and 11-13) are all common and abundant on-site, in the site vicinity and in the surrounding region. The loss of all or part of these community types was not considered a significant impact. The other vegetation communities (4, 5, 6, 7, 9, 10, 14 and 15) in the licenced area would be retained, including a large portion of vegetation community no. 1 (OMMA 1994a).

Based on the quarry site plan, all of these lost vegetation communities would eventually be converted to two open, deep water lakes. Some of the loss of the vegetation cover can be partially mitigated. Part of the site rehabilitation plan entails the planting and establishment of white spruce and poplars along the roadside edges of the perimeter berms (OMMA 1994a).

In addition to the loss of the alvar habitat, several regionally rare or significant plant species would also be removed due to site clearing. With the exception of fragrant sumac which will be retained in vegetation sub-unit 9a, these species included individuals and populations of prairie smoke, slender gerardia, umbel-like sedge and fringed gentian. However, the significance of this loss could not be determined, as the rarity designation of the effected species remains unclear. The Riley (1989) status list applied to the OMNR Central Region administrative boundary, which no longer exists.

Other individuals and populations of these same species will also be retained on portions of the property within proposed buffers, setbacks and non-extraction areas. Table 5 summarizes the effect of the proposed quarry on the regionally rare species.

Table 5: Effects of Proposed Quarry on Regionally Rare Plant Species

Species Name	Community	Lost	Retained	Lost and Retained
Agalinus tenuifolia	1			X
Carex umbellata	1			X
Gentiana crinita	1			X
Geum triflorum	1			X
Rhus aromatica	9a		X	

An associated aspect of site clearing activities would be erosion of the stockpiled overburden and topsoil and potential impacts to the wetland vegetation along the edge of the tributary. These impacts were considered extremely minor or indiscernible. This conclusion was based on proposed erosion and sedimentation controls and the retention of a 100 metre plus setback from the tributary at both ends of the north and south extraction areas (OMMA 1994a, OMMAc).

Dust

Another potential impact to the on-site and site vicinity vegetation would be dust. Although phytotoxicology was beyond the scope of this study, a general review of the literature on dust dispersal impacts on vegetation from aggregate extraction was conducted.

Most of the literature reviewed on this subject pertained to cement-kiln dust (Darley 1966, Ripley et al 1978). Cement-kiln dust is considered a toxic dust as opposed to limestone dust which is of little, if any, direct toxicity to vegetation (Pierce 1910, Darley 1966, Gale and Easton 1979). The literature on the effects of limestone dust accumulation on vegetation appears inconclusive and in some studies contradictory (Manning 1971, Brandt and Rhoades 1972, Brant and Rhoades 1973, Ricks and Williams 1974, Little 1977, Gale and Easton 1979).

In addition, numerous mitigation measures have been proposed to alleviate and mitigate dust levels resulting from such activities drilling, blasting, transporting, crushing, screening and wind erosion. Given the recommendations and dust suppression plan outlined in the OMMA (1994b) air quality report, no adverse impacts were predicted to the remaining on-site vegetation and site vicinity vegetation, particularly to the east of the property, in line with the general prevailing winds.

Water Usage

No adverse impacts were predicted to the on-site vegetation resources due to activities such as the taking and discharging of water. Mitigation measures and recommendations outlined in the hydrotechnical report appear to ensure the maintainance and viability of the vegetation cover in the proposed setback from the tributary and other parts of the licenced area.

5.1.2 Wildlife

Only site clearing (vegetation and overburden removal) and noise were identified as potential impacts of concern to the existing wildlife resources.

Site Clearing

A concomitant reduction or displacement in the on-site resident and migrant wildlife would be the most direct effect associated with the loss of vegetation cover due to site clearing. Bird species that currently utilize the short-grassed habitats or alvar would be more affected than other wildlife. This potential impact was not considered significant, considering the availability and abundance of similar habitats (alvar and short-grassed field) both within the remaining undisturbed portion of the licenced area and the site vicinity lands. In addition, most of the affected wildlife species with the exception of the loggerhead shrike and eastern bluebird, are considered common and abundant. Any loss or displacement of these common wildlife species was not considered significant.

Potential impacts to the endangered species, the loggerhead shrike, were adequately mitigated by the proposed retention of a 400 metre, naturally vegetated setback and perimeter berming between the nesting site and extraction area. The selection of this distance of 400 metres was based on discussions with the OMNR and draft habitat management guidelines for this species (Cuddy pers. comm 1994, Haxton pers. comm. 1994, Pittaway pers. comm. 1994). The location of any loggerhead head nesting site(s) should be reviewed annually, since the life span of the quarry is predicted to be in excess of 50 years (OMMA 1994c).

Site clearing impacts to the other significant bird species, the eastern bluebird were not considered adverse. Existing nesting habitat for this species appears to be in nest boxes scattered along adjacent sideroads and fencelines. Some on-site feeding habitat, in the form of short-grassed field or alvar would be lost due to the proposed quarry. However, this available and abundant habitat type remains elsewhere within the licenced area and on site vicinity lands.

No adverse impacts were identified to any potential or existing wildlife corridors. The only identified corridor on-site appeared to be along the tributary. The remainder of the property was covered with fragmented and isolated treed stands and open, short-grassed field. Any potential corridors appear to be disjunct from and to the north of the property. Off-site corridors would not be impacted by the proposed quarry. The quarry may also act as a partial impediment to the movement of some wildlife species, particularly large mammals. However, this impact was not considered adverse to the resident population.

The site rehabilitation plans entail the creation of two deep water lakes at the end of the aggregate resource extraction process. This change in vegetation cover from alvar, cropland and mixed woods to open water, would add potential breeding and feeding habitat for waterfowl and shorebirds. The significance of this additional habitat to the local wildlife population could not be determined.

Noise

The literature reviewed on noise impacts to wildlife indicated that the evidence was frequently inconclusive and sometimes contradictory (Shaw 1978). Most of the reviewed studies dealt with noise impacts on domestic livestock or wildlife in general from sources such as transmission lines, sonic booms and recreational vehicles (Fletcher 1971, Shaw 1978, Lee and Griffith 1978, Ellis 1978, Cottereau 1978, Dorrance et al 1975).

A study by Chabwela and Gilbert (1982) and Chabwela (1983) on the effects of aggregate mining operations on wildlife in Southern Ontario, concluded no impacts or only minor impacts to birds and small mammals. Chabwela and Gilbert (1982) alternatively speculated that aggregate extraction activities were not compatible with larger mammals such as white-tailed deer. However, they also noted that since their data and conclusions were based on a single gravel pit, further studies were necessary to establish a complete assessment of the effects, particularly to deer. In regards to the Ferma-Carden quarry, potential impacts to larger mammals such as white-tailed deer were not deemed a concern, as no critical habitat (i.e. major wintering yard) for this species exists on-site or on adjacent lands.

The entrance to the quarry will be located at the southeast corner of the property on Carden Road 5/6 and the unopened road allowance between Concessions IX and X (OMMA 1994a, OMMA 1994d). The positioning of the entrance at this location will help alleviate potential noise impacts to the remaining resident wildlife both on-site and in the site vicinity, particularly to the loggerhead shrike. The addition of interim and perimeter berms and the establishment of a treed screen will also help alleviate potential noise impacts (OMMA 1994a, Valcoustics 1995).

5.2 AQUATIC ENVIRONMENT

5.2.1 Stream and Tributaries

Site Clearing

Site clearing activities such as vegetation removal and potential erosion and sedimentation impacts were not considered a threat to the on-site tributary or the aquatic regime further downstream. This assessment was based on the retention of a 100 metre plus setback from the tributary between the limits of the north and south extraction areas and the proposed erosion and sedimentation controls outlined in OMMA (1994a) and OMMA (1994c).

Water Usage

No adverse impacts were predicted to the on-site tributary due to the taking or discharging of surface and/or ground water. OMMA (1994a, 1994c) proposed mitigation measures such as on and off-site water level monitoring, sediment capture techniques and the operational requirements of the MOEE for the taking and discharging of water were deemed adequate to maintain and possibly enhance the baseline flow and water quality in the on-site tributary.

