*Harmony Creek subwatershed*

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# BLACK/HARMONY/FAREWELL CREEK WATERSHED EXISTING CONDITIONS REPORT CHAPTER 12 - STORMWATER MANAGEMENT

**April 2011**

Central Lake Ontario Conservation

DURHAM REGION

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# 1.0 INTRODUCTION

Stormwater management is the practice of controlling runoff to prevent downstream erosion, flooding and water quality degradation as well as assist in maintaining groundwater recharge where relevant. It is a vital component to maintaining watershed health in a developing watershed. Stormwater management is not the sole responsibility of any one organization but must be considered by several planning agencies and as such CLOCA works with municipal partners to ensure that all development applications prepare a plan for managing urban runoff to ensure that the impacts of development are minimized and that watershed health is not jeopardized.


*'Stormwater management is not the sole responsibility of any one organization but must be considered by several planning agencies'*

# 2.0 STUDY AREA AND SCOPE

The Black/Harmony/Farewell Creek watershed is situated entirely within the Regional Municipality of Durham and covers an area of approximately 108 $km^2$ (Figure 1). The watershed drains southerly towards Lake Ontario from its headwaters which originate in the south slope till plain of the Oak Ridges Moraine. The Black/Harmony/Farewell Creek watershed is divided into 3 primary subwatersheds: Black Creek, Harmony Creek and Farewell Creek. The Harmony Creek subwatershed is further divided into 5 subwatersheds: Ritson, Wilson, Grandview, Taunton and Mitchell. This chapter will report on the stormwater management that is provided within the Black, Harmony and Farewell Creek watershed

The Ministry of the Environment (MOE) has published a Stormwater Management Planning and Design Manual (SWMPDM) (MOE, 2003) that provides minimum design standards. These standards are used by land developers and CLOCA to assist in stormwater management design. In addition to the guidelines set by the province, CLOCA has its own watershed-specific guidelines. The CLOCA developed guidelines were created considering the specific characteristics and needs of each watershed.

*'the Ministry of the Environment has published a Stormwater Management Planning and Design Manual '(SWMPDM) (MOE, 2003) that provides minimum design standards'*

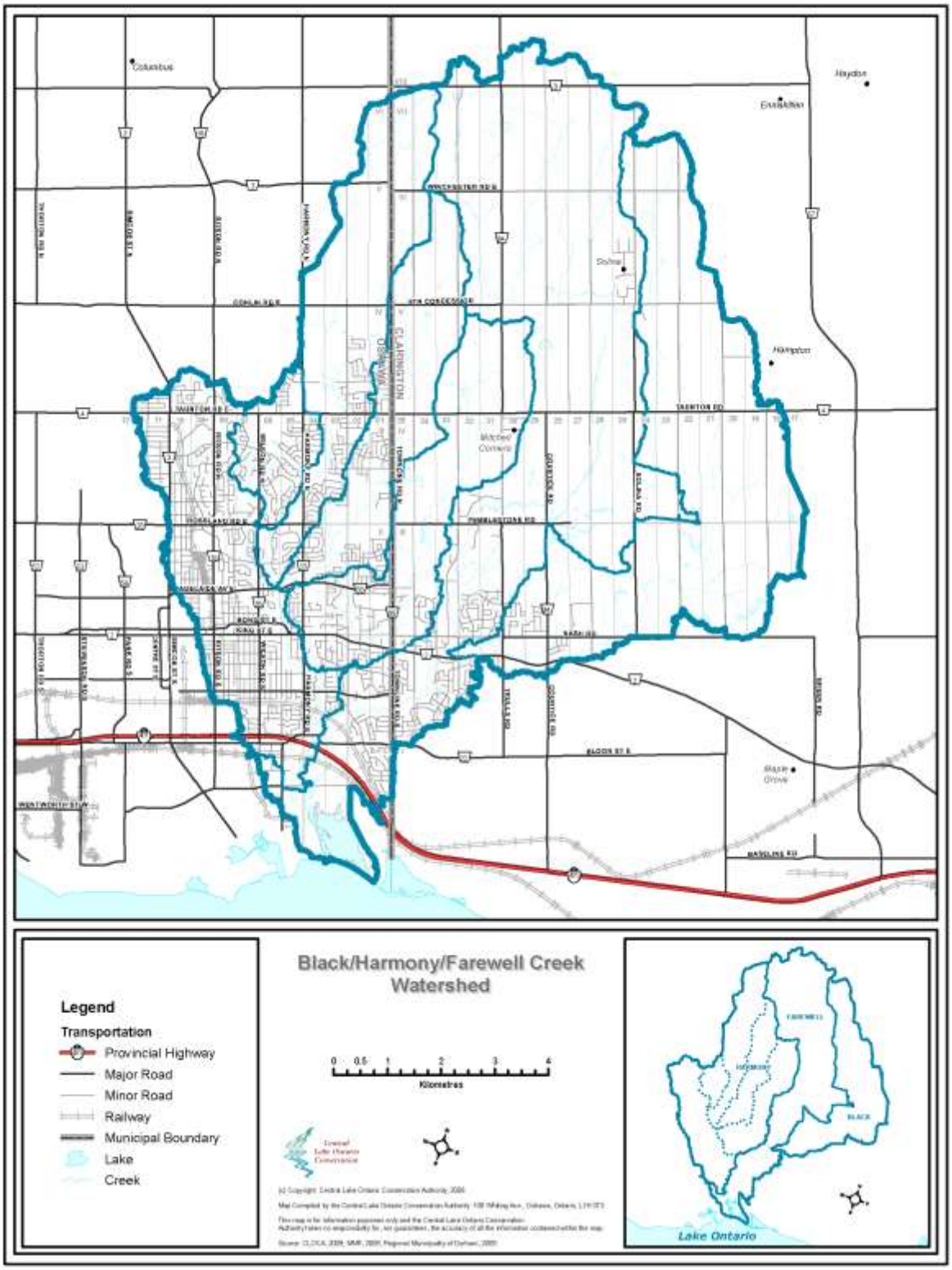


Figure 1: Black/Harmony/Farewell Creek watershed.

# 3.0 METHODOLOGY

The information that is presented in this chapter was gathered from a literature review and verified by field visits.

The Ministry of the Environment's SWMPDM (MOE, 2003), was reviewed and referenced with respect to the minimum criteria required for stormwater management. A detailed search of CLOCA's development files was also undertaken to identify the existing stormwater facilities within the Black/Harmony/Farewell Creek watershed. Municipalities were also contacted for their updated data layers. The first step taken to identify the existing stormwater management facilities was to examine CLOCA's 2008 orthophotography for any obvious pond areas. It should be noted that ponds that were still under construction at the time of this review, were considered incomplete and are not described in this report. The findings were then cross referenced with CLOCA's land development files and discussed with development review staff. In cases where the development files were still retained by CLOCA, the stormwater management design reports were reviewed and key information was extracted and input into a database.

While every effort has been made to accurately present the findings reported in this chapter, factors such as significant digits and rounding, and processes such as computer digitizing and data interpretation may influence results. For instance, in data tables no relationship between significant digits and level of accuracy is implied, and values may not always sum to the expected total.

*'a detailed search of CLOCA's development files was also undertaken to identify the existing stormwater facilities'*

# 4.0 FINDINGS

## 4.1 Black/Harmony/Farewell Creek Watershed

Stormwater management has three main components:

- Stormwater Quality;
- Stormwater Quantity; and
- Sedimentation and Erosion Control.

A complete stormwater management plan considers all three aspects in an integrated treatment train. Each component is discussed in the sections below.

### 4.1.1 Stormwater Quality

The minimum standards for stormwater quality control are set out in the MOE's SWMPDM (MOE, 2003). There are three (3) levels of quality control that can be applied within Ontario; Enhanced (Level 1), Normal (Level 2) and Basic (Level 3). Each level of protection corresponds to specific aquatic habitat characteristics to which the area drains. Enhanced (Level 1) protection should be applied to areas that drain to sensitive aquatic habitat including areas sensitive to sediment and siltation, areas of high baseflow discharge and areas with high permeability soils. Normal (Level 2) protection should be applied to areas that have natural upstream sediment loads, and less sensitive spawning areas. Basic (Level 3) protection can only be applied when the receiving area is proven to be insensitive to stormwater impacts or has little potential for long-term rehabilitation.

*'there are three (3) levels of quality control that can be applied within Ontario: Enhanced (Level 1), Normal (Level 2) and Basic (Level 3)'*

The MOE's SWMPDM (MOE,2003) includes a volumetric sizing guideline for the removal of suspended sediments that is based on the various types of stormwater management facility (SWMF), upstream imperviousness, drainage area and level of protection required.

Within the entire Black/Harmony/Farewell Creek watershed Enhanced (Level 1) Protection is required by CLOCA, as the Black/Harmony/Farewell Creeks consists primarily of cool water fisheries and drains to a provincially significant coastal wetland.

The 2003 Ministry of the Environment's SWM Planning & Design Manual discusses mitigation measures for increased temperature due to end-of-pipe SWM facilities. The bottom-draw (reverse draw or reverse graded) outlet allows the cooler water, from the bottom of the facility, to be discharged to the receiving water course, therefore reducing the thermal impact. CLOCA requires that all SWM facilities that discharge to cool or cold water receiving systems must incorporate mitigative measures such as the bottom-draw outlet.

A study of the thermal effects of stormwater management ponds is currently

underway within CLOCA. One SWMF within the Black/Harmony/Farewell Creek watershed has been selected for study, Brookview East, located on Pondview Ct. in The City of Oshawa.

### 4.1.2 Stormwater Quantity

Stormwater quantity control is implemented to prevent downstream erosion and flooding. Erosion and sediment control is discussed within the following subsection, while flooding is discussed further in Chapter 15 – Surface Water Quantity.

