

Paris Pit CAP

April 30, 2013

Permit To Take Water Application

Agenda

Welcome

Minutes from Last Meeting

Dufferin Paris Pit - General Update

Review of Permit To Take Water (PTTW) application

New Site Plan Notes

Hydrogeology Characterization

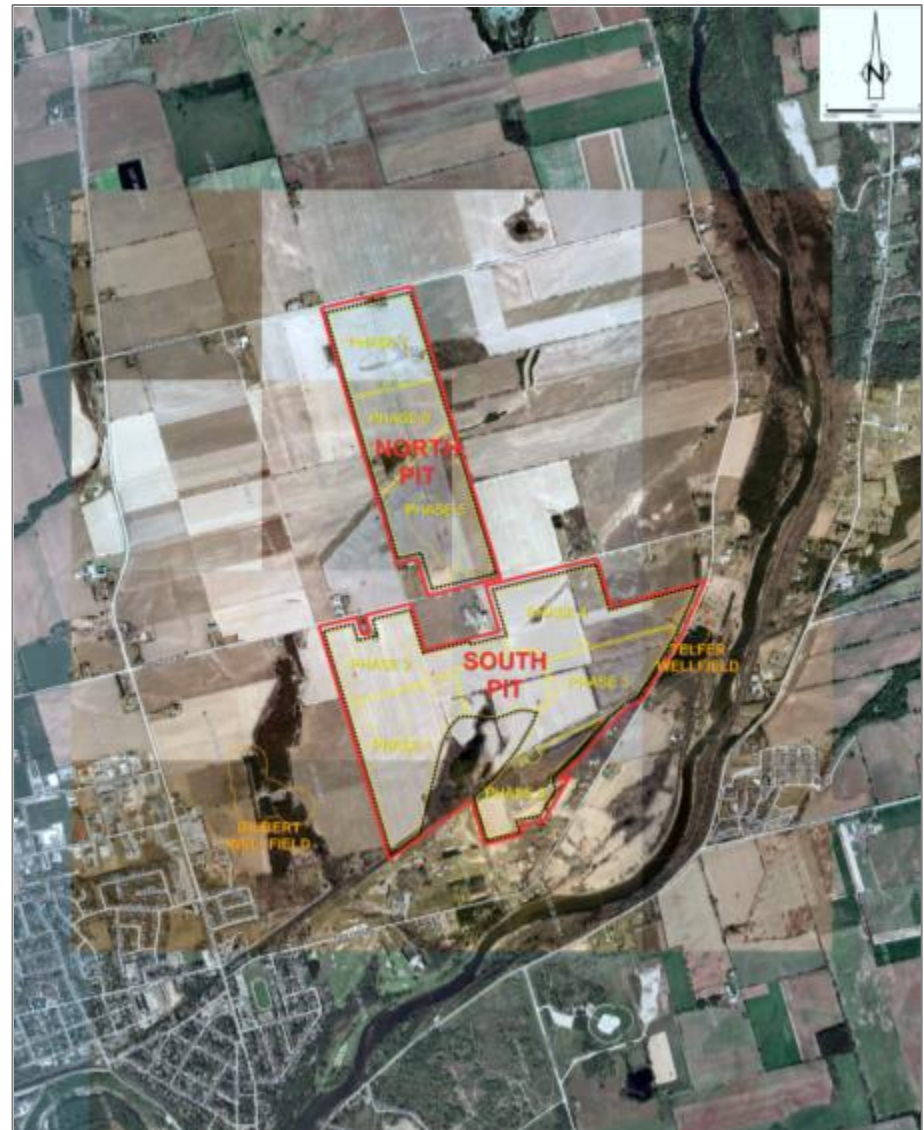
Permit to Take Water (PTTW) Application

Monitoring

Next steps

Update: Paris Pit PTTW Application

- PTTW Application
 - Filed March 13, 2013
 - EBR comment period extended to June 18, 2013 per Dufferin request



Update: Site Plan Notes

Dufferin has voluntarily added two notes to the site plans to address concerns related to below water extraction

- It is now a licence requirement to complete a comprehensive hydrogeologic assessment that will be submitted to the MNR and MOE for their review and approval prior to any below water extraction occurring.

NOTE 1:

"Extraction below the water table for the source water pond for the washing of aggregate products will not occur until the Ministry of the Environment has issued a Permit to Take Water for the purpose of aggregate washing.

Prior to commencing below water table extraction in Phase 8, the licensee shall submit for review and approval to both the District Manager, Ministry of Natural Resources and the Permit to Take Water Director, Ministry of the Environment, a comprehensive hydrogeological assessment that has been completed to the same criteria specified in the Provincial Standards under the Aggregate Resources Act, as may be amended from time to time."

Update: Site Plan Notes

Dufferin has voluntarily added two notes to the site plans to address concerns related to below water extraction

NOTE 2:

"Prior to conducting any below water table gravel extraction operation (excluding the source water pond), the licensee shall conduct groundwater monitoring for both water levels and water quality as established in an updated Groundwater Monitoring Program which has been pre-approved by the Ministry of the Environment under the Aggregate Resources Act Licence and the Permit to Take Water, for the purpose of assessing possible effects of the operation on groundwater.

The results of the Groundwater Monitoring Program and the Annual Permit to Take Water Report (required by the PTTW Permit) shall be combined and submitted annually to the both the Ministry of Natural Resources and the Ministry of the Environment as the Combined Annual Monitoring and PTTW Report. A copy of the Annual Combined Groundwater Monitoring Report shall be sent to both the District Manager, Ministry of Natural Resources and the Permit to Take Water Director, Ministry of the Environment by March 31st of each year following start up of the operation for their individual review and approval."

Update: No Extraction will occur in the Well Head Protection Area A Zone. The area will also be converted from agriculture to a natural area

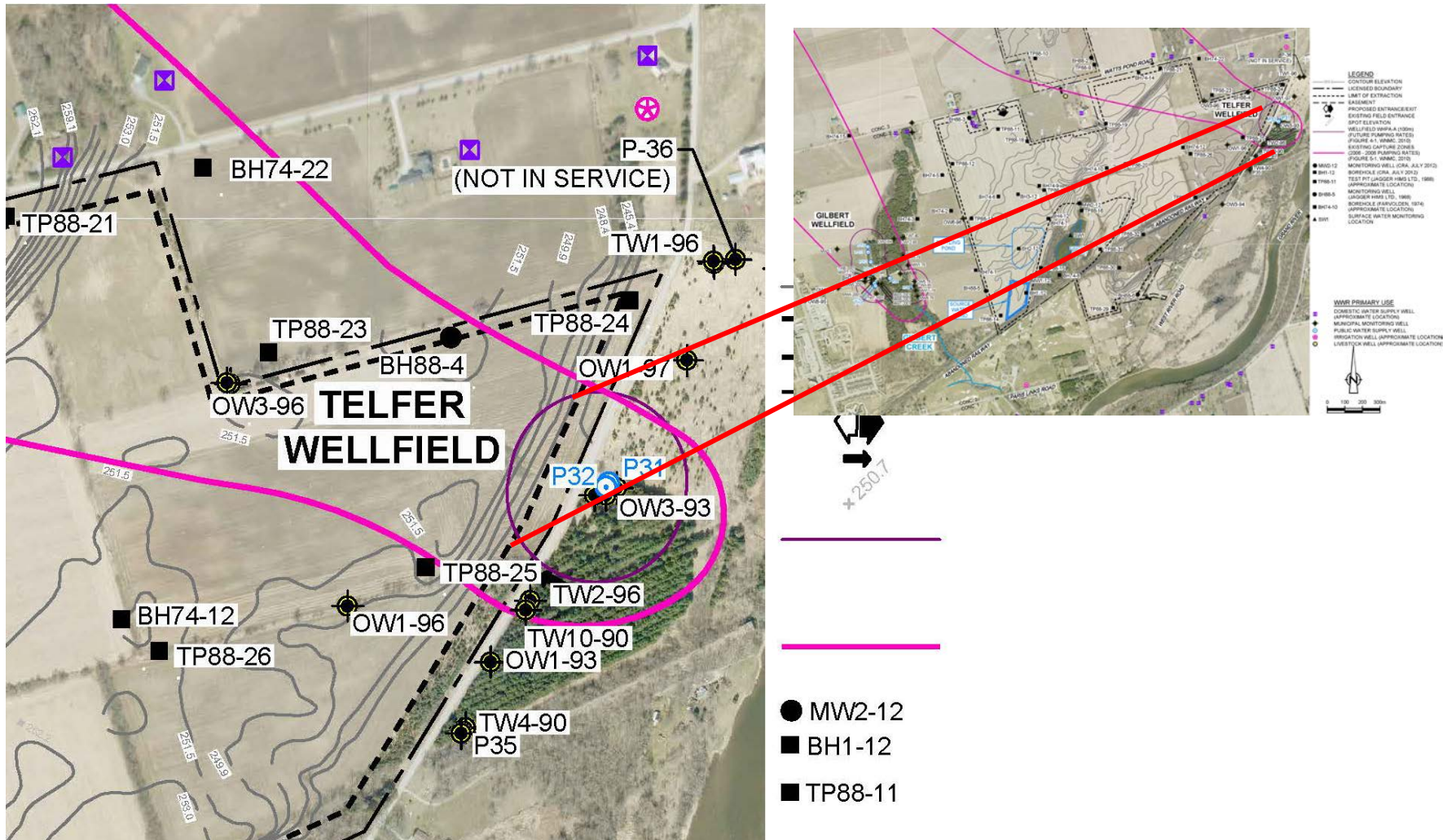


Figure 2.1 (modified), OWRA S34 PTTW Application, CRA March 2013

PTTW application - Hydrogeology Characterization

Regional Setting

Investigations and Monitoring

Hydrogeology Characterization

- Aquifer and Aquitard Zones
- Groundwater-surface water interaction
- Groundwater level variations

Municipal Wellfields

- Hydrogeology
- Existing Capture Zones
- WHPAs and Source Water Protection

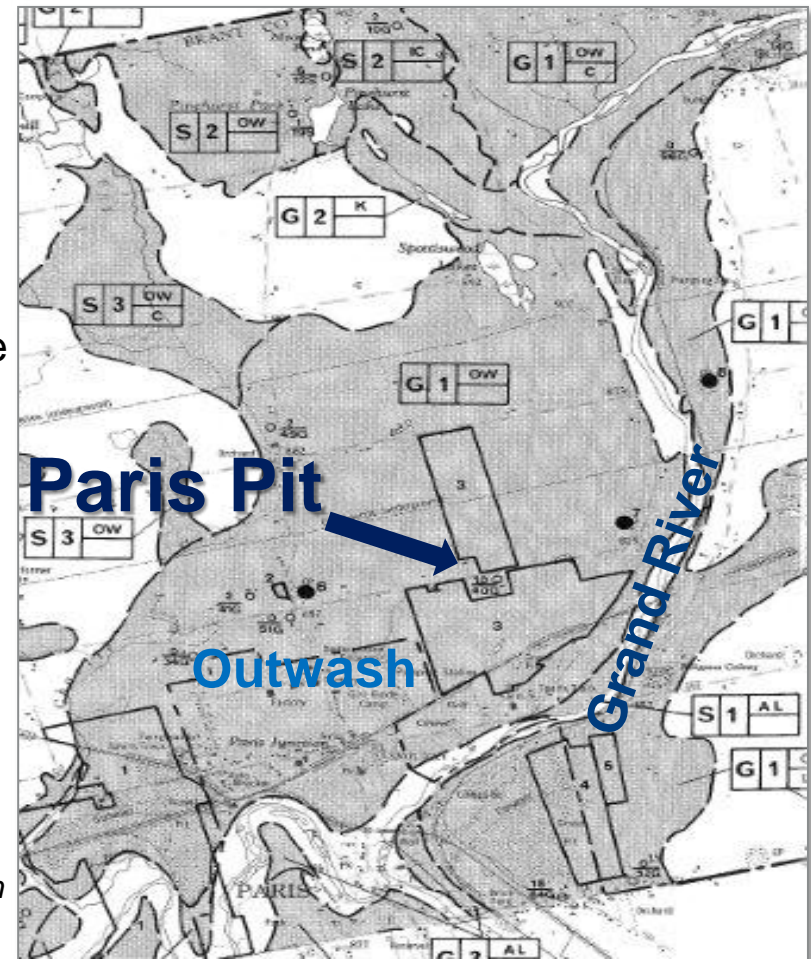
Potential Influences on Groundwater

Area north of Paris is underlain by outwash deposits that are an important source of aggregates and municipal water supply

- Outwash deposits are coarse-grained material deposited from melting glacier rivers
- Preferred source of construction aggregates
 - High gravel and cobble fraction
 - Relatively clean – low fine-grained (silt and clay) content
 - Therefore it is very important for use in public infrastructure projects that require large amounts of quality construction materials
- Outwash deposits below the water table also make good aquifers and sources of large supplies of groundwater (municipal wells)
- That's one of the reasons why you'll find co-location of municipal water supply and aggregate operations in some communities

Note: Pits refer to extraction of unconsolidated material (e.g. sand and gravel) by digging. Quarries refer to rock extraction that typically includes blasting.