5.2.2 Fish Species Composition

Site Clearing

No adverse impacts from site clearing activities were predicted to fish species composition of the on-site tributary or to the aquatic regime further downstream. The minimum standard OMNR vegetated setback of 30 metres from warm-water fisheries was deemed adequate for this proposed development (OMNR 1994b). The proposed retention of a 100 metre plus vegetated setback from the tributary for hydrogeological reasons (OMMA 1994a), in conjunction with the of erosion and sediment control techniques as outlined in OMMA (1994c) would more than adequately mitigate any adverse effects to the instream fisheries.

Water Usage

Based on the mitigation measures outlined in Section 5.2.1, no adverse or detrimental impacts were predicted to the on-site and site vicinty fisheries resourse in the Talbot River tributary. In fact, the discharging of water to the creek may elevate the baseline flow during low flow periods, a possible net benefit to the fisheries.

6.0 RECOMMENDATIONS AND CONCLUSIONS

Based on a review of the literature, site visits, operating site plan and other technical reports the following recommendations and conclusions with regard to the terrestrial and aquatic biological resources have been reached:

- 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 especial significance as to warrant extreme environmental protection measures such as large setbacks;

- 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 and that adjustments be made to the setback, if required;

- The proposed 100 metre plus vegetated setback from the Talbot River tributary as indicated on the operational site plan (OMMA 1994a) and the proposed erosion and sedimentation control techniques (OMMA 1994c) would adequately protect its fisheries community both on-site and off-site, providing the excavation does not effect or impair groundwater discharge and surface runoff to the tributary;

- The retention of a 100 metre plus setback and slightly elevated baseflows, combined with the removal of the cattle, should have the net effect of improving the fisheries in the tributary. However, cattle are also deemed a contributing factor in the maintenance of the alvar habitat;

- All of the identified potential impacts to the remaining on-site and the site vicinity terrestrial and aquatic resources from the quarry operational activities in the form of dust, noise and water usage were considered minor; and;

- To ensure the short-term and long-term alleviation of impacts to the terrestrial and aquatic biological resources, it is recommended that the proposed measures for dust, noise, water quantity and water quality as outlined in the site plan and other technical reports be implemented (OMMA 1994a, OMMA 1994b, OMMA 1994c, OMMA 1994d, Explotech 1994 and Valcoustics 1995).

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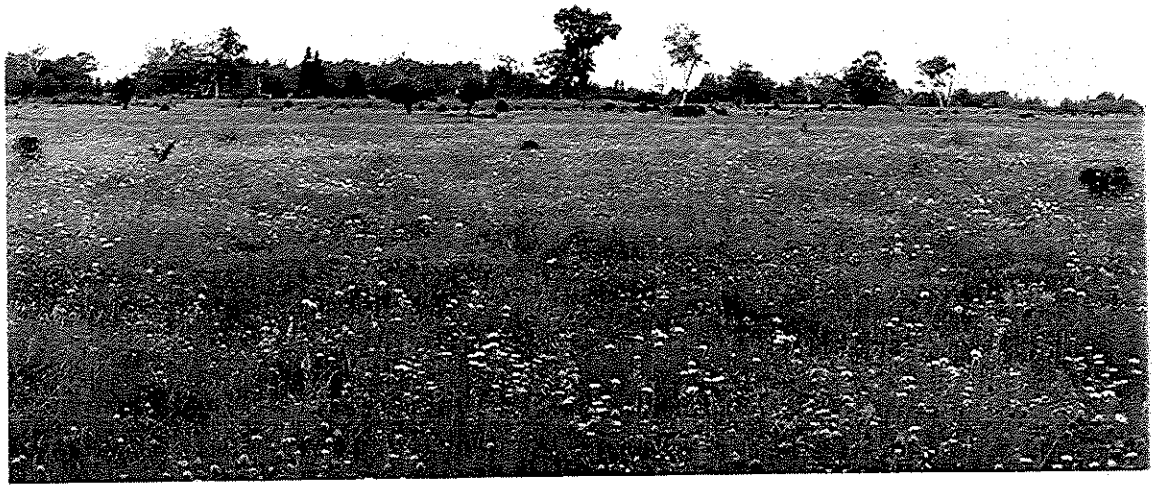
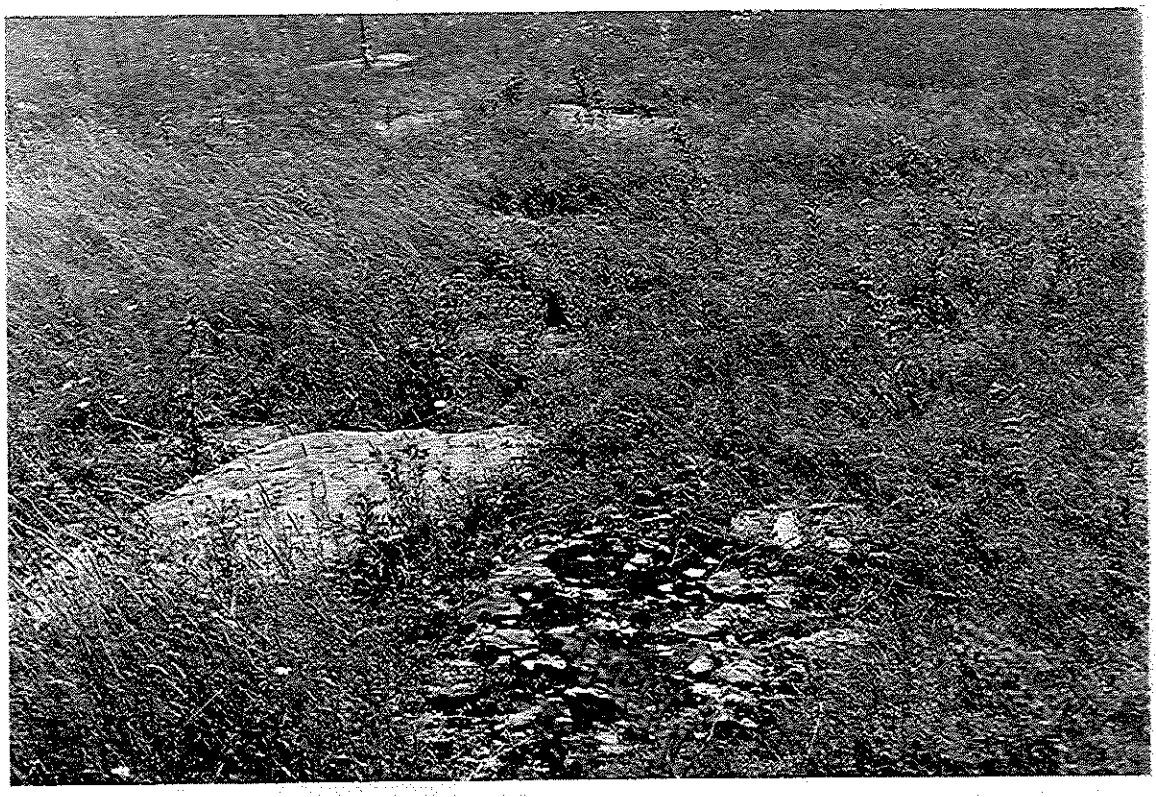
Appendix 1

Ferma-Carden Quarry - Representative Photographs of Biological Resources



Photograph 1. Westward view of vegetation community no. 1 - part of proposed north extraction area (02 July 1993)



Photograph 2. Exposed limestone of alvar habitat in vegetation community no. 1 - part of eastern 400 metre setback zone (02 July 1993)

Photograph 3. South end of vegetation community no. 2 - ridge of white pine, white spruce, white birch and common juniper (02 July 1993)

Photograph 4. Inside view of vegetation community no. 3 - eastern white cedar, poplars, balsam fir, white pine and white birch (02 July 1993)

