Project Number:
2007-317P

April/2013

Mayfield Road Improvements

Airport Road to Coleraine Drive –
Class Environmental Assessment

ENVIRONMENTAL STUDY REPORT

Volume 2 of 5
Appendix A - I

April 18, 2013

Stantec

Region of Peel
Working for you

APPENDIX A

NOTICE OF STUDY COMMENCEMENT

NOTICE OF STUDY COMMENCEMENT

CLASS ENVIRONMENTAL ASSESSMENT
MAYFIELD ROAD
FROM
EAST OF AIRPORT ROAD TO WEST OF COLERAINE DRIVE

The Study

The Regional Municipality of Peel is initiating a Class Environmental Assessment (EA) for Mayfield Road, from east of Airport Road to west of Coleraine Drive, bordering the City of Brampton and the Town of Caledon. Mayfield Road is a major east-west arterial road that is experiencing increased traffic growth. As a result, improvements are being considered which may include a combination of road widening, intersection improvements, horizontal and vertical realignments, replacement or expansion of various watercourse structures, pavement rehabilitation, and mitigation of environmental impacts (natural and social).

A comprehensive and environmentally sound planning process, that incorporates public and agency consultation and involves a wide variety of stakeholders, is required. The Study Area is shown on the plan provided below.

The Process

This Study is being conducted as a Schedule 'C' project, in accordance with the Municipal Engineers Association, *Municipal Class Environmental Assessment* (2000) guideline. Upon completion of this Study, an Environmental Study Report, documenting the process, will be submitted to the Ministry of the Environment and will be available for public review for a period of 30 calendar days.

Public consultation is vital to this Study. We want to ensure that anyone with an interest in this Study has the opportunity to get involved and provide input, before any decisions are made on a preferred solution or design concept.

As part of this Study, two (2) Public Information Centres (PICs) are planned. The first PIC is tentatively scheduled for late winter or early spring, 2008, and will be at a site in close proximity to the Study limits. The PIC will provide background information on the Study and an informal presentation of various preliminary alternative solutions and concepts, including a comparative analysis where appropriate. Representatives from the Region and the Consultant will be present at the PIC to answer questions and discuss the next steps in the Study. Notification of both PICs will be provided at an appropriate time by means of a similar advertisement in this newspaper.

Comments

We are interested in hearing any comments that you may have about this Study. With the exception of personal information, all comments will become part of the public record for this project.

To provide your comments, or to request additional information concerning this project, please contact either of the following Project Team members:

Ms. Sandy Lovisotto, P. Eng.
Project Manager
Regional Municipality of Peel
11 Indell Lane
Brampton, ON, L6T 3Y3
Tel: 905-791-7800, Ext. 7838
Fax: 905-791-1442
sandy.lovisotto@peelregion.ca

Mr. Garry E. Leveck, P. Eng.
Project Manager
Stantec Consulting Ltd.
49 Frederick Street
Kitchener, ON, N2H 6M7
Tel: 519-585-7316
Fax: 519-579-9210
garry.leveck@stantec.com

Bayley, John

From: Leveck, Garry
Sent: Monday, October 22, 2007 8:18 AM
To: [redacted] sandy.lovisotto@peelregion.ca
Subject: Resident Anderson Comments: October 21

Thank you for your time in responding by email during the early stages of this Class Environmental Assessment study. It is important that we receive feedback from residents, business owners and the general public, with respect to studies of this nature.

We are in the very early stages of the study, and there is a long way to go before we can examine alternatives to the undertaking, meet with the public at future Public Information Centre (PIC) meetings, and evaluate various designs leading up to a recommended solution. The input of everyone will be considered in this process.

You are on the mailing list and will be notified of the first PIC, at which point we hope to meet you in person to discuss the issues, design alternatives, and various environmental constraints.

Thank you again for your comments and interest in this study.

Regards.

Garry E. Leveck, P. Eng.
Vice President, Transportation
Stantec
49 Frederick Street
Kitchener ON N2H 6M7
Ph: (519) 585-7316
Fx: (519) 579-9210
garry.leveck@stantec.com
www.stantec.com

-----Original Message-----
From: [redacted]
Sent: Sunday, October 21, 2007 9:21 AM
To: sandy.lovisotto@peelregion.ca; Leveck, Garry
Subject: Project: 07-4350 Mayfield Road

Hello,

Re: Project: 07-4350 Mayfield Road, from East of Airport Road to West of Coleraine Drive
Class Environmental Assessment Study.

I live on Mayfield Road (South side, East of Gore Road)

I remember - way back - when the road was widen and land was taken from the home owners on the then 17th sideroad (now Mayfield Road).

More land was taken from the residents on the North Side of the road - because the St. Patrick's Cemetery is on the south side of the road (Mayfield Road and Gore Road) and could not be used or taken by the county.

This Cemetery and the Church founded in 1837 is " historical structure - it's the second oldest in what is now the archdiocese of Toronto."

I Believe that you cannot plan to use land that is Cemetery Land. It is so old that not all records of where all the bodies are have survived. I know this because my father was on the St. Patrick's Cemetery Board in the 1960's. I also know that the cemetery is full.

ALSO - for what it is worth - my idea is that the George Bolton Parkway - extended through the farm land eastward from hwy 50 to Airport Road might be a good alternative and help with the east/west traffic flow in the area. I know this would be creating a whole new road, but maybe it would be a better solution.

My vote is do not widen Mayfield Road in this area.

Thanks for you attention.

[redacted] Mayfield Road
Brampton, Ontario
L6P 0H6

Bayley, John

From: Lovisotto, Sandy <Sandy.Lovisotto@peelregion.ca>
Sent: Tuesday, October 30, 2007 5:17 PM
To: [redacted]
Cc: Leveck, Garry
Subject: [redacted]

Importance: High

Hi Imma, as per our telephone discussion, please see my responses below.

SANDY LOVISOTTO, P.ENG.
Project Manager, Transportation Program Planning Transportation Division Environmental, Transportation and Planning Services
(905) 791-7800 ext. 7838
lovisottos@peelregion.ca

-----Original Message-----
From: [redacted]
Sent: Tuesday, October 30, 2007 10:59 AM
To: Lovisotto, Sandy
Subject: inquiry regarding work to be done on Mayfield Rd. between Coleraine & Airport Rd
Importance: High

Hi Sandy,

I have tried to contact you by telephone and cannot seem to connect with

you. As residents of Mayfield Road (in the area specifically affected by
the work) we would like to get information and clarification of the intentions for the road and area. (Re: your letter dated October 9, 2007-regarding the road work/expansion to be done on Mayfield Rd. between
Coleraine & Airport Rd.)

Please call or email me with the information ASAP:

What plans have been "Confirmed"? We appreciate details.

Response: At this time, the Region has initiated a Study to confirm the need and justification for improvements to Mayfield Road, timeframes, alternative solutions, an evaluation of the alternatives and the preferred technical solution. As part of the process, public participation is important; hence the Region is planning two Public Information Centres.

I hear that the expansion will be to 4 lanes from the existing 2 lanes...

Response: From a traffic perspective and during our 10 year budgeting process, a high level analysis is performed to identify the need for road improvements (e.g. widening) for all Regional Roads.

Since the areas closest to the West side of Gore Road on the south are limited to frontage, does that mean that the expansion of the two extra lanes be taken only from the properties on the North side of Mayfield?

Response: It is too premature in the Study to determine this.

What would be the total width required from the existing land (not including existing road)?

Response: The Region's Official Plan designates Mayfield Road as an ultimate Right-of-Way width of 50 metres.

Will this expansion lead right up to the intersection (as this intersection is already very busy)?

Response: I am assuming you mean The Gore Road and Mayfield Road intersection. Every intersection in the Study area will be reviewed.

Will there be sidewalks? Which side? or any other "extra land" required other than that used for the lanes?

Response: Landscaping features, sidewalks and multi-use paths are all under the jurisdiction of the local municipality. During the study process, the Study Team will meet with the municipalities (i.e. Caledon and Brampton) to discuss their requests.

Will there be any changes required to the driveways that currently exit onto Mayfield?

Response: Again, this is still premature in the Study to determine this.

When is this work to be done?

Response: The Study will take approximately 18 months to complete. Following Study completion, the project will move into the implementation stage, based on the recommended solution, commencing with detailed design.

How long will it take?

Response: Implementation of the recommended solution is dependent on several factors, one being the acquisition of property in a timely manner.

Will there be any compensation to the property owners who lose their frontage due to this expansion, (as this obviously affects the visual curb appeal to the existing homes & subsequently property values)?

Response: During Public Information Centres #1 and #2, the Region will have a Realty Rep available to answer these types of questions.

In the only notice we have received, there indicates that there will be a
couple of meetings to discuss plans and discuss issues- when are these meetings & where? We have not received any further information.

Response: You will receive all future Notices, by mail, indicating the date, time and location of the meeting (informal drop-in).

If you have any information you can fax to us, please use the direct fax

number below or by email.

We await your earliest reply.

Thank You!

[redacted]
7472 Mayfield Road
Caledon, Ontario

[redacted]

APPENDIX B

PUBLIC INFORMATION CENTRE #1

NOTICE OF PUBLIC INFORMATION CENTRE
CLASS ENVIRONMENTAL ASSESSMENT
MAYFIELD ROAD
FROM
AIRPORT ROAD TO COLERAINE DRIVE

The Study

The Regional Municipality of Peel is initiating a Class Environmental Assessment (EA) for Mayfield Road, from Airport Road to Coleraine Drive, bordering the City of Brampton and the Town of Caledon. Mayfield Road is a major east-west arterial road that is experiencing increased traffic growth. As a result, improvements are being considered which may include a combination of road widening, intersection improvements, horizontal and vertical realignments, replacement or expansion of various watercourse structures, pavement rehabilitation, and mitigation of environmental impacts (natural and social).

A comprehensive and environmentally sound planning process, that incorporates public and agency consultation and involves a wide variety of stakeholders, is required. The Study Area is shown on the plan provided below.

The Process

This Study is being conducted as a Schedule 'C' project, in accordance with the Municipal Engineers Association (MEA) *Municipal Class Environmental Assessment* (2000) guideline. Upon completion of this Study, an Environmental Study Report (ESR), documenting the process, will be submitted to the Ministry of the Environment (MOE) and will be available for public review for a period of 30 calendar days.

Public consultation is vital to this Study. We want to ensure that anyone with an interest in this Study has the opportunity to get involved and provide input, before any decisions are made on a preferred solution or design concept.

As part of this Study, two (2) Public Information Centres (PICs) are planned. The first PIC is scheduled for:

Date: Wednesday June 24, 2009

Time: 6:00 pm to 9:00 pm

Location: Church or School
Wildfield

This first PIC will consist of an informal "drop-in" center with displays showing background information, a "Problem Statement" and justification for the project, various preliminary alternative solutions, and the proposed evaluation criteria that will be used to select the preferred design. Representatives from the Region and the Consultant will be present to answer questions and discuss the next steps in the Study.

Comments

We are interested in hearing any comments that you may have about this Study. With the exception of personal information, all comments will become part of the public record for this project.

If you cannot attend and would like to provide comments, please forward them to one of the following Project Team members:

Ms. Solmaz Zia, P. Eng.
Project Manager
Regional Municipality of Peel
10 Peel Centre Drive
Brampton, ON
L6T 4B9

Phone: 905-791-7800, Ext. 7845
Fax: 905-791-1442
solmaz.zia@peelregion.ca

Mr. Dave Hallman, P. Eng.
Project Manager
Stantec Consulting Ltd.
49 Frederick Street
Kitchener, ON
N2H 6M7

Phone: 519-585-7444
Fax: 519-579-4239
dave.hallman@stantec.com

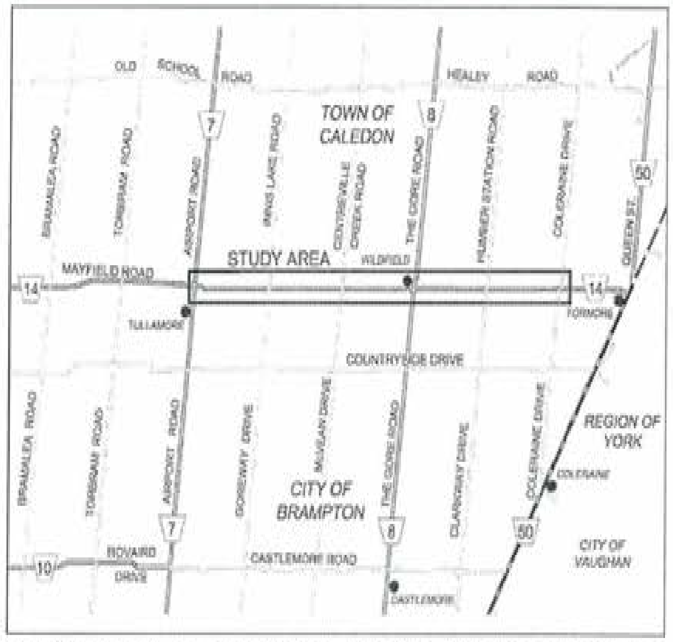
NOTICE OF PUBLIC INFORMATION CENTRE (PIC) # 1

MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT MAYFIELD ROAD (R.R #14) FROM AIRPORT ROAD TO COLERAINE DRIVE

The Study

The Regional Municipality of Peel is undertaking a Class Environmental Assessment (EA) for Mayfield Road, from Airport Road to Coleraine Drive, bordering the City of Brampton and the Town of Caledon. Mayfield Road is a major east-west arterial road that is experiencing increased traffic growth. As a result, improvements are being considered which may include a combination of road widening, intersection improvements, horizontal and vertical realignments, replacement or expansion of various watercourse structures, pavement rehabilitation, and mitigation of environmental impacts (natural and social).

A comprehensive and environmentally sound planning process, that incorporates public and agency consultation and involves a wide variety of stakeholders, is required. The Study Area is shown on the plan provided.



The Process

This Study is being conducted as a Schedule 'C' project, in accordance with the Municipal Engineers Association's Municipal Class Environmental Assessment document (October 2000, as amended in 2007) guideline. The Class EA process includes public and review agency consultation, evaluation of alternatives, assessment of the impacts of any proposed undertakings, and identification of reasonable measures to mitigate any adverse impacts. Upon completion of this study, an Environmental Study Report, documenting the process, will be submitted to the Ministry of the Environment and will be available for public review for a period of 30 calendar days.

Public Information Centre

Public consultation is vital to this study. We want to ensure that anyone with an interest in this Study has the opportunity to get involved and provide input, before any decisions are made on a preferred solution or design concept.

As part of this Study, two Public Information Centres (PICs) are planned. The first PIC is scheduled for:

Date: Thursday June 25, 2009
Time: 6 - 8 p.m.
Location: Castlemore Public School
9916 The Gore Rd., Brampton, ON

This first PIC will consist of an informal "drop-in" centre with displays showing background information, a "Problem Statement" and justification for the project, various preliminary alternative solutions, and the proposed evaluation criteria that will be used to select the preferred design. Representatives from the Region and its consultant will be present to answer questions and discuss the next steps in the study.

Comments

We are interested in hearing any comments that you may have about this study. With the exception of personal information, all comments will become part of the public record for this project.

If you cannot attend and would like to provide comments, please forward them to one of the following Project Team members:

Ms. Solmaz Zia, P. Eng.
Project Manager
Regional Municipality of Peel
9445 Airport Rd.
Brampton, ON
Tel: 905-791-7800, ext. 7845
Fax: 905-791-1442
solmaz.zia@peelregion.ca

Mr. Dave Hallman, P. Eng.
Project Manager
Stantec Consulting Ltd.
49 Frederick St.
Kitchener, ON
Tel: 519-585-7444
Fax: 519-579-4239
dave.hallman@stantec.com

Region of Peel
Working for you

Region of Peel
Working for you

Leadership

CANADA AWARDS FOR EXCELLENCE 2006

August 22, 2012
Project: 07-4350

Dear Property Owner,

Re: Notice of Public Information Centre (PIC) #1
Mayfield Road, from East of Airport Road to West of Coleraine Drive
Class Environmental Assessment Study

The Regional Municipality of Peel has retained Stantec Consulting Ltd. to undertake a Schedule 'C' Class Environmental Assessment Study to determine improvement alternatives for Mayfield Road, between Airport Road and Coleraine Drive. A project "Notice of Study Commencement" was mailed to property owners and agencies in October 2007.

During the Study, there will be two Public Information Centre (PIC) meetings, which will assist the Project Team is determining a preferred design concept. Enclosed is the ***Notice of the first PIC, to be held on Thursday June 25, 2009 from 6 – 8 pm, Castlemore Public School.*** Additional details regarding the Study and the PIC can be found on the enclosed PIC Notice.

If you wish to provide any comments on this study, but cannot attend the first PIC, please forward them to one of following project team members.

Region of Peel
9445 Airport Road
Brampton, Ontario L6S 4J3
Attn: Solmaz Zia, P.Eng.

Stantec Consulting Ltd.
49 Frederick Street
Kitchener, Ontario N2H 6M7
Attn: Dave Hallman, P.Eng.

We thank you for your attention to this matter, and we look forward to your assistance in the identification of pertinent issues affecting the design of future improvements within this roadway corridor.

Sincerely,

Solmaz Zia, P.Eng.
Project Manager, Project Planning and Studies
Environment, Transportation and Planning Services

Copy–Mr. Dave Hallman, Stantec Consulting Ltd

Enclosure – Notice of PIC #1

August 22, 2012
Project: 07-4350

LETTERS TO AGENCIES
Somewhere Street
Brampton, ON
LXX XXX

Re: Notice of Public Information Centre (PIC) #1
Mayfield Road, from East of Airport Road to West of Coleraine Drive
Class Environmental Assessment Study

The Regional Municipality of Peel has retained Stantec Consulting Ltd. to undertake a Schedule 'C' Class Environmental Assessment Study to determine improvement alternatives for Mayfield Road, between Airport Road and Coleraine Drive. A project "Notice of Study Commencement" was mailed to your agency in October 2007.

During the Study, there will be two Public Information Centre (PIC) meetings held, which will assist the Project Team is determining a preferred design concept. Enclosed is the ***Notice of the first PIC, to be held on Thursday June 25, 2009 from 6 – 8 pm, at Castlemore Public School.*** Additional details regarding the Study and the PIC can be found on the enclosed PIC Notice.

This first PIC will outline the Problem Statement and other information collected to date. We invite you to attend the PIC, however if you cannot attend and have any comments or wish additional information, please forward them to one of following project team members.

Region of Peel
9445 Airport Road
Brampton, Ontario L6S 4J3
Attn: Solmaz Zia, P.Eng.

Stantec Consulting Ltd.
49 Frederick Street
Kitchener, Ontario N2H 6M7
Attn: Dave Hallman, P.Eng.

We thank you for your attention to this matter, and we look forward to your assistance in the identification of pertinent issues affecting future improvements for this roadway corridor.

Sincerely, ***DRAFT***

Solmaz Zia, P.Eng.
Project Manager, Roads Planning
Environment, Transportation and Planning Services

encl.

c. Mr. Dave Hallman, Stantec Consulting Ltd

Region of Peel
Working for you

CANADA AWARDS FOR EXCELLENCE
GOLD RECIPIENT QUALITY 2006

August 22, 2012
Project: 07-4350

Christine Bennett
Somewhere Street
Waterloo, ON
N2J 2B5

Re: Mayfield Road, from East of Airport Road to West of Coleraine Drive
<u>Class Environmental Assessment Study</u>

The Regional Municipality of Peel has retained Stantec Consulting Ltd. to undertake a Schedule 'C' Class Environmental Assessment Study to determine improvement alternatives for Mayfield Road, between Airport Road and Coleraine Drive. A copy of the project "Notice of Study Commencement" is enclosed for your reference.

During the Study, there will be two Public Information Centre (PIC) meetings held, which will assist the Project Team is determining a preferred design concept. You will be notified of these meetings, in advance, along with information on the specific location for the PIC.

If you wish to provide any comments on this study, prior to the first PIC, we request that your comments be directed to following, no later than **October 31, 2007**. Alternatively, you may wish to attend the Information Centre meetings before providing any feedback.

Region of Peel
11 Indell Lane
Brampton, Ontario L6T 3Y3
Attn: Sandy Lovisotto, P.Eng.
Project Manager

Stantec Consulting Ltd.
49 Frederick Street
Kitchener, Ontario N2H 6M7
Attn: Garry E. Leveck, P.Eng.
Project Manager

Over the next few weeks, a topographic survey will be conducted along Mayfield Road. A topographic survey details existing physical and natural features on the ground and, as part of this survey, Stantec will be conducting actual field measurements along Mayfield Road. In order to pick up certain property features (e.g. trees, landscaping, driveways, etc.), it may be necessary to take measurements slightly beyond the road allowance, on private properties adjacent to Mayfield Road.

If there is any concern with the survey work being conducted on Mayfield Road or on your property, please contact the undersigned within **5 days of the date of this letter**.

We thank you for your attention to this matter, and we look forward to your assistance in the identification of pertinent issues affecting the design of future improvements within this roadway corridor.

Sincerely,

S. Lovisotto

Sandy Lovisotto, P.Eng.
Project Manager, Roads Planning
Environment, Transportation and Planning Services

encl.

c. Mr. Garry Leveck, Stantec Consulting Ltd.

Region of Peel
Working for you

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Stantec

Public Consultation Centre #1

Thursday, June 25, 2009
6:00 - 8:00pm
Castlemore Public School
9916 The Gore Road
Brampton, ON L6P 0A7

Welcome to the first Public Information Centre for the Mayfield Road Class Environmental Assessment Study, between Airport Road and Coleraine Drive.

This project is being completed in accordance with the Ministry of Environment guidelines for a "Schedule C Class Environmental Assessment: Municipal Road Projects" under the Environmental Assessment Act.

The Environmental Assessment Study is being directed by a Project Team made up of Staff from the Region of Peel and Stantec Consulting Limited. Liaison with local agencies is a significant component of the study.

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Stantec

THE PURPOSE OF THIS INFORMATION CENTRE IS AS FOLLOWS:

- To provide an overview of the Class Environmental Assessment Study Process;
- To provide study background information relevant to the project at this point in time;
- To provide a forum for comments by the public and outside agencies, which will be considered by the Project Team over the course of the study;
- To present the problem and opportunity statement and alternative solutions.
- To provide an opportunity for the public to meet Project Team members on an informal basis to discuss issues and to ask questions;

ALL ATTENDEES AT THIS MEETING ARE INVITED TO:

- Sign the attendance register.
- Meet with Project Team Members.
- Review the displays depicting the study area and current information.
- Discuss the project scope and any current issues that you feel are important.
- Complete a study "Comment Sheet," outlining your suggestions, concerns, support, recommendations or other thoughts concerning proposals to improve Mayfield Road.

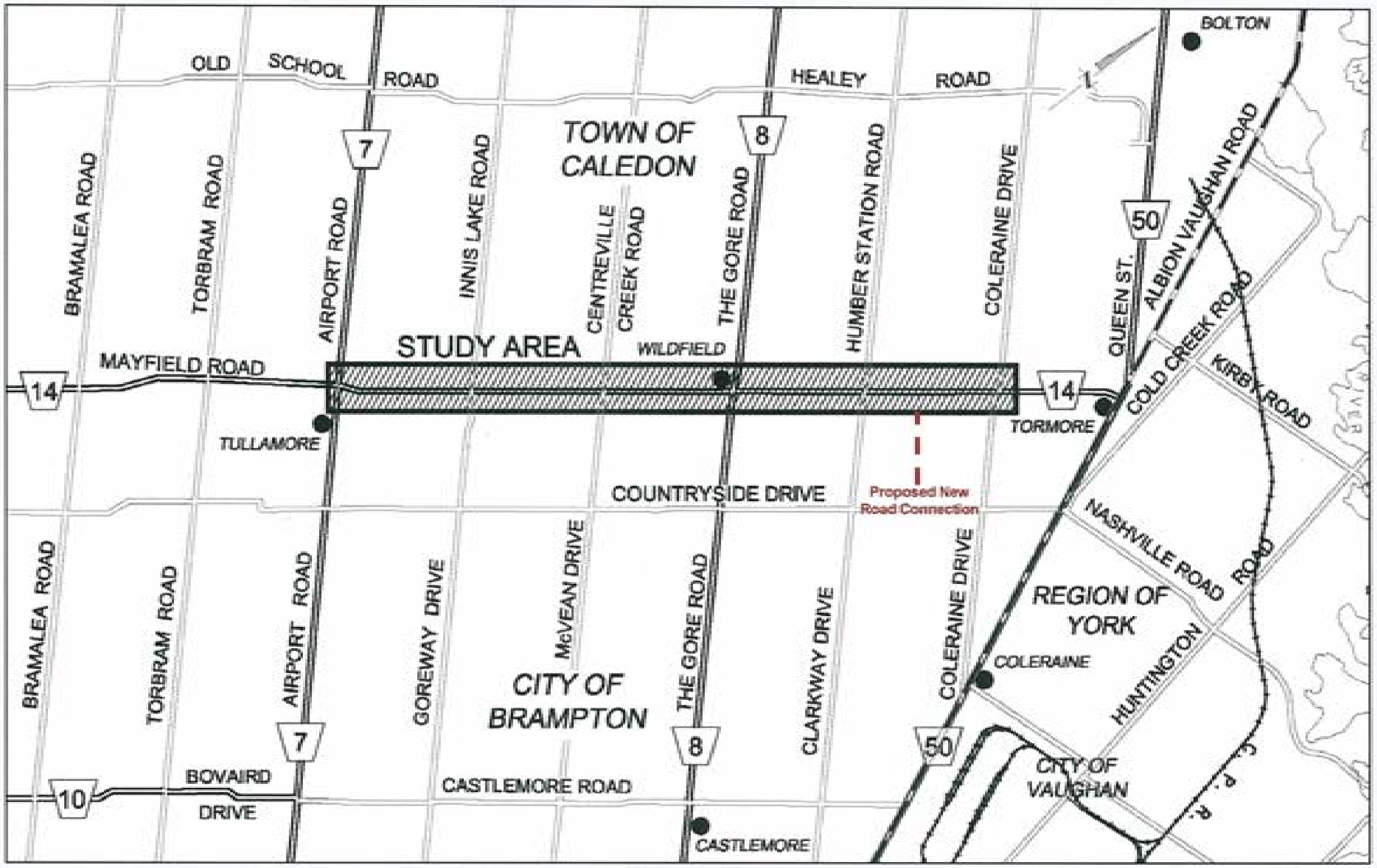
PLEASE PROCEED TO THE REMAINING DISPLAYS AVAILABLE FOR YOUR REVIEW.

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Stantec

PROJECT STUDY AREA



Project 07-4350

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Stantec

PROJECT PLANNING CONTEXT

There are various regulatory planning documents that represent a "governance roadmap" in the decision making process for environmental assessment projects.
Some of these documents include:

- The Region of Peel's Official Plan is a long term plan used to assist the Region in managing growth and development. It designates Mayfield Road as a major roadway with a 50 metre right-of-way width.

Peel Region OFFICIAL PLAN

- The area municipalities Official plans also designate Mayfield Road as having a 50 metre right-of-way width.

Official Plan Review

TOWN OF CALEDON

- The Region of Peel's Long Range Transportation Plan also supports the need for improvements to Mayfield Road.

Long Range Transportation Plan

BACKGROUND INFORMATION

Mayfield Road is one of the major east-west corridors in the Regional Municipality of Peel and extends from the western Peel boundary, at Winston Churchill Boulevard, to the eastern Peel boundary at Regional Road 50 (formerly Highway 50). The total length of this corridor is 24.8 kilometres, within the Peel municipal limits.

In 2001, the Region initiated a series of Class Environmental Assessment Studies to examine improvement needs on Mayfield Road, including:

Completed - Mayfield Road: Hurontario Street to Heart Lake Road: Final ESR Report: November 2002

Completed - Mayfield Road: Heart Lake Road to Airport Road: Final ESR Report: May 2004

Completed - Addendum to Mayfield Road Class EA, from Dixie Road to Airport Road: May 2009

Current - Mayfield Road: Airport Road to Coleraine Drive: Subject of this Public Information Centre

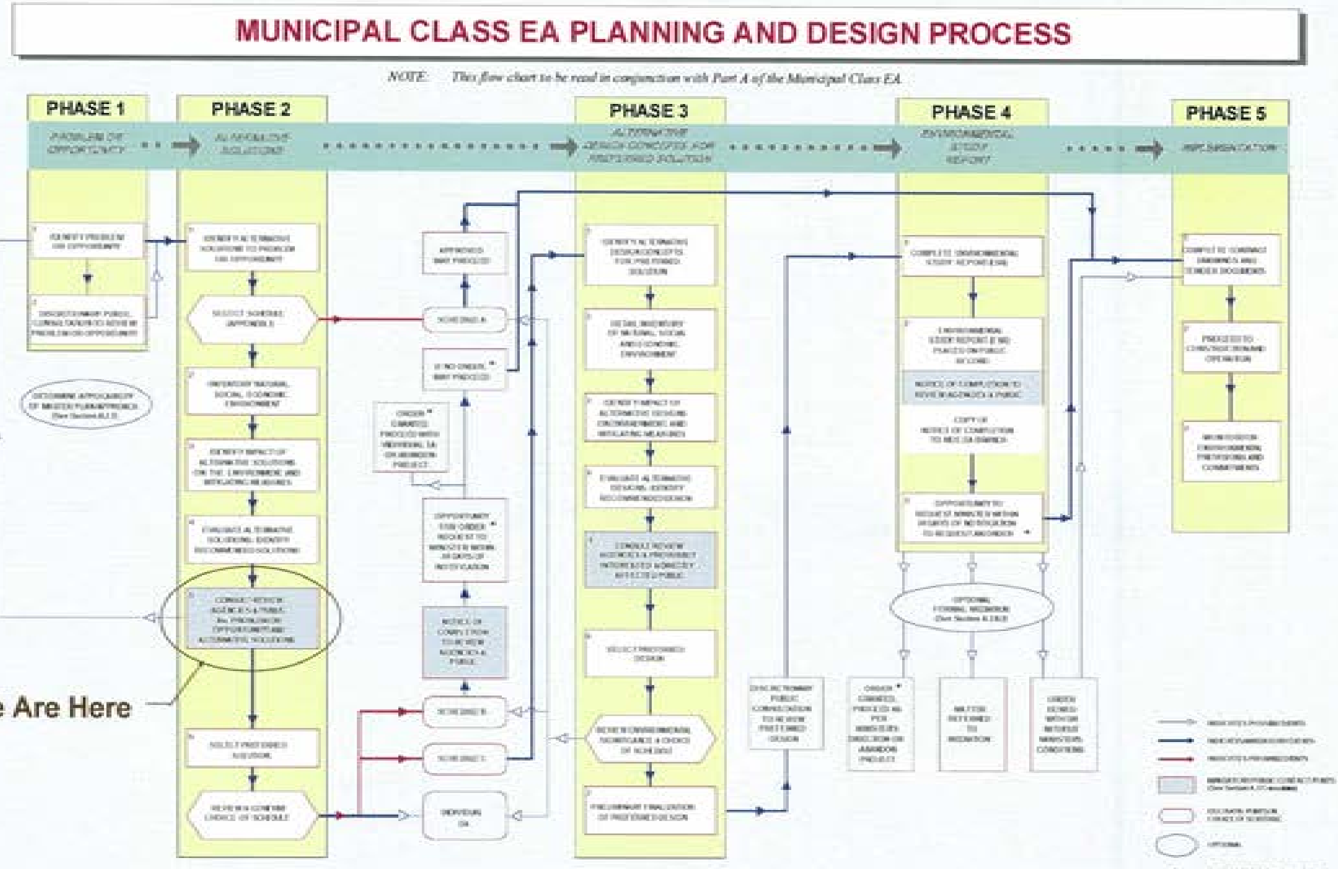
Future - Mayfield Road, Coleraine Drive to Region Road 50

The two completed studies, between Hurontario Street and Airport Road, have recognized changing travel patterns due to new development in Brampton and Caledon, the extension of Highway 410, and overall GTA growth. These changes have put significant pressure on the existing transportation network and in particular the two lane Mayfield Road corridor.

The Region of Peel's Long Range Transportation Plan and various other area municipality studies have identified that capacity improvements are required within the Mayfield Road Corridor.

The objective of this current Class Environmental Assessment study is to examine corridor improvement needs between Airport Road and Coleraine Drive to the year 2031 and to ensure that any recommendations are compatible with previous proposals, considering latest statistical and environmental data.

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

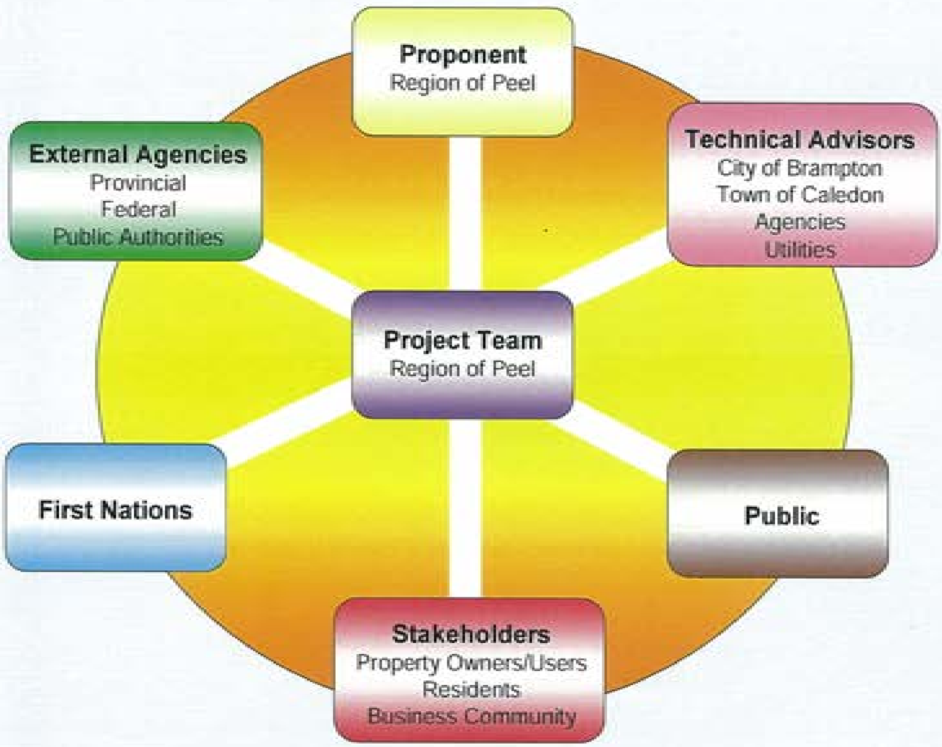


MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Stantec

STUDY ORGANIZATION AND OBJECTIVES



The objectives of this study are:

- To identify and consolidate all relevant natural, social and economic issues and constraints within the greater study area, and address how corridor improvement alternatives may conserve and enhance the current community environment, while recognizing the specific needs of the transportation network.

- To develop alternative improvement *solutions* and *concepts* for the roadway corridor based on acceptable transportation design standards, and to systematically evaluate the alternatives according to established impact criteria and mitigation potential.

- To complete a functional design for the preferred concept that outlines an approach to environmental impact mitigation and enhancement, provides appropriate solutions to traffic growth, presents project costs, and addresses community issues.

- To prepare an Environmental Study Report (ESR).

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Stantec

PROJECT NEED & JUSTIFICATION AND PROBLEM STATEMENT

With any significant Environmental Assessment project, it is incumbent upon the proponent to properly outline the NEED AND JUSTIFICATION for the proposal, which may be summed up in a PROBLEM STATEMENT:

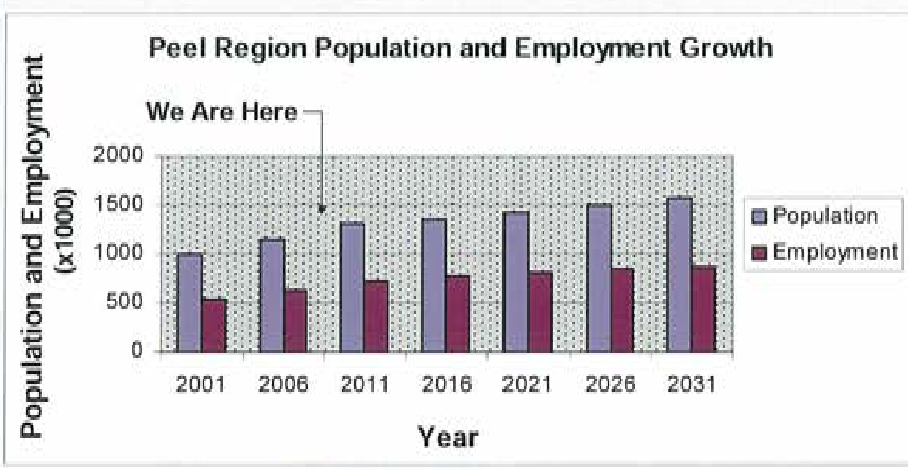
Need and Justification

Population

- It is projected that the population of Peel Region will increase approximately 28% from its current level to approximately 1,571,000 in 2031.
- Brampton and Caledon combined populations are projected to increase approximately 45% to a total of 779,000 in 2031.

Employment

- It is projected that employment in Peel Region will increase approximately 25% from its current level to 869,000 jobs in 2031.
- Brampton and Caledon combined employment will increase approximately 36% from its current level to 347,000 jobs in 2031.



MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Stantec

PROJECT NEED & JUSTIFICATION AND PROBLEM STATEMENT

TRAFFIC ASSESSMENT

General

- A traffic assessment was under taken that accounts for anticipated changes in travel patterns associated with planned, committed, and recently completed infrastructure, such as the extension of Highway 410 and Highway 427. Traffic forecasts were prepared for the years 2012, 2017 and 2032, while intersection operations were assessed for the same horizon years, under various future road network scenarios.
- A "Safety Performance Review" was also completed for Mayfield Road, in conjunction with iTRANS' Traffic Study.

Safety Performance Review

- Mayfield Road intersects with eight (8) north-south roads within the study area , three being signalized intersections as noted in the aerial photo.
- The Posted speed varies between 60 km/hr and 80 km/hr, as illustrated on the accompanying aerial photo.

60 km/hr: 490 metres west of Airport Road to 100 metres east of Goreway/Innis Lake Road

80 km/hr: 100 metres east of Goreway/Innis Lake Road to 315 metres west of The Gore Road

60 km/hr: 315 metres west of The Gore Road to 805 metres east of The Gore Road

80 km/hr: 805 metres east of The Gore Road to east of Coleraine Drive

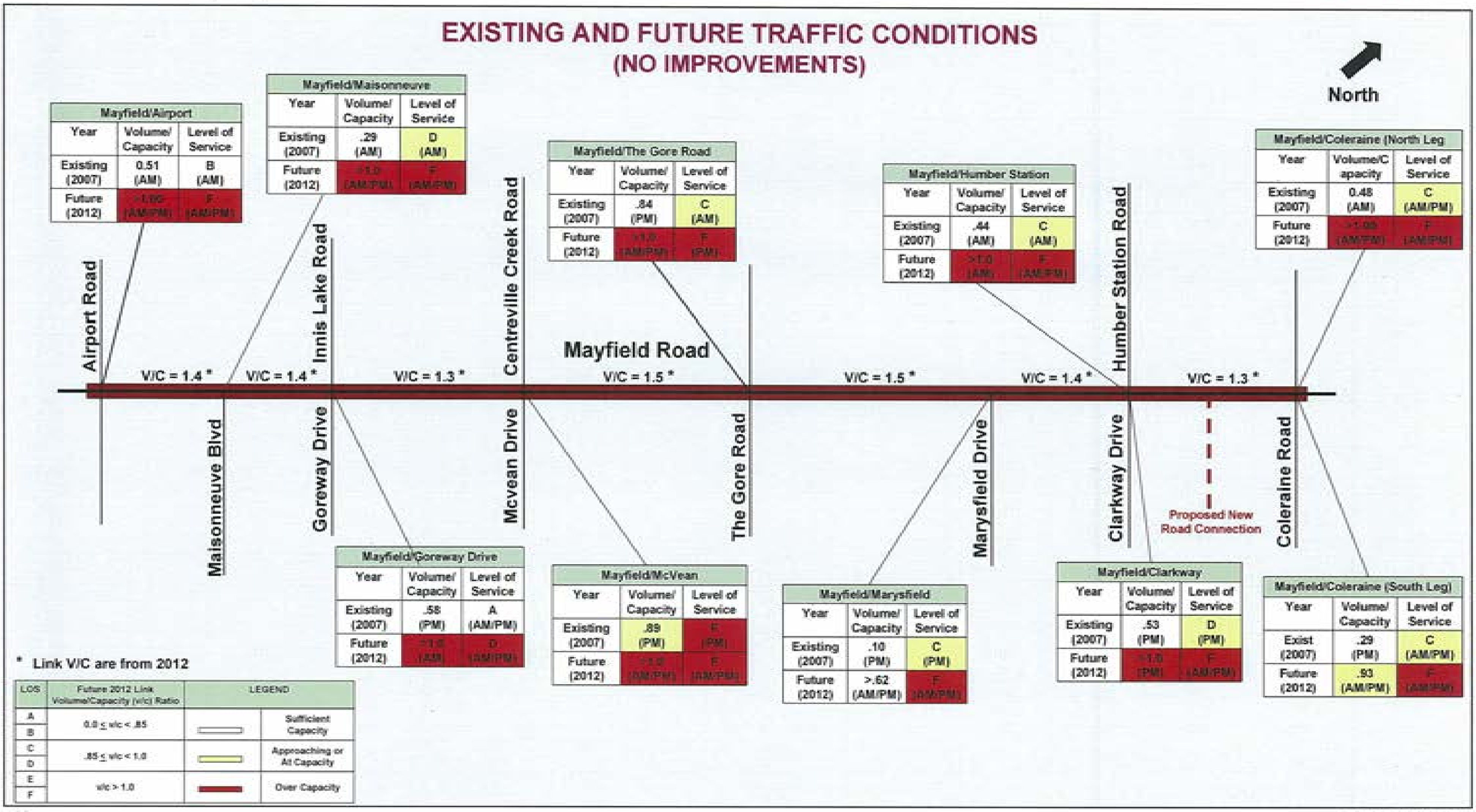
Traffic Assessment Findings

- The traffic study found that by 2012, the existing Mayfield Road will be operating at an unacceptable Level of Service (LOS) as outlined in the following board.
- This assessment was based on projected population and employment figures and took into account existing and planned transportation network improvements, including the widening of Mayfield Road and other roads in the study area, as well as the extensions of Highway 410 and Highway 427.

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Stantec



PROJECT NEED & JUSTIFICATION AND PROBLEM STATEMENT

Problem Statement

Based on the projected population, employment, development forcasts and other planned road improvements, Mayfield Road between Airport Road and Coleraine Drive is expected to operate at an unacceptable Level of Service by the year 2012. Improvements must be made in order for Mayfield Road to operate at an acceptable Level of Service in the future.

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Stantec

OTHER TECHNICAL STUDIES / INVESTIGATIONS

A number of other technical studies and investigations are being undertaken a part of this Class EA Study. The studies include:

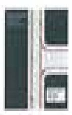
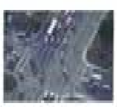

- Cultural and Built Heritage Report
- Stage I Archaeological Report
- Geotechnical (Soils) and Pavement Assessment
- Drainage Assessment
- Stormwater Management Report
- Hydrogeological Study
- Natural Ennvironment Assessment
- Culvert/Structural Report
- Contaminated Soil Screening Study
- Tree and Vegetation Inventory

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Stantec

Screening of Alternative Solutions To Address Problem/Opportunity Statement

Alternative Solutions	Description	Screening Evaluation	Recommendation
Do Nothing	This alternative identifies what would happen if no action is taken to address current deficiencies within the corridor, in both the short and long terms. This assessment provides a baseline to which other project alternatives may be measured.	The traffic study completed as part of this project has found that there will be capacity deficiencies on Mayfield Road by 2012 if the "Do Nothing" alternative is followed.	Do not carry forward
Traffic Operation Improvements 	Opportunities may exist along the Mayfield Road corridor to improve existing traffic signal timings or to add additional signal systems, to optimize the amount of traffic capacity that the existing road can handle and to improve safety at various intersections.	The traffic study completed as part of this project has found that even with traffic signal improvements, there will be Level of Service deficiencies (i.e. delays) on Mayfield Road.	Do not carry forward
Access Management 	Some of the existing traffic and safety operational issues, within the Mayfield Road corridor, may be attributed to vehicles attempting to enter and exit properties. Consideration may be given to consolidating or restricting accesses, raised centre medians, and centre left turn lanes.	Closing, restructuring or combining accesses will not solve the capacity issues on Mayfield Road. However, access management may be considered in conjunction with the final recommended concept to enhance the operations and capacity of Mayfield Road.	Carry forward in conjunction with other recommended alternatives
Intersection Improvements 	The addition of auxiliary lanes to accommodate turning movements at intersections may reduce traffic delay times through the various intersections and improve the flow along Mayfield Road. Consideration will be given to new designated left turn and right turn lanes at existing intersections, both on Mayfield Road and the cross streets.	The addition of turning lanes at intersections will not solve the capacity and operational deficiencies on Mayfield Road. However, these improvements may be considered in conjunction with the final recommended concept to enhance the operations and capacity of Mayfield Road.	Carry forward in conjunction with other recommended alternatives
Roundabouts 	Roundabouts are characterized by their lack of traffic signals and a circulating roadway providing for continual traffic flow through the intersection. Roundabouts generally provide more traffic capacity than standard signalized intersections due to their ability to reduce delays.	This alternative will be analyzed in further detail as the introduction of a series of roundabouts may reduce the extent of widening, address or reduce traffic delays and improve safety at intersections. All existing major intersections on Mayfield Road will be analyzed for the suitability of roundabouts.	Carry forward in conjunction with widening alternative solution
Widening Mayfield Road 	Widening Mayfield Road will improve corridor capacity and address existing and future congestion issues.	The widening of Mayfield Road will be considered in conjunction with other improvements, such as intersection improvements and/or roundabouts.	Carry Forward
Transit Service 	This alternative would improve the level of transit service that may be provided within the corridor, in order to reduce vehicle traffic on Mayfield Road.	The traffic study for this project included all Region and City / Town plans for increased transit service within the area. Transit service will not in itself address the capacity issues on Mayfield Road, but all planned transit service enhancements in the area will continue to be implemented regardless of the alternative chosen for Mayfield Road.	Carry forward in conjunction with other recommended alternatives
Upgrade Other Routes 	By improving other existing road corridors that perform similar functions as Mayfield Road, traffic could potentially be diverted away from Mayfield Road.	The traffic study for this project included all Region / City / Town plans for upgrading other routes in the area. This alternative in itself will not address the capacity issues on Mayfield Road. However, planned upgrades to other roads will have to be undertaken regardless of the alternative chosen for Mayfield Road.	Carry forward in conjunction with other recommended alternatives
Build Other Routes 	Ongoing transportation studies are currently examining this option, including the "GTA West Corridor Environmental Assessment (preliminary stages)" and the "Highway 427 Extension Project".	The traffic study for this project included the provincial plans for building other routes in the area. This alternative in itself will not address the capacity issues on Mayfield Road. However, the construction of other planned roads in the area will have to be undertaken regardless of the alternative chosen for Mayfield Road.	Will be implemented as per existing plans regardless of solution chosen

DESIGN CONCEPT EVALUATION CRITERIA

Preliminary Evaluation Criteria for Mayfield Road Class EA Study	
Study Element	Criteria
1) Traffic Capacity, Operations & Safety	
Exisiting Traffic	How does the alternative serve the current volume of vehicular, pedestrian, transit, and cycling traffic?
Forecasted Traffic/ Transportation Network	Does the alternative accommodate forecasted traffic to/from existing and future planned developments and properties?
	Will the alternative address the transportation network demand needs and be compatible with other transportation plans?
Safety	Does the alternative address identified traffic safety issues along the corridor or at specific locations?
Access Management	What effect will the alternative have on traffic access to properties fronting on Mayfield Road?
Transit Use	How does the alternative serve future transit needs?
Cycling Needs	How does the alternative serve future cycling needs?
Pedestrian Needs	How does the alternative serve future pedestrian traffic needs?
2) Natural Environment	
Aquatic Habitat, Fisheries, and Surface Water	How does the alternative affect the aquatic life and aquatic habitats contained within various watercourses crossing Mayfield Road?
Terrestrial Habitat	How does the alternative affect existing vegetation i.e. trees, and woodlots?
Floodplain	What effect would the alternative have on the flood plains of various watercourses?
Wetlands	What impact does the alternative have on any evaluated wetlands within the project area?
Trees (Landscaping)	Are there any impacts to existing tree plantings and tree canopies within the study limit?
Wildlife	What are the effects of the alternative on "species at risk/endangered" within the project area?
Property Contamination	Are there any known or potentially contaminated sites that require further investigation, and how will they affect any improvements?

DESIGN CONCEPT EVALUATION CRITERIA

Preliminary Evaluation Criteria for Mayfield Road Class EA Study	
Study Element	Criteria
3) Social Environment	
Heritage and Archaeological Impacts	What impact does the alternative have on the following : Built Heritage Resources and Features, Cultural Heritage Landscapes , and Archaeological Impacts?
Cultural & Recreational	Are there any cultural or recreational institutions within the project area that may be affected by the alternative?
Business Impacts	How would the alternative affect existing businesses and how will businesses be affected during construction?
Construction Impacts	Is it constructable? How long will construction take?
Streetscaping	Can the alternative incorporate streetscaping features to maintain and enhance the character of the community?
Private Property Impacts	How does the alternative impact residential and commercial properties along the corridor?
	How much property will be required, if any, for the alternative?
Air Quality & Noise	What effect does the alternative have on air quality and noise levels within the project area?
4) Costs	
Utility Relocation	What would be the extent of impacts on existing utilites that must be relocated and/or protected to construct the alternative?
Initial Capital Cost	What is the initial capital cost of the alternative?
Restoration/Environmental Cost	What are the costs as a result of restoration or compensation as a result of loss of environmental habitat?
Life-Cycle Cost	What is the total life-cycle cost of the alternative including the cost for construction, utility relocations, property acquisitions as well as ongoing operation and maintenance costs?

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Stantec

WHAT ARE THE NEXT STEPS IN THE PROJECT?

The Project Team will collect all comments obtained from the public at this Public Information Centre.

<u>The next steps in the study process will include:</u>

- **Select a preferred alternative solution**
- **Develop alternative design concepts for the preferred alternative solution, including a preliminary recommended design concept**
- **Finalize environmental and technical studies (i.e. archaeological, natural environment, geotechnical, stormwater management, structural, etc.)**
- **Hold the second Public Information Centre to present the preferred alternative solution and preliminary recommended design concept**

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Stantec

HOW WILL I RECEIVE FURTHER NOTIFICATION REGARDING THIS PROJECT ?

Adjacent property owners and members of the public registering at this Public Information Centre will receive any forthcoming additional information and be notified of future meetings. Advertisements will also be placed in local newspapers advising the public of upcoming Public Information Centre and the filing/ availability of the Final Environmental Study Report.

Contact Information

We encourage you to comment on the study and the work that has been completed to date by either writing us, filling out the comment sheets, emailing or calling us.

Ms. Solmaz Zia, P.Eng.
Project Manager, Project Planning & Studies
Transportation Division
Region of Peel
9445 Airport Road
Brampton, ON L6S 4J3
Telephone: 905-791-7800 ext. 7845
Fax: 905-791-1442
Email: solmaz.zia@peelregion.ca

Mr. Dave Hallman, P.Eng.
Project Manager
Stantec Consulting Ltd.
49 Frederick Street
Kitchener, ON N2H 6M7
Telephone: 519-585-7444
Fax: 519-579-4239
Email: dave.hallman@stantec.com

(1)

MAYFIELD ROAD
CLASS ENVIRONMENTAL ASSESSMENT STUDY
AIRPORT ROAD TO COLERAINE DRIVE
REGIONAL MUNICIPALITY OF PEEL

PUBLIC INFORMATION CENTRE #1
Thursday June 25, 2009

QUESTIONNAIRE / COMMENT SHEET

1. Where do you live? ☐ City of Brampton ☐ Town of Caledon

   ☐ Other ______________________

2. My property interest is? (check all applicable)

   ☑ Direct access onto Mayfield Road ☑ Residential property

   ☐ Business/commercial ☐ Industrial

   ☐ Other (specify) ______________________

3. How frequently do you use Mayfield Road between Airport Road and Coleraine Drive?

   ☑ Daily ☐ Weekly

   ☐ Monthly ☐ Rarely

4. Do you have any comments, concerns or suggestions regarding the existing conditions of Mayfield Road?

   My concern is the same as yours Safety First! It is my opinion that if you were not concerned you wouldn't have been studying this section of road from Coleraine to Airport Roads. This section is just like a subdivision and no person in their right mind would build a four lane highway through a subdivision unless 110% safe would be constructed

JUL-24-2009 09:48 PM
P.01

(2)

5. Please provide any additional questions or comments you may have ...

because everytime we are entering our driveway we would be sitting ducks. At the presentation at your meeting I didn't see any proposal the way the road would be constructed in regard to safety

Thank you for participating in this study. For more information please visit our website at http://www.peelregion.ca/pw/roads/environ-assess/index-bram.htm. Please place your completed comment sheet in the Comment Box. You can also send it to Solmaz Zia, Region of Peel, Project Manager (see below for information) by Wednesday, July 15, 2009.

Solmaz Zia, P.Eng.
Project Manager, *Project Planning & Studies*
Environment, Transportation & Planning Services
Region of Peel, Transportation Division
9445 Airport Road, 3rd Floor
Brampton, ON L6S 4J3
Tel: 905-791-7800 x7845 / Fax 905-791-1442
Email: solmaz.zia@peelregion.ca

Name: [redacted]

Address: 6934 Mayfield Rd

Email/Telephone: Caledon On L7C0Z8

[redacted]

Region of Peel
Working for you

TORONTO AND REGION Conservation for The Living City

June 2, 2009 CFN 39924

BY MAIL AND EMAIL (Solmaz.Zia@peelregion.ca)

Ms. Solmaz Zia
Regional Municipality of Peel
11 Indell Lane
Brampton, ON L6T 3Y3

Dear Ms. Zia:

Re: **Response to Public Information Centre (PIC) #1 Boards**
Mayfield Road Improvements (Airport Road to Coleraine Drive)
Municipal Class Environmental Assessment (EA) - Schedule C
Humber River Watershed; City of Brampton; Regional Municipality of Peel

Toronto and Region Conservation Authority (TRCA) staff received the PIC boards for the above-noted file on May 26, 2009. Further to TRCA correspondence dated October 29, 2007 and November 28, 2007, staff has expressed interest in this project. While staff is unable to attend the meeting, comments on the PIC boards are provided below for consideration.

1. The traffic assessment should also consider other projects within the study area that may alleviate the need to widen Mayfield Road. It is mentioned in the alternative solutions section that other studies are currently underway including the GTA West Corridor Environmental Assessment and the Peel-Highway 427 Extension Area Transportation Master Plan. In addition, the boards discuss that the option of building other routes will not address capacity issues on Mayfield Road and that all planned building of other roads will still be undertaken, regardless of the alternative chosen for Mayfield Road. It is important that a comprehensive review of this study area be undertaken rather than approaching each project as a separate entity. The need for the Mayfield Road widening should be examined in conjunction with other studies, potential road widenings and extensions as development of other roads in the area may serve to relieve pressures on Mayfield Road.

2. It should also be noted that a separate EA is currently underway for Highway 50 and the section of Mayfield Road to Coleraine Drive. Impacts as a result of the Highway 50 EA should also be considered when determining the need to widen Mayfield Road.

3. The Preliminary Evaluation Criteria examines costs due to utility relocation, initial capital cost and life-cycle cost. It should also be noted that costs as a result of restoration or compensation as a result of the loss of restorable habitat should also be factored into the evaluation.

Please ensure TRCA staff is kept involved throughout this EA process as there are 14 regulated areas within the study limits which will require further TRCA input. Should you have any questions please contact me at extension 5717 or by email at slingertat@trca.on.ca.

Yours truly,

Sharon Lingertat
Planner II, Environmental Assessment Planning
Planning and Development

SL/

BY EMAIL

cc: Stantec:		Dave Hallman (dave.hallman@stantec.com)
	TRCA:	Carolyn Woodland, Director, Planning and Development
		Beth Williston, Manager, Environmental Assessments
		Gary Wilkins, Humber River Watershed Specialist

F:\EA\Letters for Mailing\39924 - PIC

TORONTO AND REGION
Conservation
for The Living City

June 29, 2009 CFN 39924

BY MAIL AND EMAIL (Solmaz.Zia@peelregion.ca)

Ms. Solmaz Zia
Project Manager
Regional Municipality of Peel
9445 Airport Road, 3rd Floor
Brampton, ON L6S 4J3

Dear Ms. Zia:

Re: Response to Notice of Public Information Centre #1
Mayfield Road Improvements (Airport Road to Colcraine Drive)
Municipal Class Environmental Assessment (EA) - Schedule C
Humber River Watershed; City of Brampton; Regional Municipality of Peel

Toronto and Region Conservation Authority (TRCA) staff received notice of the Public Information Centre (PIC) which was scheduled for June 25, 2009. While staff was unable to attend the meeting, comments on the PIC #1 boards were provided in a letter dated June 2, 2009. Please ensure staff is kept involved as the EA progresses.

Yours truly,

Sharon Lingertat
Planner II, Environmental Assessments
Planning and Development

SL/ks

BY EMAIL

cc: Stantec:	Dave Hallman (dave.hallman@stantec.com)
TRCA:	Carolyn Woodland, Director, Planning and Development
	Beth Williston, Manager, Environmental Assessments
	Quentin Hanchard, Development, Planning and Regulation
	Gary Wilkins, Humber River Watershed Specialist

F:\Home\Public\Development Services\EA\Letters for Mailing\39924 - PIC 1.doc

'04901 39

MAYFIELD ROAD
CLASS ENVIRONMENTAL ASSESSMENT STUDY
AIRPORT ROAD TO COLERAINE DRIVE
REGIONAL MUNICIPALITY OF PEEL

PUBLIC INFORMATION CENTRE #1
Thursday June 25, 2009

QUESTIONNAIRE / COMMENT SHEET

1. Where do you live? ☐ City of Brampton ☐ Town of Caledon

   ☐ Other ______________________

2. My property interest is? (check all applicable)

   ☐ Direct access onto Mayfield Road ☐ Residential property

   ☐ Business/commercial ☐ Industrial

   ☐ Other (specify) ______________________

3. How frequently do you use Mayfield Road between Airport Road and Coleraine Drive?

   ☐ Daily ☐ Weekly

   ☐ Monthly ☐ Rarely

4. Do you have any comments, concerns or suggestions regarding the existing conditions of Mayfield Road?

Region of Peel
Working for you

5. Please provide any additional questions or comments you may have ...

Thank you for participating in this study. For more information please visit our website at http://www.peelregion.ca/pw/roads/environ-assess/index-bram.htm. Please place your completed comment sheet in the Comment Box. You can also send it to Solmaz Zia, Region of Peel, Project Manager (see below for information) by Wednesday, July 15, 2009.

Solmaz Zia, P.Eng.
Project Manager, Project Planning & Studies
Environment, Transportation & Planning Services
Region of Peel, Transportation Division
9445 Airport Road, 3rd Floor
Brampton, ON L6S 4J3
Tel: 905-791-7800 x7845 / Fax 905-791-1442
Email: solmaz.zia@peelregion.ca

Name: ______________________________

Address: ______________________________

Email/Telephone: ______________________________

Note: Comments and information regarding this project are being collected in accordance with the Municipal Freedom of Information & Protection of Privacy Act for the purpose of meeting environmental assessment requirements. With the exception of personal information, all comments will become a part of the public record.

MAYFIELD ROAD
CLASS ENVIRONMENTAL ASSESSMENT STUDY
AIRPORT ROAD TO COLERAINE DRIVE
REGIONAL MUNICIPALITY OF PEEL

PUBLIC INFORMATION CENTRE #1
Thursday June 25, 2009

QUESTIONNAIRE / COMMENT SHEET

1. Where do you live? ☐ City of Brampton ☑ Town of Caledon

   ☐ Other ____________________

2. My property interest is? (check all applicable)

   ☐ Direct access onto Mayfield Road ☑ Residential property

   ☐ Business/commercial ☐ Industrial

   ☐ Other (specify) ____________________

3. How frequently do you use Mayfield Road between Airport Road and Coleraine Drive?

   ☑ Daily ☐ Weekly

   ☐ Monthly ☐ Rarely

4. Do you have any comments, concerns or suggestions regarding the existing conditions of Mayfield Road?

   I live at 7660 Mayfield Rd. A large culvert serving both my [illegible] and an adjacent property, presumably to be dealt [illegible] during the road expansion. I would like to see separate culvert for my land and that of my neighbour.

[redacted]

5. Please provide any additional questions or comments you may have ...

Thank you for participating in this study. For more information please visit our website at http://www.peelregion.ca/pw/roads/environ-assess/index-bram.htm. Please place your completed comment sheet in the Comment Box. You can also send it to Solmaz Zia, Region of Peel, Project Manager (see below for information) by Wednesday, July 15, 2009.

Solmaz Zia, P.Eng.
Project Manager, Project Planning & Studies
Environment, Transportation & Planning Services
Region of Peel, Transportation Division
9445 Airport Road, 3rd Floor
Brampton, ON L6S 4J3
Tel: 905-791-7800 x7845 / Fax 905-791-1442
Email: solmaz.zia@peelregion.ca

Name: [redacted]

Address: 7660 Mayfield Rd Caledon On

Email/Telephone: [illegible]@sympatico.ca

Note: Comments and information regarding this project are being collected in accordance with the Municipal Freedom of Information & Protection of Privacy Act for the purpose of meeting environmental assessment requirements. With the exception of personal information, all comments will become a part of the public record.

Region of Peel
Working for you

Name	Title	Add 1
Ms. Sharon Lingertat	Acting Planner II	Toronto and Region Conservation Authority. Development Services Section 5 Shoreham Drive Downsview ON M3N 1S4
Mr. Thane Munn	Manager, Planning Projects	Dufferin-Peel Roman Catholic Separate School Board 40 Matheson Boulevard West Mississauga ON L5R 1C5
[redacted]	Superintendent of Business Affairs	Dufferin-Peel Roman Catholic Separate School Board 40 Matheson Boulevard West Mississauga ON L5R 1C5
Ms. Cindy Lalendresse	Fisheries, Oceans Canada	Fisheries and Oceans Canada District Office, 3027 Harvester Road, Unit 304 Burlington ON L7R 4K3
Mr. Jeremy Craigs	Environmental Officer	Transport Canada - Ontario Region 4900 Yonge Street North York ON M2N 6A5
Mr. Michael S. Wolczyk	Manager Marketing and Planning	GO Transit 20 Bay Street, Suite 600 Toronto ON M5J 2W3
Mr. Gary McNeil	General Manager	GO Transit 20 Bay Street, Suite 600 Toronto ON M5J 2W3
Ms. Naomi Irizawa	General Manager, Planning Services	Ontario Realty Corporation 11th Floor, Ferguson Block 77 Wellesley Street West Toronto ON M7A 2G3
Mr. Michael Johnson	Manager Culture, Sport Recreation	Ministry of Culture 400 University Avenue, 4th Floor Toronto ON M7A 2R9
Mr. Bob Farrow	Manager	Ministry of Tourism and Recreation 123 Edward Street Toronto ON M5G 1E2
Ms. Sheryl Bennett	Senior Officer	Accomodation Services Section Ontario Provincial Police 777 Memorial Avenue, 1st Floor Orillia ON L3V 7V3
Mr. Usman Ahmed	Senior Planner	Provincial Planning and Environmental Services Branch Ministry of Municipal Affairs and Housing 777 Bay Street, 14 Floor Toronto ON M5G 2E5
[redacted]	Manager, Planning Projects	Ministry of Municipal Affairs and Housing 777 Bay Street, 2nd Floor Toronto ON M5G 2E5

Name	Title	Add 1
Mr. Lou Politano	Manager	Ministry of Transportation, Engineering Office 1201 Wilson Avenue, 4th Floor, Atrium Tower Downsview ON M3M 1J8
Mr. Barry Putt	A/NWP Inspections Officer	Fisheries and Oceans Canada Canadian Coast Guard, Central and Arctic Region Suite 703 - 201 North Front Street Sarnia ON N7T 8R1
Ms. Susan Motkaluk	Manager	Ministry of Agriculture, Food & Rural Affairs 175 Sandalwood Parkway West Brampton ON L7S 1E8
Mr. Michael Warrian	Executive Director	Trout Unlimited 20 Rhine Court Brampton ON L6Z 1N9
Ms. Lois Griffin	Chair of The Humber Watershed Aliance	The Humber Watershed Alliance 95 Mercury Road Toronto ON M9W 3H4
Mr. John Sprovieri	Regional Councillor	City of Brampton 2 Wellington Street West Brampton ON L6Y 4R2
Councillor Vicky Dhillon	City Councillor Ward 10	City of Brampton 2 Wellington Street West Brampton ON L6Y 4R2
Mr. Allan A. Parsons	Development Planner	City of Brampton Planning and Building Department 2 Wellington Street West Brampton ON L6Y 4R2
Marolyn Morrison	Mayor	Town of Caledon, Box 1000 6311 Old Church Road Caledon, ON L7C 1J6
Mr. Allan Thompson	Regional Councillor Ward 2	Town of Caledon 6311 Old Church Road Caledon East ON L7C 1J6
Mr. Richard Whitehead	Councillor Wards 3 & 4	Town of Caledon 6311 Old Church Road Caledon East ON L7C 1J6
Mr. Gord McClure	Town Councillor Ward 2	Town of Caledon 6311 Old Church Road Caledon East ON L7C 1J6
Mr. Nick deBoer	Town Councillor Ward 3 & 4	Town of Caledon 6311 Old Church Road Caledon East ON L7C 1J6

Name	Title	Add 1
Doug Beffort	Town Councillor Ward 1	Town of Caledon 6311 Old Church Road Caledon East ON L7C 1J6
Jason Payne	Town Councillor Ward 5	Town of Caledon 6311 Old Church Road Caledon East ON L7C 1J6
Mr. Craig Campbell	Director, Public Works & Engineering	Town of Caledon 6311 Old Church Road Caledon East ON L7C 1J6
Ms. P. Foley	Regional Councillor Ward 5	Town of Caledon 6311 Old Church Road Caledon East ON L7C 1J6
Richard Paterak	Regional Councillor Ward 1	Town of Caledon 6311 Old Church Road Caledon East ON L7C 1J6
Mr. Khurram Tunio	Senior Project Manager	City of Brampton Engineering & Construction Division Works and Transportation Department 8850 McLaughlin Road Brampton ON L6Y 5T1
Mara Samardzic		Delta Urban 7501 Keele Street, Ste. 505 Vaughan ON L4K 1Y2
[redacted]	Manager of Engineering & Construction	Town of Caledon 6311 Old Church Road Caledon East ON L0N 1E2
Mr. Glenn Middlebrook	Chief Building Official/Director	Town of Caledon 6311 Old Church Road Caledon East ON L0N 1E3
Mr. Bruce Hay	Superintendent of Parks	City of Brampton 115 Orenda Road Brampton ON L6W 1V7
Mr. Bill Winterhalt	Director, Planning Policy and Research	City of Brampton 2 Wellington Street West Brampton ON L6Y 4R2
Mr. Peter J. Anderson	Manager-Engineering Services	City of Brampton 2 Wellington Street West Brampton ON L6Y 4R2
Mr. Bryan Smith	Supervisor of Open Space Planning	City of Brampton 2 Wellington Street West Brampton ON L6Y 4R2

Name	Title	Add 1
[redacted]	Director of Engineering and Development Services	City of Brampton 2 Wellington Street West Brampton ON L6Y 4R2
[redacted]	O.A.L.A, Landscape Architect	City of Brampton 2 Wellington Street West Brampton ON L6Y 4R2
[redacted]	Heritage Coordinator	City of Brampton 2 Wellington Street West Brampton ON L6Y 4R2
[redacted]	Heritage Coordinator	City of Brampton 2 Wellington Street West Brampton ON L6Y 4R2
Ms. Teri Brenton	Clerk, City of Brampton Heritage Board	City of Brampton 2 Wellington Street West Brampton ON L6Y 4R2
Mr. Tom Mulligan	Commissioner of Works and Transportation	City of Brampton 2 Wellington Street West Brampton ON L6Y 4R2
Mr. Christopher Heike	Open Space Panner Parks & Facility Planning Community Design, Parks Planning & Development	City of Brampton 2 Wellington Street West Brampton ON L5Y 4R2
Mr. Peter Fay	City Clerk	City of Brampton 2 Wellington Street West Brampton ON L6Y 4R2
Mr. John Marshall	Commissioner of Community Services	City of Brampton 2 Wellington Street West Brampton ON L6Y 4R2
Mr. David Kenth	Development Engineer - Approvals	City of Brampton Planning, Design & Development Department 2 Wellington Street West Brampton ON L6Y 4R2
Ms. Tara Buonpensiero	Policy Planner	City of Brampton 2 Wellington Street West Brampton ON L6Y 4R2
Chief V. Clark		City of Brampton, Fire Department 8 Rutherford Road South Brampton ON L6W 3J1
Chief Terry Irwin	Fire Chief	Brampton Fire and Emergency Services 8 Rutherford Road South Brampton ON L6W 3J1

Name	Title	Add 1
Ms. Miranda Lesperance	Jr. Environmental Officer	Indian and Northern Affairs – Ontario 25 St. Clair Avenue East 8th Floor Toronto ON M4T 1M2
Mr. Alan Kary, Duputy Director		Ministry of Aboriginal Affairs, Policy and Relationships Branch 720 Bay Street, 4th Floor Toronto ON M5G 2K1
Sir/Madam		Chiefs of Ontario Office 188 Mohawk Street Brantford ON N3S 2X2
Mr. Allan Dokis	Intergovernmental Affairs Director	Union of Ontario Indians, Nipissing First Nation P.O. Box 711 North Bay ON P1B 8J8
Ms. Adriana Poulette, B.A., M.A.	Senior Policy Analyst & Government Relationship Advisor	The Association of Iroquois and Allied Indians 387 Princess Avenue London ON N6B 2A7
Chief Brian Laforme	Chief	Mississaugas of the New Credit First Nation 2789 Mississauga Road, R.R. 6 Hagersville ON N0A 1M0
Councillor George Montour	Chair	Six Nations Lands and Resources Committee SIX NATIONS OF GRAND RIVER 2498 Chiefswood Road, P.O. Box 5000
Chief Tracy Gauthier		Mississaugas of the Scugog Island 22521 Island Road Port Perry ON L9L 1B6
Mr. Alex Phillips	Environmental Resource Planner & EA Coordinator	Ministry of the Environment 5775 Yonge Street, 8th Floor North York ON M2M 4J1
Mr. John Budz	District Manager	Ministry of the Environment Halton-Peel District Office 4145 North Service Road, Suite 300 Burlington ON L7L 6A3
Mr. Tracy Smith	District Manager	Ministry of Natural Resources Aurora District 50 Bloomington Road West Aurora ON L4G 3G8
Ms. Terry Fancy	District Planner	Ministry of Natural Resources Aurora District 50 Bloomington Road West Aurora ON L4G 3G8
Ms. Shari Prowse	Heritage Planner/Archaeologist	Ministry of Culture Heritage Policy and Program Development Unit 400 University Avenue, 4th Floor Toronto ON M7A 2R9

Name	Title	Add 1
Ms. Tamara Anson-Cartwright	Heritage Conservation Advisor	Ministry of Culture Heritage Policy and Program Development Unit 400 University Avenue, 4th Floor Toronto ON M7A 2R9
Ms. Donna Mundie	Land Use Policy Specialist	Ministry of Argicultural, Food and Rural Affairs Agricultural Land Use 1 Stone Road West Guelph ON N1G 4Y2
Mr. Rob Dobos	Head EA Section, Ontario Region	Environment Canada 867 Lakeshore Road P.O. Box 5050 Burlington ON L7R 4A6
Mr. Tom Brankovic	District Engineer	Environment Canada Halton-Peel District Office 4905 Dufferin Street Downsview ON M3H 5T4
Mr. Steve Hounsell	Senior Advisor, Sustainable Development	Ontario Power Generation 700 University Avenue H19 F02 Toronto ON M5G 1X6
Ms. Lynn Chaput		Bell Canada Municipal Operations Centre 100 Borough Drive, Floor 5 Blue Scarborough ON M1P 4W2
Ms. Janice Young	Manager - Right of Way	Bell Canada F3 Section Green 100 Borough Drive Scarborough ON M1P 4W2
[redacted]		AT & T Canada 50 Worcester Road Etobicoke ON M9W 5X2
Mr. Anthony Segrelo		Telus Communcations 11 King Street West, 11th Floor Toronto ON M5H 4C7
Mr. Bob Quick	Network Planning Manager	Telus 82 Locust Street Kitchener ON N2H 1W9
Mr. Camelo Tancioco	Manager of Special Projects	Enbridge Gas Distribution Inc P.O. Box 650, STN A Scarborough ON M1K 5E3
Mr Tony Ciccone	Manager, Network Analysis	Enbridge Gas Distribution Inc. P.O. Box 650 Scarborough ON M1K 5E3

Name	Title	Add 1
Mr. Russ McLean	Manager of Distribution Planning	Enbridge Gas Distribution Inc 500 Consumers Road North York ON M2J 1P8
Ms. Diane Beaulne		Enbridge Gas Distribution Inc. 500 Consumers Road North York ON M2J 1P8
Ms Ruth Grecy	Manager	Hydro One Inc. 483 Bay Street, North Tower, 14th Floor Toronto ON M5G 2P5
Mr Robert Evangelista, C.E.T.	Engineering Supervisor - Development	Hydro One Brampton Engineering Department 175 Sandalwood Parkway West Brampton ON L7A 1E8
Mr. Wolf Schaefer	Engineering Supervisor Brampton	Hydro One Brampton 175 Sandalwood Parkway West Brampton ON L7A 1E8
Mr Brian McCormick	Manager, Environmental Services and Approvals	Hydro One Inc. 483 Bay Street, North Tower Toronto ON M5G 2P5
Ms Marilou Baluyut		Enersource Hydro Mississauga 3240 Mavis Road Mississauga ON L5C 3K1
Mr. Peter F. Dundas	Director, Ambulance and Emergency Programs	Peel Regional Paramedic Services (EMS) 5299 Maingate Drive Mississauga ON L4W 1G8
Mr. Mike Grodzinski	Operation Planning and Resources	Peel Region Police Department 7750 Hurontario Street Brampton ON L6V 3W6
Ms. Suzanne Bass	Director of Brampton Transit	Brampton Transit 185 Clark Boulevard Brampton ON L6T 3J1
[redacted]	Project Leader - AcceleRide	Brampton Transit 185 Clark Boulevard Brampton ON L6T 3J1
Mr Doug Rieger	Senior Supervisor, Service Development	Brampton Transit 185 Clark Boulevard Brampton ON L6T 3J1
Mr. Bill Roberts	Administrator	Ontario One Call 335 Laird Road, Unit 6 Guelph ON N1G 4P7

Name	Title	Add 1
Ms. Agatha Le Donne	Planning Co-ordinator	Rogers Cable TV Limited 3573 Wolfedale Road Mississauga ON L5C 3T6
Mr. Vito Cassano	System Planner	Rogers Cable TV Limited 3573 Wolfedale Road Mississauga ON L5C 3T6
Ms. Marion Wright	OPE Coordinator - GTA West	Rogers Cable TV Limited 3573 Wolfedale Road Mississauga ON L5C 3T6
Mr. Stephen Hare	Senior Planner	Peel District School Board H.J.A. Brown Education Centre 5650 Hurontario Street Mississauga ON L5R 1C6
Mr. Paul Mountford	Intermediate Planning Officer, Planning & Accommondation Department	Peel District School Board H.J.A. Brown Education Centre 5650 Hurontario Street Mississauga ON L5R 1C6
[redacted]		Peal Region Police **Attention: Sergeant Dale Walter** 7750 Hurontario Street Brampton ON L6V 3W6
Sir/Madam	Manager, Environmental Health	Region of Peel 150 Central Park Drive Brampton ON L6Y 4R2
Mr George Garland	Manager	Ministry of Agriculture, Food 1 Stone Road W. 2nd Floor SW Guelph ON N1G 4Y2
John Byrne, President		St. Patrick's Cemetery Committee 59 Shady Glen Cres. Bolton ON L7E 2K5
Kathryn Stokes		St. Patrick's Cemetery Committee 7740 Mayfield Road Caledon ON L7E 5J1
James Doyle		St. Patrick's Cemetery Committee 11621 The Gore Road Brampton ON L6T 3Z8
John Fitzpatrick		St. Patrick's Cemetery Committee 10496 The Gore Road Brampton ON L6T 3Z8
Tom Pickett		St. Patrick's Cemetery Committee 111 Meadowvale Crt Bolton ON L7E 3G9

Name	Title	Add 1
Nick Timoshenko		St. Patrick's Cemetery Committee 82 DeRose Avenue Bolton ON L7E 1A8
Additional Persons Added to Mailing List After First Mailout		
Richard Pernicky, CET, MITE	Project Manager - Transportation	Cole Engineering Group Ltd. 100 Renfrew Dr., Suite 100 Markham ON L3R 9R6
J.P.Melito	Superintendent of Planning and Operations	Dufferin-Peel Catholic District School Board 40 Matheson Boulevard West Mississauga, ON N5R 1C5
Daniella Groszenor	Growth Management Policy Planer	City of Brampton 2 Wellington Street West Brampton ON L6Y 4R2
Anil Wjessoorya	Gneral Manager, Planning Services	Ontario Realty Corporation 11th Floor, Ferguson Block 77 Wellesley Street West Toronto, ON M7A 2G3
Mr. Malcolm Horne	Planner/Archaeologist	Ministry of Culture 400 University Avenue, 4th Floor Toronto, ON M7A 2R9
Mr. Ted Lagakos	Corridor Management Technician	Ministry of Transportation 1201 Wilson Avenue, 7th Floor Toronto, ON M5G 2E5
Ms. Rina Kulathinal	Peel Halton Section	Ministry of Transportation 1201 Wilson Avenue, 7th Floor Toronto, ON M5G 2E5
Ms. Janette Leask	Policy Advisor	Ministry of Agriculture, Food and Rural Affairs 1 Stone Road West, 2nd Floor SW Guelph, ON N1G 4Y2
Ms. Dorothy Mosynski	EA Coordinator	Ministry of the Environment 5775 Yonge Street, 8th Floor North York ON M2M 4J1
Ms. Gemma Connoly	Special Project Officer	Ministry of the Environment Environmental Assessment and Approvals Branch 2 St. Clair Avenue West, 14th Floor Toronto, ON M4V 1L5
Ms. Gael Miles	Regional Councillor	City of Brampton 2 Wellington Street West Brampton ON L6Y 4R2

Name	Title	Add 1
Ms. Sandra Hames	City Councillor Wards 7 & 8	City of Brampton 2 Wellington Street West Brampton ON L6Y 4R2
Mr. Chris Duyvestyn	Manager, Infrastructure Planning	City of Brampton Engineering & Construction Division Works and Transportation Department 8850 McLaughlin Road Brampton ON L6Y 5T1
Mr. Compton Bobb	Project Engineer	City of Brampton 8850 Mclaughlin Road Brampton, ON L6Y 5T1
Mr. Brian Maltby	Division Chief - Fire Prevention	City of Brampton Fire and Emergency Services 225 Central Park Drive Brampton, ON L6S 6H1
Mr. Steve Wollaston	Superintendent - 21 Division	Peel Regional Police 10 Peel Centre Drive, Suite C Brampton, ON L6T 4B9
Mr. Kant Chawla	Senior Transportation Planner	Town of Caledon 6311 Old Church Road Caledon, ON L7C 1J6
Mr Kerry Dick		Enbridge Gas Distribution Inc. Construction and Maintenance 6 Colony Court Brampton, ON L6T 4E4
Mr. Satish Kumar	Coordinator - Crossings and Facilities	Trans-Northern Pipelines 45 Vogell Road, Suite 301 Richmond Hill, ON I4B 3P6
Mr. Peter Rutkowski		Allstream Canada PUCC Brampton/Caledon 50 Worcester Road Etobicoke. ON M9W 5X2
Mr. Phillip Bauslaugh		Bell Canada 5115 Creek Bank Road. Floor 3 West Mississauga, ON L4W 5R1
Mr. Scott Arbuckle	Principal - Planning	IBI Group 30 Eglinton Avenue West, Suite 308 Mississauga, ON L5R 3E7
Mr. Don Darroch	President	Canadian Commerical Capital 20 Bay Street, Suite 1205 Toronto, ON M5J 2N8
Ms. Monique Mousseau	Regional Manager Environmental Affairs, Programs Branch	Transport Canada - Ontario Region 4900 Yonge Street North York ON M2N 6A5
Ms. Shannon Doyle	Acting Director of Lands and Trust Services, Ontario Region	Indian and Northern Affairs – Ontario 25 St. Clair Avenue East, 8th Floor Toronto ON M4T 1M2

Name	Title	Add 1
Mr. Surinder Gill	Policy Advisor	Ontario Secretary of Aboriginal Affairs 720 Bay Street, 4th Floor Toronto, ON M5G 2K1
Ms. Rolanda Elijah	Director of Intergovernmental Affairs	Association of Iroquois and Allied Indians 387 Princess Avenue London, ON N6B 2A7
Ms. Kate Cave		Six Nations Lands and Resources Committee SIX NATIONS OF GRAND RIVER 2498 Chiefswood Road, P.O. Box 5000 Ohsweken ON N0A 1M0
Ms Angre Johnson		Mississaugas of the Scugog Island 22521 Island Road Port Perry ON L9L 1B6
Mr. Gary Lipinski	President	Metis Nation of Canada #3-500 Old St Patrick Street Ottawa, ON K1N 9G4
Mr. David Connoly		Founding First Nation Circle Gilbert's LLP Lawyers 49 Wellington Street East Toronto, ON M5E 1C9
Ms. Margaret Sault	Director	Mississaugas of the New Credit First Nation 2789 Mississauga Road, R.R 6 Hagersville ON N0A 1M0
Mr Mark Heaton	Fish and Wildlife Biologist	Ministry of Natural Resources Halton/Peel Toronto Area Aurora District 50 Bloomington Road West Aurora, ON L4G 3G8

Aurora, ON L4G 3G8

APPENDIX C

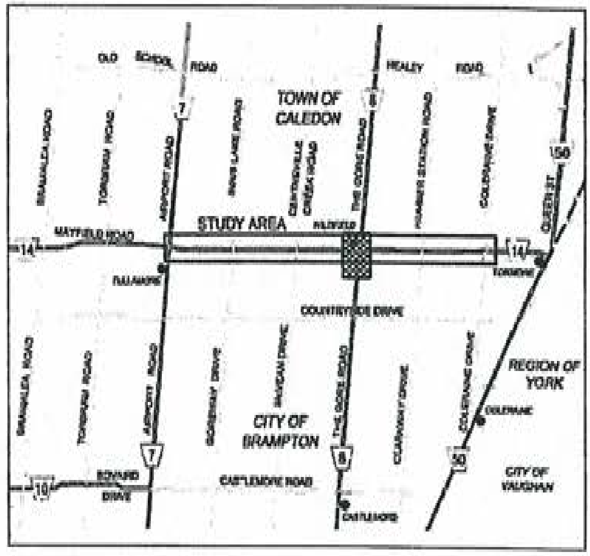
PUBLIC INFORMATION CENTRE #2

NOTICE OF PUBLIC INFORMATION CENTRE NO.2

MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT
MAYFIELD ROAD (R.R.#14) IMPROVEMENTS FROM AIRPORT ROAD TO COLERAINE DRIVE

The Study

In June 2007, the Regional Municipality of Peel initiated a Municipal Class Environmental Assessment (EA) Study for improvements to Mayfield Road from Airport Road to Coleraine Drive. The proposed improvements are necessary to support planned growth in the area and provide for additional east-west road capacity in accordance with the Region's Long Range Transportation Plan.



The Process

This study is being undertaken in accordance with the requirements for a Schedule "C" project as described in the Municipal Engineers Association "Municipal Class Environmental Assessment" document, October 2000, as amended in 2007.

Public Information Centre No.1

The first Public Information Centre (PIC) was held in June 2009, and presented the problem statement, background information, evaluation of planning alternatives and the preliminary recommended planning alternative. The recommended planning alternative is to widen Mayfield from 2 to 4 lanes initially and to 6 lanes by 2031, in conjunction with access management, intersection improvements and transportation demand management.

Public Information Centre No. 2:

DATE:	**Wednesday, November 16, 2011**
TIME:	**6:30 p.m. to 8:30 p.m.**
LOCATION:	**St. Patrick Separate School 11948 The Gore Road, Brampton**

The second PIC format will be an informal drop-in centre. The finalized recommended planning alternative, technical studies, evaluation of alternative design concepts and the recommended preliminary design for the study area will be presented at the PIC.

The project team will review and consider the feedback received at PIC No. 2 and confirm the recommended preliminary design. An Environmental Study Report (ESR) will be prepared to document the planning process including conclusions and recommendations. The ESR will be made available for public review.

Comments

Public consultation is vital to this study. Comments received through the course of this study will be considered in finalizing the preferred design concept. If you cannot attend the PIC, you can alternatively provide input and/or be kept informed by:

- Visiting the Region's website for study updates: www.peelregion.ca/pw/roads/environ-assess; and/or
- Contacting either team member below if you have any questions, comments or wish to be added to the mailing list:

Mr. Hitesh Topiwala, RPP, PMP
Project Manager, Transportation Division
Public Works, Region of Peel
10 Peel Centre Drive, 4th Floor
Brampton, ON L6T 4B9
Tel: 905-791-7800 ext. 7805
Fax: 905-791-1442
E-mail: hitesh.topiwala@peelregion.ca

Mr. John Bayley, P.Eng.
Manager, Transportation
Stantec Consulting Ltd.
49 Frederick Street
Kitchener, ON N2H 6M7
Tel: 519-585-7112
Fax: 519-579-4239
E-mail: john.bayley@stantec.com

Information will be collected in accordance with the Municipal Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will become part of the public record.

Region of Peel
Working for you

This notice first published on November 2, 2011.

November 3, 2011
Project: 07-4350

Dear Agency Contact:

Re: Notice of Public Information Centre (PIC) #2
Municipal Class Environmental Assessment
Mayfield Road (R.R. #14) Improvements from Airport Road to Coleraine Drive

The Regional Municipality of Peel initiated a Schedule 'C' Class Environmental Assessment (EA) Study in 2007 to determine improvement alternatives for Mayfield Road, between Airport Road and Coleraine Drive. The Region retained Stantec Consulting Ltd. to undertake this Class EA.

In June 2009, the first Public Information Centre (PIC) was held to present the need and justification for the project along with a range of potential solutions to the problem.

Since that time, the project team has prepared alternative designs for the project, has completed various technical studies and has completed an assessment of the potential impacts of the various alternatives. A second PIC meeting is being held to invite feedback and assist the Project Team in determining a preferred design concept.

Enclosed is the ***Notice of the second PIC, to be held on Wednesday, November 16, 2011 from 6:30 – 8:30 pm, at St. Patrick Separate School.*** Additional details regarding the Study and the PIC can be found in the enclosed PIC Notice.

The second PIC will present the finalized recommended planning alternative, summary of the related technical studies, evaluation of alternative design concepts and the recommended preliminary design for the study area. We invite you to attend the PIC, however if you cannot attend and have any comments or wish to receive additional information, please forward them to one of following project team members:

Mr. Hitesh Topiwala, RPP, PMP
Project Manager, Transportation Division
Public Works, Region of Peel
10 Peel Centre Drive, 4th Floor
Brampton, ON L6T 4B9
Tel: 905-791-7800 – ext. 7805
Fax: 905-791-1442
E-mail: Hitesh.topiwala@peelregion.ca

Mr. John Bayley, P. Eng.
Manager, Transportation
Stantec Consulting Ltd.
49 Frederick Street
Kitchener, Ontario N2H 6M7
Tel: 519-585-7112
Fax: 519-579-4239
E-mail: john.bayley@stantec.com

We thank you for your attention to this matter, and we look forward to your assistance in the identification of pertinent issues affecting future improvements for this roadway corridor.

Sincerely,

Hitesh, Topiwala, RPP, PMP
Project Manager, Transportation Division

Encl: Notice of PIC

c. Mr. John Bayley, Stantec Consulting Ltd.

Public Works
10 Peel Centre Dr., Suite B, Brampton, ON L6T 4B9
Tel: 905-791-7800 www.peelregion.ca

Agency Contact
City of Brampton
Engineering & Construction Division
Senior Project Manager
8850 McLaughlin Road
Brampton ON L6Y 5T1

Agency Contact
Town of Caledon
Chief Building Official/Director
6311 Old Church Road
Caledon East ON L0N 1E3

Agency Contact
City of Brampton
Manager-Engineering Services
2 Wellington Street West
Brampton ON L6Y 4R2

Agency Contact
City of Brampton
O.A.L.A, Landscape Architect
2 Wellington Street West
Brampton ON L6Y 4R2

Agency Contact
City of Brampton
Commissioner of Works and Transportation
2 Wellington Street West
Brampton ON L6Y 4R2

Agency Contact
City of Brampton
Commissioner of Community Services
2 Wellington Street West
Brampton ON L6Y 4R3

Agency Contact
City of Brampton, Fire Department
8 Rutherford Road South
Brampton ON L6W 3J1

Agency Contact
Ministry of Aboriginal Affairs, Policy &
Relationships Branch, Deputy Director
720 Bay Street, 4th Floor
Toronto ON M5G 2K1

Agency Contact
The Association of Iroquois & Allied Indians,
Sr Policy Analyst & Government Relationship,
Advisor
387 Princess Avenue
London ON N6B 2A7

Agency Contact
Mississaugas of the Scugog Island
Chief
22521 Island Road
Port Perry ON L9L 1B6

Agency Contact
Town of Caledon
Senior Transportation Planner
6315 Old Church Road
Caledon East ON L7C 1J7

Agency Contact
City of Brampton
Superintendent of Parks
115 Orenda Road
Brampton ON L6W 1V7

Agency Contact
City of Brampton
Supervisor of Open Space Planning
2 Wellington Street West
Brampton ON L6Y 4R2

Agency Contact
City of Brampton
Heritage Coordinator
2 Wellington Street West
Brampton ON L6Y 4R2

Agency Contact
City of Brampton, Open Space Panner
Parks & Facility Planning
2 Wellington Street West
Brampton ON L6Y 4R2

Agency Contact
City of Brampton
Development Engineer - Approvals
2 Wellington Street West
Brampton ON L6Y 4R4

Agency Contact
City of Brampton Fire and Emergency Services
Fire Chief
8 Rutherford Road South
Brampton ON L6W 3J1

Agency Contact
Chiefs of Ontario Office
188 Mohawk Street
Brantford ON N3S 2X2

Agency Contact
Mississaugas of the New Credit First Nation
Chief
2789 Mississauga Road, R.R. 6
Hagersville ON N0A 1M0

Agency Contact
Ministry of the Environment
Environmental Resource Planner & EA
Coordinator
5775 Yonge Street, 8th Floor
North York ON M2M 4J1

Agency Contact
Town of Caledon
Manager of Engineering & Construction
6311 Old Church Road
Caledon East ON L0N 1E2

Agency Contact
City of Brampton
Director, Planning Policy and Research
2 Wellington Street West
Brampton ON L6Y 4R2

Agency Contact
City of Brampton
Director of Engineering & Development Services
2 Wellington Street West
Brampton ON L6Y 4R2

Agency Contact
City of Brampton
Clerk, City of Brampton Heritage Board
2 Wellington Street West
Brampton ON L6Y 4R2

Agency Contact
City of Brampton
City Clerk
2 Wellington Street West
Brampton ON L6Y 4R2

Agency Contact
City of Brampton
Policy Planner
2 Wellington Street West
Brampton ON L6Y 4R5

Agency Contact
Indian and Northern Affairs – Ontario
Jr. Environmental Officer
25 St. Clair Avenue East, 8th Floor
Toronto ON M4T 1M2

Agency Contact
Union of Ontario Indians, Nipissing First Nation
Intergovernmental Affairs Director
P.O. Box 711
North Bay ON P1B 8J8

Agency Contact
Six Nations Land and Resources Committee
SIX NATIONS OF GRAND RIVER, Councillor
2498 Chiefswood Road, P.O. Box 5000
Ohsweken ON N0A 1M0

Agency Contact
Ministry of the Environment
District Manager
4145 North Service Road, Suite 300
Burlington ON L7L 6A3

H.T.

Agency Contact
Toronto and Region Conservation Authority,
Development Services Section, Acting Planner II
5 Shoreham Drive
Downsview ON M3N 1S4

Agency Contact
Fisheries, Oceans Canada
District Office, 3027 Harvester Road, Unit 304
Burlington ON L7R 4K3

Agency Contact
GO Transit
General Manager
20 Bay Street, Suite 600
Toronto ON M5J 2W3

Agency Contact
Accomodation Services Section - Ontario
Provincial Police, Senior Officer
777 Memorial Avenue, 1st Floor
Orillia ON L3V 7V3

Agency Contact
Ministry of Transportation, Engineering Office
Manager
1201 Wilson Avenue, 4th Floor, Atrium Tower
Downsview ON M3M 1J8

Agency Contact
Trout Unlimited
Executive Director
20 Rhine Court
Brampton ON L6Z 1N9

Agency Contact
City of Brampton
City Councillor Ward 9 and 10
2 Wellington Street West
Brampton ON L6Y 4R2

Agency Contact
Town of Caledon
Regional Councillor Ward 2
6311 Old Church Road
Caledon East ON L7C 1J6

Agency Contact
Town of Caledon
Town Councillor Ward 1
6311 Old Church Road
Caledon East ON L7C 1J6

Agency Contact
Town of Caledon
Director, Public Works & Engineering
6311 Old Church Road
Caledon East ON L7C 1J6

Agency Contact
Dufferin-Peel Roman Catholic Separate School
Board, Manager, Planning Projects
40 Matheson Boulevard West
Mississauga ON L5R 1C5

Agency Contact
Transport Canada - Ontario Region
Environmental Officer
4900 Yonge Street
North York ON M2N 6A5

Agency Contact
Ministry of Culture
Manager Culture, Sport Recreation
400 University Avenue, 4th Floor
Toronto ON M7A 2R9

Agency Contact
Ministry of Municipal Affairs and Housing
Senior Planner
777 Bay Street, 14 Floor
Toronto ON M5G 2E5

Agency Contact
Fisheries and Oceans Canada, Canadian Coast
Guard, Central and Arctic Region
A/NWP Inspections Officer
Suite 703 - 201 North Front Street
Sarnia ON N7T 8B1

Agency Contact
The Humber Watershed Alliance
Chair of The Humber Watershed Aliance
95 Mercury Road
Toronto ON M9W 3H4

Agency Contact
City of Brampton
Development Planner
2 Wellington Street West
Brampton ON L6Y 4R2

Agency Contact
Town of Caledon
Regional Councillor Wards 3 & 4
6311 Old Church Road
Caledon East ON L7C 1J6

Agency Contact
Town of Caledon
Town Councillor Ward 5
6311 Old Church Road
Caledon East ON L7C 1J6

Agency Contact
Town of Caledon
Regional Councillor Ward 5
6311 Old Church Road
Caledon East ON L7C 1J6

Agency Contact
Dufferin-Peel Roman Catholic Separate School
Board, Superintendent of Business Affairs
40 Matheson Boulevard West
Mississauga ON L5R 1C5

Agency Contact
GO Transit
Manager Marketing and Planning
20 Bay Street, Suite 600
Toronto ON M5J 2W3

Agency Contact
Ministry of Tourism and Recreation, Manager
123 Edward Street
Toronto ON M5G 1E2

Agency Contact
Ministry of Municipal Affairs and Housing
Director Infrastructure
777 Bay Street, 2nd Floor
Toronto ON M5G 2E5

Agency Contact
Ministry of Agriculture, Food & Rural Affairs
Manager
175 Sandalwood Parkway West
Brampton ON L7S 1E8

Agency Contact
City of Brampton
Regional Councillor, Ward 9 and 10
2 Wellington Street West
Brampton ON L6Y 4R2

Agency Contact
Town of Caledon, Mayor
Box 1000, 6311 Old Church Road
Caledon East ON L7C 1J6

Agency Contact
Town of Caledon
Town Councillor Ward 2
6311 Old Church Road
Caledon East ON L7C 1J6

Agency Contact
Town of Caledon
Town Councillor Ward 3 &4
6311 Old Church Road
Caledon East ON L7C 1J6

Agency Contact
Town of Caledon
Regional Councillor Ward 1
6311 Old Church Road
Caledon East ON L7C 1J7

Agency Contact
Ministry of Natural Resources - Aurora
DistrictDistrict Manager
50 Bloomington Road West
Aurora ON L4G 3G8

Agency Contact
Ministry of Culture - Heritage Policy and
Program Development Unit
Heritage Conservation Advisor400 University
Avenue, 4th Floor
Toronto ON M7A 2R9

Agency Contact
Environment Canada - Halton-Peel District
Office, District Engineer
4905 Dufferin Street
Downsview ON M3H 5T4

Agency Contact
Bell Canada - F3 Section Green
Manager - Right of Way
100 Borough Drive
Scarborough ON M1P 4W2

Agency Contact
Telus
Network Planning Manager
82 Locust Street
Kitchener ON N2H 1W9

Agency Contact
Enbridge Gas Distribution Inc.
Manager of Distribution Planning
500 Consumers Road
North York ON M2J 1P8

Agency Contact
Hydro One Brampton
Engineering Supervisor - Development
175 Sandalwood Parkway West
Brampton ON L7A 1E8

Agency Contact
Enersource Hydro Mississauga
3240 Mavis Road
Mississauga ON L5C 3K1

Agency Contact
Brampton Transit
Director of Brampton Transit
185 Clark Boulevard
Brampton ON L6T 3J1

Agency Contact
Rogers Cable TV Limited
Planning Co-ordinator
3573 Wolfedale Road
Mississauga ON L5C 3T6

Agency Contact
Ministry of Natural Resources - Aurora District
District Planner
50 Bloomington Road West
Aurora ON L4G 3G8

Agency Contact
Ministry of Argicultural, Food and Rural Affairs
Agricultural Land Use
Land Use Policy Specialist
1 Stone Road West
Guelph ON N1G 4Y2

Agency Contact
Ontario Power Generation
Senior Advisor, Sustainable Development
700 University Avenue
Toronto ON M5G 1X6

Agency Contact
AT & T Canada
50 Worcester Road
Etobicoke ON M9W 5X2

Agency Contact
Enbridge Gas Distribution Inc.
Manager of Special Projects
P.O. Box 650, STN A
Scarborough ON M1K 5E3

Agency Contact
Enbridge Gas Distribution Inc.
500 Consumers Road
North York ON M2J 1P8

Agency Contact
Hydro One Brampton
Engineering Supervisor Brampton
175 Sandalwood Parkway West
Brampton ON L7A 1E8

Agency Contact
Peel Regional Paramedic Services (EMS)
Director, Ambulance and Emergency Programs
5299 Maingate Drive
Mississauga ON L4W 1G8

Agency Contact
Brampton Transit
Project Leader - AcceleRide
185 Clark Boulevard
Brampton ON L6T 3J1

Agency Contact
Rogers Cable TV Limited
System Planner
3573 Wolfedale Road
Mississauga ON L5C 3T6

Agency Contact
Ministry of Culture - Heritage Policy and
Program Development Unit
Heritage Planner/Archaeologist
400 University Avenue, 4th Floor
Toronto ON M7A 2R9

Agency Contact
Environmental Canada
Head EA Section, Ontario Region
867 Lakeshore Road, P.O. Box 5050
Burlington ON L7R 4A6

Agency Contact
Bell Canada - Municipal Operations Centre
100 Borough Drive, Floor 5 Blue
Scarborough ON M1P 4W2

Agency Contact
Telus Communications
11 King Street West, 11th Floor
Toronto ON M5H 4C7

Agency Contact
Enbridge Gas Distribution Inc.
Manager, Network Analysis
P.O. Box 650
Scarborough ON M1K 5E3

Agency Contact
Hydro One Inc.
Manager, Environmental Services and Approvals
483 Bay Street, North Tower
Toronto ON M5G 2P5

Agency Contact
Peel Region Police Department
Operation Planning and Resources
7750 Hurontario Street
Brampton ON L6V 3W6

Agency Contact
Brampton Transit
Senior Supervisor, Service Development
185 Clark Boulevard
Brampton ON L6T 3J1

Agency Contact
Rogers Cable TV Limited
OPE Coordinator - GTA West
3573 Wolfedale Road
Mississauga ON L5C 3T6

Agency Contact
Peel District School Board
H.J.A. Brown Education Centre, Senior Planner
5650 Hurontario Street
Mississauga ON L5R 1C6

Agency Contact
Peel District School Board - H.J.A. Brown Education Centre, Intermediate Planning Officer, Planning & Accommondation Dept.
5650 Hurontario Street
Mississauga ON L5R 1C6

Peel Region Police
Attention: Sergeant Dale Waller
7750 Hurontario Street
Brampton ON L6V 3W6

Agency Contact
Region of Peel
Manager, Environmental Health
150 Central Park Drive
Brampton ON L6Y 4R2

Agency Contact
Ministry of Agriculture, Food
Manager
1 Stone Road W. 2nd Floor SW
Guelph ON N1G 4Y2

Agency Contact
St. Patrick's Cemetery Committee
President
59 Shady Glen Cres.
Bolton ON L7E 2K5

Agency Contact
St. Patrick's Cemetery Committee
7740 Mayfield Road
Caledon ON L7E 5J1

Agency Contact
St. Patrick's Cemetery Committee
11621 The Gore Road
Brampton ON L6T 3Z8

Agency Contact
St. Patrick's Cemetery Committee
10496 The Gore Road
Brampton ON L6T 3Z8

Agency Contact
St. Patrick's Cemetery Committee
111 Meadowvale Crt
Bolton ON L7E 3G9

Agency Contact
St. Patrick's Cemetery Committee
82 DeRose Avenue
Bolton ON L7E 1A8

Agency Contact
Cole Engineering Group Ltd.
Project Manager - Transportation
100 Renfrew Dr., Suite 100
Markham ON L3R 9R6

Agency Contact
Dufferin-Peel Catholic District School Board
Superintendent of Planning and Operations
40 Matheson Boulevard West
Mississauga, ON N5R 1C5

Agency Contact
City of Brampton
Growth Management Policy Planner
2 Wellington Street West
Brampton ON L6Y 4R2

Agency Contact
Ontario Realty Corporation
Gneral Manager, Planning Services
77 Wellesley Street West
Toronto, ON M7A 2G3

Agency Contact
Ministry of Culture
Planner/Archaeologist
400 University Avenue, 4th Floor
Toronto, ON M7A 2R9

Agency Contact
Ministry of Transportation
Peel Halton Section
1201 Wilson Avenue, 7th Floor
Toronto, ON M5G 2E5

Agency Contact
Ministry of Agriculture, Food and Rural Affairs
Policy Advisor
1 Stone Road West, 2nd Floor SW
Guelph, ON N1G 4Y2

Agency Contact
Ministry of the Environment
EA Coordinator
5775 Yonge Street, 8th Floor
North York ON M2M 4J1

Agency Contact
Ministry of the Environment - Environmental Assessment and Approvals Branch
Special Project Officer
2 St. Clair Avenue West, 14th Floor
Toronto, ON M4V 1L5

Agency Contact
City of Brampton
Regional Councillor
2 Wellington Street West
Brampton ON L6Y 4R2

Agency Contact
City of Brampton
City Councillor Wards 7 & 8
2 Wellington Street West
Brampton ON L6Y 4R2

Agency Contact
City of Brampton Engineering & Construction Division
8850 McLaughlin Road
Brampton ON L6Y 5T1

Agency Contact
City of Brampton
Project Engineer
8850 Mclaughlin Road
Brampton, ON L6Y 5T1

Agency Contact
City of Brampton Fire and Emergency Services
Division Chief - Fire Prevention
225 Central Park Drive
Brampton, ON L6S 6H1

Agency Contact
Peel Regional Police
Superintendent - 21 Division
10 Peel Centre Drive, Suite C
Brampton, ON L6T 4B9

Agency Contact
Town of Caledon
Senior Transportation Planner
6311 Old Church Road
Caledon, ON L7C 1J6

Agency Contact
Enbridge Gas Distribution Inc. - Construction and Maintenance
6 Colony Court
Brampton, ON L6T 4E4

Agency Contact
Trans-Northern Pipelines
Coordinator - Crossings and Facilities
45 Vogell Road, Suite 301
Richmond Hill, ON l4B 3P6

Agency Contact
Allstream Canada PUCC Brampton/Caledon
50 Worcester Road
Etobicoke, ON M9W 5X2

Agency Contact
Indian and Northern Affairs – Ontario
Acting Director of Lands and Trust Services,
Ontario Region25 St. Clair Avenue East, 8th Fl
Toronto ON M4T 1M2

Agency Contact
Mississaugas of the Scugog Island
22521 Island Road
Port Perry ON L9L 1B6

Agency Contact
Mississaugas of the New Credit First Nation
Director
2789 Mississauga Road, R.R. 6
Hagersville ON N0A 1M0

Agency Contact
Bell Canada
5115 Creek Bank Road, Floor 3 West
Mississauga, ON L4W 5R1

Agency Contact
Ontario Secretary of Aboriginal Affairs
Policy Advisor
720 Bay Street, 4th Floor
Toronto, ON M5G 2K1

Agency Contact
Metis Nation of Canada
President
#3-500 Old St. Patrick Street
Ottawa, ON K1N 9G4

Agency Contact
Schaeffer Consulting Engineers
64 Jardin Drive
Concord, ON L4K 3P3

Agency Contact
Transport Canada - Ontario Region
Regional Manager Environmental Affairs,
Programs Branch
4900 Yonge Street
North York ON M2N 6A5

Agency Contact
Association of Iroquois and Allied Indians
Director of Intergovernmental Affairs
387 Princess Avenue
London, ON N6B 2A7

Agency Contact
Founding First Nation Circle
Gilbert's LLP Lawyers
49 Wellington Street East
Toronto, ON M5E 1C9

Agency Contact
Ministry of Natural Resources - Halton/Peel
Toronto Area Aurora District
Fish and Wildlife Biologist
50 Bloomington Road West
Aurora, ON L4G 3G8

November 2, 2011
Project: 07-4350

Dear Resident/Property Owner:

Re: Notice of Public Information Centre (PIC) #2
Municipal Class Environmental Assessment
Mayfield Road (R.R. #14) Improvements from Airport Road to Coleraine Drive

The Regional Municipality of Peel initiated a Schedule 'C' Class Environmental Assessment (EA) Study in 2007 to determine improvement alternatives for Mayfield Road, between Airport Road and Coleraine Drive. The Region retained Stantec Consulting Ltd. to undertake this Class EA.

In June 2009, the first Public Information Centre (PIC) was held to present the need and justification for the project along with a range of potential solutions to the problem.

Since that time, the project team has prepared alternative designs for the project, has completed various technical studies and has completed an assessment of the potential impacts of the various alternatives. A second PIC meeting is being held to invite feedback and assist the Project Team in determining a preferred design concept.

Enclosed is the ***Notice of the second PIC, to be held on Wednesday, November 16, 2011 from 6:30 – 8:30 pm, at St. Patrick Separate School.*** Additional details regarding the Study and the PIC can be found in the enclosed PIC Notice.

The second PIC will present the finalized recommended planning alternative, summary of the related technical studies, evaluation of alternative design concepts and the recommended preliminary design for the study area. We invite you to attend the PIC, however if you cannot attend and have any comments or wish to receive additional information, please forward them to one of following project team members:

Mr. Hitesh Topiwala, RPP, PMP
Project Manager, Transportation Division
Public Works, Region of Peel
10 Peel Centre Drive, 4th Floor
Brampton, ON L6T 4B9
Tel: 905-791-7800 – ext. 7805
Fax: 905-791-1442
E-mail: Hitesh.topiwala@peelregion.ca

Mr. John Bayley, P. Eng.
Manager, Transportation
Stantec Consulting Ltd.
49 Frederick Street
Kitchener, Ontario N2H 6M7
Tel: 519-585-7112
Fax: 519-579-4239
E-mail: john.bayley@stantec.com

We thank you for your attention to this matter, and we look forward to your assistance in the identification of pertinent issues affecting future improvements for this roadway corridor.

Sincerely,

Hitesh, Topiwala, RPP, PMP
Project Manager, Transportation Division

Encl: Notice of PIC

c. Mr. John Bayley, Stantec Consulting Ltd.

H.T

Resident/Property Owner
40 Cherry Hills Road
Concord ON L4K 1M4

Resident/Property Owner
57 Exbury Road
North York ON M3M 1P9

Resident/Property Owner
160 Cidermill Avenue Unit 7
Concord ON L4K 4K5

Resident/Property Owner
40 Katie Court
North York ON M6L 1R6

Resident/Property Owner
8373 Mayfield Road
Brampton ON L6P 0H5

Resident/Property Owner
8387 Mayfield Road
Brampton ON L6P 0H5

Resident/Property Owner
3901 Highway 7 Suite 400
Woodbridge ON L4L 8L5

Resident/Property Owner
160 Cidermill Avenue Unit 7
Concord ON L4K 4K5

Resident/Property Owner
8600 Dufferin Street
Concord ON L4K 5P5

Resident/Property Owner
7377 Mayfield Road
Brampton ON L6P 0H7

Resident/Property Owner
1 Softneedle Avenue
Brampton ON L6R 1L3

Resident/Property Owner
7421 Mayfield Road
Brampton ON L6P 0H7

Resident/Property Owner
7435 Mayfield Road
Brampton ON L6P 0H7

Resident/Property Owner
7481 Mayfield Road
Brampton ON L6P 0H7

Resident/Property Owner
11962 The Gore Road
Brampton ON L6P 0A2

Resident/Property Owner
1155 Yonge Street Suite 6003
Toronto ON M4T 1W2

Resident/Property Owner
276 Carlaw Avenue Unit 200
Toronto ON M4M 3L1

Resident/Property Owner
55 Silton Road Unit 2
Woodbridge ON L4L 7Z8

Resident/Property Owner
7771 Mayfield Road
Brampton ON L6P 0H6

Resident/Property Owner
7755 Mayfield Road
Brampton ON L6P 0H6

Resident/Property Owner
7743 Mayfield Road
Brampton ON L6P 0H6

Resident/Property Owner
39 Bowring Walk
North York ON M3H 5Z8

Resident/Property Owner
2 Marysfield Drive
Brampton ON L6P 0J3

Resident/Property Owner
82 Marysfield Drive
Brampton ON L6P 0J3

Resident/Property Owner
8700 Dufferin Street
Concord ON L4K 4S6

Resident/Property Owner
24 Bumblebee Crescent
Brampton ON L6R 2J6

Resident/Property Owner
6443 Mayfield Road
Brampton ON L6P 0H9

Resident/Property Owner
RR 9 LCD 1
Brampton ON L6Y 3Z8

Resident/Property Owner
23 Garden Avenue
Richmond Hill ON L4C 6L5

Resident/Property Owner
90 Mondavi Road
Richmond Hill ON L4H 1L8

Resident/Property Owner
6607 Mayfield Road
Brampton ON L6P 0H8

Resident/Property Owner
2 Holland Drive Unit 1
Bolton ON L7E 1E1

Resident/Property Owner
6737 Mayfield Road
Brampton ON L6P 0H8

Resident/Property Owner
2 Holland Drive Unit 1
Bolton ON L7E 1E1

Resident/Property Owner
80 Brewster Crescent
North York ON M3N 1C6

Resident/Property Owner
6875 Mayfield Road
Brampton ON L6P 0H8

Resident/Property Owner
6889 Mayfield Road
Brampton ON L6P 0H8

Resident/Property Owner
91 Haist Avenue Suite
Woodbridge ON L4L 5V5

Resident/Property Owner
291 Edgeley Boulevard Suite
Concord ON L4K 3Z4

Resident/Property Owner
2 Maisonneuve Boulevard
Brampton ON L6P 1W8

Resident/Property Owner
28 Citadel Crescent
Brampton ON L6P 1X9

Resident/Property Owner
30 Citadel Crescent
Brampton ON L6P 1X9

Resident/Property Owner
32 Citadel Crescent
Brampton ON L6P 1X9

Resident/Property Owner
34 Citadel Crescent
Brampton ON L6P 1X9

Resident/Property Owner
36 Citadel Crescent
Brampton ON L6P 1X8

Resident/Property Owner
38 Citadel Crescent
Brampton ON L6P 1X8

Resident/Property Owner
40 Citadel Crescent
Brampton ON L6P 1X8

Resident/Property Owner
30 Carmel Crescent
Brampton ON L6P 1Y1

Resident/Property Owner
32 Carmel Crescent
Brampton ON L6P 1Y1

Resident/Property Owner
34 Carmel Crescent
Brampton ON L6P 1Y1

Resident/Property Owner
36 Carmel Crescent
Brampton ON L6P 1Y1

Resident/Property Owner
38 Carmel Crescent
Brampton ON L6P 1Y2

Resident/Property Owner
40 Carmel Crescent
Brampton ON L6P 1Y2

Resident/Property Owner
42 Carmel Crescent
Brampton ON L6P 1Y2

Resident/Property Owner
11903 Airport Road
Brampton ON L6P 0X9

Resident/Property Owner
58 Laurentide Crescent
Brampton ON L6P 1Y3

Resident/Property Owner
56 Laurentide Crescent
Brampton ON L6P 1Y3

Resident/Property Owner
54 Laurentide Crescent
Brampton ON L6P 1Y3

Resident/Property Owner
52 Laurentide Crescent
Brampton ON L6P 1Y3

Resident/Property Owner
50 Laurentide Crescent
Brampton ON L6P 1Y3

Resident/Property Owner
6607 Mayfield Road
Brampton ON L6P 0H8

Resident/Property Owner
2 Holland Drive Unit 1
Bolton ON L7E 1E1

Resident/Property Owner
6737 Mayfield Road
Brampton ON L6P 0H8

Resident/Property Owner
2 Holland Drive Unit 1
Bolton ON L7E 1E1

Resident/Property Owner
80 Brewster Crescent
North York ON M3N 1C6

Resident/Property Owner
6875 Mayfield Road
Brampton ON L6P 0H8

Resident/Property Owner
6889 Mayfield Road
Brampton ON L6P 0H8

Resident/Property Owner
91 Haist Avenue Suite
Woodbridge ON L4L 5V5

Resident/Property Owner
291 Edgeley Boulevard Suite
Concord ON L4K 3Z4

Resident/Property Owner
2 Maisonneuve Boulevard
Brampton ON L6P 1W8

Resident/Property Owner
28 Citadel Crescent
Brampton ON L6P 1X9

Resident/Property Owner
30 Citadel Crescent
Brampton ON L6P 1X9

Resident/Property Owner
32 Citadel Crescent
Brampton ON L6P 1X9

Resident/Property Owner
34 Citadel Crescent
Brampton ON L6P 1X9

Resident/Property Owner
36 Citadel Crescent
Brampton ON L6P 1X8

Resident/Property Owner
38 Citadel Crescent
Brampton ON L6P 1X8

Resident/Property Owner
40 Citadel Crescent
Brampton ON L6P 1X8

Resident/Property Owner
30 Carmel Crescent
Brampton ON L6P 1Y1

Resident/Property Owner
32 Carmel Crescent
Brampton ON L6P 1Y1

Resident/Property Owner
34 Carmel Crescent
Brampton ON L6P 1Y1

Resident/Property Owner
36 Carmel Crescent
Brampton ON L6P 1Y1

Resident/Property Owner
38 Carmel Crescent
Brampton ON L6P 1Y2

Resident/Property Owner
40 Carmel Crescent
Brampton ON L6P 1Y2

Resident/Property Owner
42 Carmel Crescent
Brampton ON L6P 1Y2

Resident/Property Owner
11903 Airport Road
Brampton ON L6P 0X9

Resident/Property Owner
58 Laurentide Crescent
Brampton ON L6P 1Y3

Resident/Property Owner
56 Laurentide Crescent
Brampton ON L6P 1Y3

Resident/Property Owner
54 Laurentide Crescent
Brampton ON L6P 1Y3

Resident/Property Owner
52 Laurentide Crescent
Brampton ON L6P 1Y3

Resident/Property Owner
50 Laurentide Crescent
Brampton ON L6P 1Y3

Resident/Property Owner
6716 Mayfield Road
Caledon East ON L7C 0Z8

Resident/Property Owner
6734 Mayfield Road
Caledon East ON L7C 0Z8

Resident/Property Owner
6750 Mayfield Road
Caledon East ON L7C 0Z8

Resident/Property Owner
45 Princeton Terr
Brampton ON L6S 3S4

Resident/Property Owner
6788 Mayfield Road
Caledon East ON L7C 0Z8

Resident/Property Owner
245 Golfdale Road
Toronto ON M4N 2C2

Resident/Property Owner
6902 Mayfield Road
Caledon East ON L7C 0Z8

Resident/Property Owner
6934 Mayfield Road
Caledon East ON L7C 0Z8

Resident/Property Owner
6960 Mayfield Road
Caledon East ON L7C 0Z8

Resident/Property Owner
7040 Mayfield Road
Bolton ON L7E 5S1

Resident/Property Owner
PO Box 758 Main
Bolton ON L7E 5T5

Resident/Property Owner
244 Epsom Downs Drive
North York ON M3M 1T4

Resident/Property Owner
7174 Mayfield Road R.R. 5
Bolton ON L7E 5S1

Resident/Property Owner
7743 Mayfield Road
Brampton ON L6P 0H6

Resident/Property Owner
PO Box 1113
Cookstown ON L0L 1L0

Resident/Property Owner
7236 Mayfield Road R.R. 5
Bolton ON L7E 5S1

Resident/Property Owner
53 North Humber Drive
Woodbridge ON L4L 2G5

Resident/Property Owner
7472 Mayfield Road R.R. 5 STN Main
Bolton ON L7E 5S1

Resident/Property Owner
32 Jayfield Road
Brampton ON L6S 3G7

Resident/Property Owner
10 Acme Crescent
Etobicoke ON M9R 3B8

Resident/Property Owner
8600 Dufferin Street
Concord ON L4K 5P5

Resident/Property Owner
7660 Mayfield Road
Bolton ON L7E 0V9

Resident/Property Owner
40 Aviemore Drive
Weston ON M9L 2L5

Resident/Property Owner
7540 Mayfield Road
Bolton ON L7E 0V9

Resident/Property Owner
7542 Mayfield Road
Bolton ON L7E 0V9

Resident/Property Owner
7566 Mayfield Road
Bolton ON L7E 0V9

Resident/Property Owner
7650 Mayfield Road
Bolton ON L7E 0V9

Resident/Property Owner
7674 Mayfield Road
Bolton ON L7E 0V9

Resident/Property Owner
12796 Innis Lake Road
Caledon East ON L7C 2Y4

Resident/Property Owner
7660 Mayfield Road
Bolton ON L7E 0V9

Resident/Property Owner
7740 Mayfield Road
Bolton ON L7E 0W1

Resident/Property Owner
7780 Mayfield Road
Bolton ON L7E 0W1

Resident/Property Owner
87 Aviemore Drive
North York ON M9L 2L9

Resident/Property Owner
82 Lawnside Drive
North York ON M6L 1Z7

Resident/Property Owner
157 Spenvalley Drive
North York ON M3L 1Z8

Resident/Property Owner
35 Impala Crescent
Woodbridge ON L4L 3T7

Resident/Property Owner
1862 Albion Road
Etobicoke ON M9W 5T2

Resident/Property Owner
8014 Mayfield Road
Bolton ON L7E 0W2

Resident/Property Owner
8026 Mayfield Road
Bolton ON L7E 0W2

Resident/Property Owner
8036 Mayfield Road
Bolton ON L7E 0W2

Resident/Property Owner
8040 Mayfield Road
Bolton ON L7E 0W2

Resident/Property Owner
8070 Mayfield Road
Bolton ON L7E 0W2

Resident/Property Owner
8114 Mayfield Road
Bolton ON L7E 0W2

Resident/Property Owner
15 Genthorn Avenue
Etobicoke ON M9W 2S8

Resident/Property Owner
37 Richwood Crescent
Brampton ON L6X 4K8

Resident/Property Owner
8260 Mayfield Road
Bolton ON L7E 0W2

Resident/Property Owner
8282Mayfield Road
Bolton ON L7E 0W2

Resident/Property Owner
223 Maple Leaf Drive
North York ON M6L 1P2

Resident/Property Owner
48 Madras Place
Brampton ON L6S 2Z2

Resident/Property Owner
8410 Mayfield Road
Bolton ON L7E 0W2

Resident/Property Owner
7728 Mayfield Road
Bolton ON L7E 0V9

Resident/Property Owner
7712 Mayfield Road
Bolton ON L7E 0V9

Resident/Property Owner
8424 Mayfield Road
Bolton ON L7E 0W2

Resident/Property Owner
122 Romina Drive
Concord ON L4K 4Z7

Resident/Property Owner
8576 Mayfield Road
Bolton ON L7E 0W3

Resident/Property Owner
8602 Mayfield Road
Bolton ON L7E 0W3

Resident/Property Owner
30 International Boulevard
Toronto ON M9W 5P3

Resident/Property Owner
R.R. 6
Woodstock ON N4S 7W1

Resident/Property Owner
2 Holland Drive Unit 1
Bolton ON L7E 1E1

Resident/Property Owner
700 Applewood Cres., Suite 100
Vaughan ON L4K 5X3

Resident/Property Owner
Delata Urban Inc.
7501 Keele Street, suite 505
Vaughan ON L4K 1Y2

Enzo Tontodonati
84 Rota Cresent
Woodbridge ON L4H 1K8

Resident/Property Owner
Delata Urban Inc.
7501 Keele Street
Vaughan ON L4K 1Y2

Irene Clyde
47 Couperthwaite Crescent
Unionville ON L3R 6N1

Resident/Property Owner
Pacific Home Limited
2 Holland Drive, Unit 1
Bolton ON L7E 1E1

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Stantec

Public Information Centre No. 2

Wednesday, November 16, 2011
6:30 p.m. - 8:30 p.m.
St. Patrick Separate School
11948 The Gore Road
Brampton

Welcome

to the second Public Information Centre for the Mayfield Road Class Environmental Assessment Study, between Airport Road and Coleraine Drive. The first Public Consultation Centre for this project was held on June 25, 2009.

This project is being completed in accordance with the Municipal Engineers' Association's document for conducting a Schedule C Class Environmental Assessment project.

The Environmental Assessment Study is being directed by a project team made up of staff from the Region of Peel and Stantec Consulting Limited. Liaison with area municipalities, the public, external review agencies and other stakeholders is a significant component of the study.

Please:

- sign the attendance register;
- review the display boards; and
- ask questions of the team members.

You may submit comments tonight or mail/email/fax by *Thursday, November 30, 2011* to:

Hitesh Topiwala, RPP, PMP
Project Manager
Transportation Division
Public Works, Region of Peel
10 Peel Centre Drive, Suite B, 4th floor
Brampton, ON L6T 4B9
hitesh.topiwala@peelregion.ca
fax: 905-791-1442
tel: 905-791-7800 x7805

or

John C. Bayley, P.Eng.
Manager, Transportation
Stantec Consulting Ltd.
49 Frederick Street
Kitchener, ON N2H
john.bayley@stantec.com
fax: 519-579-4239
tel: 519-585-7112

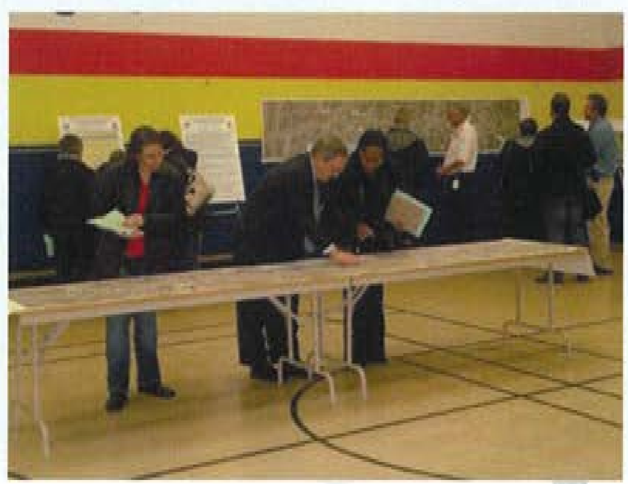
MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Stantec

The purpose of this information centre is to:

- Provide an overview of the Class Environmental Assessment Study Process and the progress to date;
- Provide the background study information and present the action taken on the feedback received from Public Information Centre (PIC) No. 1 in June 2009;
- Present a summary of technical studies and assessments that have been completed following PIC#1;
- Present a summary of the evaluation of alternative design concepts and present the preliminary recommended design;
- Present the benefits, impacts and proposed mitigation of impacts for the preliminary recommended design concept; and,
- Outline the next steps and provide a further opportunity for public comments and input.

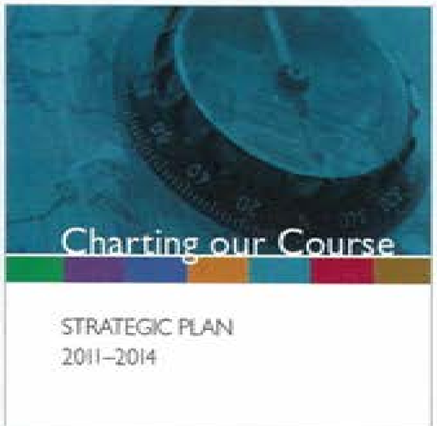


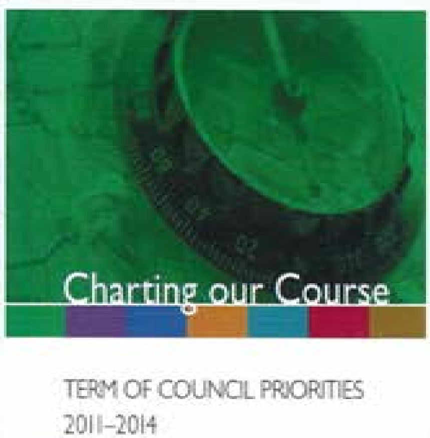
MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Region of Peel Strategic Plan and Term of Council Priorities 2011-2014

Stantec





The Region of Peel's *Strategic Plan* charts the long-term vision for the communities in Peel, and the Region's role in achieving that vision. The Strategic Plan goals have been aligned to seven key themes that encompass the programs and services delivered to the Peel community.

- **Environment**
  Protect, enhance and restore the environment
- **Social Development**
  Build a community that is stable, responsive and adaptable
- **Community Health**
  Maintain and improve the health of Peel's community
- **Transportation**
  Support and influence sustainable transportation systems
- **Cultural Development**
  Build a cohesive Peel community
- **Public Safety**
  Ensure a safe Peel community
- **Service Excellence**
  Strive for continued excellence as a municipal government

The *Term of Council Priorities* were introduced as a second step to help the Region confidently chart its course. The Term of Council Priorities are aligned to goals and actions of the Strategic Plan.

This Environmental Assessment supports a number of actions and initiatives related to transportation and environment in the Region's Strategic Plan Goals and Actions and the Term of Council Priorities.

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

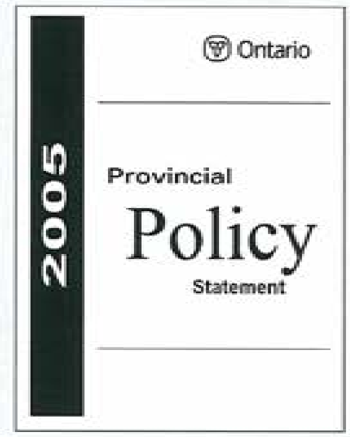
Region of Peel
Working for you

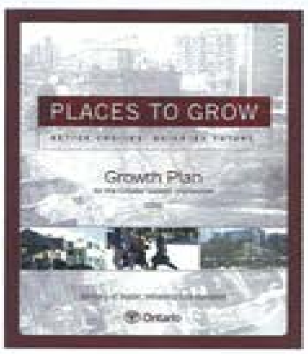
Stantec

Background

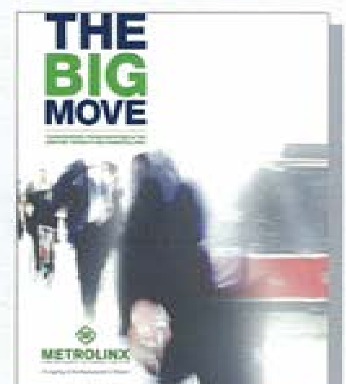
The population and employment growth in the Region of Peel and transportation infrastructure improvements are driven by the following key Provincial policy documents.

Transportation systems should be provided which are safe, efficient, facilitate the movements of people and goods, and are appropriate to address projected needs





The Places to Grow, Growth Plan, for the Greater Golden Horseshoe (2006), forecasts the Region of Peel to grow to 1.49 million by 2021, and 1.6 million by 2031.



The Big Move **will help to revitalize our communities into the kinds of places where residents can take transit, ride a bicycle or walk to fulfill their day's activities, and where children can once again walk to school. New lanes, trails and pathways for pedestrians and cyclists will make walking and cycling safe and encourage healthy lifestyles.**

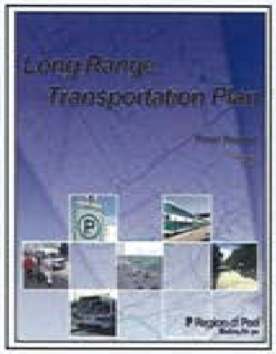
MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Stantec

Background

The Regional and Area Municipal Official Plans and Transportation studies highlight the role of Mayfield Road to address future east – west travel demand and support the need for improvements on this section of Mayfield Road.

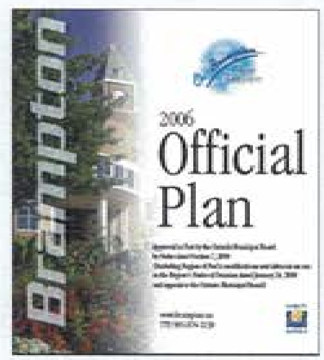


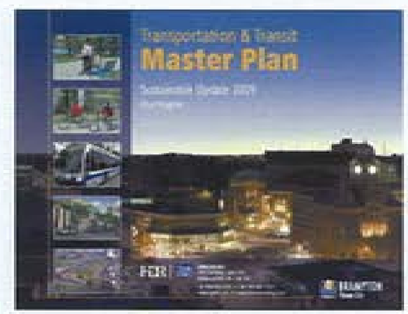
The Region's Official Plan (2008) designates the right-of-way for Mayfield Road at 50 metres.

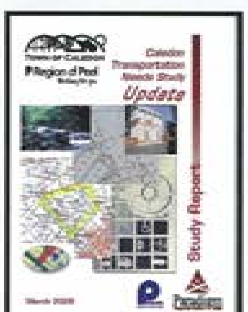
The Region's Long Range Transportation Plan (2005) identified the need for capacity improvements to this section of Mayfield Road.

The Brampton official Plan (2006) designates the area south of this section of Mayfield Road for future development through the Vales of the Humber and Highway 427 Secondary Plans.

The Brampton Transportation and Transit Master Plan (update 2009) acknowledges the need for improvements to this section of Mayfield Road.







The Caledon Official Plan designates the area north of this section of Mayfield Road for future development within the Tullamore Land Use Area and West Bolton Secondary Plan Area.

The Caledon Transportation Needs Study Update (2009) acknowledges the need for improvements to this section of Mayfield Road.

Region of Peel
Working for you

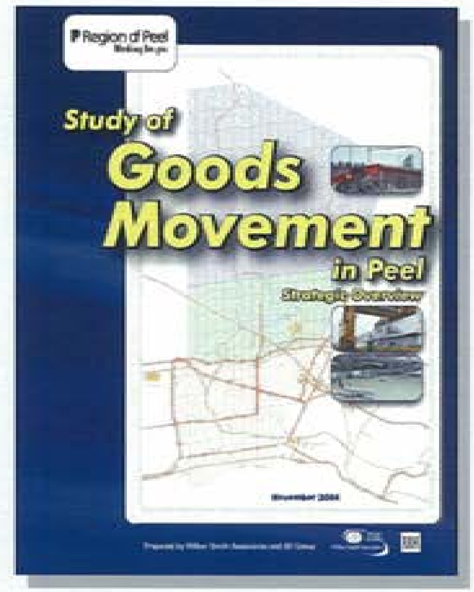
MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Stantec

Background

The Region of Peel's
Active Transportation Study

The Active Transportation Study recommends a multi-use trail and sidewalk along the corridor.

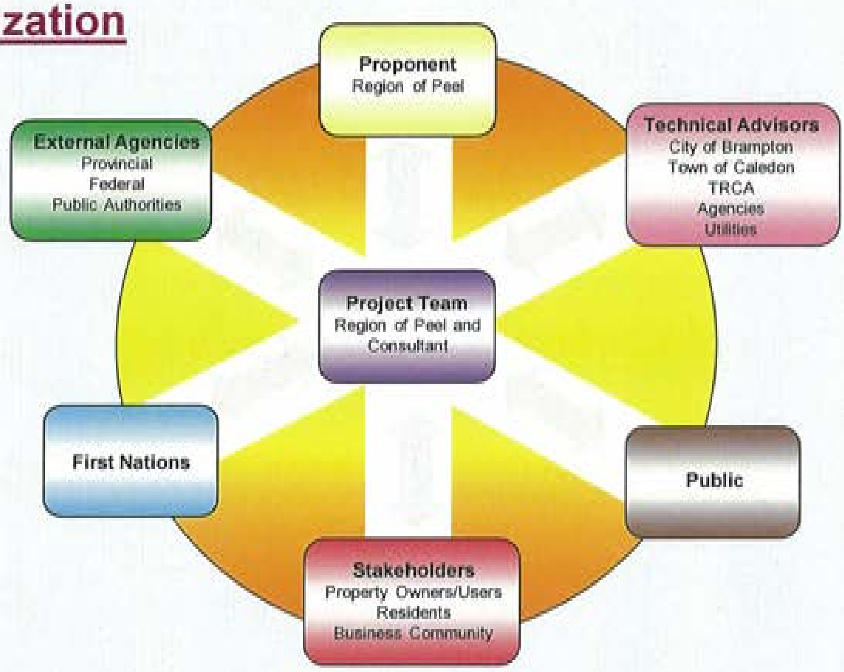


The Study of Goods Movement in Peel identifies Mayfield Road as an essential corridor for goods movement.

The Brampton Transportation and Transit Master Plan identifies the need for improved transit service and correlating infrastructure along Mayfield Road corridor by 2031.

Study Organization/Objectives

Study Organization



Study Objectives

- **Identify problems and opportunities within the corridor; investigate solutions that consider community needs and address transportation issues;**
- **Develop planning alternative solutions and establish a preferred solution based on public and agency input and application of acceptable transportation design standards;**
- **Develop and evaluate design concepts for the preferred solution;**
- **Complete a functional design for the preferred concept that:**
  - **supports the implementation of current Council Priorities (2011-2014) for Transportation related to active transportation and goods movement.**
  - **outlines an approach to environmental impact mitigation and enhancement;**
  - **provides appropriate solutions to traffic growth;**
  - **presents representative project costs; and,**
  - **addresses related community issues.**
- **Prepare a formal Environmental Study Report (ESR) documenting the study findings and recommendations.**

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Municipal Class EA Process

Stantec

☑ Completed Item

Phases

Phase 1: PROBLEM OR OPPORTUNITY
- ☑ Identify and describe the problem(s) and opportunities

⇐ **Notice of Study Commencement**

Phase 2: Alternative Solutions
- ☑ Identify alternative solutions to the problem(s)
- ☑ Inventory of the natural, social, economic & cultural environments
- ☑ Identify the impact of the alternative solutions after mitigation
- ☑ Evaluate the alternative solutions with consideration of environmental and technical impacts
- ☑ Identify a preferred solution

⇐ **PIC#1 (June 25, 2009)**
- **Needs & Justification**
- **Planning Alternative Solutions**
- **Evaluation of Planning Alternative Solutions**
- **Preliminary Preferred Solution**

Phase 3: Alternative Design Concepts for the Preferred Solution
- ☑ Identify alternative designs to implement the preferred solution
- ☑ Inventory the natural, social, economic & cultural environments
- ☑ Identify the impact of the alternative designs after mitigation
- ☑ Evaluate alternative designs with consideration of the impacts (preliminary recommendation made)
- ☐ Confirm the recommended design concept

⇐ **PIC#2 (November 16, 2011)**
- **Alternative designs for the preferred solution**
- **Evaluation of alternative design concepts**
- **Preliminary recommended design concept**

We are here

Phase 4: Environmental Study Report
- ☐ Complete an Environmental Study Report (ESR which sets out all of the activities undertaken to date through Phases 1, 2 & 3
- ☐ Place ESR on public record for 30 calendar days for review
- ☐ Notify the public and government agencies of completion of the ESR and of the PART II Order provision in the EA Act

⇐ **Notice of Study Completion & Filing the ESR**

Phase 5: Implementation
- ☐ Proceed to design and construction of the project
- ☐ Initiate construction as appropriate
- ☐ Monitor for environmental provisions and commitments

MAYFIELD ROAD IMPROVEMENT

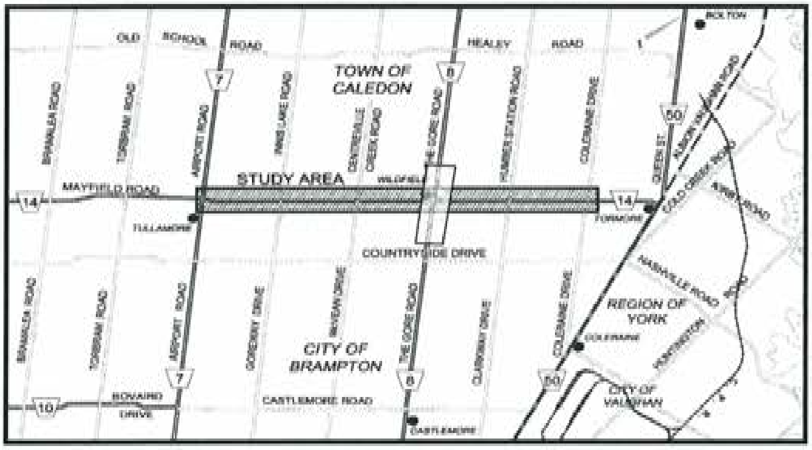
AIRPORT ROAD TO COLERAINE DRIVE

Class Environmental Assessment

Region of Peel
Working for you

Stantec

Study Area & Planning Context



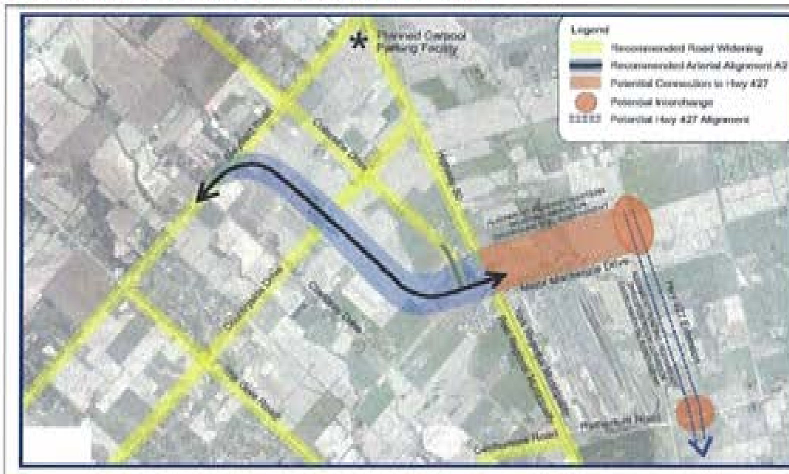
Study Area

- Mayfield Road from Airport Road to Coleraine Drive
- The Gore Road from just north of Mayfield Road to 470 meters south of Mayfield Road

Peel-Highway 427 Extension Area Transportation Master Plan

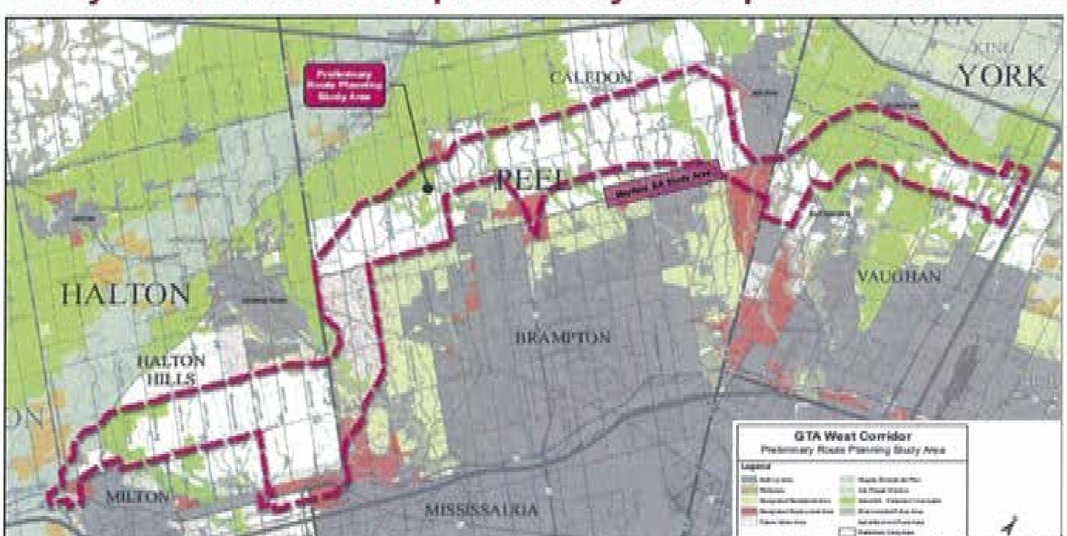
Future road network in the study area proposed by another agency:

- Hwy 427 extension to Major Mackenzie Drive
- Connection from Major Mackenzie Drive to Mayfield Road



Note: Through the City's Secondary Plan process, the recommended arterial connections will be complemented by a new collector road system.

