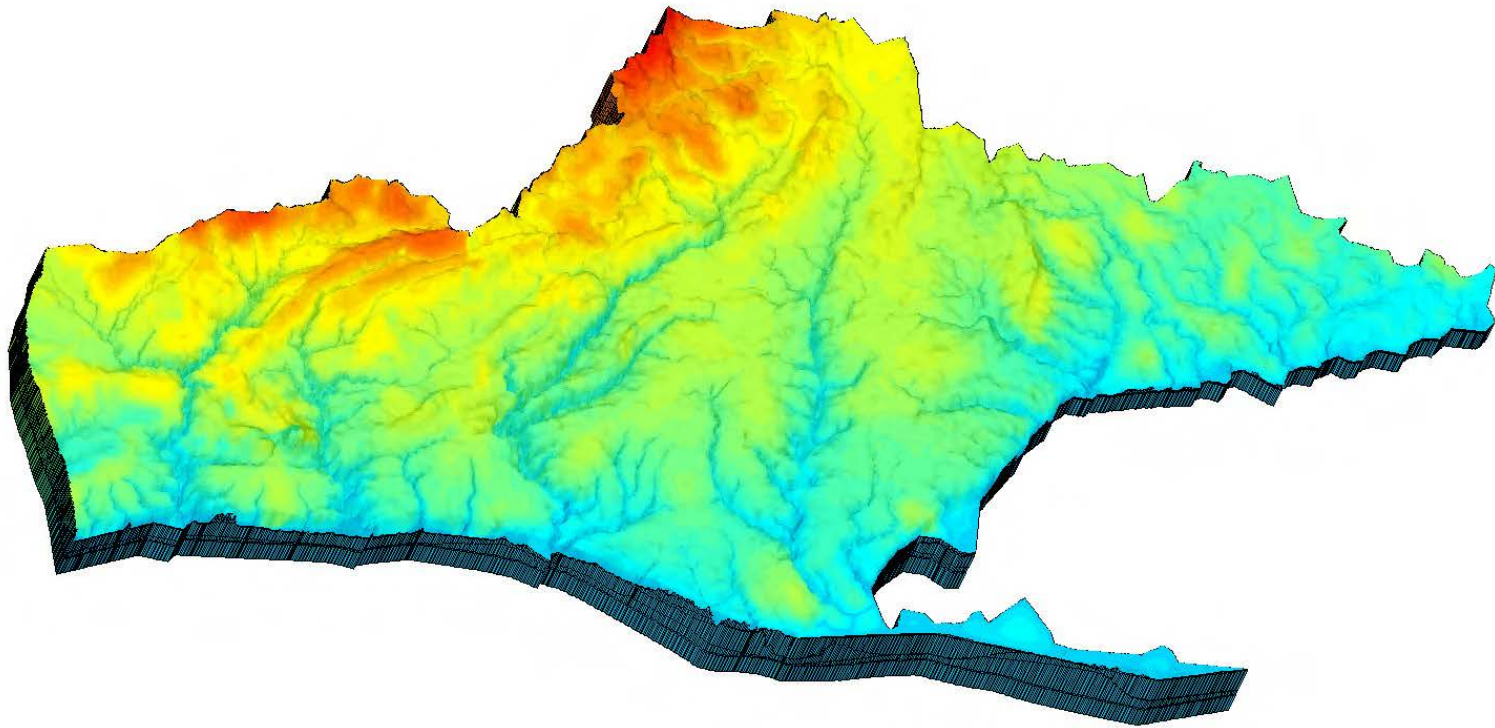




# **Long Point Region, Kettle Creek and Catfish Creek Integrated Water Budget Report**

## **Map Booklet**

April 2009






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Long Point Region Conservation Authority  
**Long Point Region Watershed**



-  Lake/River
-  Stream
-  Road
-  Municipal Boundary
-  Long Point Region Watershed

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**Map 1.2a**  
**Long Point Region**  
**Conservation Authority**

3 0 3 6 Kilometers





Catfish Creek Conservation Authority

**Catfish Creek Watershed**

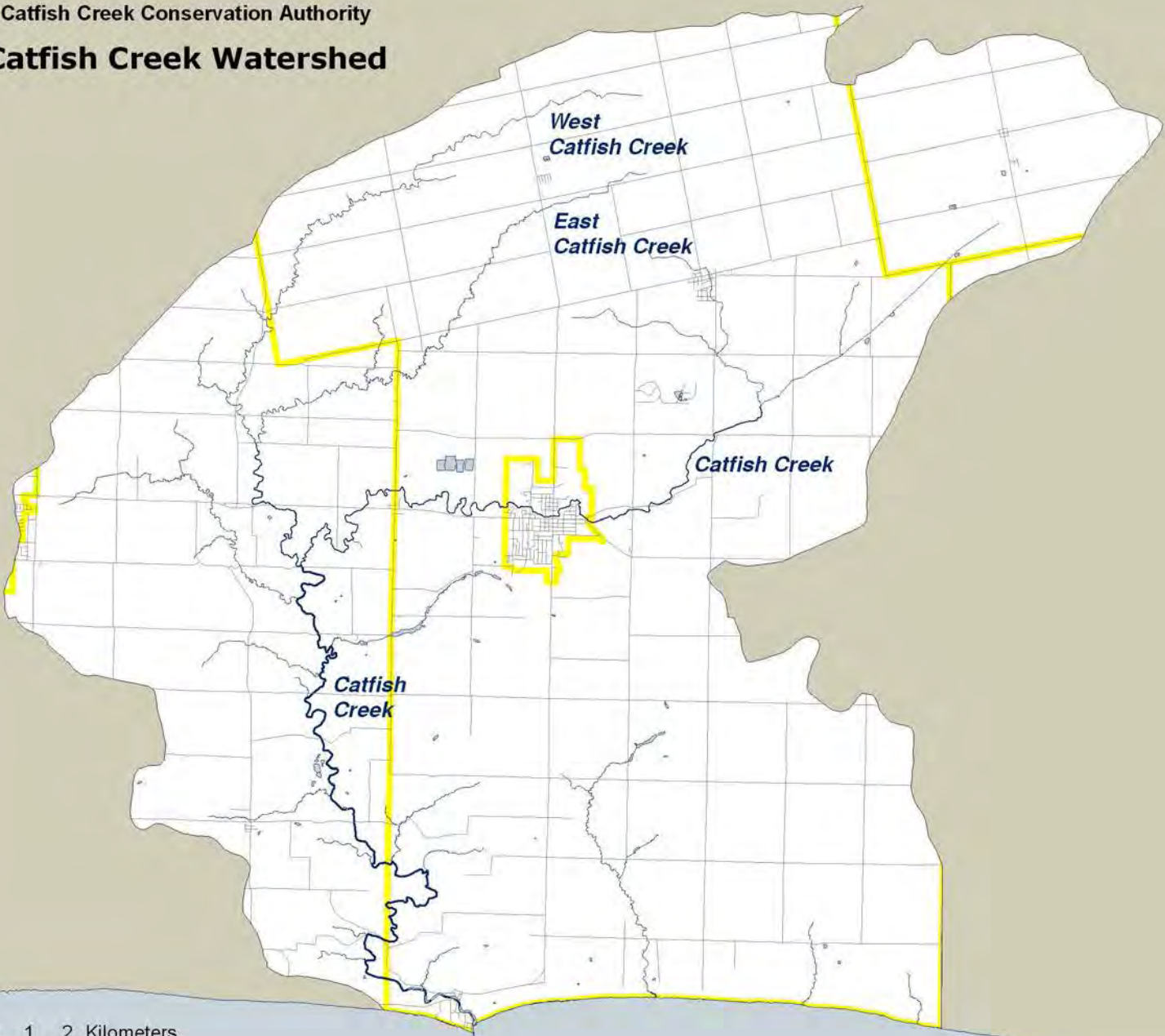
-  Lake/River
-  Stream
-  Road
-  Municipal Boundary
-  Catfish Creek Watershed

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**Map 1.2b**  
**Catfish Creek**  
**Conservation Authority**



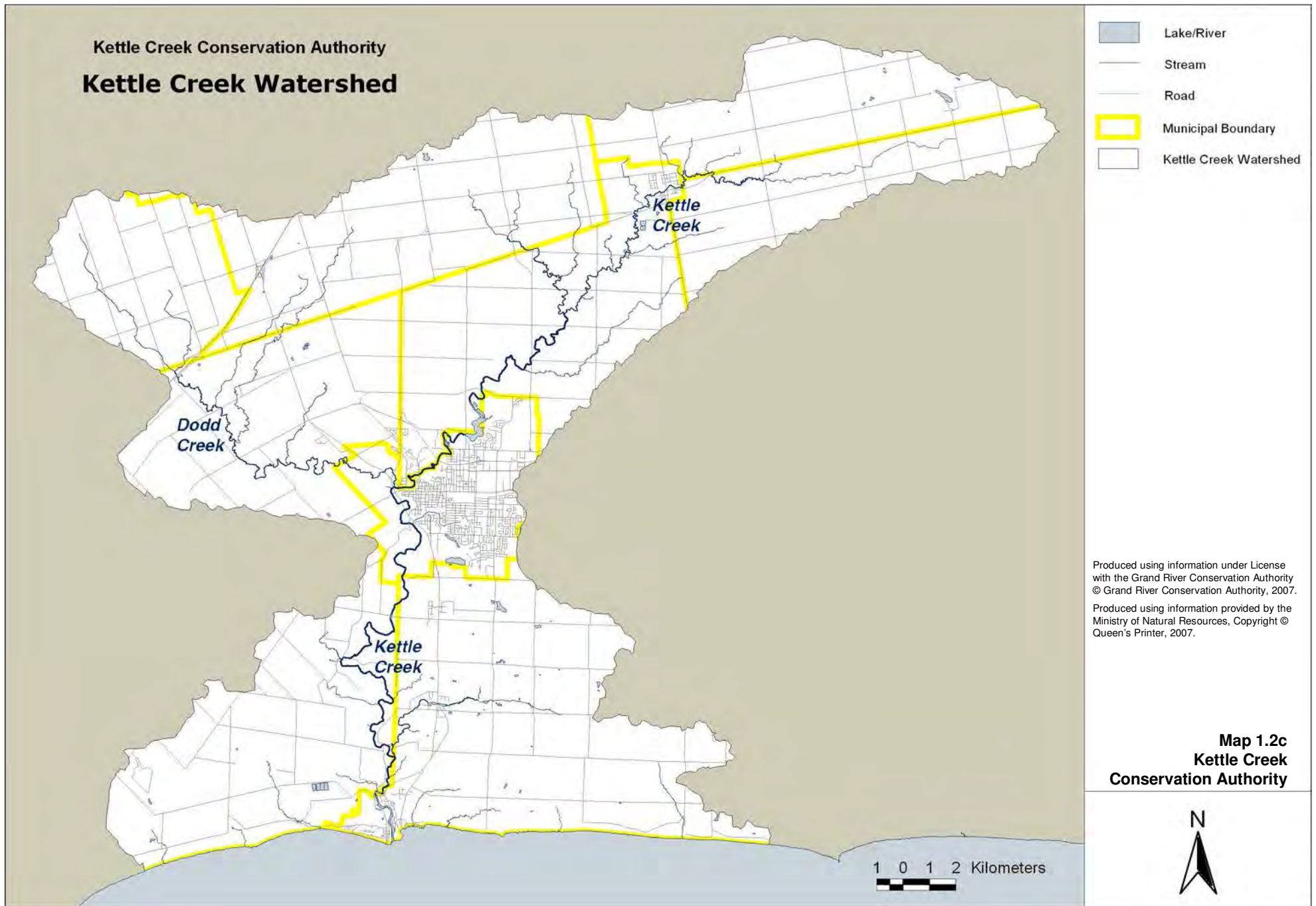
1 0 1 2 Kilometers





Kettle Creek Conservation Authority  
**Kettle Creek Watershed**

-  Lake/River
-  Stream
-  Road
-  Municipal Boundary
-  Kettle Creek Watershed



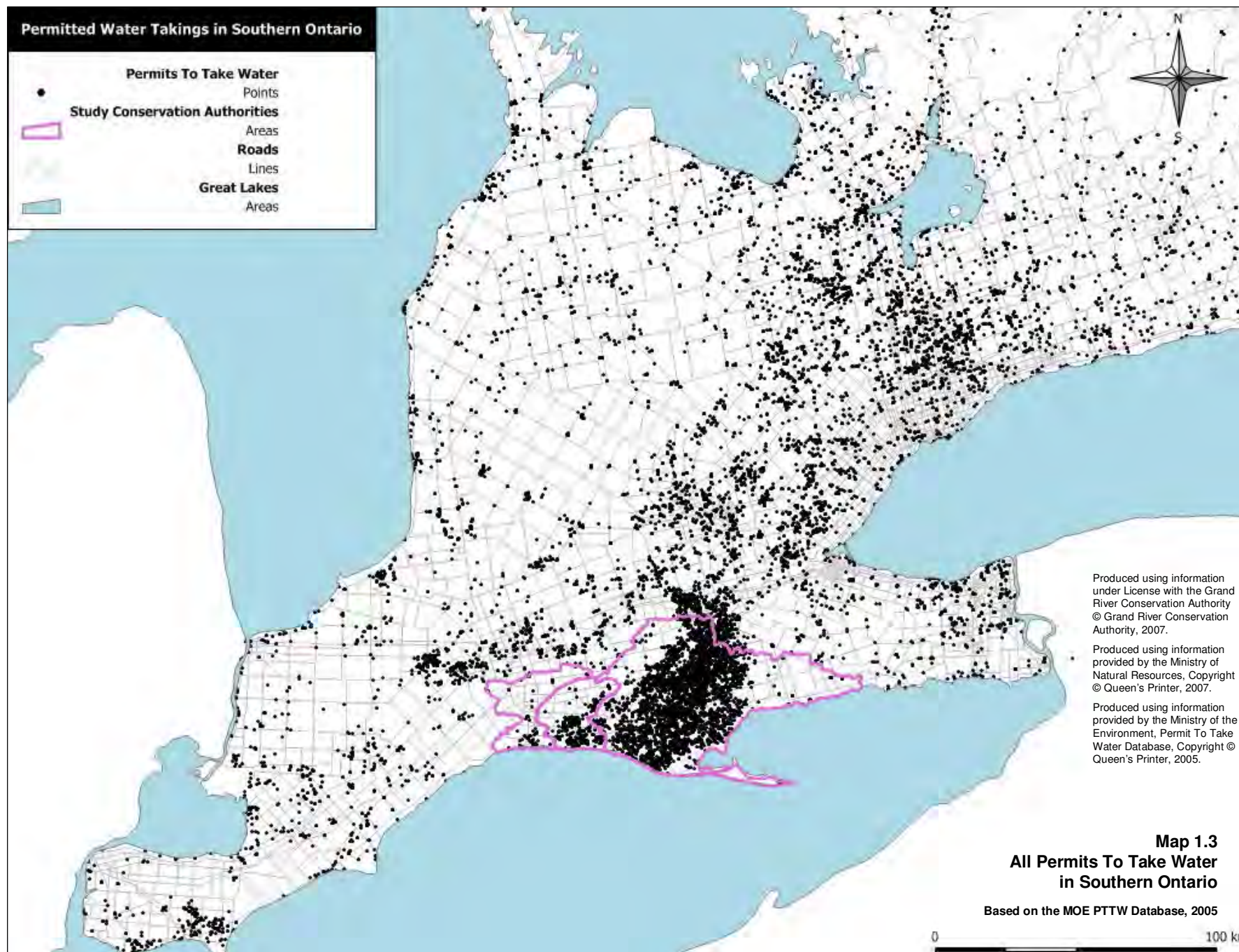
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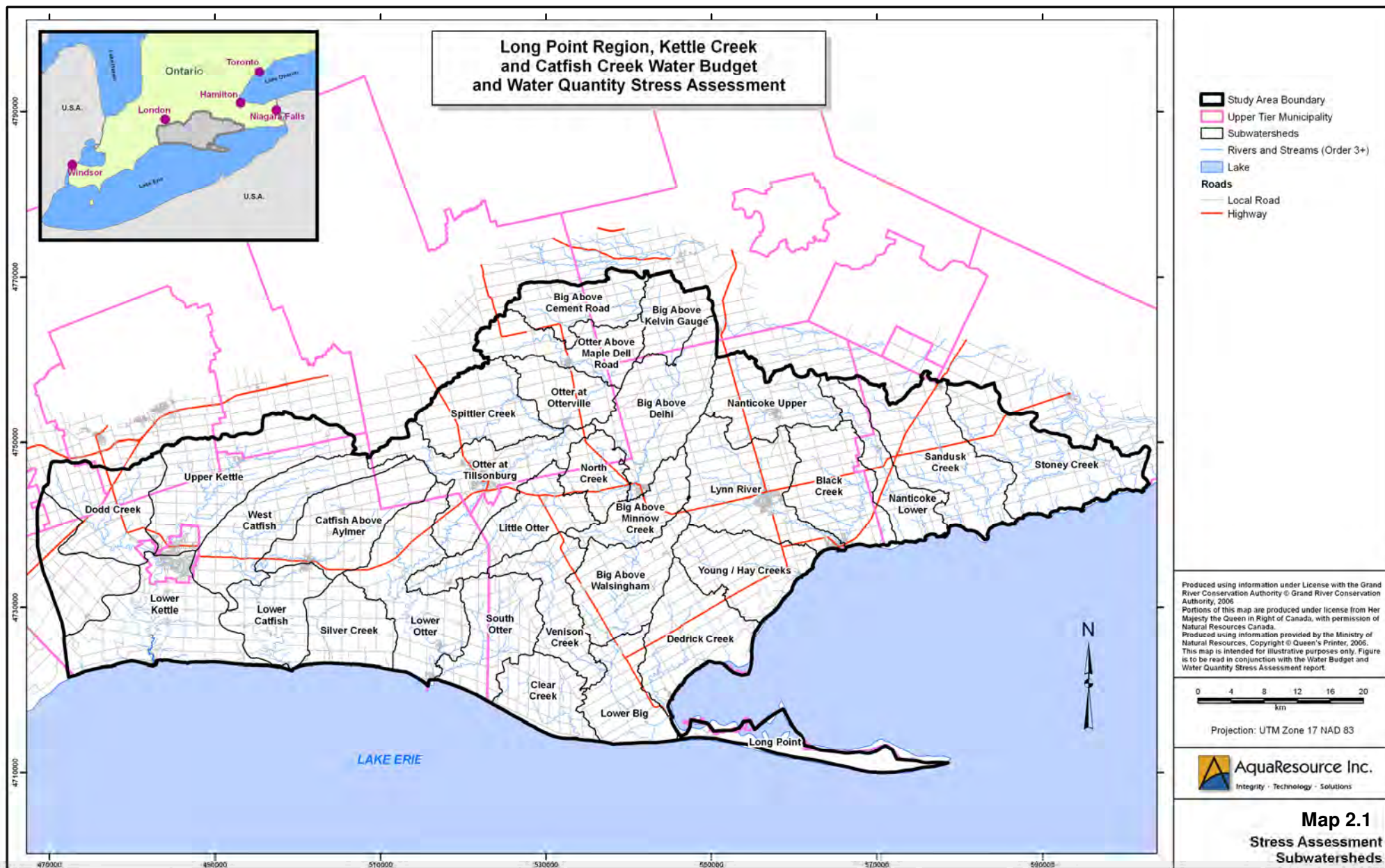
**Map 1.2c**  
**Kettle Creek**  
**Conservation Authority**



1 0 1 2 Kilometers

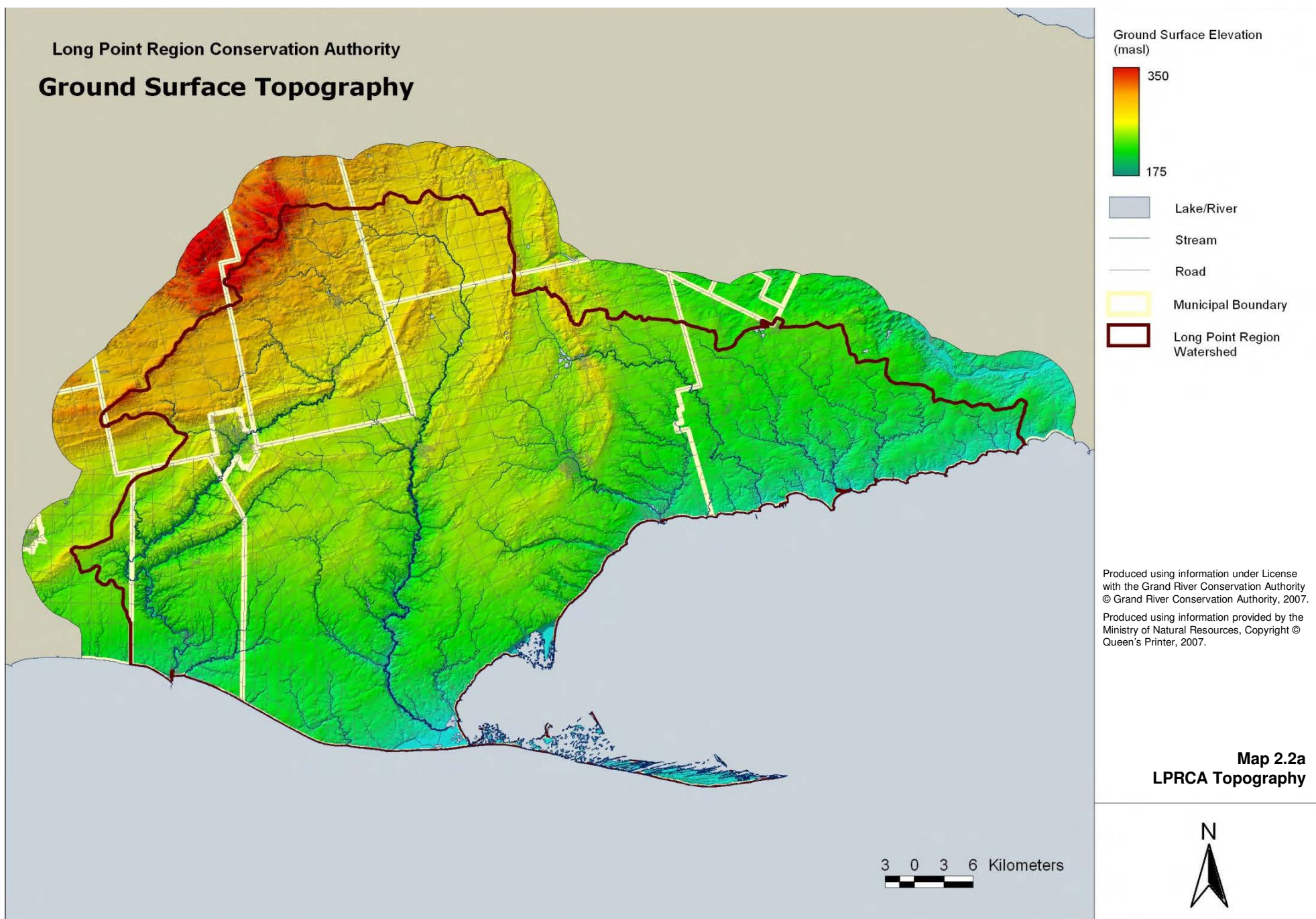






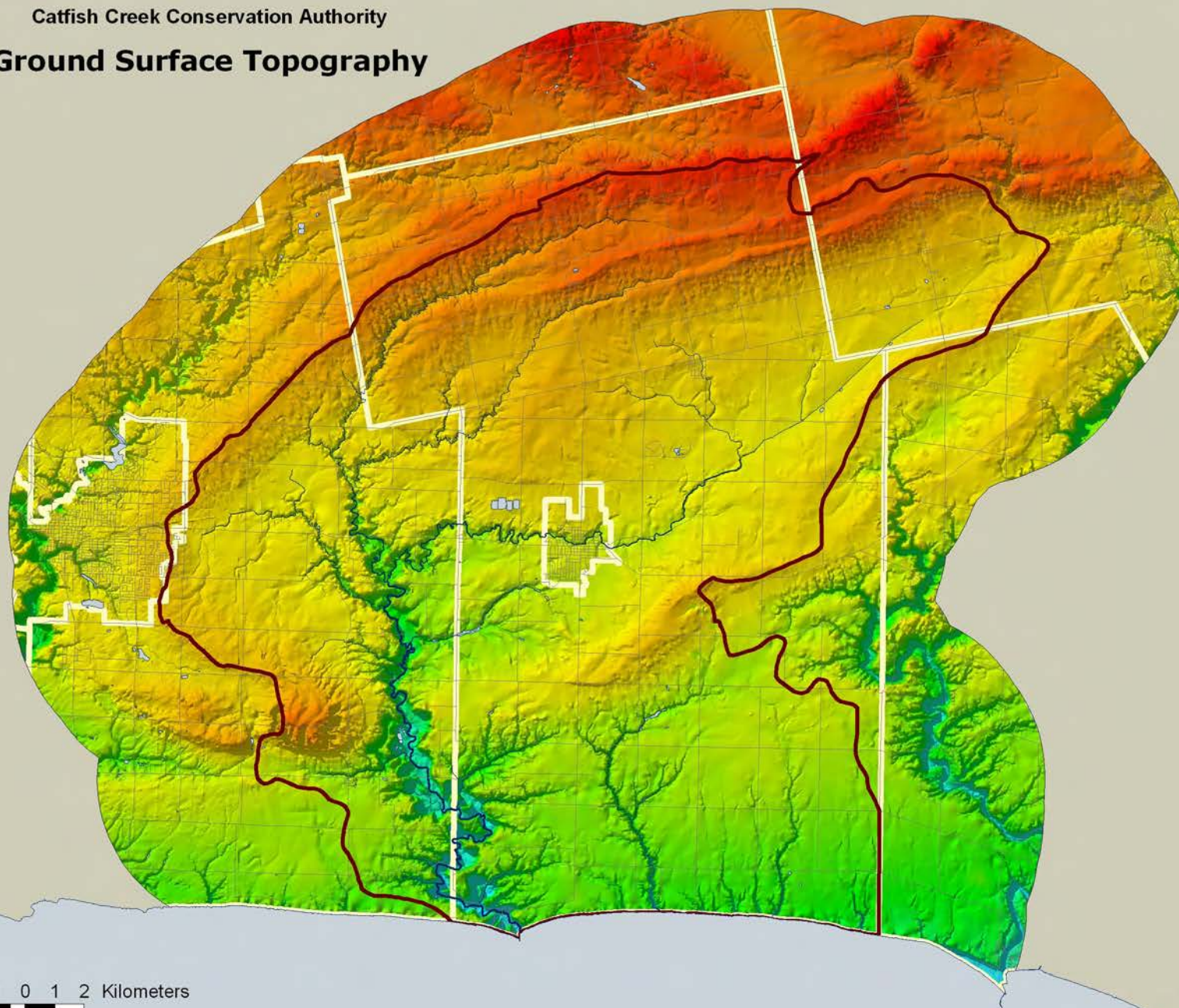


Long Point Region Conservation Authority  
**Ground Surface Topography**

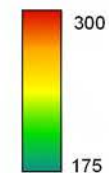




Catfish Creek Conservation Authority  
**Ground Surface Topography**



Ground Surface Elevation  
(masl)



- Lake/River
- Stream
- Road
- Municipal Boundary
- Catfish Creek Watershed

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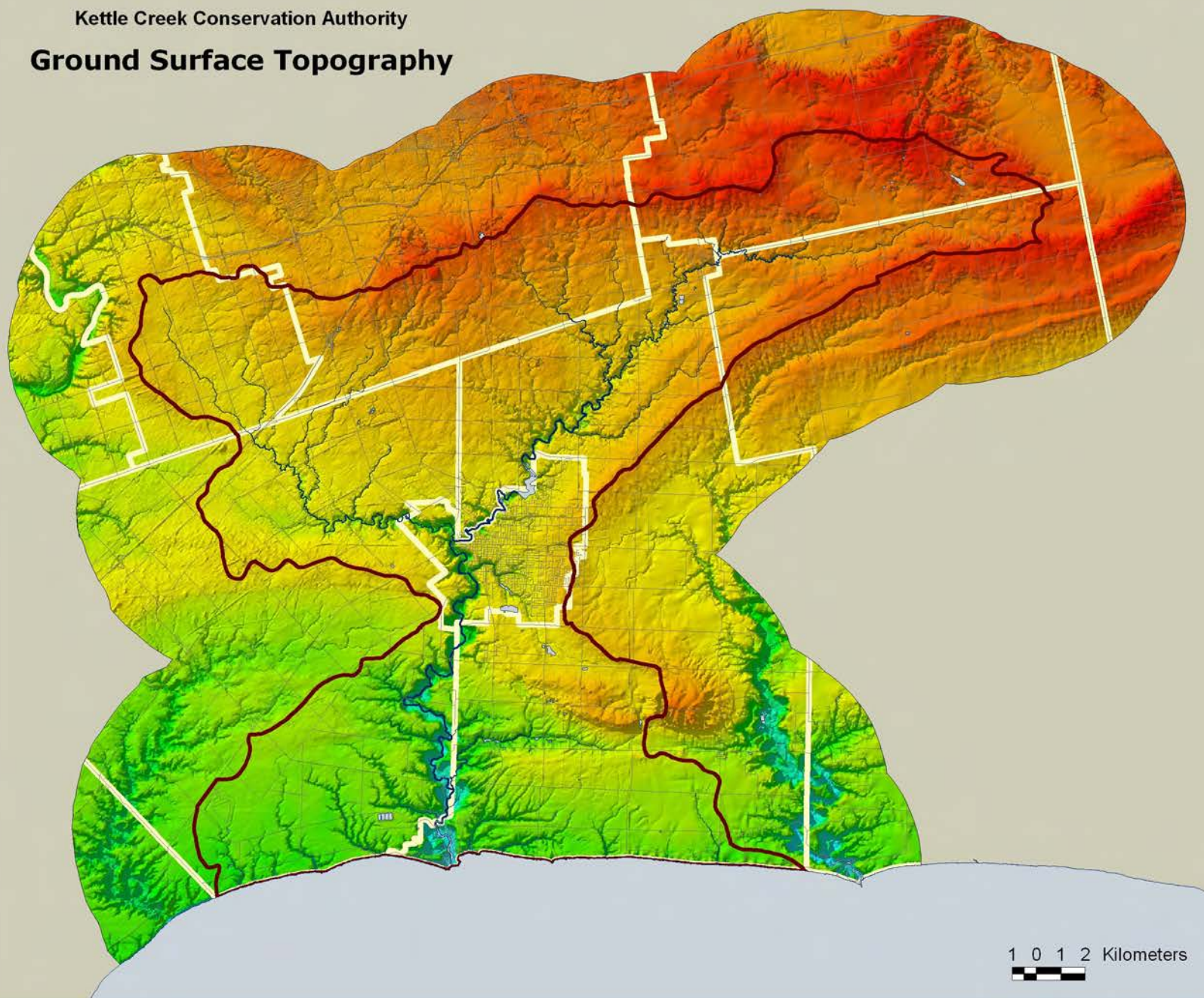
**Map 2.2b**  
**CCCA Topography**



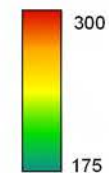
1 0 1 2 Kilometers



Kettle Creek Conservation Authority  
**Ground Surface Topography**



Ground Surface Elevation  
(masl)



- Lake/River
- Stream
- Road
- Municipal Boundary
- Kettle Creek Watershed

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**Map 2.2c**  
**KCCA Topography**

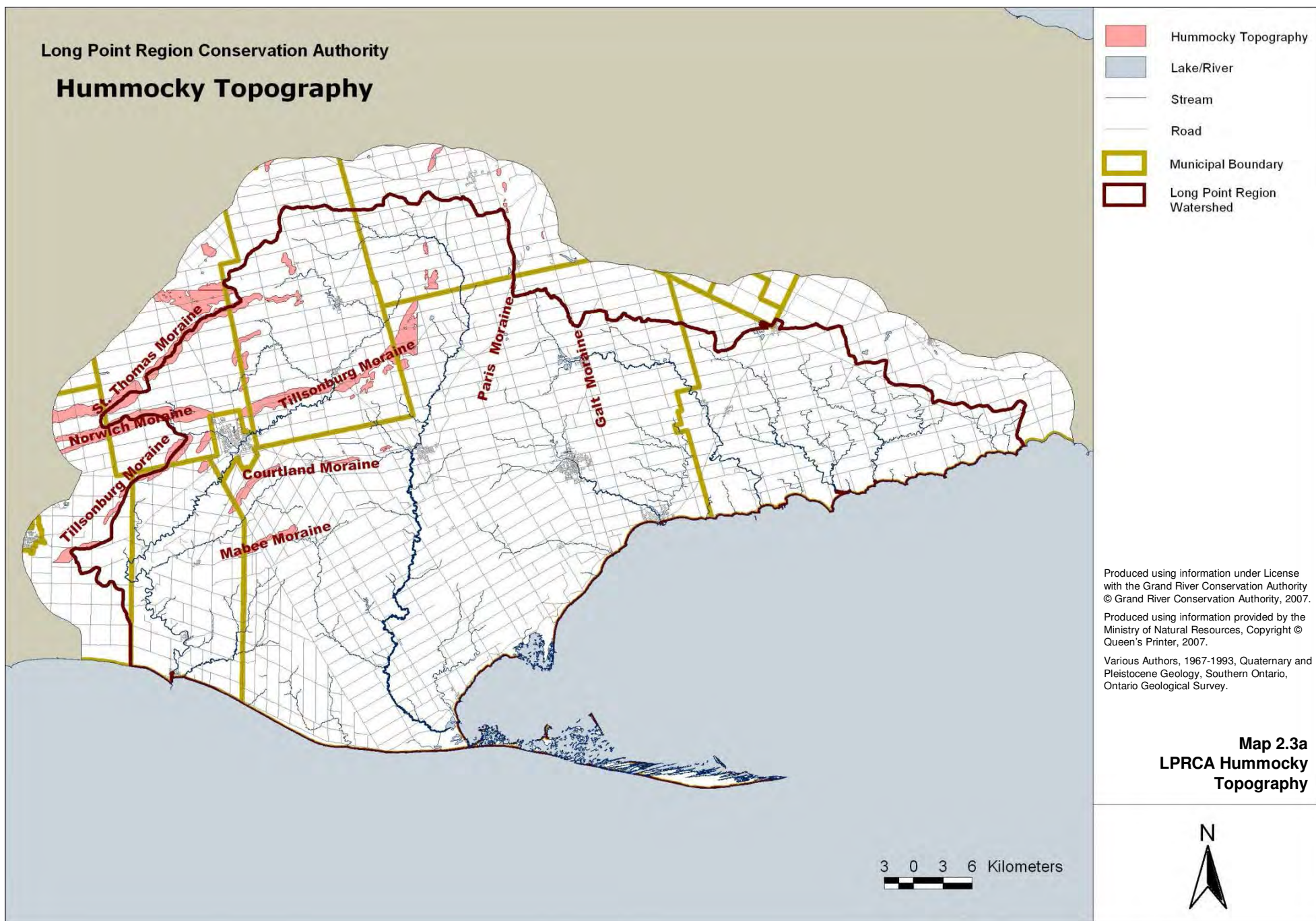
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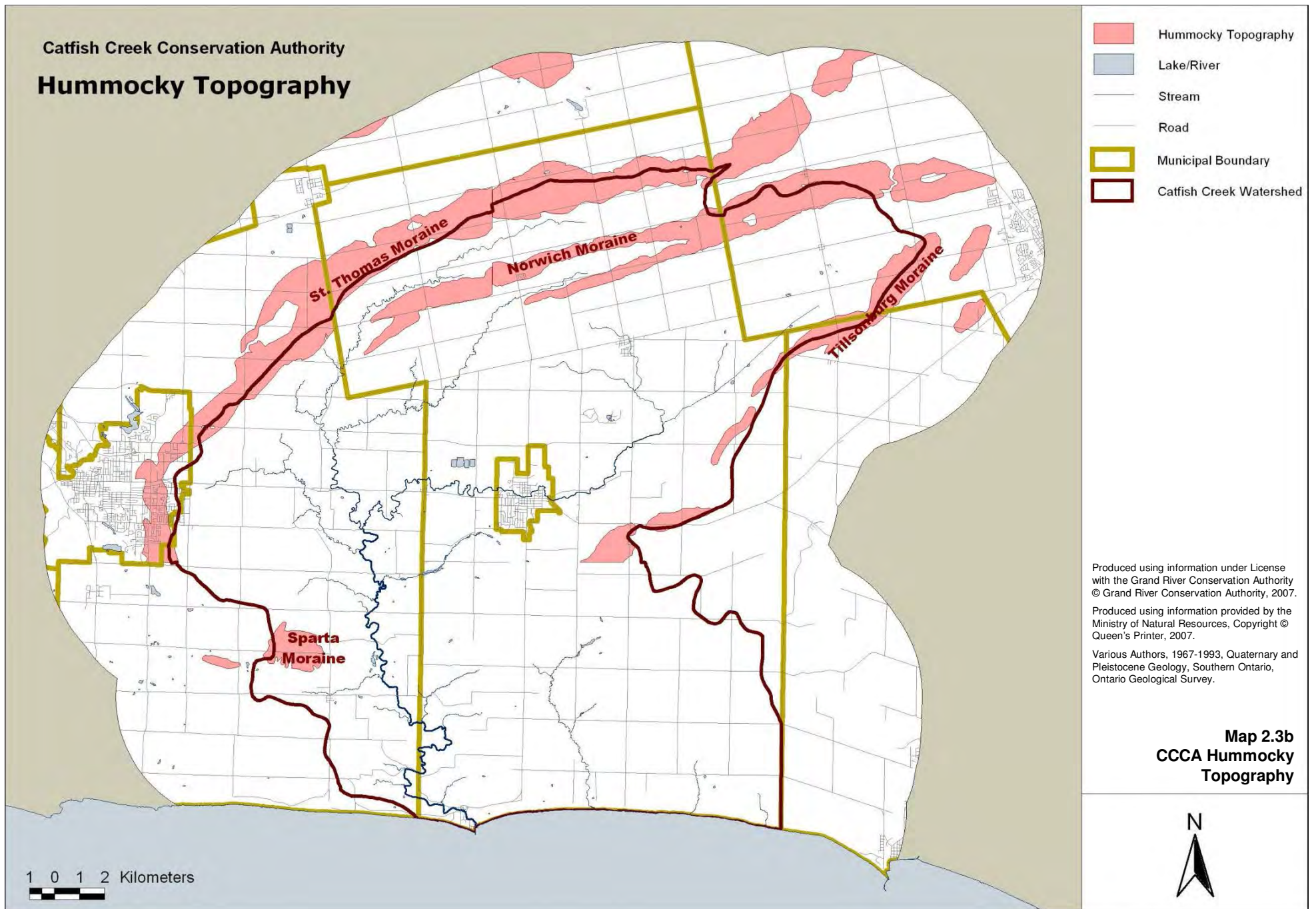
Long Point Region Conservation Authority

## Hummocky Topography



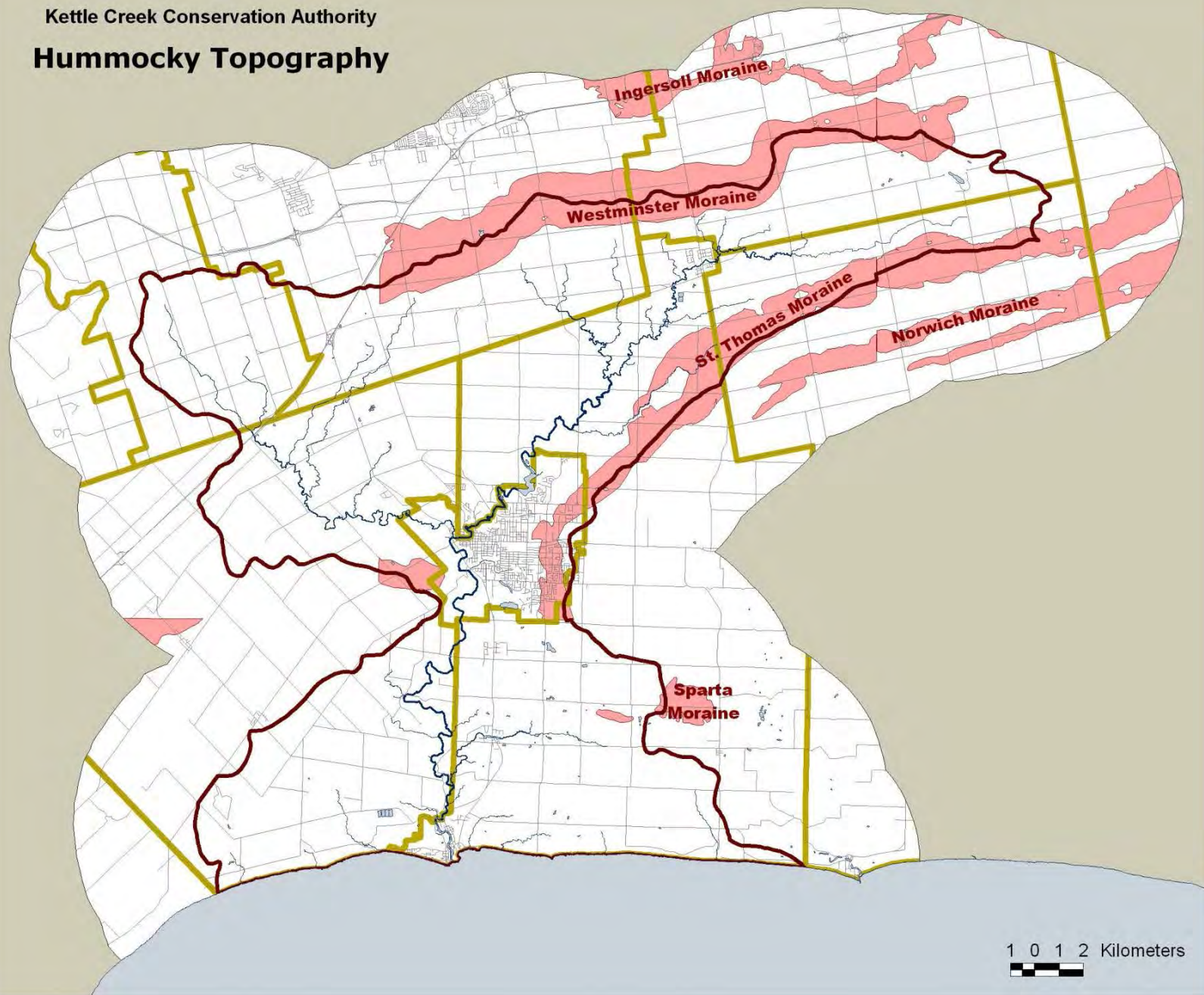
Catfish Creek Conservation Authority





## Hummocky Topography





Kettle Creek Conservation Authority  
**Hummocky Topography**




-  Hummocky Topography
-  Lake/River
-  Stream
-  Road
-  Municipal Boundary
-  Kettle Creek Watershed

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Various Authors, 1967-1993, Quaternary and Pleistocene Geology, Southern Ontario, Ontario Geological Survey.