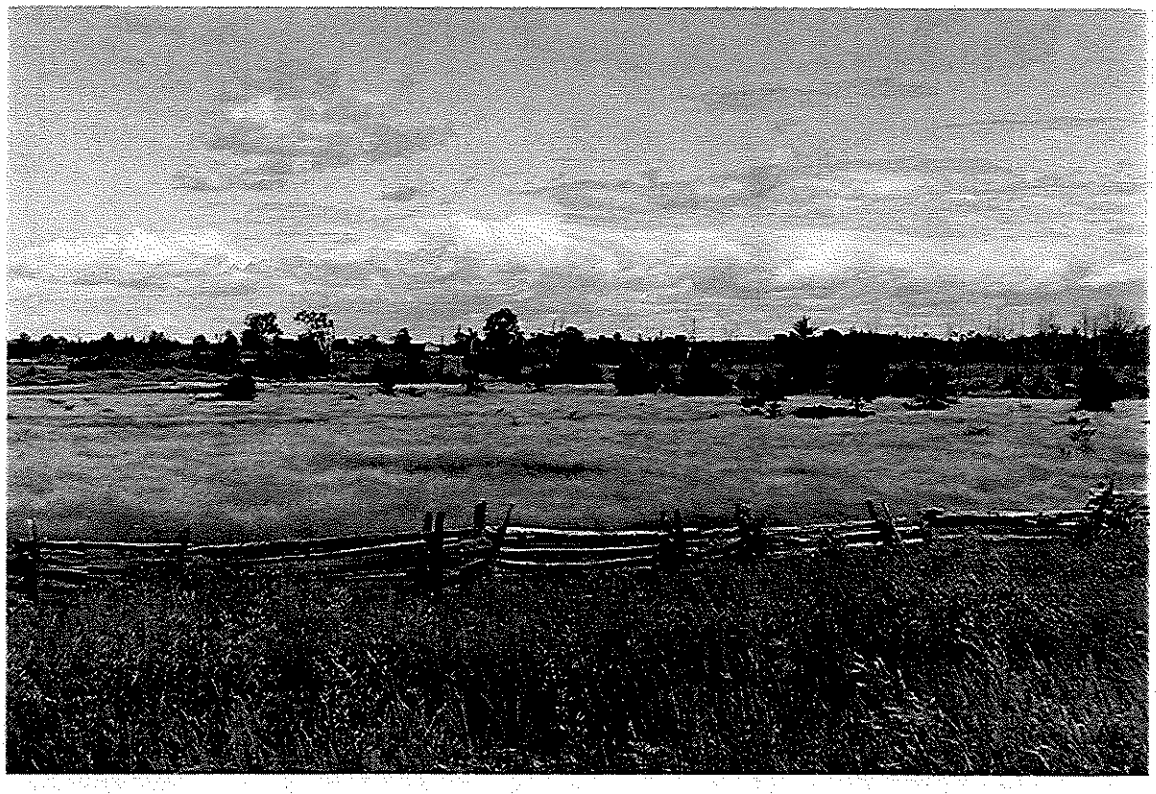
Photograph 5. Eastward view of vegetation community no. 7 - farmstead and hay field - in proposed south extraction area (21 July 1993)

Photograph 6. High-graded section of hardwood bush with hard maple, white ash, basswood and dense shrub layer - part of subunit 9a (21 July 1993)

Photograph 7. Remnant beaver pond in vegetation community no. 14 with graminoids, sedges, ferns and open water (02 July 1993)

Photograph 8. Fringed gentian (*Gentiana crinita*), regionally rare plant species found in vegetation community no. 1 (27 August 1993)

Photograph 9. Wetland habitat on Talbot River tributary along central eastern edge of property (02 July 1993)



Photograph 10. Grassland and hawthorn-conifer scrubland on site vicinity lands to the east of the proposed north extraction area (02 July 1993)

Appendix 2

Ferma-Carden Quarry - List of Plant Species

Appendix 2 - List of Plant Species Found or Reported in the Study Area

Families and genera for the plant species found in the Ferma Quarry study area are listed in taxonomic order. The genus within each family and the species within each genus are listed alphabetically.

Four standard reference works were used for the botanical nomenclature and taxonomy (Fernald 1950; Gleason 1952; Gleason and Cronquist 1963; Voss 1980, 1985). Other published works for botanical names included; ferns (Cody and Britton 1989); grasses (Dore and McNeill 1982); orchids (Whiting and Catling 1986); and shrubs (Soper and Heimburger 1982).

SCIENTIFIC NAME	COMMON NAME
LYCOPODIACEAE	**CLUBMOSS FAMILY**
Lycopodium clavatum var. clavatum	staghorn clubmoss
L. dendroideum	round-branched ground-pine
L. digitatum	crowfoot clubmoss
L. lucidulum	shining clubmoss
SELAGINELLACEAE	**SPIKEMOSS FAMILY**
Selaginella rupestris	rock spikemoss
EQUISETACEAE	**HORSETAIL FAMILY**
Equisetum arvense	field horsetail
E. hyemale	common scouring-rush
E. pratense	marsh horsetail
E. sylvaticum	wood horsetail
OPHIOGLOSSACEAE	**ADDER'S-TONGUE FAMILY**
Botrychium multifidum	leathery grapefern
B. virginianum	rattlesnake fern
OSMUNDACEAE	**FLOWERING FERN FAMILY**
Osmunda cinnamomea	cinnamon fern
O. claytoniana	interrupted fern
O. regalis var. spectabilis	royal fern
POLYPODIACEAE	**FERN FAMILY**
Adiantum pedatum	maidenhair fern
Athyrium filix-femina	lady fern
A. thelypterioides	silvery glade fern
Cystopteris bulbifera	bulblet fern
C. tenuis	Mackay's fragile fern

SCIENTIFIC NAME	COMMON NAME
ALISMATACEAE	**WATER PLANTAIN**
Alisma plantago-aquatica	water plantain
Sagittaria latifolia	broad-leaved arrowhead
HYDROCHARITACEAE	**FROG'S-BIT FAMILY**
Anacharis canadensis	Canada water-weed
POACEAE	**GRASS FAMILY**
Agropyron repens	quack grass
Agrostis gigantea	redtop
A. scabra	tickle grass
A. stolonifera	creeping bent grass
Alopecurus aequalis	short-awn foxtail
Brachyelytrum erectum	bearded shorthusk
Bromus ciliatus	fringed brome grass
B. inermis	awnless brome grass
Calamagrostis canadensis	Canada bluejoint grass
Dactylis glomerata	orchard grass
Danthonia spicata	poverty oat-grass
Echinchloa crusgalli	barnyard grass
Elymus hystrix	bottlebrush grass
E. virginicus	wild-rye grass
Festuca pratensis	meadow fescue
F. rubra	red fescue
Glyceria grandis	tall manna grass
G. striata	fowl manna grass
Hordeum jubatum	foxtail barley
Leerzia oryzoides	rice cut-grass
Oryzopsis asperifolia	white mountain-rice
Panicum capillare	old witch grass
P. lanuginosum var. implicatum	hairy panic grass
P. linearifolium	narrow-leaved panic grass
Phalaris arundinacea	reed canary grass
Phleum pratense	timothy
Poa compressa	Canada bluegrass
P. palustris	fowl meadow grass
P. pratensis	Kentucky blue grass
Seteria glauca	yellow foxtail
S. viridis	green foxtail
CYPERACEAE	**SEDGE FAMILY**
Carex aurea	golden sedge
C. bebbii	Bebb's sedge
C. comosa	bristly sedge
C. crinita	fringed sedge
C. deweyana	Dewey's sedge

SCIENTIFIC NAME	COMMON NAME
LILIACEAE	**LILY FAMILY**
Clintonia borealis	bluebead-lily
Erythronium americanum	dog-tooth violet
Maianthemum canadense	Canada mayflower
Medeola virginiana	Indian cucumber-root
Polygonatum pubescens	hairy Solomon's-seal
Smilacina racemosa	false Solomon's-seal
S. stellata	starry false Solomon's-seal
S. trifolia	three-leaved Solomon's-seal
Smilax herbacea	carrion-flower
Streptopus roseus	rose twisted stalk
Trillium erectum	red trillium
T. grandiflorum	white trillium
Uvularia grandiflora	bellwort
IRIDACEAE	**IRIS FAMILY**
Iris versicolor	blug flag
Sisyrinchium montanum	blue-eyed grass
ORCHIDACEAE	**ORCHID FAMILY**
Epipactis helleborine	helleborine
SALICACEAE	**WILLOW FAMILY**
Populus balsamifera	balsam poplar
P. grandidentata	largetooth aspen
P. tremuloides	trembling aspen
S. bebbiana	Bebb's willow
S. discolor	pussy willow
S. lucida	shining willow
S. petiolaris	slender willow
MYRICACEAE	**BAYBERRY FAMILY**
Myrica gale	sweet gale
JUGLANDACEAE	**WALNUT FAMILY**
Carya cordiformis	bitternut hickory
Juglans cinerea	butternut

