Appendix A1-: AECOM Study Report

Memorandum

To	City of Hamilton	Page	1
Subject	**Residential Drainage Assistance (RDA) Program** 941 Mohawk Road East		
Date	March 15, 2022	Project Number	60656489

1. Scope of Study

The City of Hamilton requested that AECOM complete a review of flooding concerns of the rear yards of 941 Mohawk Road East. This home will be described as the Study Area (**Fig. 1**). The review will be completed under the Residential Drainage Assistance Program.

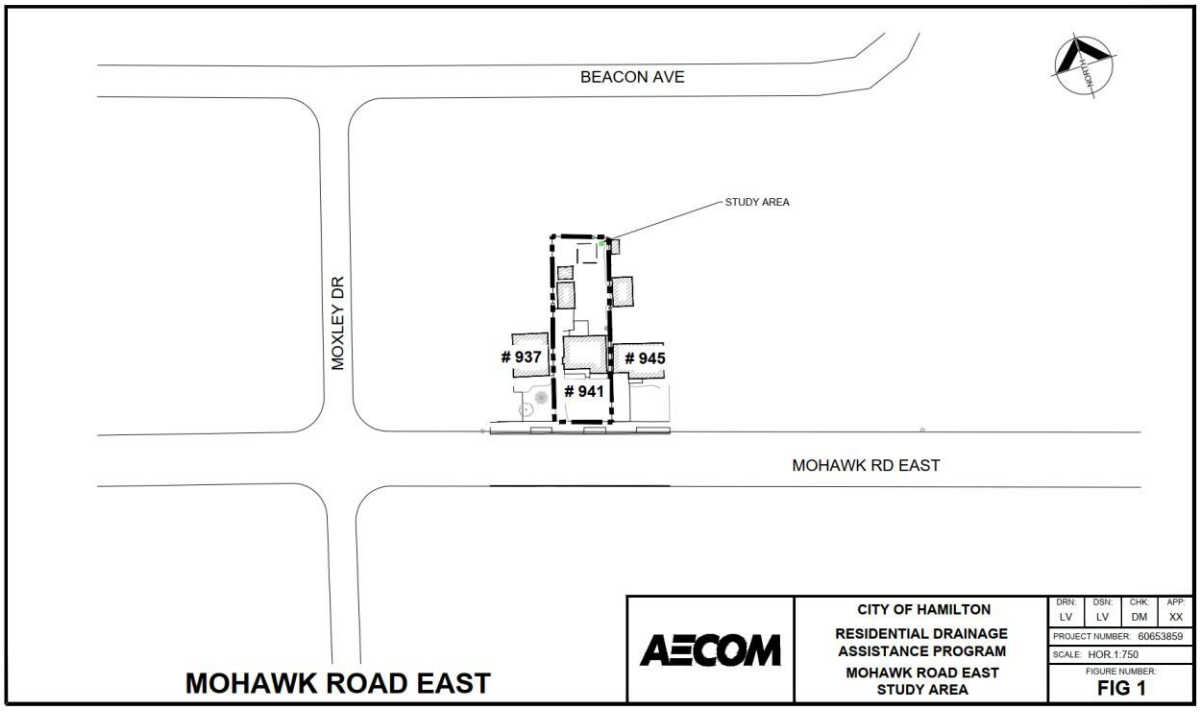

Fig.1 Study Area

The resident in the Study Area raised concerns about the amount of storm runoff from rainfalls or snow melts that is ponding within the rear yard. The ponding has limited the use of their property because of the soggy conditions created by a lack of drainage from the rear yard.

Fig. 1A Aerial View of Study Area

The City of Hamilton initiated this study:

- To assess the causes of the drainage issues;
- To determine if there were any mitigation measures that could be put in place to alleviate some of the flooding concerns; and/ or
- To determine if a drainage outlet solution could be put in place to eliminate or reduce the flooding concerns.

