4.0 EXISTING CONDITIONS

This Chapter provides an overview of the existing conditions found in the study area. These inventories identify not only the sensitive environmental features to be taken into consideration for assessment of alternatives (Chapter 5.0) and protection / mitigation, (Chapter 6.0) but also to provide a portrayal of the local environmental context in which the project will be undertaken. A more detailed summary is provided in **Appendix F**, Existing Conditions Report.

4.1 Natural Environment

The natural environment section provides a description of the intrinsic physical factors that include the geology, soils, ground water, surface water, fisheries and aquatic habitat, terrestrial ecosystems, including flora, fauna and wildlife corridors.

4.1.1 Geology and Soils

4.1.1.1 Bedrock

The bedrock beneath the study area is predominately calcareous Precambrian marble found at either end of the study area, including Madawaska River and Bruce Street. Crystalline limestone bedrock is found in the eastern portion at White Lake Road and County Road 508 of the study area. Also found is greywacke bedrock at Division Street, Campbell Road (15 m depth) and Scheel Drive.

4.1.1.2 Soils

The study area is made up of a variety of soils types[2], refer to **Figures 4-1, 4-2 and 4-3, Soils**.

A brief description of the predominant soils is given below.

Renfrew soils are the best agricultural soils in Renfrew County. Renfrew clay soils are imperfectly drained and have developed profile characteristics typical of the Grey Wooded Great Group. These soils are under cultivation and are good for hay and pasture crops which are usually fed to livestock, particularly beef cattle.

Rideau soils are found in the eastern portion of the study area, extending west from Arnprior to Glasgow Station. Rideau soils are divided into two categories, clay and sand complex. Rideau-clay soils are imperfectly drained, clay textured soils that are capable of producing good hay and grain crops for the livestock industry. However, Rideau-sand complex soils contain sandy soils in addition to clay soils and are not desirable for cultivation and productivity.

Monteagle soils are found within the Precambrian Upland. They offer no potential for agriculture due to the high percentage of rock outcrop.

Many areas of **White Lake** soils in the Precambrian shield are under cultivation but are not very productive when compared with many other soil series in the county.

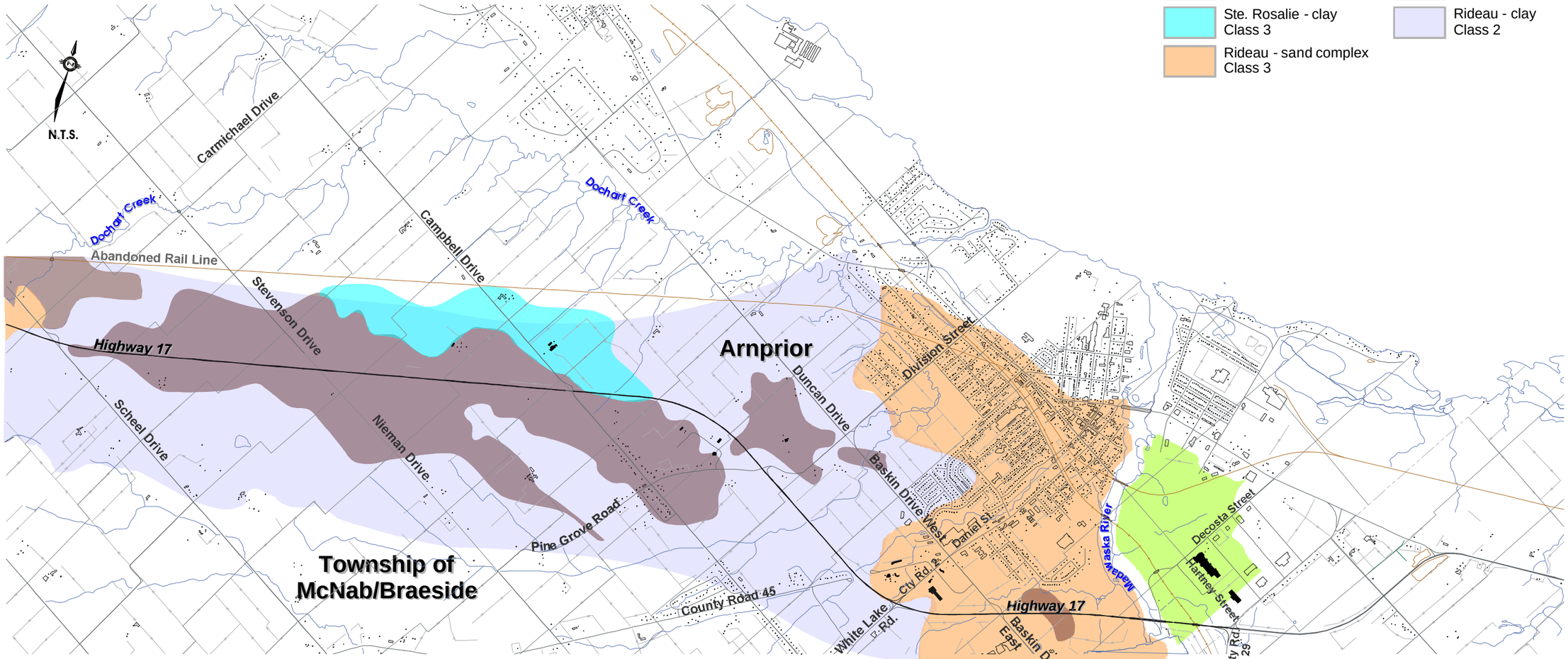
Tweed soils are associated with surface outcrops of crystalline limestone in certain portions of the Precambrian shield. These soils have many desirable qualities including good drainage and high base status, which makes forestry their most productive use. These soils are not recommended for use as range lands for livestock.

4.1.2 Physiography

The physiography along Highway 17 between Arnprior and Renfrew consists mainly of clay plains interrupted by shadow till and rock ridges, sand plains and a small area of kame moraines at County Road 6[3], refer to **Figures 4-4, 4-5 and 4-6**, **Physiography**.

[2] Soil Survey of Renfrew County, Report No. 37 of the Ontario Soils Survey, 1964.

[3] The Physiography of Southern Ontario, Second Edition. Ontario Research Foundation by University of Toronto Press, 1973.



Soil Class Definition:

Class 2 - Soils with moderate limitations that reduce choice of crops or require moderate conservation practices.

Class 3 - Soils with severe limitations that reduce choice of crops or require special conservation practices.

Class 4 - Soils with severe limitations that restrict choice of crops and require very special conservation practices or very careful management, or both.

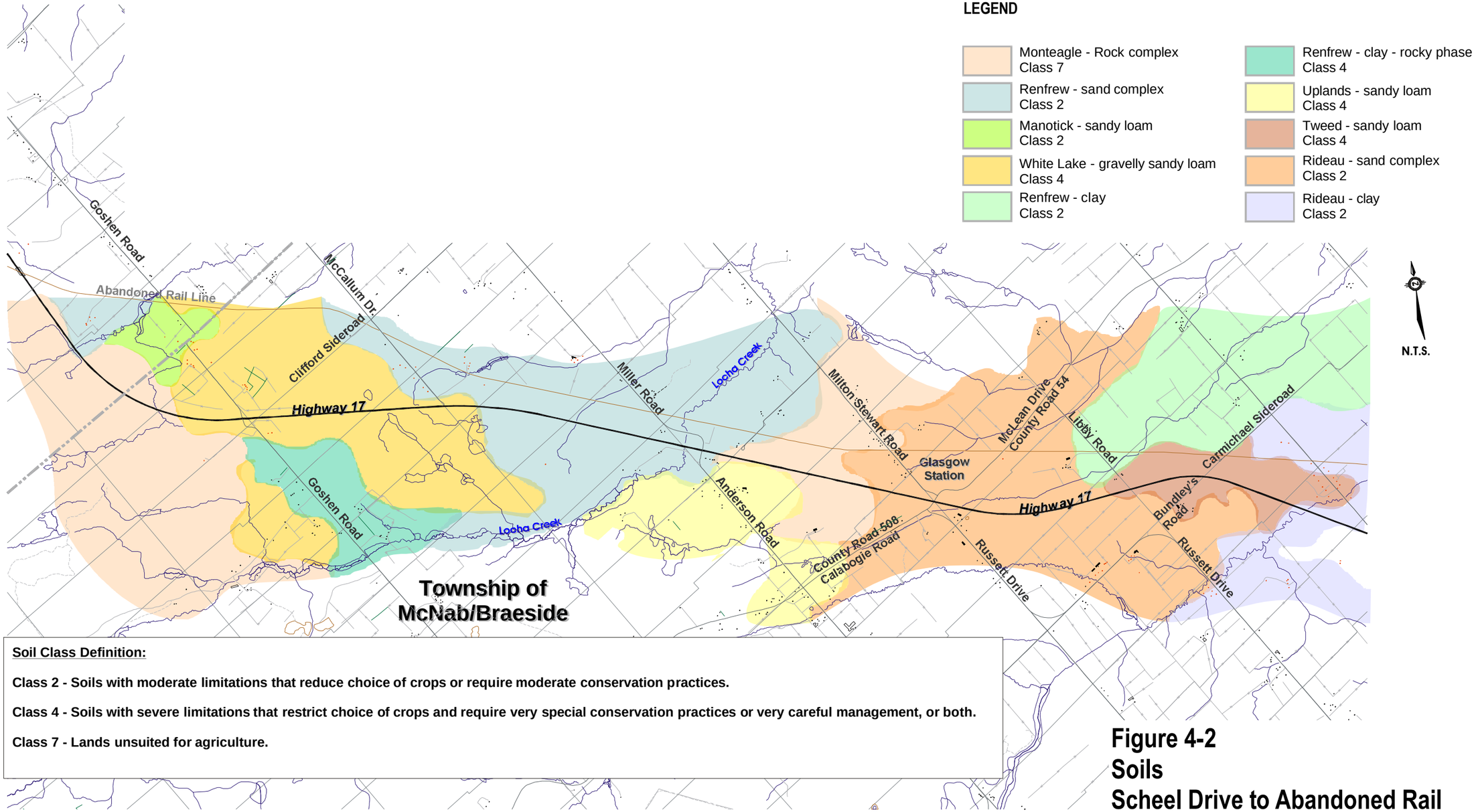
Figure 4-1
Soils
County Road 9 to Scheel Drive

HIGHWAY 17 TWINNING
ARNPRIOR TO RENFREW

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NCE

Soils Survey of Renfrew County, Report No. 37 of the Ontario Soils Survey. 1964.



Soil Class Definition:

Class 2 - Soils with moderate limitations that reduce choice of crops or require moderate conservation practices.

Class 4 - Soils with severe limitations that restrict choice of crops and require very special conservation practices or very careful management, or both.

Class 7 - Lands unsuited for agriculture.

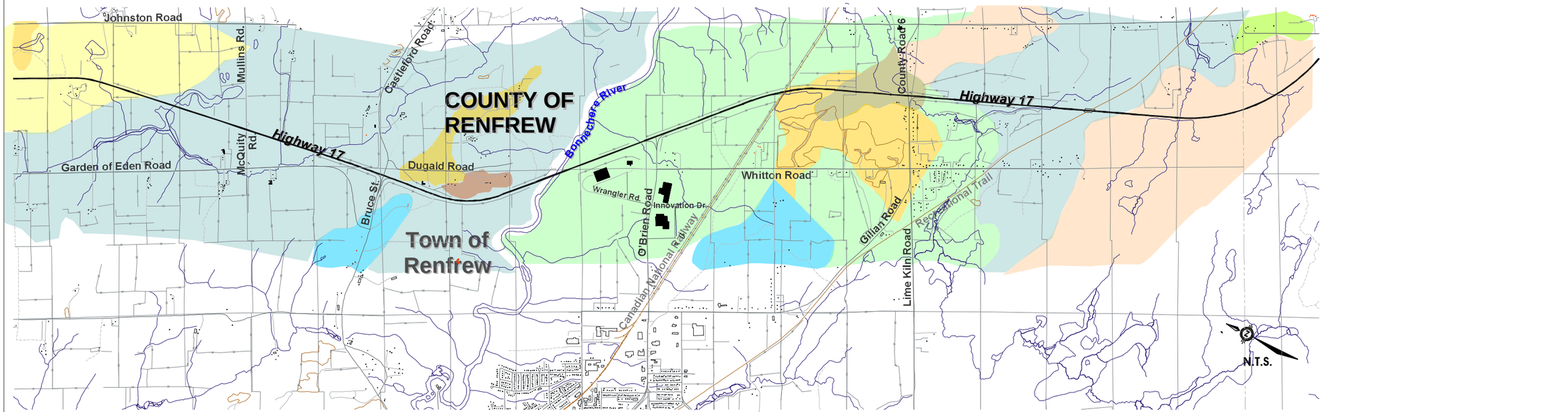
Figure 4-2
Soils
Scheel Drive to Abandoned Rail Line

HIGHWAY 17 TWINNING
ARNPRIOR TO RENFREW

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Soils Survey of Renfrew County, Report No. 37 of the Ontario Soils Survey. 1964.



Soil Class Definition:

Class 2 - Soils with moderate limitations that reduce choice of crops or require moderate conservation practices.

Class 4 - Soils with severe limitations that restrict choice of crops and require very special conservation practices or very careful management, or both.

Class 6 - Soils are unsuited to cultivation but are capable of uses for improved permanent pasture.

Class 7 - Lands unsuited for agriculture.

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Soils Survey of Renfrew County, Report No. 37 of the Ontario Soils Survey. 1964.

Figure 4-3
Soils
Abandoned Rail Line to 3 km West of Bruce Street

HIGHWAY 17 TWINNING
ARNPRIOR TO RENFREW

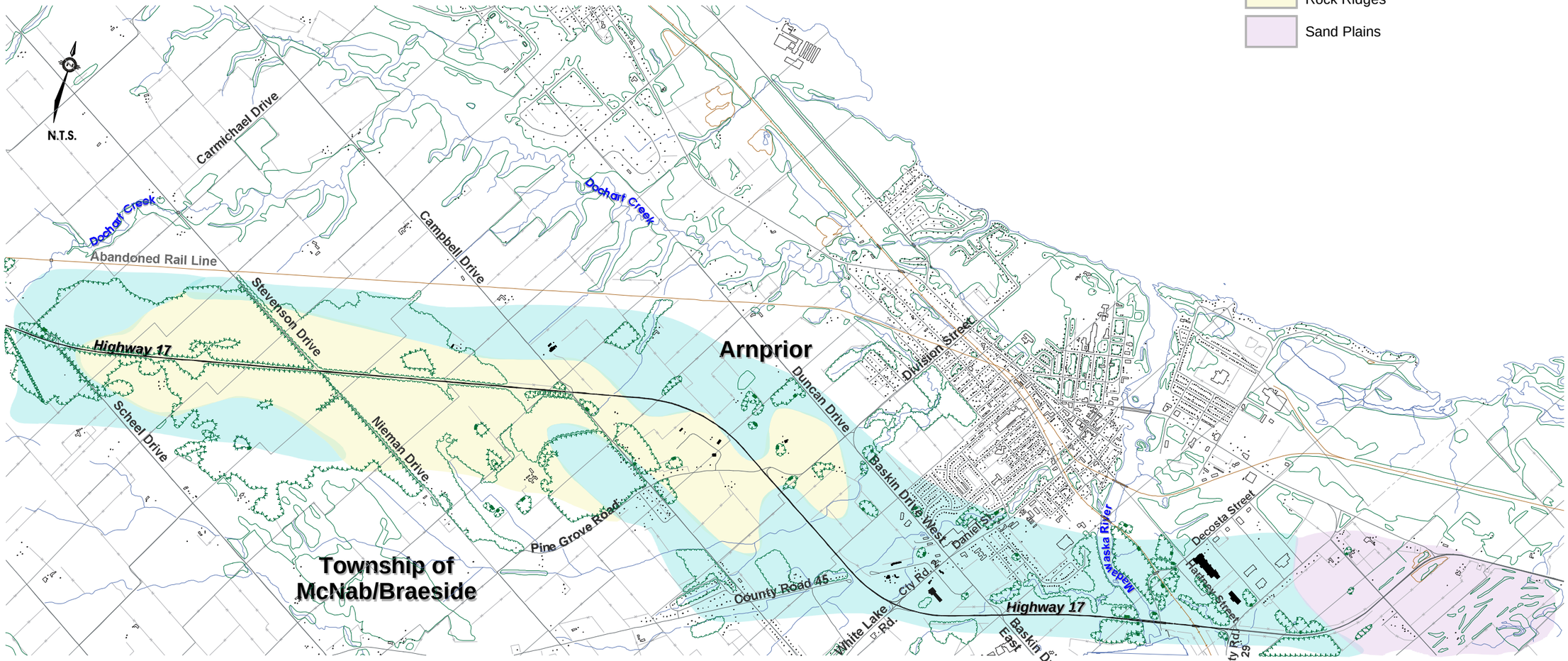


Figure 4-4
Physiography
County Road 9 to Scheel Drive

HIGHWAY 17 TWINNING
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The Physiography of Southern Ontario, Second Edition. Ontario Research Foundation by University of Toronto Press, 1973.