Stormwater quantity control criteria within CLOCA's jurisdiction have been set by CLOCA, with reference to the MOE's SWMPDM (MOE,2003). CLOCA mandates that:

- every effort should be made to maintain existing watershed boundaries and drainage patterns;
- unless specified otherwise by the municipality, subwatershed study, or fluvial geomorphic analysis, the post-development peak flow rates must not exceed corresponding pre-development rates for the 1:2-year through 1:100-year design storm events and the Regional Event (Hurricane Hazel);
- Erosion requirements from the MOE Stormwater Management Practices Planning and Design Manual 2003, will be applied, requiring the 25 mm 4 hr Chicago storm be stored and released over a 24 to 48 hour period; and,
- if there are known undersized pipes/culverts downstream that could impede water conveyance or if there is private property within the riparian area that could be affected, then quantity control must be provided.

*'stormwater quantity control criteria within CLOCA's jurisdiction have been set by CLOCA, with reference to the MOE's SWMPDM'*

In addition all quantity control facilities are to be designed in accordance with recommendations set out in the MOE's SWMPDM (MOE,2003). The amount of water produced during a storm event is predicted through modelling a synthetic design storm. A synthetic design storm, or model storm, is a single event rainfall that is assumed to produce flows of a desired return period. Each design storm has a unique variation of intensity over time. Synthetic design storms are developed from compiled intensity-duration-frequency (IDF) curves. The frequency, or return period is simply the inverse of the probability of a storm of a certain intensity, duration and frequency of occurring, expressed in years. The Regional storm is a historical design storm, constructed from a large single storm event usually containing the maximum precipitation on record. In Southern Ontario, Hurricane Hazel is used.

Within the Black/Harmony/Farewell Creek watershed quantity control for the 2 through 100-year and Regional storm is required unless otherwise noted in master plans. Generally, in the lower and mid-portions of the watershed systemit may be preferable to discharge drainage from new developments without stormwater quantity controls, so that this drainage can flow through the system before the larger discharges from the upper portion of the watershed arrive. A hydrologic and hydraulic assessment may be necessary, however, to determine if the drainage from the new developments will have local impacts on the floodplain and the bank stability of smaller receiving streams. These issues will be discussed in future phases of the Black/Harmony/Farewell Creek Watershed Plan. Master Plans within the Black/Harmony/Farewell Creek watershed include:

- Black Creek Master Drainage Study, GM Sernas & Associates Ltd., 1991
- Courtice Stormwater Management Study, Totten, Sims & Hubicki, 1991
- East Macourtice Tributary of Black Creek Master Drainage Plan, GM Sernas & Associates Ltd., 1991
- Macourtice Stormwater Management Plan, GM Sernas & Associates Ltd., 2003
- Municipal Servicing Report Courtice North, Municipal Servicing Report Courtice, 1996
- Stormwater Drainage and Erosion Control Report, South Courtice Community Centre, D.G.Biddle & Associates Ltd, 1992
- Harmony Creek Subwatershed Study, Aquafor Beech, 2000
- Taunton Community Stormwater Master Plan, GM Sernas & Associates Ltd., 2004
- Harmony Creek Watershed Study, Totten, Sims & Hubicki, 1990
- Harmony Creek Branch 1 Stormwater Detention Study, Totten, Sims & Hubicki, 1993
- Erosion Control & Bank Stablization, Simco Engineering, 1978
- Harmony Creek Watershed Stormwater Management Study, Totten, Sims & Hubicki, 1990
- Environmental Impact Statement Courtice North, Ecoplans, 1996

In some areas of a watershed significant amounts of precipitation are naturally intercepted and absorbed by the ground. These areas indicate high groundwater recharge. In these areas special measures are taken to ensure the balance between surface water and groundwater is maintained. More detail pertaining to water budgeting and balancing can be found within Chapter 9 - Water Budget.

*"In some areas of a watershed significant amounts of precipitation are naturally intercepted and absorbed by the ground"*

### 4.1.3 Sedimentation and Erosion Control

Sedimentation and erosion control within CLOCA's jurisdiction is jointly prescribed by CLOCA and the MOE. The MOE SWMPDM (MOE,2003) requires that the 25 mm 4 hr Chicago storm be stored and released over a 24 to 48 hour period. This ensures that the peak flows are released slowly reducing high volumes and velocities that can cause erosion.

In addition, preventative measures must be taken during construction activities to reduce the transport of sediments from the stripped site to waterways. Such measures include silt fencing, rock check dams and sedimentation ponds. These measures slow the rate at which stormwater runoff drains and encourage the settling out of suspended sediments.

### 4.1.4 Existing Stormwater Management Conditions

Within the Black/Harmony/Farewell Creek watershed there are many end-of-pipe stormwater management facilities in place. End-of-pipe stormwater management facilities receive stormwater from a conveyance system (ditches, sewers) and discharge the treated water to the receiving waters (MOE, 2003). The primary types of facilities are oil grit separators (OGS) and stormwater management ponds. Oil grit separators, typically installed below grade in highly impervious areas such as parking lots, are designed to help remove sediment, screen debris, and separate oil from stormwater. Wet ponds are the most commonly used end-of-pipe stormwater

management facility in Ontario (MOE, 2003). Wet ponds provide for water quality and quantity, and erosion control. Unlike a wet pond, a dry pond does not have a permanent pool of water. As such, while they can be effectively used for erosion control and flood control, the removal of stormwater contaminants in these facilities is purely a function of the detention time in the pond (MOE, 2003).

Based on the literature review, there are twenty-four stormwater management ponds (SWM ponds) and nineteen known OGSs within the Black/Harmony/Farewell Creek watershed. The SWM ponds are designed to provide control for quality, quantity, or both. Typically, stormwater ponds have not been designed to provide or promote wildlife habitat, as the primary purpose are stormwater quality and quantity control. That being said, various wildlife species are often found using these ponds. Figure 2 shows the location and type of the existing stormwater management ponds as well as the location of oil grit separators.

Using the location map (Figure 2) and the available development files, areas that are receiving quality and/or quantity treatment have been delineated. Figure 3 shows the areas receiving quality and/or quantity treatment within the Black/Harmony/Farewell Creek watershed. OGS units typically treat very small sites and thus the areas treated by the units are not shown on this figure.

The areas that are not receiving quality treatment are the older parts of Black/Harmony/Farewell Creek watershed within the City of Oshawa. This is a direct result of the fact that the treatment of stormwater quality and quantity has only been a requirement of development for the last 20 or so years. The results from the biological water quality sampling, that are discussed in chapter 15, indicate that these older urbanized areas of the watershed are impaired, where the newer areas that are receiving stormwater treatment are not impaired. The biological water quality impairment can be linked to the lack of stormwater management, groundwater discharge and cumulative effects.

*'within the Black, Harmony and Farewell Creek watershed there are many end-of-pipe stormwater management facilities in place'*

***Taunton subwatershed - Stormwater Management Pond***

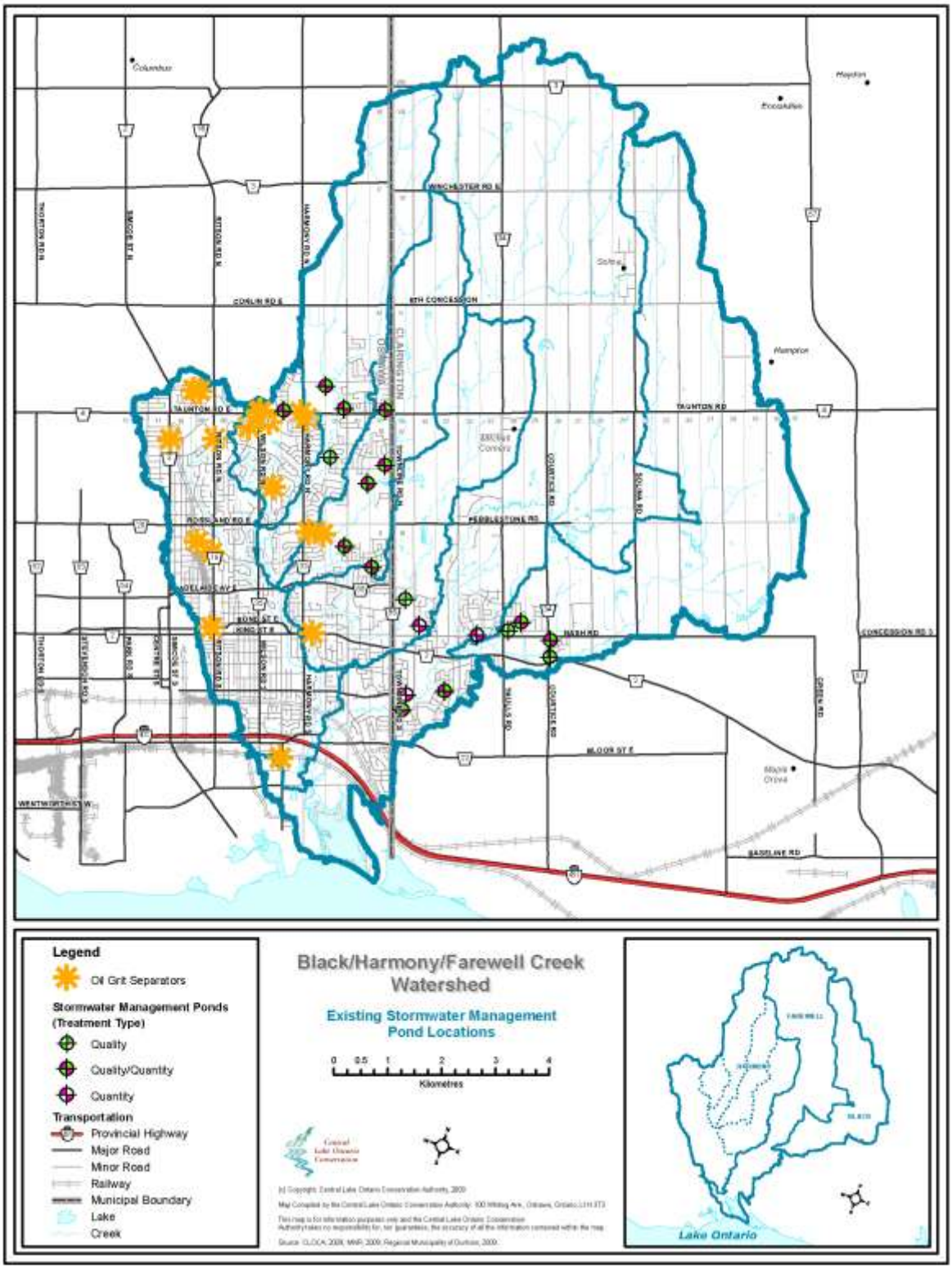


Figure 2. Existing Stormwater Management Pond (SWM) pond and Oil Grit Separator (OGS) locations within the Black/Harmony/Farewell Creek watershed.