**Map 2.3c**  
**KCCA Hummocky**  
**Topography**

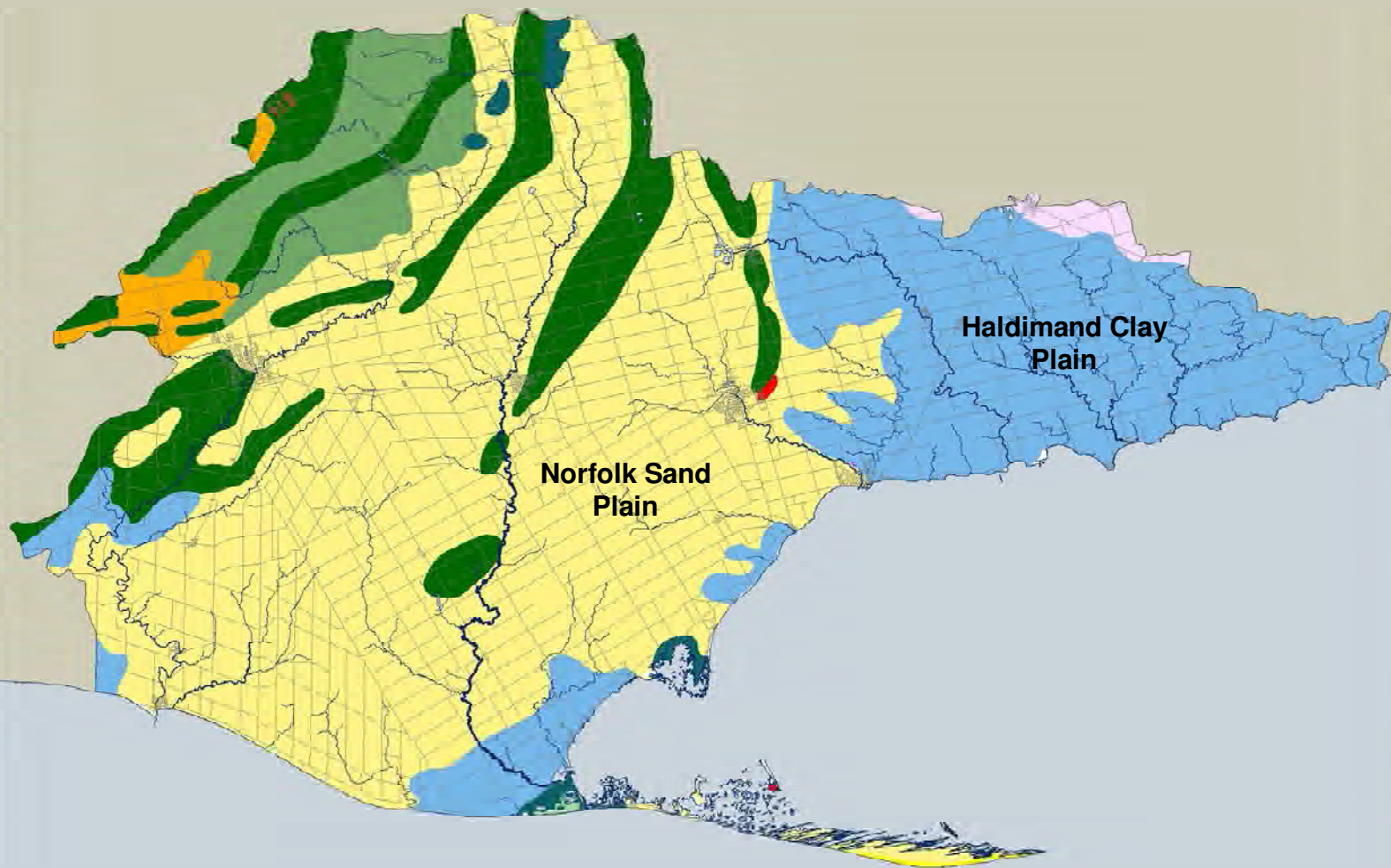
1 0 1 2 Kilometers  






Long Point Region Conservation Authority

## Physiography



### Physiographic Features

- Beaches
- Clay Plain
- Drumlins
- Limestone Plain
- Peat and Muck
- Sand Plain
- Spillway
- Till Moraine
- Till Plain (drumlinized)
- Till Plain (undrumlinized)

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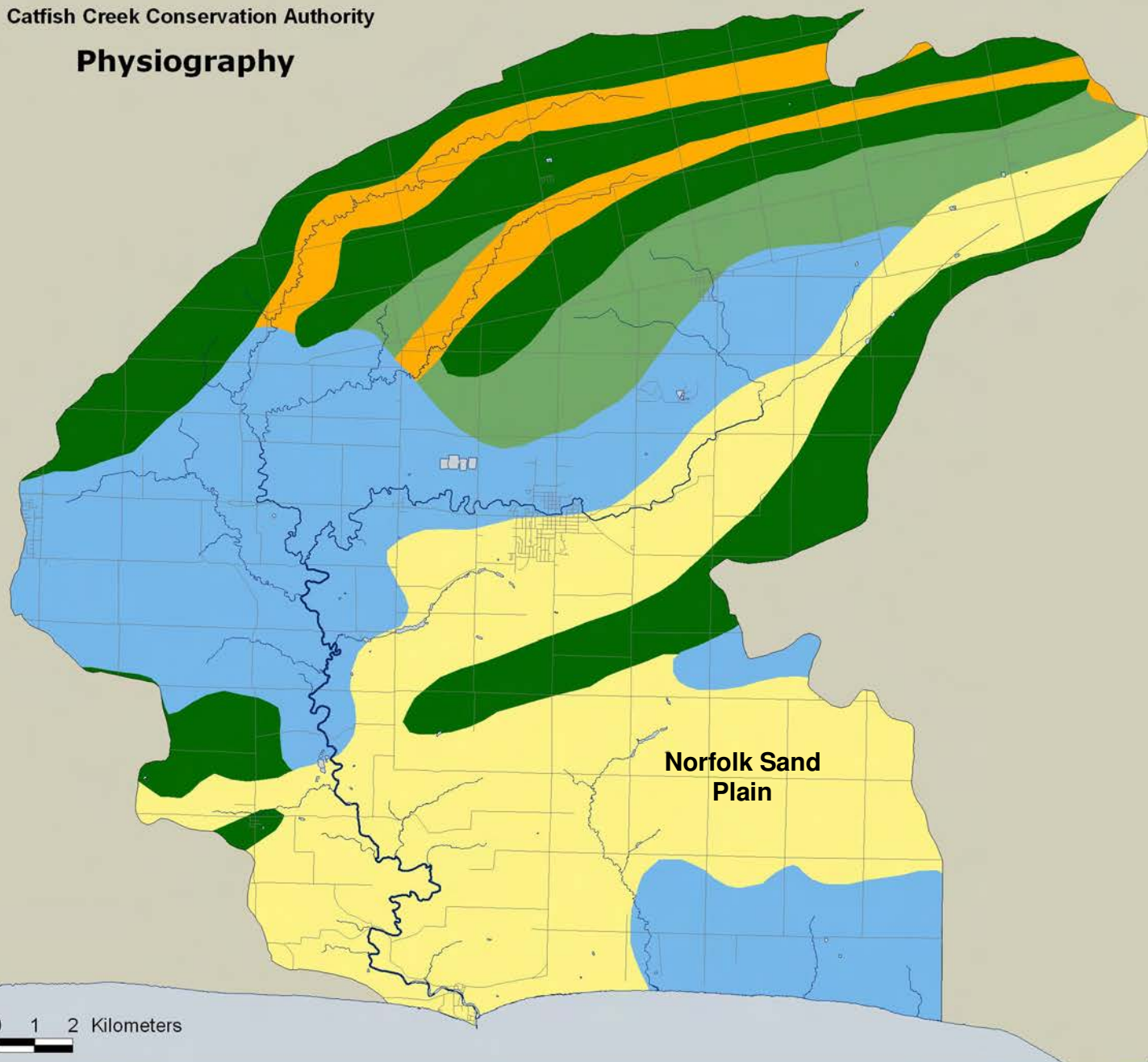
**Map 2.4a**  
**LPRCA Physiography**

0 3 6 Kilometers



Catfish Creek Conservation Authority

## Physiography



### Physiographic Features

- Clay Plain
- Sand Plain
- Spillway
- Till Moraine
- Till Plain (undrumlinized)

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**Map 2.4b**  
**CCCA Physiography**

Kettle Creek Conservation Authority

## Physiography

### Physiographic Features

- Beaches
- Clay Plain
- Sand Plain
- Till Moraine
- Till Plain (undrumlinized)

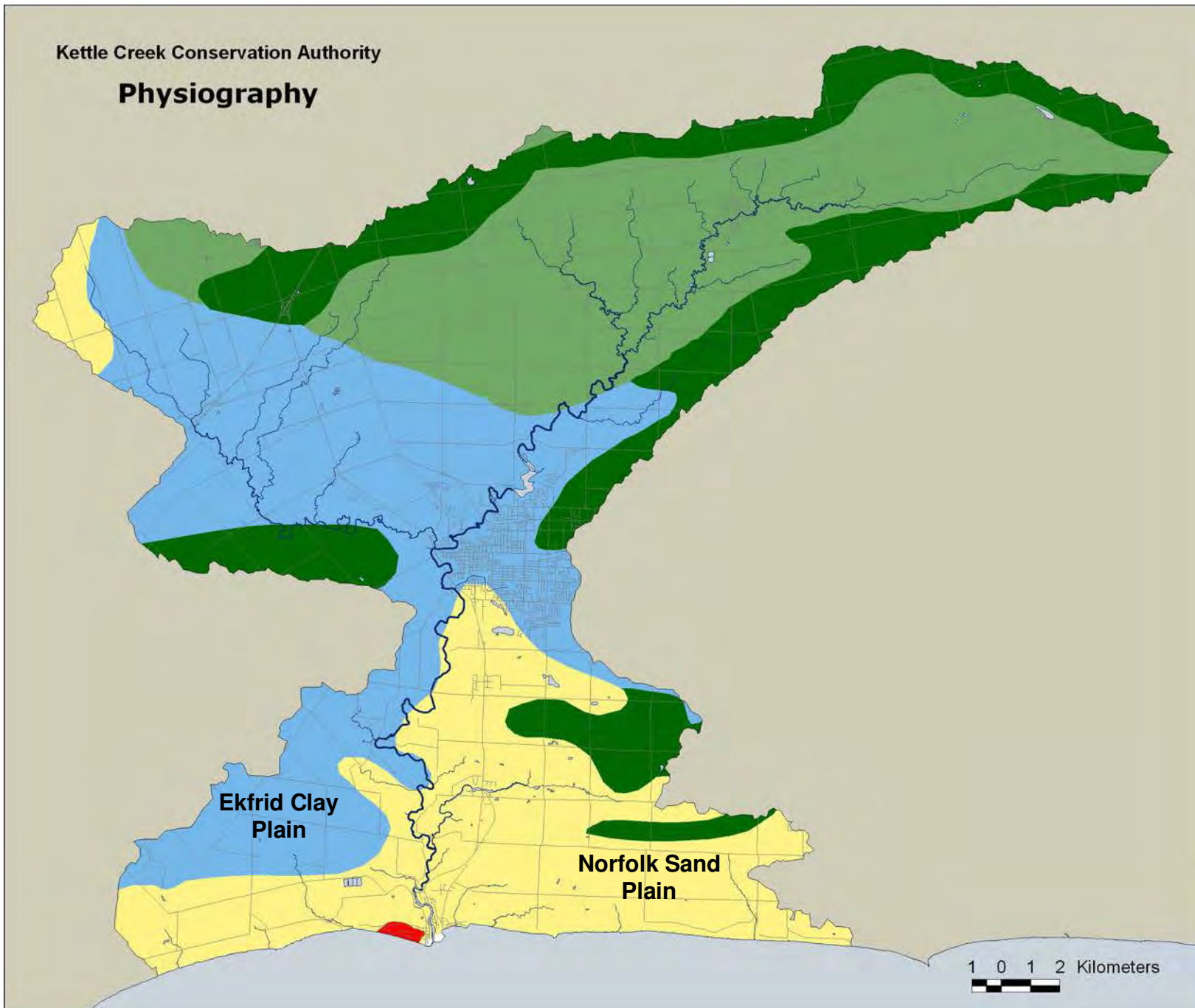
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Map 2.4c  
KCCA Physiography



1 0 1 2 Kilometers



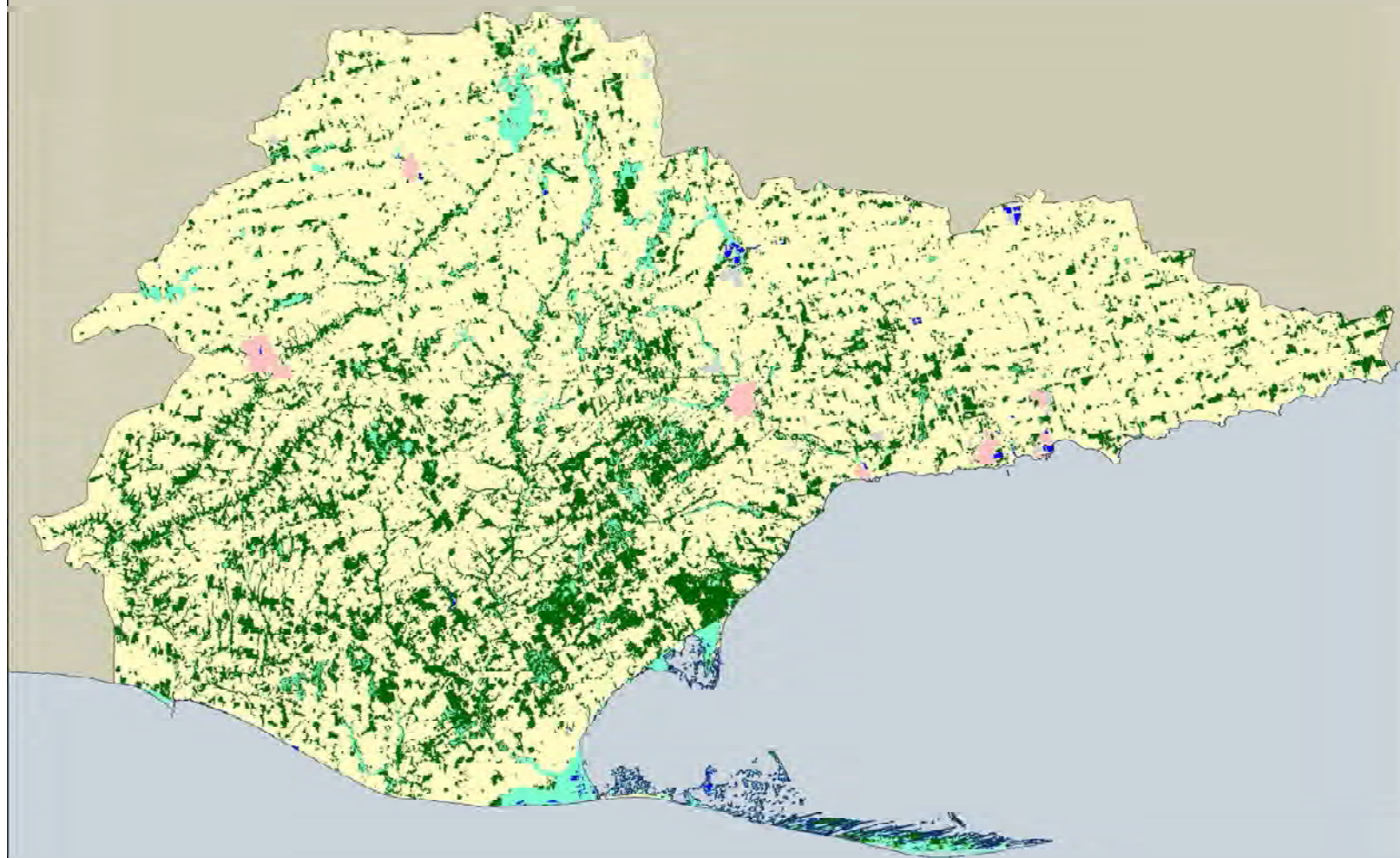


Long Point Region Conservation Authority

## Land Cover

### Land Cover Class

- Water
- Wetland
- Forest
- Mines/Quarries/Bedrock
- Built-Up
- Agriculture



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**Map 2.5a**  
**LPRCA Land Cover**

0 3 6 Kilometers



Catfish Creek Conservation Authority

## Land Cover

### Land Cover Class

- Water
- Wetland
- Forest
- Mines/Quarries/Bedrock
- Built-Up
- Agriculture

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Map 2.5b  
CCCA Land Cover



1 0 1 2 Kilometers





Kettle Creek Conservation Authority

## Land Cover

### Land Cover Class

- Water
- Wetland
- Forest
- Mines/Quarries/Bedrock
- Built-Up
- Agriculture

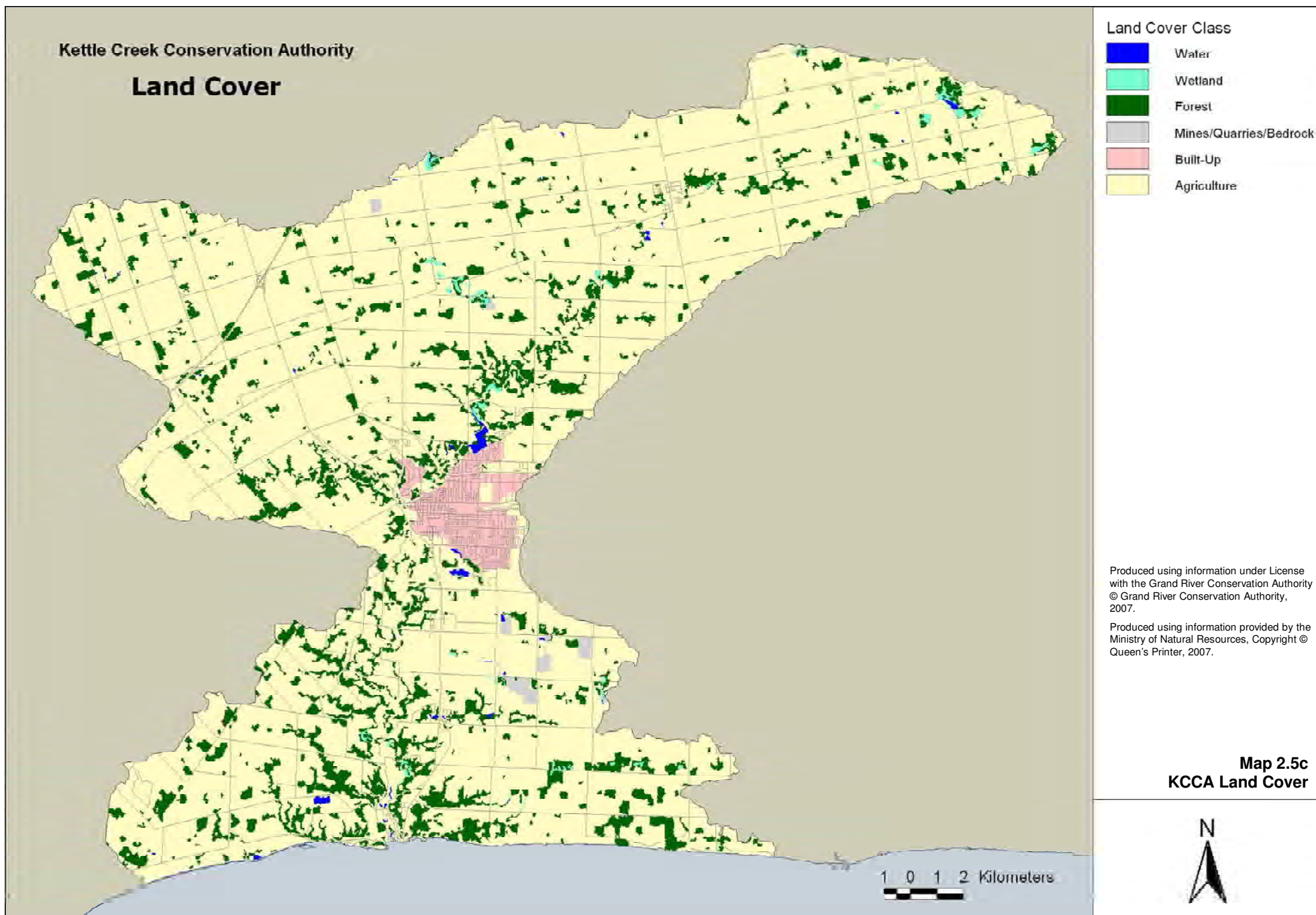
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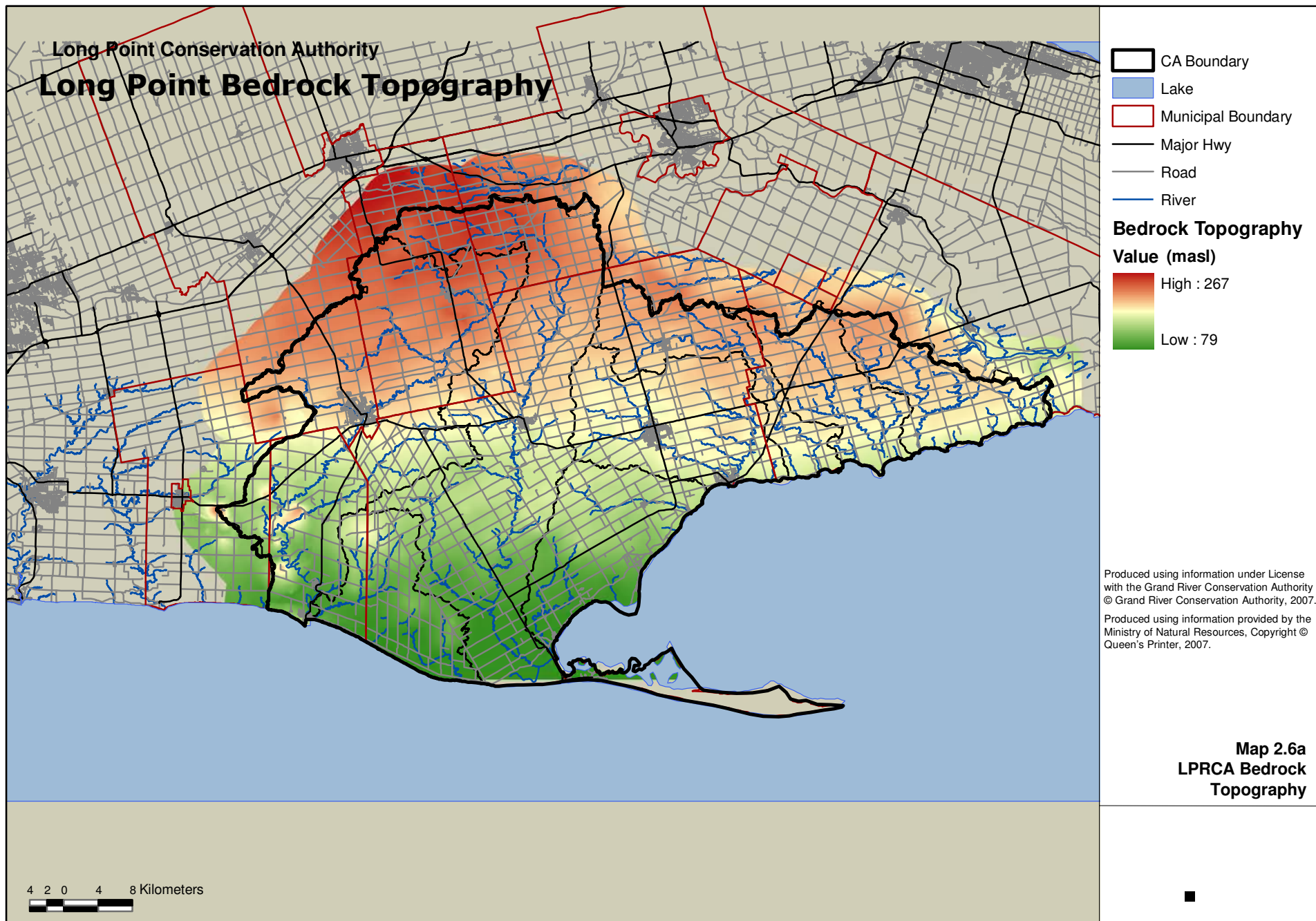
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Map 2.5c  
KCCA Land Cover



1 0 1 2 Kilometers

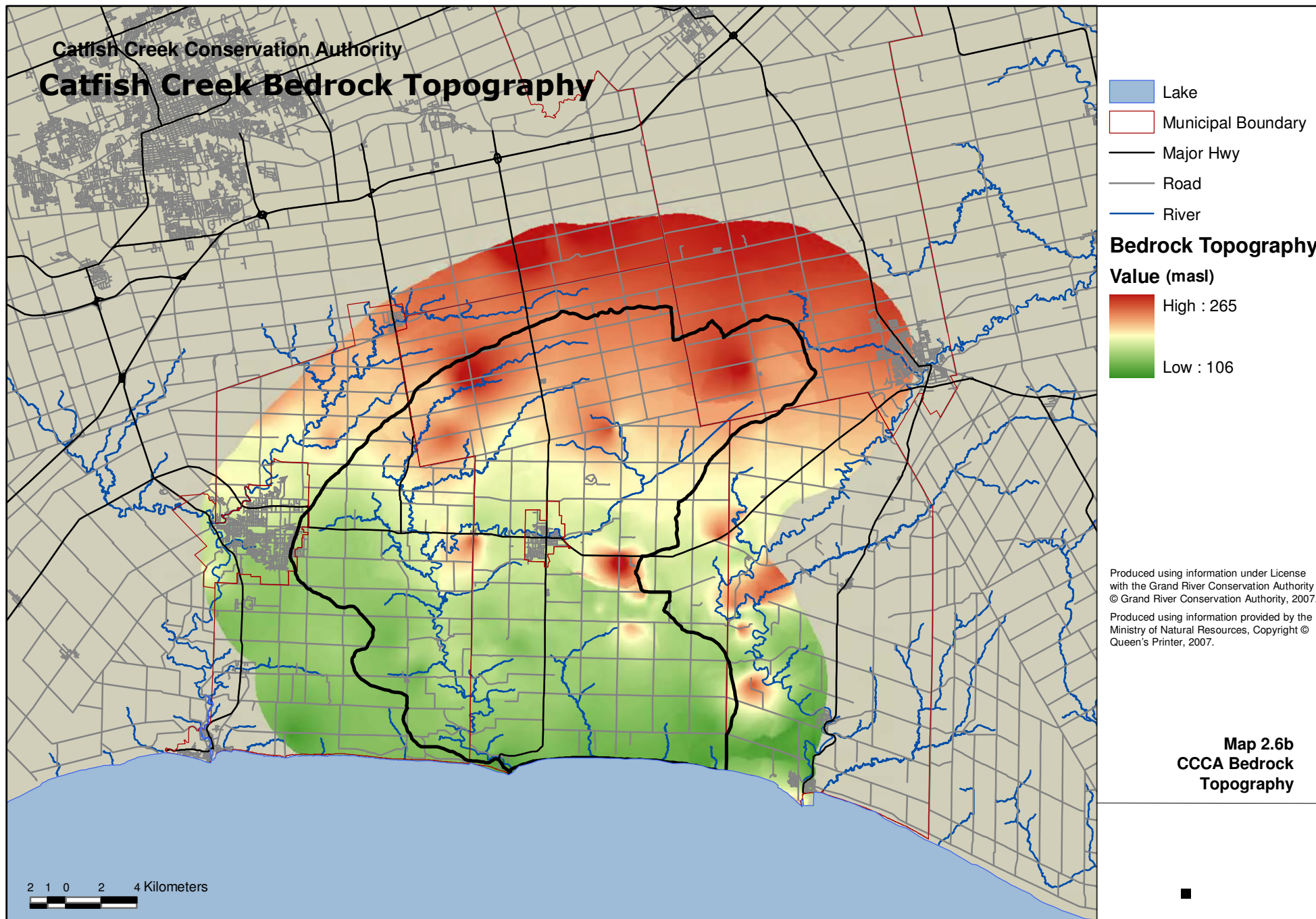






Catfish Creek Conservation Authority

## Catfish Creek Bedrock Topography

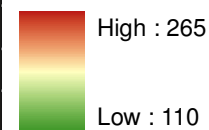


Kettle Creek Conservation Authority

# Kettle Creek Bedrock Topography

- Lake
- Major Hwy
- Road
- Municipal Boundary
- River

## Bedrock Topography Value (masl)



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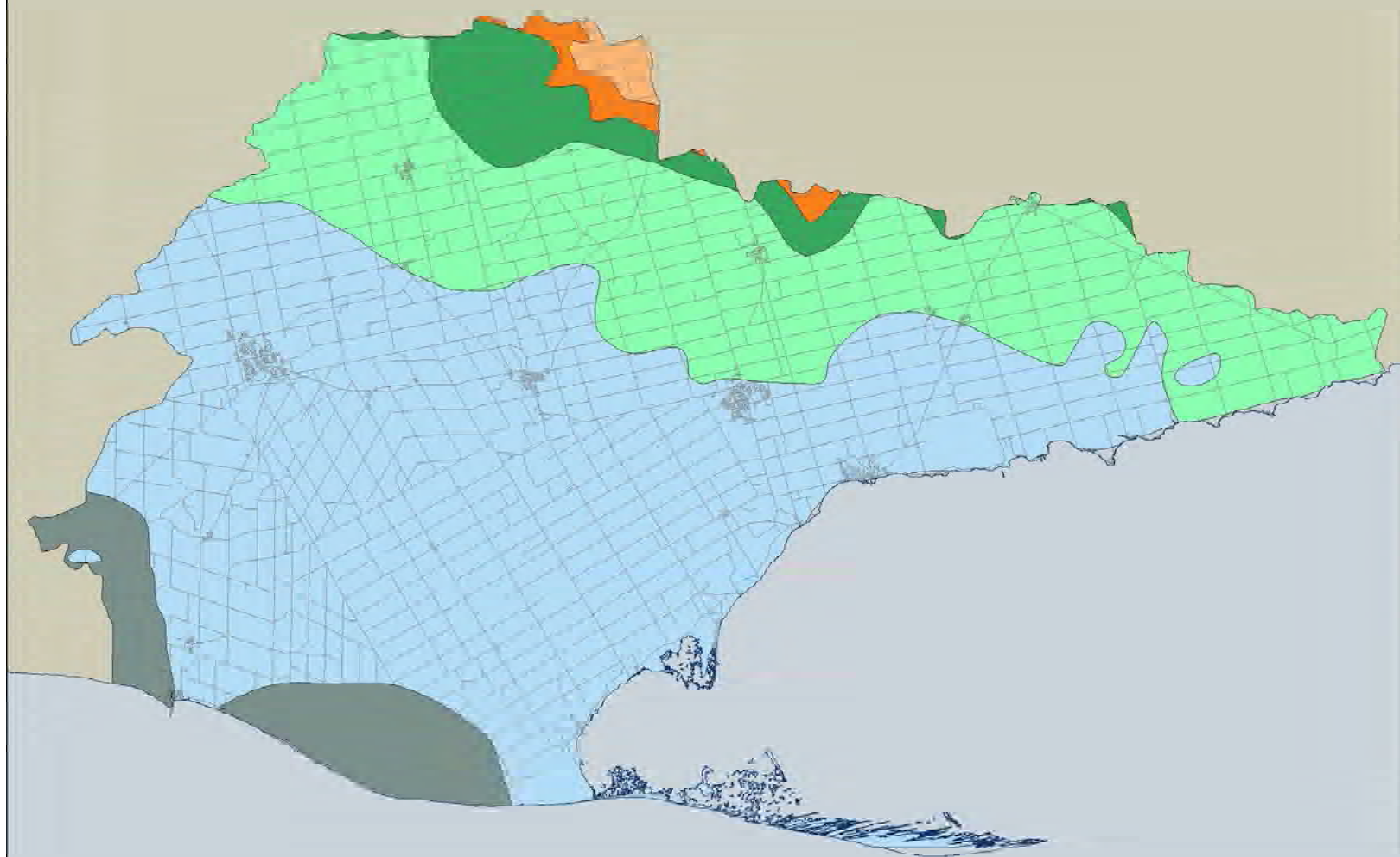
Map 2.6c  
KKCA Bedrock  
Topography

2 1 0 2 4 Kilometers



Long Point Region Conservation Authority

## Bedrock Geology



### Bedrock Formation

- Marcellus Formation
- Dundee Formation
- Detroit River Group
- Bois Blanc Formation
- Bass Island Formation
- Salina Formation

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**Map 2.7a**  
**LPRCA Bedrock Geology**



