

Paris Pit CAP

February 26, 2013

Groundwater

Agenda

Welcome

Minutes from last meeting

Dufferin Paris Pit – General Update

Operating to Today's Standards

Discussion on Groundwater in Area Around Paris Pit

- Water Cycle

- Geology & Water

- Monitoring Wells

- Paris Water Table

- Detailed Site Investigation

- Phasing

- Extraction Above the Water Table

- Gilbert Creek

- Water Quality

General Discussion

Next Steps

Dufferin Paris Pit – General Update

- *Ministry of Natural Resources:* MNR visit to Paris Pit
- *Six Nations:* Dufferin Aggregates met with Six Nations
- *Pipeline on Site:* Dufferin Aggregates has connected with Imperial Oil (pipeline owner) and confirmed it is empty. It has not been in use since the mid-1990s

The Paris Pit Site Plan – Operating at Today’s Standards

While our license was obtained in 1974, Dufferin Aggregates will operate the Paris Pit based on **TODAY’S standards.**

It is the law and regulation:

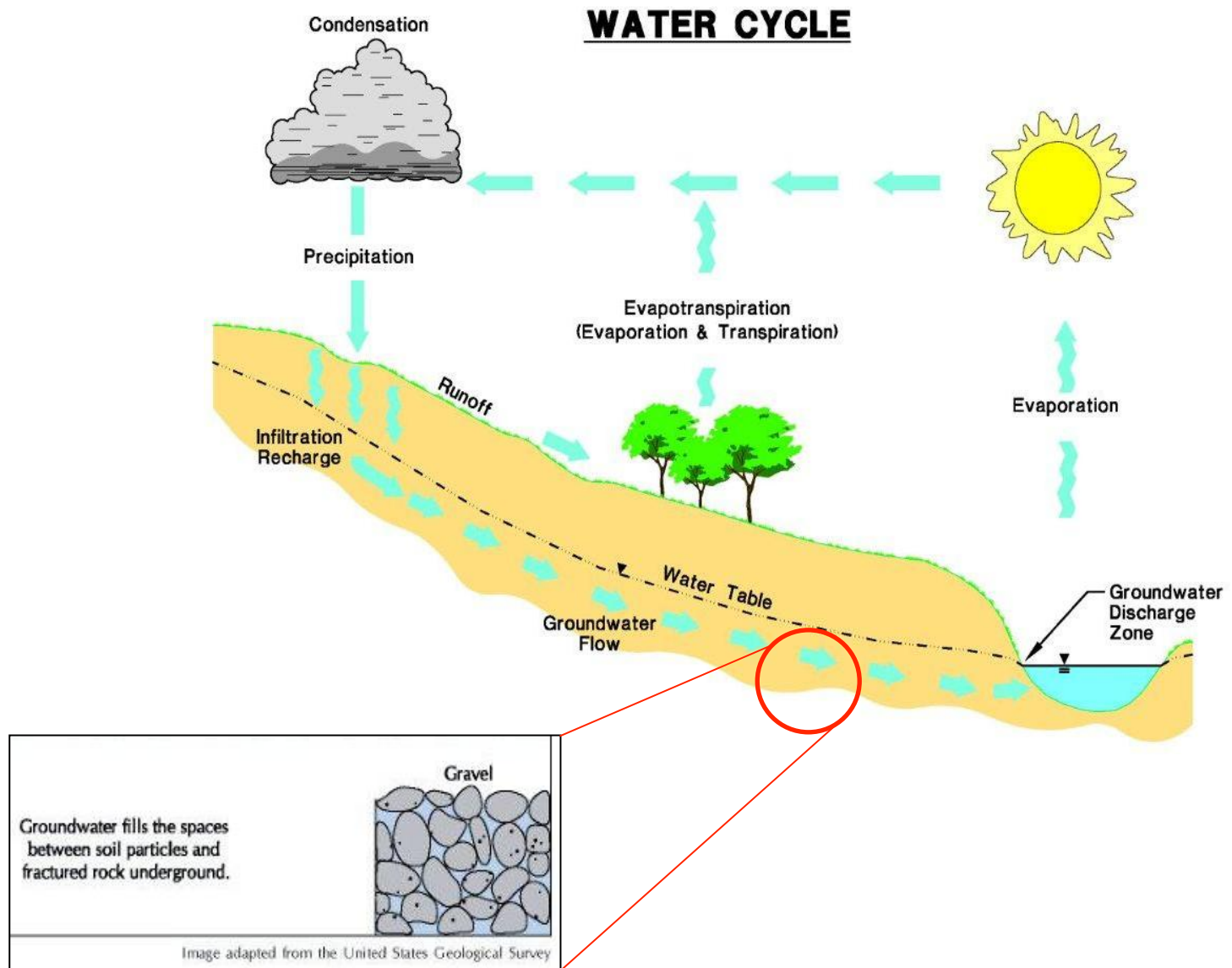
- Ontario Aggregate Resources Act:
http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90a08_e.htm
- Ontario Water Resources Act:
http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90o40_e.htm
- Ministry of Environment- Permit to Take Water:
http://www.ene.gov.on.ca/environment/en/industry/assessment_and_approvals/water_taking/STDPROD_075554.html
- Ministry of Environment – Environmental Compliance Approval:
http://www.ene.gov.on.ca/environment/en/industry/assessment_and_approvals/environmental_approvals/index.htm
- Ministry of Natural Resources - Endangered Species Act:
http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/STEL01_131232.html
- Technical Standards and Safety Authority - Fuel Storage Standards:
<http://www.tssa.org/regulated/fuels/default.asp>



As any new rules and regulation take effect, we are required and we will comply with any new standards and regulation. It is the law and how we do business..

Water Cycle

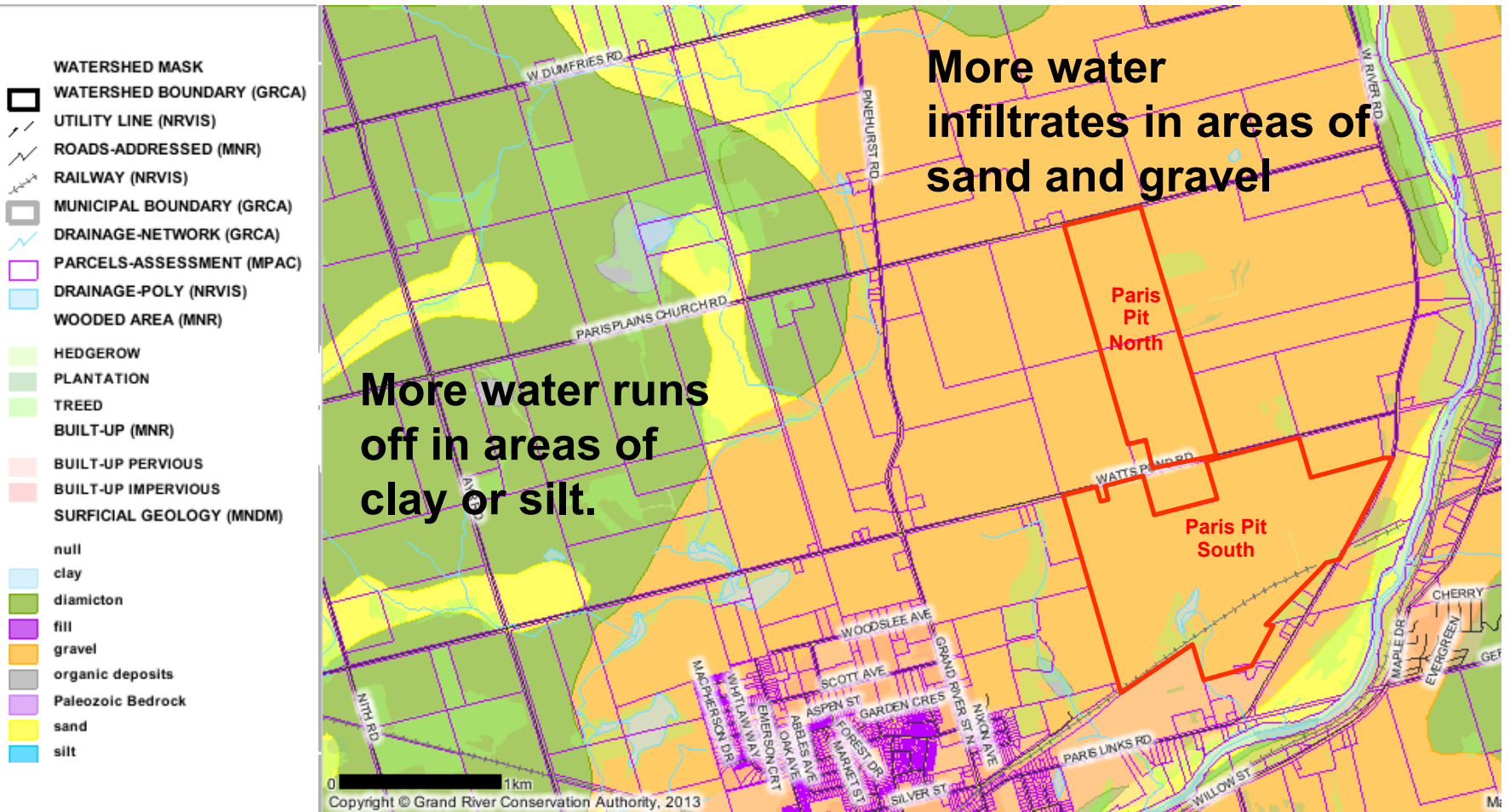
Water around the Paris Pit originates from local precipitation. About half of this water evapotranspirates (evaporates or transpired by plants) and the rest infiltrates or runs off.