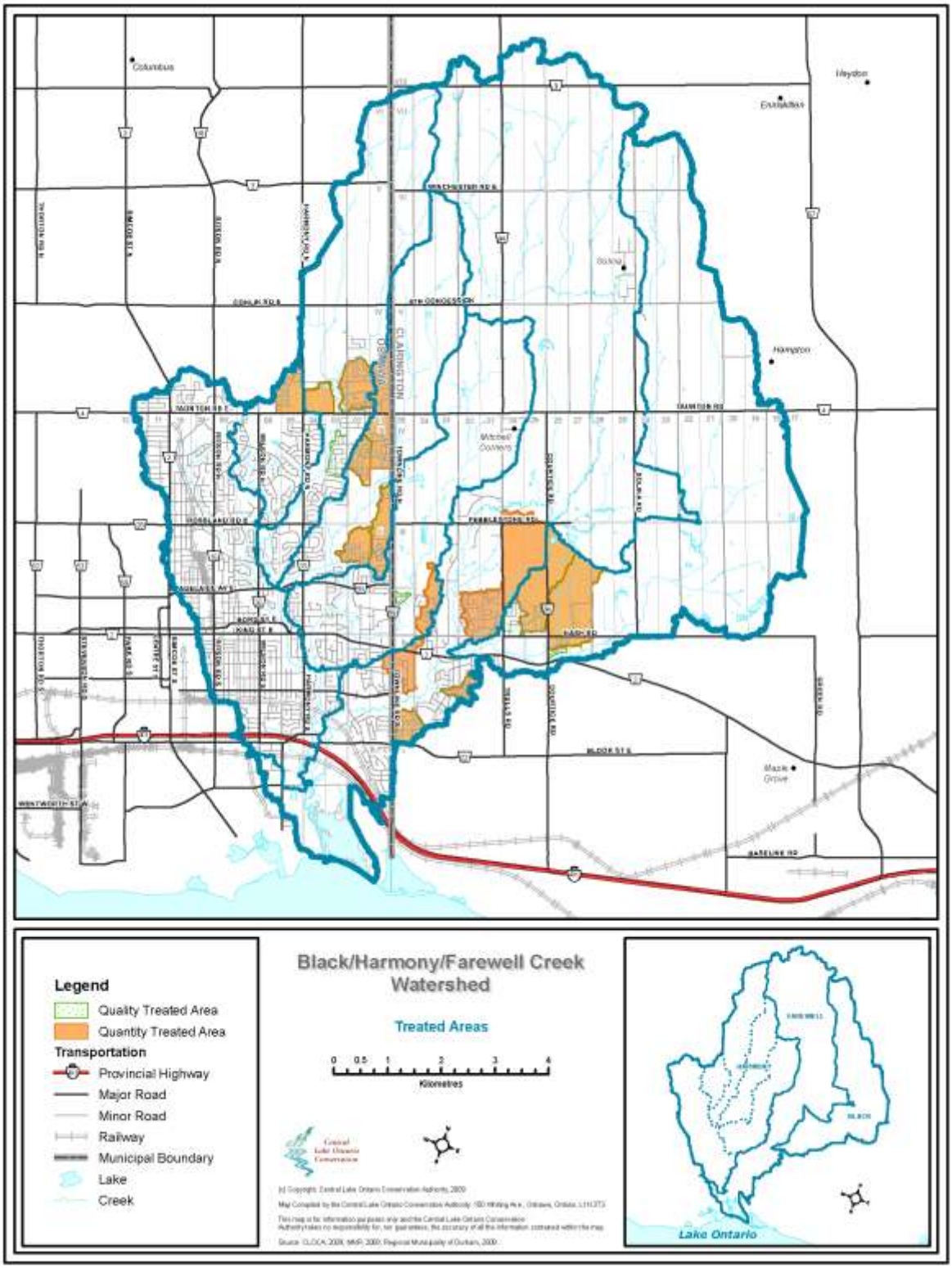


Figure 3: Areas Receiving Quality Treatment within the Black/Harmony/Farewell Creek watershed.

## 4.2 Subwatershed Findings

### 4.2.1 Harmony Subwatershed

#### 4.2.1.1 Ritson Subwatershed

There are no stormwater management ponds, and 8 OGSs identified within the Ritson subwatershed (Figure 4). The OGSs treat small individual sites, thus, no significant area within the Ritson subwatershed is receiving water quality treatment.

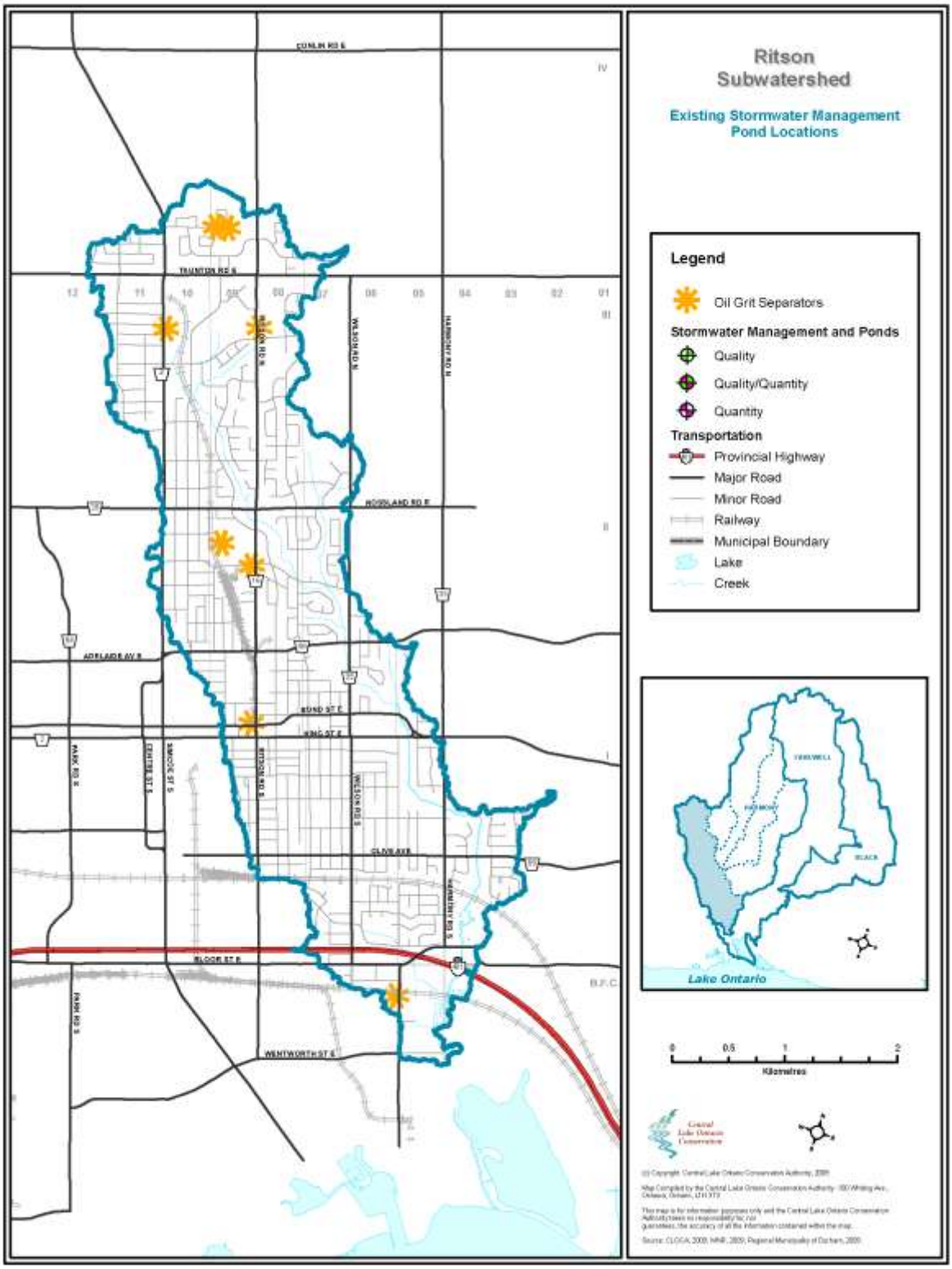


**Figure 4: Existing SWM pond and OGS locations within the Ritson subwatershed**

#### 4.2.1.2 Wilson Subwatershed

The Wilson subwatershed contains 1 stormwater management pond and 8 OGSs (Figure 5). The SWM pond is located within the Taunton Community provides both quality (enhanced) and quantity control for an area of approximately 40 ha. The OGSs treat small individual sites, thus, no significant area within the Wilson subwatershed is receiving water quality treatment with the exception of the Taunton Community serviced by the stormwater management pond (Figure 6). The same area is also receiving quantity control from the stormwater management pond (Figure 6).