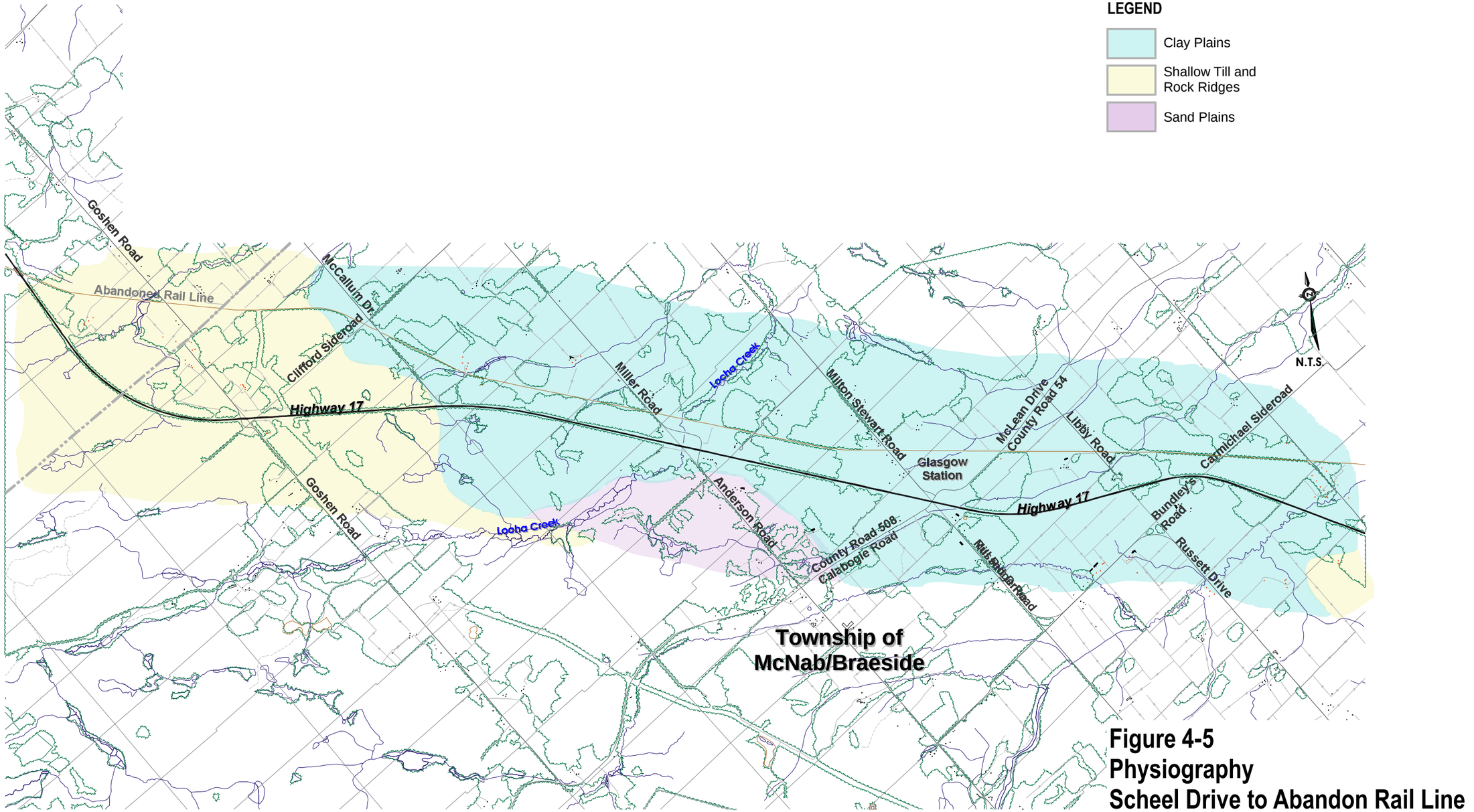


Figure 4-5
Physiography
Scheel Drive to Abandon Rail Line

HIGHWAY 17 TWINNING
ARNPRIOR TO RENFREW

The Physiography of Southern Ontario, Second Edition. Ontario Research Foundation by University of Toronto Press, 1973.

LEGEND

- Clay Plains
- Shallow Till and Rock Ridges
- Sand Plains
- Kame Moraines

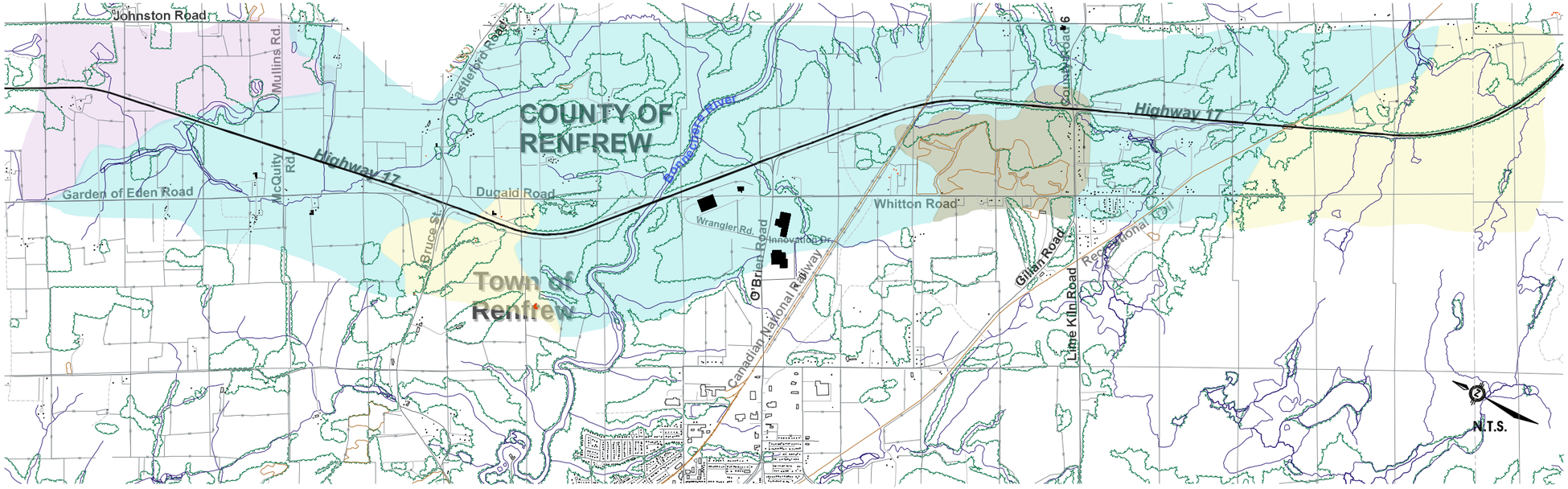


Figure 4-6
Physiography
Abandoned Rail Line to 3 km West of Bruce Street

HIGHWAY 17 TWINNING
ARNPRIOR TO RENFREW

The Physiography of Southern Ontario, Second Edition. Ontario Research Foundation by University of Toronto Press, 1973.

4.1.3 Soil Capability Classification for Agriculture

Soils are divided into classes with similar dominant limitations for agricultural use as a result of soil and climate. Soil classes within the project limits range from Class 2 to Class 7[4], refer to **Figures 4-1, 4-2 and 4-3**, **Soils**. The following is a brief description of the classes found within the study area:

- Class 2 soils have moderate limitations that reduce choice of crops or require moderate conservation practices;
- Class 3 soils have severe limitations that reduce the choice of crops or require special conservation practices;
- Class 4 soils have severe limitations that restrict the choice of crops and require very special conservation practices or very careful management, or both;
- Class 6 soils are unsuited for cultivation but are capable of uses for improved permanent pasture; and
- Class 7 soils are unsuited for agriculture.

Class 1 to 3 soils are considered Provincially Significant resources for agricultural production.

Class 2 and Class 4 soils appear to dominate the area along Highway 17 extending from Arnprior Road to Scheel Drive. The section from Scheel Drive to the abandoned rail line ranges from Class 2 to Class 7 with the majority of the lands being Class 2. The western section of the study area is comprised mainly of Class 2 soils, with Class 7 lands at the east end of the study area and Class 4 lands located in the vicinity of Whitton Road / County Road 6 gravel pits.

4.1.4 Groundwater

A Stage 1 groundwater assessment was undertaken to locate water wells in within the study area. The Ministry of the Environment (MOE) was contacted and they provided relevant data. The **Well Records - MOE Data Sheets** are found in **Appendix F**. The data indicated 233 water wells within a 1 km distance from existing Highway 17, refer to **Figure 4-7**, **Groundwater - Well Locations.** It should be noted that the Towns of Arnprior and Renfrew are on a municipal water system. Water well locations are dispersed throughout the study area indicating the rural landscape of the study area. A high concentration of wells can be found at major intersections along Highway 17, they are County Road 508, County Road 6 and Bruce Street. These intersections have a relatively high concentration of wells due to the number of residential dwelling units near Highway 17. A Stage II groundwater assessment was undertaken following the selection of the recommended plan for roadway alignment and interchanges. The Stage II assessment considered and concluded that no private wells were located within 150 m of any area that required cut, with excavation greater than 2 m, or blasting.

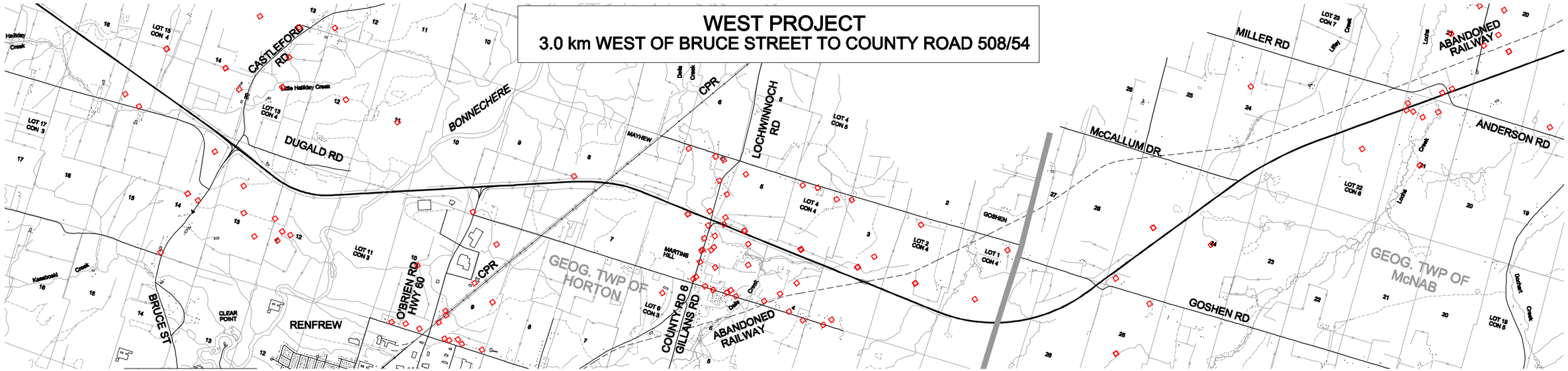
4.1.5 Surface Water

There are 22 watercourses crossing the Highway 17 study area in a northerly direction towards the Bonnechere, Madawaska Rivers, and subsequently the Ottawa River. Starting at the west end the watercourses include Little Halliday Creek and its tributaries located west of the Bonnechere River. The Bonnechere River is one of the largest watercourses located in a very deep and steep ravine near the Town of Renfrew. The tributaries of the Bonnechere River have also eroded deep ravines due to the clay soils found here. Deils Creek crisscrosses Gillan Road (County Road 6) and is a high quality stream with good water quality and aquatic habitat. Locha Creek and numerous tributaries are found in the vicinity of Miller Road. Dochart Creek and its tributaries cross Highway 17 at Scheel Drive. At the east end of the study area the Madawaska River and its tributaries flow northward through the Town of Arnprior.

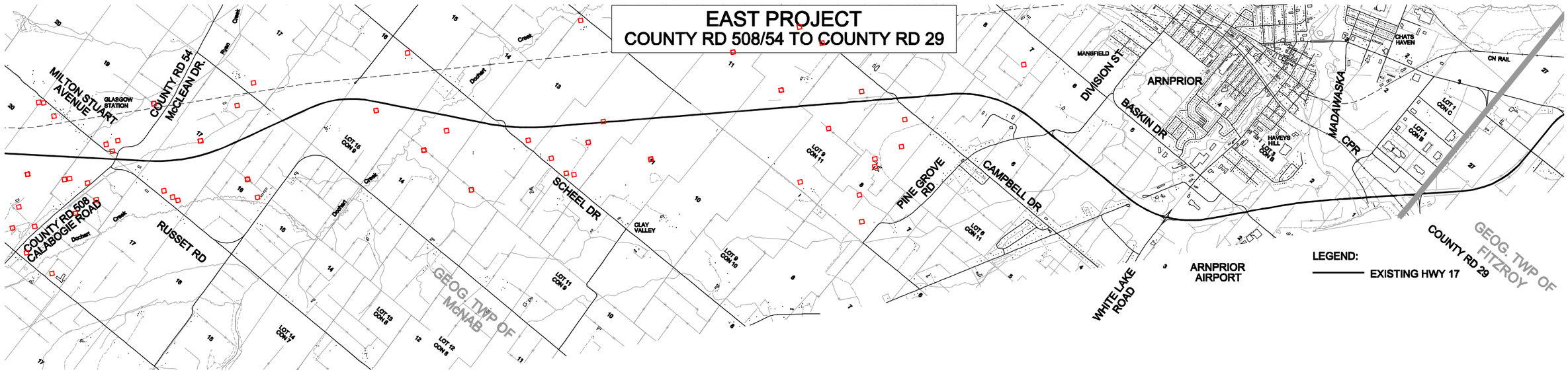
NCE undertook a review of the existing surface water conditions in August / October 2002.

[4] Soil Survey of Renfrew County, Report No. 37 of the Ontario Soils Survey, 1964.

WEST PROJECT
3.0 km WEST OF BRUCE STREET TO COUNTY ROAD 508/54



EAST PROJECT
COUNTY RD 508/54 TO COUNTY RD 29



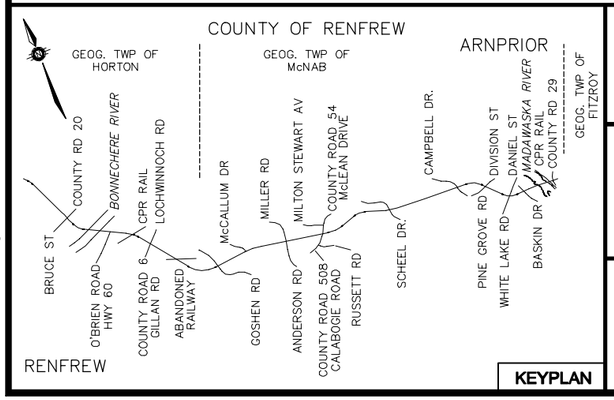


FIGURE 4-7

GROUNDWATER - WELL LOCATIONS

500m 0 1000m
Horizontal

Ministry of Transportation

HIGHWAY 17 TWINNING, COUNTY ROAD 29 to 3.0 km WEST OF BRUCE STREET
PRELIMINARY DESIGN/ ENVIRONMENTAL ASSESSMENT STUDY
WP 647-92-00

NCE
TRANSPORTATION AND VALUE ENGINEERS

FIGURE 4-07.dwg – Mon, 1 Dec 2003 – 11:41

4.1.5.1 Minor Watercourses

The majority of the "minor" culvert crossings within the Study Area are 900 mm diameter corrugated steel pipe culverts and largely dedicated to local highway drainage and small external catchments.

4.1.5.2 Stormwater Management

There are no formal measures within the Study Area which provide stormwater management for the highway runoff. It is expected that vegetated roadside ditches provide some degree of sediment removal, as most vegetation appears to be well established. There were no visible signs of degraded water quality, with the exception of significant sediment deposits at a number of the culvert crossings. These deposits are likely the result of channel erosion, observed in a number of locations where new construction, or suspected recent ditch maintenance has removed the ditch vegetation.

The highway is expected to be a relatively minor contributor to increased flows in the majority of the watercourse / channel sections. The presence of the highway does, however result in the concentration of flows in various locations, which may result in downstream erosion. This appears to be the problem in the case of the public comment regarding insufficient hydraulic capacity immediately northwest of Castleford Road and Highway 17 (Section 3).

4.1.5.3 Drainage System

The existing drainage system for the current Highway 17 configuration is typical of many current provincial highway drainage systems, with some deterioration of the existing culvert structures due to aging (corrosion and buckling), and isolated problematic areas associated with local hydraulic capacity and erosion.

4.1.6 Fisheries and Aquatic Habitat

Warmé Engineering and Biological Services carried out a preliminary survey in the spring and summer of 2002. The objective of the on-site inventory was to determine the status of fish habitat within the watercourses along Highway 17 within the study area, and thus accurately describe the fish and aquatic habitat during later times in the season. A copy of the **Fisheries and Aquatic Habitat Report** is found in **Appendix H** of this report.

Twenty-one watercourse crossings were confirmed to have fish habitat that may be impacted as a result of proposed road construction, within the project limits. Locations are illustrated on **Figures 4-8**, **4-9 and 4-10, Natural Environment**. The details of the preliminary findings are summarized in **Table 4.1**, **Summary of Fisheries and Aquatic Habitat Findings**.

4.1.7 Terrestrial Ecosystems

Daniel F. Brunton Consulting Services carried out an inventory of the terrestrial ecosystems in the spring and summer of 2002. The **Natural Environment Assessment, Highway 17 (Arnprior to Renfrew)** is found in **Appendix I** of this report.

The Highway 17 corridor contains natural features and values that are largely confined to 'islands' of habitat in an otherwise transformed landscape. These include extensive upland areas on shallow bedrock outcrops and in wetland areas. Areas of developed agricultural landscape hedgerows and scattered clumps of trees are also present.

Refer to **Figures 4-8, 4-9 and 4-10, Natural Environment**.