Study area in context of preliminary route plan for the GTA West Corridor Plan



The GTA West Corridor Environmental Assessment Study supports the need for improvements to Mayfield Road.

MAYFIELD ROAD IMPROVEMENT

AIRPORT ROAD TO COLERAINE DRIVE

Class Environmental Assessment

Region of Peel
Working for you

Stantec

Traffic Assessment

- The traffic study found that the existing two lane configuration of Mayfield Road will operate at an unacceptable Level of Service (LOS) as development occurs and population and employment grow.
- This assessment was based on projected population and employment figures, and took into account existing and planned transportation network improvements, including the widening of Mayfield Road and other roads in the study area, as well as the extensions of Highway 410 and Highway 427.

Problem Statement

Based on the projected population, employment, development forecasts and other planned road improvements, Mayfield Road, between Airport Road and Coleraine Drive, is expected to operate at an unacceptable Level of Service beyond 2012.

Capacity improvements must be made in order for Mayfield Road to operate at an acceptable Level of Service (LOS) in the future.

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

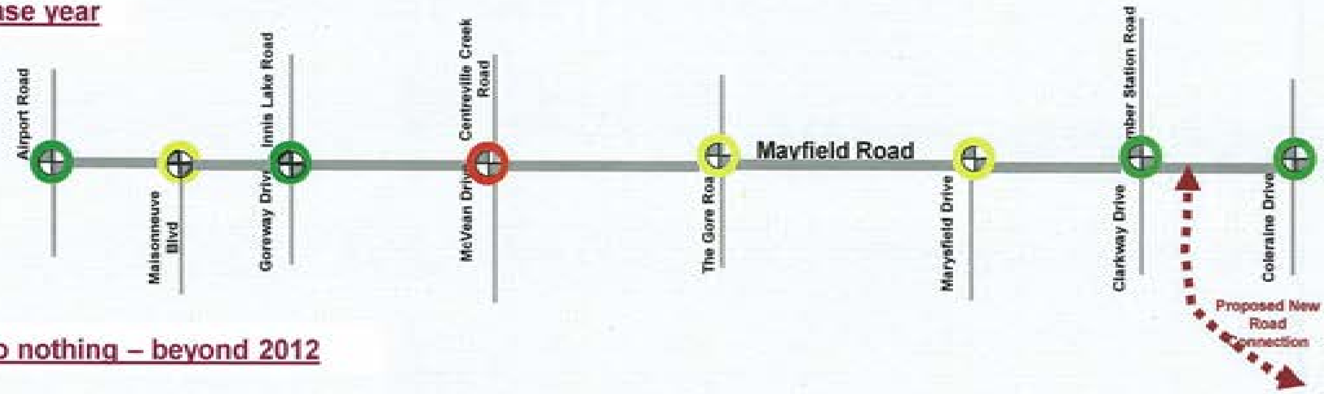
Region of Peel
Working for you

Traffic Needs Assessment

Stantec

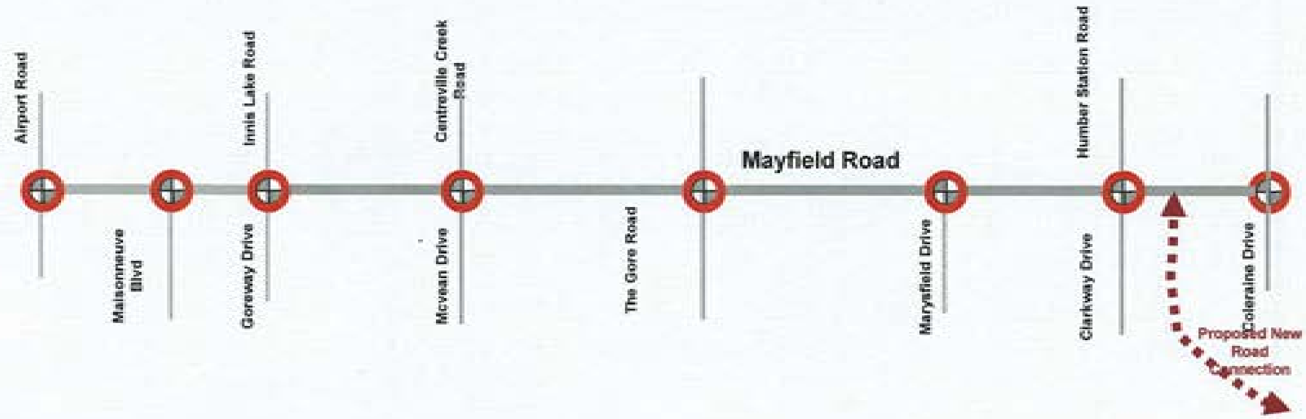
EXISTING AND FUTURE TRAFFIC CONDITIONS WITH NO IMPROVEMENTS

2007 - base year



Intersection Level of Service (LOS) Definition: Average Delay per Vehicle (s/veh)	
≤ 10	A
> 10 – 20	B
> 20 – 35	C
> 35 – 55	D
> 55 – 80	E
> 80	F

Future do nothing – beyond 2012



LEGEND

- Sufficient Capacity
- Approaching or at Capacity
- Over Capacity

MAYFIELD ROAD IMPROVEMENT

AIRPORT ROAD TO COLERAINE DRIVE

Class Environmental Assessment

Region of Peel
Working for you

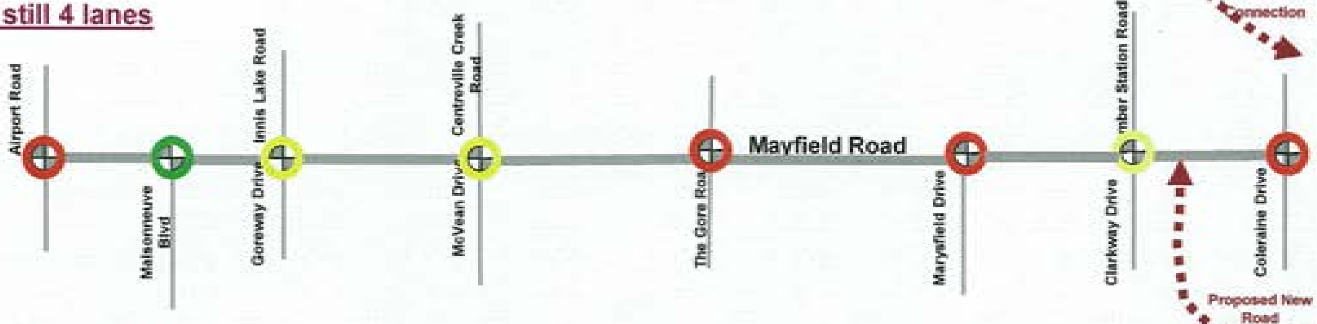
Stantec

Traffic Needs Assessment

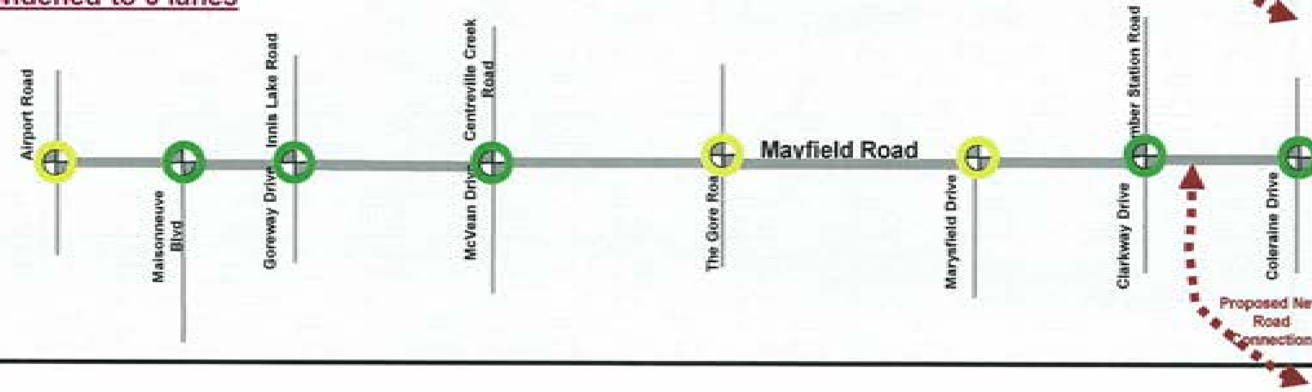
FUTURE TRAFFIC CONDITIONS TO 2031 TRAFFIC PROJECTIONS WITH A 4 LANE WIDENING

2017 – widened to 4 lanes

2031 – if still 4 lanes



2031 – if widened to 6 lanes



Intersection Level of Service (LOS) Definition: Average Delay per Vehicle (s/veh)	
≤ 10	A
> 10 – 20	B
> 20 – 35	C
> 35 – 55	D
> 55 – 80	E
> 80	F

LEGEND

- Sufficient Capacity
- Approaching or at Capacity
- Over Capacity

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

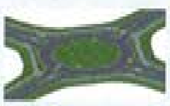
Region of Peel *Working for you*

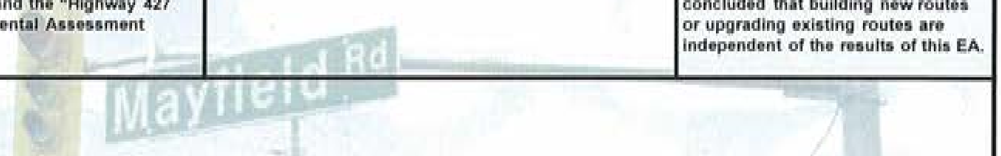
Alternative Solutions

Stantec

A number of alternative solutions were identified and analyzed resulting in the preferred alternative of "Widening Mayfield Road" Alternative Solution being carried forward as the Selected Solution. As noted in the following Screening Table, a number of other solutions will be implemented in conjunction with the "Widening of Mayfield Road".

Screening of Alternative Solutions To Address Problem/Opportunity Statement

Alternative Solutions	Description	Screening Evaluation	Recommendation
Do Nothing	No action is taken to address current deficiencies. This assessment provides a baseline to which other alternatives may be measured.	Traffic study has found capacity deficiencies on Mayfield Road by 2012 if the "Do Nothing" alternative is followed.	Do not carry forward
Roundabouts 	Roundabouts function without traffic signals providing continual traffic flow through the intersection. Roundabouts generally provide greater traffic capacity than signalized intersections due to their ability to reduce delays.	All existing major intersections were analyzed for roundabout suitability. Roundabouts will not be carried forward because: • installing 2-lane roundabouts and upgrading to 3-lane roundabouts or reverting to signals is not cost effective. • roundabouts would result in unacceptable operational delays because of existing signals in the corridor.	Do not carry forward
Traffic Operation Improvements 	Improvement of traffic signal timings or additional signal systems to optimize traffic capacity and improve safety at intersections.	Traffic signal improvements will not improve Level of Service deficiencies (i.e. delays) on Mayfield Road.	Do not carry forward
Access Management 	Consolidation or restriction of access using raised centre medians and centre left turn lanes.	Closing, restructuring or combining accesses will not solve capacity issues. Access management may be considered in conjunction with the recommended design to enhance operations and capacity.	Carry forward in conjunction with other recommended alternatives ✓
Intersection Improvements 	Addition of auxiliary lanes to accommodate turning movements and reduce traffic delay and flow. Consideration given to new designated left turn and right turn lanes at intersections on Mayfield Road and cross streets.	Addition of turning lanes at intersections will not solve capacity and operational deficiencies. Improvements may be considered in conjunction with the design to enhance the operations and capacity.	Carry forward in conjunction with other recommended alternatives ✓
Widening Mayfield Road 	Widen Mayfield Road to improve corridor capacity and address existing and future congestion issues.	Widening will solve operational and capacity deficiencies and is to be considered in conjunction with other alternatives such as transportation demand management.	Carry Forward (preferred planning alternative) ✓
Transit and Transportation Demand Management (TDM) 	Improve transit service and active transportation (multi-use trail) opportunities within corridor to address capacity issues on Mayfield Road.	Improved transit service and active transportation facilities will not in themselves address capacity issues. However all planned transit service enhancements and active transportation initiatives will be implemented in conjunction with the preferred alternative	Carry forward in conjunction with other recommended alternatives ✓
Upgrade or Build Other Routes 	•Improve other existing road corridors that perform a similar function and could divert traffic load away from Mayfield Road. •The construction of other routes are being examined in external agencies including the "GTA West Corridor Environmental Assessment Study and the "Highway 427 Extension Environmental Assessment Study".	These alternatives will not address the capacity issues on Mayfield Road. Planned upgrades to other roads will be reviewed by others regardless of the alternative chosen for Mayfield Road.	The Region's Long Range Transportation Plan (2005) and Brampton's Transit and Transportation Master Plan and the Caledon Area Transportation study have reviewed options and concluded that building new routes or upgrading existing routes are independent of the results of this EA.



MAYFIELD ROAD IMPROVEMENT

AIRPORT ROAD TO COLERAINE DRIVE

Class Environmental Assessment

Region of Peel
Working for you

Preferred Alternative Solutions

Stantec

A number of alternative solutions were identified and analyzed resulting in the identification of "Widening Mayfield Road" as the preferred solution in conjunction with:

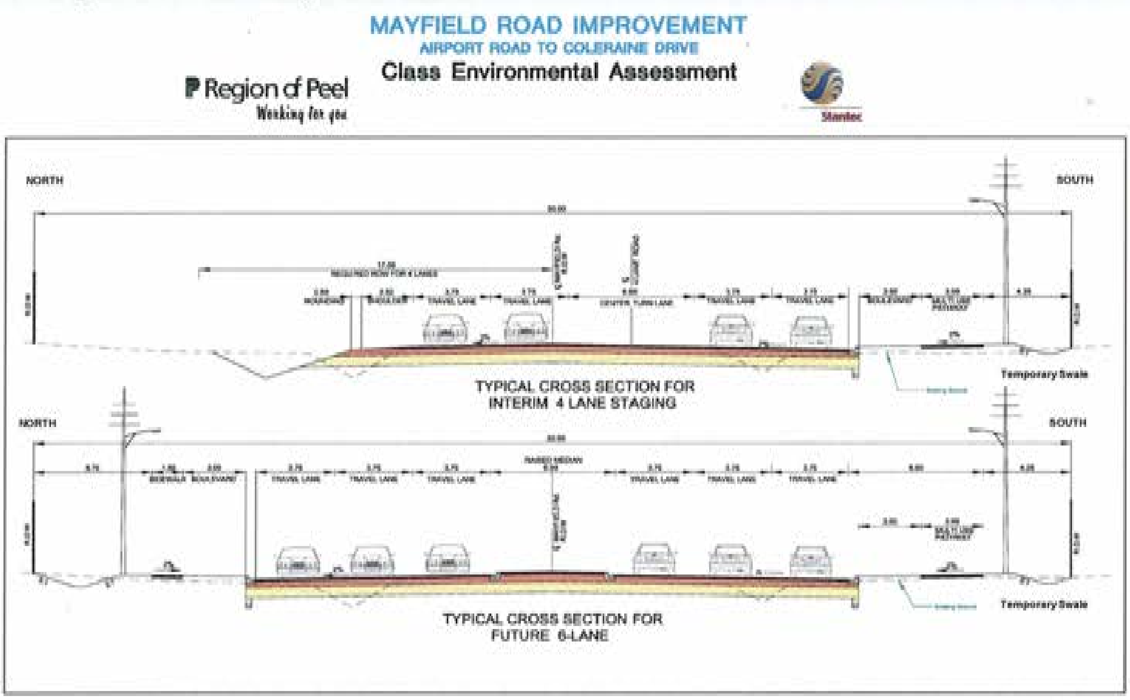
- ☑ **Access Management**
- ☑ **Intersection Improvements**
- ☑ **Transportation Demand Management**

The Traffic Study examined the effect of improvements to the corridor including:

- **Proposed upgrades to transit services and active transportation facilities; and,**
- **Upgrades to other routes and the addition of new routes/roadways.**

Development of Alternative Design Concepts

Widening of Mayfield Road will be completed in stages with construction of four lanes initially, and six lanes by 2031 (projected). Regardless of staging, property acquisition and utility relocations would be completed initially to accommodate the ultimate six lane configuration on Mayfield Road.



Cross Section Illustrating Staging of Widening

MAYFIELD ROAD IMPROVEMENT

AIRPORT ROAD TO COLERAINE DRIVE

Class Environmental Assessment

Region of Peel
Working for you

Stantec

FEEDBACK RECEIVED AFTER PUBLIC INFORMATION CENTRE NO. 1

Comment/Concern	Response	Action
• Safe access onto Mayfield Road, if widened	• Safety is of primary concern • Design proposal and options considered will be presented at PIC#2 and will address safe access	• Acceptable design standards and guidelines applied to all aspects of the work • Individual driveway / entrance access sight distances reviewed
• Safe access on to Mayfield Road	• Safety is of primary concern	• Same as above
• Property impacts and a decrease in value of property if road widened	• Potential solutions examined and presented at PIC#2	• Various alternatives considered. Options refined to minimize overall impact on property
• Request to consult stakeholders separately as a Resident's Opinion Group for Wildfield	• Region staff willing to meet with group and listen to concerns / comments	• PIC#2 is an opportunity to present the recommended solution and receive feedback and input
• Memorial signage and garden at one corner in Wildfield	• Staff held meetings with various stakeholders. Region will address in archaeological assessment/built heritage report	• Preliminary landscaping plans have considered streetscape elements and possible entrance features
• Retention of historic house located at 11962 The Gore Road	• Will be addressed in built heritage assessment and presented at PIC#2	• Options considered and recommendations made

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment
Evaluation Criteria
Alternative Design Concepts

Region of Peel
Working for you

Stantec

Study Element	Criteria
1. Traffic Capacity, Operations & Safety	
Existing Traffic	*How does the alternative serve the currently volume of vehicular, pedestrian, transit and cycling traffic?*
Forecasted Traffic/ Transportation Network	*Does the alternative accommodate forecasted traffic to/from existing and future planned developments and properties?* *Will the alternative address the transportation network demand needs and be compatible with other transportation plans?*
Safety	*Does the alternative address identified traffic safety issues along the corridor or at specific locations?*
Access Management	*What effect will the alternative have on traffic access to properties fronting on Mayfield Road?*
Transportation Demand Management (transit, cycling and pedestrian provisions)	*How does the alternative serve future transit, cycling and pedestrian needs?*
Emergency Services	*How does the alternative affect emergency service response times?*
2. Natural Environment	
Aquatic Habitat, Fisheries and Surface Water	*How does the alternative affect the aquatic life and aquatic habitats contained within the various watercourses crossing Mayfield Road?*
Terrestrial Habitat	*How does the alternative affect existing vegetation, i.e. trees and woodlots?*
Floodplain	*What effect would the alternative have on the flood plains of various watercourses?*
Wetlands	*What impact does the alternative have on any wetlands within the project area?*
Trees (Landscaping)	*Are there any impacts to existing tree plantings and tree canopies within the study limits?*
Wildlife	*What are the effects of the alternative on wildlife including species at risk and endangered species?*
Property Contamination	*Are there any known or potentially contaminated sites that require further investigation, and how will they affect any improvements or land transactions?*
Storm Water Management	*Are storm water management facilities required and what impact do they have on property requirements and the environment?*

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Evaluation Criteria for Alternative Design Concepts (continued)

Stantec

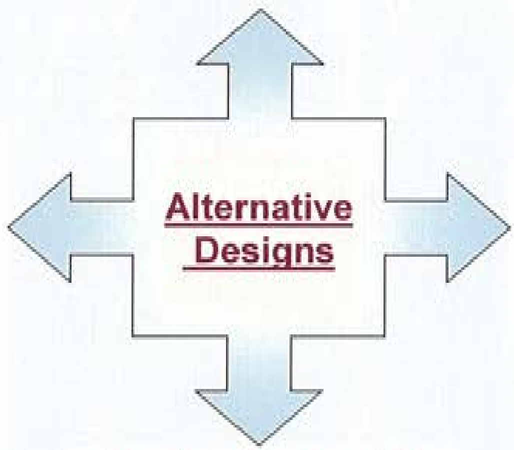
Study Element	Criteria
3. Social Environment	
Heritage and Archaeological Impacts	*What impact does the alternative have on the following: Built* Heritage Resources and Features, Cultural Landscapes, and Archaeological significance?
Cultural & Recreational	*Are there any cultural or recreational institutions within the project area that may be affected by the alternative?*
Business Impacts	*How would the alternative affect existing businesses and how will businesses be affected during construction?*
Construction Impacts	*Is it constructible? How long will construction take?*
Streetscaping	*Can the alternative incorporate streetscaping features to maintain and enhance the character of the community?*
Private Property Impacts	*How Does the alternative impact residential and commercial properties along the corridor?* *How much property will be required, if any , for the alternative?*
Air Quality & Noise	*What effect does the alternative have on air quality and noise levels within the project area?*
4. Costs	
Utility Relocation	*What would be the extent of impacts on existing utilities that must be relocated and/or protected to construct the alternative?*
Initial Capital Cost	*What is the initial capital cost of the alternative?*
Restoration/Environmental Cost	*What are the costs as a result of restoration or compensation as a result of loss of the environmental habitat?*

Alternative Design Concepts

Four main alternative design concepts were developed to accommodate the ultimate six lane widening on Mayfield Road.

Design Concept 1

Widen equally about the centre line



Design Concept 4

Modified equal widening concept optimized to minimize property impacts and avoid identified heritage resources

Design Concept 2

Widen entirely to the north side

Design Concept 3

Widen entirely to the south side

The following display boards illustrate the 4 alternative design concepts. The first three boards illustrate the relative cross sections for the concepts that have been screened out and the larger plan and profile display drawings represent the preliminary preferred design alternative.

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Technical Reports

Stantec

KEY FINDINGS

Built Heritage and Cultural Assessment Report

- Designs should avoid impacts to any identified cultural heritage resources to the greatest extent possible.
- Avoid impacts to pioneer cemeteries located at Airport Road and Mayfield Road (St. Mary's Anglican Cemetery), and The Gore Road and Mayfield Road (St. Patrick's Cemetery).
- Wherever possible, landscape with historic plant materials for berms and screens.

Cultural Heritage Impact Assessment Report for 11962 the Gore Road

- Proposed intersection improvements should avoid impacts to both the cemetery and the residence if possible.
- If the structure cannot be preserved in situ, relocate the structure within its current property limits.
- If the structure cannot be relocated within its current property limits, relocate where possible within Wildfield.
- If structure is demolished, prepare photographic documentation for archiving and install a commemorative plaque on site.

Stage 1 and Stage 2 Archaeology Reports

- The Stage 1 archaeological report concluded that the existing Mayfield Road right of way generally does not retain archaeological site potential due to previous road and residential disturbances. Additional archaeological assessment is not required, and that portion of the study corridor can be cleared of further archaeological concern.
- A Stage 2 archaeological assessment should be conducted on lands outside the existing road allowance if impacted by construction. Stage 2 assessments are presently being undertaken where future construction impacts are expected.

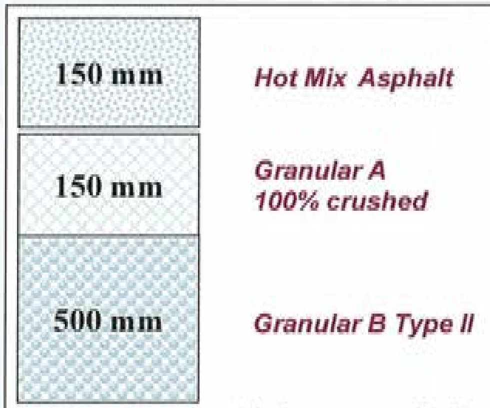
Stage 3 Archaeology Report

- A Stage 3 archaeological assessment (Cemetery Investigation test dig) will be conducted within the right-of-way adjacent to St. Patrick's cemetery to confirm the presence or absence of unmarked graves beyond the cemetery limits. This action will be conducted following Public Information Centre No. 2.

Technical Reports

KEY FINDINGS (continued)

Geotechnical (Soils) and Pavement Assessment



Pavement profile for areas of full reconstruction

- Recommended pavement structure is illustrated to the left.
- Existing pavement is adequate for design traffic conditions and can be reused when maintaining existing profile and elevation.
- Areas of widening to have a similar pavement structure as existing pavement.

Hydrogeological Study

- Groundwater will likely be encountered in some areas during construction. All permit requirements will be documented in the final ESR and secured during detailed design.
- A baseline monitoring program is recommended during construction for any domestic wells that remain as a water supply.
- All four road design concepts have similar impacts, and would be viable from a hydrogeological perspective.

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Technical Reports

Stantec

KEY FINDINGS (continued)

Culvert Structural Report & Replacement Recommendations

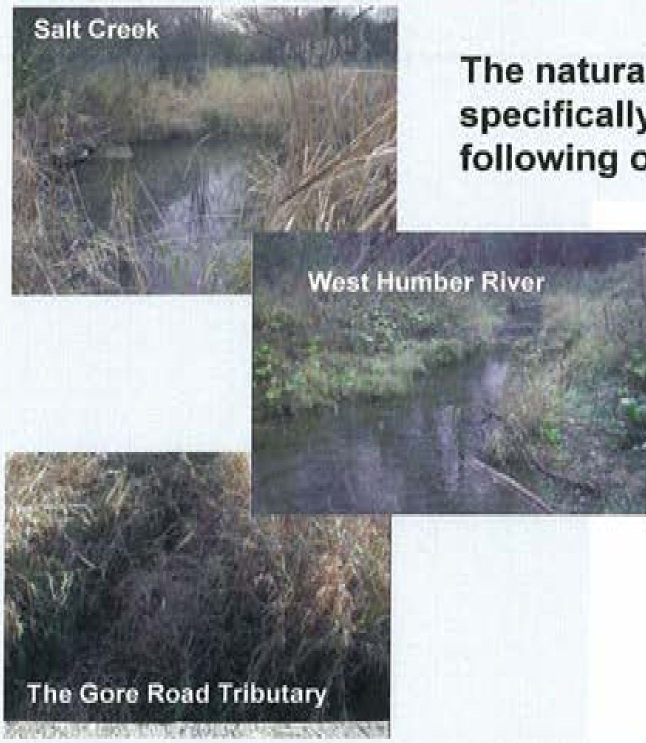
- **sixteen culvert crossings and several minor local culvert crossings identified.**
- **twelve of the sixteen culverts to be extended and replaced entirely to accommodate the proposed widening.**
- **four culverts to require extensions; three of which are concrete rigid frame structures.**
- **two rigid frame structures to be replaced due to hydraulic and alignment requirements (see locations 5 and 12 on the plan).**
- **several culverts to be replaced based solely on current condition. All Corrugated Steel Pipe (CSP) culverts will be replaced or upgraded.**
- **hydraulic analysis, meander belt analysis and 100 year erosion analysis are being finalized and will confirm appropriate preliminary culvert sizing and related property impacts and provisions.**

All of the proposed culverts will meet the Regional storm event criteria without overtopping the roadway.

Technical Reports

KEY FINDINGS (continued)

Natural Environment Assessment

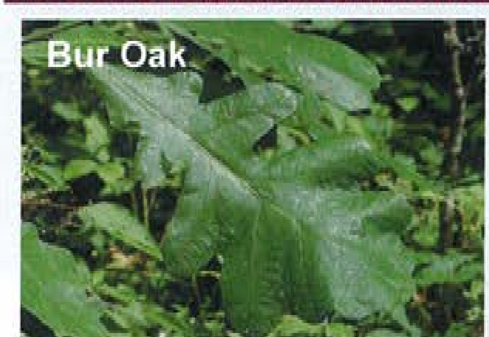


The natural environment investigation undertaken specifically for this assignment has resulted in the following observations:

- **No impacts to woodland areas or significant vegetation communities.**
- **Culvert extensions and resultant stream works will impact Redside Dace communities in three of the watercourses and permits will be required for all watercourses.**
- **Some non-provincially significant wetland areas will be impacted by all alternatives.**

Mitigation measures are to include best practices for erosion and sediment controls during construction, delineation and protection of sensitive areas, and adequate communications and control of measures required to protect the natural environment and related resources.

Tree and Vegetation Inventory Assessment



No rare or endangered tree or vegetation species were observed within the project area. Trees species are detailed in the tree inventory data summary report and are predominantly in good condition with high preservation priority.

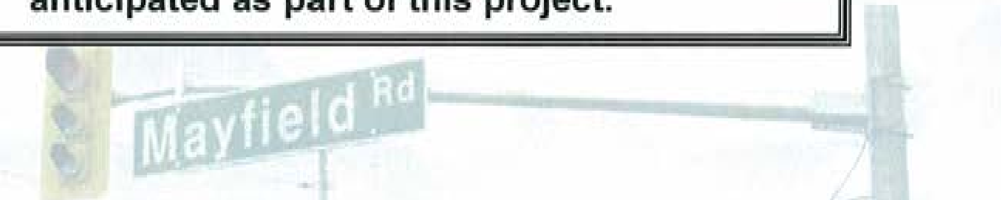
Technical Reports

KEY FINDINGS (continued)

Acoustic Assessment

- Future noise impacts were assessed for existing reverse frontage lots adjacent to Mayfield Road.
- Seven receptors were used to predict the noise impacts
- The predicted future no build noise levels (without road widening) will exceed the desired threshold of 60dB in outdoor living areas.
- The future build noise levels (with road widening) will increase marginally by 1- 2 dB, which is generally considered an imperceptible change.
- Noise mitigation measures were recommended and provided for existing subdivision development as part of the development planning process.

Supplementary noise attenuation measures are not anticipated as part of this project.

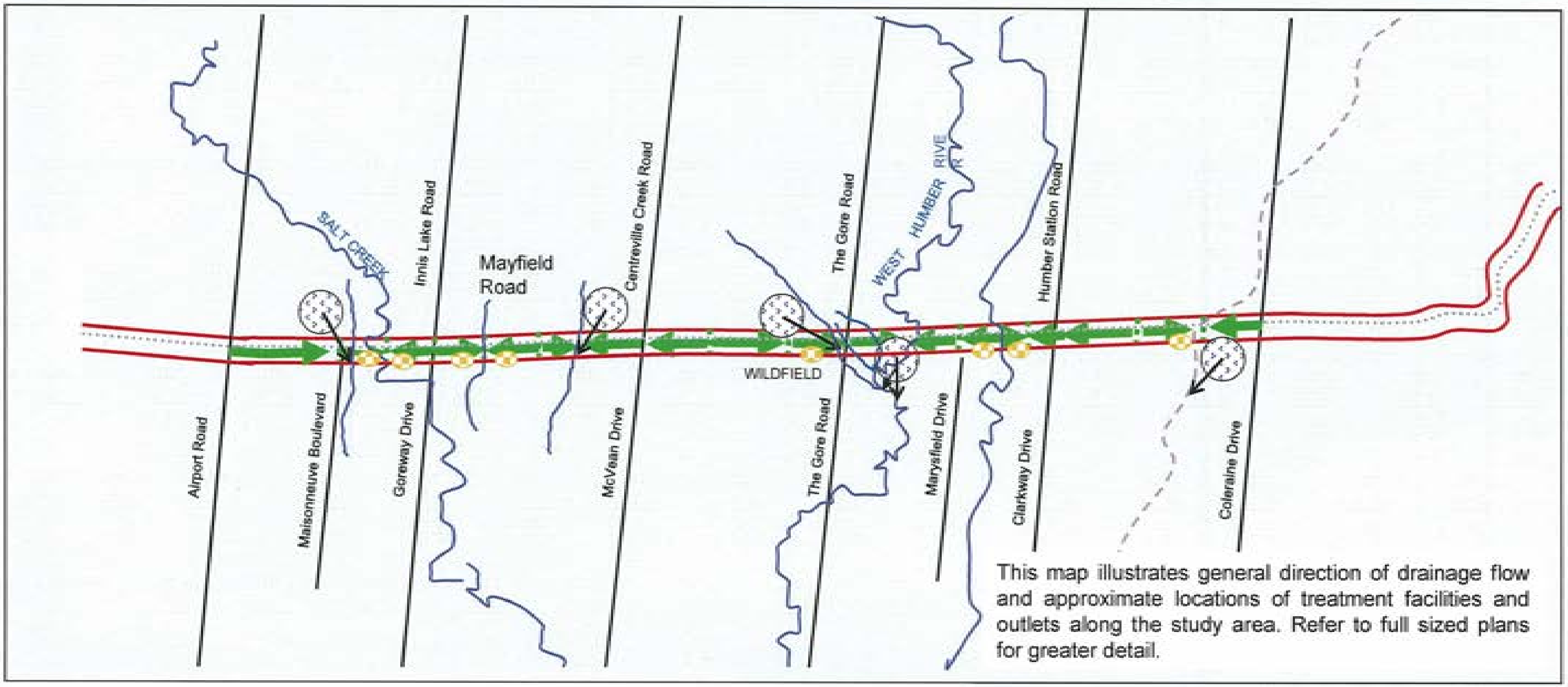


MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Technical Reports
Drainage and Storm Water Management

Storm water quality and quantity control will occur through a combination of storm water management basins, oil/grit separators and enhanced roadside ditches providing water quality control as follows:

- **Five Storm Water Management (SWM) basins are proposed over the entire length of the corridor.**
- **Eight oil-grit separator units are proposed along the corridor to improve storm water run-off quality.**



Legend:

- Direction of flow of water on roadway
- Direction of flow from SWM basin
- Storm Water Management (SWM) basin for water quality and quantity control
- Oil and grit separator for water quality control

ALTERNATIVE DESIGN CONCEPTS 1-4

Including the following:

CROSS SECTIONS FOR CONCEPTS 1-4

ROLL PLAN & PROFILES FOR PREFERRED CONCEPT 4 MODIFIED

OVERALL PROPERTY IMPACT PLAN

AERIAL PHOTOGRAPH AT REDUCED SCALE FOR OVERALL CONTEXT

FULL DRAWINGS TO BE INSERTED

THE GORE ROAD DESIGN CONCEPT

FULL DRAWINGS TO BE INSERTED

MAYFIELD ROAD IMPROVEMENT

AIRPORT ROAD TO COLERAINE DRIVE

Class Environmental Assessment

Region of Peel
Working for you

Stantec

Preliminary Alternative Design Concepts

NOTE: ALL ALTERNATIVES INCLUDE WIDENING MAYFIELD ROAD TO SIX LANES, A CENTRE TWO WAY LEFT TURN LANE AND MEDIAN ISLANDS AT INTERSECTIONS				
EVALUATION CRITERIA	DESIGN CONCEPT NO. 1 WIDENING EQUALLY ABOUT EXISTING CENTRELINE	DESIGN CONCEPT NO. 2 WIDENING TO THE NORTH	DESIGN CONCEPT NO. 3 WIDENING TO THE SOUTH	DESIGN CONCEPT NO. 4 MODIFIED "EQUAL WIDENING CONCEPT" TO MINIMIZE PROPERTY IMPACTS
LEGEND:	LEAST PREFERRED ○ (0 Pts.) (quarter-filled circle) (1 Pts.) (half-filled circle) (2 Pts.) (three-quarter-filled circle) (3 Pts.) MOST PREFERRED ● (4 Pts.)			
1. Traffic Capacity, Operations, Safety				
Existing Traffic How does the alternative serve the current volume of vehicular, pedestrian and cycling traffic?	● A widened Mayfield Road including multi-use trail on south side and sidewalk on north side will serve the current vehicle, pedestrian and cycling needs			
Forecasted Traffic/ Transportation Network Does the alternative efficiently and safely handle the forecasted traffic?	● Six (6) through lanes plus turn lanes will handle forecasted traffic volumes to 2031			
Safety Does the alternative address identified traffic safety issues along the corridor or at specific locations?	● Centre two-way left turn lane provided in all locations except near intersections, where dedicated turn lanes are provided Vertical profile improvements proposed to address sight distance issues Widening and reconstruction of roadway to address pavement condition			
Access Management What effect will the alternative have on traffic access to properties fronting on Mayfield Road?	● All existing accesses maintained with full left and right turn access by means of a centre two-way left turn lane, except near intersections where the centre median is required to minimize turning conflicts near intersections/traffic signals.			
Transportation Demand Management **Transit** How does the alternative serve future transit needs?	● Proposed transit volumes incorporated into traffic forecasts. Proposed transit stops incorporated into design.			
Cycling How does the alternative serve future cycling needs?	● 3 metre wide multi-use cycling trail to be constructed on south side of new Mayfield Road right-of-way			
Pedestrians How does the alternative serve future pedestrian traffic needs?	● Room for sidewalk to be constructed on north side of right-of-way			
Emergency Services How does the alternative improve Emergency Service Response times?	● Emergency response times will improve due to additional lanes and related reductions in delays/congestion.			
Traffic Score	32 Points	32 Points	32 Points	32 Points

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Preliminary Alternative Design Concepts

NOTE: ALL ALTERNATIVES INCLUDE WIDENING MAYFIELD ROAD TO SIX LANES, A CENTRE TWO WAY LEFT TURN LANE AND MEDIAN ISLANDS AT INTERSECTIONS				
EVALUATION CRITERIA	DESIGN CONCEPT NO. 1 WIDENING EQUALLY ABOUT EXISTING CENTRELINE	DESIGN CONCEPT NO. 2 WIDENING TO THE NORTH	DESIGN CONCEPT NO. 3 WIDENING TO THE SOUTH	DESIGN CONCEPT NO. 4 MODIFIED "EQUAL WIDENING CONCEPT" TO MINIMIZE PROPERTY IMPACTS
LEGEND:	LEAST PREFERRED ○ (0 Pts.) ◔ (1 Pts.) ◑ (2 Pts.) ◕ (3 Pts.) MOST PREFERRED ● (4 Pts.)			
2. Natural Environment				
Aquatic Habitat, Fisheries, and Surface Water How does the alternative affect the aquatic life and aquatic habitats contained within the various watercourses crossing Mayfield Road?	◑ Culvert widening is required on both sides of Mayfield Road, and has slightly more impact on aquatic habitat than a widening to one side. However overall impacts to streams are similar for all alternatives. All impacts can be mitigated.	● Culvert widening is only required on north side of Mayfield Road, and has slightly less impact on aquatic habitat than all the other alternatives widening to one side. However overall impacts to streams are similar for all alternatives. All impacts can be mitigated.	◕ Culvert widening is only required on south side of Mayfield Road, and has slightly more impact on aquatic habitat than Concept 2. However overall impacts to streams are similar for all alternatives. All impacts can be mitigated.	◑ Culvert widening is required on both sides of Mayfield Road, and has slightly more impact on aquatic habitat than a widening to one side. However overall impacts to streams are similar for all alternatives. All impacts can be mitigated.
	◑ Culvert/bridge widening will require approval from TRCA Will require mitigation of impacts to redside dace at some watercourses			
Terrestrial Habitat (Natural) How would the alternative affect existing vegetation (i.e. trees & woodlots) and bird/animal habitat within the project area?	● No impacts to significant woodland areas or vegetation communities. Vegetation removal is limited to cultural woodland or cultural thicket communities and landscape trees.			
Floodplain What effect would the alternative have on the flood plain of various watercourses?	◑ Culvert widening will occur on both sides of Mayfield Road	◕ Culvert widening will occur on north side of Mayfield Road only.	◕ Culvert widening will occur on south side of Mayfield Road only.	◑ Culvert widening will occur on both sides of Mayfield Road
	◑ All alternatives including culvert widening and replacements will have impacts on the floodplains and will require TRCA approval. Twelve (12) culvert replacements required			
Wetlands What impacts does the alternative have on any evaluated wetlands within the project area?	◔ Several non-provincially significant wetland pockets will be impacted by all alternatives. This alternative has slightly more impacts to wetlands than Concept 2 (widening to the north). All impacts are mitigable.	◕ Several non-provincially significant wetland pockets will be impacted by all alternatives. This alternative has slightly less impacts to wetlands than the other Concepts. All impacts are mitigable	◔ Several non-provincially significant wetland pockets will be impacted by all alternatives. This alternative has slightly more impacts to wetlands than Concept 2 (widening to the north). All impacts are mitigable.	◔ Several non-provincially significant wetland pockets will be impacted by all alternatives. This alternative has slightly more impacts to wetlands than Concept 2 (widening to the north). All impacts are mitigable.
	◑ Hydrogeological impacts are similar for all alternatives, and are mitigable.			
Trees (Landscaping) Are there any impacts to existing tree plantings and tree canopy within the project area?	● Least impact on individual property landscaping.	◑ More impact on Individual property landscaping as compared to Concepts1 & 4.	More impact on Individual property landscaping as compared to Concepts1 & 4.	● Least impact on individual property landscaping.
	● No significant existing landscape trees on existing road allowance. Trees that need to be removed can be replaced during construction, with enhanced plantings.			
Wildlife What are the effects of the alternative on "Species At Risk/Endangered Species" within the project area?	◑ Will require mitigation of impacts to redside dace in three of the tributaries, if the streambed is disturbed. These measures include improved water quality through SWM and enhanced erosion control, restore riparian vegetation cover through the planting of overhanging grasses, shrubs, etc., and undertake no in-water work between September 15th and June 30th.			

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Preliminary Alternative Design Concepts

Stantec

NOTE: ALL ALTERNATIVES INCLUDE WIDENING MAYFIELD ROAD TO SIX LANES, A CENTRE TWO WAY LEFT TURN LANE AND MEDIAN ISLANDS AT INTERSECTIONS				
EVALUATION CRITERIA	DESIGN CONCEPT NO. 1 WIDENING EQUALLY ABOUT EXISTING CENTRELINE	DESIGN CONCEPT NO. 2 WIDENING TO THE NORTH	DESIGN CONCEPT NO. 3 WIDENING TO THE SOUTH	DESIGN CONCEPT NO. 4 MODIFIED "EQUAL WIDENING CONCEPT" TO MINIMIZE PROPERTY IMPACTS
LEGEND:	LEAST PREFERRED ○ (0 Pts.) ◔ (1 Pts.) ◑ (2 Pts.) ◕ (3 Pts.) MOST PREFERRED ● (4 Pts.)			
Property Contamination Are there any known or potentially contaminated sites that require further investigation, and how will they affect any improvements?	◑ Gas Station at North East corner of Mayfield & The Gore Road is impacted, and property is required from them. Additional ESA Investigation required. No other contaminated properties identified, but additional ESA's should be undertaken where potential environmental impacts are suspected, based on historic land uses.			
Storm Water Management Are stormwater management ponds required?	● A combination of 5 storm water management (SWM) ponds and 8 oil/grit separators are planned.			
	◑ A total of 4.20 ha of private property is required for SWM ponds	◑ A total of 3.86 ha of private property are required for SWM ponds.	◑ A total of 4.03 ha of private property is required for SWM ponds	◑ A total of 4.63 ha of private property is required for SWM ponds
Natural Environment Score	33 Points	36 Points	33 Points	33 Points
3. Social Environment				
Heritage and Archaeological Impacts What impact does the alternative have on the following; Built Heritage Resources and Features, Cultural Heritage Landscapes and Archaeological Impacts?	◑ St. Patrick's Cemetery not impacted. Stage 3 investigation (test dig) will be completed before the detailed design phase. Character of "Historic Settlement of Wildfield" will be impacted due to removal of some existing houses, but plaque/entrance feature can be incorporated into the design. 11962 The Gore Road (BHF) will be impacted the same by all alternatives as the cross section on th South leg of The Gore Road must provide for future traffic volumes and as such is increased to four lanes with turn lanes. The options including relocation are discussed in the HIA. 12031 The Gore Road (BHF) is closer to the new road for all alternatives.			
Encroachment on St. Patrick's Cemetery at Mayfield Road Frontage	◔ 2nd most encroachment on St. Patrick's Cemetery due to shift to south within corridor.	◑ 2nd least encroachment on St. Patrick's Cemetery due to shift to north within corridor.	○ Most encroachment on St. Patrick's Cemetery due to shift to south within corridor.	● Least encroachment on St. Patrick's Cemetery due to modified lanes and shift to north within corridor.
Cultural & Recreational Are there any cultural or recreational institutions with the project area that may be affected by this alternative?	◑ St. Patrick's Church will be in construction zone, but access can be maintained during construction. No other cultural or recreational impacts are anticipated.			
Business Impacts How will the alternative affect existing businesses, and how will businesses be affected during construction	● Less Impact on business properties than Concept No.2	◑ Property requirements intrude into parking lot of business at northeast corner of Mayfield/Innis Lake Rd.	● Less Impact on business properties than Concept No.2	● Less Impact on business properties than Concept No.2
Any businesses affected by a particular alternative?	◑ Gas Station near Northeast corner of Mayfield/The Gore Road is severely impacted by all alternatives, and a full buyout is anticipated. Traffic projections have incorporated anticipated traffic from future developments in the area. Less congestion may improve overall future access to businesses. Will be disruption during construction but access will be maintained.			

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Preliminary Alternative Design Concepts

Stantec

NOTE: ALL ALTERNATIVES INCLUDE WIDENING MAYFIELD ROAD TO SIX LANES, A CENTRE TWO WAY LEFT TURN LANE AND MEDIAN ISLANDS AT INTERSECTIONS				
EVALUATION CRITERIA	DESIGN CONCEPT NO. 1 WIDENING EQUALLY ABOUT EXISTING CENTRELINE	DESIGN CONCEPT NO. 2 WIDENING TO THE NORTH	DESIGN CONCEPT NO. 3 WIDENING TO THE SOUTH	DESIGN CONCEPT NO. 4 MODIFIED "EQUAL WIDENING CONCEPT" TO MINIMIZE PROPERTY IMPACTS
LEGEND:	LEAST PREFERRED ○ (0 Pts.) ◔ (1 Pts.) ◑ (2 Pts.) ◕ (3 Pts.) MOST PREFERRED ● (4 Pts.)			
Construction Impacts Is it constructible and how long will construction take?	◑ Traffic will be able to be maintained by constructing the north side, then the south side (or vice versa) while maintaining traffic on existing pavement or newly constructed pavement. Construction will likely proceed in stages (i.e. between major intersection possibly one block at a time), with construction taking approximately 1+ year for each stage.			
Streetscaping Can the alternative incorporate streetscaping features to maintain and enhance the character of the community?	● Opportunities for Streetscaping exist within the new designated road allowance including plantings, decorative paving materials, decorative streetlights, etc.			
Private Property Impacts • How does the alternative impact the residential and commercial properties along the corridor? • How much property will be required?	◑ 23 existing buildings are impacted the majority of which may require a complete buyout. Including buyouts, the total of impacted property is 27.98 ha of which 16.47 ha is to accommodate the works including 4.20 ha for SWM ponds, enhanced swales and culvert extensions. Portions of 137 Private Properties need to be purchased.	○ 33 existing buildings are impacted the majority of which may require a complete buyout. Including buyouts, the total of impacted property is 40.61 ha of which 17.11 ha is to accommodate the works including 3.86 ha for SWM ponds, enhanced swales and culvert extensions. Portions of 104 Private Properties need to be purchased.	◔ 22 existing buildings are impacted the majority of which may require a complete buyout. Including buyouts, the total of impacted property is 39.67 ha of which 18.08 ha is to accommodate the works which includes 4.03 ha for SWM ponds, enhanced swales and culvert extensions. Portions of 83 Private Properties need to be purchased.	◕ 17 existing buildings are impacted the majority of which may require a complete buyout. Including buyouts, the total of impacted property is 28.26 ha of which 17.96 ha is to accommodate the works which includes 4.62 ha for SWM ponds, enhanced swales and culvert extensions. Portions of 133 Private Properties need to be purchased.
Air Quality & Noise What effect does the alternative have on air quality and noise within the project area?	◑ A reduction in overall traffic delay and related vehicle idling will result in reduced exhaust air emissions and, as a result, should provide improved overall Air quality. Predicted Noise levels will increase due to projected traffic volume and will increase only marginally as a result of road widening. Predicted increase is 1 to 2 dB due to build-out scenario; All options are the same in the area of existing development at Maissoneuve Boulevard.			
Social Score	21 Points	18 Points	19 Points	25 Points

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel *Working for you*

Preliminary Alternative Design Concepts

Stantec

NOTE: ALL ALTERNATIVES INCLUDE WIDENING MAYFIELD ROAD TO SIX LANES, A CENTRE TWO WAY LEFT TURN LANE AND MEDIAN ISLANDS AT INTERSECTIONS

EVALUATION CRITERIA	DESIGN CONCEPT NO. 1 WIDENING EQUALLY ABOUT EXISTING CENTRELINE	DESIGN CONCEPT NO. 2 WIDENING TO THE NORTH	DESIGN CONCEPT NO. 3 WIDENING TO THE SOUTH	DESIGN CONCEPT NO. 4 MODIFIED "EQUAL WIDENING CONCEPT" TO MINIMIZE PROPERTY IMPACTS
LEGEND:	LEAST PREFERRED ○ (0 Pts.) ◔ (1 Pts.) ◑ (2 Pts.) ◕ (3 Pts.) MOST PREFERRED ● (4 Pts.)			
4. Costs				
Utility Impacts What would be the extent of impacts on existing utilities that must be relocated and/or protected to construct the alternative?	◔ Hydro/Communication poles on both sides of Mayfield Rd. Approximately 195 Hydro poles will have to be relocated under this alternative at approx. cost of approx. $975,000.	◑ Hydro/Communication poles on both sides of Mayfield Rd. Approximately 120 Hydro poles will have to be relocated under this alternative at approx. cost of approx. $600,000.	◑ Hydro/Communication poles on both sides of Mayfield Rd. Approximately 125 Hydro poles will have to be relocated under this alternative at approx. cost of approx. $625,000.	◔ Hydro/Communication poles on both sides of Mayfield Rd. Approximately 190 Hydro poles will have to be relocated under this alternative at approx. cost of approx. $935,000.
	◑ No significant impacts to existing underground gas lines, watermains, sewers or communications cables, anticipated other than minor relocations, adjustments to manholes, etc.			
Initial Capital Cost What is the estimated initial capital cost of the alternative? (including utility relocations and property acquisition/ decommissioning)	● Preliminary Cost Estimate including the following: • Property Acquisition • Utility Relocations • Road and Drainage Works • Signals/Illumination/ • Roadside Protection and Line Markings • Bridges & Culvert Extensions and Replacement • Landscaping/Trails/Sidewalks • Engineering TOTAL (Excl. HST) $107,047,000	◑ Preliminary Cost Estimate including the following: • Property Acquisition • Utility Relocations • Road and Drainage Works • Signals/Illumination/ • Roadside Protection and Line Markings • Bridges & Culvert Extensions and Replacement • Landscaping/Trails/Sidewalks • Engineering TOTAL (Excl. HST) $125,913,000	◕ Preliminary Cost Estimate including the following: • Property Acquisition • Utility Relocations • Road and Drainage Works • Signals/Illumination/ • Roadside Protection and Line Markings • Bridges & Culvert Extensions and Replacement • Landscaping/Trails/Sidewalks • Engineering TOTAL (Excl. HST) $117,898.000	● Preliminary Cost Estimate including the following: • Property Acquisition • Utility Relocations • Road and Drainage Works • Signals/Illumination/ • Roadside Protection and Line Markings • Bridges & Culvert Extensions and Replacement • Landscaping/Trails/Sidewalks • Engineering TOTAL (Excl. HST) $106,421,000
Total Cost Score	7 Points	6 Points	7 Points	7 Points
Total Overall Score	93 Points	92 Points	91 points	97 Points

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel *Working for you*

Recommended Design Alternative

Stantec

Key Features of Design Concept No. 4:

1. **An urban cross-section with curb and gutter and storm sewers in all locations.**
2. **Access to existing properties with a centre two-way left turn lane will be maintained except for new intersections, where access may be limited to right-in, right-out, or where a median island is required for traffic signals.**
3. **A 3.0 m wide multi-use trail on the south side and 1.5m wide sidewalk on the north side.**
4. **Transit facilities at all intersections along the corridor.**
5. **Enhanced landscaping and gateway features at key locations within the corridor subject to safety, operational, property and utility review at detail design stage.**

ULTIMATE 6 LANES WITH MEDIAN (where access not required)

ULTIMATE 6 LANES WITHOUT MEDIAN

MAYFIELD ROAD IMPROVEMENT
AIRPORT ROAD TO COLERAINE DRIVE
Class Environmental Assessment

Region of Peel
Working for you

Stantec

WHAT ARE THE NEXT STEPS IN THE STUDY PROCESS ?

- Collect and review all public and agency comments received following this Public Information Centre;
- Address all comments and confirm the recommended design concept;
- Document the study findings and results and incorporate them along with the recommended design concept into an Environmental Study Report;
- Notify all stakeholders including the public and agencies of the recommended design and completion of the study; and,
- File the Environmental Study Report on the public record for a 30 day review period.

HOW WILL I RECEIVE FURTHER NOTIFICATION REGARDING THIS PROJECT ?

The notice of completion will be mailed to adjacent property owners and other members of the public registering at the Public Information Centers for this project. Advertisements will also be placed in local newspapers advising the public of the filing and locations for review of the final Environmental Study Report.

HOW CAN I PROVIDE COMMENT ON THE PROJECT TO DATE?

We encourage you to comment on the study and the work that has been completed to date by filling out the comment sheet today or by email/fax/letter to either of the contacts below by <u>November 30, 2011.</u>

Hitesh Topiwala, RPP, PMP
Project Manager, Transportation Division
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th floor
Brampton, ON L6T 4B9
hitesh.topiwala@peelregion.ca
fax: 905-791-1442
tel: 905-791-7800 x7805

John C. Bayley, P.Eng.
Manager, Transportation
Stantec Consulting
49 Frederick Street
Kitchener, ON N2H
john.bayley@stantec.com
fax: 519-579-4239
tel: 519-585-7112

THANK YOU FOR YOUR INTEREST AND PARTICIPATION!

07-4350-10

CLASS ENVIRONMENTAL ASSESSMENT STUDY MAYFIELD ROAD FROM CHINGUACOUSY ROAD TO HEART LAKE ROAD

FIRST PUBLIC INFORMATION CENTRE
November 30, 2011

QUESTIONNAIRE / COMMENT SHEET

Where do you live? ☐ Town of Caledon ☐ City of Brampton ☑ Other Dufferin-Peel Catholic District School Board.

1. My interest is? (check all applicable)
   - ☐ Direct access onto Mayfield Road
   - ☐ Residential property
   - ☐ Business/commercial
   - ☐ Industrial
   - ☐ Other (specify)

2. Do you have any comments on the study information to date or the recommended planning alternative?

We currently have no comments but wish to be on your notification list as recommended improvements to Mayfield may affect bussing routes to schools in the future.

3. If you would like us to contact you, please give us your name and address or telephone number or email:

Name: Stephanie Cox, Senior Planner
Address: 40 Matheson Blvd. West Miss. ON L5R 1C5
Telephone/Email: stephanie.cox@dpcdsb.org (905)890-0708 x24163

Thank you for participating in this study. For more information please visit our website at http:// http://www.peelregion.ca/pw/roads/environ-assess/mayfield-road-ea.htm. Please place your completed comment sheet in the comment box at the PIC or send to Mr. Neal Smith, Region of Peel, Project Manager (address below) by December 14, 2011.

Mr. Neal Smith, C.E.T.
Project Manager, Transportation Program Planning
Public Works, Region of Peel
10 Peel Centre Drive, 4th Floor, Suite B
Brampton, ON L6T 4B9
Tel: 905-791-7800 x7866 / Fax 905-791-1442
E-mail: neal.smith@peelregion.ca

Region of Peel
Working for you

1602 10480/37

MUNICIPAL FEEDBACK FROM BRAMPTON

Bayley, John

From: Zia, Solmaz [Solmaz.Zia@peelregion.ca]
Sent: Monday, March 07, 2011 10:45 AM
To: Bayley, John
Cc: Topiwala, Hitesh
Subject: FW: Hwy 50/ Mayfield Road EA 09-4390- PIC# 2 and other Documents

Brampton's comments

Solmaz Zia, P. Eng.
Project Manager, Project Planning & Studies
Region of Peel, Public Works
Tel: 905-791-7800 x7845 Fax: 905-791-1442
Solmaz.Zia@peelregion.ca
9445 Airport Road, 3rd Floor, Brampton, ON, L6S 4J3

From: Bobb, Compton [mailto:Compton.Bobb@brampton.ca]
Sent: March 4, 2011 11:31 AM
To: Zia, Solmaz
Subject: RE: Hwy 50/ Mayfield Road EA 09-4390- PIC# 2 and other Documents

Solmar:

Below are some comments on the PIC 2 and other project documents:

Tree Inventory Assessment Report

- Although there are no rare or endangered trees identified, this project is to consider <u>all</u> impacts to existing vegetation during the detailed design stage. ☑

PIC 2 Boards

- Both slides 22 &24, under Landscaping and Streetscaping should clearly speak to landscape plans being prepared during the detail design stage. ☑
- Slide 25, Bullet 8. Elaborate on what enhanced landscape features will be provided? i.e. Street trees, decorative paving, opportunities for "floral feature intersections". ☑

Drawings

- The Cross sections are to show proposed blvd trees on the south side of Mayfield Road. Ideally set back 1.0m-1.5m from far side of 3.0m Multipurpose trail, with an overall set back of 6.75m minimum from the curb. ☑
- Please ensure continuous facilities for pedestrians and cyclists along Mayfield Road (for example, a sidewalk platform on the north side and multi-use path on the south side, consistent with the EA further to the west). ☑

Question: What is the Town of Caledon position on boulevard street trees on the north side of Mayfield road? It is vital that both the City of Brampton's and the Town of Caledon's goals are achieved, all whilst ensuring the streetscape is complementary.

Slide 5: Please also include a discussion of population and employment figures (including projections) for the study area (Secondary Plan areas 49, 26, 50, and 47 in Brampton and neighbouring areas in Caledon). ☑

Slide 7 and 11:

- What is the source of the traffic counts on these slides, and what growth rate was used? A V/C ratio of 1.5 seems very high. Also, are traffic conditions stated those in a single direction (if so, please specify which)?
- Is the new north-south arterial road connection shown considered in this study? It should relieve some of the projected congestion. Consequently, the current Transportation and Transit Master Plan (TTMP) shows four lanes on Mayfield Road from the new north-south connection to Highway 50, rather than the six lanes shown here. In addition, the TTMP does not show a need for six lanes between Airport Road and Coleraine Dr until 2031.

Regards,

Compton Bobb, LEL
Project Engineer
Engineering and Construction
Works and Transportation
City of Brampton
Ph: 905 874 2581

TORONTO AND REGION
Conservation
for The Living City

March 3, 2011 CFN 39924

BY MAIL AND EMAIL (Solmaz.Zia@peelregion.ca)

Ms. Solmaz Zia
Region of Peel
3445 Airport Road, 3rd Floor
Brampton, ON L6S 4J3

Dear Ms. Zia:

Re: Response to Public Information Centre #2 Boards
Mayfield Road Improvements (Airport Road to Coleraine Drive)
Municipal Class Environmental Assessment (EA) - Schedule C
Humber River Watershed; City of Brampton, Town of Caledon; Regional Municipality of Peel

Toronto and Region Conservation Authority (TRCA) staff received the draft Public Information Centre #2 Boards, on March 1, 2011. It is our understanding that this project involves widening Mayfield Road from Airport Road to Coleraine Drive, and that the preferred alignment is concept 4 which involves widening equally about the centreline in most areas, and to the north or south in areas where property impacts are expected.

Staff has reviewed the PIC information and comments are provided in Appendix A. Please refer to our letter dated December 1, 2010 for comments on the alignment plans.

Should you have any questions please contact me at extension 5717 or by email at slingertat@trca.on.ca.

Yours truly,

Sharon Lingertat
Planner II, Environmental Assessments
Planning and Development

BY EMAIL
cc: TRCA: Beth Williston, Manager, Environmental Assessment Planning
Gary Wilkins, Humber River Watershed Specialist

F:\Home\Public\Development Services\EA\Letters for Mailing\39924 - PIC#2.doc

APPENDIX A

1. Page 8, Natural Environment Assessment, should be revised from "roadside dace" to "redside dace".

2. Page 13, Wetlands, indicates that the evaluation criterion only applies to evaluated wetlands. The evaluation criteria should consider all wetlands not just evaluated wetlands. Please revise and ensure that the evaluation matrix reflects these changes.

3. Page 13 indicates that the evaluation criterion only applies to species at risk or endangered species. The evaluation criteria should consider all species, not just species at risk or endangered species. A larger suite of wildlife will need to be considered in addition to redside dace. Please revise and ensure that the evaluation matrix reflects these changes.

4. Page 13 of the evaluation matrix states that "all impacts are mitigable" as it relates to aquatic habitat, fisheries and wetlands. It has not been demonstrated that all impacts will be mitigated nor does it seem likely that all impacts can be mitigated. Construction projects such as a road widenings have inherent impacts on natural systems. While efforts can be made to minimize impacts, they are almost never completely avoided. Please remove the statement "all impacts are mitigable" from the PIC materials.

5. Page 13, Stormwater Management, discusses possible property requirements for stormwater management ponds. Depending on the water treatment methodologies proposed, enhanced swales may also be required. Please ensure property requirements take this into account.

6. The Ministry of Natural Resources should be consulted regarding redside dace in relation to this work and the fisheries timing windows verified by MNR.

7. Page 2, Flood Plain, notes that culverts will have impacts on the flood plain. Please revise such that the table indicates, "culverts should not have any impacts on the flood plain."

8. Page 2, Wildlife, indicates that mitigation of impacts will be required to redside dace if the streambed is disturbed. Please consult with MNR for their requirements regarding mitigation of impacts to redside dace.

MAYFIELD ROAD
CLASS ENVIRONMENTAL ASSESSMENT STUDY
AIRPORT ROAD TO COLERAINE DRIVE
REGIONAL MUNICIPALITY OF PEEL

PUBLIC INFORMATION CENTRE #2
Wednesday, November 16, 2011

QUESTIONNAIRE / COMMENT SHEET

1. Where do you live? ☑ City of Brampton ☐ Town of Caledon

   ☐ Other ____________

2. My property interest is? (check all applicable)

   ☐ Direct access onto Mayfield Road ☑ Residential property

   ☐ Business/commercial ☐ Industrial

   ☐ Other (specify) ____________

3. How frequently do you use Mayfield Road between Airport Road and Coleraine Drive?

   ☑ Daily ☐ Weekly

   ☐ Monthly ☐ Rarely

4. Do you have any comments, concerns or suggestions regarding the evaluation of alternatives and the recommended preliminary design alternative?

① BUS ALCOVES OR BUS BAYS TO REDUCE TRAFFIC SLOWDOWNS ?

② NOISE AND DEBRIS BARRIERS ?

5. Please provide any additional questions or comments that you may have.

Thank you for participating in this study. For more information please visit our website at http://www.peelregion.ca/pw/roads/environ-assess/index-bram.htm. Please place your completed comment sheet in the Comment Box. You can also send it to Hitesh Topiwala, Region of Peel, Project Manager (see below for information) by Wednesday, November 30, 2011.

Hitesh Topiwala, RFP, PMP.
Project Manager, Transportation Division
Public Works, Region of Peel
10 Peel Centre Drive, 4th Floor
Brampton, ON L6T 4B9
Tel: 905-791-7800 – Ext. 7805/Fax 905-791-1442
Email: Hitesh.topiwala@peelregion.ca

Your Name: [redacted]

Address: 6443 MAYFIELD RD

Email/Telephone: [redacted]

Note: Comments and information regarding this project are being collected in accordance with the Municipal Freedom of Information & Protection of Privacy Act for the purpose of meeting environmental assessment requirements. With the exception of personal information, all comments will become a part of the public record.

MAYFIELD ROAD
CLASS ENVIRONMENTAL ASSESSMENT STUDY
AIRPORT ROAD TO COLERAINE DRIVE
REGIONAL MUNICIPALITY OF PEEL

PUBLIC INFORMATION CENTRE #2
Wednesday, November 16, 2011

QUESTIONNAIRE / COMMENT SHEET

1. Where do you live? ☑ City of Brampton ☐ Town of Caledon

   ☐ Other ______________________

2. My property interest is? (check all applicable)

   ☑ Direct access onto Mayfield Road ☑ Residential property

   ☐ Business/commercial ☐ Industrial

   ☐ Other (specify) ______________________

3. How frequently do you use Mayfield Road between Airport Road and Coleraine Drive?

   ☑ Daily ☐ Weekly

   ☐ Monthly ☐ Rarely

4. Do you have any comments, concerns or suggestions regarding the evaluation of alternatives and the recommended preliminary design alternative?

5. Please provide any additional questions or comments that you may have.

Thank you for participating in this study. For more information please visit our website at http://www.peelregion.ca/pw/roads/environ-assess/index-bram.htm. Please place your completed comment sheet in the Comment Box. You can also send it to Hitesh Topiwala, Region of Peel, Project Manager (see below for information) by Wednesday, November 30, 2011.

Hitesh Topiwala, RFP, PMP.
Project Manager, Transportation Division
Public Works, Region of Peel
10 Peel Centre Drive, 4th Floor
Brampton, ON L6T 4B9
Tel: 905-791-7800 – Ext. 7805/Fax 905-791-1442
Email: Hitesh.topiwala@peelregion.ca

Your Name: [redacted]

Address: 12052 The Gore Rd

Email/Telephone: [redacted]

Note: Comments and information regarding this project are being collected in accordance with the Municipal Freedom of Information & Protection of Privacy Act for the purpose of meeting environmental assessment requirements. With the exception of personal information, all comments will become a part of the public record.

Region of Peel
Working for you

MAYFIELD ROAD
CLASS ENVIRONMENTAL ASSESSMENT STUDY
AIRPORT ROAD TO COLERAINE DRIVE
REGIONAL MUNICIPALITY OF PEEL

PUBLIC INFORMATION CENTRE #2
Wednesday, November 16, 2011

QUESTIONNAIRE / COMMENT SHEET

1. Where do you live? ☐ City of Brampton ☑ Town of Caledon

   ☐ Other ____________________

2. My property interest is? (check all applicable)

   ☑ Direct access onto Mayfield Road ☐ Residential property

   ☐ Business/commercial ☐ Industrial

   ☐ Other (specify) ____________________

3. How frequently do you use Mayfield Road between Airport Road and Coleraine Drive?

   ☑ Daily ☐ Weekly

   ☐ Monthly ☐ Rarely

4. Do you have any comments, concerns or suggestions regarding the evaluation of alternatives and the recommended preliminary design alternative?

____

____

____

____

____

____

____

____

Region of Peel
Working for you

5. Please provide any additional questions or comments that you may have.

____

____

____

____

____

____

____

____

____

____

Thank you for participating in this study. For more information please visit our website at http://www.peelregion.ca/pw/roads/environ-assess/index-bram.htm. Please place your completed comment sheet in the Comment Box. You can also send it to Hitesh Topiwala, Region of Peel, Project Manager (see below for information) by Wednesday, November 30, 2011.

Hitesh Topiwala, RFP, PMP.
Project Manager, Transportation Division
Public Works, Region of Peel
10 Peel Centre Drive, 4th Floor
Brampton, ON L6T 4B9
Tel: 905-791-7800 – Ext. 7805/Fax 905-791-1442
Email: Hitesh.topiwala@peelregion.ca

Your Name: [redacted]

Address: 8082 Mayfield Road

Email/Telephone: [redacted]

Note: Comments and information regarding this project are being collected in accordance with the Municipal Freedom of Information & Protection of Privacy Act for the purpose of meeting environmental assessment requirements. With the exception of personal information, all comments will become a part of the public record.

MAYFIELD ROAD
CLASS ENVIRONMENTAL ASSESSMENT STUDY
AIRPORT ROAD TO COLERAINE DRIVE
REGIONAL MUNICIPALITY OF PEEL

PUBLIC INFORMATION CENTRE #2
Wednesday, November 16, 2011

QUESTIONNAIRE / COMMENT SHEET

1. Where do you live? ☐ City of Brampton ☑ Town of Caledon

   ☑ Other ________________________

2. My property interest is? (check all applicable)

   ☐ Direct access onto Mayfield Road ☐ Residential property

   ☐ Business/commercial ☐ Industrial

   ☐ Other (specify) ____________________

3. How frequently do you use Mayfield Road between Airport Road and Coleraine Drive?

   ☐ Daily ☐ Weekly

   ☐ Monthly ☐ Rarely

4. Do you have any comments, concerns or suggestions regarding the evaluation of alternatives and the recommended preliminary design alternative?

____

____

____

____

____

____

____

____

Region of Peel
Working for you

5. Please provide any additional questions or comments that you may have.

you would provide more information on Heavy Rd + the Central vill Creek II west south lot. now I have plans to make house - so please how the road widening plan
I will be glad to have more information for futur study
10th Nov 2011

Thank you for participating in this study. For more information please visit our website at http://www.peelregion.ca/pw/roads/environ-assess/index-bram.htm. Please place your completed comment sheet in the Comment Box. You can also send it to Hitesh Topiwala, Region of Peel, Project Manager (see below for information) by Wednesday, November 30, 2011.

Hitesh Topiwala, RFP, PMP.
Project Manager, Transportation Division
Public Works, Region of Peel
10 Peel Centre Drive, 4th Floor
Brampton, ON L6T 4B9
Tel: 905-791-7800 – Ext. 7805/Fax 905-791-1442
Email: Hitesh.topiwala@peelregion.ca

Your Name: [redacted]

Address: 6 Tigerlily Place.
Brampton Ont L6R 2C6

Email/Telephone:

Note: Comments and information regarding this project are being collected in accordance with the Municipal Freedom of Information & Protection of Privacy Act for the purpose of meeting environmental assessment requirements. With the exception of personal information, all comments will become a part of the public record.

MAYFIELD ROAD
CLASS ENVIRONMENTAL ASSESSMENT STUDY
AIRPORT ROAD TO COLERAINE DRIVE
REGIONAL MUNICIPALITY OF PEEL

PUBLIC INFORMATION CENTRE #2
Wednesday, November 16, 2011

QUESTIONNAIRE / COMMENT SHEET

1. Where do you ~~live?~~ LIVE & HAVE PROPERTY
   - ☑ City of Brampton ☑ Town of Caledon
   - ☑ Other ______________

2. My property interest is? (check all applicable)
   - ☑ Direct access onto Mayfield Road
   - ☐ Residential property
   - ☐ Business/commercial
   - ☐ Industrial
   - ☐ Other (specify) ______________

3. How frequently do you use Mayfield Road between Airport Road and Coleraine Drive?
   - ☑ Daily
   - ☐ Weekly
   - ☐ Monthly
   - ☐ Rarely

4. Do you have any comments, concerns or suggestions regarding the evaluation of alternatives and the recommended preliminary design alternative?

____
____
____
____
____
____
____
____

5. Please provide any additional questions or comments that you may have.

Thank you for participating in this study. For more information please visit our website at http://www.peelregion.ca/pw/roads/environ-assess/index-bram.htm. Please place your completed comment sheet in the Comment Box. You can also send it to Hitesh Topiwala, Region of Peel, Project Manager (see below for information) by Wednesday, November 30, 2011.

Hitesh Topiwala, RFP, PMP.
Project Manager, Transportation Division
Public Works, Region of Peel
10 Peel Centre Drive, 4th Floor
Brampton, ON L6T 4B9
Tel: 905-791-7800 – Ext. 7805/Fax 905-791-1442
Email: Hitesh.topiwala@peelregion.ca

Your Name: [redacted]

Address: 5923 MAYFIELD RD.
BRAMPTON L6R 0A8

Email/Telephone: [redacted]

Note: Comments and information regarding this project are being collected in accordance with the Municipal Freedom of Information & Protection of Privacy Act for the purpose of meeting environmental assessment requirements. With the exception of personal information, all comments will become a part of the public record.

MAYFIELD ROAD
CLASS ENVIRONMENTAL ASSESSMENT STUDY
AIRPORT ROAD TO COLERAINE DRIVE
REGIONAL MUNICIPALITY OF PEEL

PUBLIC INFORMATION CENTRE #2
Wednesday, November 16, 2011

QUESTIONNAIRE / COMMENT SHEET

1. Where do you live? ☑ City of Brampton ☐ Town of Caledon

   ☐ Other ____________________

2. My property interest is? (check all applicable)

   ☐ Direct access onto Mayfield Road ☑ Residential property

   ☐ Business/commercial ☐ Industrial

   ☐ Other (specify) ____________________

3. How frequently do you use Mayfield Road between Airport Road and Coleraine Drive?

   ☐ Daily ☑ Weekly

   ☐ Monthly ☐ Rarely

4. Do you have any comments, concerns or suggestions regarding the evaluation of alternatives and the recommended preliminary design alternative?

   Noise pollution
   Air pollution
   sound barriers
   Hydro poles
   Air brake signs posted?
   ⇒ Affects Kids

5. Please provide any additional questions or comments that you may have.

____

____

____

____

____

____

____

____

____

____

Thank you for participating in this study. For more information please visit our website at http://www.peelregion.ca/pw/roads/environ-assess/index-bram.htm. Please place your completed comment sheet in the Comment Box. You can also send it to Hitesh Topiwala, Region of Peel, Project Manager (see below for information) by Wednesday, November 30, 2011.

Hitesh Topiwala, RFP, PMP.
Project Manager, Transportation Division
Public Works, Region of Peel
10 Peel Centre Drive, 4th Floor
Brampton, ON L6T 4B9
Tel: 905-791-7800 – Ext. 7805/Fax 905-791-1442
Email: Hitesh.topiwala@peelregion.ca

Your Name: ______________________________

Address: ______________________________

____

Email/Telephone: ______________________________

Note: Comments and information regarding this project are being collected in accordance with the Municipal Freedom of Information & Protection of Privacy Act for the purpose of meeting environmental assessment requirements. With the exception of personal information, all comments will become a part of the public record.

Region of Peel
Working for you

Bayley, John

From: [redacted]
Sent: Thursday, November 03, 2011 8:26 PM
To: hitesh.topiwala@peelregion.ca; Bayley, John
Subject: Concerning the Meeting on November, 16, 2011

Hello,

This is Amrit Singh Aujla, owner of 11903 Airport Road, Brampton, Ontario, Canada. We had met before concerning my property on the corner and the amount of expropriation that has taken place or will be taking place. I want to also include the Peel Region expropriation authority, Owen Chimmery, said they might take more land for 6 lanes.

Here are my following questions I would like answered to better my understanding of the situation, with the help of your expertise.

1)Has the peel region already taken the land for 6 lanes from Dixie/Mayfield to Dixie/Airport? As you know, there is a massive Countryside Villages project that was approved, by amendment to the secondary plan. The Entire rectangular block from Airport/Dixie to Dixie/CountrySide to Airport/Countrysdie to Airport/Mayfield is going to be developed into a large scale block subdivision and commercial area. Have you taken the land or have plans to take this land for road widening from Dixie/Mayfield to Dixie/Airport(West side)?

2)How much has your transportation division of the peel region expropriated? Was it for 4 lanes or for 6 lanes? for my property on 11903 airport road.

3) In our last meeting, you mentioned that the current plan you showed me for road widening, said 50-60 m total wide, and 25-30m from the middle line of the road and extending out to both sides. I have forgotten was this for the 4 lanes or for the 6 lanes? Can you please clarify?

4)Can you give me the exact measurements from the middle of the line PLUS buffer - I need this information even in estimation to create my commercial budget from the ground up on how much land would I have.

4)Finally I know our properties on Airport/Mayfield are going to be amended in the secondary plan as commercial from employment lands, then we are going to apply for zoning(commercial) then site plan approval and leading to final building permit and physical construction. I know that if I place in a site plan, I have to give up that piece of land for the 6th lane + a buffer for free and no compensation since you will not grant me the permit to build. I want to know who I can talk to about this because I am not going to give away that piece of land without other forms of compensation, such as special commercial zoning, to allow me to build to 2 to 3 stories, or have a larger building foot print.

Looking forward to your response and your email,

Sincerely,

[redacted]

MAYFIELD ROAD
CLASS ENVIRONMENTAL ASSESSMENT STUDY
AIRPORT ROAD TO COLERAINE DRIVE
REGIONAL MUNICIPALITY OF PEEL

PUBLIC INFORMATION CENTRE #2
Wednesday, November 16, 2011

QUESTIONNAIRE / COMMENT SHEET

1. Where do you live? ☐ City of Brampton ☐ Town of Caledon

   ☐ Other ________________

2. My property interest is? (check all applicable)

   ☒ Direct access onto Mayfield Road ☒ Residential property

   ☐ Business/commercial ☐ Industrial

   ☐ Other (specify) ________________

3. How frequently do you use Mayfield Road between Airport Road and Coleraine Drive?

   ☐ Daily ☒ Weekly

   ☐ Monthly ☐ Rarely

4. Do you have any comments, concerns or suggestions regarding the evaluation of alternatives and the recommended preliminary design alternative?

   not at this time

5. Please provide any additional questions or comments that you may have.

noise, Debring Tree line, will then Be. plantion ?

Thank you for participating in this study. For more information please visit our website at http://www.peelregion.ca/pw/roads/environ-assess/index-bram.htm. Please place your completed comment sheet in the Comment Box. You can also send it to Hitesh Topiwala, Region of Peel, Project Manager (see below for information) by Wednesday, November 30, 2011.

Hitesh Topiwala, RFP, PMP.
Project Manager, Transportation Division
Public Works, Region of Peel
10 Peel Centre Drive, 4th Floor
Brampton, ON L6T 4B9
Tel: 905-791-7800 – Ext. 7805/Fax 905-791-1442
Email: Hitesh.topiwala@peelregion.ca

Your Name: [redacted]

Address: 5743 Bell HarBour DR. Miss ONT. 6 ?5 ? Road Rd. Brampton ONT.

Email/Telephone: [redacted]

Note: Comments and information regarding this project are being collected in accordance with the Municipal Freedom of Information & Protection of Privacy Act for the purpose of meeting environmental assessment requirements. With the exception of personal information, all comments will become a part of the public record.

APPENDIX D

NOTICE OF STUDY COMPLETION

Region of Peel
Working for you

Public Notice

Environmental Assessment Study

NOTICE OF STUDY COMPLETION FOR MAYFIELD ROAD (R.R. 14) FROM AIRPORT ROAD (R.R. 7) TO COLERAINE DRIVE, CITY OF BRAMPTON AND TOWN OF CALEDON

The Region of Peel has completed the Schedule “C” Municipal Class Environmental Assessment study for the improvements to Mayfield Road from Airport Road to Coleraine Drive, an approximate distance of 7.0 km, in the Region of Peel at the municipal boundary to the City of Brampton and the Town of Caledon (study area is shown on the map).

The Process

The project team received input from interested stakeholders, the public and agencies and at two Public Information Centres. The team evaluated various road improvement alternatives and assessed the potential environmental effects of the proposed improvements and developed reasonable means to mitigate any potential adverse impacts.

Key Elements of the Recommended Design

The study recommends:

- The phased widening of Mayfield road from 2 lanes to 6 lanes as follows:
  - 2 lanes to 4 lanes from Airport Road to Coleraine Drive by 2021;
  - 4 lanes to 6 lanes from Airport Road to future A2 Arterial Road by 2031
- Intersection improvements, transit facilities, as sidewalk and multi-use trail

Environmental Study Report (ESR)

An ESR has been prepared to document the planning and decision making process. The results of the study will be available for review for 30 calendar days starting on Monday, April 22, 2013 and ending Tuesday, May 21, 2013. The document is available for review at the following locations:

Region of Peel, Clerk’s Department
10 Peel Centre Drive
5th Floor, Suite A
Brampton, ON L6T 4B9
Phone: 905.791.7800 ext. 4526

City of Brampton, Clerk’s Department
2 Wellington Street West, 1st Floor
Brampton, ON L6Y 4R2
Phone: 905.874.2101

City of Brampton Public Library
Cyril Clark Branch
20 Loafers Lake Lane
Brampton, ON L6Z 1X9
Phone: 905.793.INFO(4636)
Mon. - Thurs. 10:00 a.m. – 9:00 p.m.
Fri. 10:00 a.m. – 6:00 p.m. Sat. 10:00 a.m. – 5:00 p.m.
Sun. 1:00 p.m. – 5:00 p.m.

Town of Caledon, Clerk’s Department
6311 Old Church Road,
Caledon, Ontario L7C 1J6
Phone: 905.584.2272
Toll Free: 1.888.225.3366
Monday – Friday
8:30 a.m. – 4:30 p.m.

Caledon Public Library – Albion-Bolton Branch
150 Queen Street South
Bolton, ON L7E 1E3
Phone: 905.857.1400
Mon. – Thurs.10:00 a.m. – 8:30 p.m.
Fri. – Sat. – 10:00 a.m. – 4:00 p.m.
Sun. – 12 Noon – 4:00 p.m.

Comments

Please provide written comments to **Mr. P. Gino Dela Cruz, P. Eng.** at the Region of Peel within the 45 day review period. If the concerns cannot be resolved, you may request that the Minister of the Environment make an Order for the project to comply with Part II of the Environmental Assessment Act, which addresses individual environmental assessments.

The Minister must receive requests for Part II Orders, at the address below, by 4:30 p.m. on: Wednesday, May 29, 2013.

The Honourable Jim Bradley, Minister of the Environment

Ministry of the Environment, 77 Wellesley Street West, 11th Floor, Ferguson Block, Toronto, Ontario M7A 2T5

A copy of the Part II Order request must also be sent to:

P. Gino Dela Cruz, P. Eng.
Project Manager
Transportation Program Planning
Region of Peel, Public Works
10 Peel Centre Dr., Suite B 4th Floor
Brampton, ON L6T 4B9
Tel: (905)791-7800, ext. 7805 Fax: (905)791-1442

John C. Bayley, P. Eng., Principal
Consultant Project Manager
Stantec Consulting Ltd.
49 Frederick Street (Map)
Kitchener ON N2H 6M7
Phone: 519.585.7112, Fax: 519).579.6733
Toll free: 1-866-579-4410
Email: john.bayley@stantec.com

APPENDIX E

NATURAL ENVIRONMENT REPORT

MAYFIELD ROAD IMPROVEMENTS (AIRPORT ROAD TO COLERAINE DRIVE) CLASS ENVIRONMENTAL ASSESSMENT

NATURAL ENVIRONMENT REPORT

Prepared for:
Regional Municipality of Peel
10 Peel Centre Drive, 4th Floor
Brampton, Ontario
L6T 4B9

Prepared by:
Stantec Consulting Ltd.
49 Frederick Street
Kitchener, Ontario
N2H 6M7

File No. 160210480
October 2012

Stantec

Table of Contents

Table of Contents

Table of Contents

List of Appendices

List of Figures

Appendix A

List of Tables

1.0 Introduction

Stantec Consulting Ltd. was retained by the Region of Peel to complete a Natural Environment Report (NER) as part of the Mayfield Road (Airport Road to Coleraine Drive) Class Environmental Assessment. This project is being completed in accordance with Schedule C projects under the *Municipal Class Environmental Assessment* (MEA, 2000). This technical report has been prepared as an appendix to the Environmental Study Report (ESR) to address the natural environment components of the Municipal Class EA process.

The purpose of this report is to describe and characterize the significance and sensitivity of the natural features within the study area, to identify potential environmental impacts, assess various alternatives and to recommend appropriate measures to avoid or minimize negative environmental impacts.

The NER provides information collected through a review of existing background data and supplemented through field investigations as it relates to the proposed undertaking. Environmental descriptions and recommended mitigation measures are presented based on the data collected for this project and existing Provincial, Regional and Conservation Authority policies to protect the environmental features in this area.

1.1 STUDY AREA

The study area for this Class EA generally includes the 5.5 kilometre reach of Mayfield Road between Airport Road and Coleraine Drive in the Region of Peel (**Figure 1**). For the purposes of this Natural Environment Report (NER), the study area extends approximately 120 m north and south of Mayfield Drive. The immediate and adjacent areas along Mayfield Road were investigated to identify and describe the natural features and their functions and to evaluate the potential impacts on such features from potential construction activities.

At present, the majority of this area is agricultural with some existing residential development located near Airport Road and east of The Gore Road. Future urban development is proposed within the area south of Mayfield Road in the City of Brampton, while the area north of Mayfield Road in the Town of Caledon is designated as Prime Agricultural Land. The natural features in the area are confined to the watercourses associated with the West Humber River, Salt Creek and associated tributaries and include wetlands, floodplains and aquatic habitat, as well as isolated woodland and meadow features scattered along the route.

1.2 AGENCY CONSULTATION

Communication with the various review and approval agencies, including the Region of Peel, Toronto Region Conservation Authority (TRCA), and Ministry of Natural Resources (MNR) throughout the process is recognized as a means to solicit input and incorporate knowledge and expertise into the assessment and selection of a preferred alternative. The following is a summary of agency consultation for this project:

- TRCA – Sharon Lingertat (Acting Planner II) and Scott Smith (Acting Planner 1) provided background information (Regulatory mapping, GIS layers, fish data), guidance documents and process suggestions regarding the completion of the EA);
- MNR Aurora District – Mark Heaton (Fish and Wildlife Biologist) and Karen Golby provided background information (fisheries data for the West Humber watershed) and issued the MNR License to Collect Fish for Scientific Purposes (**Appendix F**);
- ROM – Erling Holm (Assistant Curator) provided background information pertaining to the location of Redside dace within the West Humber River watershed;
- Region of Peel - Sandy Lovisotto (Project Manager) provided existing Region of Peel GIS layers.

A pre-consultation meeting and site visit was conducted with staff from the Region of Peel and TRCA on November 21, 2007. The purpose of that meeting was to review the location, size and characteristics of the various watercourse crossings within the study area and to confirm which of these features are subject to the TRCA Regulation.

2.0 Environmental Planning Considerations

An assessment of the natural heritage features and functions within the study area was undertaken to comply with the requirements of the following policy and guideline documents:

2.1 PROVINCIAL POLICY STATEMENT

When planning for corridors and rights-of-way for significant transportation and infrastructure facilities, consideration will be given to the significant resources in Section 2: Wise Use and Management of Resources (MMAH, 2005). This assessment has been done in a manner consistent with Policy 2.1 of the *Provincial Policy Statement* (*PPS*) (Ministry of Municipal Affairs and Housing, 2005), with guidance provided through the *Natural Heritage Reference Manual* for Policy 2.3 (Ministry of Natural Resources (MNR), 1999). The natural heritage features to be considered in accordance with the *PPS* include:

- Significant wetlands (PSW) and significant coastal wetlands;
- Significant habitat of endangered and threatened species;
- Significant woodlands;
- Significant valleylands;
- Significant wildlife habitat;
- Significant areas of natural and scientific interest (ANSIs); and
- Fish habitat.

In southern Ontario, development is not permitted in significant habitat of endangered and threatened species, significant wetlands or significant coastal wetlands. Development and site alteration may be permitted on lands adjacent to significant wetlands, coastal wetlands and the habitat of endangered and threatened species if it is demonstrated that there will be no negative impacts on the natural features or the ecological functions for which the area was identified.

Development is not permitted within, or on lands adjacent to, the other significant natural heritage features unless the ecological function of these lands has been evaluated and it has been demonstrated that no negative impacts on the natural heritage features or their ecological function will occur. Development and site alteration is not permitted within fish habitat except in accordance with provincial and federal requirements.

2.2 GREENBELT PLAN

The *Greenbelt Plan* (2005) is intended to provide for the permanent protection of the natural heritage and water resource systems that sustain ecological and human health and that form the environmental framework around which major urbanization in south-central Ontario will be organized (MMAH, 2005). It identifies the Protected Countryside areas where urbanization should not occur in order to provide for the permanent protection of the agricultural land base and ecological features and functions occurring on this landscape,

The *Greenbelt Plan* also identifies major River Valley Connections to the broader natural systems of southern Ontario, including Lake Ontario. Although these areas are not within the regulated boundary of the Greenbelt Plan, the *Greenbelt Plan* recommends the protection and restoration of major river valleys as key components of the long-term health of the Natural System. As such, efforts to improve fish habitat, restore the habitat and corridor functions of native species and that avoid, minimize and/or mitigate impacts associated with the quality and quantity of urban run-off into the valley systems are encouraged.

2.3 REGION OF PEEL OFFICIAL PLAN

The *Region of Peel Official Plan* (Consolidated 2008) (Peel OP) recognizes the need to protect important natural features and environmentally sensitive areas, to restore and enhance ecosystems and to promote clean air, water and land. The goal of the environmental policies recognized in the Peel OP is to create and maintain a system of viable, well-functioning environmental features to ensure a healthy, resilient and self-sustaining natural environment (Peel OP Section 2.1.2).

The policies identify, protect and support the restoration and rehabilitation of the Greenlands System and the natural environment, which consists of Core Areas, Natural Areas and Corridors, and Potential Natural Areas and Corridors (Peel OP Section 2.3). Core Areas include PSWs, woodlands greater than 30 ha, environmentally sensitive or significant areas (ESA), Provincial Life Science ANSIs, habitats of vulnerable, threatened and endangered species, and major valley and stream corridors. Development and site alteration are prohibited within Core Areas, with some exceptions, including essential services (Peel OP Section 2.3.2.5).

Natural and Potential Natural Areas and Corridors include other wetlands and woodlands, the Lake Ontario shoreline, Provincial Earth Science ANSIs, sensitive groundwater recharge areas, small valley and stream corridors and headwater source and discharge areas. These areas support and enhance the integrity of the Core Areas and are protected, restored and enhanced through local municipal plans (Peel OP Section 2.3.2.13).

One of the goals of the transportation system in the Peel OP is to plan and implement a transportation system in Peel that is safe, sensitive to the protection of the Greenlands System, environmentally responsible and cost effective (Peel OP Section 5.6.1). The objective is to minimize adverse environmental impacts when developing and planning for transportation facilities. Where Regional roads are proposed to be widened, reconstructed or improved, the natural environment should be protected and preserved in a manner consistent with the objectives and policies of the Peel OP, area municipal official plans, and Environmental Assessment procedures (Peel OP Section 5.6.4.2.7).

2.4 CITY OF BRAMPTON OFFICIAL PLAN

The *City of Brampton Official Plan* (2006) (Brampton OP) recognizes the need to preserve the City's diverse natural heritage for future generations, to conserve and protect the long-term ecological function and biodiversity of the natural heritage system and to ensure that the community is protected from environmental pollution (Brampton OP Section 2.4.3). Protecting the environment is identified as one of the Six Pillars of the City of Brampton Strategic Plan, which promotes the implementation of an ecosystem approach to land use planning that recognizes the dynamic interrelationship of all elements of a biophysical community to achieve a sustainable, healthy ecosystem.

The components of the Natural Heritage System include valleylands/watercourse corridors, woodlands, all wetlands, ESAs, ANSIs, fish and wildlife habitat and the Greenbelt Plan Natural System (Brampton OP Section 4.5.6). Protection of these natural features and functions are consistent with the PPS policies outlined above.

Polices aimed at conserving and protecting natural heritage features, functions and linkages are outlined in the Brampton OP, and include the concepts of achieving no net loss, or a net gain, in natural heritage system values and ecological functions. The identification of Restoration Areas or opportunities to improve existing conditions are encouraged through the following principles:

a. Maintenance of the landforms and physical features of the site in their natural state to the greatest extent practicable;
b. Protection, enhancement and restoration of any stream, pond, marsh, valleyland and woodland habitat for both fish and wildlife;
c. Maintenance, enhancement and restoration of the features and functions of watercourses and drainage features consistent with natural geomorphic, hydrologic and fish habitat processes;
d. Protection of the quantity and quality of groundwater and surface waters and their quality; and
e. Protection, maintenance and restoration of remaining trees and woodlots (Brampton OP Section 4.5.6.22).

In terms of transportation, one objective of the transportation system is to promote a high standard of environmental management and aesthetic quality in the routing, design and construction of transportation and associated structures (Brampton OP Section 4.4). It also states that the City shall, in the planning and construction of all elements of the transportation system, ensure consistency with the Natural Heritage & Environmental Management and Urban Design sections of the Brampton OP.

2.5 TOWN OF CALEDON OFFICIAL PLAN

The Town of Caledon Official Plan (Consolidated 2008) (Caledon OP) recognizes that the sustained integrity of the natural environment is essential to the continued social and economic well-being of the Town and promotes an ecosystem-based planning and management approach to guide land use decisions. The Caledon OP promotes the protection, maintenance, enhancement and restoration of ecosystem functions, processes and natural system attributes that are vital to ecosystem integrity.

The components of the Ecosystem Framework in Caledon include Natural Core Areas and Corridors, Supportive Natural System and Natural Linkages, which incorporates and refines the components of the Regional Greenlands System. Natural Core Areas and Corridors are "the fundamental biological and physical building blocks of ecosystems" and are designated as Environmental Policy Areas (EPA). EPAs include woodland and wetland core areas, all Niagara Escarpment Natural Areas, Life Science ANSis, ESAs, habitats of vulnerable, threatened and endangered species, core fish habitat and valley and stream corridors. The Supportive Natural System includes all other woodlands and wetlands and associated adjacent lands, all Niagara Escarpment Protection Areas, Earth Science ANSIs, Potential ESAs, and other fishery areas.

Uses permitted within an EPA are be limited to, among other minor exceptions, essential infrastructure where all reasonable alternatives to locating the proposed infrastructure outside of the EPA have been explored, where the ecosystem policies and objectives have been met, and where appropriate mitigation, restoration and management measures have been employed (Caledon OP 5.7.3.5.1). These policies apply to the expansion of existing infrastructure.

2.6 TORONTO AND REGION CONSERVATION AUTHORITY POLICIES

Pursuant to *Ontario Regulation 166/06*, any development in areas defined in the Regulation (i.e. floodplain, valleyland, hazardous land), interference with a wetland or alteration to a river, creek, stream or watercourse channels requires permission from the TRCA. A decision regarding the approval of an application for a Permit from the TRCA pursuant to Ontario Regulation 166/06 is guided by the *Valley and Stream Corridor Management Program* (TRCA, 1994).

Generally, development, interference or alterations within a regulated area, including floodplain, wetland, watercourse or other hazardous area, is not permitted, except in accordance with various general and specific exceptions as outlined in the Policy document.

Transportation facilities are not permitted to be routed within valley and stream corridors, however, may be permitted to cross valley and stream corridors where approved through an Environmental Assessment process (TRCA Policy 4.3(a)(1)). Such facilities should, among others, not impede the safe passage of flood flows or obstruct the flow of water, should not aggravate slope instability or restrict fish migration, and should re-establish a minimum 10 metre wide zone of riparian habitat on both sides of a watercourse

Through correspondence from the TRCA (dated October 29, 2007), the following criteria were identified as requirements for the selection and design of the preferred alternative:

Criteria 1: prevents the risk associated with flooding, erosion or slope instability;

Criteria 2: protects and rehabilitates existing landforms, features and functions;

Criteria 3: provides for aquatic, terrestrial and human access;

Criteria 4: minimizes water / energy consumption and pollution; and

Criteria 5: addresses TRCA property and archaeology concerns.

This letter also identified various environmental concerns, policies and documentation requirements to be addressed through the EA process and documented in the ESR in regards to aquatic species and habitat, aquifers, regional storm flood plains, regulation limit, stream corridors, terrestrial natural heritage system, valley corridors, watercourses and wetlands.

2.7 SPECIES AT RISK ACT

The Species at Risk Act (SARA) identifies wildlife species considered to be at risk in Canada and designates them as threatened, endangered, extirpated or of special concern. Species at risk are identified and assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), which is an independent committee of wildlife experts and scientists that makes recommendations to the federal government regarding the status of wildlife species in Canada.

The purpose of SARA is to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity and to manage species of special concern to prevent them from becoming endangered or threatened. SARA prohibits various activities related to listed species, such as killing or harming of species, or destroying critical habitat identified in recovery strategies, action plans or management plans prepared under the Act.

The protection and conservation measures afforded by SARA apply to those species identified on Schedule 1. Other species identified by COSEWIC as species at risk that require further assessment in accordance with current assessment criteria are identified on Schedule 2 (Endangered and Threatened) and Schedule 3 (Special Concern) of the Act. All listed (Schedule 1) aquatic species and migratory birds in Canada are protected by SARA, but these protections only apply to other listed species (i.e. plants, mammals, reptiles, amphibians) where they occur on federal lands (i.e. National Parks, First Nations Reserves).

Any activity affecting a listed species or its critical habitat requires the prior issuance of a Permit from the applicable agency (Environment Canada, Department of Fisheries and Oceans). Permits may only be issued for scientific research relating to the conservation of the species, where activities are required to benefit a species or to enhance its chances of survival, or for incidental impacts. Efforts to avoid, reduce or minimize impacts must first be employed, and activities will not be permitted if they would jeopardize the survival or recovery of the species.

2.8 ENDANGERED SPECIES ACT

The Endangered Species Act (ESA) identifies wildlife species considered to be at risk in Ontario and designates them as threatened, endangered, extirpated or of special concern. Provincial species at risk are identified and assessed by the Committee on the Status of Species at Risk in Ontario (COSSARO) which is a committee of wildlife experts and scientists, as well as those who provide Aboriginal Traditional Knowledge, that classify species according to their degree of risk based on the best available scientific information, community knowledge and aboriginal traditional knowledge. When COSSARO classifies a species at risk, that classification applies throughout Ontario, unless otherwise noted.

The ESA protects species at risk and their habitats by prohibiting anyone from killing, harming, harassing or possessing protected species, as well as prohibiting any damage or destruction to the habitat of species identified on the SARO List. All species on the SARO List are provided with general habitat protections under the ESA, which protect areas that species depend on to carry out their life processes, such as reproduction, rearing, hibernation, migration or feeding.

Any species added to the SARO List is required to have a regulation approved by the MNR within a set period of time to define species specific habitat requirements, which identifies specific boundaries, areas or features of an area where the species lives, used to live or is believed to be capable of living. This 'regulated habitat' replaces the general habitat description once approved.

Any activity that may impact a protected species or its habitat requires the prior issuance of a Permit from the MNR. Such permits may only be issued under certain circumstances, which are limited to activities required to protect human health and safety, activities that will assist in the protection or recovery of the species, activities that will result in an overall benefit to the species or activities that may provide significant social or economic benefit without jeopardizing the survival or recovery of the species in Ontario.

The ESA (2007) replaces the original ESA (1971) to provide broader protection for species at risk and their habitats, a stronger commitment to recovery of species, greater flexibility, increased fines and more effective enforcement, as well as greater accountability through government reporting requirements.

2.9 SUMMARY OF POLICY IMPLICATIONS

The Class EA study should recognize the objectives of the legislation, policies and guideline documents noted above and the requirements of the individual agencies. The approach to this study should take these policy requirements and guidelines into consideration, both in the selection and design of the preferred alternative and in the identification of mitigation measures related to construction and operation of this facility.

3.0 Methodology for Data Collection and Analysis

3.1 BACKGROUND DATA COLLECTION AND REVIEW

A variety of background documents and sources of information were consulted during the preparation of this report, including the following primary data sources:

- Natural Heritage Information Centre database (NHIC, 2007)
- Local and Regional Official Plans (Peel, Brampton and Caledon)
- *Valley and Stream Corridor Management Program* (TRCA, 1994)
- *Fisheries Management Plan for the West Humber River* (TRCA, 2005)
- *Humber River Watershed Report Card* (TRCA, 2007)
- *Terrestrial Natural Heritage System Strategy* (TRCA, 2007)
- Ministry of Natural Resources and Royal Ontario Museum Fisheries Data Records
- Toronto and Region Conservation Authority Regulation Mapping

Aerial photography (2006) was used to interpret the location of the natural heritage features in the area. Preliminary findings based on air photos and background data were confirmed and refined during site visits to the study area as observed from the road right-of-way.

Existing fisheries, aquatic and terrestrial information for this area was obtained from the Ministry of Natural Resources (MNR), Toronto Region Conservation Authority (TRCA), Natural Heritage Information Centre (NHIC), Royal Ontario Museum (ROM), published reports, maps and studies. This information included:

- drainage patterns, watercourses/tributaries and drainage basin boundaries;
- existing fisheries data for the study area and throughout the watershed;
- fisheries and watershed management plans and strategies;
- mammal, herpetofaunal and bird survey records in the vicinity of the study area;
- records of designated significant species occurrences; and
- location and boundaries of provincially and locally significant natural heritage features, including wetlands, woodlands, valleylands, Areas of Natural and Scientific Interest (ANSIs), Environmental Significant Area (ESA), and other designated features.

3.2 FIELD STUDIES AND INVESTIGATIONS

The fieldwork methodology for this study was designed to generate a dataset sufficient to describe the natural features and functions in the area potentially affected by the potential alternatives. It was also intended to allow for the identification of potential impacts and recommendation of appropriate mitigation measures for the production of an NER as an appendix to the ESR. A description, characterization and assessment of the natural heritage features within the study area were based on the existing background data supplemented by site specific observations obtained during the various field investigations.

Field investigations were carried out to characterize and confirm the limit of all natural vegetation communities within the study area, to identify any significant vegetation species potentially affected by the project, and to assess the aquatic habitat characteristics for each of the 16 watercourses crossed by Mayfield Road. **Table 1** provides a summary of the field investigations undertaken for this study.

Table 1 Ecological Field Work, Mayfield Road Class EA

Purpose of Field Work	Date(s) of Field Work	Personnel
Ecological Land Classification (ELC) and Botanical Inventories	2007: October 22 (Fall survey) 2008: June 12 (Spring survey)	Gwendolyn Weeks Dr. Chris Zoladeski
Incidental Wildlife Observations	Each Site Visit	All
Aquatic Habitat Assessment	2007: November 8, November 13, and December 8 2008: May 2	Roxanne Dibbley and Marc Faiella
Electrofishing Survey	2008: May 2	Roxanne Dibbley and Marc Faiella

Incidental observations of wildlife species were recorded during each of the above field investigations.

3.2.1 Vegetation Surveys

Spring and fall botanical surveys were conducted for all vegetation communities within the study area. The study area was systematically covered on foot to ensure a complete inventory of plant species and vegetation communities. Vegetation communities were delineated on aerial photographs (2006) and confirmed in the field. Community characterizations (ecosites and ecotypes) were based on the Ecological Land Classification (ELC) system (Lee et *al.*, 1998).

Common and Latin nomenclature of plant species generally follows Newmaster et al. (1998). Provincial significance of vegetation communities were identified based on draft rankings assigned by the NHIC (Bakowsky, 1996), with updates provided by the NHIC database.

Identification of potentially sensitive plant species is based on an assignment of a coefficient of conservatism value (CC) to each native species in southern Ontario (Oldham et al., 1995). The value of CC, ranging from 0 (low) to 10 (high), is based on a species' tolerance of disturbance and fidelity to a specific natural habitat. For example, species with a CC value of 9 or 10 generally exhibit a high degree of fidelity to a narrow range of habitat parameters.

Wetland indicator plants cited in the *Ontario Wetland Evaluation System - Southern Manual* (OMNR, 1993) and Wetness Index values (Oldham et al., 1995) are used to demarcate wetland habitats.

3.2.2 Aquatic Habitat and Electrofishing

Detailed aquatic habitat assessments were completed upstream and downstream of each of the 16 watercourse crossings of Mayfield Road in 2007 and 2008. **Figures 3A to 3G** identify the location of each Tributary crossing within the study area. Fish habitat characteristics were recorded for each of these watercourses during the field surveys, generally identifying the following habitat characteristics upstream and downstream of Mayfield Road:

- watercourse size and flow;
- key habitat features (e.g. pools, riffles, undercut banks);
- groundwater seepage and upwelling areas;
- watercourse substrate types;
- watercourse bank stability;
- in-stream cover;
- riparian vegetation; and
- adjacent land uses.

During each aquatic habitat assessment, air temperature, recent weather conditions, UTM coordinates, length of each reach surveyed, and, where feasible, general water quality data (pH, conductivity, dissolved oxygen, water temperature) were also recorded.

Background information regarding fish species potentially affected by the proposed project was obtained through a review of MNR, ROM and TRCA data records and the *Fisheries Management Plan for the West Humber River* (TRCA, 2005). To supplement the existing information, two stations were surveyed using a Smith Root Model 12 backpack electrofishing unit for a total of 874 electrofishing seconds at the direction of MNR staff. A *Scientific Collectors Permit* was obtained from the MNR for these surveys. A single-pass habitat method of electrofishing was conducted at the confluence of Tributary 8 and 9 (d/s of Gore Road) and upstream and downstream of Station 10 to determine the presence/absence of fish, diversity, and relative abundance of fish species. The length of each reach surveyed and assessed varied by station, depending on habitat conditions. The terrestrial environment along the shoreline of each watercourse was identified and evaluated in light of the potential impacts associated with the proposed project.

3.3 ASSESSMENT OF SPECIES SIGNIFICANCE AND SENSITIVITY

Biological field data were evaluated to establish the significance of the observed features. The provincial status of wildlife flora and fauna was provided by the Natural Heritage Information Centre (NHIC, 2007). Status rankings (SRANKs) for both plants and wildlife are based on the number of occurrences in Ontario and have the following meanings:

- S1: Critically Imperiled; often 5 or fewer occurrences
- S2: Imperiled; very few populations, often 20 or fewer
- S3: Vulnerable; relatively few populations, often 80 or fewer
- S4: Apparently Secure; uncommon but not rare
- S5: Secure; common, widespread, and abundant

The global, federal and provincial status of wildlife was determined by reviewing species accounts published by the Natural Heritage Information Centre (NHIC, 2007).

Provincial significance of vegetation communities was based on the draft rankings assigned by the Natural Heritage Information Centre (Bakowsky, 1996). The provincial status of all plant species is based on Newmaster et. al (1998), with updates from the database of the Natural Heritage Information Centre (NHIC, 2007).

4.0 Existing Natural Features and Functions

The study area is located along the boundary between with City of Brampton and Town of Caledon in the Region of Peel, between Airport Road and Coleraine Drive. The majority of the study area is located within the West Humber River watershed, with the exception of a small intermittent tributary of the Main Branch of Humber River located at the easternmost extent of the study area.

The purpose of this section is to identify and describe the designated natural features in the study area, as well as the physiographic, hydrologic, hydrogeologic, and biologic characteristics of the study area. Photographs of the site taken during the field investigations are provided in **Appendix D**.

4.1 DESIGNATED / REGULATED ENVIRONMENTAL FEATURES

The *Region of Peel Official Plan* recognizes the West Humber River corridor as a Core Area of the Greenlands System. **Figure 2** identifies the various Core Greenlands and other natural features based on existing Region of Peel mapping for this area.

According to the *Town of Caledon Official Plan*, areas along the West Humber River and its major tributaries (i.e. Salt Creek, Tributary 5 and 6) are identified as Environmental Protection Areas. The *City of Brampton Official Plan* recognizes the West Humber River and the majority of its tributaries (i.e. Salt Creek and Tributaries 2, 5 to 12 and 14) as Valleylands and Watercourse Corridors that form part of the Open Space system.

The *Greenbelt Plan* (2005), which is also recognized in the Region of Peel OP, identifies the West Humber River as a major River Valley Connection between the Greenbelt and Lake Ontario. The study area is located outside of the Oak Ridges Moraine and therefore not subject to the policies of the Oak Ridges Moraine Conservation Plan.

According to the TRCA Regulation Mapping, and observations made during field investigations and site meetings, there are 16 watercourse crossings of Mayfield Road within the study area, with associated wetlands, floodplains, meander belts and steep. A summary of the regulated areas associated with each watercourse is provided in **Table 2**. These areas are regulated and protected by the TRCA pursuant to the *Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation* (O. Reg. 166/06).

Table 2 TRCA Regulated Areas, Mayfield Road Class EA

Stn No.	TRCA Regulated*		Watercourse		Floodplain		Wetland		Meander Belt		Slope	
	u/s	d/s	u/s	d/s	u/s	d/s	u/s	d/s	u/s	d/s	u/s	d/s
1	No	No										
2	Yes	Yes	X	X								X
3	Yes	Yes	X	X	X	X					X	X
4	No	No										
5	Yes	Yes	X	X	X	X					X	X
6	Yes	Yes	X	X	X	X			X		X	X
7	Yes	No	X						X		X	
8	No	No		X								
9	Yes	Yes	X	X								X
10	Yes	Yes	X	X					X			X
11	Yes	Yes	X	X	X	X					X	X
12	Yes	Yes	X	X	X	X			X	X		
13	Yes	Yes	X	X	X	X						X
14	Yes	Yes	X	X	X	X					X	X
15	No	No		X								
16	No	No		X								

*Confirmed during Site Meeting with TRCA staff on November 21, 2007

Of note, the Humber River is recognized as a Canadian Heritage River, which is a designation that recognizes the outstanding river-related human heritage and recreational values of national significance. This designation carries no regulatory or legal restrictions.

4.2 PHYSIOGRAPHY

The study area is situated within the South Slope physiographic region, which is situated on the south side of the Oak Ridges Moraine, and is characterized by drumlinized and beveled till plains (Chapman and Putnam, 1984). The Gooseville Moraine is also present in the western portion of the study area, however has little surface expression (i.e. typically less than 1.5 metres) (Chapman and Putnam, 1984).

The topography generally slopes southward towards Lake Ontario and has been shaped by the numerous drainage features that generally flow in a south-easterly direction. The ground surface elevation of the study area ranges from 213 metres to 238 metres AMSL.

According to the Ontario Geological Survey (OGS, 2003), the study area is predominantly interbedded silt and clay and gritty, pebbly flow till and rainout deposits, with areas of clay to silt-textured till located between Humber Station Road and Coleraine Drive, as well as between Airport Road and Innis Lake Road (Stantec, 2008). Modern alluvial deposits of clay, silt, sand and gravel are found along the majority of the current and former river valleys that cut through the study area, with bedrock exposed at surface along Salt Creek and the former river valley immediately to the northeast.

The depth to groundwater across the study area ranges from 2.4 metres to 29.0 metres below grade, with an average depth of 9 metres BGS. The depth to groundwater is shallowest near the various watercourses and associated valleys. None of the 16 watercourses that pass through the study area are considered to be significantly dependent upon groundwater discharge.

Additional details regarding geologic and hydrogeologic conditions within the study area are provided in the *Hydrogeological Investigation – Mayfield Road Improvements Class EA Report* (Stantec, 2010).

4.3 HYDROLOGY

The study area is located within the Humber River Watershed, which is the largest watershed in the Toronto region covering roughly 903 km^2. Specifically, the study area is located primarily within the West Humber River watershed, which flows approximately 43 km from its source in the rolling hills of Caledon and over the Peel Plain in Brampton before joining the Main Humber in Toronto downstream of Albion Road in Summerlea Park (TRCA, 2007). A small, intermittent tributary of the Main branch of the Humber River crosses the easternmost portion of the study area.

A total of 16 watercourse crossings were identified within the study area during a site visit with TRCA and Region of Peel staff on November 21, 2007, including the West Humber River and Salt Creek. These watercourses, along with 8 other small cross-culverts, were surveyed by Stantec in 2007 and 2008, and were characterized according to water flow, fish barriers, instream and riparian cover. Additional details regarding the hydrologic and hydraulic conditions in the study area, including peak flows, conveyance capacity, and culvert conditions, are contained within the *Culvert and Stormwater Management Report* (Stantec, 2008).

4.4 AQUATIC RESOURCES

4.4.1 Fish Species

According to the *Humber River Fisheries Management Plan* (TRCA, 2005) and the *Humber River Watershed Plan* (TRCA, 2008), a total of 74 species of fish have historically been found within the Humber River watershed (**Appendix B**), 64 of which are considered native species. Some notable fish species identified within the Humber River watershed include mottled sculpin, brook trout, brown trout, rainbow trout, redside dace, American brook lamprey, brassy minnow and rainbow darter (TRCA, 2007, TRCA 2005).

However, only 40 native fish species have been observed since 2001. Those species that have disappeared are the larger fish-eating species or those that are particularly sensitive to changing habitats, the loss or decline of which has been attributed to increases in stream flow velocities, turbidity, siltation and temperature that are typical of urbanization (TRCA, 2007). Other invasive species have been introduced to the watershed include the Rusty crayfish, rudd, sea lampreys, goby and carp, which compete with native species for food and habitat (TRCA, 2007).

Based on a review of the site specific data obtained from the MNR, TRCA and ROM, supplemented by electrofishing efforts completed for this project, a total of 22 fish species have historically been identified within the vicinity of the study area. A summary of these species and the tributaries within which they were found is provided in **Table 3.** Additional details regarding the stream characteristics and habitat conditions in these tributaries are provided in Section 4.4.2.

Table 3 Fish Species Identified within Mayfield Road Tributaries

Fish Species		Status*			Tributary					
Common Name	Scientific Name	SRANK	Provincial	Federal	3	5	6	11	12	14
LAMPREY FAMILY	PETROMYZONTIDAE									
American Brook Lamprey	*Lampetra appendix*	S3						x		
MINNOW FAMILY	CYPRINIDAE									
Redside Dace	*Clinostomus elongatus*	S3	END	END	x		x	x		
Hornyhead Chub	*Nocomis biguttatus*	S4						x		
Common Shiner	*Luxilus cornutus*	S5			x		x	x		
Blackchin Shiner	*Notropis heterodon*	S4			x			x	x	
Bluntnose Minnow	*Pimephales notatus*	S5			x		x	x		x
Fathead Minnow	*Pimephales promelas*	S5			x		x	x	x	x
Blacknose Dace	*Rhinichthys atratulus*	S5			x		x	x		x
Longnose Dace	*Rhinichthys cataractae*	S5								x
Creek Chub	*Semotilus atromaculatus*	S5			x		x	x		x
Pearl Dace	*Margariscus margarita*	S5			x	x		x		x
SUCKER FAMILY	CATOSTOMIDAE									
White Sucker	*Catostomus commersoni*	S5			x		x	x		x
Northern Hog Sucker	*Hypentelium nigricans*	S4						x	x	
CATFISH FAMILY	ICTALURIDAE									
Brown Bullhead	*Ameiurus nebulosus*	S5			x		x			
STICKLEBACK FAMILY	GASTEROSTEIDAE									
Brook Stickleback	*Culaea inconstans*	S5			x	x			x	x

Fish Species		Status*			Tributary					
Common Name	Scientific Name	SRANK	Provincial	Federal	3	5	6	11	12	14
SUNFISH FAMILY	CENTRARCHIDAE									
Rock Bass	*Ambloplites rupestris*	S5					x	x		
Pumpkinseed	*Lepomis gibbosus*	S5			x					x
Largemouth Bass	*Micropterus salmoides*	S5			x					
PERCH FAMILY	PERCIDAE									
Rainbow Darter	*Etheostoma caeruleum*	S4			x		x	x		
Iowa Darter	*Etheostoma exile*	S5						x		
Fantail Darter	*Etheostoma flabellare*	S5					x	x		x
Johnny Darter	*Etheostoma nigrum*	S5			x		x	x		x
			Total Species Present:		15	2	12	16	4	11

* END – Endangered (Refer to **Figure 3A to 3G** for Tributary locations).

Potential impacts to aquatic species at risk (SAR) must be considered if any in water works are anticipated. Projects that do not cause a Harmful Alteration, Disruption or Destruction (HADD) of fish habitat would protect any fish SAR present through proposed mitigation measures. Maps of the *Fish Species at Risk in the Toronto Region* (DFO, 2009) indicate there are no Schedule 1 SAR fish species present within the study area.

Redside dace is listed as Endangered under the provincial Endangered Species Act, and designated by COSEWIC as Endangered. This species is recognized as a species of Special Concern under the federal SARA, uplisting of which is pending. The habitat of the redside dace receives general protection under the habitat provisions of the federal *Fisheries Act* and provincial *Endangered Species Act, 2007* (ESA 2007).

The DFO mapping identifies the presence of redside dace in three of the watercourses in the study area, including tributary 3 (Salt Creek), tributary 6 and tributary 11 (West Humber River). The presence of redside dace has been confirmed through discussions with the MNR and ROM staff.

Some of these fisheries records date back to 1946 and may not reflect current watershed or habitat conditions. According to the *Humber River Fisheries Management Plan* (TRCA, 2005), the West Humber River and its tributaries are to be managed as warmwater systems. This is supported by the various warmwater indicator species historically identified within the vicinity of the study area, such as fathead minnow, brown bullhead, and largemouth bass. The cool and coldwater indicator species, such as the American brook lamprey, redside dace and pearl dace, were recorded between 1972 and 1985. No recent records of these species within the vicinity of the study area have been reported.

4.4.2 Habitat Characteristics

A total of 16 watercourse crossings along Mayfield Road have been identified through a review of background data, aerial photography and on-site field investigation, as confirmed during the on-site meeting with TRCA and Region of Peel staff on November 21, 2007.

Each watercourse was investigated to identify and record stream characteristics, flow conditions, and habitat conditions upstream and downstream of Mayfield Road (as appropriate). These watercourses ranged in size from small, intermittent swales or ditches impacted by local agricultural operations to large stream valleys permanently conveying flows from large upstream drainage areas originating in the Oak Ridges Moraine and Niagara Escarpment (West Humber River). The West Humber River is the largest watercourse within the study area. **Table 4** provides a summary of the site conditions and habitat conditions identified during the aquatic habitat assessment surveys. Photographs of the various tributaries are also included in **Appendix D**.

Table 4 Aquatic Habitat Characterization, Mayfield Road Class EA

Trib	Flow Regime	Channel Characteristics	Vegetation	Substrate	Adjacent Land Use	Habitat	Notes
1	Intermittent	upstream swale drains to roadside ditch downstream, which outlets to wetland at Tributary 2	terrestrial grasses	silt with some gravel (roadside)	Agricultural	indirect (flow)	roadside ditch
2	Intermittent	upstream consists of ill-defined; downstream contains open water at culvert outlet flowing into marsh	upstream is almost entirely closed canopy (willow, shrubs); downstream is cattail wetland with tall grasses	silt/clay with small amounts of organic debris and sparse cobble;	Agricultural (u/s); Residential (d/s)	indirect (flow)	Construction approx. 40m downstream
3	Permanent	upstream and downstream consist of narrow, ill-defined channels with some pockets of standing water; 15-25 m wide floodplain	tall overhanging grasses, with pockets of cattail downstream; sparse shrub and willow species located within floodplain	exposed bedrock with some cobble, gravel, silt and clay; some muck occurred in pools		direct	Salt Creek; fish observed d/s of Mayfield Rd; banks exhibited signs of erosion (undercut, exposed roots); dry section limit fish migration
4	Intermittent	narrow upstream channel between 2 residential properties; downstream channel is a roadside ditch	terrestrial grasses	silt with some gravel and cobble; cobble downstream has been placed at outlet from CSP; some asphalt within upstream channel	Residential (u/s)	indirect (flow)	roadside ditch

Trib	Flow Regime	Channel Characteristics	Vegetation	Substrate	Adjacent Land Use	Habitat	Notes
5	Permanent	well-defined channel approx.2.5-4 metres wide; sections of elevated dry channel between standing water / pools; braided channel downstream; no flow between pools during survey	upstream channel is bordered by deciduous and coniferous trees (50% canopy cover), with dense shrub and mixed tree woodlot on downstream; mix of emergent (cattails) and aquatic vegetation (duckweed, watercress)	silt and clay with some cobble and gravel; small amounts of detritus / leaf litter; exposed bedrock and cobble section (dry) upstream;	Agricultural and woodland	direct	watercress upstream and downstream suggest possible groundwater discharge; erosion evidence apparent on both d/s banks (exposed roots, exposed soil); fish observed u/s of Mayfield Rd, although migration limited by dry sections
6	Permanent	no-defined channel upstream or downstream; some standing water present	cattail marsh with adjacent meadow (west) and deciduous trees (east); mix of mature willow species and cattail marsh downstream; algae blooms within standing water	mix of cobble, silt and muck, with some detritus	Agricultural and meadow (u/s); cattail marsh (d/s)	direct	fish observed upstream of Mayfield Rd, although migration limited by dry sections
7	Intermittent	upstream channel is narrow and flows through cattail marsh, with run morphology further upstream; pool at outlet from culvert and further downstream within marsh community (no defined channel d/s); second CSP downstream	meadow vegetation on either side of upstream channel, with some cattails and grasses along banks; downstream consisted of cattail marsh community	clay and silt, with organic debris		indirect (flow)	

Trib	Flow Regime	Channel Characteristics	Vegetation	Substrate	Adjacent Land Use	Habitat	Notes
8	Intermittent	roadside ditch upstream, with small pool u/s of culvert; narrow channel with standing water / pools downstream flowing to cattail marsh	Terrestrial grasses, reed canary grass and some cattails	silt and clay with some sand and gravel	Agricultural	indirect (flow)	downstream channel showed signs of being ditched / cleaned out
9	Intermittent	no upstream channel; pool at outlet from culvert leading to narrow channel; channel loses definition further downstream before joining with Tributary 8, where flows increase and channel is well-defined	terrestrial grasses on both sides, with abundance of leaf litter and soft woody debris; cattail marsh sections scattered along downstream reach	gravel, mud, and small amounts of cobble, with silt and fine mud as well as mud and sand with a large amount of organic debris further downstream		indirect (flow) near Mayfield Road, direct below confluence	clear, flowing water occurred near confluence of Tributary 8 & 9, possibly as a result of groundwater discharge
10	Intermittent	upstream narrow channel with small pocket of cattails; pool downstream of culvert leading to diffuse, undefined channel through dense cattails; downstream sections began to meander through wide floodplain meadow	cattails along upstream channel with grassed and treed banks; cattail marsh on downstream leading opening up to wide floodplain meadow; west side of downstream channel is manicured grass (church / cemetery)	clay with some coarse sand and gravel; few large boulders upstream of culvert		indirect (flow)	2 barrels within upstream channel create barriers to flow and fish passage

Trib	Flow Regime	Channel Characteristics	Vegetation	Substrate	Adjacent Land Use	Habitat	Notes
11	Permanent	wide, defined channel (4-6 metres); pool and riffle morphology; high channel banks; upstream channel divided by a treed island; large pool approx. 50 metres downstream	terrestrial grasses, shrubs and trees were along both upstream banks (partial open canopy); submergent and emergent vegetation downstream of culvert, with deciduous woodland and shrubs along banks;	substrate of silt, clay, sand, gravel and cobble; amount of cobble increased downstream through riffle sections; woody debris in downstream channel;		direct	West Humber River; exposed roots along banks evidence of erosion; fish observed upstream and downstream of Mayfield Rd
12	Intermittent	ill-defined channel; standing water within culvert; wide floodplain meadow downstream of culvert; small bridge between agricultural property occurred 50 m upstream	terrestrial grasses, cattails and reed canary grass, with scattered deciduous trees and willows; downstream dense plain of vegetation dominated by reed canary grass, with 60-70% closed canopy for cover	mud (dry) substrate upstream;	Agricultural	direct	
13	Intermittent	small, shallow channel between upstream residential properties; ill-defined downstream	manicured grasses upstream; cattails and terrestrial grasses downstream (saturated ground conditions)	silt and mud	Residential (u/s);	indirect (flow)	no trespassing sign - visual observation from Mayfield Rd only

Trib	Flow Regime	Channel Characteristics	Vegetation	Substrate	Adjacent Land Use	Habitat	Notes
14	Permanent	pool and riffle morphology, with a pool immediately upstream of Mayfield Rd; slightly undercut banks upstream	upstream banks vegetated with grasses, and some tree cover in upstream sections (partial canopy cover); overhanging grasses, shrubs and trees provided 40-50% cover in downstream section	sand and silt, with minor amounts of muck and gravel; clay and gravel dominated upstream sections; cobble observed in downstream; some leaf litter and filamentous algae	Agricultural	direct	water quality was slightly cloudy
15	Intermittent	swale through agricultural field (ploughed); pool at outlet from culvert	none; small grassy meadow north of Mayfield Rd	mud (dry)	Agricultural	indirect (flow)	ploughed swale
16	Intermittent	swale through agricultural field; pool at outlet from culvert	some terrestrial grasses along downstream channel; small cattail stand at outlet	mud (dry)	Agricultural	indirect (flow)	swale

4.4.3 Water Quality

As part of the *Humber River Watershed Plan* (TRCA, 2007), a number of water quality monitoring stations were established to collect on-going data within the Humber River watershed. Overall, the West Humber River subwatershed is considered to provide fair to good water quality based on the Index of Biotic Integrity (IBI), which considers and scores species richness and composition, including local indicator species, trophic composition, and fish abundance (TRCA, 2007).

To supplement existing water quality data, a number of water quality measurements were taken during the aquatic habitat assessments (where feasible), the results of which are summarized in **Table 5**.

Table 5 In-situ Water Quality Parameters, Mayfield Road Class EA

Trib	Location	pH	Conductivity (µs/cm)	Temp (°c)	D.O. (mg/L)
3	~ 20m downstream of culvert	7.41	2800	7.33	5.72
3	~ 40m downstream of culvert	6.92	5351	8.71	7.86
5	~ 2 m upstream of culvert	7.75	5921	5.87	10.92
6	upstream at culvert	8.10	11,218	5.68	11.76
8	~ 0.1 m upstream of culvert	8.09	694	9.86	11.0
11	~ 30m upstream of culvert	8.24	608	5.84	12.56
11	~ 0.5m upstream of culvert	7.74	7934	5.97	5.05
11	~ 0.5m upstream of culvert	8.21	957	7.30	12.35

4.5 TERRESTRIAL RESOURCES

4.5.1 Landscape Ecology

The study area is located within the Niagara section of the Deciduous Forest Region (Rowe, 1972). The Niagara Section is dominated by sugar maple and American beech, mixed with basswood, red maple, red oak, white oak, and bur oak. The bulk of Canada's black walnuts, sycamores, swamp white oaks, and shagbark hickories are found in this forest region. Other associated species include butternut and bitternut hickories, rock elm, silver maple, and blue beech. Coniferous species are generally limited to scattered white pine, eastern hemlock, eastern red cedar, and, more rarely, black spruce, tamarack, and eastern white cedar.

Approximately 26% of the Humber River watershed is developed, while 40% is considered rural land and 32% natural vegetation (TRCA, 2007). Of the 32% natural vegetation cover, 18.3% is forest, while only 1.6% is considered interior forest (TRCA, 2007). The target for natural vegetation cover in the Humber River watershed is 39%, according to the *Terrestrial Natural*

Heritage System Strategy (TRCA, 2007), while Environment Canada suggests 30% forest cover is needed to sustain a healthy watershed, which is the target of the Toronto and Region Remedial Action Plan.

Specifically, the West Humber River watershed has only 7.2% forest cover. It is identified as providing fair quality natural vegetation cover, which suggests that the existing vegetation cover supports, or is close to supporting, both regional species and vegetation communities of conservation concern (TRCA, 2007).

4.5.2 Vegetation Communities

The vegetation communities for the subject property, based on the Ecological Land Classification (ELC) system, are shown on **Figure 3A to 3G (Appendix A)**. The lands adjacent to Mayfield Road through the study area have been impacted by past (agriculture) and present (urbanization) pressures, generally resulting in only remnant vegetation communities primarily occurring along the watercourses. Several cultural units have established on abandoned lands, including old field meadows, buckthorn thickets and woodlots. Some better quality habitats occur as open wet meadows, shallow marshes and a few treed swamp communities, although floral diversity in general was limited due to anthropogenic influences and disturbance.

The vegetation community types within, and adjacent to, Mayfield Road are summarized in **Table 6** below. Where a community observed on site did not conform to the system outlined in the first approximation of the ELC (Lee et al. 1998), a new type, based on the principles of the ELC, has been assigned and described. These are indicated by an asterisk.

Table 6 ELC Vegetation Community Types, Mayfield Road Class EA

ELC Type	Description
FOREST (FO)	
Deciduous Forest (FOD)	
FOD7-3 Fresh-Moist Willow Lowland Deciduous Forest	Related to the willow swamp (SWD4-1), these units are located on higher ground and slopes along some watercourses. Species include the dominant crack willow, as well as trembling aspen, white elm and Manitoba maple. The shrub layer is often almost entirely composed of exotic invasive common buckthorn, while most of the herbs are of old field meadows, including awnless brome, orchard grass, wild carrot and timothy.
CULTURAL (CU) **Cultural Woodland (CUW)**	
CUW1 Mixed Cultural Woodland	A highly variable type, consisting of several possible tree species, including crack willow, white elm, sugar maple, white ash, bur oak, Norway maple, white pine or Scots pine. The ground cover is dominated by exotic species, such as common buckthorn, garlic

ELC Type	Description
	mustard, awnless brome, rough-fruited cinquefoil, and dandelion.
Plantation (CUP)	
CUP3-2 White Pine Coniferous Plantation	Simply structured communities, dominated by young white pine with some newly established white ash. Most of the understorey is dominated by common buckthorn with little development of the herb layer.
CUP3-12* White Spruce-Scots Pine Coniferous Plantation	Young white spruce, in association with Scots pine, forms the canopy, with common buckthorn in the scattered shrub layer. There is limited herbaceous vegetation, except in small openings where sunlight reaches the ground supporting species such as dandelion, wild carrot and tufted vetch.
Cultural Meadow (CUM)	
CUM1-1 Fresh-Moist Old Field Meadow	There are various community compositions of this type on either abandoned agricultural fields or disturbed sites. Numerous graminoid and forb species form associations, to the degree that dominants cannot be identified. Amongst the diverse exotic components and native species of weedy predisposition are awnless brome, tall goldenrod, orchard grass, tufted vetch, wild carrot, New-England aster, bird's-foot trefoil, and Kentucky bluegrass.
Cultural Thicket (CUT)	
CU1-7* Common Buckthorn Cultural Thicket	This unit consists of large coalescing patches of common buckthorn, occasionally toppled by young white ash and elm trees. Hawthorn is a frequent associate. The herb layer is well developed, even amongst the densely-growing entanglements of shrubs. It is generally composed of old field meadow species and pasture grasses, including awnless brome, bird's-foot trefoil, Kentucky bluegrass, orchard grass, New-England aster, tall goldenrod, rough-fruited cinquefoil, tufted vetch, wild carrot, and common yarrow.
Deciduous Swamp (SWD)	
SWD4-1 Willow Mineral Deciduous Swamp	This type is associated with floodplain areas, where it forms either distinct patches or, more often, narrow units along the watercourses. Crack willow forms the main tree canopy, with a secondary shorter layer of Manitoba maple. Shrub cover is variously developed, but usually rich, with such species as Manitoba maple and green ash saplings, common buckthorn, and currants. The lush but weed-rich herb layer is composed of species such as dame's rocket, garlic mustard, white avens, fringed loosestrife, spotted touch-me-not and star-flowered Solomon's-seal.

ELC Type	Description
Meadow Marsh (MAM)	
MAM2-2 Reed-canary Grass Mineral Meadow Marsh	These are very simply structured meadows along creek floodplains, dominated virtually entirely by reed-canary grass.
MAM2-11* Forb-Graminoid Mineral Meadow Marsh	A mix of grasses (reed-canary grass) and forbs (goldenrods, asters) is characteristic of this type which occurs in association with pure reed-canary grass meadows and cattail marshes.
Shallow Marsh (MAM)	
MAS2-1 Cattail Mineral Shallow Marsh	These are classic communities of narrow-leaved and/or broad-leaved cattail in the wettest portions of creek floodplains. They also often follow and delineate the overgrown portions of creek beds.

*not listed in Southern Ontario ELC

4.5.3 Vascular Plants

Ninety-three species of vascular plants were recorded from the study area during the inventories (**Appendix E**). The majority of the species are exotic (55%, or 51 species), on account of the highly urbanized and agricultural character of the subject lands. In contrast, 45%, (or 42) species are considered native and these are concentrated largely in the remaining willow swamp types along some watercourses and in the open wetland units.

All of the native species are ranked S5 – "very common in Ontario". There were two species of some interest in the Region of Peel:

- Blunt spike-rush (*Eleocharis obtusa*) is considered uncommon (U) and was observed growing on the banks of a pond just west of Airport Road, north of Mayfield Road
- White spruce (*Picea glauca*) is considered rare (R3) in Peel. All observed species in the study area are planted trees.

No nationally or provincially rare, threatened or endangered species were recorded from the subject lands.

4.5.4 Wildlife Species

During field investigations, the following incidental wildlife were observed: European starling, American robin, American crow, Red-winged blackbird, raccoon, grey squirrel and white-tailed deer. All of the species observed are considered common and secure in Ontario. They represent species that are tolerant to human activity, as suspected due to the anthropogenic influences in the area.

Inventories of historical wildlife records in the vicinity of the study area were compiled to determine potential wildlife use in the study area (**Appendix C**). Although they can be useful resources in terms of identifying potential species of concern, it is important to note that the exact locations of species occurrences are not available, since observations are recorded within a 10 km by 10 km square. It is likely that many of these species do not occur within the primary area of investigation.

According to the *Atlas of the Mammals of Ontario* (Dobbyn, 1994), a total of 44 mammals have been known to exist within the vicinity of the study area. Two of these species are considered species at risk:

- Grey fox (*Urocyon cinereoargenteus*) is ranked SZB (a breeding migrant) and is considered a provincially, and federally Threatened species. The most recent records of this species are thought to involve immigrants from the United States. There is very little evidence that the species breeds on a regular basis in Ontario, with only one documented instance of breeding (Pelee Island in 1999) in the Province (NHIC, 2008).
- Southern flying squirrel (*Glaucomys volans*) is ranked S3 and is considered a federal and provincial Species of Special Concern. This species is typically restricted to the Carolinian region of Ontario, although there have been rare occurrences as far north as Deep River and Parry Sound (Dobbyn, 1994). The species is area sensitive requiring a minimum of 20 hectares of mature deciduous forest, specifically maple with beech, hickory or oak. No suitable habitat was observed in eth study area.

According to the *Ontario Herpetofaunal Summary Atlas* (Oldham and Weller, 2001), 16 amphibians and 12 reptiles are known to exist within the vicinity of the study area. Four of these species are considered species at risk:

- Jefferson salamander (*Ambystoma jeffersonianum)* is ranked S2 and is considered a provincially and federally Threatened species. This species is terrestrial during its adult stage but requires vernal pools associated with upland deciduous forest for breeding. In order for juvenile salamanders to survive in these ponds, the ponds should not contain fish. After breeding is completed, the species moves back to the upland forest where it lives underground in rodent burrows. No suitable breeding pools were observed within the study area.
- Eastern Milksnake (*Lampropeltis triangulum triangulum*) is ranked S3 and is considered a provincial and federal Species of Special Concern. This species occurs in a variety of habitat, but favours open woodlands, forest edges and agricultural fields and is commonly associated with rural areas (Lamond, 1994). Potentially suitable habitat is found within agricultural fields and small woodlands within the study area.

- Common map turtle (*Graptemys geographica*) is ranked S3 and is considered a provincial and federal Species of Special Concern. This species frequents large, slow moving creeks with pools and riffles, and can also be found in large bodies of water where there is a soft gravel bottom and aquatic vegetation. Potentially suitable habitat is not found within the study area.

- Ribbon snake (*Thamnophis sauritus*) is ranked S3 and is considered a provincial and federal Species of Special Concern. In Ontario, this species is restricted to southern Ontario, where it is usually found close to water and is particularly characteristic of wetlands that are associated with large wooded areas (Lamond, 1994). Potentially suitable habitat is not found within the study area.

Of the 106 birds recorded within the Ontario Breeding Bird Atlas (Ontario Breeding Bird Atlas, 2005) as living within the vicinity of the study area, only three species are species at risk:

- Chimney swift (Chaetura pelagica) is ranked S5 and is designated as a federally and provincially Threatened species. This bird species nests mainly in the trunks of large, hollow trees, and occasionally on cave walls or in rocky crevices, however, have also adapted to roosting and nesting chimneys. While this species may be present within the study area, breeding opportunities are limited.

- Hooded warbler (*Wilsonia citrina*) is ranked S3 and is considered a provincially and federally Threatened species. It is also considered a locally significant species by the TRCA. This species nests in large, mature hardwood forests with tall trees and a well-closed canopy. It requires more than 15 hectares of mature, upland deciduous or mixed forest, where clearings have been created naturally or by logging (Evans Ogden and Stutchbury, 1994). It prefers clearings with low, dense, shrubby vegetation less than two meters in height, where nests are often placed in shrubs along the forest edge. Once a rare breeding bird in Ontario it has increased its population size and rapidly expanded its range in recent years (Cadman et al. 2007). There are no woodland areas that satisfy the breeding size requirements within the study area.

- Common nighthawk (*Chordeiles minor*) is ranked S4 and COSEWIC has been identified this species as Threatened within Canada, although it has no formal status. This species traditionally nests on the ground in open, vegetation-free habitats, such as recently harvested forests, burnt-over areas, pastures and riverbanks, but has adapted to nest on flat, gravel-covered roofs. The study area contains some areas that may be suitable for this species, although no field observations of this species were recorded.

Area sensitive birds are typically those that require at least 20 hectares of contiguous woodland area within which to breed. Three area sensitive species were identified within the Ontario Breeding Bird Atlas (Cadman et al., 2005) as being within the vicinity of the study area, including the oven bird (*Seiurus aurocapillus*), brown creeper (*Certhia Americana*) and Blue-grey gnatcatcher (*Polioptila caerulea*). All of these species are ranked S5 and require a minimum of 20, 30 and 30 ha respectively. Vegetation patches of this size do not exist within the study area.

Finally, an NHIC database search was completed for the study area, resulting in only one significant species being recorded within the vicinity of the study area – redside dace (S3). As noted in Section 4.4.1 (above), the redside dace is listed as Endangered under the provincial Endangered Species Act, and has been designated by COSEWIC as Endangered. This species is currently considered a species of Special Concern under the federal SARA. This coolwater species prefers pools and slow moving waters with undercut banks and overhanging vegetation.

A provincial recovery strategy (2010) is in place and provides a framework for action for responsible jurisdictions and others to secure the persistence and sustainability of Redside Dace in Ontario. The long-term goal of this recovery strategy is to restore viable populations of Redside Dace in a significant portion of their historic range in Ontario by:

- protecting existing healthy, self-sustaining populations and their habitats;
- restoring degraded populations and habitats; and
- re-introducing Redside Dace to sites of former distribution where feasible.

The recovery strategy recommends that all currently occupied and historic watercourse reaches be regulated as habitat under the ESA, including the stream and riparian area a minimum of 30 metres from the meander belt edge. In addition, it recommends that all headwater areas indirectly supporting Redside Dace be regulated under ESA habitat regulation (MNR, 2010).

4.6 SUMMARY OF ENVIRONMENTAL CONSTRAINTS

Based on the information provided in this section, and the policies outlined above, the preferred alternative should consider and aim to minimize potential adverse impacts on the following natural heritage and hazard features within the study area:

- Direct fish habitat and migration is found within Tributaries 3 (Salt Creek), 5, 6, 11 (West Humber River), 12 and 14, and indirect fish habitat (flow, surface water quality) in the remaining tributaries;
- Potential habitat for the redside dace in tributaries 3 (Salt Creek), 6 and 11 (West Humber River);
- Natural vegetation communities and native plant species identified within the study area, with specific attention paid to restoring and enhancing the natural corridors within the study area;
- All woodland areas and mature trees, especially along riparian corridors;

- Non Provincially significant wetland communities identified along Tributaries 3, 6, 7, 8, 9, 10, 11, 12, 13 and 14;
- Maintaining natural stream morphology and minimizing excessive erosion along the various Tributaries;
- Flood flows, depths and velocities at each watercourse crossing;
- Designated Natural Heritage System features identified in various Provincial, Regional and Municipal Plans, with specific consideration for maintaining the major River Valley Connection along the West Humber River; and
- TRCA Regulated areas as identified in **Table 2** and as delineated on the TRCA Regulation mapping.

5.0 Assessment of Alternatives

5.1 EVALUATION CRITERIA

The general criteria used to assess the potential impacts of each alternative alignment on the natural environment system include:

Wildlife and Wildlife Habitat:

- Impact on significant woodland areas and vegetation (size, composition, habitat);
- Impact on wetland areas (hydrologic functions, water regime, habitat, size);
- Impact on fish habitat and spawning areas (water quality);
- Impact on rare, threatened and endangered species (species, habitat, diversity);
- Impacts on wildlife and wildlife habitat;
- Impacts on wildlife corridors and linkages; and
- Impacts on designated / regulated natural heritage features

Surface Drainage:

- Impact on surface water features which include the West Humber River, Salt Creek and 14 other watercourse crossings (conveyance, habitat, water quality);
- Effects on Regulatory Floodplain (storage capacity, flow conveyance, elevation);
- Impacts on water quality (erosion and sedimentation);
- Impacts on erosion and bank stability; and
- Impacts on groundwater recharge.

5.2 ASSESSMENT OF ALTERNATIVES

The intent of this section is to identify and summarize the various viable alternatives being considered for the roadway expansion within the study area. These alternatives include:

Concept 1 – Widening equally about the existing centerline;

Concept 2 – Widening to the north;

Concept 3 – Widening to the south; and

Concept 4 – Modified alignment to minimize property impacts.