OGS AGGREGATES MAPPING

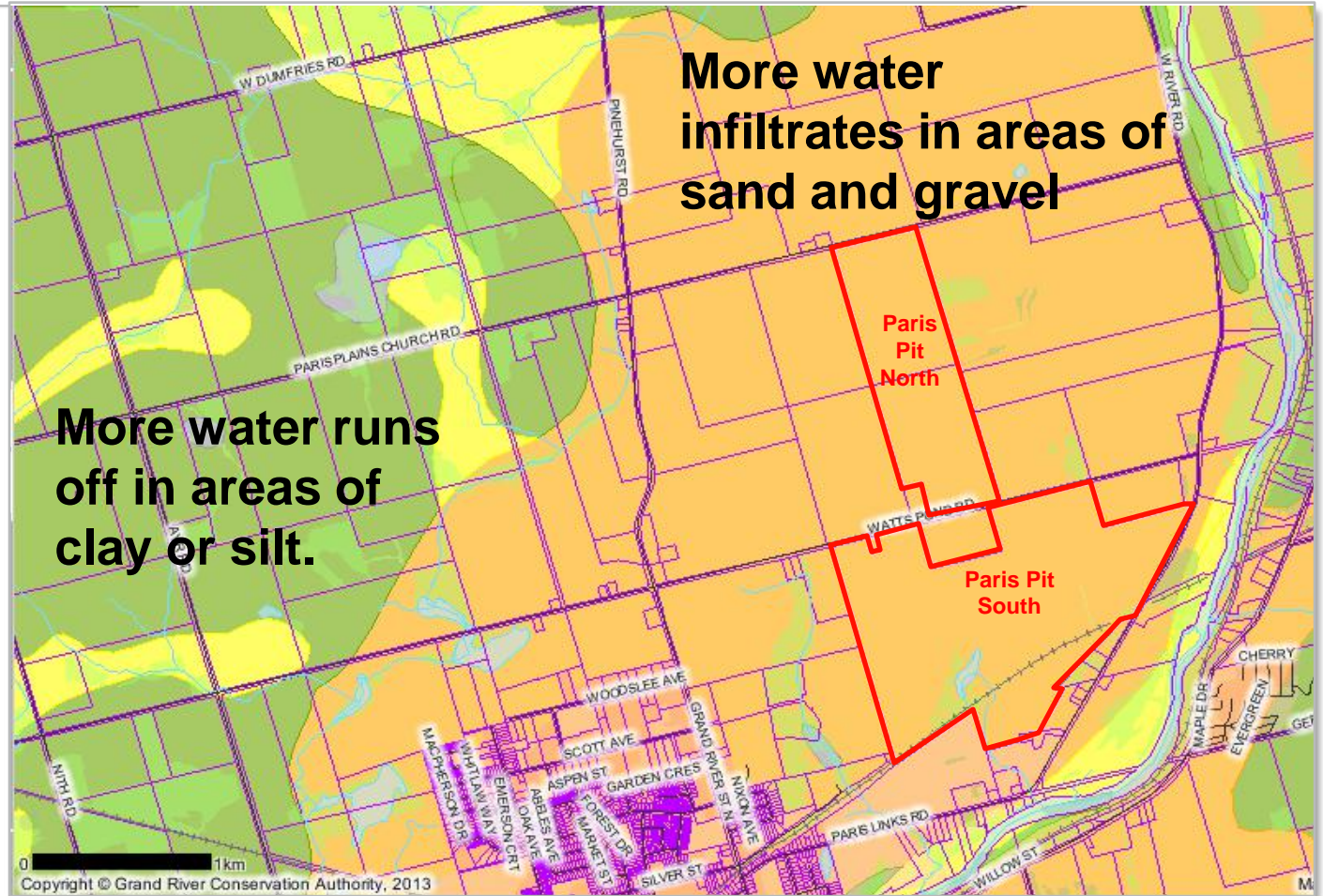


Surficial Geology & Water

Outwash sand and gravel have high infiltration of precipitation and little runoff.

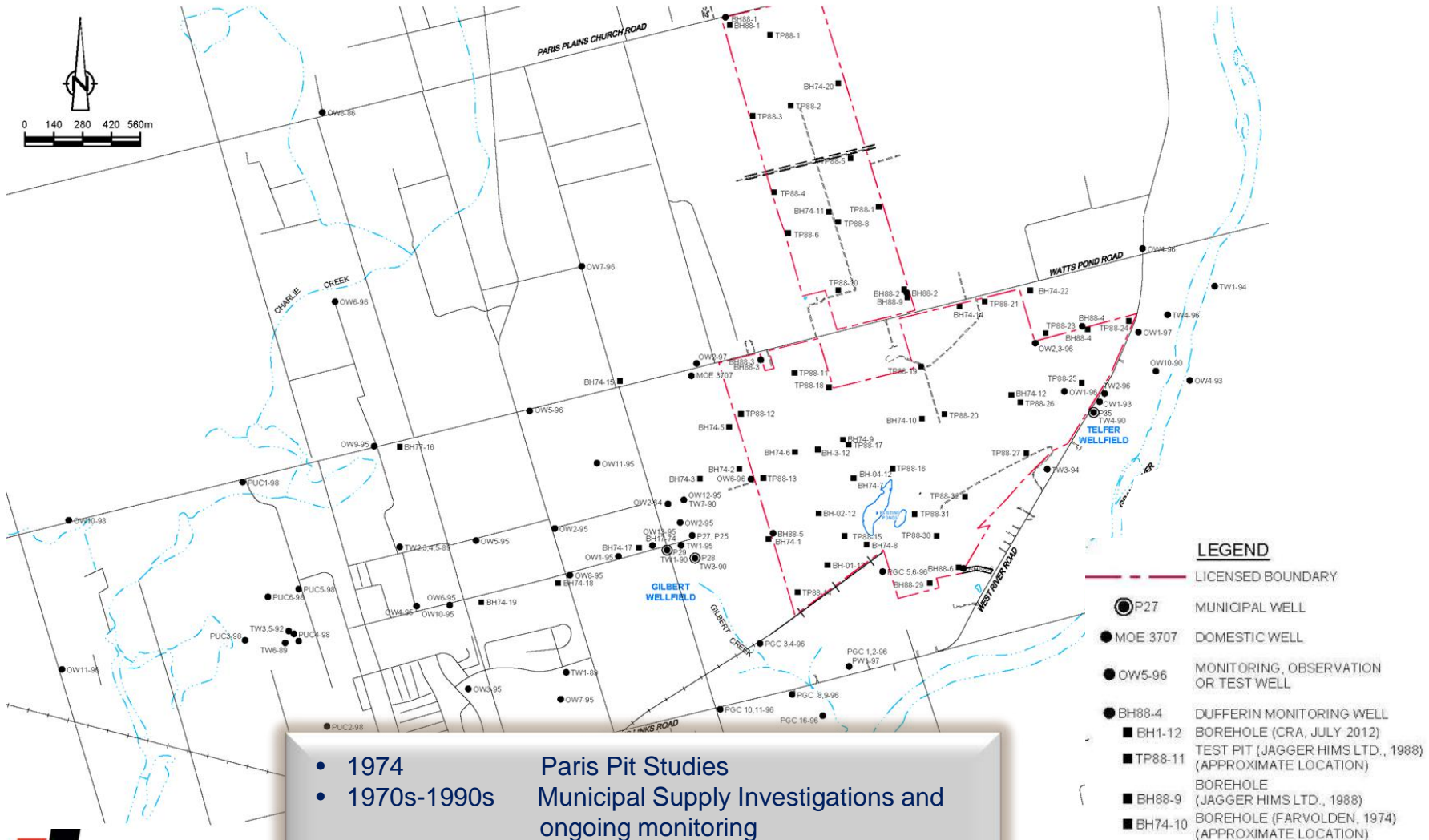
Map Legend

- WATERSHED MASK
- WATERSHED BOUNDARY (GRCA)
- UTILITY LINE (NRVIS)
- ROADS-ADDRESSED (MNR)
- RAILWAY (NRVIS)
- MUNICIPAL BOUNDARY (GRCA)
- DRAINAGE-NETWORK (GRCA)
- PARCELS-ASSESSMENT (MPAC)
- DRAINAGE-POLY (NRVIS)
- WOODED AREA (MNR)
- HEDGEROW
- PLANTATION
- TREED
- BUILT-UP (MNR)
- BUILT-UP PERVIOUS
- BUILT-UP IMPERVIOUS
- SURFICIAL GEOLOGY (MNDM)
- null
- clay
- diamicton
- fill
- gravel
- organic deposits
- Paleozoic Bedrock
- sand
- silt



Investigations and Monitoring

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.



- 1974 Paris Pit Studies
- 1970s-1990s Municipal Supply Investigations and ongoing monitoring
- 1988/90 Paris Pit Additional Investigations
- 1988 to present Ongoing monitoring of levels & quality
- 2012 PTTW additional investigations



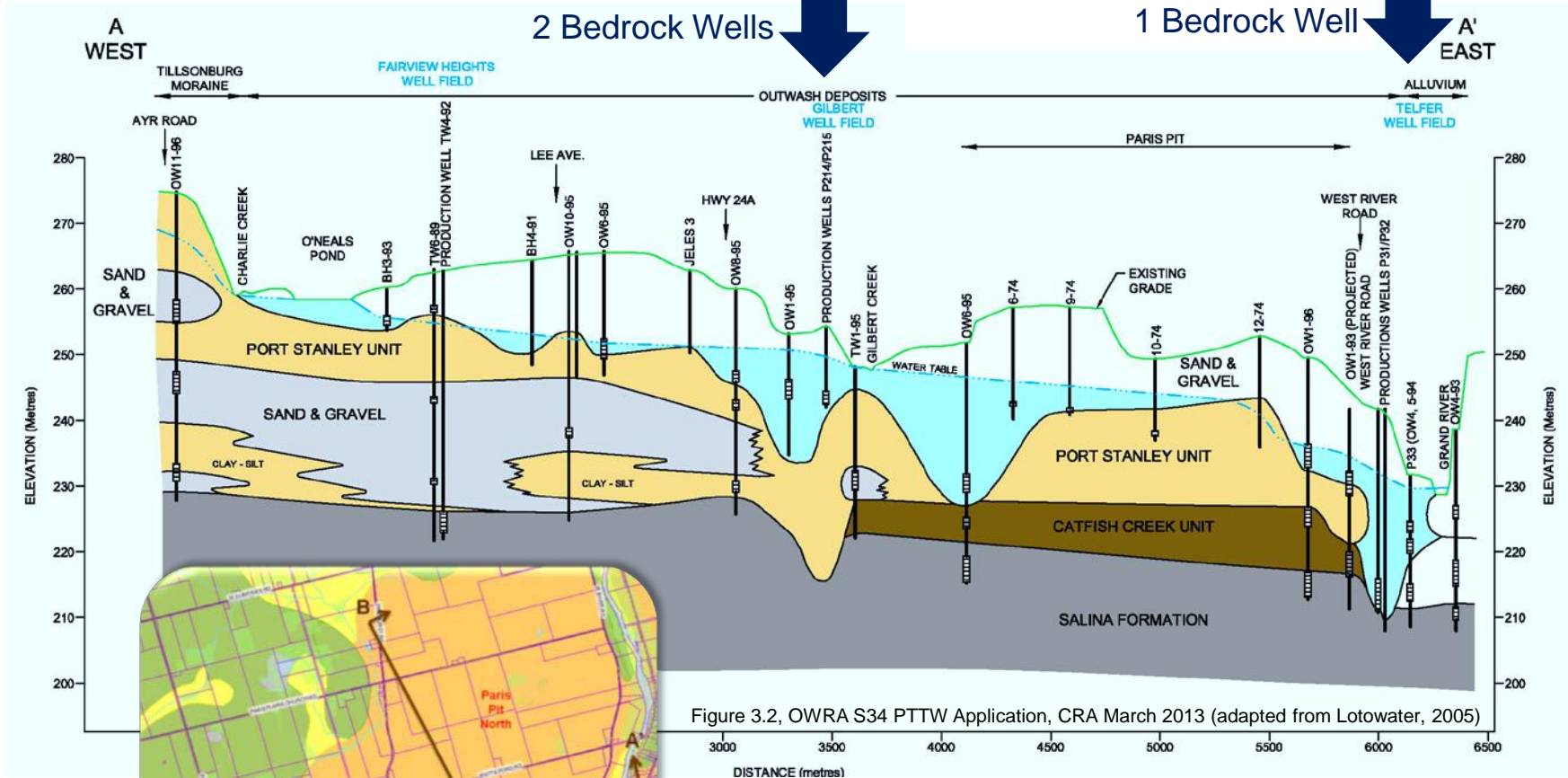
An upper unconfined aquifer occurs in the outwash deposits underlain by till aquitards and the Salina bedrock aquifer

