LYNDE CREEK WATERSHED
EXISTING CONDITIONS REPORT
CHAPTER 12 - STORMWATER MANAGEMENT

June 2008

Central Lake Ontario Conservation

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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 Lynde Creek watershed is situated entirely within the Regional Municipality of Durham and covers an area of approximately 130 km^2 (Figure 1). The watershed drains southerly towards Lake Ontario from its headwaters in the Oak Ridges Moraine. The Lynde Creek watershed is divided into 5 subwatersheds being Lynde Main, Heber Down, Kinsale, Ashburn, and Myrtle Station. This chapter will report on the stormwater management that is provided with the Lynde 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.

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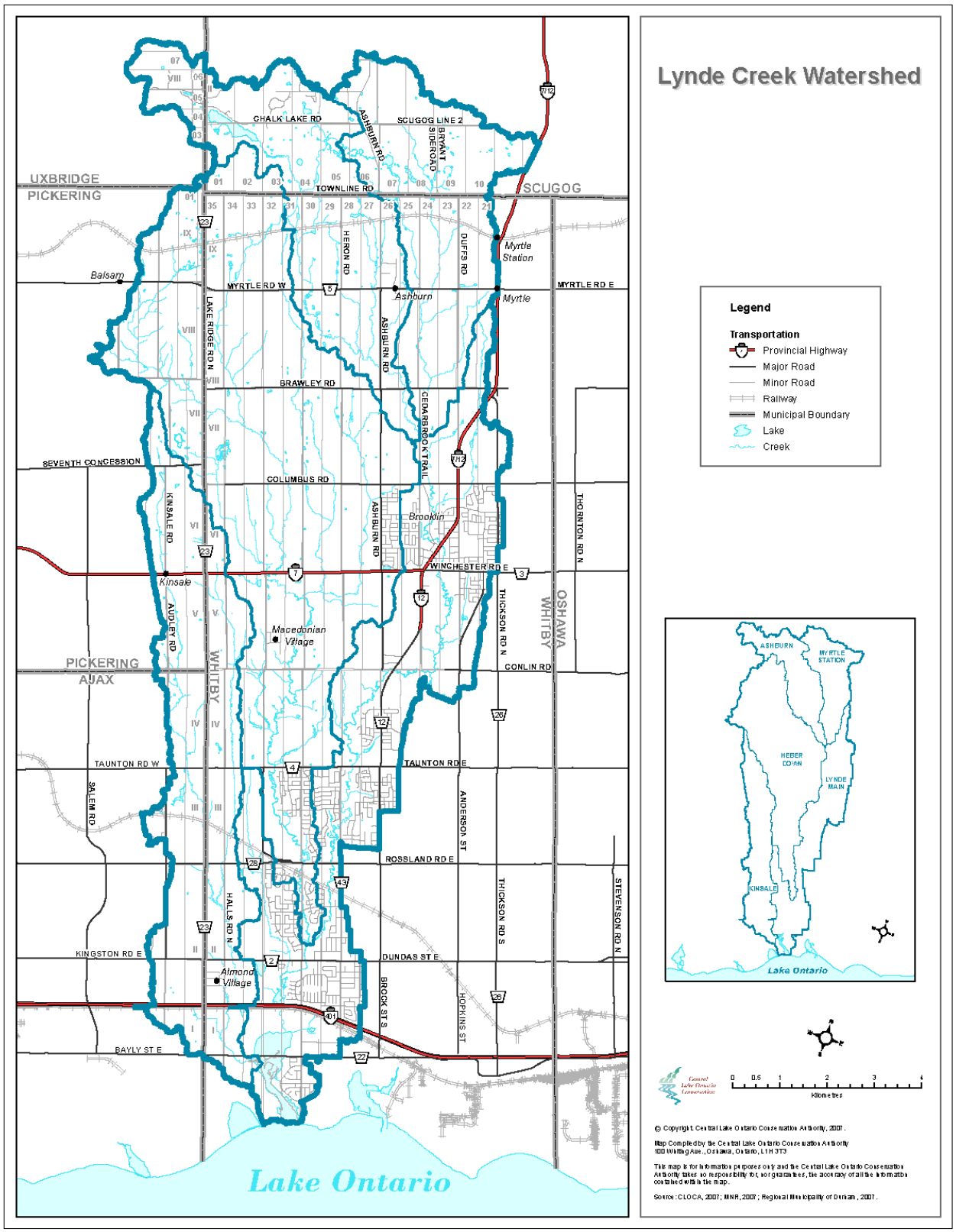

Figure 1: Lynde Creek watershed.

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 Lynde Creek watershed. The first step taken to identify the existing stormwater management facilities was to examine CLOCA's 2005 orthophotography for any obvious pond areas. 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.

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4.0 FINDINGS

4.1 Lynde 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.

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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 Lynde Creek watershed Enhanced (Level 1) Protection is required by CLOCA, as the Lynde Creek consists primarily of cool water fisheries and drains to a provincially significant coastal wetland.

A study of the thermal effects of stormwater management ponds is currently underway within CLOCA. Two (2) SWMF within the Lynde Creek have been selected for study including the Brookvalley South SWMF in Brooklin and the Gates of Whitby West SWMF in Whitby. The results from the first season of this project are expected in the late fall of 2007. In addition, and as part of a subdivision requirement, thermal monitoring is taking place at a SWM pond located northwest of the Brock and Taunton Road intersection.

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.