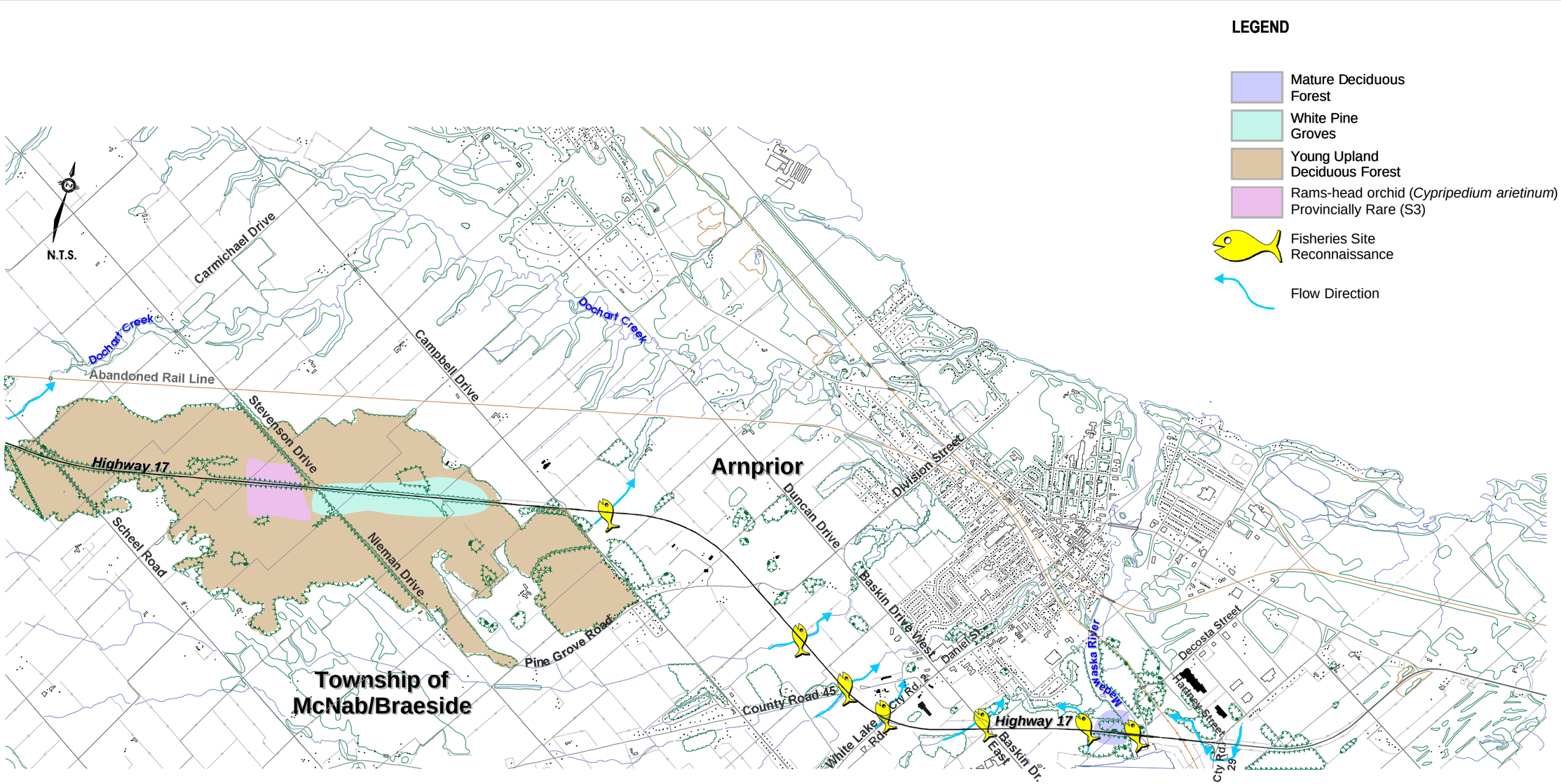


Figure 4-8
Natural Environment Features
County Road 9 to Scheel Drive

HIGHWAY 17 TWINNING
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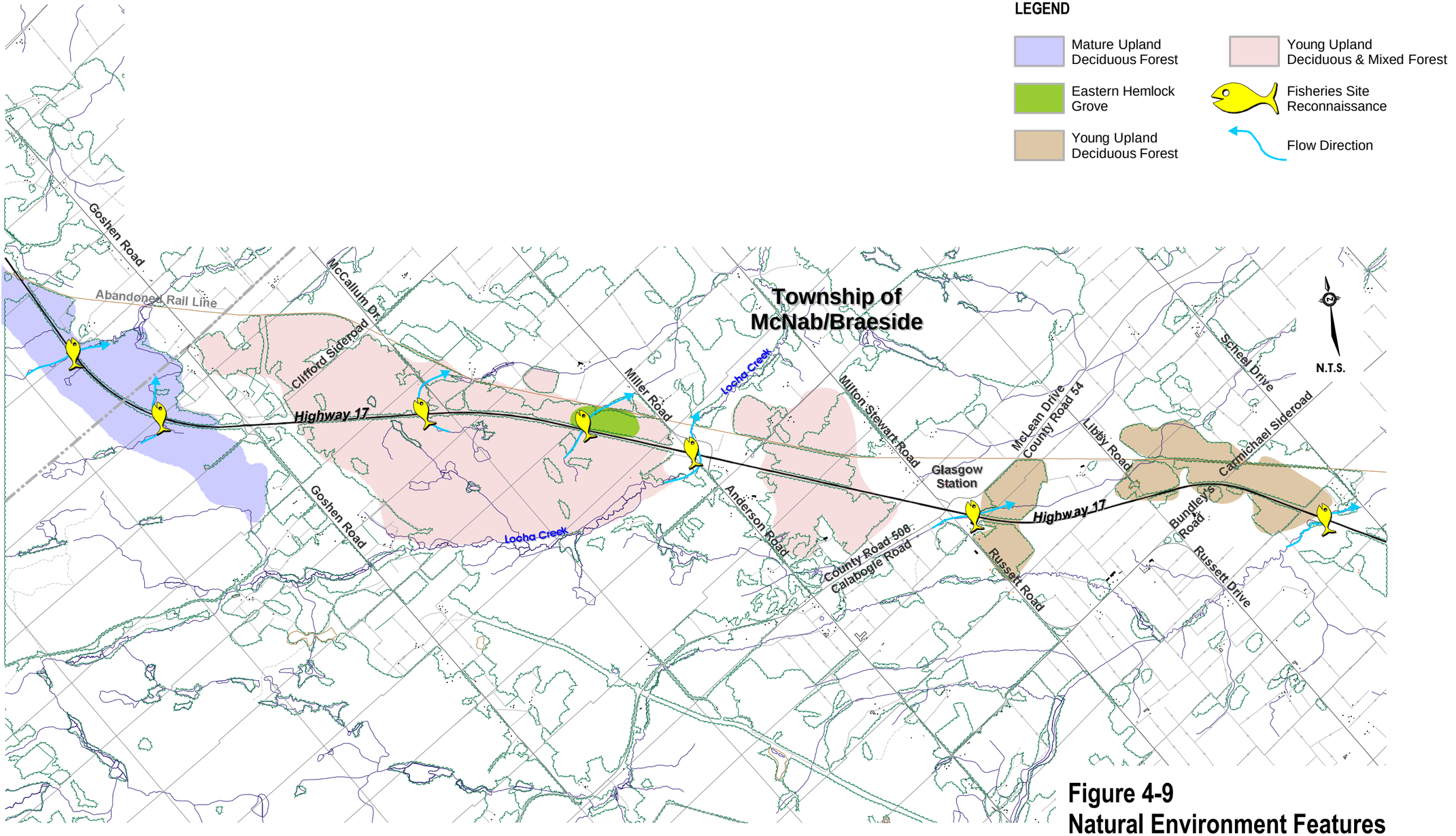


Figure 4-9
Natural Environment Features
Scheel Drive to Abandoned Rail Line

HIGHWAY 17 TWINNING
ARNPRIOR TO RENFREW

LEGEND

- Provincially Significant Fauna (Red-shouldered Hawk)
- Young Upland Deciduous Forest
- Mature Upland Mixed Forest
- Fisheries Site Reconnaissance
- Mature Upland Deciduous Forest
- Upland Coniferous Forest
- Marble Cliff; Provincially Rare Flora (Purple Cliff-brake)
- Flow Direction

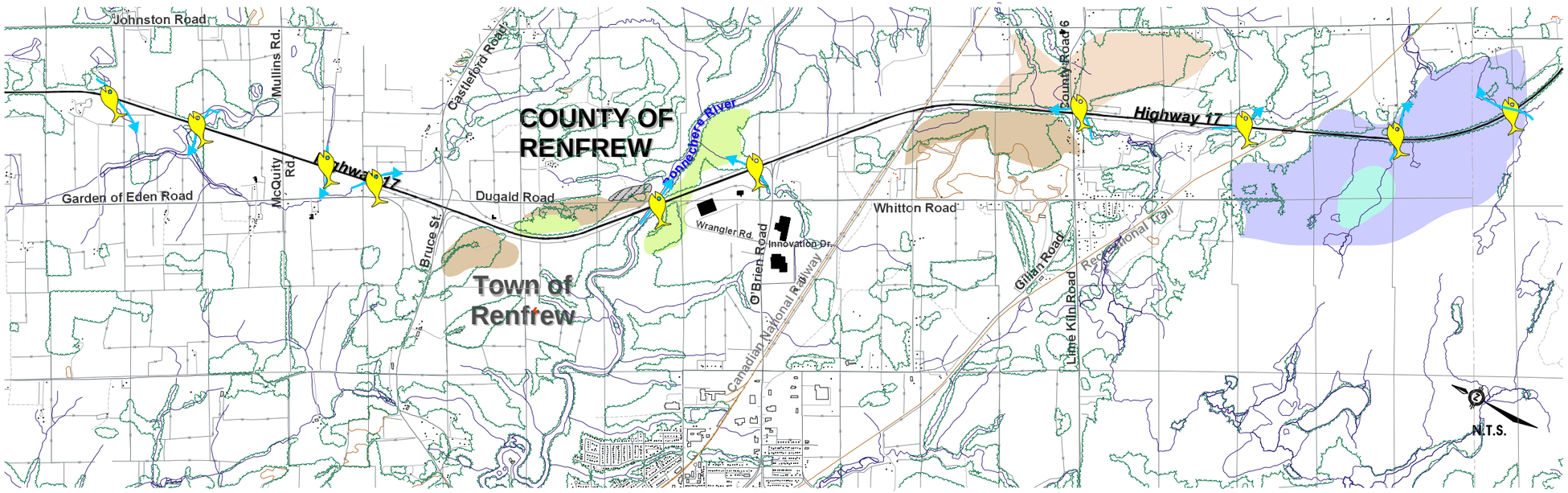


Figure 4-10
Natural Environment Features
Abandoned Rail Line to 3 km West of Bruce Street

HIGHWAY 17 TWINNING
ARNPRIOR TO RENFREW

Table 4-1
Summary of Fisheries and Aquatic Habitat Findings

Site Number	Site Location	Site Description	Fish Habitat Assessment
Site 1	Township of Horton Station No. 15+825 Little Halliday Creek Tributary A	• 1524 x 38.34 CSP • Flow is from north to south, does not clearly show a permanent channel. • Swale travels through pasture land north of highway. • Overgrown with common cattail later in season (north and south). • Roadside species surround the marsh and include Canada thistle, golden rod, blue vervain, long grasses. • Willow shrubs at inlet of culvert. • Muck bottomed with minor contributions of gravel and sand.	Provides permanent fish habitat on both sides of the highway, although only a very small area of pooled water appears to be available for fish habitation at certain times of the year immediately downstream of the culvert. Migration is likely impeded by the slightly perched downstream (southern) end of the culvert. Documented species: see **Appendix H**
Site 2	Station No. 16+525 Little Halliday Creek Tributary B	• 1676 x 55.46 CSP culvert drains into 4 m wide and 0.6 m deep channel, south side of highway. • Active beaver dam about 25 m upstream, north side of road, which hinders but does not prevent fish migration. • Filamentous green algae and duckweed observed. • Marsh supports common cattails, tamarack and white cedar, extends beyond right-of-way downstream toward active farmland. • Groundhog holes near culvert openings on both sides of highway, stability of banks not affected. • Banks populated by common mullein, common evening primrose, curled dock, blue vervain, common milkweed, Canada thistle, golden rod, Virginia creeper, staghorn sumac, soft rush, bluegrass and sedges.	Provides permanent fish habitat on both sides of the highway. Migration is likely hindered but not prevented by the beaver dam upstream (north) of the culvert. Documented species: see **Appendix H**
Site 3	Station No. 17+563 Little Halliday Creek Tributary C	• 1650 x 33.73 CSP culvert • 1 m wide and 0.4 m deep watercourse. • Sedges, soft rushes, spotted jewelweed and blue vervain grow in the right-of-way and indicate that these areas are continually wet. • Drains active pasture land on north side of highway (upstream). • Small fish observed, likely seasonal pike spawning habitat. • Slight erosion adjacent to culvert due to groundhog burrows.	Provides permanent fish habitat on both sides of the highway. Documented species: see **Appendix H**
Site 4	Station No. 17+887 Little Halliday Creek	• 2438 x 41.12 CSP culvert • 2-3 m wide channel with substantial water flow. • Average water depth 0.5-0.6 m early in the season; later dropped to 0.25 m at end of July. • Potential trout habitat; cool water temperatures, high oxygen and low specific conductance, overhangs and cobble and	Provides permanent fish habitat on both sides of the highway. Documented species: see **Appendix H**

Table 4-1
Summary of Fisheries and Aquatic Habitat Findings

Site Number	Site Location	Site Description	Fish Habitat Assessment
		sand substrate. • Scrub willows, speckled alder, European buckthorn, and young elm and sugar maple line channelized banks (~150 m in length parallel to highway) in the northern right-of-way. • Common evening primrose and grass like vegetation predominate across highway. • No livestock access from adjacent pasture land (fenced). • Rill erosion with slumping and cracking beside the road surface on north side.	
Site 6	Station No. 21+100 Bonnechere River East Tributary 1	• 1.5 m wide and 0.25 m deep heavily treed stream located within deeply incised wooden ravine • riparian zone supports moss, fern and woodland species such as bloodroot and prickly gooseberry • trees include oak, ash, white birch, white spruce, white cedar and staghorn sumac • rock steep slopes leading to culvert openings on both sides of road • flow from south to north	Provides seasonal fish habitat on both sides of the highway as evidenced by topographic maps. No fish species were documented, as electrofishing was not possible due to insufficient water volume.
Site 7	Station No. 23+625 Deils Creek	• Concrete box culvert (3.64 m wide, 1.5 m high, 58 m long). • Water flows from south to north and drains into two large diameter CSP culverts under Lochwinnoch Road / County Road 6 and then into wooded area which consists of white cedar, black spruce and white ash. • South end of channel is 2-3 m wide and north end is 5-6 m wide with constant depth of 0.25-1 m. • Roadside and riparian vegetation includes bull thistle, blue vervain, purple loosestrife, spotted joe-pye weed, St. John's wort, common evening primrose, prickly lettuce, common mullein, bedstraw, curled dock, bittersweet nightshade, golden rod, ferns, common yarrow, northern bugleweed, asparagus, stinging nettle, common cattail, monkey flower, brown-eyed Susan, giant bulrush, arrowhead and sapling American basswood. • Minnows observed during first site visit. • Potential trout habitat due to riffle zones and cold clear water which support growth of watercress.	Provides permanent fish habitat on both sides of the highway. Documented species: see **Appendix H**
Site 8	Station No. 24+975 Deils Creek Tributary	• (2) 1220 mm CSP culverts. • 1-2 m wide channel in southern right-of-way. • Common cattail and coarse-toothed poplar on north side of highway. • Balsam poplar in shallow channel parallel to highway. • Sandy substrate supports watercress growth in watercourse	Provides permanent fish habitat on both sides of the highway. Documented species: see **Appendix H**

Table 4-1
Summary of Fisheries and Aquatic Habitat Findings

Site Number	Site Location	Site Description	Fish Habitat Assessment
		on both sides of the highway. • Herbaceous vegetation growing in upstream and downstream reaches consists of Canada thistle, spotted jewelweed, curled dock, white sweet clover, purple loosestrife, blue vervain, common milkweed, common yarrow, bittersweet nightshade, common burdock, horsetails and hairy willow herb.	
Site 9	Township of McNab-Braeside Station No. 10+075 Bonnechere River East Tributary 2	• Main channel is 0.4-1 m wide and 0.4-0.5 m deep. • 1821 mm CSP culvert (downstream of channel). • 0.25 m deep drainage ditches along highway to the east and west. • Common cattails, horsetails, ferns and sedges blanket shallow drainage basins. • Roadside species include common mullein, bull thistle, common milkweed, golden rod, cow vetch, oxeye daisy, brambles and common yarrow. • Downstream, north of highway, the watercourse is 1 m wide and meanders through a treed area containing poplar, willow, white cedar, elm and white birch.	Provides permanent fish habitat on both sides of the highway. Documented species: see **Appendix H**
Site 10	Station No. 10+890 Bonnechere River East Tributary 2A	• 1619 mm CSP culvert drains brown-water wetland that extends about 100 m south of highway. • 1 m deep channel. • Historical beaver activity. • Duckweed, algae, emergent sedges and common cattails provide shelter and nursery habitat for fish. • Stream re-enters wooded cedar swamp on north side. • Dissolved oxygen levels were very low.	Provides permanent fish habitat on both sides of the highway, as evidenced by topographic information and habitat structure. Electrofishing attempts did not produce any fish.
Site 11	Station No. 13+240 Locha Creek West Tributary	• 1012 mm CSP culvert drains extensive marsh located in southern part of the right-of-way. Contains common cattails, willow, some red osier dogwood, balsam poplar and duckweed. • Beaver dam, located downstream on north side of highway, maintains water level in the marsh. • Resident of lodge located on opposite side of road uses culvert as route of travel • Fish observed upstream of dam. • Beyond beaver dam, water flows to west, parallel to highway and further north into wetland populated with common cattails and balsam poplar.	Provides permanent fish habitat on both sides of the highway. The beaver dam prevents fish migration, but documented species captured both above and below the beaver dam. Documented species: see **Appendix H**
Site 11-B	Station No. 14+275 Locha Creek West Tributary A	• Site not described in reconnaissance report (initial visit suggested it was not fish habitat – very little water. • Several fish were seen near the end of the culvert on second	Provides permanent fish habitat on both sides of the highway.