Gilbert Wellfield

6 Overburden Wells
2 Bedrock Wells

Telfer Wellfield

1 Lower Overburden Well
1 Bedrock Well



Paris "North" Groundwater Flow (Upper Aquifer)

Regional groundwater flow is South-Southeast towards the Grand River

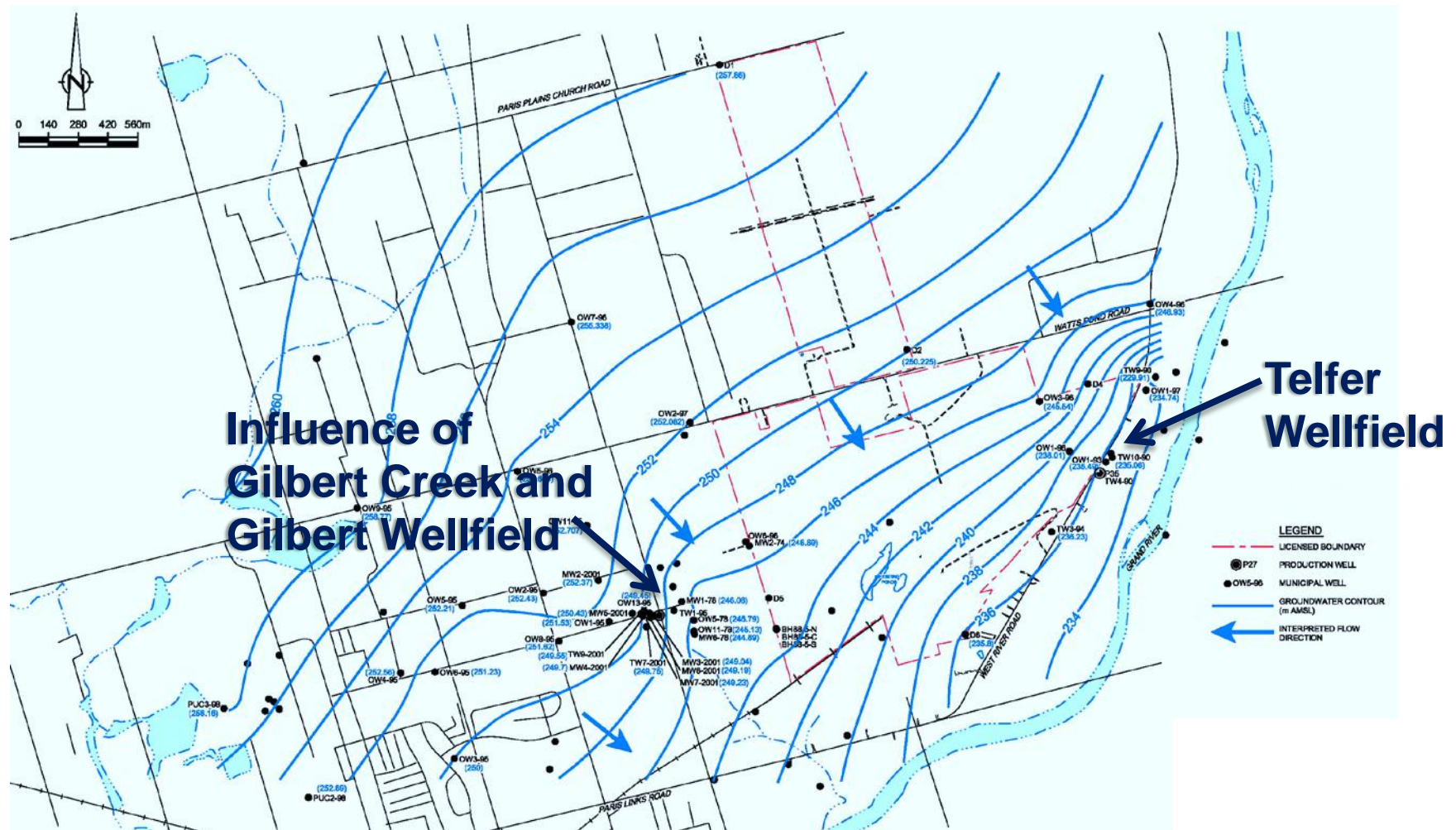
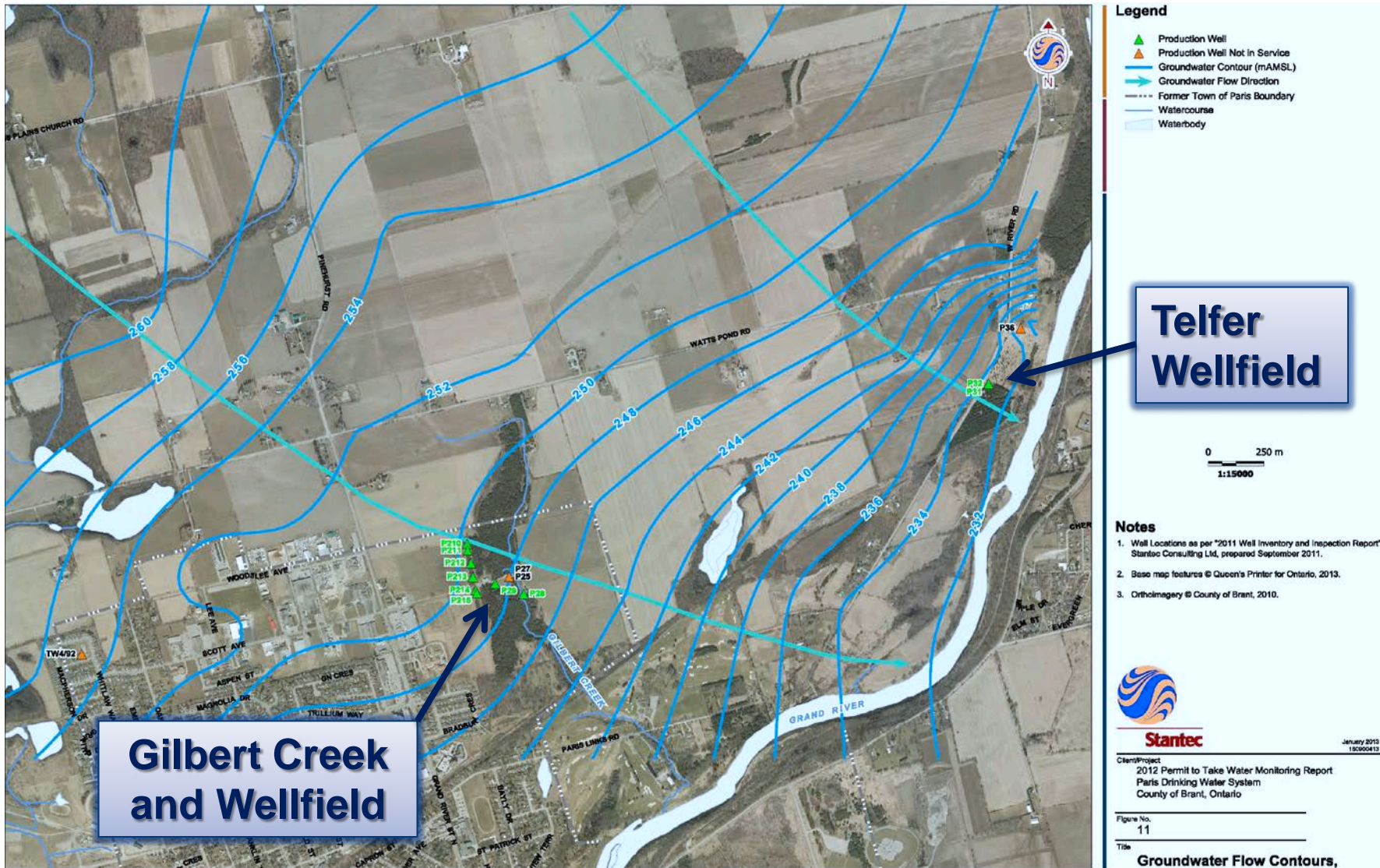


Figure 3.4, OWRA S34 PTTW Application, CRA March 2013 (adapted from Stantec Letter dated July 2009, May 2008 Groundwater Contours)

Municipal (County) Water Supply Monitoring - 2012 (consistent with previous information)



\\nt004420\Work_group\01609\action\100900413_Paris Water Level\hydro\khw\2012 Monitoring Report\20130116\0160900413_Jessie_MonitoringReport.mxd [Fig11_GroundwaterUpperAquifer Layer]

Source: Stantec, February 2013

Additional Paris Pit Investigations (2012)

Additional detailed investigation was undertaken by Dufferin Aggregates in area of proposed water taking to confirm geology and groundwater conditions in the area where the proposed source pond will be located.

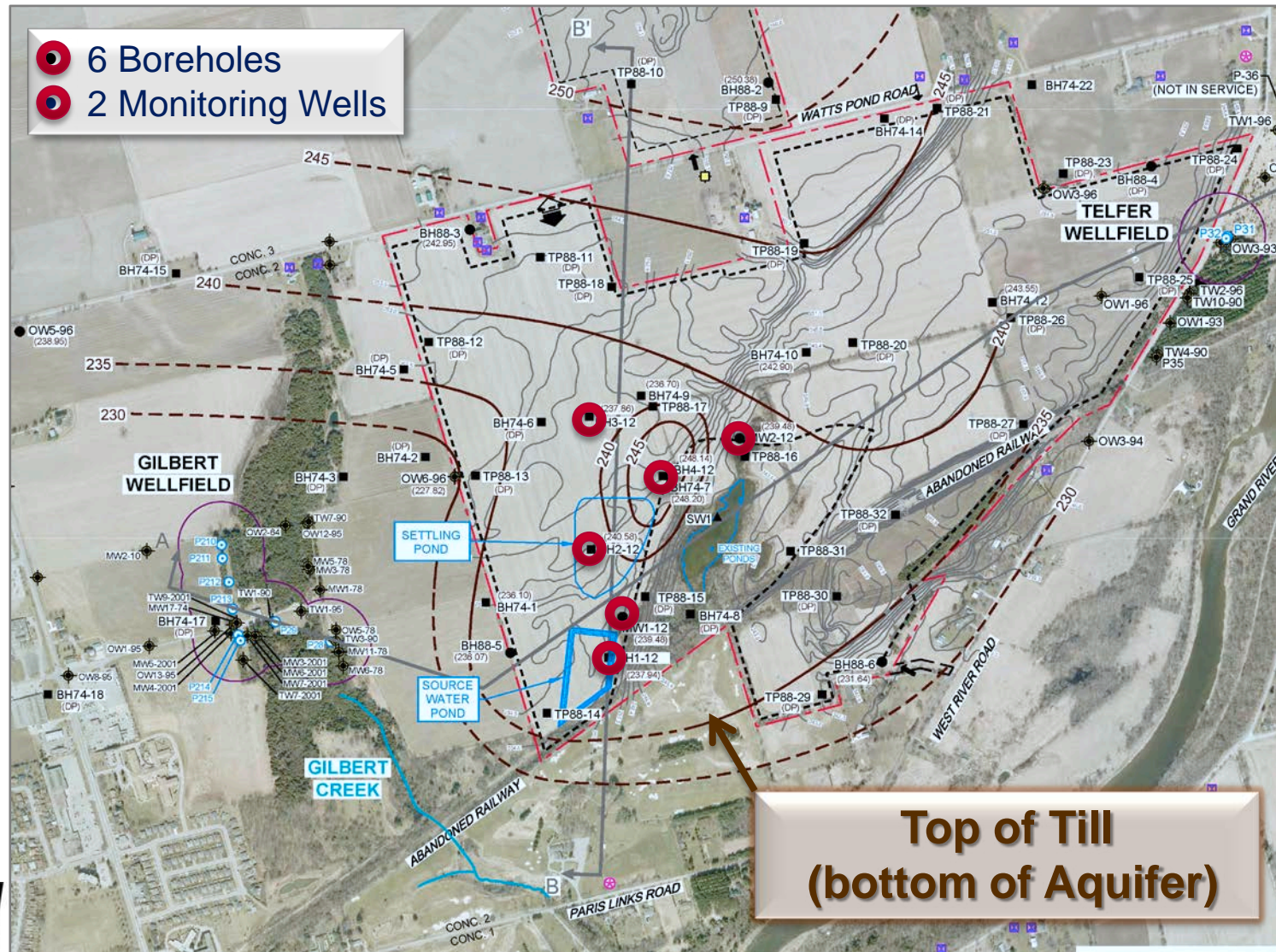


Figure 3.8, OWRA S34 PTTW Application, CRA March 2013

Locally, upper aquifer is present in source pond location and the existing on-site pond is connected to the groundwater flow system. Gilbert Creek is up-gradient/cross-gradient of Paris Pit.