Since the "Do Nothing" Alternative is not considered a viable alternative, no assessment of environmental impacts is included.

5.2.1 Concept 1 – Widening equally about the existing centerline

Culvert extensions and or replacements will occur on both sides of Mayfield Road and will have a potential impact on aquatic habitat that will require approval from TRCA and possible approval from DFO and MNR. Impacts could be mitigated through the implementation of best management practices, such as erosion and sediment controls, construction timing, and site restoration.

The expansion of the roadway on either side of the existing alignment could have a direct impact on the four (4) roadside ditches that contribute flow to downstream fish habitat, although this flow conveyance function can be replicated.

This option would encroach into non-provincially significant wetland pockets identified on both the north and south sides of Mayfield Road. Encroachment into wetland areas by construction machinery to remove vegetation and excavate soil material would result in localized impacts on the wetland pockets. This option would result in the greatest wetland loss.

5.2.2 Concept 2 – Widening to the north

Culvert extensions and or replacements will occur only on the north side of Mayfield Road and will have a potential impact on aquatic habitat that will require approval from TRCA and possible approval from DFO and MNR. Impacts could be mitigated through the implementation of best management practices, such as erosion and sediment controls, construction timing, and site restoration.

The expansion of the roadway on either side of the existing roadway could have a direct impact on only one (1) roadside ditch that contributes flow to downstream fish habitat, although this flow conveyance function can be replicated.

This option would encroach into non-provincially significant wetland pockets identified on the north side of Mayfield Road. Encroachment into wetland areas by construction machinery to remove vegetation and excavate soil material would result in localized impacts on the wetland pockets. This option would result in the least wetland loss as the larger wetland pockets are located on the south side of the existing roadway and would be avoided.

5.2.3 Concept 3 – Widening to the south

Culvert extensions and or replacements will occur only on the south side of Mayfield Road and will have a potential impact on aquatic habitat that will require approval from TRCA and possible approval from DFO and MNR. Impacts could be mitigated through the implementation of best management practices, such as erosion and sediment controls, construction timing, and site restoration.

The expansion of the roadway on either side of the existing roadway could have a direct impact on three (3) roadside ditches that contribute flow to downstream fish habitat, although this flow conveyance function can be replicated.

This option would encroach into non-provincially significant wetland pockets identified on the south side of Mayfield Road. Encroachment into wetland areas by construction machinery to remove vegetation, excavate soil material would result in localized impacts on the wetland pockets. This option would result in greater wetland loss than Concept 2 as the larger wetland pockets are located on the south side of the existing roadway.

5.2.4 Concept 4 – Modified alignment to minimize property impacts

Culvert extensions and or replacements will occur on both sides of Mayfield Road and will have a potential impact on aquatic habitat that will require approval from TRCA and possible approval from DFO and MNR. Impacts could be mitigated through the implementation of best management practices, such as erosion and sediment controls, construction timing, and site restoration.

The expansion of the roadway on either side of the existing roadway could have a direct impact on the four (4) roadside ditches that contribute flow to downstream fish habitat, although this flow conveyance function can be replicated.

This option would encroach into non-provincially significant wetland pockets identified on both the north and south sides of Mayfield Road. Encroachment into wetland areas by construction machinery to remove vegetation, excavate soil material would result in localized impacts on the wetland pockets. This alignment would result in greater wetland loss than Concept 2 but less than Concept 3.

5.3 SUMMARY OF NATURAL ENVIRONMENT ASSESSMENT

The following is a summary of the assessment of the alternative alignments on the natural environment system:

- Each of the alternatives requires the extension or replacement of culverts on Salt Creek, West Humber River and 14 smaller watercourses;
- All of the alternatives will require the mitigation of potential impacts to redside dace communities historically found in three (3) of the watercourses within the study area. Further discussion with MNR and DFO staff is recommended during detailed design to confirm appropriate measures;

- Each of the alternatives will impact the roadside ditches within the study area, that although they do not provide direct fish habitat, contribute flow to downstream fish habitat;

- No impacts to significant woodland areas or significant vegetation communities are anticipated with any of the alternatives. Vegetation removal is limited to cultural woodlands, cultural thicket communities, landscaping trees and some wetland communities adjacent to the existing roadway;

- Each of the alternatives will result in impacts to several non-provincially significant wetland communities found adjacent to the watercourses within the study area, resulting from culvert extensions and construction impacts;

- Each of the alternatives has the potential to impact flood elevations, riparian vegetation, natural stream morphology and erosion. These can be mitigated through the restoration of existing grades, vegetative cover following construction and sediment and erosion control measures during construction;

- Based on the hydrogeological investigation, the proposed design concepts would all be equally viable from a hydrogeological perspective. A slight preference for Concept 4 was assessed as minimizing property impacts would also serve to minimize potential domestic well impacts (Stantec, 2010); and

- All culvert extensions and construction within regulated natural heritage features will require a permit from TRCA and may require approval under the Endangered Species Act from the MNR where culvert extensions and associated in water work is proposed within redside dace habitat.

6.0 Impact Assessment and Mitigation for the Preferred Alternative

Based on the assessment of the natural, social and economic impacts of the various alternatives, Concept 4 was selected as the preferred alternative to address the traffic problems in this area.

During the planning, design, and construction of the preferred alternative, the potential exists for causing adverse environmental impacts on the natural features and ecological functions identified within the study area. The potential also exists for the preferred alternative to impact flooding, erosion and the natural meander pattern of these watercourses, although mitigation measures to minimize such impacts are provided under separate cover.

The opportunity exists at this time to provide an environmentally responsible alternative that avoids significant impacts and minimizes adverse environmental impacts through the implementation of mitigation, restoration and enhancement of areas impacted by the preferred alternative. This approach is consistent with the objectives and policies of the Peel OP, area municipal official plans, TRCA policies and Environmental Assessment procedures.

6.1 IMPACT ASSESSMENT

6.1.1 Wetlands

Several non-provincially significant wetland communities will be directly impacted as a result of the proposed road expansion. Encroachment into wetland areas by construction machinery to remove vegetation and excavate soil material to accommodate future road widenings will result in localized impacts (loss) to wetland pockets.

The preferred alternative will result in impacts to approximately 0.7 ha of wetland associated with 7 riparian wetland areas on the north side of the road and approximately 1.0 ha of wetland associated with 9 riparian wetland areas on the south side of the road. The approximate total area of wetland directly impacted by the proposed road construction is 1.7 ha. All wetland areas are considered to be non-provincially significant, contain no rare vegetation communities or species and are primarily meadow marsh communities (with the exception of one Willow Mineral Deciduous Swamp (SWD4-1) community adjacent to the West Humber River). Loss of wetland areas adjacent to the three (3) watercourses historically supporting redside dace will result from the expansion of culverts and construction activity (0.054ha adjacent to watercourse 3, 0.26 ha adjacent to watercourse 6 and 0.5 ha adjacent to the West Humber River)).

6.1.2 Woodlands

No loss of significant woodlands will result with the preferred alternative. The alternative does directly impact a small portion of a cultural woodland and a portion of a Scots Pine coniferous plantation, although potential impacts to the remaining woodland features will be mitigated during construction.

6.1.3 Wildlife Habitat

No impacts to wildlife habitat are anticipated with the preferred alternative. The proposal does not result in the loss of any significant wildlife habitat or impact wildlife movement corridors that may be present within the study area. Wildlife within the study area is already impacted by the presence of the existing roadway. Minor displacements of wildlife will occur as a result of the loss of some vegetation communities, including wetlands, however there remains suitable similar habitat within the immediate vicinity. Minor displacement of wildlife may occur during the construction of the roadway, however it is anticipated that wildlife will return once construction is complete.

6.1.4 Fish Habitat

The preferred alternative will require either the replacement or extension of existing culverts on both sides of Mayfield Road at each of the watercourse crossings within the study area. These replacements and extensions will have a potential impact, both direct and indirect, on aquatic habitat, including habitat for Redside dace.

Culvert replacements will be required for the existing culverts on watercourses 1, 2, 4, 7, 8, 12, 14, 16. None of these watercourses support direct fish habitat except for watercourses 12 and 14.

Existing culverts on watercourses 3, 5, 6, 9, 10, 11, 13 and 15 will require extensions or replacements on both the north and the south side of the existing roadway. Direct fish habitat is found in watercourses 3, 5, 6 and 11. Potential habitat for Redside dace is found in watercourses 3, 6 and 11. The culverts on these watercourses are proposed to be replaced with single span bridges. **Table 7** summarizes the proposed changes to culvert lengths along watercourses that support direct fish habitat.

The replacement and/or expansion of the culverts will have a direct impact on fish habitat within the watercourse and will result in the loss of fish habitat (reduced open channel). The culvert extensions may also require additional channel realignments to accommodate the culvert extensions resulting in further alteration of fish habitat. Additional channel realignments will be required on the east side of the road on watercourse 12. Consultation with the TRCA and DFO at the final design stage will be required to discuss the mitigation of impacts and assess the requirement for compensation of the loss of fish habitat.

Potential habitat for Redside dace will be impacted as a result of culvert extensions or replacements on watercourses 3, 6 and 11. Approximately 75m of watercourse length potentially providing habitat for Redside Dace will be impacted as a result of increased bridge spans. These impacts will need to be mitigated during the final design process in consultation with the MNR. Mitigation measures should include the provision of low flow channels and creek bed restoration and enhancement. The final design of the bridge spans and any channel realignments will need to demonstrate that there will be an overall improvement to Redside dace habitat.

Table 7 Proposed Culvert Replacements and Extensions, Mayfield Road Class EA

Trib	Culvert Type	Existing Culvert Length (m)	Proposed Culvert Length (m)	Increase in Culvert Length (m)	Potential Impacts to Redside Dace
3	Single Bridge	12.229	48.00	35.771 North -16.475 South - 19.296	Yes
5	Concrete Box	29.225	55.3	26.075 North -12.099 South – 13.976	No
6	Single Span Bridge	37.870	48.00	10.130 North – 4.437 South -5.693	Yes
11	Single Span Bridge	19.870	48.00	28.130 North – 9.563 South 0 18.567	Yes
12	Concrete Box	20.650	50.923	30.273	No
14	Concrete Box	20.310	51.424	31.114 North – 15.2 South – 15.914	No

No impacts to indirect fish habitat are anticipated with the culvert replacements or extensions and new bridge structures as long as appropriate mitigation measures are in place during construction to prevent impacts to downstream fish communities. No changes to flow contribution to downstream fish habitat are anticipated as this flow conveyance function will be maintained.

Further reduction in the length of the culvert extensions, and corresponding loss of open channel habitat, may be possible through the implementation of retaining walls, reduced grading (i.e. steepen road embankments) or other measures that allow for the proposed road widening while limiting the need for culvert extensions. This should be considered during detailed design and discussed with the TRCA / MNR / DFO, especially within Tributaries 3, 6 and 11.

6.1.5 Stormwater Management

Stormwater management measures (SWM), including the use of SWM facilities and oil grit separators (OGS) have been incorporated into the design of the new roadways and intersection improvements to maintain pre-development quantity and quality of stormwater run-off. The proposed SWM pond locations are proposed outside of any natural heritage features in either active agricultural areas or cultural meadows. No impacts are anticipated.

6.2 MITIGATION MEASURES

Impacts could be mitigated through the implementation of best management practices, such as erosion and sediment controls, construction timing, site restoration and construction timing.

Table 8 summarizes the recommended mitigation and enhancement measures, and suggested application, to minimize and mitigate the potentially adverse environmental impacts associated with the planning, design and construction of the proposed roadway improvements. This information should be used in preparing the final detailed design plans, construction timing, agency approvals and on-going monitoring to ensure that the natural environment features identified within this report are protected, maintained, restored and enhanced (where applicable) through the implementation of the preferred alternative.

Table 8 Potential Impacts and Mitigation Measures (Fish, Wildlife and Vegetation)

Potential Impact	Recommended Mitigation and Enhancement Measures
1. Aquatic Habitat, Fisheries and Water Quality	
Direct loss, alteration, or disruption of fish habitat	• Minimize the footprint of any required culvert extensions associated with road widening during the design process to minimize the length of watercourse (fish habitat) affected by culvert / bridge extensions. • Ensure sufficient fish passage is provided during and post construction through all culvert replacements or extensions where direct fish habitat exists; • The use of open bottom culverts should be considered where feasible to mitigate impacts to aquatic habitats; • Countersink and backfill any new or extended culverts with natural substrate (bed material), ensuring that a low flow channel is maintained through natural substrate material to allow for fish passage; • Restore vegetation and aquatic habitat (substrate) to pre-construction conditions, ensuring that any habitat features

Potential Impact	Recommended Mitigation and Enhancement Measures
	(pools, riffles, structure) are restored or enhanced; • Any Harmful Alteration, Disruption or Destruction (HADD) of fish habitat that may result from the proposed roadway improvements will require prior Authorization from DFO. A compensation plan will be required for review and approval and should be discussed with TRCA staff on behalf of DFO; • Opportunities to enhance riparian vegetation through the planting of other hanging grasses, shrubs and trees will improve stream cover, reduce temperature impacts, and provide allochthonous inputs (food source for various fish species. • Minimum 2 years of Post construction monitoring to ensure the success of rehabilitation efforts;
Increased turbidity and siltation in downstream areas resulting in "smothered" plants and animals due to the deposition of silt and increased turbidity of surface watercourses	• Ensure appropriate erosion control measures are installed and maintained throughout all phases of construction to protect exposed surfaces, control run-off and minimize the deposition of silt or suspended sediments within downstream habitats; • Worksite isolation and dewatering plans should be prepared to identify appropriate isolation methods, siltation controls and dewatering measures to be implemented. ; • Any pumped water resulting from dewatering activities should be discharged to settling areas or through filter media before entering the surface water bodies; • Utilize suitable backfill material along banks and footings; • Stage construction activity to minimize the frequency and duration of any in-water work, as much as feasible; • Re-vegetate all disturbed areas as soon as possible following disturbance to stabilize the area and minimize erosion potential.
Impacts on Redside dace	• Improve water quality through SWM and erosion control; • Restore riparian vegetation cover through the planting of overhanging grasses, forbs and shrubs, to provide cover, shade and a source of food (insects); • No in-water work should occur between September 15th and June 30th for all tributaries containing, historically

Potential Impact	Recommended Mitigation and Enhancement Measures
	containing or draining to redside dace or its habitat. While dace spawn in May, the coldwater timing window is typically applied by MNR to ensure that no unstable construction areas are prone to erosion through the winter months and during spring freshet, which reduces the risk of a sediment event in redside dace habitat areas. A review of the particular activity may assist in negotiating the timing window.
Stress on fish communities	• Any fish that may occur within isolated work areas should be captured and released in accordance with appropriate MNR protocols. MNR should be consulted to confirm the appropriate fish relocation plan for watercourses potentially containing redside dace.
Reduced water quality in downstream habitat areas	• Incorporate SWM measures into the design of the new roadways and intersection improvements to maintain pre-development quantity and quality of stormwater run-off; • Implement provisions during construction for quick and effective spill control, containment and response, ensuring cleanup materials are stored on-site for easy access; • Implement accurate reporting protocols to ensure quick and accurate reporting of all spills; • Ensure all equipment entering the water (if deemed necessary) is properly washed and degreased prior to entering the watercourse; • Ensure refuelling stations are located outside of the floodplain and at least 30 m from the watercourse; • Establish and maintain erosion and control measures throughout all phases of construction.
Timing effects of construction on aquatic species	• Staging of work to avoid spawning and breeding activity • No in-water work should occur between September 15th and June 30th in the West Humber River or any of its tributaries supporting Redside dace in accordance with MNR Fisheries timing windows • All other watercourses are to be managed as warmwater systems and no in-water work should occur between March 15th and June 30th .

Potential Impact	Recommended Mitigation and Enhancement Measures
2. Terrestrial Habitat and Species	
Removal or disturbance of significant trees or ground flora	• Minimize tree removal and bank disturbance during construction; • Stabilize all disturbed areas upon completion of any grading works through re-vegetation of the disturbed areas utilizing native plant species (ex. seed and mulch, compost mix, tree and shrub planting); • Direct roadway improvements away from sensitive areas, such as wetlands or pools, where feasible.
Stress on biological communities	• The stress on wildlife is not anticipated to increase significantly due to the existing high traffic volumes already occurring in the area • Avoid construction impacts during sensitive wildlife periods, such as breeding seasons for various fish and bird species
Introduction of exotic species through disturbance	• Use only native species for all re-vegetation work
Interference with ecological corridors and linkages	• The existing roadway already represents an interference point to the linkage function along the various watercourses • Maintain culvert diameter to maintain existing wildlife movement and migration along corridors

The above-referenced mitigation measures are standard procedures used at locations where in-stream or near stream works are required. Detailed mitigation and compensation measures should be further developed as the detailed design of the preferred alternative is finalized in consultation with appropriate regulatory agencies.

6.3 APPROVALS

Prior to constructing the road alignment, a number of permits and approvals will need to be obtained. Approvals will be required from the TRCA, DFO and MNR. The following are considerations and/or requirements that may be part of the final implementation:

- **TRCA** – A Development, Interference with Wetlands and Alterations to Shorelines and Watercourses permit, pursuant to Ontario Regulation 166/06 will be required for all work within regulated areas including, but not limited to, any watercourse alterations, wetland removal / interference or any development (grading, construction) within the floodplain;

- **Department of Fisheries and Oceans** - Any Harmful Alteration, Disruption or Destruction (HADD) of fish habitat that may result from the proposed roadway improvements will require prior Authorization from DFO. A compensation plan will be required for review and approval and should be discussed with TRCA staff on behalf of DFO;

- **Ministry of Natural Resources** - The proposed road widening will require work to be undertaken at three watercourse crossings known to support Redside Dace. Redside dace receive both species protection (under Section 9) and general habitat protection (under Section 10) of the Endangered Species Act (ESA). A permit under Section 17 (2)(c) is required for any activity that will adversely affect Redside Dace. Permits require the permit holder to undertake activities that result in an overall net benefit to the affected species at the local level. The MNR Aurora District Office should be consulted prior to initiation of the permit application process to confirm requirements in this regard.

- **Ministry of Natural Resources** – Any in-water work within the bed of the river(s) could require a Public Lands Act permit. MNR should be consulted to confirm if a permit is required.

- **Transport Canada** – As outlined in the *Navigable Waters Protection Act* – any work in, upon, over, under, through or across a navigable waterway, including dredging or dam/weir construction requires approval. The Sarnia office of Transport Canada, Navigable Waters Branch, should be consulted for an Assessment of Navigability early in the final design process.

7.0 Summary and Conclusion

We trust that the above adequately characterizes the natural environment features and functions within the study area of this project and appropriately recommends the implementation of mitigation measures to minimize any potential impacts that may result.

Respectfully Submitted,

STANTEC CONSULTING LTD.

Chris Powell, M.A.
Project Manager
Tel: (519) 585-7416
Fax: (519) 585-4239
chris.powell@stantec.com

Shari Muscat, B.A., B.E.S.
Project Manager
Tel: (519) 575-4116
Fax: (519) 585-4239
shari.muscat@stantec.com

8.0 References

Bakowsky, W.D. 1996 (draft). Natural heritage resources in Ontario: S-ranks for communities in Site Regions 6 and 7. Natural Heritage Information Centre, Ontario Ministry of Natural Resources, Peterborough. 11 pp.

Cadman, M.D., D.A. Sutherland, G.G. Beck, D. Lepage, and A.R. Couturier. 2005. Atlas of the Breeding Birds of Ontario. Federation of Ontario Naturalists. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural

Chapman, L.J., and Putnam, D.F. 1984. The Physiography of Southern Ontario, Third Edition; Ontario Geological Survey, Special Volume 2, 270p. Accompanied by Map P.2715 (coloured), scale 1:600,000.

City of Brampton. 2006. City of Brampton Official Plan.

Dobbyn, J. 1994. Atlas of the Mammals of Ontario. Federation of Ontario Naturalists.

Layberry, Ross A., Peter W. Hall, and J. Donald Lafontaine. 1998. the Butterflies of Canada. University of Toronto Press. 280 pp.

Lee, H.T., W.D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig and S. McMurray. 1998. Ecological land classification for Southwestern Ontario: first approximation and its application. Ontario Ministry of Natural Resources, South Central Region, Science Development and Transfer Branch. Technical Manual ELC-005.

Ministry of Environment, 2003. Stormwater Planning and Design Manual: Appendix C – Rapid Geomorphic Assessment.

Ministry of Municipal Affairs and Housing. 2005. Provincial Policy Statement. Queen's Printer for Ontario.

MEA (Municipal Engineers Association) 2000. Municipal Class Environmental Assessment. June 2000.

Natural Heritage Information Centre. 2007. Internet database .Ontario Ministry of Natural Resources. http://www.mnr.gov.on.ca/MNR/nhic/nhic.html

Natural Heritage Information Centre. 2003. Provincial Status of plants and wildlife database. Ontario Ministry of Natural Resources.

Newmaster, S.G., A. Lehela, P.W.C Uhlig, S. McMurray and M.J. Oldham. 1998. Ontario plant list. Ontario Ministry of Natural Resources, Ontario Forest Research Institute, Sault Ste. Marie, ON, Forest Research Information Paper No. 123. 550 pp. + appendices.

Oldham, M.J. 1993. Distribution and status of the vascular plants of southwestern Ontario (Draft). Ontario Ministry of Natural Resources, Aylmer District, Aylmer, Ontario. 150 pp.

Oldham, M.J., W.D. Bakowsky and D.A. Sutherland. 1995. Floristic quality assessment for southern Ontario. OMNR, Natural Heritage Information Centre, Peterborough. 68 pp.

Oldham, M.J. and W.F. Weller. 2001. Ontario Herpetofaunal Atlas internet database. Natural Heritage Information Centre, Ministry of Natural Resources. Accessed February 7, 2007. http://www.mnr.gov.on.ca/MNR/nhic/herps/ohs.html

Ontario Breeding Bird Atlas. 2005. Online results from 2001-2005 Ontario Breeding Bird Atlas program. http://www.birdsontario.org/atlas/atlasmain.html

Ontario Ministry of Municipal Affairs and Housing. 2005. Greenbelt Plan.

Ontario Ministry of Natural Resources. 1993. Ontario Wetland Evaluation System, Southern Manual. 107 pp.

Ontario Ministry of Natural Resources. 2000. Significant Wildlife Habitat Technical Guide. Fish and Wildlife Branch, Wildlife Section, Science Development and Transfer Branch, South-central Sciences Section. 151 pp.

Ontario Ministry of Natural Resources. 2002. Ontario Wetland Evaluation System, Southern Manual, 3rd Edition. NEST Technical Manual TM-002, March 1993, revised December 2002.

Ontario Ministry of Natural Resources. 2007. Endangered Species Act.

Ontario Ministry of Natural Resources. 2009. NRVIS digital mapping of significant natural features.

Ontario Ministry of Natural Resources. 2009. Draft Significant Wildlife Habitat Ecoregion Criteria Schedules. Addendum to Significant Wildlife Habitat Technical Guide, Ontario Ministry of Natural Resources, Working Draft January 2009.

Ontario Ministry of Natural Resources. 2010. Natural Heritage Reference Manual for Policy 2.3 of the Provincial Policy Statement. 247 pp

Redside Dace Recovery Team. 2010. Recovery Strategy for Redside Dace (*Clinostomus elongatus*) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. vi + 29 pp.

Region of Peel. 2008. Region of Peel Official Plan – Consolidated 2008.

Rowe, J.S. 1972. Forest regions of Canada. Canadian Forest Service Publication No. 1300. 172 pp.

Toronto and Region Conservation Authority. 1994. Valley and Stream Corridor Management Program

Toronto and Region Conservation Authority. 2005. Fisheries Management Plan for the West Humber River

Toronto and Region Conservation Authority. 2007. Humber River Watershed Report Card

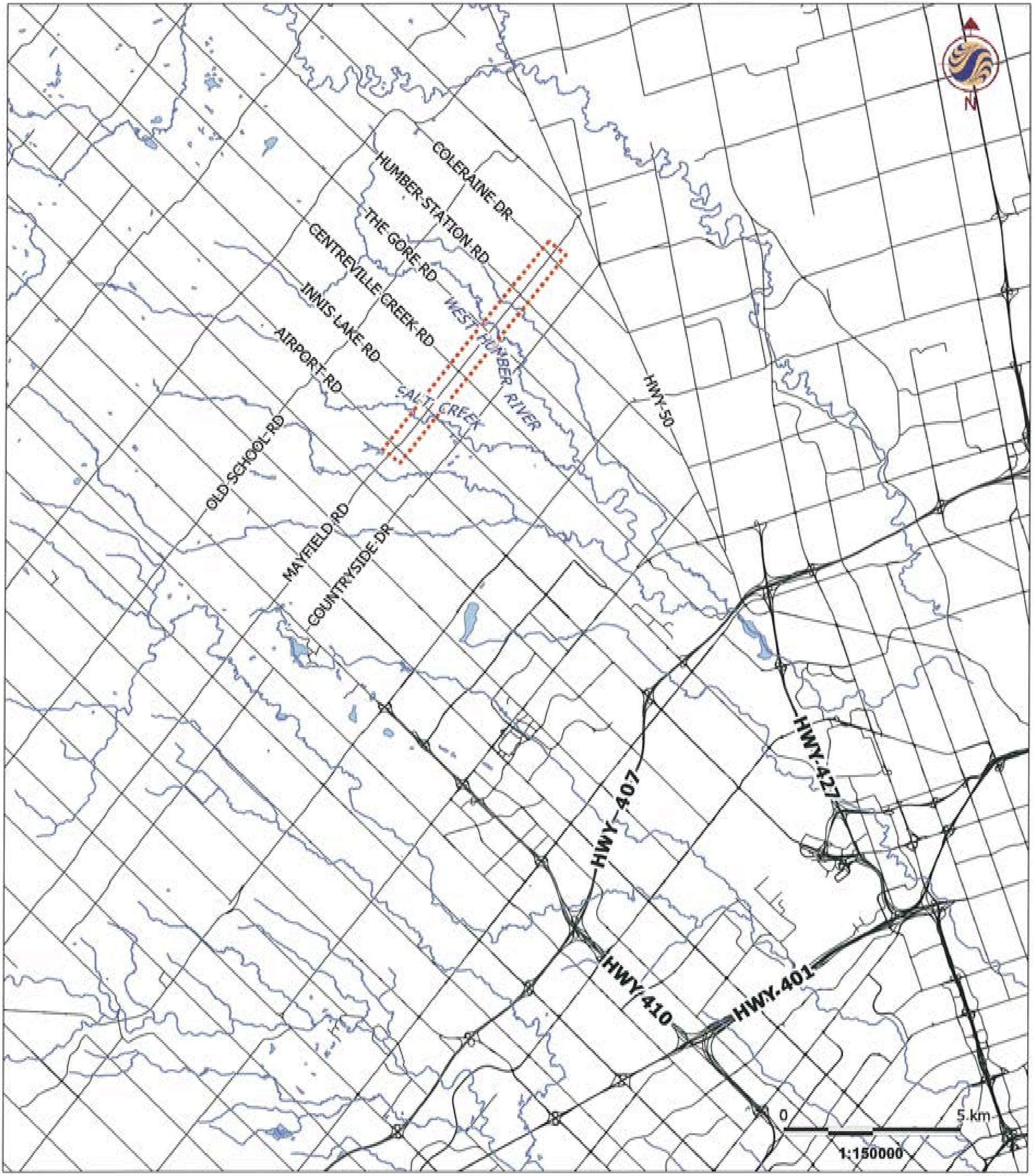
Toronto and Region Conservation Authority. 2007. Terrestrial Natural Heritage System Strategy.

Toronto and Region Conservation Authority. Regulation 166/06 Regulation Mapping.

Town of Caledon. 2008. Town of Caledon Official Plan.

APPENDIX A

FIGURES



V:\01609\active\160210480_Mayfield_Road_Class_EA\planning\drawing\Class EA 200802\160210480_105_NatEnv.mxd [Fig 01 - Site Location Layout]
6/24/2008 11:14:31 AM By: sstroszkal Revised 06-23-2008 By: sstroszkal

June 2008
Project No. 160210480

Legend

Stream
Roads
Study Area
Waterbody

Stantec

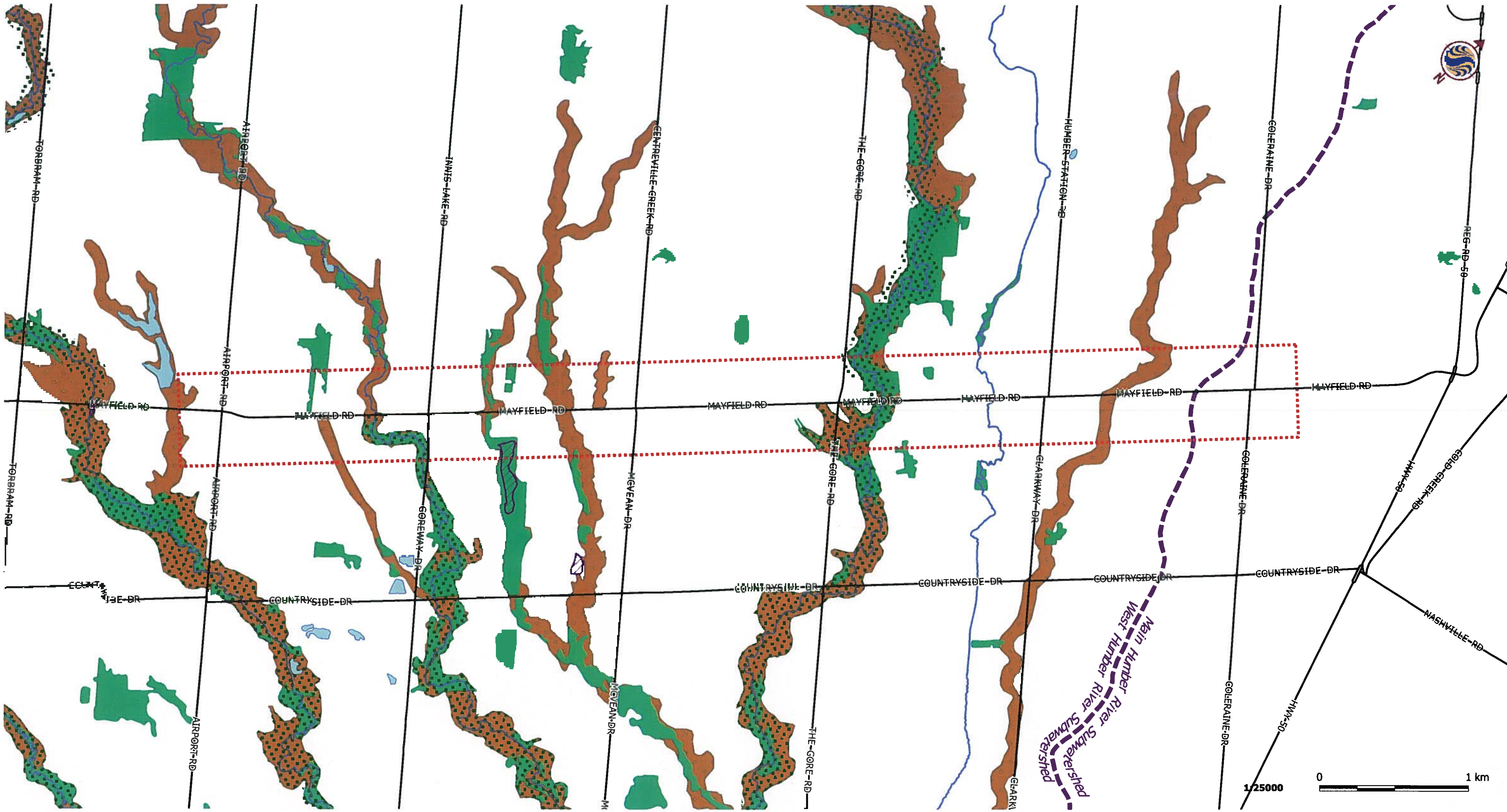
Notes

1. Roads provided by the Ontario Road Network.
2. Streams provided by the Region of Peel.

Client/Project
Region of Peel
Mayfield Road Class EA

Figure No.
1

Title
Site Location



June 2008
Project No. 160210480

Legend

- Roads
- Stream
- Study Area
- Greenlands System
- Subwatershed Boundary
- Environmentally Sensitive Area
- Wetland
- Waterbody
- Woodland
- Valleylands
- Earth Science ANSI
- Life Science ANSI

Notes

1. Data provided by the Region of Peel.

Stantec

Client/Project
Region of Peel
Mayfield Road Class EA

Figure No.
2

Title
Region of Peel Greenlands System

June
Project No. 1602

Legend

- Watercourse
- ELC Community
- Anticipated Wetland Impacts
- Study Area
- 1 Tributary Crossings

CUM1-1	Fresh-Moist Old Field Meadow
CUP3-12	White Spruce-Scots Pine Coniferous Plantation
CUT1-7	Common Buckthorn Cultural Thicket
CUW1	Mixed Cultural Woodland
FOD7-3	Fresh-Moist Willow Lowland Deciduous Forest
MAM2-2	Reed-canary Grass Mineral Meadow Marsh
MAM2-11	Forb-Graminoid Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh
P	Pond
SWD4-1	Willow Mineral Deciduous Swamp

Notes

1. Orthoimagery and base features provided by the Regional Municipality of Peel, 2008.
2. Watercourse features provided by the TRCA, 2008.

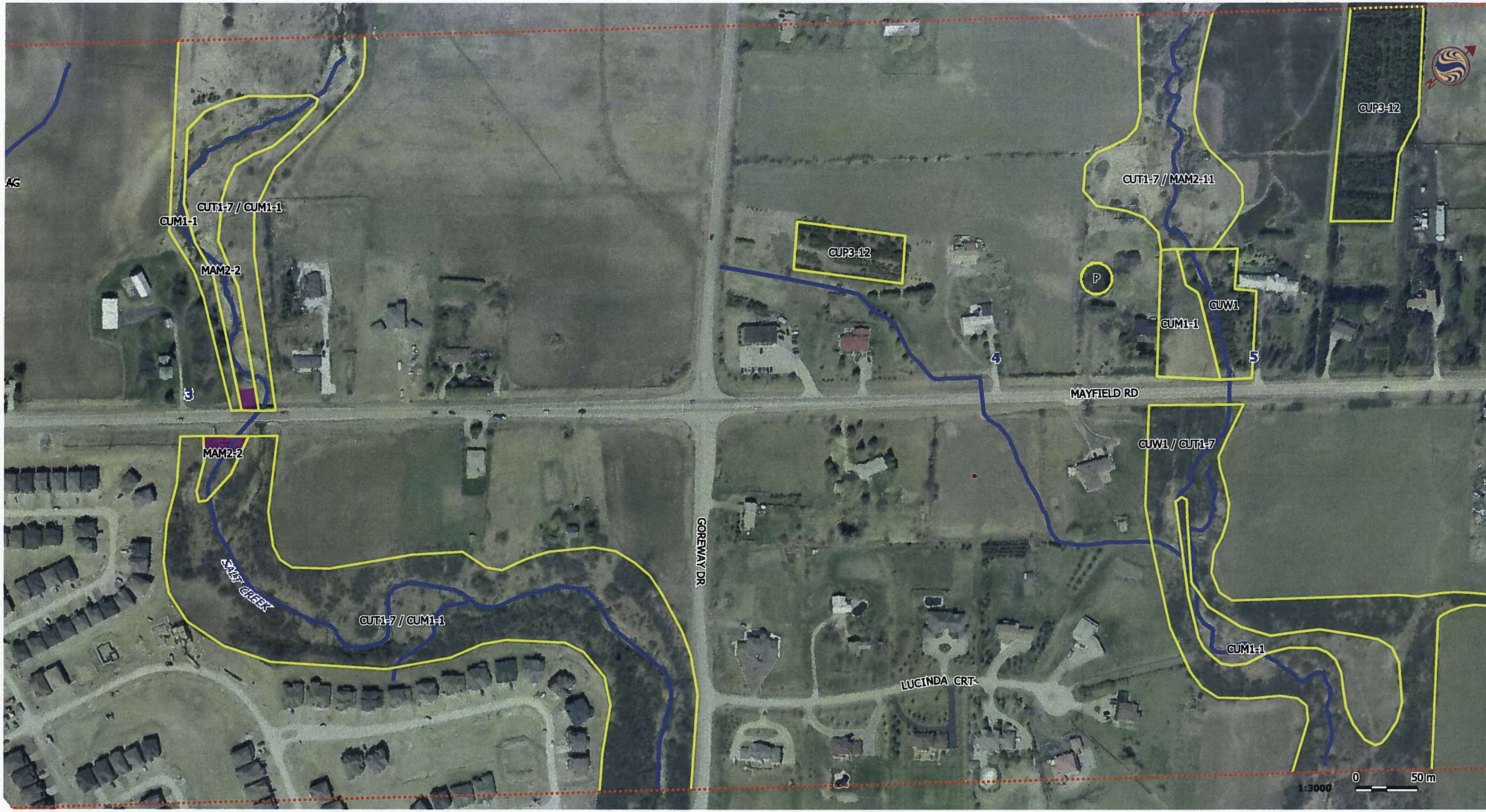
Stantec

Client/Project
Region of Peel
Mayfield Road Class EA

Figure No.
3A

Title
ELC Vegetation Communities

\\cd1004-f06\work_group\01609\active\160210480\planning\drawing\Class EA 200802\Manifold\160210480_105_NatEnv.map [Fig 03B -
4/14/2011 1:19:34 PM By: ccoghlan Revised 06-24-2008 By: sstroszkoli



Legend

Watercourse	
ELC Community	
Anticipated Wetland Impacts	
Study Area	
1 Tributary Crossings	

CUM1-1	Fresh-Moist Old Field Meadow
CUP3-12	White Spruce-Scots Pine Coniferous Plantation
CUT1-7	Common Buckthorn Cultural Thicket
CUW1	Mixed Cultural Woodland
FOD7-3	Fresh-Moist Willow Lowland Deciduous Forest
MAM2-2	Reed-canary Grass Mineral Meadow Marsh
MAM2-11	Forb-Graminoid Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh
P	Pond
SWD4-1	Willow Mineral Deciduous Swamp

Notes

1. Orthoimagery and base features provided by the Regional Municipality of Peel, 2008.
2. Watercourse features provided by the TRCA, 2008.

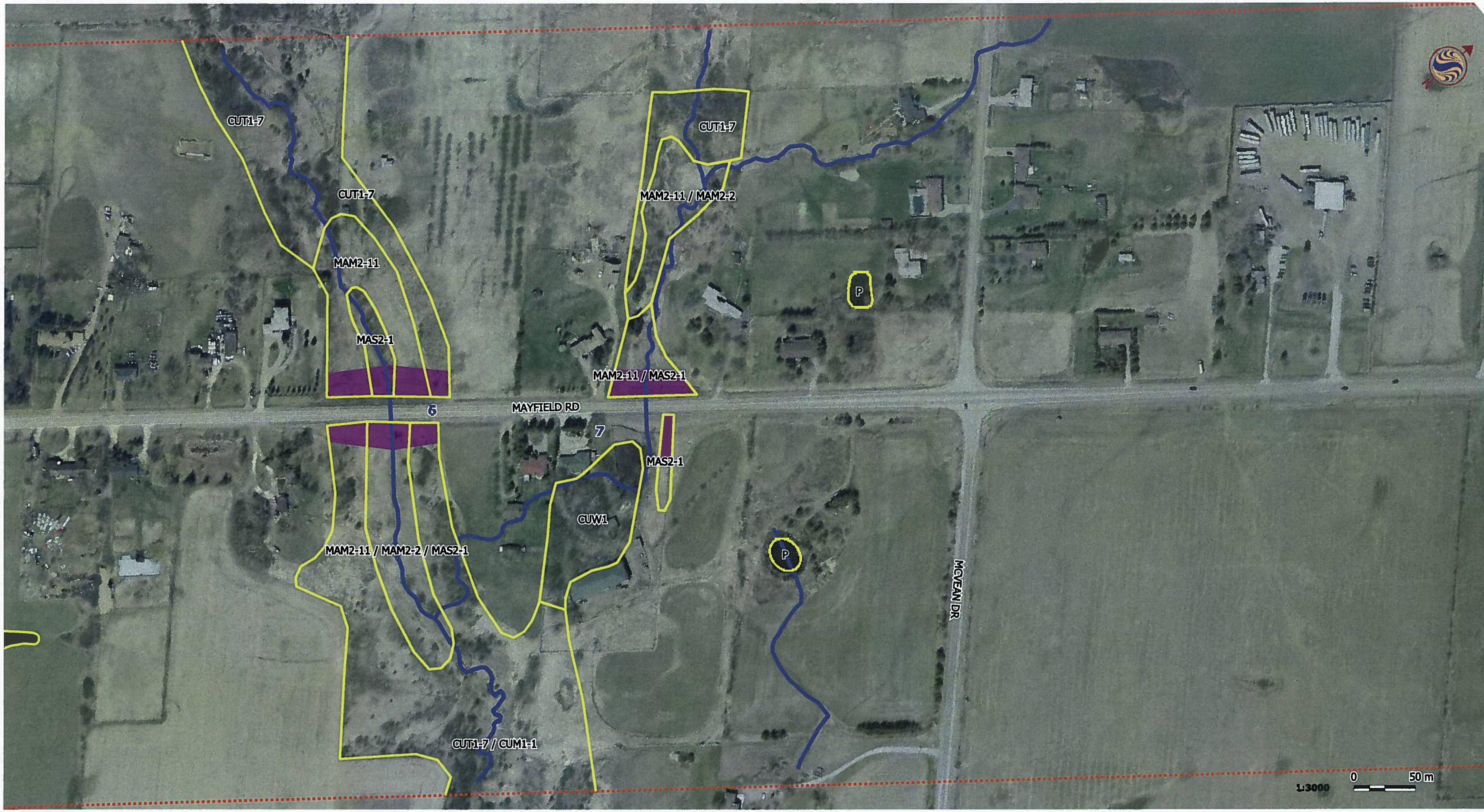
Stantec

Region of Peel
Mayfield Road Class EA

3B

ELC Vegetation Communities

\\cd1004-f06\work_group\01609\active\160210480_Mayfield Road_Class EA\planning\drawing\Class EA 200802\Manifold\160210480_105_NatEnv.map [Fig 03C -
4/14/2011 1:19:42 PM By: ccoghlan Revised MM-DD-YYYY By: Username



June
Project No. 1602

Legend

- Watercourse
- ELC Community
- Anticipated Wetland Impacts
- Study Area
- 1 Tributary Crossings

CUM1-1	Fresh-Moist Old Field Meadow
CUP3-12	White Spruce-Scots Pine Coniferous Plantation
CUT1-7	Common Buckthorn Cultural Thicket
CUW1	Mixed Cultural Woodland
FOD7-3	Fresh-Moist Willow Lowland Deciduous Forest
MAM2-2	Reed-canary Grass Mineral Meadow Marsh
MAM2-11	Forb-Graminoid Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh
P	Pond
SWD4-1	Willow Mineral Deciduous Swamp

Notes

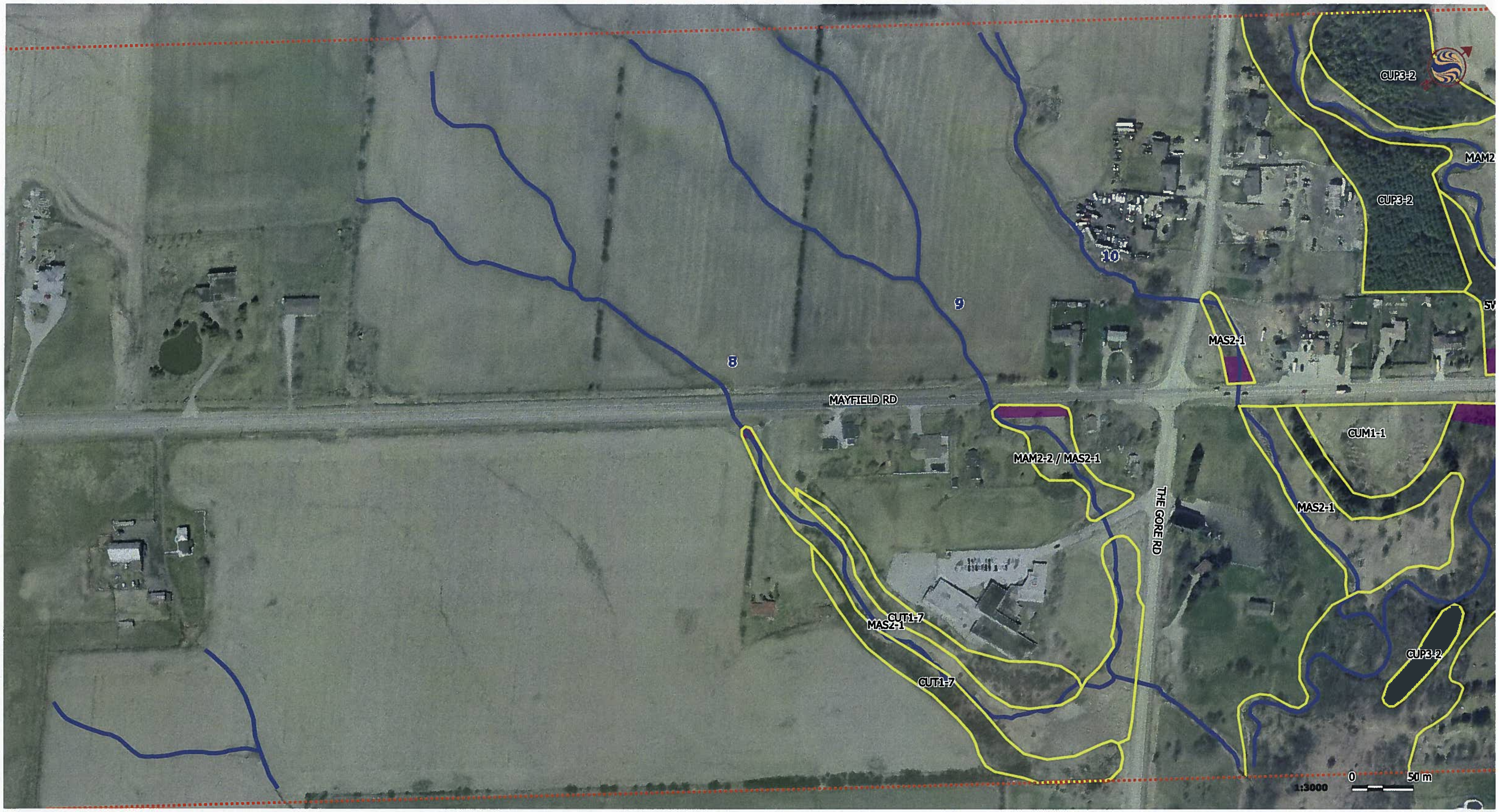
1. Orthoimagery and base features provided by the Regional Municipality of Peel, 2008.
2. Watercourse features provided by the TRCA, 2008.

Stantec

Client/Project
Region of Peel
Mayfield Road Class EA

Figure No.
3C

Title
ELC Vegetation Communities



\\cd1004-f06\work_group\01609\active\160210480_Mayfield Road_Class EA\planning\drawing\Class EA 200802\Manifold\160210480_105_NatEnv.map [Fig 03D -
4/14/2011 1:19:52 PM By: ccoghlan Revised 06-24-2008 By: sstroszkal

Stantec

Legend

- Watercourse
- ELC Community
- Anticipated Wetland Impacts
- Study Area
- 1 Tributary Crossings

CUM1-1	Fresh-Moist Old Field Meadow
CUP3-12	White Spruce-Scots Pine Coniferous Plantation
CUT1-7	Common Buckthorn Cultural Thicket
CUW1	Mixed Cultural Woodland
FOD7-3	Fresh-Moist Willow Lowland Deciduous Forest
MAM2-2	Reed-canary Grass Mineral Meadow Marsh
MAM2-11	Forb-Graminoid Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh
P	Pond
SWD4-1	Willow Mineral Deciduous Swamp

Notes

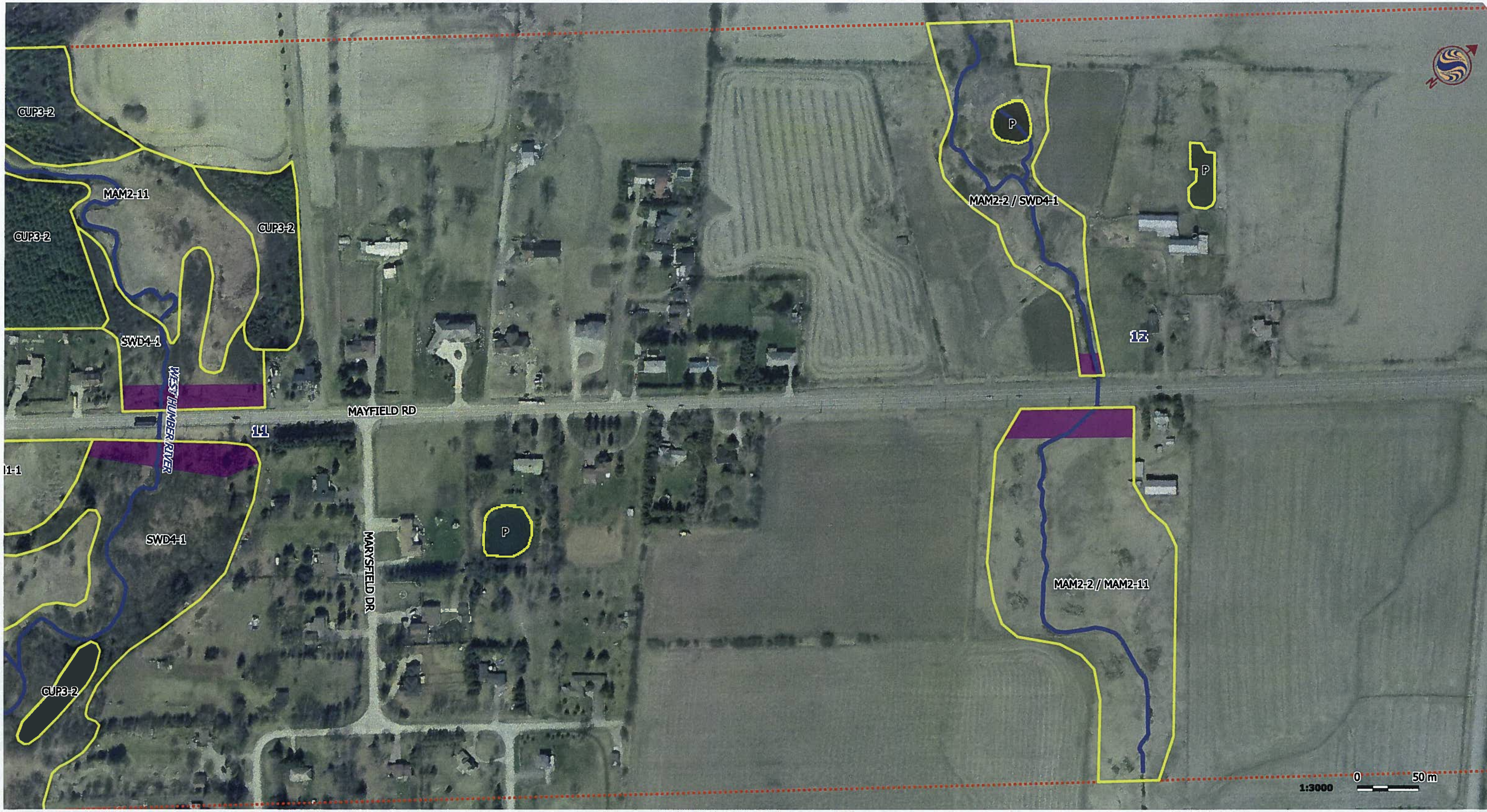
1. Orthoimagery and base features provided by the Regional Municipality of Peel, 2008.
2. Watercourse features provided by the TRCA, 2008.

Region of Peel
Mayfield Road Class EA

Figure No.
3D

ELC Vegetation Communities

\\cd1004-f06\work_group\01609\active\160210480_Mayfield Road_Class EA\planning\drawing\Class EA 200802\Manifold\160210480_105_NatEnv.map [Fig 03E -
4/14/2011 1:20:00 PM By: ccoghlan Revised 06-24-2008 By: sstroszkali



Project No. 160210480

Legend

- Watercourse
- ELC Community
- Anticipated Wetland Impacts
- Study Area
- 1 Tributary Crossings

CUM1-1	Fresh-Moist Old Field Meadow
CUP3-12	White Spruce-Scots Pine Coniferous Plantation
CUT1-7	Common Buckthorn Cultural Thicket
CUW1	Mixed Cultural Woodland
FOD7-3	Fresh-Moist Willow Lowland Deciduous Forest
MAM2-2	Reed-canary Grass Mineral Meadow Marsh
MAM2-11	Forb-Graminoid Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh
P	Pond
SWD4-1	Willow Mineral Deciduous Swamp

Notes

1. Orthoimagery and base features provided by the Regional Municipality of Peel, 2008.
2. Watercourse features provided by the TRCA, 2008.

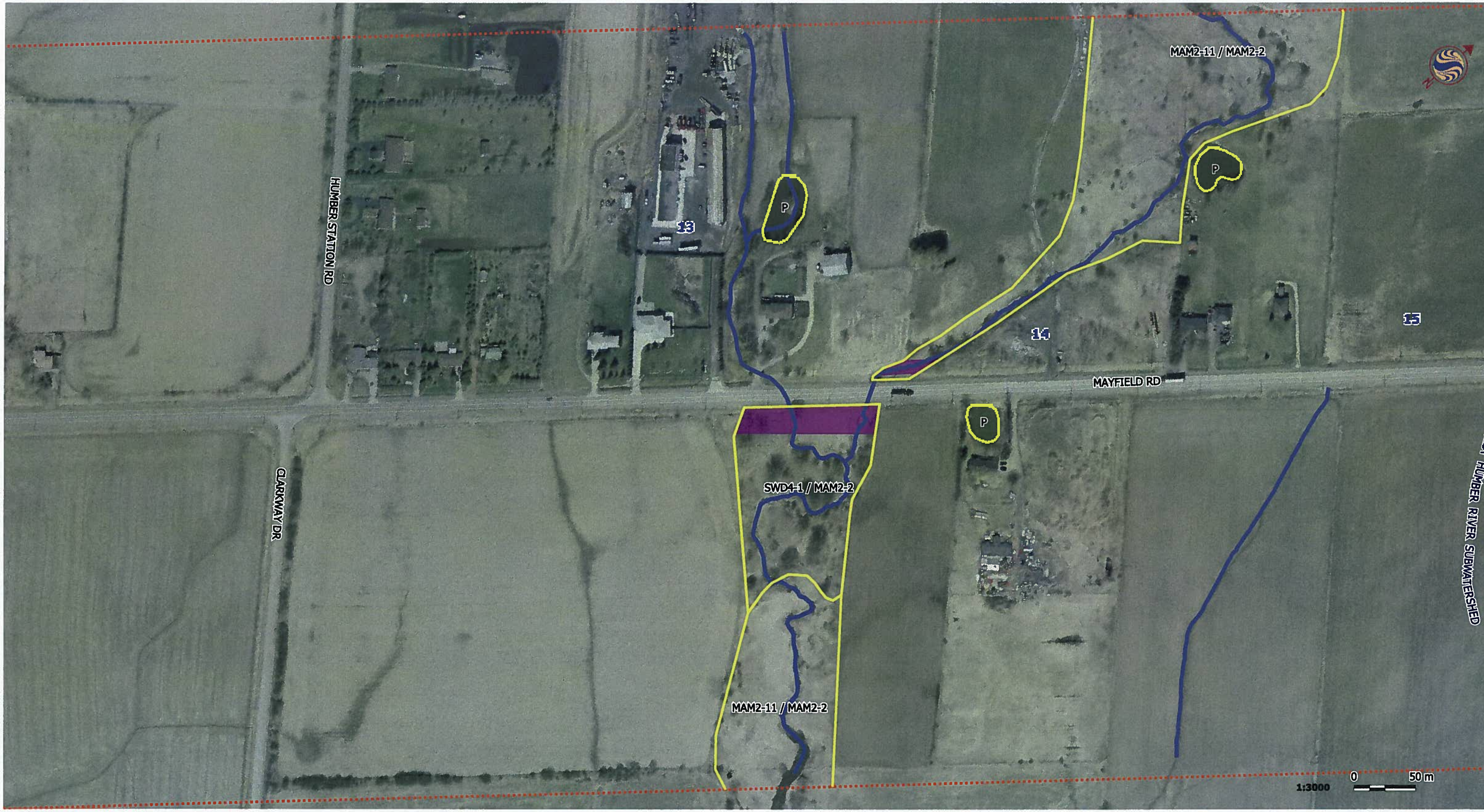
Stantec

Client/Project
Region of Peel
Mayfield Road Class EA

Figure No.
3E

Title
ELC Vegetation Communities

\\cd1004-f06\work_group\01609\active\160210480_Mayfield Road_Class EA\planning\drawing\Class EA 200802\Manifold\160210480_105_NatEnv.map [Fig 03F - 4/14/2011 1:20:10 PM By: ccoghlan Revised 06-24-2008 By: sstroszkoll



Project No.

Stantec

Legend

- Watercourse
- ELC Community
- Anticipated Wetland Impacts
- Study Area
- 1 Tributary Crossings

CUM1-1	Fresh-Moist Old Field Meadow
CUP3-12	White Spruce-Scots Pine Coniferous Plantation
CUT1-7	Common Buckthorn Cultural Thicket
CUW1	Mixed Cultural Woodland
FOD7-3	Fresh-Moist Willow Lowland Deciduous Forest
MAM2-2	Reed-canary Grass Mineral Meadow Marsh
MAM2-11	Forb-Graminoid Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh
P	Pond
SWD4-1	Willow Mineral Deciduous Swamp

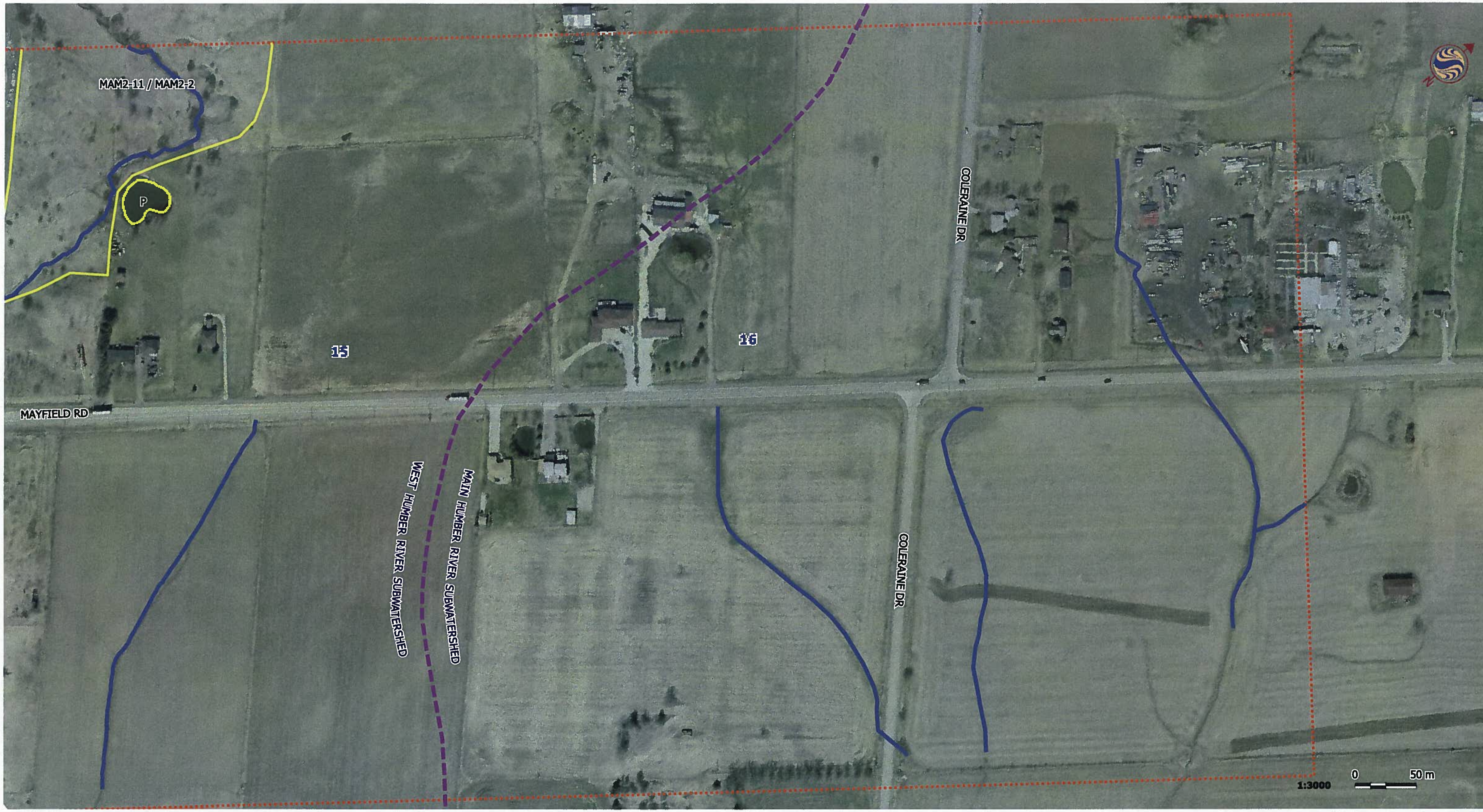
Notes

1. Orthoimagery and base features provided by the Regional Municipality of Peel, 2008.
2. Watercourse features provided by the TRCA, 2008.

Client/Project
Region of Peel
Mayfield Road Class EA

Figure No.
3F

Title
ELC Vegetation Communities



\\cd1004-f06\work_group\01609\active\160210480_Mayfield Road_Class EA\planning\drawing\Class EA 200802\Manifold\160210480_105_NatEnv.map [Fig 03G -
4/14/2011 1:20:18 PM By: ccoghlan Revised 06-24-2008 By: sstroszkali

Stantec

Legend

- Watercourse
- ELC Community
- Study Area
- 1 Tributary Crossings

CUM1-1	Fresh-Moist Old Field Meadow
CUP3-12	White Spruce-Scots Pine Coniferous Plantation
CUT1-7	Common Buckthorn Cultural Thicket
CUW1	Mixed Cultural Woodland
FOD7-3	Fresh-Moist Willow Lowland Deciduous Forest
MAM2-2	Reed-canary Grass Mineral Meadow Marsh
MAM2-11	Forb-Graminoid Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh
P	Pond
SWD4-1	Willow Mineral Deciduous Swamp

Notes

1. Orthoimagery and base features provided by the Regional Municipality of Peel, 2008.
2. Watercourse features provided by the TRCA, 2008.

Project No.

Client/Project
Region of Peel
Mayfield Road Class EA

Figure No.
3G

Title
ELC Vegetation Communities

APPENDIX B

FISH SPECIES IN THE WEST HUMBER RIVER AND TRIBUTARIES

Appendix B: Fish Species in the West Humber River Watershed

COMMON NAME	SCIENTIFIC NAME	ONTARIO STATUS	GLOBAL STATUS	MNR	COSEWIC
LAMPREY FAMILY	**PETROMYZONTIDAE**				
Northern Brook Lamprey	*Ichthyomyzon fossor*	S3	G4	SC	SC
American Brook Lamprey	*Lampetra appendix*	S3	G4		
Sea Lamprey	*Petromyzon marinus*	SE	G5		
GAR FAMILY	**LEPISOSTEIDAE**				
Longnose Gar	*Lepisosteus osseus*	S4	G5		
BOWFIN FAMILY	**AMIIDAE**				
Bowfin	*Amia calva*	S4	G5		
HERRING FAMILY	**CLUPEIDAE**				
Alewife	*Alosa pseudoharengus*	SE	G5		
Gizzard Shad	*Dorosoma cepedianum*	S4	G5		
TROUT FAMILY	**SALMONIDAE**				
Coho Salmon	*Oncorhynchus kisutch*	SE	G4		
Chinook Salmon	*Oncorhynchus tshawytscha*	SE	G5		
Rainbow Trout	*Oncorhynchus mykiss*	SE	G5		
Atlantic Salmon	*Salmo salar*	SXC	G5		
Brown Trout	*Salmo trutta*	SE	G5		
Brook Trout	*Salvelinus fontinalis*	S5	G5		
SMELT FAMILY	**OSMERIDAE**				
Rainbow Smelt	*Osmerus mordax*	S5	G5		
MUDMINNOW FAMILY	**UMBRIDAE**				
Central Mudminnow	*Umbra limi*	S5	G5		
PIKE FAMILY	**ESCOCIDAE**				
Northern Pike	*Esox lucius*	S5	G5		
MINNOW FAMILY	**CYPRINIDAE**				
Goldfish	*Carassius auratus*	SE	G5		
Northern Redbelly Dace	*Phoxinus eos*	S5	G5		
Finescale Dace	*Phoxinus neogaeus*	S5	G5		
Redside Dace	*Clinostomus elongatus*	S3	G4	THR	SC
Lake Chub	*Couesius plumbeus*	S5	G5		
Common Carp	*Cyprinus carpio*	SE	G5		
Brassy Minnow	*Hybognathus hankinsoni*	S5	G5		
Hornyhead Chub	*Nocomis biguttatus*	S4	G5	NAR	NAR
River Chub	*Nocomis micropogon*	S4	G5	NAR	NAR
Central Stoneroller	*Campostoma anomalum*	S4	G5	NAR	NAR
Golden Shiner	*Notemigonus crysoleucas*	S5	G5		
Emerald Shiner	*Notropis atherinoides*	S5	G5		
Common Shiner	*Luxilus cornutus*	S5	G5		NAR
Blackchin Shiner	*Notropis heterodon*	S4	G5	NAR	NAR
Blacknose Shiner	*Notropis heterolepis*	S5	G5		
Spottail Shiner	*Notropis hudsonius*	S5	G5		
Rosyface Shiner	*Notropis rubellus*	S4	G5	NAR	NAR
Sand Shiner	*Notropis stramineus*	S4	G5		
Mimic Shiner	*Notropis voluvellus*	S5	G5		
Spotfin Shiner	*Cyprinella spiloptera*	S4	G5		
Bluntnose Minnow	*Pimephales notatus*	S5	G5	NAR	NAR
Fathead Minnow	*Pimephales promelas*	S5	G5		
Blacknose Dace	*Rhinichthys atratulus*	S5	G5		
Longnose Dace	*Rhinichthys cataractae*	S5	G5		
Creek Chub	*Semotilus atromaculatus*	S5	G5		

Appendix B: Fish Species in the West Humber River Watershed

COMMON NAME	*SCIENTIFIC NAME*	ONTARIO STATUS	GLOBAL STATUS	MNR	COSEWIC
Fallfish	*Semotilus corporalis*	S4	G5		
Pearl Dace	*Margariscus margarita*	S5	G5		
SUCKER FAMILY	**CATOSTOMIDAE**				
White Sucker	*Catostomus commersoni*	S5	G5		
Northern Hog Sucker	*Hypentelium nigricans*	S4	G5		
CATFISH FAMILY	**ICTALURIDAE**				
Yellow Bullhead	*Ameiurus natalis*	S4	G5		
Brown Bullhead	*Ameiurus nebulosus*	S5	G5		
Channel Catfish	*Ictalurus punctatus*	S4	G5		
Stonecat	*Noturus flavus*	S4	G5		
EEL FAMILY	**ANGUILLIDAE**				
American Eel	*Anguilla rostrata*	S5	G5		
KILLIFISH FAMILY	**CYPRINODONTIDAE**				
Banded Killifish	*Fundulus diaphanus*	S5	G5	NAR	NAR
STICKLEBACK FAMILY	**GASTEROSTEIDAE**				
Brook Stickleback	*Culaea inconstans*	S5	G5		
Threespine Stickleback	*Gasterosteus aculeatus*	S4	G5		
TROUT-PERCH FAMILY	**PERCOPSIDAE**				
Trout-Perch	*Percopsis omiscomaycus*	S5	G5		
TEMPERATE BASS FAMILY	**PERCICHTHYIDAE**				
White Perch	*Morone americana*	SE	G5		
White Bass	*Morone chysops*	S4	G5		
SUNFISH FAMILY	**CENTRARCHIDAE**				
Rock Bass	*Ambloplites rupestris*	S5	G5		
Green Sunfish	*Lepomis cyanellus*	S4	G5	NAR	NAR
Pumpkinseed	*Lepomis gibbosus*	S5	G5		
Bluegill	*Lepomis macrochirus*	S5	G5		
Smallmouth Bass	*Micropterus dolomieu*	S5	G5		
Largemouth Bass	*Micropterus salmoides*	S5	G5		
Black Crappie	*Pomoxis nigromaculatus*	S4	G5		
PERCH FAMILY	**PERCIDAE**				
Yellow Perch	*Perca flavescens*	S5	G5		
Walleye	*Sander vitreus*	S5	G5		
Rainbow Darter	*Etheostoma caeruleum*	S4	G5		
Iowa Darter	*Etheostoma exile*	S5	G5		
Fantail Darter	*Etheostoma flabellare*	S5	G5		
Johnny Darter	*Etheostoma nigrum*	S5	G5		
Logperch	*Percina caprodes*	S5	G5		
Blackside Darter	*Percina maculata*	S4	G5		
River Darter	*Percina shumardi*	S3	G5	NAR	NAR
DRUM FAMILY	**SCIAENIDAE**				
Freshwater Drum	*Aplodinotos grunniens*	S5	G5		
SCULPIN FAMILY	**COTTIDAE**				
Mottled Sculpin	*Cottus bairdi*	S5	G5		

*SOURCE: TRCA, 2005

APPENDIX C

PLANT AND WILDLIFE SPECIES IN THE STUDY AREA (NHIC, OBBA, ETC)

Appendix C - List of Historic Wildlife Species Occurences, Mayfield Road Class EA

COMMON NAME	SCIENTIFIC NAME	ONTARIO STATUS	GLOBAL STATUS	COSSARO	COSEWIC	AREA
AMPHIBIANS (Oldham and Weller, 2001)						
Mudpuppy	*Necturus maculosus*	S4	G5	NIAC	NAR	10
Red-spotted Newt	*Notophthalmus viridescens*	S5	G5T5			
Blue-spotted Salamander	*Ambystoma laterale*	S4	G5			
Jefferson Salamander	*Ambystoma jeffersonianum*	S2	G5	THR	THR	
Spotted Salamander	*Ambystoma maculatum*	S4	G5			
Four-toed Salamander	*Hemidactylium scutatum*	S4	G5	NIAC	NAR	
Northern Redback Salamander	*Plethodon cinereus*	S5	G5			
American Toad	*Bufo americanus*	S5	G5			
Tetraploid Gray Treefrog	*Hyla versicolor*	S5	G5			
Western Chorus Frog	*Pseudacris triseriata*	S4	G5		NAR	
Spring Peeper	*Pseudacris crucifer*	S5	G5			
Bullfrog	*Rana catesbeiana*	S4	G5			1
Northern Green Frog	*Rana clamitans*	S5	G5			
Pickerel Frog	*Rana palustris*	S4	G5	NIAC	NAR	
Wood Frog	*Rana sylvatica*	S5	G5			
Northern Leopard Frog	*Rana pipiens*	S5	G5	NIAC	NAR	
REPTILES (Oldham and Weller, 2001)						
Snapping Turtle	*Chelydra serpentina*	S5	G5			
Midland Painted Turtle	*Chrysemys picta marginata*	S5	G5T5			
Slider	*Trachemys scripta*	SE1	G5			
Common Map Turtle	*Graptemys geographica*	S3	G5	SC	SC	30-50
Eastern Gartersnake	*Thamnophis sirtalis*	S5	G5			
Ribbon Snake	*Thamnophis sauritus*	S3	G5	SC	SC	
Northern Watersnake	*Nerodia sipedon sipedon*	S5	G5T5		NAR	1
Redbelly Snake	*Storeria occipitomaculata*	S5	G5			
Brown Snake	*Storeria dekayi*	S5	G5		NAR	
Smooth Greensnake	*Opheodrys vernalis*	S4	G5			
Ringneck Snake	*Diadophis punctatus*	S4	G5			
Eastern Milksnake	*Lampropeltis triangulum*	S3	G5	SC	SC	
BIRDS (OBBA, 2005)						
Canada Goose	*Branta canadensis*	S5	G5			
Wood Duck	*Aix sponsa*	S5	G5			
Mallard	*Anas platyrhynchos*	S5	G5			
Hooded Merganser	*Lophodytes cucullatus*	S5	G5			
Ring-necked Pheasant	*Phasianus colchicus*	SE	G5			
Ruffed Grouse	*Bonasa umbellus*	S5	G5			25
Wild Turkey	*Meleagris gallopava*	S4	G5			
Great Blue Heron	*Ardea herodias*	S5	G5			
Green Heron	*Butorides virescens*	S4	G5			
Turkey Vulture	*Cathartes aura*	S4	G5			
Northern Harrier	*Circus cyaneus*	S4	G5		NAR	30
Sharp-shinned Hawk	*Accipiter striatus*	S5	G5	NIAC	NAR	30
Cooper's Hawk	*Accipiter cooperii*	S4	G5	NIAC	NAR	4-50+
Red-tailed Hawk	*Buteo jamaicensis*	S5	G5	NIAC	NAR	
American Kestrel	*Falco sparverius*	S5	G5			
Sora	*Porzana carolina*	S4	G5			
Killdeer	*Charadrius vociferus*	S5	G5			

Appendix C - List of Historic Wildlife Species Occurences, Mayfield Road Class EA

COMMON NAME	SCIENTIFIC NAME	ONTARIO STATUS	GLOBAL STATUS	COSSARO	COSEWIC	AREA
Spotted Sandpiper	*Actitis macularia*	S5	G5			
Wilson's Snipe	*Gallinago delicata*	S5	G5			
American Woodcock	*Scolopax minor*	S5	G5			
Rock Pigeon	*Columba livia*	SE	G5			
Mourning Dove	*Zenaida macroura*	S5	G5			
Black-billed Cuckoo	*Coccyzus erythropthalmus*	S4	G5			
Yellow-billed Cuckoo	*Coccyzus americanus*	S4	G5			
Eastern Screech-Owl	*Megascops asio*	S5	G5		NAR	
Great Horned Owl	*Bubo virginianus*	S5	G5			
Long-eared Owl	*Asio otus*	S4	G5			
Common Nighthawk	*Chordeiles minor*	S4	G5		THR	
Chimney Swift	*Chaetura pelagica*	S5	G5		THR	
Ruby-throated Hummingbird	*Archilochus colubris*	S5	G5			
Belted Kingfisher	*Ceryle alcyon*	S5	G5			
Yellow-bellied Sapsucker	*Sphyrapicus varius*	S5	G5			30
Downy Woodpecker	*Picoides pubescens*	S5	G5			
Hairy Woodpecker	*Picoides villosus*	S5	G5			10
Northern Flicker	*Colaptes auratus*	S5	G5			
Pileated Woodpecker	*Dryocopus pileatus*	S4S5	G5			30-50
Eastern Wood-Pewee	*Contopus virens*	S5	G5			
Alder Flycatcher	*Empidonax alnorum*	S5	G5			
Willow Flycatcher	*Empidonax traillii*	S5	G5			
Least Flycatcher	*Empidonax minimus*	S5	G5			
Eastern Phoebe	*Sayornis phoebe*	S5	G5			
Great Crested Flycatcher	*Myiarchus crinitus*	S5	G5			
Eastern Kingbird	*Tyrannus tyrannus*	S5	G5			
Blue-headed Vireo	*Vireo solitarius*	S5	G5			100
Warbling Vireo	*Vireo gilvus*	S5	G5			
Red-eyed Vireo	*Vireo olivaceus*	S5	G5			
Blue Jay	*Cyanocitta cristata*	S5	G5			
American Crow	*Corvus brachyrhynchos*	S5	G5			
Horned Lark	*Eremophila alpestris*	S5	G5			
Purple Martin	*Progne subis*	S4	G5			
Tree Swallow	*Tachycineta bicolor*	S5	G5			
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	S5	G5			
Bank Swallow	*Riparia riparia*	S5	G5			
Cliff Swallow	*Hirundo pyrrhonota*	S5	G5			
Barn Swallow	*Hirundo rustica*	S5	G5			
Black-capped Chickadee	*Poecile atricapilla*	S5	G5			
Red-breasted Nuthatch	*Sitta canadensis*	S5	G5			10
White-breasted Nuthatch	*Sitta carolinensis*	S5	G5			10
Brown Creeper	*Certhia americana*	S5	G5			30
House Wren	*Troglodytes aedon*	S5	G5			
Winter Wren	*Troglodytes troglodytes*	S5	G5			30
Sedge Wren	*Cistothorus platensis*	S4	G5		NAR	
Golden-crowned Kinglet	*Regulus satrapa*	S5	G5			30
Blue-gray Gnatcatcher	*Polioptila caerulea*	S4	G5			30
Veery	*Catharus fuscescens*	S4	G5			10
Wood Thrush	*Hylocichla mustelina*	S5	G5			4
American Robin	*Turdus migratorius*	S5	G5			
Gray Catbird	*Dumetella carolinensis*	S5	G5			

Appendix C - List of Historic Wildlife Species Occurences, Mayfield Road Class EA

COMMON NAME	SCIENTIFIC NAME	ONTARIO STATUS	GLOBAL STATUS	COSSARO	COSEWIC	AREA
Northern Mockingbird	*Mimus polyglottos*	S4	G5			
Brown Thrasher	*Toxostoma rufum*	S5	G5			
European Starling	*Sturnus vulgaris*	SE	G5			
Cedar Waxwing	*Bombycilla cedrorum*	S5	G5			
Nashville Warbler	*Vermivora ruficapilla*	S5	G5			
Yellow Warbler	*Dendroica petechia*	S5	G5			
Chestnut-sided Warbler	*Dendroica pensylvanica*	S5	G5			
Pine Warbler	*Dendroica pinus*	S5	G5			30
American Redstart	*Setophaga ruticilla*	S5	G5			30
Ovenbird	*Seiurus aurocapilla*	S5	G5			20
Mourning Warbler	*Oporornis philadelphia*	S5	G5			30
Common Yellowthroat	*Geothlypis trichas*	S5	G5			
Hooded Warbler	*Wilsonia citrina*	S3	G5	THR	THR	50-100
Scarlet Tanager	*Piranga olivacea*	S5	G5			30
Eastern Towhee	*Pipilo erythrophthalmus*	S4	G5			
Chipping Sparrow	*Spizella passerina*	S5	G5			
Clay-colored Sparrow	*Spizella pallida*	S4	G5			
Field Sparrow	*Spizella pusilla*	S5	G5			
Vesper Sparrow	*Pooecetes gramineus*	S4	G5			
Savannah Sparrow	*Passerculus sandwichensis*	S5	G5			
Grasshopper Sparrow	*Ammodramus savannarum*	S4	G5			
Song Sparrow	*Melospiza melodia*	S5	G5			
Swamp Sparrow	*Melospiza georgiana*	S5	G5			
White-throated Sparrow	*Zonotrichia albicollis*	S5	G5			20
Northern Cardinal	*Cardinalis cardinalis*	S5	G5			
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	S5	G5			
Indigo Bunting	*Passerina cyanea*	S5	G5			
Red-winged Blackbird	*Agelaius phoeniceus*	S5	G5			
Eastern Meadowlark	*Sturnella magna*	S5	G5			
Common Grackle	*Quiscalus quiscula*	S5	G5			
Brown-headed Cowbird	*Molothrus ater*	S5	G5			
Orchard Oriole	*Icterus spurius*	SZB	G5			
Baltimore Oriole	*Icterus galbula*	S5	G5			
Purple Finch	*Carpodacus purpureus*	S5	G5			
House Finch	*Carpodacus mexicanus*	SE	G5			
American Goldfinch	*Carduelis tristis*	S5	G5			
House Sparrow	*Passer domesticus*	SE	G5			
MAMMALS (Dobbyn, 1994)						
Virginia Opossum	*Didelphis virginiana*	S4	G5			
Masked Shrew	*Sorex cinereus*	S5	G5			
Smoky Shrew	*Sorex fumeus*	S5	G5			
Pygmy Shrew	*Sorex hoyi*	S4	G5			
Water Shrew	*Sorex palustris*	S5	G5			
Northern Short-tailed Shrew	*Blarina brevicauda*	S5	G5			
Hairy-tailed Mole	*Parascalops breweri*	S4	G5			
Star-nosed Mole	*Condylura cristata*	S5	G5			
Little Brown Bat	*Myotis lucifugus*	S5	G5			
Northern Long-eared Bat	*Myotis septentrionalis*	S3?	G4			
Silver-haired Bat	*Lasionycteris noctivagans*	S4	G5			
Red Bat	*Lasiurus borealis*	S4	G5			

Appendix C - List of Historic Wildlife Species Occurences, Mayfield Road Class EA

COMMON NAME	SCIENTIFIC NAME	ONTARIO STATUS	GLOBAL STATUS	COSSARO	COSEWIC	AREA
Big Brown Bat	*Eptesicus fuscus*	S5	G5			
Hoary Bat	*Lasiurus cinereus*	S4	G5			
Eastern Cottontail	*Sylvilagus floridanus*	S5	G5			
Snowshoe Hare	*Lepus americanus*	S5	G5			20
European Hare	*Lepus europaeus*	SE	G5			
Eastern Chipmunk	*Tamias striatus*	S5	G5			
Woodchuck	*Marmota monax*	S5	G5			
Grey Squirrel	*Sciurus carolinensis*	S5	G5			
Red Squirrel	*Tamiasciurus hudsonicus*	S5	G5			
Northern Flying Squirrel	*Glaucomys sabrinus*	S5	G5			
Southern Flying Squirrel	*Glaucomys volans*	S3	G5	SC		20
Beaver	*Castor canadensis*	S5	G5			
White-footed Mouse	*Peromyscus leucopus*	S5	G5			
Deer Mouse	*Peromyscus maniculatus*	S5	G5			
Muskrat	*Ondatra zibethicus*	S5	G5			
Southern Bog Lemming	*Synaptomys cooperi*	S4	G5			
Meadow Vole	*Microtus pennsylvanicus*	S5	G5			
Norway Rat	*Rattus norvegicus*	SE	G5			
House Mouse	*Mus musculus*	SE	G5			
Meadow Jumping Mouse	*Zapus hudsonicus*	S5	G5			
Woodland Jumping Mouse	*Napaeozapus insignis*	S5	G5			
Porcupine	*Erethizon dorsatum*	S5	G5			
Coyote	*Canis latrans*	S5	G5			
Red Fox	*Vulpes vulpes*	S5	G5			
Grey Fox	*Urocyon cineroargenteus*	SZB?	G5	THR	THR	
Black Bear	*Ursus americanus*	S5	G5	NIAC	NAR	
Raccoon	*Procyon lotor*	S5	G5			
Ermine	*Mustela erminea*	S5	G5			
Long-tailed Weasel	*Mustela frenata*	S4	G5			
Mink	*Mustela vison*	S5	G5			
Striped Skunk	*Mephitis mephitis*	S5	G5			
White-tailed Deer	*Odocoileus virginianus*	S5	G5			

*Area - Minimum contiguous habitat required for breeding

APPENDIX D

**PHOTOGRAPHIC RECORD
(INCLUDING FIGURE SHOWING
PHOTO LOCATIONS)**

Photo 2a: Stn 2, north of Mayfield rd, facing south (d-s). Nov 08, 2007.

Photo 2b: Stn 2, north of Mayfield rd, facing north (u-s). Nov 08, 2007.

Photo 2c: Stn 2, 15m north of Mayfield rd, facing south (d-s). Nov 08, 2007.

Photo 2d: Stn 2, facing south (d-s) from Mayfield rd. Nov 08, 2007.

Photo 2e: Stn 2, south of Mayfield rd facing south (d-s). Nov 08, 2007.

Photo 2f: Stn 2, south of Mayfield rd, looking north (u-s). Nov 08, 2007.

FILENAME: W:\active_Other_PCs_Active\602 - Kitchener\60210480\graphics\Corel\60210480_01.cdr

Stantec

PREPARED FOR:

REGION OF PEEL

MAYFIELD ROAD CLASS EA
(AIRPORT ROAD TO COLERAINE DRIVE)

Initiated: November 2007
Revised: June, 2008

APPENDIX:
F

TITLE
PHOTOGRAPHIC RECORD

PAGE

Photo 2g: Stn 2, culvert at north side of Mayfield rd. Nov 08, 2007.

Photo 3a: Stn 3, Salt Creek. Facing north (u-s) from Mayfield rd. Nov 08, 2007.

Photo 3b: Stn 3, Salt Creek. North (u-s) of Mayfield rd, standing water. Nov 08, 2007.

Photo 3c: Stn 3, Salt Creek. North (u-s) of Mayfield rd facing north (u-s). Nov 08, 2007.

Photo 3d: Stn 3, Salt Creek. Facing south (d-s) from Mayfield rd. Nov 08, 2007.

Photo 3e: Stn 3, Salt Creek. 5m south (d-s) of culvert south of Mayfield rd. Nov 08, 2007.

FILENAME: W:\active_Other_POs_Active\602 - Kitchener\60210460\graphics\Corel\60210460_01.cdr

Stantec

PREPARED FOR:

REGION OF PEEL

MAYFIELD ROAD CLASS EA
(AIRPORT ROAD TO COLERAINE DRIVE)

Initiated: November 2007
Revised: June, 2008

APPENDIX: F

TITLE: PHOTOGRAPHIC RECORD

Photo 3f: Stn 3, Salt Creek. South (d-s) of Mayfield rd, standing water. Nov 08, 2007.

Photo 3g: Stn 3, Salt Creek. South (d-s) of Mayfield rd facing upstream. Nov 08, 2007.

Photo 5a: Stn 5, facing north (u-s) from Mayfield rd. Nov 08, 2007.

Photo 5b: Stn 5,15-20m north (u-s) of Mayfield rd, facing upstream. Nov 08, 2007.

Photo 5c: Stn 5, north (u-s) of Mayfield rd. Nov 08, 2007.

Photo 5d: Stn 5, north (u-s) of Mayfield rd, facing d-s. Nov 08, 2007.

FILENAME: W:\active_Other_PCs_Active\602 - Kitchener\60210480\graphics\Corel\60210480_01.cdr

Photo 5e: Stn 5, facing south (d-s) Mayfield rd culvert. Nov 08, 2007.

Photo 5f: Stn 5, south (d-s) of Mayfield rd, facing upstream. Nov 08, 2007.

Photo 5g: Stn 5, 40-50m south (d-s) of Mayfield rd. Nov 08, 2007.

Photo 6a: Stn 6. facing north (u-s) from culvert. Nov 08, 2007.

Photo 6b: Stn 6. facing north (u-s) from Mayfield rd. Nov 08, 2007.

Photo 6c: Stn 6, standing water at north culvert. Nov 08, 2007.

Stantec

PREPARED FOR:

REGION OF PEEL

MAYFIELD ROAD CLASS EA
(AIRPORT ROAD TO COLERAINE DRIVE)

Initiated: November 2007
Revised: June, 2008

APPENDIX:
F

TITLE
PHOTOGRAPHIC RECORD

Photo 6d: Stn 6, facing south (d-s) from Mayfield rd. Nov 08, 2007.

Photo 6e: Stn 6, looking from north (u-s) end of culvert downstream. Nov 08, 2007.

Photo 8a: Stn 8, facing north (u-s) from Mayfield rd. Nov 08, 2007.

Photo 8b: Stn 8, water at north culvert. Nov 08, 2007.

Photo 8c: Stn 8, facing south (d-s) from Mayfield rd. Nov 08, 2007.

Photo 8d: Stn 8, south (d-s) of Mayfield rd, facing upstream. Nov 08, 2007.

FILENAME: W:\active_Other_PCs_Active\602 - Kitchener\60210480\graphics\Corel\60210480_01.cdr

Photo 8e: Stn 8, south (d-s) of Mayfield rd. Nov 08, 2007.

Photo 11a: Stn 11, West Humber River. Facing north (u-s) from Mayfield rd. Nov 08, 2007.

Photo 11b: Stn 11, West Humber River. 40-50m north (u-s) of Mayfield rd, facing upstream. Nov 08, 2007.

Photo 11c: Stn 11, West Humber River. 50-60m north (u-s) of Mayfield rd, facing upstream. Nov 08, 2007.

Photo 11d: Stn 11, West Humber River. 3-4m south (d-s) of Mayfield rd culvert, facing downstream (south). Nov 08, 2007.

Photo 11e: Stn 11, West Humber River. 4-5m south (d-s) of Mayfield rd culvert, facing upstream. Nov 08, 2007.

FILENAME: W:\active_Other_PCs_Active\602 - Kitchener\60210480\graphics\Corel\60210480_01.cdr

Stantec

PREPARED FOR:

REGION OF PEEL

MAYFIELD ROAD CLASS EA
(AIRPORT ROAD TO COLERAINE DRIVE)

Initiated: November 2007
Revised: June, 2008

APPENDIX:
F

TITLE
PHOTOGRAPHIC RECORD

Photo 11f: Stn 11, West Humber River. South (d-s) of Mayfield rd, riffle. Nov 08, 2007.

Photo 11g: Stn 11, West Humber River. 50-60m south (d-s) of Mayfield rd, large pool. Nov 08, 2007.

Photo 11h: Stn 11, West Humber River. 50-60m south (d-s) of Mayfield rd, west bank of large pool. Nov 08, 2007.

Photo 12a: Stn 12, The Gore Road tributary. Looking north (u-s) from Mayfield rd. Nov 13, 2007.

Photo 12b: Stn 12, The Gore Road tributary. 5-8m north (u-s) of culvert on north side of Mayfield rd. Nov 13, 2007.

Photo 12c: Stn 12, The Gore Road tributary. Under culvert from north (u-s) side of Mayfield rd. Nov 13, 2007.

Photo 12d: Stn 12, The Gore Road tributary. South side of Mayfield rd (d-s) facing south (d-s). Nov 13, 2007.

Photo 12e: Stn 12, The Gore Road tributary. 30-40m south (d-s) of Mayfield rd culvert. Nov 13, 2007.

Photo 14a: Stn 14, north (u-s) of Mayfield rd, facing north (u-s). Nov 13, 2007.

Photo 14b: Stn 14, 30-40m north (u-s) of Mayfield rd, looking north (u-s). Nov 13, 2007.

Photo 14c: Stn 14, south side of Mayfield rd, facing south (d-s). Nov 13, 2007.

Photo 14d: Stn 14, 80-90m south (d-s) of Mayfield rd, facing d-s. Nov 13, 2007.

FILENAME: W:\active_Other_PCs_Active\602 - Kitchener\60210480\graphics\Corel\60210480_01.cdr

Stantec

PREPARED FOR:

REGION OF PEEL

MAYFIELD ROAD CLASS EA
(AIRPORT ROAD TO COLERAINE DRIVE)

Initiated: November 2007
Revised: June, 2008

APPENDIX
F

TITLE
PHOTOGRAPHIC RECORD

APPENDIX E

PLANT LIST, MAYFIELD ROAD CLASS EA

Appendix E: Plant List, Mayfield Road Class EA

LATIN NAME		COMMON NAME	COEFFICIENT OF CONSERVATISM	WETNESS INDEX	WEEDINESS INDEX	PROVINCIAL STATUS	OMNR STATUS	COSEWIC STATUS	GLOBAL STATUS	LOCAL STATUS PEEL
	LOCAL STATUS SOURCE LAST UPDATE/ INITIALS									VARGA 2000 July 2002/KH
GYMNOSPERMS		**CONIFERS**								
Pinaceae		**Pine Family**								
Picea	*abies*	Norway Spruce		5	-1	SE3			G?	X
Picea	*glauca*	White Spruce	6	3		S5			G5	R3
Pinus	*strobus*	Eastern White Pine	4	3		S5			G5	X
Pinus	*sylvestris*	Scotch Pine		5	-3	SE5			G?	X
DICOTYLEDONS		**DICOTS**								
Aceraceae		**Maple Family**								
Acer	*negundo*	Manitoba Maple	0	-2		S5			G5	X
Acer	*saccharum* ssp. *saccharum*	Sugar Maple	4	3		S5			G5T?	X
Apiaceae		**Carrot or Parsley Family**								
Daucus	*carota*	Wild Carrot		5	-2	SE5			G?	X
Apocynaceae		**Dogbane Family**								
Apocynum	*androsaemifolium* ssp. *androsaemifolium*	Spreading Dogbane	3	5		S5			G5T?	X
Asclepiadaceae		**Milkweed Family**								
Asclepias	*syriaca*	Common Milkweed	0	5		S5			G5	X
Asteraceae		**Composite or Aster Family**								
Achillea	*millefolium* ssp. *millefolium*	Common Yarrow		3	-1	SE?			G5T?	X
Ambrosia	*artemisiifolia*	Common Ragweed	0	3		S5			G5	X
Arctium	*minus* ssp. *minus*	Common Burdock		5	-2	SE5			G?T?	X
Aster	*novae-angliae*	New England Aster	2	-3		S5			G5	X
Aster	*puniceus* var. *puniceus*	Purple-stemmed Aster				S5			G5T?	X
Centaurea	*jacea*	Brown Knapweed		5	-1	SE5			G?	
Chrysanthemum	*leucanthemum*	Ox-eye Daisy		5	-1	SE5			G?	X
Cichorium	*intybus*	Chicory		5	-1	SE5			G?	X
Cirsium	*arvense*	Canada Thistle		3	-1	SE5			G?	X
Cirsium	*vulgare*	Bull Thistle		4	-1	SE5			G5	X
Erigeron	*philadelphicus* ssp. *philadelphicus*	Philadelphia Fleabane	1	-3		S5			G5T?	X
Erigeron	*strigosus*	Daisy Fleabane	0	1		S5			G5	X
Hieracium	*piloselloides*	Glaucous King Devil		5	-2	SE5			G?	X
Inula	*helenium*	Elecampane		5	-2	SE5			G?	X
Lactuca	*serriola*	Prickly Lettuce		0	-1	SE5			G?	X
Matricaria	*perforata*	Scentless Chamomile		5	-1	SE?			G?	X
Solidago	*altissima* var. *altissima*	Tall Goldenrod	1	3		S5				X
Solidago	*canadensis*	Canada Goldenrod	1	3		S5			G5	X
Solidago	*gigantea*	Giant Goldenrod	4	-3		S5			G5	X
Sonchus	*arvensis* ssp. *arvensis*	Field Sow-thistle				SE5			G?T?	X
Taraxacum	*officinale*	Common Dandelion		3	-2	SE5			G5	X
Tragopogon	*pratensis* ssp. *pratensis*	Meadow Goat's-beard		5	-1	SE5			G?T?	X
Balsaminaceae		**Touch-me-not Family**								
Impatiens	*capensis*	Spotted Touch-me-not	4	-3		S5			G5	X
Brassicaceae		**Mustard Family**								
Alliaria	*petiolata*	Garlic Mustard		0	-3	SE5			G5	X
Barbarea	*vulgaris*	Yellow Rocket		0	-1	SE5			G?	X
Erysimum	*cheiranthoides* ssp. *cheiranthoides*	Wormseed Mustard		3	-1	SE5				X

Appendix E: Plant List, Mayfield Road Class EA

LATIN NAME		COMMON NAME	COEFFICIENT OF CONSERVATISM	WETNESS INDEX	WEEDINESS INDEX	PROVINCIAL STATUS	OMNR STATUS	COSEWIC STATUS	GLOBAL STATUS	LOCAL STATUS PEEL
	LOCAL STATUS SOURCE LAST UPDATE/ INITIALS									VARGA 2000 July 2002/KH
Hesperis	*matronalis*	Dame's Rocket		5	-3	SE5			G4G5	X
Caprifoliaceae		**Honeysuckle Family**								
Lonicera	*tatarica*	Tartarian Honeysuckle		3	-3	SE5			G?	X
Caryophyllaceae		**Pink Family**								
Stellaria	*graminea*	Grass-leaved Stitchwort		5	-2	SE5			G?	X
Chenopodiaceae		**Goosefoot Family**								
Chenopodium	*album* var. *album*	Lamb's Quarters		1	-1	SE5			G5T5	X
Convolvulaceae		**Morning-glory Family**								
Convolvulus	*arvensis*	Field Bindweed		5	-1	SE5			G?	X
Fabaceae		**Pea Family**								
Lotus	*corniculatus*	Bird's-foot Trefoil		1	-2	SE5			G?	X
Medicago	*lupulina*	Black Medick		1	-1	SE5			G?	X
Medicago	*sativa* ssp. *sativa*	Alfalfa		5	-1	SE5			G?T?	X
Melilotus	*officinalis*	Yellow Sweet-clover		3	-1	SE5			G?	X
Trifolium	*pratense*	Red Clover		2	-2	SE5			G?	X
Vicia	*cracca*	Tufted Vetch		5	-1	SE5			G?	X
Fagaceae		**Beech Family**								
Quercus	*macrocarpa*	Bur Oak	5	1		S5			G5	X
Grossulariaceae		**Currant Family**								
Ribes	*americanum*	Wild Black Currant	4	-3		S5			G5	X
Ribes	*rubrum*	Red Currant		5	-2	SE5			G4G5	X
Hippocastanaceae		**Buckeye Family**								
Aesculus	*hippocastanum*	Horse Chestnut		5	-1	SE2			G?	X
Nepeta	*cataria*	Catnip		1	-2	SE5			G?	X
Moraceae		**Mulberry Family**								
Morus	*alba*	White Mulberry		0	-3	SE5			G?	X
Oleaceae		**Olive Family**								
Fraxinus	*americana*	White Ash	4	3		S5			G5	X
Fraxinus	*pennsylvanica*	Red Ash	3	-3		S5			G5	X
Onagraceae		**Evening-primrose Family**								
Epilobium	*ciliatum* ssp. *ciliatum*	Ciliate Willow-herb	3	3		S5			G5T?	X
Oxalidaceae		**Wood Sorrel Family**								
Oxalis	*stricta*	Upright Yellow Wood-sorrel	0	3		S5			G5	X
Polygonaceae		**Smartweed Family**								
Rumex	*crispus*	Curly-leaf Dock		-1	-2	SE5			G?	X
Primulaceae		**Primrose Family**								
Lysimachia	*ciliata*	Fringed Loosestrife	4	-3		S5			G5	X
Ranunculaceae		**Buttercup Family**								
Ranunculus	*acris*	Tall Buttercup			-2	SE5			G5	X
Rhamnaceae		**Buckthorn Family**								

Appendix E: Plant List, Mayfield Road Class EA

LATIN NAME		COMMON NAME	COEFFICIENT OF CONSERVATISM	WETNESS INDEX	WEEDINESS INDEX	PROVINCIAL STATUS	OMNR STATUS	COSEWIC STATUS	GLOBAL STATUS	LOCAL STATUS PEEL
	LOCAL STATUS SOURCE LAST UPDATE/ INITIALS									VARGA 2000 July 2002/KH
Rhamnus	*cathartica*	Common Buckthorn		3	-3	SE5			G?	X
Rosaceae		**Rose Family**								
Crataegus	*species*	Hawthorn species								
Crataegus	*monogyna*	English Hawthorn		5	-1	SE5			G5	X
Fragaria	*vesca* ssp. *americana*	Woodland Strawberry	4	4		S5			G5T?	X
Fragaria	*virginiana* ssp. *virginiana*	Scarlet Strawberry	2	1		SU			G5T?	X
Geum	*canadense*	White Avens	3	0		S5			G5	X
Potentilla	*recta*	Rough-fruited Cinquefoil		5	-2	SE5			G?	X
Rubus	*allegheniensis*	Alleghany Blackberry	2	2		S5			G5	X
Rubus	*idaeus* ssp. *melanolasius*	Wild Red Raspberry	0	-2		S5			G5T	X
Salicaceae		**Willow Family**								
Populus	*tremuloides*	Trembling Aspen		0		S5			G5	X
Salix	*species*	Willow species								
Salix	*fragilis*	Crack Willow		-1	-3	SE5			G?	X
Scrophulariaceae		**Figwort Family**								
Linaria	*vulgaris*	Butter-and-eggs		5	-1	SE5			G?	X
Solanaceae		**Nightshade Family**								
Solanum	*dulcamara*	Bitter Nightshade		0	-2	SE5			G?	X
Tiliaceae		**Linden Family**								
Tilia	*americana*	American Basswood	4	3		S5			G5	X
Ulmaceae		**Elm Family**								
Ulmus	*americana*	White Elm	3	-2		S5			G5?	X
Ulmus	*pumila*	Siberian Elm		5	-1	SE3			G?	X
Vitaceae		**Grape Family**								
Parthenocissus	*inserta*	Inserted Virginia-creeper	3	3		S5			G5	X
Vitis	*riparia*	Riverbank Grape	0	-2		S5			G5	X
MONOCOTYLEDONS		**MONOCOTS**								
Alismataceae		**Water-plantain Family**								
Alisma	*plantago-aquatica*	Common Water-plantain	3	-5		S5			G5	X
Cyperaceae		**Sedge Family**								
Carex	*spicata*	Spiked Sedge		5	-1	SE5			G?	X
Carex	*vulpinoidea*	Fox Sedge	3	-5		S5			G5	X
Eleocharis	*obtusa*	Blunt Spike-rush	5	-5		S5			G5	U
Liliaceae		**Lily Family**								
Maianthemum	*stellatum*	Star-flowered Solomon's Seal	6	1		S5			G5	X
Orchidaceae		**Orchid Family**								
Epipactis	*helleborine*	Common Helleborine		5	-2	SE5			G?	X
Poaceae		**Grass Family**								
Bromus	*inermis* ssp. *inermis*	Awnless Brome		5	-3	SE5			G4G5T?	X
Dactylis	*glomerata*	Orchard Grass		3	-1	SE5			G?	X
Festuca	*pratensis*	Meadow Fescue		4	-1	SE5			G5	X
Phalaris	*arundinacea*	Reed Canary Grass	0	-4		S5			G5	X
Phleum	*pratense*	Timothy		3	-1	SE5			G?	X

Appendix E: Plant List, Mayfield Road Class EA

LATIN NAME		COMMON NAME	COEFFICIENT OF CONSERVATISM	WETNESS INDEX	WEEDINESS INDEX	PROVINCIAL STATUS	OMNR STATUS	COSEWIC STATUS	GLOBAL STATUS	LOCAL STATUS PEEL
	LOCAL STATUS SOURCE LAST UPDATE/ INITIALS									VARGA 2000 July 2002/KH
Phragmites	*australis*	Common Reed	0	-4		S5			G5	X
Poa	*compressa*	Canada Blue Grass	0	2		S5			G?	X
Poa	*pratensis ssp. pratensis*	Kentucky Bluegrass	0	1		S5			G5T	X
Puccinellia	*distans*	Spreading Goose Grass		-5	-1	SE5			G5	X
Typhaceae		**Cattail Family**								
Typha	*angustifolia*	Narrow-leaved Cattail	3	-5		S5			G5	X
Typha	*latifolia*	Broad-leaved Cattail	3	-5		S5			G5	X
FLORISTIC SUMMARY & ASSESSMENT										
Species Diversity										
Total Species:		**93**								
Native Species:		**42**	45%							
Exotic Species		**51**	55%							
Regionally Significant Species		enter manually								
S1-S3 Species		0	0%							
S4 Species		0	0%							
S5 Species		41	100%							
Co-efficient of Conservatism and Floristic Quality Index										
Co-efficient of Conservatism (CC) (average)		**2.4**								
CC 0 to 3	*lowest sensitivity*	26	67%							
CC 4 to 6	*moderate sensitivity*	13	33%							
CC 7 to 8	*high sensitivity*	0	0%							
CC 9 to 10	*highest sensitivity*	0	0%							
Floristic Quality Index (FQI)		**15**								
Presence of Weedy & Invasive Species										
mean weediness		**-1.6**								
weediness = -1	*low potential invasiveness*	27	54%							
weediness = -2	*moderate potential invasiveness*	15	30%							
weediness = -3	*high potential invasiveness*	8	16%							
Presence of Wetland Species										
average wetness value		**1.8**								
upland		27	30%							
facultative upland		26	29%							
facultative		18	20%							
facultative wetland		13	15%							
obligate wetland		5	6%							

APPENDIX F

MNR LICENSE TO COLLECT FISH FOR SCIENTIFIC PURPOSES (NO. 1044427)

Ministry of
Natural Resources

Ministère des
Richesses naturelles

Ontario

RECEIVED
FEB 0 4 2008

50 Bloomington Road West
Aurora, Ontario
L4G 3G8

January 16, 2008

Marc Faiellla
Stantec Consulting
361 Southgate Drive
Guelph, Ontario
N1G 3M5

Dear Mr. Faiella:

Please find enclosed a Licence to Collect Fish for Scientific Purposes # 1044427.

Please sign the enclosed licences in the space marked "Signature of Licencee" on both the licence and the attached conditions schedule. Return one signed copy of the licence and one signed copy of the conditions to me by return mail.

A new condition has been included in all fish collection licences to address concerns with the spread of aquatic invasive species and diseases. Please note that all collections and sampling must be in compliance with the best management practices identified in the enclosed technical bulletin. A fish disease known as Viral Hemorrhagic Septicemia (VHS) has been confirmed in the lower Great Lakes and some inland tributaries. A map has been enclosed with your licence to assist you in determining the location of your work site(s) in relation to Ontario's VHS management zone where waters are considered to be VHS positive. Please feel free to contact us should you have any questions regarding the definition of VHS positive waters.

A completed Field Collection Record (FCR) is required for each sampling location. FCR's must be properly completed, including the site UTM coordinates. Incomplete forms will be returned and may delay the issuance of future licenses. A blank FCR is enclosed. Please copy the attached form as required and ensure that the Scientific Collector Licence number is marked on each page.

FCR's for licence # 1044427 must be submitted by September 30, 2008.

Please contact me if you have any questions.

Yours truly,

K. Golby

Karen Golby
Resource Management Clerk
Aurora District Office
Tel: (905) 713-7403
Fax: (905) 713-7361
karen.golby@ontario.ca

Ontario

Ministry of Natural Resources

Ministère des Richesses naturelles

Licence to Collect Fish for Scientific Purposes

Permis pour faire la collecte de poissons à des fins scientifiques

Licence No. / N° de permis	1044427
Local Reference No. / N° de référence local	
Issuer Account No. / N° de compte du delivreur de permis.	7491147

This licence is issued under Part I of the Fish Licensing Regulation made under the Fish and Wildlife Conservation Act, 1997 to:

Ce permis est délivré en vertu de la Partie I du règlement sur la délivrance de permis de pêche formulé conformément à la Loi sur la protection du poisson et de la faune de 1997 à:

Name of Licencee / Nom du titulaire du permis

Last Name / Nom de famille	First Name / Prénom	Middle Name / Second Prénom
Mr. Faiella	Marc	

Name of Business/Organization/Affiliation (if applicable) / Nom de l'entreprise/de l'organisme/de l'affiliation (le cas échéant)

Stantec Consulting Ltd.

Mailing address of Licencee / Adresse postale du titulaire du permis

Street Name & No./PO Box/RR#/Gen. Del./ N° rue/C.P./R.R./poste restante

361 Southgate Drive

City/Town/Municipality / Ville/village/municipalité	Province/State / Province/État	Postal Code/Zip Code / Code Postal/Zip
Guelph	ON	N1G 3M5

to collect the species, size and quantites of fish from the waters as set out below.
Pour faire la collecte des espèces suivantes (stade et nombre indiqués ci-dessous):

Species / Espèces	Eggs / Oeuf X	Juvenile / Fretin X	Adults / Adulte X	Numbers / Nombre	Name of Waterbody / Nom de l'étendue d'eau
fish		X	X		Three tributaries of the West Humber River

Yes/Oui ☐ Additional species/Waterbody list attached / Liste d'espèces/d'étendue d'eau additionnelles ci-jointe

Purpose of collection / But de la collecte

fish inventory

Licence Dates / Dates du permis

Effective Date / Date d'entr ée en vigueur (YYYY-MM-DD)	Expiry Date / Date d'expiration (YYYY-MM-DD)
2008-01-16	2008-08-31

Licence conditions / Conditions du permis

This licence is subject to the conditions contained in Schedule A if included. / Ce permis doit respecter les conditions de l'annexe A si celle-ci est jointe.

Yes/Oui ☒ No/Non ☐ Schedule A included. / Annexe A ci-jointe

Issued by (please print) / Délivré par (veuillez écrire en caractères d'imprimerie)	Signature of Issuer / Signature du délivreur	Date of Issue/Date de délivrance (YYYY-MM-DD)
John Almond	[signature]	2008-01-16

Signature of Licencee / Signature du titulaire du permis	Date (YYYY-MM-DD)
[signature]	2008-01-16

Personal information contained on this form is collected under the authority of the Fish and Wildlife Conservation Act, 1997 and will be used for the purpose of licencing, identification, enforcement, resource management and customer service surveys. Please direct further inquiries to the District Manager of the MNR issuing district.

Les renseignements personnels dans ce formulaire sont recueillis conformément à la Loi sur la protection du poisson de la faune, 1997, et ils seront utilisés aux fins de délivrance de permis, d'identification, d'application des règlements, de gestion des ressources et de sondage sur les services à la clientèle. Veuillez communiquer avec le chef du district du MRN qui délivré le permis si vous avez des questions.

FW0032 (04/00)

Licence to Collect Fish for Scientific Purposes
Permis pour faire la collecte de poissons à des fins scientifiques
Schedule A - Licence Conditions
Annexe A - Conditions du permis

Licence No. 1044427
No de permis

This licence is subject to the conditions listed below.

1. Licencee may collect fish in three tributaries of the West Humber River, in the Regional Municipality of Peel as per the map attached to your application dated November 16, 2007.

2. This Licence is valid only for the persons, species, numbers, areas and calendar year indicated. A written report covering the operation of the preceding year must be submitted to the licence issuer within 30 days of the termination date, but in no case later than January 31 next following the year of issue. The report shall contain a statement outlining the objectives of the operations, the methods used, the number and species of fish caught and their fate as well as a map indicating where the collections took place. **A completed Field Collection record (FCR) must be submitted for each station where sampling occurred.** An analysis is not required. The submission of a satisfactory report and completed FCR's is a prerequisite to any subsequent renewals.

3. Before carrying out any operation under the licence in any area the licenced person shall inform the Area Supervisor or Lake Manager of his or her intentions at least a week before commencing work and include information as to the type of operation, location, duration, and the name or names of personnel involved.

4. A copy of the original licence must be carried by the licenced person when working at the designated sites. An assistant of the licenced person who is carrying out activities under this licence during the absence of the licenced person shall carry a copy of the licence on his or her person.

5. All collection gear shall be clearly marked with the licenced person's and the organization's name.

6. This licence is not valid in Provincial Parks, park reserves, or National Parks without the written permission from the authorized person in charge of the area concerned.

7. Capture gear shall be inspected regularly and live holding traps must be inspected at least once daily.

8. **The licencee shall follow the best management practices for the collection, handling, transportation and holding of fish identified in FS Bulletin 2007-01 (March 30, 2007) included with the licence in order to minimize the risk of spreading aquatic invasive species and diseases.**

9. Licencee must release all fish live at the capture site with the exception of any specimens required for identification purposes.

10. Licencee must photograph and release live any redside dace captured. The photographs must be forwarded to MNR's Aurora District office for identification confirmation.

11. Any person, while acting under the authority of this authorization, shall immediately report the capture of any invasive species (eg. Ruffe, tubenose goby,**round goby**, rusty crayfish, Asian carp, etc.) found outside its previously known range (as determined by the distribution information available at http://www.invadingspecies.com/indexen.cfm to the licence issuing office. Any such specimens captured outside of their established range (not already naturalized) **shall be euthanized**, not returned to the water and kept for identification purposes.

12. Licencee may fish with a backpack electrofisher.

Signature of Licencee / Signature du titulaire du permis **Date**

[signature] Feb 12 - 08

Licence to Collect Fish for Scientific Purposes
Permis pour faire la collecte de poissons à des fins scientifiques
Schedule A - Licence Conditions
Annexe A - Conditions du permis

Licence No. 1044427
No de permis

13. Licencee may be assisted by Ryan Park, Roxanne Dibbley, Jessica Sosa, Tim Boudreau, and James Leslie.

Signature of Licencee / Signature du titulaire du permis

Date

Feb 12 - 08

COLLECTION OF FISH FOR SCIENTIFIC PURPOSES

The Ministry of Natural Resources is implementing control measures to slow and limit the spread of **Viral Hemorrhagic Septicemia (VHS)** into new waters. VHS positive waters include the waters of Lakes Ontario, Erie and Huron (including Georgian Bay), their connecting waterways and adjacent tributaries up to the first impassable barrier for all fish species. Where fish are manually transferred over barriers or pass through a fishway, that barrier will not be considered to be impassable. Low head lamprey weirs or dams that do not normally stop salmonid passage also are not considered impassable.

VHS is a sensitive organism that can be destroyed by disinfection treatments, drying or heat. However, it is capable of surviving on inanimate objects, particularly those not completely dried between uses.

These Best Management Practices should be followed by all personnel involved in the collection, handling, transportation and holding of all fish under a Licence to Collect Fish for Scientific Purposes. Ministry staff will confirm that appropriate control measures and Best Management Practices will be in place before issuing a Licence to Collect Fish for Scientific Purposes.

Collection and Handling of Fish Gametes

Where the purpose is to collect fish gametes for fertilization and rearing, please refer to MNR Fish Culture Technical Bulletin Best Management Practices BMP 2007-01, *Egg Disinfection and Incubation Procedures.*

Collection and Handling of Fish

Fish should not be collected from VHS positive waters unless appropriate precautions are put into place to ensure that the VHS virus is not transferred to waters that are not VHS positive.

1. When cleaning/gutting fish, ensure that the waste products do not contact natural waterways – refer to treatment of holding water (next page).
2. Do not transfer fish that appear to be sick to any facility (exception - fish appearing sick may be transferred to an approved fish health lab or research facility for testing/research) – refer to disposal of fish (next page).

Disinfection of all Equipment and Clothing

The following measures are particularly important and must be followed if equipment will be used to collect fish in a VHS positive waterbody and then used to collect fish in waterbody that is not VHS positive.

1. Thoroughly clean by removing all mud, aquatic plants and animals from all gear, boats, and boat motors when leaving a body of water and prior to disinfecting gear.
2. Ensure all equipment, livewells and clothing used during fish collection is disinfected in either a 10% chlorine bleach solution (add 100 mL of chlorine bleach per litre of clean water to make up a 10% chlorine bleach solution), 100 mg/L iodophor solution (add 100 mL of iodophor per litre of clean water to make

up a 100 mg/L iodophor solution), or **completely** dried after each use (exposure to sunlight can help to speed the drying process).

3. Holding water should be treated with household bleach prior to discharge (100mL per litre of clean water, exposure time of 1 hour; if water contains a lot of organic matter use 250 mL of bleach per litre of water and let sit for 1 hour).
4. Treated fish holding water and treated wash water used for equipment cleaning should be disposed of properly in a municipal sewer system or on the ground well away from fish bearing waters. Care should be taken while disposing of this water, as chlorine bleach is toxic to fish.

Movement of Fish

1. Water used to transport live fish should be pathogen free and not taken from VHS positive waters.
2. A Licence to Collect Fish for Scientific Purposes does not authorize the release of live fish into other waters.
3. Live fish taken from VHS positive waters and transported to facilities in areas where the waters are not VHS positive need to implement the treatment and disposal practices described in this bulletin.
4. It is permissible to transport live fish within VHS positive areas.
5. It is permissible to transport live fish taken from waters that are not VHS positive to VHS positive areas.
6. Live fish taken from the VHS positive waters should not be transported to areas that are not VHS positive.
7. Fish collected from VHS positive waters for future scientific study should be killed immediately and properly preserved or frozen.
8. Collected fish should be labelled with date, location of capture and name of licence holder.

Disposal of Facility Effluent

1. Control facility effluent to minimize impact on fish bearing waters.
2. Effluent from fish that may have been exposed to VHS should be disinfected with a 20% chlorine bleach solution and let sit until the chlorine dissipates before being discharged to a municipal sewage system
3. Dumping effluent into municipal drains on the roadway is not acceptable.

Disposal of Fish

The following precautions should be taken to dispose of fish that have not been properly preserved or frozen for future scientific study.

1. Dispose of fish, internal organs, skin, scales, heads and tails in the garbage.
2. Do not release fish into a lake or river (this activity is not authorized under a Licence to Collect Fish for Scientific Purposes). Put them in the garbage or biohazard disposal.
3. Do not give away any fish collected under your permit.

Ontario | Ministry of Natural Resources | Ministère des Richesses naturelles

Licence to Collect Fish for Scientific Purposes

Permis pour faire la collecte de poissons à des fins scientifiques

Licence No. / N° de permis	1044427
Local Reference No. / N° de référence local	
Issuer Account No. / N° de compte du delivreur de permis.	7491147

This licence is issued under Part I of the Fish Licensing Regulation made under the Fish and Wildlife Conservation Act, 1997 to:

Ce permis est délivré en vertu de la Partie I du règlement sur la délivrance de permis de pêche formulé conformément à la Loi sur la protection du poisson et de la faune de 1997 à:

***Name of Licencee* / Nom du titulaire du permis**

Last Name / Nom de famille	First Name / Prénom	Middle Name / Second Prénom
Mr. Faiella	Marc	

Name of Business/Organization/Affiliation (if applicable) / Nom de l'entreprise/de l'organisme/de l'affiliation (le cas échéant)

Stantec Consulting Ltd.

Mailing address of Licencee* / *Adresse postale du titulaire du permis

Street Name & No./PO Box/RR#/Gen. Del./ N° rue/C.P./R.R./poste restante

361 Southgate Drive

City/Town/Municipality / Ville/village/municipalité	Province/State Province/État	Postal Code/Zip Code Code Postal/Zip
Guelph	ON	N1G 3M5

to collect the species, size and quantites of fish from the waters as set out below.
Pour faire la collecte des espèces suivantes (stade et nombre indiqués ci-dessous):

Species Espèces	Eggs Oeuf x	Juvenile Fretin x	Adults Adulte x	Numbers Nombre	Name of Waterbody Nom de l'étendue d'eau
fish		X	X		Three tributaries of the West Humber River

Yes/Oui ☐ Additional species/Waterbody list attached / Liste d'espèces/d'étendue d'eau additionnelles ci-jointe

Purpose of collection* / *But de la collecte: fish inventory

Licence Dates* / *Dates du permis

Effective Date / Date d'entr ée en vigueur (YYYY-MM-DD)	Expiry Date / Date d'expiration (YYYY-MM-DD)
2008-01-16	2008-08-31

Licence conditions* / *Conditions du permis

This licence is subject to the conditions contained in Schedule A if included. / Ce permis doit respecter les conditions de l'annexe A si celle-ci est jointe.

Yes/Oui ☒ No/Non ☐ Schedule A included. / Annexe A ci-jointe

Issued by (please print) Délivré par (veuillez écrire en caractères d'imprimerie)	Signature of issuer / Signature du délivreur	Date of Issue/Date de délivrance (YYYY-MM-DD)
John Almond		2008-01-16

Signature of Licencee / Signature du titulaire du permis	Date (YYYY-MM-DD)
	2008-01-16

Personal information contained on this form is collected under the authority of the Fish and Wildlife Conservation Act, 1997 and will be used for the purpose of licencing, identification, enforcement, resource management and customer service surveys. Please direct further inquiries to the District Manager of the MNR issuing district.

Les renseignements personnels dans ce formulaire sont recueillis conformément à la Loi sur la protection du poisson de la faune, 1997, et ils seront utilisés aux fins de délivrance de permis, d'identification, d'application des règlements, de gestion des ressources et de sondage sur les services à la clientèle. Veuillez communiquer avec le chef du district du MRN qui délivré le permis si vous avez des questions.

Licence to Collect Fish for Scientific Purposes
Permis pour faire la collecte de poissons à des fins scientifiques
Schedule A - Licence Conditions
Annexe A - Conditions du permis

Licence No. 1044427
No de permis

This licence is subject to the conditions listed below.

1. Licencee may collect fish in three tributaries of the West Humber River, in the Regional Municipality of Peel as per the map attached to your application dated November 16, 2007.

2. This Licence is valid only for the persons, species, numbers, areas and calendar year indicated. A written report covering the operation of the preceding year must be submitted to the licence issuer within 30 days of the termination date, but in no case later than January 31 next following the year of issue. The report shall contain a statement outlining the objectives of the operations, the methods used, the number and species of fish caught and their fate as well as a map indicating where the collections took place. **A completed Field Collection record (FCR) must be submitted for each station where sampling occurred.** An analysis is not required. The submission of a satisfactory report and completed FCR's is a prerequisite to any subsequent renewals.

3. Before carrying out any operation under the licence in any area the licenced person shall inform the Area Supervisor or Lake Manager of his or her intentions at least a week before commencing work and include information as to the type of operation, location, duration, and the name or names of personnel involved.

4. A copy of the original licence must be carried by the licenced person when working at the designated sites. An assistant of the licenced person who is carrying out activities under this licence during the absence of the licenced person shall carry a copy of the licence on his or her person.

5. All collection gear shall be clearly marked with the licenced person's and the organization's name.

6. This licence is not valid in Provincial Parks, park reserves, or National Parks without the written permission from the authorized person in charge of the area concerned.

7. Capture gear shall be inspected regularly and live holding traps must be inspected at least once daily.

8. **The licencee shall follow the best management practices for the collection, handling, transportation and holding of fish identified in FS Bulletin 2007-01 (March 30, 2007) included with the licence in order to minimize the risk of spreading aquatic invasive species and diseases.**

9. Licencee must release all fish live at the capture site with the exception of any specimens required for identification purposes.

10. Licencee must photograph and release live any redside dace captured. The photographs must be forwarded to MNR's Aurora District office for identification confirmation.

11. Any person, while acting under the authority of this authorization, shall immediately report the capture of any invasive species (eg. Ruffe, tubenose goby,**round goby**, rusty crayfish, Asian carp, etc.) found outside its previously known range (as determined by the distribution information available at http://www.invadingspecies.com/indexen.cfm to the licence issuing office. Any such specimens captured outside of their established range (not already naturalized) **shall be euthanized**, not returned to the water and kept for identification purposes.

12. Licencee may fish with a backpack electrofisher.

Signature of Licencee / Signature du titulaire du permis **Date**

[signature] Feb 12-08

Licence to Collect Fish for Scientific Purposes
Permis pour faire la collecte de poissons à des fins scientifiques
Schedule A - Licence Conditions
Annexe A - Conditions du permis

Licence No. 1044427
No de permis

13. Licencee may be assisted by Ryan Park, Roxanne Dibbley, Jessica Sosa, Tim Boudreau, and James Leslie.

Signature of Licencee / Signature du titulaire du permis

Date

Feb 12-08

Ontario

MNR Office Use
Watershed:
Waterbody Name:
FishDot No.:

Licence to Collect Fish for Scientific Purposes
Field Collection Record

Licence No: | Licencee Name:

Business Name: | Telephone: | Fax:

Mailing Address: | Town/City | Postal Code:

Waterbody Name: | Township/Municipality:

General Description of Sampling Site Location/Access:

Collection Site No. ☐ of ☐ | Site UTM Coordinates: ☐☐☐☐☐☐ E ☐☐☐☐☐☐☐ N

Collection Date: | Start Time: | End Time: | Duration (hrs)

Electrofisher Seconds: | Length of Station (m) | Water Temp. (C) | Air Temp. (C)

Stream Type: ☐ Intermittent ☐ Permanent | Watercress Present: ☐ Yes ☐ No

Waterbody Type: ☐ Spring ☐ Canal ☐ Stream/River ☐ River/Lake Junction ☐ Flooded Area
☐ Pool ☐ Pond ☐ Lake ☐ Reservoir ☐ Muskeg/Bog
☐ Other *(Describe)* ____

Bottom Type by Percent: *(Total = 100%)*	Rock	Boulder	Rubble	Gravel	Sand
	Silt	Clay	Muck	Marl	Detritus
	Other *(Description)*				

Current: ☐ Still ☐ Slow ☐ Medium ☐ Fast ☐ Quantitative (m/s) ____

Water Colour/Clarity: ☐ Colourless ☐ Yellow/Brown ☐ Blue/Green ☐ Turbid
☐ Other ____ Secchi Depth: (m) ____

Aquatic Vegetation: ☐ Submergent ☐ Floating ☐ Emergent ☐ None

Cover (Shore): ☐ None ☐ Sparse ☐ Moderate ☐ Dense ☐ Other ____

Cover (In Water): ☐ None ☐ Sparse ☐ Moderate ☐ Dense ☐ Other ____

Gear: ☐ Seine ☐ Gill Net ☐ Dip Net ☐ Angled ☐ Trawl ☐ Minnow Trap ☐ Piscicide
☐ Trap Net ☐ Electrofisher ☐ Surber ☐ Other ____

Size of Net (Gill or Seine Net) Length (m):	Size of Net or Mouth (Trap, Hoop or Trawl) (m):	Mesh Size (cm)	
		Smallest:	Largest:

Selectivity of Sample: ☐ All Kept ☐ None Kept* ☐ Some Kept* ☐ No Catch
** Record released fish on back.*

Date: Day ☐☐ Month ☐☐ Year ☐☐☐☐

Collectors:

Additional Data: *(Pollution, Condition of Fish, Habitat Conditions)*

Continued on Reverse

APPENDIX F

HYDROGEOLOGICAL REPORT

HYDROGEOLOGICAL INVESTIGATION
MAYFIELD ROAD IMPROVEMENTS (AIRPORT ROAD TO COLERAINE DRIVE) CLASS EA
REGIONAL MUNICIPALITY OF PEEL

Prepared for:
Regional Municipality of Peel
10 Peel Centre Drive, 4th Floor
Brampton ON L6T 4B9

Prepared by:
Stantec Consulting Ltd.
49 Frederick Street
Kitchener ON N2H 6M7

Stantec

160210480
February 2010

Table of Contents

Table of Contents

List of Appendices

List of Tables

List of Figures

Appendix A

1.0 Introduction

Stantec Consulting Ltd. (Stantec) was retained by the Region of Peel (Region) to complete a Hydrogeologic Assessment Report as part of the Mayfield Road (Airport Road to Coleraine Drive) Class Environmental Assessment (Class EA). This project is being completed in accordance with Schedule C projects under the *Municipal Class Environmental Assessment* (MEA, 2000). This technical report has been prepared as an appendix to the Environmental Study Report (ESR).

The purpose of the Class EA was to provide a comprehensive and environmentally sound planning process to be used in the identification and evaluation of roadway improvement alternative solutions. The objectives of the hydrogeologic assessment were to characterize the hydrogeological setting; identify potential hydrogeological constraints; assess various alternatives; and recommend appropriate measures to avoid or minimize negative hydrogeological impacts. Specifically, the assessment involved completing the following tasks:

1. Identify aquifer and aquitard sequences;
2. Characterize areas of aquifer vulnerability;
3. Delineate areas of significant groundwater recharge and discharge; and
4. Compile this information to develop hydrogeological constraint mapping to be used in evaluating the various roadway improvement alternatives.

These objectives were addressed mainly through completion of a desktop level review of available published mapping, records and reports, although limited field investigations were also completed.

The report is organized into eight (8) sections including this introduction. Section 2 provides an overview of background information, including a description of the Study Area, an overview of the proposed upgrades to Mayfield Road, and information regarding sources of information used for the assessment. Section 3 provides a description of the hydrogeologic setting of the Study Area, including physiography and topography, surface water features, geology and groundwater conditions. Section 4 summarizes the hydrogeological constraints. Section 5 provides an assessment of the alternative solutions identified as part of the Class EA with respect to the hydrogeological constraints. Section 6 outlines an impact assessment and mitigation methods for the identified preferred alternative. The study conclusions and recommendations are provided in Section 7. A list of references is provided in Section 8. All figures and tables referenced throughout this report are provided in Appendices A and B, respectively.

2.0 Background

2.1 PROPOSED MAYFIELD ROAD UPGRADES

Mayfield Road is a major east-west arterial road under the jurisdiction of the Region (Regional Road No. 14), and forms the boundary between the City of Brampton and the Town of Caledon. Within the Study Area, Mayfield Road generally consists of two lanes, carrying traffic between the eastern and western portions of the Region, with a posted speed limit of 80 km/hr, although approaching and at the intersections of Airport Road and The Gore Road the posted speed limit is 60 km/hr.

In an earlier study, the Region identified a number of factors that have triggered the need for improvements to Mayfield Road. These factors include:

- Capacity deficiencies, both existing and future;
- Structural condition;
- Safety issues; and
- Approved and proposed changes in surrounding land use.

In addition, the Region anticipates that proposed long-term future changes to Highway 407 will have a significant impact on travel patterns on Mayfield Road.

The Region is therefore currently completing a Class EA to outline proposed alternatives for implementing upgrades to the stretch of Mayfield Road between Airport Road in the west and Coleraine Drive in the east.

2.2 GENERAL STUDY AREA DESCRIPTION

The Study Area for this Class EA generally includes the 5.5 km stretch of Mayfield Road between Airport Road and Coleraine Drive in the Region of Peel. For the purposes of this Hydrogeologic Assessment Report, the Study Area extends 500 m north and south of Mayfield Drive, 500 m west of Airport Road and 500 m east of Coleraine Drive. Figure 1 illustrates the location of the Study Area.

The land north of Mayfield Road is part of the Town of Caledon, and the land south of Mayfield Road is part of the City of Brampton. At present, the majority of this area is agricultural with some existing residential development located near Airport Road and east of The Gore Road. Future urban development is proposed within the area south of Mayfield Road in the City of Brampton, while the area north of Mayfield Road in the Town of Caledon is designated as Prime Agricultural Land.

2.3 SOURCES OF INFORMATION

This hydrogeologic assessment has been completed primarily as a desktop review, meaning that limited field investigations and collection of site-specific data has been undertaken. As part of the desk-top review, data were available from a number of sources including:

- Per an agreement between the Region and the MOE, an output from the MOE's water well record (WWR) database was provided to Stantec by the Region for use in obtaining information on groundwater usage and stratigraphic information in the vicinity of the Study Area;
- The Region also provided GIS mapping for the Study Area, which included aerial photography and mapping of surficial features;
- Published GIS mapping from the Ministry of Natural Resources (MNR), which included the Ontario Base Mapping (OBM) and a digital elevation model (DEM) were used to obtain topographic information;
- Published GIS mapping from the Ontario Geological Survey (OGS), which included mapping of physiography, surficial geology and bedrock geology;
- A published geological report that covered the Study Area (White, 1975);
- A groundwater modeling study of the Oak Ridges Moraine (EarthFX, 2006), which included the Study Area as part of its wider model domain;
- A Toronto Region Conservation Authority (TRCA) report on the geology and groundwater resources within the Humber River Watershed (TRCA, 2008);
- A geotechnical report (Stantec, 2008) prepared for the Study Area as part of the technical appendices for this Class EA; and
- The Natural Environment Report (Stantec, 2010) prepared for the Study Area as part of the technical appendices for this Class EA.

3.0 Hydrogeologic Setting

3.1 PHYSIOGRAPHY AND TOPOGRAPHY

The Study Area is located within the physiographic region defined by Chapman and Putnam (1984) as the South Slope. The South Slope is the first of three physiographic regions, together with the Peel Clay Plain and the Iroquois Lake Plain, which separate the Oak Ridges Moraine from Lake Ontario. As the name implies, the South Slope physiographic region comprises the southern slope of the Oak Ridges Moraine extending from the Niagara Escarpment in the west to the Trent River in the east. The Study Area is located about 15 km east of the Niagara Escarpment, in an area described by Chapman and Putnam (1984) as being covered by ground moraine of limited relief. Figure 2 reproduces mapping from Chapman and Putnam (1984) and shows that the Study Area is primarily within a zone mapped as bevelled till plain, with the far western portion of the Study Area mapped as drumlinized till plain, consistent with the description of ground moraine in the area. Immediately east of the Study Area, sand plains are mapped.

Regionally, the ground surface topography slopes southward toward Lake Ontario, as shown in Figure 3. The topography within the Study Area has been shaped somewhat by the numerous drainage features that cut through the Study Area in a roughly northwesterly to southeasterly direction; the West Humber River in particular where the river can be seen to have cut a steep valley into the surrounding landscape. Along the length of Mayfield Road within the Study Area (see cross-section A-A'; Figure 7), the ground surface elevation ranges from a high of 238 metres above mean sea level (mAMSL) at the western extent near Airport Road, to a low of 213 mAMSL where the road crosses the West Humber River. At the eastern limits of the Study Area at Coleraine Drive the ground surface elevation is approximately 230 mAMSL.

3.2 SURFACE WATER FEATURES

The Study Area is located within the Humber River Watershed, which is the largest watershed in the Toronto region covering roughly 903 km^2. Specifically, the Study Area is located primarily within the West Humber River subwatershed, which flows approximately 43 km from its source in the rolling hills of Caledon, over the Peel Plain in Brampton before joining the Main Humber in Toronto downstream of Albion Road in Summerlea Park (TRCA, 2007).

Figure 4 provides a map of surface water features identified within and surrounding the Study Area. A total of sixteen (16) water crossings were identified within the Study Area, numbered as tributaries 1 to 16 as shown on Figure 4, and discussed in detail in the Natural Environment Report (Stantec, 2010). The West Humber River (tributary 11; Figure 4) is the main watercourse that flows through the Site, roughly parallel to The Gore Road. Salt Creek (tributary 3; Figure 4), a tributary of the West Humber River, passes through the western portion of the Study Area. Fifteen of the sixteen watercourses that flow through the Study Area are within the West Humber River subwatershed, with only the most easterly un-named watercourse (tributary 16; Figure 4) being part of the Main Humber River subwatershed.

Stantec (2010) did not identify any Provincially Significant Wetlands (PSWs) within the Study Area. A single TRCA regulated wetland was noted in the NER upstream of tributary #11 (West Humber River). As part of the terrestrial habitat survey completed for the Natural Environment Report, wetland communities were identified along 10 of the 16 tributaries (Stantec, 2010). In addition, base mapping from the Region identifies two small wetland areas southeast of Mayfield Road between Innis Lake Road and Centreville Creek Road, outside of the Study Area of the Natural Environment Report (Study Area extended 120 m south of Mayfield Road).

3.3 GEOLOGY

The surficial quaternary geology of the area was originally mapped by White (1975). Figure 5 provides a map of the local surficial geology, based on mapping compiled by the Ontario Geological Survey (OGS, 2003) for the entire province. A review of Figure 5 shows that the majority of the Study Area is underlain by fine-textured glaciolacustrine deposits of silt and clay, with the western and eastern limits underlain by clay to silt till. Modern alluvium deposits of clay, silt and sand are mapped immediately surrounding the West Humber River (tributary #11) and four (4) of the other unnamed tributaries (5, 6, 12 and 14), with thin lenses of clay to silt till mapped within some of the stream valleys. Bedrock is reported to be exposed at surface surrounding Salt Creek (tributary #3) and part of tributary #5.

A review of the original mapping by White (1975) provides some additional information on the nature and origin of the surficial deposits. The fine-textured glaciolacustrine deposits that underlie the majority of the Site are part of the Lacustrine-Wildfield Till Complex, which are interpreted by White (1975) to have been deposited in former Glacial Lake Peel. The deposits are typically thin, only 0.6 to 0.9 m thick but may be up to 3 m thick where infilling of depressions on the ground surface at the time of deposition occurred. Due to the thin nature of the unit, some of the original stratification of the deposits were lost due to on-going geomorphologic processes.

The Lacustrine-Wildfield Till Complex overlies the Wildfield Till. The Wildfield Till is the youngest till in the area, typically found directly overlying the Halton Till in an area approximately 200 to 260 km^2 centered on the West Humber River (White, 1975). The Wildfield Till is a dark grey fine-grained till without any appreciable pebble content, but the presence of fine gravel together with light coloured silt balls gives the till a conglomeratic appearance (White, 1975). The Wildfield Till is only exposed at surface over an area of approximately 50 km^2, generally immediately north of the Study Area but also represents the genesis of the clay to silt till mapped by the OGS (2003) at the eastern and western limits of the Study Area. The Gooseville Moraine, a small horseshoe shaped moraine approximately 0.8 km wide by 27 km long composed of Wildfield Till, is mapped by White (1975) at the western end and north of the Study

Area. However, the Gooseville Moraine has little surface expression, typically less than 1.5 m. The Wildfield Till is typically 0.6 m to 1.8 m thick, except in river valleys and in the Gooseville Moraine where it is found at thicknesses of 2.4 m to 4.6 m (White, 1975).

The clay and silt till mapped along the various stream reaches is not the Wildfield Till, but the underlying older Halton Till. The overlying Wildfield Till and Lacustrine-Wildfield Till Complex are interpreted to have been eroded away by the streams. The Halton Till is a grey, weathered to yellowish or reddish brown, texturally variable, sandy silt to clayey silt diamicton interbedded with silt, sand and gravel. It is typically 3 m to 6 m thick and locally up to 30 m thick. The Halton Till is distinguished from the overlying Wildfield Till either by a 0.2 m to 0.3 m thickness of stratified silt which serves as a marker bed or on the basis of texture and colour (White, 1975).

A geotechnical investigation was conducted by Stantec (2008) and involved the drilling of 30 auger probes (AP1 to AP15 and AP17 to AP31) along Mayfield Road to depths of 1.5 m to 3.5 m below ground surface (BGS), at the locations shown on Figure 6. The subsurface conditions encountered in this investigation are generally similar to those mapped by the OGS (2003) and White (1975). Soil samples from AP4 and AP23 where submitted for grain size analysis, with the soils classified as sandy silty clay. The D10 value, determined from a soil sample collected from AP23, was used to estimate a Hazen Permeability (Hazen, 1911) of 1×10^{-8} m/s.

Cross-sections A-A' to G-G' (Figures 7 to 13; locations shown on Figure 6) were created using MOE WWR obtained by the Region in 2007, and geology information from the geotechnical auger probes drilled by Stantec in 2008. It should be noted that the locations of the MOE WWR have not been field verified. Cross-Section A-A' follows Mayfield Road through the Study Area, whereas the remaining cross-sections are perpendicular to Mayfield Road and progress from west to east, as shown on Figure 6.

As shown in the cross-sections, the overburden at the Site is comprised mainly of clay with some sand and gravel. The clay unit is found at ground surface, typically extending to bedrock throughout most of the Study Area although sand/gravel is mapped below the clay along cross-section E-E' (Figure 11) which runs roughly parallel to the West Humber River. It is interpreted that the clay unit shown on the cross-sections represents undifferentiated Lacustrine-Wildfield Till Complex, Wildfield Till and Halton Till. These units will be undifferentiated due to the nature of the logging associated with water well drilling.

Sand and gravel is found at depth and is mainly discontinuous except in the central portion of the Site. The sand and gravel is found directly overlying the bedrock in three of the MOE WWR or as a thin (< 5 m) layer within the clay. The majority of the MOE WWR do not extend to the bottom of the sand and gravel unit therefore the maximum thickness is unknown. A regional cross-section along the West Humber River (TRCA, 2008), prepared using the model developed by EarthFX (2006), indicates that the upper fine-grained materials (Lacustrine-Wildfield Till Complex, Wildfield Till and Halton Till are grouped together in the model) are underlain by a thin layer (< 10 m thick) of aquifer material, directly overlying bedrock.

Regionally, Precambrian bedrock is overlain by westward dipping Paleozoic bedrock formations, which were deposited in an ancient sea and subsequently tilted when the North American tectonic plate collided with the European plate. The Site is underlain by the Georgian Bay Shale, which in turn rests on limestones of the Simcoe Group, which overlay the Precambrian basement (OGS, 2006). The shale is described as grey-green to grey-blue, platy to thin bedded, and is interbedded with 0.03 m to 0.08 m thick lenticular beds of calcareous siltstone and limestone (White, 1975).

The bedrock surface in the area is of variable topography, having been weathered considerably prior to the onset of major glacial activities approximately 135,000 years ago. At the onset of the glaciation, the ancient Laurentian River and its tributaries were the predominant drainage features for the Great Lakes basin area. These drainage features eroded the Paleozoic bedrock, forming deep bedrock channels or troughs that subsequently influenced glacial flows and their deposits. Mapping of the bedrock topography by White (1975) indicates that the bedrock elevation along Mayfield Road within the Study Area is variable, on the order of 205 to 226 mAMSL, with an overall decreasing trend in top of bedrock elevation to the south towards Lake Ontario. To the west of the Study Area, a large bedrock valley is mapped by White (1975), while to the northeast of the Study Area a smaller southeast trending bedrock trough is mapped.

OGS (2003) mapping indicates that bedrock is found at surface along Salt Creek and the former river valley immediately to the northeast, and MOE WWR within 500 m of the Site indicate that the top of the bedrock ranges in depth from 2 m BGS to 50 m BGS (see cross-sections; Figures 7 to 13). Bedrock was not encountered during the geotechnical investigation.