SCIENTIFIC NAME	COMMON NAME
PORTULACACEAE	**PURSLANE FAMILY**
Claytoniana caroliniana	spring-beauty
CARYOPHYLLACEAE	**PINK FAMILY**
Arenaria serpyllifolia	thyme-leaved sandwort
Cerastium arvense	field chickweed
C. fontanum	mouse-eared chickweed
Dianthus armeria	Deptford pink
Saponaria officinalis	bouncing bet
Silene antirrhina	sleepy catchfly
S. cucubalus	bladder campion
S. noctiflora	night-flowering catchfly
Stellaria graminea	lesser stitchwort
S. media	common chickweed
NYMPHAEACEAE	**WATER-LILY FAMILY**
Nuphar variegatum	bullhead lily
Nymphaea odorata	fragrant white water-lily
CERATOPHYLLACEAE	**HORNWORT FAMILY**
Ceratophyllum demersum	coontail
RANUNCULACEAE	**CROWFOOT FAMILY**
Actaea pachpoda	white baneberry
A. rubra	red baneberry
Anemone canadensis	Canada anemone
A. cylindrica	thimbleweed
Aquilegia canadensis	wild columbine
Caltha palustris	marsh marigold
Clematis virginiana	virgin's bower
Coptis trifolia	goldthread
Hepatica acutiloba	sharp-lobed hepatica
Ranunculus abortivus	kidney-leaved buttercup
R. acris	common buttercup
R. longirostris	white water-crowfoot
R. sceleratus	cursed crowfoot
Thalictrum dioicum	early meadowrue
T. pubescens	tall meadowrue
BERBERIDACEAE	**BARBERRY FAMILY**
Berberis vulgaris	common barberry
Caulophyllum thalictroides	blue cohosh

SCIENTIFIC NAME	COMMON NAME
ROSACEAE - cont'd	
R. pubescens	dwarf raspberry
Spiraea alba	narrow-leaved meadowsweet
S. latifolia	broad-leaved meadowsweet
S. tomentosa	hardback
Waldsteinia fragarioides	barren strawberry
FABACEAE	**BEAN FAMILY**
Amphicarpa bracteata	hog peanut
Lathyrus palustris	marsh pea
Lotus corniculatus	bird's-foot trefoil
Medicago lupulina	black medic
M. sativa	alfalfa
Melilotus alba	white sweet clover
M. officinalis	yellow sweet clover
Trifolium agrarium	hop clover
T. hybridum	alsike clover
T. pratense	red clover
T. repens	white clover
Vicia cracca	cow vetch
V. tetrasperma	sparrow vetch
GERANIACEAE	**GERANIUM FAMILY**
Geranium bicknellii	Bicknell's crane's-bill
G. robertianum	herb robert
OXALIDACEAE	**WOOD-SORREL FAMILY**
Oxalis montana	wood-sorrel
O. stricta	yellow wood-sorrel
ANACARDIACEAE	**CASHEW FAMILY**
Rhus aromatica	fragrant sumac
R. typhina	staghorn sumac
Toxicodendron radicans	poison ivy
CELASTRACEAE	**STAFF-TREE FAMILY**
Celastrus scandens	climbing bittersweet

SCIENTIFIC NAME	COMMON NAME
LYTHRACEAE	**LOOSESTRIFE FAMILY**
Lythrum salicaria	purple loosestrife
ONAGRACEAE	**EVENING-PRIMROSE FAMILY**
Circaea quadrisulcata	enchanters nightshade
Epilobium angustifolium	fireweed
E. ciliatum	northern willow-herb
E. palustre	swamp willow-herb
Oenothera biennis	evening primrose
ARALIACEAE	**GINSENG FAMILY**
Aralia nudicaulis	wild sarsaparilla
A. racemosa	spikenard
UMBELLIFERAE	**PARSLEY FAMILY**
Cicuta bulbifera	bulb-bearing water-hemlock
C. maculata	spotted water-hemlock
Daucus carota	wild carrot
Osmorhiza claytonii	sweet cicely
Pastinaca sativa	wild parsnip
Sanicula gregaria	snakeroot
S. marilandica	black snakeroot
Sium sauve	water parsnip
CORNACEAE	**DOGWOOD FAMILY**
Cornus alternifolia	alternate-leaved dogwood
C. canadensis	bunchberry
C. racemosa	grey dogwood
C. rugosa	round-leaved dogwood
C. stolonifera	red-osier dogwood
PYROLACEAE	**WINTERGREEN FAMILY**
Monotropa uniflora	Indian pipe
Pyrola elliptica	shinleaf
ERICACEAE	**HEATH FAMILY**
Gaultheria procumbens	wintergreen
Vaccinium angustifolium	low sweet blueberry
PRIMULACEAE	**PRIMROSE FAMILY**
Lysimachia ciliata	fringed loosestrife
Trientalis borealis	starflower

SCIENTIFIC NAME	COMMON NAME
SCROPHULARIACEAE	**FIGWORT FAMILY**
Agalinus tenuifolia	slender gerardia
Castilleja coccinea	Indian paint brush
Chelone glabra	turtlehead
Linaria vulgaris	butter-and-eggs
Mimulus ringens	square-stemmed monkey flower
Penstemon hirsutus	hairy beardtongue
Verbascum thapsus	common mullein
Veronica officinalis	common speedwell
V. serpyllifolia	thyme-leaved speedwell
OROBANCHACEAE	**BROOM-RAPE FAMILY**
Epifagus virginiana	beech-drops
LENTIBULARIACEAE	**BLADDERWORT FAMILY**
Urticularia vulgaris	common bladderwort
PHRYMACEAE	**LOPSEED FAMILY**
Phryma leptostachya	lopseed
PLANTAGINACEAE	**PLANTAIN FAMILY**
Plantago lanceolata	common plantain
P. major	common plantain
P. rugelii	Rugel's plantain
RUBIACEAE	**MADDER FAMILY**
Galium lanceolatum	yellow wild licorice
G. palustre	marsh bedstraw
G. triflorum	fragrant bedstraw
Mitchella repens	partridge-berry
CAPRIFOLIACEAE	**HONEYSUCKLE FAMILY**
Diervilla lonicera	northern bush honeysuckle
Lonicera canadensis	Canada honeysuckle
L. tatarica	tartarian honeysuckle
Sambucus canadensis	common elderberry
S. racemosa	red-berried elder
Symphoricarpos albus	snowberry
Triosteum perfoliatum	horse gentian
Viburnum acerifolium	maple-leaved viburnum
V. lentago	nannyberry
V. rafinesquianum	downy arrow-wood
V. trilobum	highbush cranberry

SCIENTIFIC NAME	COMMON NAME
ASTERACEAE - cont'd	
Senecio pauperculus	balsam ragwort
Solidago caesia	blue-stemmed goldenrod
S. canadensis	Canada goldenrod
S. flexicaulis	zig-zag goldenrod
S. gigantea	tall goldenrod
S. nemoralis	gray goldenrod
S. rugosa	rough goldenrod
Sonchus arvensis	sow thistle
S. asper	spiny-leaved sow thistle
Taraxacum officinale	common dandelion
Tragopogon dubius	goat's-beard
T. pratensis	yellow goat's-beard
Virgulus novae-angliae	New England aster

Appendix 3

Ferma - Carden Quarry - List of Bird Species

Appendix 3 - List of Bird Species Observed or Reported in the Study Area

Common and scientific names follow the American Ornithologists' Union (AOU) *Check-list of North American Birds* (1983) and its 35th and 37th supplements (AOU 1985, 1989).