Geology & Water

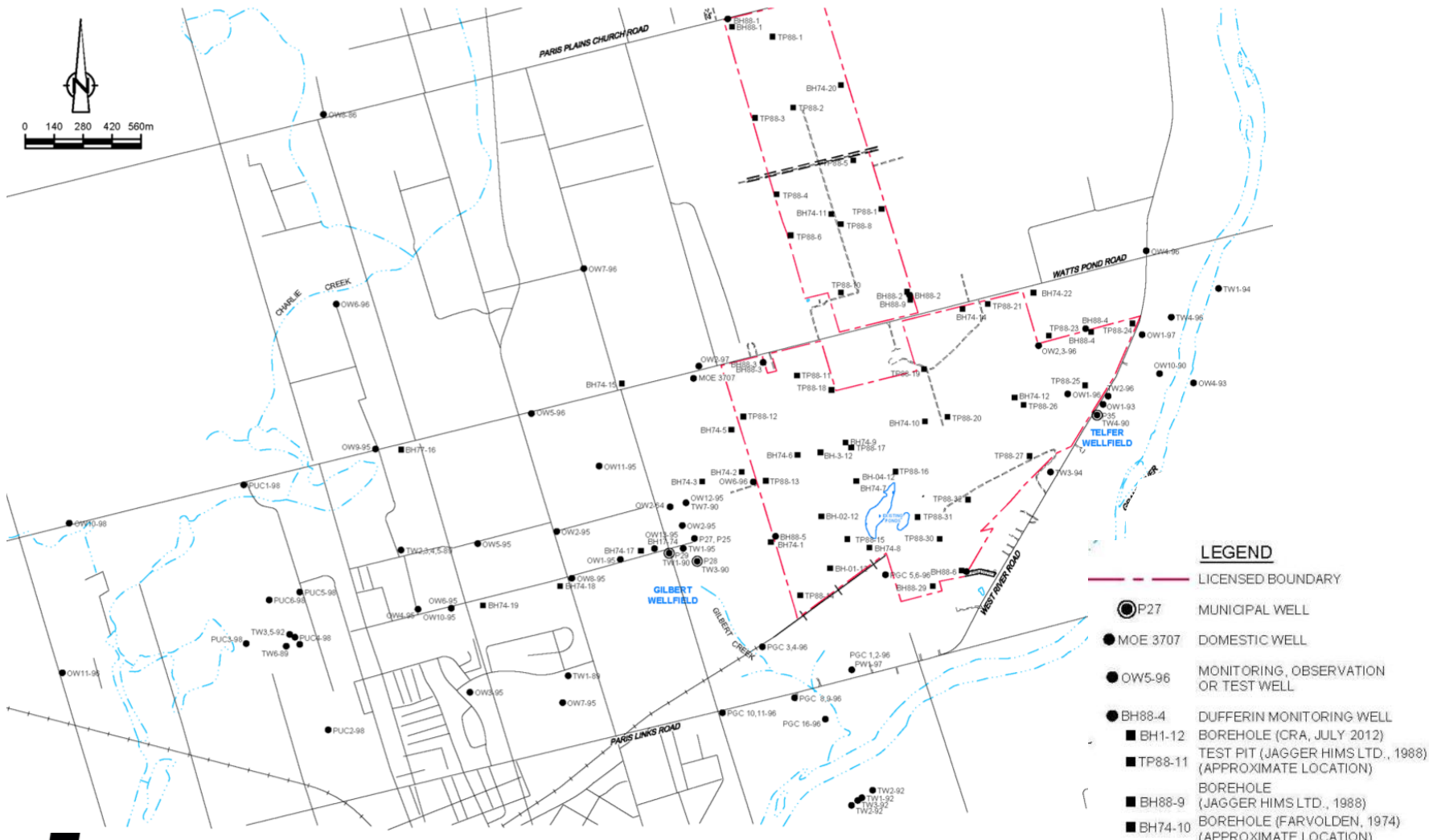
Surficial Geology: The Paris Pit and surrounding area is underlain by glacial deposits of sand and gravel.

Map Legend



Hydrogeologic Investigations

Extensive subsurface investigations have been completed in the Paris Pit and surrounding area. The information is available to all agencies and the public. Monitoring of this area is ongoing.

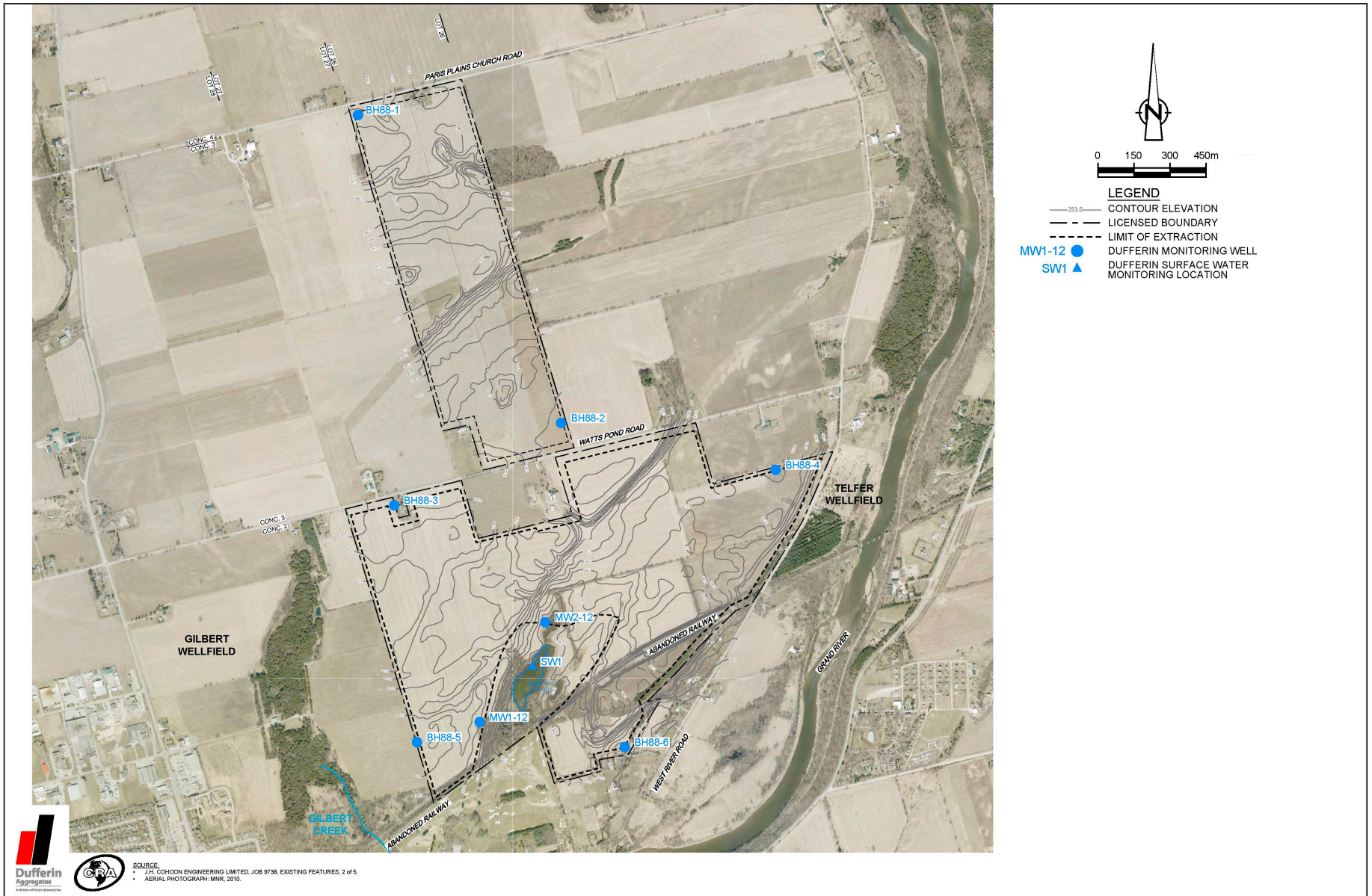


- LEGEND**
- LICENSED BOUNDARY
 - P27 MUNICIPAL WELL
 - MOE 3707 DOMESTIC WELL
 - OW5-96 MONITORING, OBSERVATION OR TEST WELL
 - BH88-4 DUFFERIN MONITORING WELL
 - BH1-12 BOREHOLE (CRA, JULY 2012)
 - TP88-11 TEST PIT (JAGGER HIMS LTD., 1988) (APPROXIMATE LOCATION)
 - BH88-9 BOREHOLE (JAGGER HIMS LTD., 1988)
 - BH74-10 BOREHOLE (FARVOLDEN, 1974) (APPROXIMATE LOCATION)



Monitoring Wells

Dufferin Aggregates has 12 monitoring wells at 8 locations in the Paris Pit and has been monitoring the area since the 1980's. Additional wells and a surface water staff gauge were added in 2012. The County of Brant has access to the Dufferin Aggregates wells.