Gilbert Wellfield

Telfer Wellfield

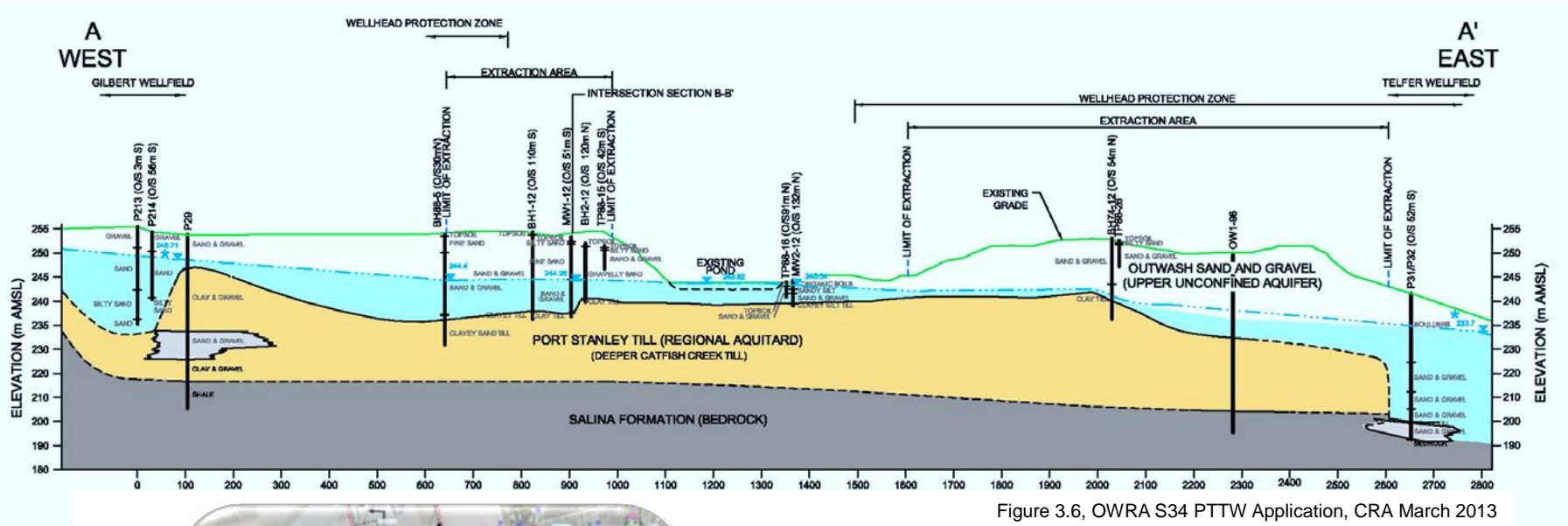


Figure 3.6, OWRA S34 PTTW Application, CRA March 2013



Local Groundwater Elevation Contours August 2012 (Summer)

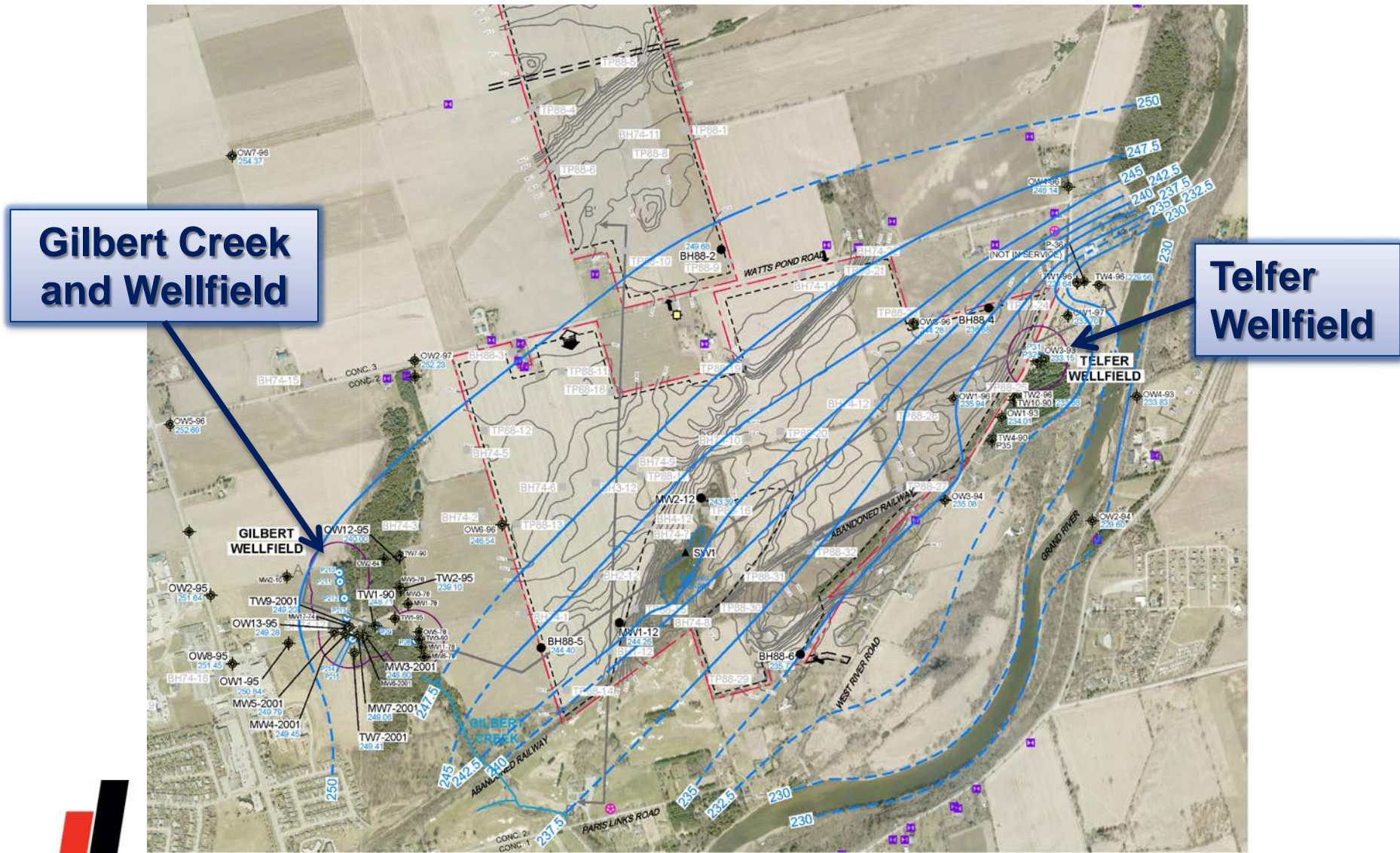
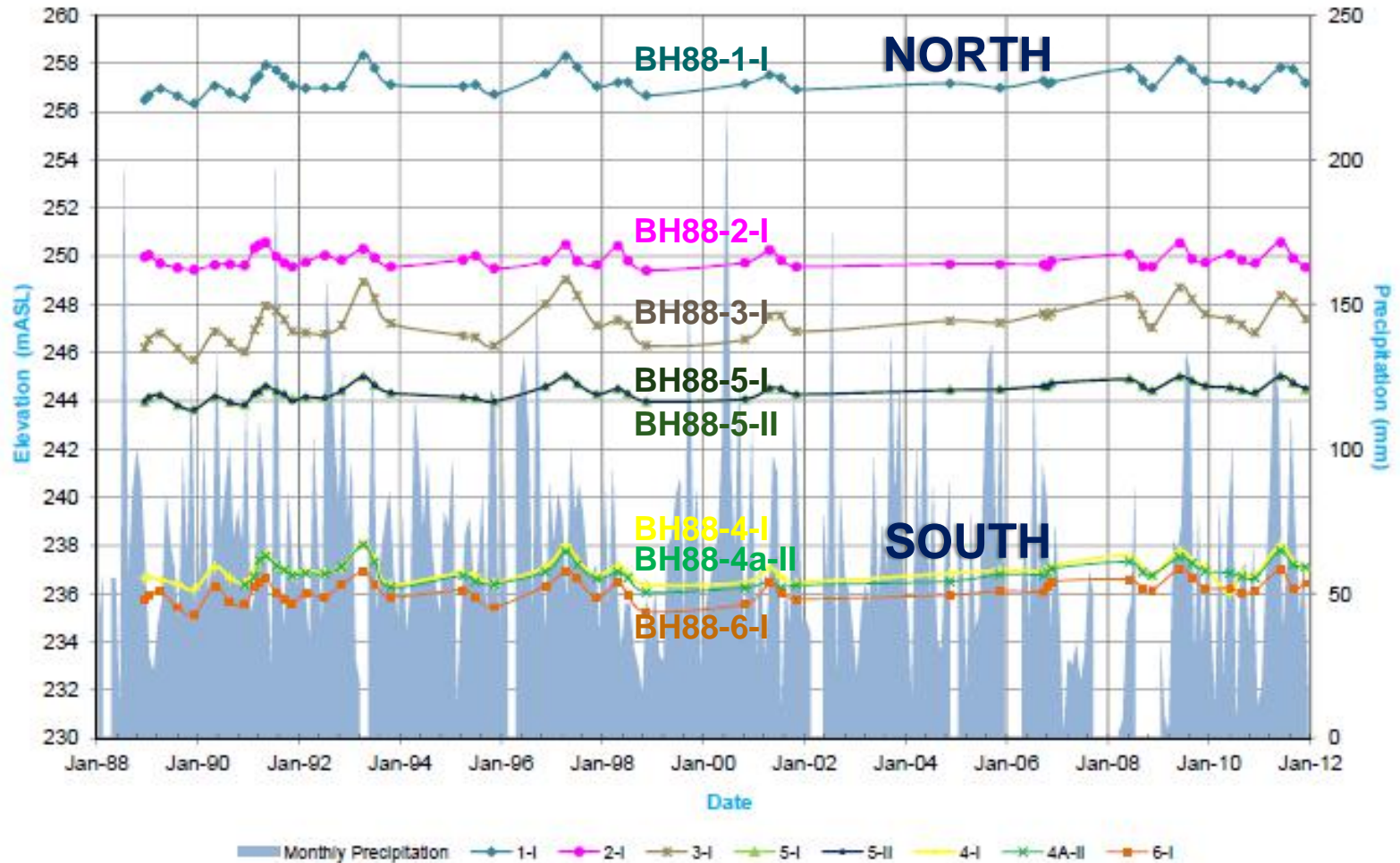


Figure 3.9b, OWRA S34 PTTW Application, CRA March 2013 (modified)

Groundwater Level Variations

The historical data collected at the Paris Pit provides good baseline information. Groundwater levels typically vary by $\pm 2\text{m}$ with climatic conditions. Data is used for identifying conditions and to compare with data collected in the future.

Figure 2
Groundwater Hydrographs - Unconfined Overburden Aquifer



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

Existing on-site Ponds

Water levels of surface features that are connected to the water table illustrate the influence of precipitation on the water table. Surface water levels tend to show somewhat smaller fluctuations in elevation than groundwater.