3.4 HYDROGEOLOGY

Due to the complex nature of the deposits within the vicinity of the Oak Ridges Moraine, nine (9) conservation authorities across the ORM joined together in 2000 as the Conservation Authorities Moraine Coalition (CAMC) to advocate for and protect the moraine along its 160-kilometre length. As part of its on-going work, the CAMC commissioned a comprehensive hydrogeologic study / groundwater model of the ORM which included within its scope the South Slope, Peel Clay Plain and Iroquois Lake Plain physiographic regions. The Study Area for this assignment thus falls within the model domain. The hydrogeologic study included a thorough review of the literature and compilation of all available geologic sources (i.e. water well records, consultant borehole logs, municipal well records, etc). The results of the study are presented in a report entitled *Groundwater Modeling of the Oak Ridges Moraine Area (*EarthFX, 2006).

A series of eight (8) hydrostratigraphic units, consisting of four (4) overburden aquifers, three (3) overburden aquitards, and the upper weathered bedrock zone, were identified by EarthFX

(2006) within the model domain. A cross-section, along the length of the West Humber River, crossing through the Study Area at Mayfield Road and The Gore Road, was prepared using the EarthFX (2006) model and presented in TRCA (2008). This cross-section shows that in the vicinity of the Study Area only the upper three hydrostratigraphic units are present: an upper surficial aquifer comprised of surficial sand deposits and weathered surfaces of till; an aquitard referred to as the Halton Aquitard comprised mainly of the Halton Till across the model domain but will include the Wildfield Till local to the Study Area; and an aquifer comprised of ORM sand and gravel deposits. This is in general agreement with the local cross-sections presented within this report for the Study Area.

With the Study Area, static groundwater elevations reported in the MOE WWR for overburden wells and bedrock wells within 500 m of the Site are presented in Figures 14 and 15, respectively. The depth to groundwater ranges from 5.5 m below ground surface (BGS) to 29.0 mBGS. The auger probes drilled at the Site by Stantec (2008) as part of the geotechnical investigation within the Study Area were not found to contain any standing water at their final depth of 1.5 mBGS, with the exception of auger probes AP30 and AP31 (Figure 6). These two auger probes, drilled adjacent to Salt Creek and West Humber River, respectively, were advanced deeper than the remaining auger probes to depths of 3.5 mBGS. At the completion of drilling, groundwater was measured in both auger probes at a static level of 2.4 mBGS. In addition, auger probes AP19 and AP26, located near West Humber River and tributary #12, respectively, were reported to have wet soil at a depth of 0.4 to 1.5 mBGS and 0.7 to 1.5 mBGS, respectively. In drive-point piezometers installed as part of this hydrogeologic investigation (locations shown on Figure 6), groundwater levels ranged from 0.2 to 1.2 m in depth.

Due to the highly variable water levels shown on Figures 14 and 15, it was not possible to draw groundwater elevation contours based on these data, regional overburden groundwater flow was mapped by TRCA (2008) for the Humber River Watershed using the EarthFX (2006) groundwater model. Groundwater flow direction is generally correlated with major topographical features, and in the vicinity of the Study Area is in a general southeasterly direction towards Lake Ontario.

3.5 GROUNDWATER RECHARGE

Estimates of groundwater recharge within the Humber River watershed are provided in TRCA (2008). The major recharge areas are to the north of the Study Area, where the sands and gravels of the Oak Ridges Moraine are exposed at ground surface. Within the vicinity of the Study Area, the presence of till and other fine-grained deposits at surface limit groundwater recharge. Mapping by the TRCA (2008) indicates that within the Study Area annual groundwater recharge rates are less than 100 mm/year compared to areas of the Oak Ridges Moraine where groundwater recharge rates up to 300 mm/year are estimated.

3.6 GROUNDWATER-SURFACE WATER INTERACTION

The South Slope physiographic region is drained by numerous small creeks that are tributaries to major rivers draining into Lake Ontario. Springs along the lower slopes of the Oak Ridges Moraine provide baseflow for many of those creeks (EarthFX, 2006).

A map showing groundwater discharge within the Humber River Watershed is provided in TRCA (2008) based on output from the EarthFX (2006) groundwater model. Minor areas of groundwater discharge are noted north of Mayfield Road near the headwaters of Salt Creek, with an area of groundwater discharge to the West Humber River noted downstream from Mayfield Road. No significant groundwater discharge to either Salt Creek, the West Humber River or the unnamed tributaries are noted within the vicinity of the Study Area.

As part of the Natural Environment Report (Stantec, 2010), a detailed assessment of each surface water crossing was completed, and an assessment of fish species found within the Study Area undertaken. In general, conditions of the tributaries did not suggest groundwater discharge conditions existed, with two exceptions. On tributary #5 (see Figure 4), watercress was noted upstream and downstream of the Mayfield Road crossing, evidence to suggest possible groundwater discharge conditions. On tributary #9, downstream of the Mayfield Road crossing at the confluence of tributary #9 with tributary #8 near where these tributaries join the West Humber River, clear flowing water was noted and was thought to potentially be due to groundwater discharge conditions. However, during a site visit on September 11, 2009 as part of this hydrogeologic investigation, tributaries #8 and 9 were found to be dry.

To further investigate the potential interaction of groundwater and surface water within the Study Area, six (6) drive-point piezometers were installed within the surface water features at water crossings 3, 5, 6, 11, 12 and 14 on September 11, 2009. Over the period September 15 to 18, 2009, water levels in the drive-point piezometers and the adjacent surface water body were monitored a total of four (4) times. Table 1 provides a summary of the drive-point piezometer details and the water level data. A review of the results indicates that at tributaries 5 and 12, groundwater discharge conditions exist, with strong upward vertical hydraulic gradients on the order of 0.36 and 0.1 m/m, respectively. At tributary #3 (Salt Creek) weaker upward vertical hydraulic gradient on the order of 0.03 to 0.05 m/m was measured, also indicating groundwater discharge conditions. At tributary #6, the groundwater and surface water levels are approximately coincident, indicating interaction between the two but only very weak vertical hydraulic gradients. In contrast, strong downward vertical hydraulic gradients on the order of 0.6 and 0.5 m/m, respectively, were measured at tributary #11 (West Humber River) and tributary #14, indicating that groundwater discharge conditions are not anticipated.

3.7 GROUNDWATER USE

The TRCA (2008) provides a discussion of groundwater use within the Humber River Watershed. In general, water supply for urban centres is from surface water sources, although in rural areas and smaller urban centres groundwater is relied on for individual and municipal water supply. There are currently no municipal supply wells within the West Humber River subwatershed, in which the Study Area is located. The estimated total daily withdrawl of groundwater (including agricultural, commercial, recreational, livestock, institutional and water supply) from the West Humber River subwatershed was 810 m^3/day, compared to 8,581 m^3/day in the East Humber River subwatershed and 10,389 m^3/day in the Main Humber River subwatershed.

The closest municipal groundwater well to the Study Area is Kleinburg #3 (TRCA, 2008) located east of the intersection of Mayfield Road and Coleraine Drive, within the Main Humber River subwatershed. Delineation of well head protection areas (WHPA) for the Kleinburg #3 municipal well was completed by EarthFX (2007), and show that the 25-year time of travel to the Kleinburg #3 does not extend west of Highway 50 and therefore is outside of the Study Area.

The MOE WWR indicates that there are 86 private wells within 500 m of the section of Mayfield Road being considered as part of this Class EA. Of these wells, 65% (56) are completed in the shale, 23% (20) are completed in the lower overburden (silt, sand or gravel) and 8% (7) are completed in clay. Wells installed in the shale were installed at depths ranging from 4.57 mBGS to 51.82 mBGS, and the wells installed in the silt, sand and gravel range in depth from 5.49 mBGS to 60.96 mBGS. The current status of these wells has not been confirmed as part of this assessment. However, given the rural setting of the section of Mayfield Road in which the Study Area is located, with the exception of an urban subdivision noted south of Mayfield Road in the vicinity of Airport Road, it is probable that many of the wells identified within the MOE WWR are in use currently for water supply to individual residences.

4.0 Identification of Hydrogeological Constraints

This section provides a discussion of constraints to development based on the geologic and hydrogeologic conditions in the Study Area outlined in the previous section.

4.1 DEPTH TO BEDROCK

Although it does not represent a true hydrogeological constraint, a review of the geologic conditions has indicated that there are locations within the Study Area where the depth to bedrock is shallow. Bedrock is mapped at ground surface along Salt Creek between Innis Lake Road and Airport Road. A review of the cross-sections developed for the Study Area shows that the depth to bedrock is only a few metres between Innis Lake Road and Airport Road (cross-section A-A'; Figure 7), at Innis Lake Road (cross-section C-C'; Figure 9) and at Humber Station Road (cross-section F-F'; Figure 12).

Consideration for the shallow bedrock should be allowed for in planning for excavation in these areas.

4.2 DEPTH TO GROUNDWATER

The depth to groundwater within the Study Area, as determined from the geotechnical study, is typically greater than 1.5 m BGS. Water levels adjacent to Salt Creek and West Humber River were found to be about 2.4 m BGS. Groundwater discharge conditions were measured at Salt Creek (Creek #3), Creek #5, Creek #6 and Creek #12.

Therefore, depending on the depth of excavation for the road work, dewatering may be required during construction, particularly at the creek crossings. However, based on the fine-grained texture and relatively low permeability of the upper overburden identified as part of the geotechnical investigation (Stantec, 2008), dewatering rates would not likely be significant.

4.3 GROUNDWATER DISCHARGE FEATURES

Within the Study Area, several areas where groundwater discharges to surface water features have been identified. Specifically, this has been confirmed at tributaries #3, 5, 6 and 12.

Therefore, groundwater discharge to surface water represents a potential constraint to development. The prime concern with respect to this is the temporary reduction of baseflow in the surface water features during dewatering for construction. Potential mitigation measures could include the discharge of water pumped for dewatering to the surface water features.

4.4 GROUNDWATER RECHARGE

Within the vicinity of the Study Area, the presence of till and other fine-grained deposits at surface serve to reduce groundwater recharge, and the TRCA (2008) estimates that the annual groundwater recharge rate is less than 100 mm/year. However, in areas where the bedrock is shallow and the overburden is thin, specifically near Salt Creek and Humber Station Road groundwater recharge rates may be higher.

In general, maintaining groundwater recharge post-development is not considered a significant constraint for development.

4.5 MUNICIPAL WELL HEAD PROTECTION AREAS

No municipal water supply wells, or municipal well head protection areas (WPHA) are defined within the Study Area, and therefore do not represent a constraint to development.

4.6 PRIVATE WELLS

MOE WWR indicate there are 86 private wells within 500 m of the section of Mayfield Road being considered as part of this Class EA . Sixteen (16) of these wells are less than 10 m deep, which is considered relatively shallow. All except three of these wells are screened in the shale. If these wells still exist and are still in use, the quantity and quality of the water could be impacted by the proposed construction, and therefore represents a potential constraint to development.

Temporary impacts to quantity could result from dewatering during the construction. Impacts to water quality could result from dewatering or active construction. Water quality concerns related to dewatering may result from drawing impacted groundwater (i.e. from a septic system) toward private wells that are located within the zone of influence of the pumping. It is also possible that the operation of heavy equipment and excavation into the bedrock, if required, could temporarily increase turbidity and total suspended solids in the water.

A residential well survey should be conducted within the Study Area to verify the presence and status of private wells along Mayfield Road, prior to construction. If private wells are found and still in use, Stantec recommends collecting a baseline water quality sample and conducting water level monitoring before and throughout the construction period. Monitoring would only be completed with the owner’s permission. In the event of groundwater interference, a remedial measure, such as provision of potable water to the resident, should be implemented until the water quantity and/or quality is restored to pre-construction conditions.

4.7 AQUIFER SENSITIVITY

In order to further characterize the potential impact to the aquifer system underlying the study area, intrinsic susceptibility mapping was completed using data provided in the MOE water well records. An intrinsic susceptibility index (ISI) was calculated for each well using the method presented in MOE (2001). This method considers the depth and type of material overlying a confined aquifer to arrive at a semi-quantitative risk rating of High, Medium, or Low.

The results of the ISI mapping for the study area are presented on Figure 16. Individual well ISI designations are indicated using red, yellow, and green dots for High, Medium, and Low index ratings, respectively. As shown in Figure 16, the ISI at the Site ranges from High to Low. The ISI is High near Salt Creek and Humber Station Road where the bedrock is shallow and overlain by a relatively thin layer of clay. Cross-sections C-C' (Figure 9) and F-F' (Figure 12) illustrate this. Elsewhere at the Site where the bedrock is deeper and the clay overburden is thicker, the ISI is Medium to Low.

In areas where the ISI is High, activities at the surface (e.g. road construction and road salt application) have a greater potential for impacting the groundwater. When the road is widened, more road salt would likely be applied. The potential additional impact from this could be mitigated through diverting runoff from the sensitive areas through drainage improvements or by using less or alternative de-icing agents.

5.0 Assessment of Alternative Solutions

There are four (4) preliminary design concepts being considered for the widening of Mayfield Road, as follows:

Concept 1 – Widening equally about the existing centerline;

Concept 2 – Widening to the north;

Concept 3 – Widening to the south; and

Concept 4 – Modified alignment to minimize property impacts.

Based on a review of the hydrogeological constraints presented in Section 4.0, the proposed design concepts would all be equally viable from a hydrogeological perspective. A slight preference for Concept 4 was assessed as minimizing property impacts would also serve to minimize potential domestic well impacts.

6.0 Conclusions and Recommendations

Based on the results of the hydrogeologic assessment conducted along the section of Mayfield Road between Airport Road and Coleraine Drive, the following conclusions are provided:

- The surficial geology is comprised mainly of clay that extends to bedrock throughout most of the Study Area. A discontinuous sand and gravel layer is found at depth and usually directly overlies the bedrock wherever present. Bedrock was not encountered in any of the geotechnical auger probes; however, is expected to be near surface in the vicinity of Salt Creek based on the review of regional mapping sources.
- From a hydrogeological perspective, the four (4) preliminary design concepts were found to be equally viable.
- It is likely that during construction groundwater will be encountered in the vicinity of the watercourse crossings and the need for a Ministry of the Environment Permit to Take Water should be assessed as part of detailed design.
- A number of residential wells were identified along Mayfield Road. A baseline monitoring program is recommended for any wells that will remain as a domestic water supply following construction. The baseline monitoring program should include both water quantity and quality sampling.
- The domestic water wells on properties that are purchased as part of this project should be decommissioned in accordance with Ontario Regulation 903.

All of which is respectfully submitted,

STANTEC CONSULTING LTD.

LICENSED PROFESSIONAL ENGINEER
R. J. FREYMOND
April 5/13
PROVINCE OF ONTARIO

Clare L. Stewart, M.Sc., P.Eng.
Senior Hydrogeologist

Roger Freymond, P.Eng.
Senior Hydrogeologist

7.0 References

Chapman, L.J. and D.F. Putnam, 1984. The Physiography of Southern Ontario. Ontario Geological Survey, Special Volume 2, 270 p. Accompanied by Map P.2715, scale 1:600,000.

EarthFX Incorporated, 2006. Groundwater Modelling of the Oak Ridges Moraine Area, York Peel Durham Toronto (YPDT) Groundwater Management Study. CAMC /YPDT Technical Report No. 01-06. Prepared for Conservation Authorities Moraine Coalition, February 2006.

EarthFX Incorporated and Azimuth Environmental Consulting Inc, 2007. Vulnerabilty Assessment and Scoring of Wellhead Protection Area, Regional Municipality of York. Prepared for Regional Municipality of York, November 2007.

Hazen, A., 1911, Discussion: Dams on sand foundations: Transactions, American Society of Civil Engineers, v. 73, p. 199

MacLaren Plansearch (MacLaren), 1987. Area VI Pumping Test Results. Report prepared for the Regional Municipality of Peel.

Ministry of the Environment Ontario (MOE), 2001. Groundwater Studies 2001/2002, Technical Terms of Reference.

Municipal Engineers Association (MEA), 2000. Municipal Class Environmental Assessment. June 2000.

Ontario Geological Survey (OGS). 2003. Surficial Geology of Southern Ontario.

Ontario Geological Survey (OGS). 2006. Paleozoic Geology of Southern Ontario. Miscellaneous Release Data 126.

Stantec Consulting Ltd. (Stantec), 2010. Mayfield Road Improvements (Airport Road To Coleraine Drive) Class Environmental Assessment Natural Environment Report. February, 2010.

Stantec Consulting Ltd. (Stantec), 2008. Preliminary Geotechnical Investigation Report Mayfield Road - Airport Road to Coleraine Drive. Brampton and Caledon, Ontario. July 2008.

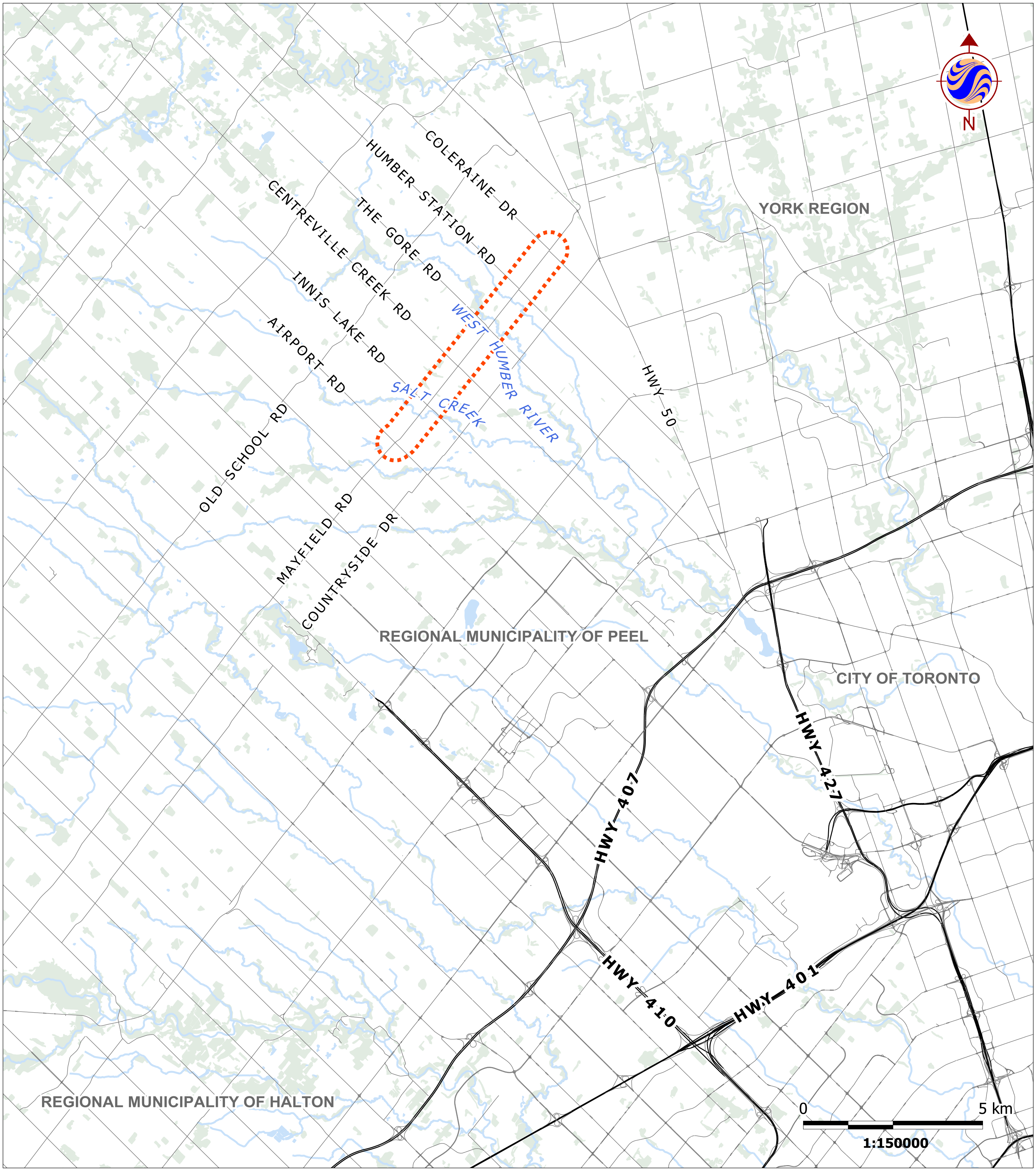
Toronto and Region Conservation Authority (TRCA), 2007. Listen To Your River – A Report Card on the Health of the Humber River Watershed. Prepared for the Humber Watershed Alliance.

Toronto Region Conservation Authority (TRCA), 2008. Humber River State of the Watershed Report – Geology and Groundwater Resources.

White, O.L., 1975. Quaternary Geology of the Bolton Area, Southern Ontario. Geological Report 117, Ministry of Natural Resources. Accompanied by Map 2275 (Quaternary Geology) and Map 2276 (Bedrock Topography), scale 1 inch to 1 mile (1:63,360).

APPENDIX A

FIGURES



\\cd1004-f06\Work_group\01609\active\160210480_Mayfield Road_Class EA\planning\drawing\Class EA 200802\160210480_borehole.map [Fig 01 (Study Location) Layout]
9/18/2009 4:09:19 PM By: sstroszkali Revised 09-11-2009 By: sstroszkali

September 2009
160210480

Stantec

Legend

- Site Boundary
- Stream
- Road
- Waterbody
- Wooded Area

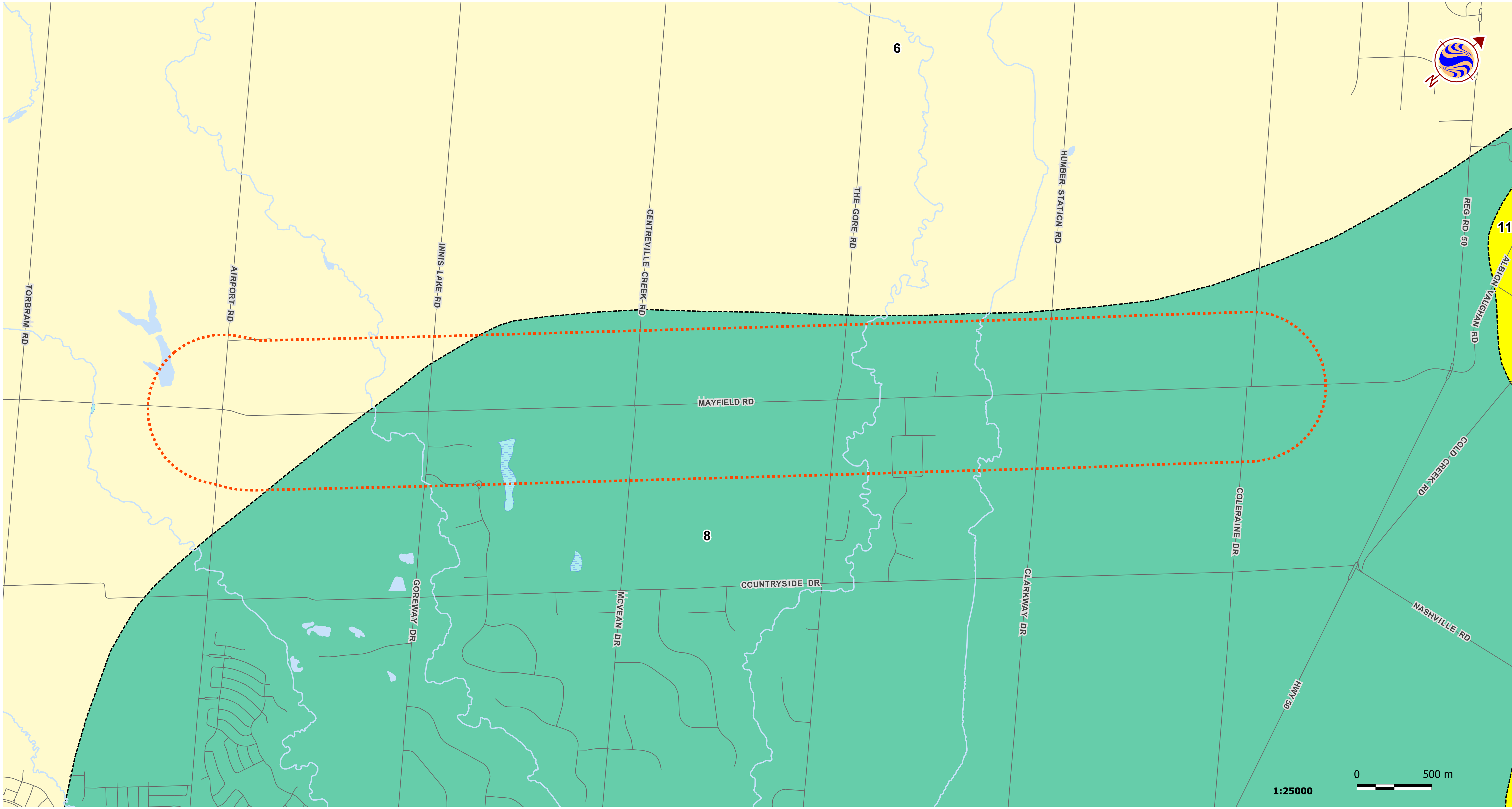
Notes

1. Roads provided by the Ontario Base Map: © Queen's Printer for Ontario, 2008.
2. Streams provided by the Regional Municipality of Peel.

Client/Project
Regional Municipality of Peel
Hydrogeologic Assessment
Mayfield Road Improvements Class EA

Figure No.
1

Title
Study Location



September 2009
160210480

Stantec

Legend

- Site Boundary
- Stream
- Waterbody
- Wetland
- Contact
- 6: Till Plains (Drumlinized)
- 8: Bevelled Till Plains
- 11: Sand Plains

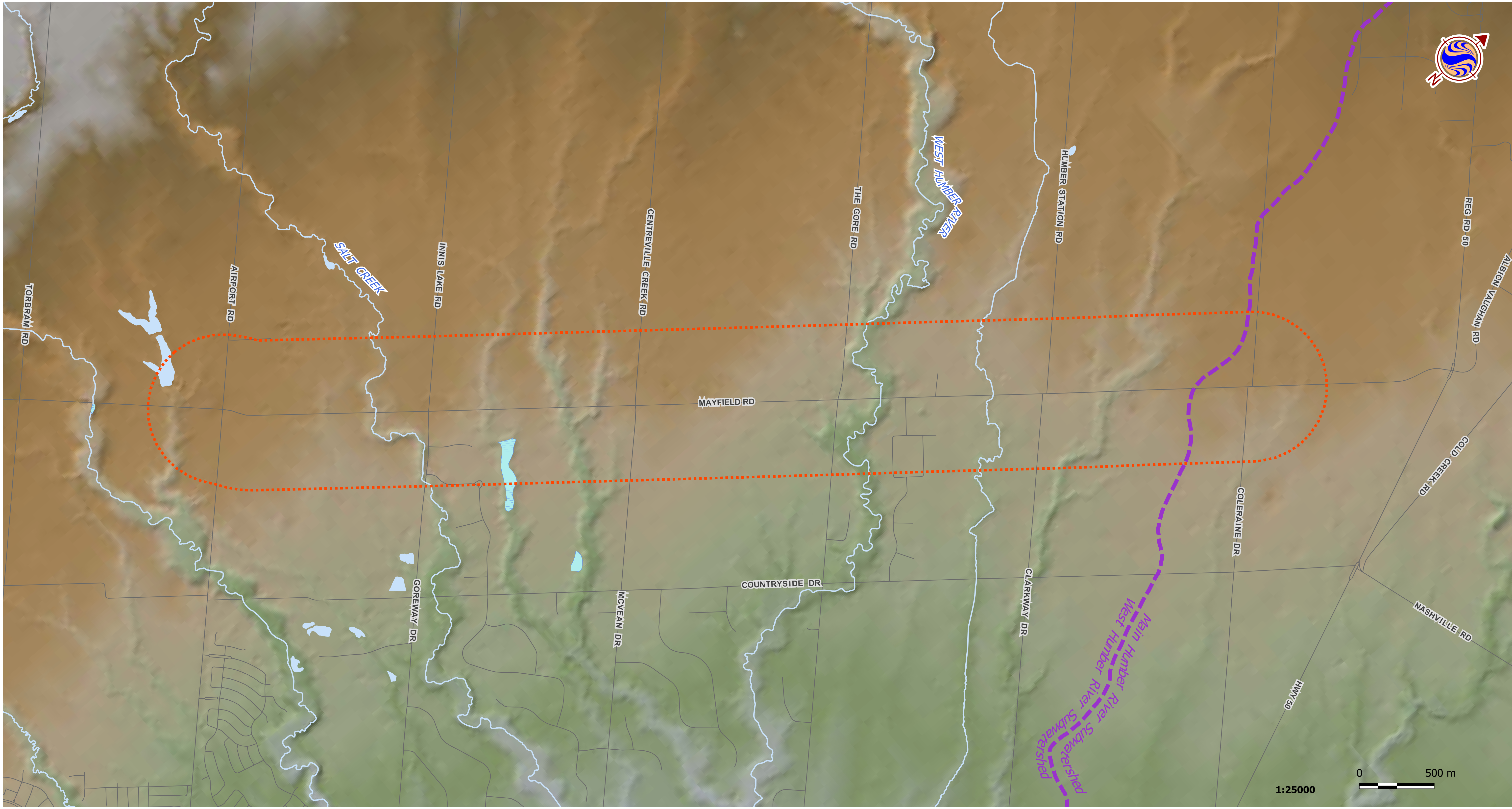
Notes

1. Physiography: Chapman and Putnam, 1984.

Client/Project
Regional Municipality of Peel
Hydrogeologic Assessment
Mayfield Road Improvements Class EA

Figure No.
2

Title
Physiography



\\cd1004-f06\Work_group\01609\active\160210480_Mayfield Road_Class EA 200802\160210480\planning\drawing\Class EA 200802\160210480_borehole.map [Fig 03 (Ground Surface Topography) Layout]
9/11/2009 1:58:09 PM By: sstroszkali Revised 09-11-2009 By: sstroszkali

September 2009
160210480

Stantec

Legend

- Site Boundary
- Stream
- Waterbody
- Wetland
- Subwatershed Boundary

Topographic Elevation (mAMSL)

280
255
230
210
190
165

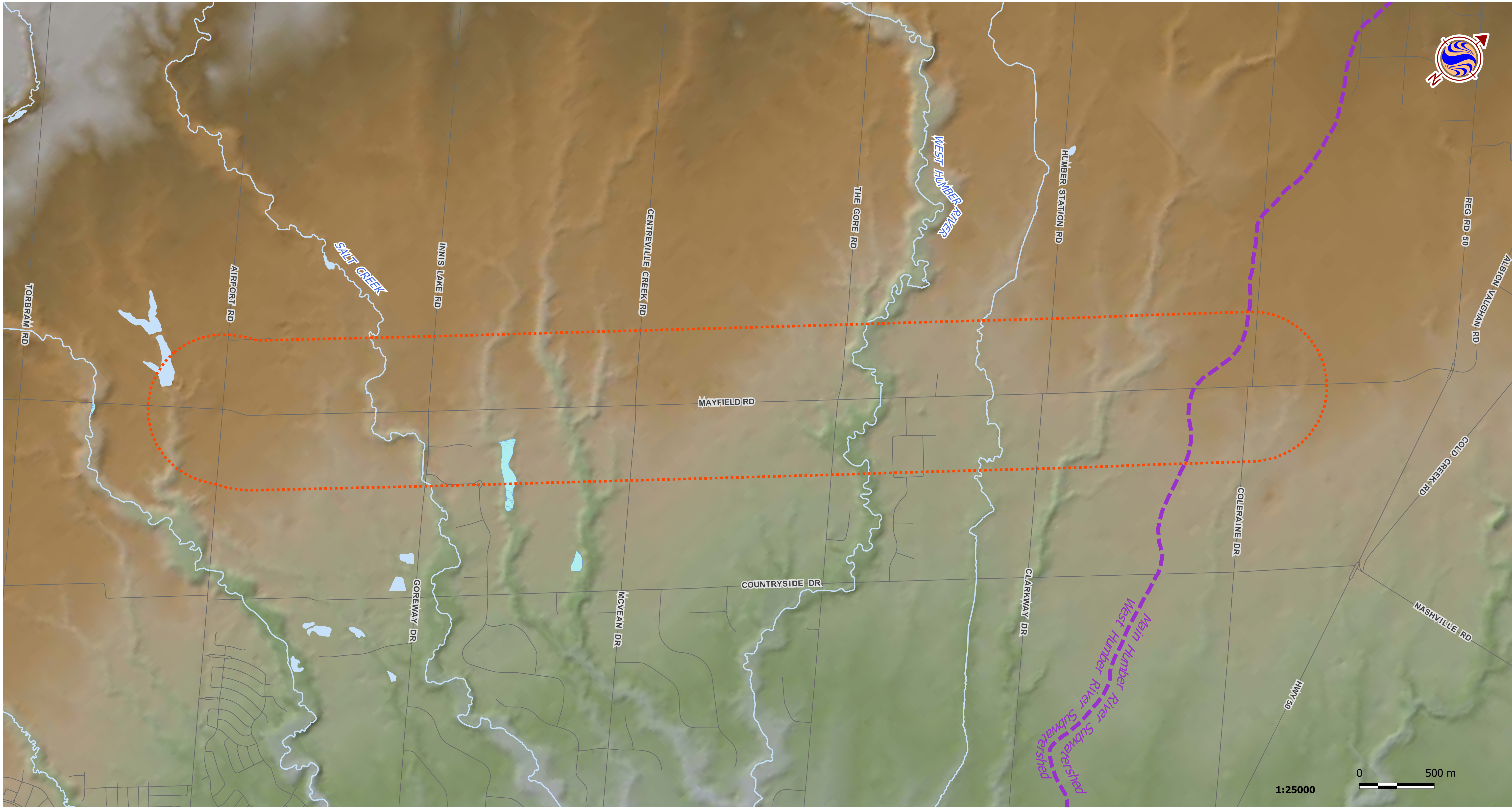
Notes

1. Base features provided by the Regional Municipality of Peel, 2008.
2. Ground Surface Contours from Ministry of Natural Resources: Digital Elevation Model, Version 2, 2006.

Client/Project
Regional Municipality of Peel
Hydrogeologic Assessment
Mayfield Road Improvements Class EA

Figure No.
3

Title
Ground Surface Topography



\\cd1004-f06\Work_group\01609\active\160210480_Mayfield Road_Class EA\planning\drawing\Class EA 2008\02\160210480_borehole.map [Fig 03 (Ground Surface Topography) Layout]
9/11/2009 1:58:09 PM By: sstroszkali Revised 09-11-2009 By: sstroszkali

September 2009
160210480

Stantec

Legend

- Site Boundary
- Stream
- Waterbody
- Wetland
- Subwatershed Boundary

Topographic Elevation (mAMSL)

280
255
230
210
190
165

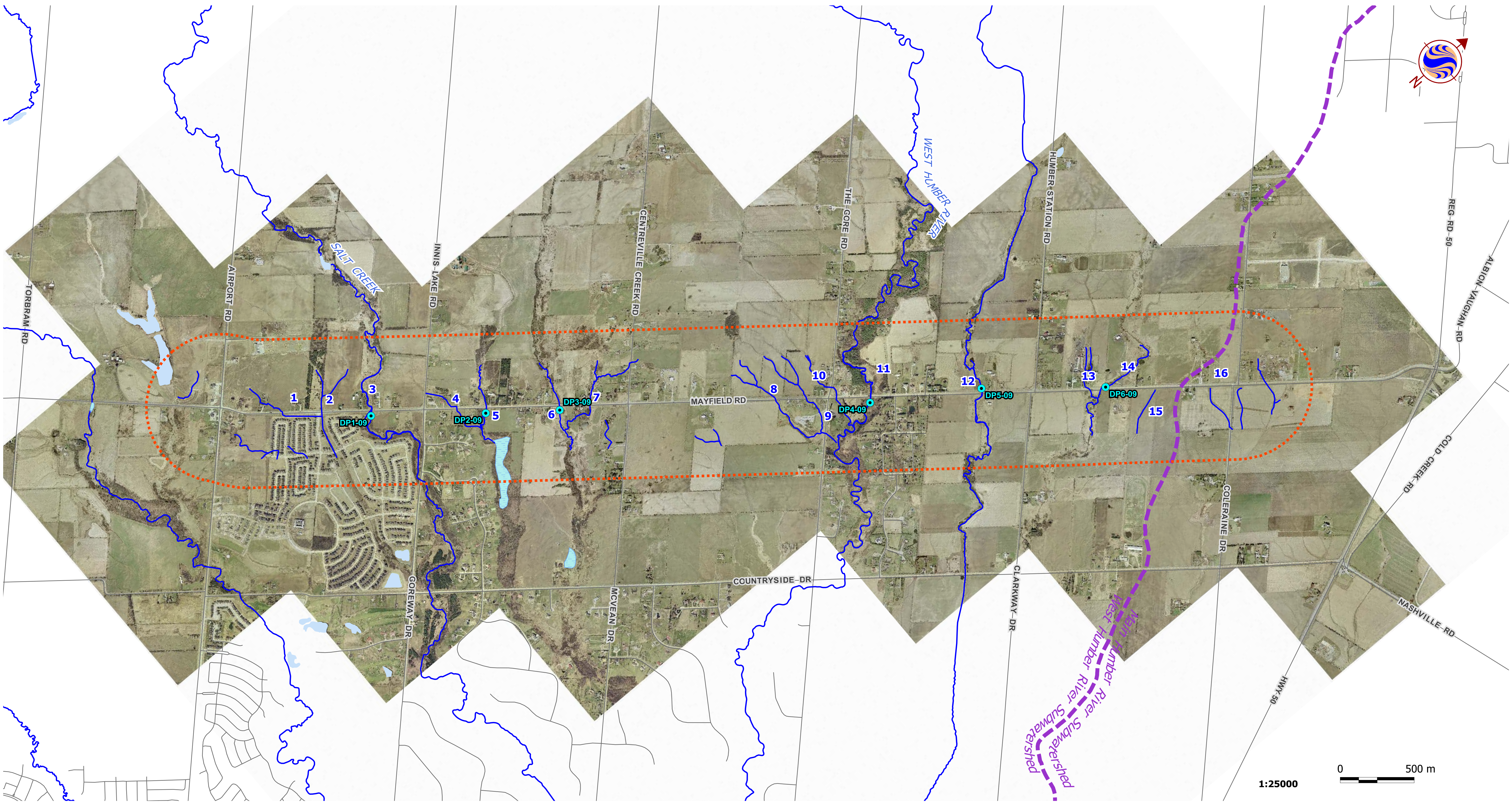
Notes

1. Base features provided by the Regional Municipality of Peel, 2008.
2. Ground Surface Contours from Ministry of Natural Resources: Digital Elevation Model, Version 2, 2006.

Client/Project
Regional Municipality of Peel
Hydrogeologic Assessment
Mayfield Road Improvements Class EA

Figure No.
3

Title
Ground Surface Topography



\\cd1004-f06\Work_group\01609\active\160210480_Mayfield Road_Class EA 2008\02\160210480\planning\drawing\Class EA 2008\02\160210480_borehole.map [Fig 04 (Surface Water Features) Layout]
9/18/2009 3:09:34 PM By: sstroszkali Revised 09-18-2009 By: sstroszkali

September 2009
160210480

Stantec

Legend

- 1 Watercourse Crossing
- Drive-Point Piezometer (Stantec, 2009)
- Stream
- Site Boundary
- Subwatershed Boundary
- Waterbody
- Wetland

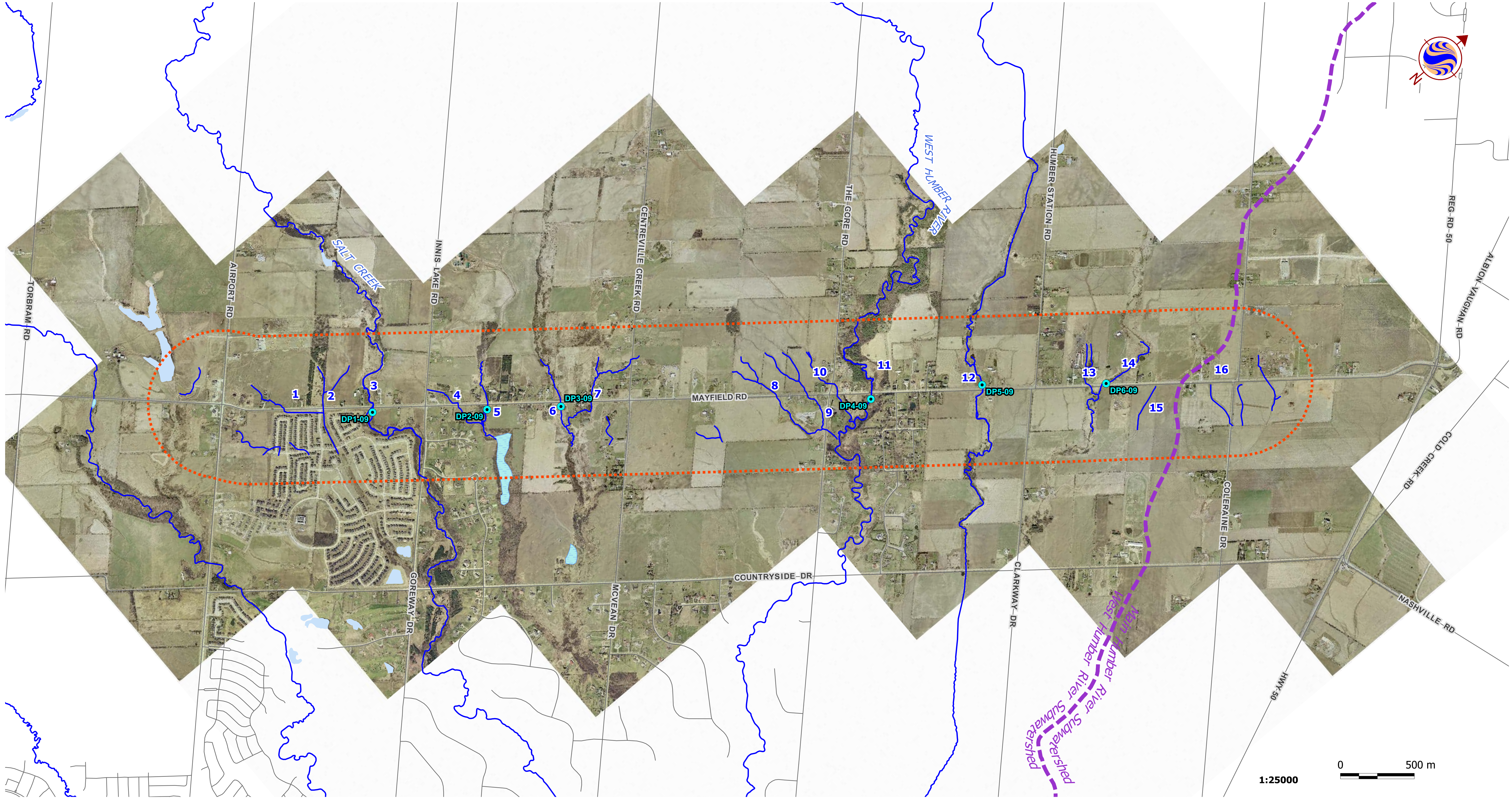
Notes

1. Orthoimagery and base features provided by the Regional Municipality of Peel, 2008.

Client/Project
Regional Municipality of Peel
Hydrogeologic Assessment
Mayfield Road Improvements Class EA

Figure No.
4

Title
Surface Water Features



\\cd1004-f06\Work_group\01609\active\160210480_Mayfield Road_Class EA\planning\drawing\Class EA 20080211\160210480_borehole.map [Fig 04 (Surface Water Features) Layout]
9/18/2009 3:09:34 PM By: sstroszkali Revised 09-18-2009 By: sstroszkali

September 2009
160210480

Stantec

Legend

- 1 Watercourse Crossing
- Drive-Point Piezometer (Stantec, 2009)
- Stream
- Site Boundary
- Subwatershed Boundary
- Waterbody
- Wetland

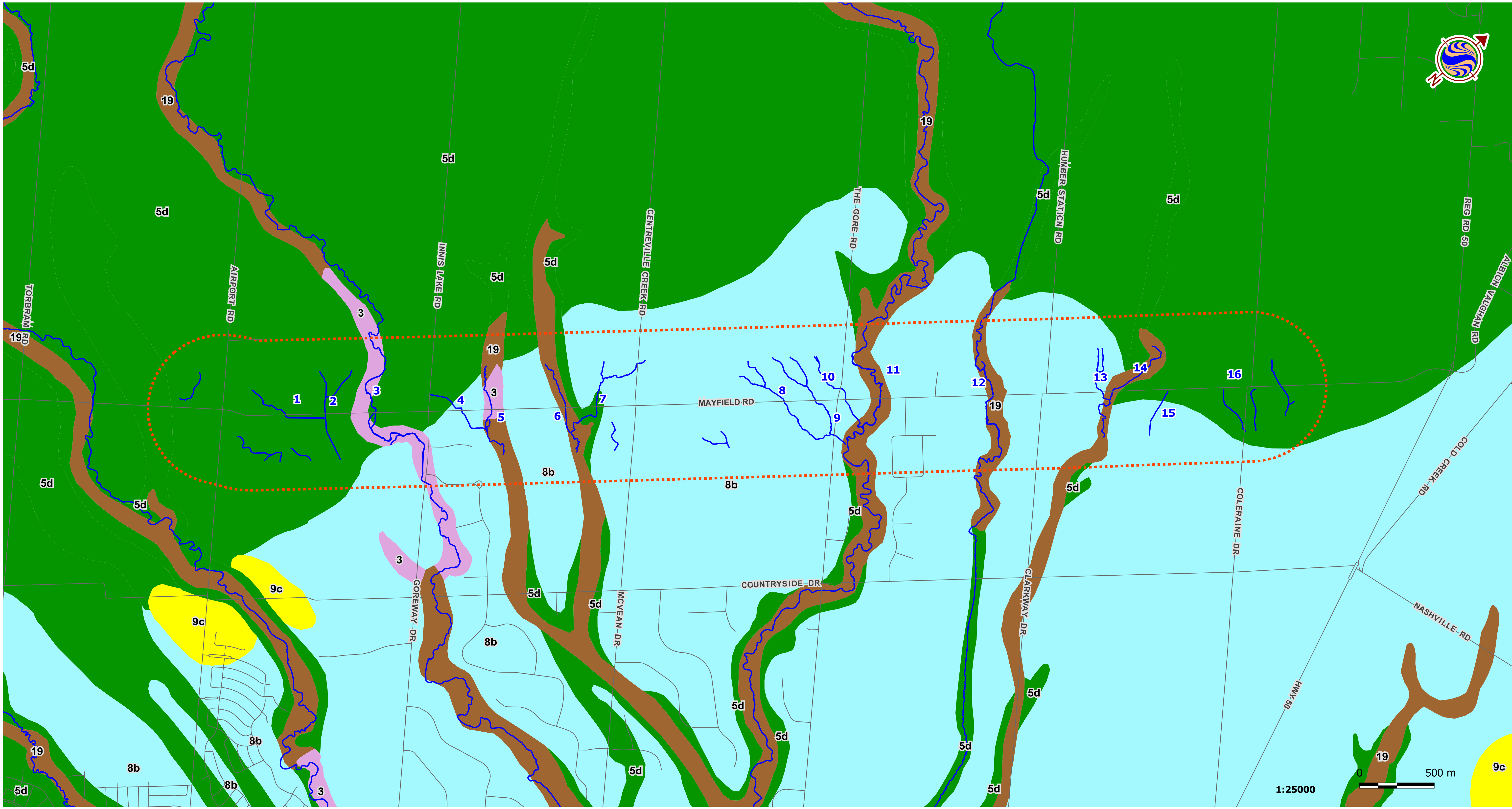
Notes

1. Orthoimagery and base features provided by the Regional Municipality of Peel, 2008.

Client/Project
Regional Municipality of Peel
Hydrogeologic Assessment
Mayfield Road Improvements Class EA

Figure No.
4

Title
Surface Water Features



\\cd1004-f06\Work_group\01609\active\160210480_Mayfield Road_Class EA\planning\drawing\Class EA 2008\02\160210480_borehole.map [Fig 05 (Surficial Geology) Layout]
9/11/2009 2:10:09 PM By: sstroszkali Revised 09-11-2009 By: sstroszkali

September 2009
160210480

Stantec

Legend

- Site Boundary
- 1 Watercourse Crossing
- Stream

Surficial Geology

- 19: Modern alluvial deposits - Clay, silt sand
- 9: Coarse-textured glaciolacustrine deposits - Sand, gravel
- 9a: Coarse-textured glaciolacustrine deposits - Deltaic
- 9b: Coarse-textured glaciolacustrine deposits - Littoral
- 9c: Coarse-textured glaciolacustrine deposits - Basinal
- 8: Fine-textured glaciolacustrine deposits - Silt & clay
- 8a: Fine-textured glaciolacustrine deposits - Well laminated
- 8b: Fine-textured glaciolacustrine deposits - Interbedded silt
- 5d: Till - Clay to silt-textured till
- 3: Paleozoic Bedrock

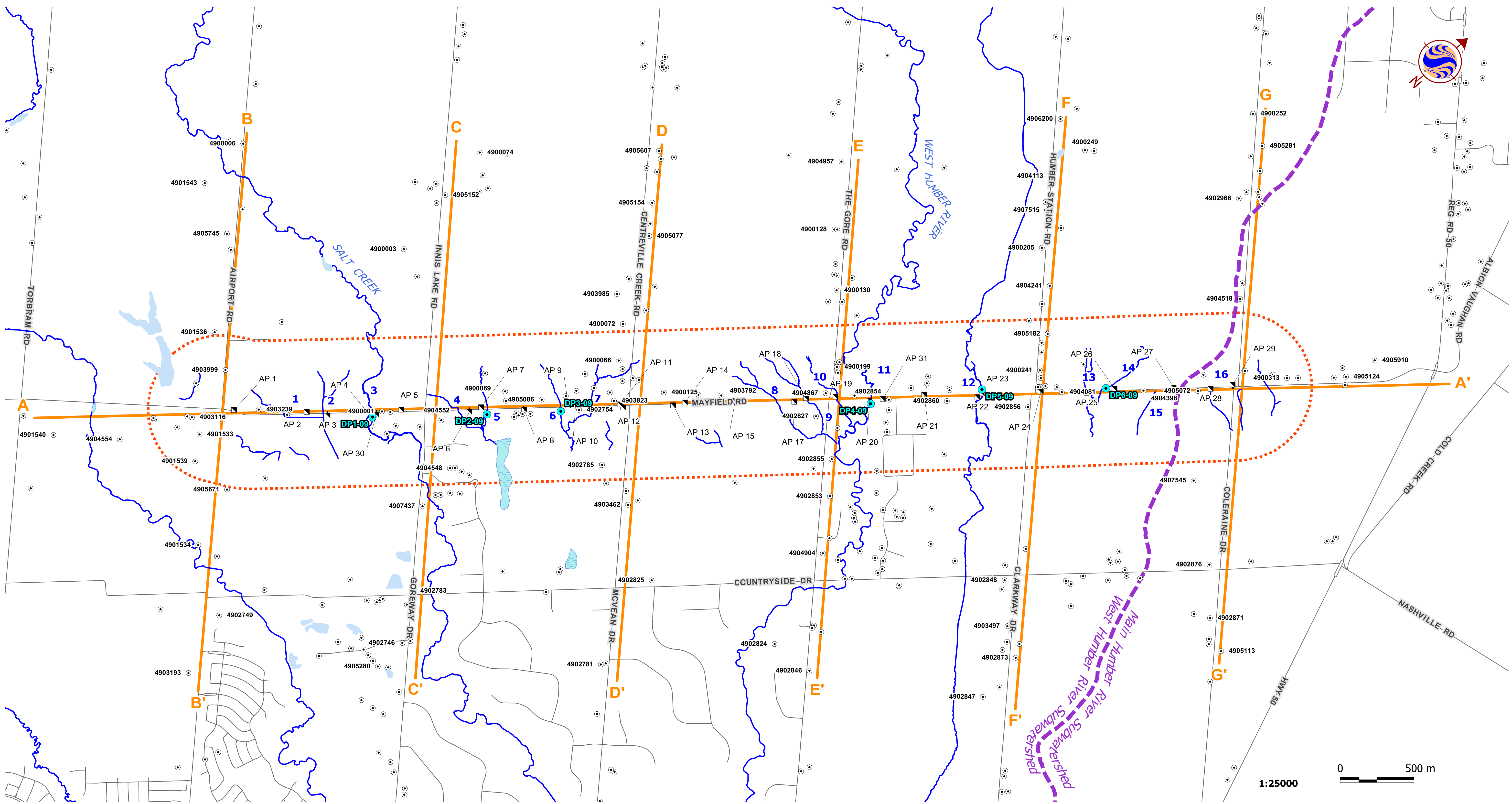
Notes

1. Surficial Geology Source: The Ontario Geological Survey, 2003. Surficial Geology of Southern Ontario.

Client/Project
Regional Municipality of Peel
Hydrogeologic Assessment
Mayfield Road Improvements Class EA

Figure No.
5

Title
Surficial Geology



September 2009
160210480

\\cd1004-f06\Work_group\01609\active\160210480_Mayfield Road_Class EA\planning\drawing\Class EA 200802\Manifold\160210480_borehole.map [Fig 06 (Site Plan) Lay
4/5/2013 9:49:18 AM By: ccoghlan Revised 09-18-2009 By: sstroszkali

Stantec

Legend

- 1 Watercourse Crossing
- Auger Probe (Stantec, 2008)
- Drive-Point Piezometer (Stantec, 2009)
- MOE WWR
- Stream
- Cross-Section Location
- Site Boundary
- Subwatershed Boundary
- Waterbody
- Wetland

Notes

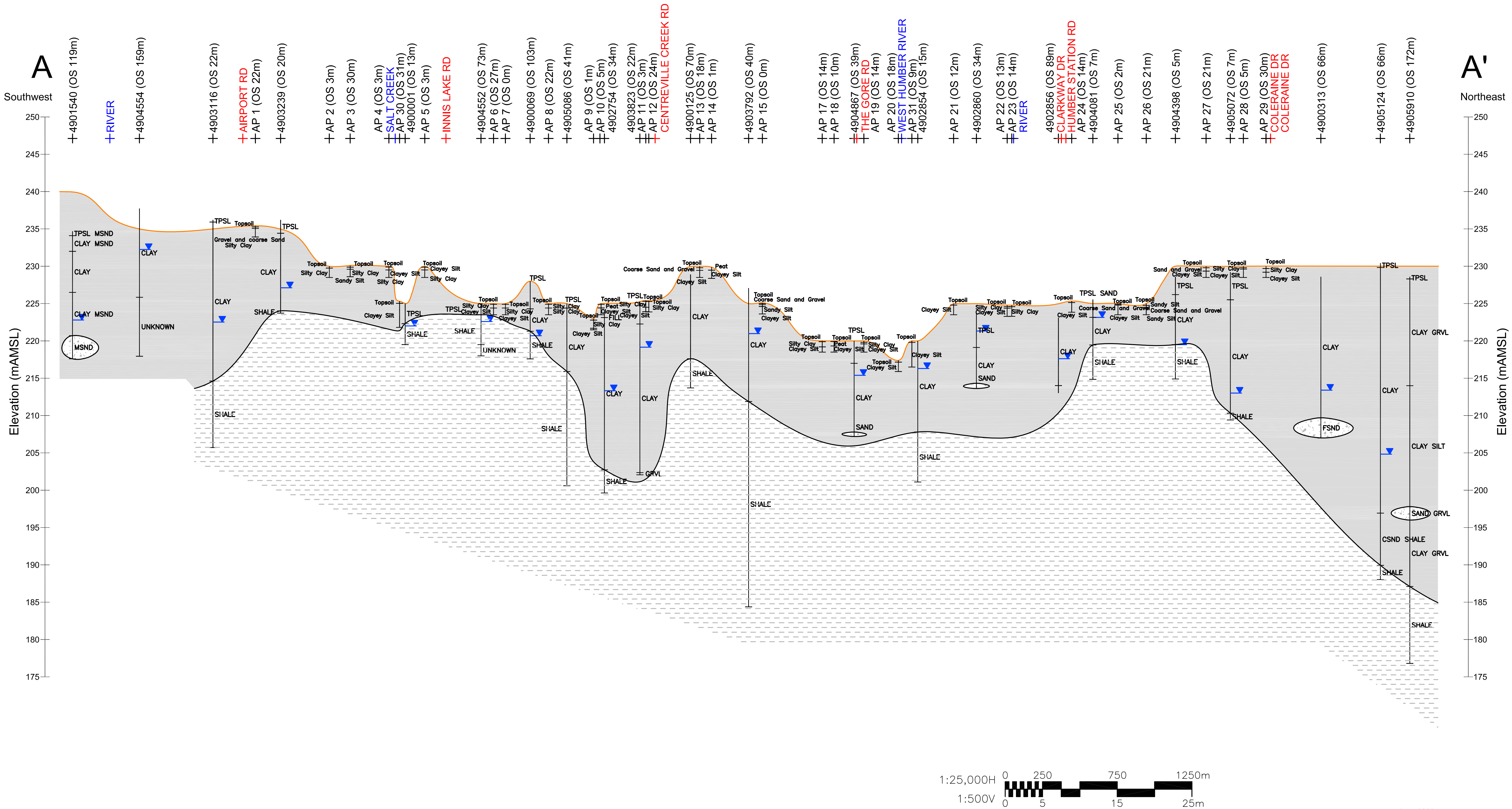
1. Base features provided by the Regional Municipality of Peel, 2008.

Client/Project
Regional Municipality of Peel
Hydrogeologic Assessment
Mayfield Road Improvements Class EA

Figure No.
6

Title
Site Plan and Cross-Section Locations

\\cd1004-f06\Work_group\01609\active\160210480\planning\drawing\Class EA 200802\160210480_xsecAA.dwg
\\cd1004-f06\Work_group\01609\active\160210480_Mayfield Road_Class EA\planning\drawing\Class EA 200802\160210480_xsecAA.dwg
Printed on: 2009-09-11 02:15PM By: sstroszkali   Revised on: 09-11-2009 By: sstroszkali



June 2008
160210480

Legend

MW3 — Monitoring Well/Auger Probe ID

SAND — Stratigraphy

Water Level

OBM Elevation

Clay

Sand / Gravel

Shale

Notes

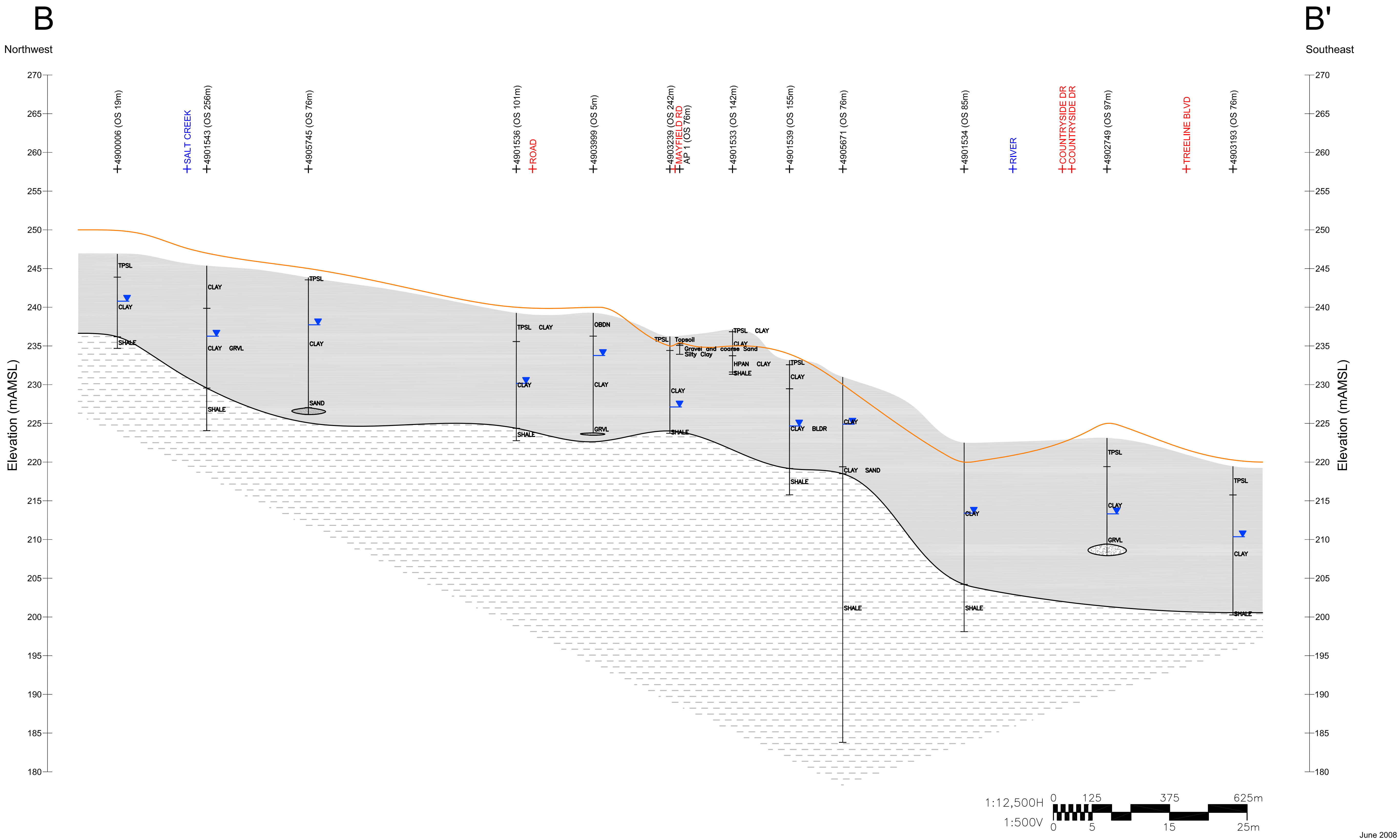
1. OBM - Ontario Base Map

Stantec

Client/Project
Region of Peel
Hydrogeological Impact Assessment
Mayfield Road Class EA

Figure No.
7

Title
Cross-Section A-A'



Legend

MW3 — Monitoring Well/Auger Probe ID

SAND — Stratigraphy

Water Level

OBM Elevation

Clay

Sand / Gravel

Shale

Notes

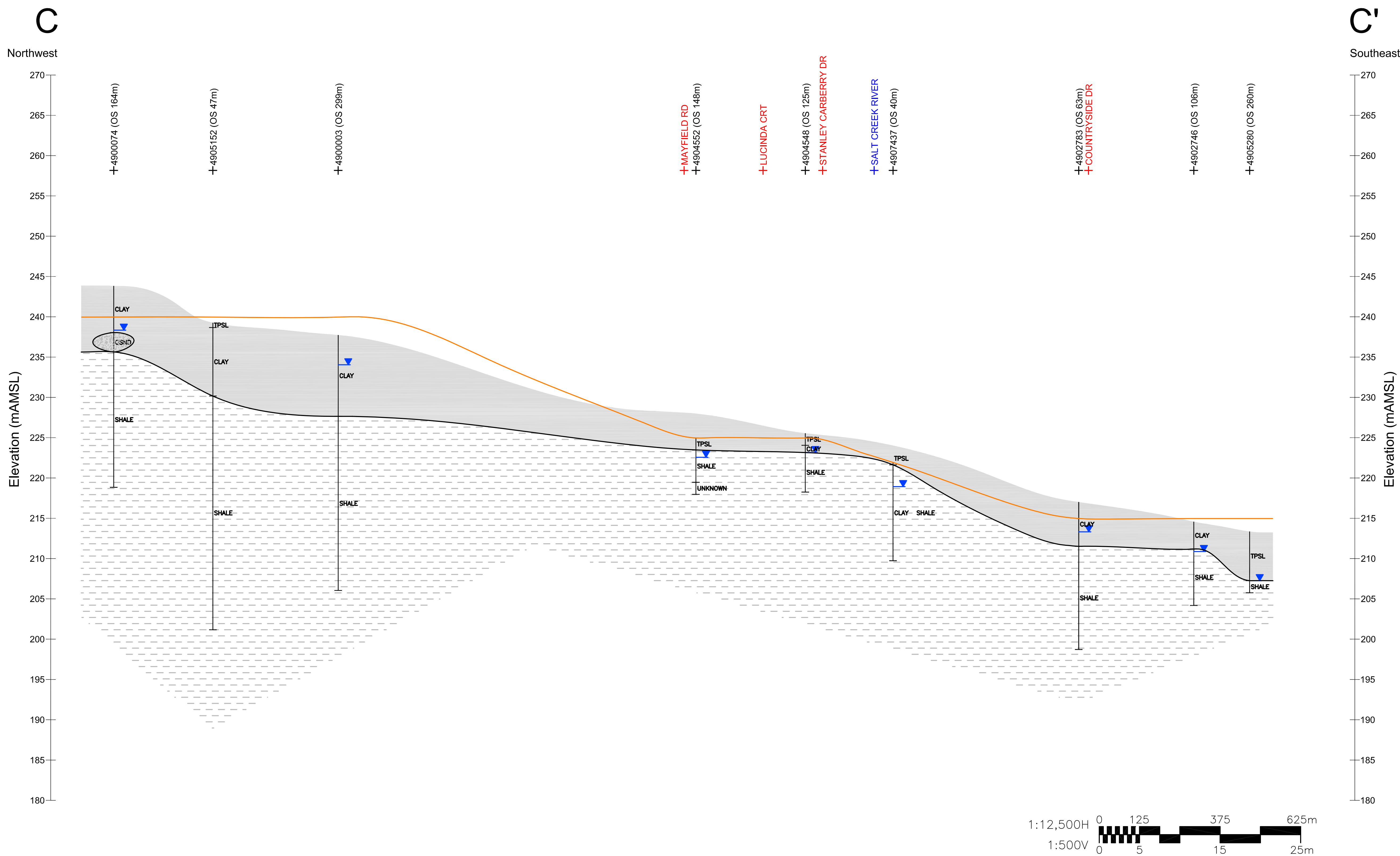
1. OBM - Ontario Base Map

Client/Project
Region of Peel
Hydrogeological Impact Assessment
Mayfield Road Class EA

Figure No.
8

Title
Cross-Section B-B'

\\cd1004-f06\Work_group\01609\active\160210480_Mayfield Road_Class EA\planning\drawing\Class EA 200802\160210480_xsec.dwg
Printed on: 2009-09-11 02:29PM By: sstroszkali Revised on: 09-11-2009 By: sstroszkali



June 2008
160210480

\\cd1004-f06\Work_group\01609\active\160210480_Mayfield Road_Class EA\planning\drawing\Class EA 200802\160210480_xsec.dwg
Printed on: 2009-09-11 02:31PM By: sstroszkali Revised on: 09-11-2009 By: sstroszkali

Stantec

Legend

- MW3 — Monitoring Well/Auger Probe ID
- SAND — Stratigraphy
- Water Level
- OBM Elevation
- Clay
- Sand / Gravel
- Shale

Notes

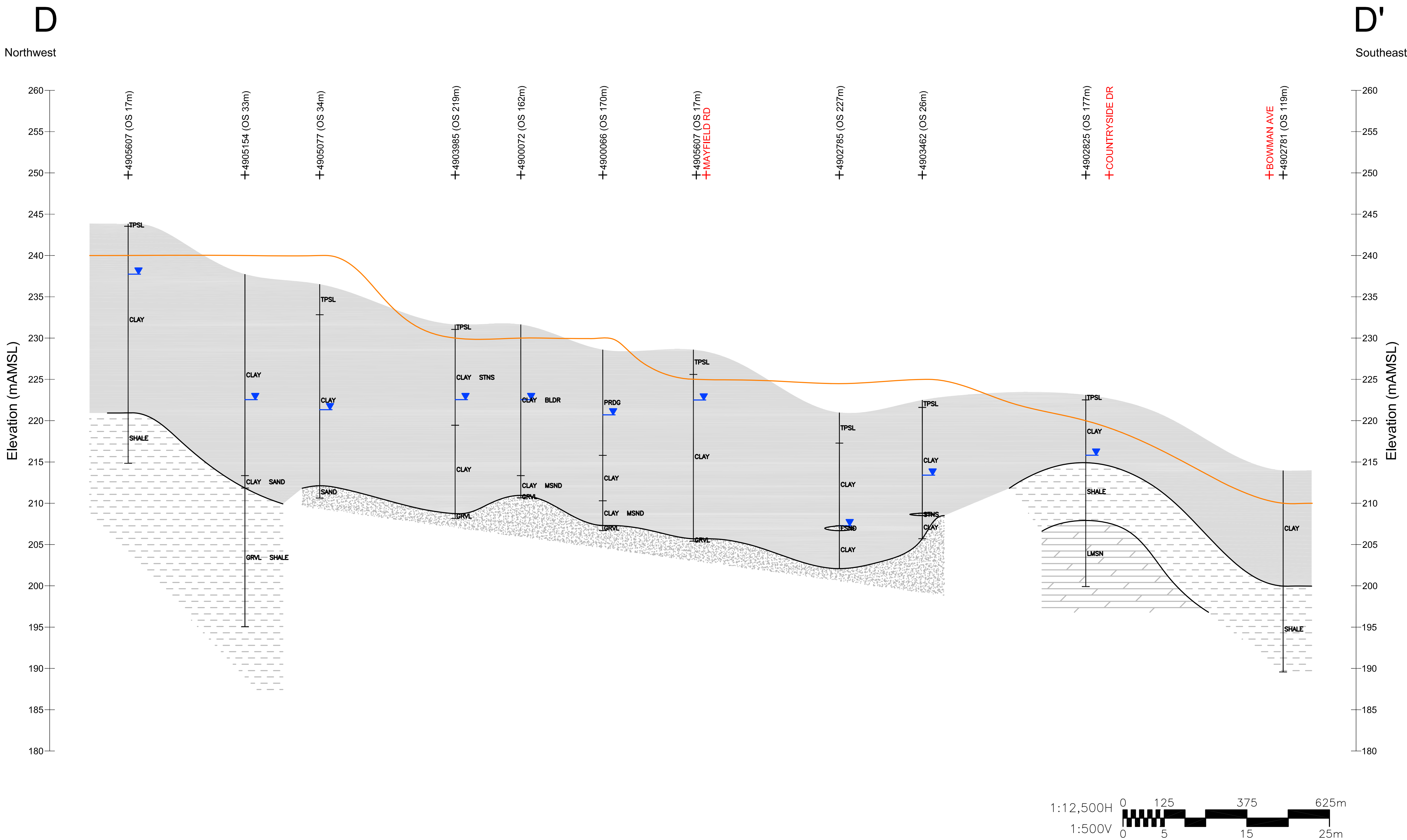
1. OBM - Ontario Base Map

Client/Project
Region of Peel
Hydrogeological Impact Assessment
Mayfield Road Class EA

Figure No.
9

Title
Cross-Section C-C'

\\cd1004-f06\Work_group\01609\active\160210480\planning\drawing\Class EA 200802\160210480_xsec.dwg
Printed on: 2009-09-11 02:40PM By: sstroszkali Revised on: 09-11-2009 By: sstroszkali



June 2008
160210480

Stantec

Legend

MW3 — Monitoring Well/Auger Probe ID

SAND — Stratigraphy

Water Level

OBM Elevation

Clay

Sand / Gravel

Shale

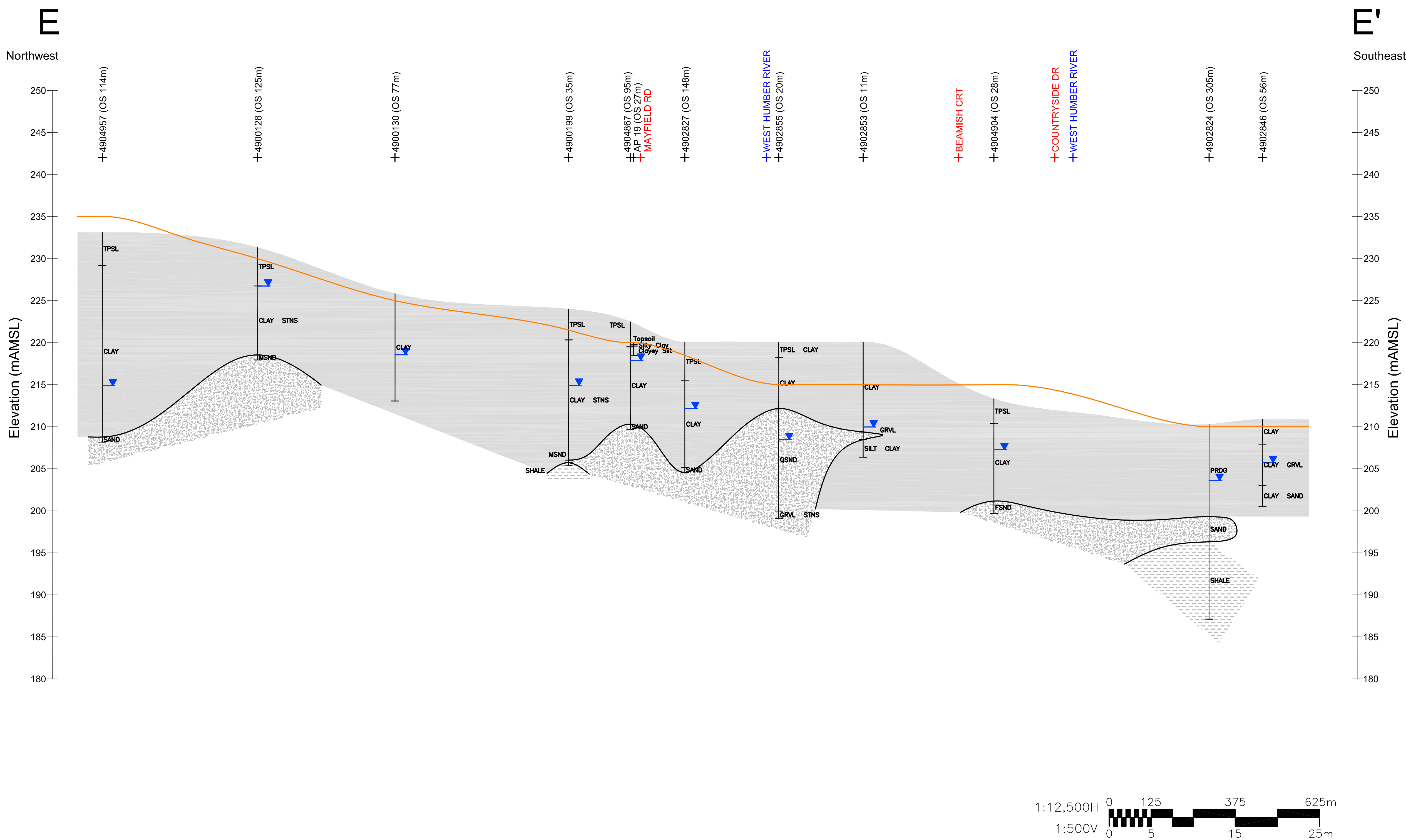
Notes

1. OBM - Ontario Base Map

Client/Project
Region of Peel
Hydrogeological Impact Assessment
Mayfield Road Class EA

Figure No.
10

Title
Cross-Section D-D'



\\cd1004-f06\Work_group\01609\active\160210480_Mayfield Road_Class EA\planning\drawing\Class EA 200802\160210480_xsec.dwg
Printed on: 2009-09-11 02:42PM By: sstroszkali Revised on: 09-11-2009 By: sstroszkali

June 2008
160210480

Stantec

Legend

MW3	Monitoring Well/Auger Probe ID
SAND	Stratigraphy
	Water Level
	OBM Elevation
	Clay
	Sand / Gravel
	Shale

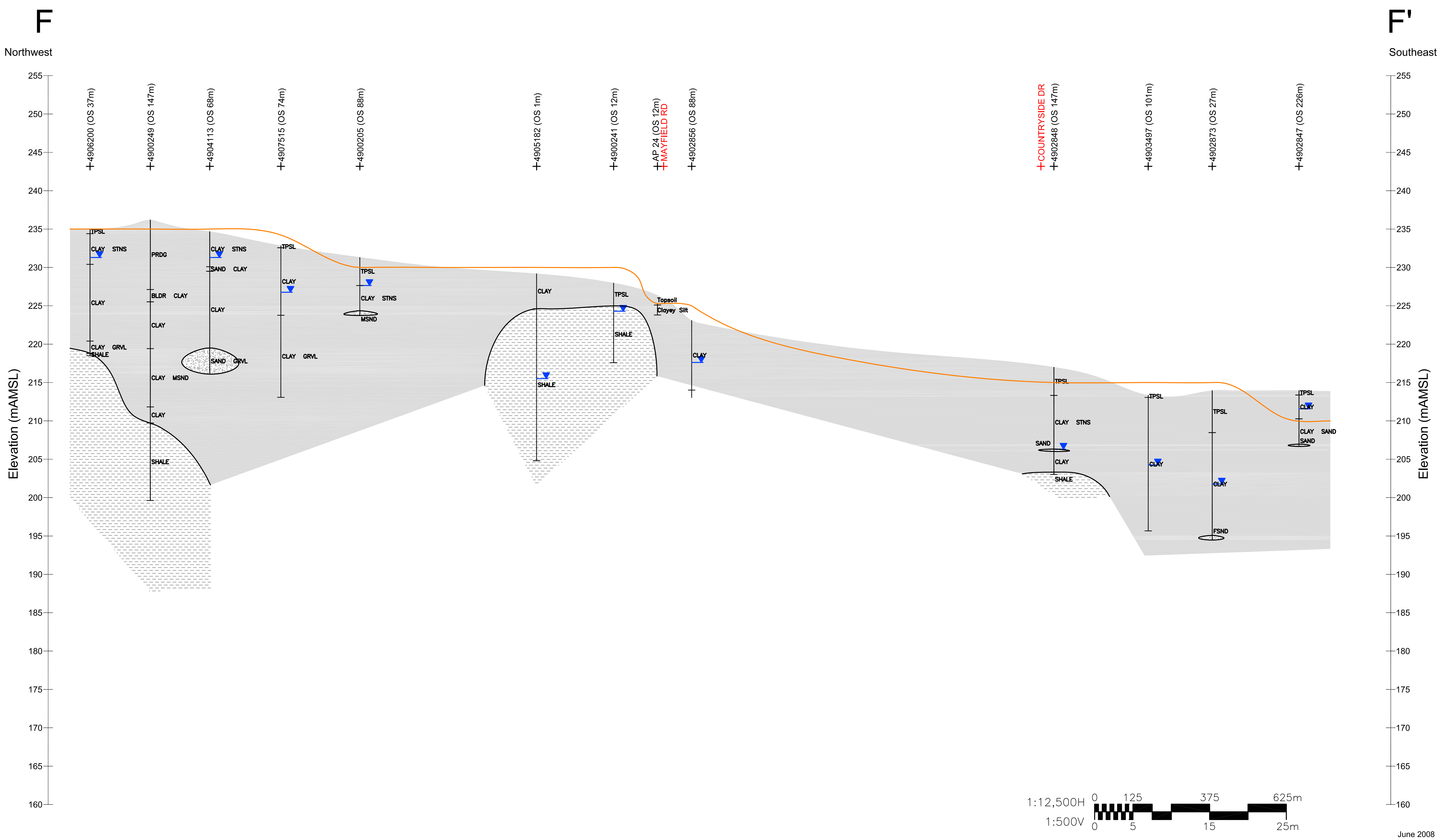
Notes

1. OBM - Ontario Base Map

Client/Project
Region of Peel
Hydrogeological Impact Assessment
Mayfield Road Class EA

Figure No.
11

Title
Cross-Section E-E'



Legend

MW3	Monitoring Well/Auger Probe ID		OBM Elevation
			Clay
SAND	Stratigraphy		Sand / Gravel
	Water Level		Shale

Notes

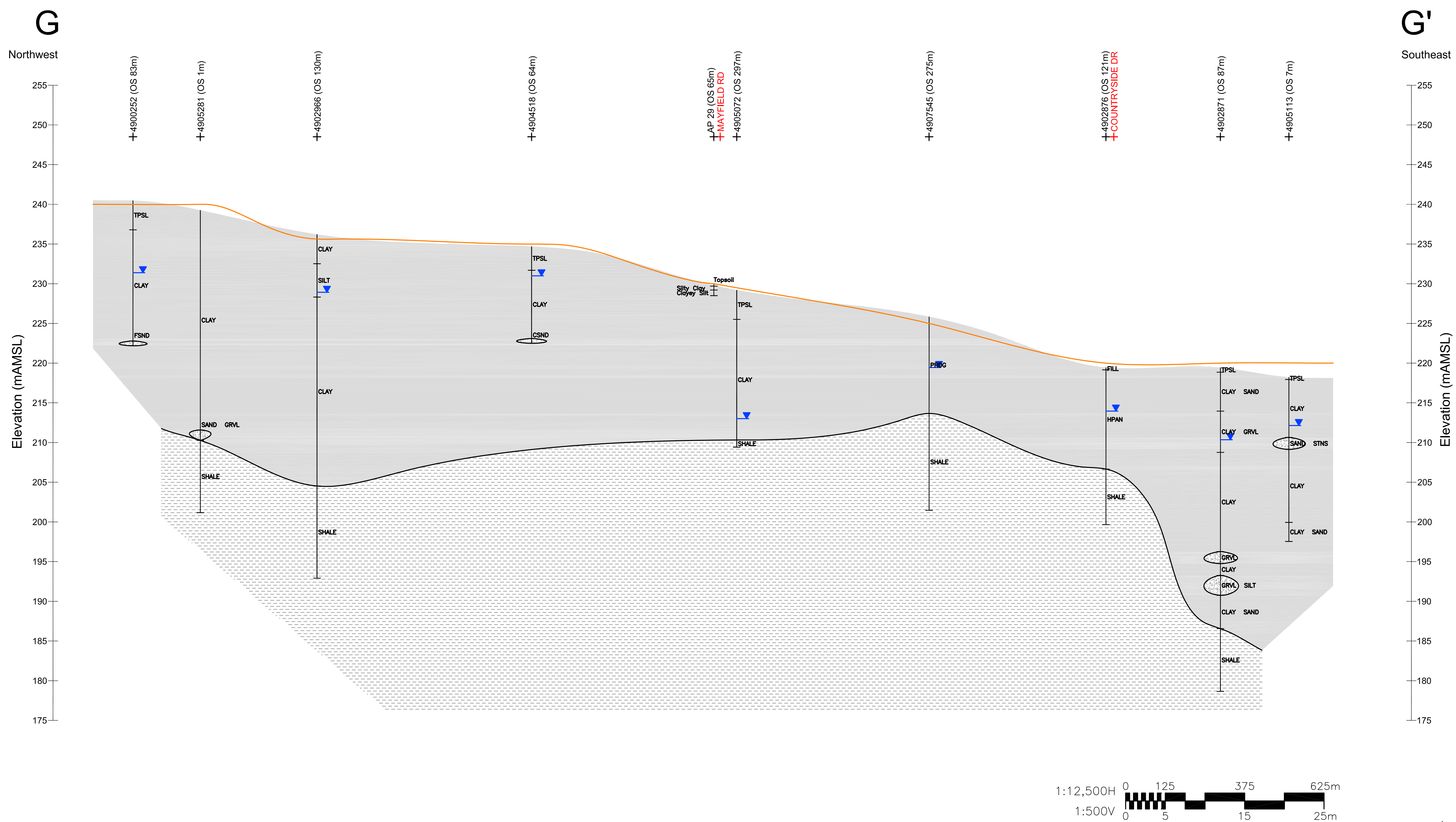
1. OBM - Ontario Base Map

Stantec

Client/Project
Region of Peel
Hydrogeological Impact Assessment
Mayfield Road Class EA

Figure No.
12

Title
Cross-Section F-F'



June 2008
160210480

Stantec

Legend

MW3	Monitoring Well/Auger Probe ID		OBM Elevation
			Clay
SAND	Stratigraphy		Sand / Gravel
	Water Level		Shale

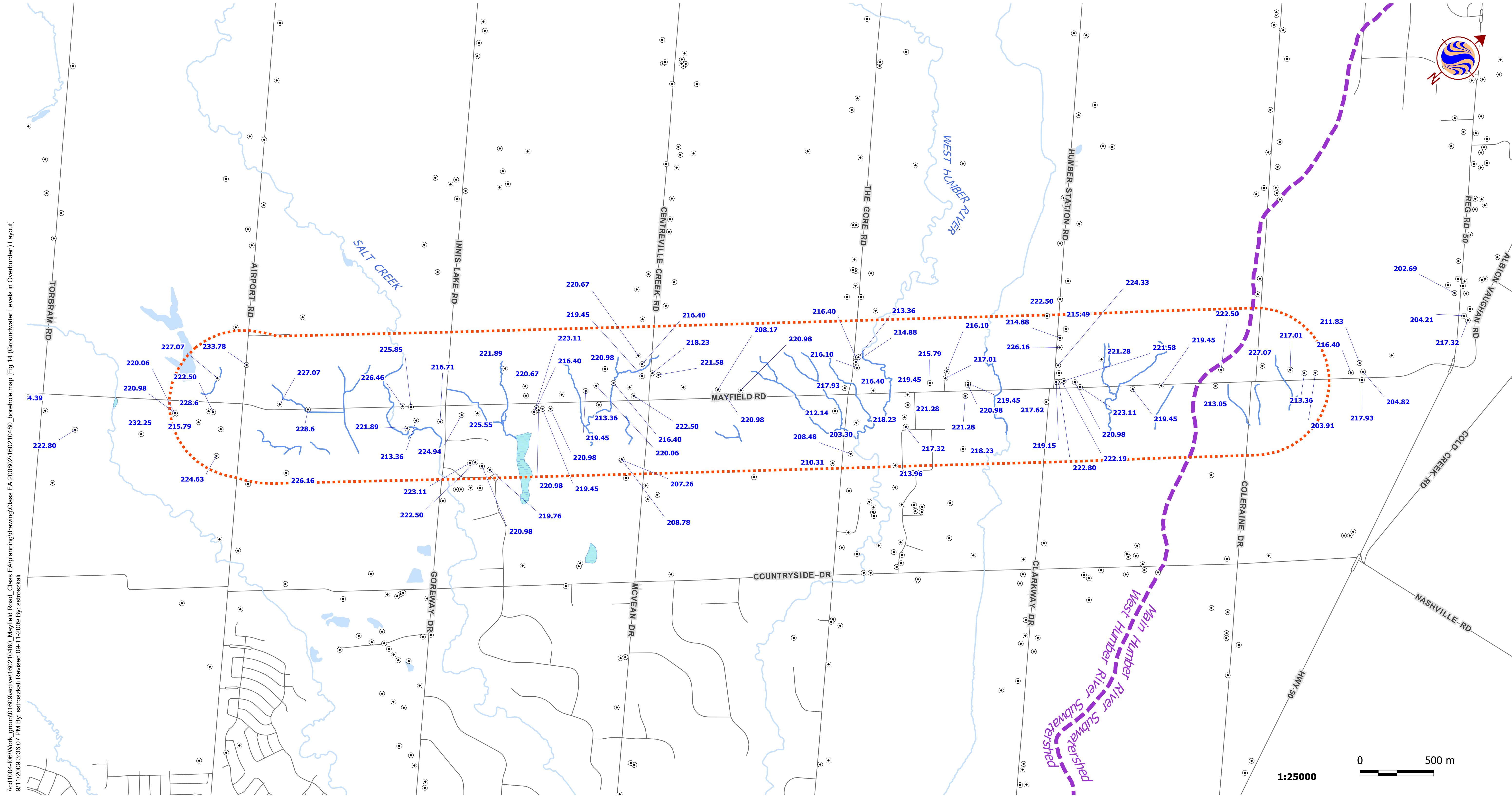
Notes

1. OBM - Ontario Base Map

Client/Project
Region of Peel
Hydrogeological Impact Assessment
Mayfield Road Class EA

Figure No.
13

Title
Cross-Section G-G'



September 2009
160210480

Legend

- Site Boundary
- MOE WWR
- Stream
- Subwatershed Boundary
- Waterbody
- Wetland

Notes

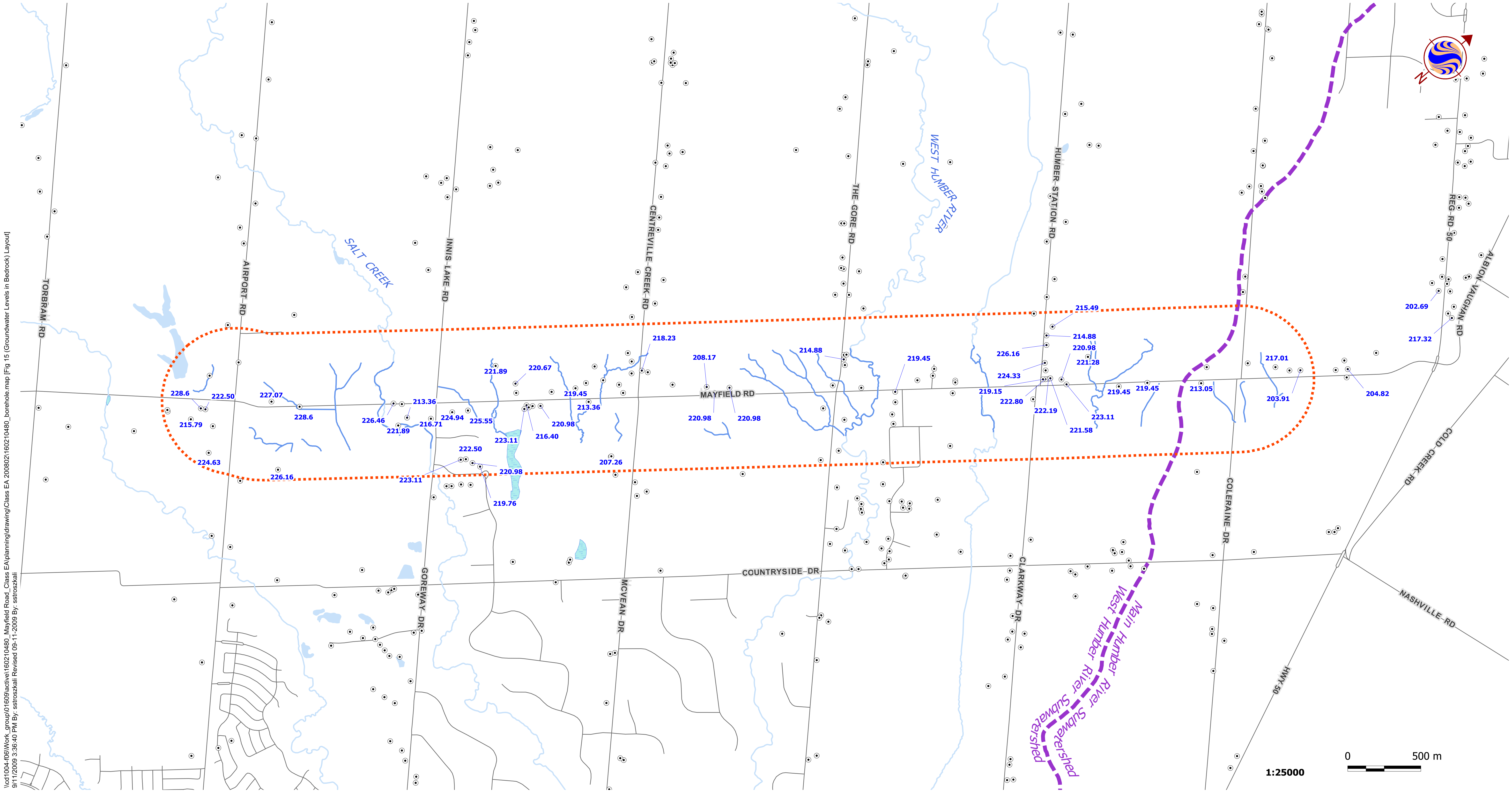
1. Base features provided by the Regional Municipality of Peel, 2008.
2. Water levels are in mASL.

Stantec

Client/Project
Regional Municipality of Peel
Hydrogeologic Assessment
Mayfield Road Improvements Class EA

Figure No.
14

Title
Groundwater Levels in Overburden



September 2009
160210480

Legend

- Site Boundary
- MOE WWR
- Stream
- Subwatershed Boundary
- Waterbody
- Wetland

Notes

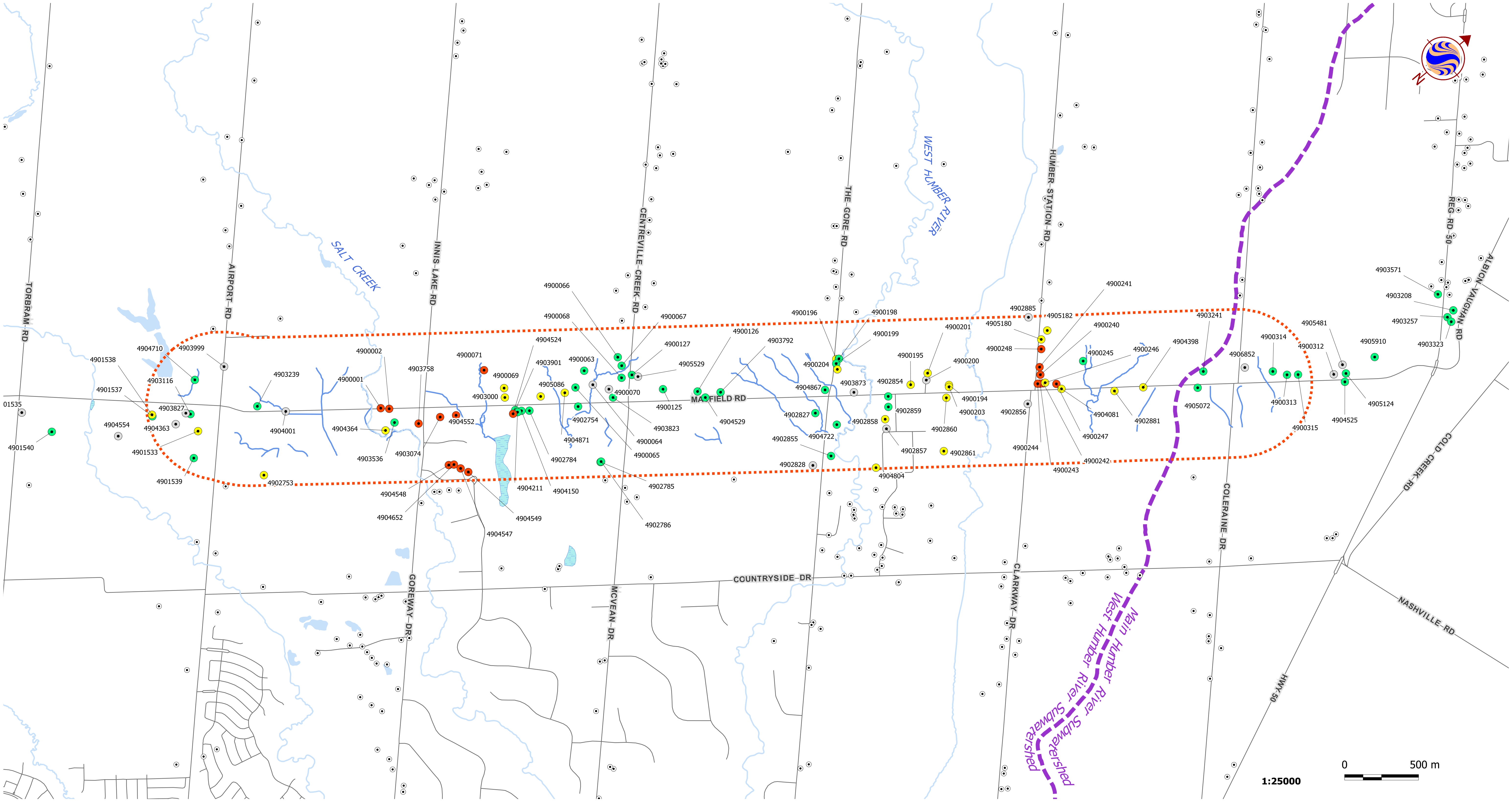
1. Base features provided by the Regional Municipality of Peel, 2008.
2. Water levels are in mASL.

Client/Project
Regional Municipality of Peel
Hydrogeologic Assessment
Mayfield Road Improvements Class EA

Figure No.
15

Title
Groundwater Levels in Bedrock

\\cd1004-f06\Work_group\01609\active\160210480_Mayfield Road_Class EA\planning\drawing\Class EA 20080216021 0480_borehole.map [Fig 16 (Intrinsic Susceptibility Index) Layout]
9/11/2009 3:02:16 PM By: sstroszkali Revised 09-11-2009 By: sstroszkali



September 2009
160210480

Legend

- Site Boundary
- MOE WWR
- High ISI
- Medium ISI
- Low ISI
- ISI Could Not Be Calculated Due To Incomplete Information in WWR
- Stream
- Subwatershed Boundary
- Waterbody
- Wetland

Notes

1. Base features provided by the Regional Municipality of Peel, 2008.
2. MOE Water Well Record (WWR) information provided by the Regional Municipality of Peel.

Stantec

Client/Project
Regional Municipality of Peel
Hydrogeologic Assessment
Mayfield Road Improvements Class EA

Figure No.
16

Title
Intrinsic Susceptibility Index

APPENDIX G

TREE INVENTORY & ASSESSMENT

Memo

Stantec

To:	Dave Hallman Kitchener ON Office	From:	Jennifer Koskinen Kitchener ON Office
File:	160210480	Date:	September 11, 2009

Reference: Tree Inventory and Assessment Report Mayfield Road, Caledon, Ontario

1.0 Introduction

Stantec Consulting Ltd. has been retained by the Region of Peel to complete a Tree Inventory and Assessment for the proposed road improvements on Mayfield Road in Caledon, Ontario. This report has been prepared to support the Class EA.

The proposed road improvements extend from east of Airport Road to west of Coleraine Drive. It is a rural roadway abutting primarily residential lots, grass fields, and commercial property.

2.0 Methodology

Ms. Jennifer Koskinen, HBESfcon, Certified Arborist, completed a field investigation on March 13, 18, and 20, 2008 to conduct a visual assessment of trees within and adjacent to the Right-of-Way (ROW). The area was examined to determine tree species including rare or endangered trees and any significant area, general tree condition, and diameter class which is a range of measurement of the diameter of the stem 1.4 metres above the ground. Trees were identified based on bud and bark patterns and general tree condition has been assessed based on observed health indicators which include live buds, dead wood, structural defects and presence of disease.

2.1 Tree Condition Rating

Outlined below are the detailed guidelines utilized for the classification of condition rating:

Excellent: (Vigour Class 6: Healthy)

No major branch mortality: crown is reasonably normal with less than 10% branch or twig mortality; no signs of decay.

Good: (Vigour Class 5: Light Decline)

Branch mortality, twig dieback in 11-25% of the crown: broken branches or crown missing based on presence of old snags is less than 26%; minor evidence of decay.

Fair: (Vigour Class 4: Moderate Decline)
Branch mortality, twig dieback in 26-50% of the crown: broken branches or crown area missing based on presence of old snags is 50% or less; decay evident.

Poor: (Vigour Class 3: Severe Decline)
Branch mortality, twig dieback in more than 50% of the crown: broken branches or crown area missing based on presence of old snags in more than 50%; decay resulting in high hazard assessment.

Dead: (Vigour Class 2: Dead due to Natural Causes)
Tree is dead, either standing or down: phloem under bark has brown streaks: few epicormic shoots may be present.

Dead: (Vigour Class 1: Dead due to Human Causes)
Tree removed: tree has been sawed or girdled by human activity.

2.2 Tree Preservation Rating

Tree inventory data was assessed to identify any significant areas and endangered or rare trees. The observed trees were then given a preservation priority of High, Medium, or Low. The following dictates the qualifications for each:

High- A tree in good condition and greater than the diameter class of 0 to 10cm. Trees designated 'high' are desirable to retain.

Medium - A tree in fair condition.

Low- A tree that in poor condition and less than 10cm DBH. OR. A tree that is considered to be an invasive species, i.e. Manitoba Maple (*Acer negundo)*, Black Locust (*Robinia pseudoacacia*), and Buckthorn spp. (*Rhamnus spp.*). Trees designated 'low' are not desirable to retain.

3.0 Observations and Assessment

There were no rare or endangered species, observed within the project area. Trees were predominantly in good condition and therefore with a preservation priority of high. Detailed Tree Inventory Data is available in Table 1.
Species inventoried included: Austrian Pine (*Pinus nigra*), Scots Pine (*Pinus sylvestris*), Jack Pine (*Pinus banksiana*), White Pine (*Pinus strobus*), Mugo Pine (*Pinus mugho*), White Spruce (*Picea glauca*), Norway Spruce (*Picea abies*), Colorado Spruce (*Picea pungens*), Juniper spp. (*Juniperus spp.*) Tamarack (*Larix laricina*), Eastern White Cedar (*Thuja occidentalis*), Sugar Maple (*Acer saccharum*), Red Maple (*Acer rubrum*), Silver Maple (*Acer saccharinum*), Norway Maple (*Acer platanoides*), Manitoba Maple (*Acer negundo*) White Ash (*Fraxinus americana*), Red Ash (*Fraxinus pennsylvanica*), Green Ash (*Fraxinus pennsylvanica'subintegerrima'*), Black Ash (*Fraxinus nigra*), White Birch (*Betula papyrifera*), White Elm (*Ulmus americana*), Honey Locust (*Gleditsia triacanthos*), Black Locust (*Robinia pseudoacacia*), Basswood (*Tilia americana*),

**Reference: Tree Inventory and Assessment Report
Mayfield Road, Caledon, Ontario**

Northern Catalpa (*Catalpas speciosa*), Black Walnut (*Juglans nigra*), Red Oak (*Quercus rubra*), Bur Oak (*Quercus macrocarpa*), Golden Weeping Willow (*Salix alba 'vitellina'*), Poplar spp. (*Populus spp.*), Hawthorn spp. (*Crataegus spp.*), Black Cherry (*Prunus serotina*), Choke Cherry (*Prunus virginiana*), Schubert Cherry (*Prunus virginiana 'Schubert'*), Pin Cherry (*Prunus pensylvanica*), Common Lilac (*Syringa vulgaris*), Apple spp. (*Malus spp.*), Weeping Mulberry (*Morus alba 'Pendula'*), and Buckthorn spp. (*Rhamnus spp.*).

4.0 Summary

This Tree Inventory and Assessment has been prepared to support the Class EA. There were no rare or endangered trees observed within the inventoried area. Highway improvement design should consider impacts to trees throughout the planning stages.

STANTEC CONSULTING LTD.

Jennifer Koskinen, HBESfcon
ISA Certified Arborist ON-1234A
jennifer.koskinen@stantec.com

Attachment: Table 1. Tree Inventory, Mayfield Road.

Table 1. Tree Inventory, Mayfield Road.

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
1	*Pinus nigra*	Austrian Pine	20 to 30	Good		High
2	*Acer saccharum*	Sugar Maple	20 to 30	Good		High
3	*Pinus nigra*	Austrian Pine	20 to 30	Good		High
4	*Fraxinus americana*	White Ash	20 to 30	Good		High
5	*Picea glauca*	White Spruce	20 to 30	Fair to Poor	major lean	Low
6	*Acer saccharum*	Sugar Maple	20 to 30	Good		High
7	*Picea glauca*	White Spruce	20 to 30	Good		High
8	*Picea glauca*	White Spruce	20 to 30	Good		High
9	*Picea glauca*	White Spruce	10 to 20	Good		High
10	*Betula papyrifera*	White Birch	10 to 20	Good		High
11	*Juniperus spp.*	Juniper spp.	0 to 10	Good		Medium
12	*Betula papyrifera*	White Birch	10 to 20	Good		High
13	*Acer platanoides*	Norway Maple	10 to 20	Good		High
14	*Betula papyrifera*	White Birch	10 to 20	Poor		Low
15	*Acer rubrum*	Red Maple	10 to 20	Good	Multi-stemmed	High
16	*Betula papyrifera*	White Birch	10 to 20	Poor		Low
17	*Acer rubrum*	Red Maple	10 to 20	Good	Multi-stemmed	High
18	*Acer platanoides*	Norway Maple	10 to 20	Good		High
19	*Picea abies*	Norway Spruce	10 to 20	Good		High
20	*Pinus nigra*	Austrian Pine	10 to 20	Good		High
21	*Ulmus americana*	White Elm	30 to 40	Good	Multi-stemmed	High
22	*Acer saccharum*	Sugar Maple	10 to 20	Good	2 stems	High
23	*Ulmus americana*	White Elm	20 to 30	Good		High
24	*Pinus nigra*	Austrian Pine	10 to 20	Good		High
25	*Pinus nigra*	Austrian Pine	10 to 20	Good		High
26	*Acer platanoides*	Norway Maple	20 to 30	Good		High
27	*Pinus nigra*	Austrian Pine	20 to 30	Good		High
28	*Pinus nigra*	Austrian Pine	10 to 20	Good		High
29	*Pinus nigra*	Austrian Pine	10 to 20	Good		High
30	*Pinus nigra*	Austrian Pine	10 to 20	Good		High
31	*Pinus nigra*	Austrian Pine	10 to 20	Good		High
32	*Pinus nigra*	Austrian Pine	10 to 20	Good		High

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
33	*Acer negundo*	Manitoba Maple	10 to 20	Good	3 stems	Low
34	*Acer negundo*	Manitoba Maple	20 to 30	Good	6 stems	Low
35	*Prunus virginiana*	Choke Cherry	0 to 10	Good		Low
36	*Prunus virginiana*	Choke Cherry	0 to 10	Good		Low
37	*Acer negundo*	Manitoba Maple	10 to 20	Good		Low
38	*Acer negundo*	Manitoba Maple	30 to 40	Good		High
39	*Acer negundo*	Manitoba Maple	20 to 30	Good		High
40	*Salix spp.*	Willow spp.	20 to 30, 30+	Good	3 stems	High
41	*Picea pungens*	Blue Spruce	10 to 20	Good		High
42	*Picea pungens*	Blue Spruce	0 to 10	Good		Low
43	*Picea pungens*	Blue Spruce	10 to 20	Good		High
44	*Picea pungens*	Blue Spruce	10 to 20	Good		High
45	*Picea pungens*	Blue Spruce	0 to 10	Good		Low
46	*Picea pungens*	Blue Spruce	0 to 10	Good		Low
47	*Acer platanoides*	Norway Maple	10 to 20	Good		High
48	*Acer platanoides*	Norway Maple	10 to 20	Good		High
49	*Acer platanoides*	Norway Maple	10 to 20	Good		High
50	*Acer platanoides*	Norway Maple	10 to 20	Good		High
51	*Picea pungens*	Blue Spruce	10 to 20	Good		High
52	*Picea pungens*	Blue Spruce	10 to 20	Good		High
53	*Picea pungens*	Blue Spruce	10 to 20	Good		High
54	*Picea pungens*	Blue Spruce	10 to 20	Good		High
55	*Picea pungens*	Blue Spruce	10 to 20	Good		High
56	*Picea pungens*	Blue Spruce	20 to 30	Good		High
57	*Picea pungens*	Blue Spruce	20 to 30	Good		High
58	*Picea pungens*	Blue Spruce	20 to 30	Good		High
59	*Picea pungens*	Blue Spruce	20 to 30	Good		High
60	*Picea pungens*	Blue Spruce	20 to 30	Good		High
61	Blue Spruce *Picea pungens*	Blue Spruce	20 to 30	Good		High
62	*Acer platanoides*	Norway Maple	0 to 10	Good		Low
63	*Picea abies*	Norway Spruce	0 to 10	Good		Low
64	*Picea abies*	Norway Spruce	0 to 10	Good		Low
65	Norway Spruce *Picea abies*	Norway Spruce	0 to 10	Good		Low
66	Norway Spruce *Picea abies*	Norway Spruce	0 to 10	Good		Low
67	Norway Spruce *Picea abies*	Norway Spruce	0 to 10	Good		Low

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
68	Norway Spruce *Picea abies*	Norway Spruce	0 to 10	Good		Low
69	Norway Spruce *Picea abies*	Norway Spruce	0 to 10	Good		Low
70	Norway Spruce *Picea abies*	Norway Spruce	0 to 10	Good		Low
71	Norway Spruce *Picea abies*	Norway Spruce	0 to 10	Good		Low
72	Norway Spruce *Picea abies*	Norway Spruce	0 to 10	Good		Low
73	Norway Spruce *Picea abies*	Norway Spruce	10 to 20	Good		High
74	Norway Spruce *Picea abies*	Norway Spruce	10 to 20	Good		High
75	Norway Spruce *Picea abies*	Norway Spruce	10 to 20	Good		High
76	Norway Spruce *Picea abies*	Norway Spruce	10 to 20	Good		High
77	*Salix alba 'vitellina'*	Golden Weeping	40 to 50	Good		High
78	*Pinus nigra*	Austrian Pine	20 to 30	Good		High
79	*Picea abies*	Norway Spruce	0 to 10	Good		Low
80	*Picea abies*	Norway Spruce	0 to 10	Good		Low
81	*Fraxinus americana*	White Ash	20 to 30	Good		High
82	*Picea abies*	Norway Spruce	0 to 10	Good		Low
83	*Picea abies*	Norway Spruce	0 to 10	Good		Low
84	*Picea abies*	Norway Spruce	0 to 10	Good		Low
85	*Picea abies*	Norway Spruce	0 to 10	Good		Low
86	*Picea abies*	Norway Spruce	0 to 10	Good		Low
87	*Juglans nigra*	Black Walnut	20 to 30	Good		High
88	*Picea abies*	Norway Spruce	20 to 30	Good		High
89	*Picea abies*	Norway Spruce	20 to 30	Good		High
90	*Picea abies*	Norway Spruce	0 to 10	Good		Low
91	*Picea abies*	Norway Spruce	0 to 10	Good		Low
92	*Pinus nigra*	Austrian Pine	20 to 30	Good		High
93	*Picea abies*	Norway Spruce	0 to 10	Good		Low
94	*Picea abies*	Norway Spruce	0 to 10	Good		Low
95	*Picea abies*	Norway Spruce	0 to 10	Good		Low
96	*Pinus nigra*	Austrian Pine	0 to 10	Good		Low
97	*Pinus nigra*	Austrian Pine	20 to 30	Good		High
98	*Pinus nigra*	Austrian Pine	20 to 30	Good	co-dominant stems	High
99	*Pinus nigra*	Austrian Pine	20 to 30	Good		High
100	*Pinus nigra*	Austrian Pine	20 to 30	Good		High
101	*Pinus sylvestris*	Scots Pine	20 to 30	Good		High
102	*Betula papyrifera*	White Birch	20 to 30	Good	3 stems	High

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
103	*Prunus virginiana 'Schubert'*	Schubert Cherry	0 to 10	Good		Medium
104	*Picea abies*	Norway Spruce	30 to 40	Good		High
105	*Picea abies*	Norway Spruce	0 to 10	Good		Low
106	*Picea abies*	Norway Spruce	20 to 30	Good		High
107	*Picea abies*	Norway Spruce	20 to 30	Good		High
108	*Picea abies*	Norway Spruce	20 to 30	Good		High
109	*Picea abies*	Norway Spruce	20 to 30	Good		High
110	Norway Spruce *Picea abies*	Norway Spruce	20 to 30	Good		High
111	*Quercus rubra*	Red Oak	20 to 30	Good		High
112	*Quercus rubra*	Red Oak	20 to 30	Good		High
113	*Thuja occidentalis*	Eastern White Cedar	20 to 30	Good		High
114	*Thuja occidentalis*	Eastern White Cedar	20 to 30	Good		High
115	*Picea abies*	Norway Spruce	0 to 10	Good		Low
116	*Salix* spp.	Willow spp.	0 to 10	Good		Low
117	*Juniperus spp.*	Juniper spp.	10 to 20	Good		High
118	*Pinus nigra*	Austrian Pine	20 to 30	Good		High
119	*Pinus strobus*	White Pine	10 to 20	Good		High
120	*Fraxinus americana*	White Ash	10 to 20	Good		High
121	*Pinus strobus*	White Pine	20 to 30	Good		High
122	*Fraxinus americana*	White Ash	< 10	Good		Low
123	*Picea abies*	Norway Spruce	0 to 10	Good		Low
124	*Pinus sylvestris*	Scots Pine	0 to 10	Good		Low
125	*Salix spp.*	Willow spp.	10 to 20	Good		High
126	*Fraxinus americana*	White Ash	0 to 10	Good		Low
127	*Fraxinus americana*	White Ash	10 to 20	Good		High
128	*Acer saccharinum*	Silver Maple	20 to 30	Good		High
129	*Acer saccharinum*	Silver Maple	20 to 30	Good		High
130	*Acer negundo*	Manitoba Maple	20 to 30	Good		Low
131	*Acer rubrum*	Red Maple	20 to 30	Good		High
132	*Acer rubrum*	Red Maple	20 to 30	Good		High
133	*Acer negundo*	Manitoba Maple	20 to 30	Good		Low
134	*Pinus sylvestris*	Scots Pine	10 to 20	Good		High
135	*Pinus sylvestris*	Scots Pine	10 to 20	Good		High
136	*Pinus sylvestris*	Scots Pine	10 to 20	Good		High
137	*Pinus sylvestris*	Scots Pine	10 to 20	Good		High

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
138	*Pinus sylvestris*	Scots Pine	10 to 20	Good		High
139	*Pinus sylvestris*	Scots Pine	10 to 20	Good		High
140	*Prunus serotina*	Black Cherry	0 to 10	Good		Low
141	*Salix alba 'vitellina'*	Golden Weeping Willow	30 to 40	Good		High
142	*Ulmus americana*	White Elm	20 to 30	Good		High
143	*Acer negundo*	Manitoba Maple	10 to 20	Good	Approx. 5 stems	Low
144	*Acer negundo*	Manitoba Maple	0 to 10	Good		Low
145	*Prunus pensylvanica*	Pin Cherry	0 to 10	Good		Low
146	Manitoba Maple *Acer negundo*	Manitoba Maple	0 to 10	Good		Low
147	*Thuja occidentalis*	Eastern White Cedar	10 to 20	Good		High
148	*Picea abies*	Norway Spruce	20 to 30	Good		High
149	*Juglans nigra*	Black Walnut	0 to 10	Good		Low
150	*Thuja occidentalis*	Eastern White Cedar	10 to 20	Good		High
151	*Thuja occidentalis*	Eastern White Cedar	10 to 20	Good		High
152	*Thuja occidentalis*	Eastern White Cedar	10 to 20	Good		High
153	*Populus spp.*	Poplar spp.	0 to 10	Good		Low
154	*Picea abies*	Norway Spruce	20 to 30	Good		High
155	*Picea abies*	Norway Spruce	20 to 30	Good		High
156	*Picea abies*	Norway Spruce	20 to 30	Good		High
157	*Picea abies*	Norway Spruce	20 to 30	Good		High
158	*Picea abies*	Norway Spruce	20 to 30	Good		High
159	*Picea abies*	Norway Spruce	20 to 30	Good		High
160	*Picea abies*	Norway Spruce	20 to 30	Good		High
161	*Picea abies*	Norway Spruce	20 to 30	Good		High
162	*Pinus strobus*	White Pine	20 to 30	Good		High
163	*Picea pungens*	Blue Spruce	20 to 30	Good		High
164	*Picea pungens*	Blue Spruce	20 to 30	Good		High
165	*Picea pungens*	Blue Spruce	20 to 30	Good		High
166	*Picea pungens*	Blue Spruce	20 to 30	Good		High
167	*Picea pungens*	Blue Spruce	20 to 30	Good		High
168	*Picea pungens*	Blue Spruce	20 to 30	Good		High
169	*Picea pungens*	Blue Spruce	20 to 30	Good		High
170	*Picea pungens*	Blue Spruce	20 to 30	Good		High
171	*Picea pungens*	Blue Spruce	20 to 30	Good		High

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
172	*Picea pungens*	Blue Spruce	20 to 30	Good		High
173	*Picea pungens*	Blue Spruce	20 to 30	Good		High
174	*Picea pungens*	Blue Spruce	20 to 30	Good		High
175	*Picea pungens*	Blue Spruce	20 to 30	Good		High
176	*Picea pungens*	Blue Spruce	20 to 30	Good		High
177	*Picea pungens*	Blue Spruce	20 to 30	Good		High
178	*Picea pungens*	Blue Spruce	20 to 30	Good		High
179	*Picea pungens*	Blue Spruce	20 to 30	Good		High
180	*Picea pungens*	Blue Spruce	20 to 30	Good		High
181	*Picea pungens*	Blue Spruce	20 to 30	Good		High
182	*Picea pungens*	Blue Spruce	20 to 30	Good		High
183	*Picea pungens*	Blue Spruce	20 to 30	Good		High
184	*Picea pungens*	Blue Spruce	20 to 30	Good		High
185	*Picea pungens*	Blue Spruce	20 to 30	Good		High
186	*Picea pungens*	Blue Spruce	20 to 30	Good		High
187	*Picea pungens*	Blue Spruce	20 to 30	Good		High
188	*Picea pungens*	Blue Spruce	20 to 30	Good		High
189	*Picea pungens*	Blue Spruce	20 to 30	Good		High
190	*Picea pungens*	Blue Spruce	20 to 30	Good		High
191	*Picea pungens*	Blue Spruce	20 to 30	Good		High
192	*Picea pungens*	Blue Spruce	20 to 30	Good		High
193	*Picea pungens*	Blue Spruce	20 to 30	Good		High
194	*Picea pungens*	Blue Spruce	20 to 30	Good		High
195	*Picea pungens*	Blue Spruce	20 to 30	Good		High
196	*Picea pungens*	Blue Spruce	20 to 30	Good		High
197	*Picea pungens*	Blue Spruce	20 to 30	Good		High
198	*Picea pungens*	Blue Spruce	20 to 30	Good		High
199	*Picea pungens*	Blue Spruce	20 to 30	Good		High
200	*Picea pungens*	Blue Spruce	20 to 30	Good		High
201	*Picea pungens*	Blue Spruce	20 to 30	Good		High
202	*Picea abies*	Norway Spruce	30 to 40	Good		High
203	*Picea abies*	Norway Spruce	30 to 40	Good		High
204	*Picea abies*	Norway Spruce	20 to 30	Good		High
205	*Picea abies*	Norway Spruce	20 to 30	Good		High
206	*Picea abies*	Norway Spruce	20 to 30	Good		High

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
207	*Picea abies*	Norway Spruce	20 to 30	Good		High
208	Acer saccharum	Sugar Maple	20 to 30	Good		High
209	*Ulmus americana*	White Elm	0 to 10	Good		Low
210	*Acer negundo*	Manitoba Maple	20 to 30	Good		Low
211	*Acer platanoides*	Manitoba Maple	< 10	Good		Low
212	Acer platanoides	Manitoba Maple	10 to 20	Good		Low
213	Acer platanoides	Manitoba Maple	10 to 20	Good		Low
214	Acer platanoides	Manitoba Maple	10 to 20	Good		Low
215	*Picea abies*	Norway Spruce	0 to 10	Good		Low
216	*Picea pungens*	Blue Spruce	0 to 10	Good		Low
217	*Picea abies*	Norway Spruce	0 to 10	Good		Low
218	*Pinus sylvestris*	Scots Pine	20 to 30	Good		High
219	*Pinus sylvestris*	Scots Pine	20 to 30	Good		High
220	*Pinus sylvestris*	Scots Pine	20 to 30	Good		High
221	*Pinus sylvestris*	Scots Pine	20 to 30	Good		High
222	*Pinus sylvestris*	Scots Pine	20 to 30	Good		High
223	*Picea abies*	Norway Spruce	20 to 30	Good		High
224	*Picea abies*	Norway Spruce	20 to 30	Good		High
225	*Picea abies*	Norway Spruce	20 to 30	Good		High
226	*Picea abies*	Norway Spruce	20 to 30	Good		High
227	*Picea abies*	Norway Spruce	20 to 30	Good		High
228	*Picea abies*	Norway Spruce	20 to 30	Good		High
229	*Picea abies*	Norway Spruce	10 to 20	Good		High
230	*Picea abies*	Norway Spruce	20 to 30	Good		High
231	*Picea abies*	Norway Spruce	20 to 30	Good		High
232	*Picea abies*	Norway Spruce	10 to 20	Good		High
233	*Picea abies*	Norway Spruce	20 to 30	Good		High
234	*Picea abies*	Norway Spruce	20 to 30	Good		High
235	*Picea abies*	Norway Spruce	20 to 30	Good		High
236	*Picea abies*	Norway Spruce	20 to 30	Good		High
237	*Picea abies*	Norway Spruce	20 to 30	Good		High
238	*Pinus strobus*	White Pine	30 to 40	Good		High
239	*Picea abies*	Norway Spruce	20 to 30	Good		High
240	*Picea abies*	Norway Spruce	30 to 40	Good		High
241	*Picea abies*	Norway Spruce	20 to 30	Good		High

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
242	*Juniperus spp.*	Juniper spp.	< 10	Good		Low
243	*Betula papyrifera*	White Birch	20 to 30	Good		High
244	*Picea pungens*	Blue Spruce	20 to 30	Good		High
245	*Pinus strobus*	White Pine	20 to 30	Good		High
246	*Thuja occidentalis*	Eastern White Cedar	10 to 20	Good		High
247	*Picea abies*	Norway Spruce	20 to 30	Good		High
248	*Acer negundo*	Manitoba Maple	10 to 20	Good		Low
249	*Ulmus americana*	White Elm	10 to 20	Good		High
250	*Ulmus americana*	White Elm	20 to 30	Good		High
251	*Acer negundo*	Manitoba Maple	20 to 30	Good		Low
252	*Acer negundo*	Manitoba Maple	0 to 10	Good		Low
253	*Acer negundo*	Manitoba Maple	20 to 30	Good		Low
254	*Picea abies*	Norway Spruce	< 10	Good		Low
255	*Salix spp.*	Willow spp.	20 to 30	Good		High
256	*Salix spp.*	Willow spp.	20 to 30	Good		High
257	*Pinus sylvestris*	Scots Pine	10 to 20	Good		High
258	*Pinus sylvestris*	Scots Pine	10 to 20	Good		High
259	Picea glauca	White Spruce	0 to 10	Good		Low
260	Picea glauca	White Spruce	0 to 10	Good		Low
261	Picea glauca	White Spruce	0 to 10	Good		Low
262	*Picea abies*	Norway Spruce	0 to 10	Good		Low
263	*Pinus sylvestris*	Scots Pine	10 to 20	Good		High
264	*Pinus sylvestris*	Scots Pine	10 to 20	Good		High
265	*Ulmus americana*	White Elm	30 to 40	Good		High
266	*Picea pungens*	Blue Spruce	0 to 10	Good		Low
267	*Picea pungens*	Blue Spruce	0 to 10	Good		Low
268	Picea glauca	White Spruce	0 to 10	Good		Low
269	*Acer negundo*	Manitoba Maple	20 to 30	Good		Low
270	*Acer platanoides*	Norway Maple	< 10	Good		Low
271	*Acer platanoides*	Norway Maple	< 10	Good		Low
272	*Acer platanoides*	Norway Maple	< 10	Good		Low
273	*Acer platanoides*	Norway Maple	< 10	Good		Low
274	*Acer platanoides*	Norway Maple	10 to 20	Good		High
275	*Acer rubrum*	Red Maple	0 to 10	Good		Low
276	*Betula papyrifera*	White Birch	0 to 10	Good		Low

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
277	*Picea pungens*	Blue Spruce	20 to 30	Good		High
278	*Picea abies*	Norway Spruce	0 to 10	Good		Low
279	*Picea pungens*	Blue Spruce	10 to 20	Good		High
280	*Picea pungens*	Blue Spruce	10 to 20	Good		High
281	*Picea pungens*	Blue Spruce	10 to 20	Good		High
282	*Picea pungens*	Blue Spruce	10 to 20	Good		High
283	*Picea pungens*	Blue Spruce	10 to 20	Good		High
284	*Picea pungens*	Blue Spruce	10 to 20	Good		High
285	*Prunus spp.*	Cherry spp.	10 to 20	Good		High
286	*Picea abies*	Norway Spruce	0 to 10	Good		Medium
287	*Betula papyrifera*	White Birch	10 to 20	Good		High
288	*Acer negundo*	Manitoba Maple	< 10	Good		Low
289	*Acer negundo*	Manitoba Maple	< 10	Good		Low
290	*Acer negundo*	Manitoba Maple	< 10	Good		Low
291	*Acer negundo*	Manitoba Maple	< 10	Good		Low
292	*Acer negundo*	Manitoba Maple	< 10	Good		Low
293	*Acer negundo*	Manitoba Maple	< 10	Good		Low
294	*Acer negundo*	Manitoba Maple	< 10	Good		Low
295	*Acer negundo*	Manitoba Maple	< 10	Good		Low
296	*Acer negundo*	Manitoba Maple	< 10	Good		Low
297	*Acer negundo*	Manitoba Maple	< 10	Good		Low
298	*Ulmus americana*	White Elm	20 to 30	Good		High
299	*Acer saccharinum*	Silver Maple	30 to 50	Good		High
300	*Ulmus americana*	White Elm	20 to 30	Good		High
301	*Acer negundo*	Manitoba Maple	30 to 40	Good		Low
302	*Acer negundo*	Manitoba Maple	50 +	Good		Low
303	*Acer negundo*	Manitoba Maple	20 to 30	Good		Low
304	*Acer negundo*	Manitoba Maple	20 to 30	Good		Low
305	*Morus alba 'Pendula'*	Weeping Mulberry	< 10	Good		Low
306	*Morus alba 'Pendula'*	Weeping Mulberry	< 10	Good		Low
307	*Morus alba 'Pendula'*	Weeping Mulberry	< 10	Good		Low
308	*Morus alba 'Pendula'*	Weeping Mulberry	< 10	Good		Low
309	*Acer saccharum*	Sugar Maple	10 to 20	Good		High
310	*Morus alba 'Pendula'*	Weeping Mulberry	< 10	Good		Low
311	*Morus alba 'Pendula'*	Weeping Mulberry	< 10	Good		Low

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
312	*Acer saccharum*	Sugar Maple	10 to 20	Good		High
313	*Picea pungens*	Blue Spruce	0 to 10	Good		Medium
314	*Picea pungens*	Blue Spruce	0 to 10	Good		Medium
315	*Picea pungens*	Blue Spruce	0 to 10	Good		Medium
316	*Ulmus americana*	White Elm	< 10	Good		Low
317	*Acer negundo*	Manitoba Maple	10 to 20	Good		Low
318	*Acer saccharum*	Sugar Maple	10 to 20	Good		High
319	*Acer saccharum*	Sugar Maple	10 to 20	Good		High
320	*Acer negundo*	Manitoba Maple	10 to 20	Good		Low
321	*Acer saccharum*	Sugar Maple	0 to 10	Good	Co-dominant stems	Low
322	*Acer saccharum*	Sugar Maple	0 to 10	Good		Low
323	*Acer saccharum*	Sugar Maple	10 to 20	Good		High
324	*Acer saccharinum*	Silver Maple	40 to 50	Good		High
325	*Acer saccharinum*	Silver Maple	0 to 10	Good		Low
326	*Acer saccharinum*	Silver Maple	30 to 40	Good		High
327	*Acer saccharinum*	Silver Maple	0 to 10	Good		Low
328	*Acer saccharinum*	Silver Maple	0 to 10	Good		Low
329	*Acer negundo*	Manitoba Maple	20 to 30	Good		Low
330	*Acer negundo*	Manitoba Maple	10 to 20	Good	Tree has slight lean	Low
331	*Salix spp.*	Willow spp.	40 to 50	Good		High
332	*Pinus sylvestris*	Scots Pine	20 to 30	Good		High
333	*Acer platanoides*	Norway Maple	0 to 10	Good		Low
334	*Ulmus americana*	White Elm	20 to 30	Good		High
335	*Acer platanoides*	Norway Maple	20 to 30	Good		High
336	*Picea abies*	Norway Spruce	10 to 20	Good		High
337	*Acer platanoides*	Norway Maple	20 to 30	Good		High
338	*Picea abies*	Norway Spruce	20 to 30	Good		High
339	*Juniperus spp.*	Juniper spp.	10 to 20	Good		High
340	*Juniperus spp.*	Juniper spp.	10 to 20	Good		High
341	*Juniperus spp.*	Juniper spp.	10 to 20	Good		High
342	*Juniperus spp.*	Juniper spp.	10 to 20	Good	Tree is leaning	High
343	*Picea abies*	Norway Spruce	20 to 30	Good		High
344	*Picea abies*	Norway Spruce	10 to 20	Good		High
345	*Picea abies*	Norway Spruce	10 to 20	Good	2 stems	High
346	*Picea abies*	Norway Spruce	10 to 20	Good		High

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
347	*Picea abies*	Norway Spruce	0 to 10	Good		Low
348	*Picea abies*	Norway Spruce	10 to 20	Good		High
349	*Picea abies*	Norway Spruce	20 to 30	Good		High
350	*Picea abies*	Norway Spruce	10 to 20	Good		High
351	*Picea abies*	Norway Spruce	20 to 30	Good		High
352	*Picea abies*	Norway Spruce	20 to 30	Good		High
353	*Picea abies*	Norway Spruce	20 to 30	Good		High
354	*Picea abies*	Norway Spruce	20 to 30	Good		High
355	*Picea abies*	Norway Spruce	20 to 30	Good		High
356	*Thuja occidentalis*	Eastern White Cedar	< 10	Good		Low
357	*Picea abies*	Norway Spruce	20 to 30	Good		High
358	*Picea abies*	Norway Spruce	20 to 30	Good		High
359	*Picea abies*	Norway Spruce	20 to 30	Good		High
360	*Thuja occidentalis*	Eastern White Cedar	< 10	Good		Low
361	*Thuja occidentalis*	Eastern White Cedar	< 10	Good		Low
362	*Picea abies*	Norway Spruce	20 to 30	Good		High
363	*Picea abies*	Norway Spruce	20 to 30	Good		High
364	*Picea abies*	Norway Spruce	20 to 30	Good		High
365	*Picea abies*	Norway Spruce	20 to 30	Good		High
366	*Picea abies*	Norway Spruce	20 to 30	Good		High
367	*Thuja occidentalis*	Eastern White Cedar	0 to 10	Good		Low
368	*Thuja occidentalis*	Eastern White Cedar	0 to 10	Good		Low
369	*Picea abies*	Norway Spruce	20 to 30	Good		High
370	*Picea abies*	Norway Spruce	20 to 30	Good		High
371	*Pinus sylvestris*	Scots Pine	10 to 20	Good		High
372	*Thuja occidentalis*	Eastern White Cedar	10 to 20	Good		High
373	*Picea abies*	Norway Spruce	10 to 20	Good		High
374	*Picea abies*	Norway Spruce	20 to 30	Good		High
375	*Populus spp.*	Poplar spp.	10 to 20	Good		High
376	*Populus spp.*	Poplar spp.	10 to 20	Good		High
377	*Populus spp.*	Poplar spp.	10 to 20	Good		High
378	*Populus spp.*	Poplar spp.	10 to 20	Good		High
379	*Populus spp.*	Poplar spp.	10 to 20	Good		High
380	*Fraxinus americana*	White Ash	0 to 10	Good		Low
381	*Populus spp.*	Poplar spp.	10 to 20	Good		High

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
382	*Populus spp.*	Poplar spp.	20 to 30	Good		High
383	*Populus spp.*	Poplar spp.	10 to 20	Good		High
384	*Populus spp.*	Poplar spp.	10 to 20	Good		High
385	*Populus spp.*	Poplar spp.	0 to 10	Good		Low
386	*Populus spp.*	Poplar spp.	0 to 10	Good		Low
387	*Populus spp.*	Poplar spp.	0 to 10	Good		Low
388	*Populus spp.*	Poplar spp.	0 to 10	Good		Low
389	*Populus spp.*	Poplar spp.	0 to 10	Good		Low
390	*Populus spp.*	Poplar spp.	0 to 10	Good		Low
391	*Populus spp.*	Poplar spp.	0 to 10	Good		Low
392	*Populus spp.*	Poplar spp.	0 to 10	Good		Low
393	*Populus spp.*	Poplar spp.	0 to 10	Good		Low
394	*Populus spp.*	Poplar spp.	0 to 10	Good		Low
395	*Populus spp.*	Poplar spp.	0 to 10	Good		Low
396	*Populus spp.*	Poplar spp.	0 to 10	Good		Low
397	*Populus spp.*	Poplar spp.	0 to 10	Good		Low
398	*Populus spp.*	Poplar spp.	0 to 10	Good		Low
399	*Fraxinus americana*	White Ash	10 to 20	Fair to Poor		Low
400	*Fraxinus americana*	White Ash	20 to 30	Good		High
401	*Salix spp.*	Willow spp.	40 to 50	Good		High
402	Willow spp. *Salix spp.*	Willow spp.	40 to 50	Good		High
403	*Fraxinus americana*	White Ash	20 to 30	Good		High
404	*Gleditsia triacanthos*	Honey-Locust	10 to 20	Good		High
405	*Gleditsia triacanthos*	Honey-Locust	10 to 20	Good		High
406	*Acer platanoides*	Norway Maple	20 to 30	Fair to Poor	Topped and suckering	Low
407	*Acer platanoides*	Norway Maple	20 to 30	Good		High
408	*Syringa vulgaris*	Common Lilac	< 10	Good		Low
409	*Tilia americana*	Basswood	20 to 30	Good		High
410	*Acer negundo*	Manitoba Maple	20 to 30	Good		Low
411	*Picea abies*	Norway Spruce	20 to 30	Good		High
412	*Catalpas speciosa*	Northern Catalpa	20 to 30	Good		High
413	*Malus spp.*	Apple spp.	10 to 20	Good		High
414	*Acer platanoides*	Norway Maple	20 to 30	Good		High
415	*Acer negundo*	Manitoba Maple	20 to 30	Good		Low
416	*Fraxinus americana*	White Ash	< 10	Good		Low

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
417	*Fraxinus americana*	White Ash	< 10	Good		Low
418	*Salix spp.*	Willow spp.	50 +	Good		High
419	*Acer negundo*	Manitoba Maple	< 10	Good		Low
420	*Thuja occidentalis*	Eastern White Cedar	0 to 10	Good	8 stems	Low
421	*Betula papyrifera*	White Birch	0 to 10	Good		Low
422	*Betula papyrifera*	White Birch	0 to 10	Good	2 stems	Low
423	*Picea abies*	Norway Spruce	0 to 10	Good		Low
424	*Picea abies*	Norway Spruce	0 to 10	Good		Low
425	*Picea abies*	Norway Spruce	0 to 10	Good		Low
426	*Picea abies*	Norway Spruce	0 to 10	Good		Low
427	*Picea abies*	Norway Spruce	10 to 20	Good		High
428	Thuja occidentalis	Eastern White Cedar	0 to 10	Fair		Low
429	*Prunus spp.*	Cherry spp.	0 to 10	Good	5 stems	Low
430	*Prunus spp.*	Cherry spp.	0 to 10	Good		Low
431	*Acer saccharinum*	Silver Maple	20 to 30	Good		High
432	*Acer saccharinum*	Silver Maple	20 to 30	Good		High
433	*Malus spp.*	Apple spp.	0 to 10	Good		Low
434	*Pinus banksiana*	Jack Pine	10 to 20	Good		High
435	*Pinus banksiana*	Jack Pine	10 to 20	Good		High
436	*Pinus banksiana*	Jack Pine	10 to 20	Good		High
437	*Ulmus americana*	White Elm	0 to 10	Good		Low
438	*Salix spp.*	Willow spp.	30 to 40	Good		High
439	*Picea pungens*	Blue Spruce	10 to 20	Good		High
440	*Picea pungens*	Blue Spruce	10 to 20	Good		High
441	*Picea pungens*	Blue Spruce	10 to 20	Good		High
442	*Picea pungens*	Blue Spruce	10 to 20	Good		High
443	*Picea pungens*	Blue Spruce	10 to 20	Good		High
444	*Picea pungens*	Blue Spruce	10 to 20	Good		High
445	*Picea pungens*	Blue Spruce	10 to 20	Good		High
446	*Picea pungens*	Blue Spruce	10 to 20	Good		High
447	*Picea pungens*	Blue Spruce	10 to 20	Good		High
448	*Picea pungens*	Blue Spruce	10 to 20	Good		High
449	*Thuja occidentalis*	Eastern White Cedar	< 10	Good		Low
450	*Thuja occidentalis*	Eastern White Cedar	< 10	Good		Low
451	Fraxinus pennsylvanica	Red Ash	10 to 20	Good		High

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
452	*Acer platanoides*	Norway Maple	20 to 30	Good		High
453	*Picea abies*	Norway Spruce	10 to 20	Good		High
454	*Salix spp.*	Willow spp.	20 to 30	Good		High
455	*Quercus macrocarpa*	Bur Oak	< 10	Good		Low
456	*Malus spp.*	Apple spp.	10 to 20	Good		High
457	Apple spp. *Malus spp.*	Apple spp.	10 to 20	Good		High
458	*Juniperus spp.*	Juniper spp.	0 to 10	Good		Low
459	*Picea abies*	Norway Spruce	0 to 10	Good		Low
460	*Picea abies*	Norway Spruce	0 to 10	Good		Low
461	*Thuja occidentalis*	Eastern White Cedar	0 to 10	Good		Low
462	*Thuja occidentalis*	Eastern White Cedar	0 to 10	Good		Low
463	*Thuja occidentalis*	Eastern White Cedar	0 to 10	Good		Low
464	*Betula papyrifera*	White Birch	20 to 30	Good		High
465	*Picea abies*	Norway Spruce	10 to 20	Good		High
466	*Picea abies*	Norway Spruce	10 to 20	Good		High
467	*Picea abies*	Norway Spruce	10 to 20	Good		High
468	*Picea abies*	Norway Spruce	10 to 20	Good		High
469	*Picea abies*	Norway Spruce	10 to 20	Good		High
470	*Picea abies*	Norway Spruce	10 to 20	Good		High
471	*Picea abies*	Norway Spruce	10 to 20	Good		High
472	*Picea abies*	Norway Spruce	10 to 20	Good		High
473	*Picea abies*	Norway Spruce	10 to 20	Good		High
474	*Picea abies*	Norway Spruce	10 to 20	Good		High
475	*Picea pungens*	Blue Spruce	10 to 20	Good		High
476	*Picea pungens*	Blue Spruce	10 to 20	Good		High
477	*Picea abies*	Norway Spruce	10 to 20	Good		High
478	*Picea abies*	Norway Spruce	10 to 20	Good		High
479	*Picea abies*	Norway Spruce	10 to 20	Good		High
480	*Picea abies*	Norway Spruce	10 to 20	Good		High
481	*Picea abies*	Norway Spruce	10 to 20	Good		High
482	*Picea abies*	Norway Spruce	10 to 20	Good		High
483	*Picea abies*	Norway Spruce	10 to 20	Good		High
484	*Picea abies*	Norway Spruce	10 to 20	Good		High
485	*Picea abies*	Norway Spruce	10 to 20	Good		High
486	*Acer saccharinum*	Silver Maple	20 to 30	Good		High

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
487	*Picea pungens*	Blue Spruce	10 to 20	Good		High
488	*Picea abies*	Norway Spruce	10 to 20	Good		High
489	*Acer saccharinum*	Silver Maple	20 to 30	Good		High
490	*Acer saccharinum*	Silver Maple	20 to 30	Good		High
491	*Picea pungens*	Blue Spruce	10 to 20	Good		High
492	*Picea pungens*	Blue Spruce	10 to 20	Good		High
493	*Picea pungens*	Blue Spruce	10 to 20	Good		High
494	*Picea abies*	Norway Spruce	10 to 20	Good		High
495	*Acer saccharinum*	Silver Maple	40 to 50	Good		High
496	Acer platanoides	Norway Maple	10 to 20	Good		High
497	*Acer saccharinum*	Silver Maple	20 to 30	Good		High
498	*Picea abies*	Norway Spruce	0 to 10	Good	2 stems	Low
499	*Thuja occidentalis*	Eastern White Cedar	< 10	Good		Low
500	*Thuja occidentalis*	Eastern White Cedar	< 10	Good		Low
501	*Picea abies*	Norway Spruce	20 to 30	Good		High
502	*Picea abies*	Norway Spruce	20 to 30	Good		High
503	*Picea abies*	Norway Spruce	20 to 30	Good		High
504	*Picea abies*	Norway Spruce	10 to 20	Good		High
505	*Picea abies*	Norway Spruce	dead	Dead		Low
506	*Picea abies*	Norway Spruce	10 to 20	Good		High
507	*Picea abies*	Norway Spruce	10 to 20	Good		High
508	*Picea abies*	Norway Spruce	20 to 30	Good		High
509	*Picea abies*	Norway Spruce	10 to 20	Good		High
510	*Picea abies*	Norway Spruce	10 to 20	Good		High
511	*Malus spp.*	Apple spp.	20 to 30	Good		High
512	*Picea glauca*	White Spruce	0 to 10	Good		Low
513	*Picea glauca*	White Spruce	10 to 20	Good		High
514	*Picea glauca*	White Spruce	0 to 10	Good		Low
515	*Larix laricina*	Tamarack	20 to 30	Good		High
516	*Larix laricina*	Tamarack	20 to 30	Good		High
517	*Larix laricina*	Tamarack	20 to 30	Good		High
518	*Larix laricina*	Tamarack	20 to 30	Good		High
519	*Larix laricina*	Tamarack	20 to 30	Good		High
520	*Larix laricina*	Tamarack	20 to 30	Good		High
521	*Fraxinus americana*	White Ash	20 to 30	Good		High