Table 4-1
Summary of Fisheries and Aquatic Habitat Findings

Site Number	Site Location	Site Description	Fish Habitat Assessment
		visit. • Maximum depth of 0.15 m in a small pool area. • Direction of flow is south to north. • Flat marshy area with no defined channel comprises this watercourse; aquatic habitat structure is similar in both the upstream and downstream reaches. • Emergent vegetation from the muck bottom consists of a homogeneous mixture of common cattail and purple loosestrife with isolated patches of scrub willow • goldenrod, bull thistle, cow vetch, St. John's wort, and ferns grow on the embankment between the asphalt surface of the highway and the cattail marsh. • Thick woods consisting of elm, sugar maple and poplar fringe the southern edge of the marsh upstream of the 1370 mm CSP. • A row of elm and white pine intersect the large expanse of marsh downstream of the highway.	Documented species: see **Appendix H**
Site 12	Station No. 14+660	• Dry at time of first site visit. • No defined channel and a muck-bottomed cattail marsh (average depth 0.1 m) dominates both the upstream and downstream reaches. • South (upstream) of the 1066 mm CSP culvert, speckled alder grow in the marsh while deciduous forest extends beyond the highway right-of-way. • Forest also surrounds the downstream reach of the marsh but contains mature and several dead white pine, white cedar and white ash. • Roadside vegetation growing on the embankments includes goldenrod, sapling elm, bull thistle, cow vetch, common milkweed, blue vervain, and St. John's wort • Severe erosion along the wire guard rail on the north side of the highway was noted.	Provides seasonal fish habitat on both sides of the highway. Documented species: see **Appendix H**
Site 13	Station No. 15+640 Locha Creek	• Highly channelized creek, 10-15 m wide and 1 m deep. • Flows underneath a gravel road parallel to the highway on south side, then underneath Highway 17 via 4780 mm SPCSPA culvert into another culvert under Miller Road. • Substantial flow, sand / pebble / cobble bottom, undercut banks. • upstream portion of Locha Creek receives drainage from a ditch west of watercourse. • Appears to be good quality pike spawning habitat. • Moisture-loving herbaceous species i.e. purple loosestrife,	Provides permanent fish habitat on both sides of the highway. Documented species: see **Appendix H**

Table 4-1
Summary of Fisheries and Aquatic Habitat Findings

Site Number	Site Location	Site Description	Fish Habitat Assessment
		soft rush, spotted joe-pye weed, sedges, ferns, wood anemone, hairy willow herb and blue vervain line the low-lying areas adjacent to watercourse.	
Site 14	Station No. 18+174 Dochart Creek West Tributary	• Tributary passes through 1525 mm CSP culvert. • Common cattails, purple loosestrife and sedges grow along banks upstream of culvert. • Channel on south side is 1 m wide and 0.25 m deep. • Sand, gravel and pebble substrate. • Stream becomes 1-2 m wide and 0.25-0.40 m deep on north side of right-of-way. • Potential pike spawning habitat. • Giant bulrush in waterway on second visit.	Provides permanent fish habitat on both sides of the highway. Documented species: see **Appendix H**
Site 15	Station No. 21+350 Dochart Creek	• Three 2743 mm CSP culverts. • Watercourse travels through agricultural land and under Highway 17. • Upstream banks dominated by scrub willows. • Downstream supports ironwood trees. • Watercourse 8 m wide on south end and 10-15 m wide on north end (downstream). • Recent destruction of two beaver dams (upstream and downstream of culvert) • several island and deltas in the watercourse support the growth of purple loosestrife, water plantain, soft rush, arrowhead, spike rush, spotted joe-pye weed, hairy willow herb, blue vervain, monkey flower, pondweed and water smartweed. • Water extremely turbid. • Detection of pervasive odour (anoxic conditions).	Provides permanent fish habitat on both sides of the highway. Documented species: see **Appendix H**
Site 17	Station No. 28+250 Dochart Creek East Tributary 2	• Watercourse passes through pasture / agricultural land. • Flow from south to north. • Concrete culvert 1676 mm x 5486 mm. • Watercourse 2 m wide and 0.2 m deep (consistent through channel), with sandy / silty bottom. • Algae and macrophytes (common cattail, purple loosestrife, hairy willow herb, water plantain and arrowhead) grow in waterway. • Two muskrats observed swimming in the channel, very turbid water.	Provides permanent fish habitat on both sides of the highway, as substantiated by habitat structure and permanent connection to Dochart Creek (topographic information). Electrofishing attempts did not produce any fish.
Site 18	Station No. 28+750 Madawaska River West Tributary 1	• Tributary flows north through agricultural land towards Arnprior. • Two 1525 mm CSP culverts under highway. • 1.5 m wide and 0.1-0.15 m deep channel; sandy / silty bottom.	Provides permanent fish habitat on both sides of the highway. Documented species: see **Appendix H**

Table 4-1
Summary of Fisheries and Aquatic Habitat Findings

Site Number	Site Location	Site Description	Fish Habitat Assessment
		• Water plantain and duckweed profuse in channel in late July. • Receives minor flow from drainage ditch extending east. • This watercourse displayed highest water temperature, dissolved oxygen and specific conductance readings of all sites.	
Site 19	Station No. 29+125 Madawaska River West Tributary 1A	• (2) 1372 mm CSP culverts. • Receives majority of flow from culvert diverting flow under White Lake Road and minor amount of flow from drainage ditch parallel to highway. • Channel 1-2 m wide and 0.15 m deep; silty / clay bottom. • Waterway almost choked with duckweed, water plantain, hornwort and stonewort on second visit. • Nursery habitat for juvenile fish located within densely covered common cattails about 100 m north of culvert openings. • Watercourse lined by open grassy meadows with adjacent fast food establishments and gas stations associated with White Lake Road.	Provides permanent fish habitat on both sides of the highway. Documented species: see **Appendix H**
Site 20	Station No. 29+800 Madawaska River West Tributary 2	• 1 m wide tributary. • Heavy vegetation including grassy tussocks and common cattails on both sides of highway. • 1676 mm CSP culvert. • Slow flow from south to north. • Fish habitat and permanent flow confirmed on subsequent site visit.	Provides permanent fish habitat on both sides of the highway. Documented species: see **Appendix H**

4.1.7.1 Flora

The study area corridor offers limited potential for representation of native terrestrial and aquatic habitats with higher levels of ecological integrity due to a long history of habitat fragmentation and internal disturbances. The more significant areas are located on marble-based habitat, which are uncommon in the Ottawa Valley and southern Ontario (Brunton 1990) and include the marble diff and escarpment north of the highway west of the Bonnechere River and the largest woodland area in the central portion of the study area, south of the highway. This area provides a buffer and transition between the non-natural conditions of the roadway edge and more natural interior forest habitat.

Madawaska River to Pinegrove Road

A small area of Sugar Maple (*Acer saccharum*) dominated hardwood forest occupies the western bank of the Madawaska River both north and south of the highway, with an abundance of canopy seedling regeneration. The presence of White Trillium (*Trillium grandiflorum*) attests to the natural character of the woodland. Minor drainage courses cross this segment of the study area, each being open, semi-permanent drains crossing open meadows, some with scattered White Elm (*Ulmus Americana*), Bur Oak (*Quercus macrocarpa*) and Green Ash (*Fraxinus pennsylvanica*) trees and patches of deciduous thicket swamp without functional natural habitat areas.

Pinegrove Road to Scheel Drive

West of Campbell Drive the corridor rises onto an extensive marble, granitic and limestone bedrock-based highland where an almost continuous woodland predominates. The forest cover is predominantly young, upland deciduous forest, the eastern areas showing the sparse undergrowth and open canopy indicative of woodlands with past grazing history. Sugar Maple, Red Maple (*Acer rubrum*) and Ironwood (*Ostrya virginiana*) are dominant, with early successional species such as White Elm, White Ash (*Fraxinus americana*) and White Birch (*Betula papyrifera*), reflecting a significant history of disturbance, including logging. In the eastern portion of this section are distinct groves of young to submature White Pine *(Pinus strobus)* and several clusters of Red Pine (*Pinus resinosa*) are located near Campbell Drive. Undergrowth is dominated by Bracken fern (*Pteridium aquilinum*), Northern Bush-honeysuckle (*Diervilla lonicera*), Large-leaved Aster (*Aster macrophyllus*), Poison-ivy (*Toxicodendron rybergii*) and Rough Dogwood (*Cornus rugosa*), White Cedar (*Thuja occidentalis*) and White Spruce (*Picea glauca*) and Balsam Fir (*Abies balsamea*) occur at regular intervals along this woodland section. Woodlands on the south side of the highway are more disturbed.

Scheel Drive to Glasgow Station Road

The woodlands in this section are fragmented and disturbed by logging and localized pastures. Common canopy components include Red Maple, Trembling Aspen (*Populus tremuloides*), White Birch, White Ash, Basswood (*Tilia americana*), White Pine and Sugar Maple. Trembling aspen predominates the eastern section. The undergrowth is dominated by a dense regeneration of canopy saplings, with the presence of open ground herbs such as Poverty-Grass (Danthonia spicata) and Canada Blue-grass (*Poa compressa*). Ground covers include leatherwood (*Dirca palustris*), Sharp-lobed Hepatica (*Anemone acutiloba*), Poison ivy *(Rhus radicans)* and Mountain-rice (*Oryzopsis racemosa*).

Rams-head orchid, (*Cypripedium arietinum*) a Provincially Rare (S3) plant species, (at least 20 plants) is located approximately 365 m west of Neiman Road / Stevenson Road along the north and south sides of the existing highway. The same species occurs on Lot 11, Concession 10. The two areas where the orchid occurs contains elements of a single population extending across the Campbell-Scheel Drive marble outcrop area that is now split by Highway 17. The highway twinning to the north side in this area will impact the north-side Rams-head Orchid site.

Glasgow Station Road to Miller Road

This section contains large woodland areas separated by open areas of active or regenerating agricultural land. These woodlands contain young to submature tree species, including Red Maple, White Ash, Sugar Maple and Eastern Hemlock (*Tsuga canadensis*). A grove of submature Eastern Hemlock occurs north of the highway west of Miller Road with scattered Yellow Birch (*Betula alleghaniensis*) and Balsam Fir. Ground flora includes Shining Clubmoss (Huperzialucidula), Sensitive Fern (*Onoclea sensibilis*), sedges *Carex intumescens* and *S. crinita*, Blue-bead Lily (*Clinonia borealis*) and Gold thread (*Coptis groenlandicum*). Small, swampy depressions occur throughout, dominated by White Cedar, White Spruce, Black Ash (*Fraximus nigra*) and Balsam Fir.

Miller Road to Horton Township Boundary

West of Goshen Road the woodlands contain mature Sugar Maple covering most of the steeply sloping, marble-based upland forest south of Highway 17. Ironwood and American Beech (*Fagus grandifolia*) are found here in smaller numbers. The ground cover is typical of rich hardwood forests including an abundance of White Trillium, Blue Cohosh (*Caulophllum giganteum*), Mountain-rice and large Bellflower (*Uvularia grandiflora*).

Eastward the woodlands become more mixed and swampy. Typical tree species contain White Cedar, Black Ash and Tamarack swamp with the understory containing common herbaceous species, including Sensitive Fern (*Onoclea sensibilis*), Beggar's-ticks (*Bidens cernua*), sedge *Carex retrorsa*, and Bulblet Water-hemlock (*Cicrta Bulbifera*) being common.

East of Goshen Road there is a wooded upland highland area on granitic and marble bedrock outcropping supporting a young to submature upland forest of Sugar Maple, Ironwood, Red Oak (*Quercus rubra*), White Pine, Bitternut Hickory (*Carya cordiformis*) and White Ash. On the dry portions White Pine and Red Oak become dominant with individual trees approximately 1 m in diameter, located 100 m north of the highway. The ground flora is rich with sedge *Carex pennsylvanica* forming an abundant cover and with Mountain-rice (*Oryzopsis racemosa* and *O. asperifolia*), Barren-ground Strawberry (*Waldsteinia fragarioides*), Bottle-brush grass (*Elymus hystrix*), Nodding Fescue (*Festuca subverticillatus*) and large-leaved Aster (*Aster macrophyllus*).

Beaver-created wetlands are extensive south of the highway in the central portion of this section. These wetlands exhibit low floristic diversity.

The eastern portion contains young, low deciduous and mixed forest of Red Maple, White Ash, Sugar Maple, Eastern Hemlock and Trembling Aspen.

Horton Township Boundary to Gillan Road

The majority of this section is agricultural. A mature woodland is located on the south side of Highway 17 on a steeply sloping north facing hill centred on the headwaters of Deils Creek near Horton Lake. This woodland is a continuation of the hardwood forest described above, west of Goshen Road. The forest has experienced a significant level of selective cutting with numerous trails, stumps and a homogenous forest canopy. A shallow, beaver-maintained pond occupies the creek course through a young to submature White Cedar and White Spruce stand immediately south of Highway 17.

Lockwinnoch Road to Bonnechere River, eastern shore

Northward from Deils Creek is a coniferous forest containing mature trees, some approximately 0.75 m in diameter. The ground cover here contains Poison-ivy, Lady Fern (*Athyrium filix-femina*) and Canada Mayflower (*Maianthemum canadense*). The dense forest cover provides shade over the cool, shallow creek of which high water quality is indicated by the growth of Watercress (*Nasturtium officinale*) and Small Pondweed (*Potamogeton pusillus*) and a diverse native shore flora including Hog-peanut (*Amphicarpaea bracteata*), Bulblet Fern (*Cystopteris bulbifera*) and Fragile Fern (*Onoclea sensibilis*).

Between Deil's Creek and the Bonnechere River the habitat is severely disturbed upland deciduous forest and scrubby wetland habitat occupying the lowland area at the Highway 17 overpass in the central portion of this section.

The eastern slope of the Bonnechere River valley is a submature to mature mixed forest of White Cedar, Balsam Fir, Sugar Maple, Eastern Hemlock and Yellow Birch. South of the highway distinct groves of Eastern Hemlock were found with mature trees up to 0.75 m diameter. These groves contain shade tolerant undergrowth species such as, Lady Fern (*Athyrium filix-femina*), Evergreen Woodfern (*Dryopteris intermedia*) and Blue Cohosh. The forest cover north of the highway contains similar species, but evidently more disturbed and fragmented.

Bonnechere River, western shore to Bruce Street

The western side of the Bonnechere River is largely unforested in the Highway 17 right-of-way. On the north side of the highway a marble escarpment parallels the highway. The escarpment is southwest facing and is surrounded by young upland deciduous and mixed forest, with Red Oak, White Ash, Basswood, Ironwood, White Birch and White Pine, with small open areas containing Common Juniper (*Juniperus communis*). The lower slopes at the base of the escarpment and on the marble outcrop extending south of Highway 17 contain White Elm, Sugar Maple and White Pine. White Pine groves constitute as much as 10-20% of the forest cover between the escarpment and Highway 17.

The shoreline of the Bonnechere River contains a narrow band of Great Bulrush (*Schoenoplectus tabernaemontani*) and Arrowhead (*Sagittaria latifolia*) marsh vegetation borders the river.

Both Provincially Rare and regionally rare plant species are know from the marble cliff habitat and include *Arabris hoboellii* and *Pellaea atropupurea*.

4.1.7.2 Fauna

The diversity of mammal, bird and herptile species observed along the highway were relatively limited. Fauna species found are common in young woodlands, woodland edges and agricultural lands in the Ottawa Valley. The Red-shouldered Hawk, Provincially of Special Concern, was observed in the Sugar Maple forest south of the highway just west of Horton Township boundary, indicating wildlife significance for the upland area. Turkey Vultures were observed, particularly in the vicinity of the marble escarpment west of the Bonnechere River. The Turkey Vulture is a formerly rare species that is now abundant along eastern Ontario highway corridors.

Wildlife corridors and ecological linkages found along the highway include evidence of Black Bear use of the Bonnechere River valley, along with White-tailed Deer, Raccoon and Striped Skunk. The wooded areas and remnant woodlots provide wildlife movement parallel to the highway and minimize the road crossing by providing cover and shelter up to the edge of the highway.

Natural/near-natural habitats along the corridor do not offer ecological linkages between significant natural areas extending beyond the study area. The high level of transportation activity along the existing highway is a substantial deterrent to ecological linkages between areas north and south of the highway. The Bonnechere and Madawaska River valleys ultimately connect to the Ottawa River and are important tributaries, but offer limited ecological contributions at Highway 17.

Areas of significant wildlife concentrations, identified by the Ministry of Natural Resources included deer yards located on both sides of the highway between Campbell Drive and Scheel Drive.

Good representation of native biodiversity for habitat types are provided at the Bonnechere River marble cliff and the Horton Lake hill mature sugar maple hardwoods.

The larger forested areas of the corridor offer potential for interior forest representation, however, the level of disturbance within this seemingly continuous forest cover limits this ecological contribution of the study area, particularly in the immediate vicinity of the highway.

4.2 Socio/Cultural Environment

The social and cultural environments have been grouped here to describe the community's past and existing form and development. The cultural factors include an assessment of the area's archaeology resources, built heritage and cultural landscapes. Social factors include the review of the existing land uses, the function of the activity nodes, corridors and aesthetics and assessment of the noise sensitive localities.

4.2.1 Archaeological Resources

A Stage 1 archaeological assessment was conducted and included background research and field review was carried out by ASI; refer to **Appendix J, Stage 1 – Archaeological Assessment**. A review of the Ontario Archaeological Sites Database, maintained by the Ministry of Culture, found no archaeological sites have been registered within two kilometres of the study area.

There were two archaeological sites located within a seven-kilometre radius. The first is the Marshall's Bay 1 site located on the Ottawa River in Fitzroy County, approximately seven kilometres east of the Town of Arnprior. This site consists of a small stratum with contact period material overlying Middle woodland material: projectile points, scrapers, knives and pottery with coil breaks and conical bases. Decorative techniques used on the vessels include pseudo-scallop shell, rocker stamping, dentate stamping and drag stamping.

The second site was recorded at Sawdust Bay 2 located in Fitzroy County, along the south shore of Ottawa River, seven kilometres east of Arnprior. The site is 725 square feet in size and approximately 80% of the site has been excavated. The excavation has resulted in the recovery of more than 4000

artifacts including lithics, ceramics and faunal remains, and the identification of six features.

The historical review of the 1881 Renfrew County supplement in the Illustrated Atlas of the Dominion of Canada provided an assessment of the potential for the presence of nineteenth century archaeological sites within the study area. The map indicates the Highway 17 corridor passes the historic communities of Mansfield Village, Stewartville, Braeside, Carswell and Harcourt. The atlas also indicates many churches and schoolhouses to the north and south of the study area. These indications of former historic sites identify the potential for historic archaeological sites within the study area.

Water is regarded as the primary indicator of archaeological site potential and the distance from water is one of the most commonly used variable for predictive modelling of archaeological site location. The study area contains a multitude of creeks, tributaries, rivers and lakes that drain into the Ottawa River. The larger ones being the Bonnechere River, Locha Creek, Dochart Creek and Madawaska River. Based on the presence of numerous watercourses within the study area there is potential for the identification of archaeological sites.

The Stage 1 archaeological field review was carried out on June 28, 2002, to identify any archaeological sites within the right-of-way. Areas beyond the typically disturbed right-of-way generally require archaeological assessment in order to determine archaeological potential.

The typical Highway 17 cross section beyond the existing disturbed right-of-way as described has potential for the identification of archaeological sites.