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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); and
- if there are known undersized pipes/culverts down stream 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.

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 Lynde Creek watershed quantity control for the 2 through 100-year and Regional storm is required unless otherwise noted in master plans. Previous studies have shown that it is preferable to discharge drainage from new developments in the

lower and mid-portion of the watershed 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. An assessment may be necessary, however, to determine if the drainage from the new developments will have local impacts on the smaller receiving streams. These issues will be further analyzed in future phases of the Lynde Creek Watershed Plan. Master Plans within the Lynde Creek watershed include:

- Brooklin Master Drainage Plan, Cosburn Patterson Wardman, 1992;
- Lynde Creek Water Resource Management Strategy, Gartner Lee, 1994;
- Town of Whitby Stormwater Quality and Erosion Control Enhancement Study, Marshall, Macklin, Monaghan, 2001;
- Lynde Creek Sub Tributary Master Drainage Plan, GM Sernas, 2001; and
- Town of Whitby Official Plan/Taunton North Community Secondary Plan, The Town of Whitby.

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.

Stormwater Management Pond - Lynde Creek Watershed ***© CLOCA***

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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 Lynde 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 used 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).

'within the Lynde Creek watershed there are many end-of-pipe stormwater management facilities in place'

Based on the literature review, there are twenty-two (22) stormwater management ponds (SWM ponds) and ten (10) known OGSs within the Lynde Creek watershed. The SWM ponds are designed to provide control for quality, quantity, or both. Typically, stormwater ponds have not been designed to provide 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, treated drainage areas have been delineated. Figure 3 shows the treated areas within the Lynde 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 treated are the older parts of Whitby and Brooklin. 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.

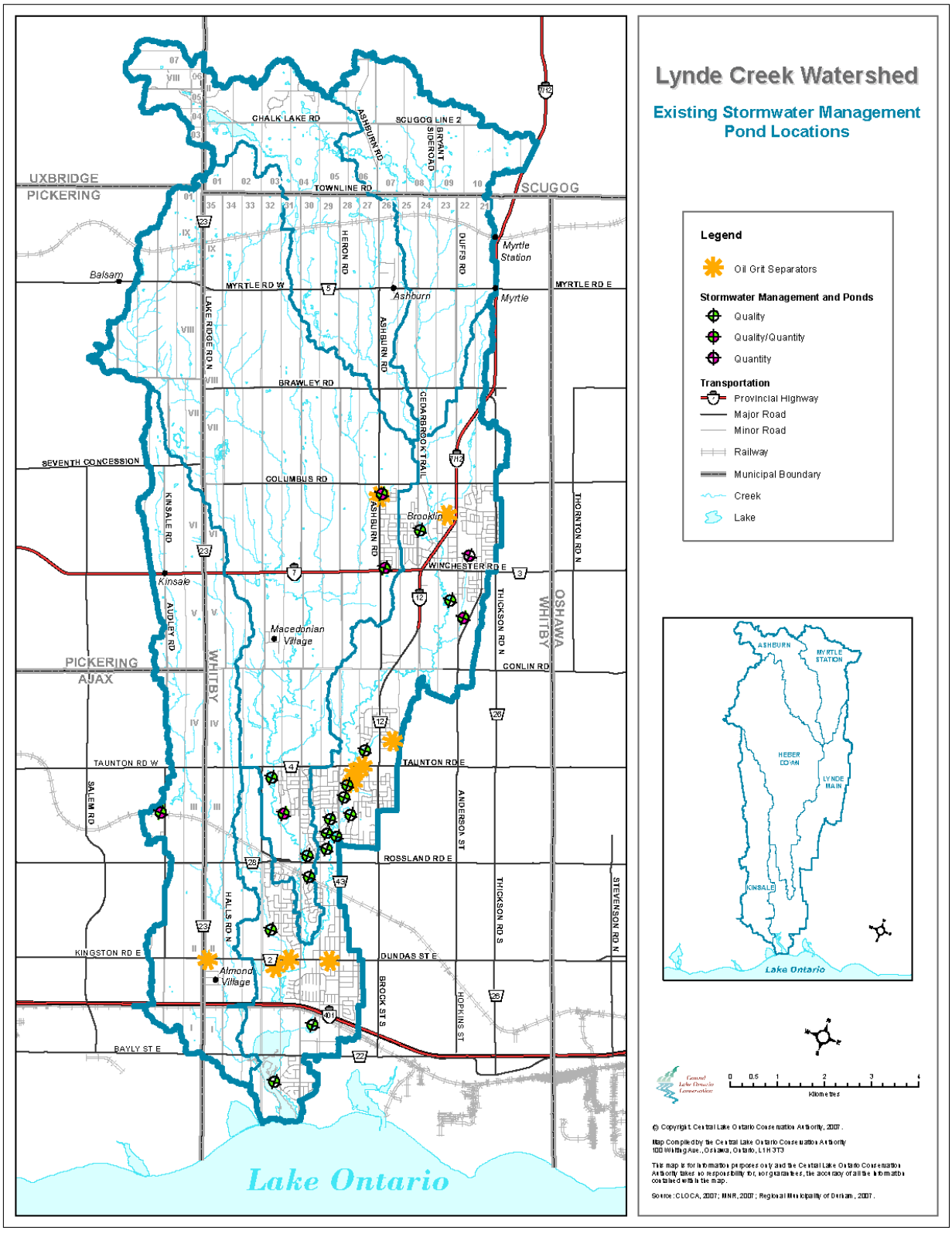

Figure 2. Existing Stormwater Management Pond (SWM) pond and Oil Grit Separator (OGS) locations within the Lynde Creek watershed.