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
522	*Picea abies*	Norway Spruce	0 to 10	Good		Low
523	*Picea abies*	Norway Spruce	0 to 10	Good		Low
524	*Picea abies*	Norway Spruce	0 to 10	Good		Low
525	*Picea abies*	Norway Spruce	0 to 10	Good		Low
526	*Larix laricina*	Tamarack	20 to 30	Good		High
527	*Picea abies*	Norway Spruce	20 to 30	Good		High
528	*Picea abies*	Norway Spruce	20 to 30	Good		High
529	*Picea abies*	Norway Spruce	20 to 30	Good		High
530	*Picea abies*	Norway Spruce	20 to 30	Good		High
531	*Picea abies*	Norway Spruce	20 to 30	Good		High
532	*Picea abies*	Norway Spruce	20 to 30	Good		High
533	*Picea abies*	Norway Spruce	20 to 30	Good		High
534	*Picea abies*	Norway Spruce	20 to 30	Good		High
535	*Picea abies*	Norway Spruce	20 to 30	Good		High
536	*Picea abies*	Norway Spruce	20 to 30	Good		High
537	*Picea abies*	Norway Spruce	20 to 30	Good		High
538	*Picea abies*	Norway Spruce	20 to 30	Good		High
539	*Picea abies*	Norway Spruce	10 to 20	Good		High
540	*Fraxinus pennsylvanica*	Red Ash	20 to 30	Good		High
541	*Picea abies*	Norway Spruce	10 to 20	Good		High
542	*Picea abies*	Norway Spruce	10 to 20	Poor		Low
543	*Fraxinus americana*	White Ash	10 to 20	Good		High
544	*Picea pungens*	Blue Spruce	< 10	Good		Low
545	*Fraxinus nigra*	Black Ash	10 to 20	Good	2 stems	High
546	*Fraxinus nigra*	Black Ash	0 to 10	Good		Low
547	*Acer saccharum*	Sugar Maple	0 to 10	Good		Low
548	*Picea abies*	Norway Spruce	10 to 20	Good		High
549	*Acer saccharum*	Sugar Maple	0 to 10	Good		Low
550	*Picea pungens*	Blue Spruce	< 10	Good		Medium
551	*Picea abies*	Norway Spruce	10 to 20	Good		Low
552	Fraxinus pennsylvanica 'subintegerrima'	Green Ash	20 to 30	Good		High
553	*Acer rubrum*	Red Maple	30 to 40	Good		High
554	*Tilia americana*	Basswood	30 to 40	Good		High
555	*Pinus sylvestris*	Scots Pine	< 10	Fair to Poor	Cracked stem	Low
556	*Picea abies*	Norway Spruce	< 10	Good		Low

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
557	*Picea abies*	Norway Spruce	< 10	Good		Low
558	*Picea abies*	Norway Spruce	20 to 30	Good		High
559	*Pinus sylvestris*	Scots Pine	< 10	Good		Low
560	*Picea abies*	Norway Spruce	20 to 30	Good		High
561	*Picea abies*	Norway Spruce	20 to 30	Good		High
562	*Picea abies*	Norway Spruce	20 to 30	Good		High
563	*Fraxinus americana*	White Ash	10 to 20	Good		High
564	*Picea abies*	Norway Spruce	20 to 30	Good		High
565	*Acer negundo*	Manitoba Maple	20 to 30	Good		High
566	*Acer saccharum*	Sugar Maple	0 to 10	Good		Medium
567	*Acer saccharum*	Sugar Maple	< 10	Good		Low
568	*Crataegus spp.*	Hawthorn spp.	10 to 20	Good		High
569	*Acer saccharum*	Sugar Maple	10 to 20	Good		High
570	*Acer rubrum*	Red Maple	10 to 20	Good		High
571	*Robinia pseudoacacia*	Black Locust	< 10	Good		Low
572	*Robinia pseudoacacia*	Black Locust	< 10	Good		Low
573	*Picea abies*	Norway Spruce	0 to 10	Good		Low
574	*Picea abies*	Norway Spruce	10 to 20	Good		High
575	*Picea abies*	Norway Spruce	0 to 10	Good		Low
576	*Larix laricina*	Tamarack	0 to 10	Good		Low
577	*Picea abies*	Norway Spruce	0 to 10	Good		Low
578	*Tilia americana*	Basswood	10 to 20	Good		High
579	*Ulmus americana*	White Elm	10 to 20	Fair to Poor	Topped	Low
580	*Betula papyrifera*	White Birch	10 to 20	Fair to Poor	Topped	Low
581	White Birch *Betula papyrifera*	White Birch	10 to 20	Good		High
582	*Acer platanoides*	Norway Maple	10 to 20	Good		High
583	*Thuja occidentalis*	Eastern White Cedar	0 to 10	Good		Medium
584	*huja occidentalis*	Eastern White Cedar	< 10	Good	6 stems	Low
585	*Ulmus americana*	White Elm	10 to 20	Poor		Low
586	*Acer platanoides*	Norway Maple	< 10	Good		Low
587	*Ulmus americana*	White Elm	< 10	Good	10 stems	Low
588	White Elm *Ulmus americana*	White Elm	< 10	Good		Low
589	White Elm *Ulmus americana*	White Elm	10 to 20	Good		High
590	*Acer rubrum*	Red Maple	10 to 20	Good		High
591	*Acer platanoides*	Norway Maple	10 to 20	Good		High

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
592	*Picea abies*	Norway Spruce	0 to 10	Good		Low
593	*Picea abies*	Norway Spruce	0 to 10	Good		Low
594	*Picea abies*	Norway Spruce	0 to 10	Good		Low
595	*Picea abies*	Norway Spruce	0 to 10	Good		Low
596	*Acer saccharum*	Sugar Maple	0 to 10	Good		Low
597	*Picea abies*	Norway Spruce	0 to 10	Good		Low
598	*Picea abies*	Norway Spruce	0 to 10	Good		Low
599	*Picea abies*	Norway Spruce	0 to 10	Good		Low
600	*Picea abies*	Norway Spruce	0 to 10	Good		Low
601	*Picea abies*	Norway Spruce	10 to 20	Good		High
602	*Picea abies*	Norway Spruce	0 to 10	Good		Low
603	*Picea abies*	Norway Spruce	0 to 10	Good		Low
604	*Picea abies*	Norway Spruce	0 to 10	Good		Low
605	*Picea abies*	Norway Spruce	20 to 30	Good		High
606	*Picea abies*	Norway Spruce	10 to 20	Good		High
607	*Pinus nigra*	Austrian Pine	20 to 30	Good		High
608	*Thuja occidentalis*	Eastern White Cedar	0 to 10	Fair		Medium
609	*Fraxinus pennsylvanica*	White Ash	10 to 20	Good		High
610	*Pinus nigra*	Austrian Pine	10 to 20	Good		High
611	*Pinus nigra*	Austrian Pine	0 to 10	Good		Low
612	*Thuja occidentalis*	Eastern White Cedar	0 to 10	Good		Low
613	*Pinus nigra*	Austrian Pine	10 to 20	Good		High
614	*Betula papyrifera*	White Birch	0 to 10	Fair		Low
615	*Pinus nigra*	Austrian Pine	10 to 20	Good		High
616	*Pinus nigra*	Austrian Pine	10 to 20	Good		High
617	*Betula papyrifera*	White Birch	< 10	Fair		Low
618	*Pinus nigra*	Austrian Pine	10 to 20	Good		High
619	*Thuja occidentalis*	Eastern White Cedar	< 10	Good		Low
620	*Pinus nigra*	Austrian Pine	10 to 20	Good		High
621	*Thuja occidentalis*	Eastern White Cedar	< 10	Good		Low
622	*Fraxinus americana*	White Ash	10 to 20	Good		High
623	*Ulmus americana*	White Elm	20 to 30	Good		High
624	*Ulmus americana*	White Elm	20 to 30	Good		High
625	*Ulmus americana*	White Elm	10 to 20	Poor		Low
626	*Ulmus americana*	White Elm	10 to 20	Poor		Low

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
627	*Ulmus americana*	White Elm	10 to 20	Poor		Low
628	*Ulmus americana*	White Elm	0 to 10	Fair		Low
629	*Fraxinus americana*	White Ash	0 to 5	Good		Low
630	*Fraxinus americana*	White Ash	0 to 5	Good		Low
631	*Picea abies*	Norway Spruce	20 to 30	Good		High
632	*Picea abies*	Norway Spruce	20 to 30	Good		High
633	*Picea abies*	Norway Spruce	20 to 30	Good		High
634	*Picea abies*	Norway Spruce	20 to 30	Good		High
635	*Picea abies*	Norway Spruce	20 to 30	Good		High
636	*Picea abies*	Norway Spruce	20 to 30	Good		High
637	*Picea abies*	Norway Spruce	20 to 30	Good		High
638	*Picea abies*	Norway Spruce	20 to 30	Good		High
639	*Picea abies*	Norway Spruce	20 to 30	Good		High
640	*Picea abies*	Norway Spruce	20 to 30	Good		High
641	*Picea abies*	Norway Spruce	20 to 30	Good		High
642	*Fraxinus americana*	White Ash	10 to 20	Good		High
643	*Picea abies*	Norway Spruce	20 to 30	Good		High
644	*Picea abies*	Norway Spruce	20 to 30	Good		High
645	*Picea abies*	Norway Spruce	20 to 30	Good		High
646	*Picea abies*	Norway Spruce	20 to 30	Good		High
647	*Picea abies*	Norway Spruce	20 to 30	Good		High
648	*Picea abies*	Norway Spruce	20 to 30	Good		High
649	*Picea abies*	Norway Spruce	20 to 30	Good		High
650	*Picea abies*	Norway Spruce	10 to 20	Good		High
651	*Picea abies*	Norway Spruce	10 to 20	Good		High
652	*Picea abies*	Norway Spruce	10 to 20	Good		High
653	*Robinia pseudoacacia*	Black Locust	10 to 20	Good		High
654	*Picea abies*	Norway Spruce	20 to 30	Good		High
655	*Picea abies*	Norway Spruce	20 to 30	Good		High
656	*Picea abies*	Norway Spruce	0 to 5	Good		Low
657	*Tilia americana*	Basswood	30 to 40	Good		High
658	*Tilia americana*	Basswood	30 to 40	Good		High
659	*Malus spp.*	Apple spp.	10 to 20	Good		High
660	*Malus spp.*	Apple spp.	20 to 30	Good		High

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
661	*Thuja occidentalis*	Eastern White Cedar	20 to 30 / 0 to 10	Good	Multi-stemmed	High
662	*Picea abies*	Norway Spruce	20 to 30	Good		High
663	*Picea abies*	Norway Spruce	20 to 30	Good		High
664	*Picea abies*	Norway Spruce	20 to 30	Good		High
665	*Morus alba 'Pendula'*	Weeping Mulberry	10 to 20	Good		High
666	*Picea abies*	Norway Spruce	10 to 20	Good		High
667	*Picea abies*	Norway Spruce	10 to 20	Good		High
668	*Picea abies*	Norway Spruce	10 to 20	Good		High
669	*Picea abies*	Norway Spruce	10 to 20	Good		High
670	*Picea abies*	Norway Spruce	10 to 20	Fair to Poor		Low
671	*Picea abies*	Norway Spruce	20 to 30	Good		High
672	*Salix spp.*	Willow spp.	50 +	Poor	Multiple stems and suckering	Low
673	*Pinus sylvestris*	Scots Pine	20 to 30	Good		High
674	*Pinus sylvestris*	Scots Pine	20 to 30	Good		High
675	*Pinus sylvestris*	Scots Pine	20 to 30	Good		High
676	*Picea glauca*	White Spruce	10 to 20	Good		High
677	*Picea glauca*	White Spruce	10 to 20	Good		High
678	*Picea glauca*	White Spruce	10 to 20	Good		High
679	*Picea glauca*	White Spruce	10 to 20	Good		High
680	*Picea glauca*	White Spruce	10 to 20	Good		High
681	*Picea glauca*	White Spruce	10 to 20	Good		High
682	*Picea glauca*	White Spruce	10 to 20	Good		High
683	*Picea glauca*	White Spruce	20 to 30	Good		High
684	*Picea glauca*	White Spruce	20 to 30	Good		High
685	*Picea glauca*	White Spruce	20 to 30	Good		High
686	*Picea glauca*	White Spruce	20 to 30	Good		High
687	*Picea glauca*	White Spruce	20 to 30	Good		High
688	*Picea glauca*	White Spruce	20 to 30	Good		High
689	*Picea glauca*	White Spruce	20 to 30	Good		High
690	*Picea glauca*	White Spruce	10 to 20	Good		High
691	*Picea glauca*	White Spruce	10 to 20	Good		High
692	*Picea glauca*	White Spruce	10 to 20	Good		High
693	*Picea glauca*	White Spruce	10 to 20	Good		High

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
694	*Picea glauca*	White Spruce	20 to 30	Good		High
695	*Picea glauca*	White Spruce	20 to 30	Good		High
696	*Picea abies*	Norway Spruce	10 to 20	Good		High
697	*Ulmus americana*	White Elm	0 to 10	Good		Low
698	*Ulmus americana*	White Elm	0 to 10	Good		Low
699	*Pinus mugho*	Mugo Pine	0 to 10	Good		Low
700	*Populus spp.*	Poplar spp.	30 to 40	Good		High
701	*Picea abies*	Norway Spruce	0 to 10	Good		Low
702	*Picea glauca*	White Spruce	20 to 30	Good		High
703	*Picea glauca*	White Spruce	10 to 20	Good		High
704	*Picea glauca*	White Spruce	10 to 20	Good		High
705	*Picea glauca*	White Spruce	10 to 20	Good		High
706	*Picea glauca*	White Spruce	10 to 20	Good		High
707	*Picea glauca*	White Spruce	10 to 20	Good		High
708	*Picea glauca*	White Spruce	10 to 20	Good		High
709	*Salix spp.*	Willow spp.	30 to 40	Good		High
710	*Acer saccharinum*	Silver Maple	30 to 40	Good		High
711	*Thuja occidentalis*	Eastern White Cedar	10 to 20	Good		High
712	*Acer negundo*	Manitoba Maple	20 to 30	Good		Low
713	*Juniperus spp.*	Juniper spp.	0 to 10	Good		Low
714	*Quercus rubra*	Red Oak	20 to 30	Good		High
715	*Malus spp.*	Apple spp.	0 to 5	Good		Low
716	*Acer saccharinum*	Silver Maple	20 to 30	Good		High
717	*Salix spp.*	Willow spp.	40 to 50	Good		High
718	*Fraxinus americana*	White Ash	0 to 10	Good		Low
719	*Fraxinus americana*	White Ash	0 to 10	Good		Low
720	*Ulmus americana*	White Elm	10 to 20	Good		High
721	*Ulmus americana*	White Elm	10 to 20	Good		High
722	*Ulmus americana*	White Elm	10 to 20	Good		High
723	*Ulmus americana*	White Elm	10 to 20	Good		High
724	*Fraxinus americana*	White Ash	0 to 5	Good		Low
725	*Acer negundo*	Manitoba Maple	0 to 10	Good		Low
726	*Acer negundo*	Manitoba Maple	0 to 10	Good		Low
727	*Acer negundo*	Manitoba Maple	0 to 10	Good		Low
728	*Acer negundo*	Manitoba Maple	0 to 10	Good		Low

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
729	*Acer negundo*	Manitoba Maple	0 to 10	Fair		Low
730	*Acer negundo*	Manitoba Maple	0 to 10	Fair		Low
731	*Acer negundo*	Manitoba Maple	0 to 10	Fair		Low
732	*Acer negundo*	Manitoba Maple	0 to 10	Fair		Low
733	*Acer negundo*	Manitoba Maple	0 to 10	Fair		Low
734	*Acer negundo*	Manitoba Maple	0 to 10	Fair		Low
735	*Acer negundo*	Manitoba Maple	0 to 10	Fair		Low
736	*Salix spp.*	Willow spp.	0 to 10	Fair	Pollarded shrubs	Low
737	*Salix spp.*	Willow spp.	0 to 10	Fair	Pollarded shrubs	Low
738	*Salix spp.*	Willow spp.	0 to 10	Fair	Pollarded shrubs	Low
739	*Salix spp.*	Willow spp.	0 to 10	Fair	Pollarded shrubs	Low
740	*Salix spp.*	Willow spp.	0 to 10	Fair	Pollarded shrubs	Low
741	*Acer platanoides*	Norway Maple	20 to 30	Good		High
742	*Picea abies*	Norway Spruce	20 to 30	Good		High
743	*Picea abies*	Norway Spruce	20 to 30	Good		High
744	*Picea pungens*	Blue Spruce	20 to 30	Good		High
745	*Acer saccharinum*	Silver Maple	20 to 30	Good		High
746	*Ulmus americana*	White Elm	10 to 20	Good		High
747	*Picea glauca*	White Spruce	0 to 10	Good		Low
748	*Picea glauca*	White Spruce	0 to 10	Good		Low
749	*Populus spp.*	Poplar spp.	20 to 30	Good		High
750	*Populus spp.*	Poplar spp.	20 to 30	Good		High
751	*Picea pungens*	Blue Spruce	0 to 10	Good		Low
752	*Acer platanoides*	Norway Maple	0 to 10	Good		Low
753	*Acer platanoides*	Norway Maple	0 to 10	Good		Low
754	*Fraxinus americana*	White Ash	10 to 20	Good		High
755	*Fraxinus americana*	White Ash	10 to 20	Good		High
756	*Fraxinus americana*	White Ash	0 to 10	Good		Low
757	*Fraxinus nigra*	Black Ash	0 to 10	Good		Low
758	*Fraxinus nigra*	Black Ash	0 to 10	Good		Low
759	*Fraxinus nigra*	Black Ash	10 to 20	Good		High
760	*Fraxinus nigra*	Black Ash	10 to 20	Good		High
761	*Fraxinus americana*	White Ash	20 to 30	Good		High
762	*Fraxinus americana*	White Ash	20 to 30	Good		High
763	*Pinus nigra*	Austrian Pine	30 to 40	Good		High

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
764	*Pinus nigra*	Austrian Pine	30 to 40	Good		High
765	*Pinus nigra*	Austrian Pine	10 to 20	Good		High
766	*Pinus nigra*	Austrian Pine	30 to 40	Good		High
767	*Picea pungens*	Blue Spruce	30 to 40	Good		High
768	*Picea abies*	Norway Spruce	10 to 20	Good		High
769	*Fraxinus americana*	White Ash	0 to 10	Good		Low
770	*Picea abies*	Norway Spruce	10 to 20	Good		High
771	*Picea abies*	Norway Spruce	0 to 10	Good		Low
772	*Picea abies*	Norway Spruce	0 to 10	Good		Low
773	*Picea abies*	Norway Spruce	0 to 10	Good		Low
774	*Picea abies*	Norway Spruce	0 to 10	Good		Low
775	*Picea abies*	Norway Spruce	0 to 10	Good		Low
776	*Picea abies*	Norway Spruce	0 to 10	Good		Low
777	*Ulmus americana*	White Elm	20 to 30	Good		Low
778	*Pinus sylvestris*	Scots Pine	0 to 5	Good		Low
779	*Quercus macrocarpa*	Bur Oak	0 to 10	Good		Low
780	*Quercus macrocarpa*	Bur Oak	0 to 10	Good		Low
781	*Ulmus americana*	White Elm	20 to 30	Good		High
782	*Ulmus americana*	White Elm	20 to 30	Good		High
783	*Salix spp.*	Willow spp.	40 to 50	Fair to Poor		Low
784	*Salix spp.*	Willow spp.	40 to 50	Fair to Poor		Low
785	*Fraxinus americana*	White Ash	10 to 20	Good		High
786	*Ulmus americana*	White Elm	20 to 30	Good		High
787	*Ulmus americana*	White Elm	20 to 30	Good		High
788	*Quercus macrocarpa*	Bur Oak	10 to 20	Good		High
789	*Quercus macrocarpa*	Bur Oak	10 to 20	Good		High
790	*Ulmus americana*	White Elm	30 to 40	Good		High
791	*Ulmus americana*	White Elm	30 to 40	Good		High
792	*Salix spp.*	Willow spp.	30 to 40	Good		High
793	*Ulmus americana*	White Elm	20 to 30	Good		High
794	*Quercus macrocarpa*	Bur Oak	10 to 20	Good		High
795	*Quercus macrocarpa*	Bur Oak	30 to 40	Good		High
796	*Picea abies*	Norway Spruce	10 to 20	Good		High
797	*Quercus macrocarpa*	Bur Oak	30 to 40	Good		High
798	*Quercus macrocarpa*	Bur Oak	30 to 40	Good		High

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
799	*Quercus macrocarpa*	Bur Oak	30 to 40	Good		High
800	*Quercus macrocarpa*	Bur Oak	30 to 40	Fair	Multi-stemmed	High
801	*Pinus sylvestris*	Scots Pine	0 to 10	Good		Low
802	*Fraxinus americana*	White Ash	10 to 20	Good		High
803	*Acer saccharinum*	Silver Maple	20 to 30	Good		High
804	*Acer saccharinum*	Silver Maple	20 to 30	Good		High
805	*Fraxinus americana*	White Ash	20 to 30	Good		High
806	*Quercus macrocarpa*	Bur Oak	20 to 30	Good		High
807	*Fraxinus americana*	White Ash	20 to 30	Good		High
808	*Pinus sylvestris*	Scots Pine	10 to 20	Good		High
809	*Fraxinus americana*	White Ash	10 to 20	Good		High
810	*Quercus macrocarpa*	Bur Oak	30 to 40	Good		High
811	*Pinus nigra*	Austrian Pine	20 to 30	Good		High
812	*Pinus nigra*	Austrian Pine	10 to 20	Good		High
813	*Picea abies*	Norway Spruce	20 to 30	Good		High
814	*Acer saccharum*	Sugar Maple	20 to 30	Good		High
815	*Ulmus americana*	White Elm	0 to 10	Good		Low
816	*Picea glauca*	White Spruce	0 to 10	Good		Low
817	*Picea glauca*	White Spruce	10 to 20	Good		High
818	*Picea glauca*	White Spruce	10 to 20	Good		High
819	*Picea glauca*	White Spruce	10 to 20	Good		High
820	*Picea glauca*	White Spruce	10 to 20	Good		High
821	*Acer saccharum*	Sugar Maple	0 to 10	Good		Low
822	*Picea glauca*	White Spruce	10 to 20	Good		High
823	*Picea glauca*	White Spruce	10 to 20	Good		High
824	*Picea glauca*	White Spruce	10 to 20	Good		High
825	*Picea glauca*	White Spruce	10 to 20	Good		High
826	*Picea glauca*	White Spruce	10 to 20	Good		High
827	*Betula papyrifera*	White Birch	10 to 20	Good		High
828	*Salix spp.*	Willow spp.	40 to 50	Good		High
829	*Salix spp.*	Willow spp.	40 to 50	Good		High
830	*Picea pungens*	Blue Spruce	30 to 40	Good		High
831	*Acer negundo*	Manitoba Maple	40 to 50	Good		High
832	*Picea glauca*	White Spruce	30 to 40	Good		High
833	*Acer negundo*	Manitoba Maple	20 to 30	Good		High

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
834	*Picea glauca*	White Spruce	20 to 30	Good		High
835	*Picea glauca*	White Spruce	20 to 30	Good		High
836	*Acer negundo*	Manitoba Maple	30 to 40	Good	4 stems	High
837	*Salix spp.*	Willow spp.	20 to 30	Good	3 stems	High
838	*Fraxinus pennsylvanica*	Red Ash	0 to 10	Good		Low
839	*Fraxinus americana*	White Ash	0 to 10	Good		Low
840	*Juniperus spp.*	Juniper spp.	10 to 20	Good		High
841	*Picea abies*	Norway Spruce	10 to 20	Good		High
842	*Picea abies*	Norway Spruce	0 to 10	Good		Low
843	*Picea abies*	Norway Spruce	0 to 10	Good		Low
844	*Juniperus spp.*	Juniper spp.	0 to 10	Good		Low
845	*Fraxinus americana*	White Ash	10 to 20	Good	3 stems	High
846	*Picea abies*	Norway Spruce	10 to 20	Good		High
847	*Picea abies*	Norway Spruce	10 to 20	Good		High
848	*Pinus sylvestris*	Scots Pine	10 to 20	Good		High
849	*Pinus sylvestris*	Scots Pine	10 to 20	Good		High
850	*Picea abies*	Norway Spruce	20 to 30	Good		High
851	*Fraxinus americana*	White Ash	20 to 30	Good		High
852	*Picea abies*	Norway Spruce	20 to 30	Good		High
853	*Fraxinus americana*	White Ash	20 to 30	Good		High
854	*Picea abies*	Norway Spruce	20 to 30	Good		High
855	*Morus alba 'Pendula'*	Weeping Mulberry	< 10	Good		Low
856	*Picea abies*	Norway Spruce	10 to 20	Good		High
857	*Picea abies*	Norway Spruce	10 to 20	Good		High
858	*Picea abies*	Norway Spruce	10 to 20	Good		High
859	*Picea abies*	Norway Spruce	20 to 30	Good		High
860	*Picea abies*	Norway Spruce	10 to 20	Good		High
861	*Picea abies*	Norway Spruce	10 to 20	Good		High
862	*Picea abies*	Norway Spruce	10 to 20	Good		High
863	*Picea abies*	Norway Spruce	10 to 20	Good		High
864	*Picea abies*	Norway Spruce	10 to 20	Good		High
865	*Picea abies*	Norway Spruce	10 to 20	Good		High
866	*Picea abies*	Norway Spruce	10 to 20	Good		High
867	*Picea abies*	Norway Spruce	10 to 20	Good		High
868	*Picea abies*	Norway Spruce	10 to 20	Good		High

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
869	*Picea abies*	Norway Spruce	10 to 20	Good		High
870	*Picea abies*	Norway Spruce	20 to 30	Good		High
871	*Salix spp.*	Willow spp.	30 to 40/ 40 to 50/ cut off	Good	3 stems; different diameter	High
872	*Betula papyrifera*	White Birch	10 to 20	Good		High
873	*Picea abies*	Norway Spruce	10 to 20	Fair to Poor		Low
874	*Picea abies*	Norway Spruce	10 to 20	Fair to Poor		Low
875	*Picea abies*	Norway Spruce	10 to 20	Fair to Poor		Low
876	*Picea abies*	Norway Spruce	10 to 20	Fair to Poor		Low
877	*Picea abies*	Norway Spruce	10 to 20	Good		High
878	*Picea abies*	Norway Spruce	10 to 20	Good		High
879	*Picea abies*	Norway Spruce	0 to 10	Good		Low
880	*Crataegus spp.*	Hawthorn spp.	0 to 10	Good		Low
881	*Populus spp.*	Poplar spp.	20 to 30	Good		High
882	*Malus spp.*	Apple spp.	20 to 30	Good		High
883	*Acer negundo*	Manitoba Maple	20 to 30	Good		Low
884	*Acer saccharinum*	Silver Maple	20 to 30	Good		High
885	*Picea glauca*	White Spruce	20 to 30	Good		High
886	*Salix spp.*	Willow spp.	40 to 50	Good		High
887	*Acer saccharinum*	Silver Maple	20 to 30	Good		High
888	*Acer saccharinum*	Silver Maple	30 to 40	Good		High
889	*Acer saccharinum*	Silver Maple	20 to 30	Good		High
890	*Fraxinus pennsylvanica*	Red Ash	10 to 20	Good		High
891	*Fraxinus pennsylvanica*	Red Ash	20 to 30	Good		High
892	*Ulmus americana*	White Elm	20 to 30	Good		High
893	*Salix spp.*	Willow spp.	20 to 30	Good		High
894	*Salix spp.*	Willow spp.	20 to 30	Good		High
895	*Salix spp.*	Willow spp.	20 to 30	Good		High
896	*Salix spp.*	Willow spp.	20 to 30	Good		High
897	*Salix spp.*	Willow spp.	20 to 30	Good		High
898	*Salix spp.*	Willow spp.	20 to 30	Good		High
899	*Salix spp.*	Willow spp.	20 to 30	Good		High
900	*Salix spp.*	Willow spp.	30 to 40	Good		High
901	*Fraxinus americana*	White Ash	0 to 10	Good		Medium
902	*Pinus sylvestris*	Scots Pine	20 to 30	Good		High

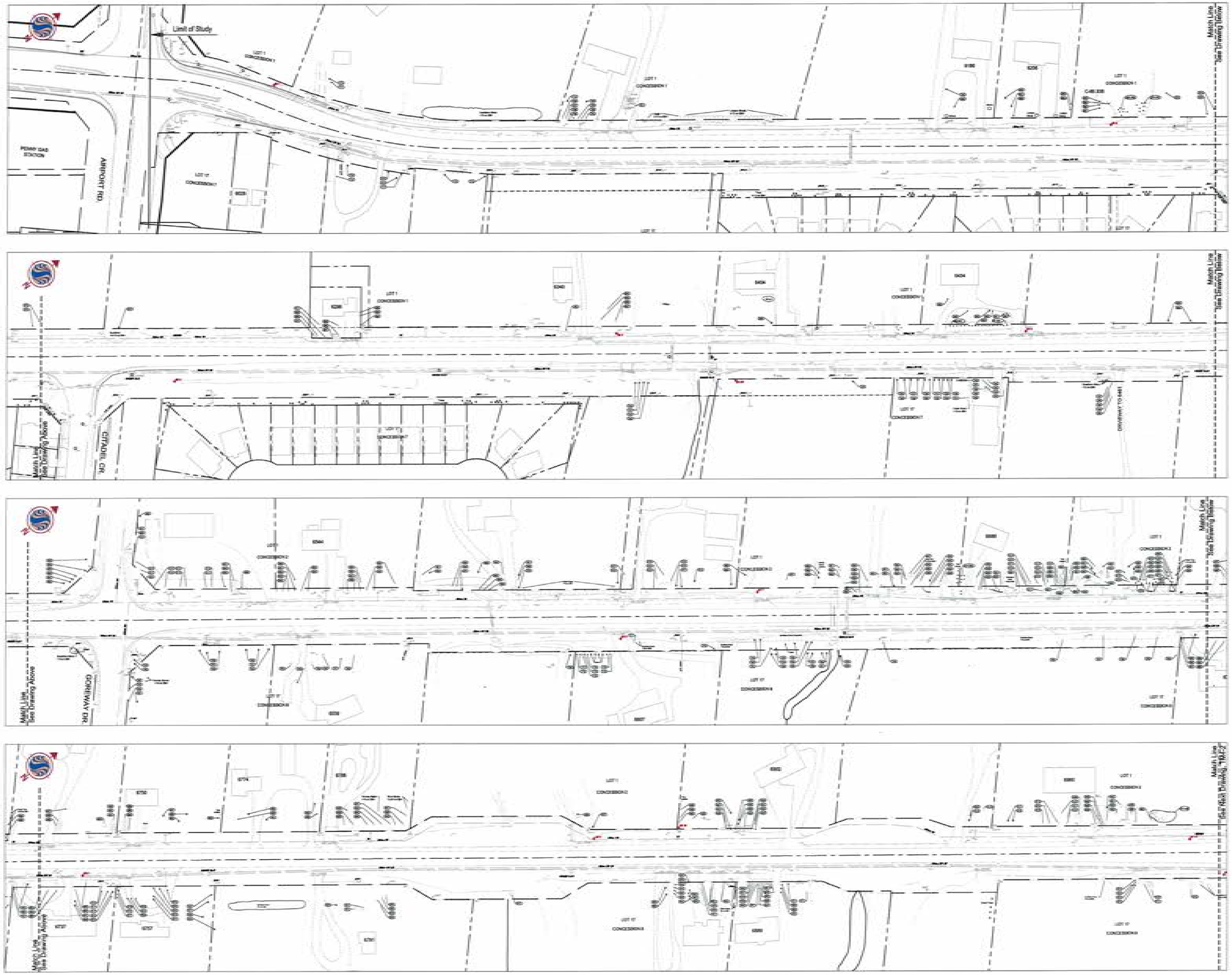
Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
903	*Robinia pseudoacacia*	Black Locust	0 to 10	Good		Low
904	*Acer saccharinum*	Silver Maple	20 to 30	Good		High
905	*Picea abies*	Norway Spruce	10 to 20	Good		High
906	*Salix spp.*	Willow spp.	30 to 40	Good		High
907	*Salix spp.*	Willow spp.	30 to 40	Good		High
908	*Salix spp.*	Willow spp.	30 to 40	Good		High
909	*Salix spp.*	Willow spp.	30 to 40	Good		High
910	*Salix spp.*	Willow spp.	30 to 40	Good		High
911	*Prunus spp.*	Cherry spp.	10 to 20	Good		High
912	*Thuja occidentalis*	Eastern White Cedar	10 to 20	Good	Multi-stemmed	High
913	*Thuja occidentalis*	Eastern White Cedar	10 to 20	Good		High
914	*Thuja occidentalis*	Eastern White Cedar	10 to 20	Good		High
915	*Thuja occidentalis*	Eastern White Cedar	10 to 20	Good		High
916	*Picea abies*	Norway Spruce	10 to 20	Good		High
917	*Fraxinus americana*	White Ash	0 to 10	Good	7 stems	Low
918	*Fraxinus pennsylvanica*	Red Ash	0 to 10	Good		Low
919	*Fraxinus pennsylvanica*	Red Ash	0 to 10	Good		Low
920	*Fraxinus pennsylvanica*	Red Ash	0 to 10	Good		Low
921	*Fraxinus pennsylvanica*	Red Ash	0 to 10	Good		Low
922	*Picea abies*	Norway Spruce	10 to 20	Good		High
923	*Picea abies*	Norway Spruce	10 to 20	Good		High
924	*Picea abies*	Norway Spruce	10 to 20	Good		High
925	*Picea abies*	Norway Spruce	10 to 20	Good		High
926	*Picea abies*	Norway Spruce	10 to 20	Good		High
927	*Picea abies*	Norway Spruce	10 to 20	Good		High
928	*Picea abies*	Norway Spruce	10 to 20	Good		High
929	*Pinus sylvestris*	Scots Pine	0 to 10	Good		Low
930	*Pinus sylvestris*	Scots Pine	0 to 10	Good		Low
931	*Pinus sylvestris*	Scots Pine	0 to 10	Good		Low
932	*Pinus sylvestris*	Scots Pine	0 to 10	Good		Low
933	*Pinus sylvestris*	Scots Pine	0 to 10	Good		Low
934	*Pinus sylvestris*	Scots Pine	0 to 10	Good		Low
935	*Pinus sylvestris*	Scots Pine	0 to 10	Good		Low
936	*Pinus sylvestris*	Scots Pine	0 to 10	Good		Low
937	*Pinus sylvestris*	Scots Pine	0 to 10	Good		Low

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
938	*Pinus sylvestris*	Scots Pine	0 to 10	Good		Low
939	*Pinus sylvestris*	Scots Pine	0 to 10	Good		Low
940	*Pinus sylvestris*	Scots Pine	0 to 10	Good		Low
941	*Pinus sylvestris*	Scots Pine	0 to 10	Good		Low
942	*Pinus sylvestris*	Scots Pine	0 to 10	Good		Low
943	*Picea abies*	Norway Spruce	10 to 20	Good		High
944	*Picea abies*	Norway Spruce	10 to 20	Good		High
945	*Picea abies*	Norway Spruce	10 to 20	Good		High
946	*Picea abies*	Norway Spruce	10 to 20	Good		High
947	*Salix spp.*	Willow spp.	10 to 20	Good		High
948	*Salix spp.*	Willow spp.	10 to 20	Good		High
949	*Salix spp.*	Willow spp.	10 to 20	Good		High
950	*Salix spp.*	Willow spp.	10 to 20	Good		High
951	*Salix spp.*	Willow spp.	10 to 20	Good		High
952	*Salix spp.*	Willow spp.	10 to 20	Good		High
953	*Salix spp.*	Willow spp.	10 to 20	Good		High
954	*Salix spp.*	Willow spp.	10 to 20	Good		High
955	*Salix spp.*	Willow spp.	10 to 20	Good		High
956	*Salix spp.*	Willow spp.	10 to 20	Good		High
957	*Fraxinus americana*	White Ash	10 to 20	Good		High
958	*Fraxinus americana*	White Ash	10 to 20	Good		High
959	*Populus spp.*	Poplar spp.	30 to 40	Good		High
960 - 969	*Pinus sylvestris*	Scots Pine	10 to 20	Good		High
970 - 1029	*Pinus sylvestris*	Scots Pine	0 to 10	Good		Medium
1030 - 1034	*Pinus sylvestris*	Scots Pine	10 to 20	Good		High
1035 - 1070	*Pinus nigra*	Austrian Pine	10 to 20	Good	18 trees alternating	High
1035 - 1070	*Pinus sylvestris*	Scots Pine	10 to 20	Good	18 trees alternating	High
1071 - 1081	*Picea abies*	Norway Spruce	10 to 20	Good		High
1082	*Picea abies*	Norway Spruce	20 to 30	Good		High

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
1083	Acer saccharinum	Silver Maple	20 to 30	Good		High
1084	Acer saccharinum	Silver Maple	20 to 30	Good		High
1085	Acer saccharinum	Silver Maple	20 to 30	Good		High
1086	Acer saccharinum	Silver Maple	20 to 30	Good	4 trees	High
1087	*Picea abies*	Norway Spruce	0 to 10	Good	3 trees	Medium
1088	*Fraxinus nigra*	Black Ash	20 to 30	Good		High
1089	*Picea glauca*	White Spruce	20 to 30	Good		High
1090	*Picea pungens*	Blue Spruce	10 to 20	Good		High
1091	Acer saccharinum	Silver Maple	30 to 40	Good		High
1092	Acer saccharinum	Silver Maple	10 to 20	Good		High
1093	Acer saccharinum	Silver Maple	10 to 20	Good		High
1094	Acer saccharinum	Silver Maple	10 to 20	Good		High
1095	*Picea abies*	Norway Spruce	20 to 30	Good		High
1096	*Picea abies*	Norway Spruce	20 to 30	Good		High
1097	*Picea abies*	Norway Spruce	20 to 30	Good		High
1098	*Picea abies*	Norway Spruce	20 to 30	Good		High
1099	*Juglans nigra*	Black Walnut	10 to 20	Good		High
1100	*Picea pungens*	Blue Spruce	10 to 20	Good		High
1101	*Acer saccharinum*	Silver Maple	40 to 50	Good		High
1102	*Acer saccharinum*	Silver Maple	40 to 50	Good		High
1103	*Acer saccharinum*	Silver Maple	40 to 50	Good		High
1104	*Acer saccharinum*	Silver Maple	40 to 50	Good		High
1105	*Juglans nigra*	Black Walnut	20 to 30	Good		High
1106 - 1110	*Picea abies*	Norway Spruce	20 to 30	Good		High
1111	*Picea pungens*	Blue Spruce	10 to 20	Good		High
1112	*Acer saccharinum*	Silver Maple	10 to 20	Good		High
1113	*Picea pungens*	Blue Spruce	10 to 20	Good		High
1114 - 1119	*Acer saccharinum*	Silver Maple	30 to 40	Good		High
1120	*Juglans regia*	English Walnut	0 to 10	Good		Low
1121	*Fraxinus americana*	White Ash	0 to 5	Good		Low
1122	*Fraxinus americana*	White Ash	0 to 10	Good		Low
1123 - 1127	*Pinus sylvestris*	Scots Pine	10 to 20	Good		High

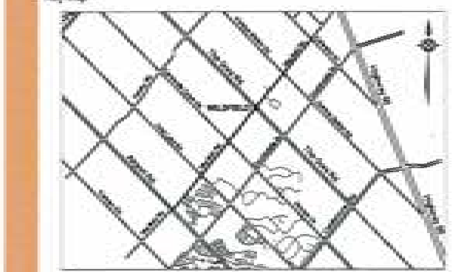
Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
1128	*Picea abies*	Norway Spruce	20 to 30	Good		High
1129	*Picea abies*	Norway Spruce	20 to 30	Good		High
1130 - 1133	*Acer saccharum*	Sugar Maple	20 to 30	Good		High
1134	*Fraxinus americana*	White Ash	10 to 20	Good	10 stems	High
1135 - 1144	*Pinus nigra*	Austrian Pine	10 to 20	Good		High
1145 - 1158	*Picea abies*	Norway Spruce	10 to 20	Good		High
1159	*Acer saccharum*	Sugar Maple	10 to 20	Good		High
1160	*Fraxinus pennsylvanica*	Red Ash	10 to 20	Good	2 trees	High
1161	*Picea abies*	Norway Spruce	30 to 40	Good		High
1162	*Populus spp.*	Poplar spp.	10 to 20	Good		High
1163	*Populus spp.*	Poplar spp.	10 to 20	Good		High
1164	*Picea abies*	Norway Spruce	0 to 10	Good		Low
1165	*Picea abies*	Norway Spruce	0 to 10	Good		Low
1166	*Picea abies*	Norway Spruce	10 to 20	Good		High
1167	*Picea abies*	Norway Spruce	10 to 20	Good		High
1168	*Picea abies*	Norway Spruce	10 to 20	Good		High
1169	*Picea abies*	Norway Spruce	0 to 10	Good		Low
1170	*Picea abies*	Norway Spruce	0 to 10	Good		Low
1171 - 1175	*Robinia pseudoacacia*	Black Locust	0 to 10	Good		Low
1176 - 1183	*Thuja occidentalis*	Eastern White Cedar	10 to 20	Good		High
1184	*Acer negundo*	Manitoba Maple	0 to 10	Good	12 stems	Low
1185	*Ulmus americana*	White Elm	20 to 30	Good		High
1186 - 1193	*Picea abies*	Norway Spruce	10 to 20	Good		High
1194 - 1196	*Acer negundo*	Manitoba Maple	30 to 40	Good to Fair		Low
1197	*Fraxinus pennsylvanica 'subintegerrima'*	Green Ash	30 to 40	Good		High
1198	*Quercus macrocarpa*	Bur Oak	20 to 30	Good		High
1199	*Acer negundo*	Manitoba Maple	10 to 20	Good	4stems	Low

Tree ID	Botanical Name	Common Name	Diameter Class (cm)	Condition	Comments	Preservation Priority
1200	*Acer negundo*	Manitoba Maple	0 to 10	Good	2 stems	Low
1201	*Acer negundo*	Manitoba Maple	10 to 20	Good		Low
1202	*Acer negundo*	Manitoba Maple	10 to 20	Good		Low
1203	*Acer negundo*	Manitoba Maple	30 to 40	Good		Low
1204	*Acer negundo*	Manitoba Maple	30 to 40	Good		Low
1205	*Acer negundo*	Manitoba Maple	30 to 40 / 20 to 30	Good	2 stems	Low
1206	*Acer negundo*	Manitoba Maple	0 to 10	Good		Low
1207	*Acer negundo*	Manitoba Maple	20 to 30	Good		Low
1208	*Acer negundo*	Manitoba Maple	10 to 20	Good		Low
1209	*Salix spp.*	Willow spp.	20 to 30/ 30 to 40	Good	2 stems; one stem topped	High
1210	*Crataegus spp.*	Hawthorn spp.	0 to 10	Fair	Multiple stems	Low
1211	*Fraxinus pennsylvanica*	Red Ash	20 to 30	Good		High
1212	*Fraxinus pennsylvanica*	Red Ash	20 to 30	Good		High
1213	*Fraxinus americana*	White Ash	10 to 20	Good	Tree is pollarded	High
1214	*Fraxinus americana*	White Ash	10 to 20	Good	Tree is pollarded	High
1215	*Betula papyrifera*	White Birch	10 to 20	Good	2 stems	High
1216	*Betula papyrifera*	White Birch	10 to 20	Good		High
1217	*Picea abies*	Norway Spruce	10 to 20	Good	2 stems	High
1218	*Picea abies*	Norway Spruce	0 to 10	Good		Low
1219	*Picea abies*	Norway Spruce	0 to 10	Good		Low
1220	*Fraxinus pennsylvanica*	Red Ash	20 to 30	Good		High
1221	*Fraxinus pennsylvanica*	Red Ash	20 to 30	Good		High
1222	*Catalpas speciosa*	Northern Catalpa	20 to 30	Good		High
1223	*Picea glauca*	White Spruce	0 to 10	Good		Low
1224	*Picea glauca*	White Spruce	10 to 20	Good		High
1225	*Picea glauca*	White Spruce	10 to 20	Good		High
1226	*Acer platanoides*	Norway Maple	10 to 20	Good		High
1227	*Fraxinus americana*	White Ash	10 to 20	Good		High
1228	*Acer saccharum*	Sugar Maple	10 to 20	Good		High
1229	*Gleditsia triacanthos*	Honey Locust	20 to 30	Good		High
1230	*Thuja occidentalis*	Eastern White Cedar	0 to 10	Good		Low



Stantec
Stantec Consulting Ltd.
49 Frederick Street
Kitchener ON Canada
N2H 6M7
Tel. 519.579.4410
Fax. 519.579.6733
www.stantec.com

Key Map



Legend

- 583 Tree Inventory Identification
- Existing Conifers
- Existing Deciduous Trees
- Existing Shrub/Tree Grouping
- Proposed Grading Limit

Revision | By | Appd. | YY.MM.DD

1 ISSUED FOR CITY REVIEW

Issued | By | Appd. | YY.MM.DD

File Name | Dwn. | Chkd. | Dsgn. | YY.MM.DD

Permit-Seal

JENNIFER KOSKINEN
ON-0284A

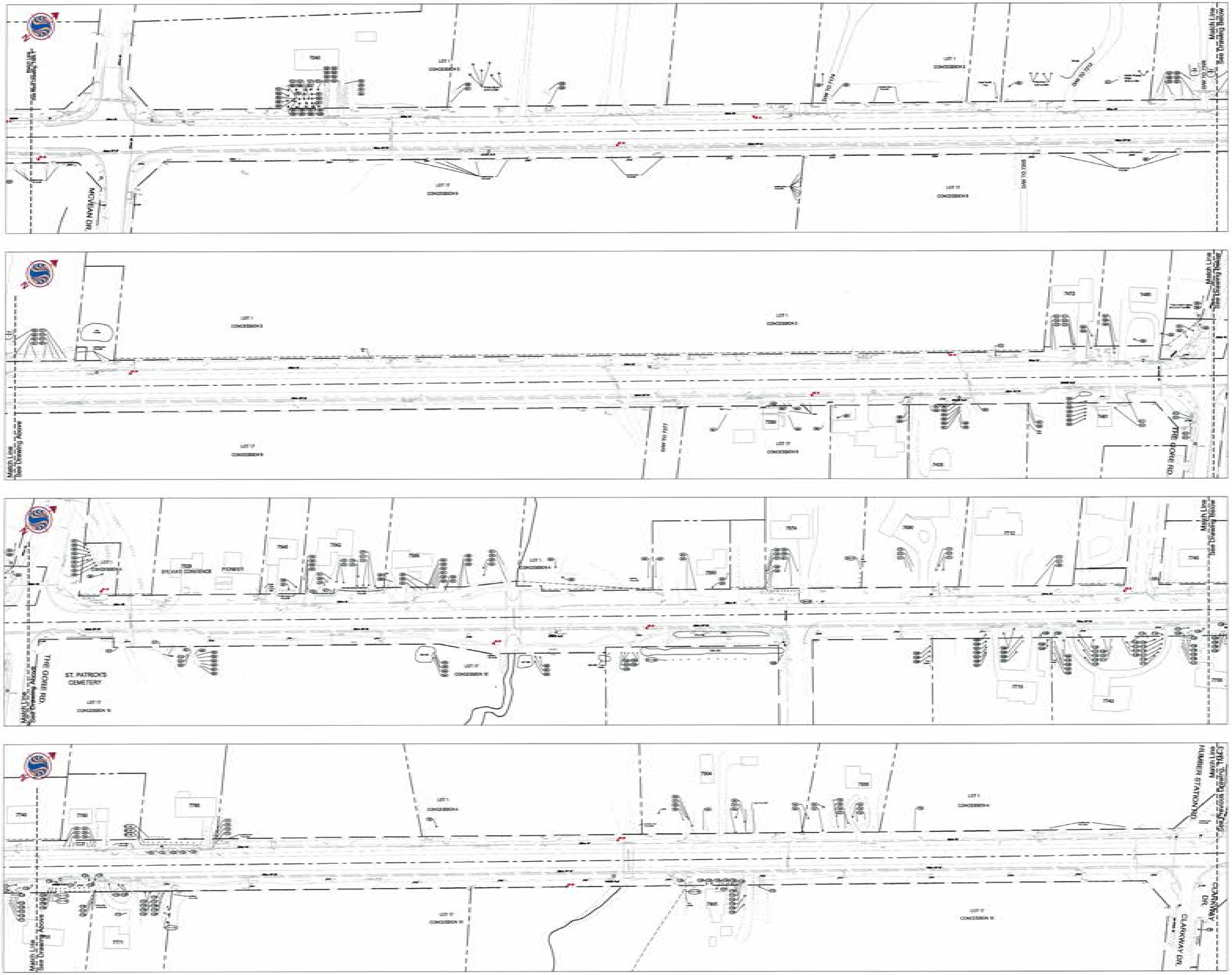
Client/Project

REGION OF PEEL

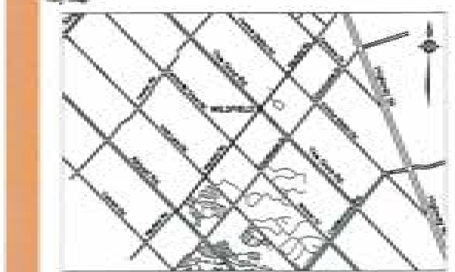
Mayfield Road Class EA
Airport Road to Coleraine Drive
Caledon, ON Canada

Title

TREE INVENTORY PLAN PRELIMINARY DESIGN CONCEPT #4

Project No.	Scale	
160210480	1:1000	
Drawing No.	Sheet	Revision
TM4-1	1 of 3	0

Stantec Consulting Ltd.
49 Frederick Street
Kitchener ON Canada
N2H 6M7
Tel. 519.579.4410
Fax. 519.579.6733
www.stantec.com

Key Map



NTS

Legend

- Tree Inventory Identification
- Existing Conifers
- Existing Deciduous Trees
- Existing Shrub/Tree Grouping
- Proposed Grading Limit

Revision | By | Appd. | YY.MM.DD

1 ISSUED FOR CITY REVIEW | D.G. | J.D.K. | 10.02.18

Issued | By | Appd. | YY.MM.DD

Dwn. D.G. | Chkd. J.D.K. | Dsgn. | YY.MM.DD

Permit-Seal

Client/Project

REGION OF PEEL

Mayfield Road Class EA
Airport Road to Coleraine Drive
Caledon, ON Canada

Title

TREE INVENTORY PLAN
PRELIMINARY DESIGN CONCEPT #4

Project No. 160210480

Scale 0 10 30 50m

Drawing No. TM4-2

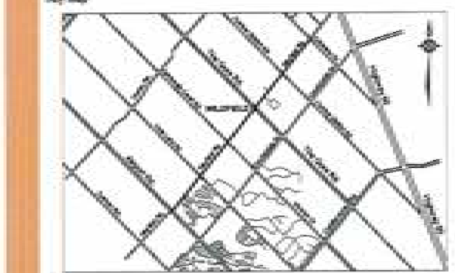
Sheet 2 of 3

Revision 0

Stantec

Stantec Consulting Ltd.
49 Frederick Street
Kitchener ON Canada
N2H 6M7
Tel. 519.579.4410
Fax. 519.579.6733
www.stantec.com

Key Map



Legend

- 583 Tree Inventory Identification
- Existing Conifers
- Existing Deciduous Trees
- Existing Shrub/Tree Grouping

Revision | By | Appd. | YY.MM.DD

Issued | By | Appd. | YY.MM.DD

Dwn. | Chkd. | Dsgn. | YY.MM.DD

Permit-Seal

Client/Project

REGION OF PEEL

Mayfield Road Class EA
Airport Road to Coleraine Drive
Caledon, ON Canada

Title

TREE INVENTORY PLAN
PRELIMINARY DESIGN CONCEPT #4

Project No. | Scale 1:1000 | 0 10 30 50m

Drawing No. TM4-3 | Sheet 3 of 3 | Revision 0

Memo

Stantec

To:	Dave Hallman Kitchener ON Office	From:	Jennifer Koskinen Kitchener ON Office
File:	160210480/14	Date:	February 17, 2010

Reference: Tree Inventory Assessment of Four Road Alignment Options Mayfield Road, Caledon, Ontario

1.0 Introduction

Stantec Consulting Ltd. has been retained by the Region of Peel to review the four proposed Mayfield Road alignment concepts and provide an analysis of the impact to the existing trees. This report has been prepared to support the Class Environmental Assessment.

Mayfield Road extends from the western Region boundary at Winston Churchill Boulevard (Region Road 19) to the eastern Region boundary at Regional Road 50 (formerly Provincial Highway No. 50). The proposed improvements include the section of Mayfield Road between Airport Road and Coleraine Drive. The proposed improvements have been developed to accommodate the increasing volume of traffic from Brampton and Caledon. The improvements include road widening of the existing two lane road to six lanes and intersection re-alignment. Four Preliminary Design Concepts were developed in order to determine which six lane concept would work best from an environmental and engineering perspective.

2.0 Methodology

This study utilizes data collected for the Tree Inventory and Assessment Report (Stantec 2009) completed for this section of Mayfield Road in March 2008. In order to determine the impact to existing vegetation, trees were organized into preservation priority categories. **High preservation priority** trees are trees in good condition and greater than the diameter class of 0 to 10 cm; **Medium priority** are trees in fair condition; and **Low priority** are trees less than 10cm, in poor condition, or invasive, non-native species. The impact to high priority trees has been evaluated in this report. These trees are considered retainable specimens based on health, size, and species. Trees of medium to low preservation priority are not considered to significantly contribute to the social, landscape, or environmental value of the roadway.

In order to determine impacts, inventoried, high priority trees indicated on the drawings (TM4-1 to TM4-3) were tabulated. The quantity of high priority trees within the limit of grading that will be detrimentally affected by site works were determined for each concept. The impacts for each concept have been summarized within Section 3 of this report.

**Reference: Tree Inventory Assessment of Four Road Alignment Options
Mayfield Road, Caledon, Ontario**

3.0 Observations and Analysis

The total number of high priority trees that were inventoried within the proposed project boundary is 779* trees. This number will be compared to the number of trees impacted by each concept below.

3.1 Preliminary Design Concept #1

This concept widens Mayfield Road equally about the existing centerline of Mayfield Road (i.e. equal widening about both sides of Mayfield Road)

The number of trees impacted in total is approximately 641; 365 on the north side, and 276 on the south.

3.2 Preliminary Design Concept #2

This concept widens Mayfield Road primarily to the north, with limited grading extending outside existing ROW to the south.

The number of trees impacted that were inventoried is approximately 468; 443 on the north, and 25 on the south.

3.3 Preliminary Design Concept #3

This concept widens Mayfield Road primarily to the south, with limited grading extending outside of the existing ROW to the north.

The number of trees impacted that were inventoried is approximately 446; 158 on the north, and 288 on the south.

3.4 Preliminary Design Concept #4

This concept widens Mayfield Road about centerline, with modifications to the north and south to minimize property impacts.

The number of trees impacted in total is approximately 559; 314 on the north, and 245 on the south.

4.0 Recommendations

Reviewing all four concepts and tree data it is determined that Concept #2 and #3 would be the least favourable concept due to the fact that both concepts would require the removal of all or the majority of the trees in the front yards of the residence that live on the north (Concept #2), or the south (Concept #3) along Mayfield Road. Either concept would not be favourable with public perception, and would not provide space in most areas for roadside planting.

*Note: Inventory includes high priority trees identified in the March 2008 site investigation. This inventory includes the majority of the trees within the proposed concepts, but due to temporal variation between site inventory and concept development, it is not a comprehensive indication of the absolute quantity of trees that will be affected by Concept #2 and Concept #3.

Concept #1 and #4 have similar roadway alignments and limits of grading. Concept #4 has limited the amount of disturbance, and as such has less effect on the existing vegetation than Concept #1. Although Concept #4 effects a greater quantity of the inventoried trees than #2 or #3, the impacts to vegetation adjacent to the residents is limited, and as such it is the recommended alignment.

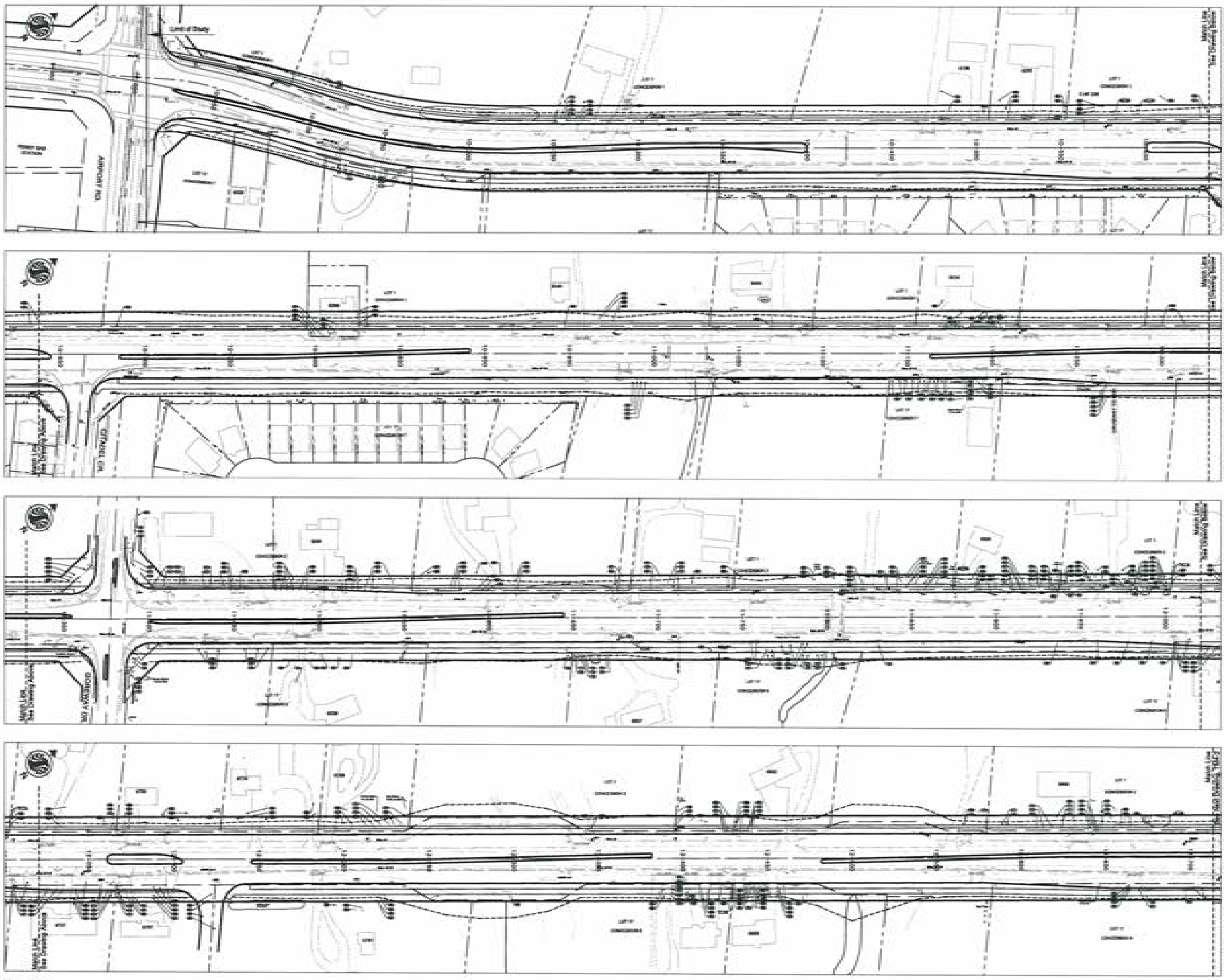
STANTEC CONSULTING LTD.

Jennifer Koskinen, HBESfcon
ISA Certified Arborist ON-1234A
jennifer.koskinen@stantec.com

Reviewed By:
Steve Bendo, OALA, CSLA
ISA Certified Arborist ON-1245A
Landscape Architect
steve.bendo@stantec.com

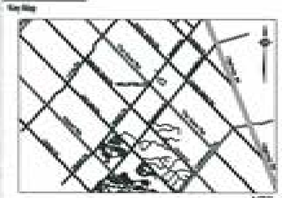
Attachment: Drawings, TM4-1, TM4-2, TM4-3

jdk w:\active\160210480\design\report\tree management\option assessment\mem_b17-10_jk_mayfieldroad_assmnt.doc



Stantec Consulting Ltd.
Kitchener, ON Canada
www.stantec.com

Key Map



Legend

- Tree Inventory Identification
- Existing Conifers
- Existing Deciduous Trees
- Existing Shrub/Tree Grouping
- Proposed Grading Limit

Client/Project

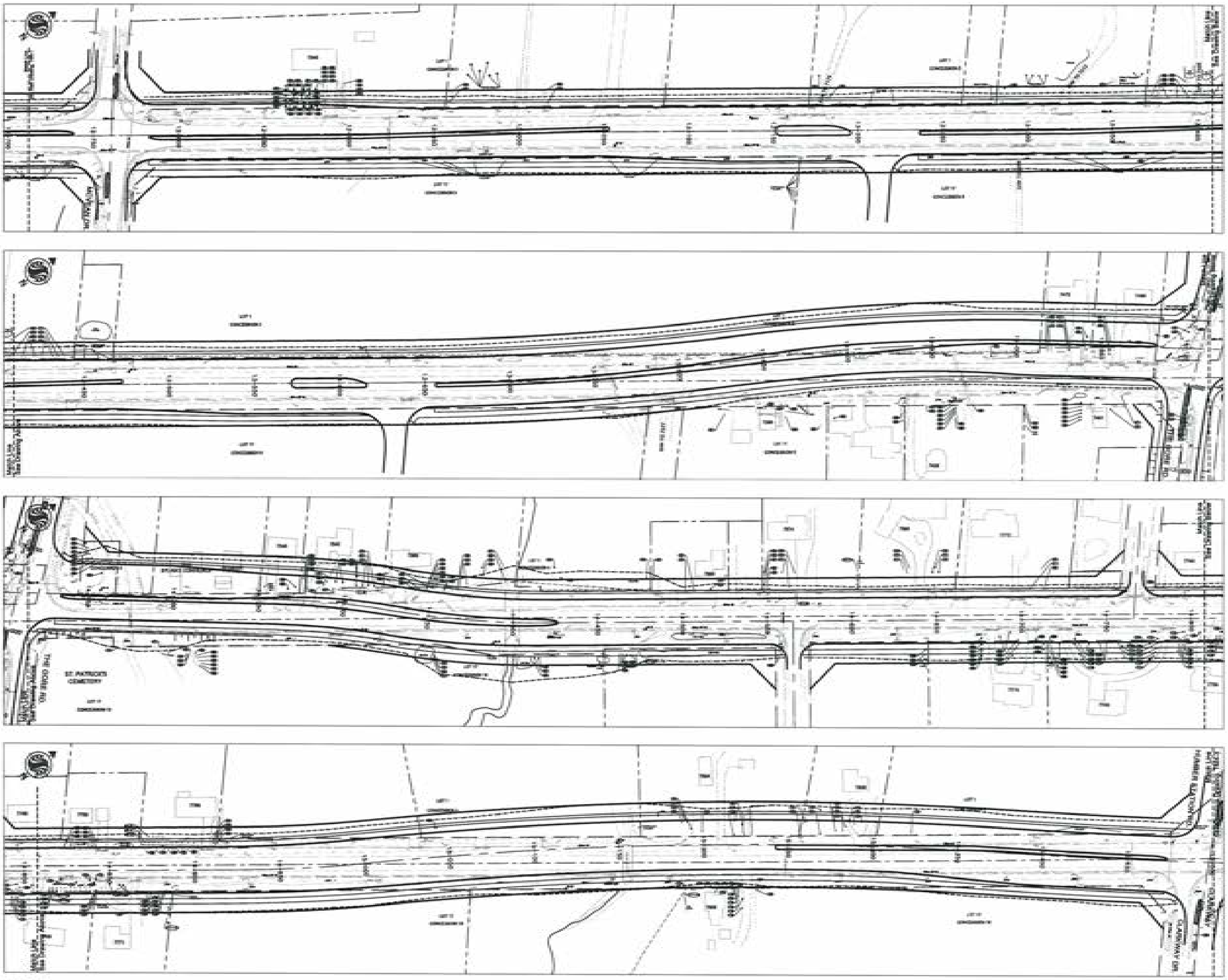
REGION OF PEEL

Mayfield Road Class EA
Airport Road to Coleraine Drive
Caledon, ON Canada

Title

TREE INVENTORY PLAN
PRELIMINARY DESIGN CONCEPT #4

Drawing No. TM4-1 | Sheet 1 of 3 | Revision 0



Stantec

Stantec Consulting Ltd.

Copyright Reserved

Key Map

Legend

Tree Inventory Identification

Existing Conifers

Existing Deciduous Trees

Existing Shrub/Tree Grouping

Proposed Grading Limit

Revision

Issued

Permit-Seal

Client/Project

REGION OF PEEL

Mayfield Road Class EA
Airport Road to Coleraine Drive
Caledon, ON Canada

Title

TREE INVENTORY PLAN
PRELIMINARY DESIGN CONCEPT #4

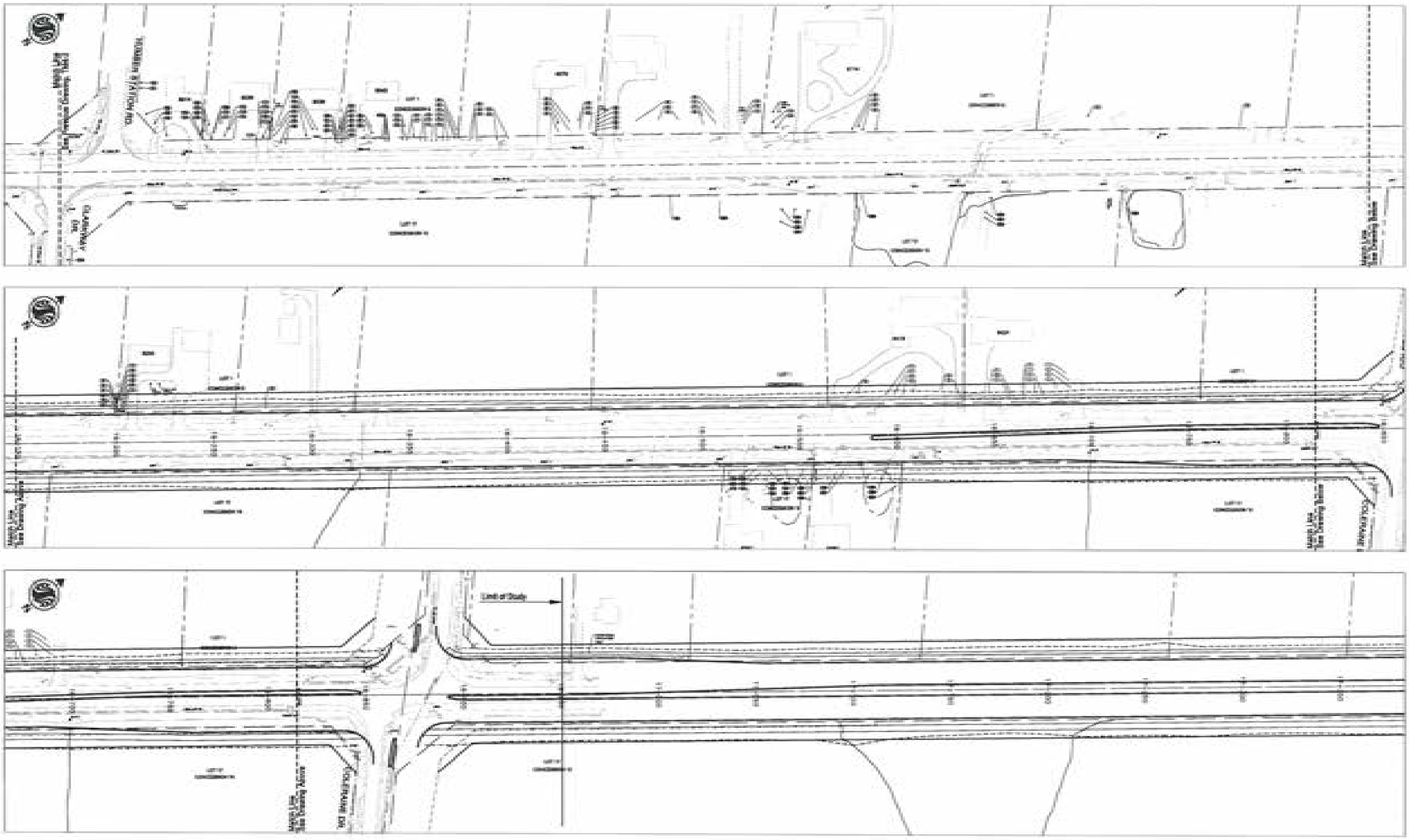
Project No.

Scale

Drawing No. TM4-2

Sheet 2 of 3

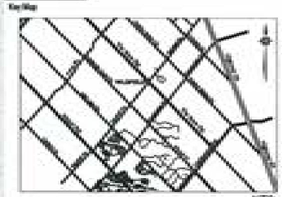
Revision 0



Stantec
Stantec Consulting Ltd.

Copyright Reserved

Key Map



Legend

- Tree Inventory Identification
- Existing Conifers
- Existing Deciduous Trees
- Existing Shrub/Tree Grouping

Revision

Issued

Permit-Seal

Client/Project

REGION OF PEEL

Mayfield Road Class EA
Airport Road to Coleraine Drive
Caledon, ON Canada

Title

TREE INVENTORY PLAN
PRELIMINARY DESIGN CONCEPT #4

Project No.	Scale
Drawing No.	Sheet	Revision
TM4-3	3 of 3	0

APPENDIX H

CULVERT & BRIDGE ASSESSMENT

CSP Culvert, Concrete Culvert & Bridge Inspection Report Mayfield Road EA - Airport Road to Coleraine Drive

Prepared for:

Region of Peel

Prepared by:

Stantec Consulting Ltd.
49 Frederick Street
Kitchener ON N2H 6M7

Project 1602-10480

October 2007

Site Number: 140-700

Inventory Data:

Structure Name:	Shaw's Bridge		
Highway Name:	Mayfield Road	Main Highway:	On: ☒ Under: ☐
Structure Location:	3 km W of the Gore Rd	Owner:	
County:		AADT:	
Township:		Inspection Route Sequence:	
Structure Type:	Rigid Frame	Interchange Number:	
Total Deck Area:	109 (Sq.m)	Skew Angle:	0
Total Deck Length:	9.1 (m)	Overall Structure Width:	11.94 (m)
No. of Spans:	1	Roadway Width:	11.05 (m)
Span Lengths:	9.10 (m)		
Direction of structure:	E-W		

Historical Data:

Year Built:	1957		
Evaluation Year:		Current Load Limit:	
Latest Biennial Inspection:		Last Bridge Master Inspect.:	
Last Condition Survey:		Last Underwater Inspect.:	

Rehab. History: (Date / description) 2004 – new PL-2 barriers, deck soffit and exterior repairs; waterproof & paving

Regional Priority Number: Programmed Work Year:

Nature of Program Work:

Appraisal Indices:		Comments:
Fatigue:		
Seismic:		
Scour:		
Flood:		
Geometrics:		Minimum Vertical Clearance: 2 m (2.41 at CL)
Barrier:		
Curb:		
Load Capacity:		

Site Number: 140-700

Field Inspection Information:		
Date of Inspection:	November 1, 2007	
Inspector:	Peter Roscoe	
Others in Party:	Matt Sim	
Equipment Used:	Hammer, tape, waders	
Weather:	Cloudy	
Temperature (°C):	8	

Additional Investigations Required:	Priority		
	None	Normal	Urgent
Detailed Deck Condition Survey:			
DART Survey:			
Detailed Coating Condition Survey:			
Underwater Investigation:			
Fatigue Investigation:			
Seismic Investigation:			
Structure Evaluation:			
Load Limit Posting – Estimated Load:			

Special Notes:

Bird nests

Next Biennial Inspection:	

Suspected Performance Deficiencies

00	None	06	Bearings not uniformly loaded/unstable	12	Slippery surface
01	Load carrying capacity	07	Jammed expansion joint	13	Flooding/channel blockage
02	Excessive deformations (deflections and rotations)	08	Pedestrian/vehicular hazard	14	Undermining of foundation
03	Continuing settlement	09	Rough riding surface	15	Unstable embankments
04	Continuing movements	10	Surface ponding	16	Other
05	Seized bearings	11	Deck drainage		

Maintenance Needs

01	Lift and Swing Bridge Maintenance	07	Repairs to Structural Steel	13	Erosion Control at Bridges
02	Bridge Cleaning	08	Repair of Bridge concrete	14	Concrete Sealing
03	Bridge handrail Maintenance	09	Repair of Bridge Timber	15	Rout and Seal
04	Painting Steel Bridge Structures	10	Bailey bridges – Maintenance	16	Bridge Deck Drainage
05	Bridge Deck Joint repair	11	Animal/Pest Control	17	Other
06	Bridge Bearing Maintenance	12	Bridge Surface Repair		

Site Number: 140-700

Element data

Element Group:	Foundation	Length:	(m)
Element Name:		Width:	(m)
Location:		Height:	(m)
Material:		Count:	
Element Type :		Total Quantity	(Sq.m)
Environment :	Benign ☒ Moderate ☐ Severe ☐	Not Inspected:	☒

Condition Data:	Units	Exc.	Good	Fair	Poor	Perform. Deficiencies	Maint. Needs
	Sq.m					00	

Comments:

Maintenance Needs

Performance Deficiencies

00-None

Recommendations: Work required

None ☒ 6-10 years ☐ 1-5 years ☐ <1 year ☐ Urgent ☐

Element Group:	Abutments	Length:	12.1 (m)
Element Name:	Walls	Width:	(m)
Location:	Both abutments	Height:	2 (m)
Material:		Count:	
Element Type:		Total Quantity	49 (Sq.m)
Environment:	Benign ☒ Moderate ☐ Severe ☐	Not Inspected:	☐

Condition Data:	Units	Exc.	Good	Fair	Poor	Perform. Deficiencies	Maint. Needs
	Sq.m		48	1		00	

Comments:
- patches have narrow random cracks
- 6 abutment drains (active)
- narrow vertical cracks (0.5mE)
- medium horizontal cracks (0.2mE)
- medium scaling ($0.1m^2E$)
- rust stains
- medium honeycombing ($0.1m^2$)

Maintenance Needs

Performance Deficiencies

00-None

Recommendations: Work required

None ☒ 6-10 years ☐ 1-5 years ☐ <1 year ☐ Urgent ☐

Site Number: 140-700

Element Group:	Abutments					Length:	6 (m)
Element Name:	Wingwalls					Width:	(m)
Location:						Height:	2.85 (m)
Material:						Count:	4
Element Type:						Total Quantity	35 (Sq.m)
Environment:	Benign ☒	Moderate ☐		Severe ☐		Not Inspected:	☐
Condition Data:	Units	Exc.	Good	Fair	Poor	Perform. Deficiencies	Maint. Needs
	Sq.m		33	2		00	

Comments: – map cracking (SE)

Maintenance Needs

Performance Deficiencies

00-None

Recommendations: Work required

None ☒ 6-10 years ☐ 1-5 years ☐ <1 year ☐ Urgent ☐

Element Group:	Approaches					Length:	0.5 (m)
Element Name:	Curb & Gutter					Width:	0.2 (m)
Location:						Height:	0.15 (m)
Material:						Count:	4
Element Type:						Total Quantity	1 (Sq.m)
Environment:	Benign ☐	Moderate ☐		Severe ☒		Not Inspected:	☐
Condition Data:	Units	Exc.	Good	Fair	Poor	Perform. Deficiencies	Maint. Needs
	Sq.m		1			00	

Comments:
– concrete spillway (x 4 corners, beyond approach)
– light spall SE

Maintenance Needs

Performance Deficiencies

00-None

Recommendations: Work required

None ☒ 6-10 years ☐ 1-5 years ☐ <1 year ☐ Urgent ☐

Site Number: 140-700

Element Group:	Approaches					Length:	(m)
Element Name:	Posts					Width:	(m)
Location:						Height:	(m)
Material:						Count:	81
Element Type:						Total Quantity	81 (ea)
Environment:	Benign ☐	Moderate ☒		Severe ☐		Not Inspected:	☐
Condition Data:	Units	Exc.	Good	Fair	Poor	Perform. Deficiencies	Maint. Needs
	ea	81				00	

Comments:
– wood (south – extruders)
– steel (5 x 8)
– steel (north)

Maintenance Needs

Performance Deficiencies

00-None

Recommendations: Work required

None ☒ 6-10 years ☐ 1-5 years ☐ <1 year ☐ Urgent ☐

Element Group:	Barriers					Length:	3.8 (m)
Element Name:	Railing System					Width:	(m)
Location:	Approaches					Height:	(m)
Material:	Steel					Count:	36
Element Type:	SBGR & Channel					Total Quantity	137 (m)
Environment:	Benign ☐	Moderate ☒		Severe ☐		Not Inspected:	☐
Condition Data:	Units	Exc.	Good	Fair	Poor	Perform. Deficiencies	Maint. Needs
	m	137				00	

Comments:
– 2 extruders (N)
– 2 fishtails (S)

Maintenance Needs

Performance Deficiencies

00-None

Recommendations: Work required

None ☒ 6-10 years ☐ 1-5 years ☐ <1 year ☐ Urgent ☐

Site Number: 140-700

Element Group:	Barriers	Length:	21.03 (m)
Element Name:	Barrier / Parapet Walls	Width:	(m)
Location:	Interior	Height:	.82 (m)
Material:	Concrete	Count:	2
Element Type:	Safety shape	Total Quantity	35 (Sq.m)
Environment:	Benign ☐ Moderate ☐ Severe ☒	Not Inspected:	☐

Condition Data:	Units	Exc.	Good	Fair	Poor	Perform. Deficiencies	Maint. Needs
	Sq.m	28		6	1	00	

Comments:
– 0.53 x 1.06 end posts
– medium vertical cracks (S x 14) (N x 12)
– wide vertical cracks (S x 1)

Maintenance Needs

Performance Deficiencies

00-None

Recommendations: Work required

None ☒ 6-10 years ☐ 1-5 years ☐ <1 year ☐ Urgent ☐

Element Group:	Barriers	Length:	19.87 (m)
Element Name:	Hand Railings	Width:	(m)
Location:		Height:	0.1 (m)
Material:		Count:	2
Protection System:	Galvanized	Total Quantity	40 (m)
Environment:	Benign ☐ Moderate ☐ Severe ☒	Not Inspected:	☐

Condition Data:	Units	Exc.	Good	Fair	Poor	Perform. Deficiencies	Maint. Needs
	m	40				00	

Comments: – (21.07 – 0.58) x 2 = length

Maintenance Needs

Performance Deficiencies

00-None

Recommendations: Work required

None ☒ 6-10 years ☐ 1-5 years ☐ <1 year ☐ Urgent ☐

Site Number: 140-700

Element Group:	Coating					Length:	19.87 (m)
Element Name:	Railing Systems / Hand Railing					Width:	(m)
Location:						Height:	0.1 (m)
Material:	Galvanizing					Count:	2
Element Type:						Total Quantity	12 (m)
Environment:	Benign ☐	Moderate ☐	Severe ☒			Not Inspected:	☐
Condition Data:	Units	Exc.	Good	Fair	Poor	Perform. Deficiencies	Maint. Needs
	m	12				00	

Comments:

Maintenance Needs

Performance Deficiencies

00-None

Recommendations: Work required

None ☒ 6-10 years ☐ 1-5 years ☐ <1 year ☐ Urgent ☐

Element Group:	Decks					Length:	9.1 (m)
Element Name:	Deck Top					Width:	12.1 (m)
Location:						Height:	(m)
Material:						Count:	
Element Type:						Total Quantity	111 (Sq.m)
Environment:	Benign ☐	Moderate ☒	Severe ☐			Not Inspected:	☐
Condition Data:	Units	Exc.	Good	Fair	Poor	Perform. Deficiencies	Maint. Needs
	Sq.m		111			00	

Comments:

Maintenance Needs

Performance Deficiencies

00-None

Recommendations: Work required

None ☒ 6-10 years ☐ 1-5 years ☐ <1 year ☐ Urgent ☐

Site Number: 140-700

Element Group:	Deck					Length:	1.0 (m)
Element Name:	Drainage					Width:	(m)
Location:						Height:	(m)
Material:						Count:	4
Protection System:	Galvanized					Total Quantity	4 (ea)
Environment:	Benign ☐	Moderate ☐		Severe ☐		Not Inspected:	☐
Condition Data:	Units	Exc.	Good	Fair	Poor	Perform. Deficiencies	Maint. Needs
	ea	4				00	

Comments: – 200 dia., 0.37 projection below deck soffit

Maintenance Needs

Performance Deficiencies

00-None

Recommendations: Work required

None ☒ 6-10 years ☐ 1-5 years ☐ <1 year ☐ Urgent ☐

Element Group:	Barriers					Length:	21.03 (m)
Element Name:	Barrier / Parapet Walls					Width:	(m)
Location:	Exterior					Height:	0.82 (m)
Material:	Concrete					Count:	2
Element Type:	Safety shape					Total Quantity	35 (Sq.m)
Environment:	Benign ☐	Moderate ☐		Severe ☐		Not Inspected:	☐
Condition Data:	Units	Exc.	Good	Fair	Poor	Perform. Deficiencies	Maint. Needs
	Sq.m	27	2	6		00	

Comments: – medium vertical cracks (5 x 9) (N x 6)
– narrow vertical cracks (x 5)

Maintenance Needs

Performance Deficiencies

00-None

Recommendations: Work required

None ☒ 6-10 years ☐ 1-5 years ☐ <1 year ☐ Urgent ☐

Element Group:	Deck					Length:	9.15 (m)
Element Name:	Soffit					Width:	(m)
Location:	Exterior (fascia)					Height:	0.6625 (m) avg
Material:	Concrete					Count:	2
Element Type:						Total Quantity	13 (Sq.m)
Environment:	Benign ☒	Moderate ☐		Severe ☐		Not Inspected:	☐
Condition Data:	Units	Exc.	Good	Fair	Poor	Perform. Deficiencies	Maint. Needs
	Sq.m		12	1		00	

Comments:
- thickness at ends = 0.85
- thickness at midspan = 0.475
- concrete patches
- rust (0.1 m^2)
- medium scaling (0.5 m^2)

Maintenance Needs

Performance Deficiencies

00-None

Recommendations: Work required

None ☒ 6-10 years ☐ 1-5 years ☐ <1 year ☐ Urgent ☐

Element Group:	Decks					Length:	9.10 (m)
Element Name:	Soffit – Thin Slab					Width:	12.1 (m)
Location:	Interior					Height:	(m)
Material:	Concrete					Count:	
Element Type:						Total Quantity	111 (Sq.m)
Environment:	Benign ☒	Moderate ☐		Severe ☐		Not Inspected:	☐
Condition Data:	Units	Exc.	Good	Fair	Poor	Perform. Deficiencies	Maint. Needs
	Sq.m		109	1	1	00	

Comments:
- medium longitudinal cracks (1.5)
- stained medium longitudinal cracks (1.65)
- concrete patches

Maintenance Needs

Performance Deficiencies

00-None

Recommendations: Work required

None ☒ 6-10 years ☐ 1-5 years ☐ <1 year ☐ Urgent ☐

Site Number: 140-700

Element Group:	Deck	Length:	9.1 (m)
Element Name:	Wearing Surface	Width:	11.05 (m)
Location:		Height:	(m)
Material:		Count:	
Element Type:		Total Quantity	101 (Sq.m)
Environment:	Benign ☐ Moderate ☐ Severe ☒	Not Inspected:	☐

Condition Data:	Units	Exc.	Good	Fair	Poor	Perform. Deficiencies	Maint. Needs
	Sq.m		101			00	

Comments: – light ravelling

Maintenance Needs

Performance Deficiencies

00-None

Recommendations: Work required

None ☒ 6-10 years ☐ 1-5 years ☐ <1 year ☐ Urgent ☐

Element Group:	Embankments	Length:	(m)
Element Name:	Embankments	Width:	(m)
Location:		Height:	(m)
Material:		Count:	
Element Type:		Total Quantity	all
Environment:	Benign ☒ Moderate ☐ Severe ☐	Not Inspected:	☐

Condition Data:	Units	Exc.	Good	Fair	Poor	Perform. Deficiencies	Maint. Needs
	all		2		2	15	

Comments:
– rock protection at SE
– steep (NW)
– erosion (NE)

Maintenance Needs

Performance Deficiencies

15–Unstable Embankments

Recommendations: Work required

Filter fabric & rock protection at NE & NW

None ☐ 6-10 years ☐ 1-5 years ☒ <1 year ☐ Urgent ☐

Site Number: 140-700

Element Group:	Embankments & Streams					Length:	(m)
Element Name:	Streams & Waterways					Width:	(m)
Location:						Height:	(m)
Material:						Count:	
Element Type:						Total Quantity	all
Environment:	Benign ☒	Moderate ☐		Severe ☐		Not Inspected:	☐
Condition Data:	Units	Exc.	Good	Fair	Poor	Perform. Deficiencies	Maint. Needs
	all			1		00	

Comments:
– (NE 0.97 to 0.34 deep)
– vegetation
– meandering

Maintenance Needs

Performance Deficiencies

00-None

Recommendations: Work required

Channelize — None ☐ 6-10 years ☐ 1-5 years ☒ <1 year ☐ Urgent ☐

Element Group:	Approaches					Length:	6 (m)
Element Name:	Wearing Surface					Width:	11.05 (m)
Location:						Height:	(m)
Material:	Asphalt					Count:	2
Element Type:						Total Quantity	133 (Sq.m)
Environment:	Benign ☐	Moderate ☐		Severe ☒		Not Inspected:	☐
Condition Data:	Units	Exc.	Good	Fair	Poor	Perform. Deficiencies	Maint. Needs
	Sq.m		131	2		00	

Comments:
– medium transverse cracks (5m NW, 5m SE)
– minor settlement

Maintenance Needs

Performance Deficiencies

00-None

Recommendations: Work required

None ☒ 6-10 years ☐ 1-5 years ☐ <1 year ☐ Urgent ☐

Site Number: 140-700

Element Group:	Approaches	Length:	6 (m)
Element Name:	Approach Slabs	Width:	11.05 (m)
Location:		Height:	(m)
Material:	Concrete	Count:	2
Element Type:		Total Quantity	133 (Sq.m)
Environment:	Benign ☐ Moderate ☐ Severe ☒	Not Inspected:	☐

Condition Data:	Units	Exc.	Good	Fair	Poor	Perform. Deficiencies	Maint. Needs
	Sq.m		133			00	

Comments:

Maintenance Needs

Performance Deficiencies

00-None

Recommendations: Work required

None ☒ 6-10 years ☐ 1-5 years ☐ <1 year ☐ Urgent ☐

Photo 1: 140700, general view, Mayfield Road.

Photo 2: 140700, Mayfield Road, general view, looking east.

Photo 3: North elevation.

Photo 4: South elevation.

Photo 5: West approach, south side, steel beam guide rail connection.

Photo 6: Steel beam guide rail connection, west approach, north side.

Photo 7: Concrete barrier, south side: medium crack.

Photo 8: Steel rail and post.

Photo 9: Steel beam guide rail connection, east approach, south side.

Photo 10: East approach, north side, steel beam guide rail connection.

Photo 11: Deck drain (count 4).

Photo 12: Curb, east approach, south side.

Photo 13: Wearing surface, east approach, looking north.

Photo 14: Wearing surface, deck, looking north.

Photo 15: Approach slab, east abutment, looking north.

Photo 16: Approach wearing surface, east abutment, looking south.

Photo 17: West approach, north side, looking east.

Photo 18: West approach, south side, looking east.

Photo 19: Bell service, east approach, north side.

Photo 20: Underground gas service, south.

Photo 21: West approach, south side, Bell and water service.

Photo 22: Observation monitoring well, east approach, south.

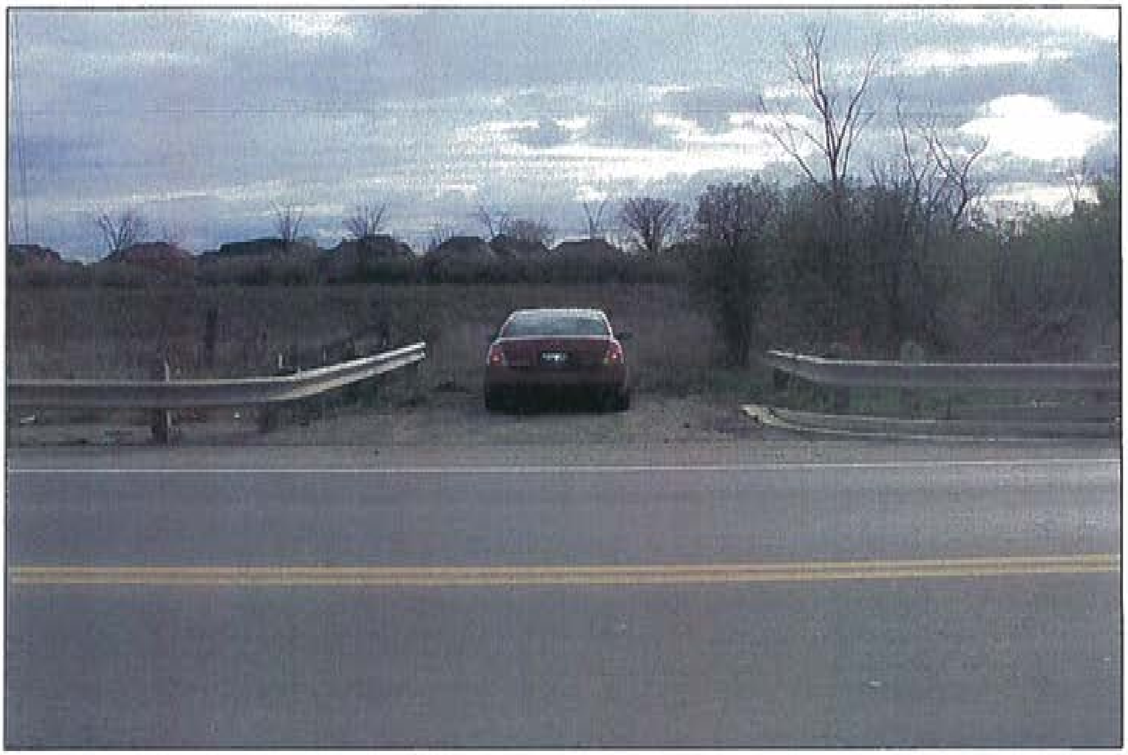


Photo 23: Field entrance, east approach, south side.

Photo 24: Field entrance, west approach, south side.

Photo 25: Underside of deck, looking south.

Photo 26: Underside of deck, looking north.

Photo 27: Underside of deck: stained medium longitudinal crack.

Photo 28: West abutment wall.

Photo 29: West abutment: birds' nests.

Photo 30: East abutment wall.

Photo 31: Abutment wall, east approach, south side.

Photo 32: Embankment, east approach, north side: erosion.

Photo 33: Embankment, west approach, south side.

Photo 34: Embankment, east approach, south side.

Photo 35: Embankment, west approach, north side.

Photo 36: Deck barrier exterior, north side, looking south.

Photo 37: Wingwall, east approach, north side.

Photo 38: Wingwall, east approach, south side.

Photo 39: Stream, looking south (downstream).

Photo 40: Stream, looking north (upstream).

CSP CULVERTS

CSP CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	1	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 10+425.83	Date:	November 1, 2007
Distance east of Airport Road:	425.46 m	Reviewed by:	
Road Name:	Mayfield Road	Date:	
Type:	CSP	Date of construction:	
Size (diameter):	750 mm	Skew:	0.80 °
Length:	19.6 m	Lefthand:	9.90 m
Inlet Elevation:		Righthand:	8.91 m
Outlet Elevation:		Flow Direction:	

OBSERVATIONS:

General:	1.2 m diameter
Inlet: N	Garbage bag, erosion (west)
	Impact damage
Outlet: S	Debris (garbage bag), unstable embankment
	Impact damage
Culvert Condition:	Sag in middle
Drainage/Flow Condition:	
Recommendations:	Replace culvert full length
	Extend south end, realign ditch

Photo 1: CSP at 10+425, outlet end, south.

Photo 2: 10+425, inlet end, looking south.

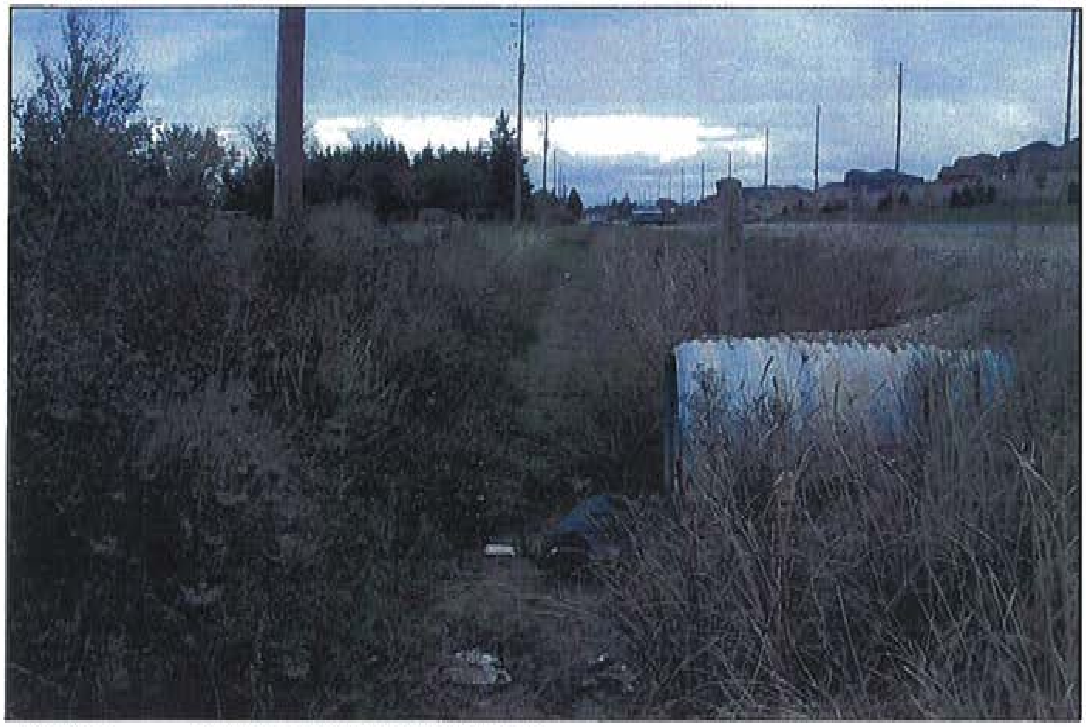


Photo 3: CSP 1, looking east, north side.

Photo 4: CSP 1, south side, looking east.

2

CSP CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	2	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 10+689.83	Date:	November 1, 2007
Distance east of Airport Road:	688.93 m	Reviewed by:	
Road Name:	Mayfield Road	Date:	
Type:	CSP	Date of construction:	
Size (diameter):	2500 mm	Skew:	6.28 °
Length:	30.6 m	Lefthand:	13.20 m
Inlet Elevation:		Righthand:	14.07 m
Outlet Elevation:		Flow Direction:	

OBSERVATIONS:

General: Elliptical 1800x2500 – bolted plate arch

Inlet: N — Blocked by debris

Outlet: S — Vegetation blockage – 3 m extension

Culvert Condition:
Sag 3-10 m from outlet (±0.5 m depression, plates separated ±60 mm)
26 m from outlet – 0.1 dia. holes
29 m from outlet – perforations
30 m from outlet – hole in bottom plate

Drainage/Flow Condition:

Recommendations:
Replace culvert full length
Remove brush and debris at north
Lower ditch line

Photo 1: 10+689, outlet end, looking north.

Photo 2: Culvert, looking south.

Photo 3: Inlet: blocked by debris.

Photo 4: Impact damage, west wall at inlet.

Photo 5: Top of CSPA, near inlet: 0.1 m diameter holes.

Photo 6: Corrosion through CSPA at inlet, east wall.

4

CSP CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	3	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 11+603.71	Date:	November 1, 2007
Distance east of Airport Road:	1603.11 m	Reviewed by:	
Road Name:	Mayfield Road	Date:	
Type:	CSP	Date of construction:	
Size (diameter):	1200 mm	Skew:	5.23 °
Length:	21.5 m	Lefthand:	9.26 m
Inlet Elevation:		Righthand:	12.09 m
Outlet Elevation:		Flow Direction:	

OBSERVATIONS:

General:

Inlet: N (1.28 H 1.17 V) deformed
Severe corrosion

Outlet: S Medium-severe corrosion
Deformed

Culvert Condition:

Drainage/Flow Condition:

Recommendations: Replace culvert full length

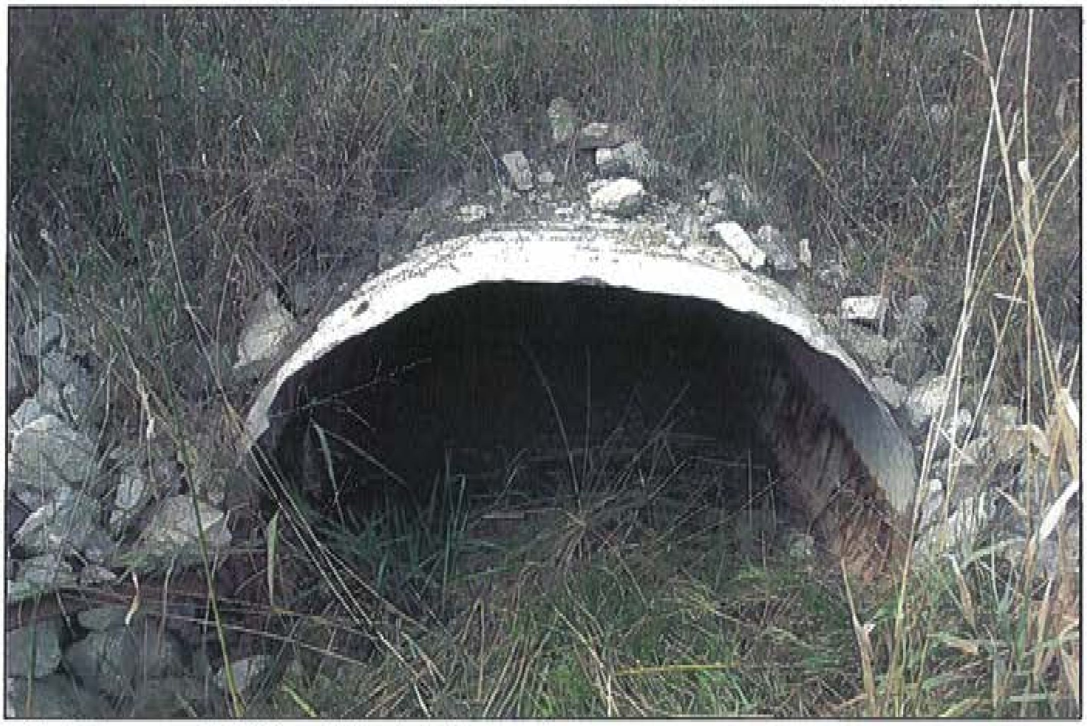


Photo 1: 11+603, outlet end, looking north.

Photo 2: Outlet, east wall: severe corrosion.

Photo 3: CSP, looking north.

Photo 4: Inlet end, looking south.

Photo 5: Inlet end: severe corrosion of bottom of CSP.

Photo 6: CSP, looking south (downstream).

Photo 7: CSP, looking north (upstream).

Photo 8: CSP, south side, looking east: rock protection.

CSP CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	4	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 11+812.76	Date:	November 1, 2007
Distance east of Airport Road:	1812.38 m	Reviewed by:	
Road Name:	Mayfield Road	Date:	
Type:	CSP	Date of construction:	
Size (diameter):	750 mm	Skew:	0.05 °
Length:	20.6 m	Lefthand:	9.58 m
Inlet Elevation:		Righthand:	11.34 m
Outlet Elevation:		Flow Direction:	

OBSERVATIONS:

General:

Inlet: N
Spill around
Overgrown
Impact damage

Outlet: S
Full of sediment
Overgrown

Culvert Condition:

Drainage/Flow Condition:

Recommendations: Extend if to be maintained, or remove

Photo 1: 11+812, outlet end.

Photo 2: Outlet, looking north.

Photo 3: Inlet end, looking south.

7

CSP CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	5	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 12+504.55	Date:	November 1, 2007
Distance east of Airport Road:	2503.65 m	Reviewed by:	
Road Name:	Mayfield Road	Date:	
Type:	CSP	Date of construction:	
Size (diameter):	1800 mm	Skew:	0.10 °
Length:	41.6 m	Lefthand:	19.66 m
Inlet Elevation:		Righthand:	21.54 m
Outlet Elevation:		Flow Direction:	

OBSERVATIONS:

General:

Inlet: N — Corrosion through at bottom
Perched

Outlet: S — Erosion – perched
Scour hole 5 m dia.

Culvert Condition: Severe corrosion (4.6 m + 5.8 m from outlet)
Medium corrosion 1 m wide on bottom
Deformation (west wall 2.8 m from inlet)

Drainage/Flow Condition: Blocked by vegetation

Recommendations: Replace 5.8 m inlet
Replace 7.2 m
Armour inlet and outlet

Photo 1: CSP 12+504, outlet end, looking south.

Photo 2: Outlet end, looking north.

Photo 3: Outlet, east wall: severe corrosion of plate.

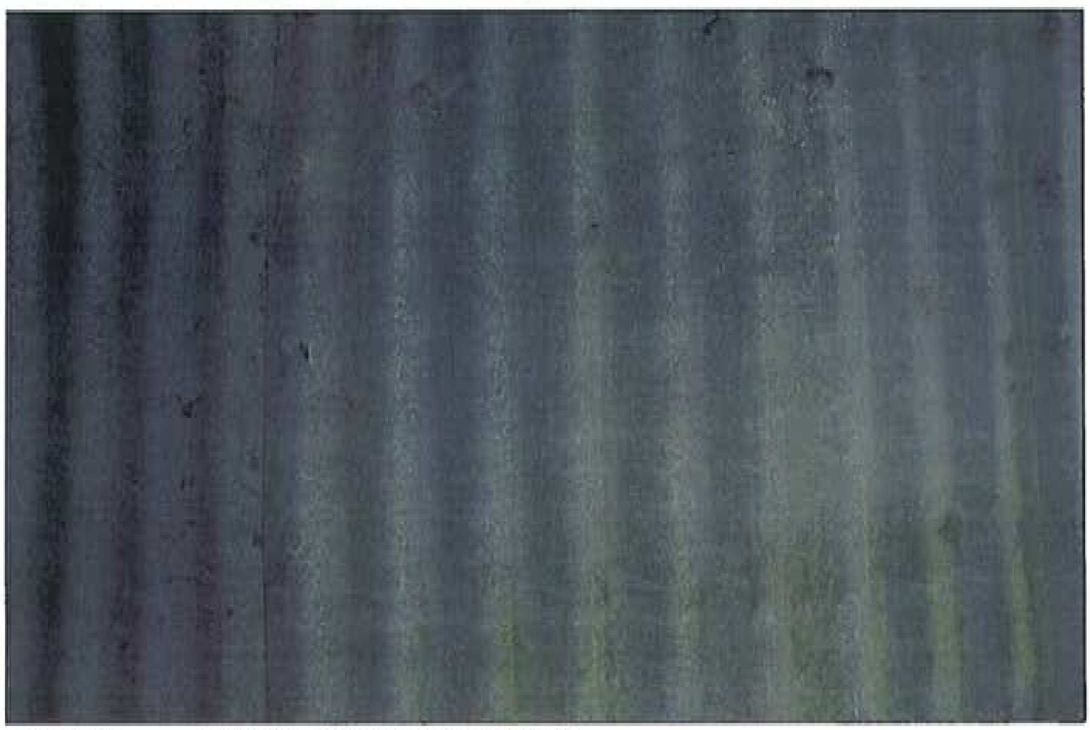


Photo 4: West wall, near inlet: deformation.

Photo 5: Inlet end, looking south: perched.

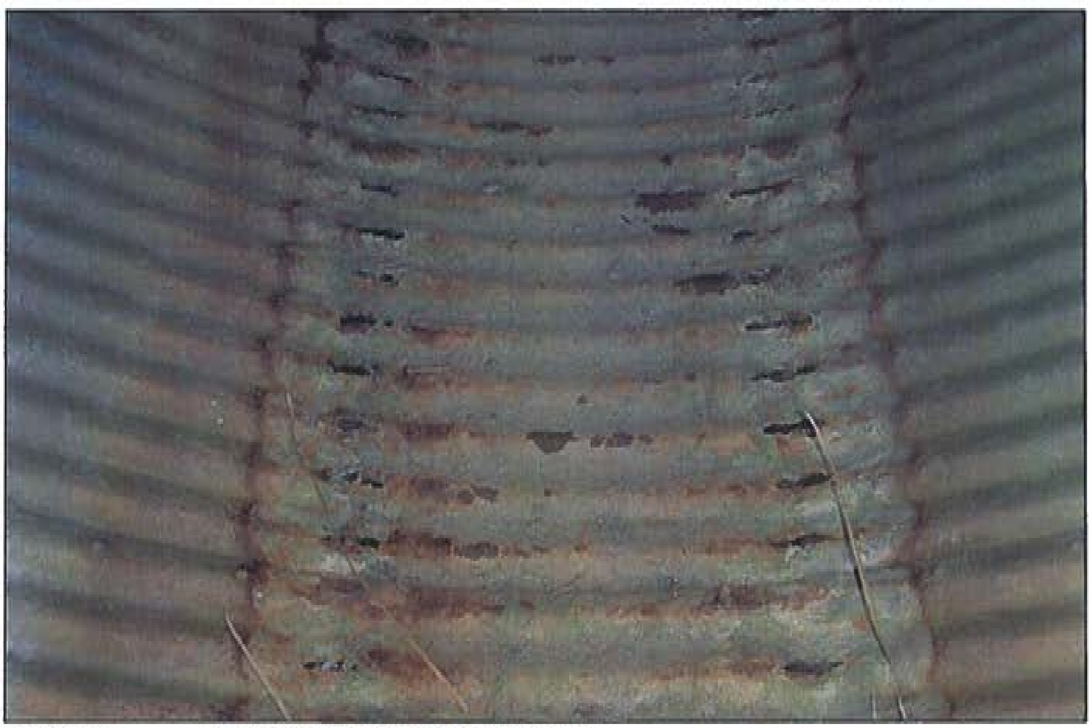


Photo 6: Floor at inlet end: corroded through.

CSP CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	6	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 12+787.72	Date:	November 1, 2007
Distance east of Airport Road:	2787.42 m	Reviewed by:	
Road Name:	Mayfield Road	Date:	
Type:	CSP	Date of construction:	
Size (diameter):	600 mm	Skew:	6.74 °
Length:	23.08 m	Lefthand:	10.50 m
Inlet Elevation:		Righthand:	12.59 m
Outlet Elevation:		Flow Direction:	

OBSERVATIONS:

General: Just east of McVean Drive (±20 m)

Inlet: N
- Minor erosion
- Severe impact

Outlet: N
- Minor erosion
- Impacted
- Perched outlet

Culvert Condition:
- Corroded
- Collapsed

Drainage/Flow Condition:

Recommendations: Replace culvert full length

Culvert Sta. 12+787

Date Inspected: 01 Nov 2007

Photo 1: 12+787, outlet end, looking north: perched.

Photo 2: Inlet end, looking north: blocked.

Photo 3: Inlet end, looking south: impact damage; blocked by vegetation.

Photo 4: CSP, looking south.

CSP CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	7	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 12+927.04	Date:	November 1, 2007
Distance east of Airport Road:	2926.82 m	Reviewed by:	
Road Name:	Mayfield Road	Date:	
Type:	CSP	Date of construction:	
Size (diameter):	450 mm I.D.	Skew:	1.21 °
Length:	21.6 m	Lefthand:	9.81 m
Inlet Elevation:		Righthand:	11.93 m
Outlet Elevation:		Flow Direction:	

OBSERVATIONS:

General: PVC

Inlet: N

Outlet: S

Culvert Condition:

Drainage/Flow Condition:

Recommendations:

Photo 1: Culvert, outlet end.

Photo 2: Outlet end, looking south.

Photo 3: Inlet end, looking north.

Photo 4: Culvert inlet, looking south.

8

CSP CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	8	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 13+763.31	Date:	November 1, 2007
Distance east of Airport Road:	3762.79 m	Reviewed by:	
Road Name:	Mayfield Road	Date:	
Type:	CSP	Date of construction:	
Size (diameter):	1050 mm	Skew:	21.57 °
Length:	24.67 m	Lefthand:	11.17 m
Inlet Elevation:		Righthand:	13.52 m
Outlet Elevation:		Flow Direction:	

OBSERVATIONS:

General:

Inlet: N
Severe corrosion at bottom, through plate
Perched – scour hole ±2 m dia.

Outlet: S
Light corrosion
Deformation

Culvert Condition:
Deformation

Drainage/Flow Condition:

Recommendations:
Replace armour at inlet (rock protection)
Replace culvert full length

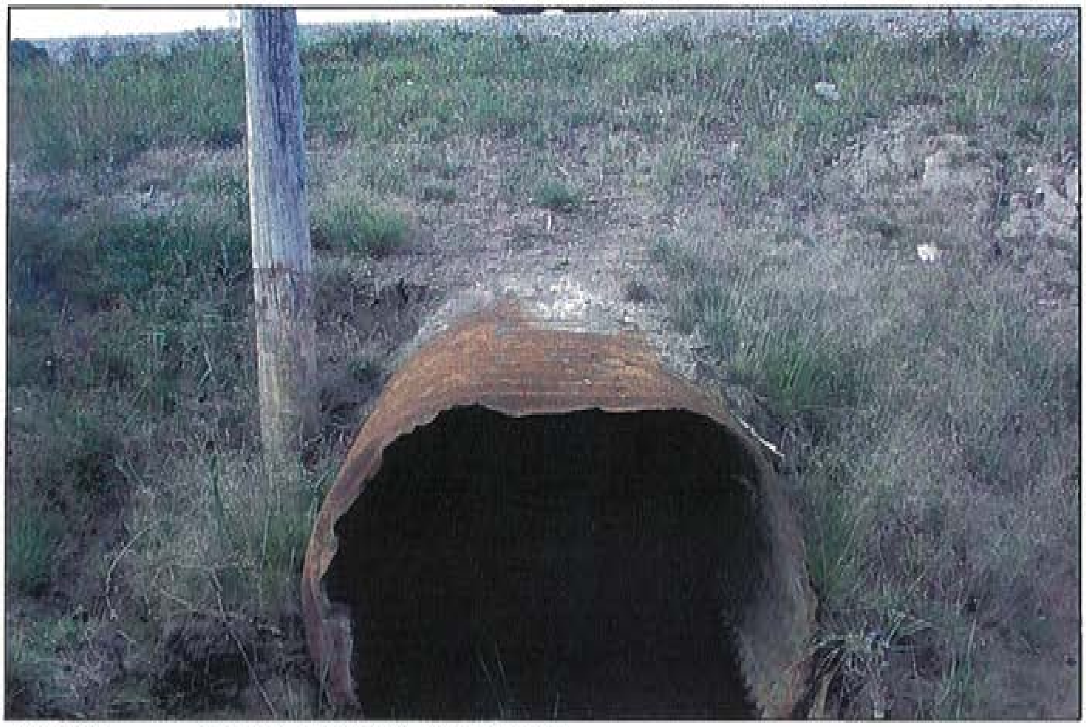


Photo 1: 13+763, outlet end, looking north.

Photo 2: Inlet end, looking south.

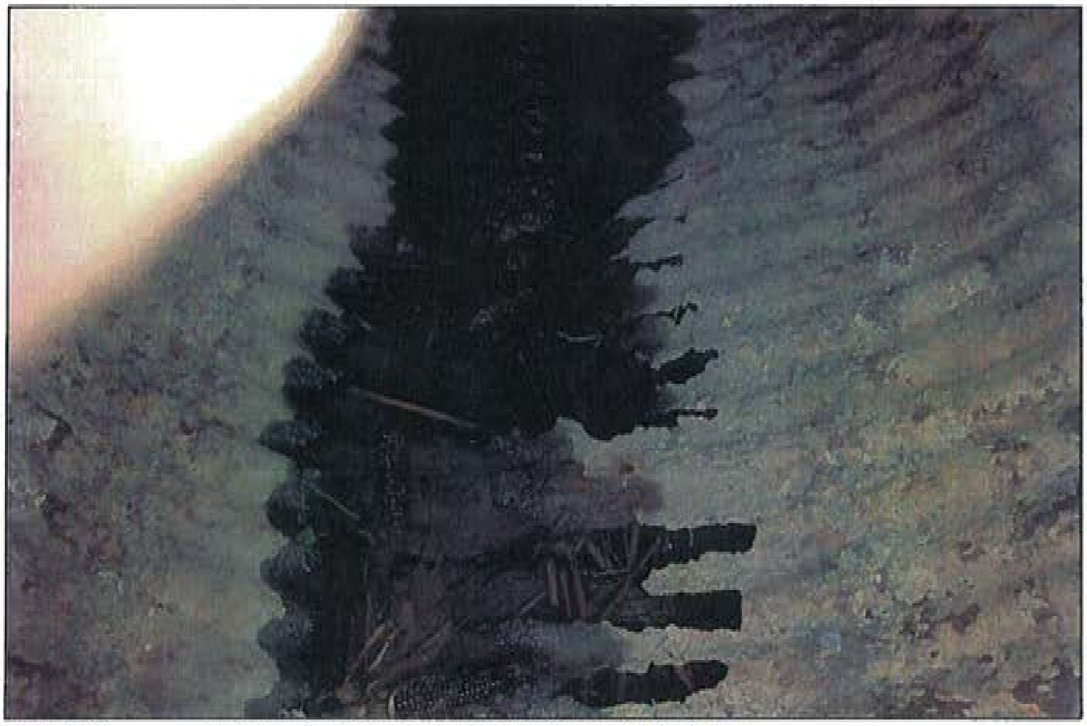


Photo 3: Inlet end: severe corrosion through bottom of CSP.

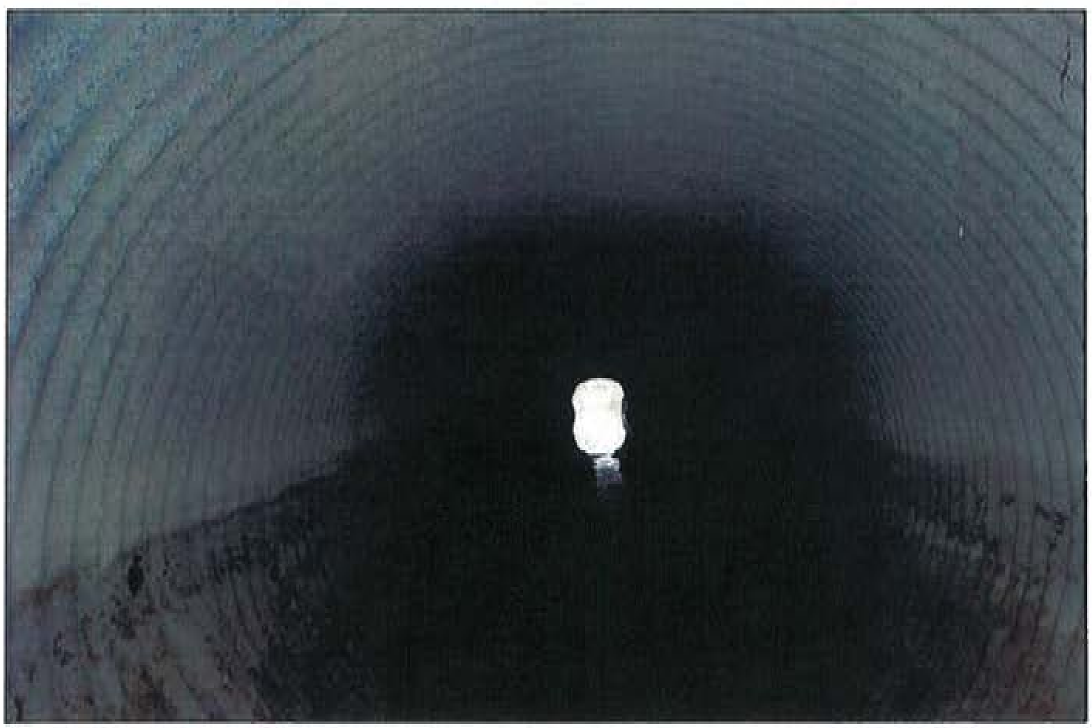


Photo 4: CSP, looking south.

9

CSP CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	9	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 13+970.05	Date:	November 1, 2007
Distance east of Airport Road:	3969.45 m	Reviewed by:	
Road Name:	Mayfield Road	Date:	
Type:	CSP	Date of construction:	
Size (diameter):	1200 mm	Skew:	18.60 °
Length:	30.98 m	Lefthand:	14.75 m
Inlet Elevation:		Righthand:	16.23 m
Outlet Elevation:		Flow Direction:	

OBSERVATIONS:

General: PVC liner in concrete filled void – hydraulic opening 915 dia.

Inlet:

Outlet:

Culvert Condition:

Drainage/Flow Condition:

Recommendations:

Photo 1: 13+970, outlet end, looking south.

Photo 2: Outlet end, looking north: liner.

Culvert Sta. 13+970 Date Inspected: 01 Nov 2007

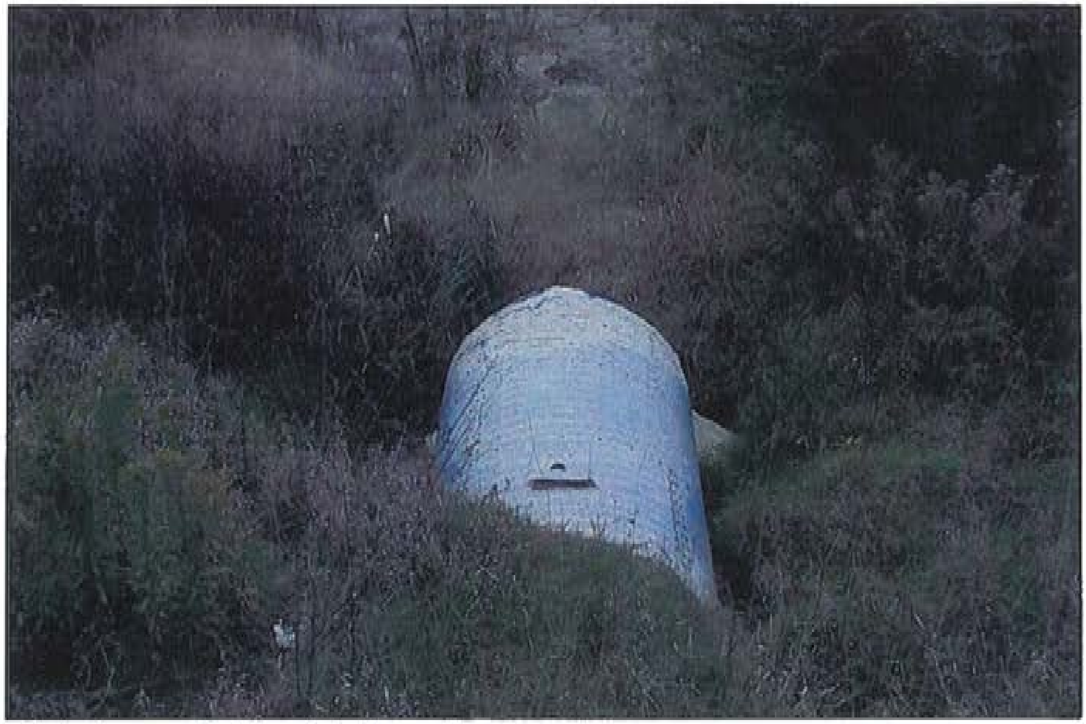


Photo 3: Outlet end, looking north.

Photo 4: Inlet end, looking south: liner.

Photo 5: Degor Road, south of Mayfield, looking east.

Photo 6: Degor Road, south of Mayfield, looking west.

10

CSP CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	10	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 14+177.40	Date:	November 1, 2007
Distance east of Airport Road:	4176.65 m	Reviewed by:	
Road Name:	Mayfield Road	Date:	
Type:	CSP	Date of construction:	
Size (diameter):	1500 mm	Skew:	3.61 °
Length:	30.7 m	Lefthand:	15.17 m
Inlet Elevation:		Righthand:	14.79 m
Outlet Elevation:		Flow Direction:	

OBSERVATIONS:

General: PVC liner in concrete fill – 1.1 m dia. I.D.

Inlet: N

Outlet: S Erosion – unstable embankment

Culvert Condition:

Drainage/Flow Condition: Granular in culvert

Recommendations: Armour embankments at inlet

Photo 1: Sta. 14+177, inlet end, looking south.

Photo 2: Culvert inlet, looking north.

Photo 3: Culvert outlet, looking east.

Photo 4: Culvert outlet, looking north.

Photo 7: Embankment, north side: erosion.

CSP CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	11	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 14+567.48	Date:	November 1, 2007
Distance east of Airport Road:	4567.48 m	Reviewed by:	
Road Name:	Marysfield Drive	Date:	
Type:	CSP	Date of construction:	
Size (diameter):	600 mm	Skew:	0.47 °
Length:	18 m	Lefthand:	m
Inlet Elevation:		Righthand:	10.57 m
Outlet Elevation:		Flow Direction:	

OBSERVATIONS:

General: Marysfield Drive

Inlet: E — Concrete block (CMV) debris (excess rock protection)

Outlet: W — Erosion

Culvert Condition:

Drainage/Flow Condition:

Recommendations: Extend outlet or replace culvert full length
Remove debris at inlet

Photo 1: 14+567 outlet, looking east.

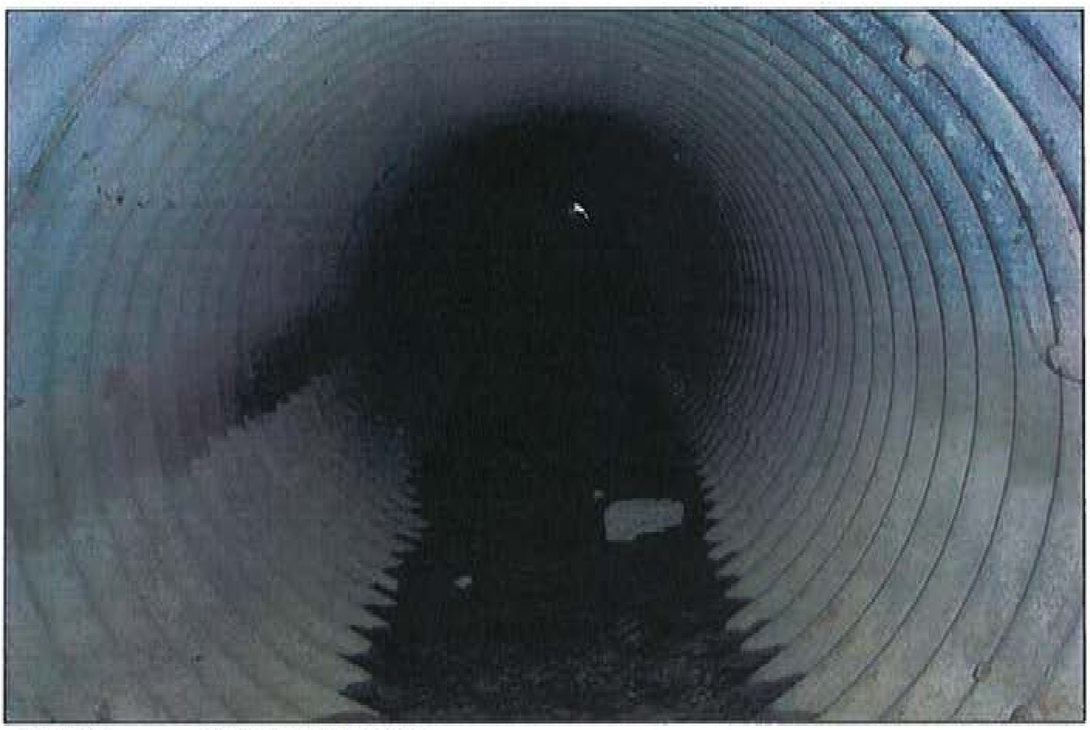


Photo 2: Culvert, looking east.

Photo 3: Inlet end: blocked with concrete debris.

13

CSP CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	12	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 15+249.88	Date:	November 1, 2007
Distance east of Airport Road:	5249.28 m	Reviewed by:	
Road Name:	Mayfield Road	Date:	
Type:	CSP	Date of construction:	
Size (diameter):	1200 mm	Skew:	1.73 °
Length:	19.7 m	Lefthand:	9.61 m
Inlet Elevation:		Righthand:	9.07 m
Outlet Elevation:		Flow Direction:	

OBSERVATIONS:

General:

Inlet: N

Outlet: S Erosion / steep

Culvert Condition: Deformation in soffit ±5 m from outlet
Bent plate

Drainage/Flow Condition:

Recommendations: Install gabions or extend outlet
Hammer plate flat / remove deformation

Culvert Sta. 15+249

Date Inspected: 01 Nov 2007

Photo 1: 15+249, outlet, looking north.

Photo 2: Inlet, looking north.

Photo 3: Inlet end, looking south.

Photo 4: Outlet, west wall: deformation 4.88 north of outlet.

CSP CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	13	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 15+454.43	Date:	November 1, 2007
Distance east of Airport Road:	5454.13 m	Reviewed by:	
Road Name:	Mayfield Road	Date:	
Type:	CSP	Date of construction:	
Size (diameter):	600 mm	Skew:	0.92 °
Length:	20 m	Lefthand:	10.12 m
Inlet Elevation:		Righthand:	10.08 m
Outlet Elevation:		Flow Direction:	

OBSERVATIONS:

General:

Inlet: N

Outlet: S — Deformed – vegetated

Culvert Condition: Light corrosion

Drainage/Flow Condition:

Recommendations: Extend outlet

Photo 1: 15+454, outlet, looking north.

Photo 2: CSP, looking north.

Culvert Sta. 15+454

Date Inspected: 01 Nov 2007

Photo 3: Inlet, looking south: blocked with vegetation.

CSP CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	14	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 15+693.02	Date:	November 1, 2007
Distance east of Airport Road:	5692.72 m	Reviewed by:	
Road Name:	Mayfield Road	Date:	
Type:	CSP	Date of construction:	
Size (diameter):	600 mm	Skew:	7.09 °
Length:	18.5 m	Lefthand:	9.70 m
Inlet Elevation:		Righthand:	9.02 m
Outlet Elevation:		Flow Direction:	

OBSERVATIONS:

General:

Inlet: N

Outlet: S
Deformation
Sediment
Vegetated

Culvert Condition: Light corrosion

Drainage/Flow Condition:

Recommendations: Extend outlet
Install gabions or extend inlet

Photo 1: 15+693, outlet, looking north.

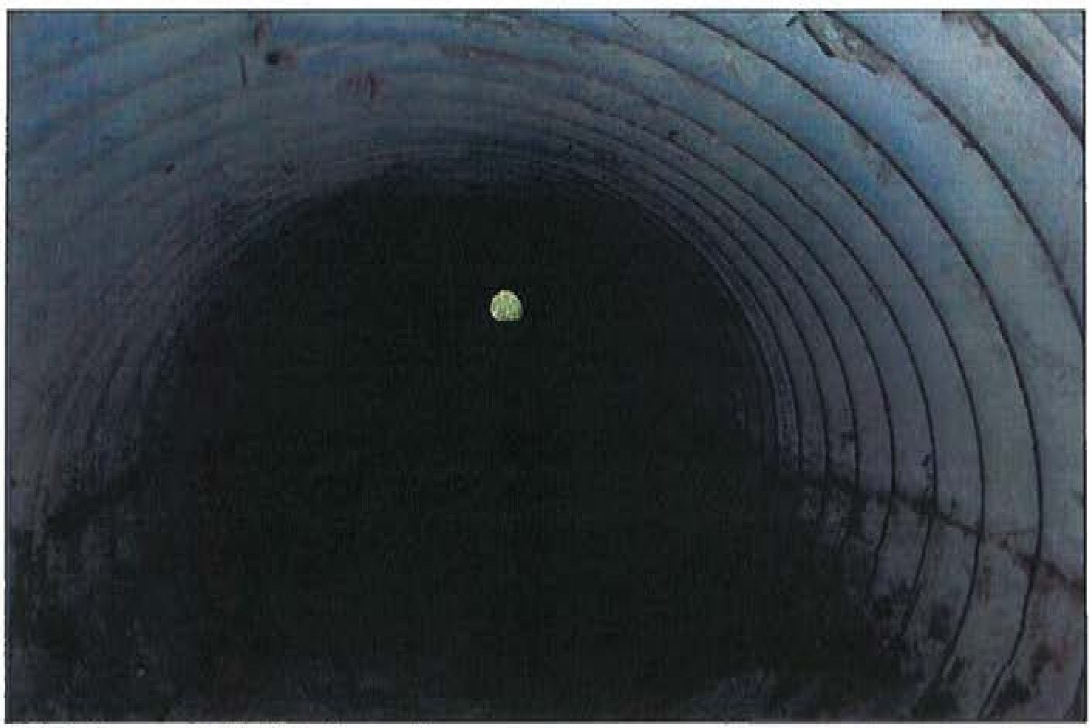


Photo 2: Culvert, looking north.

Photo 3: Inlet end, looking south.

CSP CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	15	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 15+885.34	Date:	November 1, 2007
Distance east of Airport Road:	5884.89 m	Reviewed by:	
Road Name:	Mayfield Road	Date:	
Type:	CSP	Date of construction:	
Size (diameter):	900 mm	Skew:	31.12 °
Length:	30.3 m	Lefthand:	15.22 m
Inlet Elevation:	221.209	Righthand:	15.26 m
Outlet Elevation:	221.36	Flow Direction:	

OBSERVATIONS:

General:

Inlet: N — Light corrosion

Outlet: S — Impacted – erosion – unstable embankment
Light corrosion
Obvert below ditch
Scour hole

Culvert Condition:

Drainage/Flow Condition:

Recommendations: Raise outlet

Culvert Sta. 15+885 Date Inspected: 01 Nov 2007

Photo 1: 15+885, outlet, looking east.

Photo 2: Outlet, looking north: deformation and impact damage.

Culvert Sta. 15+885

Date Inspected: 01 Nov 2007

Photo 3: Inlet, looking south.

CSP CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	16	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 16+327.03	Date:	November 1, 2007
Distance east of Airport Road:	6326.66 m	Reviewed by:	
Road Name:	Mayfield Road	Date:	
Type:	CSP	Date of construction:	
Size (diameter):	1200 mm dia.	Skew:	2.81 °
Length:	20.1 m	Lefthand:	9.24 m
Inlet Elevation:		Righthand:	9.45 m
Outlet Elevation:		Flow Direction:	

OBSERVATIONS:

General: Spiral corrugation

Inlet: S

Outlet: N

Culvert Condition:

Drainage/Flow Condition:

Recommendations: Install gabions or extend inlet

Culvert Sta. 16+327 Date Inspected: 01 Nov 2007

Photo 1: 16+327.

Photo 2: CSP, looking south.

16

CSP CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	17	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 16+700.50	Date:	November 1, 2007
Distance east of Airport Road:	6700.28 m	Reviewed by:	
Road Name:	Mayfield Road	Date:	
Type:	CSP	Date of construction:	
Size (diameter):	450 mm	Skew:	1.80 °
Length:	20.6 m	Lefthand:	9.93 m
Inlet Elevation:		Righthand:	8.63 m
Outlet Elevation:		Flow Direction:	

OBSERVATIONS:

General:

Inlet: N Vegetation blockage

Outlet: S Vegetation and sediment blockage – unstable embankment

Culvert Condition:

Drainage/Flow Condition:

Recommendations: Install gabions or extend outlet and inlet

No photos available.

CSP CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	18	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 16+842.43	Date:	November 1, 2007
Distance east of Airport Road:	6842.20 m	Reviewed by:	
Road Name:	Mayfield Road	Date:	
Type:	CSP	Date of construction:	
Size (diameter):	450 mm	Skew:	3.60 °
Length:	18.69 m	Lefthand:	9.85 m
Inlet Elevation:		Righthand:	8.84 m
Outlet Elevation:		Flow Direction:	

OBSERVATIONS:

General:

Inlet: N

Outlet: S Crushed

Culvert Condition:

Drainage/Flow Condition: Blockage

Recommendations: Replace culvert full length and extend

Culvert Sta. 16+842

Date Inspected: 01 Nov 2007

Photo 1: 16+842 inlet, looking south

Photo 2: Outlet, looking north

Photo 3: Culvert, looking north

CSP CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	19	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 16+887.38	Date:	November 1, 2007
Distance east of Airport Road:	6887.38 m	Reviewed by:	
Road Name:	Coleraine Drive	Date:	
Type:	CSP	Date of construction:	
Size (diameter):	450 mm	Skew:	3.56 °
Length:	17.76 m	Lefthand:	14.60 m
Inlet Elevation:		Righthand:	m
Outlet Elevation:		Flow Direction:	

OBSERVATIONS:

General: Coleraine Drive

Inlet: E

Outlet: ? Not visible – possibly buried

Culvert Condition:

Drainage/Flow Condition:

Recommendations: Replace culvert full length

Culvert Sta. 16+887 Date Inspected: 01 Nov 2007

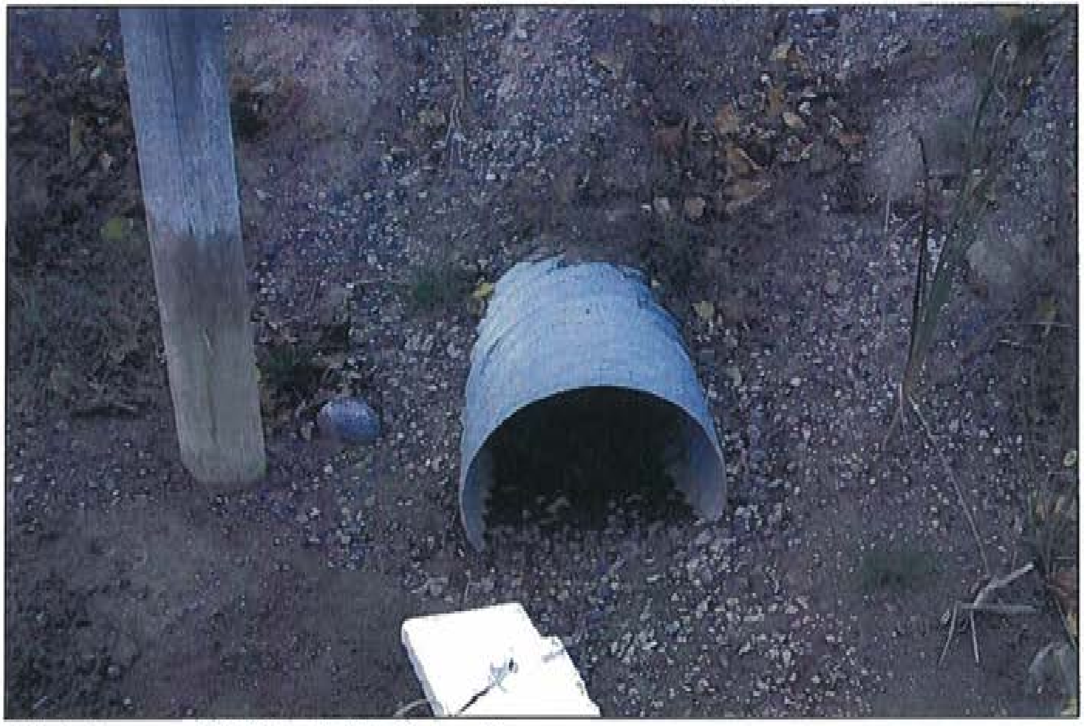


Photo 1: 16+887 outlet, looking north.

Photo 2: Outlet, looking east.

Photo 3: Embankment, looking north.

CONCRETE CULVERTS

CONCRETE CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	140150	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 15+956	Date:	October 16, 2007
Skew:	24 °	Reviewed by:	Dave Hallman
Type:	Concrete Non Rigid Frame Open	Date:	
Size:	4.63 * x 1.59	Date of construction:	1950
Inlet Elevation:			
Outlet Elevation:			
Length:	21.65		
Flow Direction:	North to South		

OBSERVATIONS:

Inlet:
- Sedimentation
- Blocked by vegetation
- Spill around at east and west sides

Outlet:
- Sedimentation
- Blocked by vegetation
- Spill around at east and west sides

Culvert Condition:
- Stained vertical medium crack 3.2 m
- Light honeycombing 0.1 m^2
- Birds' nests present

Drainage/Flow Condition:
- Flow blocked by vegetation

Recommendations:
- Connect SBGR to culvert slab (4 steel posts)
- Channelize creek
- Install gabions at 4 corners

* Span is perpendicular to culvert walls

Photo 1: General view, Mayfield Road, looking west.

Photo 2: Mayfield Road, general view, looking east.

Photo 3: South elevation.

Photo 4: North elevation.

Photo 5: East approach, south side.

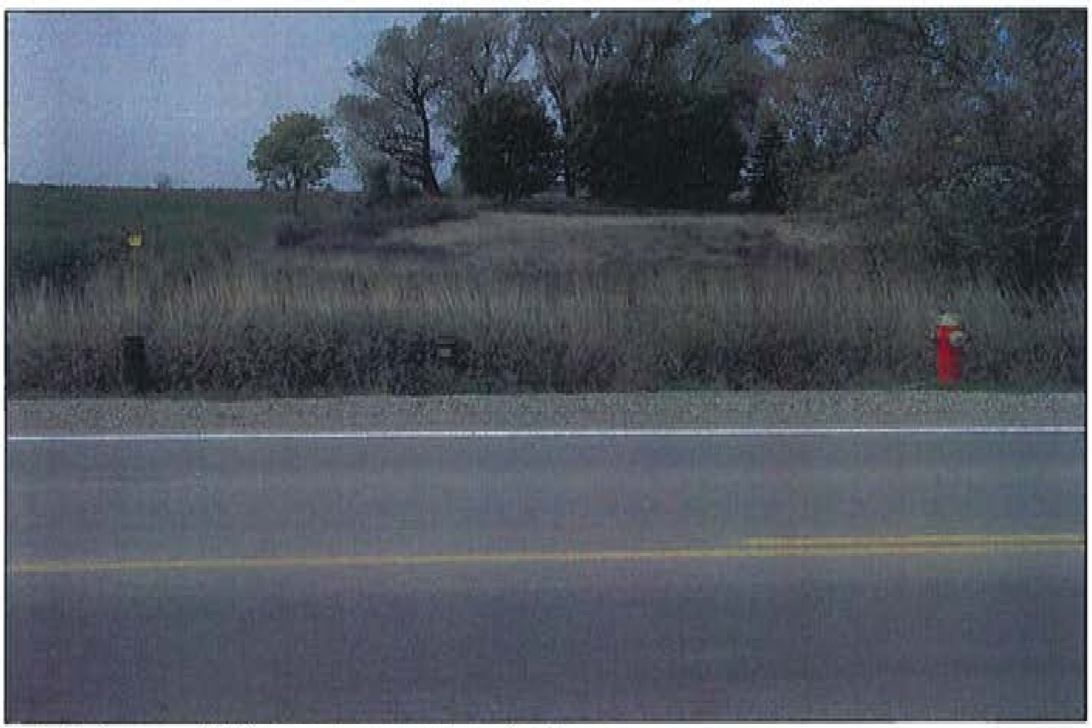


Photo 6: Utilities, east approach, north side.

Photo 7: East approach, north side.

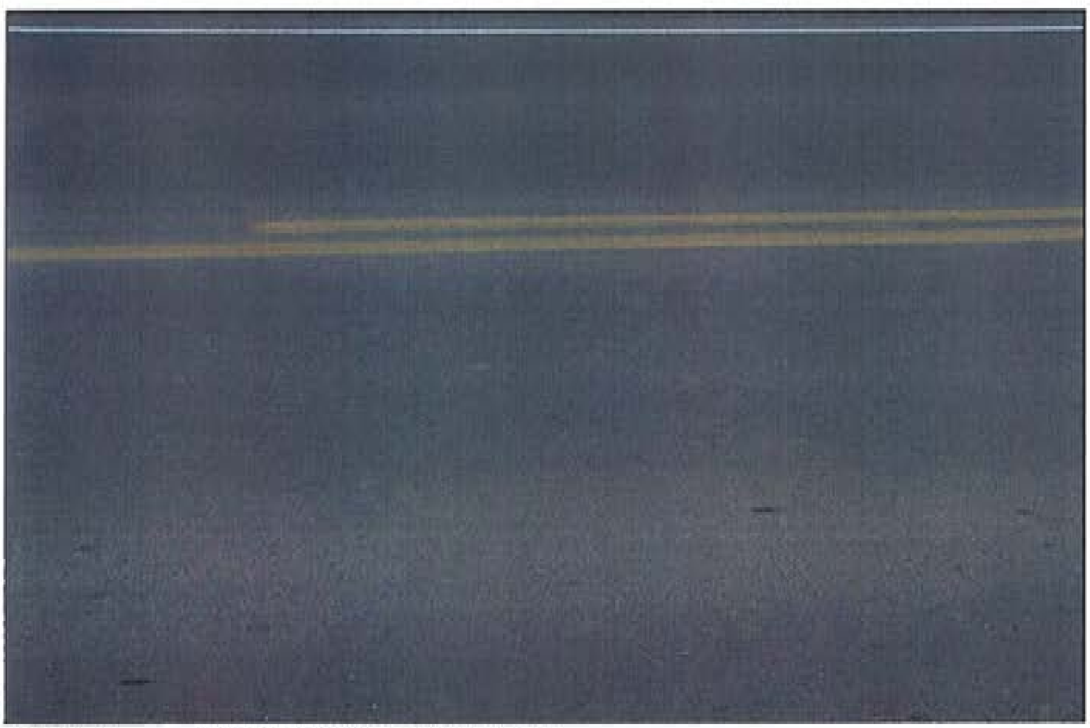


Photo 8: Wearing surface, east approach.