4.2.2 Built Heritage and Cultural Landscapes

ASI undertook a review of the built heritage and cultural landscape along the highway corridor. There were few heritage resources identified along the Highway 17 corridor due to the recent construction of the Trans-Canada Highway and because Highway 17 follows no previously existing historic right-of-way. Highway 17 does not travel through any historic communities but does pass by the historic communities of Mansfield Village, Stewartville and Carswell. Refer to **Appendix K**, **Built Heritage and Cultural Landscape Assessment**.

It was in the early 1820's that first settlement occurred in the County of Renfrew. In the 1850's The Ottawa and Opeongo Road, The Addington Road and The Hastings Road were referred to as the "Three Great Lines of Road". The intention was to follow a westward course from the Ottawa River at Castleford to Opeongo Lake in Algonquin Park, and eventually link with Georgian Bay. After a decade and only completing the road to Yantha Lake, the Opeongo Line project was cancelled due to the roughness of terrain and poor farming capabilities.

In 1858 Renfrew was incorporated as a village and by 1872 the Canada Central Railway reached it. It was in 1895 that the Arnprior and Parry Sound Railway, running from Ottawa to Georgian Bay, was built.

Arnprior was named in 1833 upon construction of a gristmill and saw mill. By 1893 the town was populated by 3,500 inhabitants.

A field review was conducted in September 2002, to identify any built heritage features and cultural landscape units along the Highway 17 corridor. Three built heritage features and eleven cultural landscape units were identified within the study area, refer to **Table 4-2**, **Built Heritage and Cultural Landscapes**, and are summarized as follows:

Table 4-2
Built Heritage and Cultural Landscapes

Built Heritage Features		
BHF 1	House	Highway 17, 300 m east of Castleford Road
BHF 2	Barn	Highway 17, 300 m east of Castleford Road
BHF 3	House	North of Highway 17, west of the former CN Rail Line
Cultural Landscape Units		
CLU 1	Roadscape	Pinnacle Road / Storybook Road
CLU 2	Roadscape	Bruce Street / Castleford Road
CLU 3	Waterscape	Bonnechere River
CLU 4	Roadscape	O'Brien Road
CLU 5	Farm complex	821 Whitton Road
CLU 6	Railscape	Highway 17, east of O'Brien Road
CLU 7	Roadscape	Gillan Road / Lochwinnoch Road
CLU 8	Railscape	Highway 17, east of Lochwinnoch Road
CLU 9	Roadscape	Goshen Road
CLU 10	Roadscape	McCallum Road and right-of-way
CLU 11	Roadscape	Scheel Drive

None of these features have been designated as heritage properties under Part IV of the *Ontario Heritage Act*.

The Bonnechere River, former Canada Central Railway Line and the abandoned Ottawa, Arnprior and Parry Sound Railway Line are considered to be important to the history of the Ottawa Valley. The roadscapes listed above mark the original configuration of Renfrew County, with Castleford Road being of most importance as it forms part of the original Opeongo colonization road right-of-way. However, it must be noted that each roadscape has been altered to some degree with the construction of Highway 17.

4.2.3 Emergency Services

The locations of the emergency services are shown on **Figure 4-11**.

Fire

McNab/Braeside Township has three (3) fire stations. The main fire station is Station No. 1 located on Russett Road, at County Road 508 and Highway 17, Station No. 2 located on White Lake Road and Station No. 3 is located on River Road in Braeside.

The Horton Fire Department for the study area is located on Johnston Road adjacent to the municipal offices. Horton Township fire department requires access to the southern portion of the township via the Highway 17 corridor to County Road 6 in both the east and west directions, due to the limited crossing opportunities on the Bonnechere River.

The Mutual Aid System involves the use of manpower and tankers of Renfrew, Arnprior, and Horton. The County Rescue System involves the use of heavy hydraulics in the case of an extraction. Zone 1 covers Renfrew and Horton while Zone 2 is for Arnprior.

Ambulance

Ambulance service to the study area is provided by Station 1 is situated at the Arnprior Hospital. This facility is staffed 24 hours a day, 7 days/week. Station 1 responds to approximately 150 emergency calls per month. The McNab/Braeside Fire Station located on the Arnprior/Renfrew boundary (ambulance service areas) at County Road 508 is the stand by area for ambulance, in the event that either Arnprior or Renfrew requires coverage while the other unit responds to an emergency call. The Ambulance Station in Renfrew is also staffed 24 hours a day, 7 days a week. There are approximately 200-250 calls per month; of which 100 are emergency calls.

Police

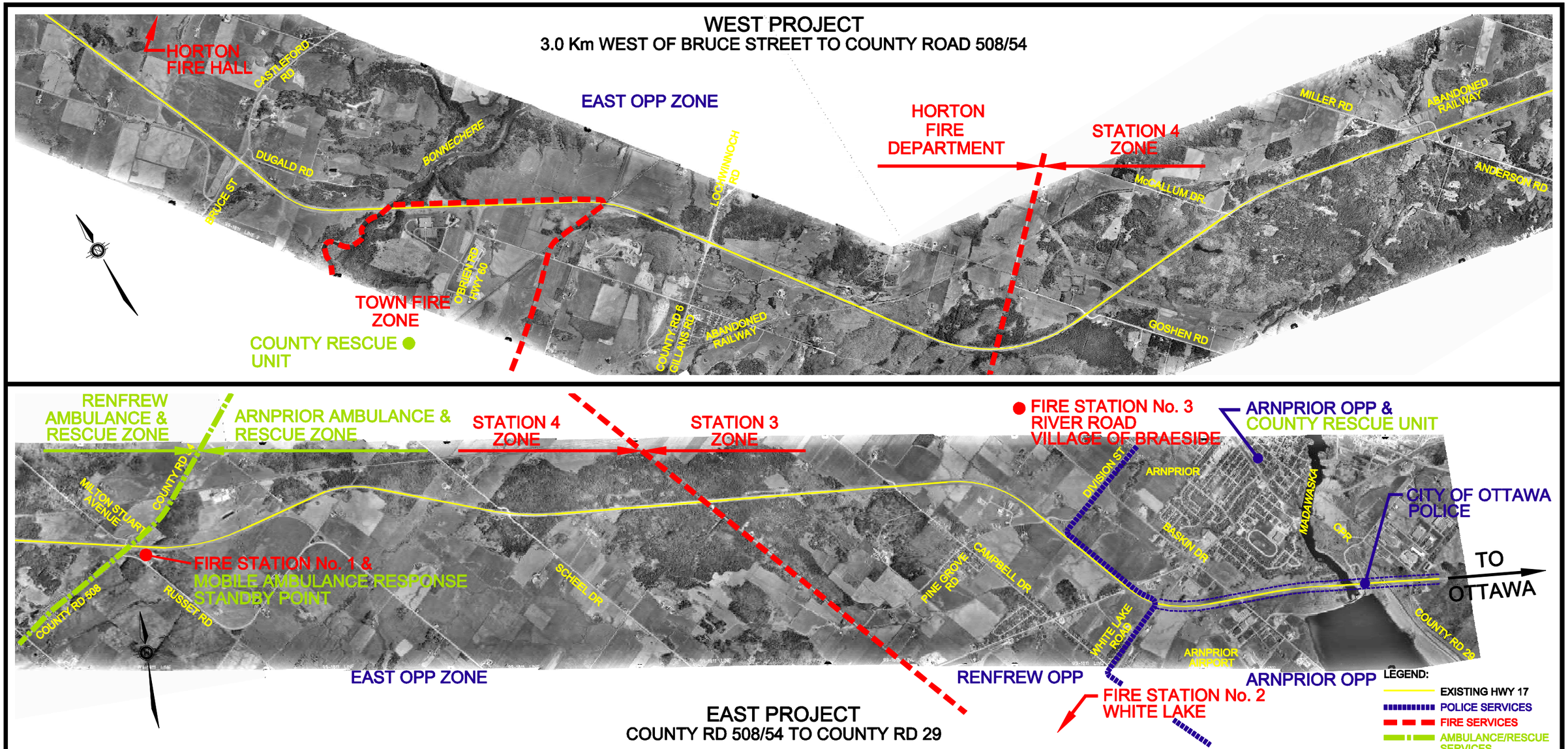
Highway 17 within the study area is serviced by the Renfrew OPP, with County Road 29 as the boundary between Ottawa/Renfrew OPP detachments. The Arnprior OPP detachment service within the municipal boundary of Arnprior and has no responsibility along Highway 17. An OPP Community Office is located adjacent to the McNab/Braeside Fire Station on Russett Road.

4.2.4 Community/Recreation

An inventory of the existing land uses and visual characteristics was carried out in July 2002. The community and recreation land uses found within the study area are illustrated on **Figures 4-12, 4-13** and **4-14**, Existing Land Use.

Residential land uses are found throughout the study area, with the majority of dwellings being single-family residences. Pine Grove Community and Glasgow Station Community are small subdivisions located at the intersection of Pine Grove Road/Campbell Drive and on Milton Stewart respectively. Clusters of single-family residences are located adjacent to Highway 17 on Scheel Drive, Libby Road, County Road 508/Mill Ridge Road, Goshen Road and County Road 6.

Community/Recreation land uses in close proximity to Highway 17 include Arnprior Water Tower, Nick Smith Centre/Arnprior Fair Grounds/Arnprior Curling Club, Arnprior Municipal Airport, Greater Arnprior Chamber of Commerce, Kingdom Hall of Jehovah's Witnesses, McNab/Braeside Fire Station/ Maintenance Building and OPP Office/ Glasgow Dows (baseball field) and Heritage Renfrew National Archives of Canada. In addition, the abandoned Canadian National Rail Corridor, owned by the McNab/Braeside Township, is used as a recreational trail for biking, hiking, horseback riding and snowmobiling.



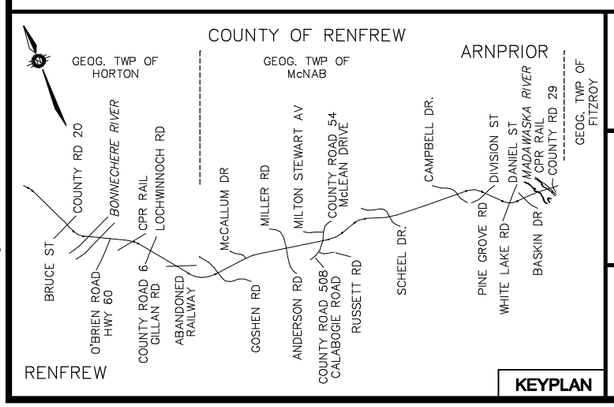


FIGURE 4-11

EMERGENCY SERVICE LOCATIONS

HIGHWAY 17 TWINNING, COUNTY ROAD 29 to 3.0 km WEST OF BRUCE STREET
PRELIMINARY DESIGN/ ENVIRONMENTAL ASSESSMENT STUDY
WP 647-92-00

500m 0 1000m
Horizontal

Ministry of Transportation

NCE
TRANSPORTATION AND VALUE ENGINEERS

FIGURE 4-11.dwg – Mon, 1 Dec 2003 – 11:33

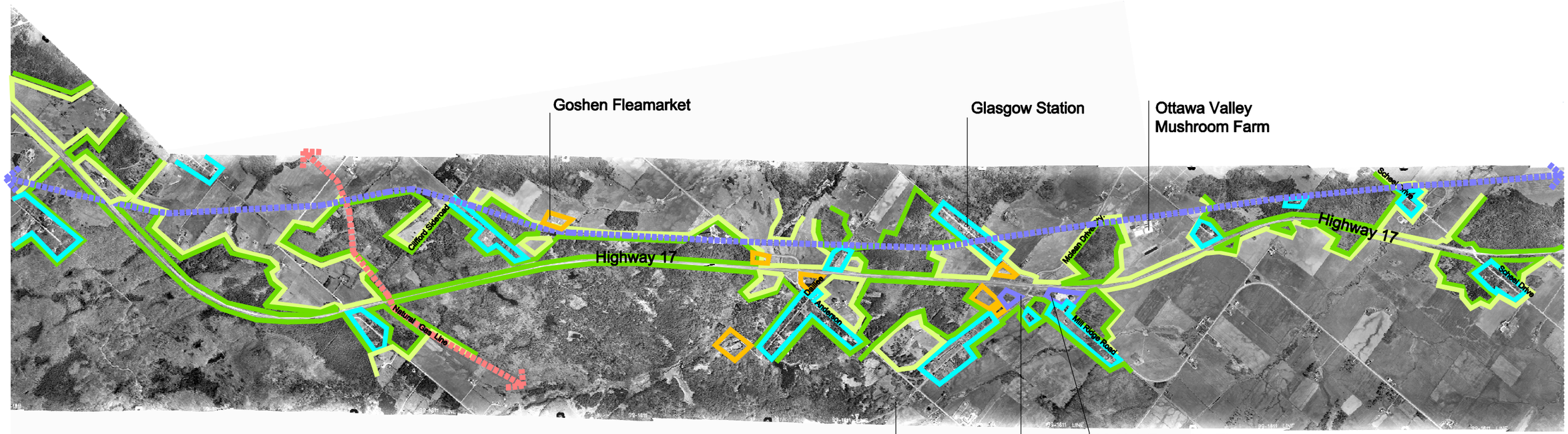


LEGEND

- Institutional
- Commercial
- Agricultural
- Industrial
- Natural Areas/Woodlots
- Residential
- Other corridors

Figure 4-12
Existing Land Use - County Road 9 to Scheel Drive
Highway 17 Twinning Arnprior to Renfrew

NTS

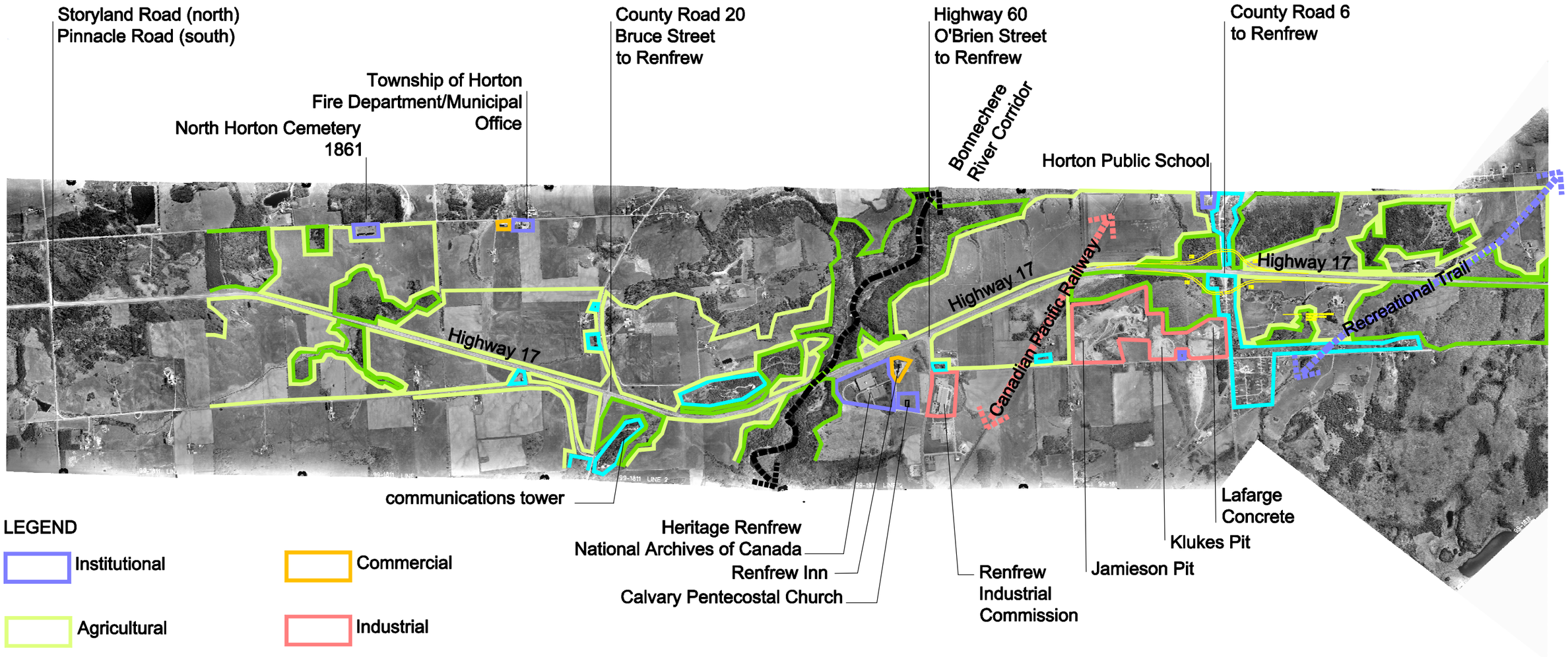


LEGEND

- Institutional
- Commercial
- Agricultural
- Industrial
- Natural Areas/Woodlots
- Residential
- Other corridors

Figure 4-13
Existing Land Use - Scheel Drive to Abandoned Rail Line
Highway 17 Twinning Arnprior to Renfrew

NTS



LEGEND

- Institutional
- Commercial
- Agricultural
- Industrial
- Natural Areas/Woodlots
- Residential
- Other corridors

Figure 4-14
Existing Land Use - Abandoned Rail Line to 3 km West of Bruce Street
Highway 17 Twinning Arnprior to Renfrew

NTS

Agriculture activities occur throughout the study area on both sides of the highway. The lands are primarily used for cultivation, with a cattle farm located north on Campbell Drive and a dairy farm east of County Road 508 intersection.

4.2.5 Noise

Highway 17 is a 2-lane undivided highway with a posted speed of 90 km/h. The study area is predominantly rural with sporadic housing adjacent to the highway, but having no direct access to the freeway. All homes and businesses must access the highway via the cross roads.

The noise analysis utilized MOE's Noise Prediction Model, STAMSON, version 5.03. The assessment was performed in accordance with the following documents: Ministry of Transportation of Ontario (MTO)/Ministry of the Environment (MOE) Noise Protocol, the Ministry of Transportation's Environmental Office Manual, Technical Areas – Noise and MTO Quality and Standards Directive A-1: Noise Policy and Acoustical Standards for Freeways (February 1992). The STAMSON software program, which is approved for use on MTO projects requiring noise assessments, was utilized to determine existing 24-hour equivalent sound levels.