2. Background Information

To better assess the flooding issues, AECOM completed a number of background reviews. AECOM's survey team completed a visual and topographic survey of the properties within the Study Area. In addition, a background review of available City of Hamilton Inspection Reports and Drawings was completed to identify existing storm and sanitary sewers in the area and to determine the depth of rock within the study area. A review of the City of Hamilton Drainage Design Guidelines was completed to verify City standards. AECOM staff had a telephone interview with the resident at 941 Mohawk Road to discuss drainage issues and options.

2.1. Existing Conditions

The home within the Study Area and surrounding homes are part of a mature subdivision. The majority of homes in the neighbourhood and the Study Area have car ports, fences, decks, shrubs,

trees or other built structures that make access to the rear yards difficult. These features also hinder a conventional drainage system or neighbourhood rear yard drainage swales. The rear yard at 941 Mohawk Road East is lower in elevation than the front yard and there is no apparent drainage outlet from the rear yards to the front yards. The rear yard also appears to be lower in elevation than the neighbouring yards.

2.2. Topographic Survey

In November 2021, AECOM's topographic survey team visited the Study Area and completed a topographic survey (**Fig. 2**) of the rear yard to identify existing conditions. The survey team also took a series of photographs (Appendix A) to show rear yard features (gates, fences, shrubs, etc.) that may not be identified on the topographic survey. The attached Fig. 2 is a graphical representation of the survey results. In general, the survey team noted the following:

- The rear yard of the 941 Mohawk Road East is lower in elevation than the municipal street elevation. It also seems lower in elevation from the neighbouring yards. There are no side yard swales that would allow any of the rear yards to drain to the streets and therefore any storm runoff is trapped in the rear yards.