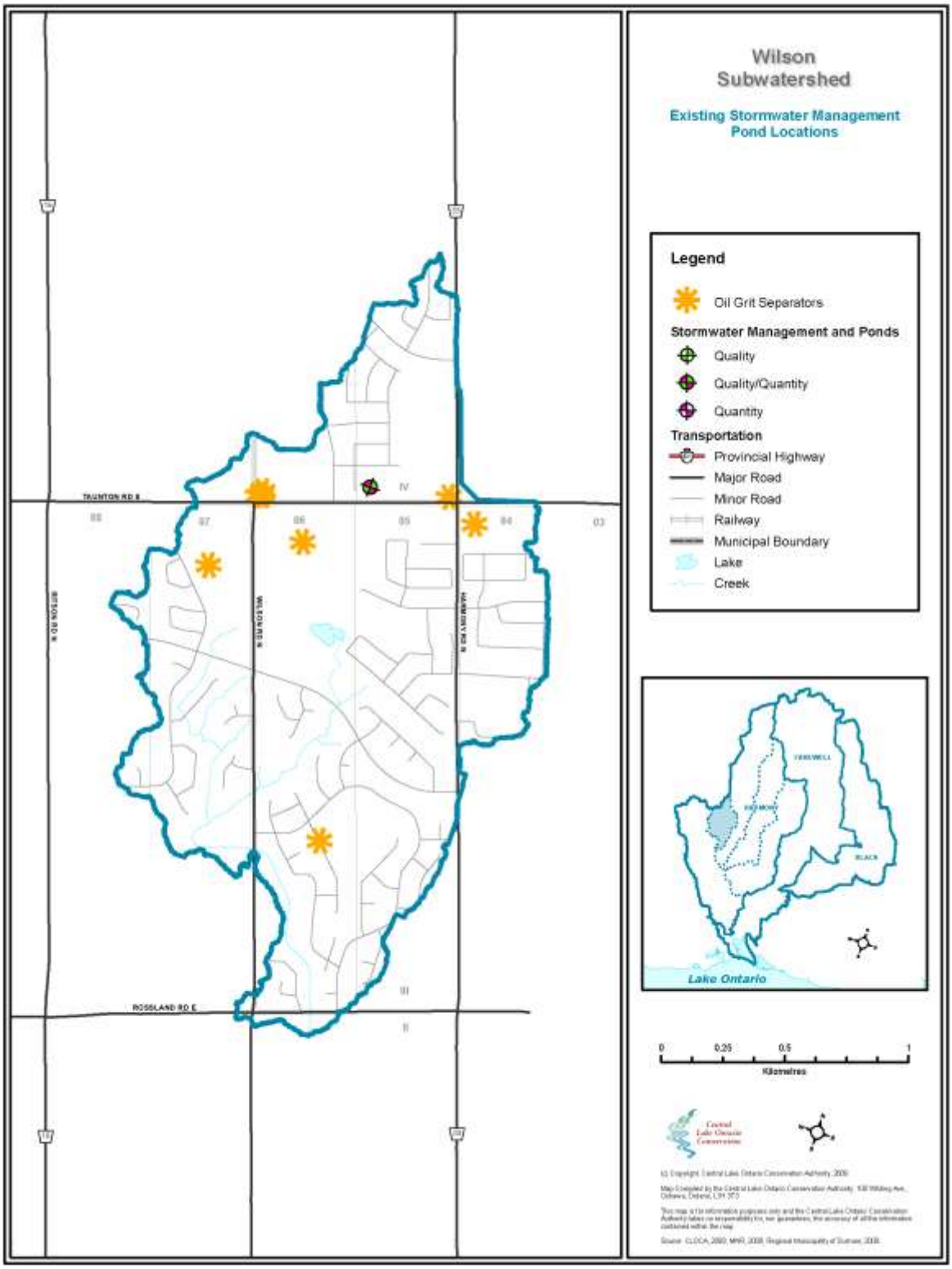


**Figure 5: Existing SWM pond and OGS locations within the Wilson subwatershed**

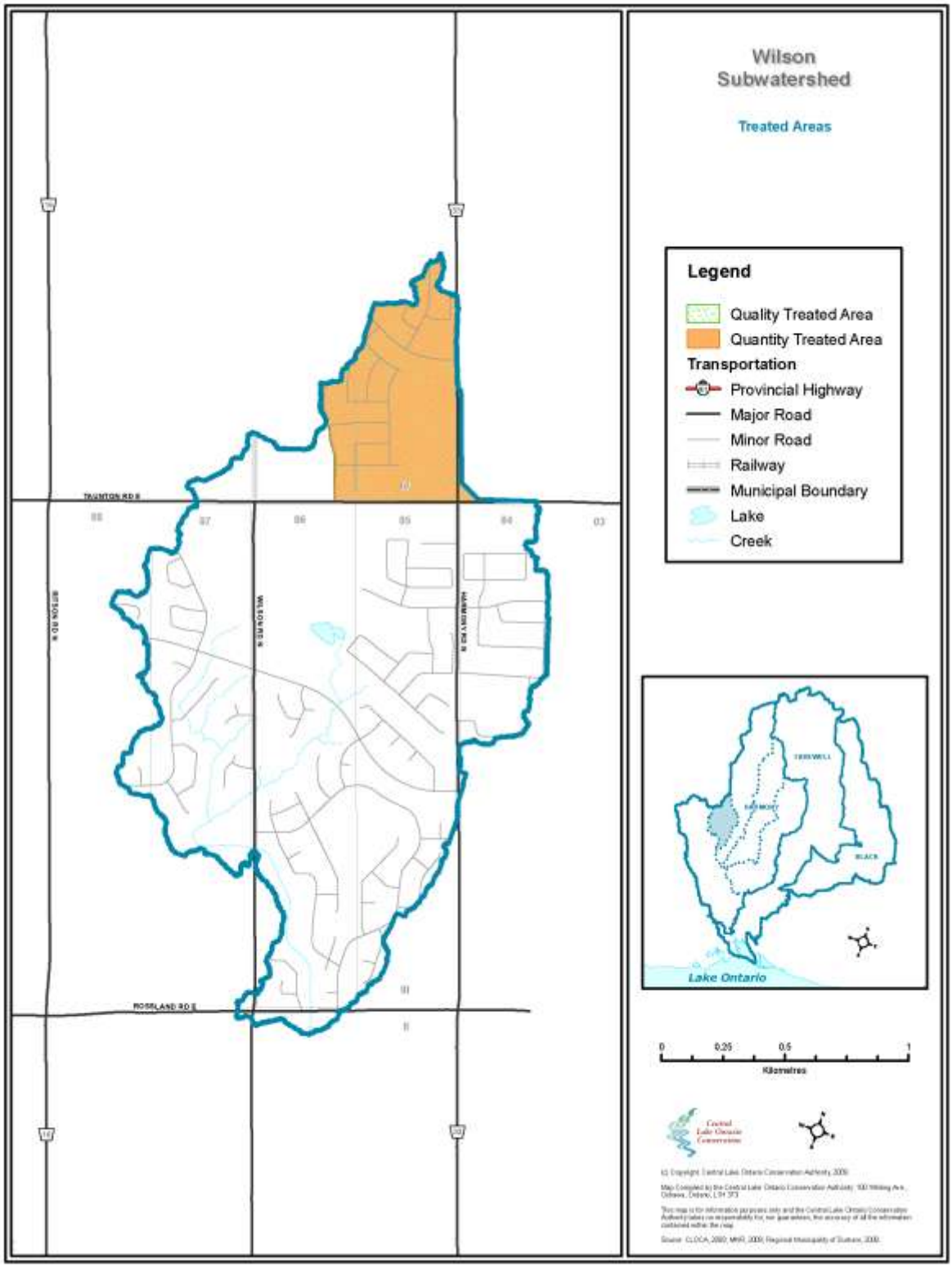


**Figure 6: Treated drainage areas in the Wilson subwatershed**

#### 4.2.1.3 Grandview Subwatershed

The Grandview subwatershed contains 3 stormwater management ponds and 1 OGS (Figure 7). All of the SWM ponds provide enhanced water quality protection, the OGS treat small individual sites, approximately 103 ha is receiving quality treatment. All of the stormwater management ponds are located in the northern urban area of the subwatershed, the remainder of the subwatershed does not receive any quality treatment (Figure 8). Only 2 of the SWM ponds function as quantity control ponds, controlling approximately 78 ha of the Grandview subwatershed (Figure 8). These ponds are located North of Taunton Road within the Taunton Community.