Monitoring Wells

Investigations include: test pits, boreholes, monitoring wells, staff gauges, and monitoring water levels and water quality.

- Borehole/Monitoring Well Log – BH5 Upper Aquifer:

BOREHOLE NO. 5

Page 1 of 2

PROJECT NAME: HYDROGEOLOGICAL INVESTIGATION PARIS SAND AND GRAVEL PIT

PROJECT NO.: 880027.07

CLIENT: DIFFERIN AGGREGATES

DATE: NOVEMBER 23, 1988

BOREHOLE TYPE: 150 mm DIAMETER AIR ROTARY

GEOLOGIST: EK/DM

GROUND ELEVATION: 253.78 mASL

REVIEWER: DEJ

| DEPTH (m) | STRATIGRAPHIC DESCRIPTION | MONITOR DETAILS | SAMPLE | | | | CONE PENETRATION | | WATER CONTENT % | | REMARKS | |
|-----------|--|-----------------|--------|---------|---------|------------|------------------|-----------|-----------------|----------|----------------|----|
| | | | TYPE | % VALUE | % WATER | % RECOVERY | ROD (m) | "N" VALUE | | 10 20 30 | | |
| | | | | | | | | 10 | 20 | 30 | | 10 |
| 0 | TOPSOIL | | | | | | | | | | | |
| 0.3 | DUNE SAND MEDIUM BROWN, SOME MEDIUM TO COARSE SAND, TRACE GRAVEL AND SILT | | | | | | | | | | SAMPLED DEPTH: | |
| 2 | | | | | | | | | | | 1.5 m TO 3.1 m | |
| 3.7 | | | | | | | | | | | 3.1 m TO 4.8 m | |
| 4 | MEDIUM TO COARSE SAND AND GRAVEL MEDIUM BROWN, TRACE SILT - SAMPLES SHOWING ±75-80% OF FRAGMENTS - OCCASIONAL COBBLES | | | | | | | | | | 4.8 m TO 8.1 m | |



| DEPTH (m) | STRATIGRAPHIC DESCRIPTION | MONITOR DETAILS | SAMPLE TYPE | REMARKS | SAMPLED DEPTH (m) |
|-----------|--|-----------------|-------------|---------|-------------------|
| 4 | MEDIUM TO COARSE SAND AND GRAVEL MEDIUM BROWN, TRACE SILT - SAMPLES SHOWING ±75-80% OF FRAGMENTS - OCCASIONAL COBBLES | | OS | | 4.8 m TO 8.1 m |
| 6 | | | OS | | 8.1 m TO 7.6 m |
| 8 | | | OS | | 7.6 m TO 9.1 m |
| 10 | | | OS | | 9.1 m TO 10.7 m |
| 12 | | | OS | | 10.7 m TO 12.2 m |
| 14 | | | OS | | 12.2 m TO 13.7 m |
| 16 | | | OS | | 13.7 m TO 15.2 m |
| 18.5 | SAND AND GRAVEL TRACE SILT AND FINE SAND | | OS | | |
| 17.7 | COARSE SAND AND GRAVEL | | OS | | |
| 18 | CLAYEY SAND TILL GREY | | OS | | |
| 20 | | | OS | | |

| DEPTH (m) | STRATIGRAPHIC DESCRIPTION | MONITOR DETAILS |
|-----------|--|-----------------|
| 0 | TOPSOIL | |
| 0.3 | DUNE SAND MEDIUM BROWN, SOME MEDIUM TO COARSE SAND, TRACE GRAVEL AND SILT | |
| 2 | | |
| 3.7 | | |
| 4 | MEDIUM TO COARSE SAND AND GRAVEL MEDIUM BROWN, TRACE SILT - SAMPLES SHOWING ±75-80% OF FRAGMENTS - OCCASIONAL COBBLES | |
| 6 | | |
| 8 | | |
| 10 | - BECOMING SATURATED AT ±10.0 m | |
| 12 | | |
| 14 | | |
| 16 | | |
| 18.5 | SAND AND GRAVEL TRACE SILT AND FINE SAND | |
| 17.7 | COARSE SAND AND GRAVEL | |
| 18 | CLAYEY SAND TILL GREY | |
| 20 | | |

Monitoring Wells

Investigations include: test pits, boreholes, monitoring wells, staff gauges, and monitoring water levels and water quality.

• Borehole/Monitoring Well Log – BH5A Bedrock:

BOREHOLE NO. 5A

Page 1 of 2

PROJECT NAME: HYDROGEOLOGICAL INVESTIGATION PARIS SAND AND GRAVEL PIT

CLIENT: DUFFERIN AGGREGATES

BOREHOLE TYPE: 150 mm DIAMETER AIR ROTARY

GROUND ELEVATION: ± 253.78 mASL

PROJECT NO.: 880027.07

DATE: OCTOBER 30, 1990

GEOLOGIST: FB

REVIEWER: DEJ

| DEPTH (m) | STRATIGRAPHIC DESCRIPTION | MONITOR DETAILS | SAMPLE | | | | CONE PENETRATION | | WATER CONTENT % | | REMARKS |
|-----------|--|-----------------|--------|----------------------|----------------------|-------------------------|------------------|----------------|-----------------|----------------|--------------|
| | | | TYPE | N _v VALUE | K _v VALUE | K _r RECOVERY | ROD (m) | SHEAR STRENGTH | W _p | W _L | |
| 0 | | | | | | | | | | | |
| 0.3 | TOPSOIL | | | | | | | | | | |
| 0.5 | FINE TO COARSE SAND MEDIUM BROWN, TRACE OF FINE GRAVEL AND SILT, BECOMING MEDIUM TO COARSE SAND, TRACE OF FINE GRAVEL AT ±2.3 m, CHANGING TO FINE TO COARSE SAND, SOME GRAVEL, TRACE TO SOME SILT AT ±3.8 m, MEDIUM TO COARSE SAND, SOME FINE SAND AND GRAVEL, TRACE SILT AT BOTTOM | | | | | | | | | | |
| 2 | | | | | | | | | | | |
| 4 | | | | | | | | | | | |
| 6 | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| 8.4 | GRAVELLY SAND MEDIUM BROWN, TRACE TO SOME SILT, BECOMING SATURATED AT ±9.8 m | | | | | | | | | | |
| 9.8 | MEDIUM TO COARSE SAND AND GRAVEL MEDIUM BROWN, SOME FINE SAND AND GRAVEL, TRACE SILT AT BEGINNING | | | | | | | | | | NATURAL CAVE |
| 12 | | | | | | | | | | | |
| 13.0 | FINE TO COARSE GRAVEL MEDIUM BROWN, SOME MEDIUM TO COARSE SAND | | | | | | | | | | |
| 14 | | | | | | | | | | | |
| 14.5 | MEDIUM TO COARSE SAND AND GRAVEL MEDIUM BROWN | | | | | | | | | | |
| 18 | 16.0 | | | | | | | | | | |
| 18 | FINE TO COARSE GRAVEL MEDIUM BROWN, ANGULAR GRAVEL, SOME MEDIUM TO COARSE SAND, TRACE SILT | | | | | | | | | | |
| 18 | 17.7 | | | | | | | | | | |
| 18 | CLAYEY SILT GREY, TRACE OF GRAVEL | | | | | | | | | | |
| 20 | | | | | | | | | | | |