For the year 2000, Average Annual Daily Traffic volumes (AADT), for segments of Highway 17, were obtained from the Ministry of Transportation. The present year 2002 AADT volumes were calculated using existing year 2000 AADT traffic volumes in conjunction with growth rates, ranging from 1.3 percent to 4.0 percent, supplied by the Ministry of Transportation, refer to **Table 4-3, AADT Volumes for Highway 17**. The AADT volumes for each segment of Highway 17 were assigned a vehicle classification mix of 88/4/8, representing 88% cars, 4% medium trucks, and 8% heavy trucks, as obtained from the Ministry of Transportation's classification count for each required segment of Highway 17.

Table 4-3
AADT Volumes for Highway 17

Highway 17 Road Segment	Year 2000 AADT	Growth Rate	Year 2002 AADT
CR 29 (formerly Highway 15)	11300	1.040	12,220
White Lake Rd/CR 2	11200	1.035	12,000
CR 54/ CR 508	10200	1.013	10,500
Anderson Rd/ CR6-7	11000	1.020	11,440
O'Brien Rd (Highway 60)	8500	1.023	8,900

The present AADT volumes for the ten cross roads that intersect Highway 17 within the study limits were obtained by performing Automatic Traffic Recorder (ATR) counts during the week of August 8th to August 12th, 2002. A vehicle classification mix of 92/3/5 was used for the local cross streets.

The Ministry of Transportation and Ministry of Environment accept the use of the computerized noise software program STAMSON to predict highway noise within the province of Ontario. In addition to traffic volumes and vehicle split, the following STAMSON input variables were used or considered for the calculation of existing sound levels:

- Topography (hills, flatlands);
- Existing attenuation due to shielding from barriers (natural or man-made, including dense rows of houses);
- The intermediate ground surface (hard surface reflects sound, soft surface absorbs sound);
- Distance, in metres, from source to receiver;
- The receiver height (1.2 m above ground level at 3.0 m offset from the residence);
- Posted speeds (refer to **Table 4-4);**
- Depth of woods; and
- Roadway grade (slope).

Table 4-4
Existing Posted Speed Limits (km/h)-Highway 17 Cross Roads

Cross Road	Posted Speed (km/h)
Baskin Drive	50
County Road 2 / White Lake Road	60
Division Street	80
Pine Grove Road	60
Campbell Dr (south)	60
Campbell Dr (north)	80 (unposted)
Scheel Drive	80 (unposted)
McLean Drive / County Road 54	80
County Road 63: Anderson Rd / Miller Rd	80
McCallum Drive	80 (unposted)
Goshen Rd	80 (unposted)
County Road 6: Gillan Rd	60
County Road 6: Lochwinnoch Rd	80
Highway 60 / O'Brien Street	60
County Road 20: Bruce St / Castleford Rd	80

Within the study area, existing sound level contours were developed using the STAMSON noise software program, at 5 dBA intervals, reflecting changes in topography and traffic volumes for all sections of Highway 17, including cross roads within the study area. See **Appendix M**, Noise Analysis.

Table 4-5 Highway 17 - 2002 Sound Levels lists existing 24 hour equivalent sound levels (Leq(24h), dBA) versus corresponding offsets for the various sections of the freeway. **Table 4-6, Cross Roads - 2002 Sound Levels** lists existing 24 h equivalent sound levels (Leq(24h), dBA) versus corresponding offsets for the intersecting cross roads along Highway 17 throughout the project limits. Noise levels are provided for road segments both north and south of the freeway, since the traffic volumes vary substantially for the north and south approaches of all key cross roads.

Table 4-5
Highway 17 - 2002 Sound Levels

Highway 17 Road Segment	Year 2002 AADT	o/s (m) versus Existing 24hrEquivalent Sound Levels				
		70 dBA	65 dBA	60 dBA	55 dBA	50 dBA
Section 1: County Road 29	12200	20	40	79	158	317
White Lake Rd / County Road 2	12000	20	39	78	157	314
Section 2 County Road 54 / County Road 508	10500	18	36	72	145	290
Anderson Rd. / County Road 6	11450	19	38	76	152	305
Section 3: O'Brien Rd. / Highway 60	8900	16	33	65	131	262

NOTES:
A. Traffic composition: 80% cars / 12% heavy trucks / 8% medium truck.
B. Posted Highway 17 Speed: 90 km / h
C. No existing noise barriers

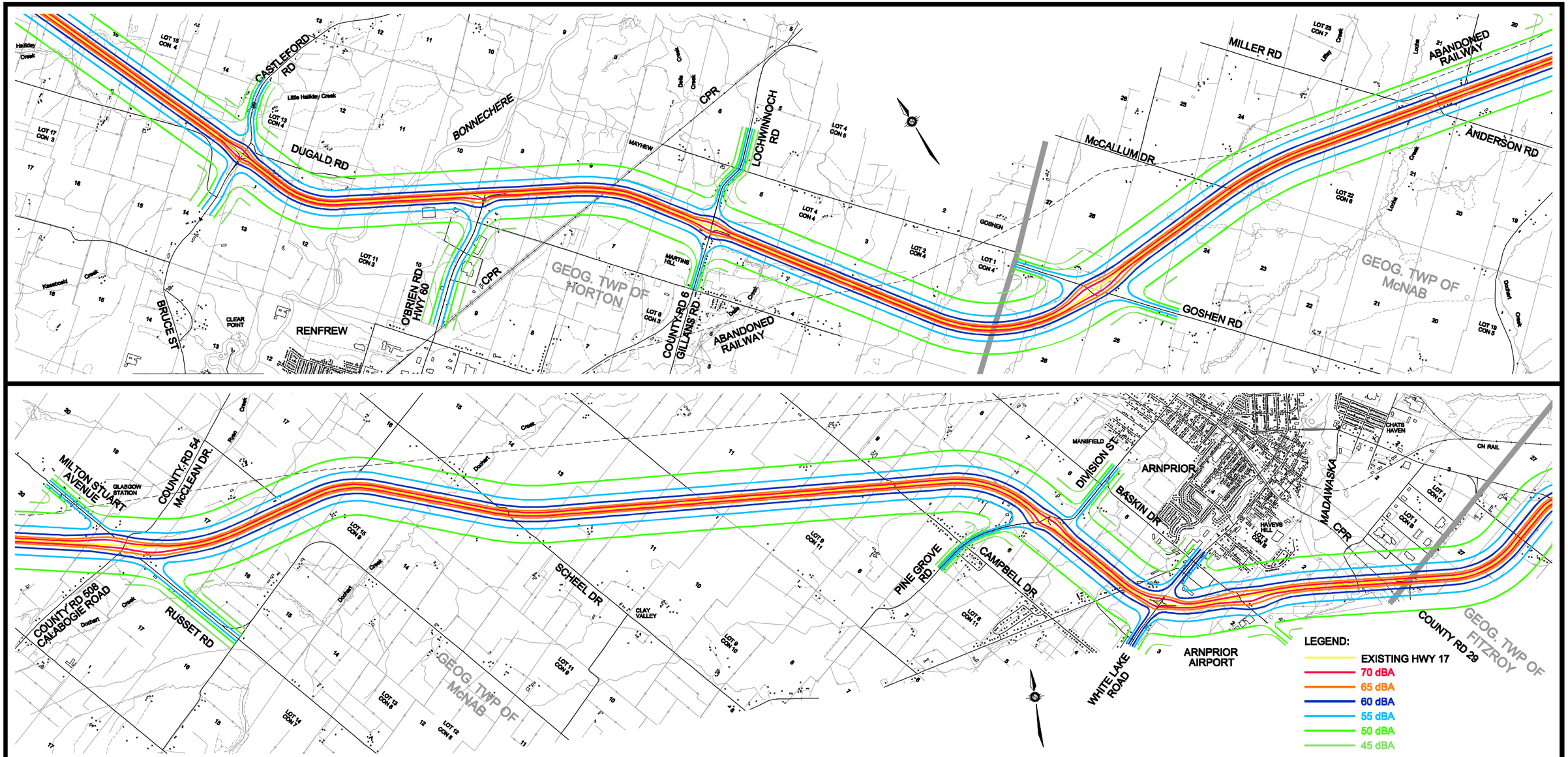
As shown in **Table 4-5**, the 5 segments of Highway 17 within the study area can be broken down into 3 sections in terms of noise. The traffic volumes for County Road 29 and County Road 2 differ by 200 AADT, and thus can be grouped into Section 1. Section 2 sound levels are also comparable for Anderson Rd and County Road 54 / 508. The traffic volume for O'Brien Rd is considerably less than Sections 1 and 2, and therefore is grouped separately as Section 3.

Figure 4-15, Existing Sound Levels illustrates the existing sound level contours, in 5 dBA increments, for both Highway 17 and the cross roads.

Table 4-6
Cross Roads – 2002 Sound Levels

Highway 17 Cross Road	Posted Speed (km/h)	Signalized Intersection	Year 2002 AADT		Centreline Offset (m) versus Existing 24h Equivalent Sound Levels (Leq 24h (dBA))							
					60 dBA		55 dBA		50 dBA		45 dBA	
			N. Hwy 17	S. Hwy 17	N	S	N	S	N	S	N	S
Baskin Dr.	50	YES	3690	1170			26		53	27	105	53
White Lake Rd.	60	YES	8820	6390	27	22	54	45	109	90	218	180
Division St.	80	NO	1440	n / a			26		51		102	
Pine Grove Rd.	60	NO	n / a	1080				15		31		61
Campbell Dr. (N) / (S)	80(unposted) / 60	NO	630	270								
Scheel Dr.	80 (unposted)	NO	180	135								
CR 54 / CR 508	80	NO	1440	2025		16	26	31	51	63	102	126
Goshen Rd.	80 (unposted)	NO	90	225			**27***		**54***		**108***	
CR 6 / Lochwinnoch Rd.	80	NO	1080	n / a			21		43		86	
CR 6 / Gillan Rd	60	NO	n / a	1845				21		42		85
O'Brien Rd. / Highway 60	60	NO	n / a	5850		21		43		85		170
Bruce St.	80	YES	1755	4410		25	29	50	58	100	116	201

* denotes offsets obtained using STAMSON minimum volume of 40 vph
NOTES:
1. Traffic composition: 92% cars / 5% heavy trucks / 3% medium trucks
2. No existing noise barriers
3. Depth of woods: Less than 30 m



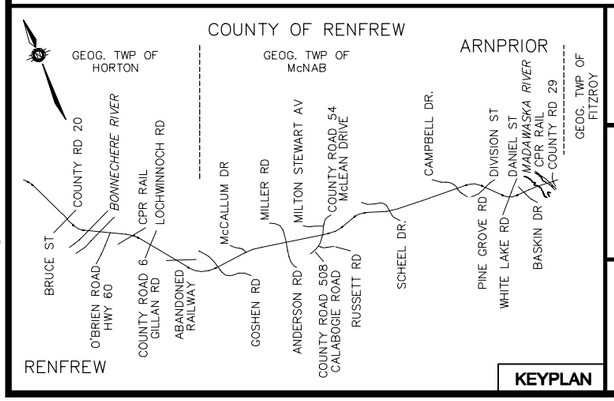


FIGURE 4-15

EXISTING SOUND LEVEL CONTOURS

HIGHWAY 17 TWINNING, COUNTY ROAD 29 to 3.0 km WEST OF BRUCE STREET
PRELIMINARY DESIGN/ ENVIRONMENTAL ASSESSMENT STUDY
WP 647-92-00

500m 0 1000m
Horizontal

Ministry of Transportation

NCE
TRANSPORTATION AND VALUE ENGINEERS

FIGURE 4-15.dwg – Mon, 1 Dec 2003 – 13:14

4.3 Economic Environment

The study area's economic environment is described in this section. Economic factors include the area's agricultural activities, mineral resources and the commercial and industrial activities. Likely areas of soil contamination from industrial/commercial activities have been identified for potential environmental screening.

4.3.1 Existing Commercial/Industrial/Agricultural Land Uses

Commercial property, starting in the eastern portion of the study area, includes: service-commercial establishments in a strip development and a gas station on White Lake Road, a large retail-commercial mall, a motel and smaller retail outlets and a storage building on Stayer Court Drive.

Glasgow Station offers a commercial nursery, a gas station/convenience store and a home building sales and display area. In the vicinity of Miller/Anderson intersection is another home building sales establishment, power equipment sales and repair shop and a tourist lodge. The Goshen Fleamarket is located at McCallum Drive north of Highway 17. In the western section of the study area the Renfrew Inn is located off O'Brien Road, and a small ceramics shop is located on Johnston Road.

Industrial areas, starting from the east include a business park north of the highway, Arnprior Generating Station, Boeing Plant and a business park south of the highway at Pine Grove Road intersection. In the western section a large business park and Renfrew Industrial Commission are located east of O'Brien Road and south of Whitton Road.

4.3.2 Aggregates/Mines

The Highway 17 study area is located within the Ottawa Valley Clay Plains Physiographic Region for the easterly section of the project and the Canadian Shield Physiographic Region for the Westerly half of the project. Both regions offer several areas of high quality bedrock suitable for the production of crushed aggregates for granular and asphalt materials. Refer to **Figure 4-16**, **Pits and Quarry Locations**.

Licensed sources for the production of aggregates may be found 6.0 km southwest of Arnprior and the Braeside area. Additional sources may be found in the Burnstown area located to the south. These sources are all within a 10 km distance of the project.

The western section of the project has several sources acceptable for asphalt and granular aggregate production near the Goshen Road area. A licensed source 4.0 km east of Renfrew and adjacent to the right-of-way may be used for the production of concrete asphalt and granular aggregates. Aggregates for the production of concrete may be obtained from licensed sources 3 km west of Braeside, and 3.5 km east of Douglas. Earth materials acceptable for construction of the roadway platform may be obtained from local sources adjacent to the right-of-way. The high grade aggregate for the production of HL1 and Heavy Duty Binder asphalt may be obtained in the Gloucester area south of Ottawa.

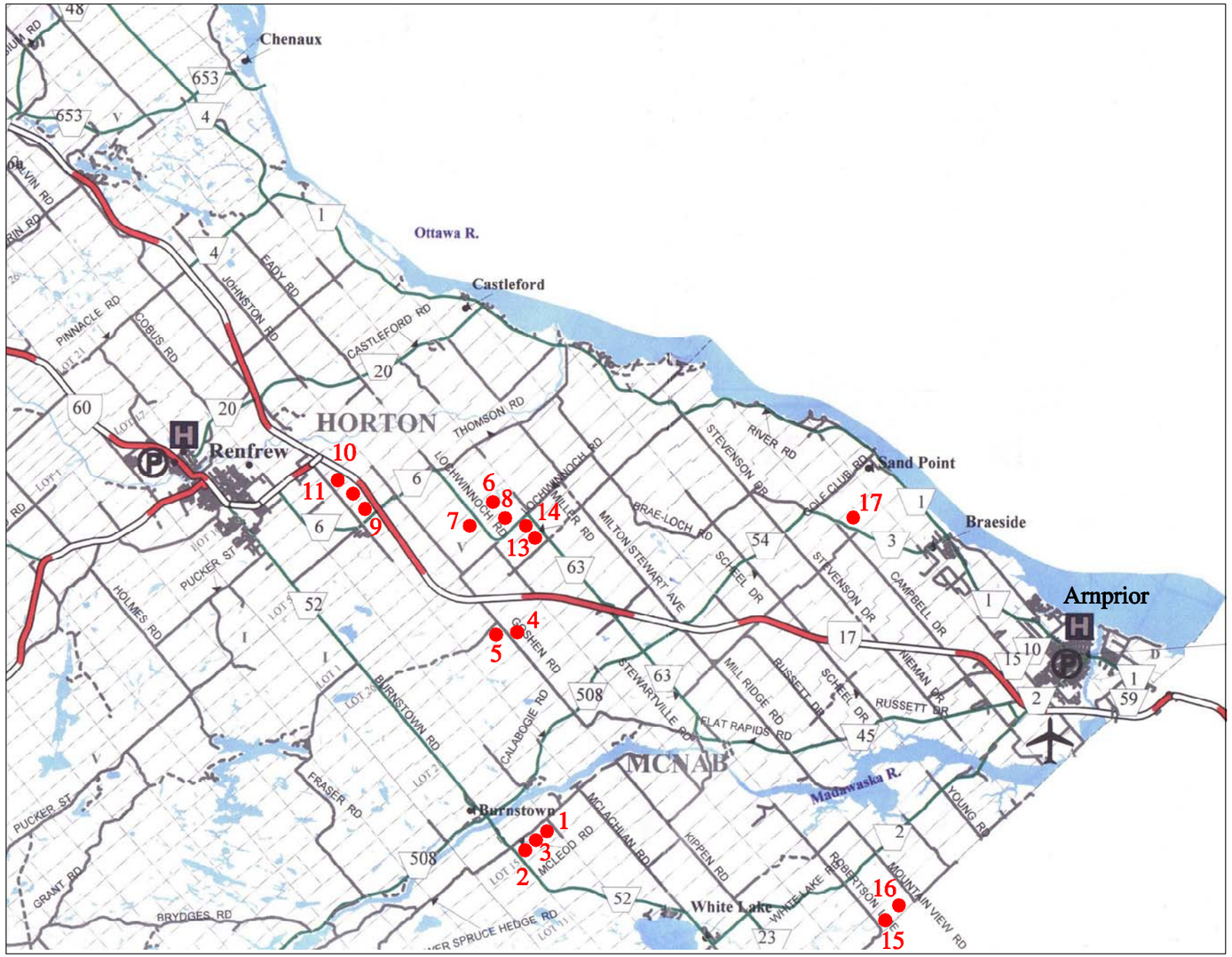
The sources indicated are generally licensed and considered acceptable within Ministry standards, and are within an economical haul distance of the project.

4.3.3 Contaminated Property and Waste Management

A preliminary inventory of properties within the study area that may present an environmental waste concern include:

- Boeing Canada – Baskin Drive
- Stinson Gas Bar – White Lake Road
- McNab/Braeside Township Salt Dome – County Road 508/Russett Road
- McEwan's Gas Bar – County Road 508
- Ottawa Valley Railway (OVR) – East of O'Brien Road
- Abandoned Railway - west of Goshen Road
- CP Railway – Madawaska River

The MOE has been contacted and indicated there was no recorded contaminated spill sites within the study area. However, where future construction will be adjacent to existing gas stations, future investigations should follow the MOE's guidelines, policies and standards with respect to site remediation and clean-up, MOE approvals requirements, management of hazardous waste and environmental legislation.