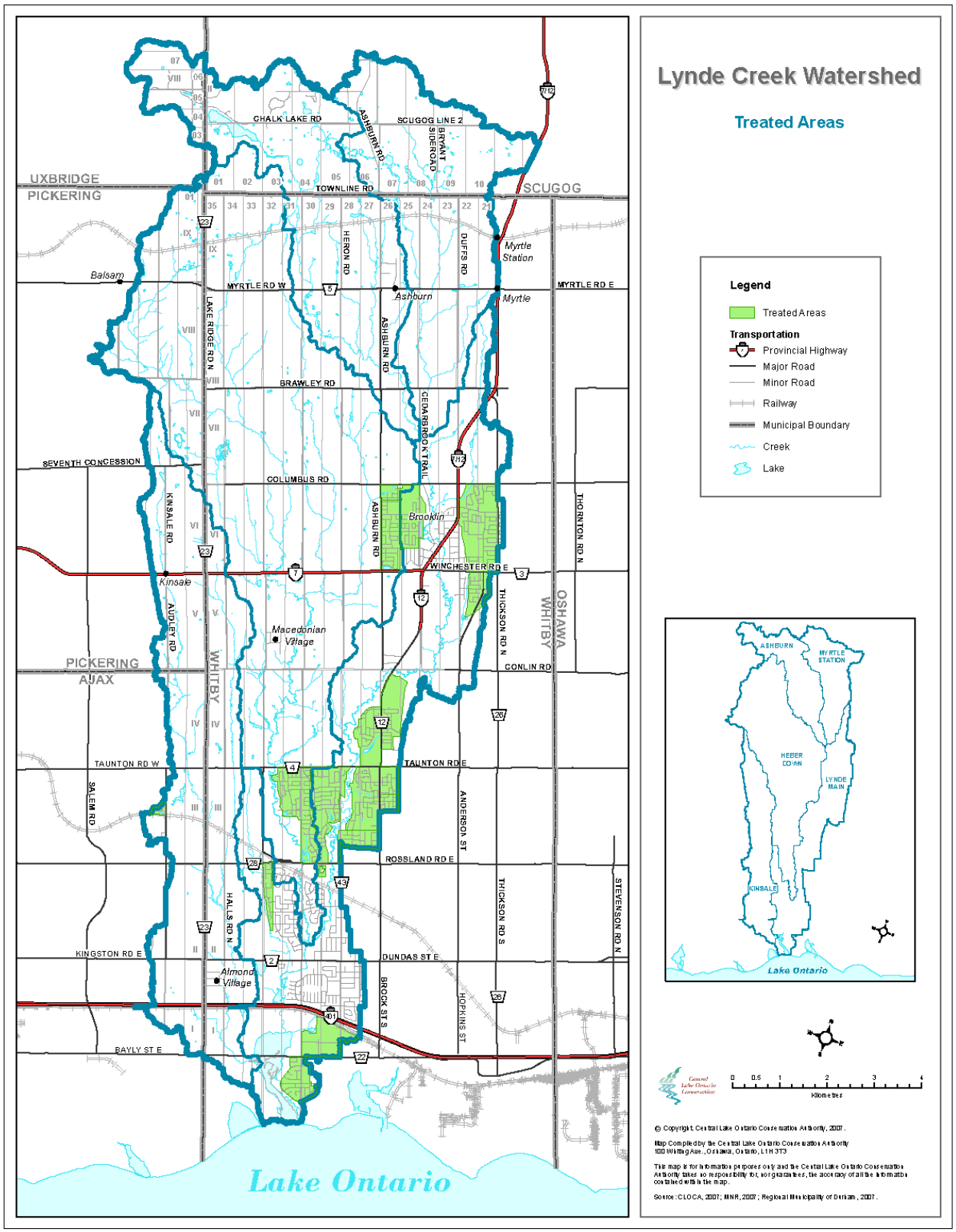

Figure 3: Treated drainage areas within the Lynde Creek watershed.

4.2 Subwatershed Findings

4.2.1 Lynde Main Subwatershed

The Lynde Main subwatershed contains the most SWM ponds within the watershed, 15 in total (Figure 4). The SWM ponds are concentrated in the urbanized areas, mainly in Brooklin, and in west Whitby between Taunton Road and Rossland Road with several south of Highway 401. The Lynde Main subwatershed also contains the most OGSs, 8 in total (Figure 4). The OGSs also tend to be concentrated in the urban areas, mainly Brooklin and west Whitby. The majority of the urbanized area within the Lynde Main subwatershed is receiving treatment, with the exception of a large area north of the 401 and south of Rossland Road, which is receiving no treatment (Figure 5).