Photo 9: Stream, looking north (upstream).

Photo 10: Embankment erosion, west approach, north side.

Photo 11: West approach, north side.

Photo 12: West approach, south side.

Photo 13: Manhole, west approach, south side.

Photo 14: Embankment erosion, west approach, south side.

Photo 15: Post anchorage at concrete deck.

Photo 16: Stream, looking south (downstream).

Photo 17: West wall, south construction joint: birds' nests.

Photo 18: Culvert barrel, looking north.

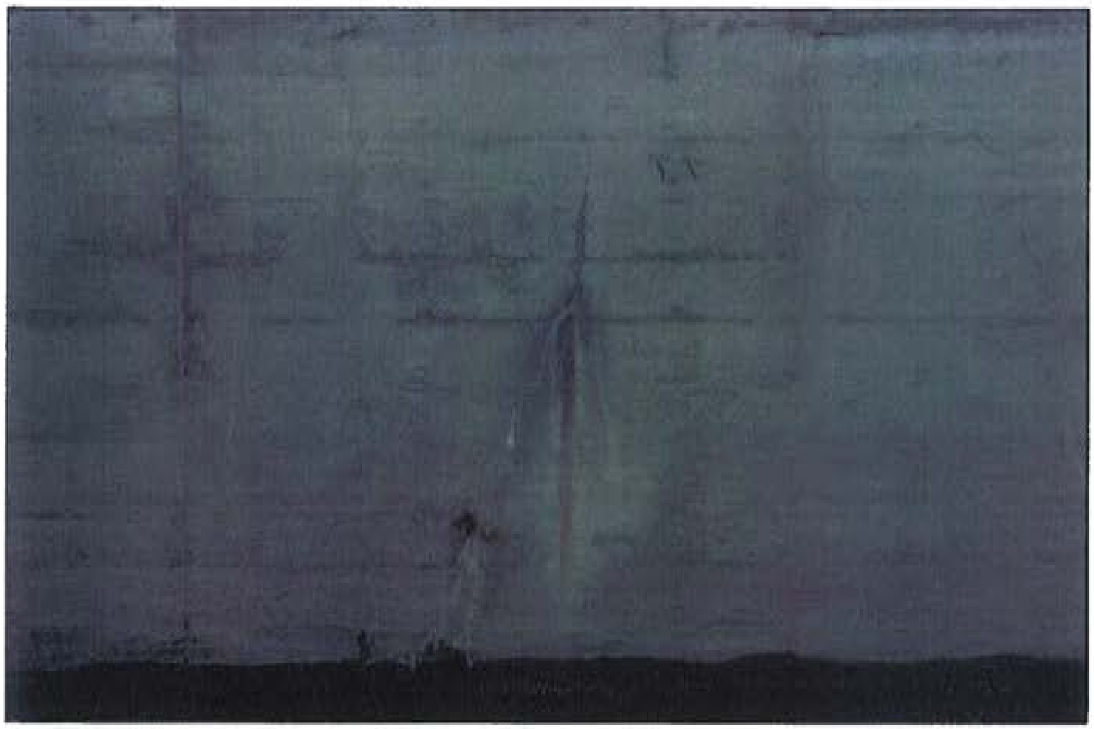


Photo 19: West wall: stain, medium crack.

Photo 20: Culvert barrel, looking south.

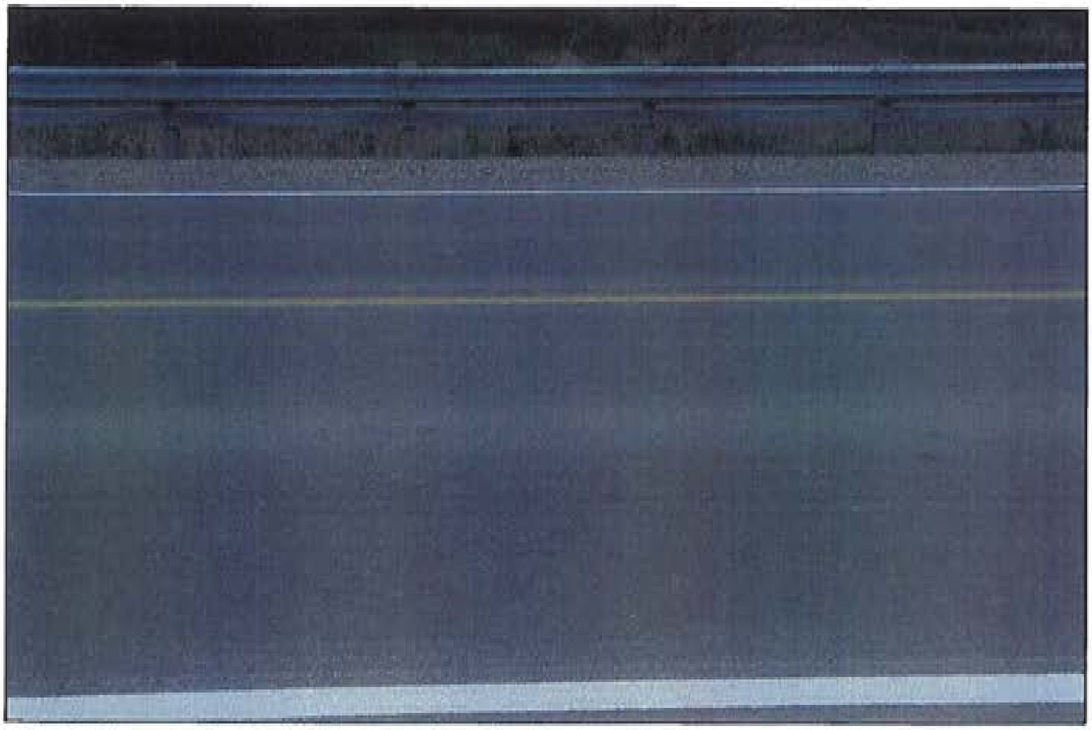


Photo 21: South steel beam guide rail with channel.

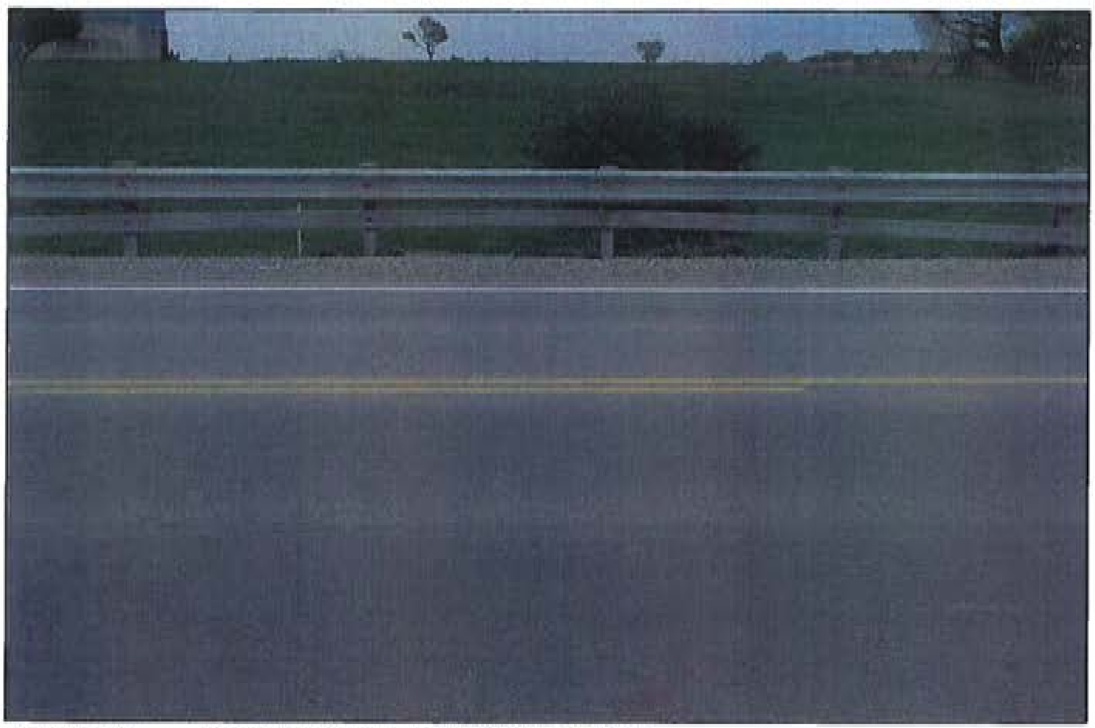


Photo 22: North steel beam guide rail with channel.

CONCRETE CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	140300	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 15+156	Date:	October 16, 2007
Skew:	0.595º	Reviewed by:	Dave Hallman
Type:	Concrete Rigid Frame Open	Date:	
Size:	6.07 * x 1.25	Date of construction:	1969
Inlet Elevation:	221.57		
Outlet Elevation:	221.59		
Length:	20.7		
Flow Direction:	North to South		

OBSERVATIONS:

Inlet:
- Sedimentation
- Blocked by vegetation
- Spill around at east and west sides

Outlet:
- Spalls 1.1 x 0.35, 2 longitudinal exposed rebar
- Wide crack 0.6 m
- Medium crack 0.9 m
- CSP 500 Ø located 0.7 m from outlet at the SE corner

Culvert Condition:
- Spalls and delaminations 1.4 m^2
- Medium stained crack 8.0 m
- Beaver lodge present

Drainage/Flow Condition:
- Flow blocked by vegetation
- Meandering

Recommendations:
- Repair concrete spall
- Channelize creek
- Install gabions at inlet
- Remove beaver

Photo 1: Mayfield Road, general view, looking east.

Photo 2: Mayfield Road, general view, looking west.

Photo 3: North elevation.

Photo 4: South elevation.

Photo 5: South ditch, looking west.

Photo 6: West approach, south side, looking east.

Photo 7: West approach, north side, looking east.

Photo 8: Stream, looking north (upstream).

Photo 9: Embankment erosion, east approach, north side.

Photo 10: Embankment erosion, east approach, north side.

Photo 11: Embankment erosion, west approach, north side.

Photo 12: Beaver lodge, west side.

Photo 13: West wall and slab: medium stained crack.

Photo 14: Culvert barrel, looking north.

Photo 15: Culvert barrel, looking south.

Photo 16: Slab at outlet: spall.

Photo 17: CSP, east approach, south side.

Photo 18: East approach, south side.

Photo 19: East approach, north side.

Photo 20: Bell utility, east approach, north side.

Photo 21: Catchbasin, east approach, south side.

Photo 22: Stream, looking south (downstream).

Photo 23: Water service, east approach, south side.

CONCRETE CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	140380	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 14+400	Date:	October 17 2007
Skew:	0 °	Reviewed by:	Dave Hallman
Type:	Concrete Arch	Date:	
Size:	4.00 x 9.00	Date of construction:	1940
Inlet Elevation:			
Outlet Elevation:			
Length:	20.6*		
Flow Direction:	North to South		

OBSERVATIONS:

Inlet:	Sedimentation
	Blocked by vegetation
	Spill around at west side
	Embankment is unstable above arch crown
Outlet:	Aggradation
	Spill around at east side
Culvert Condition:	Wet area efflorescence 19 m^2
	Delaminations 1 m^2
	Horizontal construction joint in both walls
	Sewer openings (2) at the arch crown, exposed rebar, leaking
	Light to severe honeycombing
	Medium cracks 2 m, medium stained cracks 11 m
Drainage/Flow Condition:	Aggradation
	Flow blocked by vegetation
	Flow in against west wall
Recommendations:	Repair concrete holes in arch crown
	Channelize creek
	Patch delaminations

* measured at obvert

Photo 1: Mayfield Road, general view, looking east.

Photo 2: Mayfield Road, general view, looking west.

Photo 3: South elevation.

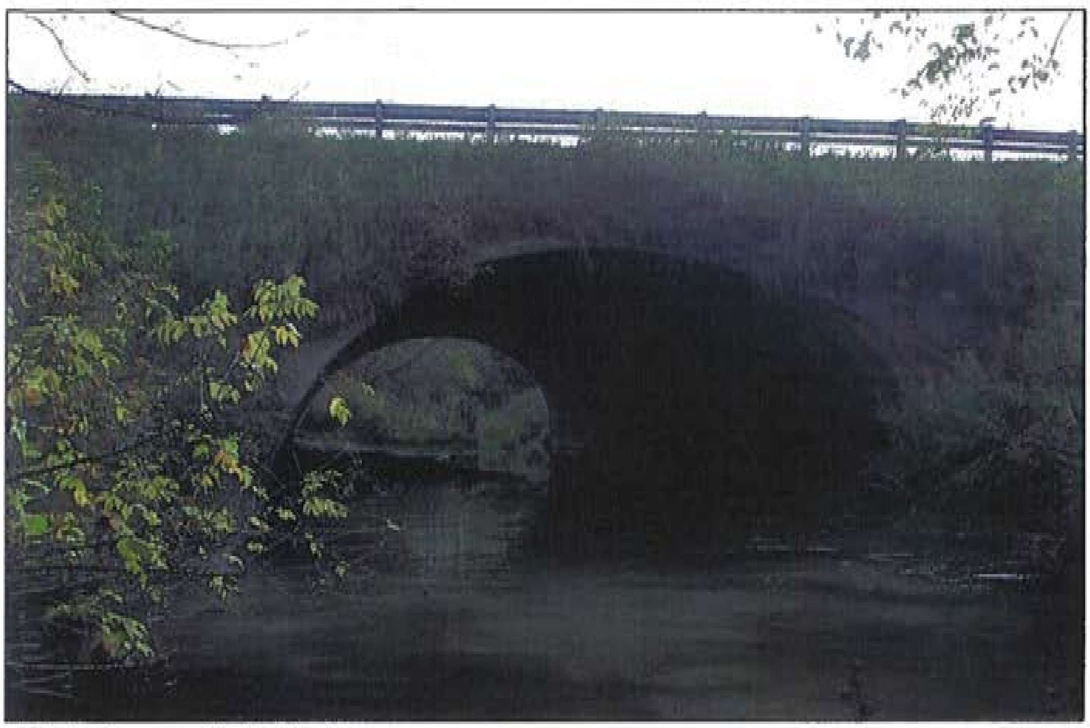


Photo 4: North elevation.

Photo 5: East approach, south side.

Photo 6: East approach, north side.

Photo 7: Steel beam guide rail, north and south sides, channel and steel post.

Photo 8: West approach, south side.

Photo 9: Eccentric loader connection, west approach, south side.

Photo 10: Water service, south side, east approach.

Photo 11: North side: unstable fill above crown.

Photo 12: Site 14380, looking north, upstream.

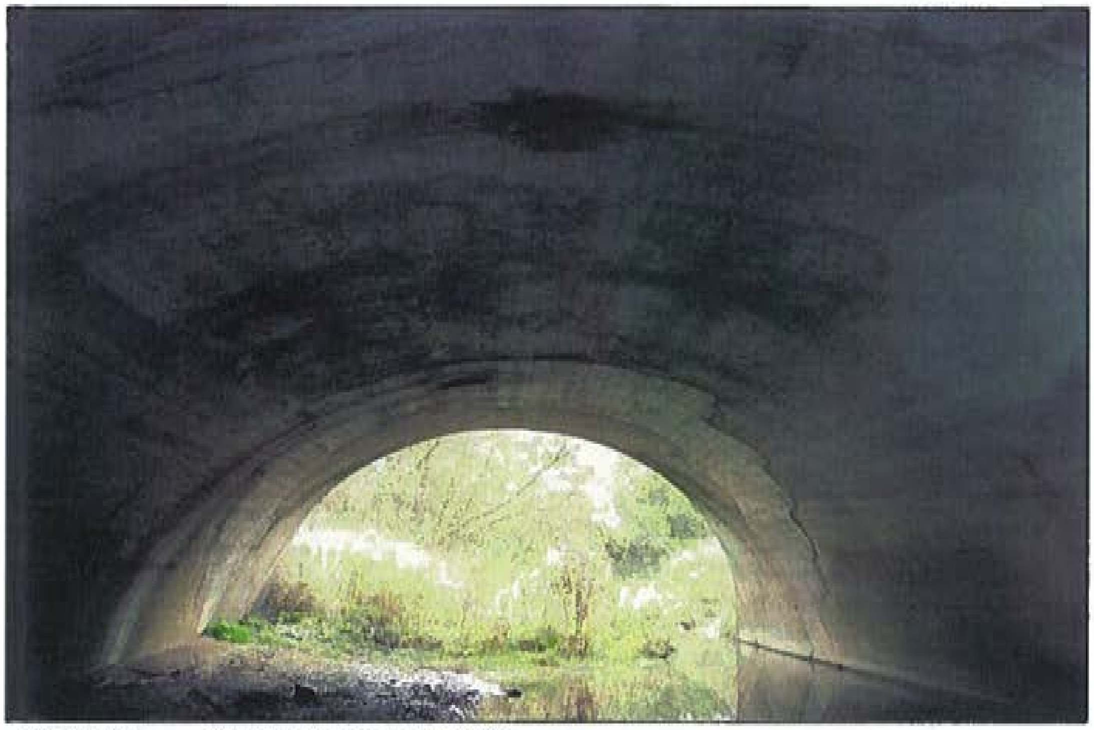


Photo 13: Culvert barrel, looking south.

Photo 14: West wall: stained medium vertical crack.

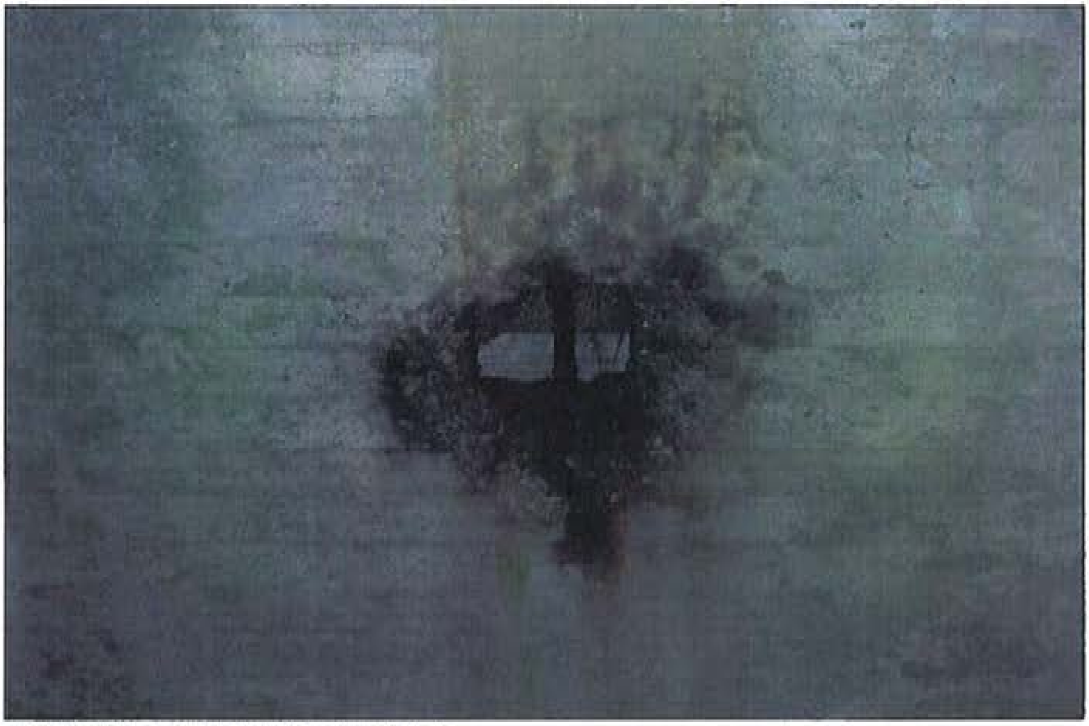


Photo 15: Underside of arch: hole.

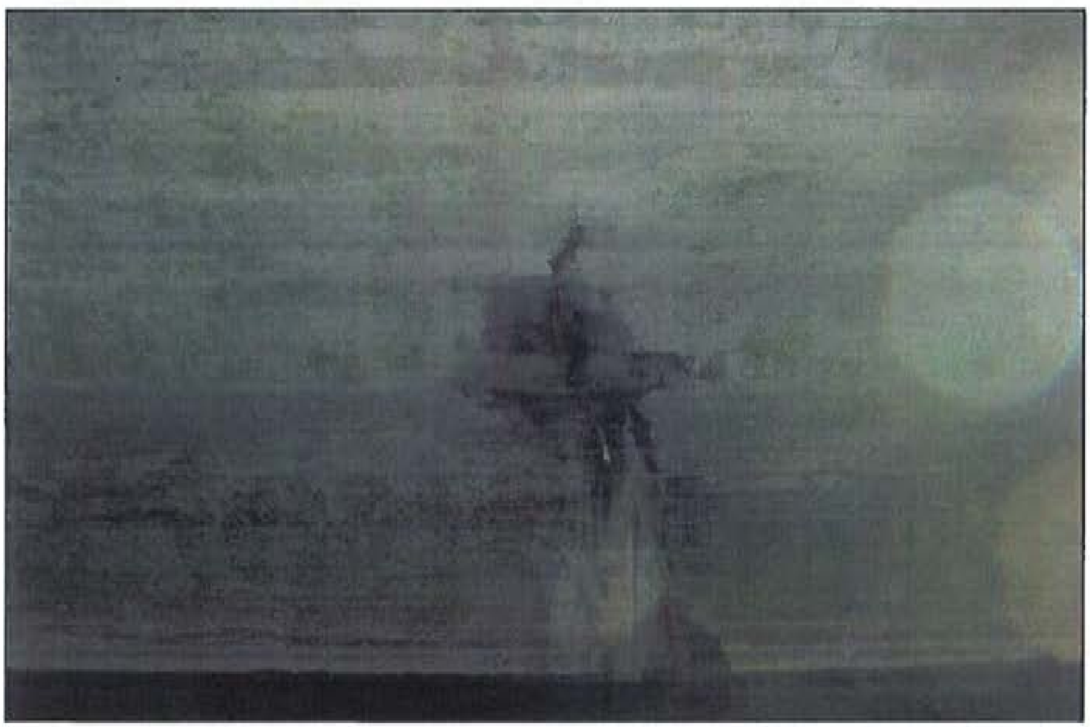


Photo 16: West wall: stained medium vertical crack.

Photo 17: Underside of arch: stained hole and exposed rebar.

Photo 18: Arch, east wall: stained medium vertical crack.

Photo 19: Stream aggradation, south side.

Photo 20: Embankment, southwest corner.

Photo 21: Embankment, southeast corner.

Photo 22: Embankment, northeast corner.

Photo 23: Embankment, northwest corner.

Photo 24: Stream, looking upstream.

Photo 25: Stream, looking south (downstream).

CONCRETE CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	140550	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 12+300	Date:	October 17, 2007
Skew:	0 °	Reviewed by:	Dave Hallman
Type:	Concrete Rigid Frame Open	Date:	
Size:	5.50 x 1.95	Date of construction:	1950
Inlet Elevation:			
Outlet Elevation:			
Length:	37.9		
Flow Direction:	North to South		

OBSERVATIONS:

Inlet:	Good condition
Outlet:	Good condition
Culvert Condition:	Spalls, delamination 1.5 m^2
	Wet areas, exudation
	Light honeycombing 2 m^2 to medium honeycombing 2 m^2
	Rust stains
	Medium horizontal cracks
	Medium vertical cracks 4.3 m, medium stained vertical cracks 13.2 m
	Light erosion east wall 0.6 m^2
Drainage/Flow Condition:	Flow blocked by vegetation
	Aggradation
Recommendations:	Repair concrete spall, delaminations, erosion
	Channelize creek

Photo 1: Mayfield Road, looking west.

Photo 2: Mayfield Road, general view, looking east.

Photo 3: North elevation.

Photo 4: South elevation.

Photo 5: East approach, south side.

Photo 6: East approach, north side.

Photo 7: West approach, north side.

Photo 8: West approach, south side.

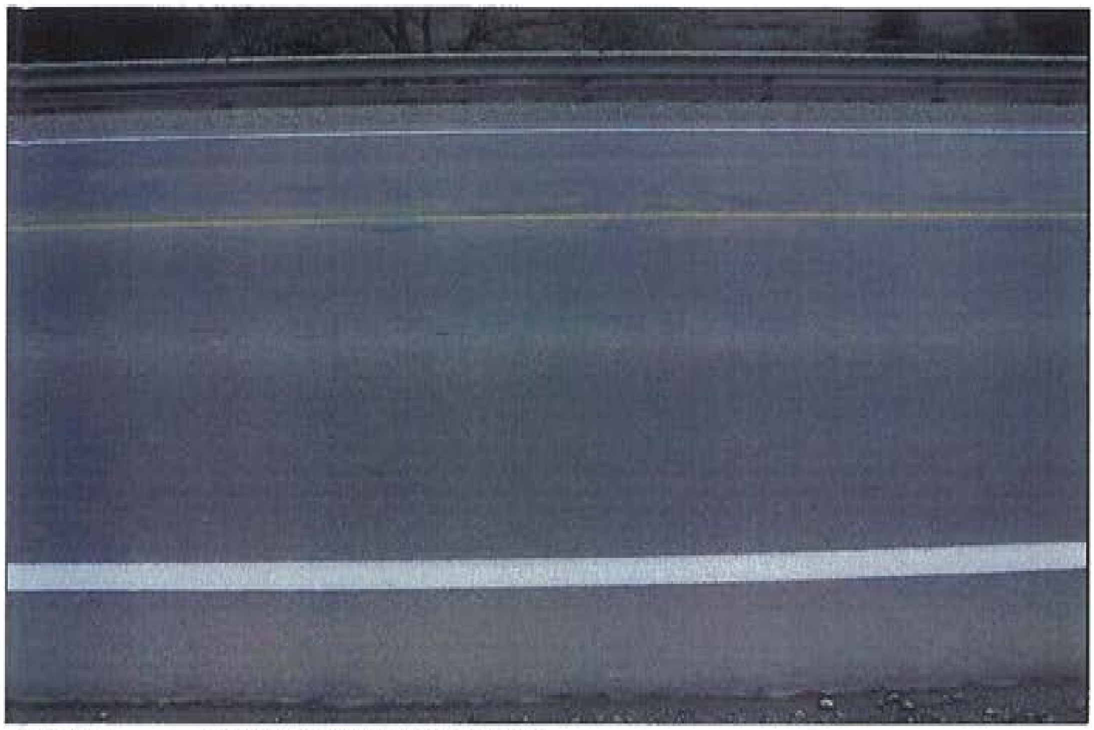


Photo 9: Wearing surface, looking south.

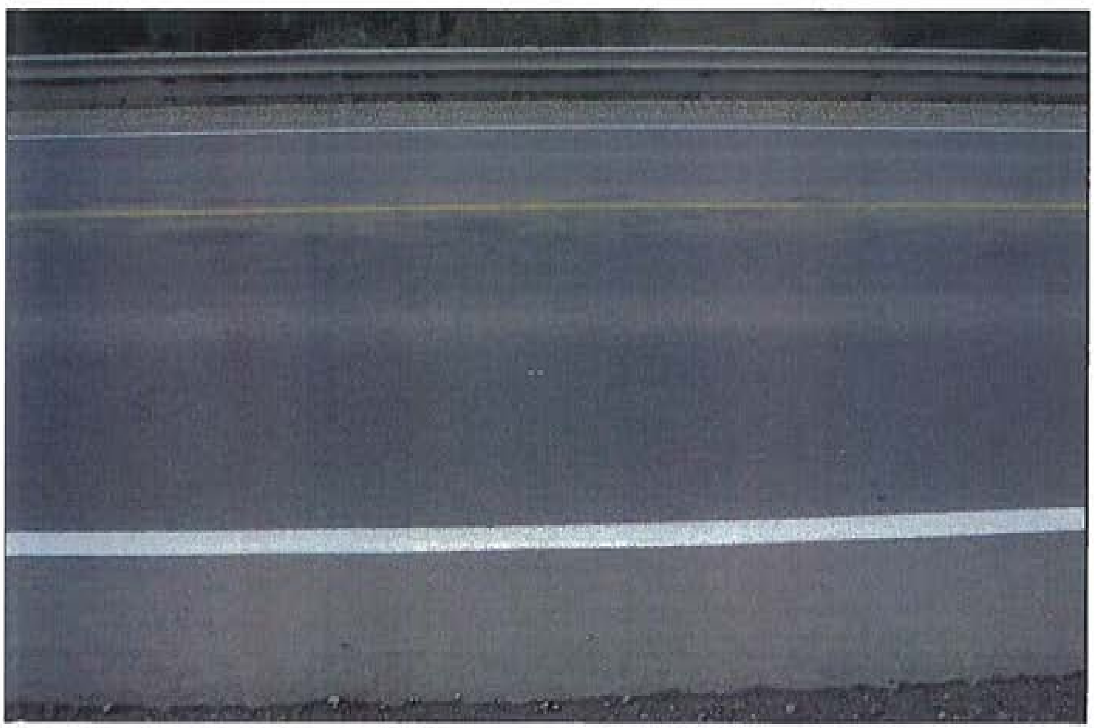


Photo 10: Wearing surface, looking north.

Photo 11: Steel beam guide rail with channel, north and south sides.

Photo 12: Culvert barrel, looking south.

Photo 13: Culvert barrel, looking north.

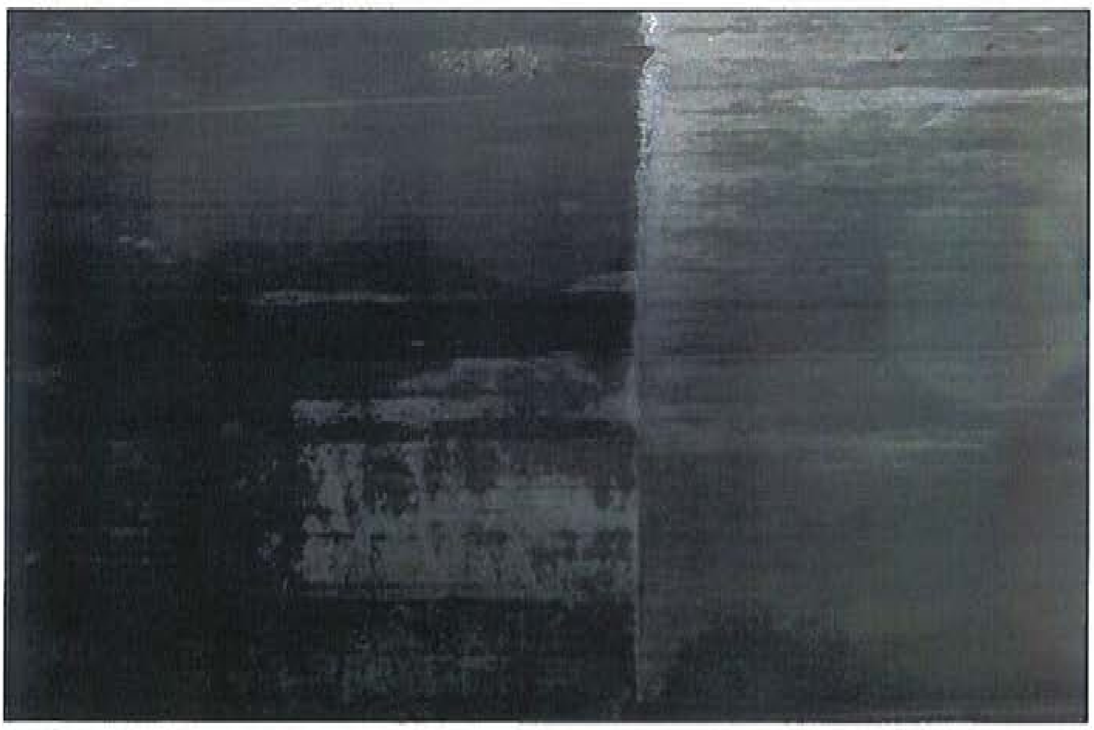


Photo 14: South construction joint, looking east.

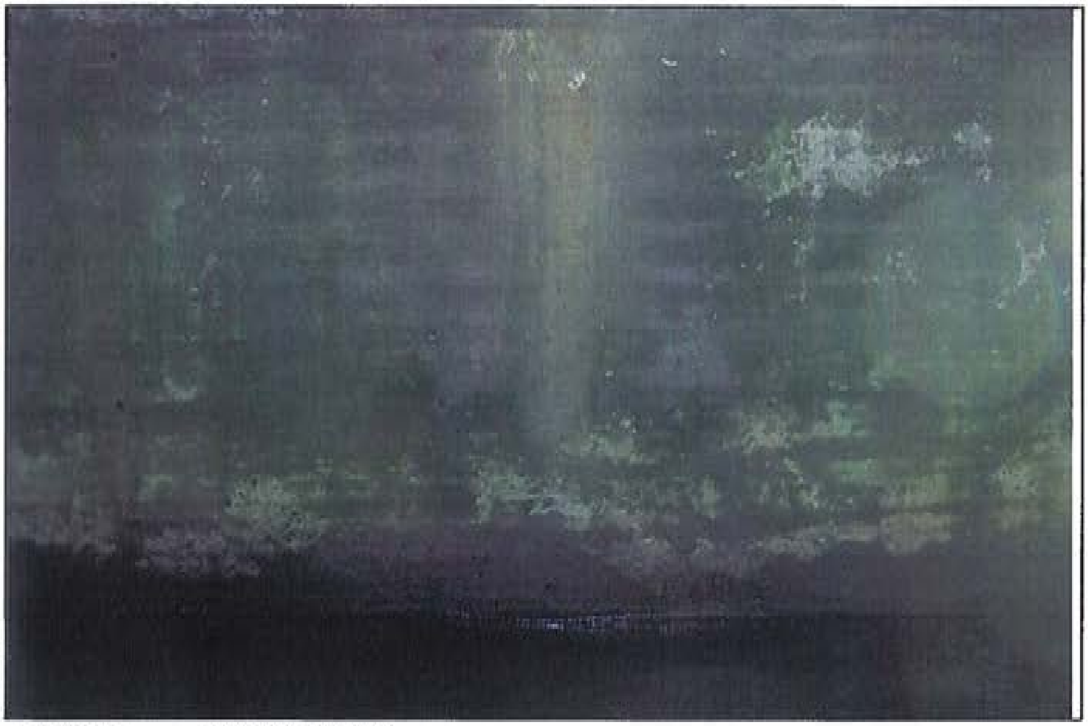


Photo 15: East wall: erosion.

Photo 16: Culvert slab: spall.

Photo 17: East wall: stained vertical crack.

Photo 18: East culvert wall: exudation, wet area.

Photo 19: Embankment, west approach, south side.

Photo 20: Embankment, east approach, south side.

Photo 21: Southwest embankment.

Photo 22: Southeast embankment.

Photo 21: Stream, looking north (upstream).

Photo 22: Stream, looking south (downstream).

CONCRETE CULVERT INSPECTIONS

Mayfield Road
STN Project No.: 160210480

Culvert No.:	140585	Inspected by:	Peter Roscoe
Culvert Location:	Sta. 11+805	Date:	October 17, 2007
Skew:	0 °	Reviewed by:	Dave Hallman
Type:	Concrete Rigid Frame Open	Date:	
Size:	3.66 x 1.75	Date of construction:	1950
Inlet Elevation:	228.2 (north)		
Outlet Elevation:	227.97 (south)		
Length:	29.4		
Flow Direction:	North to South		

OBSERVATIONS:

Inlet:	Medium stained vertical crack
	Erosion of embankment
Outlet:	Good condition
	Erosion of embankment
Culvert Condition:	Spalls, delamination 2.0 m^2
	Wet areas, 2.0 m^2
	Wide vertical cracks 7.0 m
	Medium vertical cracks 5.0 m, medium stained vertical cracks 15.0 m
Drainage/Flow Condition:	Flow blocked by vegetation
Recommendations:	Repair wide vertical crack
	Patch 25 mm Ø holes in culvert soffit
	Repair spalls delaminations

Photo 1: Site 585, general view, Mayfield Road, looking east.

Photo 2: Mayfield Road, general view, looking west.

Photo 3: North elevation.

Photo 4: South elevation.

Photo 5: West approach, south side, looking east.

Photo 6: West approach, north side, looking east.

Photo 7: East approach, south side, looking west.

Photo 8: East approach, north side, looking west.

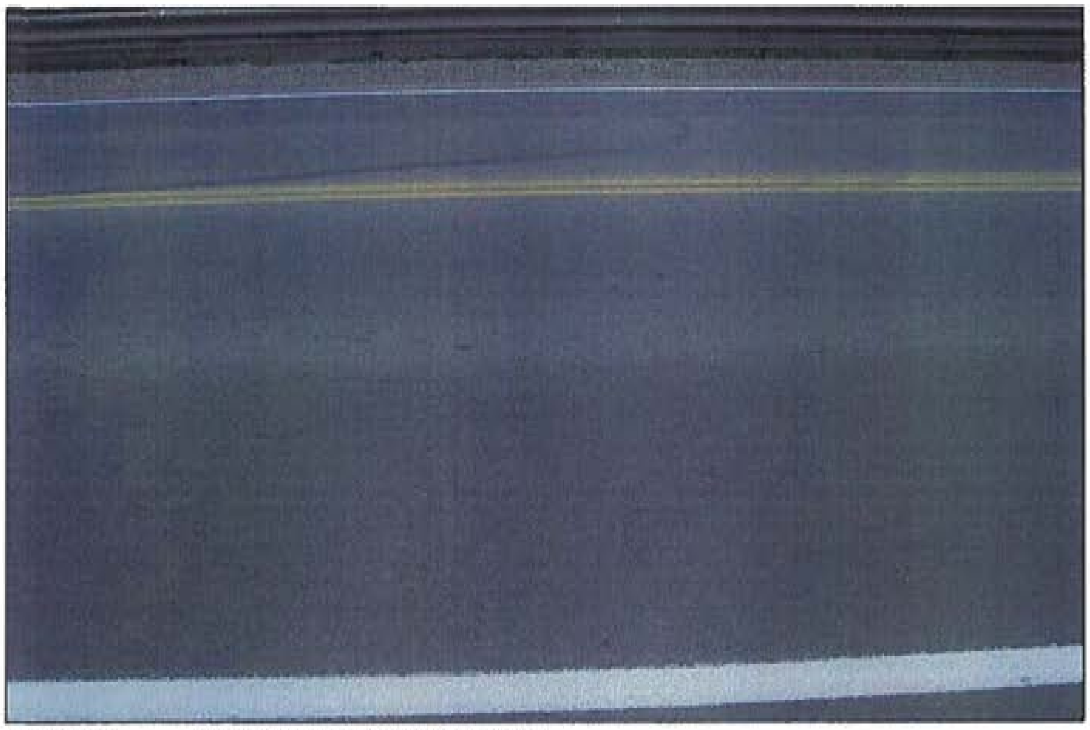


Photo 9: Wearing surface, looking south.

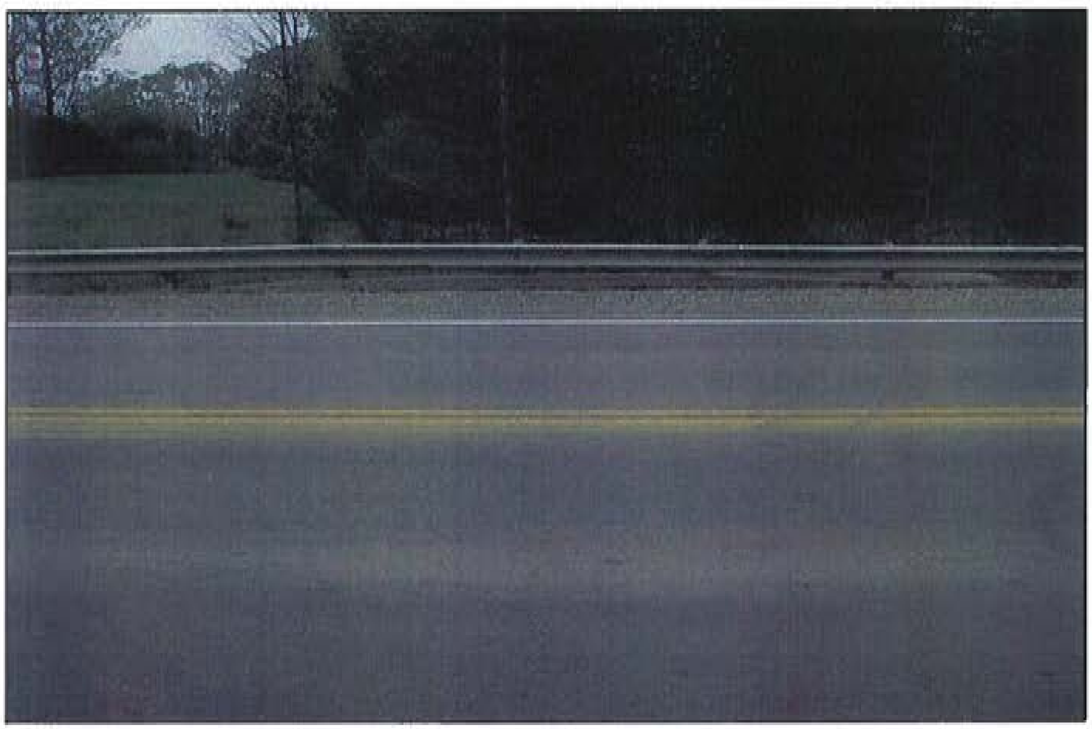


Photo 10: Steel beam guide rail with channel, north side.

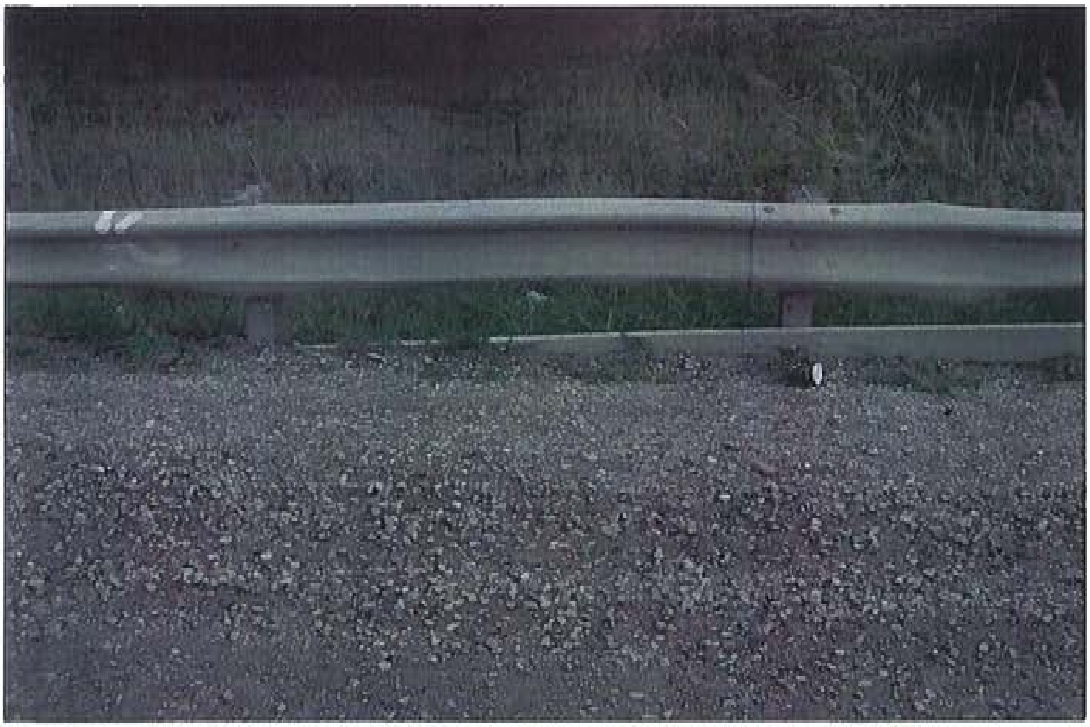


Photo 11: Steel beam guide rail, east approach, south side: impact damage.

Photo 12: Water service, east approach, south side.

Photo 13: Culvert barrel, looking north.

Photo 14: Culvert barrel, looking south.

Photo 15: East wall: wide vertical crack.

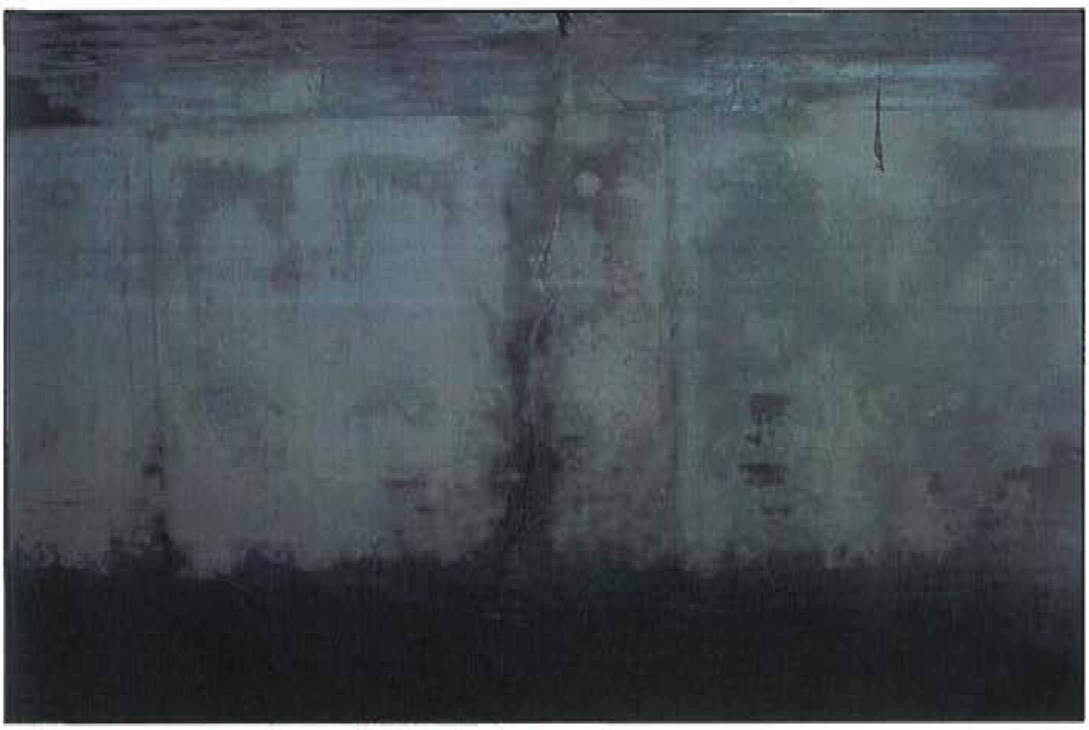


Photo 16: West wall: wide vertical crack.

Photo 17: Underside of culvert barrel: spall and delamination.

Photo 18: Underside of culvert barrel, looking west: wet area and holes in the slab.

Photo 19: Northwest embankment.

Photo 20: Northeast embankment.

Photo 23: Stream, looking north (upstream).

Photo 24: Stream, looking north (upstream).

Photo 25: Stream, looking south.

Photo 26: Stream, looking south (downstream).

SUMMARY SHEET FOR STRUCTURE SIZING (CULVERT, BRIDGE) AND PIPE CROSSING OF WATERCOURSES (WATER, SEWER)

Mayfield Road (Airport Road to Coleraine Drive)

Conservation for The Living City

DATE CHART LAST REVISED: Tuesday, November 27, 2007
DATE OF SITE VISIT: Wednesday, November 21, 2007
PROJECT NAME: Mayfield Road (Airport Road to Coleraine Drive)
PROPONENT: Region of Peel
TRCA PROJECT MANAGER: Sharon Lingertat, TRCA
MUNICIPAL PROJECT MANAGER: Sandy Lonliatto, Region of Peel
CONSULTANT PROJECT MANAGER: Garry Lacock, Stantec Consulting Ltd.
TRCA FILE #: 39504

		Location #1	Location #2	Location #3	Location #4	Location #5	Location #6	Location #7	Location #8	Location #9
TRCA to complete	Watercourse Location (refer to attached map for corresponding location number) / Location (between / and / streets)	Mayfield Road (east of Airport Rd.)	Mayfield Road (between Airport Rd. and Innis Lake Rd.)	Mayfield Road (east of Innis Lake Rd.)	Mayfield Road (east of Innis Lake Rd.)	Mayfield Road (east of Innis Lake Rd.)	Mayfield Road (east of Centreville Creek Rd.)	Mayfield Road (east of Centreville Creek Rd.)	Mayfield Road (east of Centreville Creek Rd.)	Mayfield Road (east of The Gore Rd.)
[illegible]										
TRCA to complete	Within a Regulated Area	[illegible]	Yes	Yes	No	Yes	Yes	Yes	[illegible]	Yes
	Within a Wetland Area of Interference? (Y/N)	No	No	No	No	No	No	No	No	No
	Within a Watercourse? (Y/N)	No	Yes - watercourse located both north and south of Mayfield Rd	Yes - watercourse located both north and south of Mayfield Rd	No	Yes - watercourse located both north and south of Mayfield Rd	Yes - watercourse located both north and south of Mayfield Rd	Yes - watercourse located both north and south of Mayfield Rd	Yes - Identified as a watercourse on the south of Mayfield Rd. only [illegible]	Yes - watercourse located both north and south of Mayfield Rd
	Within a Regional Storm Floodplain? (Y/N) (>50 ha upstream drainage / [illegible] upstream drainage) * = Regional Storm Floodplain; Hydraulic Capacity of existing structure [illegible] Regional Storm	No	No	Yes	No	Yes	Yes	No	No	No
Proponent to complete	Proposed Structure [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Open or Closed Footing?									
	Extension only proposed? (Y/N)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Removal, Replacement only proposed?	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Removal, Replacement and Larger [illegible] Proposed? (Y/N)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TRCA to complete	Hydraulic Analysis Required? (Y/N)	No	Yes - if extending or replacing	Yes - if extending or replacing	No	Yes - if extending or replacing	Yes - if extending or replacing	Yes - if extending or replacing	[illegible]	Yes - if extending or replacing
	Meander Belt Analysis Required? (Y/N)	No	Yes - if extending or replacing	Yes - if extending or replacing	No	Yes - if extending or replacing	Yes - if extending or replacing	Yes - if extending or replacing	[illegible]	Yes - if extending or replacing
	100-year Erosion Limit Required? (Y/N)	No	Yes - if extending or replacing	Yes - if extending or replacing	No	Yes - if extending or replacing	Yes - if extending or replacing	Yes - if extending or replacing	[illegible]	Yes - if extending or replacing
	[illegible] (Y/N)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Open Footed Required? (Y/N)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Geotechnical Report Required	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Terrestrial Passage Required? (Y/N)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Embedment and substrate for Aquatic Passage Required? (Y/N)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]										
Proponent to complete	Pipe Crossing Above or Below Culvert, as required?									
	Geotechnical Report [illegible] for pipe crossing, as required?									
	Distance between invert of creek and obvert of pipe [illegible], as required?									
	[illegible]									
[illegible]										
TRCA to complete	Ontario Regulation [illegible] permit required? (Y/N)	[illegible]	Yes	Yes	[illegible]	Yes	Yes	Yes	Yes	Yes
	a) site grading	[illegible]	Yes	Yes	[illegible]	Yes	Yes	Yes	Yes	Yes
	b) temporary/permanent placement of material	[illegible]	Yes	Yes	[illegible]	Yes	Yes	Yes	Yes	Yes
	c) construction of a structure	[illegible]	[illegible]	Yes	[illegible]	Yes	Yes	Yes	Yes	Yes
	d) change to a structure	[illegible]	[illegible]	Yes	[illegible]	Yes	Yes	Yes	Yes	Yes
	Interfere with or Alter a Wetland (Y/N)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Interfere with or Alter a Shoreline (Y/N)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Interfere with or Alter a Watercourse (Y/N)	[illegible]	Yes	Yes	[illegible]	Yes	Yes	Yes	Yes	Yes
	[illegible]	[illegible]	Yes	Yes	[illegible]	Yes	Yes	Yes	Yes	Yes
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Proponent to complete	[illegible]									
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Toronto and Region Conservation for The Living City

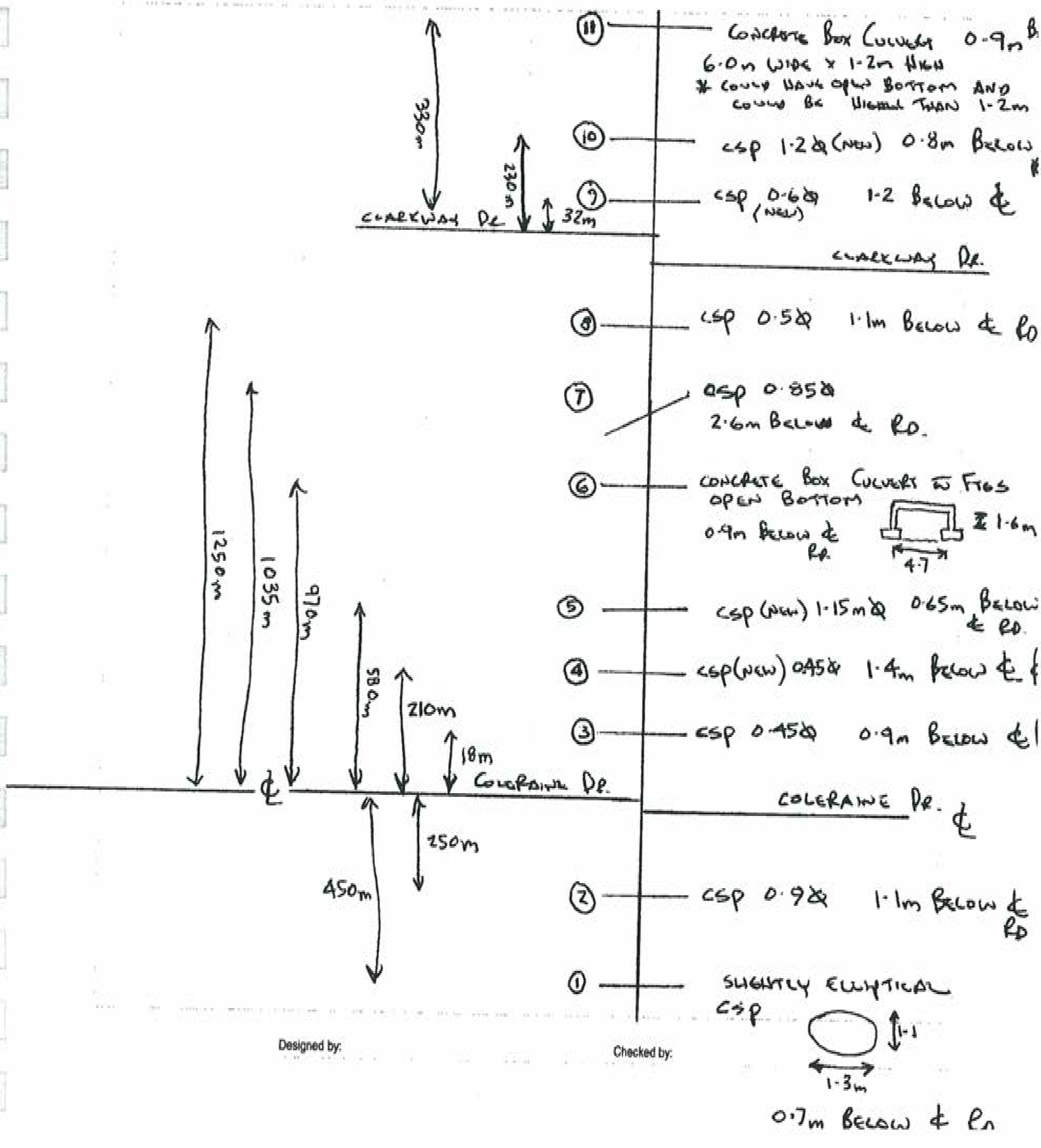
DATE CHART LAST REVISED:	Tuesday, November 27, 2007
DATE OF SITE VISIT:	Wednesday, November 21, 2007
PROJECT NAME:	Mayfield Road (Airport Road to Coleraine Drive)
PROPONENT:	Region of Peel
TRCA PROJECT MANAGER:	Sharon Lingertat, TRCA
MUNICIPAL PROJECT MANAGER:	Sandy Lentsello, Region of Peel
CONSULTANT PROJECT MANAGER	Gary Lesioh, Stantec Consulting Ltd.
TRCA FILE #	26024

[illegible]								
TRCA to complete	Watercourse Location (refer to attached map for corresponding location number)	Location #10	Location #11	Location #12	Location #13	Location #14	Location #15	Location #16
	Location (between / entry streets)	Mayfield Road (east of The Gore Rd.)	Mayfield Road (east of The Gore Rd.)	Mayfield Road (east of Clarkway Dr.)	Mayfield Road (east of The Gore Rd.)	Mayfield Road (east of The Gore Rd.)	Mayfield Road (east of Coleraine Dr.)	Mayfield Road (east of Coleraine Dr.)
[illegible]								
TRCA to complete	Within a Regulated Area	Yes	Yes	Yes	Yes	Yes	No	No
	Within a Wetland/Area of Interference ? (Y/N)	No	No	No	No	No	No	No
	Within a Watercourse? (Y/N)	Yes - watercourse located both north and south of Mayfield Rd	Yes - watercourse located both north and south of Mayfield Rd	Yes - watercourse located both north and south of Mayfield Rd	Yes - watercourse located both north and south of Mayfield Rd	Yes - watercourse located both north and south of Mayfield Rd	Yes - identified as a headwater drainage feature on the south side of Mayfield Rd	Yes - identified as a headwater drainage feature on the south side of Mayfield Rd
	Within a Regional Storm Floodplain? (Y/N)	Yes	Yes	Yes	Yes	Yes	No	No
	(>50 ha upstream drainage/<50ha? upstream drainage)							
	*= Regional Storm Floodplain							
	Hydraulic Capacity of existing structure is (adequate/inadequate) to convey Regional Storm?							
[illegible]								
Proponent to complete	Proposed Structure (L x W x H and type)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Open or Closed Footed?							
	Extension only proposed? (Y/N)	Yes	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Removal, Replacement only proposed?	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Removal, Replacement and Lengthening Proposed? (Y/N)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]								
TRCA to complete	Hydraulic Analysis Required? (Y/N)	Yes - if extending or replacing	Yes - if extending or replacing	Yes - if extending or replacing	Yes - if extending or replacing	Yes - if extending or replacing	tbd	tbd
	Meander Belt Analysis Required? (Y/N)	Yes - if extending or replacing	Yes - if extending or replacing	Yes - if extending or replacing	Yes - if extending or replacing	Yes - if extending or replacing	tbd	tbd
	100-year Erosion Limit Required? (Y/N)	Yes - if extending or replacing	Yes - if extending or replacing	Yes - if extending or replacing	Yes - if extending or replacing	Yes - if extending or replacing	tbd	tbd
	Groundwater (upwellings and shallow open footed culvert) (Y/N)	No	No	No	No	No	No	No
	Open Footed Required? (Y/N)	No	No	No	No	No	No	No
	Geotechnical Report Required	Yes	Yes	Yes	Yes	Yes	No	No
	Terrestrial Passage Required? (Y/N)	No	No	No	No	No	No	No
	Enhancement and extension for Aquatic Passage Required? (Y/N)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Net Benefit of Proposed [illegible]	No	No	No	No	No	No	No
[illegible]								
Proponent to complete	[illegible]							
	[illegible]							
	[illegible]							
	[illegible]							
[illegible]								
TRCA to complete	Ontario Regulation [illegible] permit required (Y/N)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	a) site grading	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	b) temporary/permanent placement of material	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	c) construction of a structure	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	d) change to a structure	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Interfere with or Alter a Wetland (Y/N)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Interfere with or Alter a Shoreline (Y/N)	No	No	No	No	No	No	No
	Interfere with or Alter a Watercourse (Y/N)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Proponent to complete	[illegible]							
Proponent to complete	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]								
		Cemetery located on the south side of Mayfield Road.						

Stantec

MAYFIELD RD. - CULVERT DETAILS

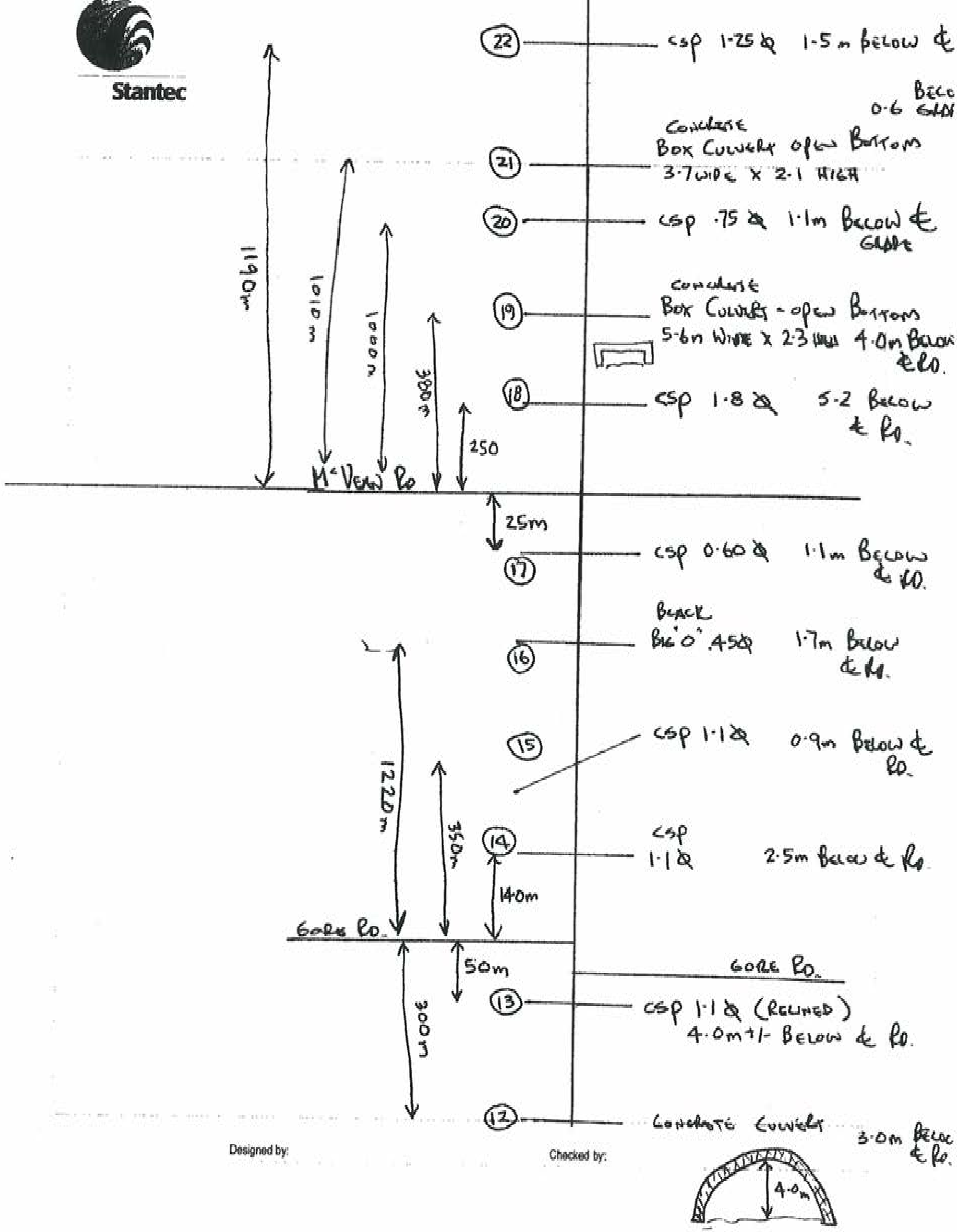
APR 30/07



Designed by:

Checked by:

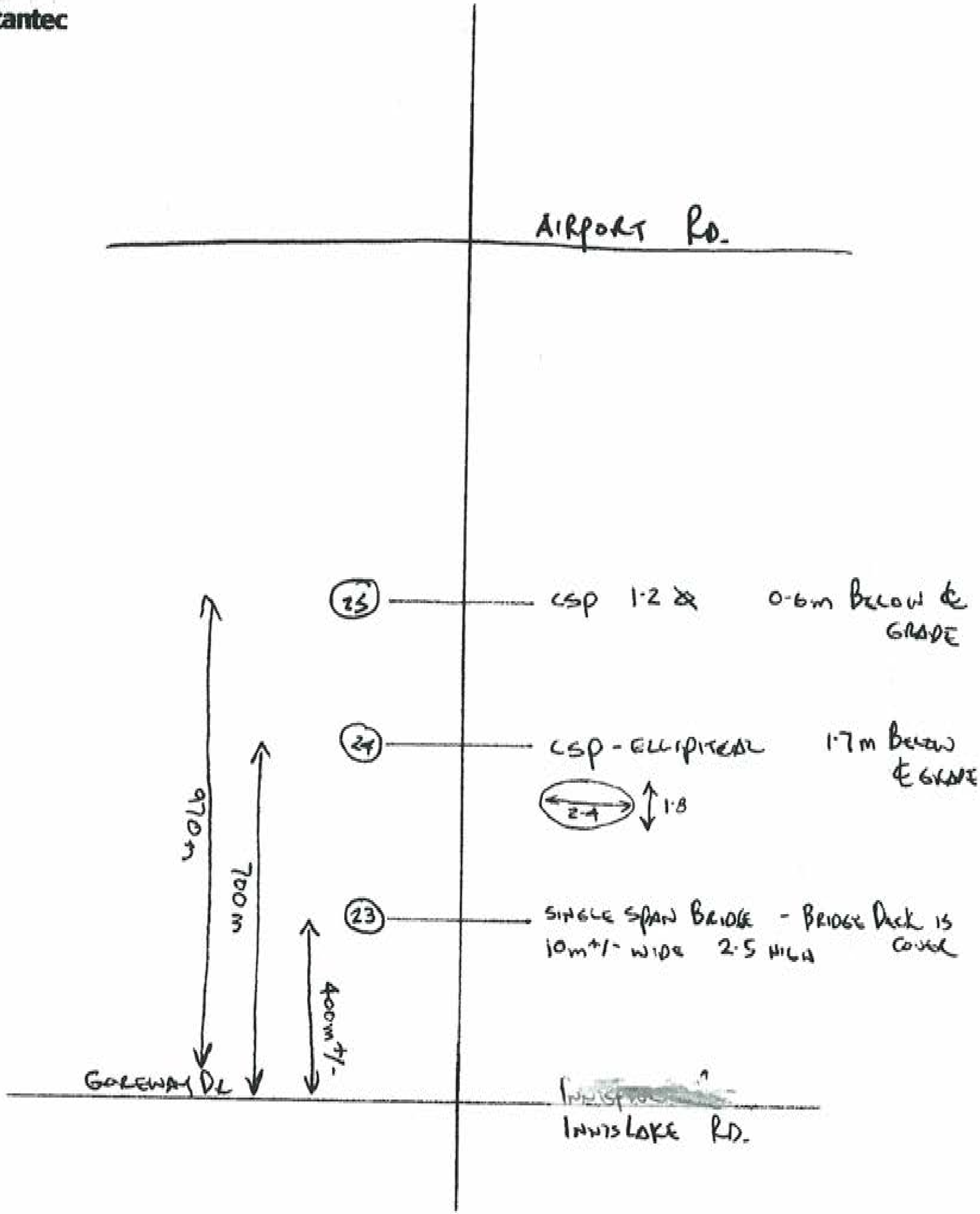
Stantec



Designed by:

Checked by:

Stantec



Designed by:

Checked by:

APPENDIX I

CULVERT &
STORMWATER MANAGEMENT REPORT

Culvert and Stormwater Management Report
Mayfield Road EA - Airport Road to Coleraine Drive

Prepared for:

Region of Peel

Prepared by:

Stantec Consulting Ltd.
49 Frederick Street
Kitchener ON N2H 6M7

Project 1602-10480

April 2013

Table of Contents

Table of Contents

List of Tables

Page

List of Figures

Following Page

List of Appendices

1.0 Introduction

The purpose of this report is to address the hydraulic and water quality concerns associated with construction along Mayfield Road, in the Region of Peel. The study area contains 23 centreline culvert crossings of Mayfield Road between Airport Road and Coleraine Drive, and one culvert across Coleraine Drive at the intersection of Mayfield Road with Coleraine Drive. This analysis was undertaken in order to determine whether the culverts are appropriately sized under existing conditions, to select the appropriate dimensions of the culverts under proposed conditions, and to determine the required stormwater management controls for the site.

Mayfield Road is a major east-west arterial road and it generally consists of two rural lanes and gravel shoulders. Mayfield Road is a Regional Road which forms the boundary between the Town of Caledon and the City of Brampton. Based on the *Region of Peel Design, Specification & Procedures Manual for Storm Sewers* (December 2006), culverts that cross an arterial roadway are to be designed for a 25-year storm and should have a minimum diameter of 600 mm. Major crossings (drainage areas larger than 50 ha) are to be designed for a Regional Storm event.

2.0 Background Information

A number of field inspections were carried out in 2007 to assess the existing highway culverts within the project limits to fully document the culverts. No visible signs of flooding were present. This information is summarized in Table 1. There were 24 centreline culverts (23 on Mayfield Road and 1 on Coleraine Drive) subject to a review of capacity within the study area. Eight of the culverts were recommend to be replaced due to poor culvert conditions observed during the culvert inspection.

Mayfield Road corridor runs through the Region of Peel and is bordered on the north by the Town of Caledon and on the south by the City of Brampton. All of the culverts are located within the Humber River watershed. The drainage areas consist primarily of clay loam till with good to poor drainage, which was derived from the *Soil Survey of Peel County – Report No. 18 of the Ontario Soil Survey*, (Ministry of Agriculture and Food, 1953). The land use is primarily agricultural with a few hamlets and one industrial park at the northeast corner of Catchment 1190.

Table 1: Summary of Existing Culvert Characteristics

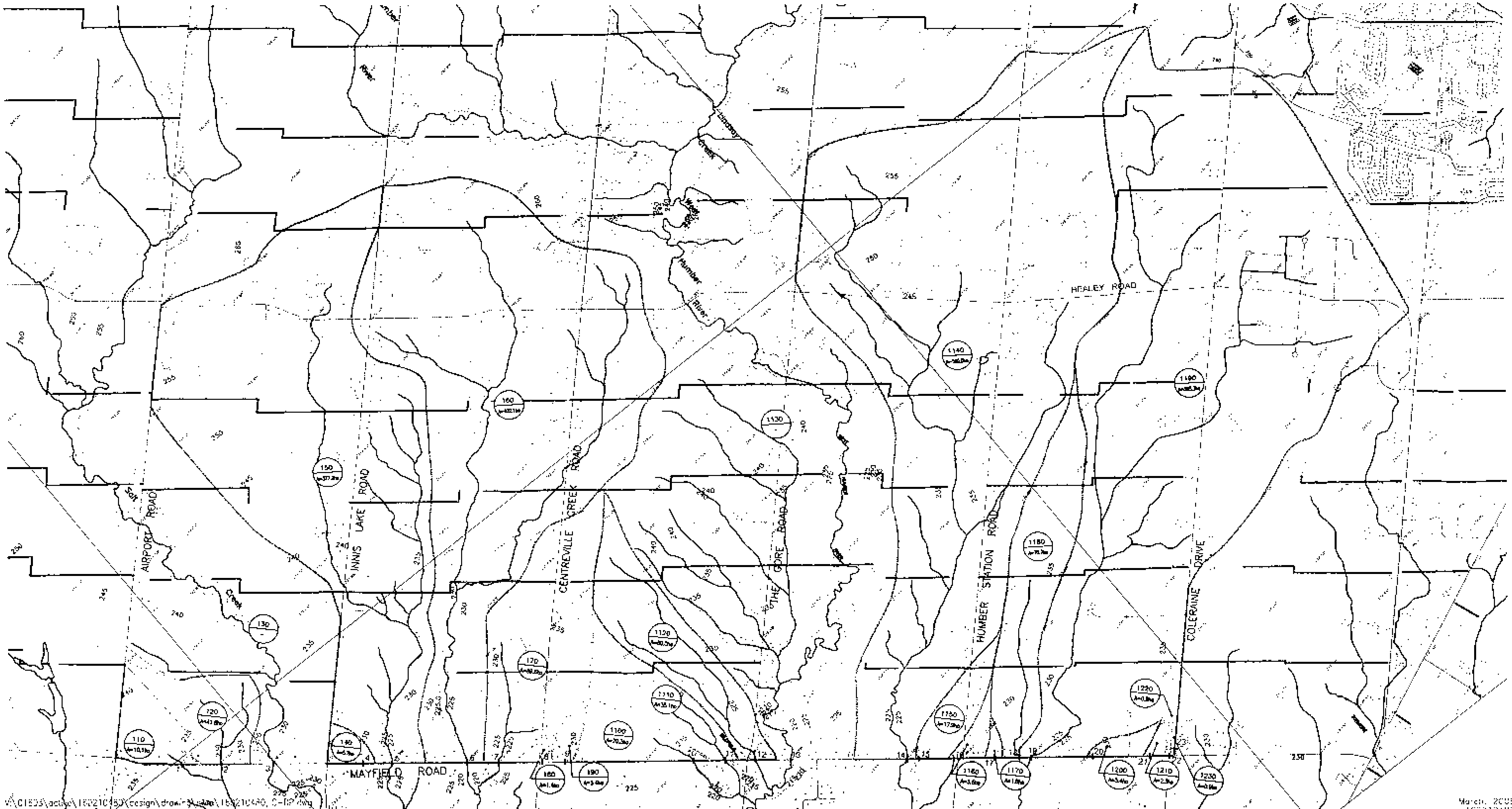
Station	Material	Shape	Dimensions (mm)		Drainage Area (ha)	Culvert Length (m)	Comments	Regulated Area
			Span	Height / Diameter				
10+425	CSP	Circular		1200	10.1	19.6	impact damage	no
10+689	CSP	Elliptical	2500	1800	42.8	30.6	blocked by debris	yes
11+015	Concrete	Box	9000	2600	N/A	25.0		yes
11+603	CSP	Circular		1200	5.7	21.5	severe corrosion / deformed	no
11+800	Concrete	Box	3600	1830	377.0	29.4	impact damage	yes
11+812	CSP	Circular		750	377.0	20.6	good condition	yes
12+300	Concrete	Box	5500	1950	402.1	37.9	good condition	yes
12+500	CSP	Circular		1800	89.6	41.6	corrosion through at bottom	yes
12+787	CSP	Circular		600	1.4	23.1	severe impact	no
12+927	PVC	Circular		450	5.4	21.6	good condition	no
13+763	CSP	Circular		1050	20.3	24.7	corrosion through at bottom	no
13+970	PVC	Circular		915	35.1	31.0	good condition	yes
14+177	PVC	Circular		1100	60.0	30.7	unstable embankment	yes
14+400	Concrete	Arch	9000	4000	N/A	25.0	sedimentation	yes
15+156	Concrete	Box	6070	1250	560.0	20.7	flow blocked by vegetation	yes
15+249	CSP	Circular		1200	17.9	19.7	good condition	no
15+454	CSP	Circular		600	5.6	20.0	light corrosion	no
15+693	CSP	Circular		600	1.8	18.5	light corrosion	no
15+885	CSP	Circular		900	666.0	30.3	light corrosion and impact damage	yes
15+955	Concrete	Box	4630	1590	666.0	21.7	sedimentation	yes
16+327	CSP	Circular		1200	5.4	20.1	good condition	no
16+700	CSP	Circular		450	2.3	20.6	unstable embankment	no
16+842	CSP	Circular		450	0.9	18.7	blocked by debris	no
16+887	CSP	Circular		450	0.9	17.8	buried outlet	no

3.0 Existing Conditions

3.1 HYDROLOGIC MODELLING

A detailed surface water assessment has been completed to quantify surface drainage characteristics of lands contributing drainage through the Mayfield Road right-of-way within the study area in order to assess the performance of the existing drainage system. Hydrologic event modelling was used to quantify the peak flow rates upstream of each culvert during the 25-year and 100-year rainfall events. The hydrologic model SWMHYMO was used to determine peak flows to the roadway. To assess the drainage system, the area was modelled using the 1, 6, 12, and 24-hour AES storm distributions for Toronto, Ontario (used in the Humber River Watershed modelling). The highest flow rate was used for the culvert analysis. The Regulatory flow rate is calculated as the higher of the proposed conditions 100-year uncontrolled flow or the Regional Storm (Hurricane Hazel).

Catchment areas were delineated based on 1:10,000 Ontario Base Mapping as shown on Figure 1.0. Additional drainage information was obtained from aerial photography of the area and supplemental topographic survey completed by Stantec Consulting Ltd. in 2007. Catchment area delineation and hydrologic modelling was not completed for the culverts at Stations 11+015 and 14+400 since detailed hydrologic and hydraulic modelling has already been completed by the Toronto and Region Conservation Authority (TRCA) for these culverts. Catchment parameters are provided in Appendix A, while the hydrologic model files are provided in Appendix B and summarized in Table 2. The culverts at Stations 11+800 and 11+812 as well as 15+885 and 15+955 are located near each other and during flood events act as a single crossing.



Stantec

Stantec Consulting Ltd.
49 Frederick Street
Kitchener ON Canada
N2H 6M7
Tel. 519.579.4410
Fax. 519.579.6733
www.stantec.com

Legend

CATCHMENT ID
CATCHMENT AREA (ha)

Notes

1:25,000 — 0 250 750 1250m

Client/Project
REGION OF PEEL
MAYFIELD ROAD
ENVIRONMENTAL ASSESSMENT

Figure No.
1.0

Title
DRAINAGE AREA PLAN

ORIGINAL SHEET - ANSI B

Table 2 – Summary of Culvert Flows

Station	Catchment ID	Drainage Area (ha)	Peak Flows (m^3/s)		
			Design	Check	Regulatory
10+425	110	10.1	0.566	0.751	1.470
10+689	120	42.8	1.850	2.484	5.792
11+015	130	N/A	25.44	33.39	96.70
11+603	140	5.7	0.304	0.420	0.805
11+800	150	377.0	8.430	11.288	43.418
11+812		377.0	8.430	11.288	43.418
12+300	160	402.1	8.254	11.073	11.661
12+500	170	89.6	2.604	3.554	0.202
12+787	180	1.4	0.086	0.120	0.777
12+927	190	5.4	0.219	0.295	2.895
13+763	1100	20.3	1.120	1.546	5.043
13+970	1110	35.1	1.741	2.340	8.518
14+177	1120	60.0	2.302	3.064	60.007
14+400	1130	N/A	31.36	41.65	112.97
15+156	1140	560.0	9.396	12.367	2.579
15+249	1150	17.9	0.774	1.039	0.793
15+454	1160	5.6	0.224	0.299	0.277
15+693	1170	1.8	0.262	0.392	9.783
15+885	1180	666.0	13.515	17.494	63.926
15+955	1190	666.0	13.515	17.494	71.888
16+327	1200	5.4	0.243	0.325	0.795
16+700	1210	2.3	0.137	0.191	0.327
16+842	1220	0.9	0.061	0.084	0.135
16+887	1230	0.9	0.109	0.163	0.127

3.2 HYDRAULIC MODELLING

In accordance with Region of Peel criteria, the culverts should accommodate the design storm (25-year flow). Culverts with less than 1.0 m of freeboard to the top-of-road elevation during the design storm may indicate that the culvert is undersized. A check was made to ensure that the water level upstream of the highway crossing was below the roadway elevation during the 100 year rainfall event. Culverts with drainage areas larger than 50 ha were also analyzed using the Regulatory storm to ensure that the proposed crossings will not negatively impact the Regulatory floodplain.

The peak flows from the hydrologic modelling were used along with the existing culvert data in CulvertMaster, a program used to assist in design and analysis of culverts, to determine the existing conveyance capacity of each culvert. The results of the hydraulic analysis for the existing highway culverts are included in Appendix C and summarized in Table 3. Tailwater depths were assumed to be 60 % of the culvert height (approximately equal to critical depth). Invert elevations, lengths, dimensions, and other culvert characteristics were obtained from culvert inspection reports and topography of the roadway. Water levels for the major crossings (Salt Creek – Station 11+015 and the West Humber River Humber –Station 14+400) were analyzed using HEC-RAS modelling provided by the TRCA and are capable of passing the Regional Storm without overtopping Mayfield Road.

Table 3 – Hydraulic Assessment of Existing Culverts

Station	Catchment ID	Dimension (mm)		Drainage Area (ha)	Summary of Hydraulic Performance		
					Design Storm		Check Storm
		Width	Height / Diameter (mm)		Freeboard	Depth of Headwater	Water Level
					> 1.0 m	< 1.5xCulvert Diameter	< Edge of Travelled Lane
10+425	110		1200	10.1	Yes	Yes	Yes
10+689	120	2500	1800	42.8	Yes	Yes	Yes
11+015	130	9000	2600	N/A	Yes	Yes	Yes
11+603	140		1200	5.7	Yes	Yes	Yes
11+800	150	3660	1830	377.0	Yes	Yes	Yes
11+812			750	377.0	Yes	Yes	Yes
12+300	160	5500	1950	402.1	Yes	Yes	Yes
12+500	170		1800	89.6	Yes	Yes	Yes
12+787	180		600	1.4	No	Yes	Yes
12+927	190		450	5.4	Yes	Yes	Yes
13+763	1100		1050	20.3	No	Yes	Yes
13+970	1110		915	35.1	Yes	Yes	Yes
14+177	1120		1100	60.0	Yes	Yes	Yes
14+400	1130	9000	4000	N/A	Yes	Yes	Yes
15+156	1140	6070	1250	560.0	Yes	Yes	Yes
15+249	1150		1200	17.9	Yes	Yes	Yes
15+454	1160		600	5.6	Yes	Yes	Yes
15+693	1170		600	1.8	Yes	Yes	Yes
15+885	1180		900	666.0	No	Yes	Yes
15+955	1190	4630	1590	666.0	No	Yes	Yes
16+327	1200		1200	5.4	Yes	Yes	Yes
16+700	1210		450	2.3	Yes	Yes	Yes
16+842	1220		450	0.9	Yes	Yes	Yes
16+887	1230		450	0.9	No	Yes	Yes

3.3 EXISTING CONDITIONS HYDRAULIC SUMMARY

Based on the existing conditions hydraulic analysis of the 24 centreline culverts the following conclusion can be drawn:

- 19 culverts passed the design storm (25-year) with greater than 1.0 m of freeboard
- 5 culverts passed the design storm with less than 1.0 m of freeboard
- None of the culverts overtop the roadway during the 100-year rainfall event

4.0 Proposed Conditions

4.1 HYDROLOGIC MODELLING

The *Humber River Watershed Plan* (TRCA, 2007) requires that all future development control post-development peak flows to pre-development levels for all storms up to and including the 100-year storm. This policy is in agreement with the guidelines for the Region of Peel, City of Brampton, and Town of Caledon. Since any future development would be required to maintain the existing flow rates, the proposed hydraulic analysis will use the existing flows to determine the proposed culvert diameters. The Regulatory flow rate, based on the greater of the proposed conditions 100-year uncontrolled flow or the Regional Storm (Hurricane Hazel) was used to determine the impact to the Regulatory flood plain for culverts with a drainage area greater than 50 ha.

4.2 HYDRAULIC MODELLING

The peak flows from the hydrologic modelling were used along with the proposed culvert data in CulvertMaster to determine the conveyance capacity of each culvert. Due to the widening of the road the culverts were extended and raised to maintain existing drainage pathways. Several culverts that were acceptable under existing conditions are proposed for replacement due to the proposed road geometry or other factors such as the presence of endangered species habitat (Redside Dace).

The roadway culverts should accommodate the design flow (25-year). Culverts were designed to have a headwater depth less than 1.5 times the height of the culvert and more than 1.0 m of freeboard during the design storm. A check was made to ensure that the water level upstream of the highway crossing was below the roadway elevation during the 100-year rainfall event.

Preliminary pipe dimensions were calculated based on the proposed road geometry, ground elevations upstream and downstream of the road, and the existing channel locations. Culvert sizes were calculated assuming the same material as existing conditions. Different culvert materials and inlet geometry (i.e. headwalls) could result in changes to the culvert dimensions. The peak flows from the hydrologic modelling were used along with the culvert data in CulvertMaster or HEC-RAS to determine the conveyance capacity of each culvert. The results of the hydraulic analysis for the highway culverts are included in Appendix C and summarized in Table 4. Tailwater at 60% of the culvert height, approximately equal to critical depth, was assumed for most of the proposed culverts. Invert elevations and top of road elevations were based on detailed topography along the roadway and the proposed road profile. For culverts with a drainage area of 50 ha or larger, the Regulatory floodplain was calculated under existing and proposed conditions to ensure the flood elevation was maintained or decreased as shown in Table 5.

Table 4 – Hydraulic Assessment of Proposed Culverts

Station	Catchment ID	Dimension (mm)		Drainage Area (ha)	Summary of Hydraulic Performance		
					Design Storm		Check Storm
		Width	Height / Diameter (mm)		Freeboard	Depth of Headwater	Water Level
					> 1.0 m	< 1.5xCulvert Diameter	< Edge of Travelled Lane
10+425	110		1200	10.1	Yes	Yes	Yes
10+689	120		1800	42.8	Yes	Yes	Yes
11+015	130	18400	3000	N/A	Yes	Yes	Yes
11+603	140		1200	5.7	Yes	Yes	Yes
11+800	150	5480	1830	377.0	Yes	Yes	Yes
11+812			750	377.0	Yes	Yes	Yes
12+300	160	6100	2100	402.1	Yes	Yes	Yes
12+500	170		2400	89.6	Yes	Yes	Yes
12+787	180		600	1.4	No	Yes	Yes
12+927	190		600	5.4	Yes	Yes	Yes
13+763	1100	Twin	900	20.3	Yes	Yes	Yes
13+970	1110		915	35.1	Yes	Yes	Yes
14+177	1120		1100	60.0	Yes	Yes	Yes
14+400	1130	15600	4000	N/A	Yes	Yes	Yes
15+156	1140	6000	1800	560.0	Yes	Yes	Yes
15+249	1150		1200	17.9	Yes	Yes	Yes
15+454	1160		600	5.6	Yes	Yes	Yes
15+693	1170		600	1.8	Yes	Yes	Yes
15+885	1180		900	666.0	Yes	Yes	Yes
15+955	1190	5480	1520	666.0	Yes	Yes	Yes
16+327	1200		1200	5.4	Yes	Yes	Yes
16+700	1210		600	2.3	Yes	Yes	Yes
16+842	1220		600	0.9	Yes	Yes	Yes
16+887	1230		600	0.9	No	Yes	Yes

Table 5 – Regulatory Floodplain Comparison

Catchment ID	Drainage Area (ha)	Station	Existing Dimensions		Proposed Dimensions		Regulatory Flow	Existing Spill Elevation	Proposed Spill Elevation	Spill Elevation Difference	Existing Regulatory Water Level	Proposed Regulatory Water Level	High Water Level Difference
			Span	Height/ Diam.	Span	Height/ Diam.							
			(mm)	(mm)	(mm)	(mm)	(m^3)	(m)	(m)	(m)	(m)	(m)	(m)
130	N/A	11+015	9000	2600	18400	3000	96.7	226.51	226.45	-0.06	227.25	225.64	-1.61
150	377.0	11+800	3600	1830	7200	1830	43.4	223.43	224.21	0.79	223.82	223.64	-0.18
	377.0	11+812		750		750	43.4	223.43	224.21	0.79	223.82	223.64	-0.18
160	402.1	12+300	5500	1950	6100	2100	46.5	222.64	223.22	0.58	221.39	220.42	-0.97
170	89.6	12+500		1800		1950	11.7	223.33	225.33	2.00	223.36	223.04	-0.32
1120	60.0	14+177		1100		1200	8.5	221.02	220.87	-0.15	221.14	221.00	-0.14
1130	N/A	14+400	9000	4000	15600	4000	130.0	218.17	218.22	0.05	216.38	214.48	-1.90
1140	560.0	15+156	6070	1250	6000	1800	60.0	222.39	222.50	0.11	222.89	222.89	0.00
1180	666.0	15+885		900		900	71.9	224.37	224.20	-0.18	223.77	223.65	-0.12
1190	666.0	15+955	4630	1590	5480	1520	71.9	223.11	223.04	-0.07	223.77	223.65	-0.12

Based on detailed culvert inspections and the hydraulic analysis all of the culverts except 1 are recommended for replacement as summarized in Table 6:

Table 6 – Summary of Culvert Recommendations

Station	Existing Dimension (mm)		Proposed Dimension (mm)		Recommendation	Comments
	Width	Height / Diameter	Width	Height / Diameter		
10+425		1200		1200	Replace	Poor condition
10+689	2500	1800		1800	Replace	Poor condition
11+015	9000	2600	18400	3000	Replace	Redside Dace Habitat
11+603		1200		1200	Replace	Poor condition
11+800	3660	1830	7200	1830	Replace	Insufficient capacity
11+812		750		750	Extend	Insufficient length
12+300	5500	1950	6100	2100	Replace	Insufficient capacity
12+500		1800		1950	Replace	Poor condition
12+787		600		600	Replace	Insufficient capacity and poor condition
12+927		450		600	Replace	Does not meet minimum size requirements
13+763		1050	Twin	900	Replace	Insufficient capacity and poor condition
13+970		915		915	Replace	New culvert alignment
14+177		1100		1200	Replace	New culvert alignment
14+400	9000	4000	15600	4000	Replace	Redside Dace Habitat
15+156	6070	1250	6000	1800	Replace	New culvert alignment
15+249		1200		1200	Replace	New culvert alignment
15+454		600		600	Replace	New culvert alignment
15+693		600		600	Replace	New culvert alignment
15+885		900		900	Replace	New culvert alignment
15+955	4630	1590	5480	1520	Replace	Insufficient capacity
16+327		1200		1200	Replace	New culvert alignment
16+700		450		600	Replace	Does not meet minimum size requirements
16+842		450		600	Replace	Poor condition
16+887		450		600	Replace	Insufficient capacity and poor condition

4.3 PROPOSED CONDITIONS HYDRAULIC SUMMARY

Of the 24 culverts along Mayfield Road, the following conclusions can be drawn:

- 10 culverts are proposed for replacement with similar culvert sizes. These culverts have sufficient capacity but were in poor condition or required realignment
- 13 culverts are proposed to be increased in size
- 1 culvert is proposed to be retained with extensions

Two of the proposed culverts (Stations 12+787 and 16+887) do not have 1 m of freeboard to the roadway during the design (25-year) rainfall event. Maximum culvert diameters were limited by the height of the road and the surrounding ditch elevations. These may change in the future design.

5.0 Stormwater Management (SWM)

The *Humber River Watershed Plan* (TRCA, 2007) requires that all future development control post-development peak flows to pre-development levels for the 2- to 100-year storm event. It also requires that enhanced water quality control and erosion control be provided for the roadway. Erosion control criterion for this site is the 48 hour detention of the runoff generated from the 25 mm rainfall event. Pre-development flow rates have been established by the TRCA as shown in Table 7.

Table 7: Allowable Flow Rates

Return Period	Flow Rate (L/s)
2-year	Area * 9.506 - 0.719*ln(Area)
5-year	Area * 14.652 - 1.135*ln(Area)
10-year	Area * 17+957 - 1.373*ln(Area)
25-year	Area * 22.639 - 1.741*ln(Area)
50-year	Area * 26.566 - 2.082*ln(Area)
100-year	Area * 29.912 - 2.316*ln(Area)

Note: Area is in hectares

The general design principles for the drainage from the proposed Mayfield Road include maintaining existing drainage boundaries and flow patterns. Stormwater Management (SWM) measures will vary depending on the ultimate road cross-section (urban or rural section) and the outlet location. The proposed SWM measures provide controls for only the highway right-of-way and external areas will continue to drain to the same locations as under existing conditions.

Rural road cross sections with roadside ditches will continue to outlet to their current locations/culverts and water quality control will be provided by grass-lined roadside ditches which will have a minimum 0.75 m wide bottom and maintain longitudinal slopes as flat as possible to maximize the contact between vegetation and runoff. Existing culverts will be extended to maintain current drainage patterns and ensure that road drainage is not mixed with other runoff.

There is no space available within the road-right-of-way to provide the required water quality and water quantity controls. Blocks adjacent to the roadway were identified to provide the required control in stormwater management facilities.

Future development in the area may provide an opportunity to combine the stormwater management facilities for the roadway with surrounding development. Under long-term, ultimate urban road cross sections conditions, drainage from Mayfield Road and areas to the north may be picked up by urban drainage networks (conveyance and stormwater management measures) associated with development in the City of Brampton. During detail design, detailed drainage area maps should be developed to delineate the detailed drainage characteristics in the study area. Water quantity and water quality control is proposed to occur in stormwater management facilities in conjunction with surrounding development. Oil and grit separator units and enhanced grass swales may also be used in specific locations where stormwater management facilities are not possible.

Preliminary SWM controls are proposed in Table 8 and were determined based on the drainage area available to each outlet. The drainage areas were calculated using the proposed storm sewer system, which was based on the road grades and available cover at culvert crossings (some culverts are located such that a storm sewer cannot cross). Where the drainage area was sufficient to maintain a SWM Facility (approximately 3 ha based on the Ministry of the Environment's Stormwater Management Planning and Design Manual (2003)) a SWM Facility has been proposed. SWM controls for smaller drainage areas are proposed to occur through a combination of oil and grit separator units and enhanced grass swales.

Table 8: Proposed SWM Controls

Station Range	Road Length (m)	Outlet Culvert Station	Proposed SWM Control
10+000 to 10+680	680	10+690	SWM Facility 1
10+680 to 11+020	340	11+015	Oil/grit separator west of outlet
11+020 to 11+380	360	11+015	Oil/grit separator east of outlet
11+380 to 11+800	420	11+800	Oil/grit separator west of outlet
11+800 to 12+055	255	11+800	Oil/grit separator east of outlet
12+055 to 12+920	865	12+300	SWM Facility 2
12+920 to 13+600	840	13+760	SWM Facility 3
13+600 to 13+760	160	13+760	Oil/grit separator west of outlet
13+760 to 15+135	1375	14+400	SWM Facility 4
15+135 to 15+250	115	15+249	Oil/grit separator west of outlet
15+250 to 15+695	445	15+249	Oil/grit separator east of outlet
15+695 to 15+960	265	15+955	Oil/grit separator west of outlet
15+960 to 16+870	910	15+955	SWM Facility 5 east of outlet

Preliminary modelling of the SWM facilities was completed for the 5 proposed SWM ponds to ensure that they are sufficient to provide the required quality and quantity Controls as per the *Humber River Watershed Plan*. The ponds were designed as wet ponds with sufficient buffers to allow for detailed design of the facilities. The inlets and outlets of the ponds were designed in accordance with site conditions and standards. Pond design characteristics are summarized in

Table 9, with design calculations, catchment area drawings (Drawings S1 to S3), and a conceptual drawing of SWM 1 (Drawing S4) are included in Appendix A.

Table 9: SWM Facility Design Characteristics

SWM Facility	1	2	3	4	5
Drainage Area (ha)	3.06	3.89	3.06	6.19	4.10
Permanent Pool Elevation (m)	227.0	221.0	222.0	215.0	221.0
100 Year Flood Elevation (m)					
Required Volumes (m^3)					
Permanent Pool	612	778	612	1238	820
Active Storage	1626	2174	1635	3485	2254
Extended Detention	122	156	122	248	164
Provided Volume (m^3)					
Permanent Pool)	1750	2838	1188	2745	1710
Active Storage	5150	7400	5200	7340	5160
Extended Detention	335	515	295	505	332

The SWM recommendations noted in Table 8 will remain the same regardless of the preferred road alignment of Mayfield Road. These recommendations are intended to provide SWM controls for only Mayfield Road. The opportunity exists to integrate some of these SWM controls with future development adjacent to the roadway.

Additional information on the timeframes during in water work can occur and proposed erosion and sedimentation control measures can be found in the *Mayfield Road Improvements (Airport Road to Coleraine Drive) Class Environmental Assessment, Natural Environmental Report* (Stantec, 2010).

Peak Flows are summarized in Table 10 with detailed model files included in Appendix B.

Table 10: SWM Facility Operating Characteristics

SWM Facility	Drainage Area (ha)		Storm event					
			2-year	5-year	10-year	25-year	50-year	100-year
1	3.06	Allowable Flow (m^3/s)	0.027	0.041	0.050	0.063	0.074	0.084
		Proposed Peak Flow (m^3/s)	0.025	0.041	0.046	0.052	0.057	0.062
		Maximum Storage Volume (m^3)	703	920	1082	1298	1463	1626
2	3.89	Existing Peak Flow (m^3/s)	0.033	0.051	0.063	0.079	0.092	0.104
		Proposed Peak Flow (m^3/s)	0.030	0.040	0.046	0.051	0.054	0.058
		Maximum Storage Volume (m^3)	891	1210	1430	1724	1949	2174
3	3.06	Existing Peak Flow (m^3/s)	0.027	0.041	0.050	0.063	0.074	0.084
		Proposed Peak Flow (m^3/s)	0.027	0.040	0.045	0.050	0.055	0.059
		Maximum Storage Volume (m^3)	695	915	1083	1303	1469	1635
4	6.19	Existing Peak Flow (m^3/s)	0.051	0.078	0.096	0.120	0.141	0.159
		Proposed Peak Flow (m^3/s)	0.045	0.057	0.065	0.075	0.082	0.090
		Maximum Storage Volume (m^3)	1427	1954	2319	2784	3135	3485
5	4.10	Existing Peak Flow (m^3/s)	0.035	0.054	0.066	0.083	0.097	0.109
		Proposed Peak Flow (m^3/s)	0.035	0.043	0.049	0.056	0.062	0.067
		Maximum Storage Volume (m^3)	921	1259	1495	1797	2026	2254

The SWM Facilities are located above the 100-year flood level as shown in Table 11.

Table 11: SWM Facility Elevations Compared to the 100-Year Flood Level

	SWMF 1	SWMF 2	SWMF 3	SWMF 4	SWMF 5
SWMF location relative to Mayfield Road	upstream	upstream	upstream	downstream	downstream
Approximate 100-year flood elevation	227.5	218.6	222.0	213.0	221.2
Approximate elevation of the limit of SWMF grading	228	222	223	216	222

6.0 Conclusions and Recommendations

Based on the analysis along Mayfield Road, the following conclusions can be drawn:

- Of the 24 culverts along this section of Mayfield Road 1 culverts can be retained (with culvert extensions) and 23 are deficient in some regard (insufficient capacity, structurally deficient, endangered species habitat, etc.)
- All of the proposed culverts passed the 100-year storm without overtopping the roadway
- Water quality and water quantity control is proposed to occur through a combination of roadside ditches, SWM Facilities, and oil and grit separator units depending on the final design of the roadway and the timing of construction
- In-water work should occur between September 15 and June 30 in the West Humber River or any of its tributaries. For all other watercourses no in-eater work should occur between March 15 and June 30
- The preliminary culvert designs should be confirmed once the proposed road design is complete

All of which is respectfully submitted;

STANTEC CONSULTING LTD.

Jayson Innes, M.A.Sc., P.Eng.
Water Resource Engineer
jayson.innes@stantec.com

APPENDIX A

Design Calculations

Mayfield Road EA & Preliminary Design - Hydrology Study 160210480
NRCS (SCS) Curve Number Determination
Existing Conditions

Soil Type	Hydrologic Soil Group
Clay Loam Imperfect Drainage (Chinguacousy)	CD
Clay Imperfect Drainage (Peel)	D
Clay Loam Good Drainage (Oneida)	C

TABLE OF CURVE NUMBERS (CN's)

Land Use		Hydrologic Soil Type							Source
		A	AB	B	BC	C	CD	D	
Meadow	"Good"	30	44	58	64.5	71	74.5	78	MTO
Woodlot	"Fair"	36	48	60	66.5	73	76	79	MTO
Lawns	"Good"	39	50	61	67.5	74	77	80	USDA
Pasture/Range		58	61.5	65	70.5	76	78.5	81	MTO
Crop		66	70	74	78	82	84	86	MTO
Bare Soil (Fallow)		77	82	86	89	91	93	94	MTO
Impervious		98	98	98	98	98	98	98	MTO

MTO - Ministry of Transportation Ontario Drainage Manual (1997), Design Chart 1.09-Soil/Land Use Curve Numbers
USDA - United States Department of Agriculture (2004), National Engineering Handbook, Part 630 Hydrology,
Chapter 9 Hydrologic Soil Cover Compexes

HYDROLOGIC SOIL TYPE (%) - Existing Conditions

	Hydrologic Soil Type							
Catchment	A	AB	B	BC	C	CD	D	TOTAL
110						100		100
120					5	95		100
130	PEAK FLOW RATES AVAILABLE FROM TRCA							0
140						100		100
150					20	65	15	100
160					25	20	55	100
170					10	85	5	100
180						100		100
190						100		100
1100						90	10	100
1110						50	50	100
1120						35	65	100
1130	PEAK FLOW RATES AVAILABLE FROM TRCA							0
1140					5	65	30	100
1150							100	100
1160							100	100
1170							100	100
1180					5	50	45	100
1190					5	10	85	100
1200						100		100
1210						100		100
1220						100		100
1230						100		100

LAND USE (%) - Existing Conditions

Catchment	Meadow	Woodlot	Lawns	Pasture Range	Crop	Bare Soil	Impervious	Total
110					80		20	100
120	5	10			75		10	100
130	PEAK FLOW RATES AVAILABLE FROM TRCA							0
140	10	10	30		40		10	100
150		5			90		5	100
160	15	5			80			100
170	45		35		10		10	100
180			50		40		10	100
190		5	5		90			100
1100			15		85			100
1110		10			90			100
1120	5		5		80		10	100
1130	PEAK FLOW RATES AVAILABLE FROM TRCA							0
1140	5	15			80			100
1150			15	45	30		10	100
1160			40		50		10	100
1170	10		45		20		25	100
1180			5		95			100
1190	5				75		20	100
1200					95		5	100
1210					95		5	100
1220					95		5	100
1230			50		25		25	100

CURVE NUMBER (CN) - Existing Conditions

Catchment	Meadow	Woodlot	Lawns	Pasture Range	Crop	Bare Soil	Impervious	Weighted CN w/ imp area	Weighted CN w/o imp area
110					67.2		19.6	87	84
120	3.7	7.6			62.9		9.8	84	82
130									
140	7.5	7.6	23.1		33.6		9.8	82	80
150		3.8			75.5		4.9	84	83
160	11.3	3.8			67.7			83	83
170	33.4		26.9		8.4		9.8	79	76
180			38.5		33.6		9.8	82	80
190		3.8	3.9		75.6			83	83
1100			11.6		71.6			83	83
1110		7.8			76.5			84	84
1120	3.8		3.9		68.2		9.8	86	84
1130									
1140	3.8	11.5			67.6			83	83
1150			12.0	36.5	25.8		9.8	84	83
1160			32.0		43.0		9.8	85	83
1170	7.8		36.0		17.2		24.5	86	81
1180			3.9		80.6			84	84
1190	3.9				64.2		19.6	88	85
1200					79.8		4.9	85	84
1210					79.8		4.9	85	84
1220					79.8		4.9	85	84
1230			38.5		21.0		24.5	84	79

** AMC II assumed
** Hydrological Soil Groups taken from MTO Drainage Manual

Mayfield Road EA & Preliminary Design - Hydrology Study 160210480
SWMHYMO Parameters

Existing Conditions

Area Description	Catchment Number	SWMHYMO Command	Area (ha)	CN	TIMP	XIMP	Slope (%)	Length (m)	Tc (hrs)	Tp (hrs)
10+425	110	DESIGN NASHYD	10.1	87			1.5	750	1.17	0.70
10+689	120	DESIGN NASHYD	42.8	84			1.18	1020	1.48	0.89
11+015	130	N/A								
11+603	140	DESIGN NASHYD	5.7	82			0.83	330	0.94	0.57
11+800 and 11+812	150	DESIGN NASHYD	377.0	84			1.14	4320	3.64	2.18
12+300	160	DESIGN NASHYD	402.1	83			1.08	4350	3.88	2.33
12+500	170	DESIGN NASHYD	89.6	79			1.23	2070	2.08	1.25
12+787	180	DESIGN NASHYD	1.4	82			0.71	210	0.79	0.48
12+927	190	DESIGN NASHYD	5.4	83			1.00	1005	1.55	0.93
13+763	1100	DESIGN NASHYD	20.3	83			1.52	500	0.95	0.57
13+970	1110	DESIGN NASHYD	35.1	84			1.52	800	1.21	0.72
14+177	1120	DESIGN NASHYD	60.0	86			1.61	2175	1.95	1.17
14+400	1130	N/A								
15+156	1140	DESIGN NASHYD	560.0	83			0.81	5145	5.14	3.08
15+249	1150	DESIGN NASHYD	17.9	84			0.96	900	1.49	0.89
15+454	1160	DESIGN NASHYD	5.6	85			0.56	885	1.76	1.05
15+693	1170	DESIGN STANDHYD	1.8	81	0.25	0.01	1.00	270		
15+885	1180	DESIGN NASHYD	70.7	84			1.68	2655	2.12	1.27
15+955	1190	DESIGN NASHYD	595.3	88			0.79	5850	4.83	2.90
16+327	1200	DESIGN NASHYD	5.4	85			0.46	540	1.47	0.88
16+700	1210	DESIGN NASHYD	2.3	85			0.75	300	0.93	0.56
16+842	1220	DESIGN NASHYD	0.9	85			1.09	300	0.82	0.49
16+887	1230	DESIGN STANDHYD	0.9	79	0.25	0.01	1.10	350		
		TOTAL	2310.30							

Notes:

TIMP — Total percent impervious

XIMP — Percent impervious directly connected

Time of Concentration calculated using the SCS Lag Equation (For areas greater than 100 ha) — $Tc = [259L^{0.8} [(1000 / CN) - 9]^{0.7}] / [1900S^{0.5}]$
Where:

Time of Concentration calculated using the Airport Method (For areas less than 100 ha) — $Tc = [3.26 (1.1\text{-}C) L^{0.5}] / S^{0.33}$
Where:

Time to Peak — $Tp = 0.6Tc$

CN calculated for pervious areas only for DESIGN STANDHYD. CN is a weighed average for DESIGN NASHYD

Existing Conditions Design and Check Flows - October - 2012

Station	Drainage Area (ha)	Peak Flows (m^3/s)									
		25-year					100-year				
		1-hr	6-hr	12-hr	24-hr	Max	1-hr	6-hr	12-hr	24-hr	Max
10+425	10.1	0.531	**0.566**	0.496	0.370	**0.566**	0.730	**0.751**	0.644	0.471	**0.751**
10+689	42.8	1.595	**1.850**	1.663	1.332	**1.850**	2.221	**2.484**	2.188	1.723	**2.484**
11+015	N/A										
11+603	5.7	0.299	**0.304**	0.264	0.190	**0.304**	0.420	**0.412**	0.349	0.246	**0.420**
11+812	377.0	5.855	**8.430**	8.362	7.397	**8.430**	8.155	**11.288**	10.979	9.606	**11.288**
11+800	377.0	5.855	**8.430**	8.362	7.397	**8.430**	8.155	**11.288**	10.979	9.606	**11.288**
12+300	402.1	5.631	**8.240**	8.254	7.360	**8.254**	7.875	**11.073**	10.873	9.587	**11.073**
12+500	89.6	1.998	**2.604**	2.433	2.062	**2.604**	2.834	**3.554**	3.253	2.720	**3.554**
12+787	1.4	0.086	**0.083**	0.070	0.048	**0.086**	0.120	**0.112**	0.093	0.062	**0.120**
12+927	5.4	0.186	**0.219**	0.198	0.160	**0.219**	0.260	**0.295**	0.261	0.208	**0.295**
13+763	20.3	1.106	**1.120**	0.971	0.696	**1.120**	1.546	**1.512**	1.280	0.899	**1.546**
13+970	35.1	1.600	**1.741**	1.538	1.171	**1.741**	2.228	**2.340**	2.022	1.511	**2.340**
14+177	60.0	1.855	**2.302**	2.118	1.765	**2.302**	2.561	**3.064**	2.765	2.270	**3.064**
14+400	N/A										
15+156	560.0	5.957	**9.059**	9.396	8.655	**9.396**	8.330	**12.167**	12.367	11.267	**12.367**
15+249	17.9	0.667	**0.774**	0.696	0.557	**0.774**	0.929	**1.039**	0.915	0.721	**1.039**
15+454	5.6	0.185	**0.224**	0.204	0.168	**0.224**	0.256	**0.299**	0.267	0.217	**0.299**
15+693	1.8	0.262	**0.167**	0.113	0.068	**0.262**	0.392	**0.230**	0.149	0.088	**0.392**
15+885	666.0	9.055	**13.253**	13.515	12.312	**13.515**	12.409	**17.486**	17.494	15.763	**17.494**
15+955	666.0	9.055	**13.253**	13.515	12.312	**13.515**	12.409	**17.486**	17.494	15.763	**17.494**
16+327	5.4	0.211	**0.243**	0.218	0.174	**0.243**	0.293	**0.325**	0.286	0.224	**0.325**
16+700	2.3	0.137	**0.137**	0.118	0.084	**0.137**	0.191	**0.184**	0.155	0.107	**0.191**
16+842	0.9	0.061	**0.058**	0.049	0.033	**0.061**	0.084	**0.078**	0.064	0.043	**0.084**
16+887	0.9	0.109	**0.073**	0.051	0.032	**0.109**	0.163	**0.103**	0.069	0.042	**0.163**

Mayfield Road EA & Preliminary Design - Hydrology Study 160210480
NRCS (SCS) Curve Number Determination
Proposed Conditions

Soil Type	**Hydrologic Soil Group**
Clay Loam Imperfect Drainage (Chinguacousy)	CD
Clay Imperfect Drainage (Peel)	D
Clay Loam Good Drainage (Oneida)	C

TABLE OF CURVE NUMBERS (CN's)

Land Use		Hydrologic Soil Type							Source
		A	AB	B	BC	C	CD	D	
Meadow	"Good"	30	44	58	64.5	71	74.5	78	MTO
Woodlot	"Fair"	36	48	60	66.5	73	76	79	MTO
Lawns	"Good"	39	50	61	67.5	74	77	80	USDA
Pasture/Range		58	61.5	65	70.5	76	78.5	81	MTO
Crop		66	70	74	78	82	84	86	MTO
Bare Soil (Fallow)		77	82	86	89	91	93	94	MTO
Impervious		98	98	98	98	98	98	98	MTO

MTO - Ministry of Transportation Ontario Drainage Manual (1997), Design Chart 1.09-Soil/Land Use Curve Numbers
USDA - United States Department of Agriculture (2004), National Engineering Handbook, Part 630 Hydrology,
Chapter 9 Hydrologic Soil Cover Compexes

HYDROLOGIC SOIL TYPE (%) - Existing Conditions

	Hydrologic Soil Type							
Catchment	A	AB	B	BC	C	CD	D	TOTAL
110						100		100
120					5	95		100
130	PEAK FLOW RATES AVAILABLE FROM TRCA							0
140						100		100
150					20	65	15	100
160					25	20	55	100
170					10	85	5	100
180						100		100
190						100		100
1100						90	10	100
1110						50	50	100
1120						35	65	100
1130	PEAK FLOW RATES AVAILABLE FROM TRCA							0
1140					5	65	30	100
1150							100	100
1160							100	100
1170							100	100
1180					5	50	45	100
1190					5	10	85	100
1200						100		100
1210						100		100
1220						100		100
1230						100		100

LAND USE (%) - Existing Conditions

Catchment	Meadow	Woodlot	Lawns	Pasture Range	Crop	Bare Soil	Impervious	Total
110			45				55	100
120			45				55	100
130	PEAK FLOW RATES AVAILABLE FROM TRCA							0
140			45				55	100
150			45				55	100
160			45				55	100
170			45				55	100
180			45				55	100
190			45				55	100
1100			45				55	100
1110			45				55	100
1120			45				55	100
1130	PEAK FLOW RATES AVAILABLE FROM TRCA							0
1140			45				55	100
1150			45				55	100
1160			45				55	100
1170			45				55	100
1180			45				55	100
1190			45				55	100
1200			45				55	100
1210			45				55	100
1220			45				55	100
1230			45				55	100

CURVE NUMBER (CN) - Existing Conditions

Catchment	Meadow	Woodlot	Lawns	Pasture Range	Crop	Bare Soil	Impervious	Weighted CN w/ imp area	Weighted CN w/o imp area
110			34.7				53.9	89	77
120			34.6				53.9	88	77
130									
140			34.7				53.9	89	77
150			34.6				53.9	88	77
160			35.1				53.9	89	78
170			34.6				53.9	88	77
180			34.7				53.9	89	77
190			34.7				53.9	89	77
1100			34.8				53.9	89	77
1110			35.3				53.9	89	79
1120			35.5				53.9	89	79
1130									
1140			35.0				53.9	89	78
1150			36.0				53.9	90	80
1160			36.0				53.9	90	80
1170			36.0				53.9	90	80
1180			35.2				53.9	89	78
1190			35.7				53.9	90	79
1200			34.7				53.9	89	77
1210			34.7				53.9	89	77
1220			34.7				53.9	89	77
1230			34.7				53.9	89	77

Note: 55% Impervious was assumed based on information from the TRCA for Proposed Conditions
** AMC II assumed
** Hydrological Soil Groups taken from MTO Drainage Manual

Mayfield Road EA & Preliminary Design - Hydrology Study 160210480
SWMHYMO Parameters

Existing Conditions

Area Description	Catchment Number	SWMHYMO Command	Area (ha)	CN	TIMP	XIMP	Slope (%)	Length (m)	Tc (hrs)	Tp (hrs)
10+425	110	DESIGN STANDHYD	10.1	77	0.55	0.30	1.5	750		
10+689	120	DESIGN STANDHYD	42.8	77	0.55	0.30	1.18	1020		
11+015	130	N/A								
11+603	140	DESIGN STANDHYD	5.7	77	0.55	0.30	0.83	330		
11+800 and 11+812	150	DESIGN STANDHYD	377.0	77	0.55	0.30	1.14	4320		
12+300	160	DESIGN STANDHYD	402.1	78	0.55	0.30	1.08	4350		
12+500	170	DESIGN STANDHYD	89.6	77	0.55	0.30	1.23	2070		
12+787	180	DESIGN STANDHYD	1.4	77	0.55	0.30	0.71	210		
12+927	190	DESIGN STANDHYD	5.4	77	0.55	0.30	1.00	1005		
13+763	1100	DESIGN STANDHYD	20.3	77	0.55	0.30	1.52	500		
13+970	1110	DESIGN STANDHYD	35.1	79	0.55	0.30	1.52	800		
14+177	1120	DESIGN STANDHYD	60.0	79	0.55	0.30	1.61	2175		
14+400	1130	N/A								
15+156	1140	DESIGN STANDHYD	560.0	78	0.55	0.30	0.81	5145		
15+249	1150	DESIGN STANDHYD	17.9	80	0.55	0.30	0.96	900		
15+454	1160	DESIGN STANDHYD	5.6	80	0.55	0.30	0.56	885		
15+693	1170	DESIGN STANDHYD	1.8	80	0.55	0.30	1.00	270		
15+885	1180	DESIGN STANDHYD	70.7	78	0.55	0.30	1.68	2655		
15+955	1190	DESIGN STANDHYD	595.3	79	0.55	0.30	0.79	5850		
16+327	1200	DESIGN STANDHYD	5.4	77	0.55	0.30	0.46	540		
16+700	1210	DESIGN STANDHYD	2.3	77	0.55	0.30	0.75	300		
16+842	1220	DESIGN STANDHYD	0.9	77	0.55	0.30	1.09	300		
16+887	1230	DESIGN STANDHYD	0.9	77	0.55	0.30	1.10	350		
		TOTAL	2310.30							

Notes:

TIMP — Total percent impervious

XIMP — Percent impervious directly connected

Time of Concentration calculated using the SCS Lag Equation (For areas greater than 100 ha) — $Tc = [259L^{0.8} [(1000 / CN) - 9]^{0.7}] / [1900S^{0.5}]$
Where:

Time of Concentration calculated using the Airport Method (For areas less than 100 ha) — $Tc = [3.26 (1.1-C) L^{0.5}] / S^{0.33}$
Where:

Time to Peak — $Tp = 0.6Tc$

CN calculated for pervious areas only for DESIGN STANDHYD. CN is a weighed average for DESIGN NASHYD

Proposed Conditions Design and Check Flows - October - 2012 - Mayreg.sum Model

Hydrograph ID's	Storm 1	Storm 2	Storm 3	Storm 15	Max
110	**1.470**	0.910	0.522	1.173	**1.470**
120	**5.792**	3.707	2.173	4.639	**5.792**
140	**0.805**	0.504	0.292	0.685	**0.805**
150	**43.418**	29.523	18.247	29.167	**43.418**
160	**46.537**	31.709	19.599	30.047	**46.537**
170	**11.661**	7.580	4.506	8.524	**11.661**
180	**0.202**	0.125	0.072	0.176	**0.202**
190	**0.777**	0.483	0.278	0.577	**0.777**
1100	**2.895**	1.810	1.045	2.453	**2.895**
1110	**5.043**	3.178	1.839	3.999	**5.043**
1120	**8.518**	5.381	3.128	6.04	**8.518**
1140	**60.007**	41.783	26.459	36.569	**60.007**
1150	**2.579**	1.627	0.945	1.94	**2.579**
1160	**0.793**	0.505	0.295	0.582	**0.793**
1170	**0.277**	0.169	0.096	0.253	**0.277**
1180	**9.783**	6.231	3.642	6.851	**9.783**
1190	**63.926**	44.635	28.336	41.016	**63.926**
180190	**71.888**	50.363	31.906	46.253	**71.888**
1200	**0.795**	0.507	0.295	0.589	**0.795**
1210	**0.327**	0.205	0.118	0.282	**0.327**
1220	**0.135**	0.082	0.047	0.114	**0.135**
1230	**0.127**	0.080	0.046	0.124	**0.127**
Storm Description	**100-year 6hr SCS**	**100-year 12hr SCS**	**100-year 24hr**	**Regional - Hazel Existing Conditions**	**Max**

Mayfield Road EA & Preliminary Design - Hydrology Study 160210480
Culvert Sizing

Existing Conditions Culvert Analysis

Catchment ID	Location	Drainage Area (ha)	Station Old	Station New	Material	Shape	U/S invert (m)	D/S invert (m)	Length (m)	Dimensions (mm)		Flow (m^3/s)		Tailwater Elev (m)	Spill Elev. (m)	Required Headwater Elev. (m)		Depth of Headwater / Height of Culvert (H/D)		Freeboard From Spill Point	
										Span	Height/ Diam.	25 yr	100 yr			25 yr	100 yr	25 yr	100 yr	25 yr	100 yr
110	550 m east of Airport Rd	10.1	10+550	10+425	CSP	Circular	230.01	229.83	19.60		1200	0.566	0.751	230.55	231.75	230.68	230.77	0.56	0.63	1.07	0.98
120	815 m east of Airport Rd	42.8	10+815	10+689	CSP	Elliptical	225.81	225.64	30.60	2500	1800	1.850	2.484	226.72	229.26	226.80	226.86	0.55	0.58	2.46	2.40
130	1150 m east of Airport Rd	N/A	11+150	11+015	Concrete	Box	223.40	223.40	25.00	9000	2600	25.440	33.390	N/A	226.50	224.66	224.90	0.48	0.58	1.84	1.60
140	1730 m east of Airport Rd	5.7	11+730	11+603	CSP	Circular	225.96	225.83	21.50		1200	0.304	0.420	226.55	228.79	226.59	226.62	0.52	0.55	2.20	2.17
150	1930 m east of Airport Rd	377.0	11+930	11+812	Concrete	Box	220.91	220.92	29.40	3660	1830	8.430	11.288	222.02	223.41	222.37	222.61	0.80	0.93	1.04	0.80
	1937 m east of Airport Rd	377.0	11+937	11+800	CSP	Circular	221.59	221.38	20.60		750	8.430	11.288	222.02	223.41	222.37	222.61	1.04	1.36	1.04	0.80
160	2422 m east of Airport Rd	402.1	12+422	12+300	Concrete	Box	217.18	217.16	37.90	5500	1950	8.254	11.073	218.33	222.88	218.49	218.61	0.67	0.73	4.39	4.27
170	2630 m east of Airport Rd	89.6	12+630	12+500	CSP	Circular	218.78	218.36	41.60		1800	2.604	3.554	219.44	225.30	220.12	220.37	0.74	0.88	5.18	4.93
180	2915 m east of Airport Rd	1.4	12+915	12+787	CSP	Circular	227.28	227.06	23.08		600	0.086	0.120	227.42	228.49	227.58	227.64	0.50	0.60	0.91	0.85
190	3055 m east of Airport Rd	5.4	13+055	12+927	PVC	Circular	227.88	227.67	21.60		450	0.219	0.295	227.94	229.74	228.44	228.61	1.24	1.62	1.30	1.13
1100	3890 m east of Airport Rd	20.3	13+890	13+763	CSP	Circular	221.33	220.68	24.67		1050	1.120	1.546	221.31	223.13	222.39	222.62	1.01	1.23	0.74	0.51
1110	4095 m east of Airport Rd	35.1	14+095	13+970	PVC	Circular	218.71	217.68	30.98		915	1.741	2.340	218.23	222.03	220.23	220.97	1.66	2.47	1.80	1.06
1120	4300 m east of Airport Rd	60.0	14+300	14+177	PVC	Circular	215.92	214.50	30.70		1100	2.302	3.064	215.16	221.03	217.42	217.99	1.36	1.88	3.61	3.04
1130	4535 m east of Airport Rd	N/A	14+535	14+400	Concrete	Arch	211.70	211.50	25.00	9000	4000	31.360	41.650	N/A	218.30	213.50	213.87	0.45	0.54	4.80	4.43
1140	5280 m east of Airport Rd	560.0	15+280	15+156	Concrete	Box	219.53	219.62	20.70	6070	1250	9.396	12.367	220.37	222.39	220.70	220.91	0.94	1.10	1.69	1.48
1150	5375 m east of Airport Rd	17.9	15+375	15+249	CSP	Circular	221.56	221.33	19.70		1200	0.774	1.039	222.05	223.60	222.34	222.50	0.65	0.78	1.26	1.10
1160	5580 m east of Airport Rd	5.6	15+580	15+454	CSP	Circular	224.00	223.78	20.00		600	0.224	0.299	224.14	225.99	224.51	224.61	0.85	1.02	1.48	1.38
1170	5820 m east of Airport Rd	1.8	15+820	15+693	CSP	Circular	225.08	224.93	18.50		600	0.167	0.230	225.29	226.83	225.51	225.60	0.72	0.87	1.32	1.23
1180	6015 m east of Airport Rd	666.0	16+015	15+885	CSP	Circular	221.21	220.29	30.30		900	13.515	17.494	221.57	223.28	222.40	222.72	1.32	1.68	0.88	0.56
1190	6085 m east of Airport Rd	666.0	16+085	15+955	Concrete	Box	220.73	220.62	21.65	4630	1590	13.515	17.494	221.57	223.28	222.40	222.72	1.05	1.25	0.88	0.56
1200	6455 m east of Airport Rd	5.4	16+455	16+327	CSP	Circular	226.92	226.68	20.10		1200	0.243	0.325	227.40	228.79	227.43	227.46	0.43	0.45	1.36	1.33
1210	6825 m east of Airport Rd	2.3	16+825	16+700	CSP	Circular	228.90	228.56	20.60		450	0.137	0.191	228.83	230.66	229.35	229.44	1.00	1.20	1.31	1.22
1220	6970 m east of Airport Rd	0.9	16+970	16+842	CSP	Circular	229.49	229.41	18.69		450	0.058	0.078	229.68	230.91	229.78	229.83	0.64	0.76	1.13	1.08
1230	Located on Coleraine Drive	0.9	17+040	16+887	CSP	Circular	229.38	229.51	17.76		450	0.073	0.103	229.78	230.57	229.86	229.93	1.07	1.22	0.71	0.64

Mayfield Road EA & Preliminary Design - Hydrology Study 160210480
Culvert Sizing

Proposed Conditions Hydraulic Analysis

					Proposed Culvert Extenstions			Proposed Culvert Inverts			Proposed Culverts				Hydrologic Analysis				Hydraulic Analysis - Culvert Conveyance							
Catchment ID	Location	TRCA ID No.	Drainage Area (ha)	Station	Extension Left (m)	Extension Right (m)	Total Length of Proposed Culvert (m)	U/S invert (m)	D/S invert (m)	Slope (m/m)	Material	Shape	Span (mm)	Height/ Diam. (mm)	Flow (m^3/s)				Tailwater Elev (m)	Spill Elev. (m)	Required Headwater Elev. (m)		Depth of Headwater / Height of Culvert (H/D)		Freeboard From Spill Point	
															Design Storm - 25 yr	Check Storm - 100 yr	Regional Storm (Existing Conditions Flows)	Regulatory			25 yr	100 yr	25 yr	100 yr	25 yr	100 yr
110	550 m east of Airport Rd	1	10.1	10+425	13.80	13.20	46.60	230.10	229.70	0.009	CSP	Circular		1200	0.566	0.751	1.173	1.470	230.42	231.75	230.76	230.86	0.55	0.63	0.99	0.89
120	815 m east of Airport Rd	2	42.8	10+689	11.90	11.90	54.40	226.20	225.90	0.006	CSP	Circular		1800	1.850	2.484	4.639	5.792	226.98	229.26	227.29	227.47	0.61	0.71	1.97	1.79
130	1150 m east of Airport Rd	3	N/A	11+015	10.10	12.90	48.00	223.00	222.90	0.002	Concrete	Box	18400	3000	25.440	33.390	96.700	96.700	N/A	226.50	224.49	224.65	0.50	0.55	2.01	1.85
140	1730 m east of Airport Rd	4	5.7	11+603	19.60	18.60	59.70	226.40	226.10	0.005	CSP	Circular		1200	0.304	0.420	0.685	0.805	226.82	228.79	226.92	226.98	0.43	0.48	1.87	1.81
150	1930 m east of Airport Rd	5	377.0	11+800	12.10	14.00	55.50	220.75	220.60	0.003	Concrete	Box	7200	1830	8.430	11.288	29.167	43.418	221.70	224.21	221.83	221.93	0.59	0.64	2.38	2.28
	1937 m east of Airport Rd	-	377.0	11+812	15.40	16.10	52.20	221.80	220.80	0.019	CSP	Circular		750	8.430	11.288	29.167	43.418	221.25	224.21	221.83	221.93	0.04	0.17	2.38	2.28
160	2422 m east of Airport Rd	6	402.1	12+300	4.50	5.60	48.00	216.90	216.80	0.002	Concrete	Box	6100	2100	8.254	11.073	30.047	46.537	218.06	223.22	218.18	218.27	0.61	0.65	5.04	4.95
170	2630 m east of Airport Rd	7	89.6	12+500	10.90	15.90	68.50	219.40	217.90	0.022	CSP	Circular		1950	2.604	3.554	8.524	11.661	219.07	225.30	220.71	220.96	0.67	0.80	4.59	4.34
180	2915 m east of Airport Rd	-	1.4	12+787	-	-	49.40	227.41	226.93	0.010	CSP	Circular		600	0.083	0.112	0.176	0.202	227.29	228.49	227.70	227.76	0.49	0.59	0.79	0.73
190	3055 m east of Airport Rd	-	5.4	12+927	15.10	16.60	53.40	227.80	227.60	0.004	HDPE	Circular		600	0.219	0.295	0.577	0.777	227.96	229.74	228.27	228.36	0.78	0.93	1.47	1.38
1100	3890 m east of Airport Rd	8	20.3	13+763	26.80	13.70	65.00	221.10	220.80	0.005	CSP	Circular	Twin	900	1.120	1.512	2.453	2.895	221.34	223.13	221.85	222.03	0.83	1.03	1.28	1.10
1110	4095 m east of Airport Rd	9	35.1	13+970	27.30	2.30	61.20	219.50	218.90	0.010	HDPE	Circular		915	1.741	2.340	3.999	5.043	219.45	222.03	220.98	221.67	1.62	2.37	1.05	0.36
1120	4300 m east of Airport Rd	10	60.0	14+177	18.40	-	48.30	216.80	215.80	0.021	HDPE	Circular		1200	2.302	3.064	6.040	8.518	216.52	221.03	218.19	218.50	1.16	1.42	2.84	2.53
1130	4535 m east of Airport Rd	11	N/A	14+400	10.10	12.90	48.00	211.80	210.80	0.021	Concrete	Box	15600	4000	31.360	41.650	129.970	129.970	213.20	218.30	213.04	213.28	0.31	0.37	5.26	5.02
1140	5280 m east of Airport Rd	12	560.0	15+156	11.00	18.50	50.90	219.60	219.60	0.000	Concrete	Box	6000	1800	9.396	12.167	36.569	60.007	220.68	222.50	220.88	221.01	0.71	0.78	1.62	1.49
1150	5375 m east of Airport Rd	13	17.9	15+249	9.60	17.70	46.80	221.70	221.30	0.009	CSP	Circular		1200	0.774	1.039	1.940	2.579	222.02	223.60	222.48	222.61	0.65	0.76	1.12	0.99
1160	5580 m east of Airport Rd	-	5.6	15+454	11.10	16.60	47.80	224.20	223.80	0.008	CSP	Circular		600	0.224	0.299	0.582	0.793	224.16	225.99	224.63	224.73	0.72	0.88	1.36	1.26
1170	5820 m east of Airport Rd	-	1.8	15+693	11.10	19.40	49.40	225.20	224.75	0.009	CSP	Circular		600	0.167	0.230	0.253	0.277	225.11	226.83	225.63	225.72	0.72	0.87	1.20	1.11
1180	6015 m east of Airport Rd	-	666.0	15+885	5.50	9.20	45.10	222.60	221.10	0.033	CSP	Circular		900	13.253	17.486	46.253	71.888	221.64	223.28	222.02	222.37	-0.64	-0.26	1.26	0.91
1190	6085 m east of Airport Rd	14	666.0	15+955	13.50	15.30	50.40	220.50	220.30	0.004	Concrete	Box	5480	1520	13.253	17.486	46.253	71.888	221.21	223.28	222.02	222.37	1.00	1.23	1.26	0.91
1200	6455 m east of Airport Rd	15	5.4	16+327	9.00	9.50	38.50	226.80	226.20	0.016	CSP	Circular		1200	0.243	0.325	0.589	0.795	226.92	228.79	227.23	227.30	0.36	0.42	1.56	1.49
1210	6825 m east of Airport Rd	16	2.3	16+700	5.90	7.50	40.80	229.00	228.44	0.014	CSP	Circular		600	0.137	0.184	0.282	0.327	228.80	230.66	229.40	229.47	0.67	0.79	1.26	1.19
1220	6970 m east of Airport Rd	-	0.9	16+842	NA	NA	18.69	229.49	229.41	0.004	CSP	Circular		600	0.058	0.078	0.114	0.135	229.77	230.91	229.80	229.82	0.52	0.55	1.11	1.09
1230	Located on Coleraine Drive	-	0.9	16+887	NA	NA	17.76	229.38	229.51	-0.007	CSP	Circular		600	0.073	0.103	0.124	0.127	229.87	230.57	229.89	229.92	0.85	0.90	0.68	0.65

1602 -10480
Mayfield Rd SWM Facility SWMHYMO Parameters

Proposed Conditions

Area Description	Catchment Number	SWMHYMO Command	Area (ha)	CN	TIMP	XIMP	Slope (%)
10+720	200	DESIGN STANDHYD	3.06	77	0.75	0.75	2.00
12+335	225	DESIGN STANDHYD	3.89	77	0.75	0.75	2.00
13+760	230	DESIGN STANDHYD	3.06	77	0.75	0.75	2.00
14+400	235	DESIGN STANDHYD	6.19	77	0.75	0.75	2.00
15+960	255	DESIGN STANDHYD	4.10	77	0.75	0.75	2.00
			20.30				

Notes:

CN calculated for pervious areas only for DESIGN STANDHYD. CN is a weighed average for DESIGN NASHYD

TIMP → *Total percent impervious*

XIMP → *Percent impervious directly connected*

Mayfield Road SWM Outlet Analysis

Comments	Station	Elev	Range	Outlet Station	Road Length (m)	Total Area (ha)	Outlet Type	SWM area with buffer (ha)
Airport Road	10000	235.51						
Citadel Cres	10660	229.46						
Culvert	10680	229.44	10000 to 10680	10690	680	3.06	SWM 1	0.638
Low point	10720	229.15						
High point	10845	229.72						
SWM	10950	227.80						
Low point	11020	226.45	10680 to 11020	11020	340	1.53	Outlet	
Gore Way / Innis Lake Road	11380	230.98	11020 to 11380	11020	360	1.62	Outlet	
Culvert	11600	228.50						
Low point	11800	224.21	11380 to 11800	11800	420	1.89	Outlet	
High point	12055	227.56	11800 to 12055	11800	255	1.15	Outlet	
Low point	12335	223.22	12055 to 12920	12300	865	3.89	SWM 2	0.825
McVean Dr. / Centreville Creek Rd.	12760	228.38						
High point	12920	229.69						
Access Road	13600	224.20	12920 to 13600	13600	680	3.06	SWM 3	0.715
IM Culvert	13760	222.96	13600 to 13760	13760	160	0.72	Outlet	
The Groe Road	14130	221.22						
Low point	14400	218.33	13760 to 15135	14400	1375	6.19	SWM 4	0.828
Marysville Dr.	14560	221.30						
O'Reilly Lane	14760	223.34						
High point	14865	223.88						
Low point	15135	222.50	15135 to 15250	15250	115	0.52	Outlet	
IM Culvert	15250	223.59	15250 to 15695	15250	445	2.00	Outlet	
Clarkway Dr. / Humber Station Rd	15500	225.94						
High point	15695	226.84	15695 to 15960	15960	265	1.19	Outlet	
Low point	15960	223.04	15960 to 16870	15960	910	4.10	SWM 5	0.644
High point	16845	231.11						
Coleraine Dr.	16870	231.10						

Total Length	6870	m
Average width	45	m
Average imperviousness	75	%

Mayfiled Road EA - SWM Facility 1 - 1602-10480
SWM Basin Stage-Storage-Discharge

Pond Block Length **85** m

Pond Block Length **75** m

Rating Curve for SWMHYMO				
Elevation (m)	Discharge (m³/s)	Active Storage (m³)	Drawdown (hrs) Increment	Drawdown (hrs) Total
225.50				
225.60				
225.70				
225.80				
225.90				
226.00				
226.10				
226.20				
226.30				
226.40				
226.50				
226.60				
226.70				
226.80				
226.90				
227.00				
227.10	0.001	162	31.6	31.6
227.20	0.002	335	26.5	58.1
227.30	0.011	517	7.9	66.0
227.40	0.030	710	2.7	68.7
227.50	0.041	912	1.6	70.3
227.60	0.050	1,125	1.3	71.6
227.70	0.057	1,347	1.2	72.8
227.80	0.064	1,580	1.1	73.8
227.90	0.070	1,822	1.0	74.8
228.00	0.075	2,075	1.0	75.8
228.10	0.390	2,337	0.3	76.1
228.20	1.078	2,610	0.1	76.2
228.30	2.127	2,892	0.0	76.3
228.40	3.560	3,185	0.0	76.3
228.50	5.401	3,487	0.0	76.3
228.60	7.677	3,800	0.0	76.3
228.70	10.413	4,122	0.0	76.3
228.80	13.633	4,455	0.0	76.4
228.90	17.360	4,797	0.0	76.4
229.00	21.616	5,150	0.0	76.4

	Volume Estimation						
		Wetpond		Total Pond		Total	Total
	Elevation (m)	Area (m²)	Perm Vol (m³)	Area (m²)	Act Vol (m³)	Perm Vol (m³)	Act Vol (m³)
Forebay Invert	225.50	759					
	225.60	813	79			79	
	225.70	868	163			163	
	225.80	922	252			252	
	225.90	977	347			347	
Top of Sed Storage	226.00	1031	447			447	
	226.10	1085	553			553	
	226.20	1140	665			665	
	226.30	1194	781			781	
	226.40	1249	903			903	
	226.50	1303	1031			1031	
	226.60	1357	1164			1164	
	226.70	1412	1302			1302	
	226.80	1466	1446			1446	
	226.90	1521	1596			1596	
Forebay PP	227.00	1575	1750	1575		1750	
	227.10			1675	162		162
	227.20			1775	335		335
	227.30			1875	517		517
	227.40			1975	710		710
	227.50			2075	912		912
	227.60			2175	1125		1,125
	227.70			2275	1347		1,347
	227.80			2375	1580		1,580
	227.90			2475	1822		1,822
	228.00			2575	2075		2,075
	228.10			2675	2337		2,337
	228.20			2775	2610		2,610
	228.30			2875	2892		2,892
	228.40			2975	3185		3,185
	228.50			3075	3487		3,487
	228.60			3175	3800		3,800
	228.70			3275	4122		4,122
	228.80			3375	4455		4,455
	228.90			3475	4797		4,797
	229.00			3575	5150		5,150

Outlet Controls				
Elevation (m)	Orifice 1 (m³/s)	Orifice 2 (m³/s)	Overflow Weir (m³/s)	Total Flow (m³/s)
225.50				
225.60				
225.70				
225.80				
225.90				
226.00				
226.10				
226.20				
226.30				
226.40				
226.50				
226.60				
226.70				
226.80				
226.90				
227.00				
227.10	0.001			0.001
227.20	0.002			0.002
227.30	0.003	0.008		0.011
227.40	0.003	0.026		0.030
227.50	0.004	0.037		0.041
227.60	0.004	0.046		0.050
227.70	0.004	0.053		0.057
227.80	0.005	0.059		0.064
227.90	0.005	0.065		0.070
228.00	0.005	0.070		0.075
228.10	0.005	0.075	0.310	0.390
228.20	0.006	0.079	0.993	1.078
228.30	0.006	0.083	2.038	2.127
228.40	0.006	0.088	3.466	3.560
228.50	0.006	0.091	5.303	5.401
228.60	0.007	0.095	7.576	7.677
228.70	0.007	0.099	10.308	10.413
228.80	0.007	0.102	13.524	13.633
228.90	0.007	0.106	17.247	17.360
229.00	0.007	0.109	21.500	21.616

Parameters	
Orifce 1	
Orifice Invert Elev. (m)	Orifice Coeff.
227.00	0.60
Orifice Mid-point Elev. (m)	Perimeter (m)
227.03	0.16
Orifice Diam.(mm)	Area (m^2)
50	0.002
Weir Coeff. (semi-circular)	Orientation
1.62	Vertical
Orifce 2	
Orifice Invert Elev. (m)	Orifice Coeff.
227.20	0.60
Orifice Mid-point Elev. (m)	Perimeter (m)
227.30	0.63
Orifice Diam.(mm)	Area (m^2)
200	0.031
Weir Coeff. (semi-circular)	Orientation
1.62	Vertical
Overflow Spillway	
Spillway Invert (m)	Top of Berm (m)
228.00	220.00
Spillway Length @ Invert (m)	Max. Flow Depth (m)
5	-8.00
Left Side Slope	Right Side Slope
10	10
Weir Coefficient (Rectangle)	Topwidth
1.7	-155.0
Weir Coefficient (Triangle)	
1.3	

Ponding Elevations

Rainfall Event	Elevation	Depth	Volume	Drawdown
25 mm	227.30	0.30	517	66
WQED	227.08	0.08	122	24

Orifice Flow Calculations: Orifice flow equation

$Q = C \cdot A \cdot (2 \cdot g \cdot H)^{0.5}$

where

C = orifice coefficient
A = area of orifice
g = acceleration due to gravity
H = head above centre line of orifice
Note: used when water elevation is above 3/4 of the orifice diameter

Sharp crested semi-circular weir equation

$Q=C*D^{2.5}*(H/D)^{1.88}$

where

C = sharp crested semi-circular weir coefficient
D = diameter of orifice
H = head above orifice invert
Note: used when water elevation is below 3/4 of the orifice diameter

Mayfiled Road EA - SWM Facility 1 - 1602-10480
Drainage Area Characteristics

Storage Requirements	Drainage Areas (See below)
Total Area Tributary to Basin (ha)	3.06
Tributary Area requiring quality control (ha)	3.06
MOE Quality Control Requirement	Level 1
Basin Design	wet pond
[1]Quality Control Volume Requirement (m^3/ha)	240
[2]Permanent Pool (m^3)	612
[3]Extended Detention - Quality Control (m^3)	122