BOREHOLE NO. 5A

Page 2 of 2

PROJECT NAME: HYDROGEOLOGICAL INVESTIGATION PARIS SAND AND GRAVEL PIT

CLIENT: DUFFERIN AGGREGATES

BOREHOLE TYPE: 150 mm DIAMETER AIR ROTARY

GROUND ELEVATION: ± 253.78 mASL

PROJECT NO.: 880027.07

DATE: OCTOBER 30, 1990

GEOLOGIST: FB

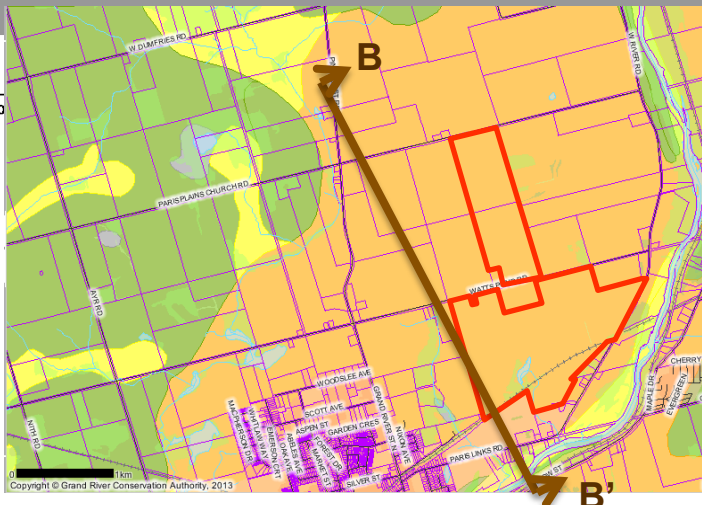
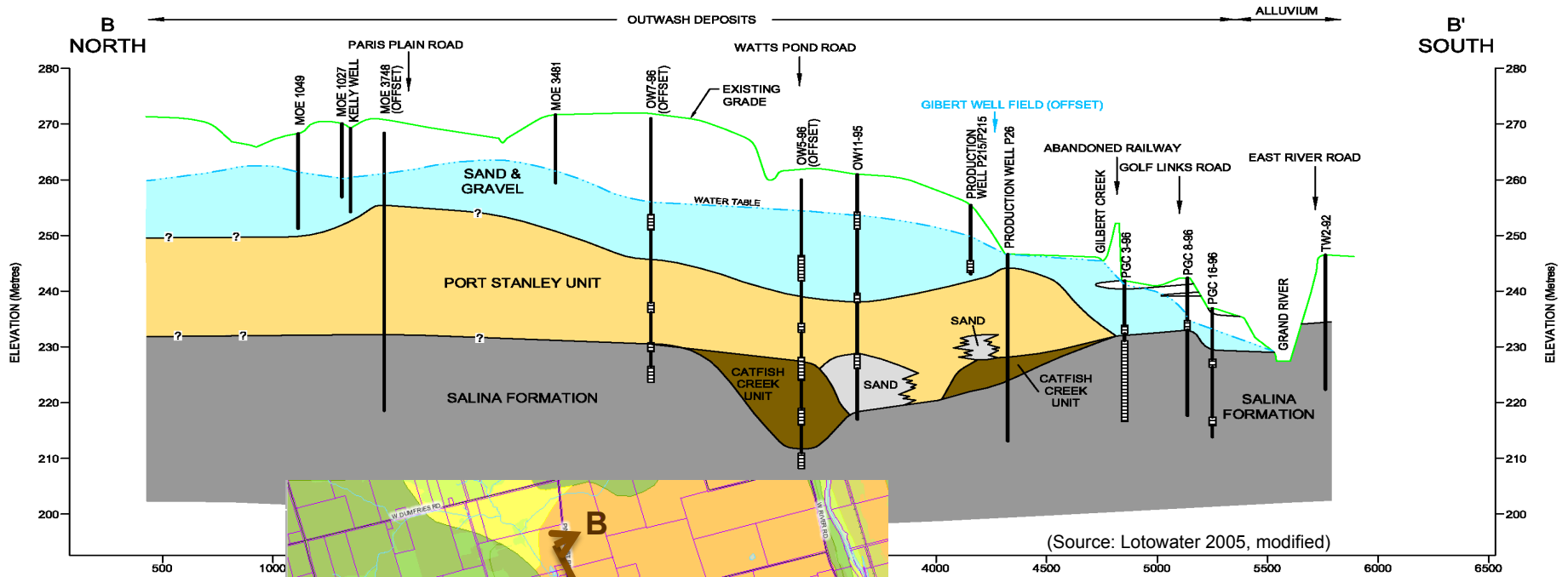
REVIEWER: DEJ

| DEPTH (m) | STRATIGRAPHIC DESCRIPTION | MONITOR DETAILS | SAMPLE | | | | CONE PENETRATION | | WATER CONTENT % | | REMARKS |
|-----------|---|-----------------|--------|----------------------|----------------------|-------------------------|------------------|----------------|-----------------|----------------|--------------------------------------|
| | | | TYPE | N _v VALUE | K _v VALUE | K _r RECOVERY | ROD (m) | SHEAR STRENGTH | W _p | W _L | |
| 20 | | | | | | | | | | | |
| 20.8 | CLAYEY SILT TILL GREY | | | | | | | | | | NATURAL CAVE |
| 22 | | | | | | | | | | | |
| 23.6 | | | | | | | | | | | |
| 24 | CLAYEY SAND TILL GREY | | | | | | | | | | |
| 28 | | | | | | | | | | | |
| 28 | | | | | | | | | | | |
| 28.2 | CLAYEY SAND TILL AND GRAVEL GREY, ANGULAR GRAVEL | | | | | | | | | | |
| 30 | | | | | | | | | | | ZONE PRODUCING ESTIMATED 150.8 L/min |
| 31.1 | BEDROCK GREEN, WEATHERED SHALE | | | | | | | | | | |
| 33.8 | BOREHOLE TERMINATED AT 33.8 m | | | | | | | | | | |
| 34 | | | | | | | | | | | |
| 35 | | | | | | | | | | | |
| 36 | | | | | | | | | | | |
| 38 | | | | | | | | | | | |
| 40 | | | | | | | | | | | |

Geology & Water

The borehole information provides the specific details on soil/overburden thickness, soil type, depth to bedrock, and the depth to the water table.

Hydrogeologic Cross-Section B-B'



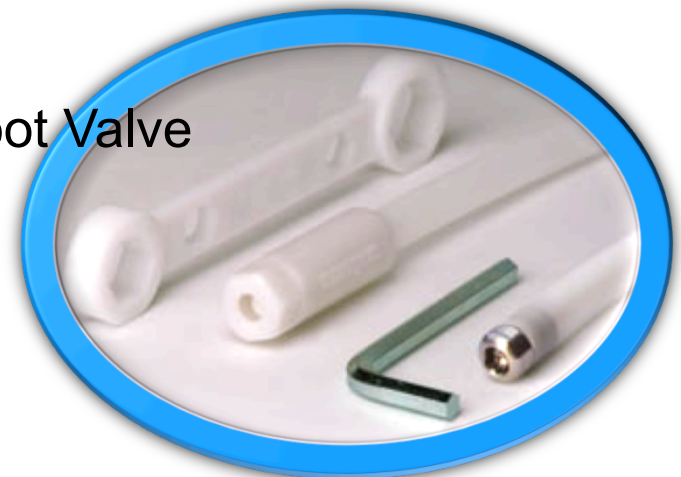
Monitoring Wells

Monitoring includes measurement of water levels and collection of water samples for analysis.