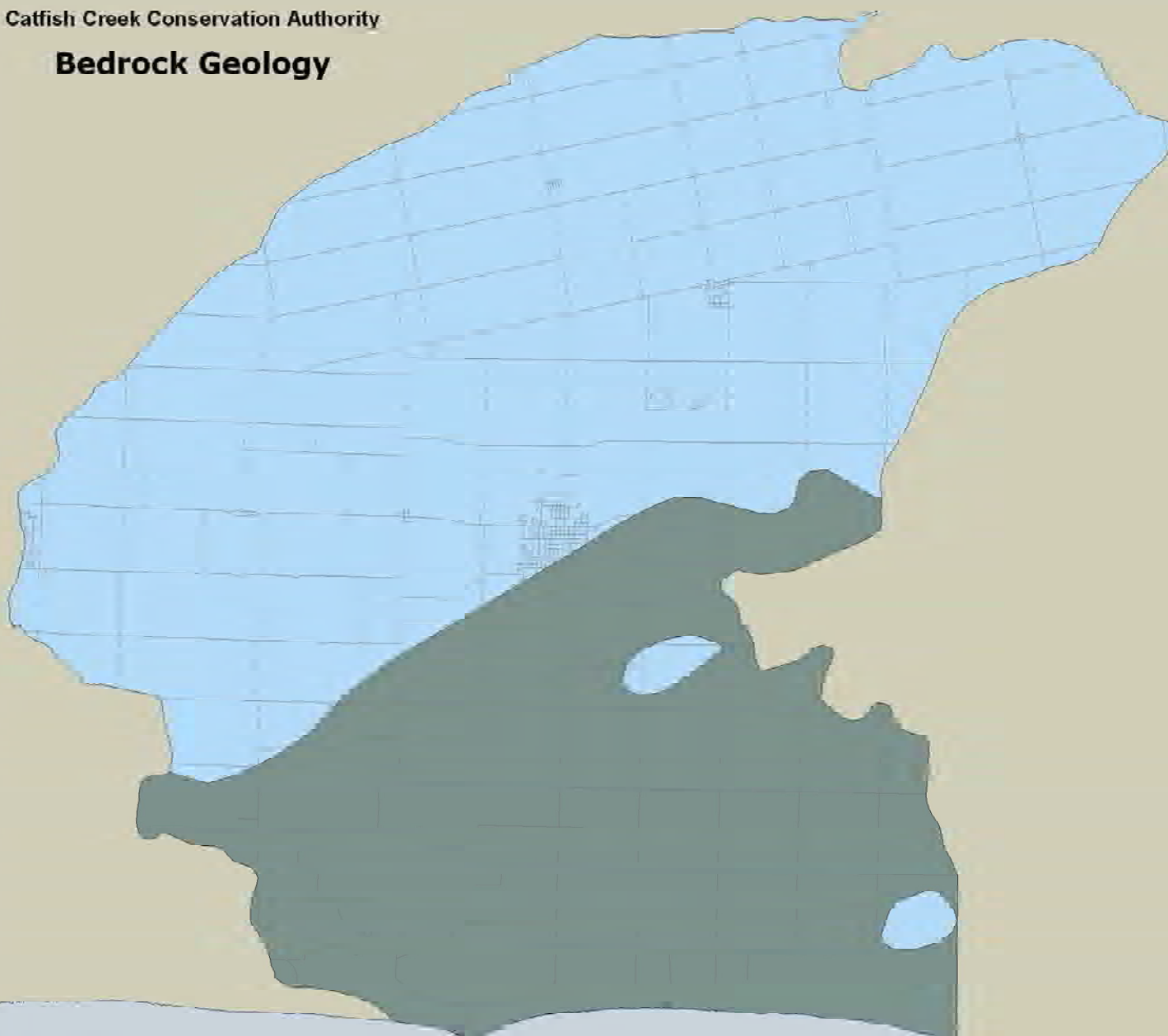
0 3 6 Kilometers

Catfish Creek Conservation Authority

## Bedrock Geology

### Bedrock Formation

- Marcellus Formation
- Dundee Formation



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**Map 2.7b**  
**CCCA Bedrock Geology**

1 0 1 2 Kilometers





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## Bedrock Geology

### Bedrock Formation

- Hamilton Group
- Marcellus Formation
- Dundee Formation

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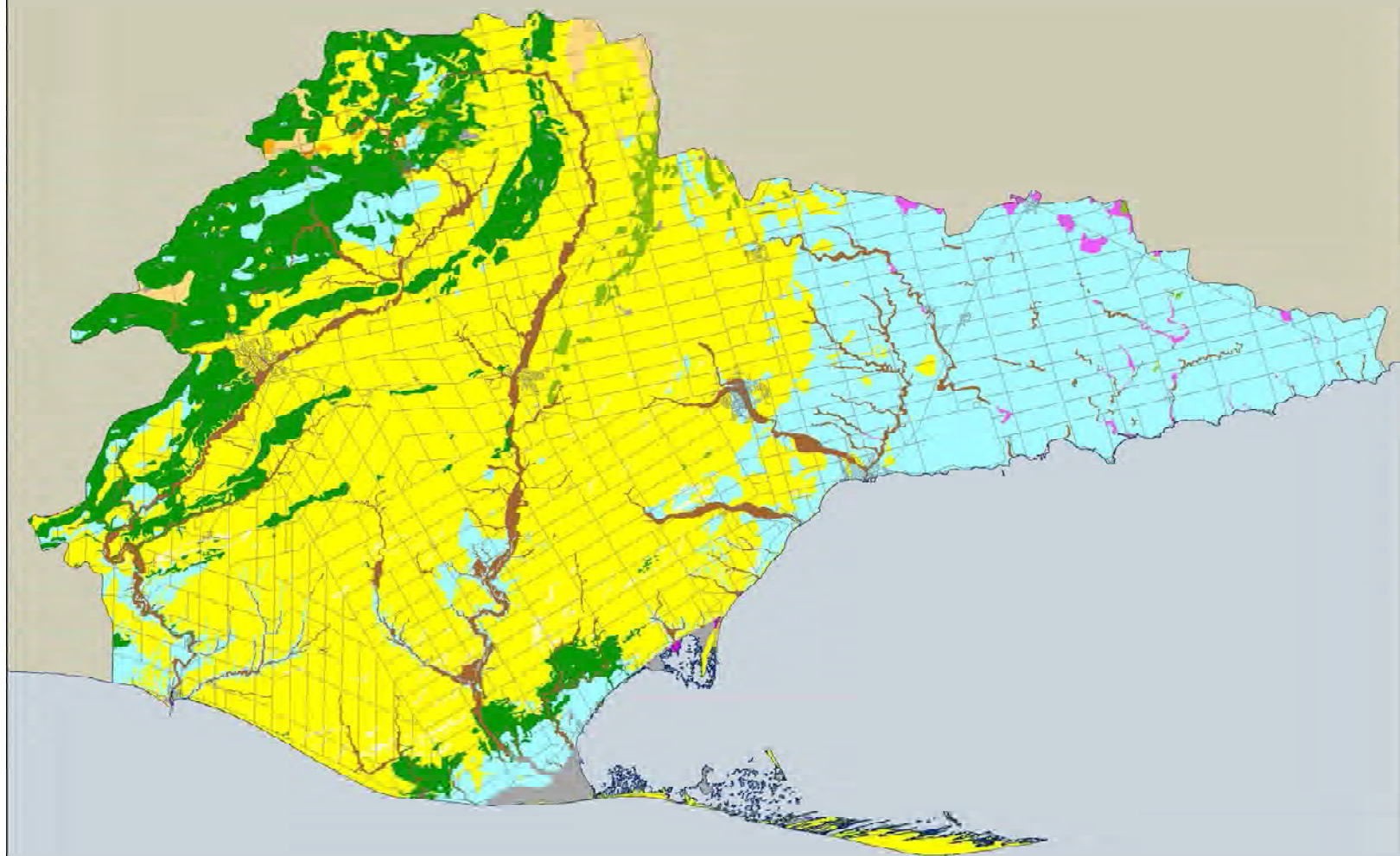
**Map 2.7c**  
**KKCA Bedrock Geology**



1 0 1 2 Kilometers

Long Point Region Conservation Authority

## Quaternary Geology



### Geologic Units

- 3 Paleozoic bedrock
- 5a Stone-poor, carbonate-derived silty to sandy till
- 5b Glaciolacustrine-derived silt to clayey fill
- 6a Till-mantled, stratified lacustrine
- 6b In moraines, kames, eskers and crevasse fills
- 7 Glaciolacustrine deposits
- 7a Sandy deposits
- 8a Massive well laminated
- 9 Coarse-textured glaciolacustrine deposits
- 9a Deltaic deposits
- 9b Littoral-foreshore deposits
- 12 Older alluvial deposits
- 14a Littoral-foreshore deposits
- 17 Eolian deposits
- 19 Modern alluvial deposits
- 20 Organic deposits
- 21 Man-made deposits

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Various Authors, 1967-1993, Quaternary and  
Pleistocene Geology, Southern Ontario,  
Ontario Geological Survey.

**Map 2.8a**  
**LPRCA Quaternary**  
**Geology**

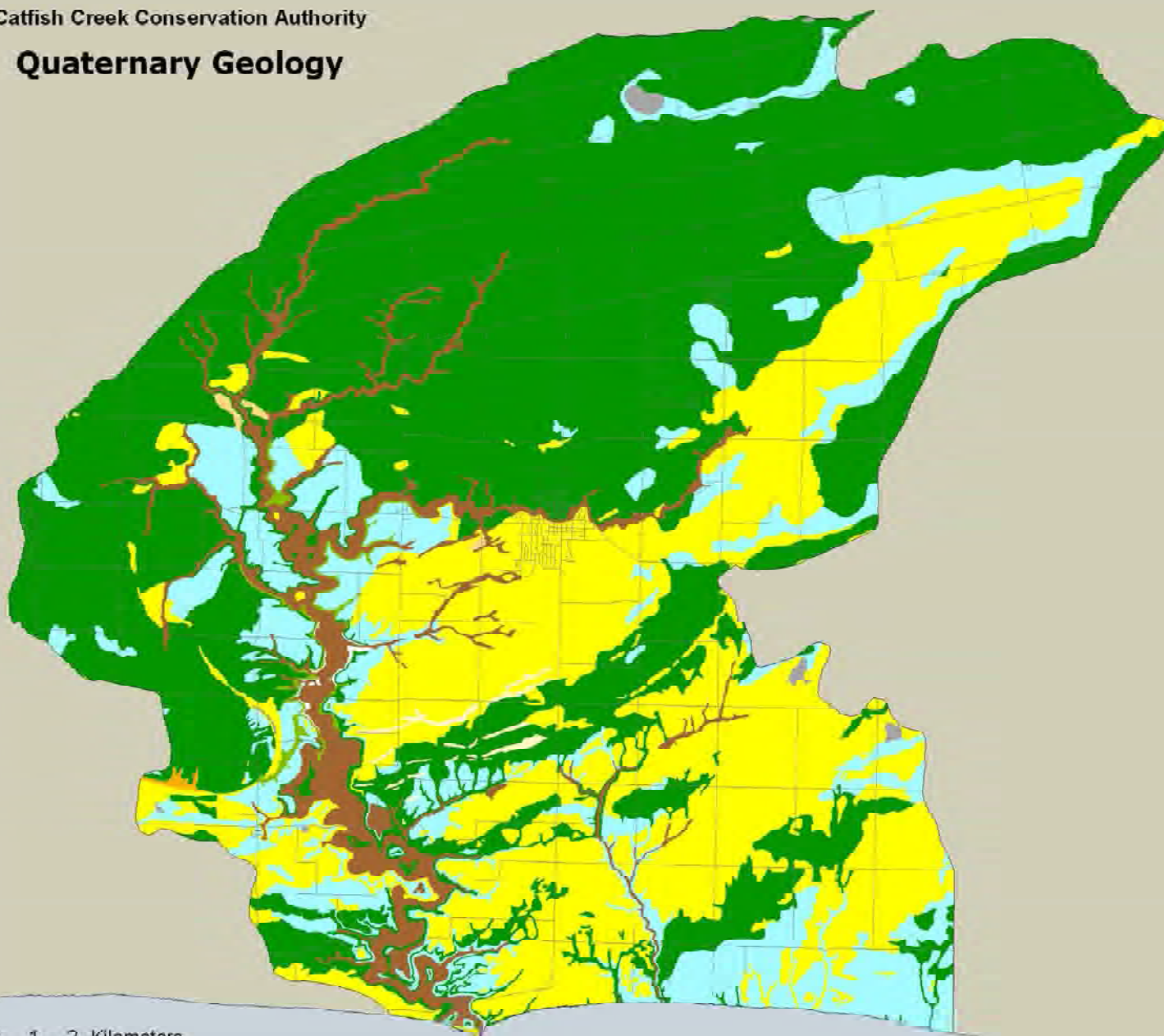
0 3 6 Kilometers





Catfish Creek Conservation Authority

## Quaternary Geology



1 0 1 2 Kilometers

Geologic Unit	
50	Stone-poor, carbonate-derived silt to sandy till
51	Carbonate-derived silt to sandy till
6	Low-contrast, stratified deposits
7	Unconsolidated deposits
8	Stratified deposits
9	Consolidated, carbonate-rich deposits
9a	Dolomite deposits
9b	Limestone deposits
10	Limestone deposits
11	Older alluvial deposits
12	Older alluvial deposits
13	Lateral alluvial deposits
14	Older alluvial deposits
15	Older alluvial deposits
16	Older alluvial deposits
17	Older alluvial deposits
18	Modern alluvial deposits
19	Organic deposits
20	Organic deposits
21	Man-made deposits

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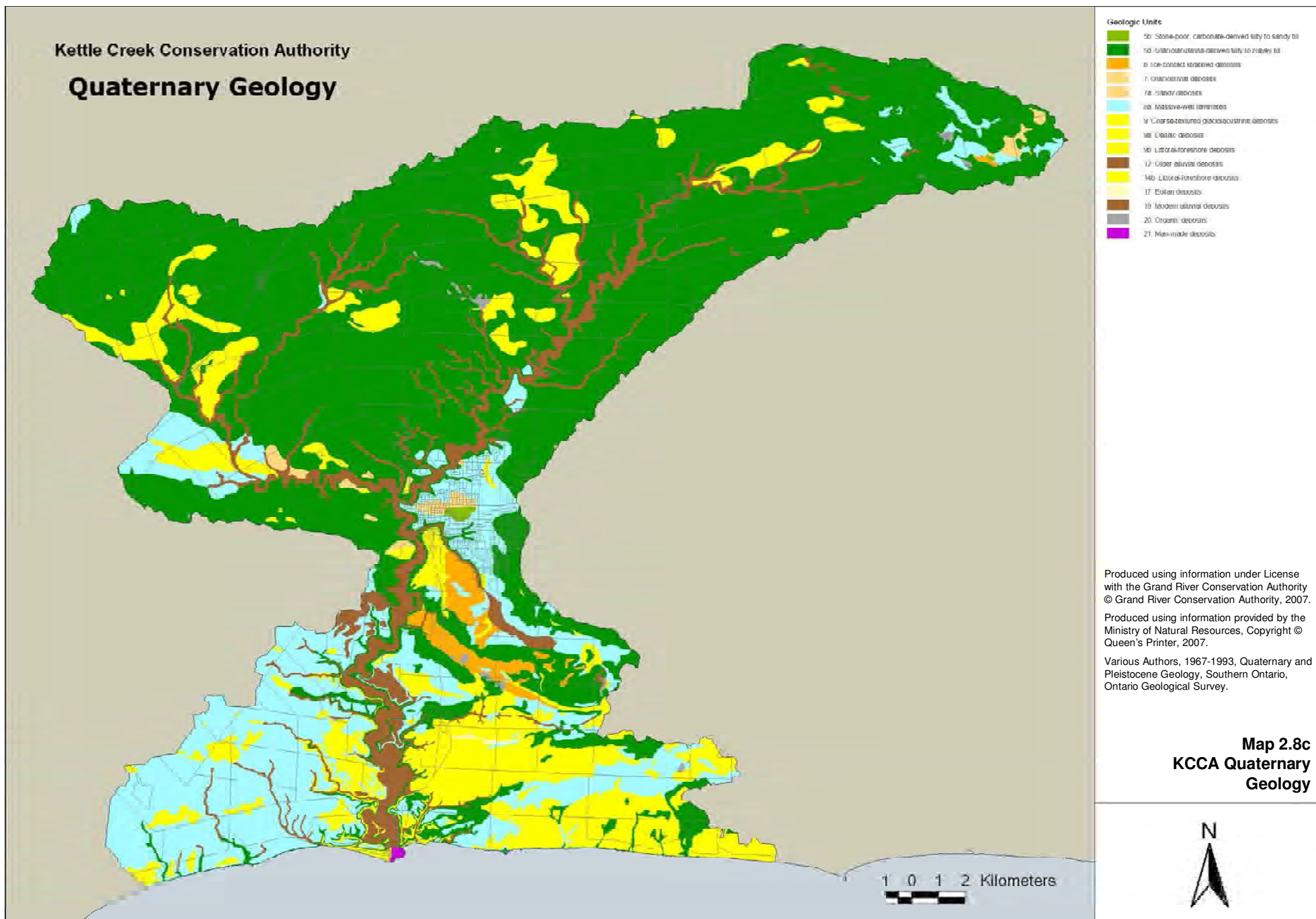
Various Authors, 1967-1993, Quaternary and  
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**Map 2.8b**  
**CCCA Quaternary**  
**Geology**

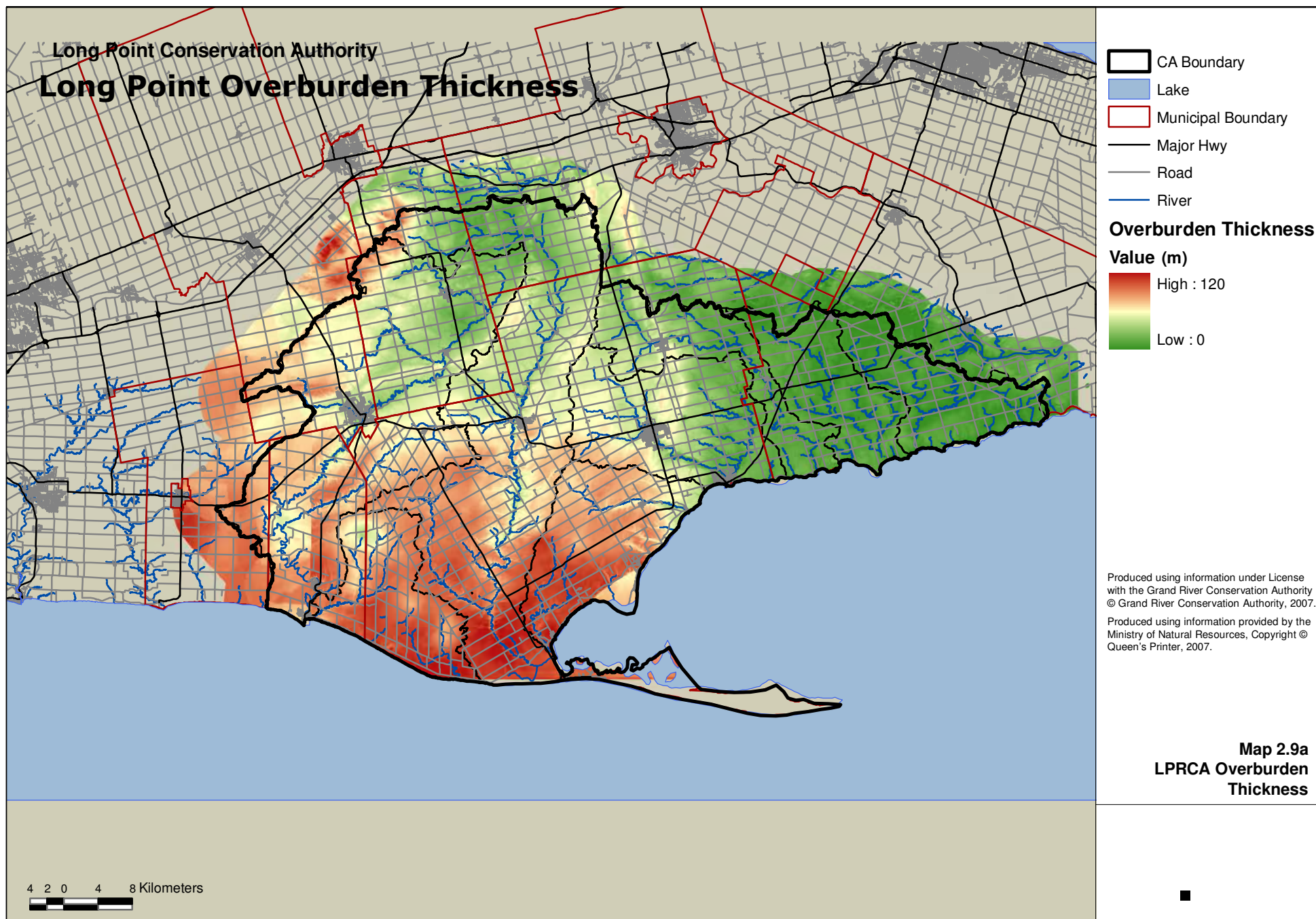


Kettle Creek Conservation Authority

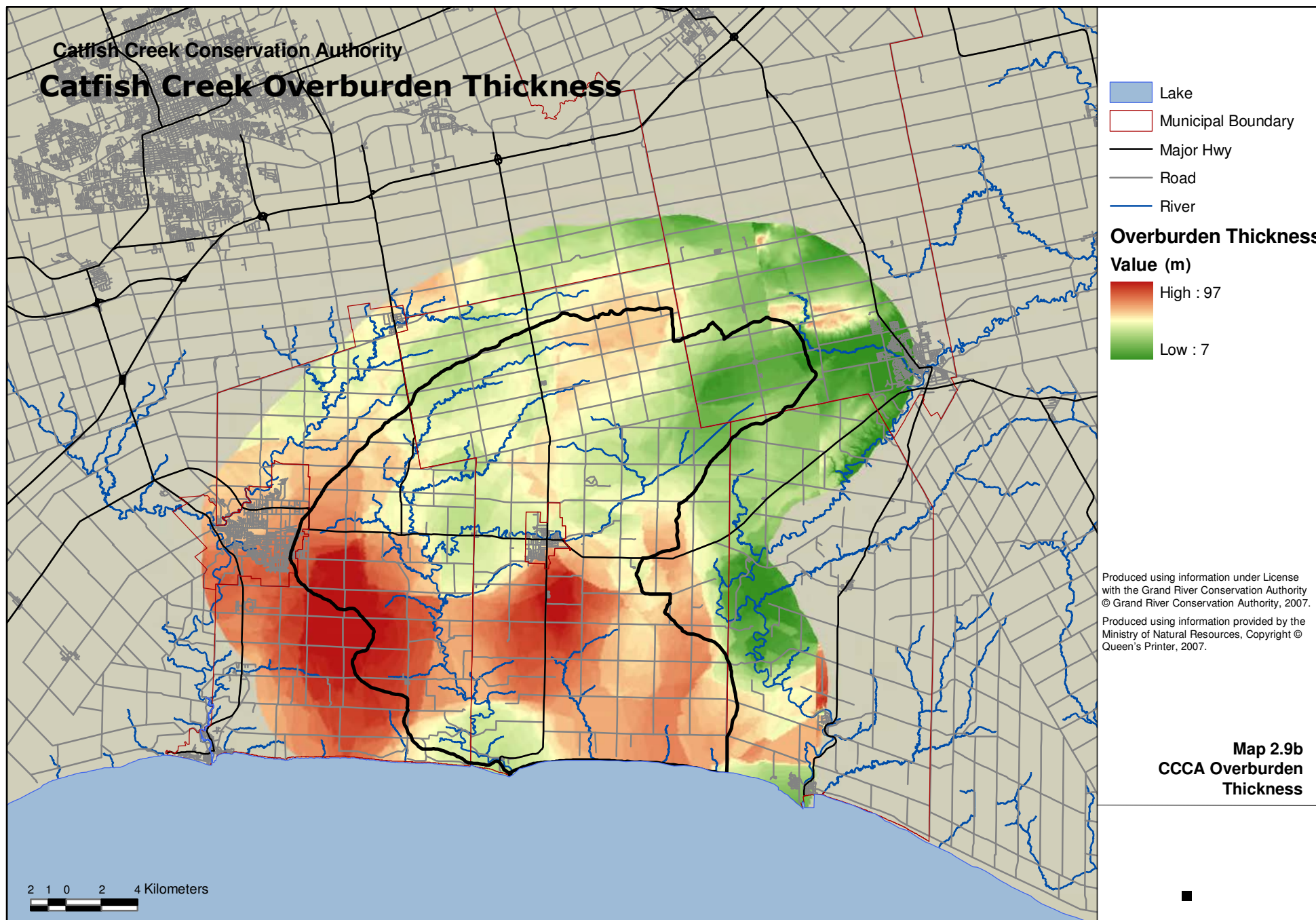
## Quaternary Geology



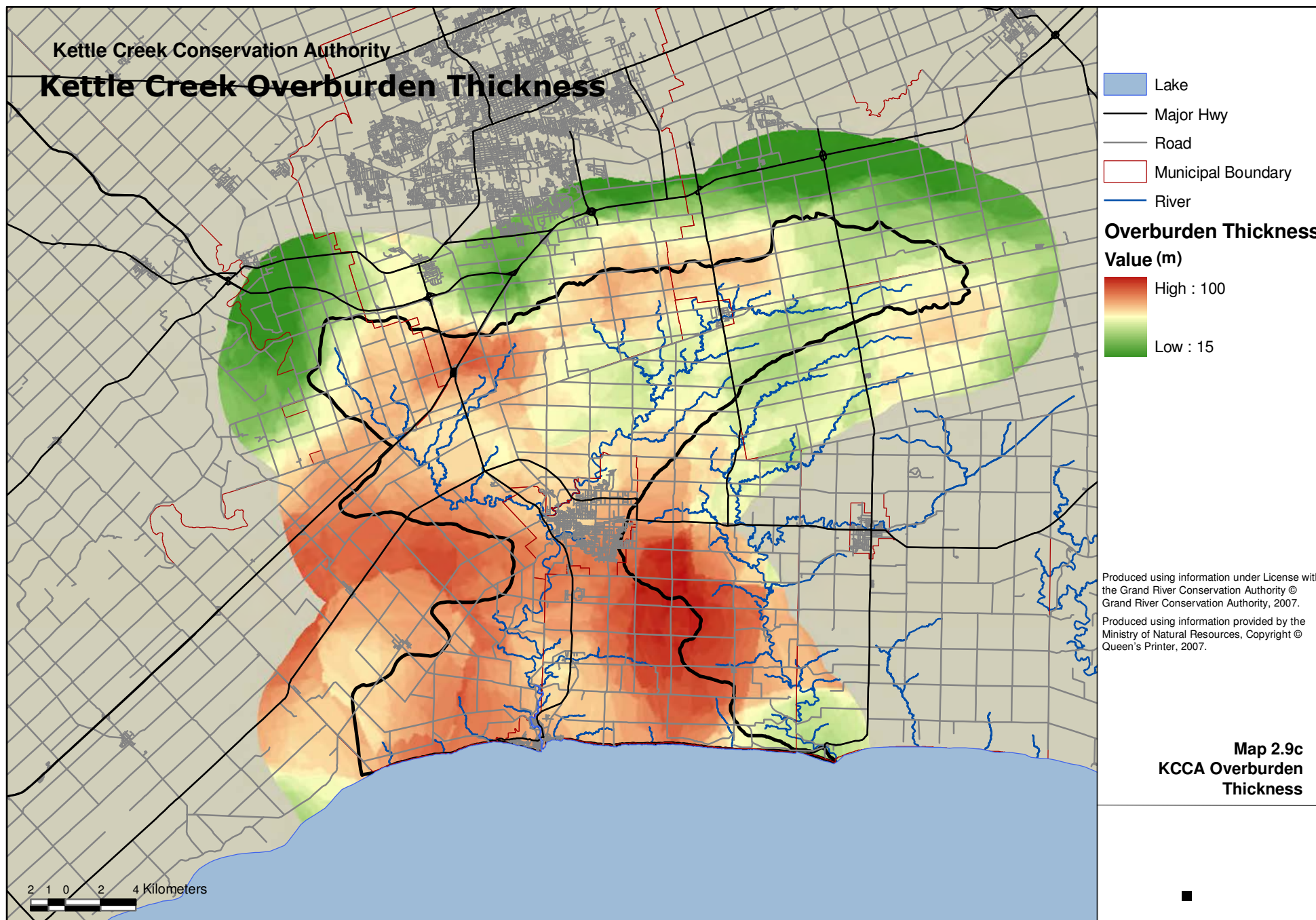




Catfish Creek Conservation Authority  
**Catfish Creek Overburden Thickness**

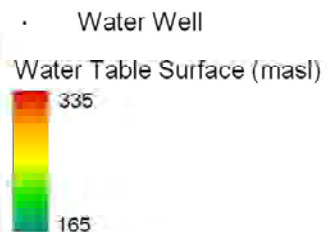
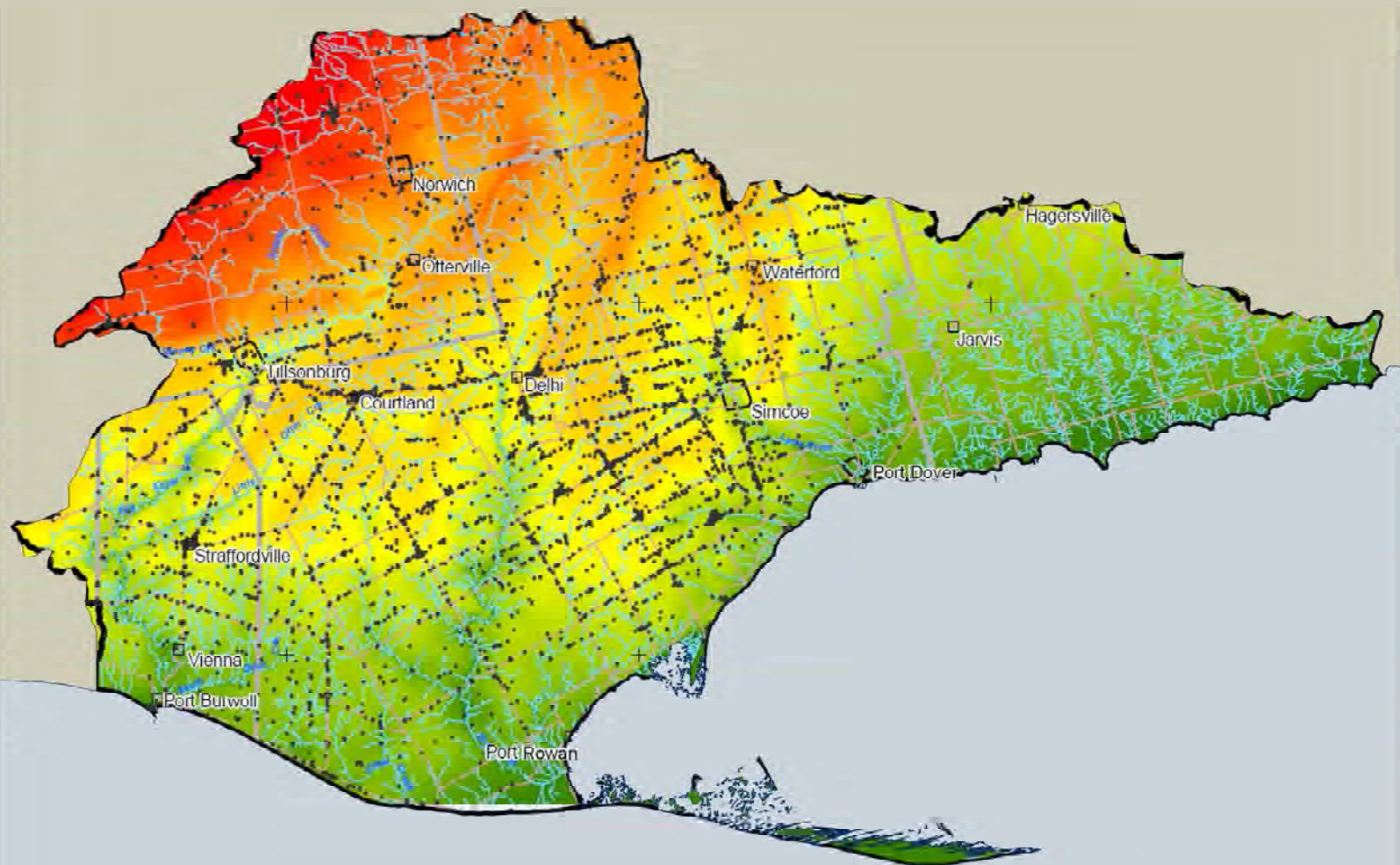






Long Point Region Conservation Authority

## Water Table Surface



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**Map 2.10a**  
**LPRCA Water Table**  
**Surface**

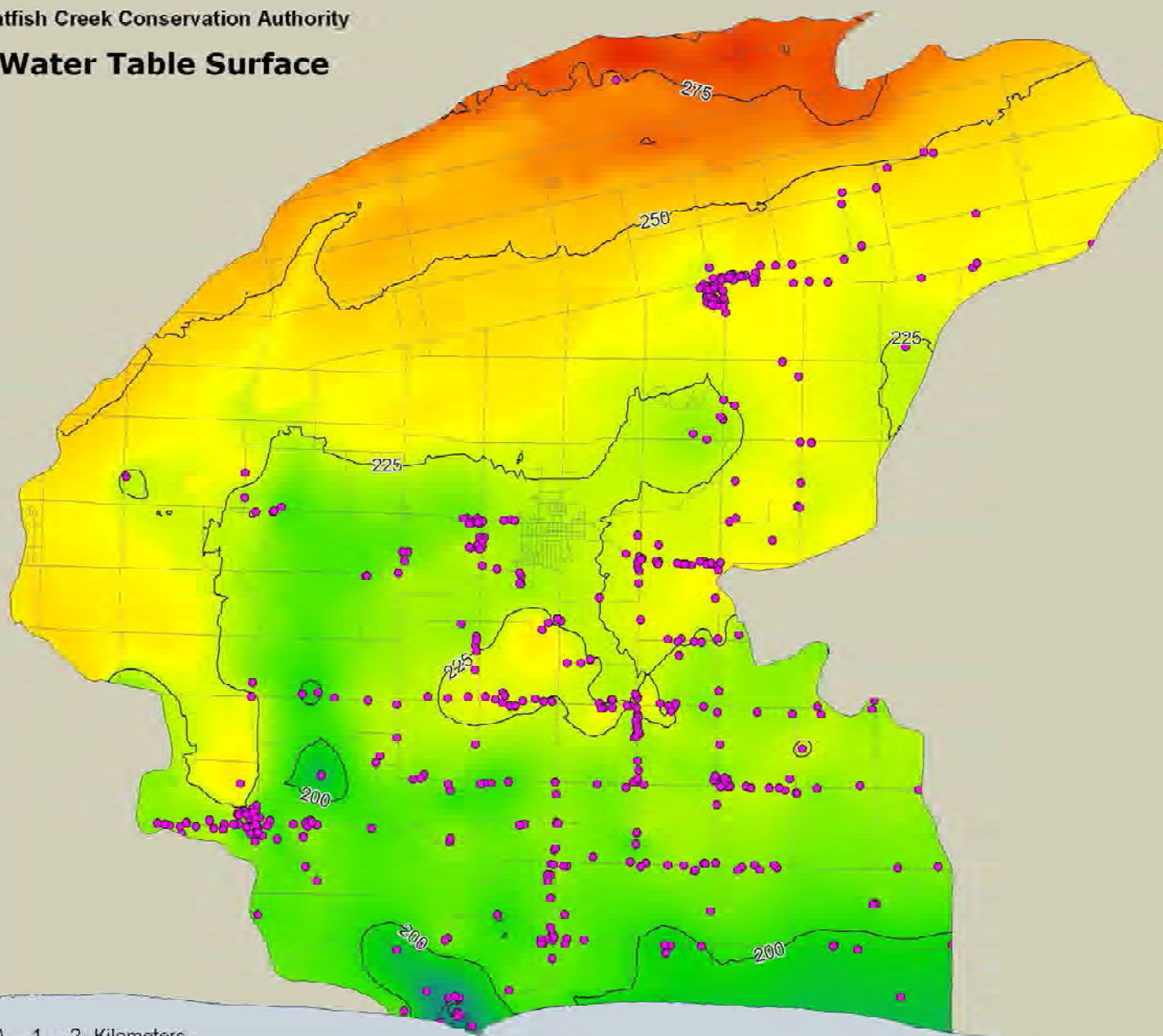
0 3 6 Kilometers





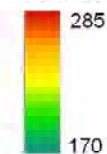
Catfish Creek Conservation Authority

## Water Table Surface



- Water well (<25 m deep)
- Contour Line (Interval = 20 metres)

Water Table Surface  
Elevation (masl)



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**Map 2.10b**  
**CCCA Water Table**  
**Surface**

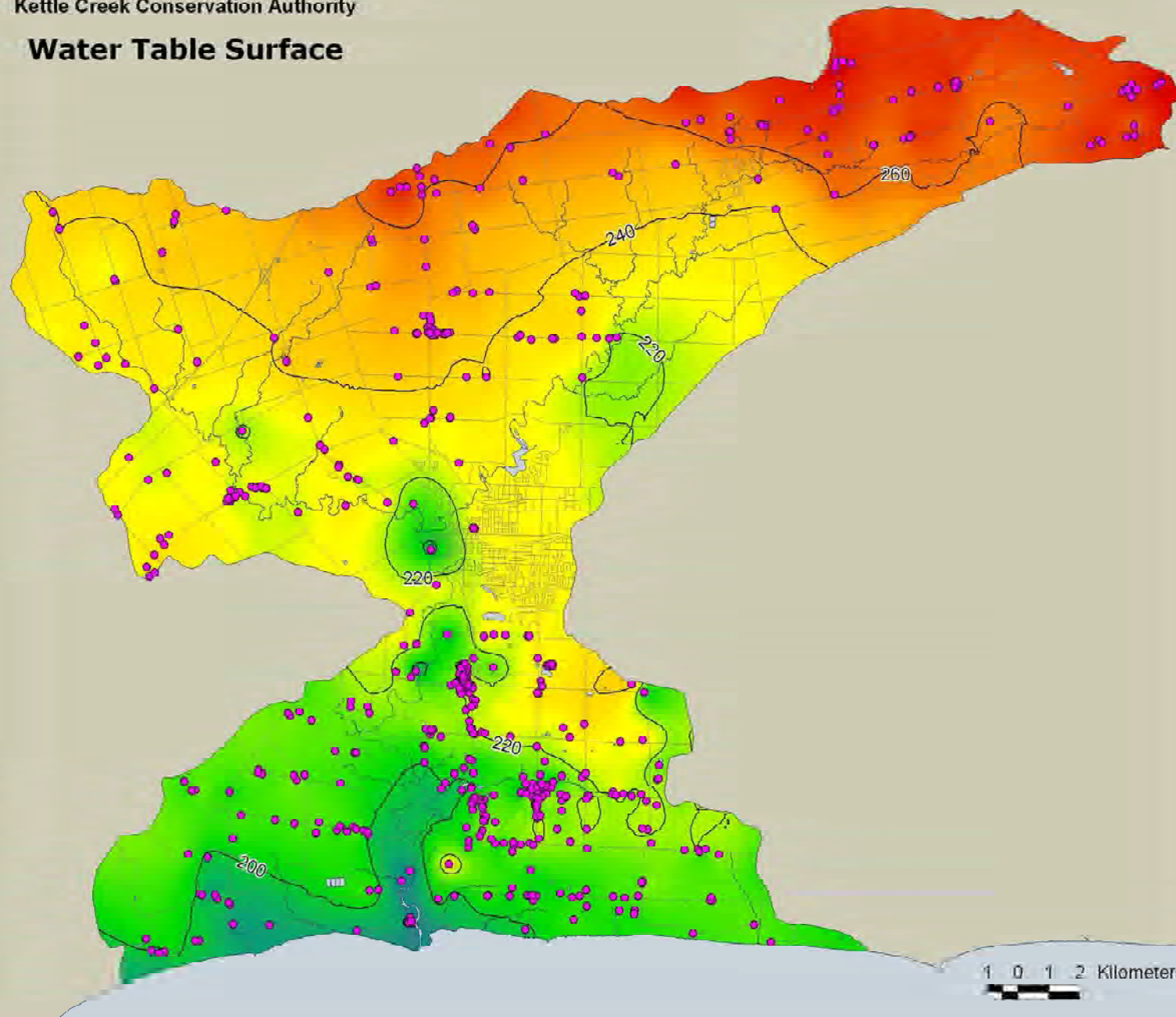


1 0 1 2 Kilometers



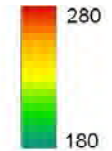
Kettle Creek Conservation Authority

## Water Table Surface



- Water well (<20 m deep)
- Contour Line (Interval = 20 metres)

Water Table Surface  
Elevation (masl)



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**Map 2.10c**  
**KCCA Water Table**  
**Surface**



1 0 1 2 Kilometers

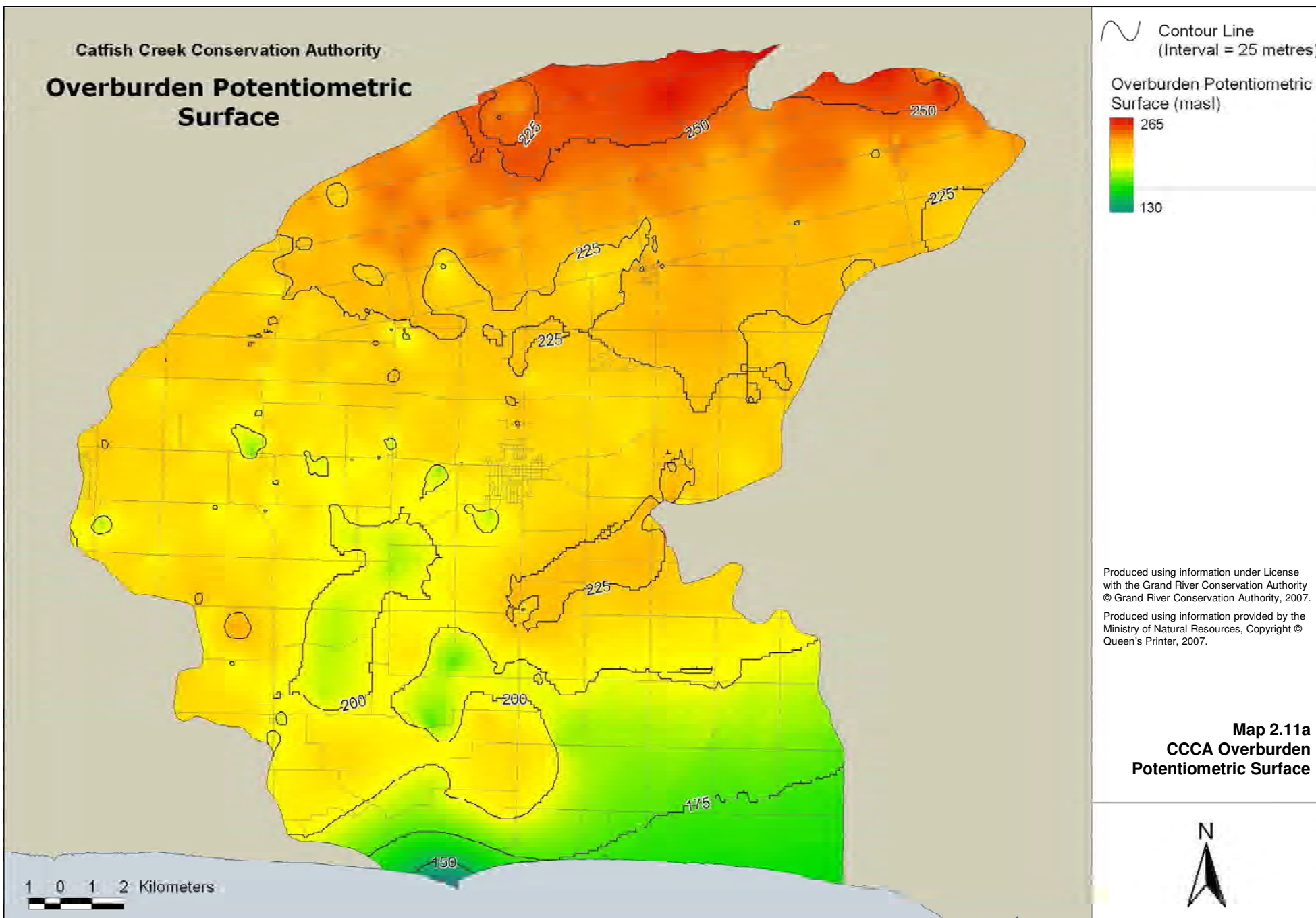
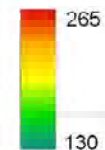


Catfish Creek Conservation Authority

## Overburden Potentiometric Surface

Contour Line  
(Interval = 25 metres)

Overburden Potentiometric  
Surface (masl)



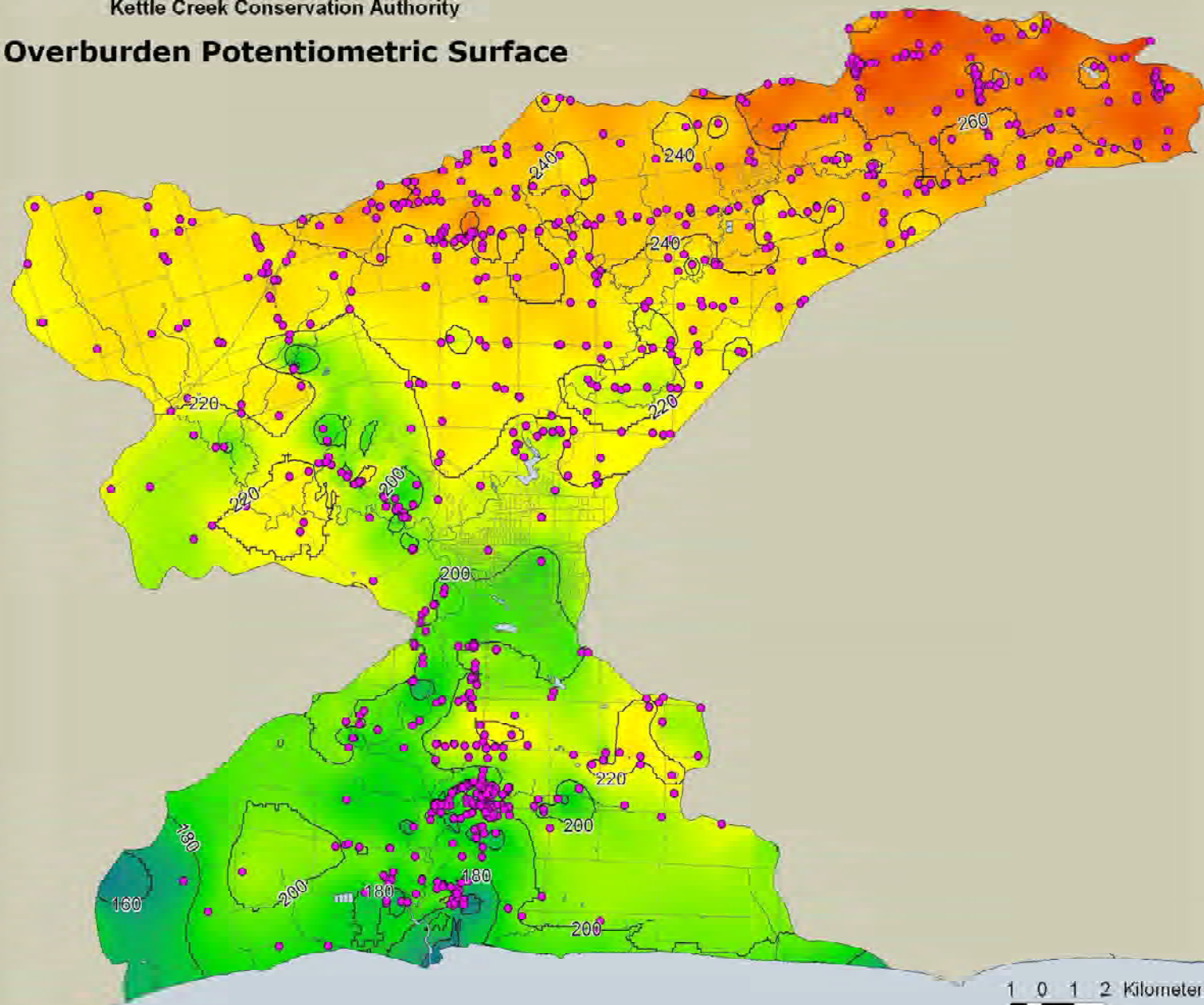
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**Map 2.11a**  
**CCCA Overburden**  
**Potentiometric Surface**

Kettle Creek Conservation Authority

## Overburden Potentiometric Surface



- Water well  
(>20 m deep)
- Contour Line  
(Interval = 20 metres)
- Overburden Potentiometric  
Surface (masl)  
280  
145

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**Map 2.11b**  
**KCCA Overburden**  
**Potentiometric Surface**

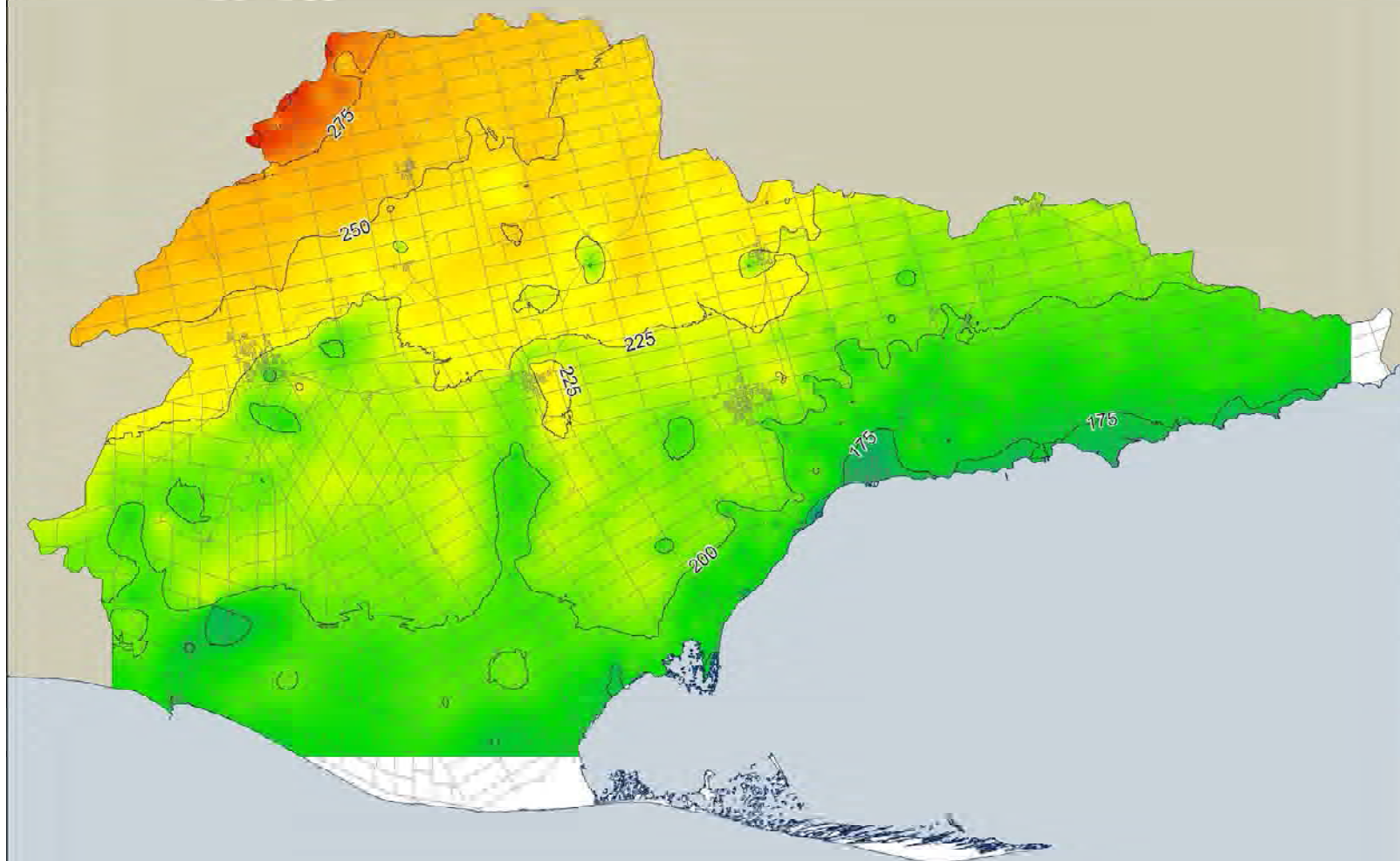
1 0 1 2 Kilometers





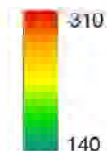
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## Bedrock Potentiometric Surface



Contour Line  
(Interval = 25 metres)

Bedrock Potentiometric  
Surface (masl)



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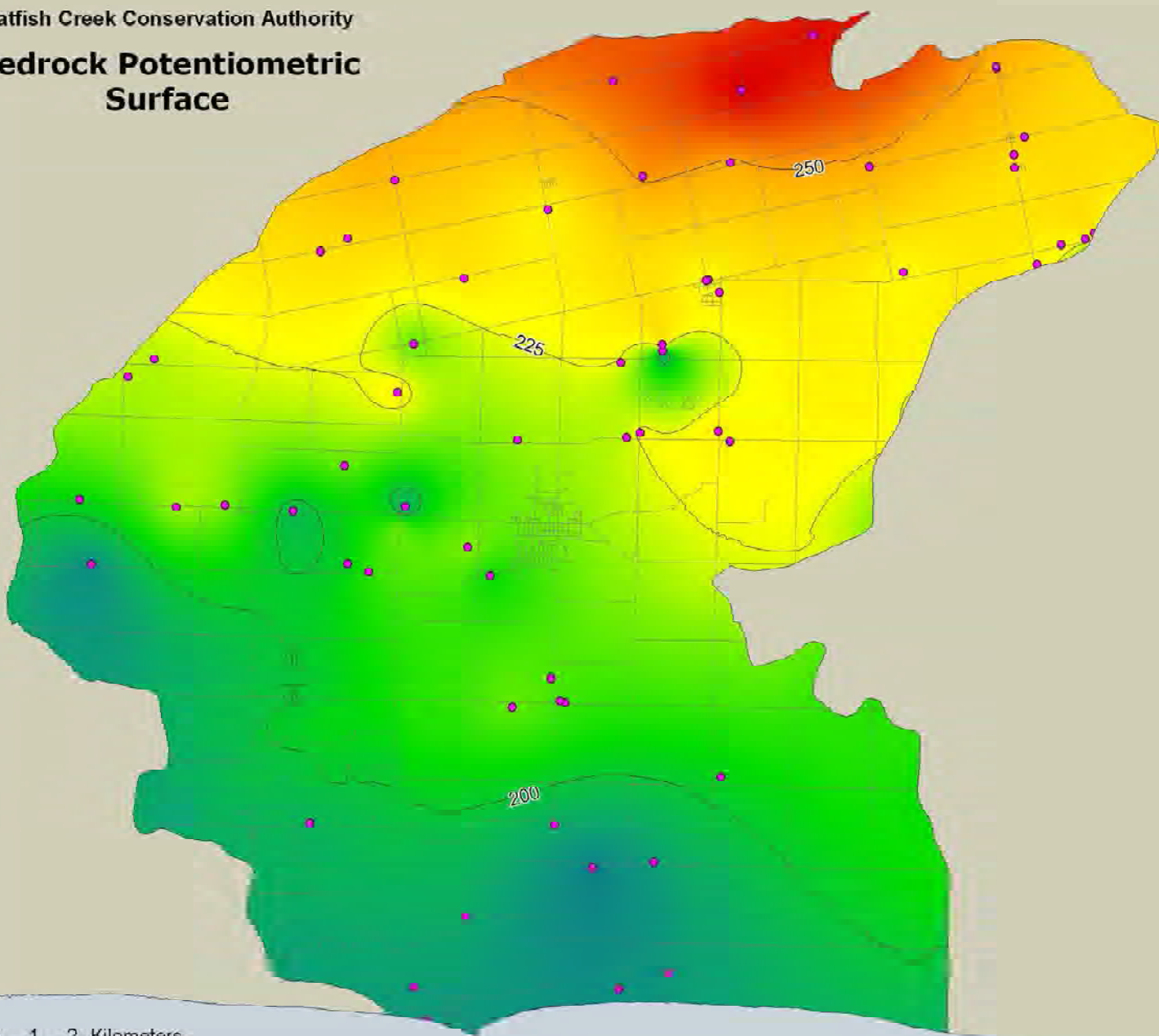
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**Map 2.12a**  
**LPRCA Bedrock**  
**Potentiometric Surface**



0 3 6 Kilometers

Catfish Creek Conservation Authority  
**Bedrock Potentiometric Surface**



1 0 1 2 Kilometers

Bedrock well  
Contour Line  
(Interval = 25 metres)

Bedrock Potentiometric Surface (masl)  
270  
180

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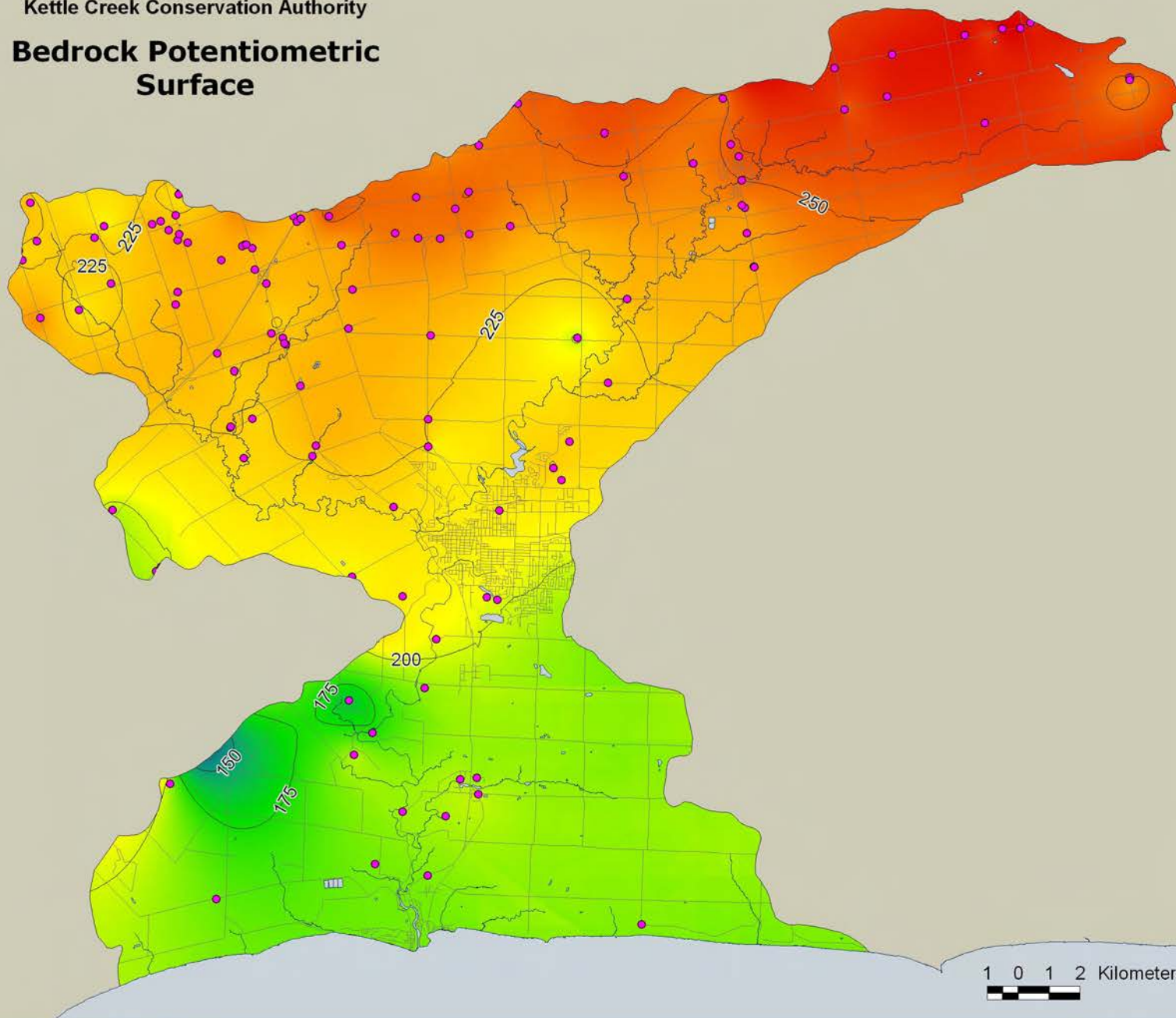
**Map 2.12b**  
**CCCA Bedrock**  
**Potentiometric Surface**





Kettle Creek Conservation Authority

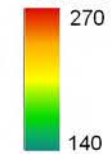
## Bedrock Potentiometric Surface



● Bedrock well

~ Contour Line  
(Interval = 25 metres)

Bedrock Potentiometric  
Surface (masl)



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**Map 2.12c**  
**KCCA Bedrock**  
**Potentiometric Surface**



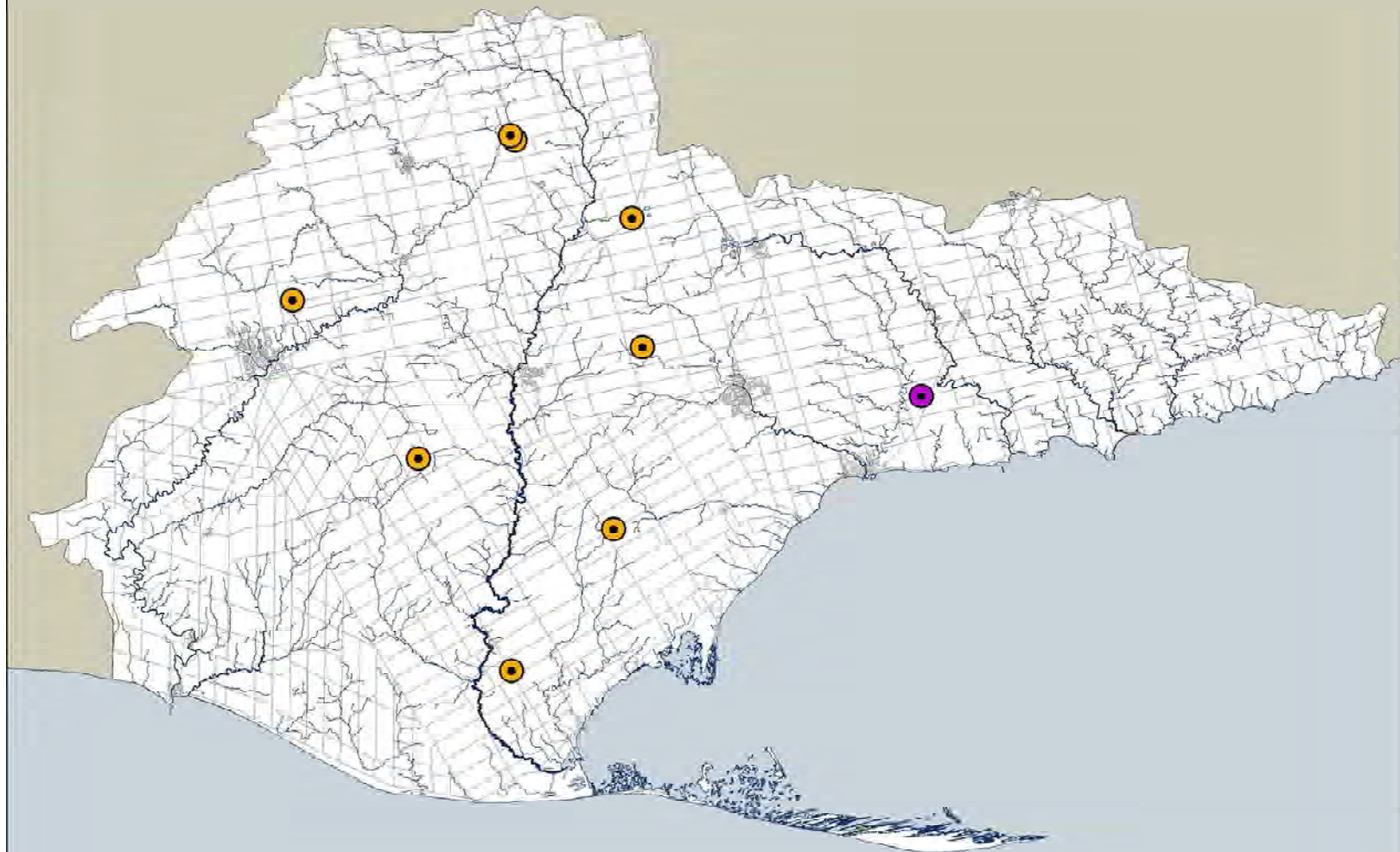
1 0 1 2 Kilometers

Long Point Region Conservation Authority

## PGMN Well Locations

PGMN Well Type

- Overburden
- Bedrock



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**Map 2.13a**  
**LPRCA PGMN**  
**Locations**

0 3 6 Kilometers





Catfish Creek Conservation Authority

## PGMN Well Locations

PGMN Well Type

Overburden

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**CCCA PGMN Locations**



1 0 1 2 Kilometers



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## PGMN Well Locations

PGMN Well Type

Overburden

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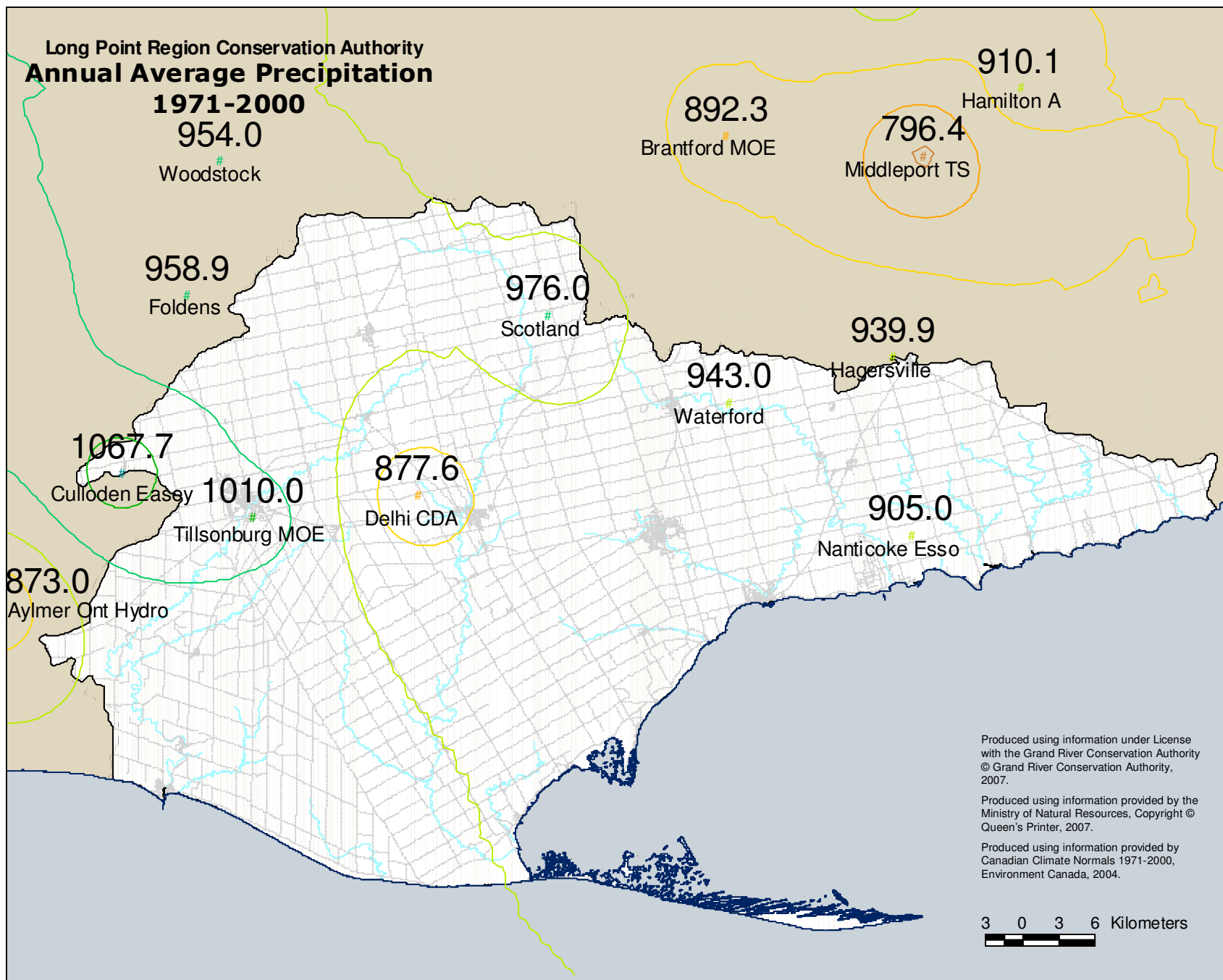
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Map 2.13c  
KCCA PGMN Locations

1 0 1 2 Kilometers







Average Annual Precipitation

- # 800 - 850
- # 850 - 900
- # 900 - 950
- # 950 - 1000
- # 1000 - 1050
- # 1050 - 1100
- # 1100 - 1150

Contours of Precipitation

- 800
- 850
- 900
- 950
- 1000
- 1050
- 1100
- 1150

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3 0 3 6 Kilometers

**Map 2.14a**  
**LPRCA Annual Precipitation**



Catfish Creek Conservation Authority  
**Average Annual Precipitation**  
**1971-2000**

988.9

# Westminster TWP WPCP

1067.7

Culloden Easey

1010.0

Tillsonburg MOE #

1016.6

# St. Thomas WPCP

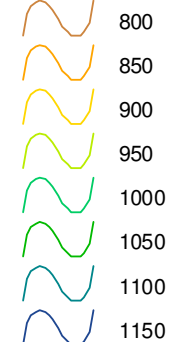
873.0

# Aylmer Ont Hydro

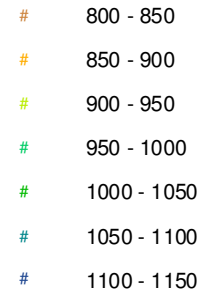
1040.3

# Port Stanley

Contours of  
Precipitation



Average Annual  
Precipitation (mm)



Waterways

Roads

Lake Erie

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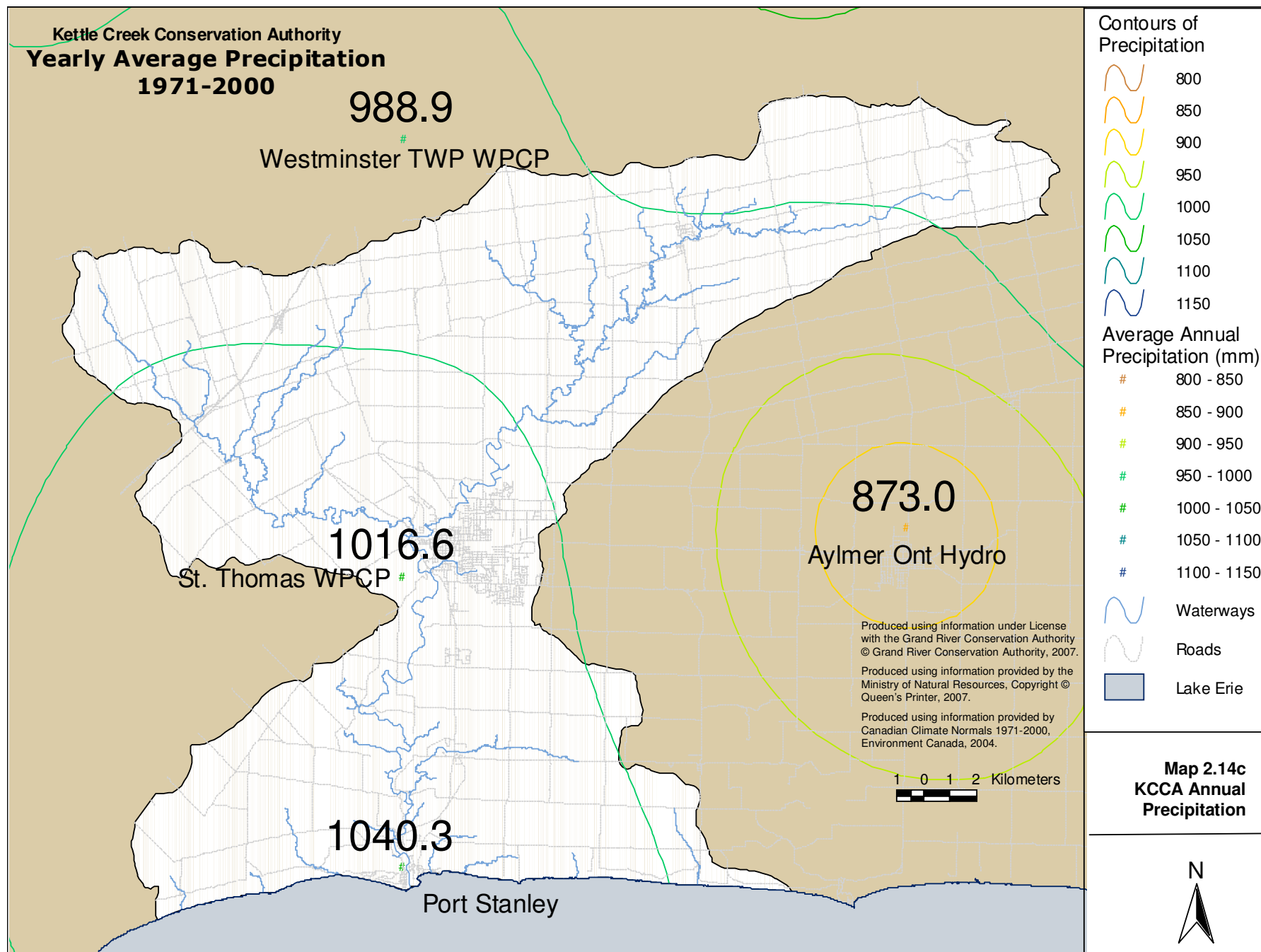
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Environment Canada, 2004.