***Grandview subwatershed - Stormwater Management Pond***

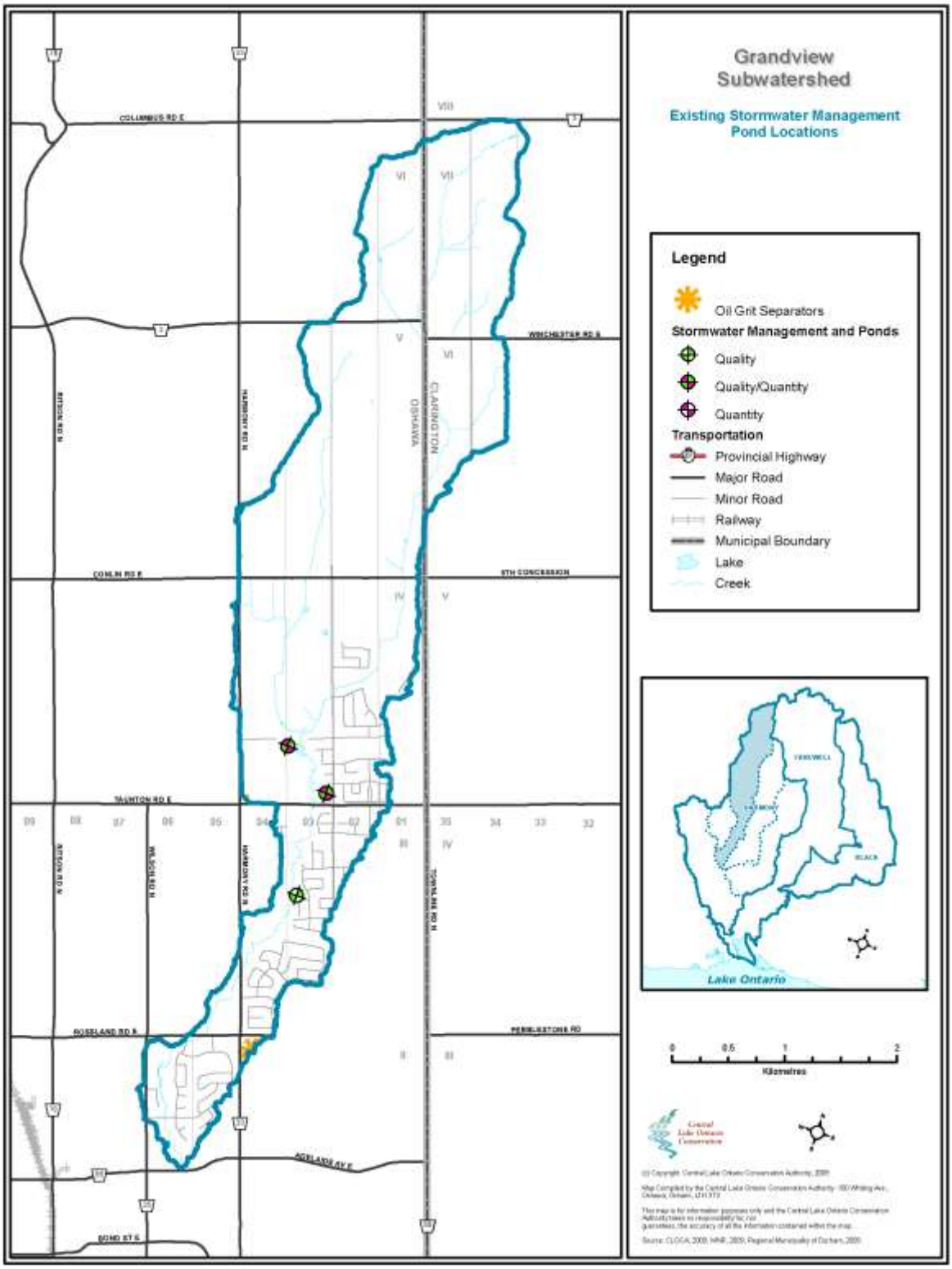


**Figure 7: Existing SWM pond and OGS locations within the Grandview subwatershed**

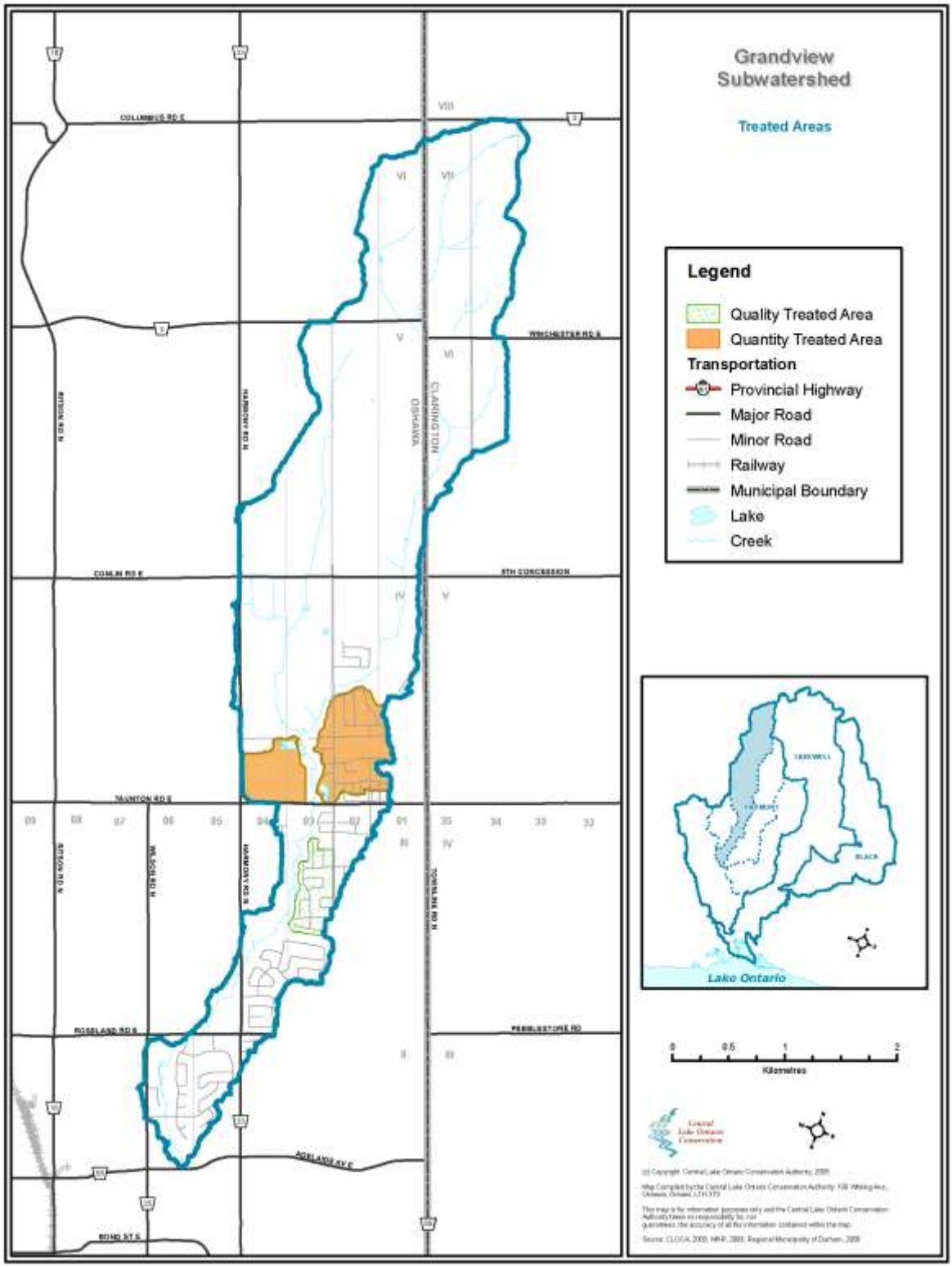


**Figure 8: Treated drainage areas within the Grandview subwatershed**

#### 4.2.1.4 Taunton Subwatershed

The Taunton subwatershed contains 5 stormwater management ponds and 1 OGS (Figure 9). All 5 SWM ponds provide both quality (enhanced) and quantity control. The stormwater management facilities provide treatment for the majority of the urbanized portion of the Taunton subwatershed, approximately 188 ha, and the OGS provides quality treatment for small individual sites (Figure 10).