Lynde Main Subwatershed *© Lou Wise*

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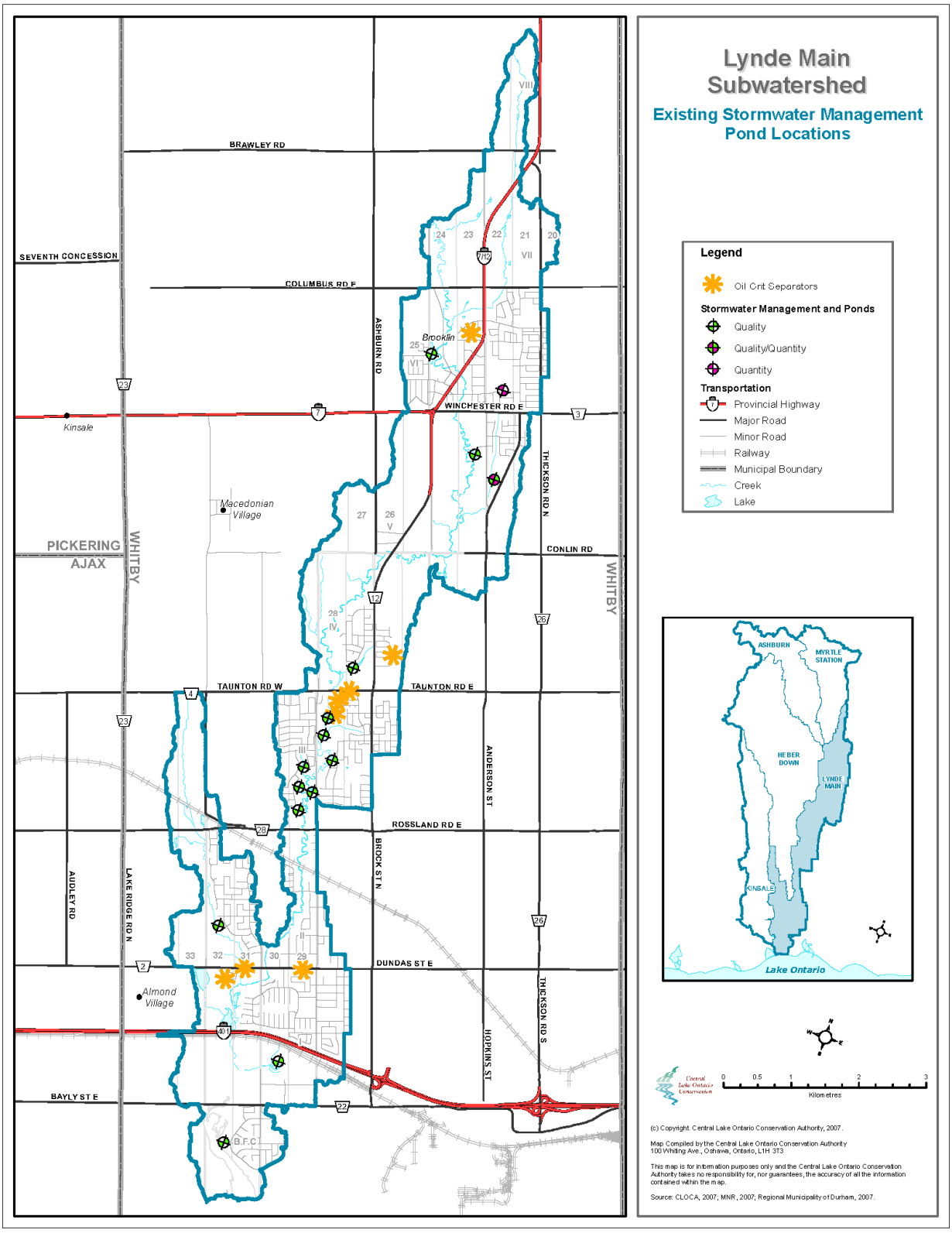


Figure 4: Existing Stormwater Management Pond (SWM) pond and Oil Grit Separator (OGS) locations within the Lynde Main subwatershed.

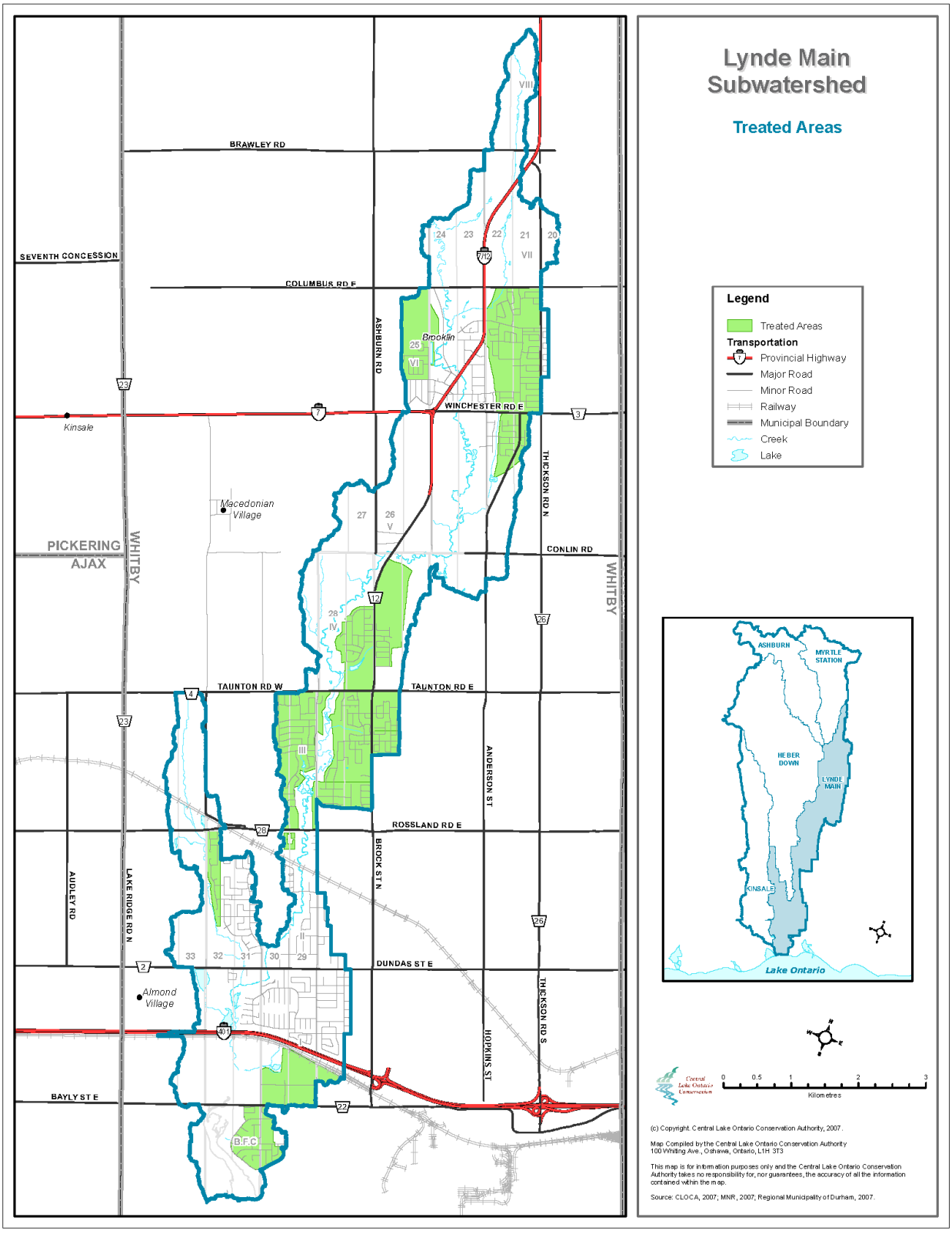
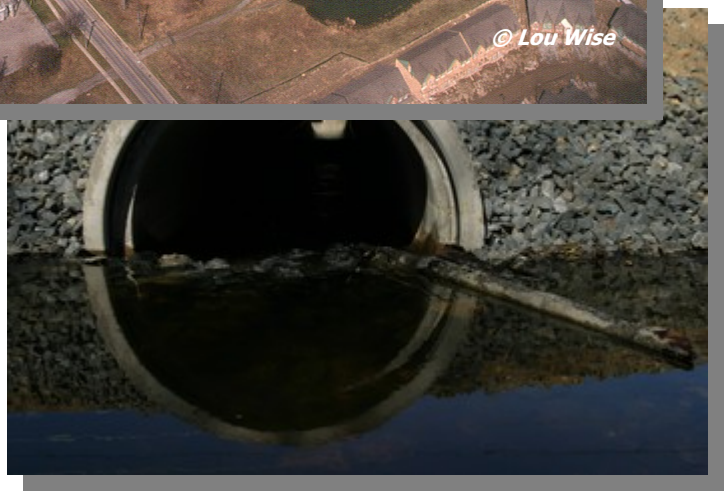


Figure 5: Treated drainage areas in the Lynde Main subwatershed.

4.2.2 Heber Down Subwatershed

The Heber Down subwatershed contains 6 stormwater management ponds, all of which provide quality control for enhanced protection (Figure 6). The SWM ponds are concentrated within the urban areas, mainly west Brooklin and west Whitby. There are 2 OGSs located within the Heber subwatershed (Figure 6); both are located in west Brooklin. All of the urban areas within the subwatershed are treated with the exception of the very southern tip of the subwatershed, south of Rossland Road (Figure 7).



'the Heber Down subwatershed contains 6 stormwater management ponds'

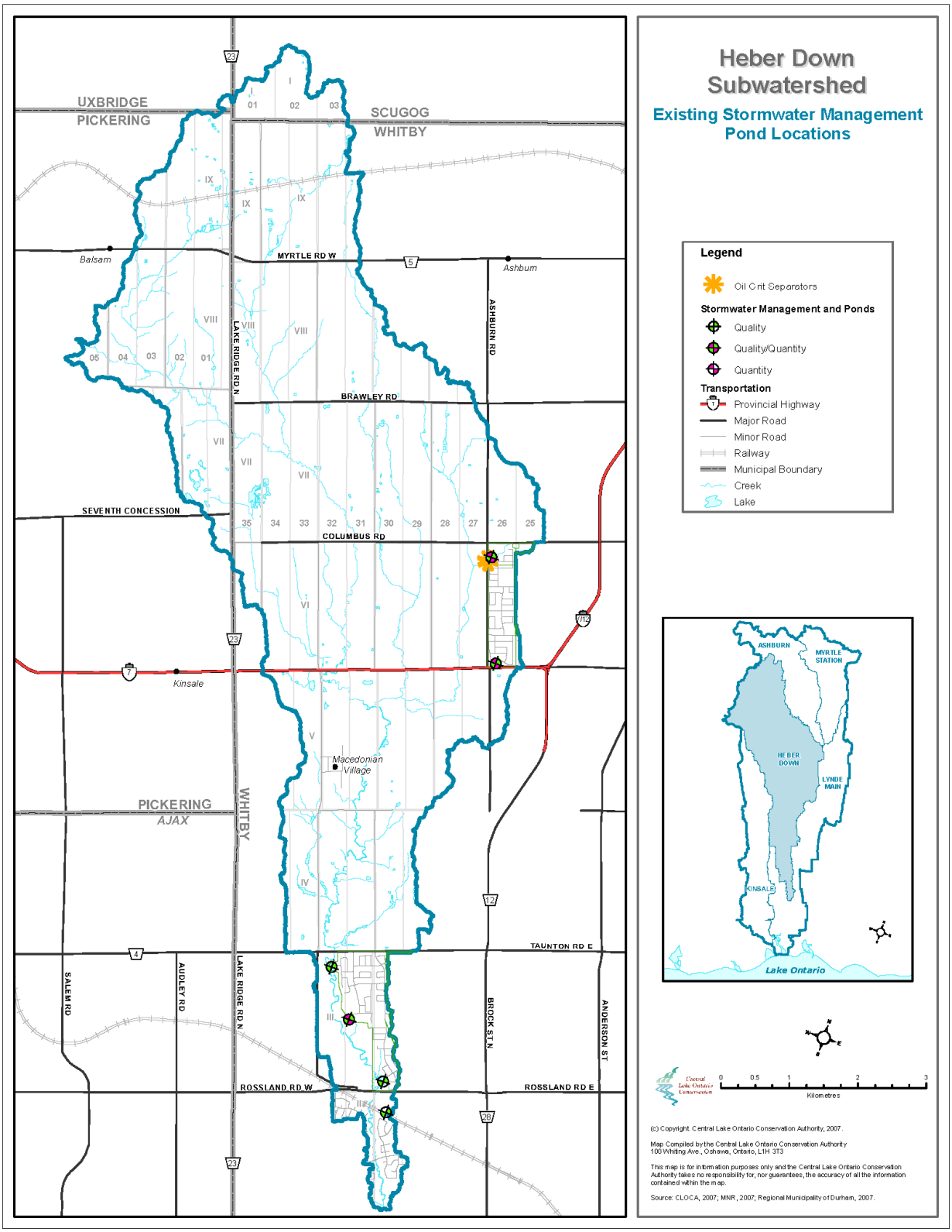


Figure 6: Existing Stormwater Management Pond (SWM) pond and Oil Grit Separator (OGS) locations within the Heber Down subwatershed.

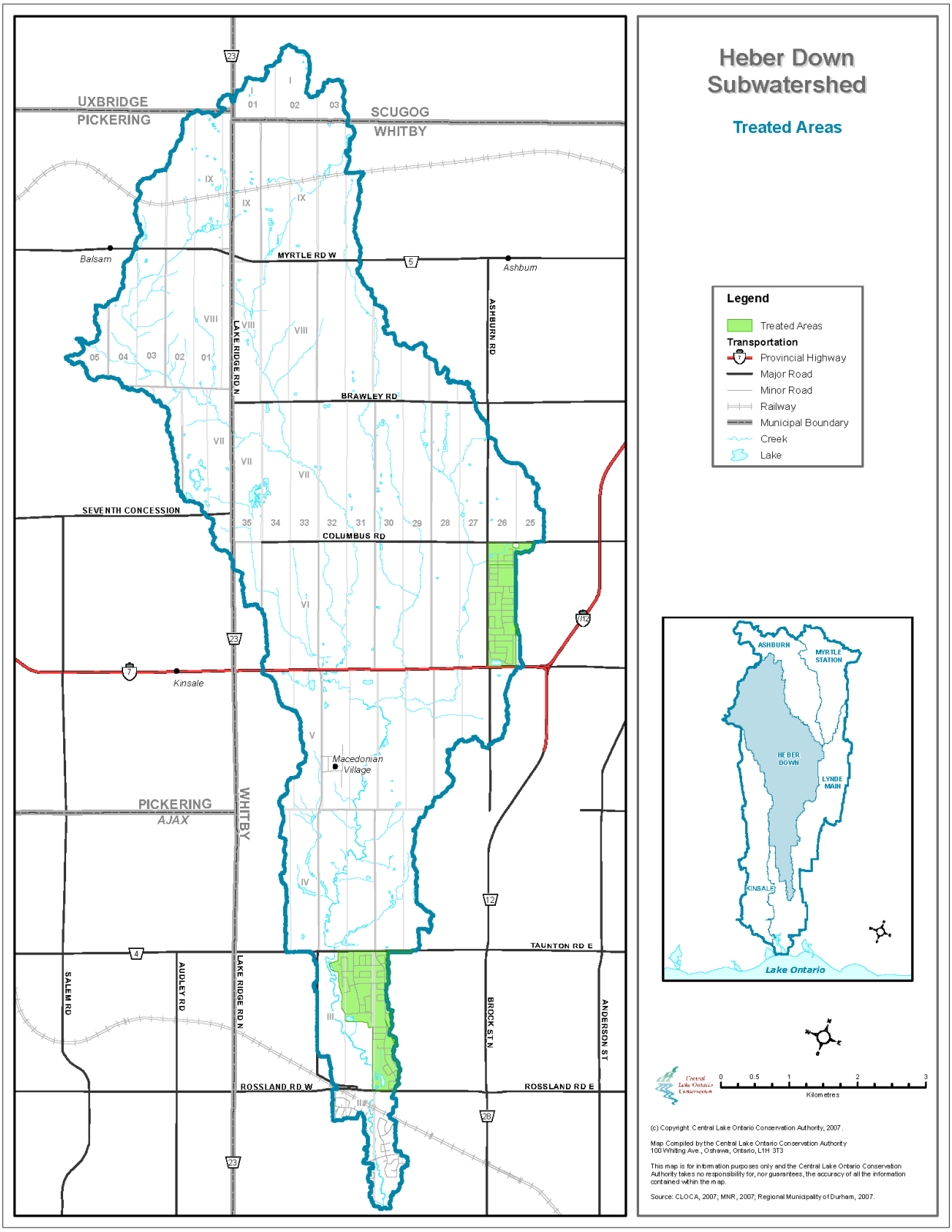


Figure 7: Treated drainage areas in the Heber Down subwatershed.

4.2.3 Kinsale Subwatershed

The Kinsale subwatershed contains 1 stormwater management pond and 1 OGS (Figure 8). Both SWM ponds and the OGS treat small individual sites, thus, no significant area within the Kinsale subwatershed is receiving water quality treatment (Figure 9). While not included in this assessment, it is worth noting that an additional SWM pond has recently been constructed just south and west of the pond depicted in Figure 8.

'the Kinsale subwatershed contains 1 stormwater management pond and 1 OGS'

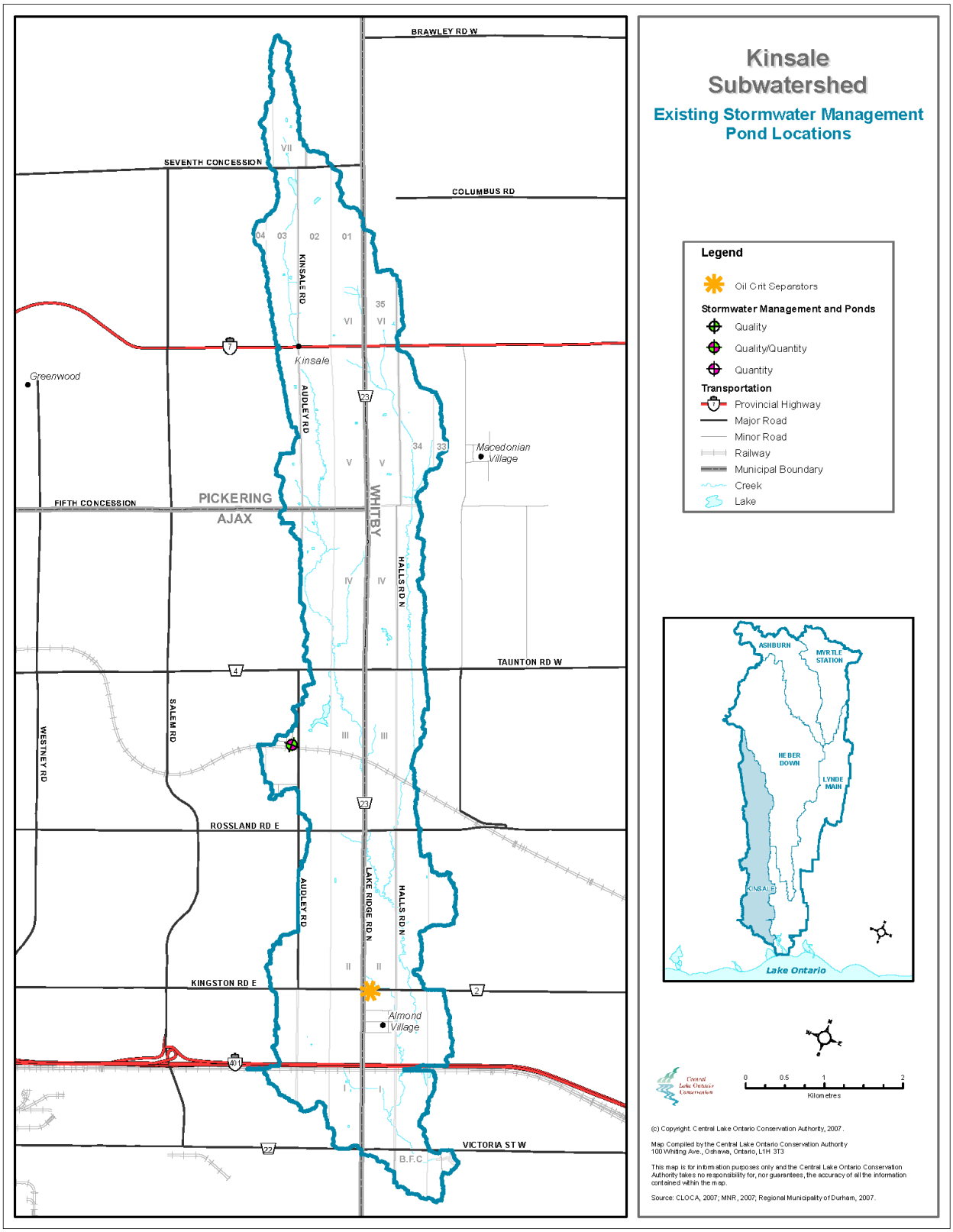


Figure 8: Existing Stormwater Management Pond (SWM) pond and Oil Grit Separator (OGS) locations within the Kinsale subwatershed.