Water Level Meter



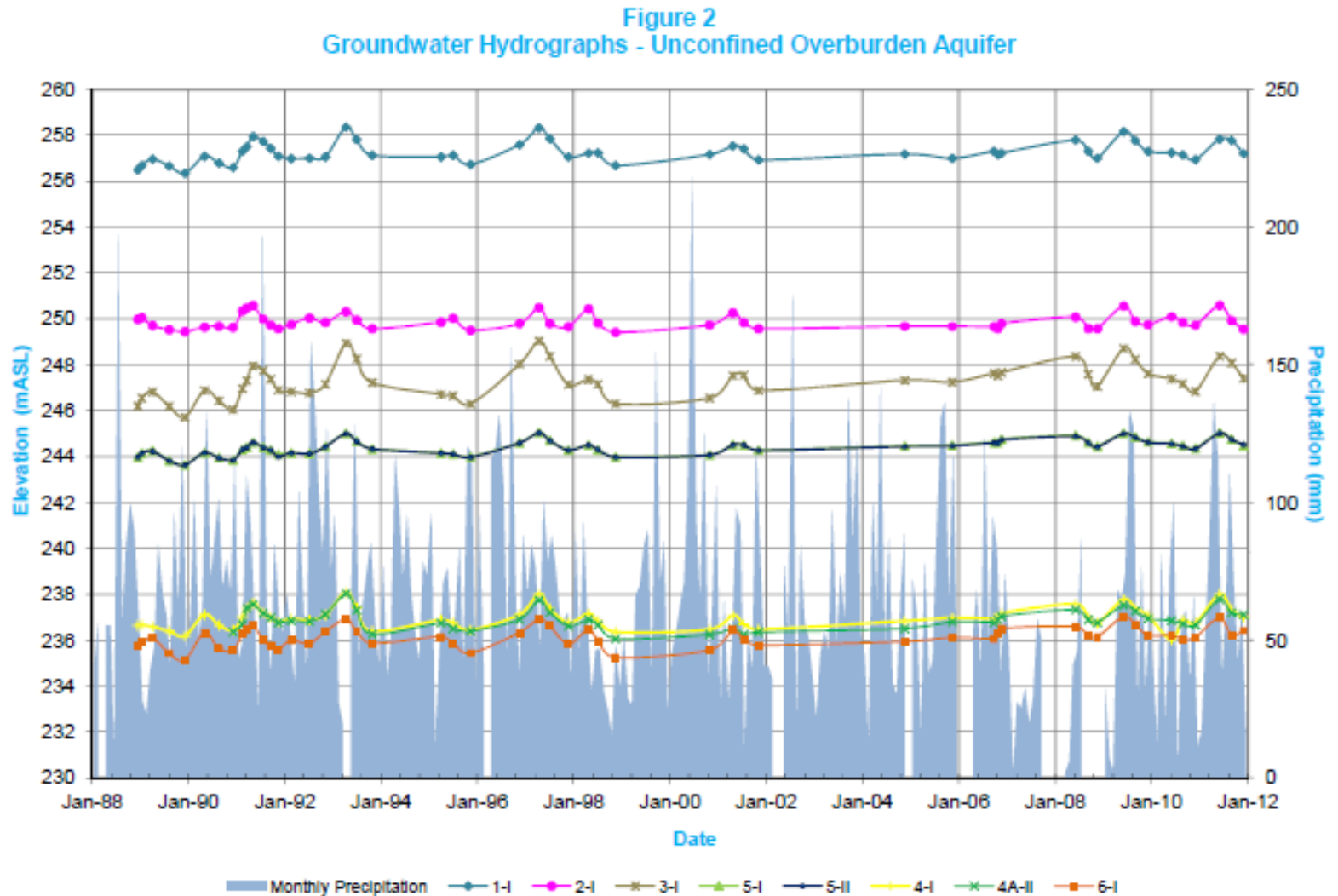
Watterra Tubing



Foot Valve

Monitoring Wells & Water Table

The historical data collected at the Paris Pit provides good baseline information. Groundwater levels vary with climatic conditions. Data is used for identifying conditions and to compare with data collected in the future.



Source: Figure 2, 2011 Paris Pit Monitoring Program Report March 13, 2011

Water Levels

Water levels of surface features that are connected to the water table illustrate the influence of precipitation on the water table. During dry periods the groundwater levels may change by a couple metres while surface water levels show smaller fluctuations.



- Photos of on-site ponds



March 28, 2012

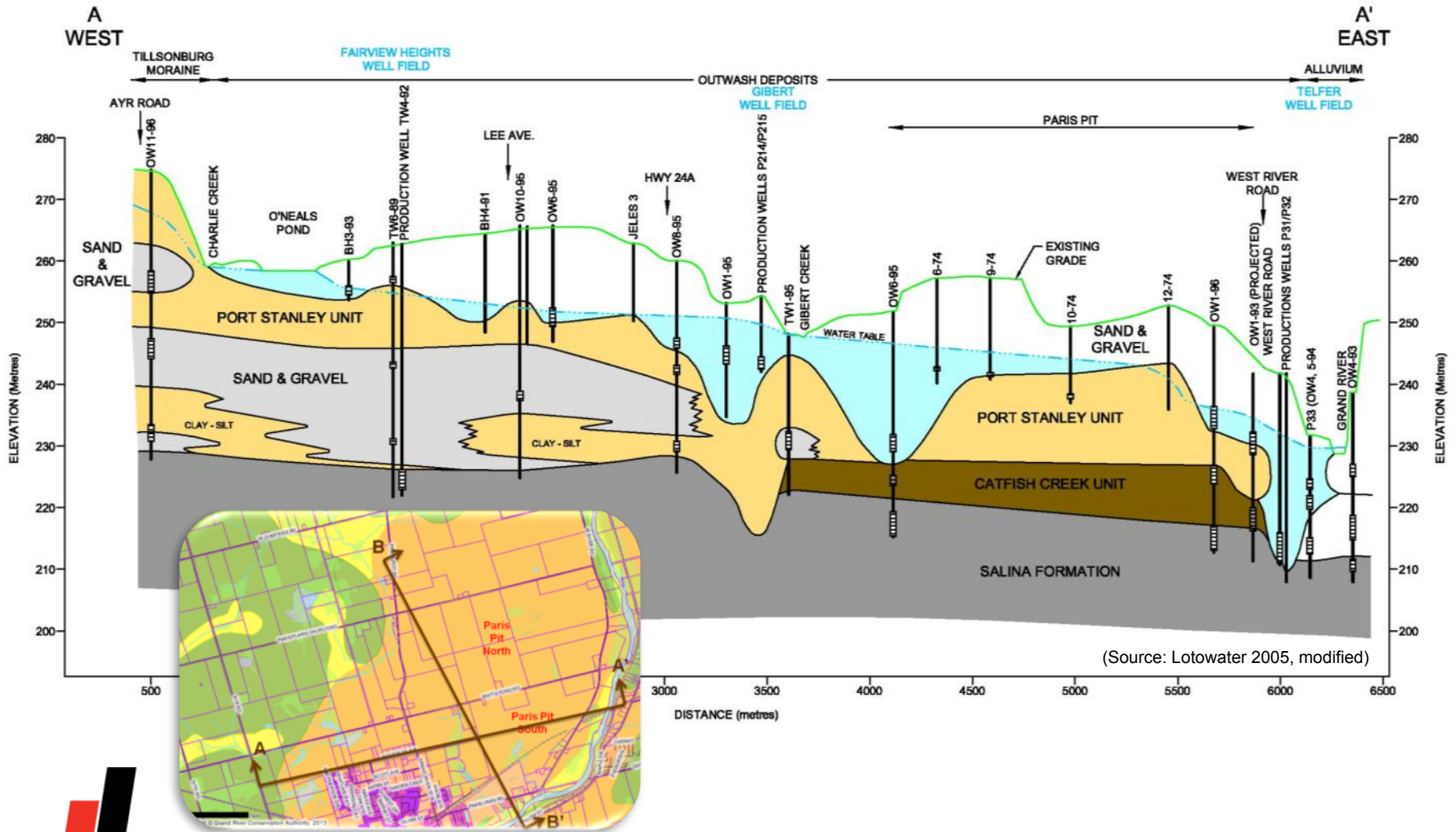


September 07, 2012

Geology & Water

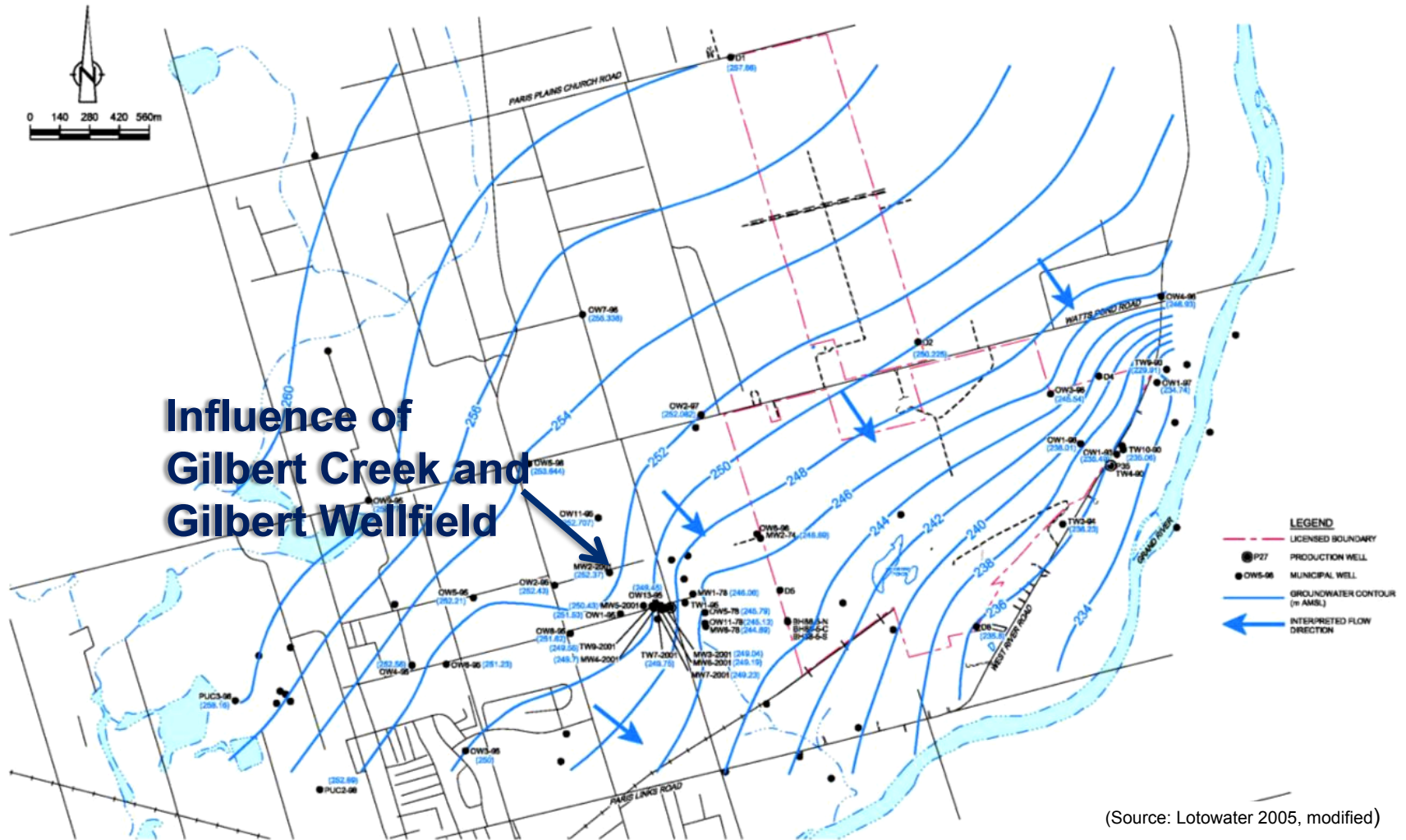
Based on data from the boreholes put down in the area, this section illustrates the geological profile and depth of water table