***Taunton subwatershed - Stormwater Management Pond***

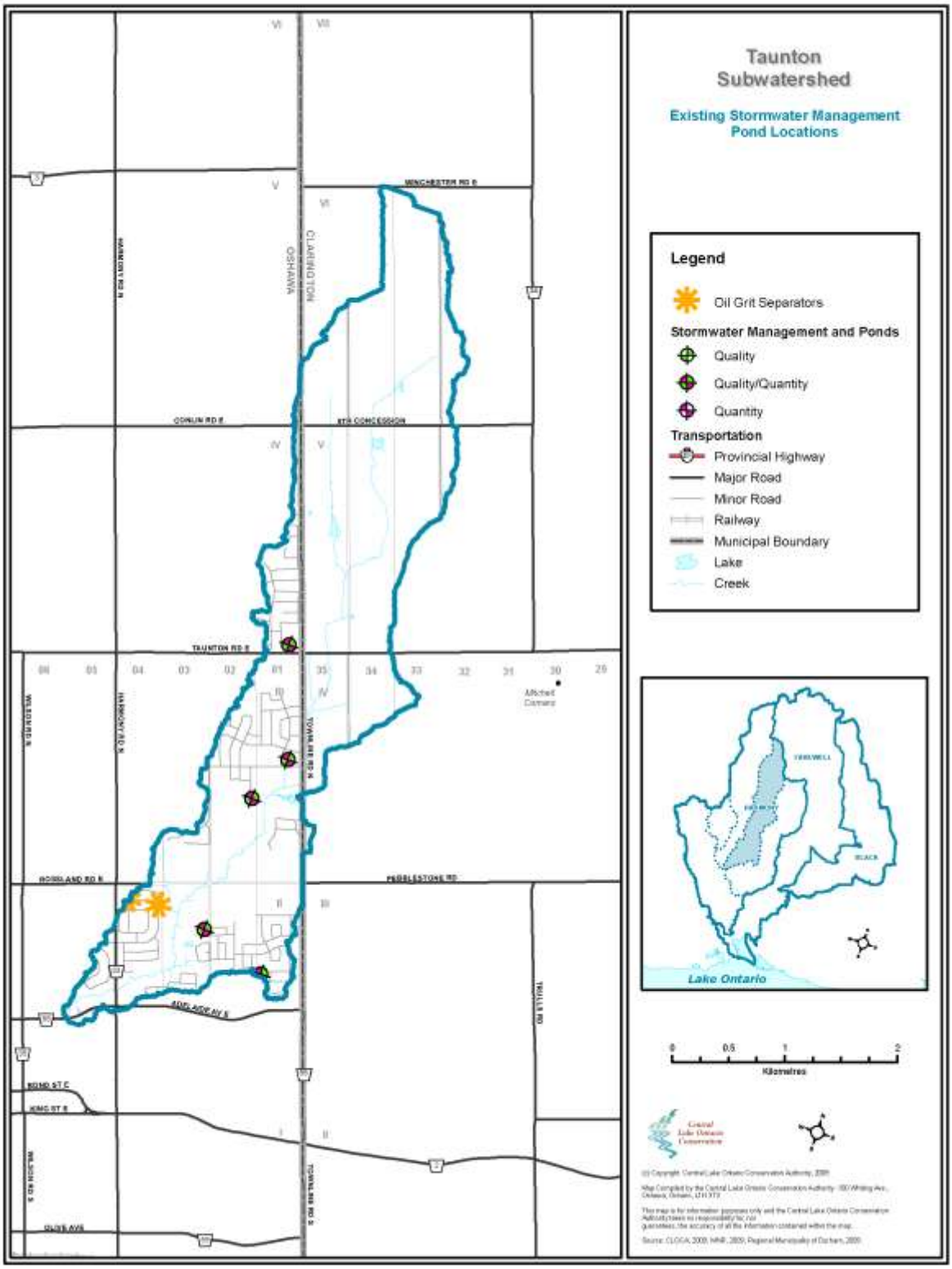


**Figure 9: Existing SWM pond and OGS locations within the Taunton subwatershed**

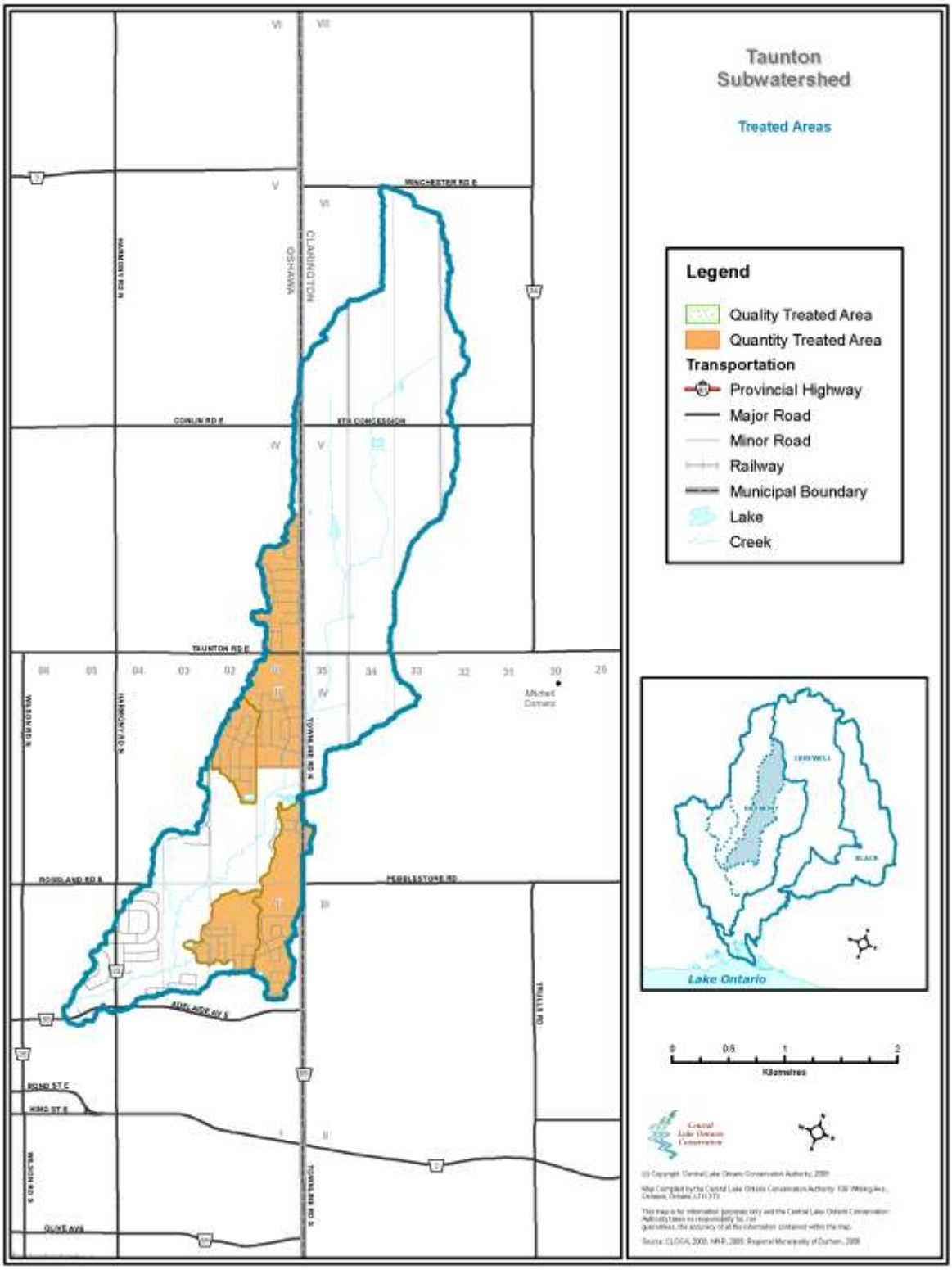


**Figure 10: Treated drainage areas within the Taunton subwatershed**

#### 4.2.1.5 Mitchell Subwatershed

The Mitchell subwatershed contains 2 stormwater management ponds and one OGS (Figure 11). Only one SWM pond provides quality treatment, enhanced protection, and treats a very small area, approximately 4 ha (Figure 12). The other pond is a quantity control pond only, it controls an area of approximately 30 ha (Figure 12). The OGSs treat small individual sites, thus, a very small area within the Mitchell subwatershed receives water quality treatment.