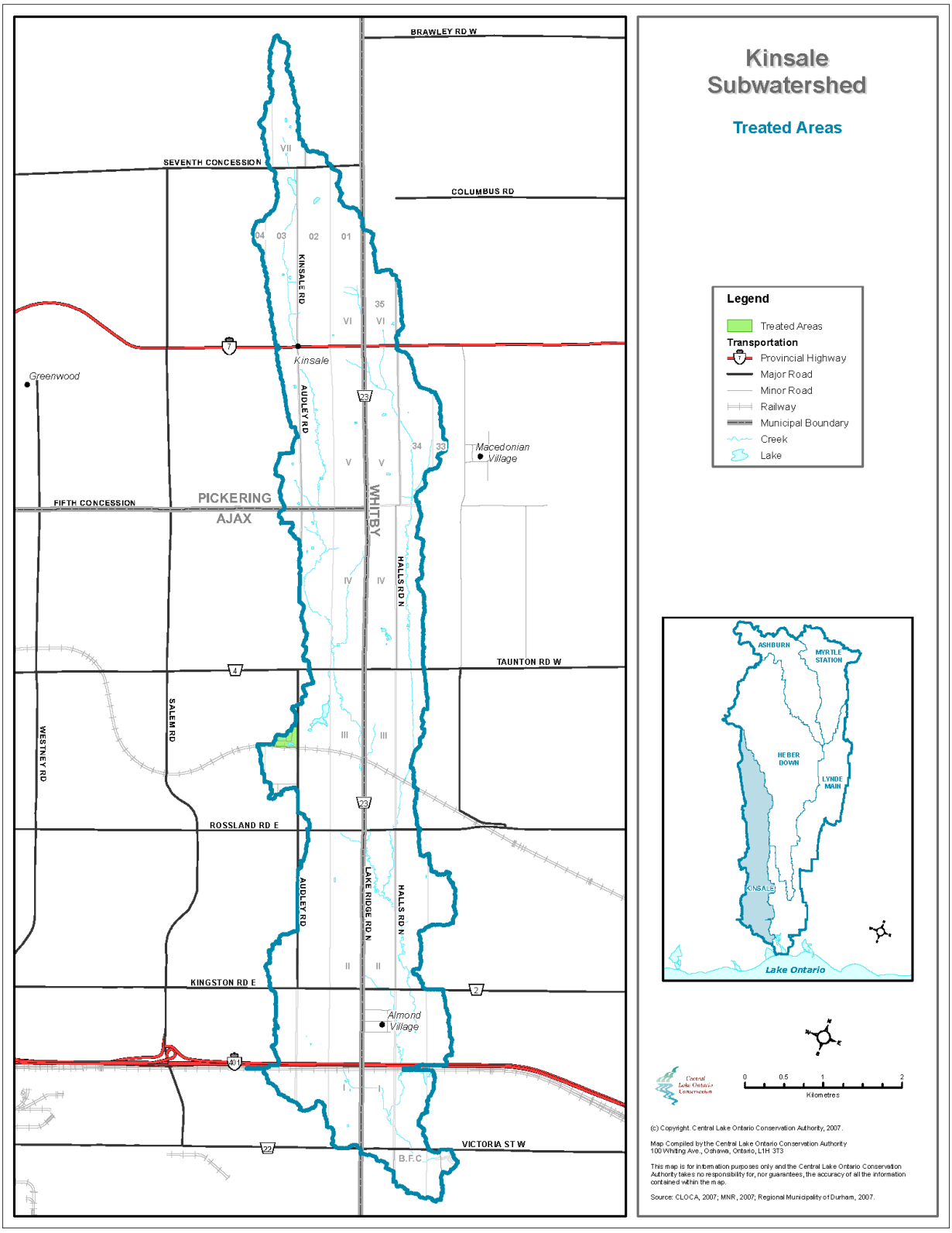


Figure 9: Treated drainage areas in the Kinsale subwatershed.

4.2.4 Ashburn Subwatershed

There were no stormwater management ponds, OGSs, or treated areas identified within the Ashburn subwatershed.

4.2.5 Myrtle Station Subwatershed

Similar to the Ashburn subwatershed, there were no stormwater management ponds, OGSs or treated areas identified within the Myrtle Station subwatershed.

5.0 CONCLUSIONS

Effective stormwater management planning assists in maintaining watershed health by minimizing water quality degradation, flooding and sediment transport. The stormwater management criteria set for Lynde Creek watershed is of the highest standards. The information in this chapter identifies areas that are receiving treatment and indicates areas in which there may be opportunity to implement new SWMF to improve the general health of the Lynde Creek Watershed.

6.0 REFERENCES

Central Lake Ontario Conservation Authority. 2006. Draft Watershed Characterization Report. Prepared as part of the Source Water Protection Program under the Clean Water Act. CLOCA.

Ontario Ministry of the Environment, 2003. Stormwater Management Planning and Design Manual. Publication #4329e.

Ontario Ministry of the Environemnt. 1995. Hydrogeological Technical Information Requirements for Land Development Applications. April.

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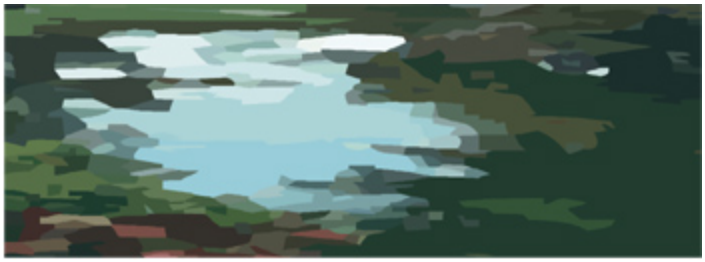

WHAT WE DO ON THE LAND IS MIRRORED IN THE WATER