**Map 2.14b**  
**CCCA Annual**  
**Precipitation**



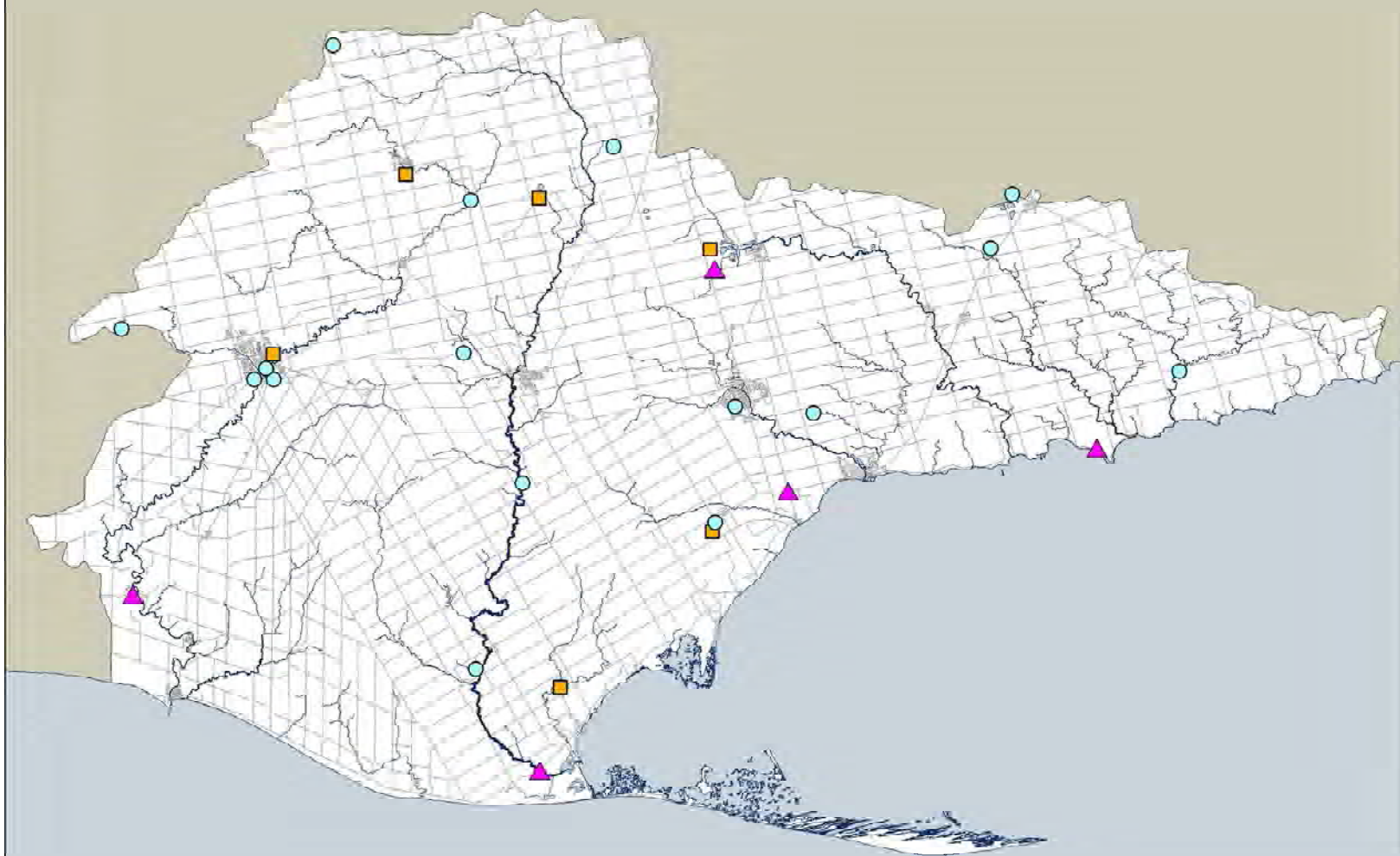
1 0 1 2 Kilometers





Long Point Region Conservation Authority  
**Precipitation Monitoring**

- ▲ LPRCA Rain Gauge
- Other Rain Gauge
- Snow Survey Location



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**Map 2.15a**  
**LPRCA Precipitation**  
**Monitoring**

0 3 6 Kilometers





Catfish Creek Conservation Authority  
**Precipitation Monitoring**

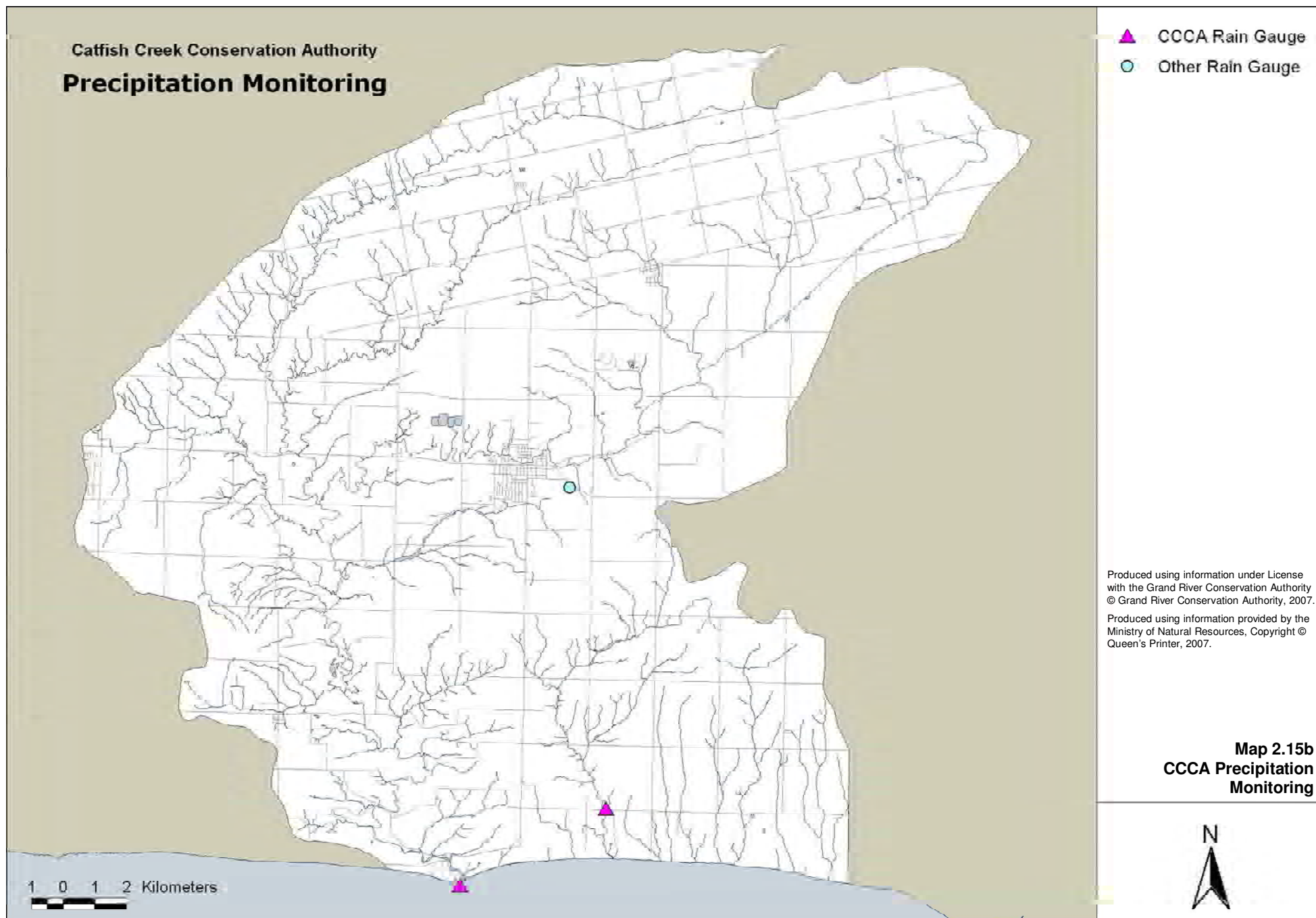
- ▲ CCCA Rain Gauge
- Other Rain Gauge

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**Map 2.15b**  
**CCCA Precipitation**  
**Monitoring**

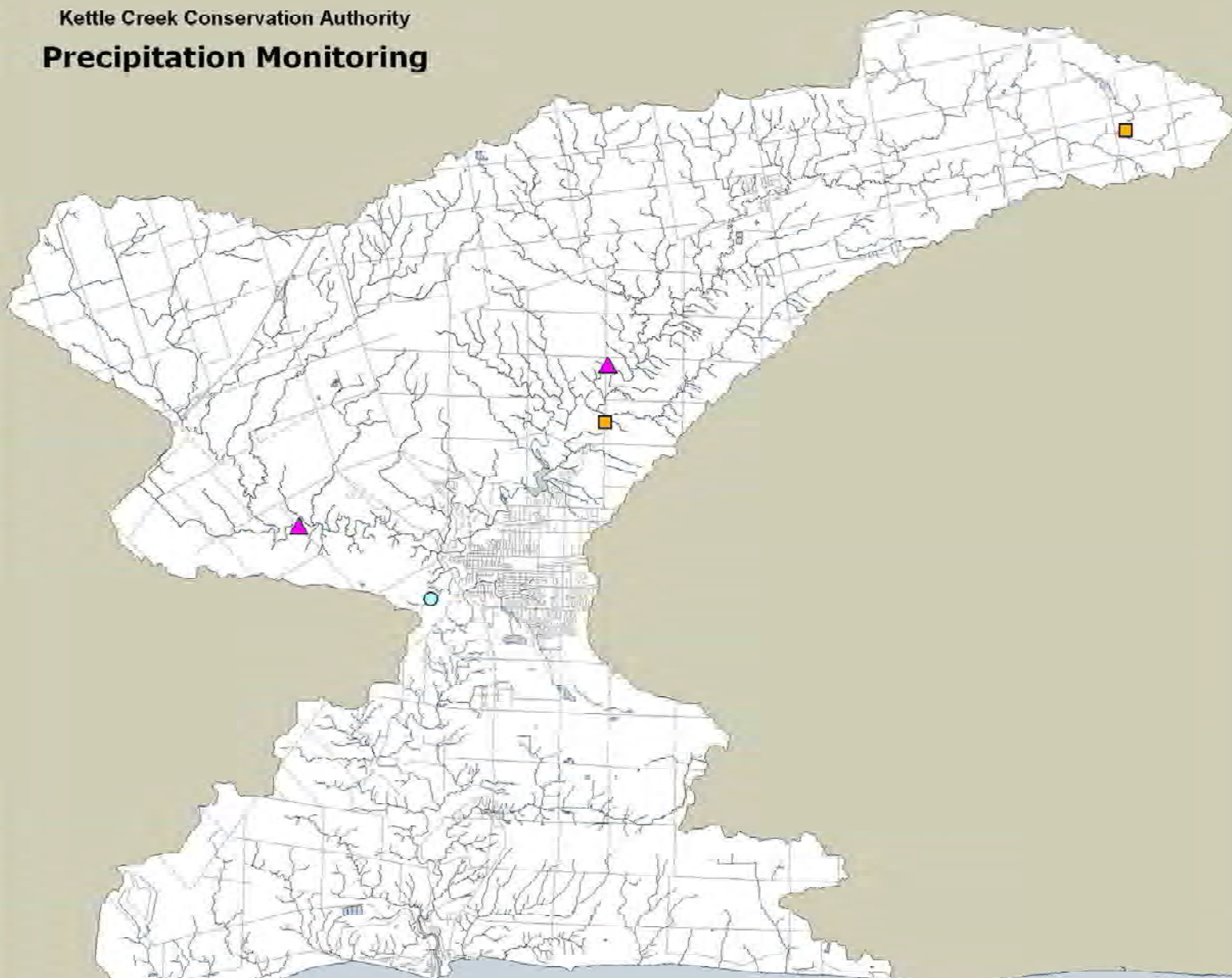


1 0 1 2 Kilometers



**Kettle Creek Conservation Authority**  
**Precipitation Monitoring**

-  KCCA Rain Gauge
-  Other Rain Gauge
-  Snow Survey Location



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**Map 2.15c**  
**KKCA Precipitation**  
**Monitoring**

1 0 1 2 Kilometers

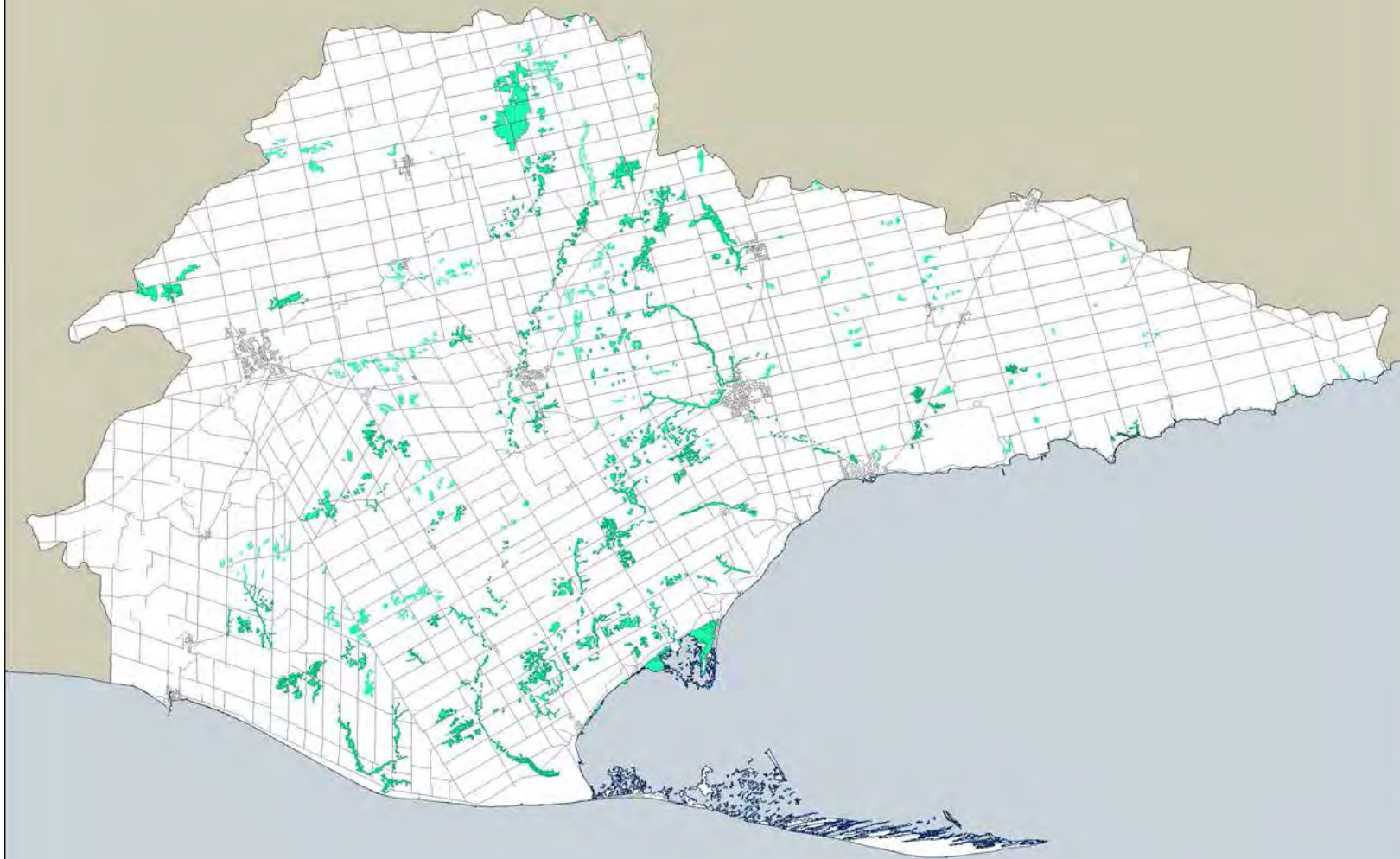




Long Point Region Conservation Authority

## Wetland Areas

-  Provincially Significant Wetland
-  Other Wetland



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**Map 2.16a**  
**LPRCA Wetland Areas**



3 0 3 6 Kilometers

Catfish Creek Conservation Authority

## Wetland Areas

-  Provincially Significant Wetland
-  Other Wetland

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**Map 2.16b**  
**CCCA Wetland Areas**



1 0 1 2 Kilometers





Kettle Creek Conservation Authority


## Wetland Areas

-  Provincially Significant Wetland
-  Other Wetland

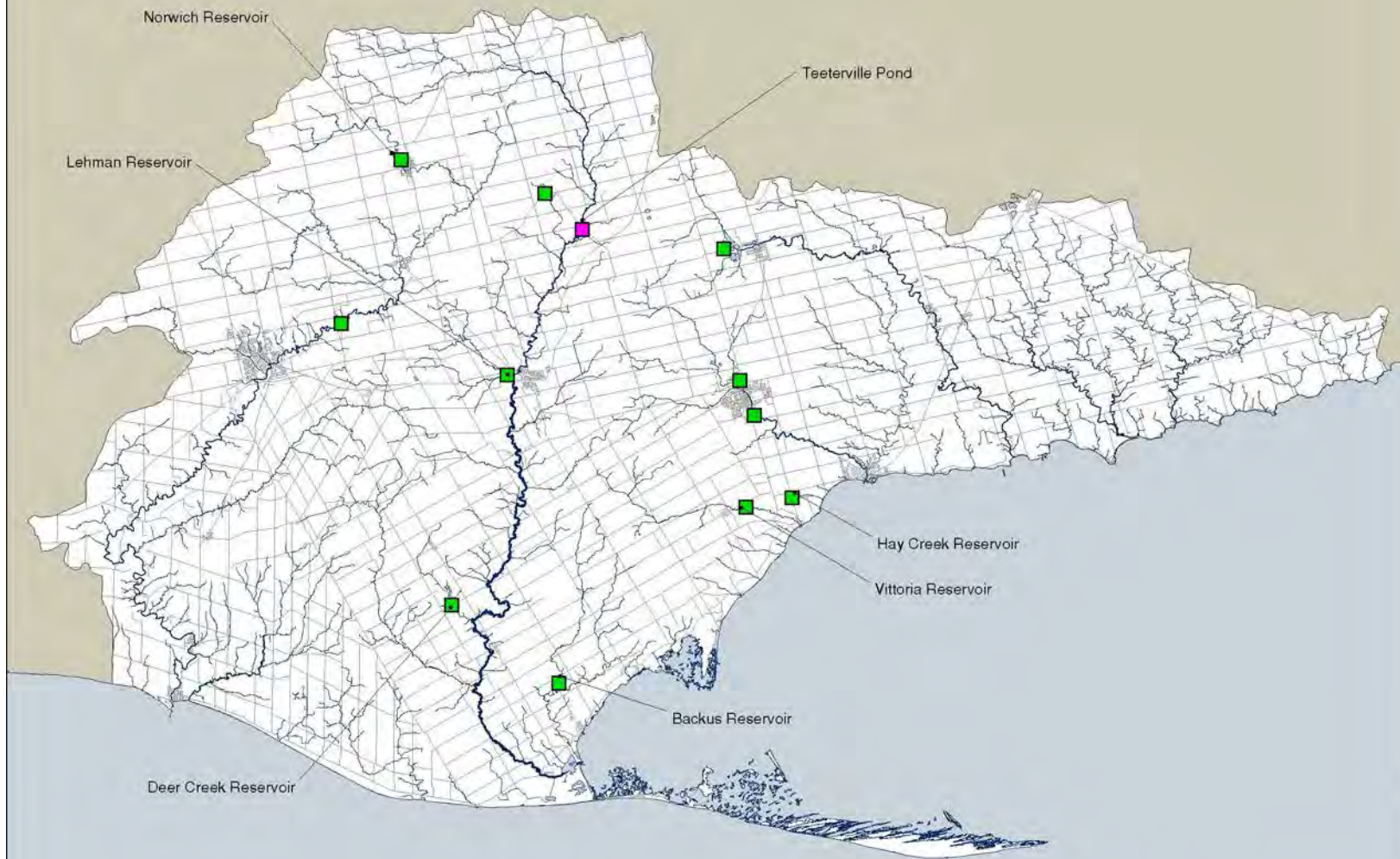
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**Map 2.16c**  
**KCCA Wetland Areas**



1 0 1 2 Kilometers  


Long Point Region Conservation Authority  
**LPRCA Dams and Reservoirs**



**Dam Use**

- Recreation
- Recreation and Flood Control

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**Map 2.17a**  
**LPRCA Dams & Reservoirs**

3 0 3 6 Kilometers

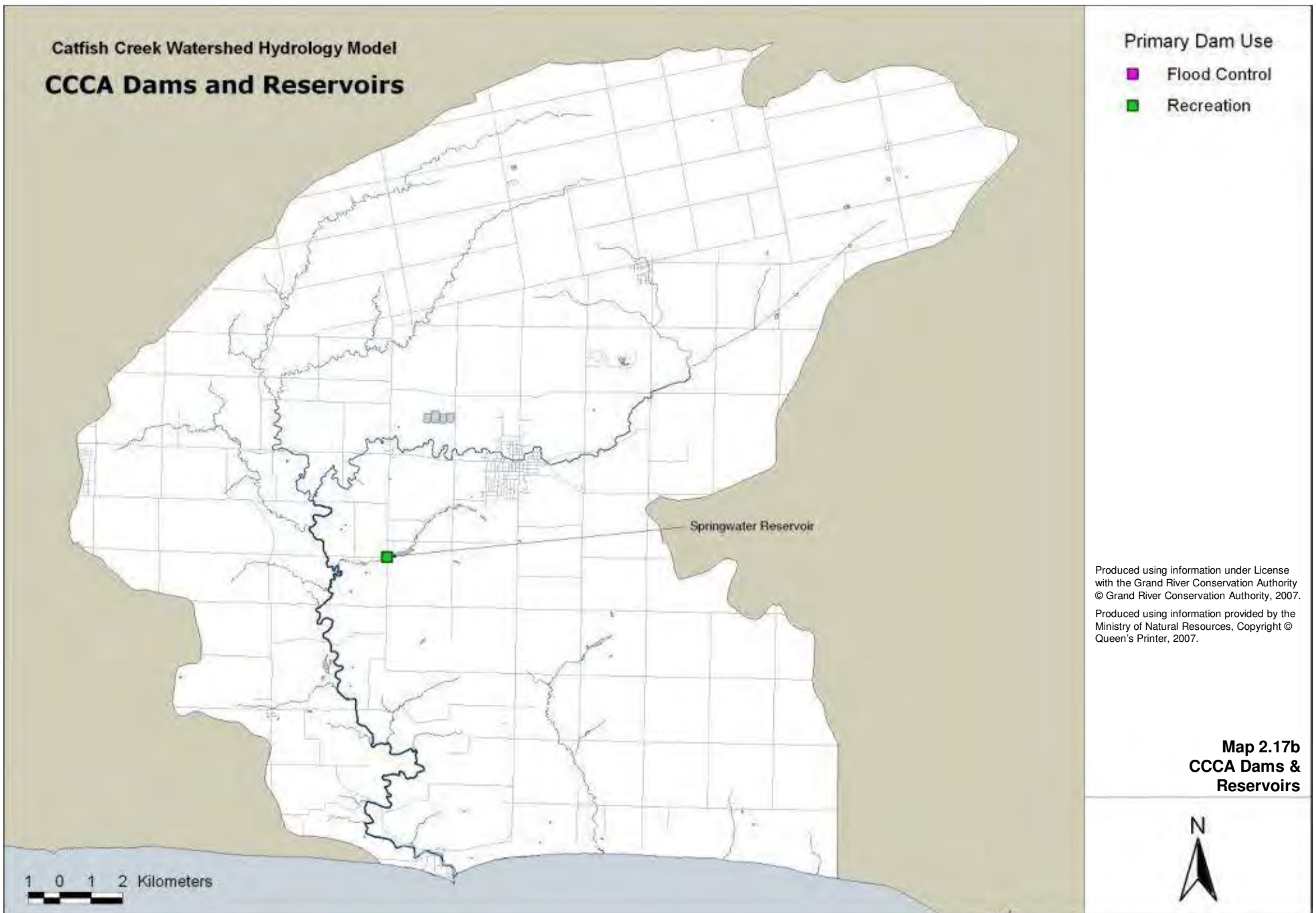




Catfish Creek Watershed Hydrology Model  
**CCCA Dams and Reservoirs**

**Primary Dam Use**

- Flood Control
- Recreation



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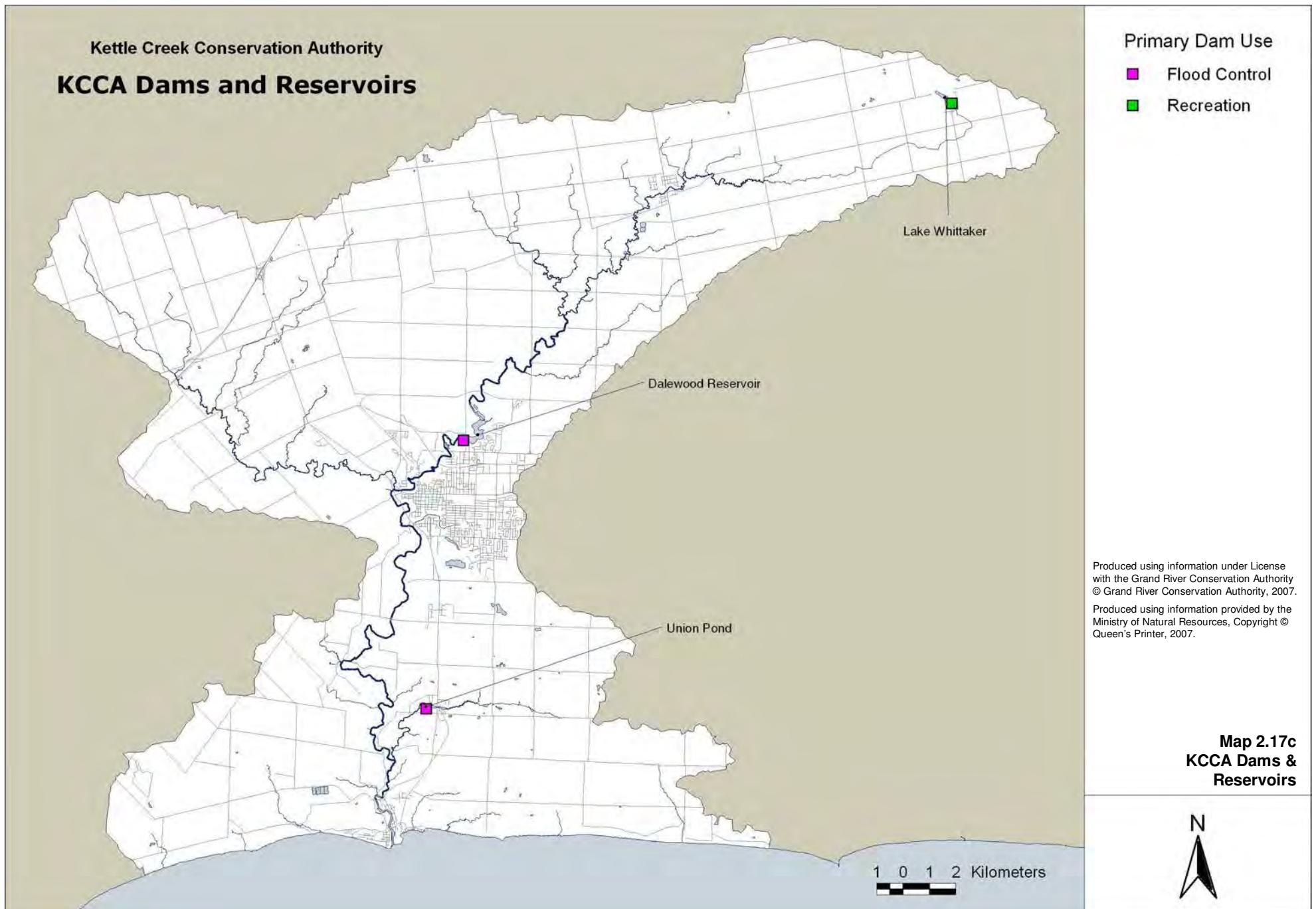
**Map 2.17b  
CCCA Dams &  
Reservoirs**



Kettle Creek Conservation Authority  
**KCCA Dams and Reservoirs**

**Primary Dam Use**

- Flood Control
- Recreation



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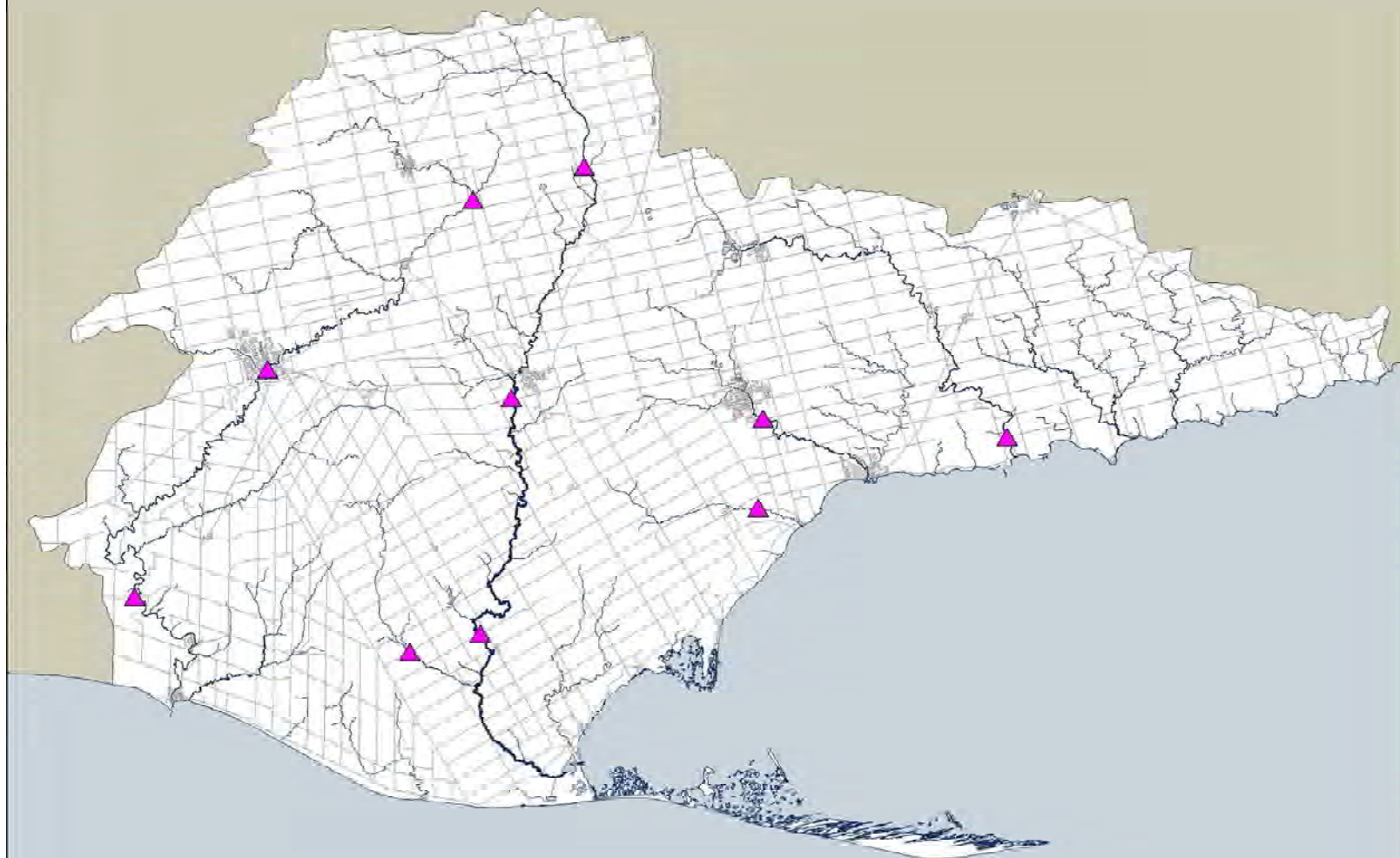
**Map 2.17c**  
**KCCA Dams &**  
**Reservoirs**





Long Point Region Conservation Authority  
**Streamflow Gauging Stations**

 Streamflow Gauging Station



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**Map 2.18a**  
**LPRCA Streamflow**  
**Gauging Stations**

3 0 3 6 Kilometers  




Catfish Creek Conservation Authority

## Streamflow Gauging Stations

▲ Streamflow Gauging Station

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**Map 2.18b**  
**CCCA Streamflow**  
**Gauging Stations**



1 0 1 2 Kilometers

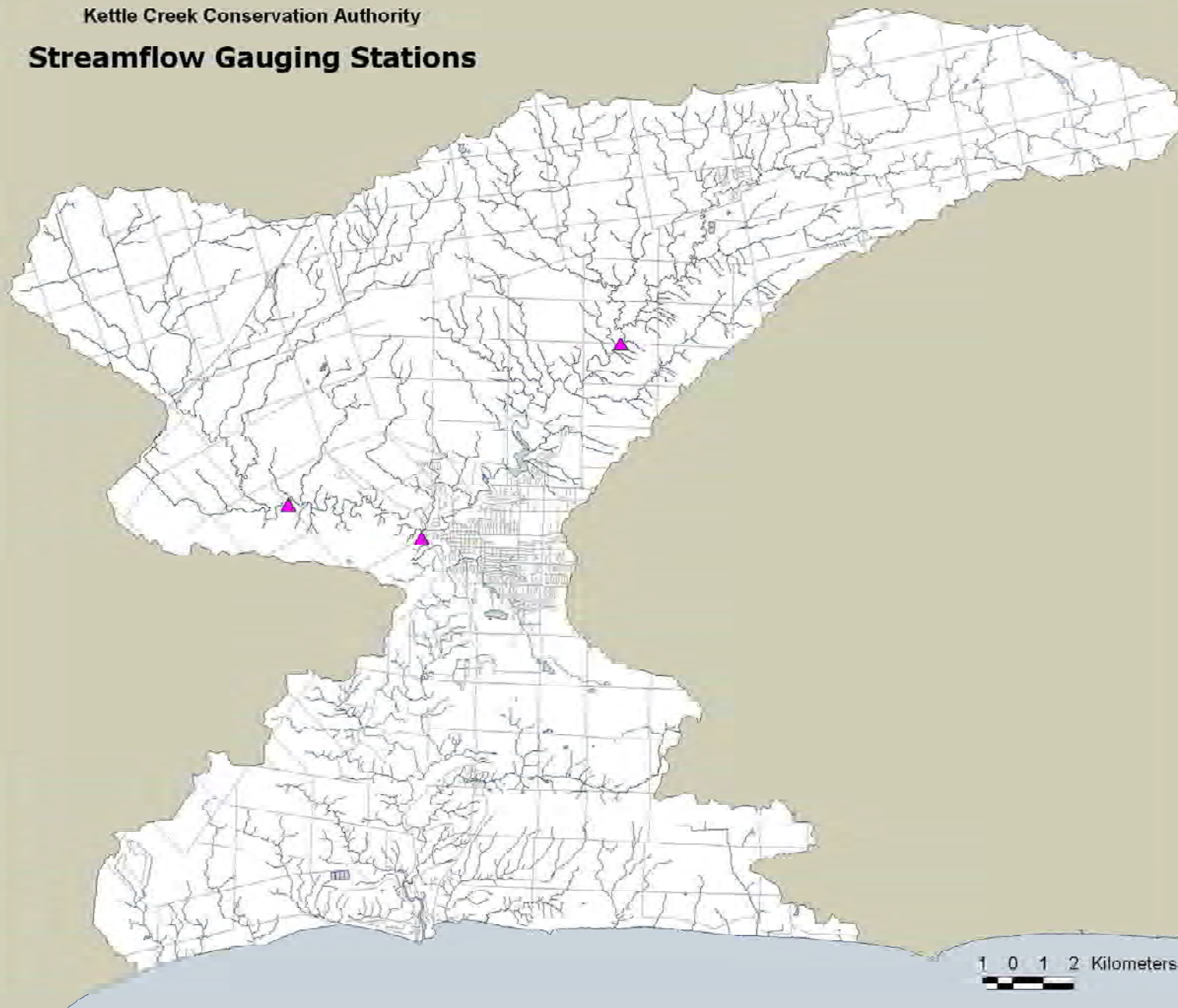




Kettle Creek Conservation Authority

## Streamflow Gauging Stations

▲ Streamflow Gauging Station



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**Map 2.18c**  
**KCCA Streamflow**  
**Gauging Stations**

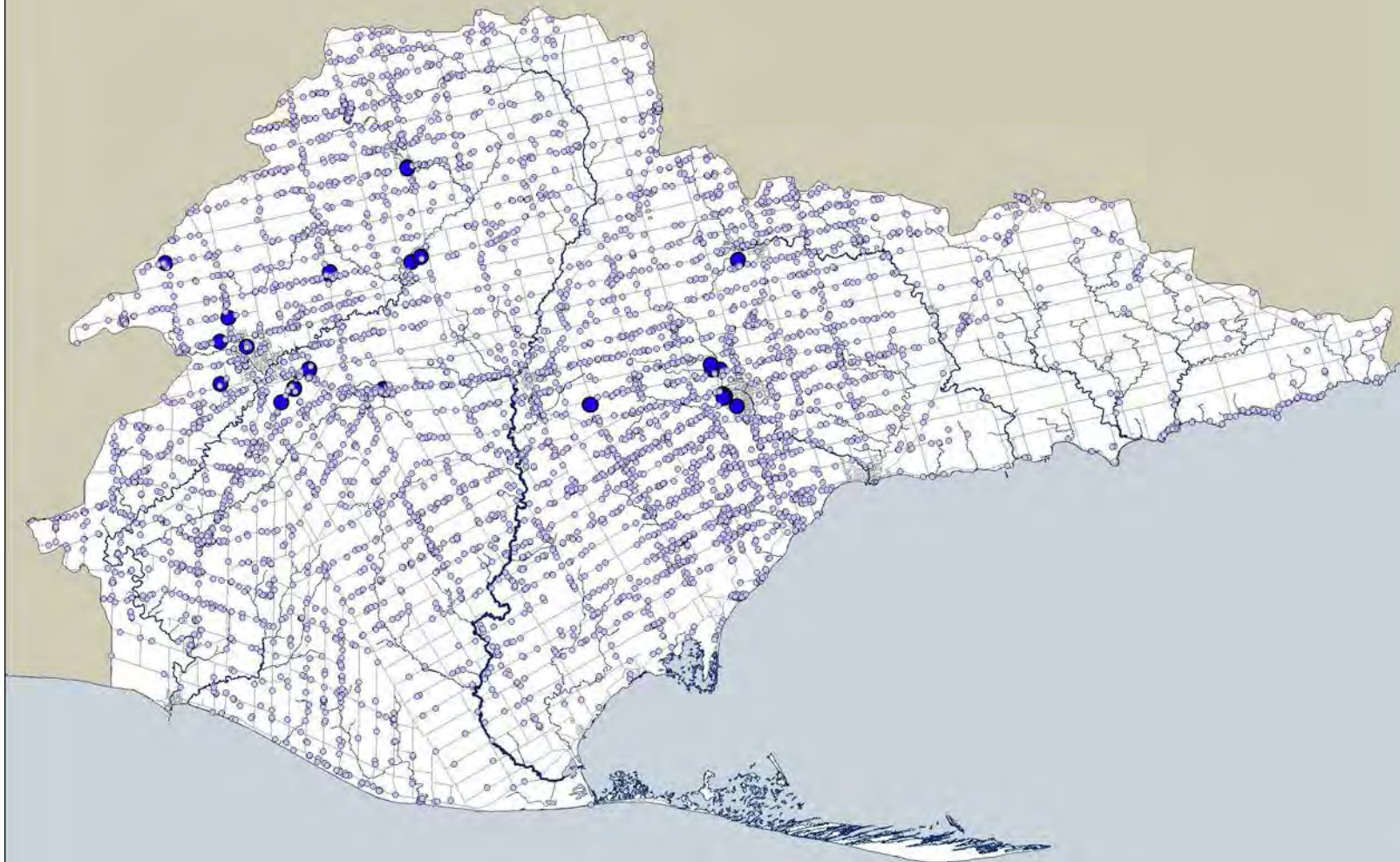


1 0 1 2 Kilometers

Long Point Region Conservation Authority

## Groundwater Use

- Municipal Well
- Domestic Well



3 0 3 6 Kilometers

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**Map 2.19a**  
**LPRCA Municipal and**  
**Domestic**  
**Groundwater Wells**