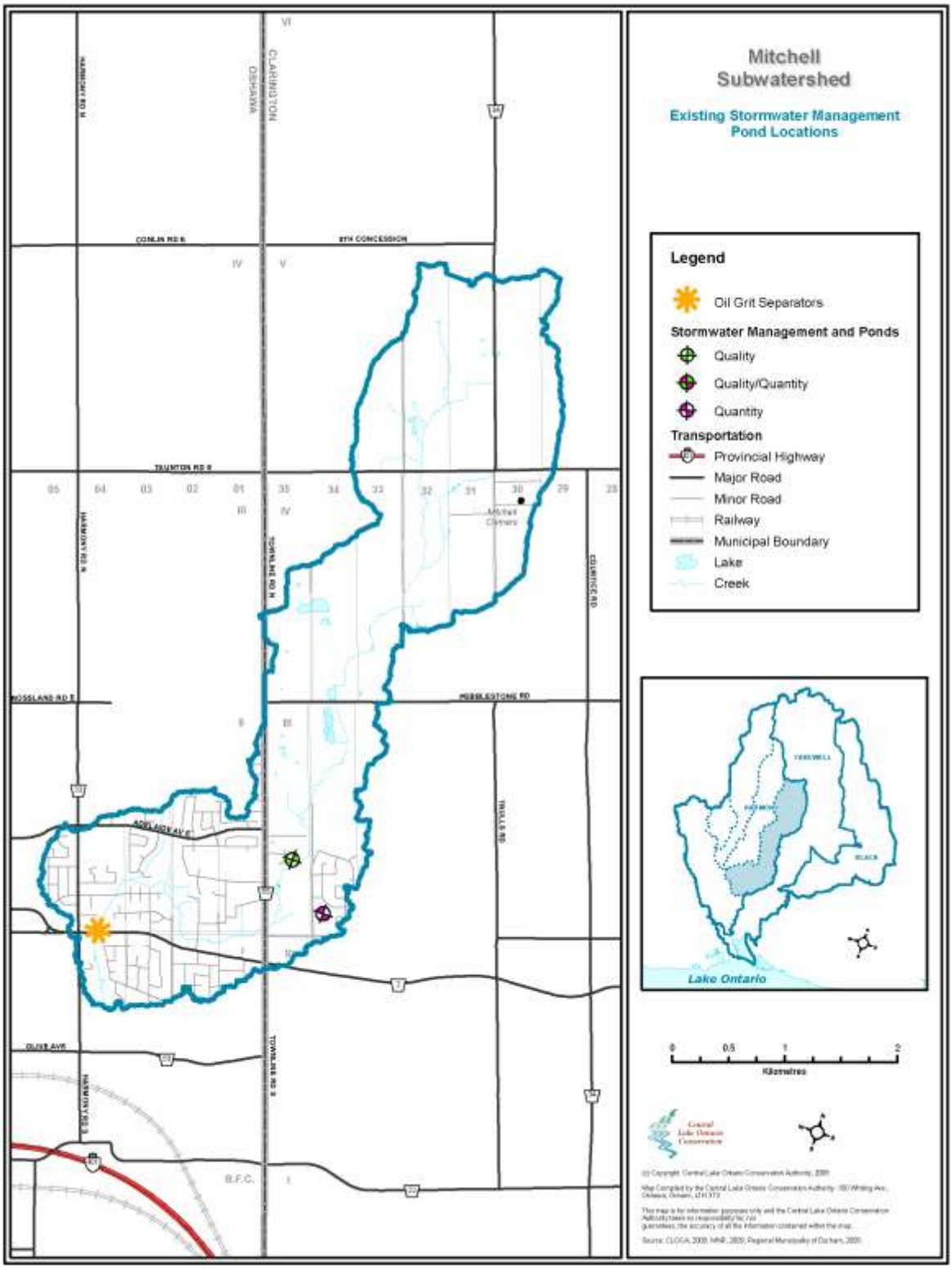


**Figure 11: Existing SWM pond and OGS locations within the Mitchell subwatershed**

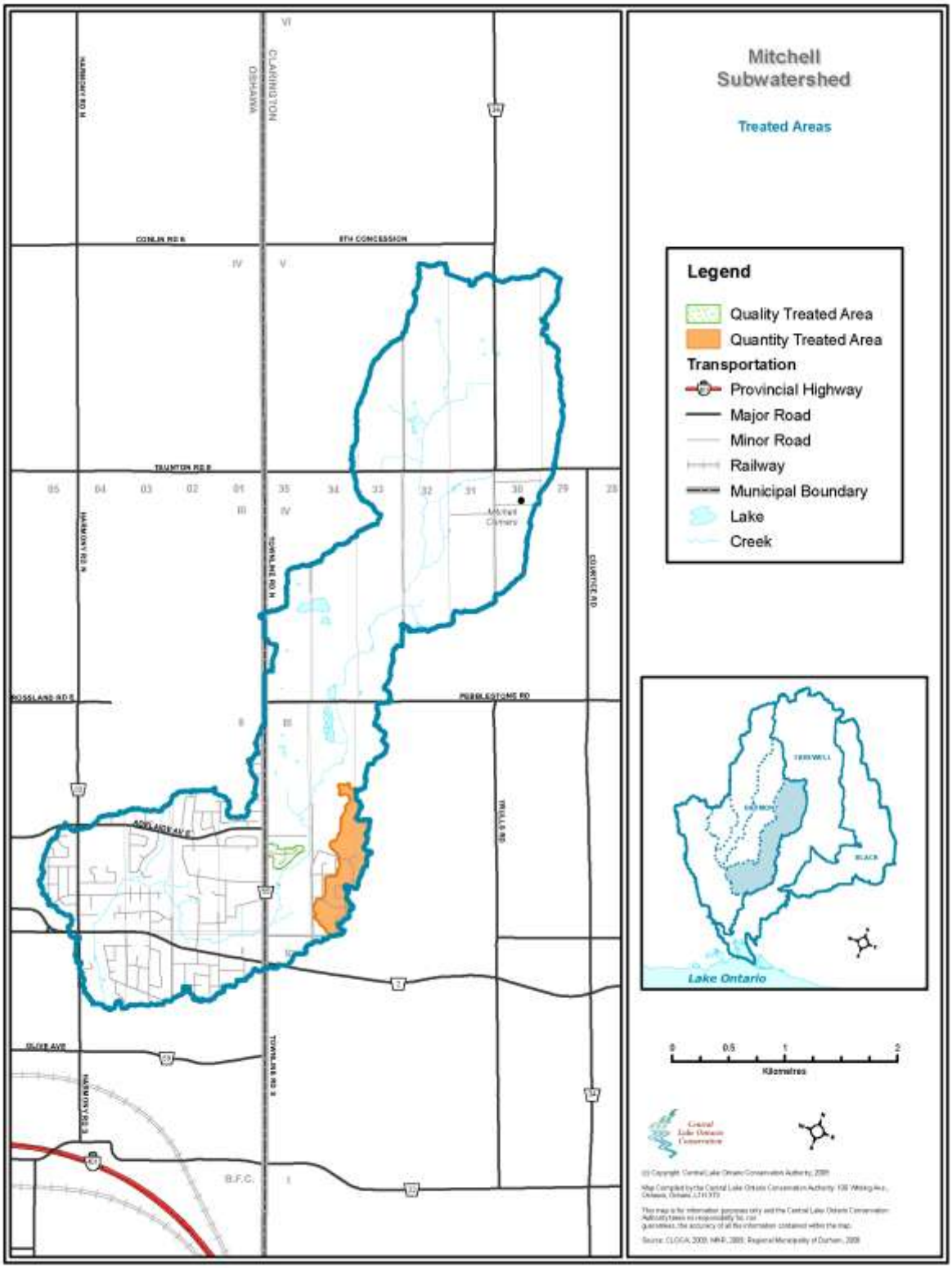


**Figure 12: Treated drainage areas within the Mitchell subwatershed**

#### 4.2.1.6 Farewell Creek Subwatershed

The Farewell Creek subwatershed contains 4 stormwater management ponds and no OGSs (Figure 13). Only 2 stormwater management ponds provide quality treatment, enhanced protection, both of which are located in Courtice. The other 2 stormwater management ponds are quantity control ponds only, they do not provide any quality treatment. Approximately 45 ha of the Farewell Creek Subwatershed is receiving quality treatment and approximately 205ha is controlled by a stormwater quantity pond (Figure 14).

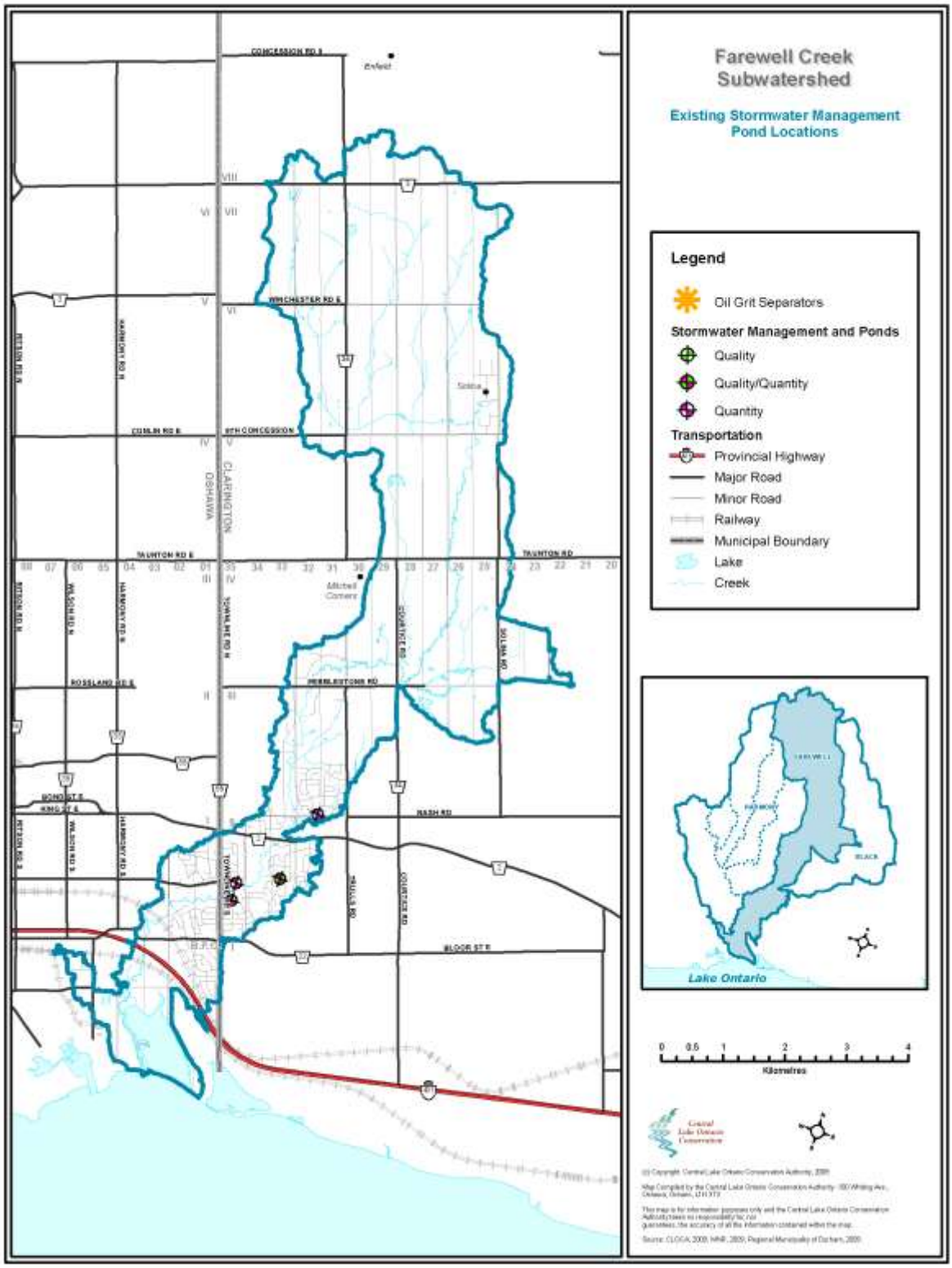


**Figure 13: Existing SWM pond and OGS locations within the Farewell Creek subwatershed**

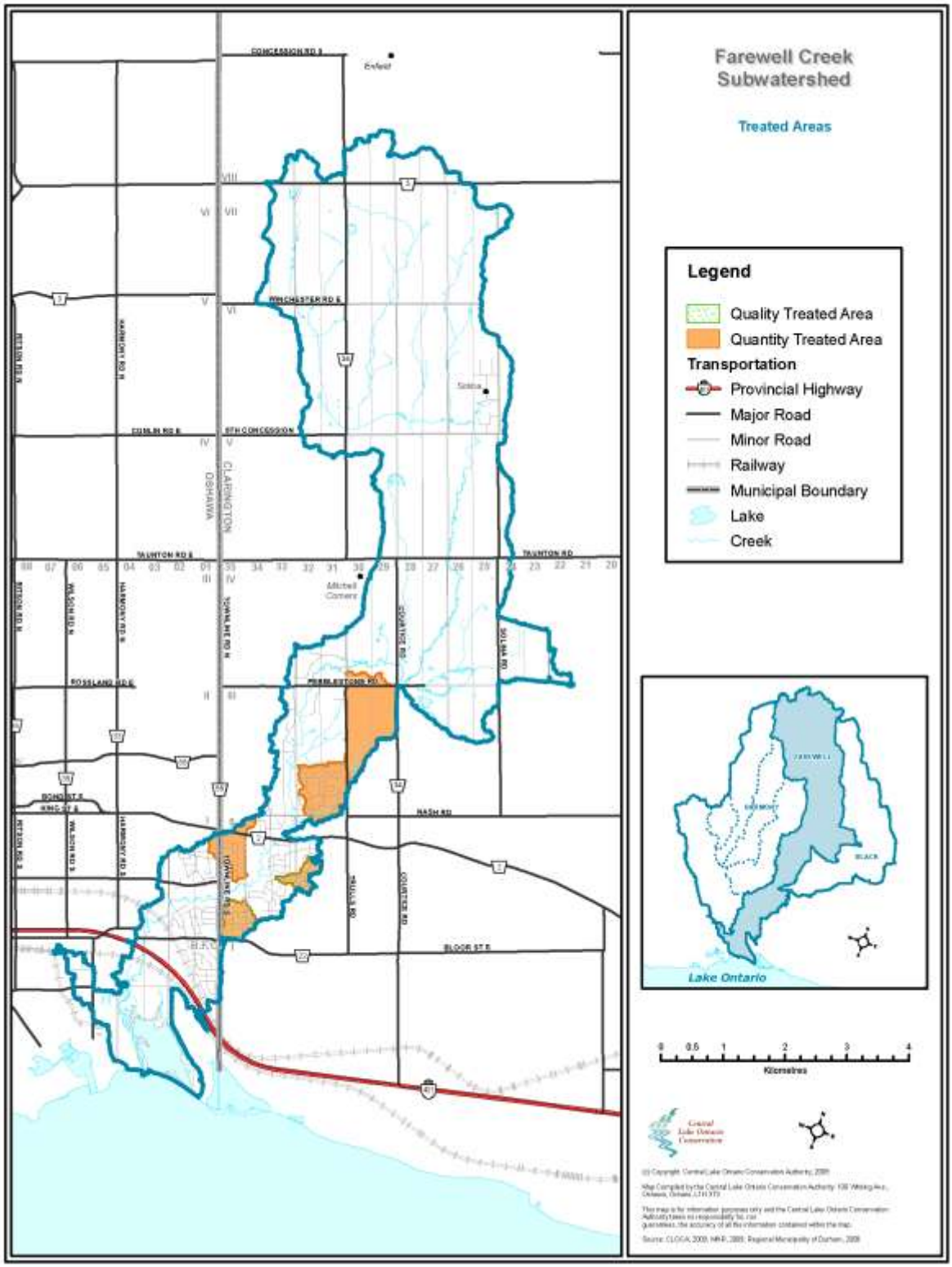


**Figure 14: Treated drainage areas within the Farewell Creek subwatershed**

#### 4.2.1.7 Black Creek Subwatershed

The Black Creek subwatershed contains 4 stormwater management ponds and no OGSs (Figure 15). All 4 ponds provide quality treatment (enhanced protection) for approximately 240 ha, which is most of the urbanized area of the Black subwatershed (Figure 16). Only 2 of the ponds provide quantity control, for an area of approximately 204.73 ha (Figure 16).

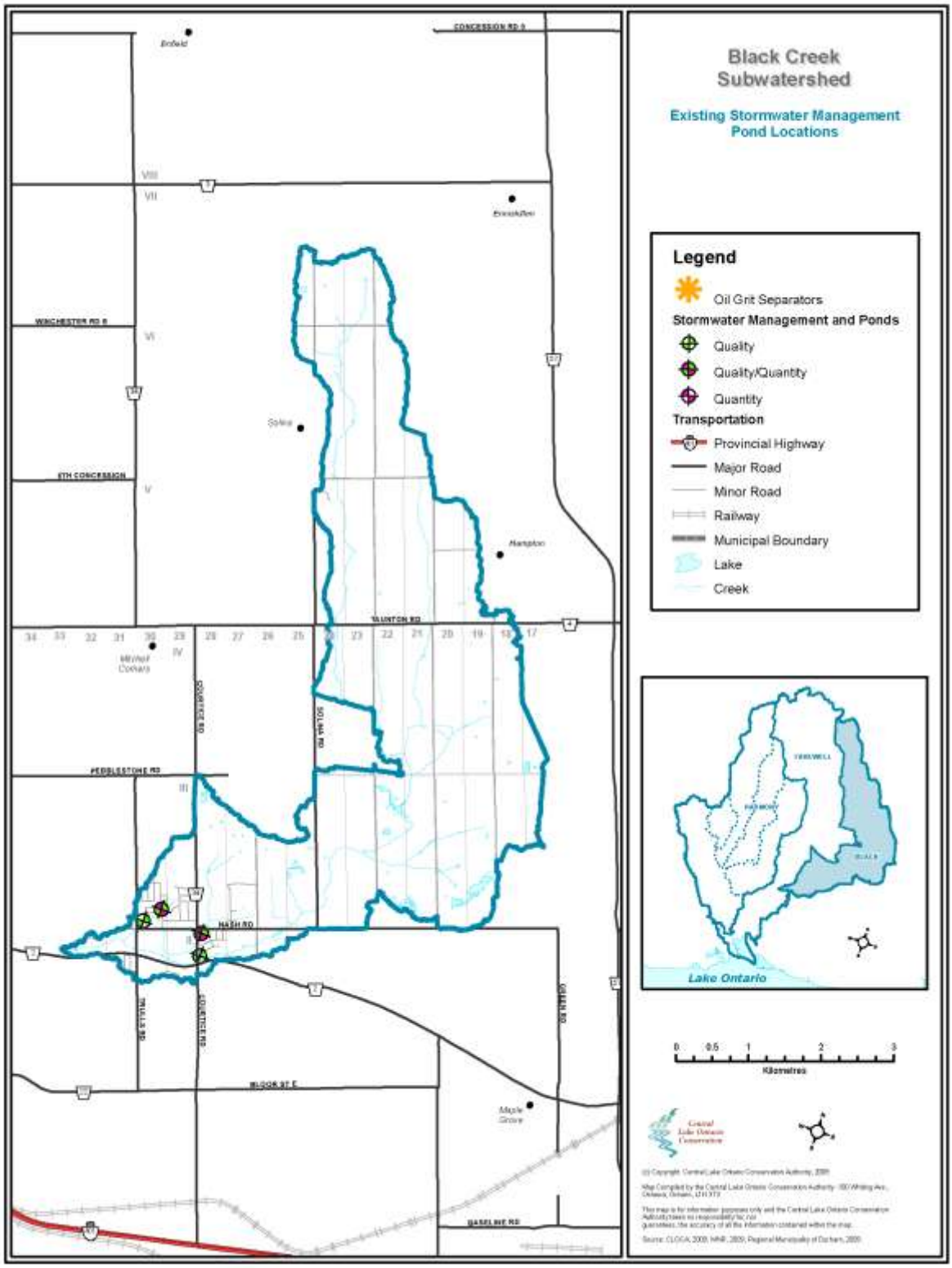


**Figure 15: Existing SWM ponds and OGS locations within the Black Creek subwatershed**

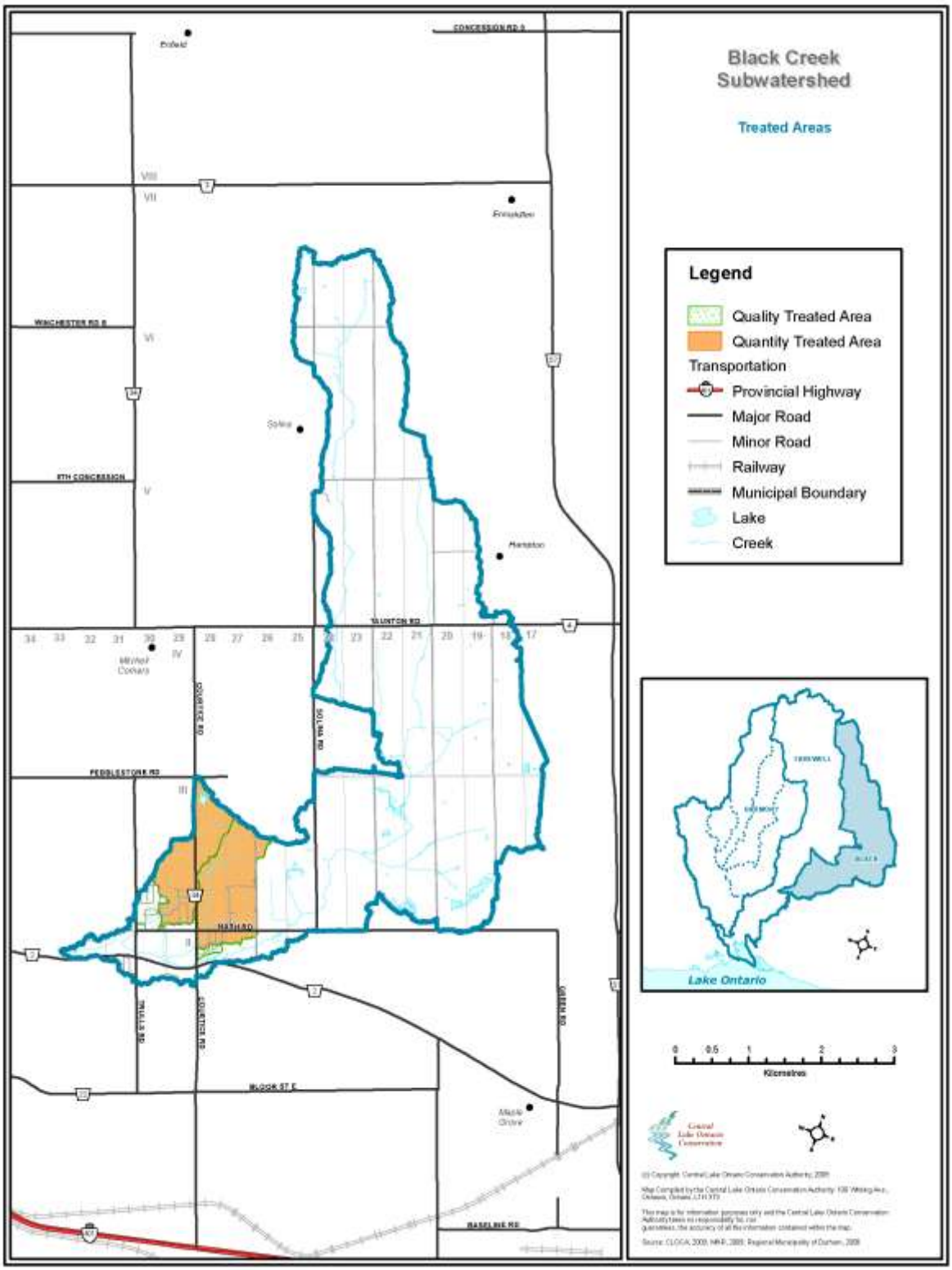


**Figure 16: Treated drainage areas within the Black Creek subwatershed**

# 5.0 CONCLUSIONS

Effective stormwater management planning assists in maintaining watershed health by minimizing water quality degradation, flooding and sediment transport. Since 2007, the stormwater management criteria set for Black/Harmony/Farewell Creek watershed is of the highest standards. The information in this chapter identifies areas that are receiving treatment, which in turn, also assists to locate areas in which there may be opportunity to implement new stormwater management facilities. Stormwater management within the older sections of the watershed is non-existent, and represents an opportunity to improve the general health of the Black/Harmony/Farewell Creek Watershed.

# 6.0 REFERENCES


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*'the information in this chapter identifies areas that are receiving treatment and indicates areas in which there may be opportunity to implement new SWMF'*

WHAT WE DO ON THE LAND IS MIRRORED IN THE WATER