- Photos of on-site ponds



March 28, 2012

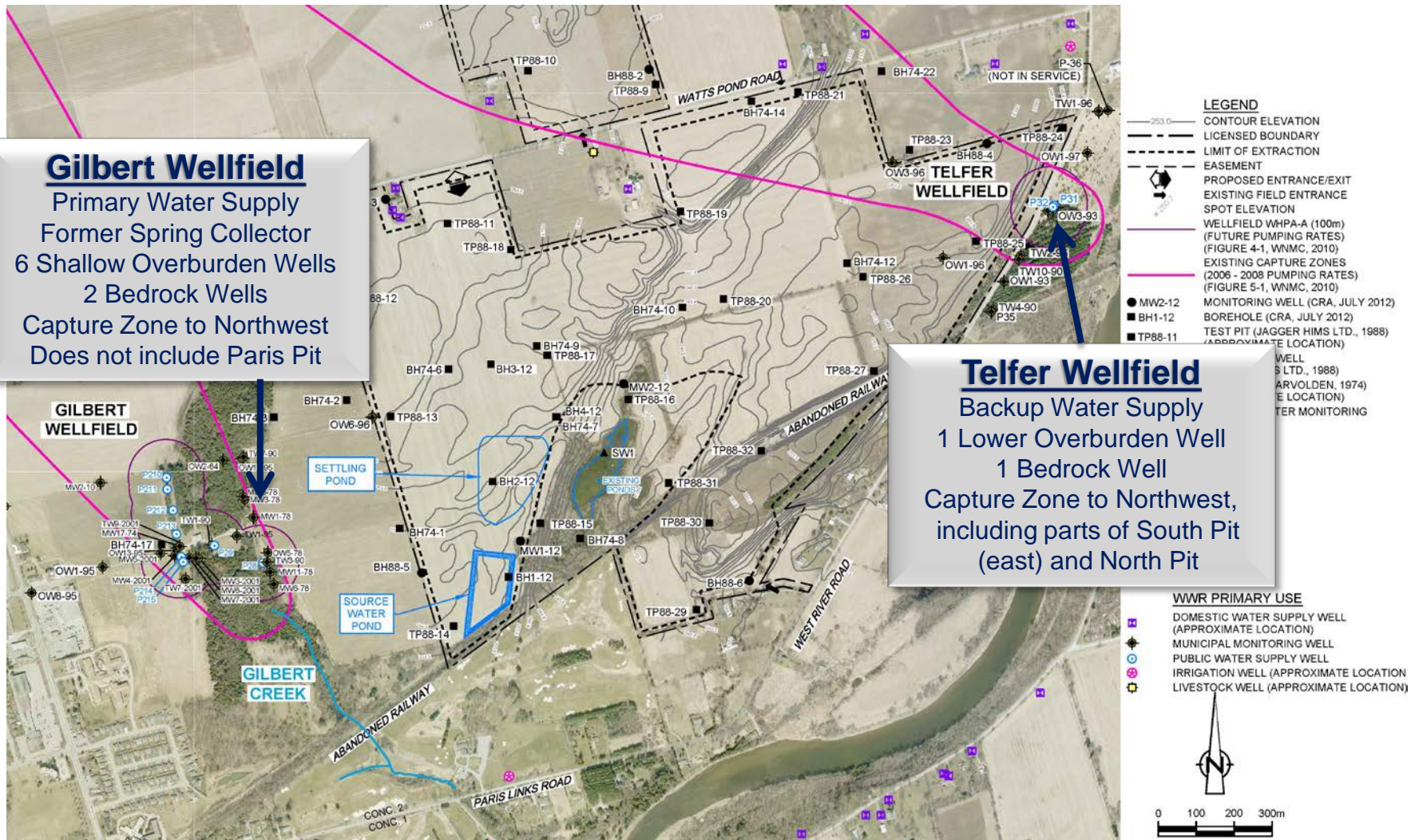


October 2012

Private Water Supply Wells

- Previous surveys of water wells (1974 and 1988)
- Private water supply wells in use (domestic, farm)
- Major irrigation (and backup) well(s) on Golf Course (PTTW limit of 2,270 L/min)
- Municipal water is available on Golf Links Road, but some wells may still be in use
- Private well survey to be updated prior to any water taking (subject to access)
 - Inspection
 - Record of water use and conditions
 - Water level measurement (subject to well construction)
 - Water quality sample

Paris "North" Municipal Water Supply



Water Supply

Paris “North” Water Supply has sufficient water quantity subject to water quality issues.

- Current water taking is $\pm 3,500$ L/min with PTTW limit of 11,280 L/min
- Source Water Protection (SWP) studies completed for the Grand River Source Protection Area concluded there is a low risk of water quantity stress. Study considered:
 - Current demand – based on actual pumping rates
 - Future demand – based on projected 2031 population
 - Drought scenario
- Water supply capacity is limited by water quality concerns:
 - Nitrate: agricultural activities (fertilizers, livestock), septic systems
 - Sodium & Chloride (Gilbert wellfield only): road salt application
 - Sulphate & Iron: naturally occurring from bedrock
 - Hardness: naturally occurring
- Nitrate is identified as an Issue under SWP for the Gilbert Wellfield (overburden only) and Telfer Wellfield

Source Water Protection (SWP) Programs have evaluated current wellfield Capture Zones – areas where groundwater is drawn to the municipal wells

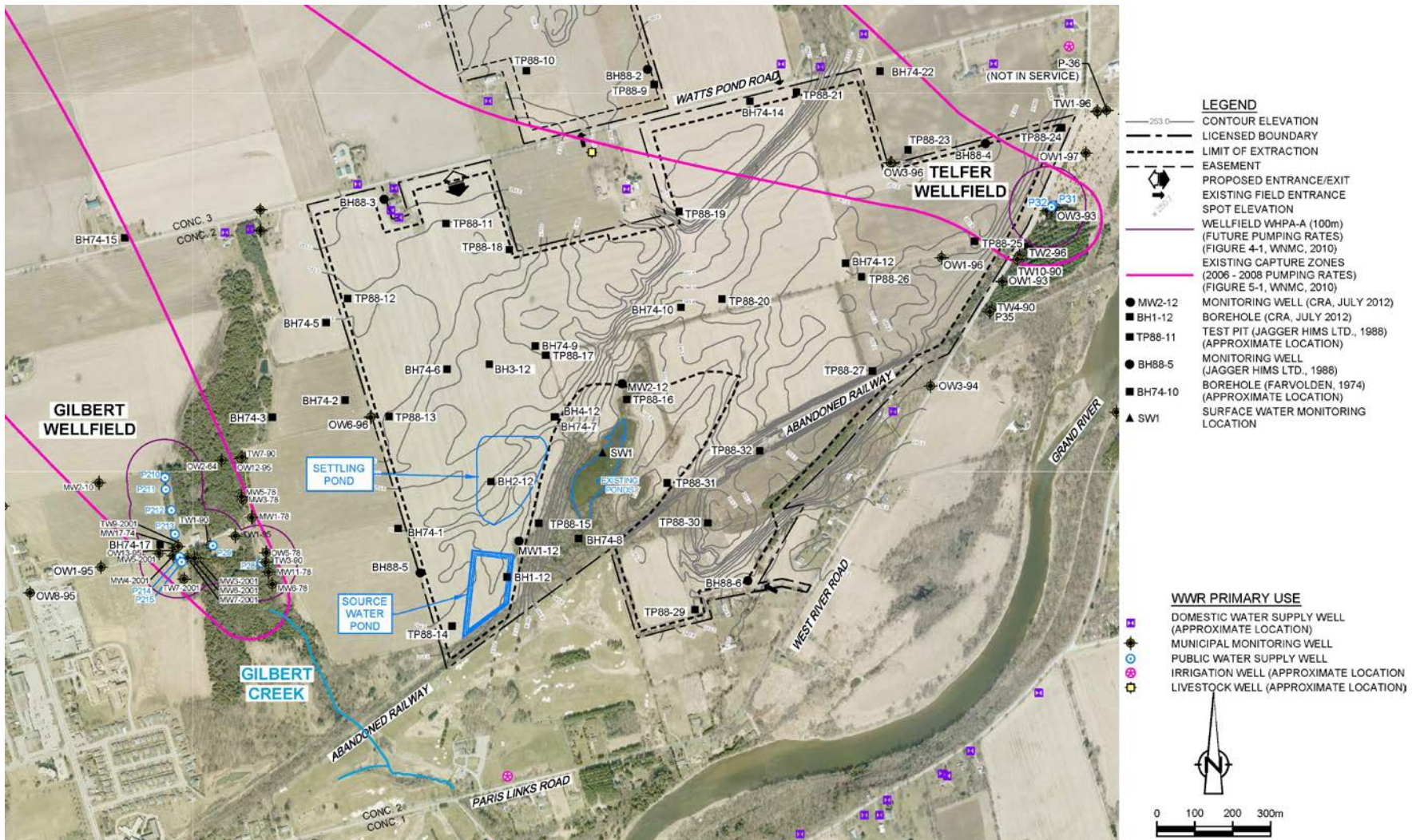
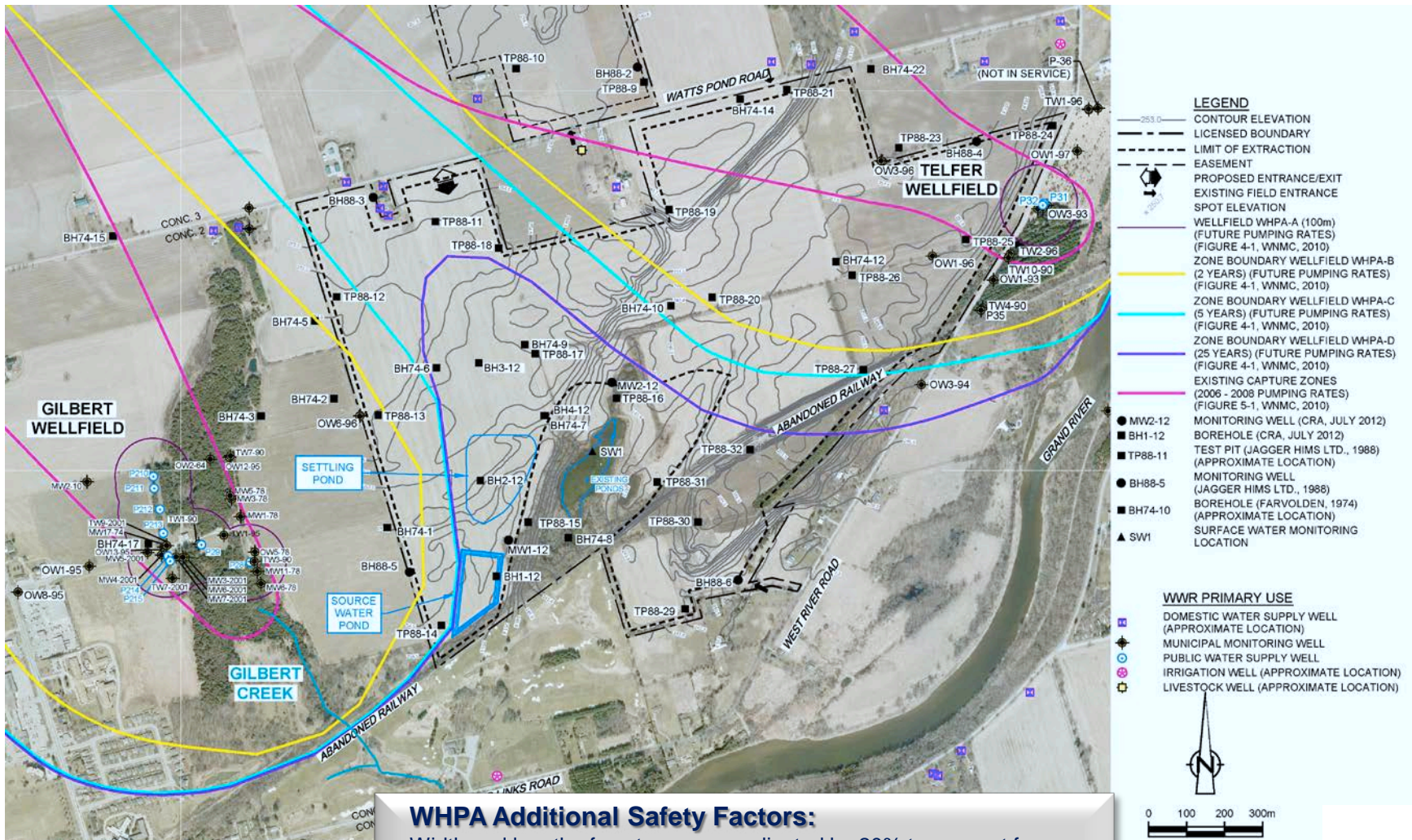


Figure 2.1 (modified), OWRA S34 PTTW Application, CRA March 2013

SWP Programs have conservatively established Wellhead Protection Areas (WHPAs) based on potential capture zones for projected future flows that are 2^{1/2} times the current flow, plus additional safety factors



WHPA Additional Safety Factors:

- Width and length of capture zones adjusted by 20% to account for uncertainty in hydraulic characteristics of the aquifer system.
- Capture zones adjusted by 5 degrees (+/-) to account for uncertainty in regional groundwater flow direction.

Figure 2.1, OWRA S34 PTTW Application, CRA March 2013

Potential Influences on Groundwater Flow – Extraction

- Above water extraction (from above the water table) has little/no influence as no pumping is required for extraction. There will be no lowering of groundwater levels.
 - Groundwater may actually increase as evapotranspiration is reduced and any runoff is retained.
- Below water extraction induces a “pumping” effect as aggregate volume is replaced by water (analogous to someone getting out of the bathtub).
 - This one-time effect can result in “drawdown” (lowering) of groundwater levels if the rate of withdrawal exceed the rate of replenishment from groundwater inflow and precipitation. This is managed by limiting the rate and timing of extraction.

Potential Influences on Groundwater Flow – Washing

- The specifications for aggregate products is defined by agencies/organizations
 - MTO, A.S.T.M., municipalities, CSA
- Aggregate products used in concrete and asphalt are required to be washed to remove the naturally occurring fine sand, silt and clay
- Operational use of water includes aggregate washing and dust control. Actual consumption (taking of water) of water is small:
 - Re-circulating of water through closed-loop system (to wash product)
 - Natural replenishment of source pond water (ground water flow, precipitation) for water loss from evaporation and in washed products

Paris Pit Permit to Take Water (PTTW) Application

- Application is for water taking to be used for:
 - Aggregate washing
 - Dust control
- All work will be outside the WHPAs (i.e., outside WHPA-D)
 - Much more stringent than proposed SWP requirements
- No dewatering will be undertaken



Source water pond and settling pond are outside the current capture zones and WHPAs, downgradient of Gilbert wellfield and Gilbert Creek.

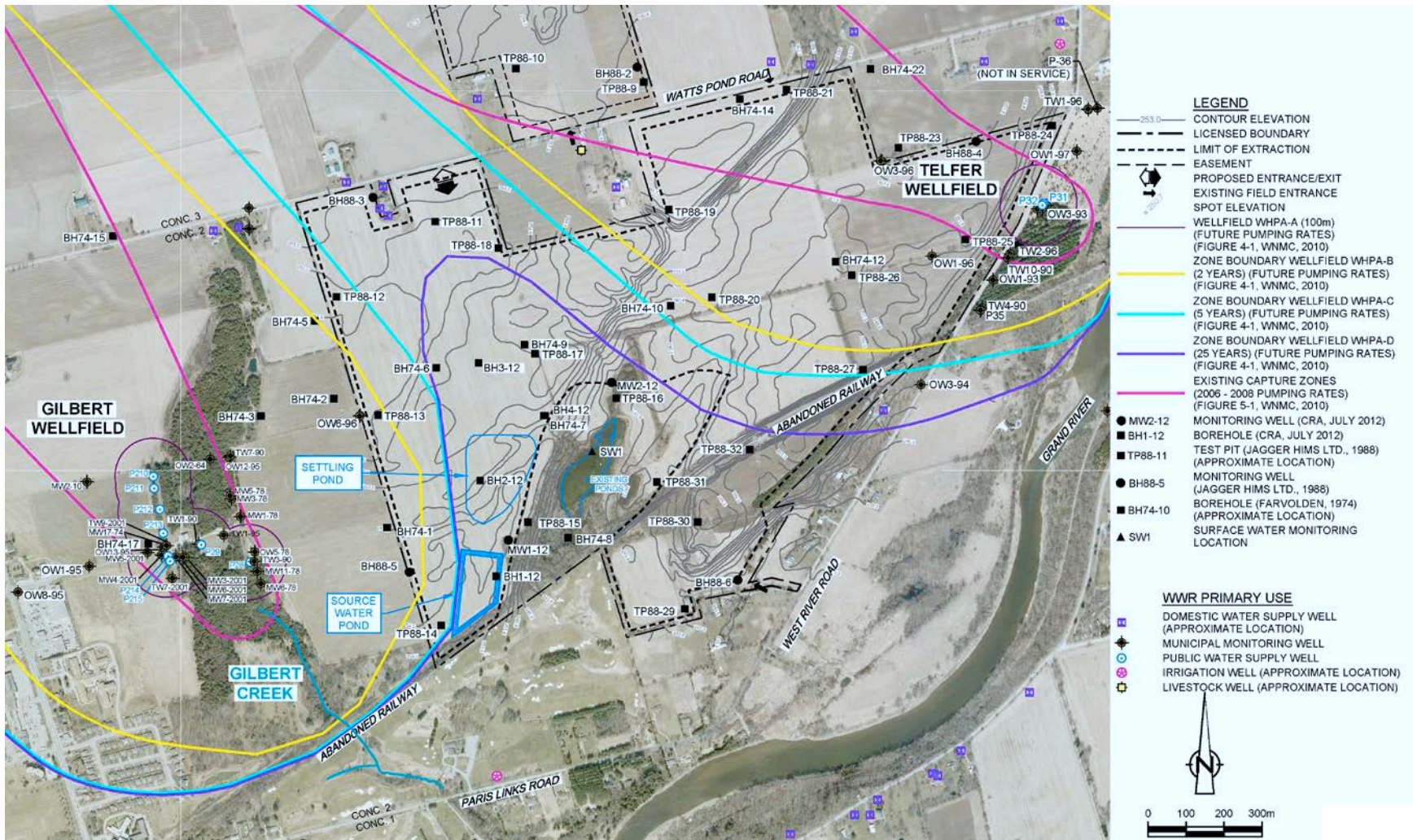
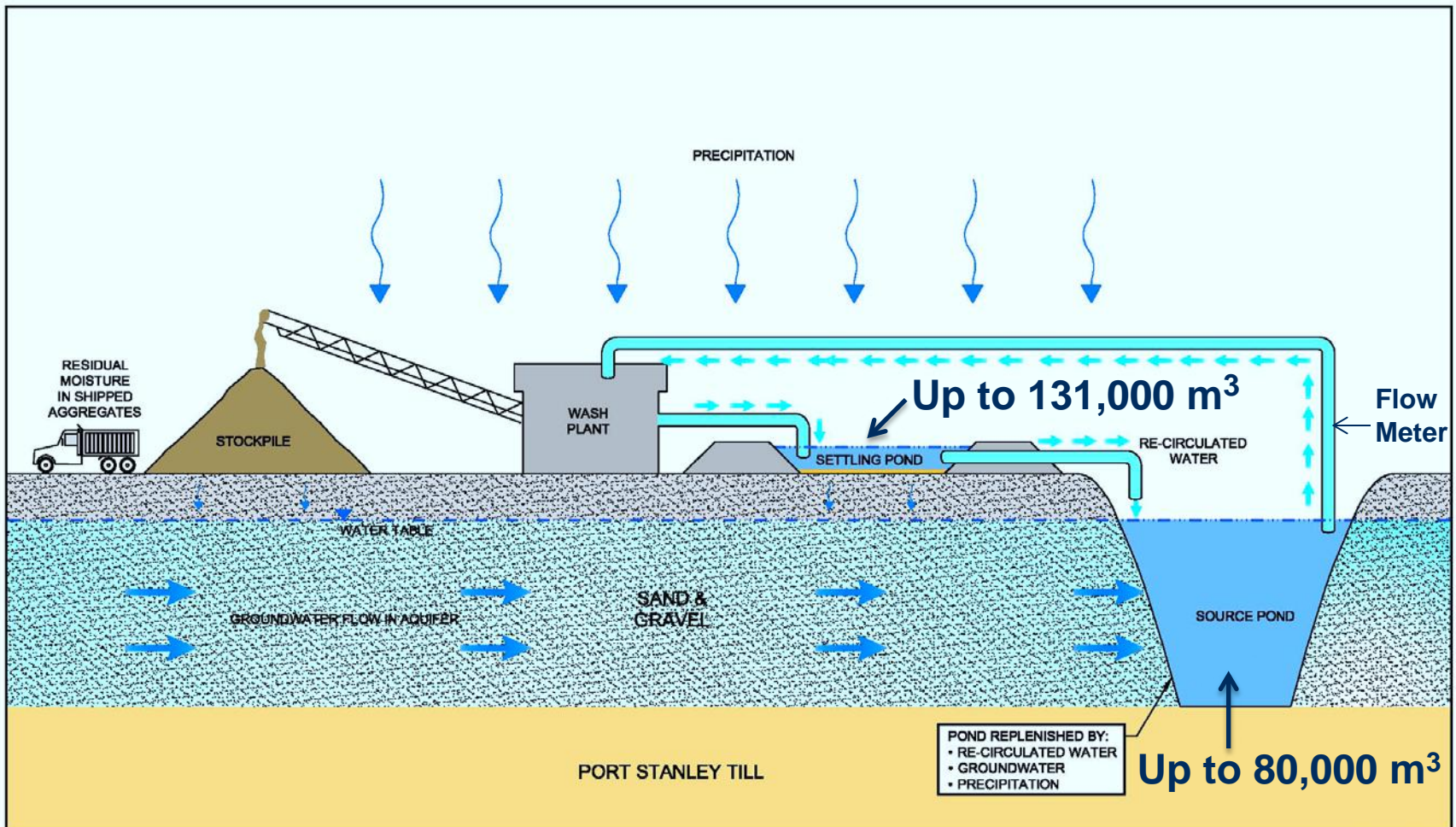


Figure 2.1, OWRA S34 PTTW Application, CRA March 2013

Closed-loop washing system circulates the wash water so only a small amount of makeup water is needed.



- Source Water Pond (Reservoir for washing Operations)
- Extraction to create source water pond will occur gradually (months)
 - Wash water is re-circulated to source water pond after passing through settling pond
 - Only water loss is through evaporation and residual moisture on material

figure 2.2
 CLOSED-LOOP AGGREGATE WASHING SYSTEM
 PTTW SUPPORTING HYDROLOGIC AND HYDROGEOLOGIC STUDY
 DUFFERIN PARIS PIT
 County of Brant, Ontario



78410-00(001)GN-WA027 MAR 7/2013

Proposed Water Taking Description

- “Water taking” = maximum pumping circulation rate
- Maximum 18,185 Litres per minutes (L/min) or about 4,000 gallons per minute (lgpm)
- Maximum 12 hours/day
- Analysis completed for the application under two scenarios:
 - 5 days/week and 70 days/year
 - Maximum 6 days/week and 200 days/year
- Consumptive use is much smaller than the “taking”

Consumptive loss of water is much smaller than water taking – about 100 times less

- Wash water is re-circulated to the source pond after washing and settling
- Consumptive loss of water averages ± 160 L/min

Per Table 4.1:

- ▶ Water retention on washed aggregate: 133 L/min
- ▶ Dust suppression: 8 L/min
- ▶ Increased evaporation over pond area: 19 L/min

Assessment of Potential Groundwater Impacts

- Experience demonstrates aggregate extraction operations, including wash ponds, have limited potential to influence on groundwater systems
- Calculated potential groundwater drawdown and change in existing pond elevation using a groundwater flow model – several scenarios considered
- Checked model results (zone of influence) by evaluating and comparing the observed influence of municipal pumping on surrounding groundwater levels

Scenario 1 (Base): Simulated Water Level Change

Influence of Source Pond: Flattens water table in source pond

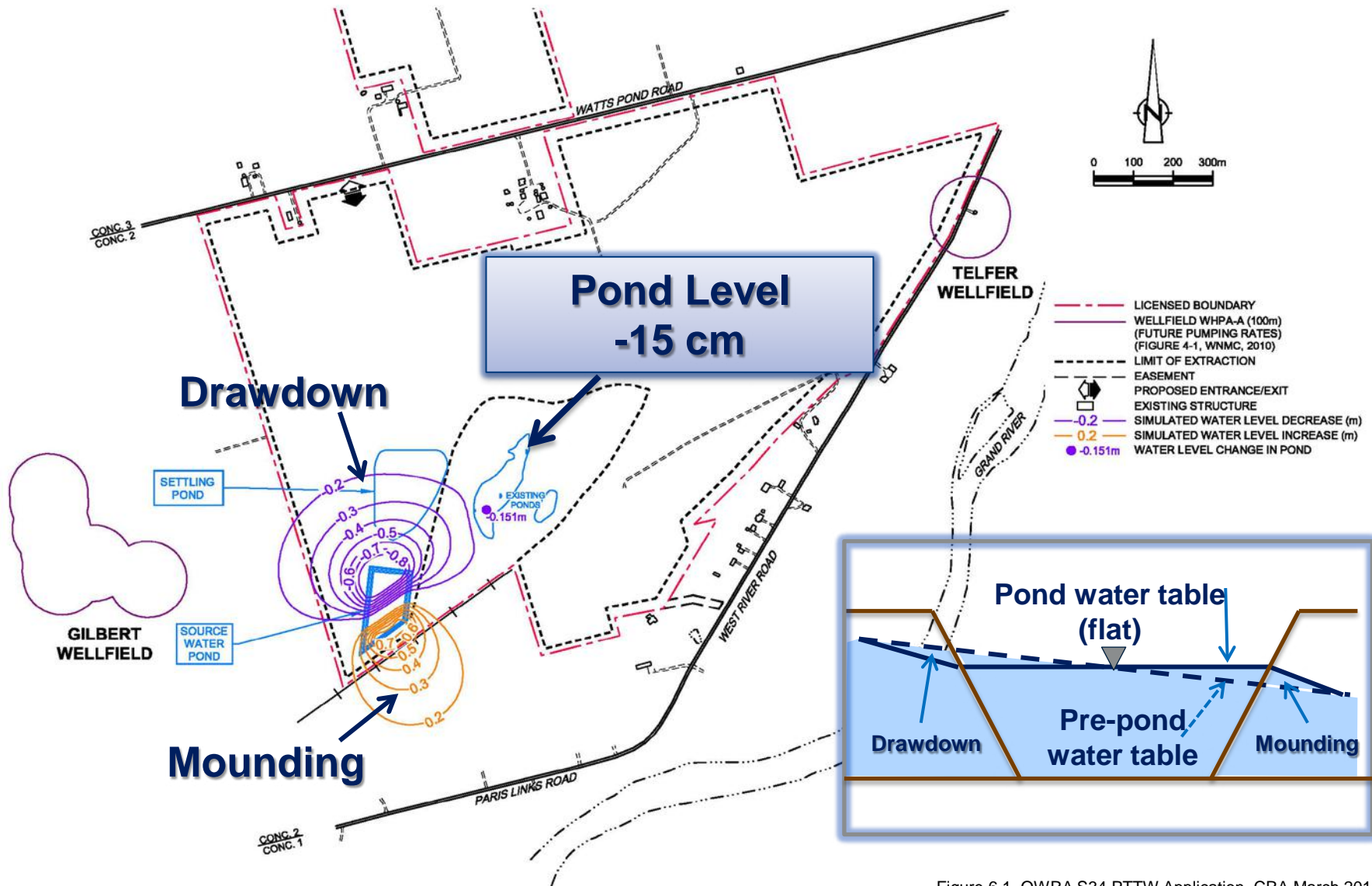


Figure 6.1, OWRA S34 PTTW Application, CRA March 2013

Scenario 4A Simulated Water Level Change

Incremental influence of full water taking with recirculation for 72 days

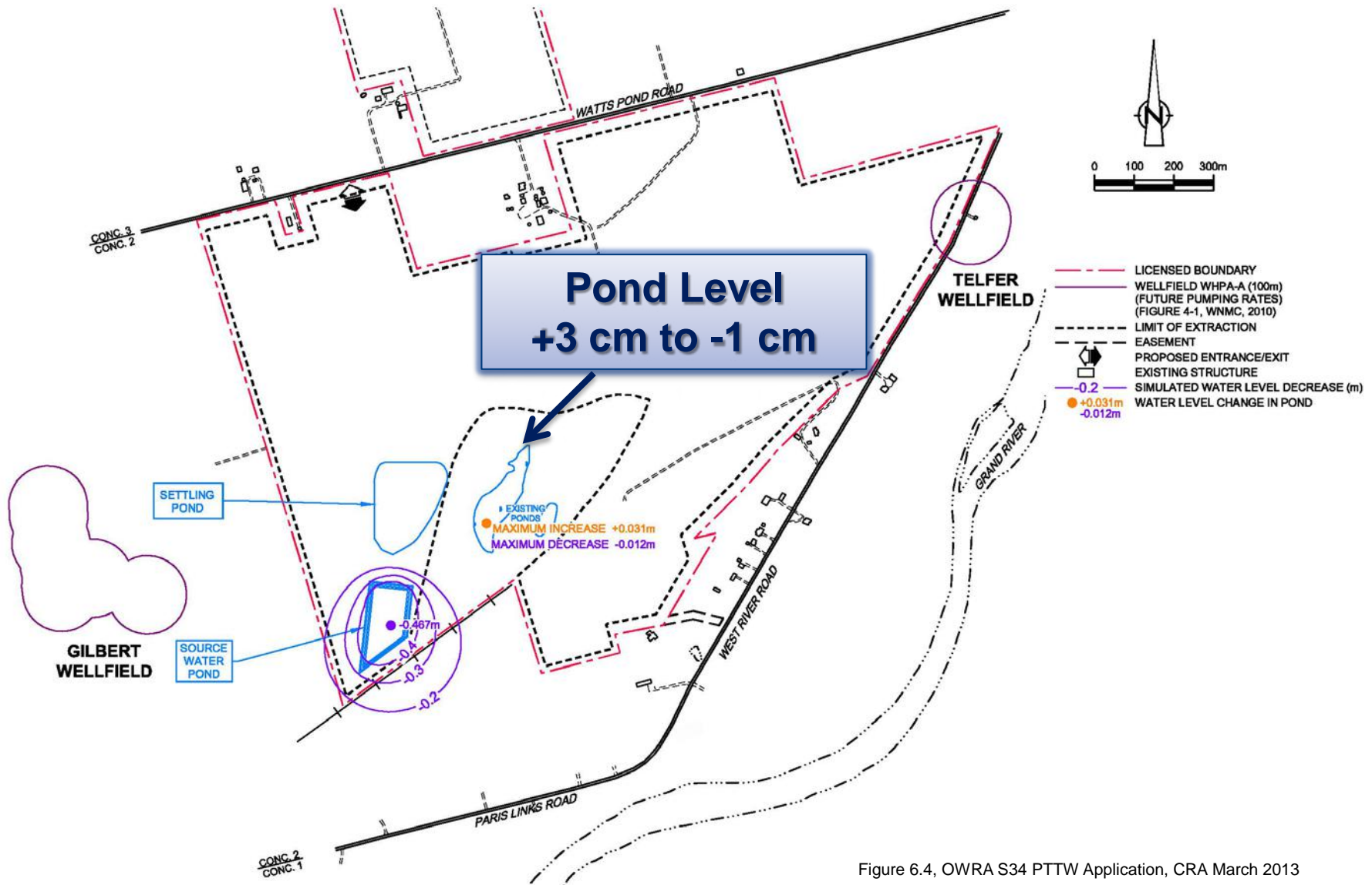


Figure 6.4, OWRA S34 PTTW Application, CRA March 2013

Scenario 4B Simulated Water Level Change

Incremental influence of full water taking with recirculation for 204 days

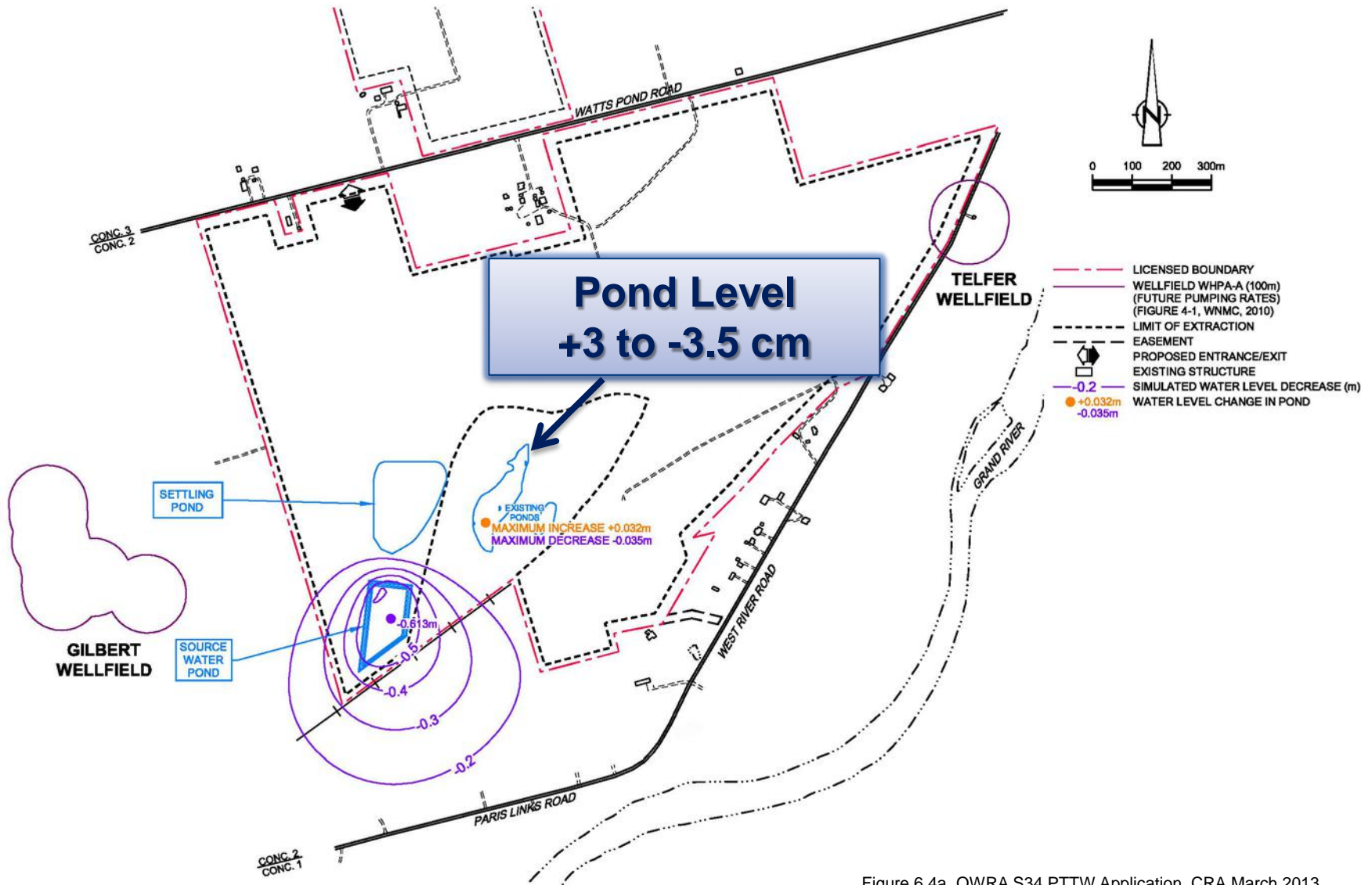


Figure 6.4a, OWRA S34 PTTW Application, CRA March 2013

Summary:

Assessment of Potential Groundwater Impacts

- Potential groundwater drawdown and change in existing pond elevation using a groundwater flow model:
 - Drawdown of 20 cm ($\pm 10\%$ of seasonal variation) was limited to less than 350m of Source Pond under worst-case (200 days operation)
 - Drawdown was less than 24 cm in existing pond under all scenarios (<30 cm in sensitivity analysis)
- Model results (zone of influence) are consistent with observed influence of municipal pumping on surrounding groundwater levels:
 - Observed influence was limited to local area of supply wells
 - No influence of Gilbert wellfield at boundary with Paris Pit (400+ metres)
 - Little, if any, influence was identified at a distance of 230m from the Telfer Wellfield

“Despite this localized impact on water levels immediately adjacent to the production wells, no long-term decline in water level in the overburden are noted at any well, indicating that the withdrawal of water is being balanced by recharge over the course of the year.”

Source: Stantec, February 7, 2013 for County of Brant

Summary:

Assessment of Potential Groundwater Impacts

- Potential Receptors:
 - Municipal Water Supply – No impact
 - Gilbert Wellfield: 550 metres upgradient/cross-gradient
 - Telfer Wellfield: 1700 metres cross-gradient
 - Private Water Supply Wells – No impact
 - Primarily upgradient
 - None within 350 metres
- Ecological Features
 - Evaluated by ecology consultants – MMM Group
 - Findings to date
 - No species at Risk (SAR) observed
 - No fish present in pond

“Overall, potential water level drawdown... are not anticipated to adversely impact the form, function and productive capacity of the aquatic habitat present.”

Source: MMM Group, March 6, 2013

Water Quality

Permit to Take Water activities will not result in water quality impacts to water supplies or ecological receptors

- No chemicals are used in aggregate processing
- Operations will not involve any Provincially Significant Drinking Water Threats
 - No prescribed threat activities are planned within the WHPA
 - Water taking/aggregate washing operations are located outside the WHPA (potential future capture zones)
 - Aggregate operations will not contribute to existing water supply quality issue with nitrate or other concerns (e.g. sulphate, salt, iron)
- Settling pond will collect naturally occurring fines washed from overburden
- No evidence of atrazine based on monitoring results at Dufferin Aggregates wells and County water supply

Monitoring

- Water Quantity
 - Water taking flow
 - Water levels
- Water Quality (chemistry)
 - Including nitrates, herbicides and pesticides
- Water Temperature
 - Source pond and down gradient monitoring well
- Results will be reported to the MOE, MNR and County, as well as being made available to the public

Monitoring History – Provides Baseline Data

Dufferin Aggregates has 12 monitoring wells at 8 locations in the Paris Pit and has been monitoring water levels and water quality in the area since the late 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.

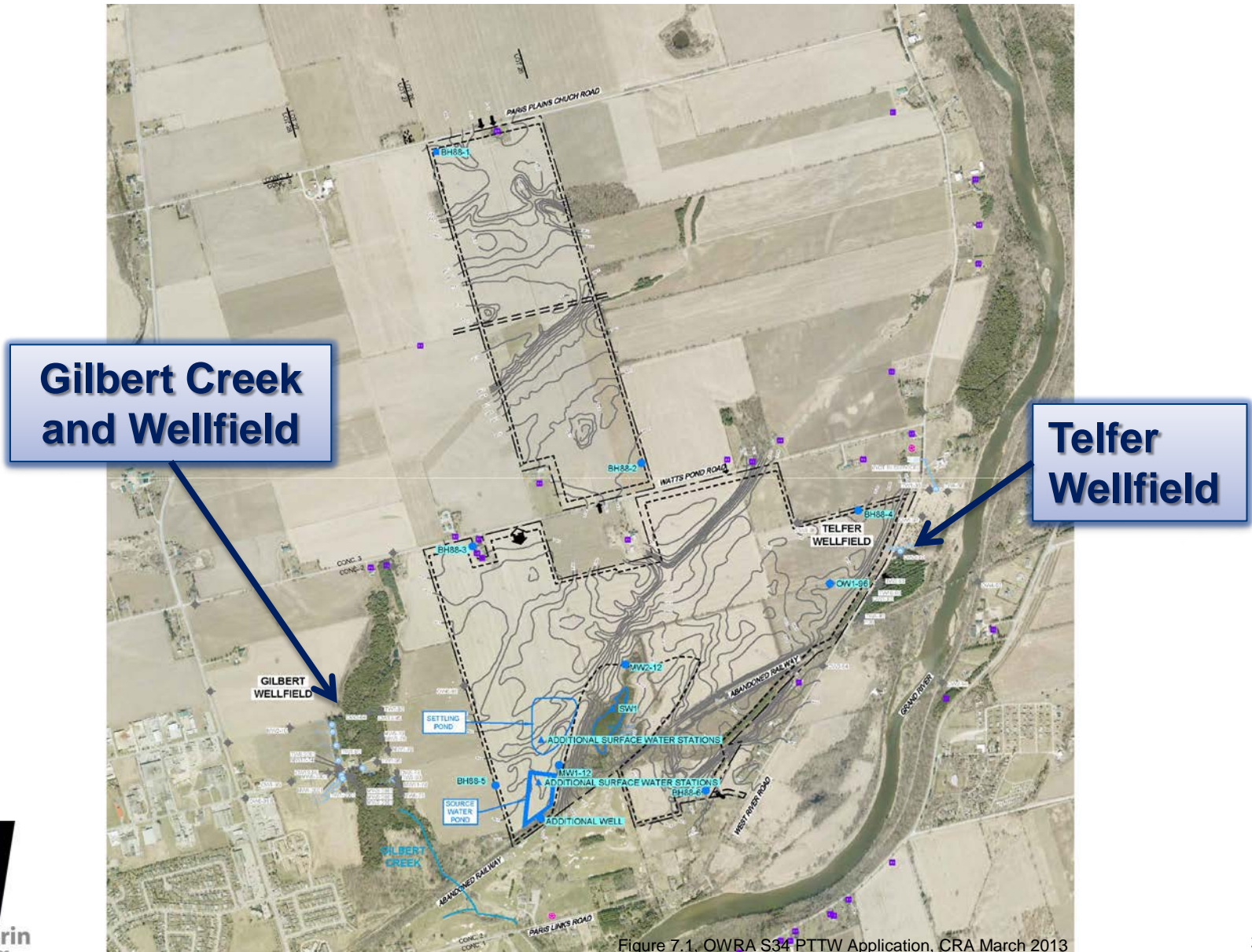


Figure 7.1. OWRA S34 PTTW Application, CRA March 2013

Proposed Water Quantity Monitoring

1. Water Taking Flow

Frequency - daily

2. Surface Water Levels

Locations – 4 ponds

- Source Pond
- Settling Pond
- 2 existing ponds

Frequency

- Minimum 3 seasonal events
- 3 data loggers

3. Groundwater Levels

Locations

- 15 wells at 10 locations
- Includes 1 new location

Frequency

- Minimum 3 seasonal events
- 12 wells with loggers

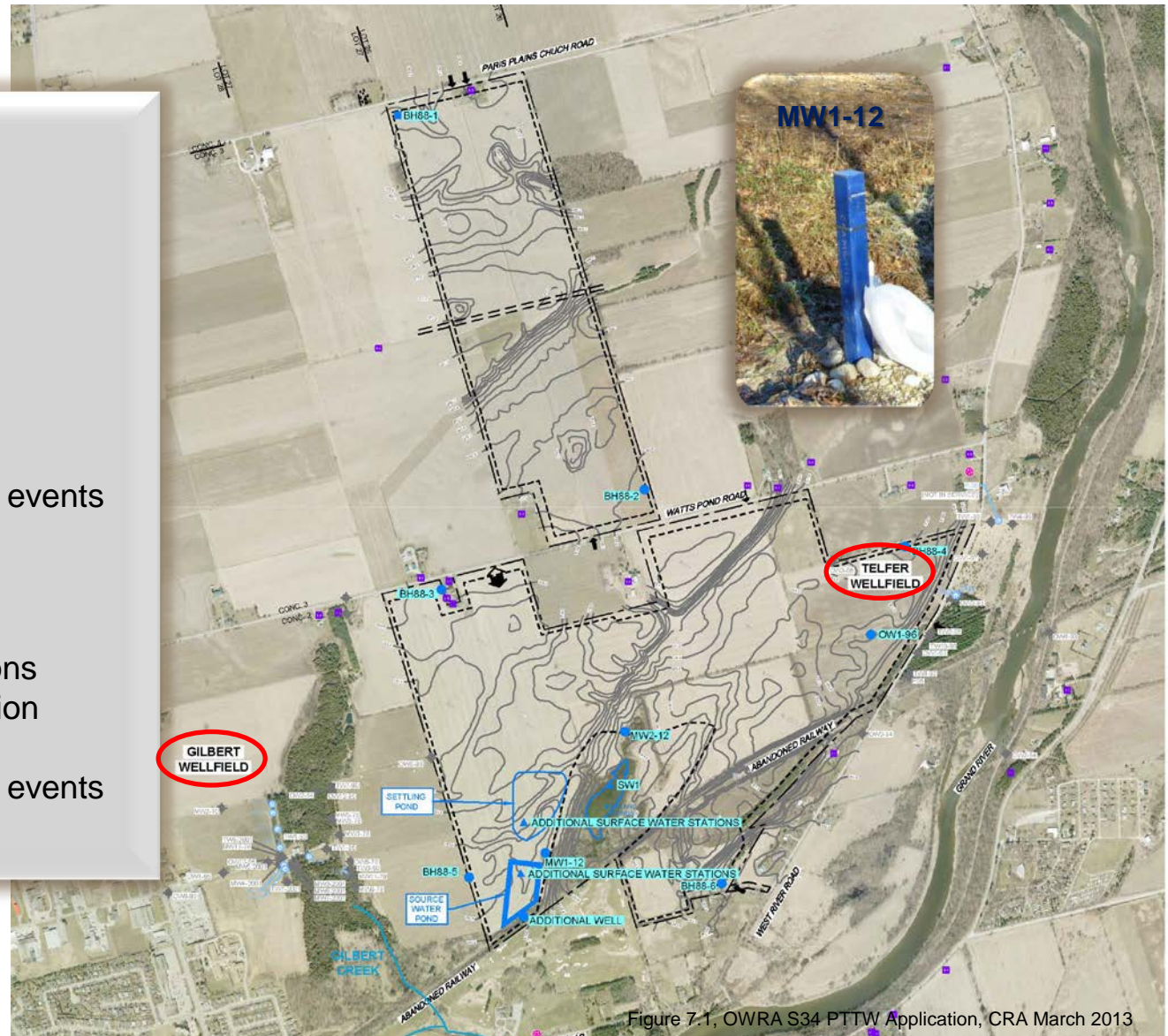


Figure 7.1, OWRA S34 PTTW Application, CRA March 2013

Proposed Water Quality Monitoring

1. Surface Water

Locations - 3 ponds

- Source Pond (pumped water)
- Settling Pond overflow
- Existing Pond

Frequency - 3 times per year

- Prior to wash operations
- Mid-year operations
- End of year operations

2. Groundwater

Locations – Same as water level monitoring

Frequency – 3 times per year

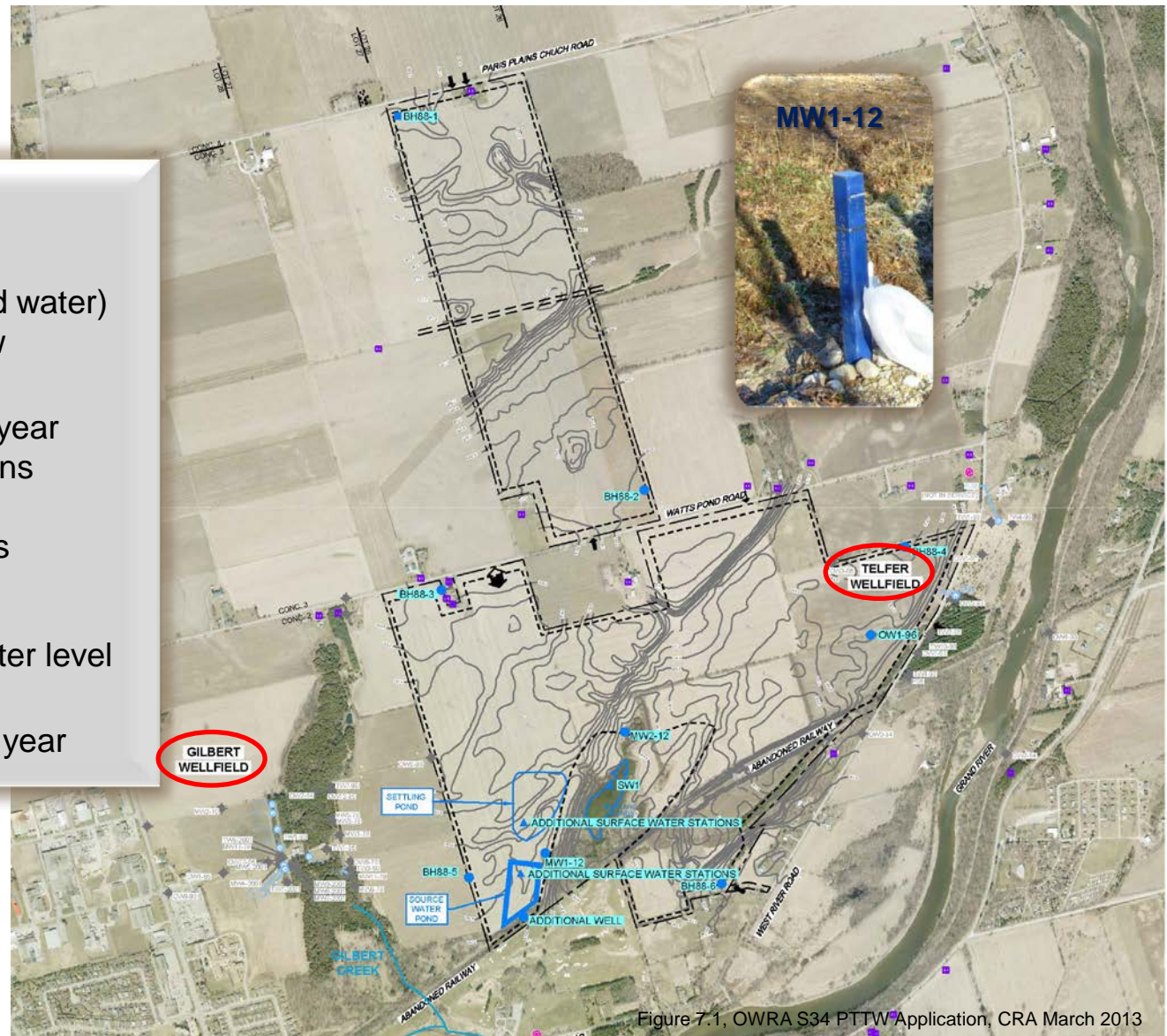


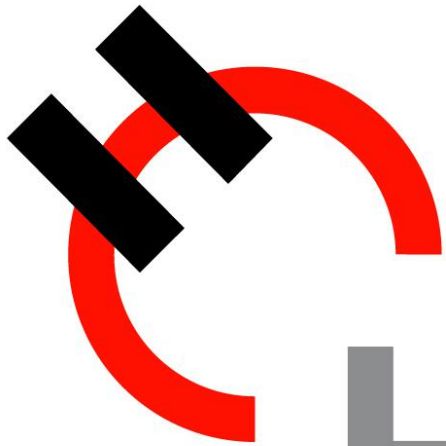
Figure 7.1, OWRA S34 PTTW Application, CRA March 2013

Next Steps

- PTTW – last day for public comment is June 18, 2013
- ECA (isw) environmental compliance approval industrial sewage works
 - ▶ Filing in the next 30-45 days
- Earth Week Tree Planting Event – May 1st at the Paris Pit
- Ecology – Work Plan is undergoing
 - ▶ Amphibian monitoring complete
 - ▶ Fish and bird monitoring in 2013
 - ▶ Working with Bird Studies Canada
- Meeting with County to discuss on-ramp at Bishop Gates Road

Next Steps

- Continue to listen to community concerns
- Continue to liaise with public through Community Advisory Panel
 - ▶ Next CAP meeting: June 2013
 - Topics could include:
 - Cornerstone Standards Council (SERA/AFO)
 - Update of Ecology



Holcim