Hydrogeologic Cross-Section A-A'



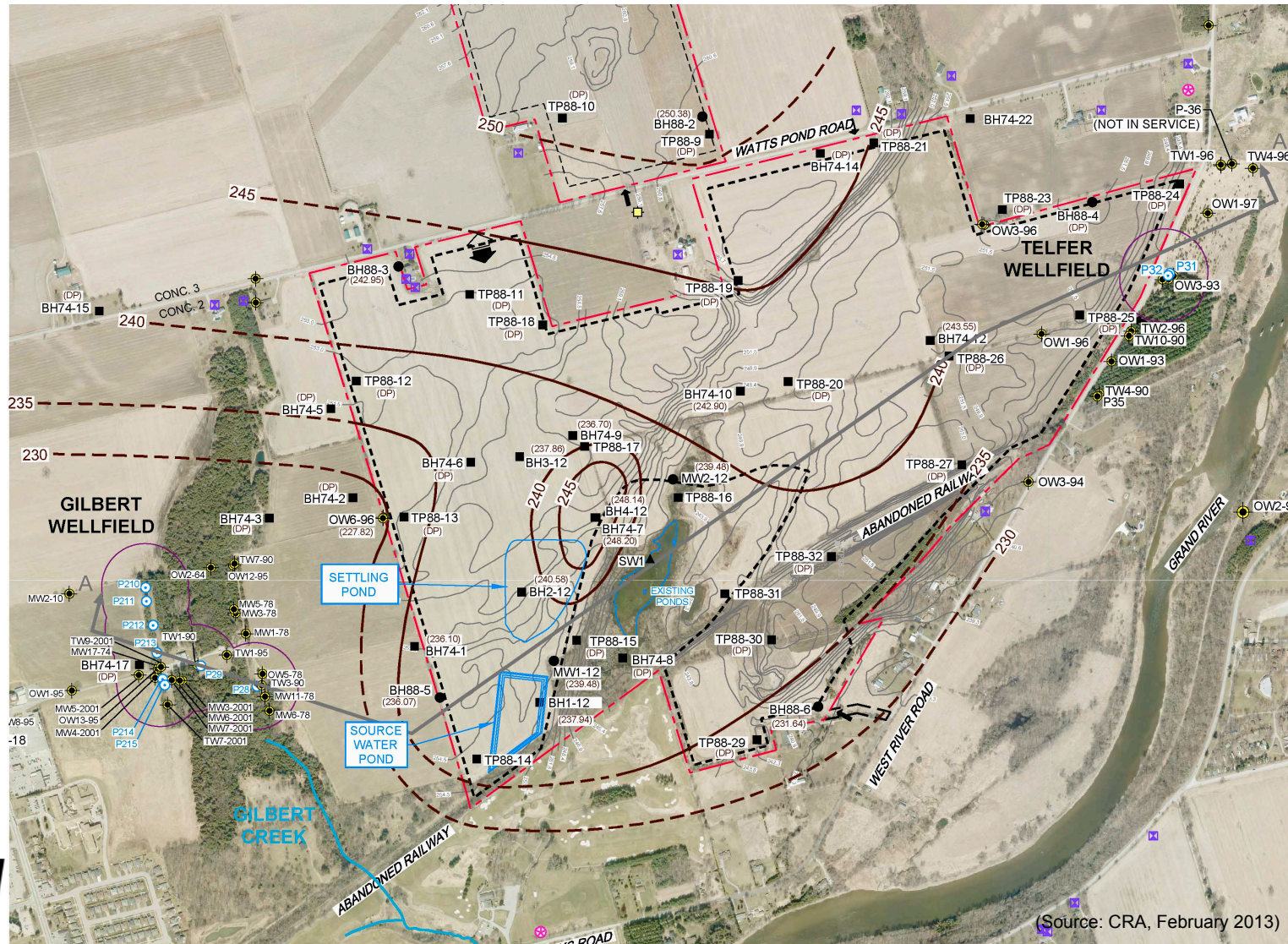
Paris Water Table Grade

Water level data from the numerous monitoring wells is used to determine depth, gradient and direction of ground water flow.



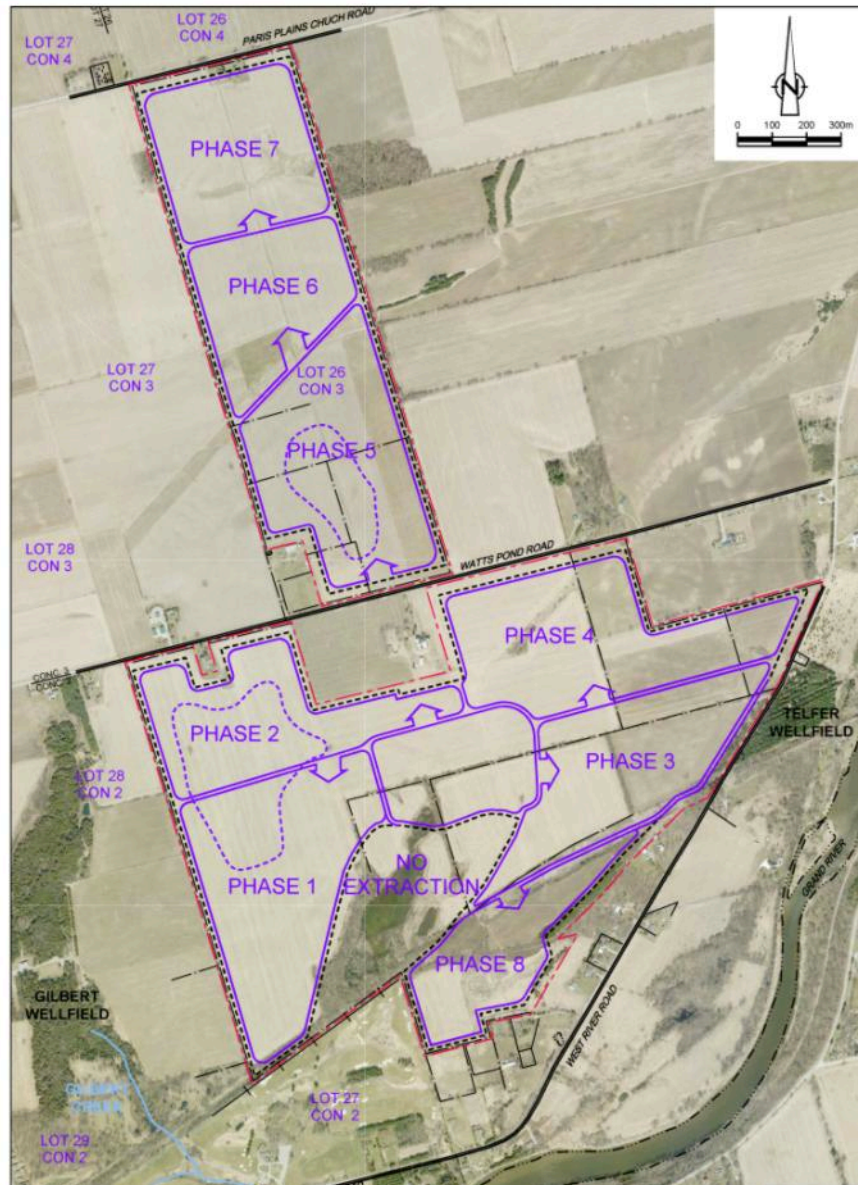
Detailed Site Investigations

Additional detailed investigation was undertaken by Dufferin Aggregates in area of proposed water taking to confirm geology and groundwater conditions as well as install future monitoring locations.