[1] Based on MOE guidelines and overall percent impervious
[2]Permanent Pool sized for quality control - All but 40 m^3/ha of required quality control volume
[3]Extended Detention sized for quality control - 40 m^3/ha

Catchment Number	Area (ha)	% Imperv (TIMP)
200	3.06	75%
Quality Control	3.06	75.0%
Quantity Control	3.06	75.0%

Mayfiled Road EA - SWM Facility 2 - 1602-10480
SWM Basin Stage-Storage-Discharge

Pond x 75 m

Pond y 110 m

Rating Curve for SWMHYMO				
Elevation (m)	Discharge (m³/s)	Active Storage (m³)	Drawdown (hrs) Increment	Drawdown (hrs) Total
219.50				
219.60				
219.70				
219.80				
219.90				
220.00				
220.10				
220.20				
220.30				
220.40				
220.50				
220.60				
220.70				
220.80				
220.90				
221.00				
221.10	0.001	251	48.8	48.8
221.20	0.008	515	16.4	65.2
221.30	0.027	791	4.4	69.7
221.40	0.037	1,080	2.5	72.1
221.50	0.045	1,381	2.0	74.2
221.60	0.052	1,695	1.8	76.0
221.70	0.058	2,021	1.7	77.6
221.80	0.063	2,360	1.6	79.2
221.90	0.068	2,711	1.5	80.7
222.00	0.073	3,075	1.4	82.1
222.10	0.387	3,451	0.5	82.5
222.20	1.074	3,840	0.1	82.7
222.30	2.123	4,241	0.1	82.8
222.40	3.555	4,655	0.0	82.8
222.50	5.396	5,081	0.0	82.8
222.60	7.671	5,520	0.0	82.8
222.70	10.407	5,971	0.0	82.9
222.80	13.626	6,435	0.0	82.9
222.90	17.353	6,911	0.0	82.9
223.00	21.609	7,400	0.0	82.9

	Volume Estimation						
		Wetpond		Total Pond		Total	Total
	Elevation (m)	Area (m²)	Perm Vol (m³)	Area (m²)	Act Vol (m³)	Perm Vol (m³)	Act Vol (m³)
Forebay Invert	219.50	1334					
	219.60	1408	137			137	
	219.70	1483	282			282	
	219.80	1557	434			434	
	219.90	1632	593			593	
Top of Sed Storage	220.00	1706	760			760	
	220.10	1780	934			934	
	220.20	1855	1116			1116	
	220.30	1929	1305			1305	
	220.40	2004	1502			1502	
	220.50	2078	1706			1706	
	220.60	2152	1918			1918	
	220.70	2227	2136			2136	
	220.80	2301	2363			2363	
	220.90	2376	2597			2597	
Forebay PP	221.00	2450	2838	2450		2838	
	221.10			2575	251		251
	221.20			2700	515		515
	221.30			2825	791		791
	221.40			2950	1080		1,080
	221.50			3075	1381		1,381
	221.60			3200	1695		1,695
	221.70			3325	2021		2,021
	221.80			3450	2360		2,360
	221.90			3575	2711		2,711
	222.00			3700	3075		3,075
	222.10			3825	3451		3,451
	222.20			3950	3840		3,840
	222.30			4075	4241		4,241
	222.40			4200	4655		4,655
	222.50			4325	5081		5,081
	222.60			4450	5520		5,520
	222.70			4575	5971		5,971
	222.80			4700	6435		6,435
	222.90			4825	6911		6,911
	223.00			4950	7400		7,400

Outlet Controls				
Elevation (m)	Orifice 1 (m³/s)	Orifice 2 (m³/s)	Overflow Weir (m³/s)	Total Flow (m³/s)
219.50				
219.60				
219.70				
219.80				
219.90				
220.00				
220.10				
220.20				
220.30				
220.40				
220.50				
220.60				
220.70				
220.80				
220.90				
221.00				
221.10	0.001			0.001
221.20	0.002	0.005		0.008
221.30	0.003	0.024		0.027
221.40	0.003	0.034		0.037
221.50	0.004	0.042		0.045
221.60	0.004	0.048		0.052
221.70	0.004	0.054		0.058
221.80	0.005	0.059		0.063
221.90	0.005	0.063		0.068
222.00	0.005	0.068		0.073
222.10	0.005	0.072	0.310	0.387
222.20	0.006	0.076	0.993	1.074
222.30	0.006	0.079	2.038	2.123
222.40	0.006	0.083	3.466	3.555
222.50	0.006	0.086	5.303	5.396
222.60	0.007	0.089	7.576	7.671
222.70	0.007	0.092	10.308	10.407
222.80	0.007	0.095	13.524	13.626
222.90	0.007	0.098	17.247	17.353
223.00	0.007	0.101	21.500	21.609

Parameters	
Orifce 1	
Orifice Invert Elev. (m)	Orifice Coeff.
221.00	0.60
Orifice Mid-point Elev. (m)	Perimeter (m)
221.03	0.16
Orifice Diam.(mm)	Area (m^2)
50	0.002
Weir Coeff. (semi-circular)	Orientation
1.62	Vertical
Orifce 2	
Orifice Invert Elev. (m)	Orifice Coeff.
221.10	0.60
Orifice Mid-point Elev. (m)	Perimeter (m)
221.20	0.60
Orifice Diam.(mm)	Area (m^2)
190	0.028
Weir Coeff. (semi-circular)	Orientation
1.62	Vertical
Overflow Spillway	
Spillway Invert (m)	Top of Berm (m)
222.00	220.00
Spillway Length @ Invert (m)	Max. Flow Depth (m)
5	-2.00
Left Side Slope	Right Side Slope
10	10
Weir Coefficient (Rectangle)	Topwidth
1.7	-35.0
Weir Coefficient (Triangle)	
1.3	

Orifice Flow Calculations: Orifice flow equation

$Q = C \cdot A \cdot (2 \cdot g \cdot H)^{0.5}$

where
- C = orifice coefficient
- A = area of orifice
- g = acceleration due to gravity
- H = head above centre line of orifice

Note: used when water elevation is above 3/4 of the orifice diameter

Sharp crested semi-circular weir equation

$Q=C*D^{2.5}*(H/D)^{1.88}$

where
- C = sharp crested semi-circular weir coefficient
- D = diameter of orifice
- H = head above orifice invert

Note: used when water elevation is below 3/4 of the orifice diameter

Ponding Elevations

Rainfall Event	Elevation	Depth	Volume	Drawdown
25-mm	221.24	0.24	639	67
WQED	221.06	0.06	156	30

Mayfiled Road EA - SWM Facility 2 - 1602-10480
Drainage Area Characteristics

Storage Requirements	Drainage Areas (See below)
Total Area Tributary to Basin (ha)	3.89
Tributary Area requiring quality control (ha)	3.89
MOE Quality Control Requirement	Level 1
Basin Design	wet pond
[1]Quality Control Volume Requirement (m^3/ha)	240
[2]Permanent Pool (m^3)	778
[3]Extended Detention - Quality Control (m^3)	156

[1] Based on MOE guidelines and overall percent impervious
[2]Permanent Pool sized for quality control - All but 40 m^3/ha of required quality control volume
[3]Extended Detention sized for quality control - 40 m^3/ha

Catchment Number	Area (ha)	% Imperv (XIMP)
225	3.89	75%
Quality Control	3.89	75.0%
Quantity Control	3.89	75.0%

Mayfiled Road EA - SWM Facility 3 - 1602-10480
SWM Basin Stage-Storage-Discharge

Pond x **130** m

Pond y **55** m

Rating Curve for SWMHYMO				
Elevation (m)	Discharge (m^3/s)	Active Storage (m^3)	Drawdown (hrs) Increment	Drawdown (hrs) Total
220.50				
220.60				
220.70				
220.80				
220.90				
221.00				
221.10				
221.20				
221.30				
221.40				
221.50				
221.60				
221.70				
221.80				
221.90				
222.00				
222.10	0.001	141	27.5	27.5
222.20	0.002	295	23.6	51.1
222.30	0.008	461	9.0	60.1
222.40	0.028	640	2.8	62.9
222.50	0.038	831	1.6	64.5
222.60	0.046	1,035	1.4	65.9
222.70	0.052	1,251	1.2	67.1
222.80	0.058	1,480	1.2	68.3
222.90	0.063	1,721	1.1	69.4
223.00	0.068	1,975	1.1	70.4
223.10	0.383	2,241	0.3	70.8
223.20	1.070	2,520	0.1	70.9
223.30	2.119	2,811	0.1	70.9
223.40	3.551	3,115	0.0	70.9
223.50	5.392	3,431	0.0	71.0
223.60	7.668	3,760	0.0	71.0
223.70	10.404	4,101	0.0	71.0
223.80	13.623	4,455	0.0	71.0
223.90	17.350	4,821	0.0	71.0
224.00	21.606	5,200	0.0	71.0

	Volume Estimation						
		Wetpond		Total Pond		Total	Total
	Elevation (m)	Area (m^2)	Perm Vol (m^3)	Area (m^2)	Act Vol (m^3)	Perm Vol (m^3)	Act Vol (m^3)
Forebay Invert	220.50	234					
	220.60	308	27			27	
	220.70	383	62			62	
	220.80	457	104			104	
	220.90	532	153			153	
Top of Sed Storage	221.00	606	210			210	
	221.10	680	274			274	
	221.20	755	346			346	
	221.30	829	425			425	
	221.40	904	512			512	
	221.50	978	606			606	
	221.60	1052	708			708	
	221.70	1127	816			816	
	221.80	1201	933			933	
	221.90	1276	1057			1057	
Forebay PP	222.00	1350	1188	1350		1188	
	222.10			1475	141		141
	222.20			1600	295		295
	222.30			1725	461		461
	222.40			1850	640		640
	222.50			1975	831		831
	222.60			2100	1035		1,035
	222.70			2225	1251		1,251
	222.80			2350	1480		1,480
	222.90			2475	1721		1,721
	223.00			2600	1975		1,975
	223.10			2725	2241		2,241
	223.20			2850	2520		2,520
	223.30			2975	2811		2,811
	223.40			3100	3115		3,115
	223.50			3225	3431		3,431
	223.60			3350	3760		3,760
	223.70			3475	4101		4,101
	223.80			3600	4455		4,455
	223.90			3725	4821		4,821
	224.00			3850	5200		5,200

Outlet Controls				
Elevation (m)	Orifice 1 (m^3/s)	Orifice 2 (m^3/s)	Overflow Weir (m^3/s)	Total Flow (m^3/s)
220.50				
220.60				
220.70				
220.80				
220.90				
221.00				
221.10				
221.20				
221.30				
221.40				
221.50				
221.60				
221.70				
221.80				
221.90				
222.00				
222.10	0.001			0.001
222.20	0.002			0.002
222.30	0.003	0.005		0.008
222.40	0.003	0.024		0.028
222.50	0.004	0.034		0.038
222.60	0.004	0.042		0.046
222.70	0.004	0.048		0.052
222.80	0.005	0.054		0.058
222.90	0.005	0.059		0.063
223.00	0.005	0.063		0.068
223.10	0.005	0.068	0.310	0.383
223.20	0.006	0.072	0.993	1.070
223.30	0.006	0.076	2.038	2.119
223.40	0.006	0.079	3.466	3.551
223.50	0.006	0.083	5.303	5.392
223.60	0.007	0.086	7.576	7.668
223.70	0.007	0.089	10.308	10.404
223.80	0.007	0.092	13.524	13.623
223.90	0.007	0.095	17.247	17.350
224.00	0.007	0.098	21.500	21.606

Parameters	
Orifce 1	
Orifice Invert Elev. (m)	Orifice Coeff.
222.00	0.60
Orifice Mid-point Elev. (m)	Perimeter (m)
222.03	0.16
Orifice Diam.(mm)	Area (m^2)
50	0.002
Weir Coeff. (semi-circular)	Orientation
1.62	Vertical
Orifce 2	
Orifice Invert Elev. (m)	Orifice Coeff.
222.20	0.60
Orifice Mid-point Elev. (m)	Perimeter (m)
222.30	0.60
Orifice Diam.(mm)	Area (m^2)
190	0.028
Weir Coeff. (semi-circular)	Orientation
1.62	Vertical
Overflow Spillway	
Spillway Invert (m)	Top of Berm (m)
223.00	220.00
Spillway Length @ Invert (m)	Max. Flow Depth (m)
5	-3.00
Left Side Slope	Right Side Slope
10	10
Weir Coefficient (Rectangle)	Topwidth
1.7	-55.0
Weir Coefficient (Triangle)	
1.3	

Orifice Flow Calculations: Orifice flow equation

$Q = C \cdot A \cdot (2 \cdot g \cdot H)^{0.5}$

where
- C = orifice coefficient
- A = area of orifice
- g = acceleration due to gravity
- H = head above centre line of orifice

Note: used when water elevation is above 3/4 of the orifice diameter

Sharp crested semi-circular weir equation

$Q=C*D^{2.5}*(H/D)^{1.88}$

where
- C = sharp crested semi-circular weir coefficient
- D = diameter of orifice
- H = head above orifice invert

Note: used when water elevation is below 3/4 of the orifice diameter

Ponding Elevations

Rainfall Event	Elevation	Depth	Volume	Drawdown
25-mm	222.33	0.33	512	61
WQED	222.09	0.09	122	24

Mayfiled Road EA - SWM Facility 3 - 1602-10480
Drainage Area Characteristics

Storage Requirements	Drainage Areas (See below)
Total Area Tributary to Basin (ha)	3.06
Tributary Area requiring quality control (ha)	3.06
MOE Quality Control Requirement	Level 1
Basin Design	wet pond
[1]Quality Control Volume Requirement (m^3/ha)	240
[2]Permanent Pool (m^3)	612
[3]Extended Detention - Quality Control (m^3)	122

[1] Based on MOE guidelines and overall percent impervious

[2]Permanent Pool sized for quality control - All but 40 m^3/ha of required quality control volume

[3]Extended Detention sized for quality control - 40 m^3/ha

Catchment Number	Area (ha)	% Imperv (XIMP)
230	3.06	75%
Quality Control	3.06	75.0%
Quantity Control	3.06	75.0%

Mayfiled Road EA - SWM Facility 4 - 1602-10480
SWM Basin Stage-Storage-Discharge

Pond x **115** m
Pond y **72** m

Rating Curve for SWMHYMO				
Elevation (m)	Discharge (m^3/s)	Active Storage (m^3)	Drawdown (hrs) Increment	Drawdown (hrs) Total
213.50				
213.60				
213.70				
213.80				
213.90				
214.00				
214.10				
214.20				
214.30				
214.40				
214.50				
214.60				
214.70				
214.80				
214.90				
215.00				
215.10	0.003	246	26.2	26.2
215.20	0.004	505	21.3	47.5
215.30	0.013	777	8.7	56.3
215.40	0.033	1,062	3.5	59.7
215.50	0.044	1,359	2.1	61.9
215.60	0.053	1,669	1.8	63.6
215.70	0.061	1,991	1.6	65.2
215.80	0.068	2,326	1.4	66.6
215.90	0.074	2,674	1.4	68.0
216.00	0.080	3,035	1.3	69.3
216.10	0.395	3,408	0.4	69.7
216.20	1.083	3,794	0.1	69.9
216.30	2.133	4,193	0.1	69.9
216.40	3.565	4,605	0.0	70.0
216.50	5.407	5,029	0.0	70.0
216.60	7.684	5,466	0.0	70.0
216.70	10.420	5,915	0.0	70.0
216.80	13.640	6,377	0.0	70.0
216.90	17.367	6,852	0.0	70.1
217.00	21.623	7,340	0.0	70.1

	Volume Estimation						
		Wetpond		Total Pond		Total	Total
	Elevation (m)	Area (m^2)	Perm Vol (m^3)	Area (m^2)	Act Vol (m^3)	Perm Vol (m^3)	Act Vol (m^3)
Forebay Invert	213.50	1260					
	213.60	1336	130			130	
	213.70	1412	267			267	
	213.80	1488	412			412	
	213.90	1564	565			565	
Top of Sed Storage	214.00	1640	725			725	
	214.10	1716	893			893	
	214.20	1792	1068			1068	
	214.30	1868	1251			1251	
	214.40	1944	1442			1442	
	214.50	2020	1640			1640	
	214.60	2096	1846			1846	
	214.70	2172	2059			2059	
	214.80	2248	2280			2280	
	214.90	2324	2509			2509	
Forebay PP	215.00	2400	2745	2400		2745	
	215.10			2527	246		246
	215.20			2654	505		505
	215.30			2781	777		777
	215.40			2908	1062		1,062
	215.50			3035	1359		1,359
	215.60			3162	1669		1,669
	215.70			3289	1991		1,991
	215.80			3416	2326		2,326
	215.90			3543	2674		2,674
	216.00			3670	3035		3,035
	216.10			3797	3408		3,408
	216.20			3924	3794		3,794
	216.30			4051	4193		4,193
	216.40			4178	4605		4,605
	216.50			4305	5029		5,029
	216.60			4432	5466		5,466
	216.70			4559	5915		5,915
	216.80			4686	6377		6,377
	216.90			4813	6852		6,852
	217.00			4940	7340		7,340

Outlet Controls				
Elevation (m)	Orifice 1 (m^3/s)	Orifice 2 (m^3/s)	Overflow Weir (m^3/s)	Total Flow (m^3/s)
213.50				
213.60				
213.70				
213.80				
213.90				
214.00				
214.10				
214.20				
214.30				
214.40				
214.50				
214.60				
214.70				
214.80				
214.90				
215.00				
215.10	0.003			0.003
215.20	0.004			0.004
215.30	0.005	0.008		0.013
215.40	0.006	0.026		0.033
215.50	0.007	0.037		0.044
215.60	0.008	0.046		0.053
215.70	0.008	0.053		0.061
215.80	0.009	0.059		0.068
215.90	0.010	0.065		0.074
216.00	0.010	0.070		0.080
216.10	0.011	0.075	0.310	0.395
216.20	0.011	0.079	0.993	1.083
216.30	0.012	0.083	2.038	2.133
216.40	0.012	0.088	3.466	3.565
216.50	0.012	0.091	5.303	5.407
216.60	0.013	0.095	7.576	7.684
216.70	0.013	0.099	10.308	10.420
216.80	0.014	0.102	13.524	13.640
216.90	0.014	0.106	17.247	17.367
217.00	0.014	0.109	21.500	21.623

Parameters	
Orifce 1	
Orifice Invert Elev. (m)	Orifice Coeff.
215.00	0.60
Orifice Mid-point Elev. (m)	Perimeter (m)
215.04	0.22
Orifice Diam.(mm)	Area (m^2)
70	0.004
Weir Coeff. (semi-circular)	Orientation
1.62	Vertical
Orifce 2	
Orifice Invert Elev. (m)	Orifice Coeff.
215.20	0.60
Orifice Mid-point Elev. (m)	Perimeter (m)
215.30	0.63
Orifice Diam.(mm)	Area (m^2)
200	0.031
Weir Coeff. (semi-circular)	Orientation
1.62	Vertical
Overflow Spillway	
Spillway Invert (m)	Top of Berm (m)
216.00	220.00
Spillway Length @ Invert (m)	Max. Flow Depth (m)
5	4.00
Left Side Slope	Right Side Slope
10	10
Weir Coefficient (Rectangle)	Topwidth
1.7	85.0
Weir Coefficient (Triangle)	
1.3	

Orifice Flow Calculations: Orifice flow equation

$Q = C \cdot A \cdot (2 \cdot g \cdot H)^{0.5}$

where
- C = orifice coefficient
- A = area of orifice
- g = acceleration due to gravity
- H = head above centre line of orifice

Note: used when water elevation is above 3/4 of the orifice diameter

Sharp crested semi-circular weir equation

$Q=C*D^{2.5}*(H/D)^{1.88}$

where
- C = sharp crested semi-circular weir coefficient
- D = diameter of orifice
- H = head above orifice invert

Note: used when water elevation is below 3/4 of the orifice diameter

Ponding Elevations

Rainfall Event	Elevation	Depth	Volume	Drawdown
25-mm	215.38	0.38	1011	59
WQED	215.10	0.10	248	26

Mayfiled Road EA - SWM Facility 4 - 1602-10480
Drainage Area Characteristics

Storage Requirements	Drainage Areas (See below)
Total Area Tributary to Basin (ha)	6.19
Tributary Area requiring quality control (ha)	6.19
MOE Quality Control Requirement	Level 1
Basin Design	wet pond
[1]Quality Control Volume Requirement (m^3/ha)	240
[2]Permanent Pool (m^3)	1238
[3]Extended Detention - Quality Control (m^3)	248

[1] Based on MOE guidelines and overall percent impervious
[2]Permanent Pool sized for quality control - All but 40 m^3/ha of required quality control volume
[3]Extended Detention sized for quality control - 40 m^3/ha

Catchment Number	Area (ha)	% Imperv (XIMP)
235	6.19	75%
Quality Control	6.19	75.0%
Quantity Control	6.19	75.0%

Mayfiled Road EA - SWM Facility 5 - 1602-10480
SWM Basin Stage-Storage-Discharge

Pond x **70** m

Pond y **92** m

Rating Curve for SWMHYMO				
Elevation (m)	Discharge (m³/s)	Active Storage (m³)	Drawdown (hrs) Increment	Drawdown (hrs) Total
219.50				
219.60				
219.70				
219.80				
219.90				
220.00				
220.10				
220.20				
220.30				
220.40				
220.50				
220.60				
220.70				
220.80				
220.90				
221.00				
221.10	0.002	161	26.3	26.3
221.20	0.003	332	22.0	48.3
221.30	0.010	514	8.0	56.3
221.40	0.026	706	2.9	59.2
221.50	0.035	907	1.8	61.0
221.60	0.042	1,120	1.5	62.6
221.70	0.048	1,342	1.4	63.9
221.80	0.054	1,574	1.3	65.2
221.90	0.059	1,817	1.2	66.4
222.00	0.063	2,070	1.2	67.5
222.10	0.377	2,333	0.3	67.9
222.20	1.064	2,606	0.1	68.0
222.30	2.113	2,890	0.0	68.0
222.40	3.545	3,184	0.0	68.0
222.50	5.385	3,487	0.0	68.1
222.60	7.661	3,802	0.0	68.1
222.70	10.396	4,126	0.0	68.1
222.80	13.615	4,460	0.0	68.1
222.90	17.342	4,805	0.0	68.1
223.00	21.597	5,160	0.0	68.1

	Volume Estimation						
		Wetpond		Total Pond		Total	Total
	Elevation (m)	Area (m²)	Perm Vol (m³)	Area (m²)	Act Vol (m³)	Perm Vol (m³)	Act Vol (m³)
Forebay Invert	219.50	720					
	219.60	776	75			75	
	219.70	832	155			155	
	219.80	888	241			241	
	219.90	944	333			333	
Top of Sed Storage	220.00	1000	430			430	
	220.10	1056	533			533	
	220.20	1112	641			641	
	220.30	1168	755			755	
	220.40	1224	875			875	
	220.50	1280	1000			1000	
	220.60	1336	1131			1131	
	220.70	1392	1267			1267	
	220.80	1448	1409			1409	
	220.90	1504	1557			1557	
Forebay PP	221.00	1560	1710	1560		1710	
	221.10			1662	161		161
	221.20			1764	332		332
	221.30			1866	514		514
	221.40			1968	706		706
	221.50			2070	907		907
	221.60			2172	1120		1,120
	221.70			2274	1342		1,342
	221.80			2376	1574		1,574
	221.90			2478	1817		1,817
	222.00			2580	2070		2,070
	222.10			2682	2333		2,333
	222.20			2784	2606		2,606
	222.30			2886	2890		2,890
	222.40			2988	3184		3,184
	222.50			3090	3487		3,487
	222.60			3192	3802		3,802
	222.70			3294	4126		4,126
	222.80			3396	4460		4,460
	222.90			3498	4805		4,805
	223.00			3600	5160		5,160

Outlet Controls				
Elevation (m)	Orifice 1 (m³/s)	Orifice 2 (m³/s)	Overflow Weir (m³/s)	Total Flow (m³/s)
219.50				
219.60				
219.70				
219.80				
219.90				
220.00				
220.10				
220.20				
220.30				
220.40				
220.50				
220.60				
220.70				
220.80				
220.90				
221.00				
221.10	0.002			0.002
221.20	0.003			0.003
221.30	0.003	0.007		0.010
221.40	0.004	0.022		0.026
221.50	0.004	0.031		0.035
221.60	0.005	0.038		0.042
221.70	0.005	0.043		0.048
221.80	0.006	0.048		0.054
221.90	0.006	0.053		0.059
222.00	0.006	0.057		0.063
222.10	0.007	0.061	0.310	0.377
222.20	0.007	0.065	0.993	1.064
222.30	0.007	0.068	2.038	2.113
222.40	0.007	0.071	3.466	3.545
222.50	0.008	0.074	5.303	5.385
222.60	0.008	0.077	7.576	7.661
222.70	0.008	0.080	10.308	10.396
222.80	0.008	0.083	13.524	13.615
222.90	0.009	0.086	17.247	17.342
223.00	0.009	0.088	21.500	21.597

Parameters	
Orifce 1	
Orifice Invert Elev. (m)	Orifice Coeff.
221.00	0.60
Orifice Mid-point Elev. (m)	Perimeter (m)
221.03	0.17
Orifice Diam.(mm)	Area (m^2)
55	0.002
Weir Coeff. (semi-circular)	Orientation
1.62	Vertical
Orifce 2	
Orifice Invert Elev. (m)	Orifice Coeff.
221.20	0.60
Orifice Mid-point Elev. (m)	Perimeter (m)
221.29	0.57
Orifice Diam.(mm)	Area (m^2)
180	0.025
Weir Coeff. (semi-circular)	Orientation
1.62	Vertical
Overflow Spillway	
Spillway Invert (m)	Top of Berm (m)
222.00	220.00
Spillway Length @ Invert (m)	Max. Flow Depth (m)
5	-2.00
Left Side Slope	Right Side Slope
10	10
Weir Coefficient (Rectangle)	Topwidth
1.7	-35.0
Weir Coefficient (Triangle)	
1.3	

Orifice Flow Calculations: Orifice flow equation

$Q = C \cdot A \cdot (2 \cdot g \cdot H)^{0.5}$

where

C = orifice coefficient

A = area of orifice

g = acceleration due to gravity

H = head above centre line of orifice

Note: used when water elevation is above 3/4 of the orifice diameter

Sharp crested semi-circular weir equation

$Q=C*D^{2.5}*(H/D)^{1.88}$

where

C = sharp crested semi-circular weir coefficient

D = diameter of orifice

H = head above orifice invert

Note: used when water elevation is below 3/4 of the orifice diameter

Ponding Elevations

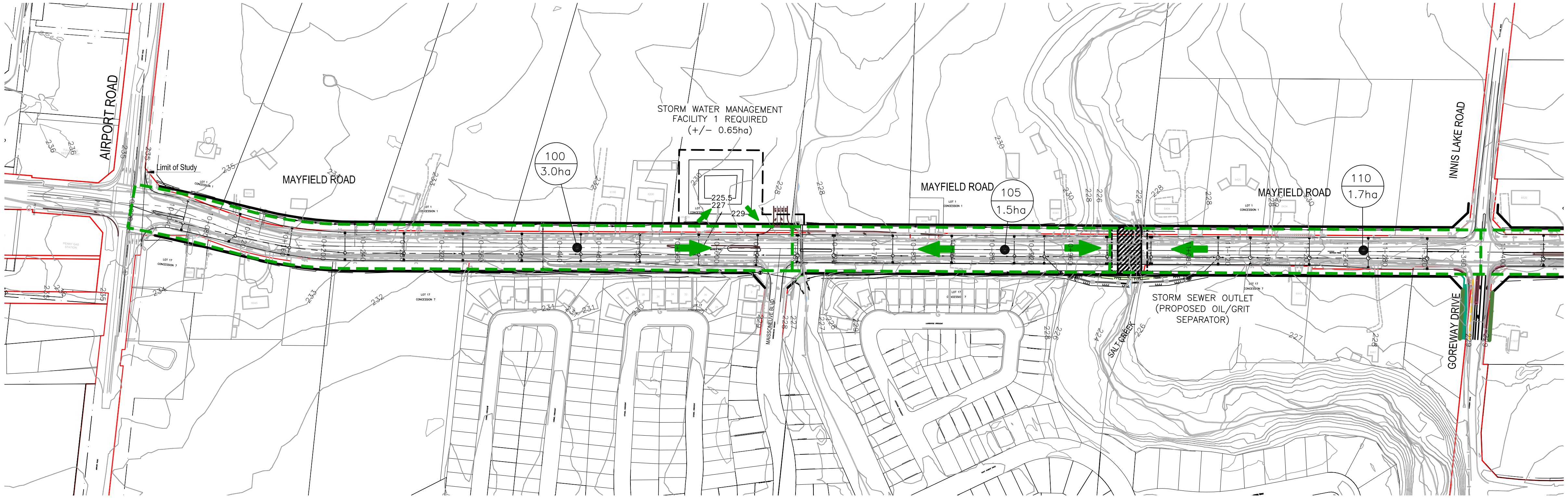
Rainfall Event	Elevation	Depth	Volume	Drawdown
25-mm	221.37	0.37	653	58
WQED	221.10	0.10	164	27

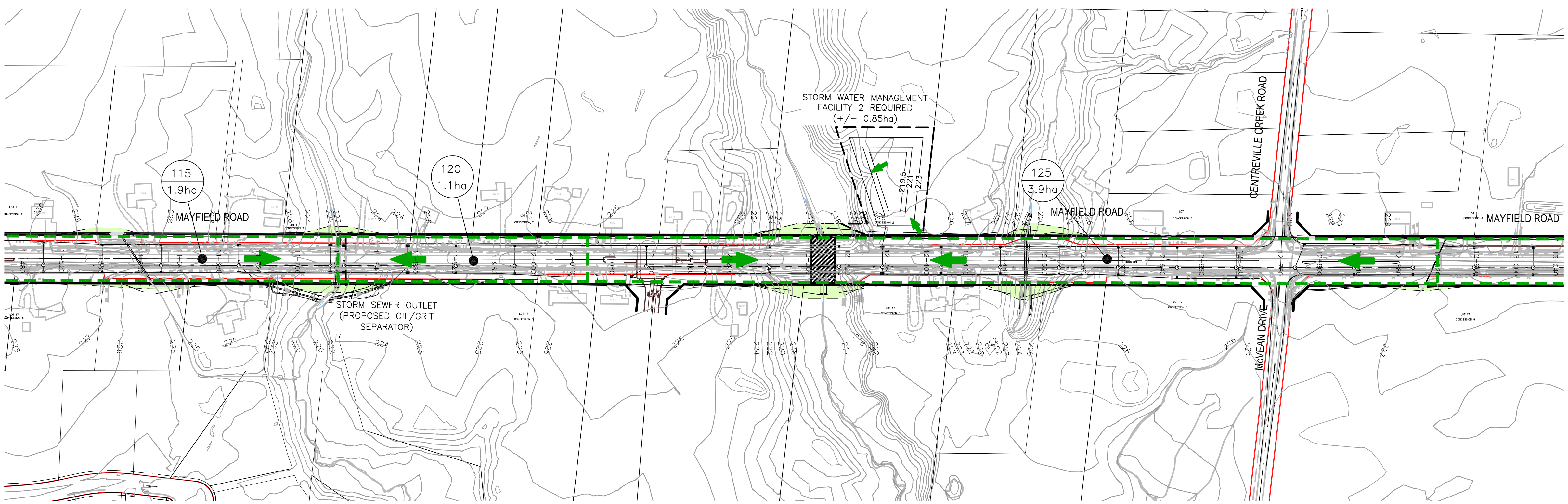
Mayfiled Road EA - SWM Facility 5 - 1602-10480
Drainage Area Characteristics

Storage Requirements	Drainage Areas (See below)
Total Area Tributary to Basin (ha)	4.10
Tributary Area requiring quality control (ha)	4.10
MOE Quality Control Requirement	Level 1
Basin Design	wet pond
[1]Quality Control Volume Requirement (m^3/ha)	240
[2]Permanent Pool (m^3)	820
[3]Extended Detention - Quality Control (m^3)	164

[1] Based on MOE guidelines and overall percent impervious
[2]Permanent Pool sized for quality control - All but 40 m^3/ha of required quality control volume
[3]Extended Detention sized for quality control - 40 m^3/ha

Catchment Number	Area (ha)	% Imperv (XIMP)
255	4.10	75%
Quality Control	4.10	75.0%
Quantity Control	4.10	75.0%





LEGEND

- EXISTING RIGHT OF WAY
- PROPOSED RIGHT OF WAY
- CATCHMENT BOUNDARY
- FLOW DIRECTION
- 100 1.2ha DRAINAGE AREA
- PROPERTY ACQUISITION FOR CULVERT EXTENSIONS

Scale

50m 0 50 100 150m

Stantec

Client

Region of Peel
Working for you

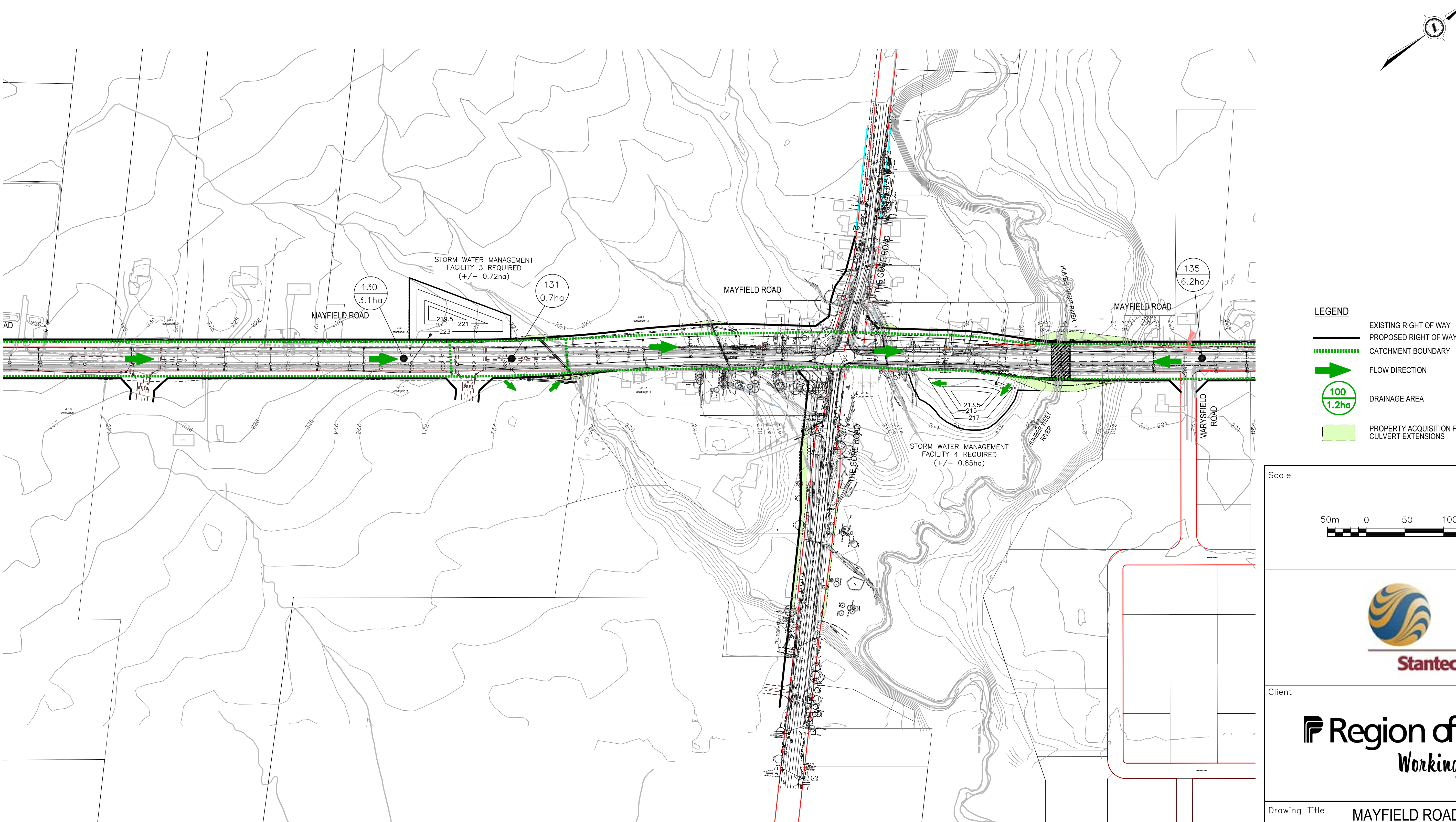
Drawing Title

MAYFIELD ROAD
AIRPORT ROAD TO COLERAINE DRIVE
CLASS EA STUDY REPORT
RECOMMENDED DESIGN ALTERNATIVE

STORM DRAINAGE
STA. 10+000 TO STA. 13+340

Drawn By	Checked By	Drawing Number
W.R.W.	J.I.	
Date	Project No.	S1
2012/10/16	160210480	

V:\01602\Active\160210480\design\drawings\class_ea\swm\opt4B_mayfield_rd_stm.dwg
2012/10/16 5:13 PM by:white, bill (kitchener)



LEGEND

- EXISTING RIGHT OF WAY
- PROPOSED RIGHT OF WAY
- CATCHMENT BOUNDARY
- FLOW DIRECTION
- 100 / 1.2ha — DRAINAGE AREA
- PROPERTY ACQUISITION FOR CULVERT EXTENSIONS

Scale

50m 0 50 100 150m

Stantec

Client

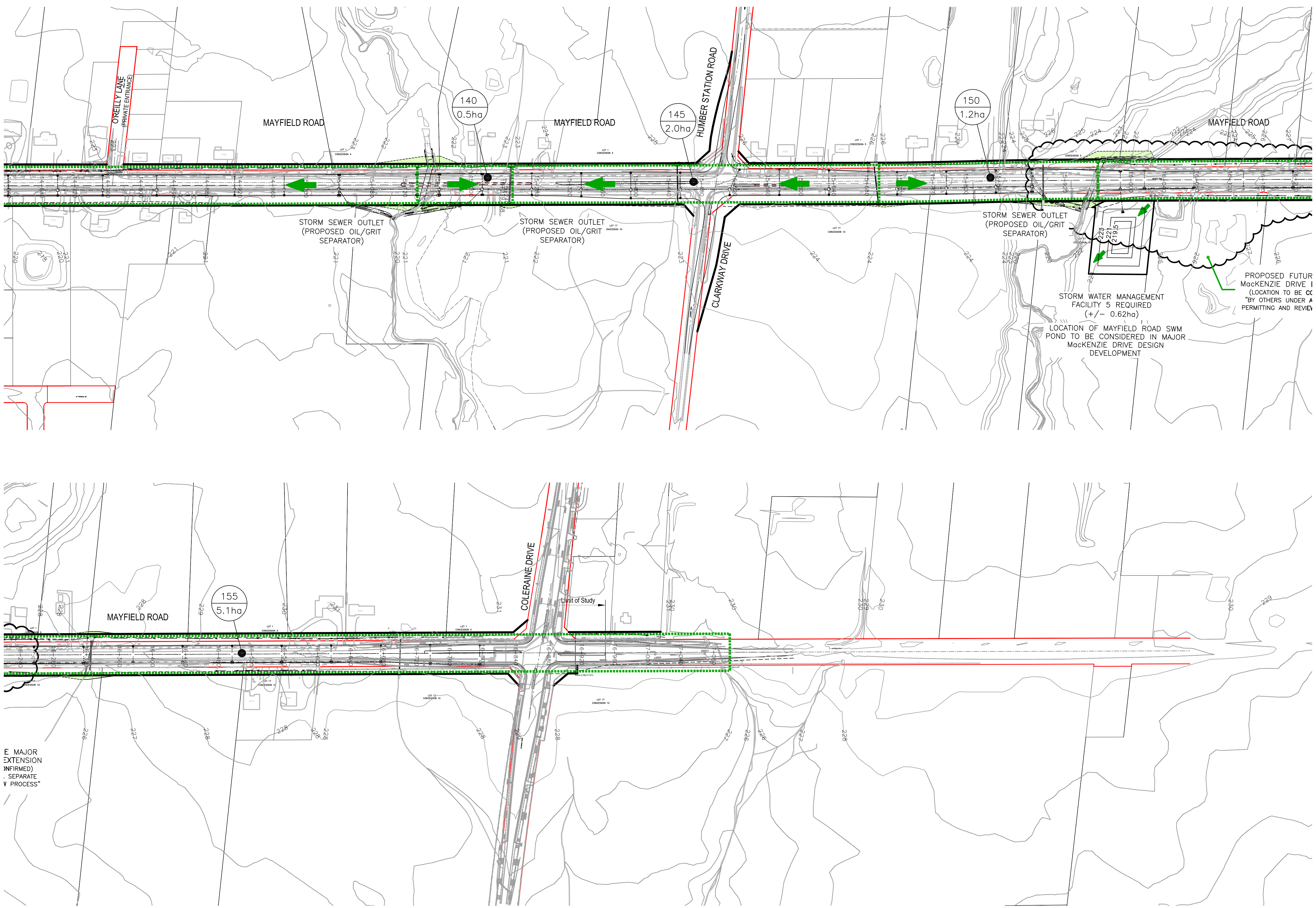
Region of Peel
Working for you

Drawing Title

MAYFIELD ROAD
AIRPORT ROAD TO COLERAINE DRIVE
CLASS EA STUDY REPORT
RECOMMENDED DESIGN ALTERNATIVE

STORM DRAINAGE
STA. 13+340 TO STA. 14+640

Drawn By	Checked By	Drawing Number
W.R.W.	J.I.	
Date	Project No.	S2
2012/10/16	160210480	



LEGEND

- EXISTING RIGHT OF WAY
- PROPOSED RIGHT OF WAY
- CATCHMENT BOUNDARY
- FLOW DIRECTION
- DRAINAGE AREA (100 / 1.2ha)
- PROPERTY ACQUISITION FOR CULVERT EXTENSIONS

Scale

50m 0 50 100 150m

Stantec

Client

Region of Peel
Working for you

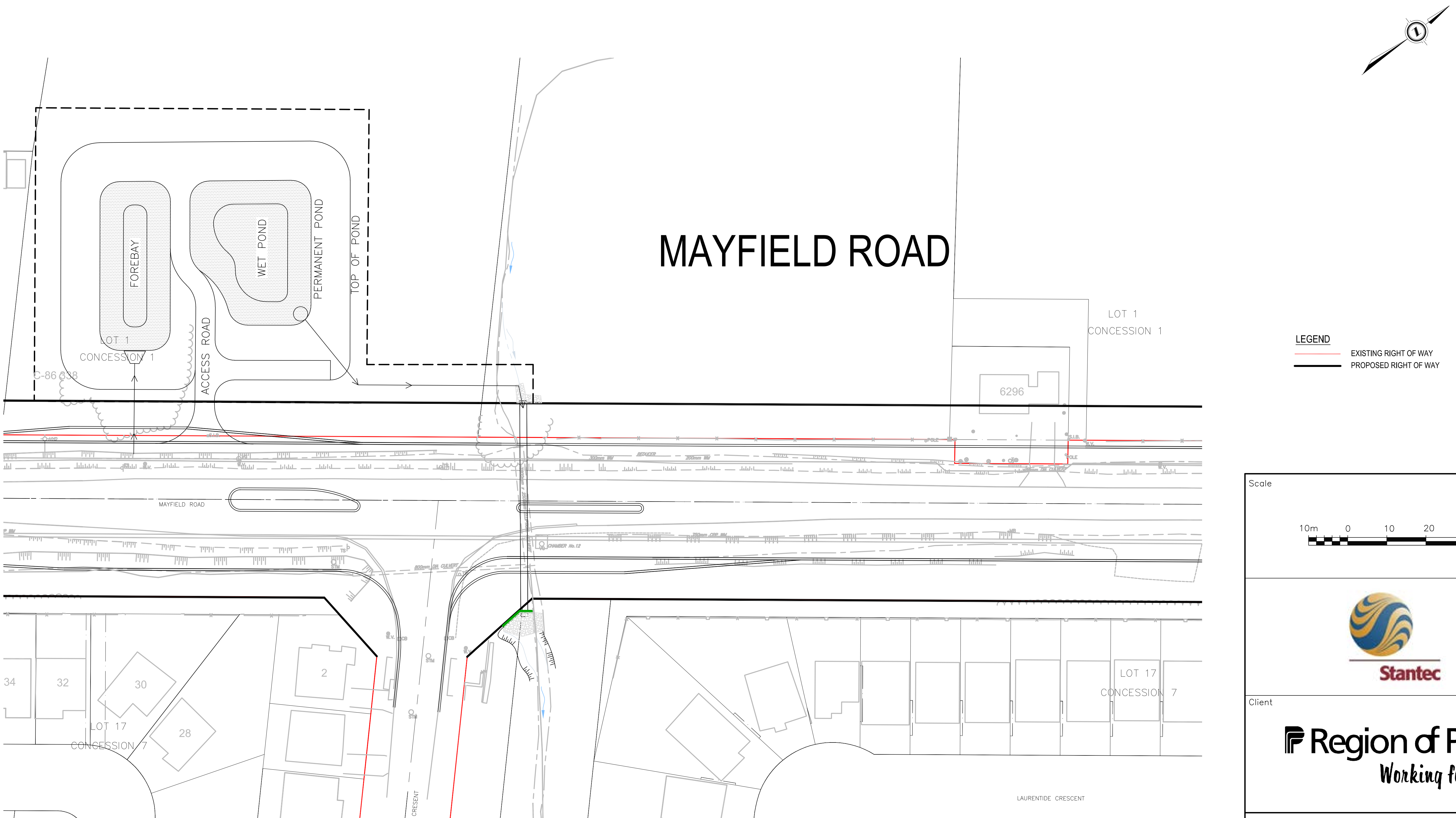
Drawing Title

MAYFIELD ROAD
AIRPORT ROAD TO COLERAINE DRIVE
CLASS EA STUDY REPORT
RECOMMENDED DESIGN ALTERNATIVE

STORM DRAINAGE
STA. 14+640 TO STA. 17+100

Drawn By	Checked By	Drawing Number
W.R.W.	J.I.	S3
Date: 2012/10/16	Project No.: 160210480	

V:\01602\Active\160210480\design\drawings\class_ea\swm\opt4B_mayfield_rd_stm.dwg
2012/10/16 5:15 PM by:white, bill (kitchener)



Scale

10m 0 10 20 30m

Stantec

Client

Region of Peel
Working for you

Drawing Title
MAYFIELD ROAD
AIRPORT ROAD TO COLERAINE DRIVE
CLASS EA STUDY REPORT
RECOMMENDED DESIGN ALTERNATIVE
STORM DRAINAGE
TYPICAL SWM FACILITY

Drawn By	Checked By	Drawing Number
W.R.W.	J.I.	
Date	Project No.	S4
2012/10/16	160210480	

APPENDIX B

Hydrologic Model Files

```
2     Metric units
*#****************************************************************************
*#  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
*#  Date         :  Feb, 2010/Revised September 2012
*#  Modeller     : [JInnes}
*#  Revised By   : [George Golding}
*#  Company      : Stantec Consulting Ltd. (Kitchener)
*#  License #    : 4730904
*#****************************************************************************
*%
*% This hydrologic analysis was prepared to determine the EXISTING Conditions
*% peak flows at culvert crossings along Mayfield Road.
*%
*%
*#****************************************************************************
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
*%                    ["2y6hAES.stm"] <--storm filename, one per line for NSTORM
*%-----------------|-----------------------------------------------------------|
READ STORM          STORM_FILENAME=["Storm.001"]
*%-----------------|-----------------------------------------------------------|
*#
*#
*% Flows to Culvert at Station 10+425
*% Catchment 110
DESIGN NASHYD       ID=[1], NHYD=["110"], DT=[1]min, AREA=[10.1](ha),
                    DWF=[0](cms), CN/C=[87], TP=[0.70]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 10+689
*% Catchment 120
DESIGN NASHYD       ID=[2], NHYD=["120"], DT=[1]min, AREA=[42.8](ha),
                    DWF=[0](cms), CN/C=[84], TP=[0.89]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 11+603
*% Catchment 140
DESIGN NASHYD       ID=[3], NHYD=["140"], DT=[1]min, AREA=[5.7](ha),
                    DWF=[0](cms), CN/C=[82], TP=[0.57]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 11+800
*% Catchment 150
DESIGN NASHYD       ID=[4], NHYD=["150"], DT=[1]min, AREA=[377.0](ha),
                    DWF=[0](cms), CN/C=[84], TP=[2.18]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 12+300
*% Catchment 160
DESIGN NASHYD       ID=[5], NHYD=["160"], DT=[1]min, AREA=[402.1](ha),
                    DWF=[0](cms), CN/C=[83], TP=[2.33]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 12+500
*% Catchment 170
DESIGN NASHYD       ID=[6], NHYD=["170"], DT=[1]min, AREA=[89.6](ha),
                    DWF=[0](cms), CN/C=[79], TP=[1.25]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 12+787
*% Catchment 180
DESIGN NASHYD       ID=[7], NHYD=["180"], DT=[1]min, AREA=[1.4](ha),
                    DWF=[0](cms), CN/C=[82], TP=[0.48]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 12+927
*% Catchment 190
DESIGN NASHYD       ID=[8], NHYD=["190"], DT=[1]min, AREA=[5.4](ha),
                    DWF=[0](cms), CN/C=[83], TP=[0.93]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 13+763
*% Catchment 1100
DESIGN NASHYD       ID=[9], NHYD=["1100"], DT=[1]min, AREA=[20.3](ha),
                    DWF=[0](cms), CN/C=[83], TP=[0.57]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 13+970
*% Catchment 1110
DESIGN NASHYD       ID=[10], NHYD=["1110"], DT=[1]min, AREA=[35.1](ha),
                    DWF=[0](cms), CN/C=[84], TP=[0.72]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 14+177
*% Catchment 1120
DESIGN NASHYD       ID=[1], NHYD=["1120"], DT=[1]min, AREA=[60.0](ha),
                    DWF=[0](cms), CN/C=[86], TP=[1.17]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 15+156
*% Catchment 1140
DESIGN NASHYD       ID=[2], NHYD=["1140"], DT=[1]min, AREA=[560.0](ha),
                    DWF=[0](cms), CN/C=[83], TP=[3.08]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 15+249
*% Catchment 1150
DESIGN NASHYD       ID=[3], NHYD=["1150"], DT=[1]min, AREA=[17.9](ha),
                    DWF=[0](cms), CN/C=[84], TP=[0.89]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 15+454
*% Catchment 1160
DESIGN NASHYD       ID=[4], NHYD=["1160"], DT=[1]min, AREA=[5.6](ha),
                    DWF=[0](cms), CN/C=[85], TP=[1.05]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 15+693
*% Catchment 1170
DESIGN STANDHYD       ID=[5], NHYD=["1170"], DT=[1]min, AREA=[1.8](ha),
                    XIMP= [0.01], TIMP= [0.25], DWF= [0] (cms), LOSS=[2], CN=[81
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 15+885
*% Catchment 1180
DESIGN NASHYD       ID=[8], NHYD=["1180"], DT=[1]min, AREA=[70.7](ha),
                    DWF=[0](cms), CN/C=[84], TP=[1.27]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 15+955
*% Catchment 1190
DESIGN NASHYD       ID=[9], NHYD=["1190"], DT=[1]min, AREA=[595.3](ha),
                    DWF=[0](cms), CN/C=[88], TP=[2.90]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% total flows to culverts at Stations 16+015 and 16+085
ADD HYD             IDsum=[1], NHYD=["180190"], IDs to add=[8+9]
*%-----------------|-----------------------------------------------------------|
*% Flows to Culvert at Station 16+327
*% Catchment 1200
DESIGN NASHYD       ID=[10], NHYD=["1200"], DT=[1]min, AREA=[5.4](ha),
                    DWF=[0](cms), CN/C=[85], TP=[0.88]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 16+700
*% Catchment 1210
DESIGN NASHYD       ID=[1], NHYD=["1210"], DT=[1]min, AREA=[2.3](ha),
                    DWF=[0](cms), CN/C=[85], TP=[0.56]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 16+842
*% Catchment 1220
DESIGN NASHYD       ID=[2], NHYD=["1220"], DT=[1]min, AREA=[0.9](ha),
                    DWF=[0](cms), CN/C=[85], TP=[0.49]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 16+887
*% Catchment 1230
DESIGN STANDHYD     ID=[3], NHYD=["1230"], DT=[1]min, AREA=[0.9](ha),
                    XIMP= [0.01], TIMP= [0.25], DWF= [0] (cms),
                    LOSS=[2], CN=[79], SLOPE=[0.5] %,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|


START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[2]
*%                    ["2Y12.stm"] <--storm filename, one per line for NSTORM ti
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[3]
*%                    ["5y6hAES.stm"] <--storm filename, one per line for NSTORM
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[4]
*%                    ["5y12.stm"] <--storm filename, one per line for NSTORM ti
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[5]
*%                    ["10y6hAES.stm"] <--storm filename, one per line for NSTOR
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[6]
*%                    ["10y12.stm"] <--storm filename, one per line for NSTORM t
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[7]
*%                    ["25y6hAES.stm"] <--storm filename, one per line for NSTOR
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[8]
*%                    ["25y12.stm"] <--storm filename, one per line for NSTORM t
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[9]
*%                    ["50y6hAES.stm"] <--storm filename, one per line for NSTOR
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[10]
*%                    ["50y12.stm"] <--storm filename, one per line for NSTORM t
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[11]
*%                    ["100y1.stm"] <--storm filename, one per line for NSTORM t
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[12]
*%                    ["1006hAES.stm"] <--storm filename, one per line for NSTOR
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[13]
*%                    ["100y12.stm"] <--storm filename, one per line for NSTORM
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[14]
*%                    ["100y24.stm"] <--storm filename, one per line for NSTORM
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[15]
*%                    ["hurhaz48.stm"] <--storm filename, one per line for NSTOR
FINISH
```

```
==============================================================================

 SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999  =========
 S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
 SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9 Ver. 4.02
     S   W W   M   M  H   H    Y    M   M  O   O       9999   9999 July 1999
 SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9 =========
                                                     9   9  9   9 # 4730904
      StormWater Management HYdrologic Model           999    999  =========

 ***************************************************************************
 ************************** SWMHYMO-99 Ver/4.02 ****************************
 *******  A single event and continuous hydrologic simulation model  *******
 *******     based on the principles of HYMO and its successors      *******
 *******                 OTTHYMO-83 and OTTHYMO-89.                  *******
 ***************************************************************************
 ******* Distributed by:  J.F. Sabourin and Associates Inc.           *******
 *******                 Ottawa,  Ontario: (613) 727-5199            *******
 *******                 Gatineau, Quebec: (819) 243-6858            *******
 *******                 E-Mail: swmhymo@jfsa.Com                    *******
 ***************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++ Licensed user: Stantec Consulting Ltd. (Kitchener)          +++++++
 +++++++                Kitchener             SERIAL#:4730904        +++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ***************************************************************************
 *******            ++++++ PROGRAM ARRAY DIMENSIONS ++++++           *******
 *******            Maximum value for ID numbers  :     10           *******
 *******            Max. number of rainfall points:  15000           *******
 *******            Max. number of flow points    :  15000           *******
 ***************************************************************************

 *** DESCRIPTION SUMMARY TABLE HEADERS (units depend on METOUT in START) ***
 ***---------------------------------------------------------------------***
 ***    ID:  Hydrograph IDentification numbers, (1-10).                  ***
 ***  NHYD:  Hydrograph reference numbers, (6 digits or characters).     ***
 ***  AREA:  Drainage area associated with hydrograph, (ac.) or (ha.).   ***
 *** QPEAK:  Peak flow of simulated hydrograph, (ft^3/s) or (m^3/s).     ***
 *** TpeakDate_hh:mm is the date and time of the peak flow.              ***
 ***  R.V.:  Runoff Volume of simulated hydrograph, (in) or (mm).        ***
 ***  R.C.:  Runoff Coefficient of simulated hydrograph, (ratio).        ***
 ***     *:  see WARNING or NOTE message printed at end of run.          ***
 ***    **:  see  ERROR  message printed at end of run.                  ***
 ***************************************************************************
 ***************************************************************************

::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

 ***************************************************************************

 ********************   S U M M A R Y   O U T P U T   ********************
 ***************************************************************************
 *      DATE: 2012-09-28     TIME: 16:47:34     RUN COUNTER: 001220       *
 ***************************************************************************
 * Input   filename: C:\SWMHYMO\160210~1\SEPTEM~1\MAYCUL~1\may5.dat       *
 * Output  filename: C:\SWMHYMO\160210~1\SEPTEM~1\MAYCUL~1\may5.out       *
 * Summary filename: C:\SWMHYMO\160210~1\SEPTEM~1\MAYCUL~1\may5.sum       *
 * User comments:                                                         *
 * 1:_____________________________________________________________________*
 * 2:_____________________________________________________________________*
 * 3:_____________________________________________________________________*
 ***************************************************************************


#*****************************************************************************
#  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
#  Date         :  Feb, 2010/Revised September 2012
#  Modeller     : [JInnes}
#  Revised By   : [George Golding}
#  Company      : Stantec Consulting Ltd. (Kitchener)
#  License #    : 4730904
#*****************************************************************************
#*****************************************************************************
 RUN:COMMAND#
 001:0001-----------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   1 ]
 001:0002------------------------------------------------------------------------
     READ STORM
      Filename = Storm.001
      Comment  = 2yr/6hr
      [SDT=15.00:SDUR=   6.25:PTOT=  36.00]
#
#
 001:0003---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:110       10.10     .227 No_date    3:26   16.43 .456
      [CN= 87.0: N= 3.00]
      [Tp=  .70:DT= 1.00]
 001:0004---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:120       42.80     .716 No_date    3:42   14.36 .399
      [CN= 84.0: N= 3.00]
      [Tp=  .89:DT= 1.00]
 001:0005---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:140        5.70     .115 No_date    3:17   13.19 .366
      [CN= 82.0: N= 3.00]
      [Tp=  .57:DT= 1.00]
 001:0006---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:150      377.00    3.297 No_date    5:11   14.36 .399
      [CN= 84.0: N= 3.00]
      [Tp= 2.18:DT= 1.00]
 001:0007---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      05:160      402.10    3.188 No_date    5:21   13.76 .382
      [CN= 83.0: N= 3.00]
      [Tp= 2.33:DT= 1.00]
 001:0008---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      06:170       89.60     .963 No_date    4:10   11.67 .324
      [CN= 79.0: N= 3.00]
      [Tp= 1.25:DT= 1.00]
 001:0009---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      07:180        1.40     .031 No_date    3:09   13.19 .366
      [CN= 82.0: N= 3.00]
      [Tp=  .48:DT= 1.00]
 001:0010---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:190        5.40     .084 No_date    3:45   13.76 .382
      [CN= 83.0: N= 3.00]
      [Tp=  .93:DT= 1.00]
 001:0011---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1100      20.30     .427 No_date    3:17   13.76 .382
      [CN= 83.0: N= 3.00]
      [Tp=  .57:DT= 1.00]
 001:0012---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1110      35.10     .673 No_date    3:28   14.36 .399
      [CN= 84.0: N= 3.00]
      [Tp=  .72:DT= 1.00]
 001:0013---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1120      60.00     .917 No_date    4:02   15.69 .436
      [CN= 86.0: N= 3.00]
      [Tp= 1.17:DT= 1.00]
 001:0014---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1140     560.00    3.512 No_date    6:10   13.76 .382
      [CN= 83.0: N= 3.00]
      [Tp= 3.08:DT= 1.00]
 001:0015---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:1150      17.90     .300 No_date    3:42   14.36 .399
      [CN= 84.0: N= 3.00]
      [Tp=  .89:DT= 1.00]
 001:0016---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:1160       5.60     .088 No_date    3:54   15.00 .417
      [CN= 85.0: N= 3.00]
      [Tp= 1.05:DT= 1.00]
 001:0017---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:1170       1.80     .056 No_date    2:57   15.39 .428
      [XIMP=.01:TIMP=.25]
      [SLP=1.00:DT= 1.00]
      [LOSS= 2 :CN= 81.0]
 001:0018---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:1180      70.70     .931 No_date    4:10   14.36 .399
      [CN= 84.0: N= 3.00]
      [Tp= 1.27:DT= 1.00]
 001:0019---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1190     595.30    4.930 No_date    5:56   17.22 .478
      [CN= 88.0: N= 3.00]
      [Tp= 2.90:DT= 1.00]
 001:0020---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     ADD HYD            08:1180      70.70     .931 No_date    4:10   14.36  n/a
                      + 09:1190     595.30    4.930 No_date    5:56   17.22  n/a
      [DT= 1.00]  SUM=  01:180190   666.00    5.433 No_date    5:36   16.91  n/a
 001:0021---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1200       5.40     .095 No_date    3:41   15.00 .417
      [CN= 85.0: N= 3.00]
      [Tp=  .88:DT= 1.00]
 001:0022---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1210       2.30     .054 No_date    3:16   15.00 .417
      [CN= 85.0: N= 3.00]
      [Tp=  .56:DT= 1.00]
 001:0023---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1220        .90     .023 No_date    3:09   15.00 .417
      [CN= 85.0: N= 3.00]
      [Tp=  .49:DT= 1.00]
 001:0024---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1230        .90     .023 No_date    3:02   14.34 .398
      [XIMP=.01:TIMP=.25]
      [SLP= .50:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
  ** END OF RUN :    1

*****************************************************************************





 RUN:COMMAND#
 002:0001----------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   2 ]
#*****************************************************************************
#  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
#  Date         :  Feb, 2010/Revised September 2012
#  Modeller     : [JInnes}
#  Revised By   : [George Golding}
#  Company      : Stantec Consulting Ltd. (Kitchener)
#  License #    : 4730904
#*****************************************************************************
#*****************************************************************************
 002:0002-----------------------------------------------------------------------
     READ STORM
      Filename = Storm.001
      Comment  = 2yr/12hr
      [SDT=15.00:SDUR=  12.25:PTOT=  42.00]
#
#
 002:0003---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:110       10.10     .218 No_date    5:41   20.91 .498
      [CN= 87.0: N= 3.00]
      [Tp=  .70:DT= 1.00]
 002:0004---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:120       42.80     .703 No_date    5:56   18.45 .439
      [CN= 84.0: N= 3.00]
      [Tp=  .89:DT= 1.00]
 002:0005---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:140        5.70     .110 No_date    5:33   17.04 .406
      [CN= 82.0: N= 3.00]
      [Tp=  .57:DT= 1.00]
 002:0006---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:150      377.00    3.572 No_date    7:38   18.45 .439
      [CN= 84.0: N= 3.00]
      [Tp= 2.18:DT= 1.00]
 002:0007---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      05:160      402.10    3.492 No_date    7:49   17.73 .422
      [CN= 83.0: N= 3.00]
      [Tp= 2.33:DT= 1.00]
 002:0008---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      06:170       89.60     .985 No_date    6:29   15.18 .362
      [CN= 79.0: N= 3.00]
      [Tp= 1.25:DT= 1.00]
 002:0009---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      07:180        1.40     .029 No_date    5:28   17.04 .406
      [CN= 82.0: N= 3.00]
      [Tp=  .48:DT= 1.00]
 002:0010---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:190        5.40     .083 No_date    5:59   17.73 .422
      [CN= 83.0: N= 3.00]
      [Tp=  .93:DT= 1.00]
 002:0011---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1100      20.30     .408 No_date    5:33   17.73 .422
      [CN= 83.0: N= 3.00]
      [Tp=  .57:DT= 1.00]
 002:0012---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1110      35.10     .651 No_date    5:43   18.45 .439
      [CN= 84.0: N= 3.00]
      [Tp=  .72:DT= 1.00]
 002:0013---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1120      60.00     .920 No_date    6:19   20.04 .477
      [CN= 86.0: N= 3.00]
      [Tp= 1.17:DT= 1.00]
 002:0014---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1140     560.00    3.987 No_date    8:43   17.73 .422
      [CN= 83.0: N= 3.00]
      [Tp= 3.08:DT= 1.00]
 002:0015---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:1150      17.90     .294 No_date    5:56   18.45 .439
      [CN= 84.0: N= 3.00]
      [Tp=  .89:DT= 1.00]
 002:0016---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:1160       5.60     .087 No_date    6:09   19.22 .458
      [CN= 85.0: N= 3.00]
      [Tp= 1.05:DT= 1.00]
 002:0017---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:1170       1.80     .045 No_date    5:23   19.63 .467
      [XIMP=.01:TIMP=.25]
      [SLP=1.00:DT= 1.00]
```

```
       [LOSS= 2 :CN= 81.0]
 002:0018---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:1180      70.70     .947 No_date    6:28   18.45 .439
      [CN= 84.0: N= 3.00]
      [Tp= 1.27:DT= 1.00]
 002:0019---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1190     595.30    5.488 No_date    8:27   21.83 .520
      [CN= 88.0: N= 3.00]
      [Tp= 2.90:DT= 1.00]
 002:0020---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     ADD HYD            08:1180      70.70     .947 No_date    6:28   18.45  n/a
                      + 09:1190     595.30    5.488 No_date    8:27   21.83  n/a
      [DT= 1.00]  SUM=  01:180190   666.00    6.038 No_date    8:09   21.47  n/a
 002:0021---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1200       5.40     .093 No_date    5:55   19.22 .458
      [CN= 85.0: N= 3.00]
      [Tp=  .88:DT= 1.00]
 002:0022---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1210       2.30     .051 No_date    5:32   19.22 .458
      [CN= 85.0: N= 3.00]
      [Tp=  .56:DT= 1.00]
 002:0023---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1220        .90     .021 No_date    5:28   19.22 .458
      [CN= 85.0: N= 3.00]
      [Tp=  .49:DT= 1.00]
 002:0024---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1230        .90     .020 No_date    5:28   18.38 .438
      [XIMP=.01:TIMP=.25]
      [SLP= .50:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
   ** END OF RUN :   2

********************************************************************************

 RUN:COMMAND#
 003:0001------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   3 ]
#*******************************************************************************
#  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
#  Date        :  Feb, 2010/Revised September 2012
#  Modeller    : [JInnes}
#  Revised By  : [George Golding}
#  Company     : Stantec Consulting Ltd. (Kitchener)
#  License #   : 4730904
#*******************************************************************************
#*******************************************************************************
 003:0002------------------------------------------------------------------------
     READ STORM
      Filename = Storm.001
      Comment  = 5yr/6hr
      [SDT=15.00:SDUR=   6.25:PTOT=  47.81]
#
#
 003:0003---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:110       10.10     .355 No_date    3:25   25.45 .532
      [CN= 87.0: N= 3.00]
      [Tp=  .70:DT= 1.00]
 003:0004---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:120       42.80    1.138 No_date    3:40   22.65 .474
      [CN= 84.0: N= 3.00]
      [Tp=  .89:DT= 1.00]
 003:0005---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:140        5.70     .184 No_date    3:16   21.01 .439
      [CN= 82.0: N= 3.00]
      [Tp=  .57:DT= 1.00]
 003:0006---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:150      377.00    5.212 No_date    5:09   22.65 .474
      [CN= 84.0: N= 3.00]
      [Tp= 2.18:DT= 1.00]
 003:0007---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      05:160      402.10    5.066 No_date    5:19   21.81 .456
      [CN= 83.0: N= 3.00]
      [Tp= 2.33:DT= 1.00]
 003:0008---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      06:170       89.60    1.563 No_date    4:08   18.84 .394
      [CN= 79.0: N= 3.00]
      [Tp= 1.25:DT= 1.00]
 003:0009---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      07:180        1.40     .050 No_date    3:08   21.01 .439
      [CN= 82.0: N= 3.00]
      [Tp=  .48:DT= 1.00]
 003:0010---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:190        5.40     .134 No_date    3:44   21.81 .456
      [CN= 83.0: N= 3.00]
      [Tp=  .93:DT= 1.00]
 003:0011---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1100      20.30     .683 No_date    3:16   21.81 .456
      [CN= 83.0: N= 3.00]
      [Tp=  .57:DT= 1.00]
 003:0012---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1110      35.10    1.070 No_date    3:27   22.65 .474
      [CN= 84.0: N= 3.00]
      [Tp=  .72:DT= 1.00]
 003:0013---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1120      60.00    1.437 No_date    4:00   24.47 .512
      [CN= 86.0: N= 3.00]
      [Tp= 1.17:DT= 1.00]
 003:0014---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1140     560.00    5.575 No_date    6:08   21.81 .456
      [CN= 83.0: N= 3.00]
      [Tp= 3.08:DT= 1.00]
 003:0015---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:1150      17.90     .476 No_date    3:40   22.65 .474
      [CN= 84.0: N= 3.00]
      [Tp=  .89:DT= 1.00]
 003:0016---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:1160       5.60     .139 No_date    3:52   23.53 .492
      [CN= 85.0: N= 3.00]
      [Tp= 1.05:DT= 1.00]
 003:0017---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:1170       1.80     .096 No_date    2:53   23.96 .501
      [XIMP=.01:TIMP=.25]
      [SLP=1.00:DT= 1.00]
      [LOSS= 2 :CN= 81.0]
 003:0018---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:1180      70.70    1.475 No_date    4:08   22.65 .474
      [CN= 84.0: N= 3.00]
      [Tp= 1.27:DT= 1.00]
 003:0019---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1190     595.30    7.599 No_date    5:54   26.49 .554
      [CN= 88.0: N= 3.00]
      [Tp= 2.90:DT= 1.00]
 003:0020---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     ADD HYD            08:1180      70.70    1.475 No_date    4:08   22.65  n/a
                      + 09:1190     595.30    7.599 No_date    5:54   26.49  n/a
      [DT= 1.00]  SUM=  01:180190   666.00    8.398 No_date    5:34   26.09  n/a
 003:0021---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1200       5.40     .151 No_date    3:39   23.53 .492
      [CN= 85.0: N= 3.00]
      [Tp=  .88:DT= 1.00]
 003:0022---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1210       2.30     .085 No_date    3:14   23.53 .492
      [CN= 85.0: N= 3.00]
      [Tp=  .56:DT= 1.00]
 003:0023---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1220        .90     .036 No_date    3:08   23.53 .492
      [CN= 85.0: N= 3.00]
      [Tp=  .49:DT= 1.00]
 003:0024---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1230        .90     .041 No_date    2:57   22.52 .471
      [XIMP=.01:TIMP=.25]
      [SLP= .50:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
   ** END OF RUN :   3

********************************************************************************

 RUN:COMMAND#
 004:0001------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   4 ]
#*******************************************************************************
#  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
#  Date        :  Feb, 2010/Revised September 2012
#  Modeller    : [JInnes}
#  Revised By  : [George Golding}
#  Company     : Stantec Consulting Ltd. (Kitchener)
#  License #   : 4730904
#*******************************************************************************
#*******************************************************************************
 004:0002------------------------------------------------------------------------
     READ STORM
      Filename = Storm.001
      Comment  = 5yr/12hr
      [SDT=15.00:SDUR=  12.25:PTOT=  54.38]
#
#
 004:0003---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:110       10.10     .324 No_date    5:40   30.78 .566
      [CN= 87.0: N= 3.00]
      [Tp=  .70:DT= 1.00]
 004:0004---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:120       42.80    1.064 No_date    5:54   27.61 .508
      [CN= 84.0: N= 3.00]
      [Tp=  .89:DT= 1.00]
 004:0005---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:140        5.70     .167 No_date    5:33   25.74 .473
      [CN= 82.0: N= 3.00]
      [Tp=  .57:DT= 1.00]
 004:0006---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:150      377.00    5.374 No_date    7:35   27.61 .508
      [CN= 84.0: N= 3.00]
      [Tp= 2.18:DT= 1.00]
 004:0007---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      05:160      402.10    5.277 No_date    7:46   26.66 .490
      [CN= 83.0: N= 3.00]
      [Tp= 2.33:DT= 1.00]
 004:0008---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      06:170       89.60    1.520 No_date    6:27   23.23 .427
      [CN= 79.0: N= 3.00]
      [Tp= 1.25:DT= 1.00]
 004:0009---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      07:180        1.40     .045 No_date    5:28   25.74 .473
      [CN= 82.0: N= 3.00]
      [Tp=  .48:DT= 1.00]
 004:0010---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:190        5.40     .126 No_date    5:58   26.66 .490
      [CN= 83.0: N= 3.00]
      [Tp=  .93:DT= 1.00]
 004:0011---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1100      20.30     .619 No_date    5:32   26.66 .490
      [CN= 83.0: N= 3.00]
      [Tp=  .57:DT= 1.00]
 004:0012---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1110      35.10     .984 No_date    5:42   27.61 .508
      [CN= 84.0: N= 3.00]
      [Tp=  .72:DT= 1.00]
 004:0013---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1120      60.00    1.374 No_date    6:17   29.68 .546
      [CN= 86.0: N= 3.00]
      [Tp= 1.17:DT= 1.00]
 004:0014---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1140     560.00    6.017 No_date    8:40   26.66 .490
      [CN= 83.0: N= 3.00]
      [Tp= 3.08:DT= 1.00]
 004:0015---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:1150      17.90     .445 No_date    5:54   27.61 .508
      [CN= 84.0: N= 3.00]
      [Tp=  .89:DT= 1.00]
 004:0016---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:1160       5.60     .131 No_date    6:07   28.62 .526
      [CN= 85.0: N= 3.00]
      [Tp= 1.05:DT= 1.00]
 004:0017---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:1170       1.80     .071 No_date    5:20   29.06 .534
      [XIMP=.01:TIMP=.25]
      [SLP=1.00:DT= 1.00]
      [LOSS= 2 :CN= 81.0]
 004:0018---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:1180      70.70    1.428 No_date    6:26   27.61 .508
      [CN= 84.0: N= 3.00]
      [Tp= 1.27:DT= 1.00]
 004:0019---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1190     595.30    8.062 No_date    8:23   31.95 .588
      [CN= 88.0: N= 3.00]
      [Tp= 2.90:DT= 1.00]
 004:0020---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     ADD HYD            08:1180      70.70    1.428 No_date    6:26   27.61  n/a
                      + 09:1190     595.30    8.062 No_date    8:23   31.95  n/a
      [DT= 1.00]  SUM=  01:180190   666.00    8.892 No_date    8:05   31.49  n/a
 004:0021---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1200       5.40     .140 No_date    5:53   28.62 .526
      [CN= 85.0: N= 3.00]
      [Tp=  .88:DT= 1.00]
 004:0022---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1210       2.30     .076 No_date    5:31   28.62 .526
      [CN= 85.0: N= 3.00]
      [Tp=  .56:DT= 1.00]
 004:0023---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1220        .90     .032 No_date    5:28   28.62 .526
      [CN= 85.0: N= 3.00]
      [Tp=  .49:DT= 1.00]
 004:0024---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1230        .90     .031 No_date    5:24   27.42 .504
      [XIMP=.01:TIMP=.25]
```

```
       [SLP= .50:DT= 1.00]
       [LOSS= 2 :CN= 79.0]
  ** END OF RUN :   4

*****************************************************************************





 RUN:COMMAND#
 005:0001--------------------------------------------------------------------
     START
       [TZERO =    .00 hrs on        0]
       [METOUT=   2    (1=imperial, 2=metric output)]
       [NSTORM=   1 ]
       [NRUN  =   5 ]
#****************************************************************************
#  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
#  Date         :  Feb, 2010/Revised September 2012
#  Modeller     : [JInnes}
#  Revised By   : [George Golding}
#  Company      : Stantec Consulting Ltd. (Kitchener)
#  License #    : 4730904
#****************************************************************************
#****************************************************************************
 005:0002---------------------------------------------------------------------
     READ STORM
      Filename = Storm.001
      Comment  = 10yr/6hr
      [SDT=15.00:SDUR=   6.25:PTOT=  55.69]
#
#
 005:0003---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:110       10.10      .446 No_date    3:24   31.87 .572
       [CN= 87.0: N= 3.00]
       [Tp=  .70:DT= 1.00]
 005:0004---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:120       42.80     1.444 No_date    3:39   28.63 .514
       [CN= 84.0: N= 3.00]
       [Tp=  .89:DT= 1.00]
 005:0005---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:140        5.70      .236 No_date    3:15   26.71 .480
       [CN= 82.0: N= 3.00]
       [Tp=  .57:DT= 1.00]
 005:0006---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:150      377.00     6.599 No_date    5:08   28.63 .514
       [CN= 84.0: N= 3.00]
       [Tp= 2.18:DT= 1.00]
 005:0007---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      05:160      402.10     6.432 No_date    5:18   27.65 .496
       [CN= 83.0: N= 3.00]
       [Tp= 2.33:DT= 1.00]
 005:0008---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      06:170       89.60     2.008 No_date    4:08   24.13 .433
       [CN= 79.0: N= 3.00]
       [Tp= 1.25:DT= 1.00]
 005:0009---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      07:180        1.40      .064 No_date    3:07   26.71 .480
       [CN= 82.0: N= 3.00]
       [Tp=  .48:DT= 1.00]
 005:0010---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:190        5.40      .171 No_date    3:43   27.65 .496
       [CN= 83.0: N= 3.00]
       [Tp=  .93:DT= 1.00]
 005:0011---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1100      20.30      .871 No_date    3:15   27.65 .496
       [CN= 83.0: N= 3.00]
       [Tp=  .57:DT= 1.00]
 005:0012---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1110      35.10     1.359 No_date    3:26   28.63 .514
       [CN= 84.0: N= 3.00]
       [Tp=  .72:DT= 1.00]
 005:0013---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1120      60.00     1.811 No_date    4:00   30.74 .552
       [CN= 86.0: N= 3.00]
       [Tp= 1.17:DT= 1.00]
 005:0014---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1140     560.00     7.075 No_date    6:07   27.65 .496
       [CN= 83.0: N= 3.00]
       [Tp= 3.08:DT= 1.00]
 005:0015---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:1150      17.90      .604 No_date    3:39   28.63 .514
       [CN= 84.0: N= 3.00]
       [Tp=  .89:DT= 1.00]
 005:0016---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:1160       5.60      .176 No_date    3:51   29.66 .533
       [CN= 85.0: N= 3.00]
       [Tp= 1.05:DT= 1.00]
 005:0017---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:1170       1.80      .126 No_date    2:52   30.10 .541
       [XIMP=.01:TIMP=.25]
       [SLP=1.00:DT= 1.00]
       [LOSS= 2 :CN= 81.0]
 005:0018---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:1180      70.70     1.870 No_date    4:07   28.63 .514
       [CN= 84.0: N= 3.00]
       [Tp= 1.27:DT= 1.00]
 005:0019---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1190     595.30     9.492 No_date    5:52   33.06 .594
       [CN= 88.0: N= 3.00]
       [Tp= 2.90:DT= 1.00]
 005:0020---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     ADD HYD            08:1180      70.70     1.870 No_date    4:07   28.63  n/a
                     +  09:1190     595.30     9.492 No_date    5:52   33.06  n/a
       [DT= 1.00]  SUM=  01:180190   666.00    10.506 No_date    5:32   32.59  n/a
 005:0021---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1200       5.40      .191 No_date    3:38   29.66 .533
       [CN= 85.0: N= 3.00]
       [Tp=  .88:DT= 1.00]
 005:0022---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1210       2.30      .108 No_date    3:14   29.66 .533
       [CN= 85.0: N= 3.00]
       [Tp=  .56:DT= 1.00]
 005:0023---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1220        .90      .046 No_date    3:08   29.66 .533
       [CN= 85.0: N= 3.00]
       [Tp=  .49:DT= 1.00]
 005:0024---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1230        .90      .054 No_date    2:55   28.42 .510
       [XIMP=.01:TIMP=.25]
       [SLP= .50:DT= 1.00]
       [LOSS= 2 :CN= 79.0]
  ** END OF RUN :   5

*****************************************************************************





 RUN:COMMAND#
 006:0001--------------------------------------------------------------------
     START
       [TZERO =    .00 hrs on        0]
       [METOUT=   2    (1=imperial, 2=metric output)]
       [NSTORM=   1 ]
       [NRUN  =   6 ]
#****************************************************************************
#  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
#  Date         :  Feb, 2010/Revised September 2012
#  Modeller     : [JInnes}
#  Revised By   : [George Golding}
#  Company      : Stantec Consulting Ltd. (Kitchener)
#  License #    : 4730904
#****************************************************************************
#****************************************************************************
 006:0002---------------------------------------------------------------------
     READ STORM
      Filename = Storm.001
      Comment  = 10yr/12hr
      [SDT=15.00:SDUR=  12.25:PTOT=  62.71]
#
#
 006:0003---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:110       10.10      .399 No_date    5:39   37.78 .602
       [CN= 87.0: N= 3.00]
       [Tp=  .70:DT= 1.00]
 006:0004---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:120       42.80     1.323 No_date    5:53   34.19 .545
       [CN= 84.0: N= 3.00]
       [Tp=  .89:DT= 1.00]
 006:0005---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:140        5.70      .209 No_date    5:32   32.03 .511
       [CN= 82.0: N= 3.00]
       [Tp=  .57:DT= 1.00]
 006:0006---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:150      377.00     6.669 No_date    7:33   34.19 .545
       [CN= 84.0: N= 3.00]
       [Tp= 2.18:DT= 1.00]
 006:0007---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      05:160      402.10     6.565 No_date    7:45   33.09 .528
       [CN= 83.0: N= 3.00]
       [Tp= 2.33:DT= 1.00]
 006:0008---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      06:170       89.60     1.912 No_date    6:26   29.11 .464
       [CN= 79.0: N= 3.00]
       [Tp= 1.25:DT= 1.00]
 006:0009---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      07:180        1.40      .056 No_date    5:27   32.03 .511
       [CN= 82.0: N= 3.00]
       [Tp=  .48:DT= 1.00]
 006:0010---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:190        5.40      .157 No_date    5:57   33.09 .528
       [CN= 83.0: N= 3.00]
       [Tp=  .93:DT= 1.00]
 006:0011---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1100      20.30      .771 No_date    5:32   33.09 .528
       [CN= 83.0: N= 3.00]
       [Tp=  .57:DT= 1.00]
 006:0012---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1110      35.10     1.224 No_date    5:41   34.19 .545
       [CN= 84.0: N= 3.00]
       [Tp=  .72:DT= 1.00]
 006:0013---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1120      60.00     1.698 No_date    6:16   36.53 .583
       [CN= 86.0: N= 3.00]
       [Tp= 1.17:DT= 1.00]
 006:0014---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1140     560.00     7.480 No_date    8:38   33.09 .528
       [CN= 83.0: N= 3.00]
       [Tp= 3.08:DT= 1.00]
 006:0015---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:1150      17.90      .553 No_date    5:53   34.19 .545
       [CN= 84.0: N= 3.00]
       [Tp=  .89:DT= 1.00]
 006:0016---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:1160       5.60      .163 No_date    6:06   35.33 .563
       [CN= 85.0: N= 3.00]
       [Tp= 1.05:DT= 1.00]
 006:0017---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:1170       1.80      .089 No_date    5:18   35.79 .571
       [XIMP=.01:TIMP=.25]
       [SLP=1.00:DT= 1.00]
       [LOSS= 2 :CN= 81.0]
 006:0018---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:1180      70.70     1.775 No_date    6:25   34.19 .545
       [CN= 84.0: N= 3.00]
       [Tp= 1.27:DT= 1.00]
 006:0019---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1190     595.30     9.877 No_date    8:21   39.09 .623
       [CN= 88.0: N= 3.00]
       [Tp= 2.90:DT= 1.00]
 006:0020---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     ADD HYD            08:1180      70.70     1.775 No_date    6:25   34.19  n/a
                     +  09:1190     595.30     9.877 No_date    8:21   39.09  n/a
       [DT= 1.00]  SUM=  01:180190   666.00    10.909 No_date    8:03   38.57  n/a
 006:0021---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1200       5.40      .174 No_date    5:52   35.33 .563
       [CN= 85.0: N= 3.00]
       [Tp=  .88:DT= 1.00]
 006:0022---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1210       2.30      .095 No_date    5:31   35.33 .563
       [CN= 85.0: N= 3.00]
       [Tp=  .56:DT= 1.00]
 006:0023---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1220        .90      .039 No_date    5:27   35.33 .563
       [CN= 85.0: N= 3.00]
       [Tp=  .49:DT= 1.00]
 006:0024---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1230        .90      .040 No_date    5:22   33.92 .541
       [XIMP=.01:TIMP=.25]
       [SLP= .50:DT= 1.00]
       [LOSS= 2 :CN= 79.0]
  ** END OF RUN :   6

*****************************************************************************





 RUN:COMMAND#
 007:0001--------------------------------------------------------------------
     START
       [TZERO =    .00 hrs on        0]
       [METOUT=   2    (1=imperial, 2=metric output)]
       [NSTORM=   1 ]
       [NRUN  =   7 ]
#****************************************************************************
#  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
#  Date         :  Feb, 2010/Revised September 2012
#  Modeller     : [JInnes}
#  Revised By   : [George Golding}
#  Company      : Stantec Consulting Ltd. (Kitchener)
#  License #    : 4730904
#****************************************************************************
#****************************************************************************
 007:0002---------------------------------------------------------------------
     READ STORM
```

```
      Filename = Storm.001
      Comment  = 25yr/6hr
      [SDT=15.00:SDUR=   6.25:PTOT=  65.59]
#
#
 007:0003---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:110       10.10     .566 No_date    3:23   40.25 .614
      [CN= 87.0: N= 3.00]
      [Tp=  .70:DT= 1.00]
 007:0004---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:120       42.80    1.850 No_date    3:38   36.52 .557
      [CN= 84.0: N= 3.00]
      [Tp=  .89:DT= 1.00]
 007:0005---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:140        5.70     .304 No_date    3:15   34.27 .523
      [CN= 82.0: N= 3.00]
      [Tp=  .57:DT= 1.00]
 007:0006---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:150      377.00    8.430 No_date    5:07   36.52 .557
      [CN= 84.0: N= 3.00]
      [Tp= 2.18:DT= 1.00]
 007:0007---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      05:160      402.10    8.240 No_date    5:17   35.37 .539
      [CN= 83.0: N= 3.00]
      [Tp= 2.33:DT= 1.00]
 007:0008---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      06:170       89.60    2.604 No_date    4:07   31.21 .476
      [CN= 79.0: N= 3.00]
      [Tp= 1.25:DT= 1.00]
 007:0009---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      07:180        1.40     .083 No_date    3:07   34.27 .523
      [CN= 82.0: N= 3.00]
      [Tp=  .48:DT= 1.00]
 007:0010---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:190        5.40     .219 No_date    3:42   35.37 .539
      [CN= 83.0: N= 3.00]
      [Tp=  .93:DT= 1.00]
 007:0011---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1100      20.30    1.120 No_date    3:15   35.37 .539
      [CN= 83.0: N= 3.00]
      [Tp=  .57:DT= 1.00]
 007:0012---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1110      35.10    1.741 No_date    3:26   36.52 .557
      [CN= 84.0: N= 3.00]
      [Tp=  .72:DT= 1.00]
 007:0013---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1120      60.00    2.302 No_date    3:59   38.96 .594
      [CN= 86.0: N= 3.00]
      [Tp= 1.17:DT= 1.00]
 007:0014---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1140     560.00    9.059 No_date    6:05   35.37 .539
      [CN= 83.0: N= 3.00]
      [Tp= 3.08:DT= 1.00]
 007:0015---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:1150      17.90     .774 No_date    3:38   36.52 .557
      [CN= 84.0: N= 3.00]
      [Tp=  .89:DT= 1.00]
 007:0016---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:1160       5.60     .224 No_date    3:50   37.71 .575
      [CN= 85.0: N= 3.00]
      [Tp= 1.05:DT= 1.00]
 007:0017---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:1170       1.80     .167 No_date    2:50   38.18 .582
      [XIMP=.01:TIMP=.25]
      [SLP=1.00:DT= 1.00]
      [LOSS= 2 :CN= 81.0]
 007:0018---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:1180      70.70    2.392 No_date    4:06   36.52 .557
      [CN= 84.0: N= 3.00]
      [Tp= 1.27:DT= 1.00]
 007:0019---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1190     595.30   11.955 No_date    5:51   41.61 .634
      [CN= 88.0: N= 3.00]
      [Tp= 2.90:DT= 1.00]
 007:0020---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     ADD HYD            08:1180      70.70    2.392 No_date    4:06   36.52  n/a
                      + 09:1190     595.30   11.955 No_date    5:51   41.61  n/a
      [DT= 1.00]  SUM=  01:180190   666.00   13.253 No_date    5:31   41.07  n/a
 007:0021---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1200       5.40     .243 No_date    3:37   37.71 .575
      [CN= 85.0: N= 3.00]
      [Tp=  .88:DT= 1.00]
 007:0022---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1210       2.30     .137 No_date    3:13   37.71 .575
      [CN= 85.0: N= 3.00]
      [Tp=  .56:DT= 1.00]
 007:0023---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1220        .90     .058 No_date    3:07   37.71 .575
      [CN= 85.0: N= 3.00]
      [Tp=  .49:DT= 1.00]
 007:0024---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1230        .90     .073 No_date    2:53   36.22 .552
      [XIMP=.01:TIMP=.25]
      [SLP= .50:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
  ** END OF RUN :   7

*******************************************************************************

 RUN:COMMAND#
 008:0001-----------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   8 ]
#*******************************************************************************
#  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
#  Date         :  Feb, 2010/Revised September 2012
#  Modeller     : [JInnes}
#  Revised By   : [George Golding}
#  Company      : Stantec Consulting Ltd. (Kitchener)
#  License #    : 4730904
#*******************************************************************************
#*******************************************************************************
 008:0002------------------------------------------------------------------------
     READ STORM
      Filename = Storm.001
      Comment  = 25yr/12hr
      [SDT=15.00:SDUR=  12.25:PTOT=  73.10]
#
#
 008:0003---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:110       10.10     .496 No_date    5:38   46.79 .640
      [CN= 87.0: N= 3.00]
      [Tp=  .70:DT= 1.00]
 008:0004---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:120       42.80    1.663 No_date    5:52   42.73 .585
      [CN= 84.0: N= 3.00]
      [Tp=  .89:DT= 1.00]
 008:0005---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:140        5.70     .264 No_date    5:32   40.25 .551
      [CN= 82.0: N= 3.00]
      [Tp=  .57:DT= 1.00]
 008:0006---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:150      377.00    8.362 No_date    7:31   42.73 .585
      [CN= 84.0: N= 3.00]
      [Tp= 2.18:DT= 1.00]
 008:0007---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      05:160      402.10    8.254 No_date    7:43   41.47 .567
      [CN= 83.0: N= 3.00]
      [Tp= 2.33:DT= 1.00]
 008:0008---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      06:170       89.60    2.433 No_date    6:24   36.85 .504
      [CN= 79.0: N= 3.00]
      [Tp= 1.25:DT= 1.00]
 008:0009---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      07:180        1.40     .070 No_date    5:27   40.25 .551
      [CN= 82.0: N= 3.00]
      [Tp=  .48:DT= 1.00]
 008:0010---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:190        5.40     .198 No_date    5:56   41.47 .567
      [CN= 83.0: N= 3.00]
      [Tp=  .93:DT= 1.00]
 008:0011---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1100      20.30     .971 No_date    5:32   41.47 .567
      [CN= 83.0: N= 3.00]
      [Tp=  .57:DT= 1.00]
 008:0012---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1110      35.10    1.538 No_date    5:41   42.73 .585
      [CN= 84.0: N= 3.00]
      [Tp=  .72:DT= 1.00]
 008:0013---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1120      60.00    2.118 No_date    6:14   45.39 .621
      [CN= 86.0: N= 3.00]
      [Tp= 1.17:DT= 1.00]
 008:0014---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1140     560.00    9.396 No_date    8:36   41.47 .567
      [CN= 83.0: N= 3.00]
      [Tp= 3.08:DT= 1.00]
 008:0015---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:1150      17.90     .696 No_date    5:52   42.73 .585
      [CN= 84.0: N= 3.00]
      [Tp=  .89:DT= 1.00]
 008:0016---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:1160       5.60     .204 No_date    6:05   44.03 .602
      [CN= 85.0: N= 3.00]
      [Tp= 1.05:DT= 1.00]
 008:0017---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:1170       1.80     .113 No_date    5:18   44.51 .609
      [XIMP=.01:TIMP=.25]
      [SLP=1.00:DT= 1.00]
      [LOSS= 2 :CN= 81.0]
 008:0018---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:1180      70.70    2.228 No_date    6:24   42.73 .585
      [CN= 84.0: N= 3.00]
      [Tp= 1.27:DT= 1.00]
 008:0019---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1190     595.30   12.218 No_date    8:19   48.26 .660
      [CN= 88.0: N= 3.00]
      [Tp= 2.90:DT= 1.00]
 008:0020---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     ADD HYD            08:1180      70.70    2.228 No_date    6:24   42.73  n/a
                      + 09:1190     595.30   12.218 No_date    8:19   48.26  n/a
      [DT= 1.00]  SUM=  01:180190   666.00   13.515 No_date    8:00   47.67  n/a
 008:0021---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1200       5.40     .218 No_date    5:51   44.03 .602
      [CN= 85.0: N= 3.00]
      [Tp=  .88:DT= 1.00]
 008:0022---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1210       2.30     .118 No_date    5:31   44.03 .602
      [CN= 85.0: N= 3.00]
      [Tp=  .56:DT= 1.00]
 008:0023---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1220        .90     .049 No_date    5:27   44.03 .602
      [CN= 85.0: N= 3.00]
      [Tp=  .49:DT= 1.00]
 008:0024---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1230        .90     .051 No_date    5:20   42.37 .580
      [XIMP=.01:TIMP=.25]
      [SLP= .50:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
  ** END OF RUN :   8

*******************************************************************************

 RUN:COMMAND#
 009:0001-----------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   9 ]
#*******************************************************************************
#  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
#  Date         :  Feb, 2010/Revised September 2012
#  Modeller     : [JInnes}
#  Revised By   : [George Golding}
#  Company      : Stantec Consulting Ltd. (Kitchener)
#  License #    : 4730904
#*******************************************************************************
#*******************************************************************************
 009:0002------------------------------------------------------------------------
     READ STORM
      Filename = Storm.001
      Comment  = 50yr/6hr
      [SDT=15.00:SDUR=   6.25:PTOT=  73.00]
#
#
 009:0003---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:110       10.10     .658 No_date    3:23   46.71 .640
      [CN= 87.0: N= 3.00]
      [Tp=  .70:DT= 1.00]
 009:0004---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:120       42.80    2.165 No_date    3:38   42.64 .584
      [CN= 84.0: N= 3.00]
      [Tp=  .89:DT= 1.00]
 009:0005---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:140        5.70     .358 No_date    3:14   40.17 .550
      [CN= 82.0: N= 3.00]
      [Tp=  .57:DT= 1.00]
 009:0006---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:150      377.00    9.851 No_date    5:07   42.64 .584
      [CN= 84.0: N= 3.00]
      [Tp= 2.18:DT= 1.00]
 009:0007---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      05:160      402.10    9.647 No_date    5:17   41.39 .567
      [CN= 83.0: N= 3.00]
      [Tp= 2.33:DT= 1.00]
 009:0008---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      06:170       89.60    3.074 No_date    4:06   36.77 .504
      [CN= 79.0: N= 3.00]
```

```
      [Tp= 1.25:DT= 1.00]
 009:0009---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      07:180        1.40     .097 No_date    3:07   40.17 .550
      [CN= 82.0: N= 3.00]
      [Tp=  .48:DT= 1.00]
 009:0010---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:190        5.40     .257 No_date    3:41   41.39 .567
      [CN= 83.0: N= 3.00]
      [Tp=  .93:DT= 1.00]
 009:0011---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1100      20.30    1.315 No_date    3:14   41.39 .567
      [CN= 83.0: N= 3.00]
      [Tp=  .57:DT= 1.00]
 009:0012---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1110      35.10    2.039 No_date    3:25   42.64 .584
      [CN= 84.0: N= 3.00]
      [Tp=  .72:DT= 1.00]
 009:0013---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1120      60.00    2.681 No_date    3:58   45.30 .621
      [CN= 86.0: N= 3.00]
      [Tp= 1.17:DT= 1.00]
 009:0014---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1140     560.00   10.604 No_date    6:05   41.39 .567
      [CN= 83.0: N= 3.00]
      [Tp= 3.08:DT= 1.00]
 009:0015---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:1150      17.90     .905 No_date    3:38   42.64 .584
      [CN= 84.0: N= 3.00]
      [Tp=  .89:DT= 1.00]
 009:0016---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:1160       5.60     .261 No_date    3:50   43.95 .602
      [CN= 85.0: N= 3.00]
      [Tp= 1.05:DT= 1.00]
 009:0017---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:1170       1.80     .199 No_date    2:49   44.42 .609
      [XIMP=.01:TIMP=.25]
      [SLP=1.00:DT= 1.00]
      [LOSS= 2 :CN= 81.0]
 009:0018---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:1180      70.70    2.797 No_date    4:06   42.64 .584
      [CN= 84.0: N= 3.00]
      [Tp= 1.27:DT= 1.00]
 009:0019---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1190     595.30   13.847 No_date    5:51   48.17 .660
      [CN= 88.0: N= 3.00]
      [Tp= 2.90:DT= 1.00]
 009:0020---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     ADD HYD            08:1180      70.70    2.797 No_date    4:06   42.64  n/a
                      + 09:1190     595.30   13.847 No_date    5:51   48.17  n/a
      [DT= 1.00]  SUM=  01:180190   666.00   15.365 No_date    5:30   47.58  n/a
 009:0021---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1200       5.40     .284 No_date    3:37   43.95 .602
      [CN= 85.0: N= 3.00]
      [Tp=  .88:DT= 1.00]
 009:0022---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1210       2.30     .161 No_date    3:13   43.95 .602
      [CN= 85.0: N= 3.00]
      [Tp=  .56:DT= 1.00]
 009:0023---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1220        .90     .068 No_date    3:07   43.95 .602
      [CN= 85.0: N= 3.00]
      [Tp=  .49:DT= 1.00]
 009:0024---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1230        .90     .087 No_date    2:52   42.28 .579
      [XIMP=.01:TIMP=.25]
      [SLP= .50:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
  ** END OF RUN :   9

*******************************************************************************





 RUN:COMMAND#
 010:0001-----------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =  10 ]
#*******************************************************************************
#  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
#  Date         :  Feb, 2010/Revised September 2012
#  Modeller     : [JInnes}
#  Revised By   : [George Golding}
#  Company      : Stantec Consulting Ltd. (Kitchener)
#  License #    : 4730904
#*******************************************************************************
#*******************************************************************************
 010:0002------------------------------------------------------------------------
     READ STORM
      Filename = Storm.001
      Comment  = 50yr/12hr
      [SDT=15.00:SDUR=  12.25:PTOT=  80.82]
#
#
 010:0003---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:110       10.10     .569 No_date    5:38   53.65 .664
      [CN= 87.0: N= 3.00]
      [Tp=  .70:DT= 1.00]
 010:0004---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:120       42.80    1.923 No_date    5:52   49.27 .610
      [CN= 84.0: N= 3.00]
      [Tp=  .89:DT= 1.00]
 010:0005---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:140        5.70     .306 No_date    5:31   46.58 .576
      [CN= 82.0: N= 3.00]
      [Tp=  .57:DT= 1.00]
 010:0006---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:150      377.00    9.655 No_date    7:30   49.27 .610
      [CN= 84.0: N= 3.00]
      [Tp= 2.18:DT= 1.00]
 010:0007---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      05:160      402.10    9.547 No_date    7:42   47.90 .593
      [CN= 83.0: N= 3.00]
      [Tp= 2.33:DT= 1.00]
 010:0008---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      06:170       89.60    2.837 No_date    6:24   42.85 .530
      [CN= 79.0: N= 3.00]
      [Tp= 1.25:DT= 1.00]
 010:0009---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      07:180        1.40     .081 No_date    5:27   46.58 .576
      [CN= 82.0: N= 3.00]
      [Tp=  .48:DT= 1.00]
 010:0010---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:190        5.40     .229 No_date    5:55   47.90 .593
      [CN= 83.0: N= 3.00]
      [Tp=  .93:DT= 1.00]
 010:0011---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1100      20.30    1.124 No_date    5:31   47.90 .593
      [CN= 83.0: N= 3.00]
      [Tp=  .57:DT= 1.00]
 010:0012---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1110      35.10    1.777 No_date    5:40   49.27 .610
      [CN= 84.0: N= 3.00]
      [Tp=  .72:DT= 1.00]
 010:0013---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1120      60.00    2.439 No_date    6:14   52.14 .645
      [CN= 86.0: N= 3.00]
      [Tp= 1.17:DT= 1.00]
 010:0014---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1140     560.00   10.864 No_date    8:35   47.90 .593
      [CN= 83.0: N= 3.00]
      [Tp= 3.08:DT= 1.00]
 010:0015---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:1150      17.90     .804 No_date    5:52   49.27 .610
      [CN= 84.0: N= 3.00]
      [Tp=  .89:DT= 1.00]
 010:0016---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:1160       5.60     .235 No_date    6:04   50.68 .627
      [CN= 85.0: N= 3.00]
      [Tp= 1.05:DT= 1.00]
 010:0017---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:1170       1.80     .131 No_date    5:17   51.16 .633
      [XIMP=.01:TIMP=.25]
      [SLP=1.00:DT= 1.00]
      [LOSS= 2 :CN= 81.0]
 010:0018---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:1180      70.70    2.575 No_date    6:23   49.27 .610
      [CN= 84.0: N= 3.00]
      [Tp= 1.27:DT= 1.00]
 010:0019---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1190     595.30   13.990 No_date    8:18   55.21 .683
      [CN= 88.0: N= 3.00]
      [Tp= 2.90:DT= 1.00]
 010:0020---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     ADD HYD            08:1180      70.70    2.575 No_date    6:23   49.27  n/a
                      + 09:1190     595.30   13.990 No_date    8:18   55.21  n/a
      [DT= 1.00]  SUM=  01:180190   666.00   15.488 No_date    7:59   54.58  n/a
 010:0021---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1200       5.40     .252 No_date    5:51   50.68 .627
      [CN= 85.0: N= 3.00]
      [Tp=  .88:DT= 1.00]
 010:0022---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1210       2.30     .136 No_date    5:30   50.68 .627
      [CN= 85.0: N= 3.00]
      [Tp=  .56:DT= 1.00]
 010:0023---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1220        .90     .057 No_date    5:27   50.68 .627
      [CN= 85.0: N= 3.00]
      [Tp=  .49:DT= 1.00]
 010:0024---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1230        .90     .060 No_date    5:19   48.84 .604
      [XIMP=.01:TIMP=.25]
      [SLP= .50:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
  ** END OF RUN :  10

*******************************************************************************





 RUN:COMMAND#
 011:0001-----------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =  11 ]
#*******************************************************************************
#  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
#  Date         :  Feb, 2010/Revised September 2012
#  Modeller     : [JInnes}
#  Revised By   : [George Golding}
#  Company      : Stantec Consulting Ltd. (Kitchener)
#  License #    : 4730904
#*******************************************************************************
#*******************************************************************************
 011:0002------------------------------------------------------------------------
     READ STORM
      Filename = Storm.001
      Comment  = 100yr/1hr
      [SDT= 5.00:SDUR=   1.08:PTOT=  58.97]
#
#
 011:0003---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:110       10.10     .730 No_date    1:09   34.61 .587
      [CN= 87.0: N= 3.00]
      [Tp=  .70:DT= 1.00]
 011:0004---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:120       42.80    2.221 No_date    1:20   31.20 .529
      [CN= 84.0: N= 3.00]
      [Tp=  .89:DT= 1.00]
 011:0005---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:140        5.70     .420 No_date    1:02   29.17 .495
      [CN= 82.0: N= 3.00]
      [Tp=  .57:DT= 1.00]
 011:0006---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:150      377.00    8.155 No_date    2:37   31.20 .529
      [CN= 84.0: N= 3.00]
      [Tp= 2.18:DT= 1.00]
 011:0007---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      05:160      402.10    7.875 No_date    2:46   30.16 .512
      [CN= 83.0: N= 3.00]
      [Tp= 2.33:DT= 1.00]
 011:0008---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      06:170       89.60    2.834 No_date    1:42   26.43 .448
      [CN= 79.0: N= 3.00]
      [Tp= 1.25:DT= 1.00]
 011:0009---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      07:180        1.40     .120 No_date    0:56   29.17 .495
      [CN= 82.0: N= 3.00]
      [Tp=  .48:DT= 1.00]
 011:0010---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:190        5.40     .260 No_date    1:23   30.16 .512
      [CN= 83.0: N= 3.00]
      [Tp=  .93:DT= 1.00]
 011:0011---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1100      20.30    1.546 No_date    1:02   30.16 .512
      [CN= 83.0: N= 3.00]
      [Tp=  .57:DT= 1.00]
 011:0012---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1110      35.10    2.228 No_date    1:10   31.20 .529
      [CN= 84.0: N= 3.00]
      [Tp=  .72:DT= 1.00]
 011:0013---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1120      60.00    2.561 No_date    1:37   33.42 .567
      [CN= 86.0: N= 3.00]
      [Tp= 1.17:DT= 1.00]
 011:0014---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1140     560.00    8.330 No_date    3:31   30.16 .512
      [CN= 83.0: N= 3.00]
      [Tp= 3.08:DT= 1.00]
 011:0015---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:1150      17.90     .929 No_date    1:20   31.20 .529
      [CN= 84.0: N= 3.00]
```

```
       [Tp=  .89:DT= 1.00]
  011:0016---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      04:1160       5.60      .256 No_date    1:30   32.29 .548
       [CN= 85.0: N= 3.00]
       [Tp= 1.05:DT= 1.00]
  011:0017---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN STANDHYD    05:1170       1.80      .392 No_date    0:36   32.74 .555
       [XIMP=.01:TIMP=.25]
       [SLP=1.00:DT= 1.00]
       [LOSS= 2 :CN= 81.0]
  011:0018---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      08:1180      70.70     2.600 No_date    1:43   31.20 .529
       [CN= 84.0: N= 3.00]
       [Tp= 1.27:DT= 1.00]
  011:0019---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      09:1190     595.30    11.171 No_date    3:20   35.86 .608
       [CN= 88.0: N= 3.00]
       [Tp= 2.90:DT= 1.00]
  011:0020---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      ADD HYD            08:1180      70.70     2.600 No_date    1:43   31.20  n/a
                      +  09:1190     595.30    11.171 No_date    3:20   35.86  n/a
       [DT= 1.00]  SUM=  01:180190   666.00    12.409 No_date    2:58   35.37  n/a
  011:0021---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      10:1200       5.40      .293 No_date    1:20   32.29 .548
       [CN= 85.0: N= 3.00]
       [Tp=  .88:DT= 1.00]
  011:0022---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      01:1210       2.30      .191 No_date    1:01   32.29 .548
       [CN= 85.0: N= 3.00]
       [Tp=  .56:DT= 1.00]
  011:0023---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      02:1220        .90      .084 No_date    0:57   32.29 .548
       [CN= 85.0: N= 3.00]
       [Tp=  .49:DT= 1.00]
  011:0024---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN STANDHYD    03:1230        .90      .163 No_date    0:38   30.97 .525
       [XIMP=.01:TIMP=.25]
       [SLP= .50:DT= 1.00]
       [LOSS= 2 :CN= 79.0]
   ** END OF RUN :  11

 *****************************************************************************





  RUN:COMMAND#
  012:0001-----------------------------------------------------------------------
      START
       [TZERO =    .00 hrs on       0]
       [METOUT=   2    (1=imperial, 2=metric output)]
       [NSTORM=   1 ]
       [NRUN  =  12 ]
 #*****************************************************************************
 #  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
 #  Date         :  Feb, 2010/Revised September 2012
 #  Modeller     : [JInnes}
 #  Revised By   : [George Golding}
 #  Company      : Stantec Consulting Ltd. (Kitchener)
 #  License #    : 4730904
 #*****************************************************************************
 #*****************************************************************************
  012:0002------------------------------------------------------------------------
      READ STORM
       Filename = Storm.001
       Comment  = 100yr/6hr
       [SDT=15.00:SDUR=   6.25:PTOT=  80.31]
 #
 #
  012:0003---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      01:110       10.10      .751 No_date    3:23   53.19 .662
       [CN= 87.0: N= 3.00]
       [Tp=  .70:DT= 1.00]
  012:0004---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      02:120       42.80     2.484 No_date    3:37   48.83 .608
       [CN= 84.0: N= 3.00]
       [Tp=  .89:DT= 1.00]
  012:0005---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      03:140        5.70      .412 No_date    3:14   46.16 .575
       [CN= 82.0: N= 3.00]
       [Tp=  .57:DT= 1.00]
  012:0006---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      04:150      377.00    11.288 No_date    5:06   48.83 .608
       [CN= 84.0: N= 3.00]
       [Tp= 2.18:DT= 1.00]
  012:0007---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      05:160      402.10    11.073 No_date    5:16   47.47 .591
       [CN= 83.0: N= 3.00]
       [Tp= 2.33:DT= 1.00]
  012:0008---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      06:170       89.60     3.554 No_date    4:05   42.45 .529
       [CN= 79.0: N= 3.00]
       [Tp= 1.25:DT= 1.00]
  012:0009---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      07:180        1.40      .112 No_date    3:06   46.16 .575
       [CN= 82.0: N= 3.00]
       [Tp=  .48:DT= 1.00]
  012:0010---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      08:190        5.40      .295 No_date    3:41   47.47 .591
       [CN= 83.0: N= 3.00]
       [Tp=  .93:DT= 1.00]
  012:0011---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      09:1100      20.30     1.512 No_date    3:14   47.47 .591
       [CN= 83.0: N= 3.00]
       [Tp=  .57:DT= 1.00]
  012:0012---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      10:1110      35.10     2.340 No_date    3:25   48.83 .608
       [CN= 84.0: N= 3.00]
       [Tp=  .72:DT= 1.00]
  012:0013---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      01:1120      60.00     3.064 No_date    3:57   51.69 .644
       [CN= 86.0: N= 3.00]
       [Tp= 1.17:DT= 1.00]
  012:0014---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      02:1140     560.00    12.167 No_date    6:04   47.47 .591
       [CN= 83.0: N= 3.00]
       [Tp= 3.08:DT= 1.00]
  012:0015---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      03:1150      17.90     1.039 No_date    3:37   48.83 .608
       [CN= 84.0: N= 3.00]
       [Tp=  .89:DT= 1.00]
  012:0016---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      04:1160       5.60      .299 No_date    3:49   50.24 .626
       [CN= 85.0: N= 3.00]
       [Tp= 1.05:DT= 1.00]
  012:0017---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN STANDHYD    05:1170       1.80      .230 No_date    2:49   50.72 .632
       [XIMP=.01:TIMP=.25]
       [SLP=1.00:DT= 1.00]
       [LOSS= 2 :CN= 81.0]
  012:0018---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      08:1180      70.70     3.207 No_date    4:05   48.83 .608
       [CN= 84.0: N= 3.00]
       [Tp= 1.27:DT= 1.00]
  012:0019---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      09:1190     595.30    15.744 No_date    5:50   54.75 .682
       [CN= 88.0: N= 3.00]
       [Tp= 2.90:DT= 1.00]
  012:0020---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      ADD HYD            08:1180      70.70     3.207 No_date    4:05   48.83  n/a
                      +  09:1190     595.30    15.744 No_date    5:50   54.75  n/a
       [DT= 1.00]  SUM=  01:180190   666.00    17.486 No_date    5:29   54.12  n/a
  012:0021---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      10:1200       5.40      .325 No_date    3:36   50.24 .626
       [CN= 85.0: N= 3.00]
       [Tp=  .88:DT= 1.00]
  012:0022---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      01:1210       2.30      .184 No_date    3:12   50.24 .626
       [CN= 85.0: N= 3.00]
       [Tp=  .56:DT= 1.00]
  012:0023---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      02:1220        .90      .078 No_date    3:06   50.24 .626
       [CN= 85.0: N= 3.00]
       [Tp=  .49:DT= 1.00]
  012:0024---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN STANDHYD    03:1230        .90      .103 No_date    2:51   48.41 .603
       [XIMP=.01:TIMP=.25]
       [SLP= .50:DT= 1.00]
       [LOSS= 2 :CN= 79.0]
   ** END OF RUN :  12

 *****************************************************************************





  RUN:COMMAND#
  013:0001-----------------------------------------------------------------------
      START
       [TZERO =    .00 hrs on       0]
       [METOUT=   2    (1=imperial, 2=metric output)]
       [NSTORM=   1 ]
       [NRUN  =  13 ]
 #*****************************************************************************
 #  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
 #  Date         :  Feb, 2010/Revised September 2012
 #  Modeller     : [JInnes}
 #  Revised By   : [George Golding}
 #  Company      : Stantec Consulting Ltd. (Kitchener)
 #  License #    : 4730904
 #*****************************************************************************
 #*****************************************************************************
  013:0002------------------------------------------------------------------------
      READ STORM
       Filename = Storm.001
       Comment  = 100yr/12hr
       [SDT=15.00:SDUR=  12.25:PTOT=  88.54]
 #
 #
  013:0003---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      01:110       10.10      .644 No_date    5:38   60.61 .685
       [CN= 87.0: N= 3.00]
       [Tp=  .70:DT= 1.00]
  013:0004---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      02:120       42.80     2.188 No_date    5:51   55.94 .632
       [CN= 84.0: N= 3.00]
       [Tp=  .89:DT= 1.00]
  013:0005---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      03:140        5.70      .349 No_date    5:31   53.05 .599
       [CN= 82.0: N= 3.00]
       [Tp=  .57:DT= 1.00]
  013:0006---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      04:150      377.00    10.979 No_date    7:29   55.94 .632
       [CN= 84.0: N= 3.00]
       [Tp= 2.18:DT= 1.00]
  013:0007---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      05:160      402.10    10.873 No_date    7:41   54.48 .615
       [CN= 83.0: N= 3.00]
       [Tp= 2.33:DT= 1.00]
  013:0008---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      06:170       89.60     3.253 No_date    6:23   49.02 .554
       [CN= 79.0: N= 3.00]
       [Tp= 1.25:DT= 1.00]
  013:0009---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      07:180        1.40      .093 No_date    5:26   53.05 .599
       [CN= 82.0: N= 3.00]
       [Tp=  .48:DT= 1.00]
  013:0010---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      08:190        5.40      .261 No_date    5:55   54.48 .615
       [CN= 83.0: N= 3.00]
       [Tp=  .93:DT= 1.00]
  013:0011---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      09:1100      20.30     1.280 No_date    5:31   54.48 .615
       [CN= 83.0: N= 3.00]
       [Tp=  .57:DT= 1.00]
  013:0012---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      10:1110      35.10     2.022 No_date    5:40   55.94 .632
       [CN= 84.0: N= 3.00]
       [Tp=  .72:DT= 1.00]
  013:0013---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      01:1120      60.00     2.765 No_date    6:13   59.01 .666
       [CN= 86.0: N= 3.00]
       [Tp= 1.17:DT= 1.00]
  013:0014---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      02:1140     560.00    12.367 No_date    8:34   54.48 .615
       [CN= 83.0: N= 3.00]
       [Tp= 3.08:DT= 1.00]
  013:0015---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      03:1150      17.90      .915 No_date    5:51   55.94 .632
       [CN= 84.0: N= 3.00]
       [Tp=  .89:DT= 1.00]
  013:0016---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      04:1160       5.60      .267 No_date    6:03   57.45 .649
       [CN= 85.0: N= 3.00]
       [Tp= 1.05:DT= 1.00]
  013:0017---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN STANDHYD    05:1170       1.80      .149 No_date    5:17   57.94 .654
       [XIMP=.01:TIMP=.25]
       [SLP=1.00:DT= 1.00]
       [LOSS= 2 :CN= 81.0]
  013:0018---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      08:1180      70.70     2.930 No_date    6:22   55.94 .632
       [CN= 84.0: N= 3.00]
       [Tp= 1.27:DT= 1.00]
  013:0019---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      09:1190     595.30    15.789 No_date    8:17   62.26 .703
       [CN= 88.0: N= 3.00]
       [Tp= 2.90:DT= 1.00]
  013:0020---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      ADD HYD            08:1180      70.70     2.930 No_date    6:22   55.94  n/a
                      +  09:1190     595.30    15.789 No_date    8:17   62.26  n/a
       [DT= 1.00]  SUM=  01:180190   666.00    17.494 No_date    7:58   61.59  n/a
  013:0021---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      10:1200       5.40      .286 No_date    5:50   57.45 .649
       [CN= 85.0: N= 3.00]
       [Tp=  .88:DT= 1.00]
  013:0022---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
      DESIGN NASHYD      01:1210       2.30      .155 No_date    5:30   57.45 .649
```

```
       [CN= 85.0: N= 3.00]
       [Tp=  .56:DT= 1.00]
 013:0023---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1220        .90     .064 No_date    5:26   57.45 .649
       [CN= 85.0: N= 3.00]
       [Tp=  .49:DT= 1.00]
 013:0024---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1230        .90     .069 No_date    5:18   55.46 .626
       [XIMP=.01:TIMP=.25]
       [SLP= .50:DT= 1.00]
       [LOSS= 2 :CN= 79.0]
  ** END OF RUN :  13

*******************************************************************************

 RUN:COMMAND#
 014:0001-----------------------------------------------------------------------
     START
       [TZERO =    .00 hrs on        0]
       [METOUT=   2    (1=imperial, 2=metric output)]
       [NSTORM=   1 ]
       [NRUN  =  14 ]
#******************************************************************************
#  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
#  Date         :  Feb, 2010/Revised September 2012
#  Modeller     : [JInnes}
#  Revised By   : [George Golding}
#  Company      : Stantec Consulting Ltd. (Kitchener)
#  License #    : 4730904
#******************************************************************************
#******************************************************************************
 014:0002------------------------------------------------------------------------
     READ STORM
      Filename = Storm.001
      Comment  = 100yr/24hr
      [SDT=15.00:SDUR=  24.25:PTOT=  95.92]
#
#
 014:0003---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:110       10.10     .471 No_date   10:25   67.35 .702
       [CN= 87.0: N= 3.00]
       [Tp=  .70:DT= 1.00]
 014:0004---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:120       42.80    1.723 No_date   10:34   62.43 .651
       [CN= 84.0: N= 3.00]
       [Tp=  .89:DT= 1.00]
 014:0005---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:140        5.70     .246 No_date   10:22   59.36 .619
       [CN= 82.0: N= 3.00]
       [Tp=  .57:DT= 1.00]
 014:0006---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:150      377.00    9.606 No_date   11:58   62.43 .651
       [CN= 84.0: N= 3.00]
       [Tp= 2.18:DT= 1.00]
 014:0007---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      05:160      402.10    9.587 No_date   12:12   60.88 .635
       [CN= 83.0: N= 3.00]
       [Tp= 2.33:DT= 1.00]
 014:0008---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      06:170       89.60    2.720 No_date   10:55   55.05 .574
       [CN= 79.0: N= 3.00]
       [Tp= 1.25:DT= 1.00]
 014:0009---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      07:180        1.40     .062 No_date   10:20   59.36 .619
       [CN= 82.0: N= 3.00]
       [Tp=  .48:DT= 1.00]
 014:0010---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:190        5.40     .208 No_date   10:36   60.88 .635
       [CN= 83.0: N= 3.00]
       [Tp=  .93:DT= 1.00]
 014:0011---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1100      20.30     .899 No_date   10:22   60.88 .635
       [CN= 83.0: N= 3.00]
       [Tp=  .57:DT= 1.00]
 014:0012---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1110      35.10    1.511 No_date   10:27   62.43 .651
       [CN= 84.0: N= 3.00]
       [Tp=  .72:DT= 1.00]
 014:0013---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1120      60.00    2.270 No_date   10:47   65.66 .685
       [CN= 86.0: N= 3.00]
       [Tp= 1.17:DT= 1.00]
 014:0014---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1140     560.00   11.267 No_date   13:08   60.88 .635
       [CN= 83.0: N= 3.00]
       [Tp= 3.08:DT= 1.00]
 014:0015---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:1150      17.90     .721 No_date   10:34   62.43 .651
       [CN= 84.0: N= 3.00]
       [Tp=  .89:DT= 1.00]
 014:0016---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:1160       5.60     .217 No_date   10:41   64.02 .667
       [CN= 85.0: N= 3.00]
       [Tp= 1.05:DT= 1.00]
 014:0017---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:1170       1.80     .088 No_date   10:16   64.52 .673
       [XIMP=.01:TIMP=.25]
       [SLP=1.00:DT= 1.00]
       [LOSS= 2 :CN= 81.0]
 014:0018---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:1180      70.70    2.437 No_date   10:54   62.43 .651
       [CN= 84.0: N= 3.00]
       [Tp= 1.27:DT= 1.00]
 014:0019---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1190     595.30   14.239 No_date   12:50   69.08 .720
       [CN= 88.0: N= 3.00]
       [Tp= 2.90:DT= 1.00]
 014:0020---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     ADD HYD            08:1180      70.70    2.437 No_date   10:54   62.43  n/a
                     +  09:1190     595.30   14.239 No_date   12:50   69.08  n/a
       [DT= 1.00]  SUM=  01:180190   666.00   15.763 No_date   12:33   68.37  n/a
 014:0021---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1200       5.40     .224 No_date   10:33   64.03 .667
       [CN= 85.0: N= 3.00]
       [Tp=  .88:DT= 1.00]
 014:0022---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1210       2.30     .107 No_date   10:22   64.02 .667
       [CN= 85.0: N= 3.00]
       [Tp=  .56:DT= 1.00]
 014:0023---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1220        .90     .043 No_date   10:20   64.02 .667
       [CN= 85.0: N= 3.00]
       [Tp=  .49:DT= 1.00]
 014:0024---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1230        .90     .042 No_date   10:17   61.90 .645
       [XIMP=.01:TIMP=.25]
       [SLP= .50:DT= 1.00]
       [LOSS= 2 :CN= 79.0]
  ** END OF RUN :  14

*******************************************************************************

 RUN:COMMAND#
 015:0001-----------------------------------------------------------------------
     START
       [TZERO =    .00 hrs on        0]
       [METOUT=   2    (1=imperial, 2=metric output)]
       [NSTORM=   1 ]
       [NRUN  =  15 ]
#******************************************************************************
#  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
#  Date         :  Feb, 2010/Revised September 2012
#  Modeller     : [JInnes}
#  Revised By   : [George Golding}
#  Company      : Stantec Consulting Ltd. (Kitchener)
#  License #    : 4730904
#******************************************************************************
#******************************************************************************
 015:0002------------------------------------------------------------------------
     READ STORM
      Filename = Storm.001
      Comment  = REGIONAL STORM
      [SDT=15.00:SDUR=  48.00:PTOT= 285.00]
#
#
 015:0003---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:110       10.10    1.173 No_date   46:39  250.03 .877
       [CN= 87.0: N= 3.00]
       [Tp=  .70:DT= 1.00]
 015:0004---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:120       42.80    4.639 No_date   47:04  242.17 .850
       [CN= 84.0: N= 3.00]
       [Tp=  .89:DT= 1.00]
 015:0005---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:140        5.70     .685 No_date   46:24  236.91 .831
       [CN= 82.0: N= 3.00]
       [Tp=  .57:DT= 1.00]
 015:0006---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:150      377.00   29.167 No_date   48:09  242.17 .850
       [CN= 84.0: N= 3.00]
       [Tp= 2.18:DT= 1.00]
 015:0007---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      05:160      402.10   30.047 No_date   48:15  239.54 .840
       [CN= 83.0: N= 3.00]
       [Tp= 2.33:DT= 1.00]
 015:0008---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      06:170       89.60    8.524 No_date   47:22  228.97 .803
       [CN= 79.0: N= 3.00]
       [Tp= 1.25:DT= 1.00]
 015:0009---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      07:180        1.40     .176 No_date   46:15  236.91 .831
       [CN= 82.0: N= 3.00]
       [Tp=  .48:DT= 1.00]
 015:0010---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:190        5.40     .577 No_date   47:06  239.54 .840
       [CN= 83.0: N= 3.00]
       [Tp=  .93:DT= 1.00]
 015:0011---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1100      20.30    2.453 No_date   46:24  239.54 .841
       [CN= 83.0: N= 3.00]
       [Tp=  .57:DT= 1.00]
 015:0012---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1110      35.10    3.999 No_date   46:42  242.17 .850
       [CN= 84.0: N= 3.00]
       [Tp=  .72:DT= 1.00]
 015:0013---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1120      60.00    6.040 No_date   47:18  247.41 .868
       [CN= 86.0: N= 3.00]
       [Tp= 1.17:DT= 1.00]
 015:0014---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1140     560.00   36.569 No_date   48:46  239.54 .841
       [CN= 83.0: N= 3.00]
       [Tp= 3.08:DT= 1.00]
 015:0015---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      03:1150      17.90    1.940 No_date   47:04  242.17 .850
       [CN= 84.0: N= 3.00]
       [Tp=  .89:DT= 1.00]
 015:0016---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      04:1160       5.60     .582 No_date   47:12  244.80 .859
       [CN= 85.0: N= 3.00]
       [Tp= 1.05:DT= 1.00]
 015:0017---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:1170       1.80     .253 No_date   46:01  245.31 .861
       [XIMP=.01:TIMP=.25]
       [SLP=1.00:DT= 1.00]
       [LOSS= 2 :CN= 81.0]
 015:0018---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      08:1180      70.70    6.851 No_date   47:23  242.17 .850
       [CN= 84.0: N= 3.00]
       [Tp= 1.27:DT= 1.00]
 015:0019---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      09:1190     595.30   41.016 No_date   48:38  252.63 .886
       [CN= 88.0: N= 3.00]
       [Tp= 2.90:DT= 1.00]
 015:0020---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     ADD HYD            08:1180      70.70    6.851 No_date   47:23  242.17  n/a
                     +  09:1190     595.30   41.016 No_date   48:38  252.63  n/a
       [DT= 1.00]  SUM=  01:180190   666.00   46.253 No_date   48:20  251.52  n/a
 015:0021---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      10:1200       5.40     .589 No_date   47:03  244.80 .859
       [CN= 85.0: N= 3.00]
       [Tp=  .88:DT= 1.00]
 015:0022---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      01:1210       2.30     .282 No_date   46:23  244.80 .859
       [CN= 85.0: N= 3.00]
       [Tp=  .56:DT= 1.00]
 015:0023---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN NASHYD      02:1220        .90     .114 No_date   46:16  244.80 .859
       [CN= 85.0: N= 3.00]
       [Tp=  .49:DT= 1.00]
 015:0024---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1230        .90     .124 No_date   46:02  240.96 .845
       [XIMP=.01:TIMP=.25]
       [SLP= .50:DT= 1.00]
       [LOSS= 2 :CN= 79.0]
 015:0002-----------------------------------------------------------------------
      FINISH
-------------------------------------------------------------------------------
*******************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2012-09-28     at 16:48:10
===============================================================================
```

```
2     Metric units
*#*****************************************************************************
*#  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
*#  Date        :  Feb, 2010/Revised September 2012
*#  Modeller    : [JInnes}
*#  Revised By  : [George Golding}
*#  Company     : Stantec Consulting Ltd. (Kitchener)
*#  License #   : 4730904
*#*****************************************************************************
*%
*% This hydrologic analysis was prepared to determine the FUTURE Conditions
*% peak flows at culvert crossings along Mayfield Road.
*% Culverts were modelled  using the Regional as the proposed 100-year uncontrol
*% and assumes 55% impervious, or the Regional Storm which ever event produces a
*%
*% 55% TIMP was assumed with a directly connected area (XIMP) of 30%
*#*****************************************************************************
START                TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
*%                     ["25y6hAES.stm"] <--storm filename, one per line for NSTOR
*%-----------------|-----------------------------------------------------------|
READ STORM           STORM_FILENAME=["Storm.001"]
*%-----------------|-----------------------------------------------------------|
*#
*#
*% Flows to Culvert at Station 10+425
*% Catchment 110
DESIGN STANDHYD      ID=[1], NHYD=["110"], DT=[1]min, AREA=[10.1](ha),
                     XIMP= [0.30], TIMP= [0.55], DWF= [0] (cms), LOSS=[2], CN=[77
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 10+689
*% Catchment 120
DESIGN STANDHYD      ID=[2], NHYD=["120"], DT=[1]min, AREA=[42.8](ha),
                     XIMP= [0.30], TIMP= [0.55], DWF= [0] (cms), LOSS=[2], CN=[77
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 11+603
*% Catchment 140
DESIGN STANDHYD      ID=[3], NHYD=["140"], DT=[1]min, AREA=[5.7](ha),
                     XIMP= [0.30], TIMP= [0.55], DWF= [0] (cms), LOSS=[2], CN=[77
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 11+800
*% Catchment 150
DESIGN STANDHYD      ID=[4], NHYD=["150"], DT=[1]min, AREA=[377.0](ha),
                     XIMP= [0.30], TIMP= [0.55], DWF= [0] (cms), LOSS=[2], CN=[77
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 12+300
*% Catchment 160
DESIGN STANDHYD      ID=[5], NHYD=["160"], DT=[1]min, AREA=[402.1](ha),
                     XIMP= [0.30], TIMP= [0.55], DWF= [0] (cms), LOSS=[2], CN=[78
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 12+500
*% Catchment 170
DESIGN STANDHYD      ID=[6], NHYD=["170"], DT=[1]min, AREA=[89.6](ha),
                     XIMP= [0.30], TIMP= [0.55], DWF= [0] (cms), LOSS=[2], CN=[77
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 12+787
*% Catchment 180
DESIGN STANDHYD      ID=[7], NHYD=["180"], DT=[1]min, AREA=[1.4](ha),
                     XIMP= [0.30], TIMP= [0.55], DWF= [0] (cms), LOSS=[2], CN=[77
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 12+927
*% Catchment 190
DESIGN STANDHYD      ID=[8], NHYD=["190"], DT=[1]min, AREA=[5.4](ha),
                     XIMP= [0.30], TIMP= [0.55], DWF= [0] (cms), LOSS=[2], CN=[77
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 13+763
*% Catchment 1100
DESIGN STANDHYD      ID=[9], NHYD=["1100"], DT=[1]min, AREA=[20.3](ha),
                     XIMP= [0.30], TIMP= [0.55], DWF= [0] (cms), LOSS=[2], CN=[77
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 13+970
*% Catchment 1110
DESIGN STANDHYD      ID=[10], NHYD=["1110"], DT=[1]min, AREA=[35.1](ha),
                     XIMP= [0.30], TIMP= [0.55], DWF= [0] (cms), LOSS=[2], CN=[79
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 14+177
*% Catchment 1120
DESIGN STANDHYD      ID=[1], NHYD=["1120"], DT=[1]min, AREA=[60.0](ha),
                     XIMP= [0.30], TIMP= [0.55], DWF= [0] (cms), LOSS=[2], CN=[79
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 15+156
*% Catchment 1140
DESIGN STANDHYD      ID=[2], NHYD=["1140"], DT=[1]min, AREA=[560.0](ha),
                     XIMP= [0.30], TIMP= [0.55], DWF= [0] (cms), LOSS=[2], CN=[78
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 15+249
*% Catchment 1150
DESIGN STANDHYD      ID=[3], NHYD=["1150"], DT=[1]min, AREA=[17.9](ha),
                     XIMP= [0.30], TIMP= [0.55], DWF= [0] (cms), LOSS=[2], CN=[80
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 15+454
*% Catchment 1160
DESIGN STANDHYD      ID=[4], NHYD=["1160"], DT=[1]min, AREA=[5.6](ha),
                     XIMP= [0.30], TIMP= [0.55], DWF= [0] (cms), LOSS=[2], CN=[80
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 15+693
*% Catchment 1170
DESIGN STANDHYD      ID=[5], NHYD=["1170"], DT=[1]min, AREA=[1.8](ha),
                     XIMP= [0.30], TIMP= [0.55], DWF= [0] (cms), LOSS=[2], CN=[80
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 15+885
*% Catchment 1180
DESIGN STANDHYD      ID=[8], NHYD=["1180"], DT=[1]min, AREA=[70.7](ha),
                     XIMP= [0.30], TIMP= [0.55], DWF= [0] (cms), LOSS=[2], CN=[78
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 15+955
*% Catchment 1190
DESIGN STANDHYD      ID=[9], NHYD=["1190"], DT=[1]min, AREA=[595.3](ha),
                     XIMP= [0.30], TIMP= [0.55], DWF= [0] (cms), LOSS=[2], CN=[79
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% total flows to culverts at Stations 16+015 and 16+085
ADD HYD              IDsum=[1], NHYD=["180190"], IDs to add=[8+9]
*%-----------------|-----------------------------------------------------------|
*% Flows to Culvert at Station 16+327
*% Catchment 1200
DESIGN STANDHYD      ID=[10], NHYD=["1200"], DT=[1]min, AREA=[5.4](ha),
                     XIMP= [0.30], TIMP= [0.55], DWF= [0] (cms), LOSS=[2], CN=[84
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 16+700
*% Catchment 1210
DESIGN STANDHYD      ID=[1], NHYD=["1210"], DT=[1]min, AREA=[2.3](ha),
                     XIMP= [0.30], TIMP= [0.55], DWF= [0] (cms), LOSS=[2], CN=[77
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 16+842
*% Catchment 1220
DESIGN STANDHYD      ID=[2], NHYD=["1220"], DT=[1]min, AREA=[0.9](ha),
                     XIMP= [0.30], TIMP= [0.55], DWF= [0] (cms), LOSS=[2], CN=[77
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

*% Flows to Culvert at Station 16+887
*% Catchment 1230
DESIGN STANDHYD      ID=[3], NHYD=["1230"], DT=[1]min, AREA=[0.9](ha),
                     XIMP= [0.30], TIMP= [0.55], DWF= [0] (cms),
                     LOSS=[2], CN=[77], SLOPE=[0.5] %,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|


START                TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[2]
*%                     ["25Y12.stm"] <--storm filename, one per line for NSTORM t
START                TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[3]
*%                     ["25Y24.stm"] <--storm filename, one per line for NSTORM t
START                TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[4]
*%                     ["1006hAES.stm"] <--storm filename, one per line for NSTOR
START                TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[5]
*%                     ["100y12.stm"] <--storm filename, one per line for NSTORM
START                TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[6]
*%                     ["100y24.stm"] <--storm filename, one per line for NSTORM
FINISH
```

```
===============================================================================

 SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO       999    999  =========
 S      W W W  MM MM  H   H   Y Y   MM MM  O   O     9   9  9   9
 SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9 Ver. 4.02
     S   W W   M   M  H   H    Y    M   M  O   O      9999   9999 July 1999
 SSSSS   W W   M   M  H   H    Y    M   M   OOO          9      9 =========
                                                      9   9  9   9 # 4730904
      StormWater Management HYdrologic Model          999    999  =========

 *****************************************************************************
 ************************** SWMHYMO-99 Ver/4.02 *****************************
 *******  A single event and continuous hydrologic simulation model  *******
 *******     based on the principles of HYMO and its successors      *******
 *******                 OTTHYMO-83 and OTTHYMO-89.                  *******
 *****************************************************************************
 ******* Distributed by:  J.F. Sabourin and Associates Inc.           *******
 *******                 Ottawa,  Ontario: (613) 727-5199            *******
 *******                 Gatineau, Quebec: (819) 243-6858            *******
 *******                 E-Mail: swmhymo@jfsa.Com                    *******
 *****************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++ Licensed user: Stantec Consulting Ltd. (Kitchener)          +++++++
 +++++++                Kitchener              SERIAL#:4730904       +++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 *****************************************************************************
 *******           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *******
 *******           Maximum value for ID numbers  :     10            *******
 *******           Max. number of rainfall points:  15000            *******
 *******           Max. number of flow points    :  15000            *******
 *****************************************************************************

 *** DESCRIPTION SUMMARY TABLE HEADERS (units depend on METOUT in START) ***
 ***-----------------------------------------------------------------------***
 ***    ID:  Hydrograph IDentification numbers, (1-10).                  ***
 ***  NHYD:  Hydrograph reference numbers, (6 digits or characters).     ***
 ***  AREA:  Drainage area associated with hydrograph, (ac.) or (ha.).   ***
 *** QPEAK:  Peak flow of simulated hydrograph, (ft^3/s) or (m^3/s).     ***
 *** TpeakDate_hh:mm is the date and time of the peak flow.              ***
 ***  R.V.:  Runoff Volume of simulated hydrograph, (in) or (mm).        ***
 ***  R.C.:  Runoff Coefficient of simulated hydrograph, (ratio).        ***
 ***     *:  see WARNING or NOTE message printed at end of run.          ***
 ***    **:  see  ERROR  message printed at end of run.                  ***
 *****************************************************************************
 *****************************************************************************

::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

 *****************************************************************************

 ********************   S U M M A R Y   O U T P U T   ********************
 *****************************************************************************
 *      DATE: 2012-10-02     TIME: 16:38:21     RUN COUNTER: 001225       *
 *****************************************************************************
 * Input   filename: C:\SWMHYMO\160210~1\SEPTEM~1\MAYCUL~1\55%BUI~1\maypro.*
 * Output  filename: C:\SWMHYMO\160210~1\SEPTEM~1\MAYCUL~1\55%BUI~1\maypro.*
 * Summary filename: C:\SWMHYMO\160210~1\SEPTEM~1\MAYCUL~1\55%BUI~1\maypro.*
 * User comments:                                                          *
 * 1:______________________________________________________________________*
 * 2:______________________________________________________________________*
 * 3:______________________________________________________________________*
 *****************************************************************************


#*******************************************************************************
#  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
#  Date         :  Feb, 2010/Revised September 2012
#  Modeller     : [JInnes}
#  Revised By   : [George Golding}
#  Company      : Stantec Consulting Ltd. (Kitchener)
#  License #    : 4730904
#*******************************************************************************
#*******************************************************************************
 RUN:COMMAND#
 001:0001-----------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   1 ]
 001:0002-----------------------------------------------------------------------
     READ STORM
      Filename = Storm.001
      Comment  = 25yr/6hr
      [SDT=15.00:SDUR=   6.25:PTOT=  65.59]
#
#
 001:0003---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    01:110       10.10    1.109 No_date    2:46    45.22 .689
      [XIMP=.30:TIMP=.55]
      [SLP=1.50:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 001:0004---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    02:120       42.80    4.318 No_date    2:48    45.22 .689
      [XIMP=.30:TIMP=.55]
      [SLP=1.18:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 001:0005---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:140        5.70     .600 No_date    2:46    45.22 .689
      [XIMP=.30:TIMP=.55]
      [SLP= .83:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 001:0006---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    04:150      377.00   32.218 No_date    2:55    45.22 .689
      [XIMP=.30:TIMP=.55]
      [SLP=1.14:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 001:0007---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:160      402.10   34.291 No_date    2:55    45.85 .699
      [XIMP=.30:TIMP=.55]
      [SLP=1.08:DT= 1.00]
      [LOSS= 2 :CN= 78.0]
 001:0008---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    06:170       89.60    8.683 No_date    2:49    45.22 .689
      [XIMP=.30:TIMP=.55]
      [SLP=1.23:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 001:0009---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    07:180        1.40     .150 No_date    2:45    45.22 .689
      [XIMP=.30:TIMP=.55]
      [SLP= .71:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 001:0010---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    08:190        5.40     .581 No_date    2:46    45.22 .689
      [XIMP=.30:TIMP=.55]
      [SLP=1.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 001:0011---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    09:1100      20.30    2.181 No_date    2:46    45.22 .689
      [XIMP=.30:TIMP=.55]
      [SLP=1.52:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 001:0012---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    10:1110      35.10    3.807 No_date    2:47    46.50 .709
      [XIMP=.30:TIMP=.55]
      [SLP=1.52:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
 001:0013---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    01:1120      60.00    6.368 No_date    2:48    46.50 .709
      [XIMP=.30:TIMP=.55]
      [SLP=1.61:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
 001:0014---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    02:1140     560.00   44.263 No_date    2:59    45.85 .699
      [XIMP=.30:TIMP=.55]
      [SLP= .81:DT= 1.00]
      [LOSS= 2 :CN= 78.0]
 001:0015---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1150      17.90    1.935 No_date    2:47    47.16 .719
      [XIMP=.30:TIMP=.55]
      [SLP= .96:DT= 1.00]
      [LOSS= 2 :CN= 80.0]
 001:0016---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    04:1160       5.60     .593 No_date    2:46    47.16 .719
      [XIMP=.30:TIMP=.55]
      [SLP= .56:DT= 1.00]
      [LOSS= 2 :CN= 80.0]
 001:0017---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:1170       1.80     .210 No_date    2:45    47.16 .719
      [XIMP=.30:TIMP=.55]
      [SLP=1.00:DT= 1.00]
      [LOSS= 2 :CN= 80.0]
 001:0018---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    08:1180      70.70    7.376 No_date    2:48    45.85 .699
      [XIMP=.30:TIMP=.55]
      [SLP=1.68:DT= 1.00]
      [LOSS= 2 :CN= 78.0]
 001:0019---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    09:1190     595.30   47.063 No_date    3:00    46.50 .709
      [XIMP=.30:TIMP=.55]
      [SLP= .79:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
 001:0020---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     ADD HYD            08:1180      70.70    7.376 No_date    2:48    45.85  n/a
                      + 09:1190     595.30   47.063 No_date    3:00    46.50  n/a
      [DT= 1.00]  SUM=  01:180190   666.00   52.973 No_date    2:57    46.43  n/a
 001:0021---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    10:1200       5.40     .604 No_date    2:47    49.98 .762
      [XIMP=.30:TIMP=.55]
      [SLP= .46:DT= 1.00]
      [LOSS= 2 :CN= 84.0]
 001:0022---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    01:1210       2.30     .246 No_date    2:45    45.22 .689
      [XIMP=.30:TIMP=.55]
      [SLP= .75:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 001:0023---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    02:1220        .90     .101 No_date    2:45    45.22 .689
      [XIMP=.30:TIMP=.55]
      [SLP=1.09:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 001:0024---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1230        .90     .094 No_date    2:45    45.22 .689
      [XIMP=.30:TIMP=.55]
      [SLP= .50:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
  ** END OF RUN :   1

********************************************************************************





 RUN:COMMAND#
 002:0001-----------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   2 ]
#*******************************************************************************
#  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
#  Date         :  Feb, 2010/Revised September 2012
#  Modeller     : [JInnes}
#  Revised By   : [George Golding}
#  Company      : Stantec Consulting Ltd. (Kitchener)
#  License #    : 4730904
#*******************************************************************************
#*******************************************************************************
 002:0002-----------------------------------------------------------------------
     READ STORM
      Filename = Storm.001
      Comment  = 25yr/12hr
      [SDT=15.00:SDUR=  12.25:PTOT=  73.10]
#
#
 002:0003---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    01:110       10.10     .709 No_date    5:15    51.82 .709
      [XIMP=.30:TIMP=.55]
      [SLP=1.50:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 002:0004---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    02:120       42.80    2.866 No_date    5:17    51.82 .709
      [XIMP=.30:TIMP=.55]
      [SLP=1.18:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 002:0005---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:140        5.70     .391 No_date    5:15    51.82 .709
      [XIMP=.30:TIMP=.55]
      [SLP= .83:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 002:0006---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    04:150      377.00   22.644 No_date    5:22    51.82 .709
      [XIMP=.30:TIMP=.55]
      [SLP=1.14:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 002:0007---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:160      402.10   24.260 No_date    5:23    52.51 .718
      [XIMP=.30:TIMP=.55]
      [SLP=1.08:DT= 1.00]
      [LOSS= 2 :CN= 78.0]
 002:0008---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    06:170       89.60    5.848 No_date    5:18    51.82 .709
      [XIMP=.30:TIMP=.55]
      [SLP=1.23:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 002:0009---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    07:180        1.40     .097 No_date    5:15    51.82 .709
      [XIMP=.30:TIMP=.55]
      [SLP= .71:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 002:0010---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    08:190        5.40     .374 No_date    5:15    51.82 .709
      [XIMP=.30:TIMP=.55]
      [SLP=1.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 002:0011---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
```

```
     DESIGN STANDHYD    09:1100      20.30    1.406 No_date    5:16   51.82 .709
      [XIMP=.30:TIMP=.55]
      [SLP=1.52:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 002:0012---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    10:1110      35.10    2.473 No_date    5:16   53.22 .728
      [XIMP=.30:TIMP=.55]
      [SLP=1.52:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
 002:0013---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    01:1120      60.00    4.179 No_date    5:16   53.22 .728
      [XIMP=.30:TIMP=.55]
      [SLP=1.61:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
 002:0014---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    02:1140     560.00   31.753 No_date    5:27   52.51 .718
      [XIMP=.30:TIMP=.55]
      [SLP= .81:DT= 1.00]
      [LOSS= 2 :CN= 78.0]
 002:0015---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1150      17.90    1.266 No_date    5:16   53.94 .738
      [XIMP=.30:TIMP=.55]
      [SLP= .96:DT= 1.00]
      [LOSS= 2 :CN= 80.0]
 002:0016---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    04:1160       5.60     .392 No_date    5:16   53.94 .738
      [XIMP=.30:TIMP=.55]
      [SLP= .56:DT= 1.00]
      [LOSS= 2 :CN= 80.0]
 002:0017---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:1170       1.80     .133 No_date    5:15   53.94 .738
      [XIMP=.30:TIMP=.55]
      [SLP=1.00:DT= 1.00]
      [LOSS= 2 :CN= 80.0]
 002:0018---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    08:1180      70.70    4.831 No_date    5:17   52.51 .718
      [XIMP=.30:TIMP=.55]
      [SLP=1.68:DT= 1.00]
      [LOSS= 2 :CN= 78.0]
 002:0019---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    09:1190     595.30   34.085 No_date    5:27   53.22 .728
      [XIMP=.30:TIMP=.55]
      [SLP= .79:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
 002:0020---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     ADD HYD            08:1180      70.70    4.831 No_date    5:17   52.51  n/a
                      + 09:1190     595.30   34.085 No_date    5:27   53.22  n/a
      [DT= 1.00]  SUM=  01:180190   666.00   38.448 No_date    5:24   53.14  n/a
 002:0021---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    10:1200       5.40     .397 No_date    5:16   56.97 .779
      [XIMP=.30:TIMP=.55]
      [SLP= .46:DT= 1.00]
      [LOSS= 2 :CN= 84.0]
 002:0022---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    01:1210       2.30     .159 No_date    5:15   51.82 .709
      [XIMP=.30:TIMP=.55]
      [SLP= .75:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 002:0023---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    02:1220        .90     .064 No_date    5:15   51.82 .709
      [XIMP=.30:TIMP=.55]
      [SLP=1.09:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 002:0024---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1230        .90     .062 No_date    5:15   51.82 .709
      [XIMP=.30:TIMP=.55]
      [SLP= .50:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
  ** END OF RUN :   2

********************************************************************************





 RUN:COMMAND#
 003:0001------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   3 ]
#*******************************************************************************
#  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
#  Date        :  Feb, 2010/Revised September 2012
#  Modeller    : [JInnes}
#  Revised By  : [George Golding}
#  Company     : Stantec Consulting Ltd. (Kitchener)
#  License #   : 4730904
#*******************************************************************************
#*******************************************************************************
 003:0002-------------------------------------------------------------------------
     READ STORM
      Filename = Storm.001
      Comment  = 25yr/24hr
      [SDT=15.00:SDUR=  24.25:PTOT=  79.70]
#
#
 003:0003---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    01:110       10.10     .415 No_date   10:15   57.70 .724
      [XIMP=.30:TIMP=.55]
      [SLP=1.50:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 003:0004---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    02:120       42.80    1.720 No_date   10:16   57.70 .724
      [XIMP=.30:TIMP=.55]
      [SLP=1.18:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 003:0005---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:140        5.70     .232 No_date   10:15   57.70 .724
      [XIMP=.30:TIMP=.55]
      [SLP= .83:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 003:0006---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    04:150      377.00   14.309 No_date   10:20   57.70 .724
      [XIMP=.30:TIMP=.55]
      [SLP=1.14:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 003:0007---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:160      402.10   15.386 No_date   10:20   58.44 .733
      [XIMP=.30:TIMP=.55]
      [SLP=1.08:DT= 1.00]
      [LOSS= 2 :CN= 78.0]
 003:0008---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    06:170       89.60    3.559 No_date   10:16   57.70 .724
      [XIMP=.30:TIMP=.55]
      [SLP=1.23:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 003:0009---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    07:180        1.40     .057 No_date   10:15   57.70 .724
      [XIMP=.30:TIMP=.55]
      [SLP= .71:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 003:0010---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    08:190        5.40     .221 No_date   10:15   57.70 .724
      [XIMP=.30:TIMP=.55]
      [SLP=1.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 003:0011---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    09:1100      20.30     .829 No_date   10:15   57.70 .724
      [XIMP=.30:TIMP=.55]
      [SLP=1.52:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 003:0012---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    10:1110      35.10    1.463 No_date   10:15   59.20 .743
      [XIMP=.30:TIMP=.55]
      [SLP=1.52:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
 003:0013---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    01:1120      60.00    2.486 No_date   10:16   59.20 .743
      [XIMP=.30:TIMP=.55]
      [SLP=1.61:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
 003:0014---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    02:1140     560.00   20.663 No_date   10:23   58.44 .733
      [XIMP=.30:TIMP=.55]
      [SLP= .81:DT= 1.00]
      [LOSS= 2 :CN= 78.0]
 003:0015---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1150      17.90     .752 No_date   10:15   59.97 .752
      [XIMP=.30:TIMP=.55]
      [SLP= .96:DT= 1.00]
      [LOSS= 2 :CN= 80.0]
 003:0016---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    04:1160       5.60     .234 No_date   10:15   59.97 .752
      [XIMP=.30:TIMP=.55]
      [SLP= .56:DT= 1.00]
      [LOSS= 2 :CN= 80.0]
 003:0017---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:1170       1.80     .077 No_date   10:15   59.97 .752
      [XIMP=.30:TIMP=.55]
      [SLP=1.00:DT= 1.00]
      [LOSS= 2 :CN= 80.0]
 003:0018---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    08:1180      70.70    2.890 No_date   10:16   58.44 .733
      [XIMP=.30:TIMP=.55]
      [SLP=1.68:DT= 1.00]
      [LOSS= 2 :CN= 78.0]
 003:0019---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    09:1190     595.30   22.156 No_date   10:24   59.20 .743
      [XIMP=.30:TIMP=.55]
      [SLP= .79:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
 003:0020---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     ADD HYD            08:1180      70.70    2.890 No_date   10:16   58.44  n/a
                      + 09:1190     595.30   22.156 No_date   10:24   59.20  n/a
      [DT= 1.00]  SUM=  01:180190   666.00   24.964 No_date   10:21   59.12  n/a
 003:0021---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    10:1200       5.40     .237 No_date   10:15   63.18 .793
      [XIMP=.30:TIMP=.55]
      [SLP= .46:DT= 1.00]
      [LOSS= 2 :CN= 84.0]
 003:0022---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    01:1210       2.30     .094 No_date   10:15   57.70 .724
      [XIMP=.30:TIMP=.55]
      [SLP= .75:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 003:0023---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    02:1220        .90     .037 No_date   10:15   57.70 .724
      [XIMP=.30:TIMP=.55]
      [SLP=1.09:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 003:0024---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1230        .90     .037 No_date   10:15   57.70 .724
      [XIMP=.30:TIMP=.55]
      [SLP= .50:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
  ** END OF RUN :   3

********************************************************************************





 RUN:COMMAND#
 004:0001------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   4 ]
#*******************************************************************************
#  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
#  Date        :  Feb, 2010/Revised September 2012
#  Modeller    : [JInnes}
#  Revised By  : [George Golding}
#  Company     : Stantec Consulting Ltd. (Kitchener)
#  License #   : 4730904
#*******************************************************************************
#*******************************************************************************
 004:0002-------------------------------------------------------------------------
     READ STORM
      Filename = Storm.001
      Comment  = 100yr/6hr
      [SDT=15.00:SDUR=   6.25:PTOT=  80.31]
#
#
 004:0003---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    01:110       10.10    1.470 No_date    2:46   58.25 .725
      [XIMP=.30:TIMP=.55]
      [SLP=1.50:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 004:0004---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    02:120       42.80    5.792 No_date    2:47   58.25 .725
      [XIMP=.30:TIMP=.55]
      [SLP=1.18:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 004:0005---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:140        5.70     .805 No_date    2:46   58.25 .725
      [XIMP=.30:TIMP=.55]
      [SLP= .83:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 004:0006---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    04:150      377.00   43.418 No_date    2:53   58.25 .725
      [XIMP=.30:TIMP=.55]
      [SLP=1.14:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 004:0007---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:160      402.10   46.537 No_date    2:54   59.00 .735
      [XIMP=.30:TIMP=.55]
      [SLP=1.08:DT= 1.00]
      [LOSS= 2 :CN= 78.0]
 004:0008---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    06:170       89.60   11.661 No_date    2:48   58.25 .725
      [XIMP=.30:TIMP=.55]
      [SLP=1.23:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 004:0009---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
```

```
     DESIGN STANDHYD    07:180       1.40     .202 No_date    2:45   58.25 .725
      [XIMP=.30:TIMP=.55]
      [SLP= .71:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 004:0010---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    08:190       5.40     .777 No_date    2:45   58.25 .725
      [XIMP=.30:TIMP=.55]
      [SLP=1.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 004:0011---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    09:1100     20.30    2.895 No_date    2:46   58.25 .725
      [XIMP=.30:TIMP=.55]
      [SLP=1.52:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 004:0012---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    10:1110     35.10    5.043 No_date    2:47   59.75 .744
      [XIMP=.30:TIMP=.55]
      [SLP=1.52:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
 004:0013---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    01:1120     60.00    8.518 No_date    2:47   59.75 .744
      [XIMP=.30:TIMP=.55]
      [SLP=1.61:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
 004:0014---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    02:1140    560.00   60.007 No_date    2:57   59.00 .735
      [XIMP=.30:TIMP=.55]
      [SLP= .81:DT= 1.00]
      [LOSS= 2 :CN= 78.0]
 004:0015---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1150     17.90    2.579 No_date    2:46   60.53 .754
      [XIMP=.30:TIMP=.55]
      [SLP= .96:DT= 1.00]
      [LOSS= 2 :CN= 80.0]
 004:0016---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    04:1160      5.60     .793 No_date    2:46   60.53 .754
      [XIMP=.30:TIMP=.55]
      [SLP= .56:DT= 1.00]
      [LOSS= 2 :CN= 80.0]
 004:0017---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:1170      1.80     .277 No_date    2:45   60.53 .754
      [XIMP=.30:TIMP=.55]
      [SLP=1.00:DT= 1.00]
      [LOSS= 2 :CN= 80.0]
 004:0018---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    08:1180     70.70    9.783 No_date    2:47   59.00 .735
      [XIMP=.30:TIMP=.55]
      [SLP=1.68:DT= 1.00]
      [LOSS= 2 :CN= 78.0]
 004:0019---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    09:1190    595.30   63.926 No_date    2:58   59.75 .744
      [XIMP=.30:TIMP=.55]
      [SLP= .79:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
 004:0020---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     ADD HYD            08:1180     70.70    9.783 No_date    2:47   59.00  n/a
                      + 09:1190    595.30   63.926 No_date    2:58   59.75  n/a
      [DT= 1.00]  SUM=  01:180190  666.00   71.888 No_date    2:56   59.67  n/a
 004:0021---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    10:1200      5.40     .795 No_date    2:46   63.75 .794
      [XIMP=.30:TIMP=.55]
      [SLP= .46:DT= 1.00]
      [LOSS= 2 :CN= 84.0]
 004:0022---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    01:1210      2.30     .327 No_date    2:45   58.25 .725
      [XIMP=.30:TIMP=.55]
      [SLP= .75:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 004:0023---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    02:1220       .90     .135 No_date    2:45   58.25 .725
      [XIMP=.30:TIMP=.55]
      [SLP=1.09:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 004:0024---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1230       .90     .127 No_date    2:45   58.25 .725
      [XIMP=.30:TIMP=.55]
      [SLP= .50:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
  ** END OF RUN :   4

*******************************************************************************

 RUN:COMMAND#
 005:0001-----------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on       0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   5 ]
#******************************************************************************
#  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
#  Date        :  Feb, 2010/Revised September 2012
#  Modeller    : [JInnes}
#  Revised By  : [George Golding}
#  Company     : Stantec Consulting Ltd. (Kitchener)
#  License #   : 4730904
#******************************************************************************
#******************************************************************************
 005:0002------------------------------------------------------------------------
     READ STORM
      Filename = Storm.001
      Comment  = 100yr/12hr
      [SDT=15.00:SDUR=  12.25:PTOT=  88.54]
#
#
 005:0003---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    01:110      10.10     .910 No_date    5:15   65.70 .742
      [XIMP=.30:TIMP=.55]
      [SLP=1.50:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 005:0004---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    02:120      42.80    3.707 No_date    5:16   65.70 .742
      [XIMP=.30:TIMP=.55]
      [SLP=1.18:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 005:0005---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:140       5.70     .504 No_date    5:15   65.70 .742
      [XIMP=.30:TIMP=.55]
      [SLP= .83:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 005:0006---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    04:150     377.00   29.523 No_date    5:21   65.70 .742
      [XIMP=.30:TIMP=.55]
      [SLP=1.14:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 005:0007---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:160     402.10   31.709 No_date    5:21   66.50 .751
      [XIMP=.30:TIMP=.55]
      [SLP=1.08:DT= 1.00]
      [LOSS= 2 :CN= 78.0]
 005:0008---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    06:170      89.60    7.580 No_date    5:17   65.70 .742
      [XIMP=.30:TIMP=.55]
      [SLP=1.23:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 005:0009---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    07:180       1.40     .125 No_date    5:15   65.70 .742
      [XIMP=.30:TIMP=.55]
      [SLP= .71:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 005:0010---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    08:190       5.40     .483 No_date    5:15   65.70 .742
      [XIMP=.30:TIMP=.55]
      [SLP=1.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 005:0011---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    09:1100     20.30    1.810 No_date    5:15   65.70 .742
      [XIMP=.30:TIMP=.55]
      [SLP=1.52:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 005:0012---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    10:1110     35.10    3.178 No_date    5:16   67.31 .760
      [XIMP=.30:TIMP=.55]
      [SLP=1.52:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
 005:0013---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    01:1120     60.00    5.381 No_date    5:16   67.31 .760
      [XIMP=.30:TIMP=.55]
      [SLP=1.61:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
 005:0014---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    02:1140    560.00   41.783 No_date    5:25   66.50 .751
      [XIMP=.30:TIMP=.55]
      [SLP= .81:DT= 1.00]
      [LOSS= 2 :CN= 78.0]
 005:0015---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1150     17.90    1.627 No_date    5:16   68.13 .770
      [XIMP=.30:TIMP=.55]
      [SLP= .96:DT= 1.00]
      [LOSS= 2 :CN= 80.0]
 005:0016---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    04:1160      5.60     .505 No_date    5:15   68.13 .770
      [XIMP=.30:TIMP=.55]
      [SLP= .56:DT= 1.00]
      [LOSS= 2 :CN= 80.0]
 005:0017---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:1170      1.80     .169 No_date    5:15   68.13 .770
      [XIMP=.30:TIMP=.55]
      [SLP=1.00:DT= 1.00]
      [LOSS= 2 :CN= 80.0]
 005:0018---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    08:1180     70.70    6.231 No_date    5:16   66.50 .751
      [XIMP=.30:TIMP=.55]
      [SLP=1.68:DT= 1.00]
      [LOSS= 2 :CN= 78.0]
 005:0019---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    09:1190    595.30   44.635 No_date    5:25   67.31 .760
      [XIMP=.30:TIMP=.55]
      [SLP= .79:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
 005:0020---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     ADD HYD            08:1180     70.70    6.231 No_date    5:16   66.50  n/a
                      + 09:1190    595.30   44.635 No_date    5:25   67.31  n/a
      [DT= 1.00]  SUM=  01:180190  666.00   50.363 No_date    5:22   67.22  n/a
 005:0021---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    10:1200      5.40     .507 No_date    5:15   71.56 .808
      [XIMP=.30:TIMP=.55]
      [SLP= .46:DT= 1.00]
      [LOSS= 2 :CN= 84.0]
 005:0022---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    01:1210      2.30     .205 No_date    5:15   65.70 .742
      [XIMP=.30:TIMP=.55]
      [SLP= .75:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 005:0023---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    02:1220       .90     .082 No_date    5:15   65.70 .742
      [XIMP=.30:TIMP=.55]
      [SLP=1.09:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 005:0024---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1230       .90     .080 No_date    5:15   65.70 .742
      [XIMP=.30:TIMP=.55]
      [SLP= .50:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
  ** END OF RUN :   5

*******************************************************************************

 RUN:COMMAND#
 006:0001-----------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on       0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   6 ]
#******************************************************************************
#  Project Name: [Mayfield Road EA - Airport to Coleraine]  Project Number: [16
#  Date        :  Feb, 2010/Revised September 2012
#  Modeller    : [JInnes}
#  Revised By  : [George Golding}
#  Company     : Stantec Consulting Ltd. (Kitchener)
#  License #   : 4730904
#******************************************************************************
#******************************************************************************
 006:0002------------------------------------------------------------------------
     READ STORM
      Filename = Storm.001
      Comment  = 100yr/24hr
      [SDT=15.00:SDUR=  24.25:PTOT=  95.92]
#
#
 006:0003---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    01:110      10.10     .522 No_date   10:15   72.45 .755
      [XIMP=.30:TIMP=.55]
      [SLP=1.50:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 006:0004---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    02:120      42.80    2.173 No_date   10:15   72.45 .755
      [XIMP=.30:TIMP=.55]
      [SLP=1.18:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 006:0005---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:140       5.70     .292 No_date   10:15   72.45 .755
      [XIMP=.30:TIMP=.55]
      [SLP= .83:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 006:0006---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    04:150     377.00   18.247 No_date   10:19   72.45 .755
      [XIMP=.30:TIMP=.55]
      [SLP=1.14:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 006:0007---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
```

```
     DESIGN STANDHYD    05:160      402.10   19.599 No_date   10:19   73.29 .764
      [XIMP=.30:TIMP=.55]
      [SLP=1.08:DT= 1.00]
      [LOSS= 2 :CN= 78.0]
 006:0008---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    06:170       89.60    4.506 No_date   10:16   72.45 .755
      [XIMP=.30:TIMP=.55]
      [SLP=1.23:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 006:0009---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    07:180        1.40     .072 No_date   10:15   72.45 .755
      [XIMP=.30:TIMP=.55]
      [SLP= .71:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 006:0010---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    08:190        5.40     .278 No_date   10:15   72.45 .755
      [XIMP=.30:TIMP=.55]
      [SLP=1.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 006:0011---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    09:1100      20.30    1.045 No_date   10:15   72.45 .755
      [XIMP=.30:TIMP=.55]
      [SLP=1.52:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 006:0012---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    10:1110      35.10    1.839 No_date   10:15   74.15 .773
      [XIMP=.30:TIMP=.55]
      [SLP=1.52:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
 006:0013---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    01:1120      60.00    3.128 No_date   10:15   74.15 .773
      [XIMP=.30:TIMP=.55]
      [SLP=1.61:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
 006:0014---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    02:1140     560.00   26.459 No_date   10:21   73.29 .764
      [XIMP=.30:TIMP=.55]
      [SLP= .81:DT= 1.00]
      [LOSS= 2 :CN= 78.0]
 006:0015---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1150      17.90     .945 No_date   10:15   75.02 .782
      [XIMP=.30:TIMP=.55]
      [SLP= .96:DT= 1.00]
      [LOSS= 2 :CN= 80.0]
 006:0016---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    04:1160       5.60     .295 No_date   10:15   75.02 .782
      [XIMP=.30:TIMP=.55]
      [SLP= .56:DT= 1.00]
      [LOSS= 2 :CN= 80.0]
 006:0017---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    05:1170       1.80     .096 No_date   10:15   75.02 .782
      [XIMP=.30:TIMP=.55]
      [SLP=1.00:DT= 1.00]
      [LOSS= 2 :CN= 80.0]
 006:0018---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    08:1180      70.70    3.642 No_date   10:15   73.29 .764
      [XIMP=.30:TIMP=.55]
      [SLP=1.68:DT= 1.00]
      [LOSS= 2 :CN= 78.0]
 006:0019---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    09:1190     595.30   28.336 No_date   10:22   74.15 .773
      [XIMP=.30:TIMP=.55]
      [SLP= .79:DT= 1.00]
      [LOSS= 2 :CN= 79.0]
 006:0020---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     ADD HYD            08:1180      70.70    3.642 No_date   10:15   73.29  n/a
                      + 09:1190     595.30   28.336 No_date   10:22   74.15  n/a
      [DT= 1.00]  SUM=  01:180190   666.00   31.906 No_date   10:20   74.06  n/a
 006:0021---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    10:1200       5.40     .295 No_date   10:15   78.60 .819
      [XIMP=.30:TIMP=.55]
      [SLP= .46:DT= 1.00]
      [LOSS= 2 :CN= 84.0]
 006:0022---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    01:1210       2.30     .118 No_date   10:15   72.45 .755
      [XIMP=.30:TIMP=.55]
      [SLP= .75:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 006:0023---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    02:1220        .90     .047 No_date   10:15   72.45 .755
      [XIMP=.30:TIMP=.55]
      [SLP=1.09:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 006:0024---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.
     DESIGN STANDHYD    03:1230        .90     .046 No_date   10:15   72.45 .755
      [XIMP=.30:TIMP=.55]
      [SLP= .50:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 006:0002-----------------------------------------------------------------------
      FINISH
-------------------------------------------------------------------------------
*******************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2012-10-02     at 16:39:03
===============================================================================
```

```
2     Metric units
*#*************************************************************************
*#  Project Name: [Mayfield Road EA - Airport Road to Coleraine Dr]    Project N
*#  Date        : October, 2012
*#  Modeller    : [J. Innes]
*#  Company     : Stantec Consulting Ltd. (Kitchener)
*#  License #   :  4730904
*#
*#  This hydrologic analysis was prepared to determine the proposed flows from
*#  from the site.
*#*************************************************************************
START                TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[1]
*                    ["25mm4hr.stm"] <--storm filename, one per line for NSTORM t
*%-----------------|-------------------------------------------------------|
READ STORM           STORM_FILENAME=["STORM.001"]
*%-----------------|-------------------------------------------------------|
*#
*#
*#*************************************************************************
*#
*#  Existing Conditions
*#
*#  Existing Conditions Flow Release Criteria was based on the following:
*#  TRCA - Humber River Stormwater Management Quantity Control Release Rate Crit
*#  Study Area is located within Basin F of the Humber River Subwateshed
*#
*#*************************************************************************
*#*************************************************************************
*#
*#  Proposed Conditions
*#
*#  Proposed catchments to SWM facilities based on an average 75% impervious
*#  within 45m-wide roadway corridor.
*#
*#*************************************************************************

*#*************************************************************************
*% Proposed Flows to SWM#1 at Station 10+680
*#*************************************************************************

DESIGN STANDHYD      ID=[1], NHYD=["200"], DT=[1]min, AREA=[3.06](ha),
                     XIMP=[0.75], TIMP=[0.75], DWF=[0](cms), LOSS=[2], CN=[77],
                     SLOPE=[2.0](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*#*************************************************************************
*% Updated to reflect Target Flows
*#*************************************************************************
ROUTE RESERVOIR      IDout=[2],   NHYD=["510"],  IDin=[1],
                     RDT=[1](min),
                           TABLE of ( OUTFLOW-STORAGE ) values
                                        (cms) - (ha-m)
                                     [   0.0 ,  0.0    ]
                                     [ 0.001 ,  0.0162  ]
                                     [ 0.002 ,  0.0335  ]
                                     [ 0.011 ,  0.0517  ]
                                     [ 0.041 ,  0.0912  ]
                                     [ 0.075 ,  0.2075  ]
                                     [   -1  ,   -1  ]  (max twenty pts)
                           IDovf=[   ], NHYDovf=[   ]
*%-----------------|-------------------------------------------------------|
*#*************************************************************************
*% Proposed Flows to SWM#2 at Station 12+300
*#*************************************************************************

DESIGN STANDHYD      ID=[1], NHYD=["225"], DT=[1]min, AREA=[3.89](ha),
                     XIMP=[0.75], TIMP=[0.75], DWF=[0](cms), LOSS=[2], CN=[77],
                     SLOPE=[2.0](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------|
ROUTE RESERVOIR      IDout=[2],   NHYD=["520"],  IDin=[1],
                     RDT=[1](min),
                           TABLE of ( OUTFLOW-STORAGE ) values
                                        (cms) - (ha-m)
                                     [   0.0 ,  0.0    ]
                                     [ 0.001 ,  0.0251 ]
                                     [ 0.008 ,  0.0515 ]
                                     [ 0.027 ,  0.0791 ]
                                     [ 0.045 ,  0.1381 ]
                                     [ 0.073 ,  0.3075 ]
                                     [   -1  ,   -1  ]  (max twenty pts)
                           IDovf=[   ], NHYDovf=[   ]
*%-----------------|-------------------------------------------------------|
*#*************************************************************************
*% Proposed Flows to SWM#3 at Station 13+600
*#*************************************************************************

DESIGN STANDHYD      ID=[1], NHYD=["230"], DT=[1]min, AREA=[3.06](ha),
                     XIMP=[0.75], TIMP=[0.75], DWF=[0](cms), LOSS=[2], CN=[77],
                     SLOPE=[2.0](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------|
ROUTE RESERVOIR      IDout=[2],   NHYD=["530"],  IDin=[1],
                     RDT=[1](min),
                           TABLE of ( OUTFLOW-STORAGE ) values
                                        (cms) - (ha-m)
                                     [   0.0 ,  0.0    ]
                                     [ 0.001 ,  0.0141  ]
                                     [ 0.002 ,  0.0295  ]
                                     [ 0.008 ,  0.0461  ]
                                     [ 0.038 ,  0.0831  ]
                                     [ 0.068 ,  0.1975  ]
                                     [   -1  ,   -1  ]  (max twenty pts)
                           IDovf=[   ], NHYDovf=[   ]
*%-----------------|-------------------------------------------------------|
*#*************************************************************************
*% Proposed Flows to SWM#4 at Station 14+400
*#*************************************************************************
DESIGN STANDHYD      ID=[1], NHYD=["235"], DT=[1]min, AREA=[6.19](ha),
                     XIMP=[0.75], TIMP=[0.75], DWF=[0](cms), LOSS=[2], CN=[77],
                     SLOPE=[2.0](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------|

ROUTE RESERVOIR      IDout=[2],   NHYD=["540"],  IDin=[1],
                     RDT=[1](min),
                           TABLE of ( OUTFLOW-STORAGE ) values
                                        (cms) - (ha-m)
                                     [   0.0 ,  0.0    ]
                                     [ 0.003 ,  0.0246  ]
                                     [ 0.004 ,  0.0505  ]
                                     [ 0.013 ,  0.0777  ]
                                     [ 0.044 ,  0.1359  ]
                                     [ 0.080 ,  0.3035  ]
                                     [   -1  ,   -1  ]  (max twenty pts)
                           IDovf=[   ], NHYDovf=[   ]
*%-----------------|-------------------------------------------------------|
*#*************************************************************************
*% Proposed Flows to SWM#5 at Station 15+960
*#*************************************************************************
DESIGN STANDHYD      ID=[1], NHYD=["255"], DT=[1]min, AREA=[4.10](ha),
                     XIMP=[0.75], TIMP=[0.75], DWF=[0](cms), LOSS=[2], CN=[77],
                     SLOPE=[2.0](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------|
ROUTE RESERVOIR      IDout=[2],   NHYD=["550"],  IDin=[1],
                     RDT=[1](min),
                           TABLE of ( OUTFLOW-STORAGE ) values
                                        (cms) - (ha-m)
                                     [   0.0 ,  0.0    ]
                                     [ 0.002 ,  0.0161 ]
                                     [ 0.003 ,  0.0332 ]
                                     [ 0.010 ,  0.0514 ]
                                     [ 0.035 ,  0.0907 ]
                                     [ 0.063 ,  0.2070 ]
                                     [   -1  ,   -1  ]  (max twenty pts)
                           IDovf=[   ], NHYDovf=[   ]
*%-----------------|-------------------------------------------------------|
START                TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[2]
*%                     ["2y6hAES.STM"] <--storm filename, one per line for NSTORM
START                TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[3]
*%                     ["5y6hAES.STM"] <--storm filename, one per line for NSTORM
START                TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[4]
*%                     ["10y6hAES.STM"] <--storm filename, one per line for NSTOR
START                TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[5]
*%                     ["25y6hAES.STM"] <--storm filename, one per line for NSTOR
START                TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[6]
*%                     ["50y6hAES.STM"] <--storm filename, one per line for NSTOR
START                TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[7]
*%                     ["1006hAES.STM"] <--storm filename, one per line for NSTOR



FINISH
```

```
 ==============================================================================

   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999   999    =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9 9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9 9   9   Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O       9999  9999   Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO           9     9   =========
                                                        9   9 9   9   # 4730904
        StormWater Management HYdrologic Model           999   999    =========

  *****************************************************************************
  **************************** SWMHYMO Ver/4.05  ****************************
  *********  A single event and continuous hydrologic simulation model  *********
  *********     based on the principles of HYMO and its successors      *********
  *********                 OTTHYMO-83 and OTTHYMO-89.                  *********
  *****************************************************************************
  ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
  *********                  Ottawa,  Ontario: (613) 836-3884           *********
  *********                  Gatineau, Quebec: (819) 243-6858           *********
  *********                  E-Mail: swmhymo@jfsa.Com                   *********
  *****************************************************************************

  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
  +++++++++ Licensed user: Stantec Consulting Ltd. (Kitchener)        +++++++++
  +++++++++                Kitchener             SERIAL#:4730904      +++++++++
  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

  *****************************************************************************
  *********            ++++++ PROGRAM ARRAY DIMENSIONS ++++++           *********
  *********            Maximum value for ID numbers  :     10          *********
  *********            Max. number of rainfall points: 105408          *********
  *********            Max. number of flow points    : 105408          *********
  *****************************************************************************

  ***** DESCRIPTION SUMMARY TABLE HEADERS (units depend on METOUT in START) *****
  *****-------------------------------------------------------------------*****
  *****    ID:  Hydrograph IDentification numbers, (1-10).                *****
  *****  NHYD:  Hydrograph reference numbers, (6 digits or characters).   *****
  *****  AREA:  Drainage area associated with hydrograph, (ac.) or (ha.). *****
  ***** QPEAK:  Peak flow of simulated hydrograph, (ft^3/s) or (m^3/s).   *****
  ***** TpeakDate_hh:mm is the date and time of the peak flow.            *****
  *****  R.V.:  Runoff Volume of simulated hydrograph, (in) or (mm).      *****
  *****  R.C.:  Runoff Coefficient of simulated hydrograph, (ratio).      *****
  *****     *:  see WARNING or NOTE message printed at end of run.        *****
  *****    **:  see  ERROR  message printed at end of run.                *****
  *****************************************************************************
  *****************************************************************************

 ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

  *****************************************************************************

  **********************   S U M M A R Y   O U T P U T   **********************
  *****************************************************************************
  *         DATE: 2012-10-15     TIME: 13:40:44     RUN COUNTER: 000162        *
  *****************************************************************************
  * Input   filename: C:\usr\may\maypond2.dat                                 *
  * Output  filename: C:\usr\may\maypond2.out                                 *
  * Summary filename: C:\usr\may\maypond2.sum                                 *
  * User comments:                                                            *
  * 1:________________________________________________________________________*
  * 2:________________________________________________________________________*
  * 3:________________________________________________________________________*
  *****************************************************************************


 #****************************************************************************
 #  Project Name: [Mayfield Road EA - Airport Road to Coleraine Dr]    Project N
 #  Date        : October, 2012
 #  Modeller    : [J. Innes]
 #  Company     : Stantec Consulting Ltd. (Kitchener)
 #  License #   :  4730904
 #
 #  This hydrologic analysis was prepared to determine the proposed flows from
 #  from the site.
 #****************************************************************************
  RUN:COMMAND#
  001:0001--------------------------------------------------------------------
      START
       [TZERO =    .00 hrs on        0]
       [METOUT=   2    (1=imperial, 2=metric output)]
       [NSTORM=   1 ]
       [NRUN  =   1 ]
  001:0002--------------------------------------------------------------------
      READ STORM
       Filename = STORM.001
       Comment  =
       [SDT=10.00:SDUR=   4.00:PTOT=  25.00]
 #
 #
 #****************************************************************************
 #
 #  Existing Conditions
 #
 #  Existing Conditions Flow Release Criteria was based on the following:
 #  TRCA - Humber River Stormwater Management Quantity Control Release Rate Crit
 #  Study Area is located within Basin F of the Humber River Subwateshed
 #
 #****************************************************************************
 #****************************************************************************
 #
 #  Proposed Conditions
 #
 #  Proposed catchments to SWM facilities based on an average 75% impervious
 #  within 45m-wide roadway corridor.
 #
 #****************************************************************************
 #****************************************************************************
 #****************************************************************************
  001:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
      DESIGN STANDHYD    01:200            3.06     .303 No_date    1:30   19.54
       [XIMP=.75:TIMP=.75]
       [SLP=2.00:DT= 1.00]
       [LOSS= 2 :CN= 77.0]
 #****************************************************************************
 #****************************************************************************
  001:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
      ROUTE RESERVOIR -> 01:200            3.06     .303 No_date    1:30   19.54
       [RDT= 1.00] out<- 02:510            3.06     .011 No_date    4:03   19.54
      {MxStoUsed=.5174E-01}
 #****************************************************************************
 #****************************************************************************
  001:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
      DESIGN STANDHYD    01:225            3.89     .374 No_date    1:30   19.54
       [XIMP=.75:TIMP=.75]
       [SLP=2.00:DT= 1.00]
       [LOSS= 2 :CN= 77.0]
  001:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
      ROUTE RESERVOIR -> 01:225            3.89     .374 No_date    1:30   19.54
       [RDT= 1.00] out<- 02:520            3.89     .017 No_date    4:03   19.53
      {MxStoUsed=.6387E-01}
 #****************************************************************************
 #****************************************************************************
  001:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
      DESIGN STANDHYD    01:230            3.06     .303 No_date    1:30   19.54
       [XIMP=.75:TIMP=.75]
       [SLP=2.00:DT= 1.00]
       [LOSS= 2 :CN= 77.0]
  001:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
      ROUTE RESERVOIR -> 01:230            3.06     .303 No_date    1:30   19.54
       [RDT= 1.00] out<- 02:530            3.06     .012 No_date    4:02   19.54
      {MxStoUsed=.5123E-01}
 #****************************************************************************
 #****************************************************************************
  001:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
      DESIGN STANDHYD    01:235            6.19     .577 No_date    1:30   19.54
       [XIMP=.75:TIMP=.75]
       [SLP=2.00:DT= 1.00]
       [LOSS= 2 :CN= 77.0]
  001:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
      ROUTE RESERVOIR -> 01:235            6.19     .577 No_date    1:30   19.54
       [RDT= 1.00] out<- 02:540            6.19     .025 No_date    4:03   19.54
      {MxStoUsed=.1011E+00}
 #****************************************************************************
 #****************************************************************************
  001:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
      DESIGN STANDHYD    01:255            4.10     .393 No_date    1:30   19.54
       [XIMP=.75:TIMP=.75]
       [SLP=2.00:DT= 1.00]
       [LOSS= 2 :CN= 77.0]
  001:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
      ROUTE RESERVOIR -> 01:255            4.10     .393 No_date    1:30   19.54
       [RDT= 1.00] out<- 02:550            4.10     .019 No_date    4:02   19.54
      {MxStoUsed=.6531E-01}
   ** END OF RUN :   1

 *****************************************************************************





  RUN:COMMAND#
  002:0001--------------------------------------------------------------------
      START
       [TZERO =    .00 hrs on        0]
       [METOUT=   2    (1=imperial, 2=metric output)]
       [NSTORM=   1 ]
       [NRUN  =   2 ]
 #****************************************************************************
 #  Project Name: [Mayfield Road EA - Airport Road to Coleraine Dr]    Project N
 #  Date        : October, 2012
 #  Modeller    : [J. Innes]
 #  Company     : Stantec Consulting Ltd. (Kitchener)
 #  License #   :  4730904
 #
 #  This hydrologic analysis was prepared to determine the proposed flows from
 #  from the site.
 #****************************************************************************
  002:0002--------------------------------------------------------------------
      READ STORM
       Filename = STORM.001
       Comment  =
       [SDT=15.00:SDUR=   6.25:PTOT=  36.00]
 #
 #
 #****************************************************************************
 #
 #  Existing Conditions
 #
 #  Existing Conditions Flow Release Criteria was based on the following:
 #  TRCA - Humber River Stormwater Management Quantity Control Release Rate Crit
 #  Study Area is located within Basin F of the Humber River Subwateshed
 #
 #****************************************************************************
 #****************************************************************************
 #
 #  Proposed Conditions
 #
 #  Proposed catchments to SWM facilities based on an average 75% impervious
 #  within 45m-wide roadway corridor.
 #
 #****************************************************************************
 #****************************************************************************
 #****************************************************************************
  002:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
      DESIGN STANDHYD    01:200            3.06     .224 No_date    2:45   29.10
       [XIMP=.75:TIMP=.75]
       [SLP=2.00:DT= 1.00]
       [LOSS= 2 :CN= 77.0]
 #****************************************************************************
 #****************************************************************************
  002:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
      ROUTE RESERVOIR -> 01:200            3.06     .224 No_date    2:45   29.10
       [RDT= 1.00] out<- 02:510            3.06     .025 No_date    3:59   29.09
      {MxStoUsed=.7034E-01}
 #****************************************************************************
 #****************************************************************************
  002:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
      DESIGN STANDHYD    01:225            3.89     .284 No_date    2:45   29.10
       [XIMP=.75:TIMP=.75]
       [SLP=2.00:DT= 1.00]
       [LOSS= 2 :CN= 77.0]
  002:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
      ROUTE RESERVOIR -> 01:225            3.89     .284 No_date    2:45   29.10
       [RDT= 1.00] out<- 02:520            3.89     .030 No_date    4:08   29.09
      {MxStoUsed=.8912E-01}
 #****************************************************************************
 #****************************************************************************
  002:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
      DESIGN STANDHYD    01:230            3.06     .224 No_date    2:45   29.10
       [XIMP=.75:TIMP=.75]
       [SLP=2.00:DT= 1.00]
       [LOSS= 2 :CN= 77.0]
  002:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
      ROUTE RESERVOIR -> 01:230            3.06     .224 No_date    2:45   29.10
       [RDT= 1.00] out<- 02:530            3.06     .027 No_date    3:55   29.09
      {MxStoUsed=.6946E-01}
 #****************************************************************************
 #****************************************************************************
  002:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
      DESIGN STANDHYD    01:235            6.19     .450 No_date    2:45   29.10
       [XIMP=.75:TIMP=.75]
       [SLP=2.00:DT= 1.00]
       [LOSS= 2 :CN= 77.0]
  002:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
      ROUTE RESERVOIR -> 01:235            6.19     .450 No_date    2:45   29.10
       [RDT= 1.00] out<- 02:540            6.19     .045 No_date    4:17   29.09
      {MxStoUsed=.1427E+00}
 #****************************************************************************
 #****************************************************************************
  002:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
      DESIGN STANDHYD    01:255            4.10     .299 No_date    2:45   29.10
       [XIMP=.75:TIMP=.75]
       [SLP=2.00:DT= 1.00]
       [LOSS= 2 :CN= 77.0]
  002:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
      ROUTE RESERVOIR -> 01:255            4.10     .299 No_date    2:45   29.10
       [RDT= 1.00] out<- 02:550            4.10     .035 No_date    3:57   29.09
      {MxStoUsed=.9210E-01}
```

```
  ** END OF RUN :   2

*******************************************************************************






 RUN:COMMAND#
 003:0001------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   3 ]
#******************************************************************************
#  Project Name: [Mayfield Road EA - Airport Road to Coleraine Dr]    Project N
#  Date        : October, 2012
#  Modeller    : [J. Innes]
#  Company     : Stantec Consulting Ltd. (Kitchener)
#  License #   :  4730904
#
#  This hydrologic analysis was prepared to determine the proposed flows from
#  from the site.
#******************************************************************************
 003:0002------------------------------------------------------------------------
     READ STORM
      Filename = STORM.001
      Comment  =
      [SDT=15.00:SDUR=   6.25:PTOT=  47.81]
#
#
#******************************************************************************
#
#  Existing Conditions
#
#  Existing Conditions Flow Release Criteria was based on the following:
#  TRCA - Humber River Stormwater Management Quantity Control Release Rate Crit
#  Study Area is located within Basin F of the Humber River Subwateshed
#
#******************************************************************************
#******************************************************************************
#
#  Proposed Conditions
#
#  Proposed catchments to SWM facilities based on an average 75% impervious
#  within 45m-wide roadway corridor.
#
#******************************************************************************
#******************************************************************************
#******************************************************************************
 003:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:200            3.06     .306 No_date    2:45   39.65
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
#******************************************************************************
#******************************************************************************
 003:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:200            3.06     .306 No_date    2:45   39.65
      [RDT= 1.00] out<- 02:510            3.06     .041 No_date    3:50   39.64
     {MxStoUsed=.9196E-01}
#******************************************************************************
#******************************************************************************
 003:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:225            3.89     .389 No_date    2:45   39.65
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 003:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:225            3.89     .389 No_date    2:45   39.65
      [RDT= 1.00] out<- 02:520            3.89     .040 No_date    4:10   39.64
     {MxStoUsed=.1210E+00}
#******************************************************************************
#******************************************************************************
 003:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:230            3.06     .306 No_date    2:45   39.65
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 003:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:230            3.06     .306 No_date    2:45   39.65
      [RDT= 1.00] out<- 02:530            3.06     .040 No_date    3:51   39.64
     {MxStoUsed=.9147E-01}
#******************************************************************************
#******************************************************************************
 003:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:235            6.19     .616 No_date    2:45   39.65
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 003:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:235            6.19     .616 No_date    2:45   39.65
      [RDT= 1.00] out<- 02:540            6.19     .057 No_date    4:18   39.64
     {MxStoUsed=.1954E+00}
#******************************************************************************
#******************************************************************************
 003:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:255            4.10     .409 No_date    2:45   39.65
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 003:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:255            4.10     .409 No_date    2:45   39.65
      [RDT= 1.00] out<- 02:550            4.10     .043 No_date    4:04   39.64
     {MxStoUsed=.1259E+00}
  ** END OF RUN :   3

*******************************************************************************






 RUN:COMMAND#
 004:0001------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   4 ]
#******************************************************************************
#  Project Name: [Mayfield Road EA - Airport Road to Coleraine Dr]    Project N
#  Date        : October, 2012
#  Modeller    : [J. Innes]
#  Company     : Stantec Consulting Ltd. (Kitchener)
#  License #   :  4730904
#
#  This hydrologic analysis was prepared to determine the proposed flows from
#  from the site.
#******************************************************************************
 004:0002------------------------------------------------------------------------
     READ STORM
      Filename = STORM.001
      Comment  =
      [SDT=15.00:SDUR=   6.25:PTOT=  55.69]
#
#
#******************************************************************************
#
#  Existing Conditions
#
#  Existing Conditions Flow Release Criteria was based on the following:
#  TRCA - Humber River Stormwater Management Quantity Control Release Rate Crit
#  Study Area is located within Basin F of the Humber River Subwateshed
#
#******************************************************************************
#******************************************************************************
#
#  Proposed Conditions
#
#  Proposed catchments to SWM facilities based on an average 75% impervious
#  within 45m-wide roadway corridor.
#
#******************************************************************************
#******************************************************************************
#******************************************************************************
 004:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:200            3.06     .362 No_date    2:45   46.81
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
#******************************************************************************
#******************************************************************************
 004:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:200            3.06     .362 No_date    2:45   46.81
      [RDT= 1.00] out<- 02:510            3.06     .046 No_date    3:51   46.81
     {MxStoUsed=.1082E+00}
#******************************************************************************
#******************************************************************************
 004:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:225            3.89     .460 No_date    2:45   46.81
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 004:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:225            3.89     .460 No_date    2:45   46.81
      [RDT= 1.00] out<- 02:520            3.89     .046 No_date    4:15   46.80
     {MxStoUsed=.1430E+00}
#******************************************************************************
#******************************************************************************
 004:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:230            3.06     .362 No_date    2:45   46.81
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 004:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:230            3.06     .362 No_date    2:45   46.81
      [RDT= 1.00] out<- 02:530            3.06     .045 No_date    3:52   46.81
     {MxStoUsed=.1083E+00}
#******************************************************************************
#******************************************************************************
 004:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:235            6.19     .730 No_date    2:45   46.81
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 004:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:235            6.19     .730 No_date    2:45   46.81
      [RDT= 1.00] out<- 02:540            6.19     .065 No_date    4:18   46.81
     {MxStoUsed=.2319E+00}
#******************************************************************************
#******************************************************************************
 004:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:255            4.10     .485 No_date    2:45   46.81
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 004:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:255            4.10     .485 No_date    2:45   46.81
      [RDT= 1.00] out<- 02:550            4.10     .049 No_date    4:10   46.81
     {MxStoUsed=.1495E+00}
  ** END OF RUN :   4

*******************************************************************************






 RUN:COMMAND#
 005:0001------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   5 ]
#******************************************************************************
#  Project Name: [Mayfield Road EA - Airport Road to Coleraine Dr]    Project N
#  Date        : October, 2012
#  Modeller    : [J. Innes]
#  Company     : Stantec Consulting Ltd. (Kitchener)
#  License #   :  4730904
#
#  This hydrologic analysis was prepared to determine the proposed flows from
#  from the site.
#******************************************************************************
 005:0002------------------------------------------------------------------------
     READ STORM
      Filename = STORM.001
      Comment  =
      [SDT=15.00:SDUR=   6.25:PTOT=  65.59]
#
#
#******************************************************************************
#
#  Existing Conditions
#
#  Existing Conditions Flow Release Criteria was based on the following:
#  TRCA - Humber River Stormwater Management Quantity Control Release Rate Crit
#  Study Area is located within Basin F of the Humber River Subwateshed
#
#******************************************************************************
#******************************************************************************
#
#  Proposed Conditions
#
#  Proposed catchments to SWM facilities based on an average 75% impervious
#  within 45m-wide roadway corridor.
#
#******************************************************************************
#******************************************************************************
#******************************************************************************
 005:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:200            3.06     .435 No_date    2:45   55.93
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
#******************************************************************************
#******************************************************************************
```

```
 005:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:200            3.06     .435 No_date    2:45   55.93
      [RDT= 1.00] out<- 02:510            3.06     .052 No_date    3:52   55.93
     {MxStoUsed=.1298E+00}
#*****************************************************************************
#*****************************************************************************
 005:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:225            3.89     .553 No_date    2:45   55.93
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 005:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:225            3.89     .553 No_date    2:45   55.93
      [RDT= 1.00] out<- 02:520            3.89     .051 No_date    4:17   55.92
     {MxStoUsed=.1724E+00}
#*****************************************************************************
#*****************************************************************************
 005:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:230            3.06     .435 No_date    2:45   55.93
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 005:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:230            3.06     .435 No_date    2:45   55.93
      [RDT= 1.00] out<- 02:530            3.06     .050 No_date    3:53   55.93
     {MxStoUsed=.1303E+00}
#*****************************************************************************
#*****************************************************************************
 005:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:235            6.19     .876 No_date    2:45   55.93
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 005:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:235            6.19     .876 No_date    2:45   55.93
      [RDT= 1.00] out<- 02:540            6.19     .075 No_date    4:18   55.93
     {MxStoUsed=.2784E+00}
#*****************************************************************************
#*****************************************************************************
 005:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:255            4.10     .582 No_date    2:45   55.93
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 005:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:255            4.10     .582 No_date    2:45   55.93
      [RDT= 1.00] out<- 02:550            4.10     .056 No_date    4:15   55.93
     {MxStoUsed=.1797E+00}
  ** END OF RUN :   5

******************************************************************************






 RUN:COMMAND#
 006:0001------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   6 ]
#*****************************************************************************
#  Project Name: [Mayfield Road EA - Airport Road to Coleraine Dr]    Project N
#  Date        : October, 2012
#  Modeller    : [J. Innes]
#  Company     : Stantec Consulting Ltd. (Kitchener)
#  License #   :  4730904
#
#  This hydrologic analysis was prepared to determine the proposed flows from
#  from the site.
#*****************************************************************************
 006:0002------------------------------------------------------------------------
     READ STORM
      Filename = STORM.001
      Comment  =
      [SDT=15.00:SDUR=   6.25:PTOT=  73.00]
#
#
#*****************************************************************************
#
#  Existing Conditions
#
#  Existing Conditions Flow Release Criteria was based on the following:
#  TRCA - Humber River Stormwater Management Quantity Control Release Rate Crit
#  Study Area is located within Basin F of the Humber River Subwateshed
#
#*****************************************************************************
#*****************************************************************************
#
#  Proposed Conditions
#
#  Proposed catchments to SWM facilities based on an average 75% impervious
#  within 45m-wide roadway corridor.
#
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
 006:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:200            3.06     .491 No_date    2:45   62.82
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
#*****************************************************************************
#*****************************************************************************
 006:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:200            3.06     .491 No_date    2:45   62.82
      [RDT= 1.00] out<- 02:510            3.06     .057 No_date    3:52   62.82
     {MxStoUsed=.1463E+00}
#*****************************************************************************
#*****************************************************************************
 006:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:225            3.89     .623 No_date    2:45   62.82
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 006:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:225            3.89     .623 No_date    2:45   62.82
      [RDT= 1.00] out<- 02:520            3.89     .054 No_date    4:17   62.81
     {MxStoUsed=.1949E+00}
#*****************************************************************************
#*****************************************************************************
 006:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:230            3.06     .491 No_date    2:45   62.82
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 006:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:230            3.06     .491 No_date    2:45   62.82
      [RDT= 1.00] out<- 02:530            3.06     .055 No_date    3:54   62.82
     {MxStoUsed=.1469E+00}
#*****************************************************************************
#*****************************************************************************
 006:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:235            6.19     .987 No_date    2:45   62.82
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 006:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:235            6.19     .987 No_date    2:45   62.82
  *   [RDT= 1.00] out<- 02:540            6.19     .082 No_date    4:19   62.82
     {MxStoUsed=.3135E+00}
#*****************************************************************************
#*****************************************************************************
 006:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:255            4.10     .655 No_date    2:45   62.82
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 006:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:255            4.10     .655 No_date    2:45   62.82
      [RDT= 1.00] out<- 02:550            4.10     .062 No_date    4:16   62.82
     {MxStoUsed=.2026E+00}
  ** END OF RUN :   6

******************************************************************************






 RUN:COMMAND#
 007:0001------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   7 ]
#*****************************************************************************
#  Project Name: [Mayfield Road EA - Airport Road to Coleraine Dr]    Project N
#  Date        : October, 2012
#  Modeller    : [J. Innes]
#  Company     : Stantec Consulting Ltd. (Kitchener)
#  License #   :  4730904
#
#  This hydrologic analysis was prepared to determine the proposed flows from
#  from the site.
#*****************************************************************************
 007:0002------------------------------------------------------------------------
     READ STORM
      Filename = STORM.001
      Comment  =
      [SDT=15.00:SDUR=   6.25:PTOT=  80.31]
#
#
#*****************************************************************************
#
#  Existing Conditions
#
#  Existing Conditions Flow Release Criteria was based on the following:
#  TRCA - Humber River Stormwater Management Quantity Control Release Rate Crit
#  Study Area is located within Basin F of the Humber River Subwateshed
#
#*****************************************************************************
#*****************************************************************************
#
#  Proposed Conditions
#
#  Proposed catchments to SWM facilities based on an average 75% impervious
#  within 45m-wide roadway corridor.
#
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
 007:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:200            3.06     .545 No_date    2:45   69.67
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
#*****************************************************************************
#*****************************************************************************
 007:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:200            3.06     .545 No_date    2:45   69.67
      [RDT= 1.00] out<- 02:510            3.06     .062 No_date    3:53   69.66
     {MxStoUsed=.1626E+00}
#*****************************************************************************
#*****************************************************************************
 007:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:225            3.89     .692 No_date    2:45   69.67
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 007:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:225            3.89     .692 No_date    2:45   69.67
      [RDT= 1.00] out<- 02:520            3.89     .058 No_date    4:17   69.66
     {MxStoUsed=.2174E+00}
#*****************************************************************************
#*****************************************************************************
 007:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:230            3.06     .545 No_date    2:45   69.67
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 007:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:230            3.06     .545 No_date    2:45   69.67
      [RDT= 1.00] out<- 02:530            3.06     .059 No_date    3:56   69.67
     {MxStoUsed=.1635E+00}
#*****************************************************************************
#*****************************************************************************
 007:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:235            6.19    1.099 No_date    2:45   69.67
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 007:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:235            6.19    1.099 No_date    2:45   69.67
  *   [RDT= 1.00] out<- 02:540            6.19     .090 No_date    4:19   69.67
     {MxStoUsed=.3485E+00}
#*****************************************************************************
#*****************************************************************************
 007:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     DESIGN STANDHYD    01:255            4.10     .729 No_date    2:45   69.67
      [XIMP=.75:TIMP=.75]
      [SLP=2.00:DT= 1.00]
      [LOSS= 2 :CN= 77.0]
 007:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-
     ROUTE RESERVOIR -> 01:255            4.10     .729 No_date    2:45   69.67
  *   [RDT= 1.00] out<- 02:550            4.10     .067 No_date    4:16   69.67
     {MxStoUsed=.2254E+00}
 007:0002------------------------------------------------------------------------
      FINISH
-------------------------------------------------------------------------------
******************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
 006:0010 ROUTE RESERVOIR
     *** WARNING: STORAGE-Q values were extrapolated.
                  Increase curve or use overflow option.
     *** WARNING: STORAGE-Q values were extrapolated.
```

```
                   Increase curve or use overflow option.
 007:0012 ROUTE RESERVOIR
      *** WARNING: STORAGE-Q values were extrapolated.
                   Increase curve or use overflow option.
   Simulation ended on 2012-10-15     at 13:40:47
================================================================================
```