COMMON NAME	SCIENTIFIC NAME
great blue heron	*Ardea herodias*
green-backed heron	*Butroides striatus*
Canada goose	*Branta canadensis*
wood duck	*Aix sponsa*
green-winged teal	*Anas crecca*
mallard	*Anas platyrhynchos*
blue-winged teal	*Anas discors*
turkey vulture	*Cathartes aura*
northern harrier	*Circus cyaneus*
red-tailed hawk	*Buteo jamaicensis*
American kestrel	*Falco sparverius*
ruffed grouse	*Bonasa umbellus*
killdeer	*Charadrius vociferus*
spotted sandpiper	*Actitis macularia*
upland sandpiper	*Bartramia longicauda*
common snipe	*Gallinago gallinago*
American woodcock	*Scolopax minor*
ring-billed gull	*Larus delawarensis*
rock dove	*Columba livia*
mourning dove	*Zenaida macroura*
great-horned owl	*Bubo virginianus*
common nighthawk	*Chordeiles minor*
ruby-throated hummingbird	*Archilochus colubris*
belted kingfisher	*Ceryle alcyon*
red-headed woodpecker	*Melanerpes erthrocephalus*
yellow-bellied sapsucker	*Sphyrapicus varius*
downy woodpecker	*Picoides pubescens*
hairy woodpecker	*Picoides villosus*
northern flicker	*Colaptes auratus*
pileated woodpecker	*Drycopus pileatus*

COMMON NAME	SCIENTIFIC NAME
rose-breasted grosbeak	*Pheucticus melanocephalus*
indigo bunting	*Passerina cyanea*
chipping sparrow	*Spizella passerina*
field sparrow	*Spizella pusilla*
vesper sparrow	*Pooecetes gramineus*
savannah sparrow	*Passerculus sandwichensis*
grasshopper sparrow	*Ammodramus savannarum*
song sparrow	*Melospiza melodia*
swamp sparrow	*Melospiza georgiana*
white-throated sparrow	*Zonotrichia albicolis*
bobolink	*Dolichonyx oryzivorus*
red-winged blackbird	*Agelaius phoeniceus*
eastern meadowlark	*Sturnella magna*
common grackle	*Quicalus quiscula*
brown-headed cowbird	*Molothrus ater*
northern oriole	*Icterus galbula*
American goldfinch	*Carduelis tristis*

Appendix 4

Ferma - Carden Quarry - List of Mammal Species

Ferma - Carden Quarry - Carden Township

Appendix 4 - List of Mammal Species Observed or Reported in the Study Area

COMMON NAME	SCIENTIFIC NAME
eastern cottontail	*Sylvilagus floridanus*
snowshoe hare	*Lepus americanus*
eastern chipmunk	*Tamias striatus*
woodchuck	*Marmota monax*
eastern gray squirrel	*Sciurus carolinensis*
red squirrel	*Tamiasciurus hudsonicus*
American beaver	*Castor canadensis*
deer mouse	*Peromyscus maniculatus*
muskrat	*Ondatra zibethica*
meadow vole	*Microtus pennsylvanicus*
American porcupine	*Erethizon dorsatum*
coyote	*Canis latrans*
red fox	*Vulpes vulpes*
raccoon	*Procyon lotor*
striped skunk	*Mephistis mephistis*
white-tailed deer	*Odocoileus virginiamus*

Appendix 5

Ferma - Carden Quarry
List of Amphibian and Reptile Species

Appendix 5 - List of Amphibians and Reptiles Observed or Reported in the Study Area

COMMON NAME	SCIENTIFIC NAME
Amphibians	
eastern redback salamander	*Plethodon cinereus cinereus*
American toad	*Bufo americanus americanus*
northern spring peeper	*Hyla crucifer crucifer*
tetraploid gray treefrog	*Hyla versicolor*
midland chorus frog	*Pseudacris triseriata triseriata*
wood frog	*Rana sylvatica*
northern leopard frog	*Rana pipiens*
green frog	*Rana clamitans melanota*
bullfrog	*Rana catesbeiana*
Reptiles	
common snapping turtle	*Chelydra serpentina serpentina*
midland painted turtle	*Chrysemys picta marginata*
eastern garter snake	*Thamnophis sirtalis sirtalis*
northern redbelly snake	*Storeria o. occipitomaculata*

Appendix 6

Ferma - Carden Quarry - Reach Site Cards

Reach/Site Card

Location	**Talbot River Tributary**								
Project #	**93-032**	Reach	**1**	Photo		Date	**05/Jul/93**	Time	**1400**

Substrata Composition			Stream Morphology		Terrain Characteristics		Instream Cover	
	Stream	Bank	(#) % of Reach		Cultivated		Cut Bank	
Bedrock			Riffle	**(2) 20%**	Pasture	✓	Boulder	
Boulder			Pool	**(1) 10%**	Meadow		Logs&Trees	
Rubble	**10 %**		Run		Upland deciduous		Organic	
Gravel	**10 %**		Flat	**(2) 70%**	Upland coniferous		Macrophyte	
Sand	**70 %**		Length		Swamp deciduous		Combined	**30 %**
Silt			Width	**1.5m**	Swamp coniferous		No cover	
Clay			Depth	**0.1m**	Shrub meadow		Overhead Cover	
Muck	**10 %**		Bank Stability		Open meadow		Dense	
Detritus			**Moderate to Low**		Lawn		Partly open	
Marl					Other		Open	**100 %**

Vegetation	
Aquatic	Terrestrial
Cattail	**Grasses**
Bulrush	
Arrowhead	
Watercress	
Coontail	

Crossectional Profile

Left (facing upstream) Right

Additional Comments:

- **cattle had access to this entire reach**
- **all locations of erosion were caused by cattle**

* If found please contatct **NIBLETT ENVIRONMENTAL ASSOCIATES INC.** (705) 277-1929
P.O. Box 160 Bethany, Ontario. L0A 1A0. **THANK YOU.**

Reach/Site Card

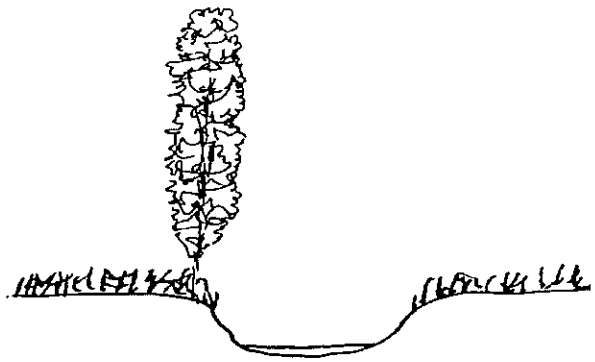
Location	**Talbot River Tributary**								
Project #	**93-032**	Reach	**2**	Photo		Date	**05/Jul/93**	Time	**0830**

Substrata Composition			Stream Morphology		Terrain Characteristics		Instream Cover	
	Stream	Bank	(#) % of Reach		Cultivated		Cut Bank	**5%**
Bedrock			Riffle	**(2) 5%**	Pasture	✓	Boulder	
Boulder			Pool		Meadow		Logs&Trees	**10%**
Rubble	**5 %**		Run		Upland deciduous		Organic	
Gravel	**10 %**		Flat	**(2) 95%**	Upland coniferous		Macrophyte	
Sand	**75 %**		Length		Swamp deciduous	✓	Combined	
Silt			Width	**1.0m**	Swamp coniferous	✓	No cover	
Clay			Depth	**0.1m**	Shrub meadow		Overhead Cover	
Muck			Bank Stability		Open meadow		Dense	**5%**
Detritus			**Moderate to Low**		Lawn		Partly open	
Marl					Other		Open	**95 %**

Vegetation	
Aquatic	Terrestrial
Duckweed	**Grasses**
Bulrush	**Cedar**
Arrowhead	**Maple**
Watercress	**Ferns**
Coontail	**Alder**
	Sedges

Crossectional Profile

Left (facing upstream) Right



Additional Comments:

- **cattle had access to this entire reach**
- **all locations of erosion were caused by cattle**

* If found please contatct **NIBLETT ENVIRONMENTAL ASSOCIATES INC.** (705) 277-1929
P.O. Box 160 Bethany, Ontario. L0A 1A0. **THANK YOU.**

Reach/Site Card

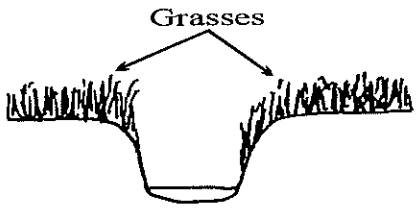
Location	Talbot River Tributary								
Project #	93-032	Reach	3	Photo		Date	05/Jul/93	Time	0845

Substrata Composition			Stream Morphology		Terrain Characteristics		Instream Cover	
	Stream	Bank	(#) % of Reach		Cultivated		Cut Bank	2%
Bedrock			Riffle		Pasture		Boulder	
Boulder			Pool		Meadow	✓	Logs&Trees	
Rubble			Run		Upland deciduous		Organic	
Gravel	5 %		Flat	(1) 100%	Upland coniferous		Macrophyte	
Sand	90 %		Length		Swamp deciduous	✓	Combined	10 %
Silt	5 %		Width	0.75m	Swamp coniferous	✓	No cover	
Clay			Depth	0.25m	Shrub meadow		Overhead Cover	
Muck			Bank Stability		Open meadow		Dense	
Detritus			Moderate to High		Lawn		Partly open	
Marl					Other		Open	100 %

Vegetation	
Aquatic	Terrestrial
Duckweed	**Grasses**
Bulrush	**Cedar**
Watercress	**Maple**
	Ash
	Alder
	Sedges

Crossectional Profile

Left (facing upstream) Right



Additional Comments:

- **cattle had access to this entire reach**
- **4 springs observed draining to creek**
- **in some locations the terrestrial grasses have completely overgrown the creek**

* If found please contatct **NIBLETT ENVIRONMENTAL ASSOCIATES INC.** (705) 277-1929
P.O. Box 160 Bethany, Ontario. L0A 1A0. **THANK YOU.**

Reach/Site Card

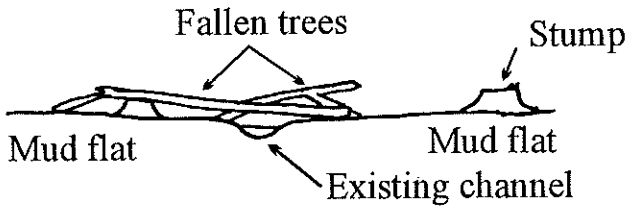
Location	**Talbot River Tributary**								
Project #	**93-032**	Reach	**4**	Photo		Date	**05/Jul/93**	Time	**0900**

Substrata Composition			Stream Morphology		Terrain Characteristics		Instream Cover	
	Stream	Bank	(#) % of Reach		Cultivated		Cut Bank	
Bedrock			Riffle		Pasture		Boulder	
Boulder			Pool		Meadow	✓	Logs&Trees	**5 %**
Rubble			Run		Upland deciduous		Organic	
Gravel			Flat	**(1) 100%**	Upland coniferous		Macrophyte	**30 %**
Sand	**50 %**		Length		Swamp deciduous	✓	Combined	
Silt			Width	**1.0m**	Swamp coniferous	✓	No cover	
Clay			Depth	**0.1m**	Shrub meadow		Overhead Cover	
Muck	**50 %**		Bank Stability		Open meadow		Dense	
Detritus			**Moderate**		Lawn		Partly open	
Marl					Other		Open	**100 %**

Vegetation	
Aquatic	Terrestrial
Cattail	**Grasses**
Bulrush	**Sedges**
Watercress	
Coontail	

Crossectional Profile

Left (facing upstream) Right



Additional Comments:

- **creek meanders through valley of old beaver pond, surrounding soils are completely saturated and soft to a depth of 0.3m**
- **several sections of the creek completely overgrown with coontail**

* If found please contatct **NIBLETT ENVIRONMENTAL ASSOCIATES INC.** (705) 277-1929
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Reach/Site Card

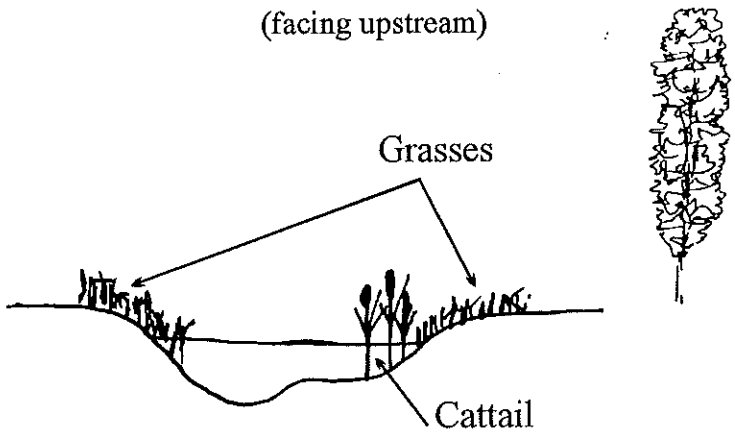
Location	**Talbot River Tributary**								
Project #	**93-032**	Reach	**5**	Photo		Date	**05/Jul/93**	Time	**0915**

Substrata Composition			Stream Morphology		Terrain Characteristics		Instream Cover	
	Stream	Bank	(#) % of Reach		Cultivated		Cut Bank	
Bedrock			Riffle		Pasture		Boulder	
Boulder			Pool		Meadow		Logs&Trees	
Rubble			Run		Upland deciduous		Organic	
Gravel			Flat	**B. pond**	Upland coniferous		Macrophyte	**30 %**
Sand			Length		Swamp deciduous	✓	Combined	
Silt			Width		Swamp coniferous	✓	No cover	
Clay			Depth		Shrub meadow		Overhead Cover	
Muck	**100 %**		Bank Stability		Open meadow		Dense	
Detritus			**High**		Lawn		Partly open	
Marl					Other		Open	**100 %**

Vegetation	
Aquatic	Terrestrial
Cattail	**Grasses**
Bulrush	**Sedges**
Watercress	**Alder**
Coontail	**Maple**
Pondweeds	**Cedar**
Duckweed	

Crossectional Profile

Left (facing upstream) Right



Additional Comments:

- **beaver pond complex made up of at least three seperate dams**
- **deep open water adjacent to upstream side of dams**
- **upstream portions of beaver ponds flood large fields of grasses and sedges, water depth averages 0.25 meters with width averaging 10 meters**

* If found please contatct **NIBLETT ENVIRONMENTAL ASSOCIATES INC.** (705) 277-1929
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Reach/Site Card

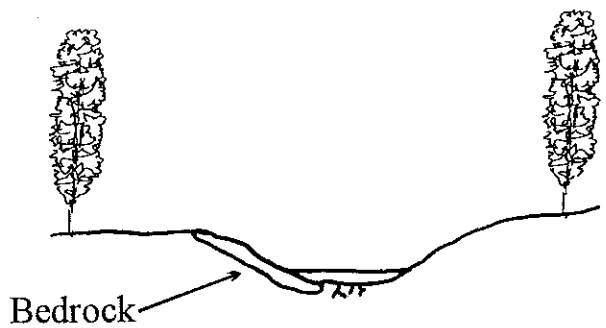
Location	**Talbot River Tributary**								
Project #	**93-032**	Reach	**6**	Photo		Date	**05/Jul/93**	Time	**0930**

Substrata Composition			Stream Morphology		Terrain Characteristics		Instream Cover	
	Stream	Bank	(#) % of Reach		Cultivated		Cut Bank	
Bedrock	**90 %**		Riffle		Pasture		Boulder	
Boulder			Pool		Meadow	✓	Logs&Trees	
Rubble			Run	**(1) 100%**	Upland deciduous	✓	Organic	
Gravel			Flat		Upland coniferous	✓	Macrophyte	**10 %**
Sand			Length		Swamp deciduous		Combined	
Silt	**5 %**		Width	**0.50m**	Swamp coniferous		No cover	
Clay			Depth	**0.10m**	Shrub meadow		Overhead Cover	
Muck			Bank Stability		Open meadow		Dense	
Detritus			**High**		Lawn		Partly open	
Marl					Other		Open	**100 %**

Vegetation	
Aquatic	Terrestrial
	Grasses
	Sedges

Crossectional Profile

Left (facing upstream) Right



Additional Comments:

- **water flowing over bedrock**
- **cattle access, little erosion due to bedrock**
- **creek choked with cladophora in several locations**

* If found please contatct **NIBLETT ENVIRONMENTAL ASSOCIATES INC.** (705) 277-1929
P.O. Box 160 Bethany, Ontario. L0A 1A0. **THANK YOU.**

Reach/Site Card

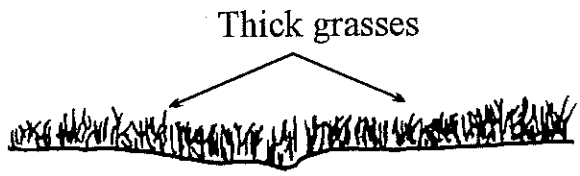
Location	**Talbot River Tributary**								
Project #	**93-032**	Reach	**7**	Photo		Date	**05/Jul/93**	Time	**0945**

Substrata Composition			Stream Morphology		Terrain Characteristics		Instream Cover	
	Stream	Bank	(#) % of Reach		Cultivated		Cut Bank	
Bedrock	**90 %**		Riffle		Pasture		Boulder	
Boulder			Pool		Meadow	✓	Logs&Trees	
Rubble			Run	**(1) 100%**	Upland deciduous		Organic	
Gravel			Flat		Upland coniferous		Macrophyte	**30 %**
Sand	**40 %**		Length		Swamp deciduous		Combined	
Silt			Width	**0.50m**	Swamp coniferous		No cover	
Clay			Depth	**0.10m**	Shrub meadow		Overhead Cover	
Muck	**60 %**		Bank Stability		Open meadow		Dense	
Detritus			**High**		Lawn		Partly open	
Marl					Other		Open	**100 %**

Vegetation	
Aquatic	Terrestrial
Coontail	**Grasses**
Arrowhead	**Sedges**
Pondweeds	
Canada w.w.	

Crossectional Profile

Left (facing upstream) Right



No defined channel

Additional Comments:

- **completely overgrown with grasses**
- **upper end at culvert is open, but has dense patches of Canada waterweed and coontail**
- **Canada w.w - Canada waterweed**

* If found please contatct **NIBLETT ENVIRONMENTAL ASSOCIATES INC.** (705) 277-1929
P.O. Box 160 Bethany, Ontario. L0A 1A0. **THANK YOU.**

Reach/Site Card

Location	**Talbot River Tributary**								
Project #	**93-032**	Reach	**8**	Photo		Date	**05/Jul/93**	Time	**1000**

Substrata Composition			Stream Morphology		Terrain Characteristics		Instream Cover	
	Stream	Bank	(#) % of Reach		Cultivated		Cut Bank	
Bedrock			Riffle		Pasture		Boulder	
Boulder			Pool		Meadow		Logs&Trees	
Rubble			Run		Upland deciduous		Organic	
Gravel			Flat	**B. pond**	Upland coniferous		Macrophyte	**30 %**
Sand			Length		Swamp deciduous	✓	Combined	
Silt			Width		Swamp coniferous	✓	No cover	
Clay			Depth		Shrub meadow		Overhead Cover	
Muck	**100 %**		Bank Stability		Open meadow		Dense	
Detritus			**High**		Lawn		Partly open	
Marl					Other		Open	**100 %**

Vegetation	
Aquatic	Terrestrial
Coontail	**Grasses**
Arrowhead	**Sedges**
Pondweeds	
Canada w.w.	
Duckweed	
Musk grass	
Cattail	
Bulrush	