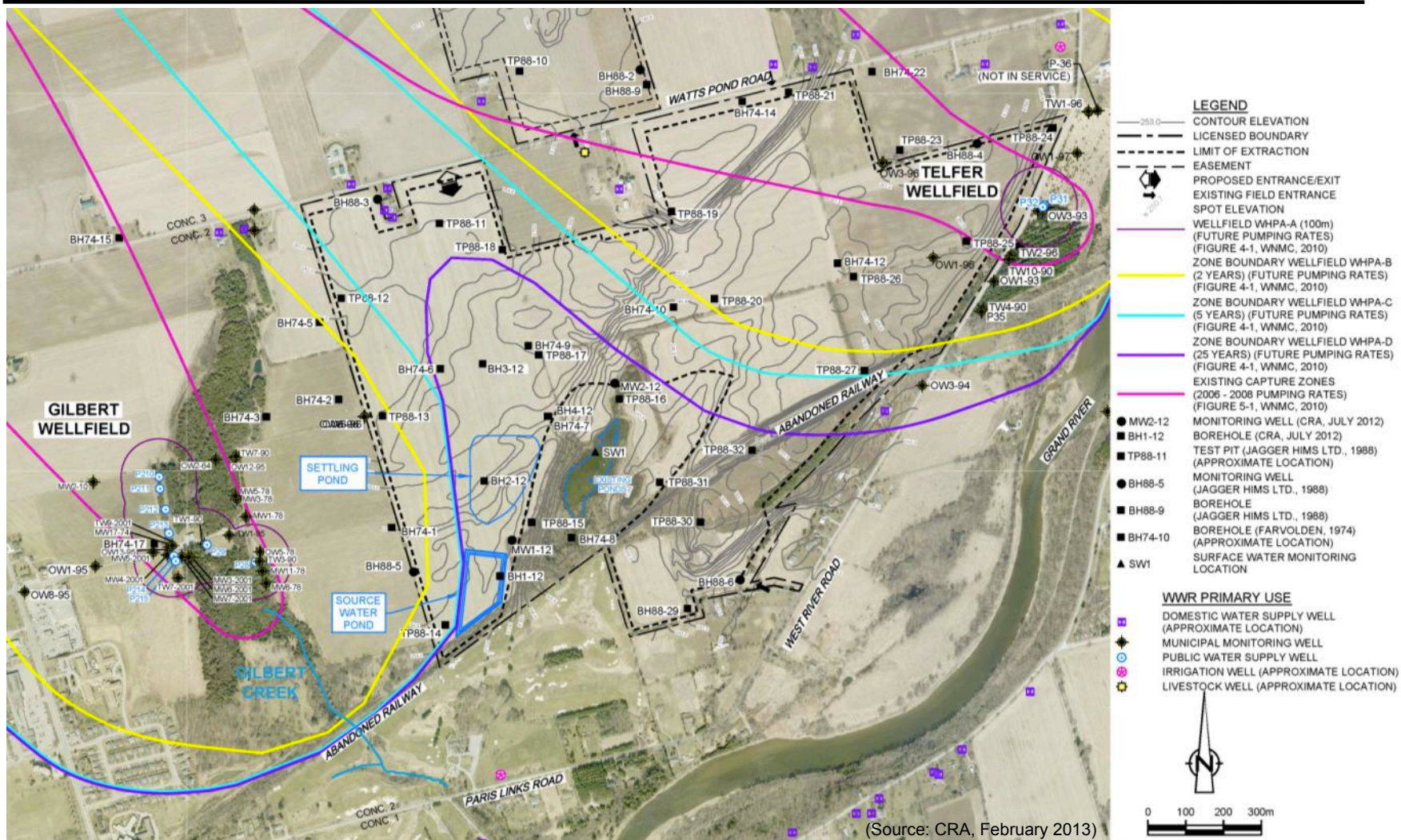
Phasing

Paris Pit plans have been modified to further protect water resources: locations of operations, fuel storage, water taking, as well as commitments to further study water supply protection



Source Water Protection

Paris Pit plans have been modified to further protect water resources: locations of operations, fuel storage, water taking, as well as commitments to further study water supply protection

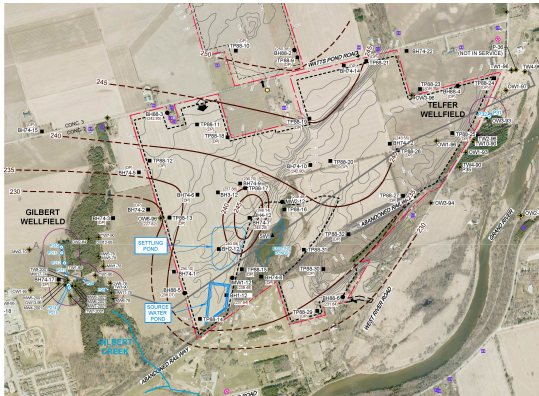
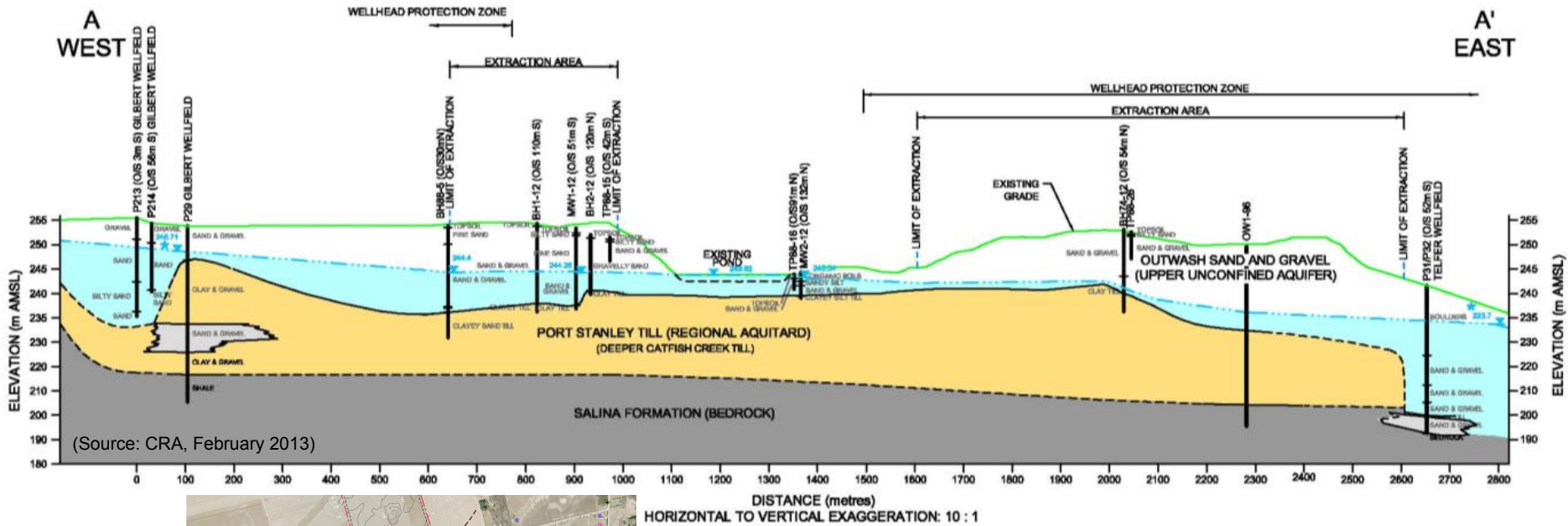


Extraction Above Water Table

Additional detailed investigation was undertaken by Dufferin's Consultants in 2012 and their monitoring continues. Work includes geology, hydrogeology, and ecology.