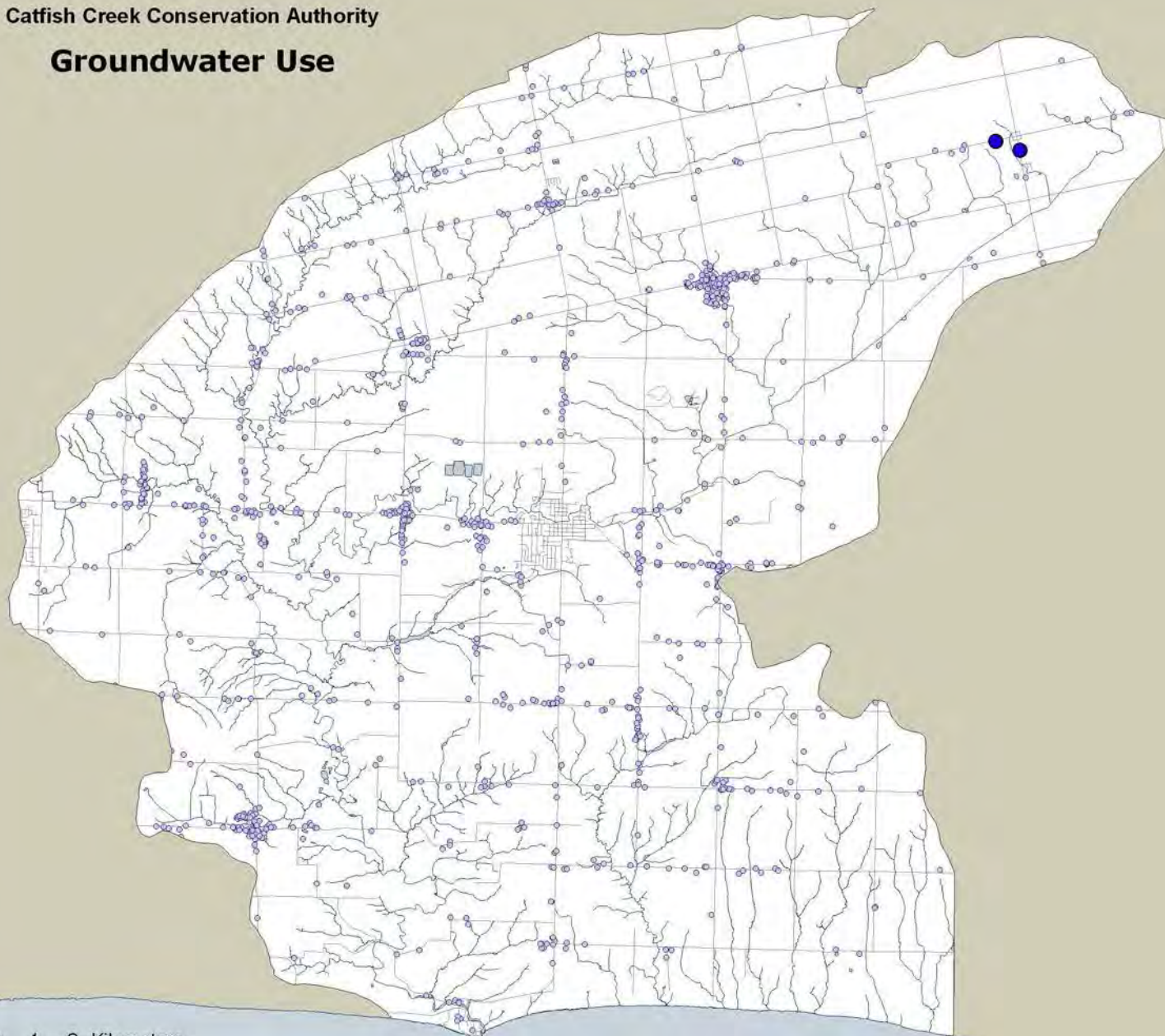




Catfish Creek Conservation Authority

## Groundwater Use

- Municipal Well
- Domestic Well



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**Map 2.19b**  
**CCCA Municipal and**  
**Domestic**  
**Groundwater Wells**

1 0 1 2 Kilometers



Kettle Creek Conservation Authority

## Groundwater Use

- Municipal Well
- Domestic Well



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**Map 2.19c**  
**KCCA Municipal and**  
**Domestic**  
**Groundwater Wells**



1 0 1 2 Kilometers



Long Point Region Conservation Authority

## Surface Water Intakes

▲ Municipal Intake

■ Private Intake



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**Map 2.20a**  
**LPRCA Surface Water**  
**Intakes**

3 0 3 6 Kilometers



Kettle Creek Conservation Authority

## Surface Water Intakes

▲ Municipal Intake

Elgin Area Primary  
Water Supply System

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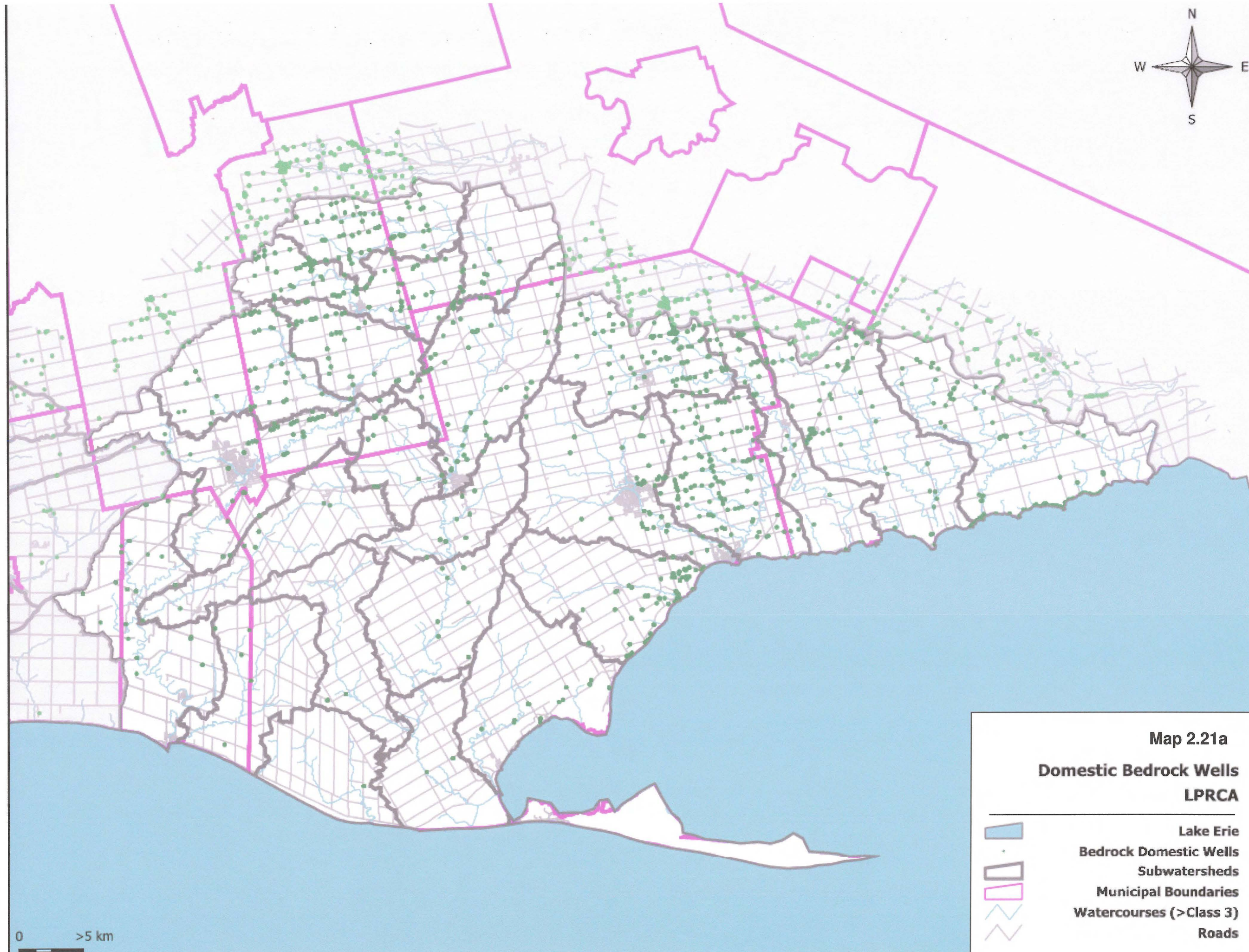
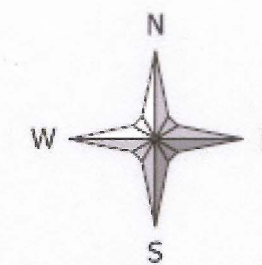
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**Map 2.20b**  
**KCCA Surface Water**  
**Intakes**






1 0 1 2 Kilometers





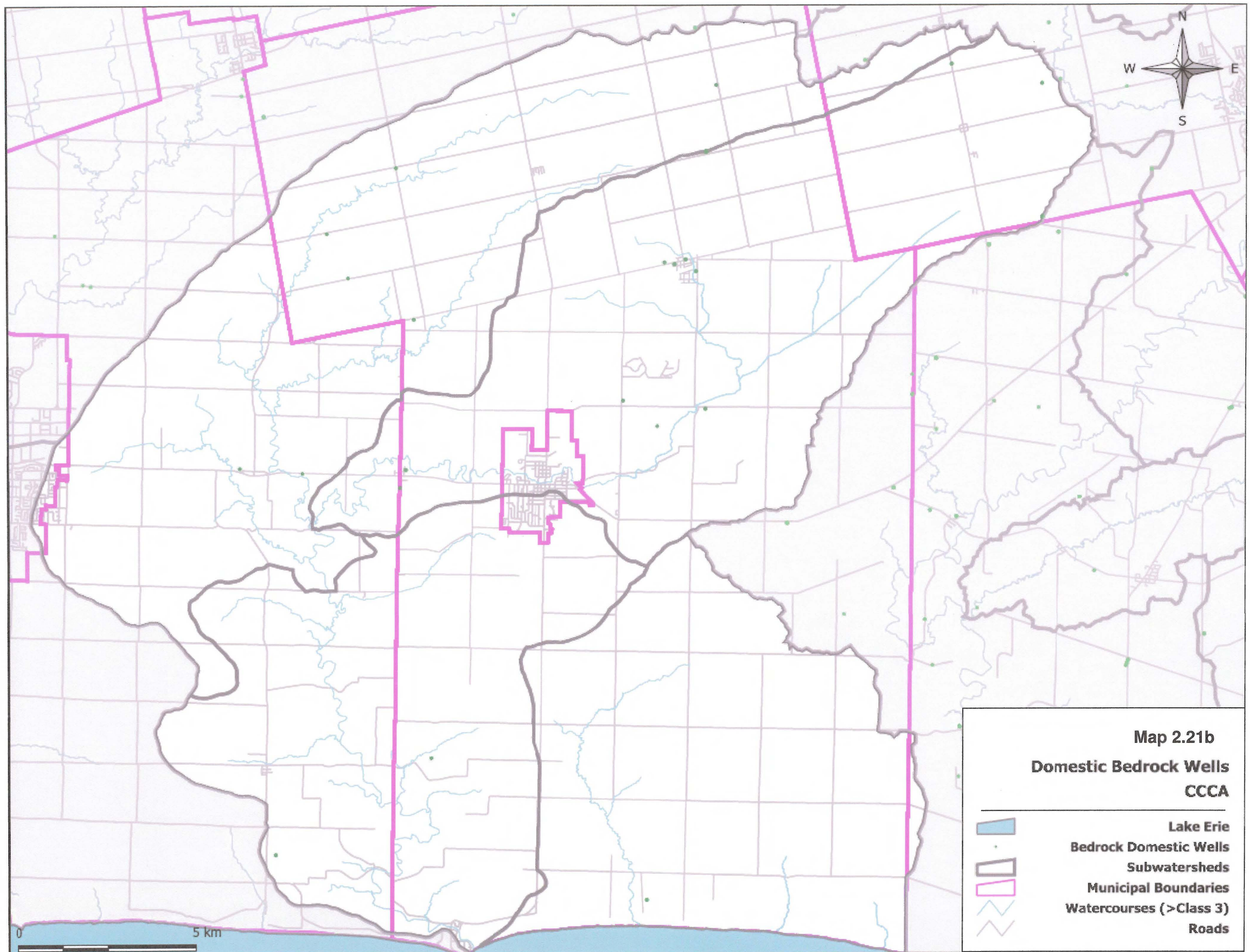


**Map 2.21a**  
**Domestic Bedrock Wells**  
**LPRCA**

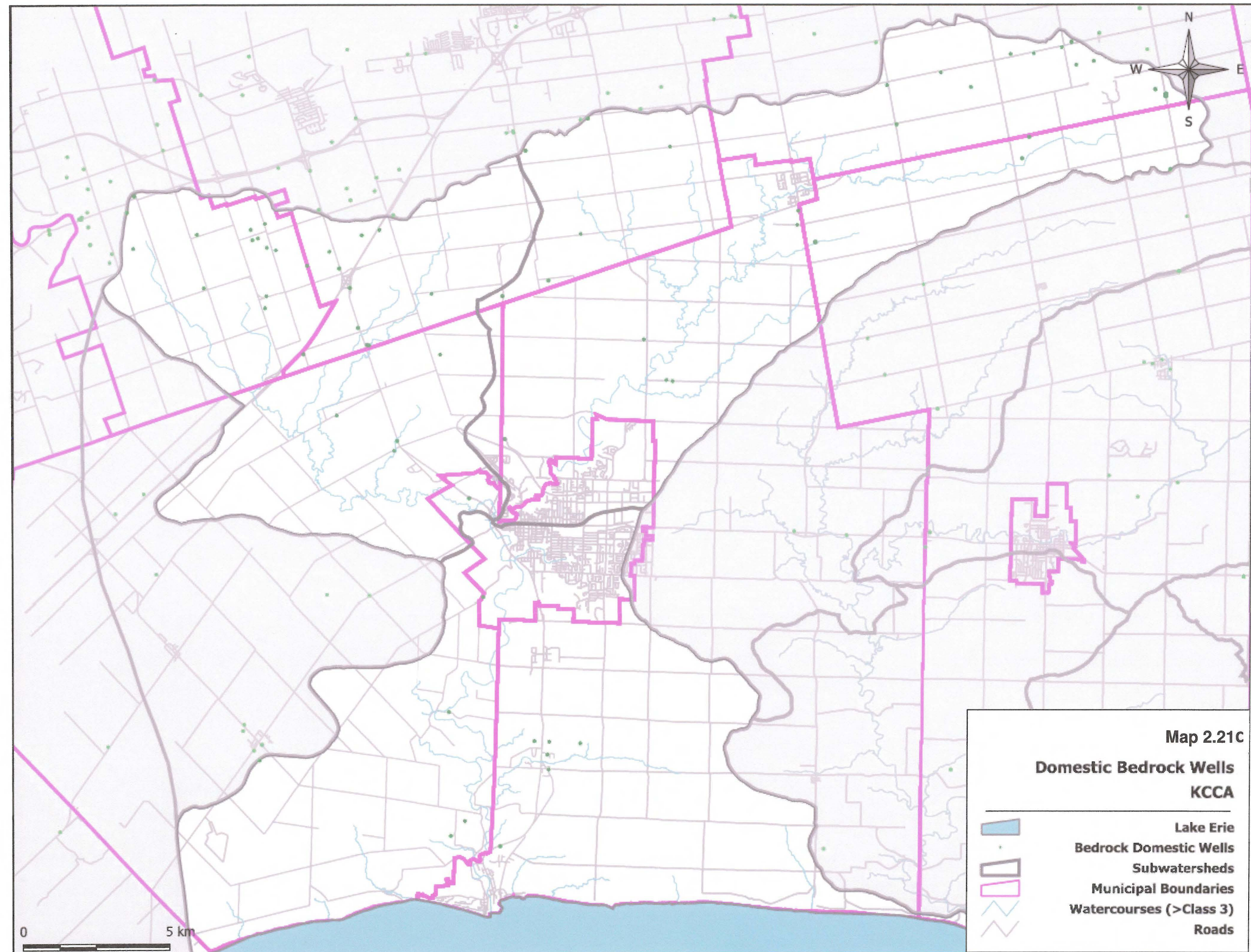
-  Lake Erie
-  Bedrock Domestic Wells Subwatersheds
-  Municipal Boundaries
-  Watercourses (>Class 3)
-  Roads

0 >5 km













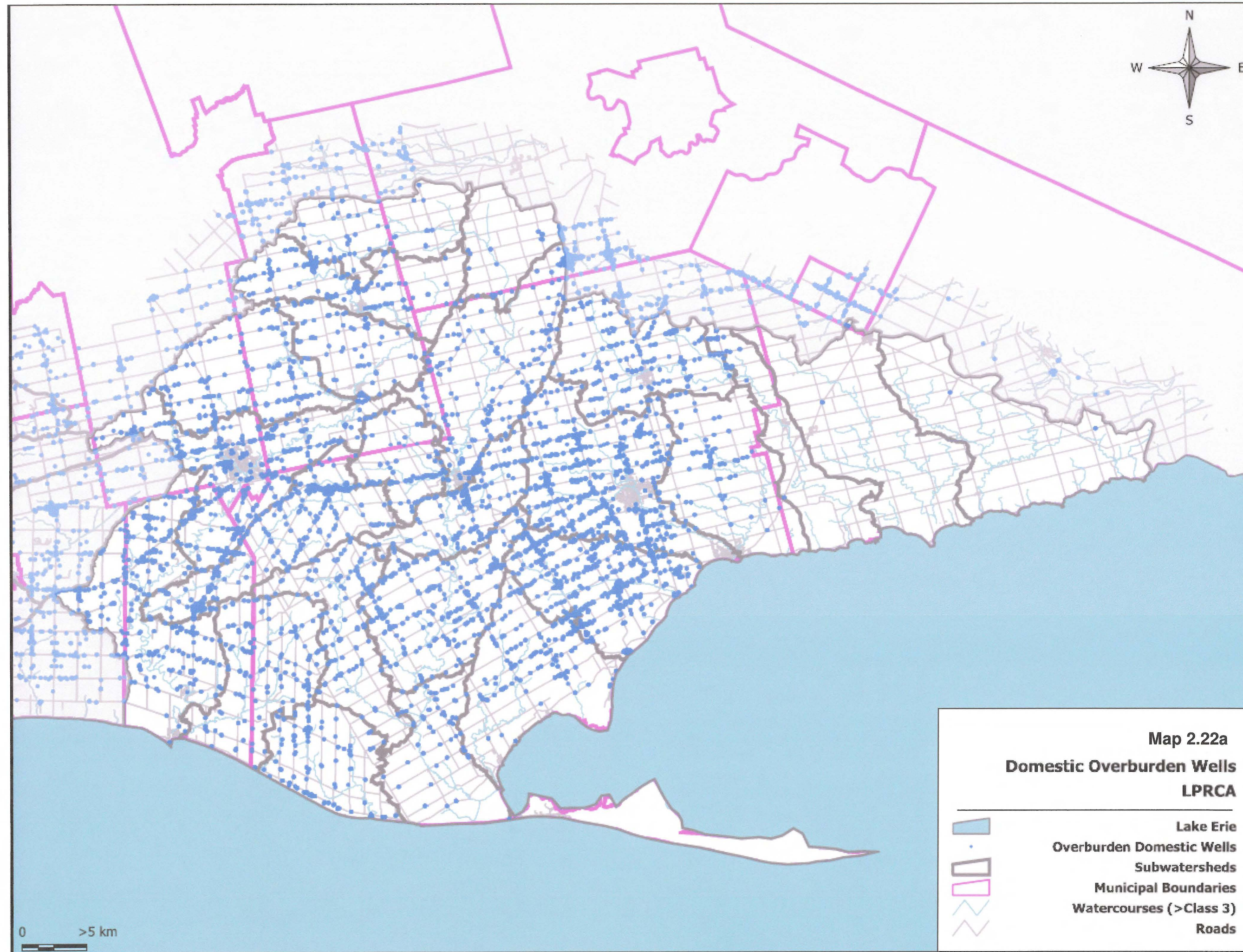
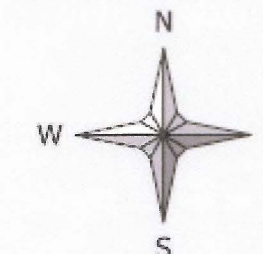


Map 2.21C







**Domestic Bedrock Wells  
KCCA**

-  Lake Erie
-  Bedrock Domestic Wells
-  Subwatersheds
-  Municipal Boundaries
-  Watercourses (>Class 3)
-  Roads





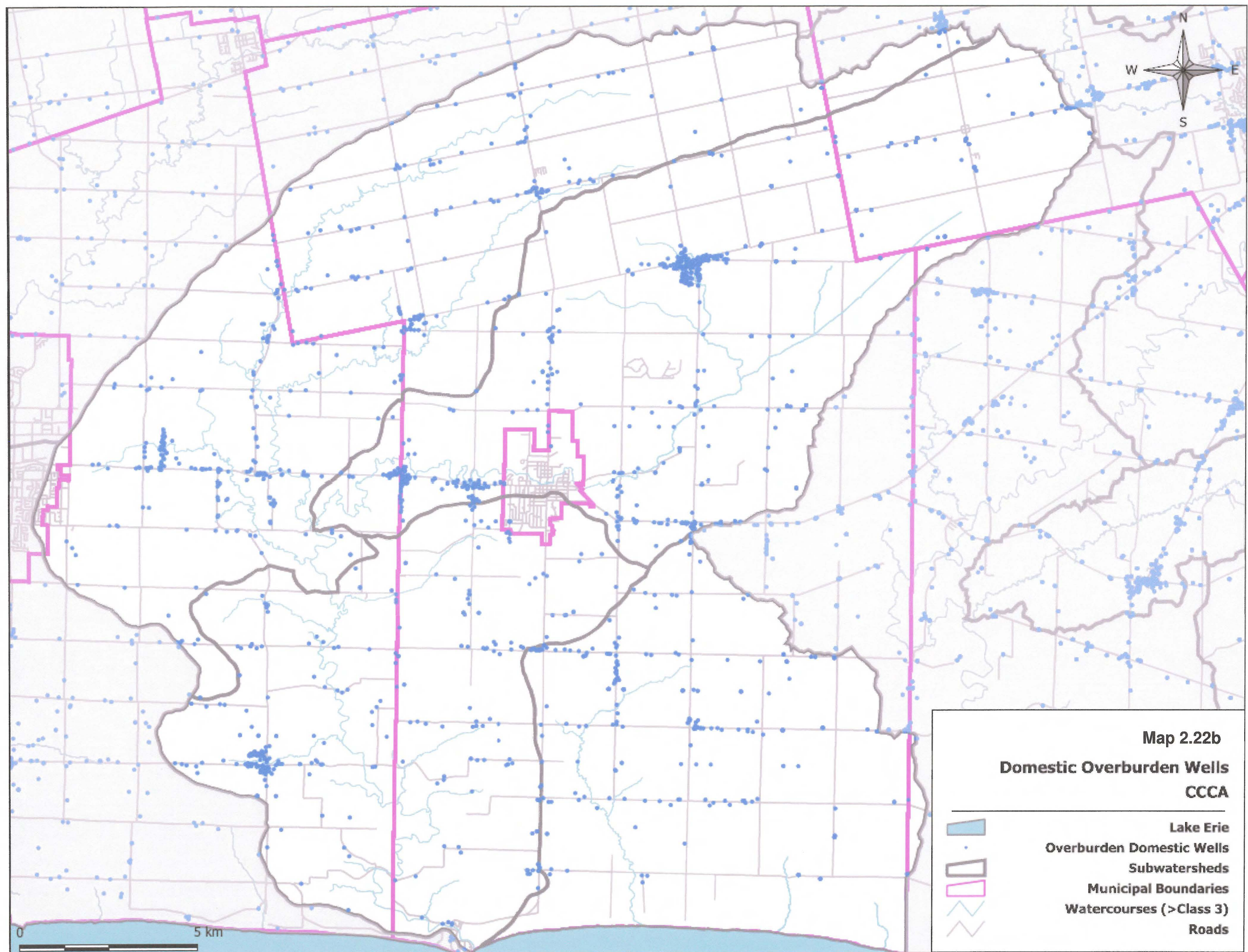
**Map 2.22a**  
**Domestic Overburden Wells**  
**LPRCA**

-  Lake Erie
-  Overburden Domestic Wells
-  Subwatersheds
-  Municipal Boundaries
-  Watercourses (>Class 3)
-  Roads

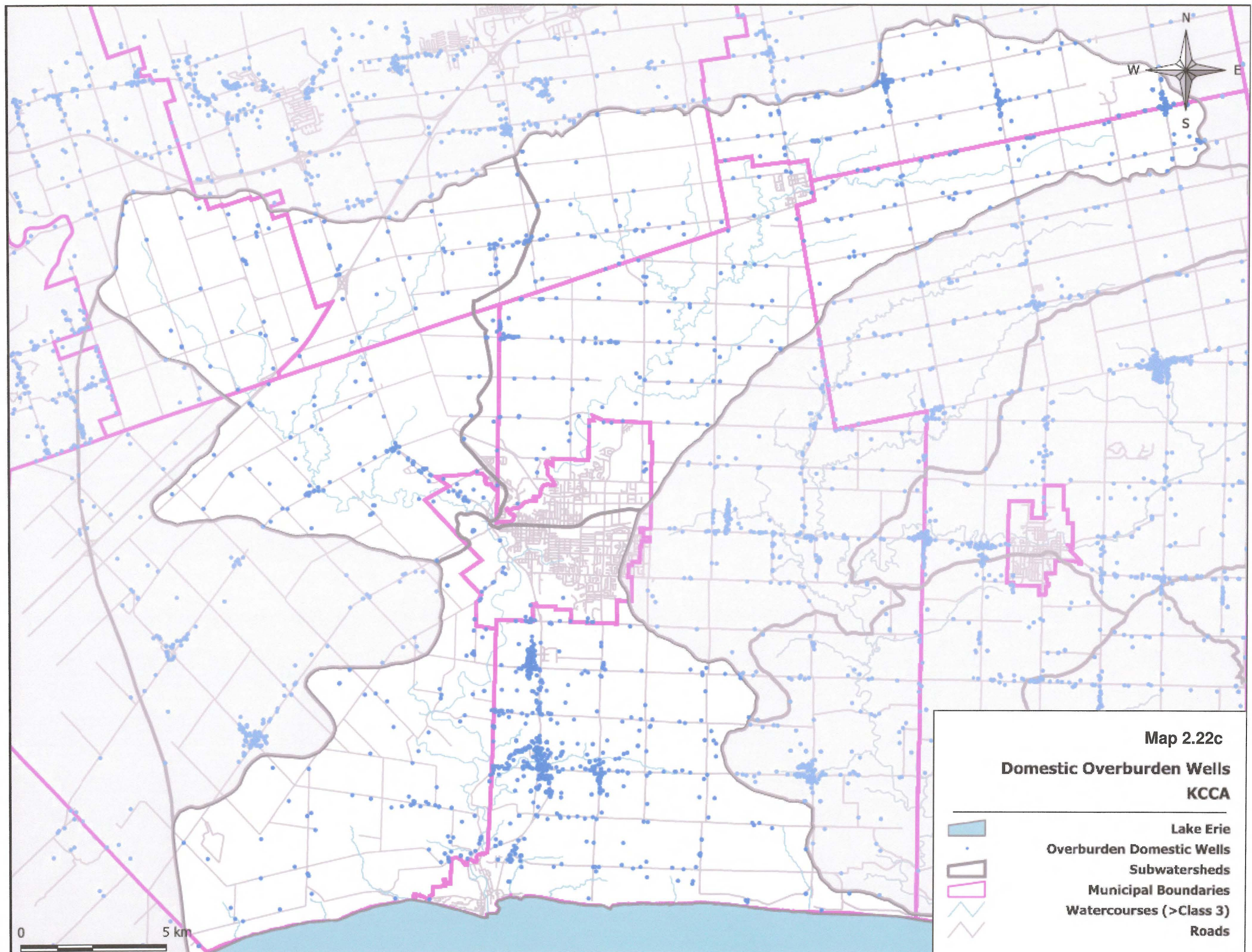
0      >5 km







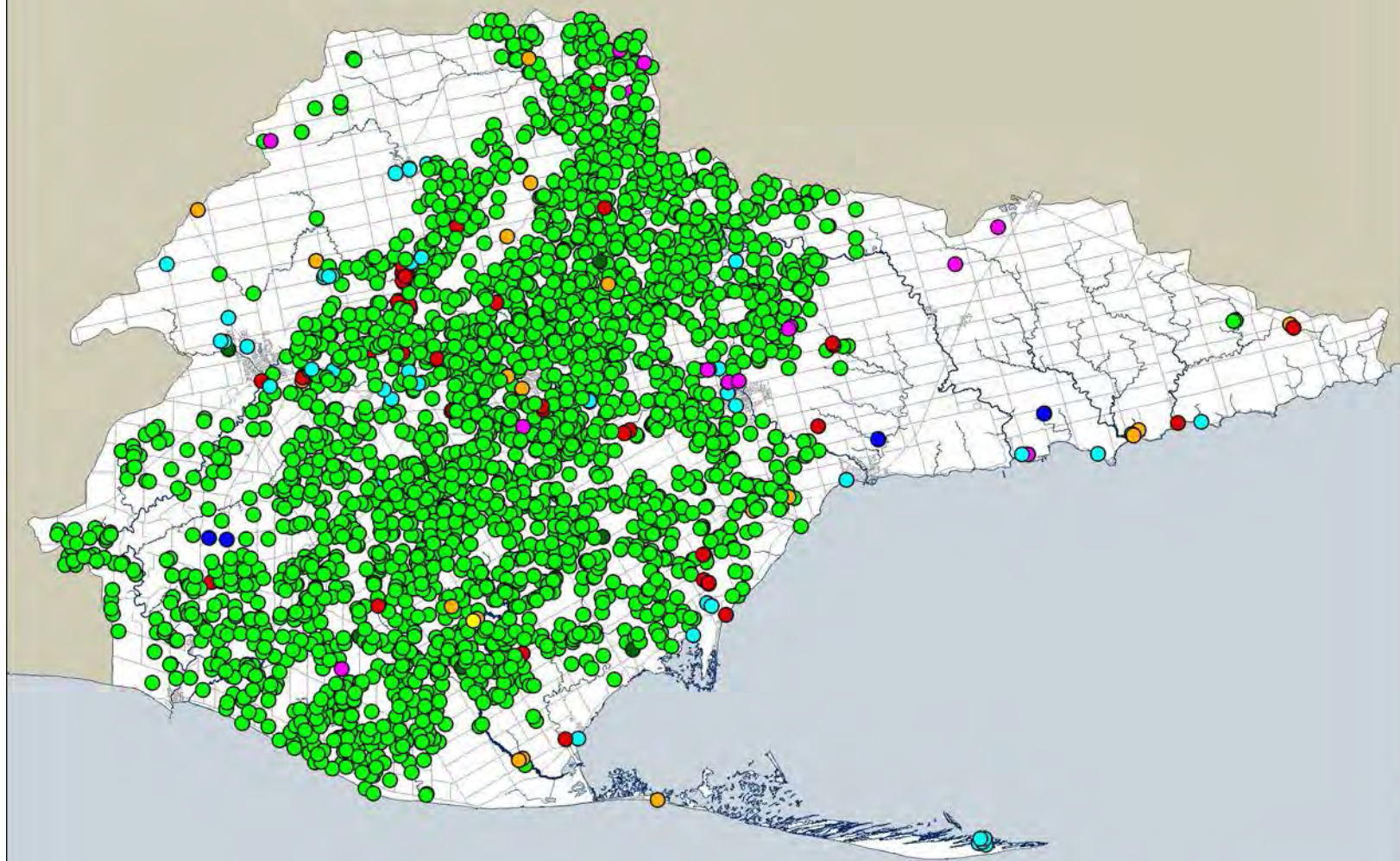






Long Point Region Conservation Authority

## Water Use



3 0 3 6 Kilometers



### Permitted Water Use

- Agricultural
- Commercial
- Construction
- Dewatering
- Industrial
- Institutional
- Miscellaneous
- Recreational
- Remediation
- Water Supply

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**Map 2.23a**  
**LPRCA Permits To Take Water**





Catfish Creek Conservation Authority

## Water Use

### Permitted Water Use

- Agricultural
- Commercial
- Construction
- Dewatering
- Industrial
- Institutional
- Miscellaneous
- Recreational
- Remediation
- Water Supply

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**Map 2.23b**  
**CCCA Permits To Take Water**

1 0 1 2 Kilometers





Kettle Creek Conservation Authority

## Water Use

### Permitted Water Use

- Agricultural
- Commercial
- Construction
- Dewatering
- Industrial
- Institutional
- Miscellaneous
- Recreational
- Remediation
- Water Supply

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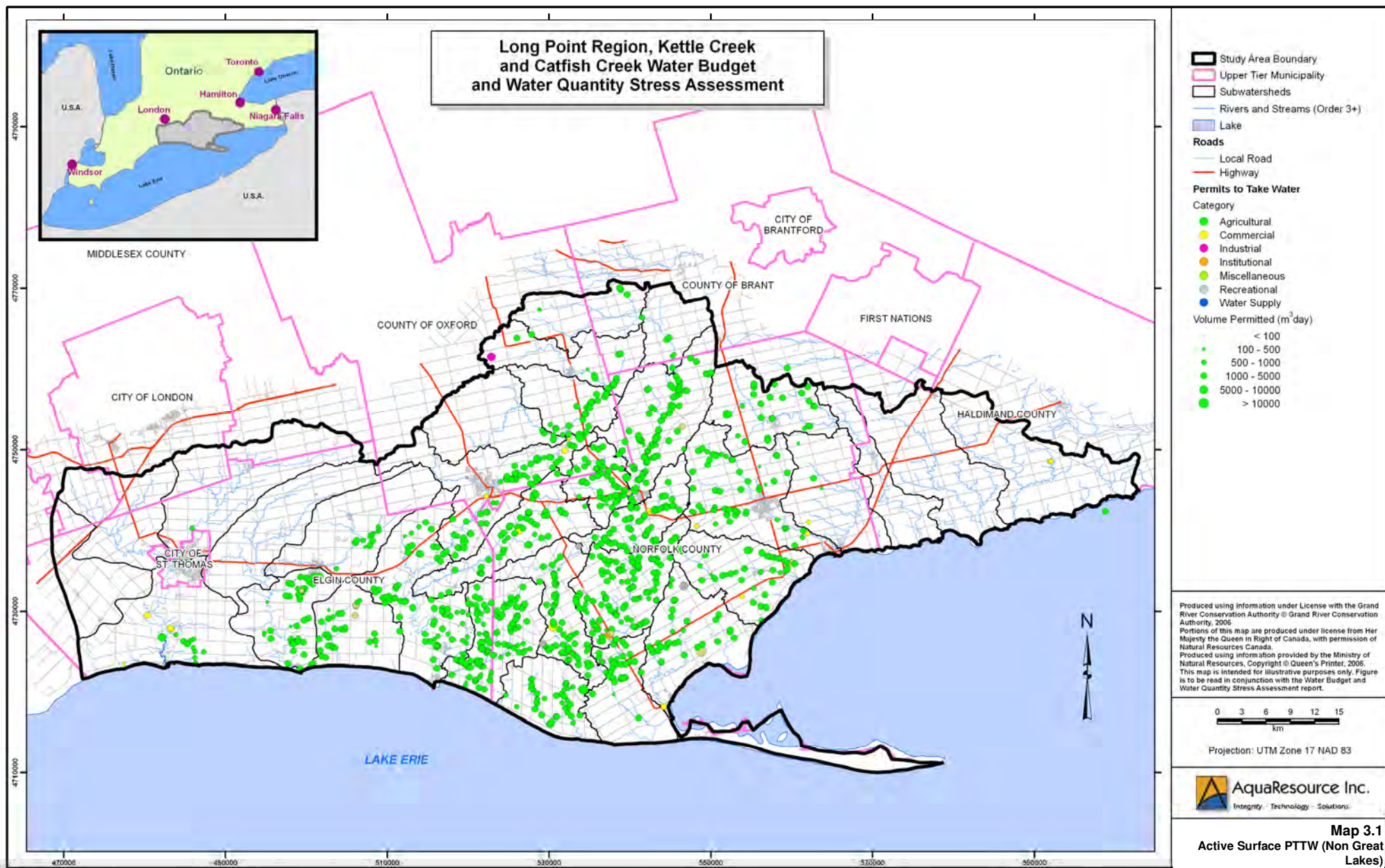
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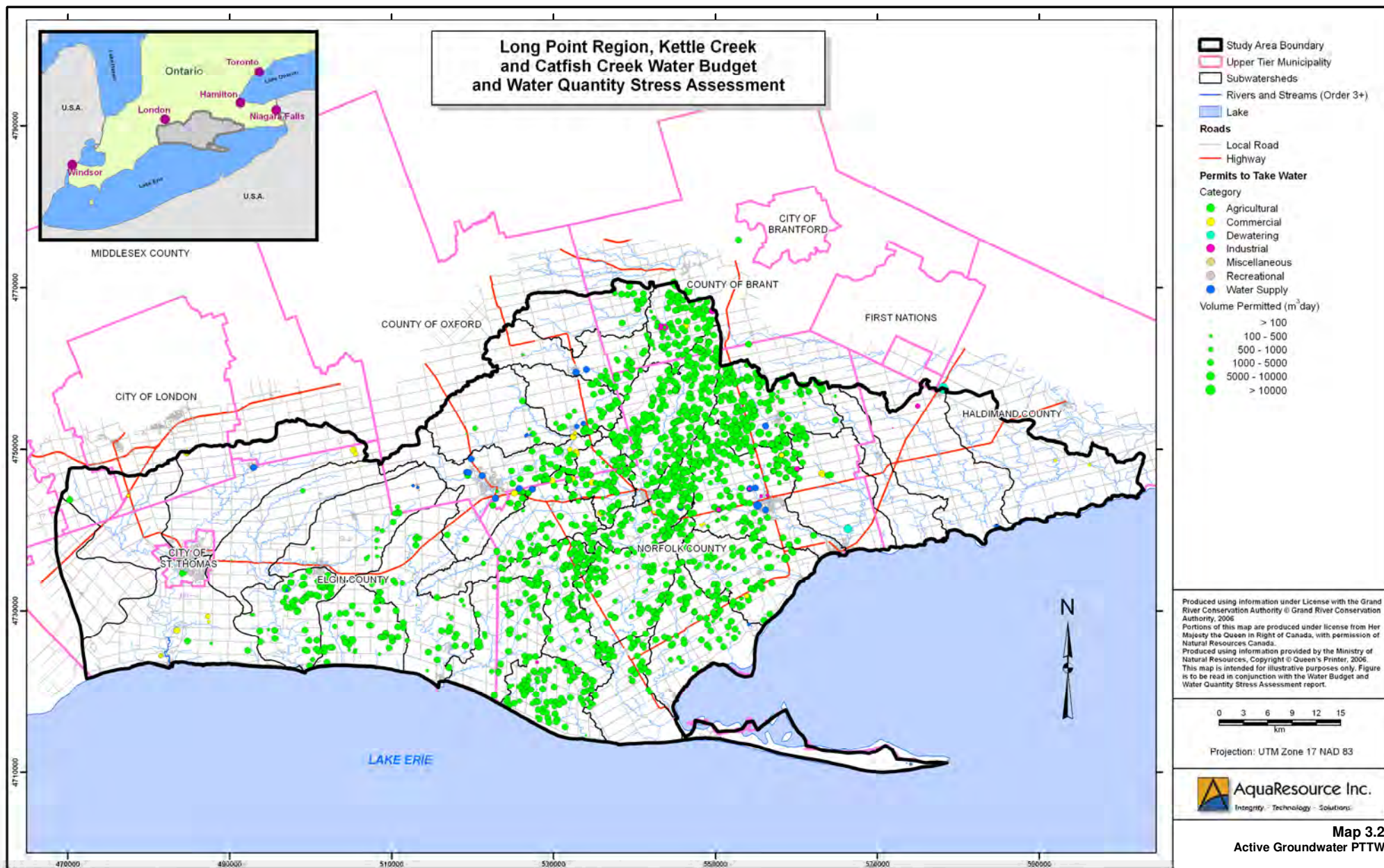
**Map 2.23c**  
**KKCA Permits To Take**  
**Water**

1 0 1 2 Kilometers

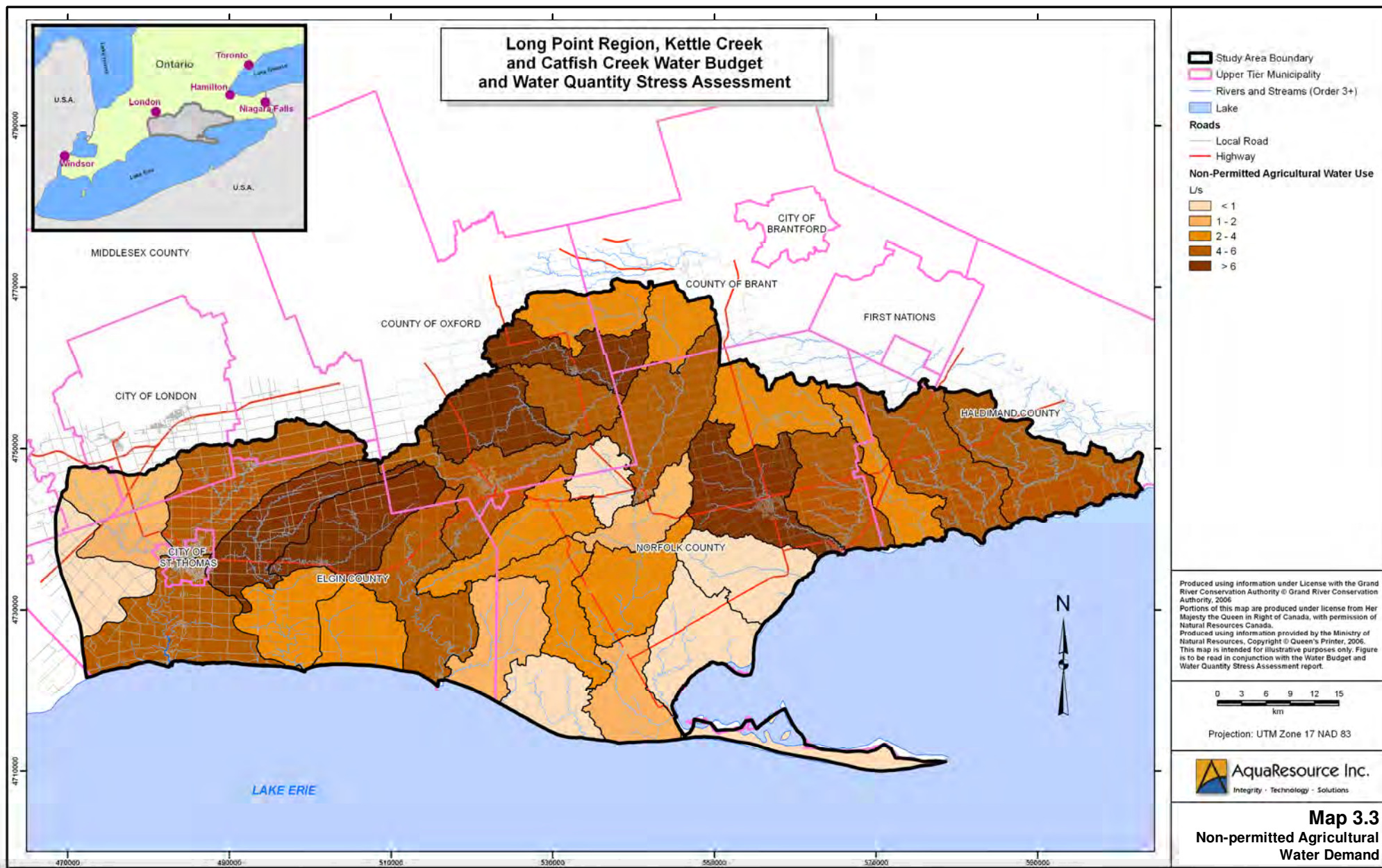




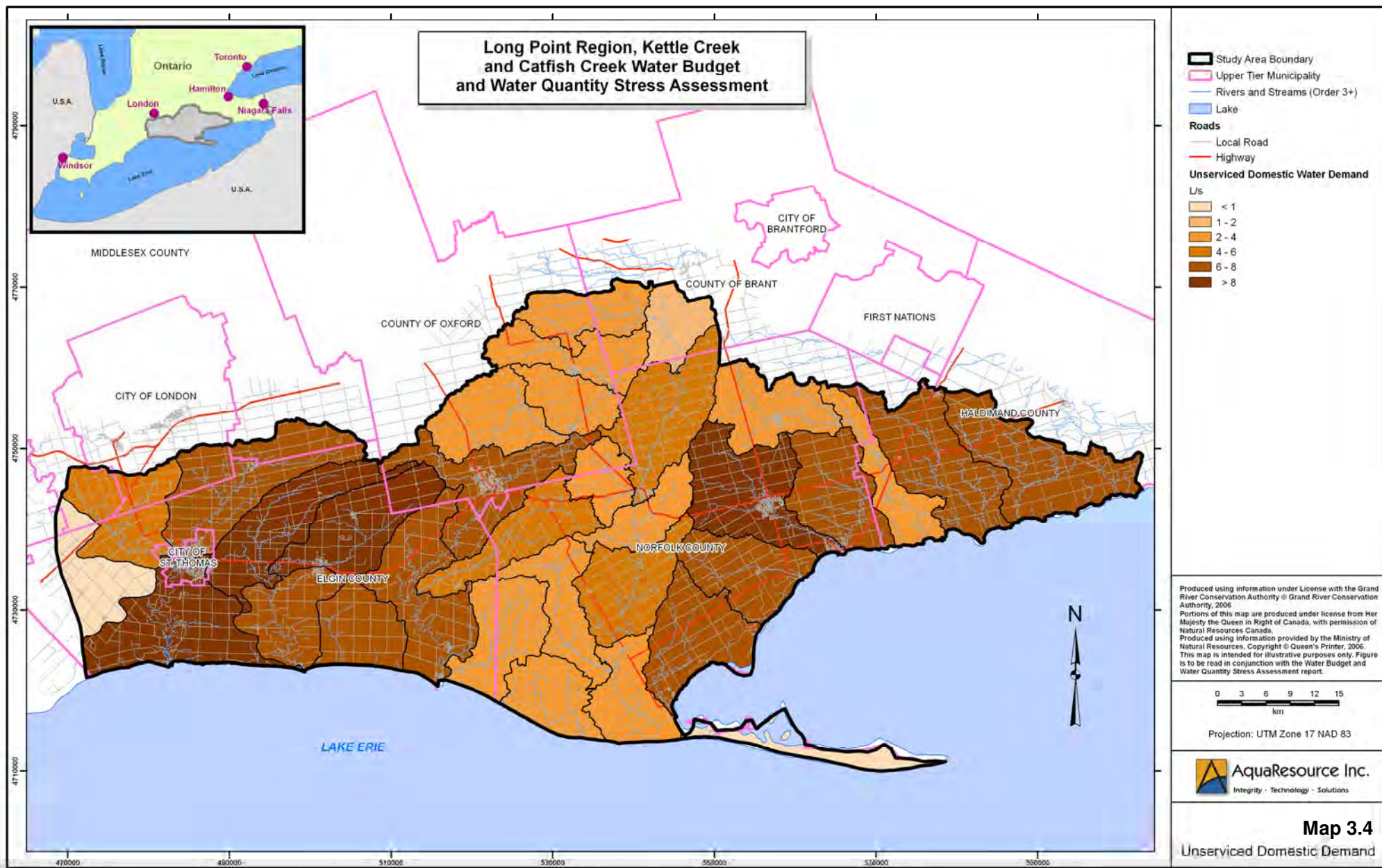




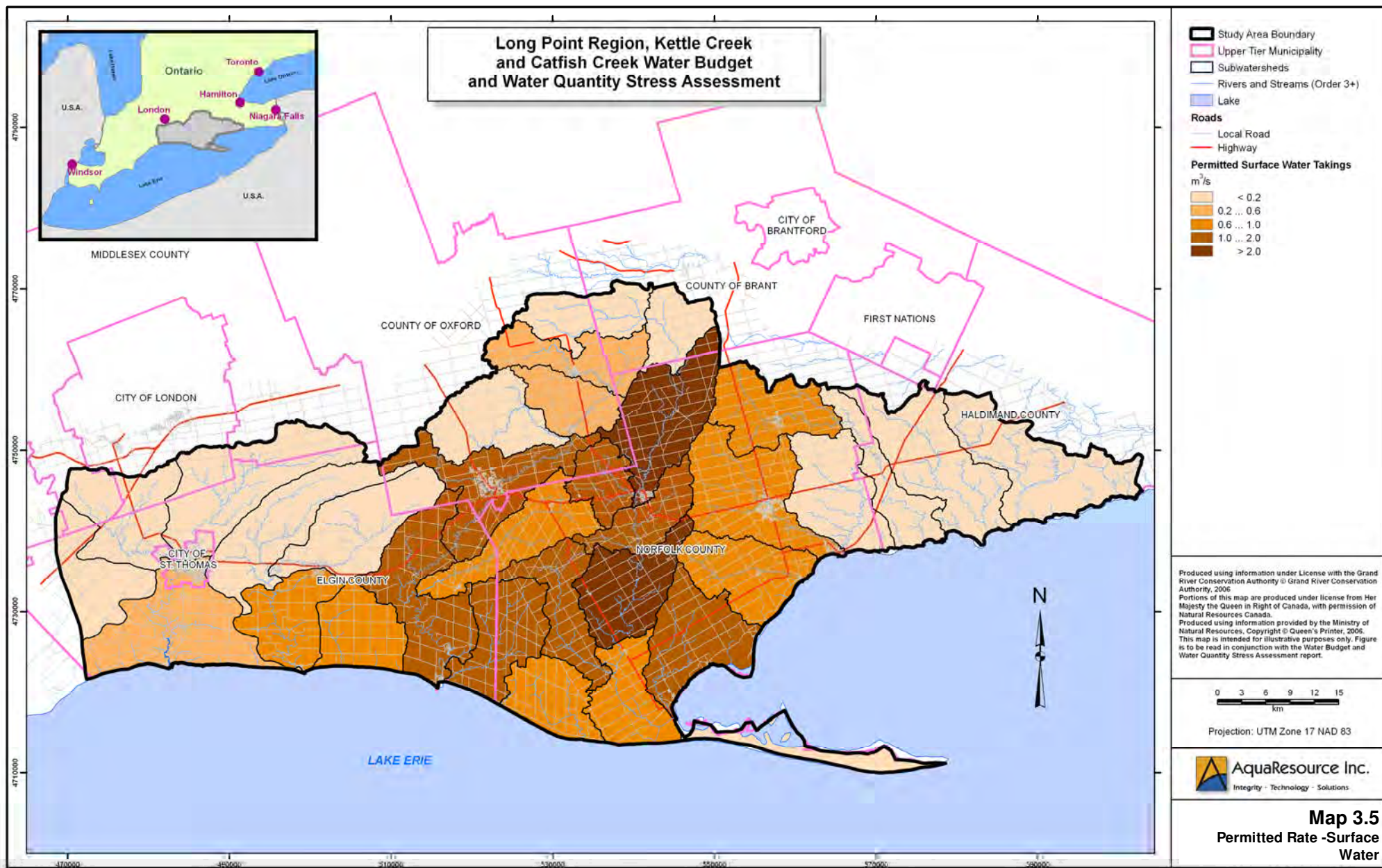




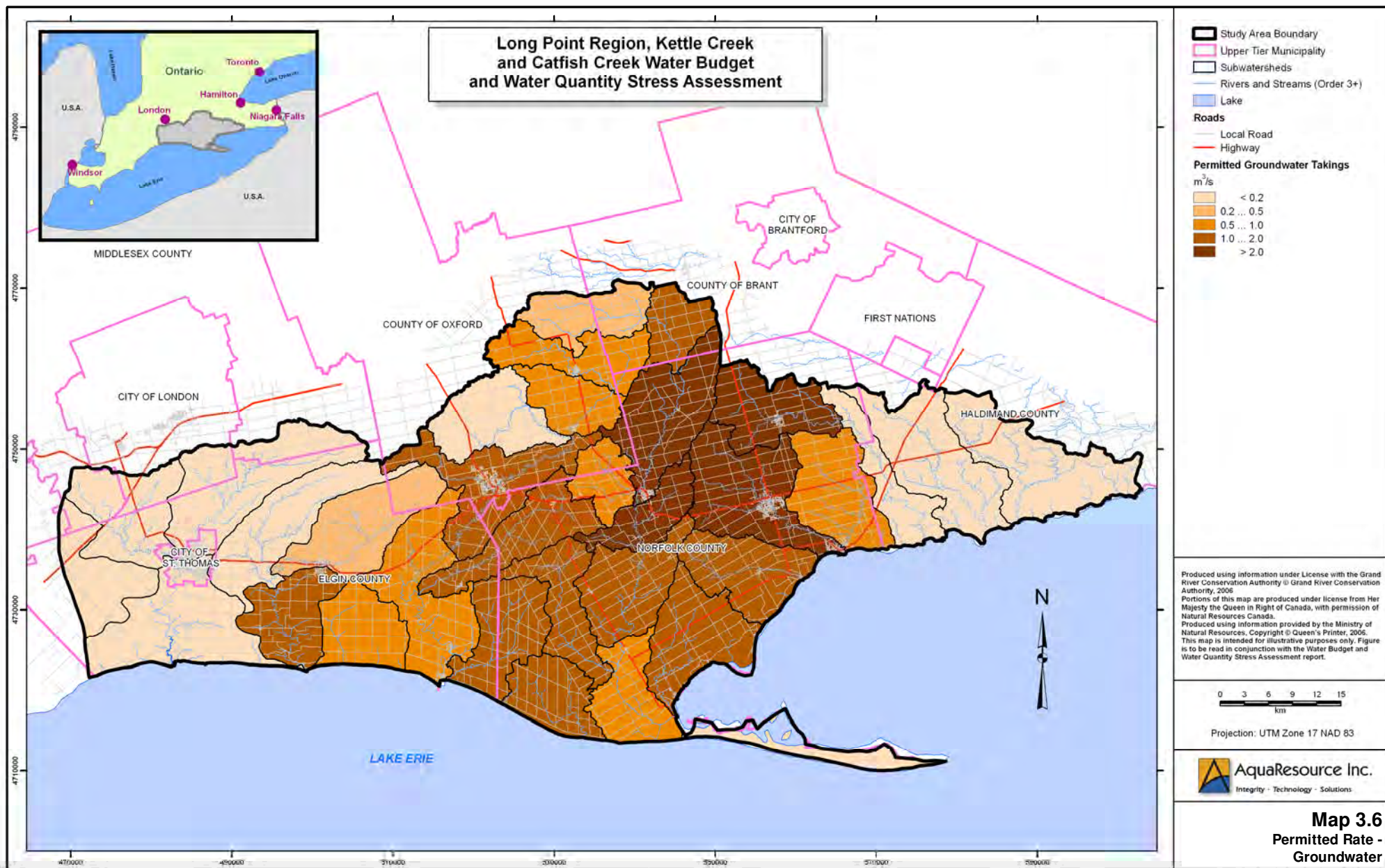




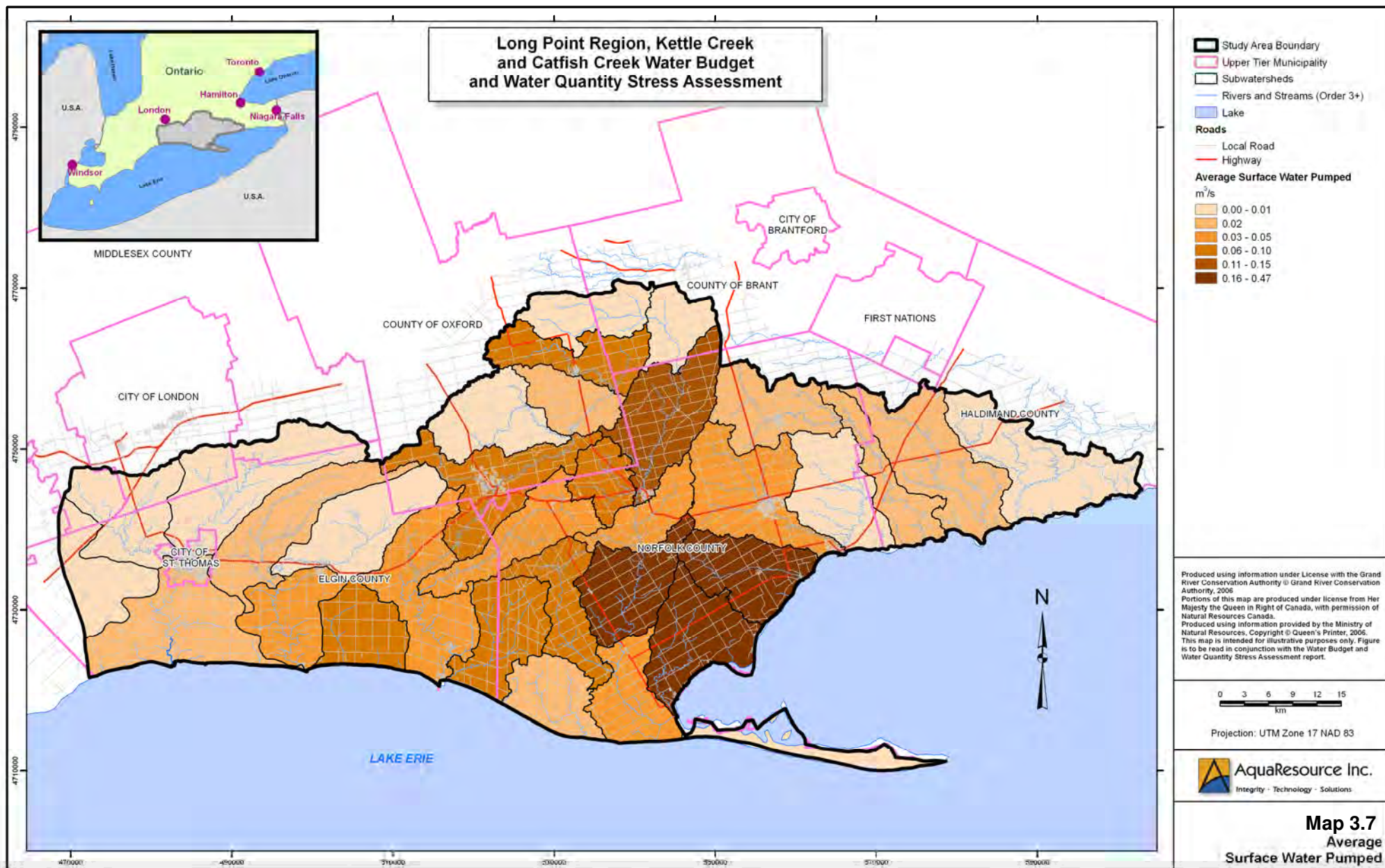




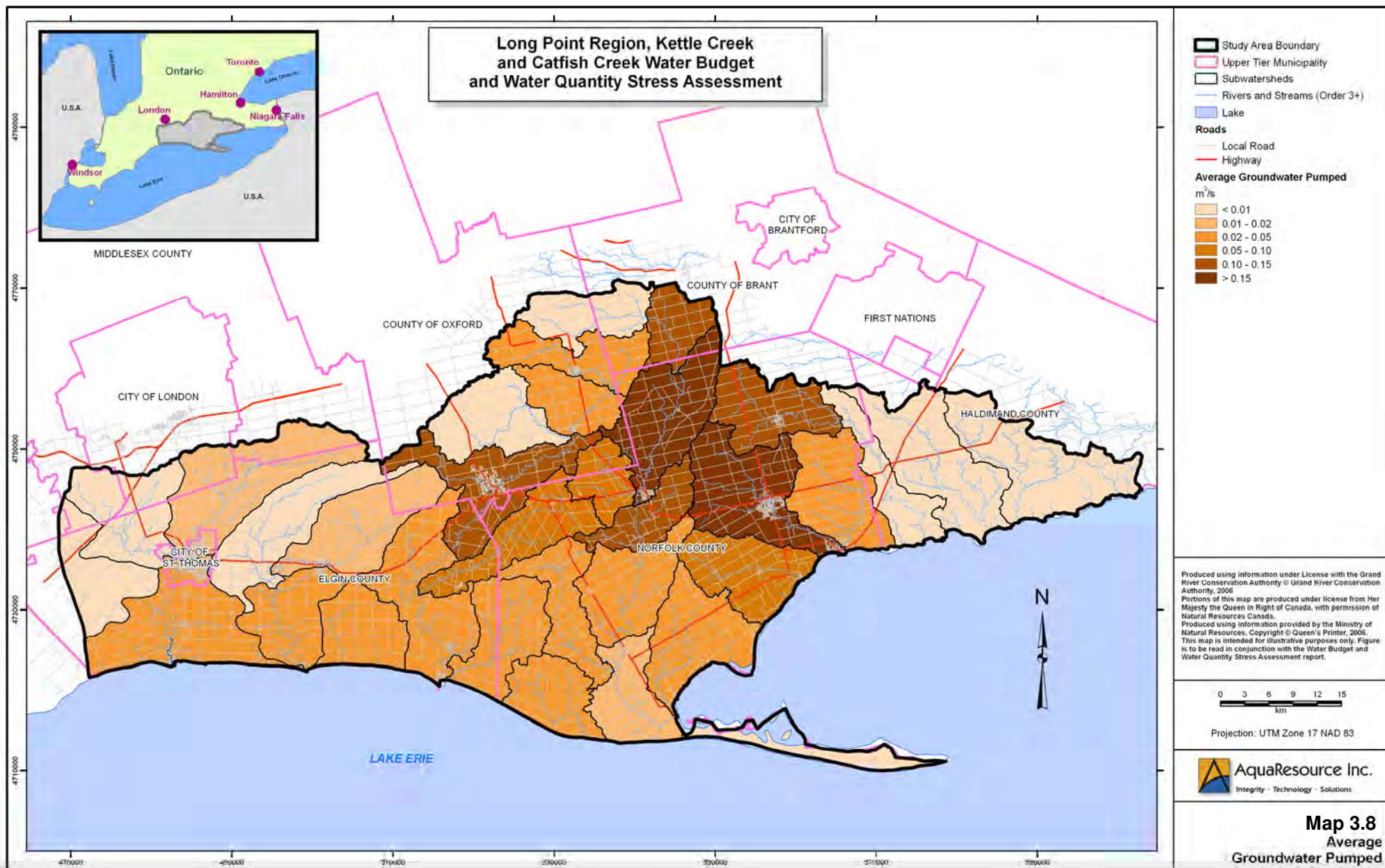




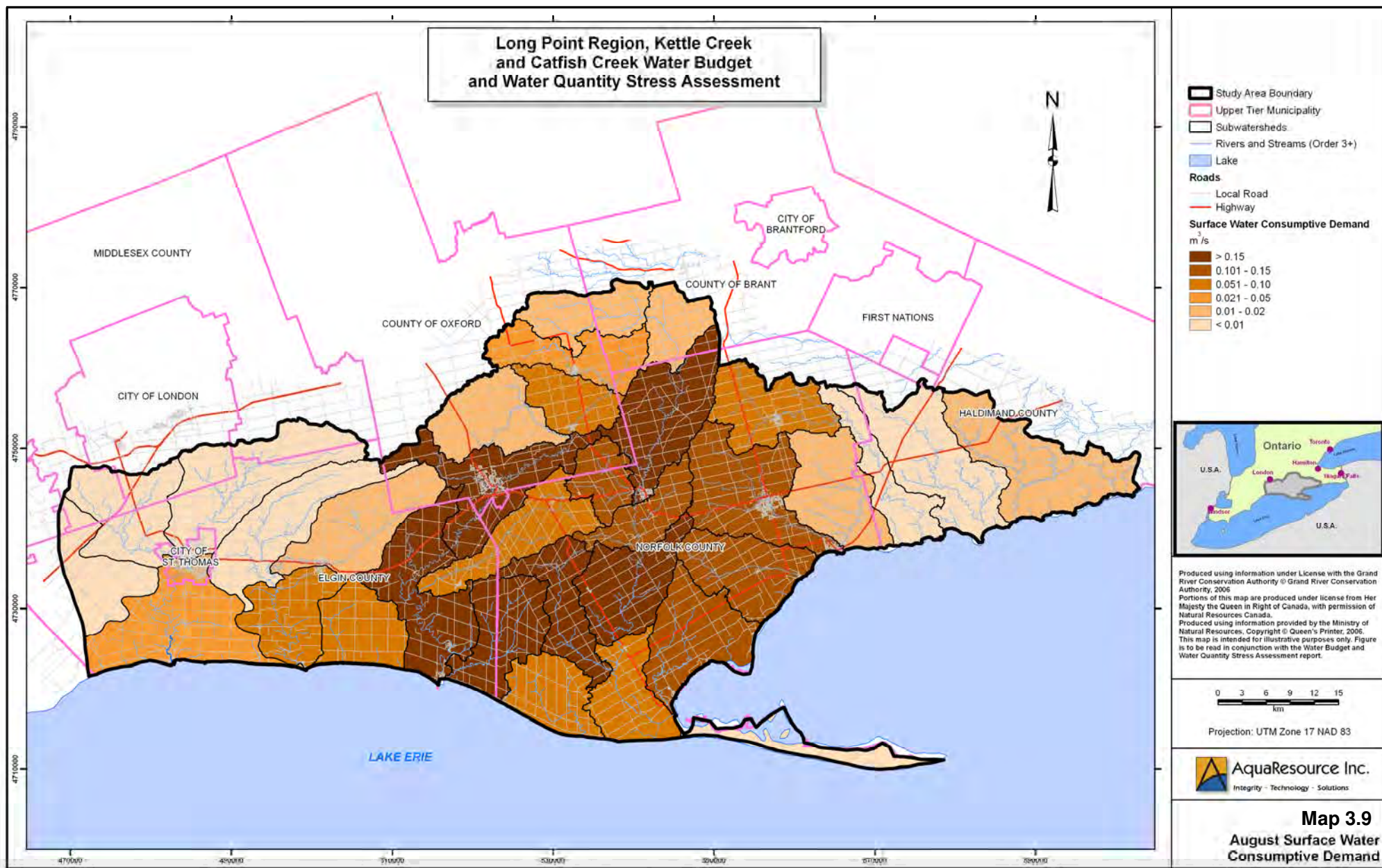




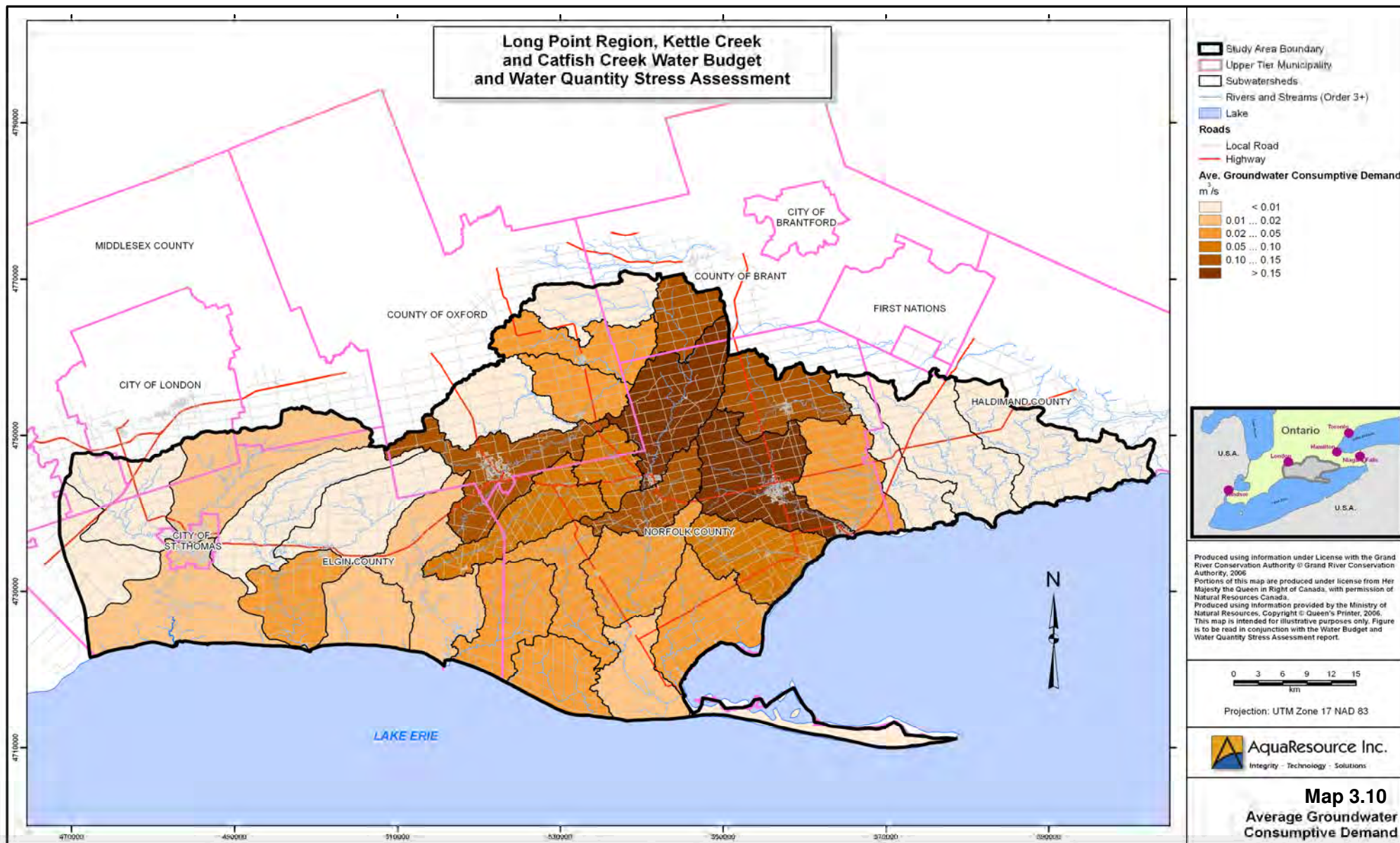


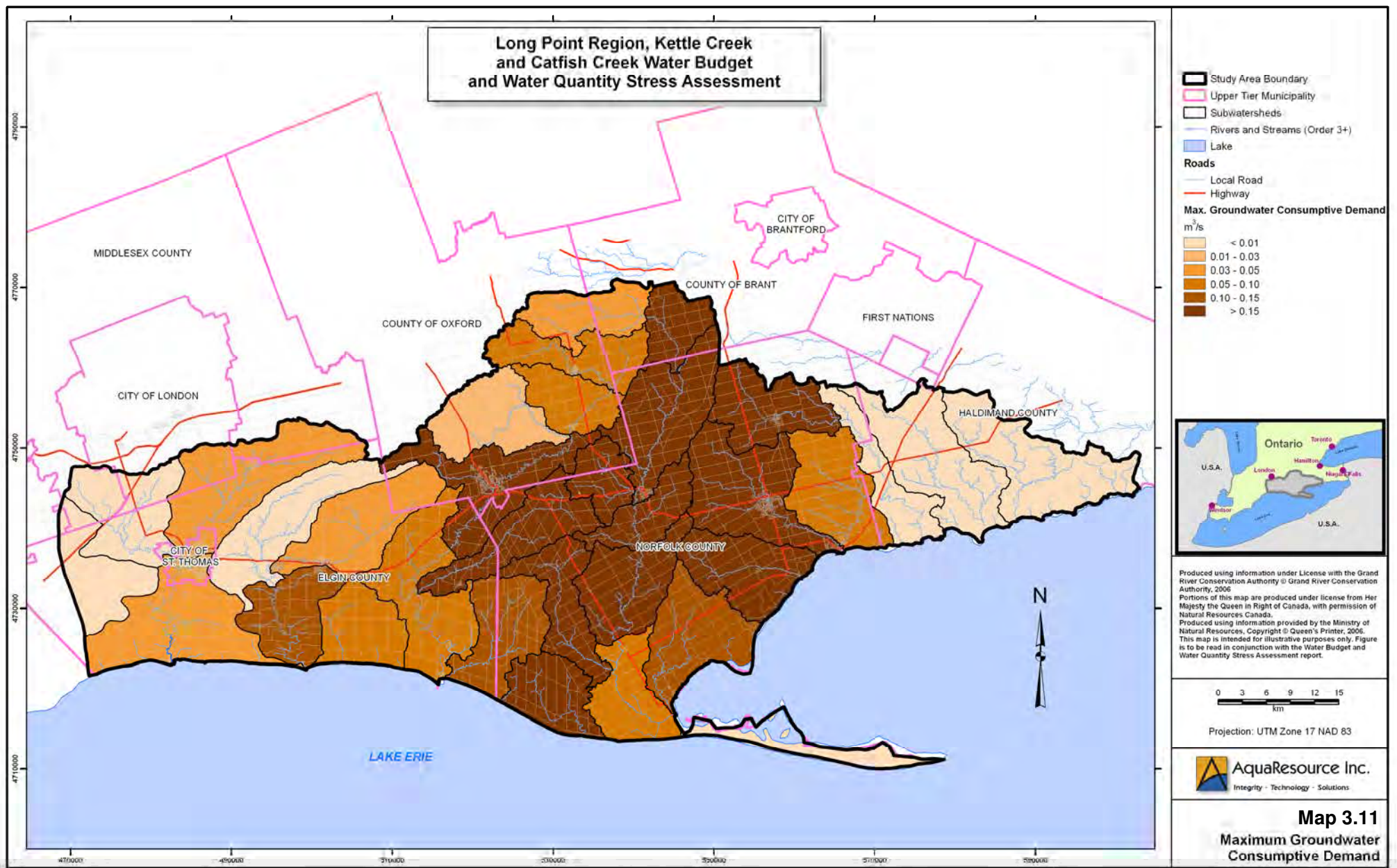




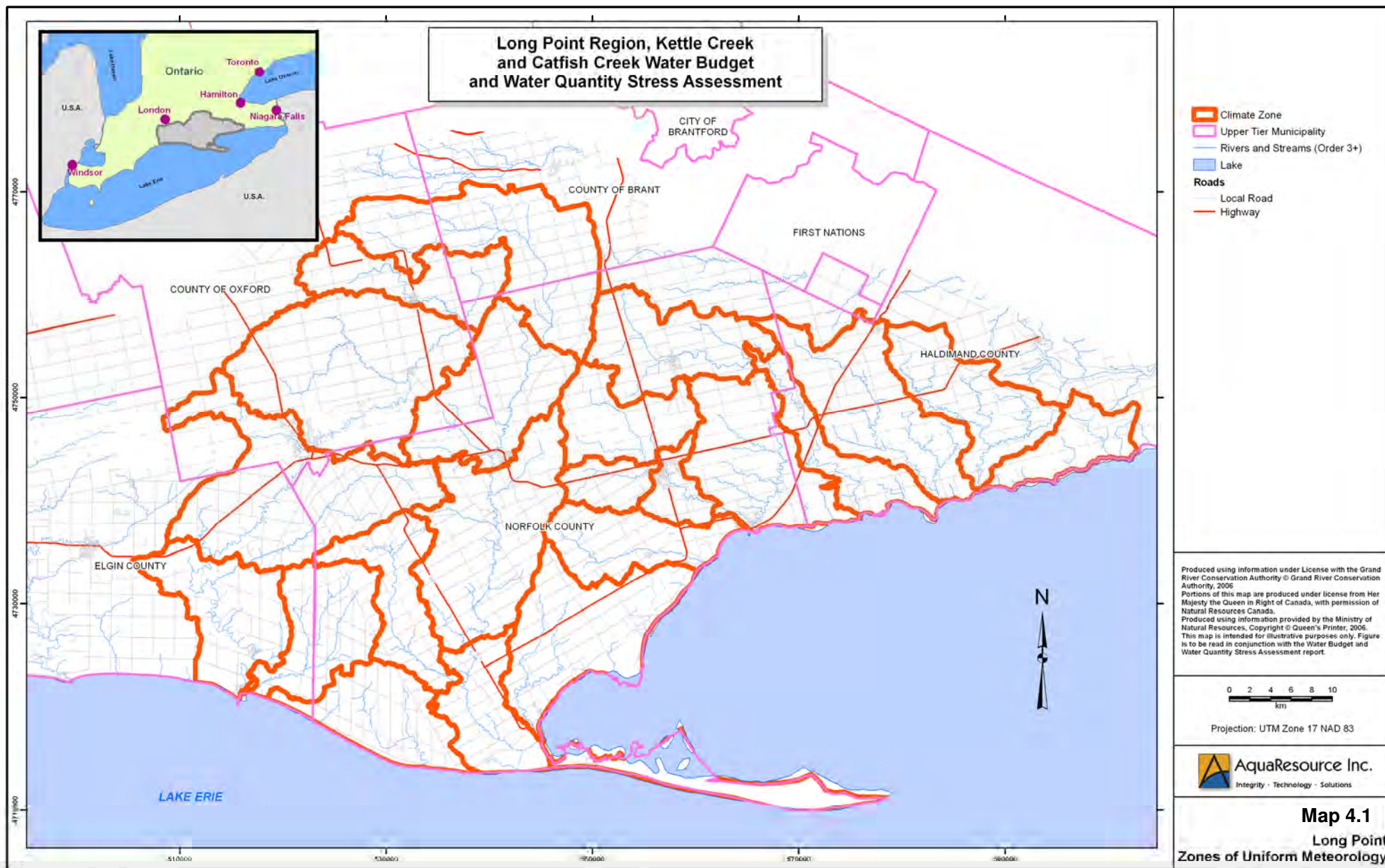


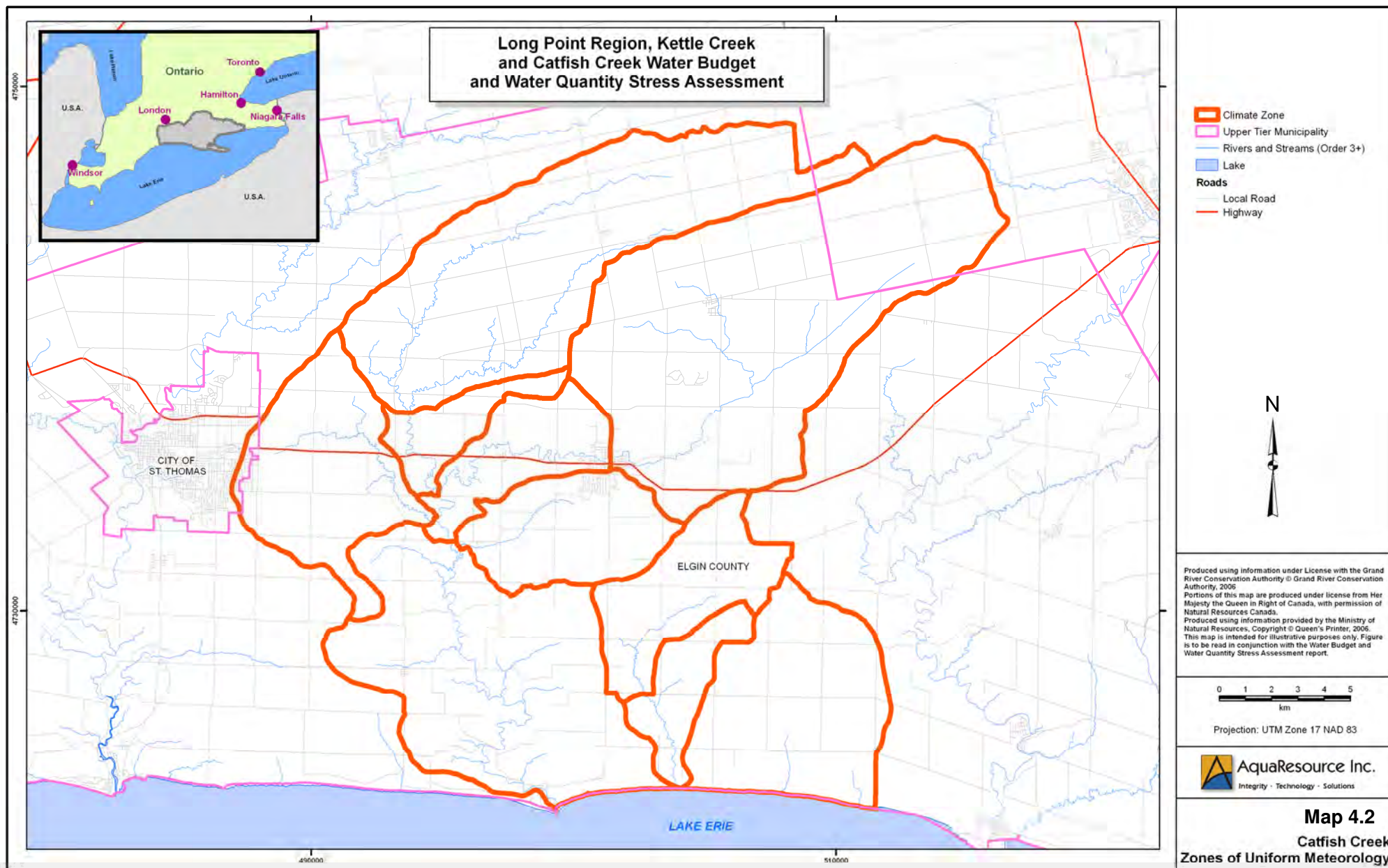




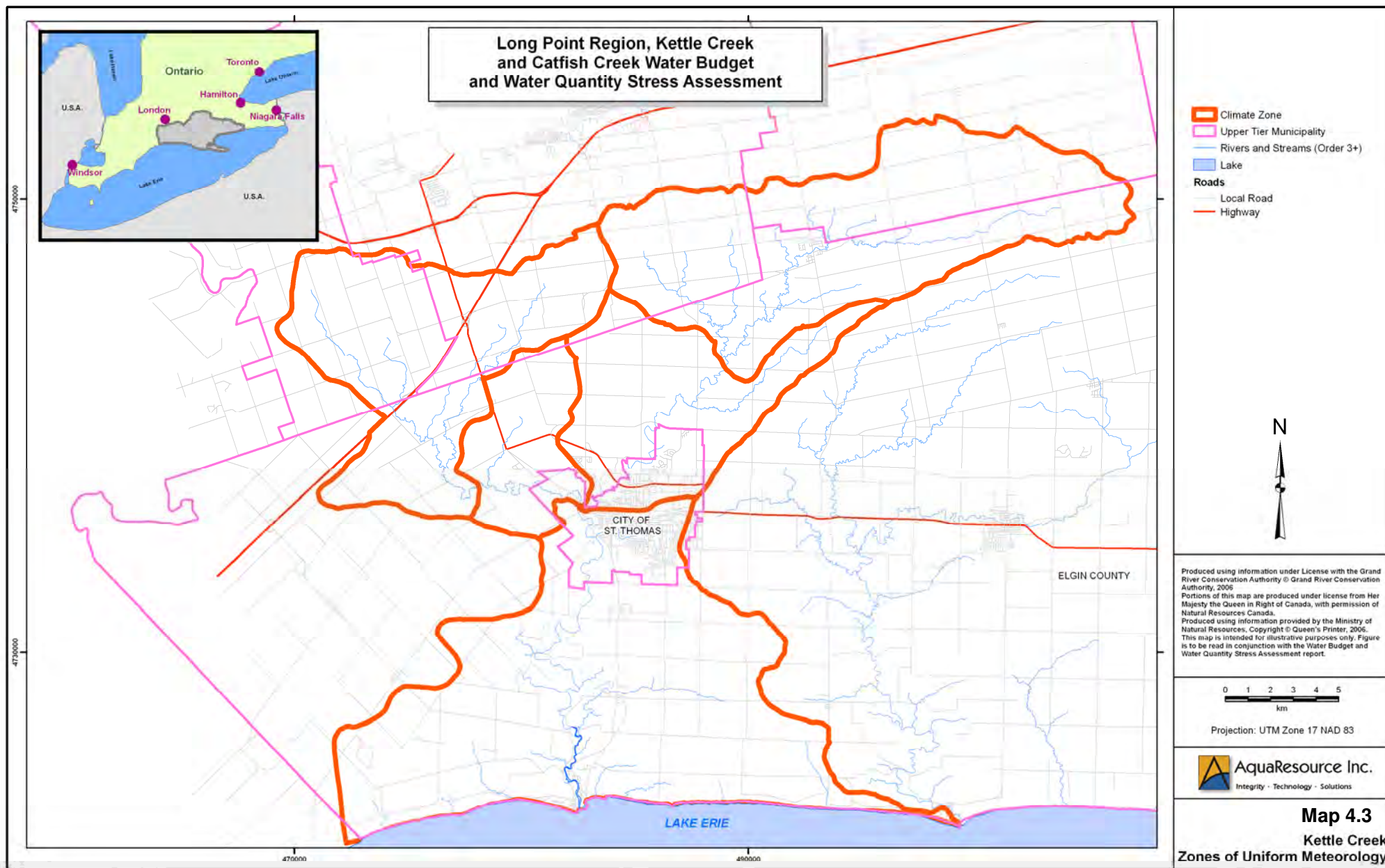


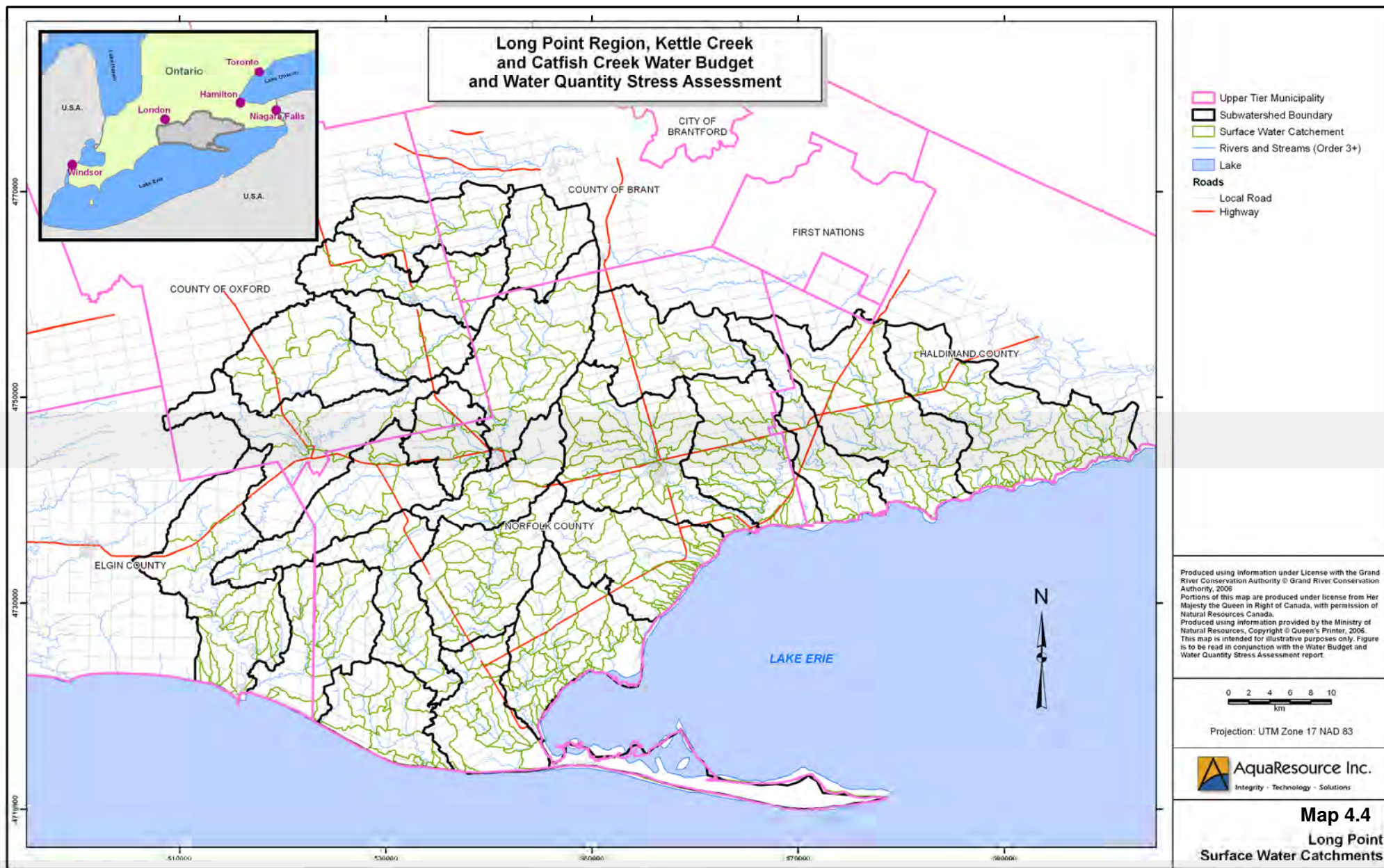




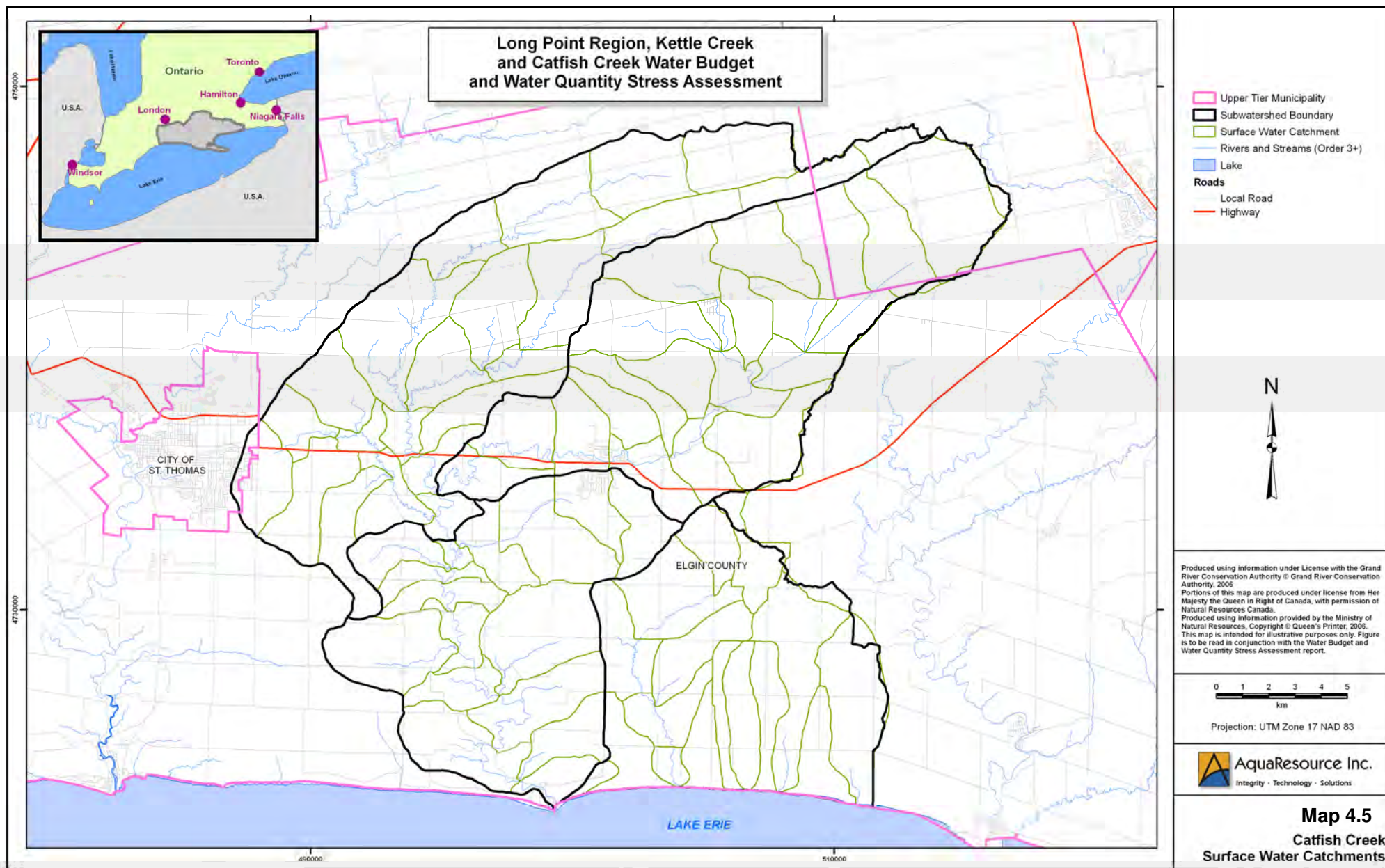


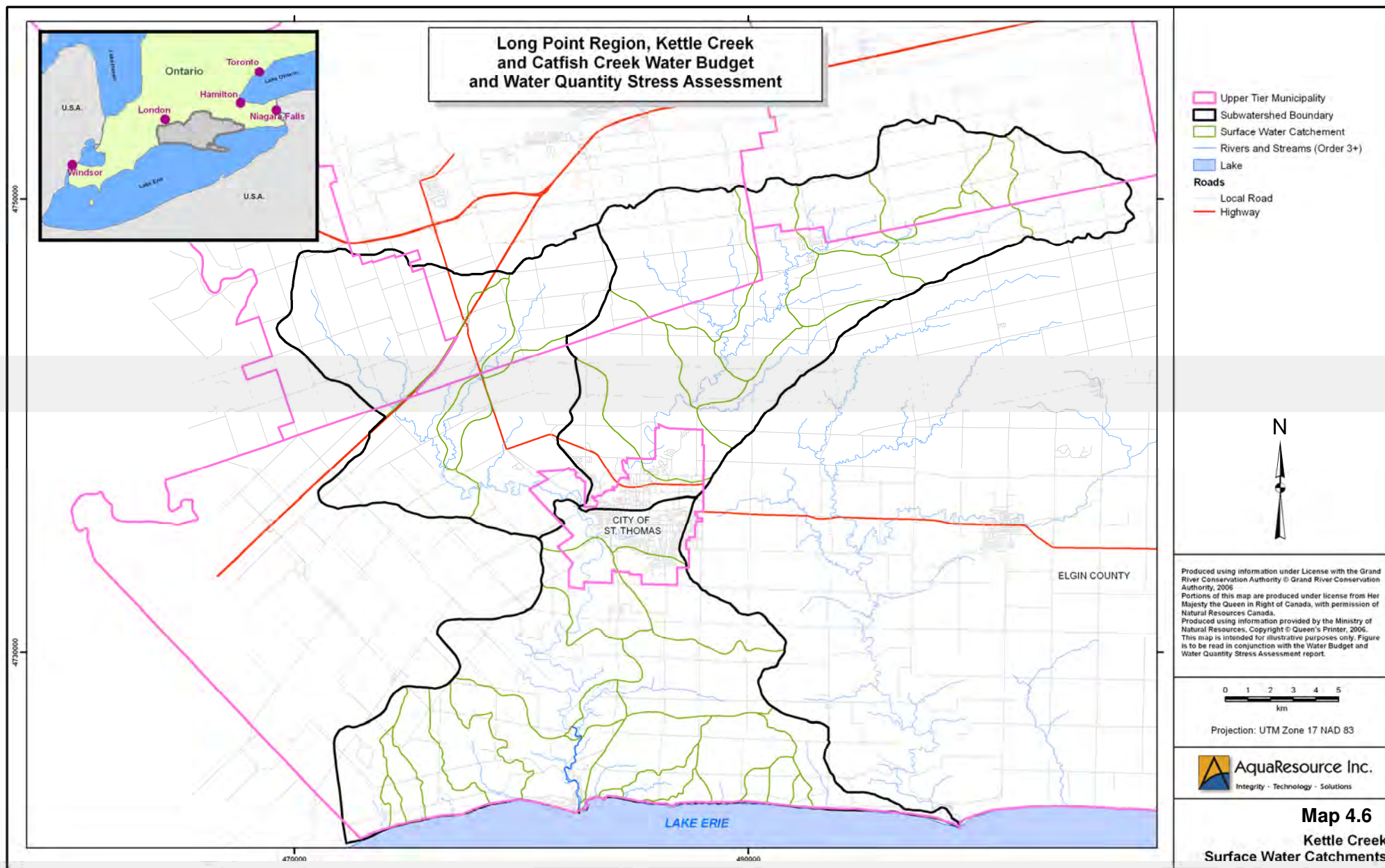














# Long Point Region, Kettle Creek and Catfish Creek Water Budget and Water Quantity Stress Assessment



- Subwatershed Boundary
- Surface Water Catchment
- Rivers and Streams (Order 3+)
- Hydrologic Response Unit**
- Type
- Impervious
- Clay Till High Vegetation
- Clay Till Medium Vegetation
- Clay Till Low Vegetation
- Sand Gravel High Vegetation
- Sand Gravel Medium Vegetation
- Sand Gravel Low Vegetation
- Sand Till High Vegetation
- Sand Till Medium Vegetation
- Sand Till Low Vegetation
- Silt Till High Vegetation
- Silt Till Medium Vegetation
- Silt Till Low Vegetation
- Urban Clay
- Urban Sand Gravel
- Urban Silt
- Wetland



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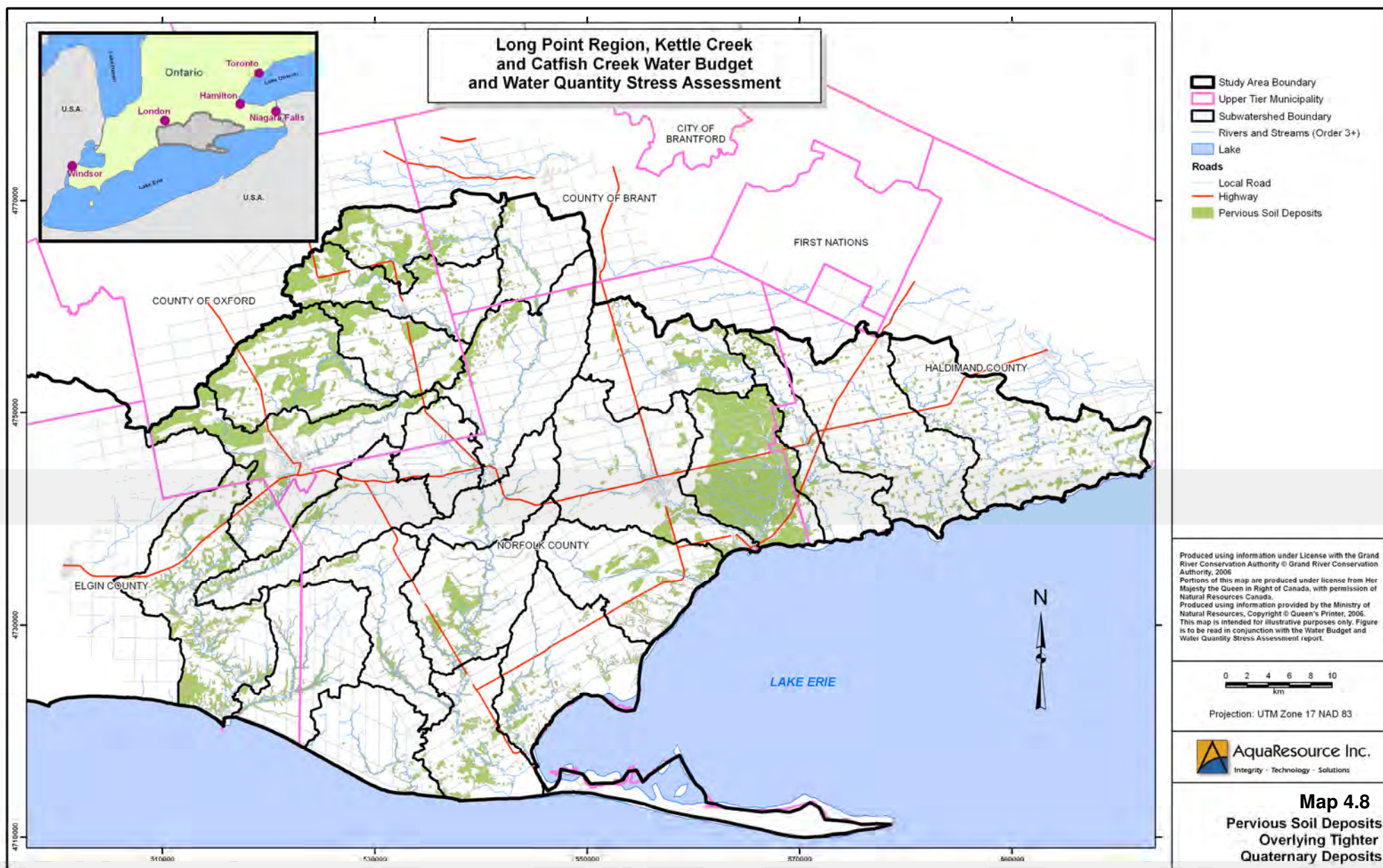


Projection: UTM Zone 17 NAD 83

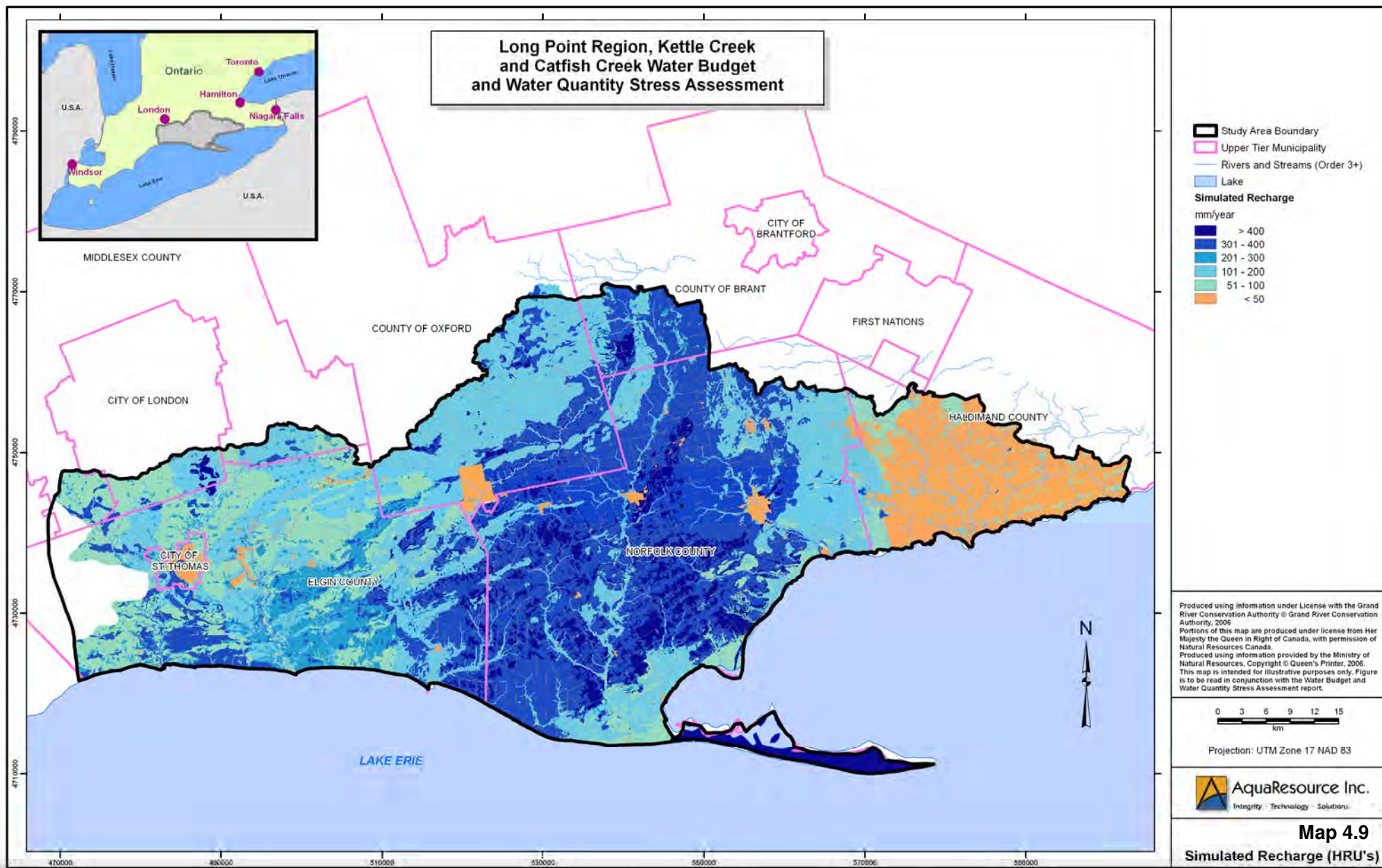


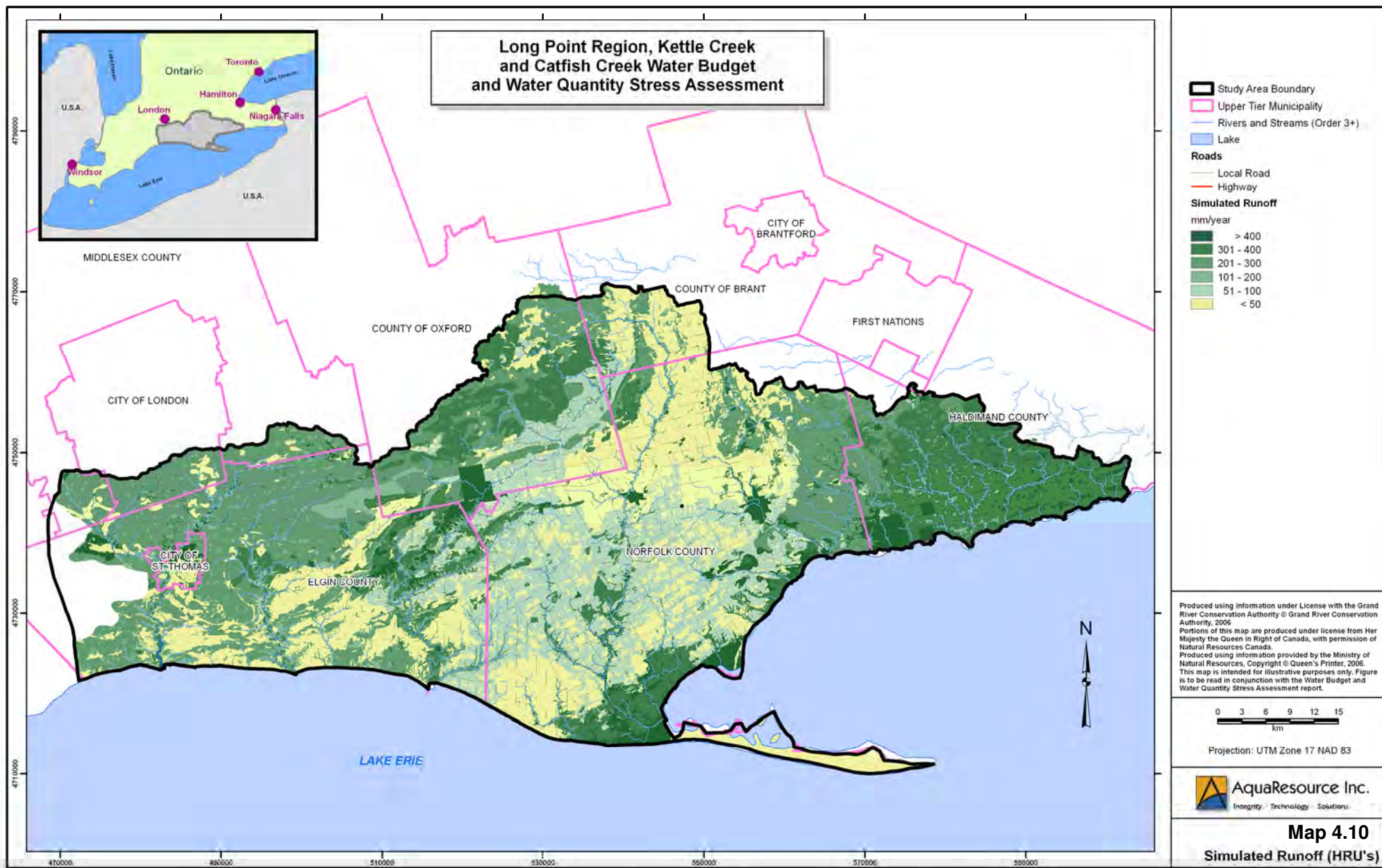
**Map 4.7**  
**Hydrologic Response Unit  
Delineation**

















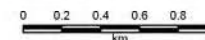
# Long Point Region, Kettle Creek and Catfish Creek Water Budget and Water Quantity Stress Assessment



- Roads**
- Local Road
  - Highway
  - Rivers and Streams (Order 3+)
  - Lake
  - Finite Element Mesh



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Projection: UTM Zone 17 NAD 83

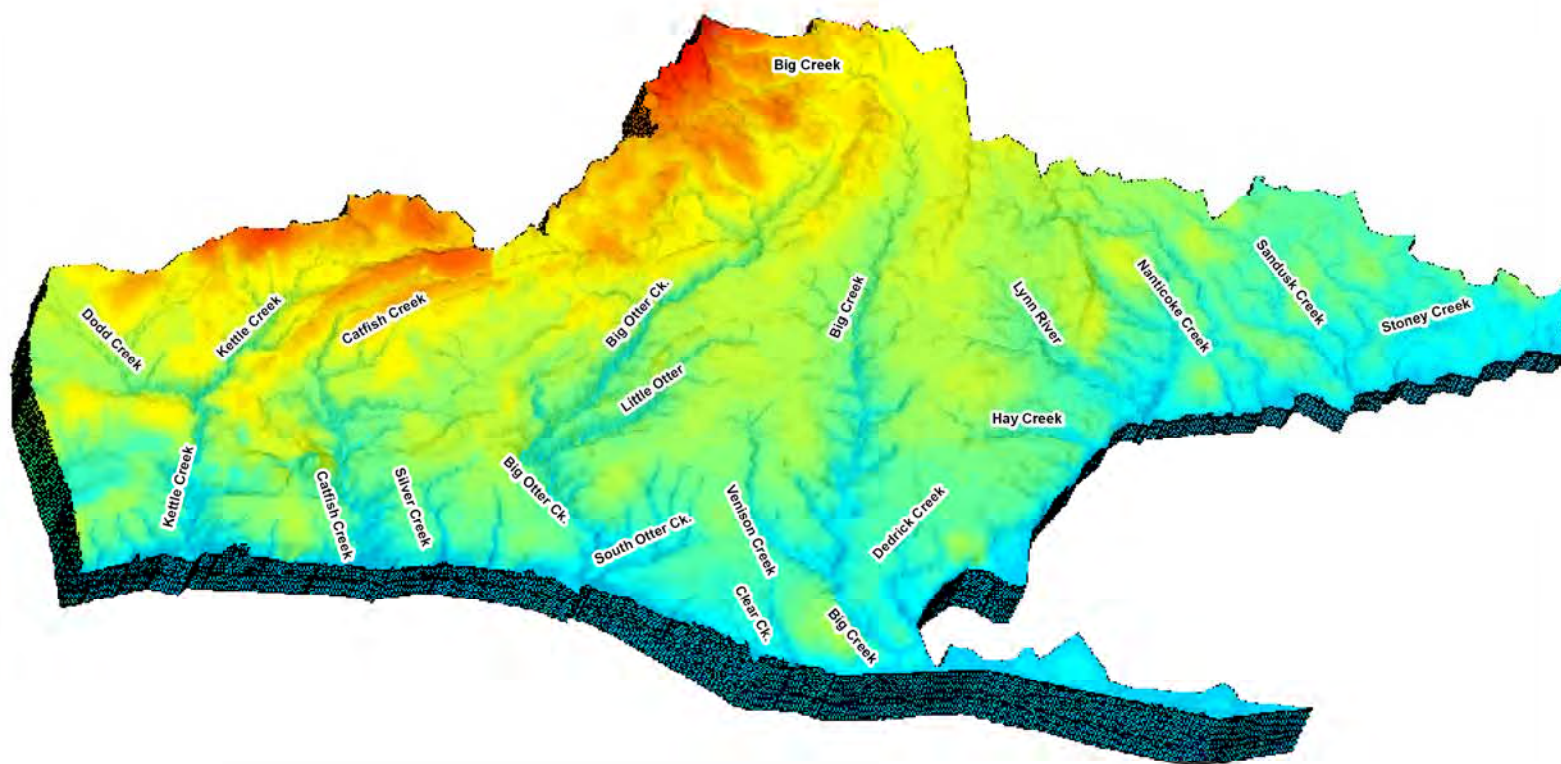


**Map 5.2**  
**Finite Element Mesh**  
**and Boundary Condition**

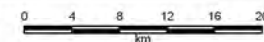




# Long Point Region, Kettle Creek and Catfish Creek Water Budget and Water Quantity Stress Assessment



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Note: Scale is approximate.



**Map 5.3**

**3D Regional FEFLOW Mesh**