LEGEND:

1 - UNNAMED
2 - UNNAMED
3 - UNNAMED
4 - UNNAMED
5 - UNNAMED
6 - NESBITT
7 - H&H AGGREGATES (McLAREN PIT)
8 - SMITH'S CONST. (MILLER PIT)
9 - LaFARGE
10 - JAMIESON
11 - KLUKE
12 - N/A
13 - SPRATT (GILLAN)
14 - DUNCAN McCALLUM

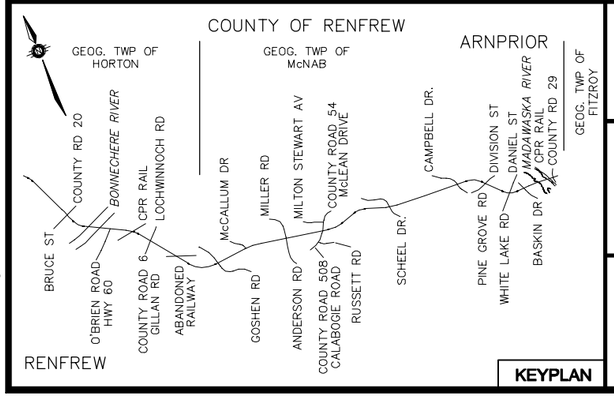


FIGURE 4-16

PIT AND QUARRY LOCATIONS

HIGHWAY 17 TWINNING, COUNTY ROAD 29 to 3.0 km WEST OF BRUCE STREET
PRELIMINARY DESIGN/ ENVIRONMENTAL ASSESSMENT STUDY
WP 647-92-00

SCALE:

Ministry of Transportation

NCE
TRANSPORTATION AND VALUE ENGINEERS

FIGURE 4-16.dwg – Tue, 2 Dec 2003 – 16:21

4.3.3.1 Official Plans

The Official Plan designations along Highway 17, from Arnprior to Renfrew, are described in the following section and are illustrated on **Figures 4-17, 4-18 and 4-19**, **Official Plans**.

Town of Arnprior Official Plan

The following describes the land use designations found in the Town of Arnprior Official Plan[5], refer to **Figure 4-17, Official Plans – Section 1.**

Industrial land uses are located between the eastern project limits to the Madawaska River on the north side. This land designation permits existing industries and future development, high-tech industries, and all forms of manufacturing, storage and sales. The area south of the highway from the Madawaska River to Baskin Drive East, is designated as **Industrial-Business Park**, which limits use to manufacturing in an enclosed building, business and professional offices.

Shopping Centre Commercial land use is found between Baskin Drive West and White Lake Road on the north side of the highway. This designation permits the use of department stores, retail stores, automotive stores, business and professional offices, personal and general service shops and restaurants. **Highway Commercial** land is found in the vicinity of White Lake Road intersection and permitted uses include automotive stations, trailer sales, restaurants, coffee shops and drive-in establishments.

Residential land use is found on the north side of Highway 17 from the Madawaska River to Baskin Drive West and between Russett Drive to Division Street. However, residential lands along Highway 17 have not been developed. Permitted land uses are limited to single and multiple density development.

Airport land is located south of the highway between Baskin Drive East to White Lake Road. This land use permits a municipal airport and ancillary facilities, including light industry associated with the aircraft industry.

A small tributary west of the Madawaska River and north of the highway is identified as **Environmental Protection.** Permitted uses include agriculture, conservation, horticultural nurseries, forestry, wildlife areas, public or private parks and other outdoor recreation uses.

The **Parks and Open Space** designation is located on the south side of the highway from the eastern town boundary to the western shore of Madawaska Lake, including the CPR and Arnprior Power Generation Station lands. This land use extends to the north side of the highway along the Madawaska River. Land uses permitted include outdoor recreation and/or those which contribute to a healthy community.

McNab/Braeside Township Official Plan

The Official Plan for the Township of McNab/Braeside was used to describe the following land designations[6], refer to **Figures 4-17 and 4-18, Official Plans – Sections 1 and 2**.

Rural land use designations are found on both the north and south sides of Highway 17 extending from the east to the west limits of the Township of McNab/Braeside. Permitted land uses include agricultural, forestry, low density residential, rural commercial, rural industrial, recreational and institutional.

Suburban land use designations are located south of the highway near Campbell Drive and Pine Grove Road and west of Glasgow Station on both the north and south sides. Permitted land uses include residential, commercial and institutional development.

[5] Town of Arnprior Official Plan, By-Law No. 4619-97 in association with Schedules 'A' and 'B'. October 27, 1997.

[6] Official Plan for the Township of McNab/Braeside, Amendement No. 1. April 1994. Consolidated April 23, 2001.

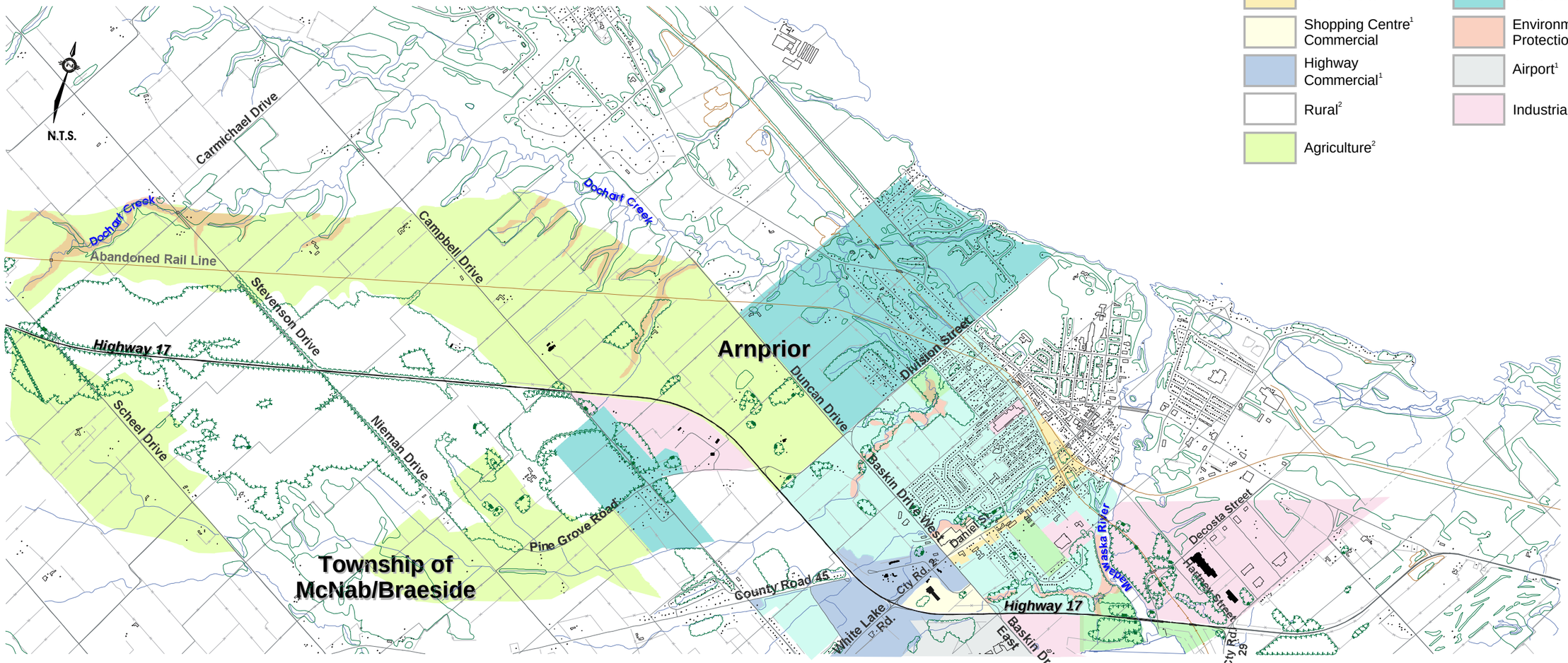


Figure 4-17
Official Plan
County Road 9 to Scheel Drive

HIGHWAY 17 TWINNING
ARNPRIOR TO RENFREW

[1] Town of Arnprior Official Plan, By-Law No. 4619-97 Schedule "A". October 27, 1997.

[2] Official Plan for the Township of McNab/ Braeside, Amendement No. 1. April 1994. Consolidated April 23, 2001.

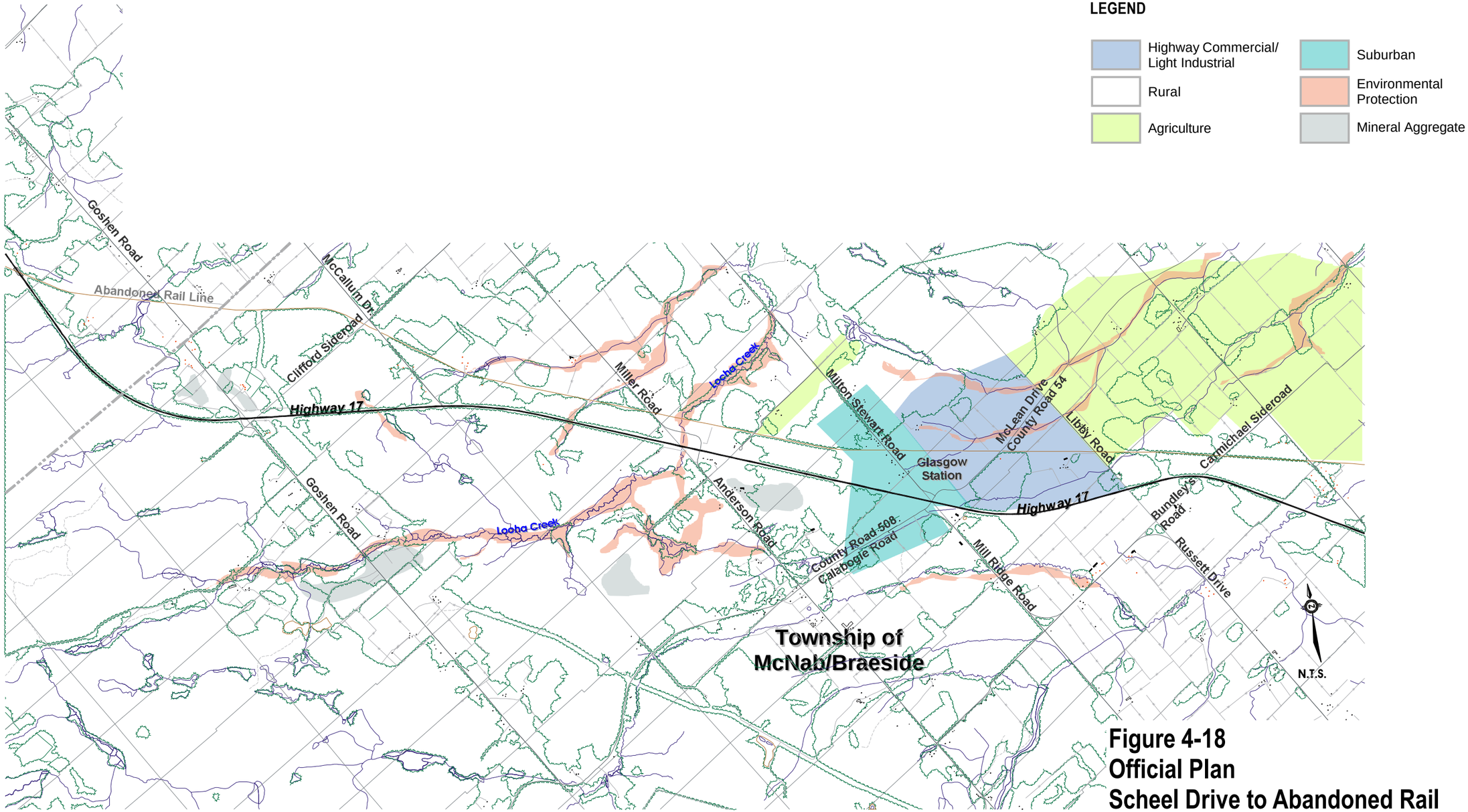


Figure 4-18
Official Plan
Scheel Drive to Abandoned Rail Line

HIGHWAY 17 TWINNING
ARNPRIOR TO RENFREW

engineers architects planners

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Official Plan for the Township of McNab/ Braeside, Amendement No. 1.
April 1994. Consolidated April 23, 2001.

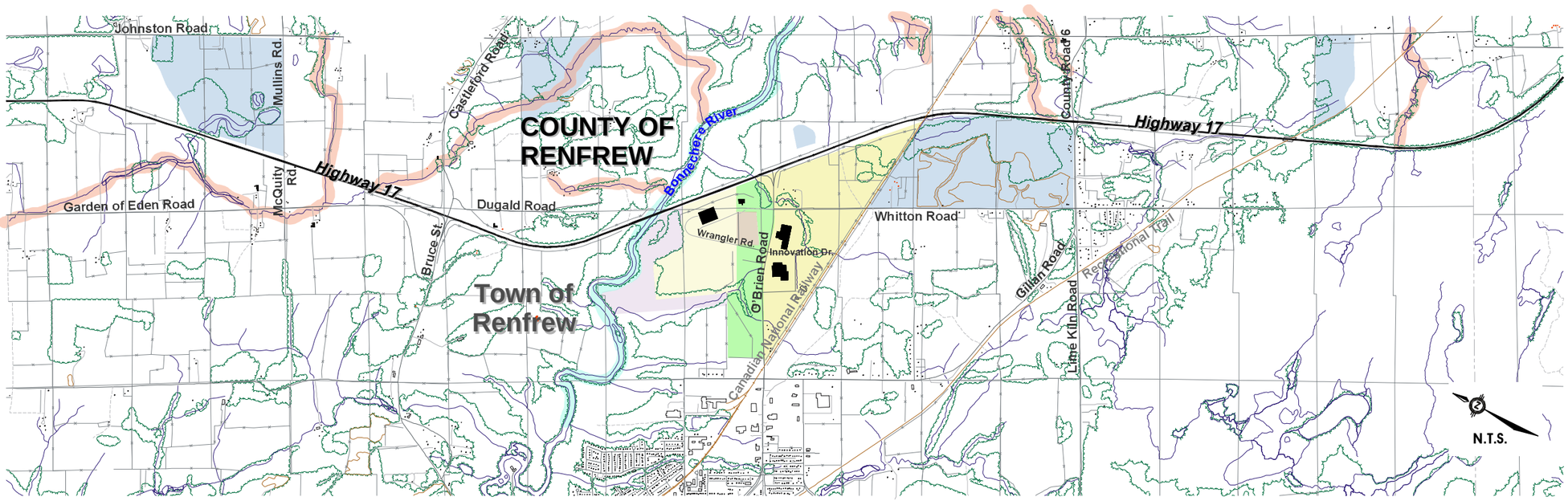


Figure 4-19
Official Plan
Abandoned Rail Line to 3 km West of Bruce Street

HIGHWAY 17 TWINNING
ARNPRIOR TO RENFREW

[1] Official Plan County of Renfrew, Adopted by County Council: March 27, 2002.

[2] Official Plan of the Town of Renfrew, Schedule 'A' Land Use Plan. August 27, 1993.

Highway Commercial/Light Industrial land is found on the northeast portion of Highway 17 at Glasgow Station extending east to Libby Road. This land use permits service stations, restaurants, coffee and gift shops, drive-in establishments and commercial agricultural operations (i.e. horse boarding facilities). Public and institutional uses such as dwelling units for caretakers, owners or employees shall be permitted.

A small parcel of land located south of the highway between Division Street and Campbell Drive is designated as **Industrial**. Permitted land uses include all forms of manufacturing, processing, storage yards, assembly of goods, transportation warehousing, wholesaling of bulk products and extraction of raw materials. Offices and eating establishments that may be required to service these activities are permitted. Sales of automobiles, boats, farm equipment and trailers are also permitted.

Agriculture land use designations extend northwest of the highway at Division Street to immediately west of Campbell Drive. The remainder of agriculture land is located further north and south of the highway until Libby Road. Permitted land uses include farm residences and structures relating to farming operations.

Locha Creek and Dochart Creek have been identified for **Environmental Protection**. Locha Creek crosses Highway 17 at Miller / Anderson Road and Dochart Creek is located north of Highway 17. Permitted land uses are limited to agriculture, conservation, horticultural nurseries, forestry, wildlife areas, public or private parks and other outdoor recreation uses.

Mineral Aggregates are located southeast of the highway at Anderson Road, and northwest of Highway 17 at Cliffort Sideroad. Permitted land uses are reserved for pits and quarries associated with manufacturing uses. Mineral aggregate extraction activities that do not preclude future use of these lands are also permitted.

Renfrew County Official Plan

The County of Renfrew Official Plan has identified the following designations[7], refer to **Figures 4-17, 4-18 and 4-19, Official Plans – Sections 1, 2 and 3**.

[7] Official Plan County of Renfrew, Adopted by County Council: March 27, 2002.

Rural land use designation covers both sides of the Highway 17 corridor between McNab/Braeside Township and the westerly study limits, except for the Town of Renfrew and Mineral Aggregate designations discussed below. The permitted uses include rural residential, agriculture and rural-related commercial, industries and recreation.

Mineral Aggregate land is found south of Highway 17 from Gillan Road to Canadian National Railway and northwest of the highway at Mullins Road. Permitted land uses include pits and quarries with associated manufacturing use and uses that do not preclude future mineral extraction activities.

Environmental Protection land use designation has been identified for Deil's Creek, which crosses Highway 17 at County Road 6 and a Bonnechere River tributary, which crosses Highway 17 west of Goshen Road. These creeks have been identified as natural water systems, which require special attention because of sensitivities regarding potential environmental damage or threats to life and property if developed.

Town of Renfrew Official Plan

The following designations have been extracted from the Town of Renfrew Official Plan[8], refer to **Figure 4-19, Official Plans – Section 3**.

Industrial land use is located south of the highway between the Canadian National Railway and O'Brien Road/Highway 60 and between Gibbons Road and the Bonnechere River valley. Land uses permitted include manufacturing, processing, storage, transportation and wholesaling of bulk products.

Highway Commercial designation is identified south of the highway, between O'Brien Road and Gibbons Road. Permitted land uses include automobile service centers, trailer sales, restaurants and any other similar uses which cater to the motoring public.