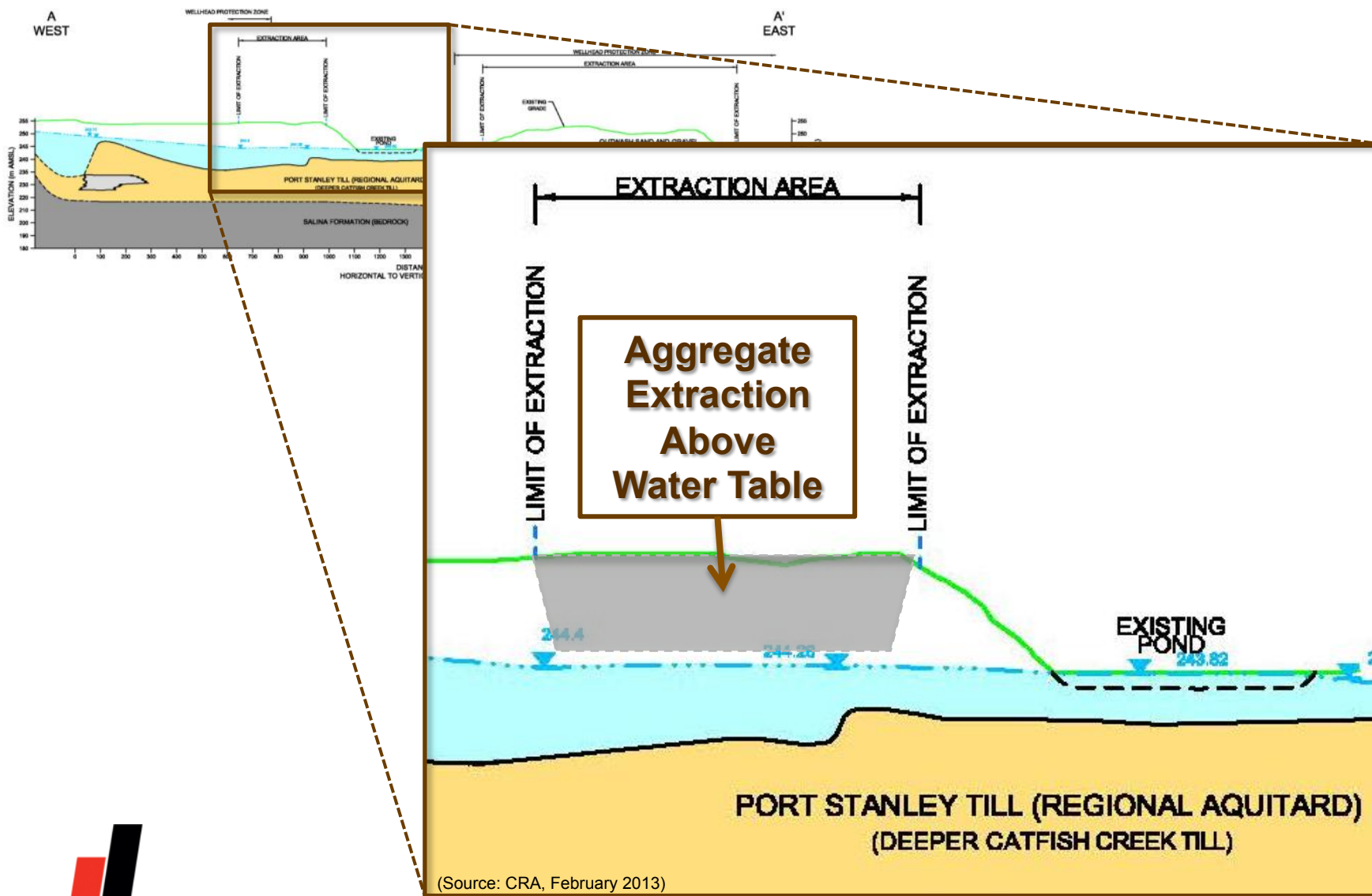
Gilbert Wellfield

Telfer Wellfield



Extraction Above Water Table

Aggregate extraction above water table **does not** impact groundwater flow system.



(Source: CRA, February 2013)

Gilbert Creek will not be affected by Paris Pit.

- The Gilbert Creek wellfield is located right along Gilbert Creek and is the primary source of water supply for Paris. The current municipal water taking is roughly 10 times greater than the water that will be used (lost) by the Paris Pit operations.
- Gilbert Creek is about 400 metres from the source water pond area.
- The Creek is not downgradient, therefore there can not be any water temperature impact.
- No impact from Paris Pit is anticipated under future conditions even if there is greatly increased municipal pumping (as represented by WHPAs) and below water extraction.
- Extensive monitoring is already in place (County's PTTW) to ensure local municipal well pumping does not negatively impact the Creek.
- Dufferin Aggregates will supplement and collaborate with the County on monitoring of Gilbert Creek conditions.

Water Quality

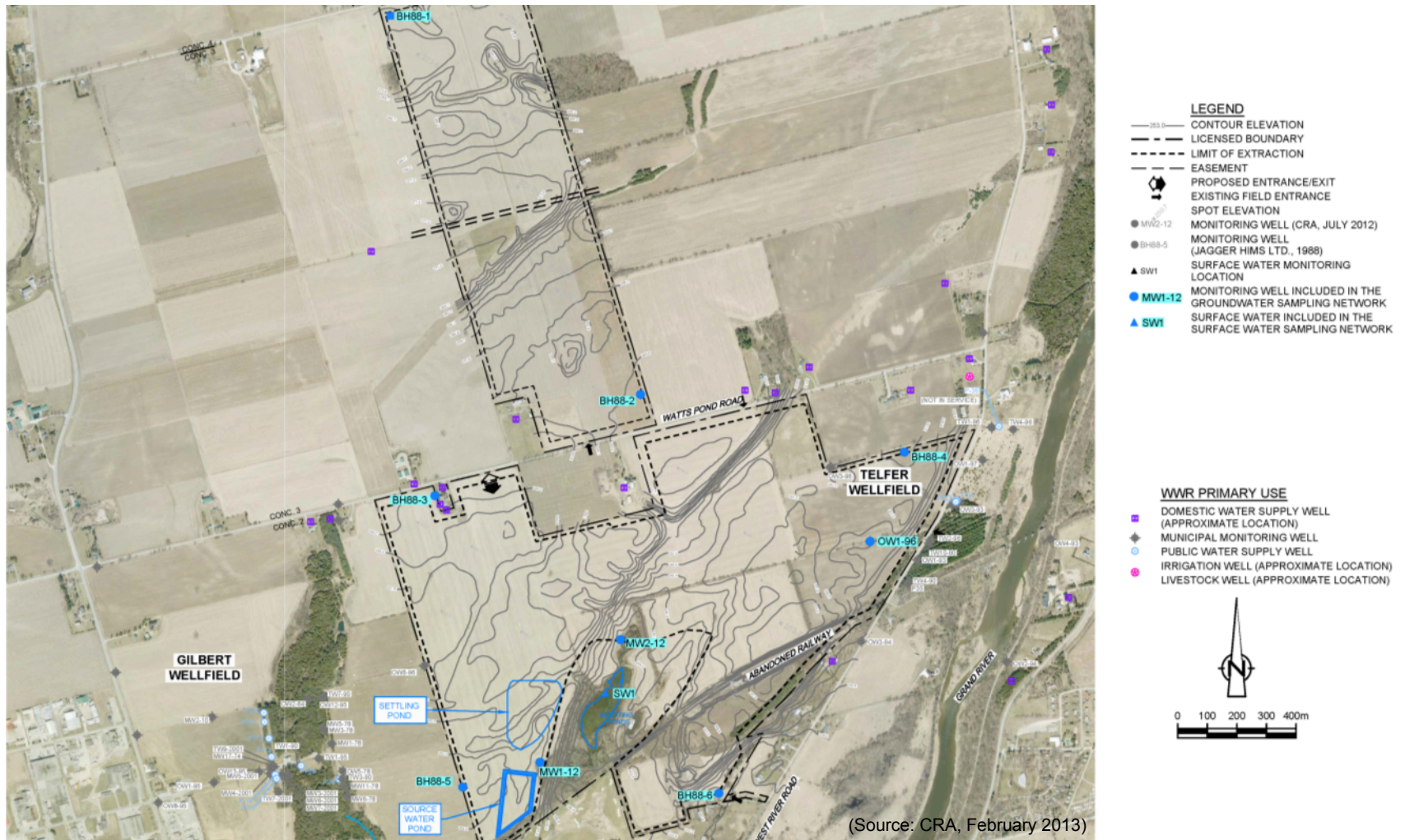
Existing water quality issues with municipal water supply **will not** be exacerbated by Paris Pit.

- Nitrate:
 - ▶ Resulting from agricultural operations
 - ▶ County program to use BMPs and minimize loading
 - ▶ Dufferin tenant farmer using BMPs
 - ▶ Non-detect levels in Existing Ponds
 - ▶ No loading from aggregate operations

- Sulphate:
 - ▶ Originates from bedrock groundwater
 - ▶ No loading from aggregate Pit operations

Water Quantity and Water Quality

Extensive monitoring will occur and results will be submitted to the MOE, MNR, and County, as well as being made available to the public.

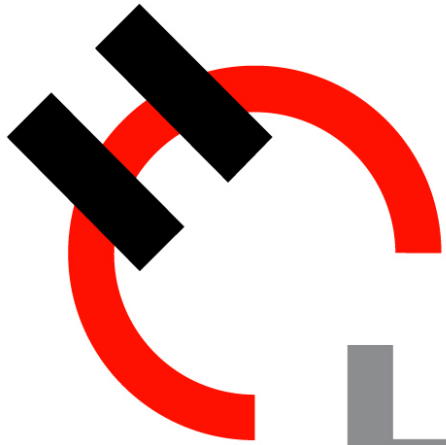


General Discussion

- Dufferin Aggregates will continue to carry out water quality and quantity monitoring.
- Additional questions

Next Steps

- Continue to listen to community concerns
- Submit Permit To Take Water Application
 - ▶ Extended EBR comment period: 90 days
- Continue to liaise with public through Community Advisory Panel
 - ▶ Next CAP meeting: March/April
 - Topics could include:
 - PTTW Application/Below water table extraction
 - Cornerstone Standards Council (SERA/AFO)



Holcim