APPENDIX C

Hydraulic Model Files

Culvert Design Report
Station 10+425 - Ex

Peak Discharge Method: User-Specified			
Design Discharge	0.5660 m^3/s	Check Discharge	0.7510 m^3/s

Grades Model: Inverts			
Invert Upstream	230.01 m	Invert Downstream	229.83 m
Length	19.60 m	Slope	0.009184 m/m
Drop	0.18 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	231.75 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	230.55 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-1200 mm Circular	0.5660 m^3/s	230.68 m	0.79 m/s
	Trial-2	1-1200 mm Circular	0.7510 m^3/s	230.77 m	1.05 m/s

Culvert Design Report
Station 10+425 - Ex

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	231.75 m	Storm Event	Design
Computed Headwater Elevation	230.68 m	Discharge	0.5660 m^3/s
Headwater Depth/Height	0.55	Tailwater Elevation	230.55 m
Inlet Control HW Elev.	230.58 m	Control Type	Outlet Control
Outlet Control HW Elev.	230.68 m		

Grades			
Upstream Invert	230.01 m	Downstream Invert	229.83 m
Length	19.60 m	Constructed Slope	0.009184 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.72 m
Slope Type	Mild	Normal Depth	0.43 m
Flow Regime	Subcritical	Critical Depth	0.40 m
Velocity Downstream	0.79 m/s	Critical Slope	0.012083 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.22 m
Section Size	1200 mm	Rise	1.22 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	230.68 m	Upstream Velocity Head	0.06 m
Ke	0.90	Entrance Loss	0.05 m

Inlet Control Properties			
Inlet Control HW Elev.	230.58 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	1.2 m^2
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 10+425 - Ex

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	231.75 m	Storm Event	Check
Computed Headwater Elevation	230.77 m	Discharge	0.7510 m^3/s
Headwater Depth/Height	0.62	Tailwater Elevation	230.55 m
Inlet Control HW Elev.	230.69 m	Control Type	Outlet Control
Outlet Control HW Elev.	230.77 m		

Grades			
Upstream Invert	230.01 m	Downstream Invert	229.83 m
Length	19.60 m	Constructed Slope	0.009184 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.72 m
Slope Type	Mild	Normal Depth	0.50 m
Flow Regime	Subcritical	Critical Depth	0.46 m
Velocity Downstream	1.05 m/s	Critical Slope	0.012253 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.22 m
Section Size	1200 mm	Rise	1.22 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	230.77 m	Upstream Velocity Head	0.10 m
Ke	0.90	Entrance Loss	0.09 m

Inlet Control Properties			
Inlet Control HW Elev.	230.69 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	1.2 m^2
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 10+689 - Ex

Peak Discharge Method: User-Specified			
Design Discharge	1.8500 m^3/s	Check Discharge	2.4840 m^3/s

Grades Model: Inverts			
Invert Upstream	225.81 m	Invert Downstream	225.64 m
Length	30.60 m	Slope	0.005556 m/m
Drop	0.17 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	229.26 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	226.72 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-1590 x 2490 mm Horiz Ellipse	1.8500 m^3/s	226.80 m	0.79 m/s
	Trial-2	1-1590 x 2490 mm Horiz Ellipse	2.4840 m^3/s	226.86 m	1.06 m/s

Culvert Design Report
Station 10+689 - Ex

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	229.26 m	Storm Event	Design
Computed Headwater Elevation	226.80 m	Discharge	1.8500 m³/s
Headwater Depth/Height	0.62	Tailwater Elevation	226.72 m
Inlet Control HW Elev.	226.72 m	Control Type	Outlet Control
Outlet Control HW Elev.	226.80 m		

Grades			
Upstream Invert	225.81 m	Downstream Invert	225.64 m
Length	30.60 m	Constructed Slope	0.005556 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	1.08 m
Slope Type	Mild	Normal Depth	0.62 m
Flow Regime	Subcritical	Critical Depth	0.54 m
Velocity Downstream	0.79 m/s	Critical Slope	0.009528 m/m

Section			
Section Shape	Horizontal Ellipse	Mannings Coefficient	0.024
Section Material	Concrete	Span	2.49 m
Section Size	1590 x 2490 mm	Rise	1.59 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	226.80 m	Upstream Velocity Head	0.05 m
Ke	0.50	Entrance Loss	0.02 m

Inlet Control Properties			
Inlet Control HW Elev.	226.72 m	Flow Control	N/A
Inlet Type	Square edge with headwall (horizontal ellipse)	Area Full	3.2 m²
K	0.01000	HDS 5 Chart	29
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Culvert Design Report
Station 10+689 - Ex

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	229.26 m	Storm Event	Check
Computed Headwater Elevation	226.86 m	Discharge	2.4840 m³/s
Headwater Depth/Height	0.66	Tailwater Elevation	226.72 m
Inlet Control HW Elev.	226.72 m	Control Type	Outlet Control
Outlet Control HW Elev.	226.86 m		

Grades			
Upstream Invert	225.81 m	Downstream Invert	225.64 m
Length	30.60 m	Constructed Slope	0.005556 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	1.08 m
Slope Type	Mild	Normal Depth	0.73 m
Flow Regime	Subcritical	Critical Depth	0.63 m
Velocity Downstream	1.06 m/s	Critical Slope	0.009386 m/m

Section			
Section Shape	Horizontal Ellipse	Mannings Coefficient	0.024
Section Material	Concrete	Span	2.49 m
Section Size	1590 x 2490 mm	Rise	1.59 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	226.86 m	Upstream Velocity Head	0.08 m
Ke	0.50	Entrance Loss	0.04 m

Inlet Control Properties			
Inlet Control HW Elev.	226.72 m	Flow Control	N/A
Inlet Type	Square edge with headwall (horizontal ellipse)	Area Full	3.2 m²
K	0.01000	HDS 5 Chart	29
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Culvert Design Report
Station 11+603 - Ex

Peak Discharge Method: User-Specified			
Design Discharge	0.3040 m³/s	Check Discharge	0.4200 m³/s

Grades Model: Inverts			
Invert Upstream	225.96 m	Invert Downstream	225.83 m
Length	21.50 m	Slope	0.006047 m/m
Drop	0.13 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	228.79 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	226.55 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-1200 mm Circular	0.3040 m³/s	226.59 m	0.42 m/s
	Trial-2	1-1200 mm Circular	0.4200 m³/s	226.62 m	0.59 m/s

Culvert Design Report
Station 11+603 - Ex

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	228.79 m	Storm Event	Design
Computed Headwater Elevation	226.59 m	Discharge	0.3040 m³/s
Headwater Depth/Height	0.51	Tailwater Elevation	226.55 m
Inlet Control HW Elev.	226.55 m	Control Type	Outlet Control
Outlet Control HW Elev.	226.59 m		

Grades			
Upstream Invert	225.96 m	Downstream Invert	225.83 m
Length	21.50 m	Constructed Slope	0.006047 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.72 m
Slope Type	Mild	Normal Depth	0.35 m
Flow Regime	Subcritical	Critical Depth	0.29 m
Velocity Downstream	0.42 m/s	Critical Slope	0.012170 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.22 m
Section Size	1200 mm	Rise	1.22 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	226.59 m	Upstream Velocity Head	0.01 m
Ke	0.90	Entrance Loss	0.01 m

Inlet Control Properties			
Inlet Control HW Elev.	226.55 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	1.2 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 11+603 - Ex

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	228.79 m	Storm Event	Check
Computed Headwater Elevation	226.62 m	Discharge	0.4200 m³/s
Headwater Depth/Height	0.54	Tailwater Elevation	226.55 m
Inlet Control HW Elev.	226.55 m	Control Type	Outlet Control
Outlet Control HW Elev.	226.62 m		

Grades			
Upstream Invert	225.96 m	Downstream Invert	225.83 m
Length	21.50 m	Constructed Slope	0.006047 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.72 m
Slope Type	Mild	Normal Depth	0.41 m
Flow Regime	Subcritical	Critical Depth	0.34 m
Velocity Downstream	0.59 m/s	Critical Slope	0.012064 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.22 m
Section Size	1200 mm	Rise	1.22 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	226.62 m	Upstream Velocity Head	0.03 m
Ke	0.90	Entrance Loss	0.02 m

Inlet Control Properties			
Inlet Control HW Elev.	226.55 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	1.2 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Analysis Report
Station 11+800 and 11+812 - Ex check

Analysis Component			
Storm Event	Check	Discharge	11.2880 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	8.4300 m³/s	Check Discharge	11.2880 m³/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	222.02 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-750 mm Circular	0.7732 m³/s	222.61 m	1.89 m/s
Culvert-2	1-3660 x 1830 mm Box	10.5162 m³/s	222.61 m	2.61 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	222.61 m	N/A
Total	----------------	11.2894 m³/s	222.61 m	N/A

Culvert Analysis Report
Station 11+800 and 11+812 - Ex check

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	222.61 m	Discharge	0.7732 m³/s
Inlet Control HW Elev.	222.55 m	Tailwater Elevation	222.02 m
Outlet Control HW Elev.	222.61 m	Control Type	Outlet Control
Headwater Depth/Height	1.34		

Grades			
Upstream Invert	221.59 m	Downstream Invert	221.38 m
Length	20.60 m	Constructed Slope	0.010194 m/m

Hydraulic Profile			
Profile	M2	Depth, Downstream	0.64 m
Slope Type	Mild	Normal Depth	N/A m
Flow Regime	Subcritical	Critical Depth	0.54 m
Velocity Downstream	1.89 m/s	Critical Slope	0.020570 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.76 m
Section Size	750 mm	Rise	0.76 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	222.61 m	Upstream Velocity Head	0.15 m
Ke	0.90	Entrance Loss	0.13 m

Inlet Control Properties			
Inlet Control HW Elev.	222.55 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.5 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Analysis Report
Station 11+800 and 11+812 - Ex check

Component:Culvert-2

Culvert Summary			
Computed Headwater Elevation	222.61 m	Discharge	10.5162 m³/s
Inlet Control HW Elev.	222.53 m	Tailwater Elevation	222.02 m
Outlet Control HW Elev.	222.61 m	Control Type	Outlet Control
Headwater Depth/Height	0.93		

Grades			
Upstream Invert	220.91 m	Downstream Invert	220.92 m
Length	29.40 m	Constructed Slope	-0.000340 m/m

Hydraulic Profile			
Profile	A2	Depth, Downstream	1.10 m
Slope Type	Adverse	Normal Depth	N/A m
Flow Regime	Subcritical	Critical Depth	0.94 m
Velocity Downstream	2.61 m/s	Critical Slope	0.002943 m/m

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	3.66 m
Section Size	3660 x 1830 mm	Rise	1.83 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	222.61 m	Upstream Velocity Head	0.28 m
Ke	0.70	Entrance Loss	0.20 m

Inlet Control Properties			
Inlet Control HW Elev.	222.53 m	Flow Control	N/A
Inlet Type	0° wingwall flares	Area Full	6.7 m²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Analysis Report
Station 11+800 and 11+812 - Ex check

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)					
Discharge	0.0000	m³/s	Allowable HW Elevation	222.61	m
Roadway Width	10.00	m	Overtopping Coefficient	1.60	SI
Length	50.00	m	Crest Elevation	223.41	m
Headwater Elevation	N/A	m	Discharge Coefficient (Cr)	2.90	
Submergence Factor (Kt)	1.00				

Sta (m)	Elev. (m)
0.00	223.41
50.00	223.41

Culvert Analysis Report
Station 11+800 and 11+812 - Ex design

Analysis Component					
Storm Event	Design		Discharge	8.4300	m³/s

Peak Discharge Method: User-Specified					
Design Discharge	8.4300	m³/s	Check Discharge	11.2880	m³/s

Tailwater Conditions: Constant Tailwater		
Tailwater Elevation	222.02	m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-750 mm Circular	0.5376 m³/s	222.37 m	1.31 m/s
Culvert-2	1-3660 x 1830 mm Box	7.8925 m³/s	222.37 m	1.96 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	222.37 m	N/A
Total	----------------	8.4300 m³/s	222.37 m	N/A

Culvert Analysis Report
Station 11+800 and 11+812 - Ex design

Component:Culvert-1

Culvert Summary					
Computed Headwater Elevation	222.37	m	Discharge	0.5376	m³/s
Inlet Control HW Elev.	222.32	m	Tailwater Elevation	222.02	m
Outlet Control HW Elev.	222.37	m	Control Type	Outlet Control	
Headwater Depth/Height	1.02				

Grades					
Upstream Invert	221.59	m	Downstream Invert	221.38	m
Length	20.60	m	Constructed Slope	0.010194	m/m

Hydraulic Profile					
Profile	M1		Depth, Downstream	0.64	m
Slope Type	Mild		Normal Depth	0.54	m
Flow Regime	Subcritical		Critical Depth	0.45	m
Velocity Downstream	1.31	m/s	Critical Slope	0.016942	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.76	m
Section Size	750 mm		Rise	0.76	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	222.37	m	Upstream Velocity Head	0.11	m
Ke	0.90		Entrance Loss	0.10	m

Inlet Control Properties					
Inlet Control HW Elev.	222.32	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.5	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Analysis Report
Station 11+800 and 11+812 - Ex design

Component:Culvert-2

Culvert Summary					
Computed Headwater Elevation	222.37	m	Discharge	7.8925	m³/s
Inlet Control HW Elev.	222.25	m	Tailwater Elevation	222.02	m
Outlet Control HW Elev.	222.37	m	Control Type	Outlet Control	
Headwater Depth/Height	0.80				

Grades					
Upstream Invert	220.91	m	Downstream Invert	220.92	m
Length	29.40	m	Constructed Slope	-0.000340	m/m

Hydraulic Profile					
Profile	A2		Depth, Downstream	1.10	m
Slope Type	Adverse		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.78	m
Velocity Downstream	1.96	m/s	Critical Slope	0.002891	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.66	m
Section Size	3660 x 1830 mm		Rise	1.83	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	222.37	m	Upstream Velocity Head	0.18	m
Ke	0.70		Entrance Loss	0.12	m

Inlet Control Properties					
Inlet Control HW Elev.	222.25	m	Flow Control	N/A	
Inlet Type	0° wingwall flares		Area Full	6.7	m²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Analysis Report
Station 11+800 and 11+812 - Ex design

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)			
Discharge	0.0000 m³/s	Allowable HW Elevation	222.37 m
Roadway Width	10.00 m	Overtopping Coefficient	1.60 SI
Length	50.00 m	Crest Elevation	223.41 m
Headwater Elevation	N/A m	Discharge Coefficient (Cr)	2.90
Submergence Factor (Kt)	1.00		

Sta (m)	Elev. (m)
0.00	223.41
50.00	223.41

Culvert Design Report
Station 12+300 - Ex

Peak Discharge Method: User-Specified			
Design Discharge	8.2540 m³/s	Check Discharge	11.0730 m³/s

Grades Model: Inverts			
Invert Upstream	217.18 m	Invert Downstream	217.16 m
Length	37.90 m	Slope	0.000528 m/m
Drop	0.02 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	222.88 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	218.33 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-5500 x 1950 mm Box	8.2540 m³/s	218.49 m	1.28 m/s
	Trial-2	1-5500 x 1950 mm Box	11.0730 m³/s	218.61 m	1.72 m/s

Culvert Design Report
Station 12+300 - Ex

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	222.88 m	Storm Event	Design
Computed Headwater Elevation	218.49 m	Discharge	8.2540 m³/s
Headwater Depth/Height	0.67	Tailwater Elevation	218.33 m
Inlet Control HW Elev.	218.33 m	Control Type	Outlet Control
Outlet Control HW Elev.	218.49 m		

Grades			
Upstream Invert	217.18 m	Downstream Invert	217.16 m
Length	37.90 m	Constructed Slope	0.000528 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	1.17 m
Slope Type	Mild	Normal Depth	1.03 m
Flow Regime	Subcritical	Critical Depth	0.61 m
Velocity Downstream	1.28 m/s	Critical Slope	0.002552 m/m

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	5.50 m
Section Size	5500 x 1950 mm	Rise	1.95 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	218.49 m	Upstream Velocity Head	0.08 m
Ke	0.70	Entrance Loss	0.06 m

Inlet Control Properties			
Inlet Control HW Elev.	218.33 m	Flow Control	Unsubmerged
Inlet Type	0° wingwall flares	Area Full	10.7 m²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Design Report
Station 12+300 - Ex

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	222.88 m	Storm Event	Check
Computed Headwater Elevation	218.61 m	Discharge	11.0730 m³/s
Headwater Depth/Height	0.73	Tailwater Elevation	218.33 m
Inlet Control HW Elev.	218.44 m	Control Type	Outlet Control
Outlet Control HW Elev.	218.61 m		

Grades			
Upstream Invert	217.18 m	Downstream Invert	217.16 m
Length	37.90 m	Constructed Slope	0.000528 m/m

Hydraulic Profile			
Profile	M2	Depth, Downstream	1.17 m
Slope Type	Mild	Normal Depth	1.26 m
Flow Regime	Subcritical	Critical Depth	0.74 m
Velocity Downstream	1.72 m/s	Critical Slope	0.002517 m/m

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	5.50 m
Section Size	5500 x 1950 mm	Rise	1.95 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	218.61 m	Upstream Velocity Head	0.15 m
Ke	0.70	Entrance Loss	0.10 m

Inlet Control Properties			
Inlet Control HW Elev.	218.44 m	Flow Control	Unsubmerged
Inlet Type	0° wingwall flares	Area Full	10.7 m²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Design Report
Station 12+500 - Ex

Peak Discharge Method: User-Specified			
Design Discharge	2.6040 m³/s	Check Discharge	3.5540 m³/s

Grades Model: Inverts			
Invert Upstream	218.78 m	Invert Downstream	218.36 m
Length	41.60 m	Slope	0.010096 m/m
Drop	0.42 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	225.30 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	219.44 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-1800 mm Circular	2.6040 m³/s	220.12 m	1.61 m/s
	Trial-2	1-1800 mm Circular	3.5540 m³/s	220.37 m	2.20 m/s

Culvert Design Report
Station 12+500 - Ex

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	225.30 m	Storm Event	Design
Computed Headwater Elevation	220.12 m	Discharge	2.6040 m³/s
Headwater Depth/Height	0.73	Tailwater Elevation	219.44 m
Inlet Control HW Elev.	219.95 m	Control Type	Outlet Control
Outlet Control HW Elev.	220.12 m		

Grades			
Upstream Invert	218.78 m	Downstream Invert	218.36 m
Length	41.60 m	Constructed Slope	0.010096 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	1.08 m
Slope Type	Mild	Normal Depth	0.80 m
Flow Regime	Subcritical	Critical Depth	0.79 m
Velocity Downstream	1.61 m/s	Critical Slope	0.010954 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.83 m
Section Size	1800 mm	Rise	1.83 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	220.12 m	Upstream Velocity Head	0.28 m
Ke	0.90	Entrance Loss	0.25 m

Inlet Control Properties			
Inlet Control HW Elev.	219.95 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	2.6 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 12+500 - Ex

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	225.30 m	Storm Event	Check
Computed Headwater Elevation	220.37 m	Discharge	3.5540 m³/s
Headwater Depth/Height	0.87	Tailwater Elevation	219.44 m
Inlet Control HW Elev.	220.21 m	Control Type	Outlet Control
Outlet Control HW Elev.	220.37 m		

Grades			
Upstream Invert	218.78 m	Downstream Invert	218.36 m
Length	41.60 m	Constructed Slope	0.010096 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	1.08 m
Slope Type	Mild	Normal Depth	0.96 m
Flow Regime	Subcritical	Critical Depth	0.92 m
Velocity Downstream	2.20 m/s	Critical Slope	0.011569 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.83 m
Section Size	1800 mm	Rise	1.83 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	220.37 m	Upstream Velocity Head	0.33 m
Ke	0.90	Entrance Loss	0.30 m

Inlet Control Properties			
Inlet Control HW Elev.	220.21 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	2.6 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 12+787 - Ex

Peak Discharge Method: User-Specified			
Design Discharge	0.0860 m³/s	Check Discharge	0.1200 m³/s

Grades Model: Inverts			
Invert Upstream	227.28 m	Invert Downstream	227.06 m
Length	23.08 m	Slope	0.009532 m/m
Drop	0.22 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	228.30 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	227.42 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-600 mm Circular	0.0860 m³/s	227.58 m	0.48 m/s
	Trial-2	1-600 mm Circular	0.1200 m³/s	227.64 m	0.67 m/s

Culvert Design Report
Station 12+787 - Ex

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	228.30 m	Storm Event	Design
Computed Headwater Elevation	227.58 m	Discharge	0.0860 m³/s
Headwater Depth/Height	0.49	Tailwater Elevation	227.42 m
Inlet Control HW Elev.	227.54 m	Control Type	Outlet Control
Outlet Control HW Elev.	227.58 m		

Grades			
Upstream Invert	227.28 m	Downstream Invert	227.06 m
Length	23.08 m	Constructed Slope	0.009532 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.36 m
Slope Type	Mild	Normal Depth	0.21 m
Flow Regime	Subcritical	Critical Depth	0.19 m
Velocity Downstream	0.48 m/s	Critical Slope	0.015190 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.61 m
Section Size	600 mm	Rise	0.61 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	227.58 m	Upstream Velocity Head	0.05 m
Ke	0.90	Entrance Loss	0.04 m

Inlet Control Properties			
Inlet Control HW Elev.	227.54 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.3 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 12+787 - Ex

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	228.30 m	Storm Event	Check
Computed Headwater Elevation	227.64 m	Discharge	0.1200 m³/s
Headwater Depth/Height	0.59	Tailwater Elevation	227.42 m
Inlet Control HW Elev.	227.60 m	Control Type	Outlet Control
Outlet Control HW Elev.	227.64 m		

Grades			
Upstream Invert	227.28 m	Downstream Invert	227.06 m
Length	23.08 m	Constructed Slope	0.009532 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.36 m
Slope Type	Mild	Normal Depth	0.25 m
Flow Regime	Subcritical	Critical Depth	0.22 m
Velocity Downstream	0.67 m/s	Critical Slope	0.015336 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.61 m
Section Size	600 mm	Rise	0.61 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	227.64 m	Upstream Velocity Head	0.06 m
Ke	0.90	Entrance Loss	0.05 m

Inlet Control Properties			
Inlet Control HW Elev.	227.60 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.3 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 12+927 - Ex

Peak Discharge Method: User-Specified			
Design Discharge	0.2190 m³/s	Check Discharge	0.2950 m³/s

Grades Model: Inverts			
Invert Upstream	227.88 m	Invert Downstream	227.67 m
Length	21.60 m	Slope	0.009722 m/m
Drop	0.21 m		

Headwater Model: Allowable HW/Height	
Headwater Depth/Height	229.74

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	227.94 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-450 mm Circular	0.2190 m³/s	228.44 m	2.09 m/s
	Trial-2	1-450 mm Circular	0.2950 m³/s	228.61 m	2.20 m/s

Culvert Design Report
Station 12+927 - Ex

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	332.92 m	Storm Event	Design
Computed Headwater Elevation	228.44 m	Discharge	0.2190 m³/s
Headwater Depth/Height	1.22	Tailwater Elevation	227.94 m
Inlet Control HW Elev.	228.42 m	Control Type	Entrance Control
Outlet Control HW Elev.	228.44 m		

Grades			
Upstream Invert	227.88 m	Downstream Invert	227.67 m
Length	21.60 m	Constructed Slope	0.009722 m/m

Hydraulic Profile			
Profile	S2	Depth, Downstream	0.28 m
Slope Type	Steep	Normal Depth	0.28 m
Flow Regime	Supercritical	Critical Depth	0.33 m
Velocity Downstream	2.09 m/s	Critical Slope	0.006167 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	Corrugated HDPE (Smooth Interior)	Span	0.46 m
Section Size	450 mm	Rise	0.46 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	228.44 m	Upstream Velocity Head	0.15 m
Ke	0.50	Entrance Loss	0.08 m

Inlet Control Properties			
Inlet Control HW Elev.	228.42 m	Flow Control	N/A
Inlet Type	Square edge w/headwall	Area Full	0.2 m²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Culvert Design Report
Station 12+927 - Ex

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	332.92 m	Storm Event	Check
Computed Headwater Elevation	228.61 m	Discharge	0.2950 m³/s
Headwater Depth/Height	1.59	Tailwater Elevation	227.94 m
Inlet Control HW Elev.	228.61 m	Control Type	Inlet Control
Outlet Control HW Elev.	228.57 m		

Grades			
Upstream Invert	227.88 m	Downstream Invert	227.67 m
Length	21.60 m	Constructed Slope	0.009722 m/m

Hydraulic Profile			
Profile	S2	Depth, Downstream	0.35 m
Slope Type	Steep	Normal Depth	0.35 m
Flow Regime	Supercritical	Critical Depth	0.38 m
Velocity Downstream	2.20 m/s	Critical Slope	0.008242 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	Corrugated HDPE (Smooth Interior)	Span	0.46 m
Section Size	450 mm	Rise	0.46 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	228.57 m	Upstream Velocity Head	0.21 m
Ke	0.50	Entrance Loss	0.11 m

Inlet Control Properties			
Inlet Control HW Elev.	228.61 m	Flow Control	N/A
Inlet Type	Square edge w/headwall	Area Full	0.2 m²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Culvert Design Report
Station 13+763 - Ex

Peak Discharge Method: User-Specified			
Design Discharge	1.1200 m³/s	Check Discharge	1.5400 m³/s

Grades Model: Inverts			
Invert Upstream	221.33 m	Invert Downstream	220.68 m
Length	24.67 m	Slope	0.026348 m/m
Drop	0.65 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	223.13 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	221.31 m

Name	Description	Discharge	HW Elev.	Velocity
x Trial-1	1-1050 mm Circular	1.1200 m³/s	222.39 m	2.04 m/s
Trial-2	1-1050 mm Circular	1.5400 m³/s	222.62 m	2.95 m/s

Culvert Design Report
Station 13+763 - Ex

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	223.13 m	Storm Event	Design
Computed Headwater Elevation	222.39 m	Discharge	1.1200 m³/s
Headwater Depth/Height	0.99	Tailwater Elevation	221.31 m
Inlet Control HW Elev.	222.27 m	Control Type	Entrance Control
Outlet Control HW Elev.	222.39 m		

Grades			
Upstream Invert	221.33 m	Downstream Invert	220.68 m
Length	24.67 m	Constructed Slope	0.026348 m/m

Hydraulic Profile			
Profile	CompositeS1S2	Depth, Downstream	0.63 m
Slope Type	Steep	Normal Depth	0.50 m
Flow Regime	N/A	Critical Depth	0.60 m
Velocity Downstream	2.04 m/s	Critical Slope	0.014598 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.07 m
Section Size	1050 mm	Rise	1.07 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	222.39 m	Upstream Velocity Head	0.24 m
Ke	0.90	Entrance Loss	0.22 m

Inlet Control Properties			
Inlet Control HW Elev.	222.27 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.9 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 13+763 - Ex

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	223.13 m	Storm Event	Check
Computed Headwater Elevation	222.62 m	Discharge	1.5400 m³/s
Headwater Depth/Height	1.21	Tailwater Elevation	221.31 m
Inlet Control HW Elev.	222.52 m	Control Type	Entrance Control
Outlet Control HW Elev.	222.62 m		

Grades			
Upstream Invert	221.33 m	Downstream Invert	220.68 m
Length	24.67 m	Constructed Slope	0.026348 m/m

Hydraulic Profile			
Profile	S2	Depth, Downstream	0.60 m
Slope Type	Steep	Normal Depth	0.60 m
Flow Regime	Supercritical	Critical Depth	0.70 m
Velocity Downstream	2.95 m/s	Critical Slope	0.016705 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.07 m
Section Size	1050 mm	Rise	1.07 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	222.62 m	Upstream Velocity Head	0.31 m
Ke	0.90	Entrance Loss	0.28 m

Inlet Control Properties			
Inlet Control HW Elev.	222.52 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.9 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 13+970 - Ex

Peak Discharge Method: User-Specified			
Design Discharge	1.7410 m^3/s	Check Discharge	2.3400 m^3/s

Grades Model: Inverts			
Invert Upstream	218.71 m	Invert Downstream	217.68 m
Length	30.98 m	Slope	0.033247 m/m
Drop	1.03 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	222.03 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	218.23 m

Name	Description	Discharge	HW Elev.	Velocity
x Trial-1	1-100 mm Circular	1.7410 m^3/s	220.23 m	214.74 m/s
Trial-2	1-100 mm Circular	2.3400 m^3/s	220.97 m	288.63 m/s

Culvert Design Report
Station 13+970 - Ex

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	222.03 m	Storm Event	Design
Computed Headwater Elevation	220.23 m	Discharge	1.7410 m^3/s
Headwater Depth/Height	1.66	Tailwater Elevation	218.23 m
Inlet Control HW Elev.	220.23 m	Control Type	Inlet Control
Outlet Control HW Elev.	220.15 m		

Grades			
Upstream Invert	218.71 m	Downstream Invert	217.68 m
Length	30.98 m	Constructed Slope	0.033247 m/m

Hydraulic Profile			
Profile	PressureProfile	Depth, Downstream	0.49 m
Slope Type	N/A	Normal Depth	N/A m
Flow Regime	N/A	Critical Depth	0.10 m
Velocity Downstream	214.74 m/s	Critical Slope	889.392735 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	Corrugated HDPE (Smooth Interior)	Span	0.10 m
Section Size	100 mm	Rise	0.10 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	220.15 m	Upstream Velocity Head	0.44 m
Ke	0.50	Entrance Loss	0.22 m

Inlet Control Properties			
Inlet Control HW Elev.	220.23 m	Flow Control	N/A
Inlet Type	Square edge w/headwall	Area Full	0.0 m^2
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Culvert Design Report
Station 13+970 - Ex

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	222.03 m	Storm Event	Check
Computed Headwater Elevation	220.97 m	Discharge	2.3400 m^3/s
Headwater Depth/Height	2.47	Tailwater Elevation	218.23 m
Inlet Control HW Elev.	220.97 m	Control Type	Inlet Control
Outlet Control HW Elev.	220.59 m		

Grades			
Upstream Invert	218.71 m	Downstream Invert	217.68 m
Length	30.98 m	Constructed Slope	0.033247 m/m

Hydraulic Profile			
Profile	PressureProfile	Depth, Downstream	0.59 m
Slope Type	N/A	Normal Depth	N/A m
Flow Regime	N/A	Critical Depth	0.10 m
Velocity Downstream	288.63 m/s	Critical Slope	1,606.673942 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	Corrugated HDPE (Smooth Interior)	Span	0.10 m
Section Size	100 mm	Rise	0.10 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	220.59 m	Upstream Velocity Head	0.69 m
Ke	0.50	Entrance Loss	0.34 m

Inlet Control Properties			
Inlet Control HW Elev.	220.97 m	Flow Control	N/A
Inlet Type	Square edge w/headwall	Area Full	0.0 m^2
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Culvert Design Report
Station 14+177 - Ex

Peak Discharge Method: User-Specified			
Design Discharge	2.3020 m^3/s	Check Discharge	3.0640 m^3/s

Grades Model: Inverts			
Invert Upstream	215.92 m	Invert Downstream	214.50 m
Length	30.70 m	Slope	0.046254 m/m
Drop	1.42 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	221.03 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	215.16 m

Name	Description	Discharge	HW Elev.	Velocity
x Trial-1	1-1050 mm Circular	2.3020 m^3/s	217.48 m	5.68 m/s
Trial-2	1-1050 mm Circular	3.0640 m^3/s	218.14 m	6.02 m/s

Culvert Design Report
Station 14+177 - Ex

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	221.03	m	Storm Event	Design	
Computed Headwater Elevation	217.48	m	Discharge	2.3020	m³/s
Headwater Depth/Height	1.46		Tailwater Elevation	215.16	m
Inlet Control HW Elev.	217.48	m	Control Type	Inlet Control	
Outlet Control HW Elev.	217.46	m			

Grades					
Upstream Invert	215.92	m	Downstream Invert	214.50	m
Length	30.70	m	Constructed Slope	0.046254	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.49	m
Slope Type	Steep		Normal Depth	0.43	m
Flow Regime	Supercritical		Critical Depth	0.86	m
Velocity Downstream	5.68	m/s	Critical Slope	0.005762	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	Corrugated HDPE (Smooth Interior)		Span	1.07	m
Section Size	1050 mm		Rise	1.07	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	217.46	m	Upstream Velocity Head	0.46	m
Ke	0.50		Entrance Loss	0.23	m

Inlet Control Properties					
Inlet Control HW Elev.	217.48	m	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	0.9	m²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Design Report
Station 14+177 - Ex

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	221.03	m	Storm Event	Check	
Computed Headwater Elevation	218.14	m	Discharge	3.0640	m³/s
Headwater Depth/Height	2.09		Tailwater Elevation	215.16	m
Inlet Control HW Elev.	218.14	m	Control Type	Inlet Control	
Outlet Control HW Elev.	217.88	m			

Grades					
Upstream Invert	215.92	m	Downstream Invert	214.50	m
Length	30.70	m	Constructed Slope	0.046254	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.59	m
Slope Type	Steep		Normal Depth	0.51	m
Flow Regime	Supercritical		Critical Depth	0.96	m
Velocity Downstream	6.02	m/s	Critical Slope	0.008669	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	Corrugated HDPE (Smooth Interior)		Span	1.07	m
Section Size	1050 mm		Rise	1.07	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	217.88	m	Upstream Velocity Head	0.67	m
Ke	0.50		Entrance Loss	0.33	m

Inlet Control Properties					
Inlet Control HW Elev.	218.14	m	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	0.9	m²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Design Report
Station 15+156 - Ex

Peak Discharge Method: User-Specified					
Design Discharge	9.3960	m³/s	Check Discharge	12.3670	m³/s

Grades Model: Inverts					
Invert Upstream	219.53	m	Invert Downstream	219.62	m
Length	20.70	m	Slope	-0.004348	m/m
Drop	-0.09	m			

Headwater Model: Maximum Allowable HW		
Headwater Elevation	222.48	m

Tailwater Conditions: Constant Tailwater		
Tailwater Elevation	220.37	m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-1220 x 200 mm Box	9.3960 m³/s	220.71 m	38.53 m/s
	Trial-2	1-1220 x 200 mm Box	12.3670 m³/s	220.92 m	50.72 m/s

Culvert Design Report
Station 15+156 - Ex

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	222.48	m	Storm Event	Design	
Computed Headwater Elevation	220.71	m	Discharge	9.3960	m³/s
Headwater Depth/Height	0.95		Tailwater Elevation	220.37	m
Inlet Control HW Elev.	220.70	m	Control Type	Outlet Control	
Outlet Control HW Elev.	220.71	m			

Grades					
Upstream Invert	219.53	m	Downstream Invert	219.62	m
Length	20.70	m	Constructed Slope	-0.004348	m/m

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	0.75	m
Slope Type	N/A		Normal Depth	N/A	m
Flow Regime	N/A		Critical Depth	0.20	m
Velocity Downstream	38.53	m/s	Critical Slope	6.619941	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	1.22	m
Section Size	1220 x 200 mm		Rise	0.20	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	220.71	m	Upstream Velocity Head	0.14	m
Ke	0.70		Entrance Loss	0.10	m

Inlet Control Properties					
Inlet Control HW Elev.	220.70	m	Flow Control	N/A	
Inlet Type	0° wingwall flares		Area Full	0.2	m²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Design Report
Station 15+156 - Ex

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	222.48 m	Storm Event	Check
Computed Headwater Elevation	220.92 m	Discharge	12.3670 m³/s
Headwater Depth/Height	1.11	Tailwater Elevation	220.37 m
Inlet Control HW Elev.	220.92 m	Control Type	Outlet Control
Outlet Control HW Elev.	220.92 m		

Grades			
Upstream Invert	219.53 m	Downstream Invert	219.62 m
Length	20.70 m	Constructed Slope	-0.004348 m/m

Hydraulic Profile			
Profile	PressureProfile	Depth, Downstream	0.76 m
Slope Type	N/A	Normal Depth	N/A m
Flow Regime	N/A	Critical Depth	0.20 m
Velocity Downstream	50.72 m/s	Critical Slope	11.468241 m/m

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	1.22 m
Section Size	1220 x 200 mm	Rise	0.20 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	220.92 m	Upstream Velocity Head	0.19 m
Ke	0.70	Entrance Loss	0.14 m

Inlet Control Properties			
Inlet Control HW Elev.	220.92 m	Flow Control	N/A
Inlet Type	0° wingwall flares	Area Full	0.2 m²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Design Report
Station 15+249 - Ex

Peak Discharge Method: User-Specified			
Design Discharge	0.7740 m³/s	Check Discharge	1.0390 m³/s

Grades Model: Inverts			
Invert Upstream	221.56 m	Invert Downstream	221.33 m
Length	19.70 m	Slope	0.011675 m/m
Drop	0.23 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	223.60 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	222.05 m

Name	Description	Discharge	HW Elev.	Velocity
x Trial-1	1-1200 mm Circular	0.7740 m³/s	222.34 m	1.08 m/s
Trial-2	1-1200 mm Circular	1.0390 m³/s	222.50 m	1.45 m/s

Culvert Design Report
Station 15+249 - Ex

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	223.60 m	Storm Event	Design
Computed Headwater Elevation	222.34 m	Discharge	0.7740 m³/s
Headwater Depth/Height	0.64	Tailwater Elevation	222.05 m
Inlet Control HW Elev.	222.25 m	Control Type	Outlet Control
Outlet Control HW Elev.	222.34 m		

Grades			
Upstream Invert	221.56 m	Downstream Invert	221.33 m
Length	19.70 m	Constructed Slope	0.011675 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.72 m
Slope Type	Mild	Normal Depth	0.48 m
Flow Regime	Subcritical	Critical Depth	0.47 m
Velocity Downstream	1.08 m/s	Critical Slope	0.012282 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.22 m
Section Size	1200 mm	Rise	1.22 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	222.34 m	Upstream Velocity Head	0.14 m
Ke	0.90	Entrance Loss	0.13 m

Inlet Control Properties			
Inlet Control HW Elev.	222.25 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	1.2 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 15+249 - Ex

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	223.60 m	Storm Event	Check
Computed Headwater Elevation	222.50 m	Discharge	1.0390 m³/s
Headwater Depth/Height	0.77	Tailwater Elevation	222.05 m
Inlet Control HW Elev.	222.39 m	Control Type	Outlet Control
Outlet Control HW Elev.	222.50 m		

Grades			
Upstream Invert	221.56 m	Downstream Invert	221.33 m
Length	19.70 m	Constructed Slope	0.011675 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.72 m
Slope Type	Mild	Normal Depth	0.56 m
Flow Regime	Subcritical	Critical Depth	0.55 m
Velocity Downstream	1.45 m/s	Critical Slope	0.012711 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.22 m
Section Size	1200 mm	Rise	1.22 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	222.50 m	Upstream Velocity Head	0.20 m
Ke	0.90	Entrance Loss	0.18 m

Inlet Control Properties			
Inlet Control HW Elev.	222.39 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	1.2 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 15+454 - Ex

Peak Discharge Method: User-Specified			
Design Discharge	0.2240 m^3/s	Check Discharge	0.2990 m^3/s

Grades Model: Inverts			
Invert Upstream	224.00 m	Invert Downstream	223.78 m
Length	20.00 m	Slope	0.011000 m/m
Drop	0.22 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	225.99 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	224.14 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-600 mm Circular	0.2240 m^3/s	224.51 m	1.25 m/s
	Trial-2	1-600 mm Circular	0.2990 m^3/s	224.61 m	1.67 m/s

Culvert Design Report
Station 15+454 - Ex

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	225.99 m	Storm Event	Design
Computed Headwater Elevation	224.51 m	Discharge	0.2240 m^3/s
Headwater Depth/Height	0.84	Tailwater Elevation	224.14 m
Inlet Control HW Elev.	224.47 m	Control Type	Outlet Control
Outlet Control HW Elev.	224.51 m		

Grades			
Upstream Invert	224.00 m	Downstream Invert	223.78 m
Length	20.00 m	Constructed Slope	0.011000 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.36 m
Slope Type	Mild	Normal Depth	0.35 m
Flow Regime	Subcritical	Critical Depth	0.31 m
Velocity Downstream	1.25 m/s	Critical Slope	0.016618 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.61 m
Section Size	600 mm	Rise	0.61 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	224.51 m	Upstream Velocity Head	0.09 m
Ke	0.90	Entrance Loss	0.08 m

Inlet Control Properties			
Inlet Control HW Elev.	224.47 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.3 m^2
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 15+454 - Ex

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	225.99 m	Storm Event	Check
Computed Headwater Elevation	224.61 m	Discharge	0.2990 m^3/s
Headwater Depth/Height	1.00	Tailwater Elevation	224.14 m
Inlet Control HW Elev.	224.57 m	Control Type	Outlet Control
Outlet Control HW Elev.	224.61 m		

Grades			
Upstream Invert	224.00 m	Downstream Invert	223.78 m
Length	20.00 m	Constructed Slope	0.011000 m/m

Hydraulic Profile			
Profile	M2	Depth, Downstream	0.36 m
Slope Type	Mild	Normal Depth	0.42 m
Flow Regime	Subcritical	Critical Depth	0.35 m
Velocity Downstream	1.67 m/s	Critical Slope	0.018073 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.61 m
Section Size	600 mm	Rise	0.61 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	224.61 m	Upstream Velocity Head	0.10 m
Ke	0.90	Entrance Loss	0.09 m

Inlet Control Properties			
Inlet Control HW Elev.	224.57 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.3 m^2
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 15+693 - Ex

Peak Discharge Method: User-Specified			
Design Discharge	0.2620 m^3/s	Check Discharge	0.3920 m^3/s

Grades Model: Inverts			
Invert Upstream	225.08 m	Invert Downstream	224.93 m
Length	18.50 m	Slope	0.008108 m/m
Drop	0.15 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	226.83 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	225.29 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-600 mm Circular	0.2620 m^3/s	225.64 m	1.46 m/s
	Trial-2	1-600 mm Circular	0.3920 m^3/s	225.84 m	1.89 m/s

Culvert Design Report
Station 15+693 - Ex

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	226.83 m	Storm Event	Design
Computed Headwater Elevation	225.64 m	Discharge	0.2620 m³/s
Headwater Depth/Height	0.93	Tailwater Elevation	225.29 m
Inlet Control HW Elev.	225.60 m	Control Type	Outlet Control
Outlet Control HW Elev.	225.64 m		

Grades			
Upstream Invert	225.08 m	Downstream Invert	224.93 m
Length	18.50 m	Constructed Slope	0.008108 m/m

Hydraulic Profile			
Profile	M2	Depth, Downstream	0.36 m
Slope Type	Mild	Normal Depth	0.43 m
Flow Regime	Subcritical	Critical Depth	0.33 m
Velocity Downstream	1.46 m/s	Critical Slope	0.017303 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.61 m
Section Size	600 mm	Rise	0.61 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	225.64 m	Upstream Velocity Head	0.08 m
Ke	0.90	Entrance Loss	0.07 m

Inlet Control Properties			
Inlet Control HW Elev.	225.60 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.3 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 15+693 - Ex

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	226.83 m	Storm Event	Check
Computed Headwater Elevation	225.84 m	Discharge	0.3920 m³/s
Headwater Depth/Height	1.24	Tailwater Elevation	225.29 m
Inlet Control HW Elev.	225.78 m	Control Type	Outlet Control
Outlet Control HW Elev.	225.84 m		

Grades			
Upstream Invert	225.08 m	Downstream Invert	224.93 m
Length	18.50 m	Constructed Slope	0.008108 m/m

Hydraulic Profile			
Profile	M2	Depth, Downstream	0.41 m
Slope Type	Mild	Normal Depth	N/A m
Flow Regime	Subcritical	Critical Depth	0.41 m
Velocity Downstream	1.89 m/s	Critical Slope	0.020495 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.61 m
Section Size	600 mm	Rise	0.61 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	225.84 m	Upstream Velocity Head	0.10 m
Ke	0.90	Entrance Loss	0.09 m

Inlet Control Properties			
Inlet Control HW Elev.	225.78 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.3 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Analysis Report
Station 15+885 and 15+955 - Ex check

Analysis Component			
Storm Event	Check	Discharge	17.4940 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	13.5150 m³/s	Check Discharge	17.4940 m³/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	221.57 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-300 mm Circular	1.4963 m³/s	222.72 m	20.51 m/s
Culvert-2	1-4575 x 1520 mm Box	15.9976 m³/s	222.72 m	3.73 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	222.72 m	N/A
Total	----------------	17.4939 m³/s	222.72 m	N/A

Culvert Analysis Report
Station 15+885 and 15+955 - Ex check

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	222.72 m	Discharge	1.4963 m³/s
Inlet Control HW Elev.	222.63 m	Tailwater Elevation	221.57 m
Outlet Control HW Elev.	222.72 m	Control Type	Outlet Control
Headwater Depth/Height	1.65		

Grades			
Upstream Invert	221.21 m	Downstream Invert	220.29 m
Length	30.30 m	Constructed Slope	0.030363 m/m

Hydraulic Profile			
Profile	PressureProfile	Depth, Downstream	1.28 m
Slope Type	N/A	Normal Depth	N/A m
Flow Regime	N/A	Critical Depth	0.30 m
Velocity Downstream	20.51 m/s	Critical Slope	7.497870 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.30 m
Section Size	300 mm	Rise	0.30 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	222.72 m	Upstream Velocity Head	0.26 m
Ke	0.90	Entrance Loss	0.24 m

Inlet Control Properties			
Inlet Control HW Elev.	222.63 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.1 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Analysis Report
Station 15+885 and 15+955 - Ex check

Component:Culvert-2

Culvert Summary			
Computed Headwater Elevation	222.72 m	Discharge	15.9976 m³/s
Inlet Control HW Elev.	222.57 m	Tailwater Elevation	221.57 m
Outlet Control HW Elev.	222.72 m	Control Type	Entrance Control
Headwater Depth/Height	1.31		

Grades			
Upstream Invert	220.73 m	Downstream Invert	220.62 m
Length	21.65 m	Constructed Slope	0.005081 m/m

Hydraulic Profile			
Profile	S2	Depth, Downstream	0.94 m
Slope Type	Steep	Normal Depth	0.87 m
Flow Regime	Supercritical	Critical Depth	1.08 m
Velocity Downstream	3.73 m/s	Critical Slope	0.002704 m/m

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	4.57 m
Section Size	4575 x 1520 mm	Rise	1.52 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	222.72 m	Upstream Velocity Head	0.54 m
Ke	0.70	Entrance Loss	0.38 m

Inlet Control Properties			
Inlet Control HW Elev.	222.57 m	Flow Control	N/A
Inlet Type	0° wingwall flares	Area Full	7.0 m²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Analysis Report
Station 15+885 and 15+955 - Ex check

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)			
Discharge	0.0000 m³/s	Allowable HW Elevation	222.72 m
Roadway Width	10.00 m	Overtopping Coefficient	1.60 SI
Length	50.00 m	Crest Elevation	223.28 m
Headwater Elevation	N/A m	Discharge Coefficient (Cr)	2.90
Submergence Factor (Kt)	1.00		

Sta (m)	Elev. (m)
0.00	223.28
50.00	223.28

Culvert Analysis Report
Station 15+885 and 15+955 - Ex design

Analysis Component			
Storm Event	Design	Discharge	13.5150 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	13.5150 m³/s	Check Discharge	17.4940 m³/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	221.57 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-300 mm Circular	1.2249 m³/s	222.40 m	16.79 m/s
Culvert-2	1-4575 x 1520 mm Box	12.2920 m³/s	222.40 m	2.83 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	222.40 m	N/A
Total	----------------	13.5169 m³/s	222.40 m	N/A

Culvert Analysis Report
Station 15+885 and 15+955 - Ex design

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	222.41 m	Discharge	1.2249 m³/s
Inlet Control HW Elev.	222.36 m	Tailwater Elevation	221.57 m
Outlet Control HW Elev.	222.41 m	Control Type	Outlet Control
Headwater Depth/Height	1.31		

Grades			
Upstream Invert	221.21 m	Downstream Invert	220.29 m
Length	30.30 m	Constructed Slope	0.030363 m/m

Hydraulic Profile			
Profile	PressureProfile	Depth, Downstream	1.28 m
Slope Type	N/A	Normal Depth	N/A m
Flow Regime	N/A	Critical Depth	0.30 m
Velocity Downstream	16.79 m/s	Critical Slope	5.024547 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.30 m
Section Size	300 mm	Rise	0.30 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	222.41 m	Upstream Velocity Head	0.26 m
Ke	0.90	Entrance Loss	0.23 m

Inlet Control Properties			
Inlet Control HW Elev.	222.36 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.1 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Analysis Report
Station 15+885 and 15+955 - Ex design

Component:Culvert-2

Culvert Summary			
Computed Headwater Elevation	222.40 m	Discharge	12.2920 m³/s
Inlet Control HW Elev.	222.27 m	Tailwater Elevation	221.57 m
Outlet Control HW Elev.	222.40 m	Control Type	Entrance Control
Headwater Depth/Height	1.10		

Grades			
Upstream Invert	220.73 m	Downstream Invert	220.62 m
Length	21.65 m	Constructed Slope	0.005081 m/m

Hydraulic Profile			
Profile	CompositeS1S2	Depth, Downstream	0.95 m
Slope Type	Steep	Normal Depth	0.73 m
Flow Regime	N/A	Critical Depth	0.90 m
Velocity Downstream	2.83 m/s	Critical Slope	0.002672 m/m

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	4.57 m
Section Size	4575 x 1520 mm	Rise	1.52 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	222.40 m	Upstream Velocity Head	0.45 m
Ke	0.70	Entrance Loss	0.32 m

Inlet Control Properties			
Inlet Control HW Elev.	222.27 m	Flow Control	N/A
Inlet Type	0° wingwall flares	Area Full	7.0 m²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Analysis Report
Station 15+885 and 15+955 - Ex design

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)			
Discharge	0.0000 m³/s	Allowable HW Elevation	222.40 m
Roadway Width	10.00 m	Overtopping Coefficient	1.60 SI
Length	50.00 m	Crest Elevation	223.28 m
Headwater Elevation	N/A m	Discharge Coefficient (Cr)	2.90
Submergence Factor (Kt)	1.00		

Sta (m)	Elev. (m)
0.00	223.28
50.00	223.28

Culvert Design Report
Station 16+327 - Ex

Peak Discharge Method: User-Specified			
Design Discharge	0.2430 m³/s	Check Discharge	0.3250 m³/s

Grades Model: Inverts			
Invert Upstream	226.92 m	Invert Downstream	226.68 m
Length	20.10 m	Slope	0.011940 m/m
Drop	0.24 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	228.79 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	227.40 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-1200 mm Circular	0.2430 m³/s	227.43 m	0.34 m/s
	Trial-2	1-1200 mm Circular	0.3250 m³/s	227.46 m	0.45 m/s

Culvert Design Report
Station 16+327 - Ex

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	228.79 m	Storm Event	Design
Computed Headwater Elevation	227.43 m	Discharge	0.2430 m³/s
Headwater Depth/Height	0.42	Tailwater Elevation	227.40 m
Inlet Control HW Elev.	227.40 m	Control Type	Outlet Control
Outlet Control HW Elev.	227.43 m		

Grades			
Upstream Invert	226.92 m	Downstream Invert	226.68 m
Length	20.10 m	Constructed Slope	0.011940 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.72 m
Slope Type	Mild	Normal Depth	0.26 m
Flow Regime	Subcritical	Critical Depth	0.26 m
Velocity Downstream	0.34 m/s	Critical Slope	0.012307 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.22 m
Section Size	1200 mm	Rise	1.22 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	227.43 m	Upstream Velocity Head	0.02 m
Ke	0.90	Entrance Loss	0.01 m

Inlet Control Properties			
Inlet Control HW Elev.	227.40 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	1.2 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 16+327 - Ex

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	228.79 m	Storm Event	Check
Computed Headwater Elevation	227.46 m	Discharge	0.3250 m³/s
Headwater Depth/Height	0.44	Tailwater Elevation	227.40 m
Inlet Control HW Elev.	227.40 m	Control Type	Outlet Control
Outlet Control HW Elev.	227.46 m		

Grades			
Upstream Invert	226.92 m	Downstream Invert	226.68 m
Length	20.10 m	Constructed Slope	0.011940 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.72 m
Slope Type	Mild	Normal Depth	0.30 m
Flow Regime	Subcritical	Critical Depth	0.30 m
Velocity Downstream	0.45 m/s	Critical Slope	0.012140 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.22 m
Section Size	1200 mm	Rise	1.22 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	227.46 m	Upstream Velocity Head	0.03 m
Ke	0.90	Entrance Loss	0.03 m

Inlet Control Properties			
Inlet Control HW Elev.	227.40 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	1.2 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 16+700 - Ex

Peak Discharge Method: User-Specified			
Design Discharge	0.1370 m³/s	Check Discharge	0.1910 m³/s

Grades Model: Inverts			
Invert Upstream	228.90 m	Invert Downstream	228.56 m
Length	20.60 m	Slope	0.016505 m/m
Drop	0.34 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	230.66 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	228.83 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-450 mm Circular	0.1370 m³/s	229.35 m	1.36 m/s
	Trial-2	1-450 mm Circular	0.1910 m³/s	229.44 m	1.63 m/s

Culvert Design Report
Station 16+700 - Ex

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	230.66 m	Storm Event	Design
Computed Headwater Elevation	229.35 m	Discharge	0.1370 m³/s
Headwater Depth/Height	0.98	Tailwater Elevation	228.83 m
Inlet Control HW Elev.	229.31 m	Control Type	Outlet Control
Outlet Control HW Elev.	229.35 m		

Grades			
Upstream Invert	228.90 m	Downstream Invert	228.56 m
Length	20.60 m	Constructed Slope	0.016505 m/m

Hydraulic Profile			
Profile	M2	Depth, Downstream	0.27 m
Slope Type	Mild	Normal Depth	0.27 m
Flow Regime	Subcritical	Critical Depth	0.26 m
Velocity Downstream	1.36 m/s	Critical Slope	0.019471 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.46 m
Section Size	450 mm	Rise	0.46 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	229.35 m	Upstream Velocity Head	0.09 m
Ke	0.90	Entrance Loss	0.08 m

Inlet Control Properties			
Inlet Control HW Elev.	229.31 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.2 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 16+700 - Ex

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	230.66 m	Storm Event	Check
Computed Headwater Elevation	229.44 m	Discharge	0.1910 m³/s
Headwater Depth/Height	1.19	Tailwater Elevation	228.83 m
Inlet Control HW Elev.	229.42 m	Control Type	Outlet Control
Outlet Control HW Elev.	229.44 m		

Grades			
Upstream Invert	228.90 m	Downstream Invert	228.56 m
Length	20.60 m	Constructed Slope	0.016505 m/m

Hydraulic Profile			
Profile	M2	Depth, Downstream	0.31 m
Slope Type	Mild	Normal Depth	0.35 m
Flow Regime	Subcritical	Critical Depth	0.31 m
Velocity Downstream	1.63 m/s	Critical Slope	0.022561 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.46 m
Section Size	450 mm	Rise	0.46 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	229.44 m	Upstream Velocity Head	0.10 m
Ke	0.90	Entrance Loss	0.09 m

Inlet Control Properties			
Inlet Control HW Elev.	229.42 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.2 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 16+842 - Ex

Peak Discharge Method: User-Specified			
Design Discharge	0.0610 m³/s	Check Discharge	0.0840 m³/s

Grades Model: Inverts			
Invert Upstream	229.49 m	Invert Downstream	229.41 m
Length	18.69 m	Slope	0.004280 m/m
Drop	0.08 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	230.91 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	229.68 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-450 mm Circular	0.0610 m³/s	229.79 m	0.60 m/s
	Trial-2	1-450 mm Circular	0.0840 m³/s	229.84 m	0.83 m/s

Culvert Design Report
Station 16+842 - Ex

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	230.91 m	Storm Event	Design
Computed Headwater Elevation	229.79 m	Discharge	0.0610 m³/s
Headwater Depth/Height	0.65	Tailwater Elevation	229.68 m
Inlet Control HW Elev.	229.74 m	Control Type	Outlet Control
Outlet Control HW Elev.	229.79 m		

Grades			
Upstream Invert	229.49 m	Downstream Invert	229.41 m
Length	18.69 m	Constructed Slope	0.004280 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.27 m
Slope Type	Mild	Normal Depth	0.25 m
Flow Regime	Subcritical	Critical Depth	0.17 m
Velocity Downstream	0.60 m/s	Critical Slope	0.016922 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.46 m
Section Size	450 mm	Rise	0.46 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	229.79 m	Upstream Velocity Head	0.02 m
Ke	0.90	Entrance Loss	0.02 m

Inlet Control Properties			
Inlet Control HW Elev.	229.74 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.2 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 16+842 - Ex

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	230.91 m	Storm Event	Check
Computed Headwater Elevation	229.84 m	Discharge	0.0840 m³/s
Headwater Depth/Height	0.77	Tailwater Elevation	229.68 m
Inlet Control HW Elev.	229.79 m	Control Type	Outlet Control
Outlet Control HW Elev.	229.84 m		

Grades			
Upstream Invert	229.49 m	Downstream Invert	229.41 m
Length	18.69 m	Constructed Slope	0.004280 m/m

Hydraulic Profile			
Profile	M2	Depth, Downstream	0.27 m
Slope Type	Mild	Normal Depth	0.31 m
Flow Regime	Subcritical	Critical Depth	0.20 m
Velocity Downstream	0.83 m/s	Critical Slope	0.017485 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.46 m
Section Size	450 mm	Rise	0.46 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	229.84 m	Upstream Velocity Head	0.03 m
Ke	0.90	Entrance Loss	0.03 m

Inlet Control Properties			
Inlet Control HW Elev.	229.79 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.2 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 17+887 - Ex Coleraine Drive

Peak Discharge Method: User-Specified			
Design Discharge	0.1090 m³/s	Check Discharge	0.1630 m³/s

Grades Model: Inverts			
Invert Upstream	229.38 m	Invert Downstream	229.51 m
Length	17.76 m	Slope	-0.007320 m/m
Drop	-0.13 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	230.57 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	229.78 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-450 mm Circular	0.1090 m³/s	229.95 m	1.08 m/s
	Trial-2	1-450 mm Circular	0.1630 m³/s	230.14 m	1.53 m/s

Culvert Design Report
Station 17+887 - Ex Coleraine Drive

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	230.57 m	Storm Event	Design
Computed Headwater Elevation	229.95 m	Discharge	0.1090 m³/s
Headwater Depth/Height	1.25	Tailwater Elevation	229.78 m
Inlet Control HW Elev.	229.87 m	Control Type	Outlet Control
Outlet Control HW Elev.	229.95 m		

Grades			
Upstream Invert	229.38 m	Downstream Invert	229.51 m
Length	17.76 m	Constructed Slope	-0.007320 m/m

Hydraulic Profile			
Profile	CompositeA2PressureProfile	Depth, Downstream	0.27 m
Slope Type	Adverse	Normal Depth	0.00 m
Flow Regime	Subcritical	Critical Depth	0.23 m
Velocity Downstream	1.08 m/s	Critical Slope	0.018286 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.46 m
Section Size	450 mm	Rise	0.46 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	229.95 m	Upstream Velocity Head	0.02 m
Ke	0.90	Entrance Loss	0.02 m

Inlet Control Properties			
Inlet Control HW Elev.	229.87 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.2 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 17+887 - Ex Coleraine Drive

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	230.57 m	Storm Event	Check
Computed Headwater Elevation	230.14 m	Discharge	0.1630 m³/s
Headwater Depth/Height	1.67	Tailwater Elevation	229.78 m
Inlet Control HW Elev.	229.98 m	Control Type	Outlet Control
Outlet Control HW Elev.	230.14 m		

Grades			
Upstream Invert	229.38 m	Downstream Invert	229.51 m
Length	17.76 m	Constructed Slope	-0.007320 m/m

Hydraulic Profile			
Profile	CompositeA2PressureProfile	Depth, Downstream	0.28 m
Slope Type	Adverse	Normal Depth	N/A m
Flow Regime	Subcritical	Critical Depth	0.28 m
Velocity Downstream	1.53 m/s	Critical Slope	0.020817 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.46 m
Section Size	450 mm	Rise	0.46 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	230.14 m	Upstream Velocity Head	0.05 m
Ke	0.90	Entrance Loss	0.05 m

Inlet Control Properties			
Inlet Control HW Elev.	229.98 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.2 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 10+425 - Proposed

Peak Discharge Method: User-Specified					
Design Discharge	0.5660	m^3/s	Check Discharge	0.7510	m^3/s

Grades Model: Inverts					
Invert Upstream	230.10	m	Invert Downstream	229.70	m
Length	46.60	m	Slope	0.008584	m/m
Drop	0.40	m			

Headwater Model: Maximum Allowable HW		
Headwater Elevation	231.75	m

Tailwater Conditions: Constant Tailwater		
Tailwater Elevation	230.42	m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-2	1-1200 mm Circular	0.5660 m^3/s	230.76 m	0.79 m/s
	Trial-1	1-1200 mm Circular	0.7510 m^3/s	230.86 m	1.05 m/s

Culvert Design Report
Station 10+425 - Proposed

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	231.75	m	Storm Event	Design	
Computed Headwater Elevation	230.76	m	Discharge	0.5660	m^3/s
Headwater Depth/Height	0.54		Tailwater Elevation	230.42	m
Inlet Control HW Elev.	230.67	m	Control Type	Outlet Control	
Outlet Control HW Elev.	230.76	m			

Grades					
Upstream Invert	230.10	m	Downstream Invert	229.70	m
Length	46.60	m	Constructed Slope	0.008584	m/m

Hydraulic Profile					
Profile	M1		Depth, Downstream	0.72	m
Slope Type	Mild		Normal Depth	0.44	m
Flow Regime	Subcritical		Critical Depth	0.40	m
Velocity Downstream	0.79	m/s	Critical Slope	0.012083	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.22	m
Section Size	1200 mm		Rise	1.22	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	230.76	m	Upstream Velocity Head	0.11	m
Ke	0.90		Entrance Loss	0.10	m

Inlet Control Properties					
Inlet Control HW Elev.	230.67	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	1.2	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
Station 10+425 - Proposed

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	231.75	m	Storm Event	Check	
Computed Headwater Elevation	230.86	m	Discharge	0.7510	m^3/s
Headwater Depth/Height	0.63		Tailwater Elevation	230.42	m
Inlet Control HW Elev.	230.78	m	Control Type	Outlet Control	
Outlet Control HW Elev.	230.86	m			

Grades					
Upstream Invert	230.10	m	Downstream Invert	229.70	m
Length	46.60	m	Constructed Slope	0.008584	m/m

Hydraulic Profile					
Profile	M1		Depth, Downstream	0.72	m
Slope Type	Mild		Normal Depth	0.51	m
Flow Regime	Subcritical		Critical Depth	0.46	m
Velocity Downstream	1.05	m/s	Critical Slope	0.012253	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.22	m
Section Size	1200 mm		Rise	1.22	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	230.86	m	Upstream Velocity Head	0.13	m
Ke	0.90		Entrance Loss	0.12	m

Inlet Control Properties					
Inlet Control HW Elev.	230.78	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	1.2	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Design Report
Station 10+689 - Proposed

Peak Discharge Method: User-Specified					
Design Discharge	1.8500	m^3/s	Check Discharge	2.4840	m^3/s

Grades Model: Inverts					
Invert Upstream	226.20	m	Invert Downstream	225.90	m
Length	54.40	m	Slope	0.005515	m/m
Drop	0.30	m			

Headwater Model: Maximum Allowable HW		
Headwater Elevation	229.26	m

Tailwater Conditions: Constant Tailwater		
Tailwater Elevation	226.98	m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-2	1-1800 mm Circular	1.8500 m^3/s	227.29 m	1.15 m/s
	Trial-1	1-1800 mm Circular	2.4840 m^3/s	227.47 m	1.54 m/s

Culvert Design Report
Station 10+689 - Proposed

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	229.26 m	Storm Event	Design
Computed Headwater Elevation	227.29 m	Discharge	1.8500 m³/s
Headwater Depth/Height	0.60	Tailwater Elevation	226.98 m
Inlet Control HW Elev.	227.15 m	Control Type	Outlet Control
Outlet Control HW Elev.	227.29 m		

Grades			
Upstream Invert	226.20 m	Downstream Invert	225.90 m
Length	54.40 m	Constructed Slope	0.005515 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	1.08 m
Slope Type	Mild	Normal Depth	0.79 m
Flow Regime	Subcritical	Critical Depth	0.66 m
Velocity Downstream	1.15 m/s	Critical Slope	0.010627 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.83 m
Section Size	1800 mm	Rise	1.83 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	227.29 m	Upstream Velocity Head	0.11 m
Ke	0.90	Entrance Loss	0.10 m

Inlet Control Properties			
Inlet Control HW Elev.	227.15 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	2.6 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 10+689 - Proposed

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	229.26 m	Storm Event	Check
Computed Headwater Elevation	227.47 m	Discharge	2.4840 m³/s
Headwater Depth/Height	0.69	Tailwater Elevation	226.98 m
Inlet Control HW Elev.	227.34 m	Control Type	Outlet Control
Outlet Control HW Elev.	227.47 m		

Grades			
Upstream Invert	226.20 m	Downstream Invert	225.90 m
Length	54.40 m	Constructed Slope	0.005515 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	1.08 m
Slope Type	Mild	Normal Depth	0.93 m
Flow Regime	Subcritical	Critical Depth	0.77 m
Velocity Downstream	1.54 m/s	Critical Slope	0.010891 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.83 m
Section Size	1800 mm	Rise	1.83 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	227.47 m	Upstream Velocity Head	0.16 m
Ke	0.90	Entrance Loss	0.14 m

Inlet Control Properties			
Inlet Control HW Elev.	227.34 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	2.6 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 11+603 - Proposed

Peak Discharge Method: User-Specified			
Design Discharge	0.3040 m³/s	Check Discharge	0.4200 m³/s

Grades Model: Inverts			
Invert Upstream	226.40 m	Invert Downstream	226.10 m
Length	59.70 m	Slope	0.005025 m/m
Drop	0.30 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	228.79 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	226.82 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-2	1-1200 mm Circular	0.3040 m³/s	226.92 m	0.42 m/s
	Trial-1	1-1200 mm Circular	0.4200 m³/s	226.98 m	0.59 m/s

Culvert Design Report
Station 11+603 - Proposed

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	228.79 m	Storm Event	Design
Computed Headwater Elevation	226.92 m	Discharge	0.3040 m³/s
Headwater Depth/Height	0.42	Tailwater Elevation	226.82 m
Inlet Control HW Elev.	226.82 m	Control Type	Outlet Control
Outlet Control HW Elev.	226.92 m		

Grades			
Upstream Invert	226.40 m	Downstream Invert	226.10 m
Length	59.70 m	Constructed Slope	0.005025 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.72 m
Slope Type	Mild	Normal Depth	0.36 m
Flow Regime	Subcritical	Critical Depth	0.29 m
Velocity Downstream	0.42 m/s	Critical Slope	0.012170 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.22 m
Section Size	1200 mm	Rise	1.22 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	226.92 m	Upstream Velocity Head	0.03 m
Ke	0.90	Entrance Loss	0.03 m

Inlet Control Properties			
Inlet Control HW Elev.	226.82 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	1.2 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 11+603 - Proposed

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	228.79 m	Storm Event	Check
Computed Headwater Elevation	226.98 m	Discharge	0.4200 m³/s
Headwater Depth/Height	0.48	Tailwater Elevation	226.82 m
Inlet Control HW Elev.	226.88 m	Control Type	Outlet Control
Outlet Control HW Elev.	226.98 m		

Grades			
Upstream Invert	226.40 m	Downstream Invert	226.10 m
Length	59.70 m	Constructed Slope	0.005025 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.72 m
Slope Type	Mild	Normal Depth	0.43 m
Flow Regime	Subcritical	Critical Depth	0.34 m
Velocity Downstream	0.59 m/s	Critical Slope	0.012064 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.22 m
Section Size	1200 mm	Rise	1.22 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	226.98 m	Upstream Velocity Head	0.05 m
Ke	0.90	Entrance Loss	0.04 m

Inlet Control Properties			
Inlet Control HW Elev.	226.88 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	1.2 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Analysis Report
Station 11+800 and 11+812 - Proposed

Analysis Component			
Storm Event	Check	Discharge	11.2880 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	8.4300 m³/s	Check Discharge	11.2880 m³/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	221.70 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-750 mm Circular	0.0182 m³/s	221.93 m	0.04 m/s
Culvert-2	2-3660 x 1830 mm Box	11.2661 m³/s	221.93 m	1.40 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	221.93 m	N/A
Total	----------------	11.2843 m³/s	221.93 m	N/A

Culvert Analysis Report
Station 11+800 and 11+812 - Proposed

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	221.93 m	Discharge	0.0182 m³/s
Inlet Control HW Elev.	221.90 m	Tailwater Elevation	221.70 m
Outlet Control HW Elev.	221.93 m	Control Type	Entrance Control
Headwater Depth/Height	0.17		

Grades			
Upstream Invert	221.80 m	Downstream Invert	220.80 m
Length	52.20 m	Constructed Slope	0.019157 m/m

Hydraulic Profile			
Profile	CompositePressureProfileS1S2	Depth, Downstream	0.90 m
Slope Type	N/A	Normal Depth	0.08 m
Flow Regime	N/A	Critical Depth	0.08 m
Velocity Downstream	0.04 m/s	Critical Slope	0.016484 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.76 m
Section Size	750 mm	Rise	0.76 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	221.93 m	Upstream Velocity Head	0.03 m
Ke	0.90	Entrance Loss	0.02 m

Inlet Control Properties			
Inlet Control HW Elev.	221.90 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.5 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Analysis Report
Station 11+800 and 11+812 - Proposed

Component:Culvert-2

Culvert Summary			
Computed Headwater Elevation	221.93 m	Discharge	11.2661 m³/s
Inlet Control HW Elev.	221.80 m	Tailwater Elevation	221.70 m
Outlet Control HW Elev.	221.93 m	Control Type	Outlet Control
Headwater Depth/Height	0.65		

Grades			
Upstream Invert	220.75 m	Downstream Invert	220.60 m
Length	55.50 m	Constructed Slope	0.002703 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	1.10 m
Slope Type	Mild	Normal Depth	0.64 m
Flow Regime	Subcritical	Critical Depth	0.62 m
Velocity Downstream	1.40 m/s	Critical Slope	0.002869 m/m

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	3.66 m
Section Size	3660 x 1830 mm	Rise	1.83 m
Number Sections	2		

Outlet Control Properties			
Outlet Control HW Elev.	221.93 m	Upstream Velocity Head	0.13 m
Ke	0.70	Entrance Loss	0.09 m

Inlet Control Properties			
Inlet Control HW Elev.	221.80 m	Flow Control	N/A
Inlet Type	0° wingwall flares	Area Full	13.4 m²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Analysis Report
Station 11+800 and 11+812 - Proposed

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)					
Discharge	0.0000	m^3/s	Allowable HW Elevation	221.93	m
Roadway Width	10.00	m	Overtopping Coefficient	1.60	SI
Length	50.00	m	Crest Elevation	224.21	m
Headwater Elevation	N/A	m	Discharge Coefficient (Cr)	2.90	
Submergence Factor (Kt)	1.00				

Sta (m)	Elev. (m)
0.00	224.21
50.00	224.21

Culvert Design Report
Station 12+300 - Proposed

Peak Discharge Method: User-Specified					
Design Discharge	8.2540	m^3/s	Check Discharge	11.0730	m^3/s

Grades Model: Inverts					
Invert Upstream	216.90	m	Invert Downstream	216.80	m
Length	48.00	m	Slope	0.002083	m/m
Drop	0.10	m			

Headwater Model: Maximum Allowable HW		
Headwater Elevation	222.88	m

Tailwater Conditions: Constant Tailwater		
Tailwater Elevation	218.60	m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-Custom 6.10 x 2.13m Box	8.2540 m^3/s	218.66 m	0.75 m/s
	Trial-2	1-Custom 6.10 x 2.13m Box	11.0730 m^3/s	218.70 m	1.01 m/s

Culvert Design Report
Station 12+300 - Proposed

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	222.88	m	Storm Event	Design	
Computed Headwater Elevation	218.66	m	Discharge	8.2540	m^3/s
Headwater Depth/Height	0.82		Tailwater Elevation	218.60	m
Inlet Control HW Elev.	218.60	m	Control Type	Outlet Control	
Outlet Control HW Elev.	218.66	m			

Grades					
Upstream Invert	216.90	m	Downstream Invert	216.80	m
Length	48.00	m	Constructed Slope	0.002083	m/m

Hydraulic Profile					
Profile	M1		Depth, Downstream	1.80	m
Slope Type	Mild		Normal Depth	0.61	m
Flow Regime	Subcritical		Critical Depth	0.57	m
Velocity Downstream	0.75	m/s	Critical Slope	0.002511	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	6.10	m
Section Size	Custom 6.10 x 2.13m		Rise	2.13	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	218.66	m	Upstream Velocity Head	0.03	m
Ke	0.70		Entrance Loss	0.02	m

Inlet Control Properties					
Inlet Control HW Elev.	218.60	m	Flow Control	Unsubmerged	
Inlet Type	0° wingwall flares		Area Full	13.0	m^2
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Design Report
Station 12+300 - Proposed

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	222.88	m	Storm Event	Check	
Computed Headwater Elevation	218.70	m	Discharge	11.0730	m^3/s
Headwater Depth/Height	0.85		Tailwater Elevation	218.60	m
Inlet Control HW Elev.	218.60	m	Control Type	Outlet Control	
Outlet Control HW Elev.	218.70	m			

Grades					
Upstream Invert	216.90	m	Downstream Invert	216.80	m
Length	48.00	m	Constructed Slope	0.002083	m/m

Hydraulic Profile					
Profile	M1		Depth, Downstream	1.80	m
Slope Type	Mild		Normal Depth	0.73	m
Flow Regime	Subcritical		Critical Depth	0.70	m
Velocity Downstream	1.01	m/s	Critical Slope	0.002460	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	6.10	m
Section Size	Custom 6.10 x 2.13m		Rise	2.13	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	218.70	m	Upstream Velocity Head	0.06	m
Ke	0.70		Entrance Loss	0.04	m

Inlet Control Properties					
Inlet Control HW Elev.	218.60	m	Flow Control	Unsubmerged	
Inlet Type	0° wingwall flares		Area Full	13.0	m^2
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Design Report
Station 12+500 - Proposed

Peak Discharge Method: User-Specified			
Design Discharge	2.6040 m³/s	Check Discharge	3.5540 m³/s

Grades Model: Inverts			
Invert Upstream	219.40 m	Invert Downstream	217.90 m
Length	68.50 m	Slope	0.021898 m/m
Drop	1.50 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	225.30 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	219.34 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-2	1-1950 mm Circular	2.6040 m³/s	220.71 m	1.08 m/s
	Trial-1	1-1950 mm Circular	3.5540 m³/s	220.96 m	1.48 m/s

Culvert Design Report
Station 12+500 - Proposed

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	225.30 m	Storm Event	Design
Computed Headwater Elevation	220.71 m	Discharge	2.6040 m³/s
Headwater Depth/Height	0.66	Tailwater Elevation	219.34 m
Inlet Control HW Elev.	220.51 m	Control Type	Entrance Control
Outlet Control HW Elev.	220.71 m		

Grades			
Upstream Invert	219.40 m	Downstream Invert	217.90 m
Length	68.50 m	Constructed Slope	0.021898 m/m

Hydraulic Profile			
Profile	CompositeS1S2	Depth, Downstream	1.44 m
Slope Type	Steep	Normal Depth	0.63 m
Flow Regime	N/A	Critical Depth	0.77 m
Velocity Downstream	1.08 m/s	Critical Slope	0.010446 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.98 m
Section Size	1950 mm	Rise	1.98 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	220.71 m	Upstream Velocity Head	0.29 m
Ke	0.90	Entrance Loss	0.26 m

Inlet Control Properties			
Inlet Control HW Elev.	220.51 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	3.1 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 12+500 - Proposed

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	225.30 m	Storm Event	Check
Computed Headwater Elevation	220.96 m	Discharge	3.5540 m³/s
Headwater Depth/Height	0.79	Tailwater Elevation	219.34 m
Inlet Control HW Elev.	220.75 m	Control Type	Entrance Control
Outlet Control HW Elev.	220.96 m		

Grades			
Upstream Invert	219.40 m	Downstream Invert	217.90 m
Length	68.50 m	Constructed Slope	0.021898 m/m

Hydraulic Profile			
Profile	CompositeS1S2	Depth, Downstream	1.44 m
Slope Type	Steep	Normal Depth	0.74 m
Flow Regime	N/A	Critical Depth	0.90 m
Velocity Downstream	1.48 m/s	Critical Slope	0.010837 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.98 m
Section Size	1950 mm	Rise	1.98 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	220.96 m	Upstream Velocity Head	0.35 m
Ke	0.90	Entrance Loss	0.31 m

Inlet Control Properties			
Inlet Control HW Elev.	220.75 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	3.1 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 12+787 - Proposed

Peak Discharge Method: User-Specified			
Design Discharge	0.0830 m³/s	Check Discharge	0.1120 m³/s

Grades Model: Inverts			
Invert Upstream	227.41 m	Invert Downstream	226.93 m
Length	49.40 m	Slope	0.009717 m/m
Drop	0.48 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	228.49 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	227.29 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-2	1-600 mm Circular	0.0830 m³/s	227.70 m	0.46 m/s
	Trial-1	1-600 mm Circular	0.1120 m³/s	227.76 m	0.62 m/s

Culvert Design Report
Station 12+787 - Proposed

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	228.49 m	Storm Event	Design
Computed Headwater Elevation	227.70 m	Discharge	0.0830 m^3/s
Headwater Depth/Height	0.48	Tailwater Elevation	227.29 m
Inlet Control HW Elev.	227.67 m	Control Type	Outlet Control
Outlet Control HW Elev.	227.70 m		

Grades			
Upstream Invert	227.41 m	Downstream Invert	226.93 m
Length	49.40 m	Constructed Slope	0.009717 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.36 m
Slope Type	Mild	Normal Depth	0.20 m
Flow Regime	Subcritical	Critical Depth	0.18 m
Velocity Downstream	0.46 m/s	Critical Slope	0.015188 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.61 m
Section Size	600 mm	Rise	0.61 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	227.70 m	Upstream Velocity Head	0.05 m
Ke	0.90	Entrance Loss	0.04 m

Inlet Control Properties			
Inlet Control HW Elev.	227.67 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.3 m^2
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 12+787 - Proposed

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	228.49 m	Storm Event	Check
Computed Headwater Elevation	227.76 m	Discharge	0.1120 m^3/s
Headwater Depth/Height	0.57	Tailwater Elevation	227.29 m
Inlet Control HW Elev.	227.71 m	Control Type	Outlet Control
Outlet Control HW Elev.	227.76 m		

Grades			
Upstream Invert	227.41 m	Downstream Invert	226.93 m
Length	49.40 m	Constructed Slope	0.009717 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.36 m
Slope Type	Mild	Normal Depth	0.24 m
Flow Regime	Subcritical	Critical Depth	0.21 m
Velocity Downstream	0.62 m/s	Critical Slope	0.015283 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.61 m
Section Size	600 mm	Rise	0.61 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	227.76 m	Upstream Velocity Head	0.06 m
Ke	0.90	Entrance Loss	0.05 m

Inlet Control Properties			
Inlet Control HW Elev.	227.71 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.3 m^2
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 12+927 - Proposed

Peak Discharge Method: User-Specified			
Design Discharge	0.2190 m^3/s	Check Discharge	0.2950 m^3/s

Grades Model: Inverts			
Invert Upstream	227.80 m	Invert Downstream	227.60 m
Length	53.40 m	Slope	0.003745 m/m
Drop	0.20 m		

Headwater Model: Allowable HW/Height	
Headwater Depth/Height	229.74

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	227.96 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-2	1-600 mm Circular	0.2190 m^3/s	228.27 m	1.22 m/s
	Trial-1	1-600 mm Circular	0.2950 m^3/s	228.36 m	1.64 m/s

Culvert Design Report
Station 12+927 - Proposed

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	367.85 m	Storm Event	Design
Computed Headwater Elevation	228.27 m	Discharge	0.2190 m^3/s
Headwater Depth/Height	0.78	Tailwater Elevation	227.96 m
Inlet Control HW Elev.	228.24 m	Control Type	Outlet Control
Outlet Control HW Elev.	228.27 m		

Grades			
Upstream Invert	227.80 m	Downstream Invert	227.60 m
Length	53.40 m	Constructed Slope	0.003745 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.36 m
Slope Type	Mild	Normal Depth	0.31 m
Flow Regime	Subcritical	Critical Depth	0.30 m
Velocity Downstream	1.22 m/s	Critical Slope	0.004137 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	Corrugated HDPE (Smooth Interior)	Span	0.61 m
Section Size	600 mm	Rise	0.61 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	228.27 m	Upstream Velocity Head	0.11 m
Ke	0.50	Entrance Loss	0.05 m

Inlet Control Properties			
Inlet Control HW Elev.	228.24 m	Flow Control	N/A
Inlet Type	Square edge w/headwall	Area Full	0.3 m^2
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Culvert Design Report
Station 12+927 - Proposed

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	367.85 m	Storm Event	Check
Computed Headwater Elevation	228.36 m	Discharge	0.2950 m³/s
Headwater Depth/Height	0.92	Tailwater Elevation	227.96 m
Inlet Control HW Elev.	228.33 m	Control Type	Outlet Control
Outlet Control HW Elev.	228.36 m		

Grades			
Upstream Invert	227.80 m	Downstream Invert	227.60 m
Length	53.40 m	Constructed Slope	0.003745 m/m

Hydraulic Profile			
Profile	M2	Depth, Downstream	0.36 m
Slope Type	Mild	Normal Depth	0.37 m
Flow Regime	Subcritical	Critical Depth	0.35 m
Velocity Downstream	1.64 m/s	Critical Slope	0.004496 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	Corrugated HDPE (Smooth Interior)	Span	0.61 m
Section Size	600 mm	Rise	0.61 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	228.36 m	Upstream Velocity Head	0.13 m
Ke	0.50	Entrance Loss	0.06 m

Inlet Control Properties			
Inlet Control HW Elev.	228.33 m	Flow Control	N/A
Inlet Type	Square edge w/headwall	Area Full	0.3 m²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Culvert Design Report
Station 13+763 - Proposed

Peak Discharge Method: User-Specified			
Design Discharge	1.1200 m³/s	Check Discharge	1.5120 m³/s

Grades Model: Inverts			
Invert Upstream	221.10 m	Invert Downstream	220.80 m
Length	65.00 m	Slope	0.004615 m/m
Drop	0.30 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	223.13 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	221.34 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	2-900 mm Circular	1.1200 m³/s	221.85 m	1.39 m/s
	Trial-2	2-900 mm Circular	1.5120 m³/s	222.03 m	1.87 m/s

Culvert Design Report
Station 13+763 - Proposed

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	223.13 m	Storm Event	Design
Computed Headwater Elevation	221.85 m	Discharge	1.1200 m³/s
Headwater Depth/Height	0.82	Tailwater Elevation	221.34 m
Inlet Control HW Elev.	221.77 m	Control Type	Outlet Control
Outlet Control HW Elev.	221.85 m		

Grades			
Upstream Invert	221.10 m	Downstream Invert	220.80 m
Length	65.00 m	Constructed Slope	0.004615 m/m

Hydraulic Profile			
Profile	M2	Depth, Downstream	0.54 m
Slope Type	Mild	Normal Depth	0.62 m
Flow Regime	Subcritical	Critical Depth	0.43 m
Velocity Downstream	1.39 m/s	Critical Slope	0.014228 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.91 m
Section Size	900 mm	Rise	0.91 m
Number Sections	2		

Outlet Control Properties			
Outlet Control HW Elev.	221.85 m	Upstream Velocity Head	0.07 m
Ke	0.90	Entrance Loss	0.07 m

Inlet Control Properties			
Inlet Control HW Elev.	221.77 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	1.3 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 13+763 - Proposed

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	223.13 m	Storm Event	Check
Computed Headwater Elevation	222.03 m	Discharge	1.5120 m³/s
Headwater Depth/Height	1.01	Tailwater Elevation	221.34 m
Inlet Control HW Elev.	221.91 m	Control Type	Outlet Control
Outlet Control HW Elev.	222.03 m		

Grades			
Upstream Invert	221.10 m	Downstream Invert	220.80 m
Length	65.00 m	Constructed Slope	0.004615 m/m

Hydraulic Profile			
Profile	M2	Depth, