Jacobs

245 Consumers Road
Suite 400
Toronto, ON M2J 1R3
Canada
T 416 499 9000
F 416 499 4687
www.jacobs.com

April 1, 2022

Hugh Skinner
Project Manager – Water & Wastewater Infrastructure Management
Capital Delivery – Asset Management Section
100 King Street West, Suite 900,
Hamilton, Ontario

Subject: Strategy Development and Cost Estimate for Evaluating Soil Conditions at Twelve City reservoirs and at the Woodward WTP Sedimentation Tanks and Clear Wells.

Dear Mr. Skinner,

This report is being submitted in response to the City of Hamilton's (City's) invitation letter dated February 9, 2022, which requested an initial desktop analysis to develop a sampling, analysis, and recommended strategy to assess soil conditions (presence or absence of contaminants) at twelve City reservoirs, and at the Woodward Water Treatment Plant (WTP) sedimentation tanks and clear wells. This also includes a budget level cost estimate to complete the recommended next steps as presented in this letter.

Enclosed is our initial assessment. Attachment 1 is the budget level cost estimate which includes assessment framework and the estimated level of effort. Attachment 2 includes aerial imaging of the subject facilities along with proposed initial assessment sampling locations to assess for the presence or absence of potential contaminants of concern.

1. Methodology

As outlined in Jacobs proposal dated February 25, 2022, the review of background information which was included with the City of Hamilton letter of invitation and completed as part of this initial strategy development and overview of next steps includes the following:

- Estimating the surface area of each reservoir from available aerial imagery.
- Consideration and interpretation of regulations and policies that would be applicable to the proposed soil quality evaluation over the reservoir areas as a potential next step.
- Development of preliminary conceptual site model (CSM) based on existing information/data including consideration of principles and assumptions used for the Kenilworth Reservoir soil management program, and definition of Contaminant of Concern (COCs) and mobility properties.
- Determination of information/data gaps.

- Preliminary recommendations for soil sampling of fill overlaying the reservoirs to assess for the presence or absence of impacts relative to the applicable MECP Standards, including methodology.

- Development of additional recommendations for next steps, likely including:

    - Recommendation for completion of Assessment of Past Uses (AOPU) in general accordance with Ontario Regulation (O. Reg.) 406/19 (MECP 2019) following the MECP document titled Rules for Soil Management and Excess Soil Quality Standards (Soil Rules) (MECP 2020). The goal of the AOPU is to identify the potential COCs that are considered most likely to have the potential to affect subsurface soil or groundwater quality based on past uses in the area.

    - Preparation of schedule and budget level cost estimate for completing the recommended next steps.

    - Preparation of a letter of opinion summarizing in tabular form (Table 1) basic details for each site such as area, number of initial samples recommended, sample collection methodology, analytical requirements, and reporting.

1.1 Budget Level Cost Estimate

Table 1 as provided in Attachment 1 is the basis of work for this desk top assignment. The table has been structured by each individual site, with estimates on: size of infrastructure, estimated soil volume, preliminary sampling details (number, chemical analysis), labour costs for screening level AOPU including Eco-Log Eris report and contingency/provisional scope item costs associated with additional analytical or background information analysis (if required). Background information provided as part of City's invitation letter was used to calculate the approximate surface areas of the 14 tanks and reservoirs. A depth of 1 m was used for soil cover thickness which matches the depth observed at the Kenilworth Reservoir. The 1m soil depth expectation is an assumption for the sites listed in this report and it is recommended that the COH carry a higher than normal budget contingency in the event greater soil depths and increased sampling is required.. Approximate soil volumes were calculated using guidance from Ontario Regulation (O. Reg.) 406/19 (MECP 2019) and following the Ministry of Environment, Conservation and Parks (MECP) document titled Rules for Soil Management and Excess Soil Quality Standards (Soil Rules) (MECP 2020).

Sample frequency was determined as 1 in 200 m^3 based on an in-situ soil sampling scenario. Sample numbers were initially calculated using this frequency to evaluate approximately how many samples would be needed if the soil was sampled at a frequency in accordance with O. Reg 406/19 necessary to support future removal and the development of a soil management plan. Given that the goal of this initial phase of sampling is to first determine if there are exceedances or not relative to the MECP *Table 3 Full Depth Generic Site Condition Standards in a Non-Potable Groundwater Condition* for industrial/commercial/community (Table 3 SCS), a reduced initial baseline level of sampling is proposed as outlined in Table 1. The reduced sample number set is proposed to be used as an initial presence/absence investigation. Pending analytical results, further delineation may or may not be required.

Chemical analyses proposed for the sites include the primary COCs required as per O. Reg 406/19 including Petroleum Hydrocarbons (PHC's), Poly Aromatic Hydrocarbons (PAHs) and Metals and Inorganics. As part of the initial assessment of each site, and with the goal of better understanding

potential issues of environmental concern or interest in the area that could potentially negatively impact soil or groundwater quality in the vicinity of the reservoirs, an Ecolog Eris Report allowance has been carried for each site, along with labour to perform a limited screening level AOPU. A contingency and provisional items budget for additional analytical testing and labour was included if preliminary findings warrant supplementary sampling or further historical information evaluation.

Sample collection methodology for this initial phase of work to assess for the presence or absence of impacts is expected to be completed by hand tools based on our experience at the Kenilworth Reservoir related to soil depths and structural/weight restrictions on top of infrastructure. Hand tools would be limited to non-powered equipment such as a shovel or trowel, which would be decontaminated between each use. Standard QA/AC procedures would also be applied to the sampling program such as field duplicates.

2. Recommendations

Based on the findings outlined in this letter, the following general recommendations are provided for the City's consideration:

- Review the findings, recommended next phases and budget level cost estimate to evaluate soil conditions at the fourteen City facilities outlined in Table 1 with applicable internal City Stakeholders to determine if/how they wish to proceed with next steps.

- Subject to City Management/Stakeholders concurrence to proceed, formalize the scope, budget level cost estimate and schedule to proceed with some or all the recommendations outlined in this letter and Table 1, which include:

    - Completion of initial baseline soil sampling for the primary COCs required as per O. Reg 406/19 including Petroleum Hydrocarbons (PHC's), Poly Aromatic Hydrocarbons (PAH's) and Metals and Inorganics at all sites using hand sampling equipment to assess for presence or absence of impacts relative to applicable MECP Standards. The number of soil samples initially proposed per site ranges from 5 to 20 based on study area and associated details as outlined in Table 1;

    - Perform a limited initial AOPU for each site, including completion of a site visit, obtaining an Ecolog Eris Report to understand details regarding publicly available records and information of potential environmental interest for each site that could potentially negatively impact soil or groundwater quality in the vicinity of the reservoirs

- Depending on the findings and recommendations from the proposed initial baseline soil sampling and desktop evaluation at each site, consider if subsequent follow-on work is required or not. Pending results, priority ranking with regards to risk for each site or between sites could be applied.

- If it is determined that soil excavation and removal is required, any soil excavated over 100 m^3 will need a Soil Management Plan (SMP) per O.Reg. 406/19 SMP. This effort can be scaled to fit site needs and be provided as a provisional or additional scope item as needed.

3. Limitations and assumptions

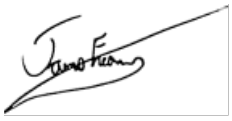
- Cost proposal and associate level of effort is for initial baseline soil sampling. A more detailed AOPU for each location may reveal additional sampling or chemical characterization needs.
- Proposed sample locations are based on aerial imagery and assumed facility limits. Locations and number of samples may change pending receipt of additional background information such as record drawings or geotechnical reports.
- Work performed as part of this strategy development was conducted under the supervision of a Qualified Person (Environmental Site Assessment) as defined under regulation 153/04.
- Utility locates are not included in the cost estimate. It is assumed that all samples will be collected manually without the use of power tools, as was done at the Kenilworth Reservoir.

4. Closing

We trust that this letter meets with your needs. Please feel free to contact Jamie Freeman at 289-308-7311 or Jamie.Freemam@jacobs.com or James Sprenger at 416-419-4556 or james.sprenger@jacobs.com.

Sincerely,

Regards,



James Sprenger, QPRA

Jamie Freeman, C.E.T, EP

Kurt Hanson, M.E.S., P.Geo, QPESA

Copies to: Mike Zantingh, SPM-Capital Delivery

Attachment 1
Cost Estimate

Table 1 - Desktop Cost Estimate of Soil Conditions at twelve City reservoirs and at the Woodward Water Treatment Plant (WTP) Sedimentation Tanks and Clear Wells

Item	Station ID	Description	Address/Location	Area (m^2)	Volume[b] (m^3)	O.Reg 406/19 Sampling Frequency	Initial No. of Soil Samples[c]	Chemical Analysis[d]	Screening Level Assessment of Past Uses (Labour)	ECOLOG ERIS Report (Expense)	Soil Sampling (Labour)	Laboratory Testing (Expense)	Subtotal for Location (Labour + Expenses)	Contingency
1	HDR00	Lee Smith Reservoir - Mineral Springs Rd- Ancaster	445 Sulphur Springs Rd, Ancaster	125	125	5	5	PHCs, PAHs, Metals and Inorganics	$2,140	$1,200	$3,315	$1,030	$7,685	$1,000
2	HDR02	Hillcrest Reservoir	7 Hillcrest Ave, Hamilton	9200	9200	46	15	PHCs, PAHs, Metals and Inorganics	$2,140	$1,200	$4,395	$3,090	$10,825	$1,000
3	HDR05	Stonechurch/Garth St	325 Stonechurch Rd W, Hamilton	37,000	37,000	110	20	PHCs, PAHs, Metals and Inorganics	$2,140	$1,200	$4,395	$4,120	$11,855	$1,000
4	HDR07	Highland Road	293 Highland Rd W, Stoney Creek	3100	3,100	16	5	PHCs, PAHs, Metals and Inorganics	$2,140	$1,200	$3,315	$1,030	$7,685	$1,000
5	HDR10	Fifty Road- Water Reservoir	7 Reservoir Park Rd W, Stoney Creek	480	480	5	5	PHCs, PAHs, Metals and Inorganics	$2,140	$1,200	$3,315	$1,030	$7,685	$1,000
6	HDR11	Woodley Lane Reservoir	4 Woodleys Lane, Hamilton	2000	2000	10	6	PHCs, PAHs, Metals and Inorganics	$2,140	$1,200	$3,315	$1,236	$7,891	$1,000
7	HDR18	Garner Rd & - Glancaster Rd	1107 Garner Road East, Hamilton	5700	5700	29	10	PHCs, PAHs, Metals and Inorganics	$2,140	$1,200	$3,315	$2,060	$8,715	$1,000
8	HDR1B	Greenhill Ave	850 Greenhill Ave, Hamilton	22,200	22,200	78	20	PHCs, PAHs, Metals and Inorganics	$2,140	$1,200	$4,395	$4,120	$11,855	$1,000
9	HDR1C	Dewitt/Ben Nevis Drive	29 Ben Nevis Drive, Stoney Creek	5000	5000	25	10	PHCs, PAHs, Metals and Inorganics	$2,140	$1,200	$3,315	$2,060	$8,715	$1,000
10	HDR2A	Bowman/Scenic Reservoir	300 Beddoe Drive, Hamilton	9900	9900	50	20	PHCs, PAHs, Metals and Inorganics	$2,140	$1,200	$4,395	$4,120	$11,855	$1,000
11	HDR5A	Lynden Reservoir	3630 Governors Rd, Hamilton	16,100	16,100	64	20	PHCs, PAHs, Metals and Inorganics	$2,140	$1,200	$4,395	$4,120	$11,855	$1,000
12	HWWTP	Woodward Ave. Water Treatment Plant - Clearwell	700 Woodward Ave., Hamilton	7900	7900	40	12	PHCs, PAHs, Metals and Inorganics	$2,140	$1,200	$3,315	$2,472	$9,127	$1,000
13	HWWTP	Woodward Ave. Water Treatment Plant - Sedimentation Tanks	700 Woodward Ave., Hamilton	16,600	16,600	65	20	PHCs, PAHs, Metals and Inorganics	$2,140	$1,200	$4,395	$4,120	$11,855	$1,000
14	HDT01	Kelly Street Standpipe & Reservoir	1 Kelly Street, Waterdown	800	800	5	5	PHCs, PAHs, Metals and Inorganics	$2,140	$1,200	$3,315	$1,030	$7,685	$1,000
												Total:	$135,288	$14,000

Notes
a Based on measurements from Google Maps
b Assumed depth of soil cover is 1m (based on experience at Kenilworth Reservoir)
c Initial sampling for presence/absence to assess if impacts may be present or not - see discussion in proposal text for rationale.
d Recommended baseline chemical analysis prior to Screening Level Assessment of Past Uses

Attachment 2
Figures

Figure 1: Sampling Locations for Lee Smith Reservoir - Mineral Springs Rd- Ancaster

Figure 2: Sampling Locations for Hillcrest Reservoir

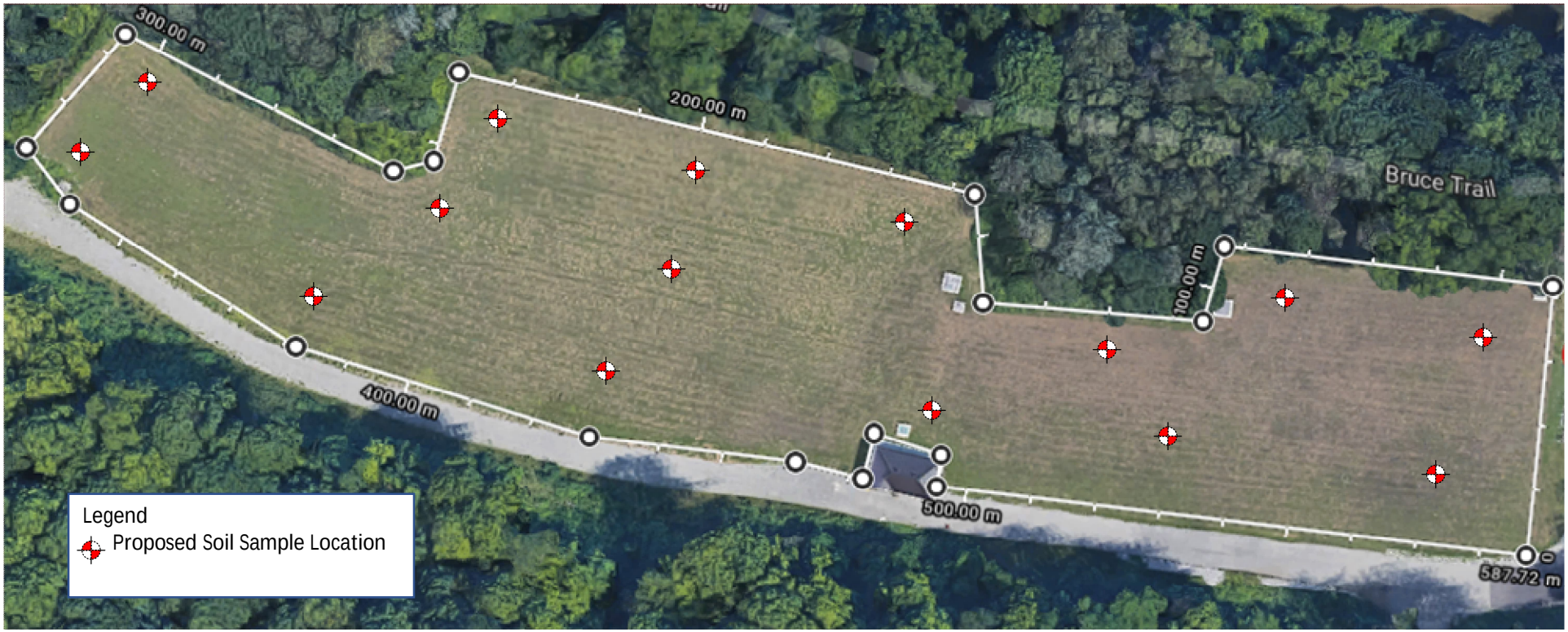


Figure 3: Sampling Locations for Stonechurch/Garth St

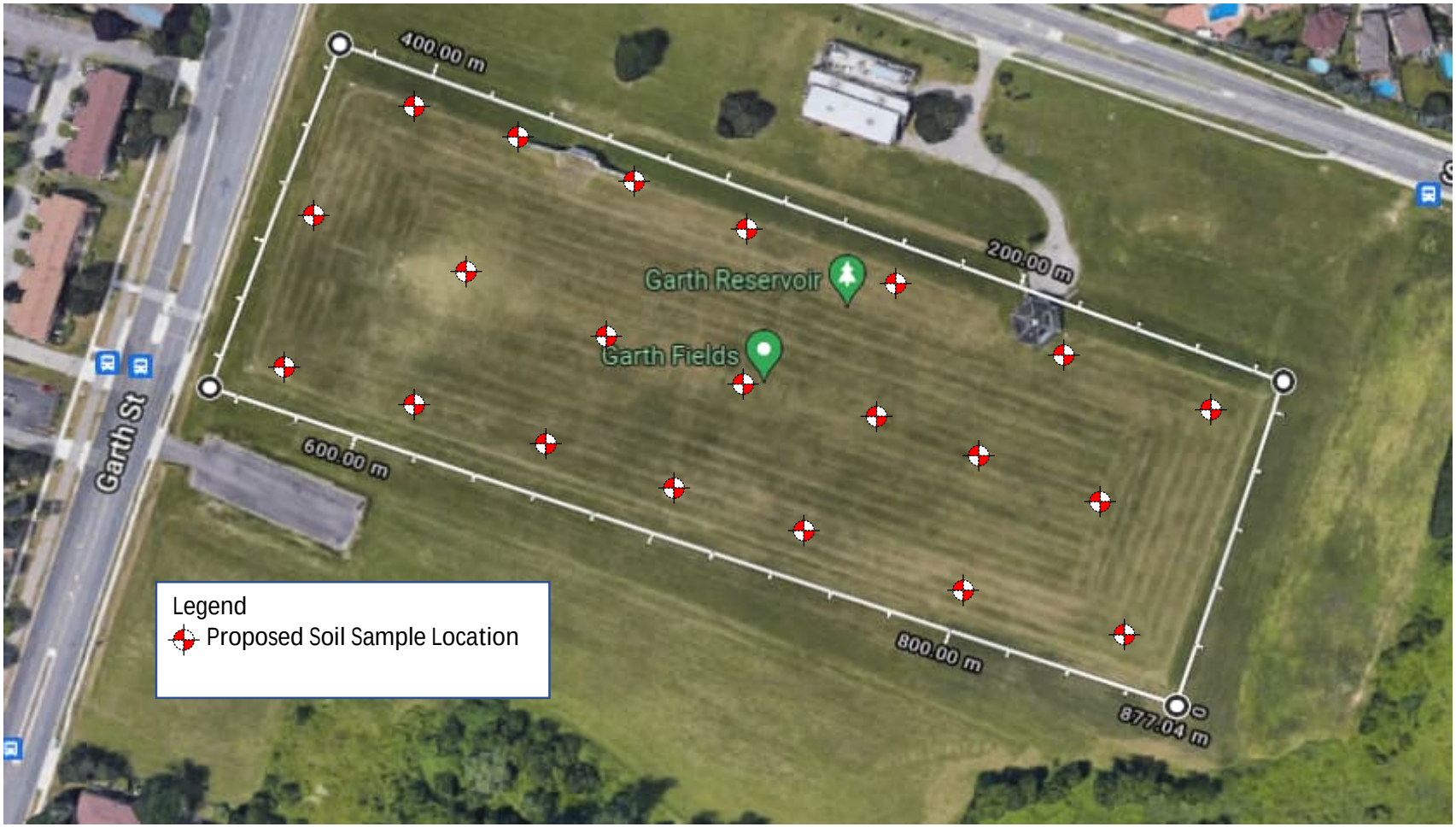


Figure 4: Sampling Locations for Highland Road

Figure 5: Sampling Locations for Fifty Road- Water Reservoir

Figure 6: Sampling Locations for Woodley Lane Reservoir

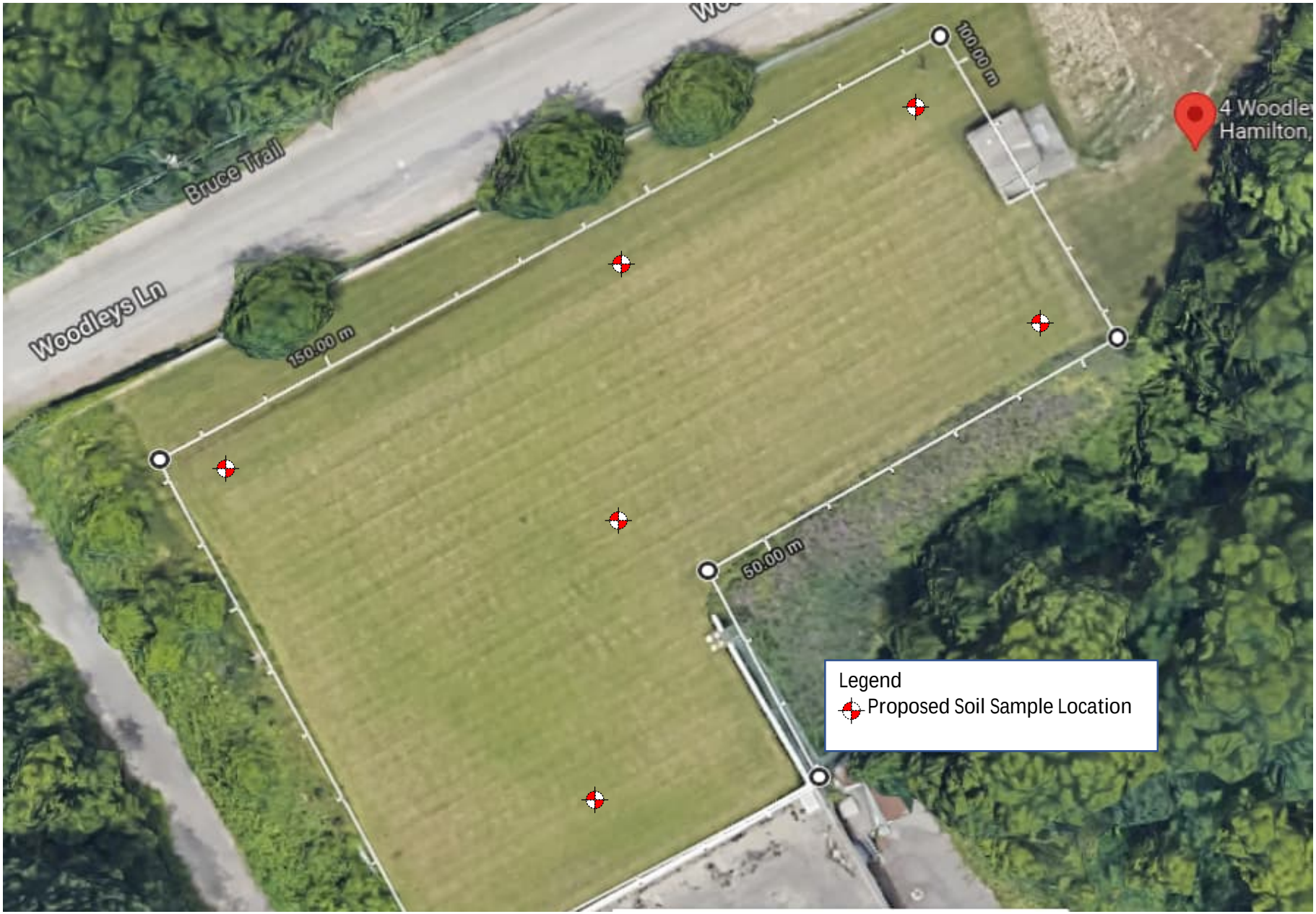


Figure 7: Sampling Locations for Garner Rd & - Glancaster Rd

Figure 8: Sampling Locations for Greenhill Ave

Figure 9: Sampling Locations for Dewitt/Ben Nevis Drive

Figure 10: Sampling Locations for Bowman/Scenic Reservoir

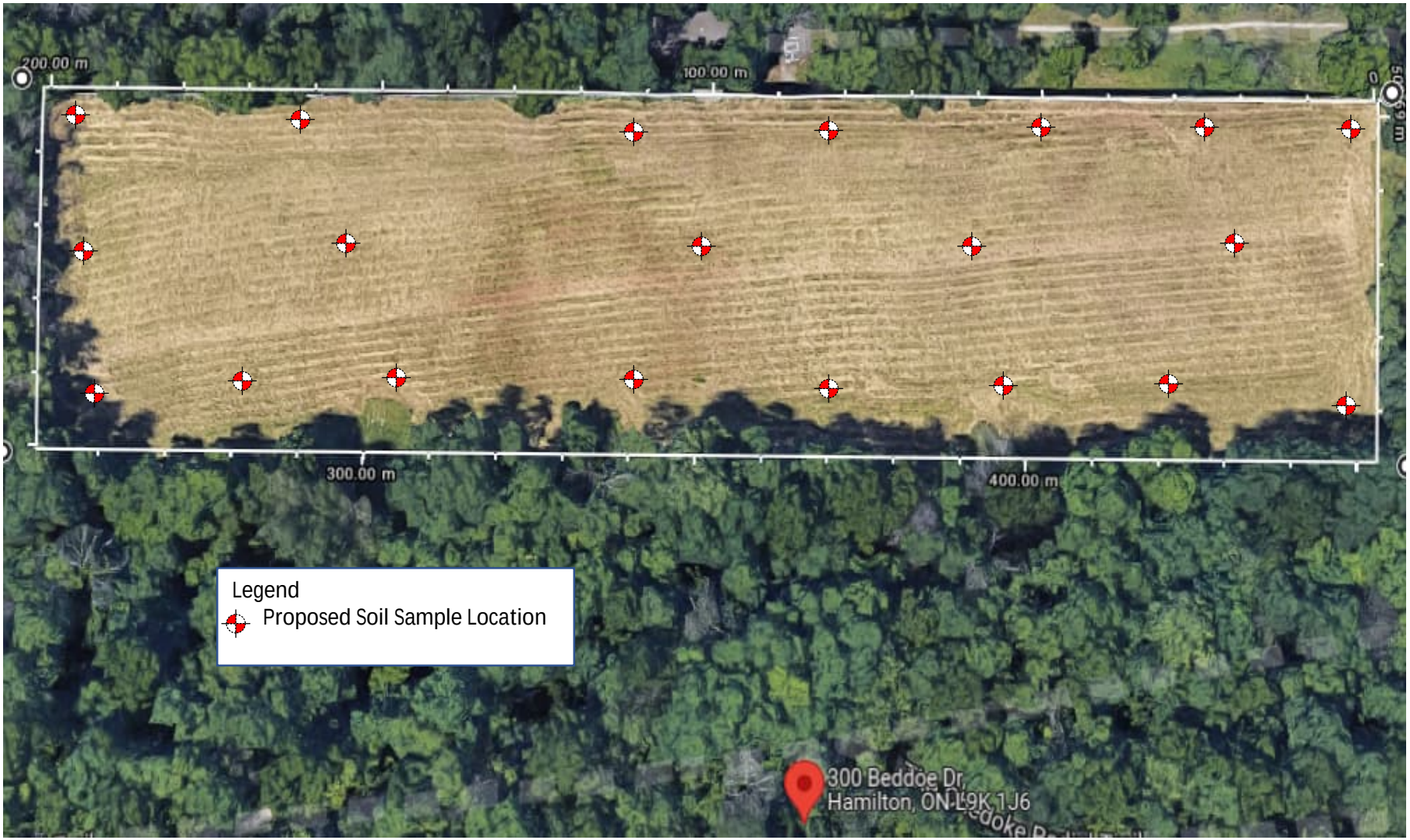


Figure 11: Sampling Locations for Lynden Reservoir

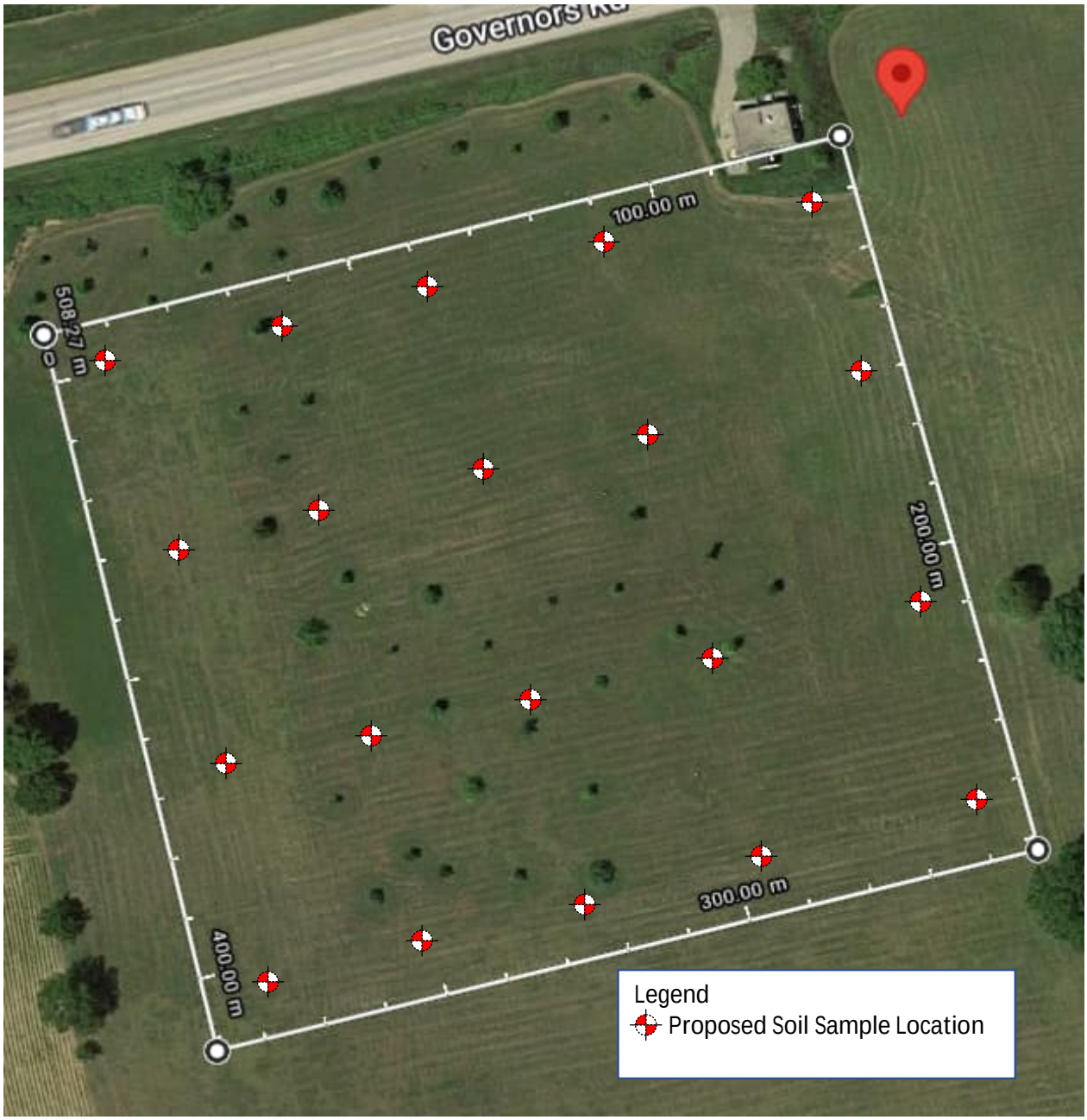


Figure 12: Sampling Locations for Woodward Ave. Water Treatment Plant - Clearwell

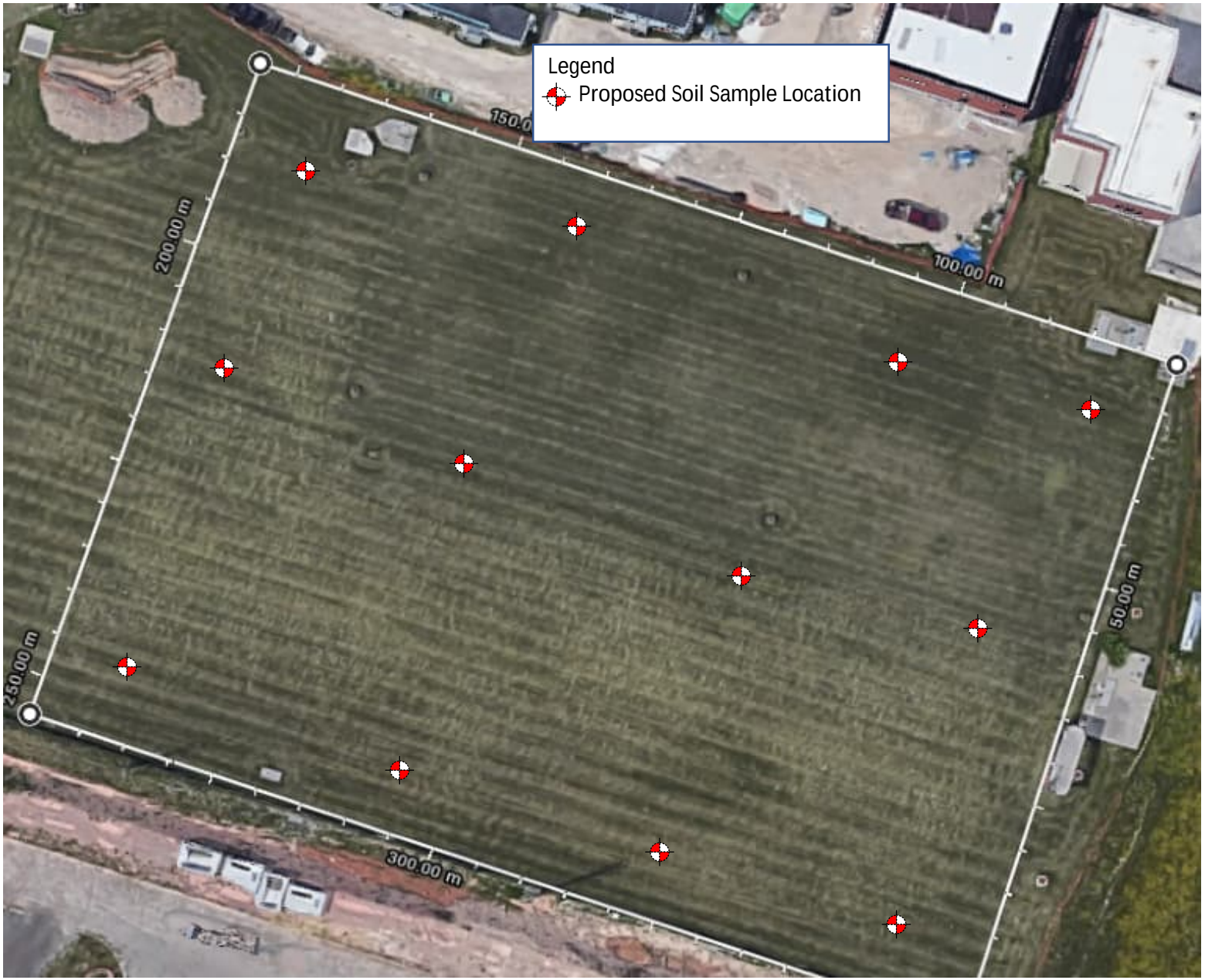


Figure 13: Sampling Locations for Woodward Ave. Water Treatment Plant - Sedimentation Tanks

Figure 14: Sampling Locations for Kelly Street Standpipe & Reservoir