Hazard Lands designation is located southeast of the highway at the Bonnechere River. Lands are intended for preservation and conservation but may be used for recreation.

Extractive Industrial designations are located west of the highway between

[8] Official Plan of the Town of Renfrew, Schedule 'A' Land Use Plan. August 27, 1993.

4.4 Summary of Significant Areas/Features

A summary of the environmentally significant feature and/or concerns within the study area is provided below and illustrated on **Figures 4-20, to 4-22 Summary of Significant Features.**

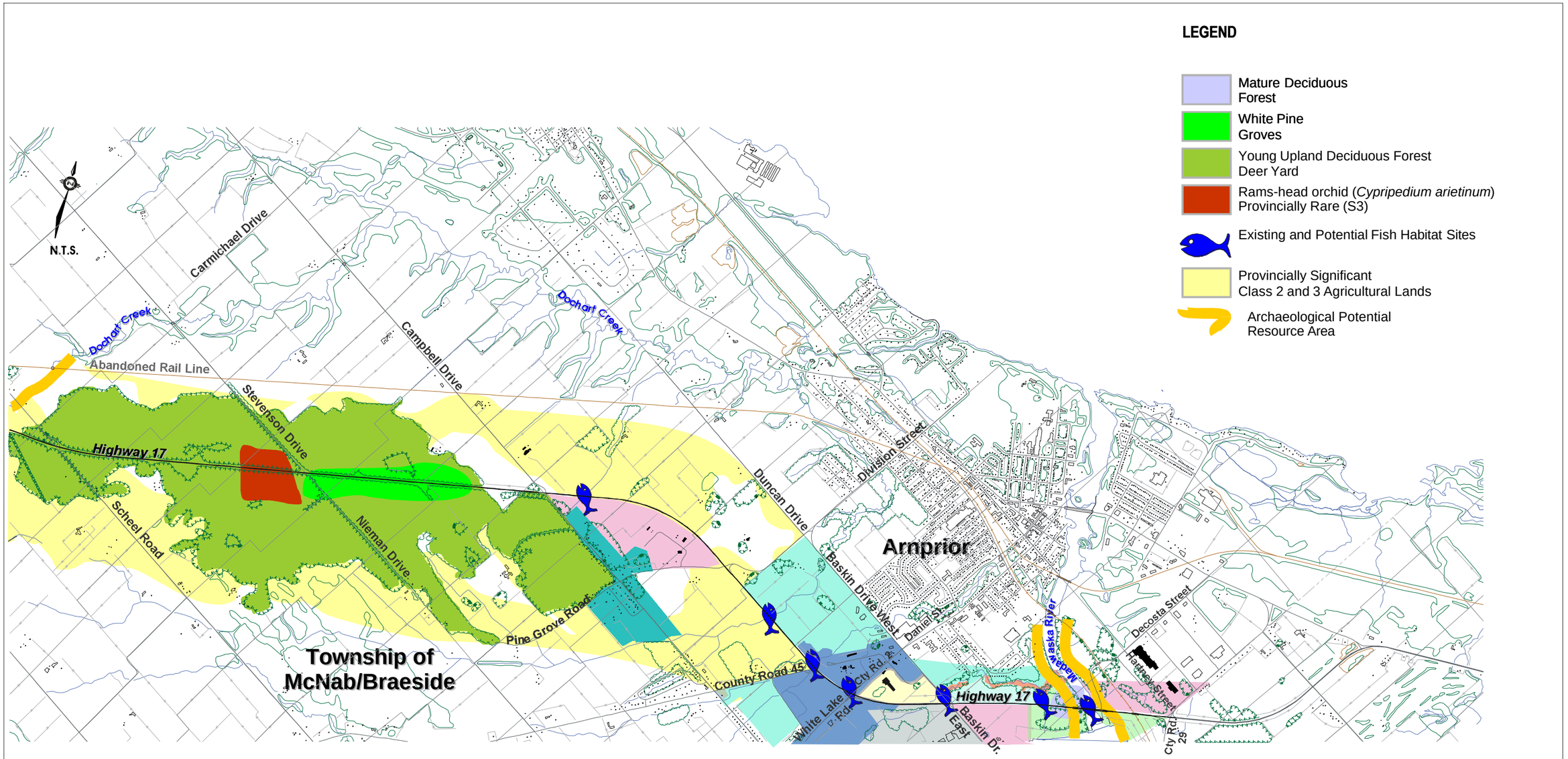
Natural Environment Features:

Class 2 and 3 soils found in the study area are considered Provincially Significant Agricultural Resource Areas and are located in the following areas:

- East study limit to east of Campbell Drive;
- Russett Drive at Bundley's Road to west of Milton Stewart;
- Anderson Road to McCallum Drive;
- Abandoned Rail line to east of County Road 6; and
- Ottawa Valley Railway (Canadian Pacific Rail Line) to 2 km west of Bruce Street, excluding the escapement east of Castleford Road and at Bruce Street.

Existing and potential fish habitat was identified at the following 22 sites:

Site Number	Station No. and Watercourses
Township of Horton:	
Site 1	Station No. 15+825 Little Halliday Creek Tributary A
Site2	Station No. 16+525 Little Halliday Creek Tributary B
Site 3	Station No. 17+563 Little Halliday Creek Tributary C
Site 4	Station No. 17+887 Little Halliday Creek
Site 5	Station No. 20+250 Bonnechere River
Site 6	Station No. 21+020 Bonnechere River East Tributary 1
Site 7	Station No. 23+625 Deil's Creek
Site 8	Station No. 24+921 Deil's Creek Tributary
Township of McNab/Braeside:	
Site 9	Station No. 10+075 Bonnechere River East Tributary 2
Site 10	Station No. 11+000 Bonnechere River East Tributary 2A
Site 11	Station No. 13+309 Locha Creek West Tributary
Site 12	Station No. 14+700 Locha Creek West Tributary A
Site 13	Station No. 15+700 Locha Creek
Site 14	Station No. 18+174 Dochart Creek West Tributary
Site 15	Station No. 21+350 Dochart Creek
Site 16	Station No. 26+319 Dochart Creek East Tributary 1
Town of Arnprior:	
Site 17	Station No. 28+209 Dochart Creek East Tributary 2
Site 18	Station No. 28+736 Madawaska River West Tributary 1
Site 19	Station No. 29+110 Madawaska River West Tributary 1A
Site 20	Station No. 29+785 Madawaska River West Tributary 2
Site 21	Station No. 30+730 Madawaska River West Tributary 2A
Site 22	Station No. 31+100 Madawaska River



Residential[1]
Parks & Open Space[1]
Shopping Centre[1] Commercial
Highway Commercial[1]
Suburban[2]
Environmental[1 & 2] Protection
Airport[1]
Industrial[1 & 2]

[1] Town of Arnprior Official Plan, By-Law No. 4619-97 Schedule "A". October 27, 1997.

[2] Official Plan for the Township of McNab/ Braeside, Amendement No. 1. April 1994. Consolidated April 23, 2001.

Figure 4-20
Significant Features
County Road 29 to Scheel Drive

HIGHWAY 17 TWINNING
ARNPRIOR TO RENFREW

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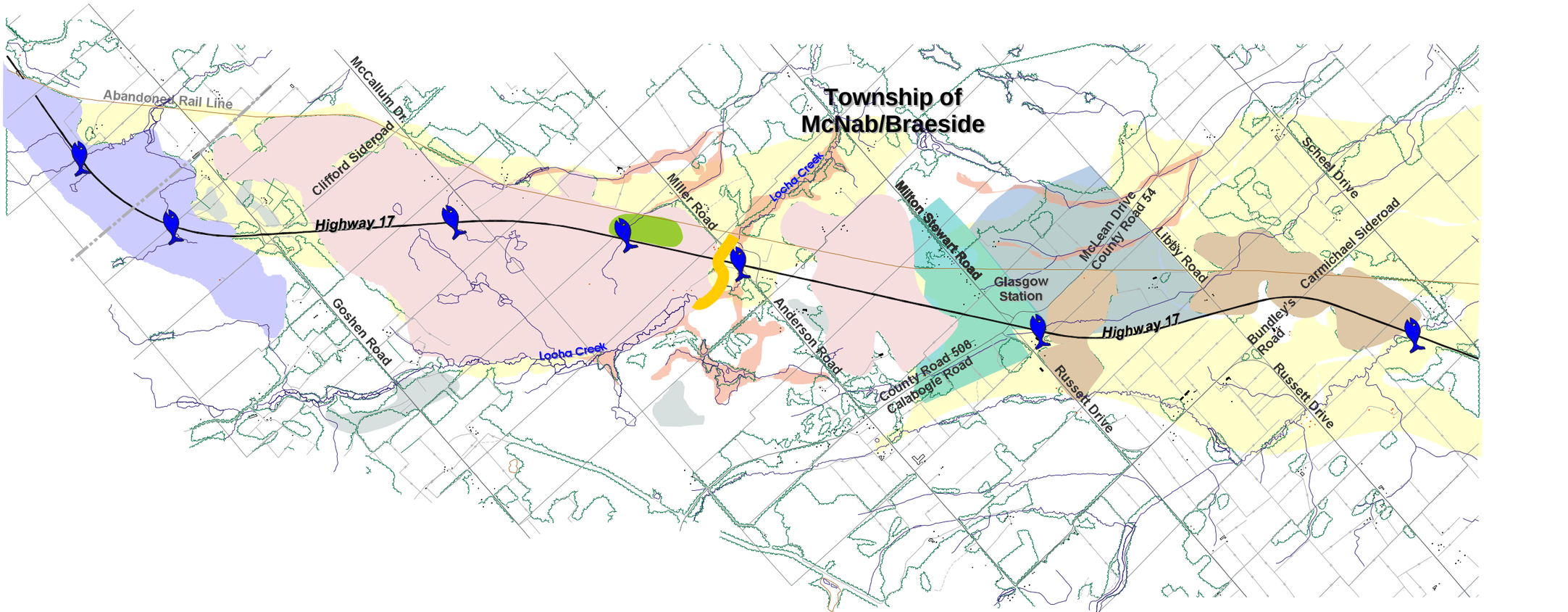
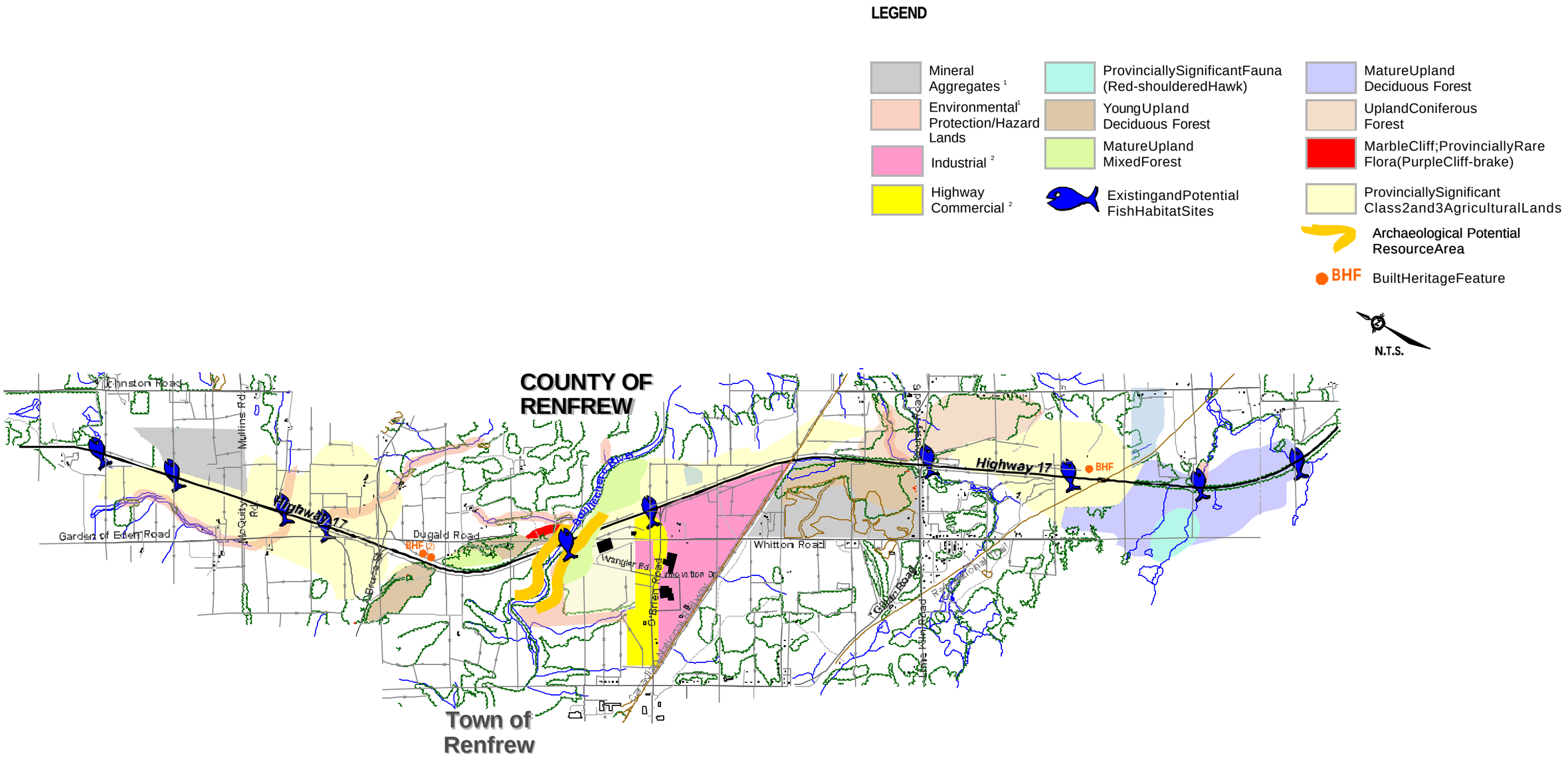


Figure 4-21
Significant Features
Scheel Drive to Abandoned Rail Line

HIGHWAY 17 TWINNING
ARNPRIOR TO RENFREW

Official Plan for the Township of McNab/ Braeside, Amendement No. 1.
April 1994. Consolidated April 23, 2001.



[1] OfficialPlanCountyofRenfrew,AdoptedbyCountyCouncil:March 27,2002.

[2] OfficialPlanoftheTownofRenfrew,Schedule'A'LandUsePlan. August27,1993.

engineers architects planners

NCE

Figure 4-22
Significant Features
Abandoned Rail Line to 3 km West of Bruce Street

HIGHWAY17TWINNING
ARNPRIORTORENFREW

Seven locations of native terrestrial habitats with high ecological qualities are listed as follows:

- Mature hardwood forest along the western bank of the Madawaska River;
- Large undisturbed deciduous and coniferous woodland between Campbell Drive and Scheel Drive (north side) provides potential for interior forest and is designated a 'Deer Yard' by the Ministry of Natural Resources;
- Large deciduous and coniferous forest on the south side of Highway 17 between Campbell Drive and Scheel is more disturbed but has been identified as a 'Deer Yard' by the Ministry of Natural Resources;
- Provincially Rare (S3) plant: Rams-head orchid (*Cypripedium arietinum*) located west of Neiman Road within the right-of-way;
- Mature hardwood forest located on the south side of Highway 17, located west of Goshen Road. Provincially Significant Species of Concern;
- Provincially Rare and regionally rare plant species located on the marble cliff habitat west of the Bonnechere River, north of Highway 17. Significant species include two plant species the *Arabris hoboellii* and the *Pellaea atropupurea* and one bird species the Turkey Vulture, a former rare species that is now abundant; and
- Madawaska and Bonnechere River wildlife corridors.

Social/Cultural Environment:

Four locations that exhibit a high potential for Archaeological Resources include areas adjacent to the following watercourses:

- Bonnechere River;
- Locha Creek;
- Dochart Creek; and
- Madawaska River;

Three built heritage features were identified within the study area and include the following:

- House (BHF 1) 300 m east of Castleford Road, north side of Highway 17;
- Barn (BHF 2) 300 m east of Castleford Road, north side of Highway 17; and
- House (BHF 3) west of the Abandoned Rail Line, north side of Highway 17.

Eleven cultural landscape units (roadscapes) were identified and are listed as follows:

- Pinnacle Road / Storybook Road
- Bruce Street / Castleford Road
- Bonnechere River
- O'Brien Road
- 821 Whitton Road
- Highway 17, east of O'Brien Road
- Gillan Road / Lochwinnoch Road (County Road 6)
- Highway 17, east of Lochwinnoch Road
- Goshen Road
- McCallum Road and right-of-way
- Scheel Drive

Nine sites were identified as significant local Community / Recreation Areas:

- Town of Arnprior:
  - A.J. Charbonneau Elementary School.
  - McNab / Braeside Township:
  - Pine Grove Community;
  - Township Municipal Offices;
  - Township Fire Station;
  - Glasgow Station; and
  - Glasgow Dows Softball field.
  - Horton Township:
  - Recreational Trail (abandoned rail line);
  - Horton Public School
  - Township Fire Station
  - Township Municipal Offices
  - Bonnechere River

Economic Environment

The following areas, located adjacent to Highway 17 are considered critical to the economic outlook of the study area:

- Town of Arnprior:
  - Arnprior Generating Station / Ontario Power Generation;
  - Boeing;
  - Arnprior Municipal Airport; and
  - Daniel Street commercial area.
- McNab / Braeside Township:
  - Jackson Lane Business Park;
  - Quarry Operations; and
  - Agricultural Resource areas.
- Horton Township:
  - Quarry Operations; and
  - Agricultural Resources.
- Town of Renfrew:
  - Renfrew Inn;
  - O'Brien Road Business Park; and
  - Renfrew Industrial Commission.

Areas identified by the municipalities for future development are listed as follows:

- Town of Arnprior:
  - Undeveloped residential land on the north side of Highway 17; and
  - Undeveloped industrial land on the south side of Highway 17.
- McNab / Braeside Township:
  - Undeveloped industrial lands south side of Highway 17, west of Campbell Drive; and
  - Undeveloped highway commercial / industrial lands north of Highway 17 at Glasgow Station.
- Horton Township:
  - Undeveloped Mineral Aggregate Areas, north of Highway 17.
- Town of Renfrew:
  - Undeveloped industrial areas, south side of Highway 17.