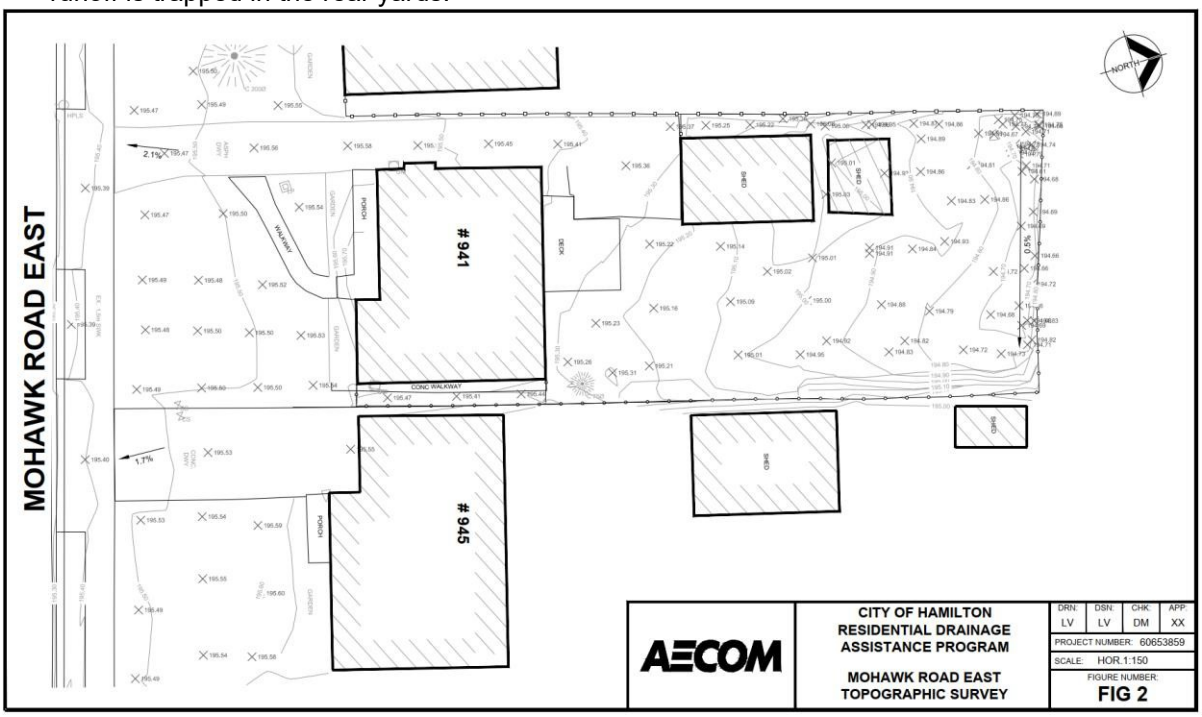

Fig 2. Topographic Survey of the Rear Yards

2.3. Background Information Review- Drawings, Reports

AECOM reviewed the Engineering drawings received from the City of Hamilton from 1972 for Mohawk Road East. These reports were prepared during the installation of the storm sewer on Mohawk Road East. The provided information indicates that the elevation of the local bedrock is approx. 192.0m.

A review of the Engineering drawings indicated that there was a combined sewer along Mohawk Road East. Connection to the combined sewer has some inherent difficulties. Municipal combined sewers are normally designed to convey sanitary flows from the local community as well as convey stormwater from the local municipal Right of Way. Adding additional stormwater flows to the combined sewers could surcharge the sewer and caused sewage backups in local homes.

The City has confirmed that the additional flows from the rear yards will not surcharge the municipal combined sewer. The existing 375mm combined sewer in the street is at elevation 192.00m(+/-) and is approx. 3.25m deep.

2.4. City of Hamilton Drainage Design Guidelines

In newer subdivisions, the grading of residential lots is governed by the City of Hamilton's "Engineering Guidelines for Servicing Lands under Development Applications". Section 2.5.2 of the Guidelines outlines the "Design Criteria" that must be followed to prepare residential lots for ready for house construction.

Drainage from rear yards is normally directed from the back of the yards to side yard swales (running along the side property line) which would convey storm runoff to the municipal street and then to the municipal catchbasin (storm sewer) system.

The intent of the guidelines is to ensure that each residential lot is independently drained thereby reducing the risk of rear yard flooding issues. Unfortunately, the age of this subdivision pre-dates the current Engineering Guidelines and the existing lot grading does not comply with the current specifications.

3. Recommended Options

3.1. Design Considerations

Subsequent to the topographic survey, the design team reviewed the following:

1. The existing drainage patterns within the rear yard;
2. Options that are available to collect storm runoff; and
3. Options for storm runoff be conveyed to the municipal storm sewer system.

3.2. Drainage Options

After discussions with the homeowners, reviewing the topographic survey information, the inspection reports and the restrictions within the rear and side yards, the following solution/measures were considered to help alleviate some of the drainage issues. The proposed solution is intended to eliminate (or reduce) soggy back yards or minor flooding issues.

3.2.1. Soak Away Pit

An option reviewed to reduce the chronic flooding issues **(Fig. 3)** included the installation of a rear yard soak away pits in resident's back yards. The rear yard drainage pit would be designed to capture a volume of storm runoff equal to 25mm of water covering the rear yard. The approximate size (approx. 3.5mx7.5m) and location of the soak away pits are described on Fig.3.

3.2.1.1. Benefits

The construction of individual drainage pit would have the following benefits:

- Since the pit would be constructed on the individual resident's property, the timing of construction could be arranged by the residents;
- The soak away pits can be placed and orientated to minimize damage existing properties (trees, building, etc.);
- After construction the residents would have full use of their rear yards; and
- The drainage pits would provide for storage of stormwater underground, for most local storms,

thereby decreasing the time for yards to return to normal usage.

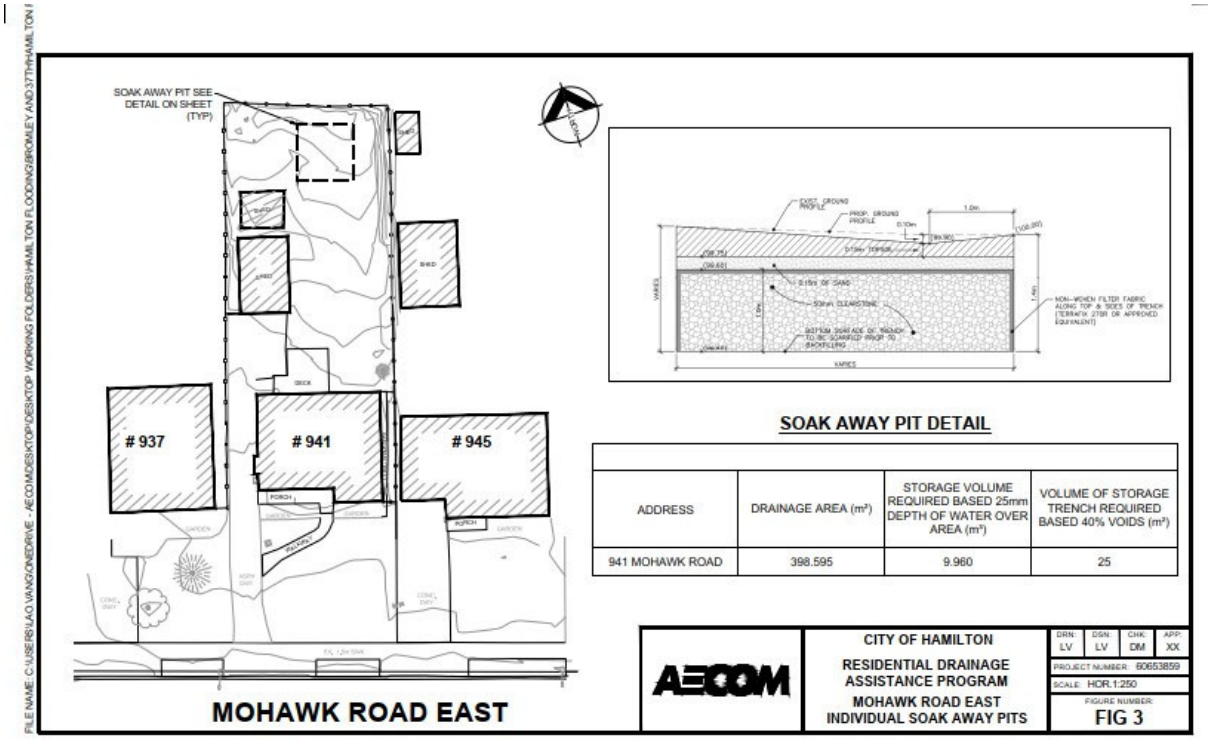

Fig. 3– Individual Soak Away Pits

3.2.1.2. Costs

The anticipated total cost of the installation of the rear yard soak away pit is approx. $6,000.00 to $9,000.00 per lot. The final costs for the construction of the soak away pit will depend on the ability of the approved contractor to gain access to the rear yard. As noted previously, the timing and construction soak away pit can be arranged by the individual residents.

The reader should note that the cost listed is an estimate only and the final costs will vary when the residents.

3.2.2. Rear Yard Catchbasin

Another potential option to reduce the amount of drainage that gets trapped in the rear yard of 941 Mohawk Road East is the installation of a rear yard catchbasin (**Fig. 4**). A rear yard catchbasin would be connected the municipal combined sewer within the municipal Right of Way.

The storm sewer from the rear yard catchbasin to the municipal combined sewer will be 250mm in diameter with 100mm cleanouts. Ideally, the sewer would be placed at a depth of 1.2m below grade (approx. frost depth). The depth will vary depending on the elevation of the yard or existing ground surfaces. Where the sewer is less than 1.2m deep, insulation over the sewer will be used to protect the sewer from freezing.

Memorandum

City of Hamilton
Residential Drainage Assistance Program

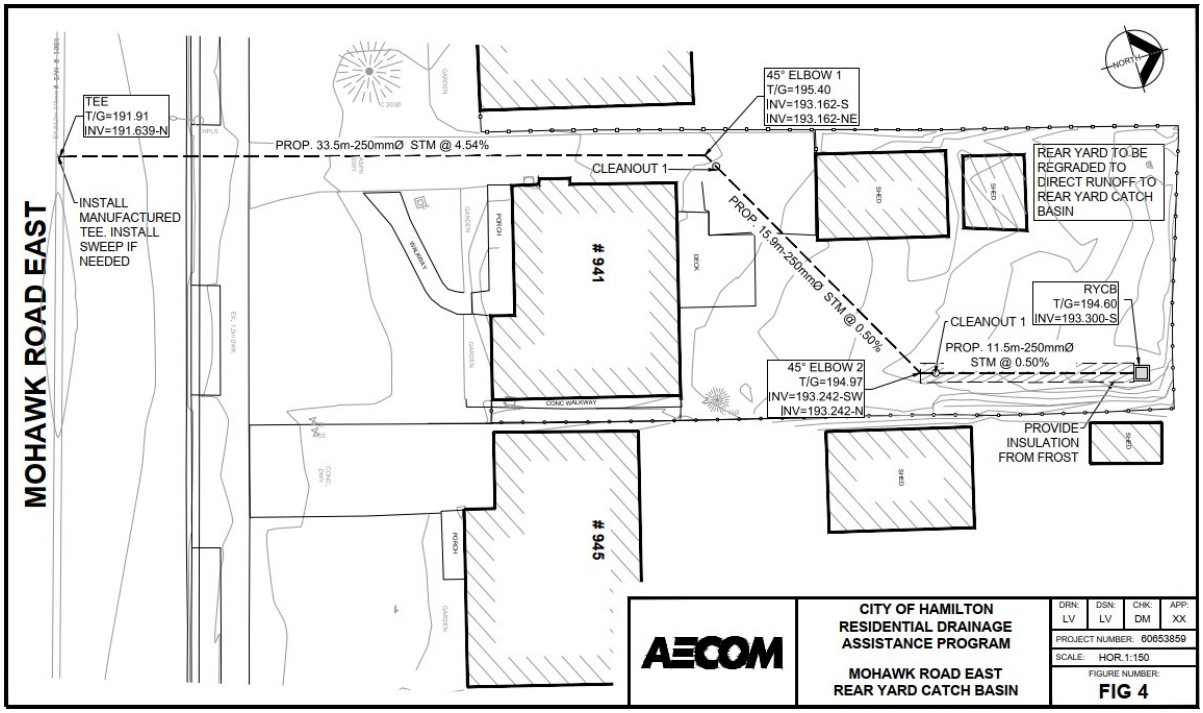

Fig. 4 – Rear Yard Catchbasin

3.2.2.1. Benefits

- The rear yard at 941 Mohawk Road is lower in elevation than the adjacent properties and is therefore collecting storm runoff from the neighbouring properties. The rear yard catchbasin system can be designed to accommodate runoff from a larger catchment area.;
- A sewer connection from the rear yard to the municipal sewer would provide a year-round connection and provide the best solution to the chronic flooding issue;
- After construction the residents would have full use of their rear yards.

3.2.2.2. Difficulties

- Adding additional storm flows to a combined sewer could result in sewer back ups.;
- The installation of a rear yard catchbasin will be require the removal and replacement of the driveway, excavation adjacent to the building foundation and regrading of the rear yards.;
- Construction of the drainage sewer from the rear yard to the street will include construction close to the garage, the deck and the foundation of the house. Excavation close to existing structures can cause damage from settlement, vibration and having equipment close to structures
- The existing driveway at 66 Bromley Road would have to be entirely reconstructed.

3.2.2.3. Costs

The anticipated total cost of the installation of the rear yard catch basin is approx. $19,500.00 for work within the municipal Right of Way and $22,000.00 for work on the private side. The final costs for the construction of the rear yard catchbasin will depend on the ability of the approved contractor to gain access to the rear yard. As noted previously, the timing and construction of the rear yard catchbasin can be arranged by the individual residents.

The reader should note that the cost listed is an estimate only and the final costs will vary when the residents.

3.2.3. Recommendation

Having discussed the options, issues with the various options with the homeowner, a rear yard catchbasin system, although more expensive than soak away pits, would provide the best solution to reduce the flooding issues at 941 Mohawk Road.