Crossectional Profile

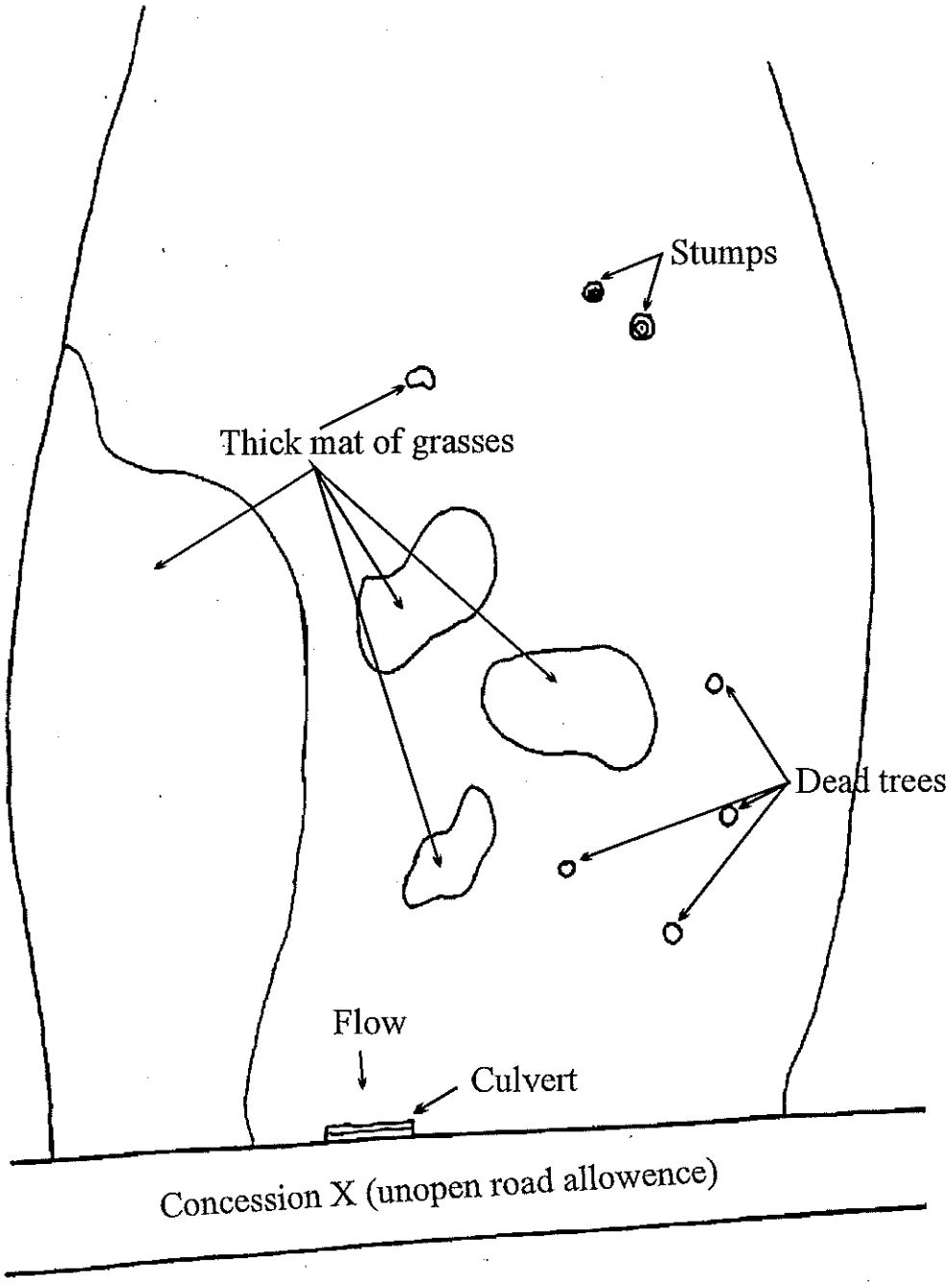
Left (facing upstream) Right

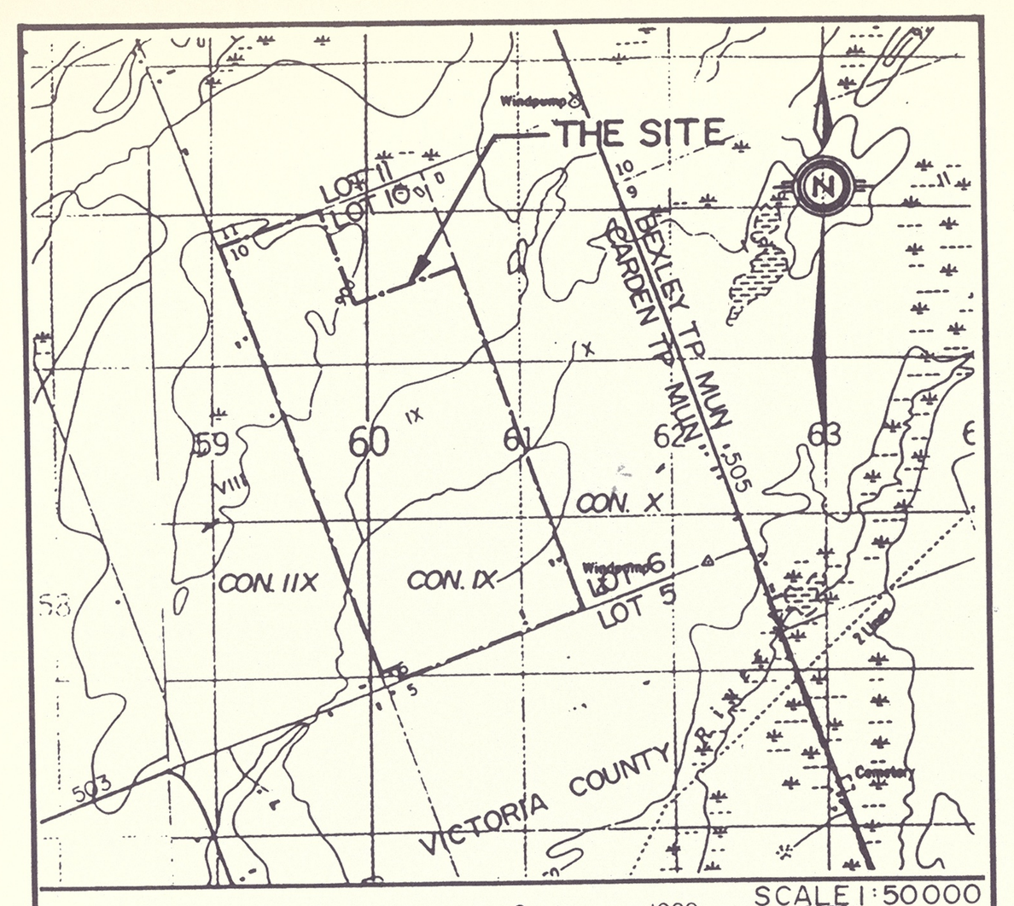
Additional Comments:

- a large pond created by beaver activity and road crossing

- Canada w.w - Canada waterweed

* If found please contatct **NIBLETT ENVIRONMENTAL ASSOCIATES INC.** (705) 277-1929
P.O. Box 160 Bethany, Ontario. L0A 1A0. **THANK YOU.**


Stumps
Thick mat of grasses
Dead trees
Flow
Culvert
Concession X (unopen road allowence)



KEY MAP

NOTES

1. AREA TO BE LICENSED - 384.5 ha
2. EXISTING LICENSED AREA - 0.0 ha
3. EXISTING DISTURBED AREA - 0.0 ha
4. THE WATER TABLE ELEVATION RANGES BETWEEN 258.0 AND 273.0, AND BETWEEN 0.0 m AND 14 m BELOW THE GROUND SURFACE AS RECORDED BY FIELD SURVEY.
5. THIS PLAN WAS PREPARED USING PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHS.
6. LOT, CONCESSION AND BOUNDARY LINES ON THIS PLAN ARE APPROXIMATE.
7. THIS IS NOT A LEGAL SURVEY DRAWINGS IN ACCORDANCE WITH THE PROVINCE OF ONTARIO SURVEYORS ACT 1987.

LEGEND

- 268.20 — EXISTING ELEVATION
- 270 — 2.0m CONTOUR INTERVAL
- TREES / BUSH
- CREEK — DRAINAGE COURSE & FLOW DIRECTIONS
- GENERAL SURFACE DRAINAGE DIRECTION
- BD — BEAVER DAM
- SWAMP
- W/L 270.10 — POND AND WATER LEVEL
- W1 — WELL LOCATION AND NUMBER
- SURFACE WATER MONITORING POINT
- H B S G C (5m x 7m, 20 x 15, 15x7, 4x5, 5x6) — BUILDINGS (HOUSE-BARN-SHED-GARAGE-COTTAGE) DIMENSIONS
- C.WYLIE / W.GOULD — OWNER / TENANT
- P&W 1.2m S.R. — FENCE TYPE & HEIGHT (P& W-POST & WIRE) (S.R.-SPLIT RAIL)
- GATE
- ASSUMED ROAD
- UNASSUMED ROAD
- TRAIL
- ENTRANCE / EXIT
- LOT / CONCESSION LINE
- ZONE BOUNDARY
- AI OI — ZONING (AI-RURAL GENERAL) (OI-OPEN SPACE)
- PASTURE / WOODLOT — LAND USE
- 6R — AGRICULTURAL LAND CLASSIFICATION
- N19°04'20"W 900.0m — BOUNDARY OF AREA TO BE LICENSED METES AND BOUNDS
- LIMIT OF PROPOSED EXTRACTION
- 30m SETBACK — PROPOSED SETBACK DISTANCE
- 500m INFORMATION AREA LIMIT LINE
- A — CROSS SECTION/PROFILE NUMBER & LOCATION
- 2 — BOREHOLE NUMBER AND LOCATION

THIS SITE PLAN IS PREPARED FOR SUBMISSION TO THE MINISTRY OF NATURAL RESOURCES IN CONJUNCTION WITH AN APPLICATION FOR A CLASS A LICENCE UNDER THE AGGREGATE RESOURCES ACT AND REGULATIONS.

FERMA CRUSHED STONE INC.
2680 RENA ROAD
MISSISSAUGA, ONTARIO
L4T 1G6
Telephone: (416) 677-9241 Fax: (416) 677-9817

SIGNATURE OF LICENSEE DATE

AMENDMENTS	DATE
SITE PLANS APPROVED BY MINISTRY OF NATURAL RESOURCES SIGNATURE DATE	

THESE PLANS WERE DESIGNED TO ENSURE COMPLETE PRACTICALITY DURING THE OPERATIONS, PROGRESSIVE REHABILITATION AND FINAL REHABILITATION OF THE LICENSED PROPERTY

OLIVER MANGIONE McCALLA
& ASSOCIATES LIMITED
Consulting Engineers Nepean, Ontario
34 Market Street, Orillia, Ontario L3V 3C9
Telephone: (705) 327-0686 Fax: (705) 326-1788

92-8977

FERMA-CARDEN QUARRY

LOTS 6,7,8,9, & WEST HALF OF LOT 10
CONCESSION IX
TOWNSHIP OF CARDEN
COUNTY OF VICTORIA

PAGE OF

PHOTO SCALE	ROLL No.	PHOTO Nos.	LINE No.	PHOTO DATE
1:16000	87-4426	188 – 190	3	MAY 1987

MAP SCALE	CONTOUR INTERVAL	DATE OF SITE PLAN
1:5000	2.0 m	12 APRIL 1993

100 0 100 200 300 400m

Figure 3: Natural Environment

Legend

- · · · · · - Talbot Creek tributaries
- Reach 1 - Aquatic habitat types
- ⟷ - Boundaries of reaches
- E1 - Fisheries electroshocking stations
- WQ1 - Water quality station
- (1) - Vegetation units

Significant Species

- ◆ - fragrant sumac (*Rhus aromatica*)
- ✚ - fringed gentian (*Gentiana crinita*)
- ■ - loggerhead shrike (*Tyrannus tyrannus*)
- ✱ - prairie smoke (*Geum triflorum*)
- ● - slender gerardia (*Agalinus tenuifolia*)
- ▲ - umbel-like sedge (*Carex umbellata*)

Niblett Environmental Associates Inc.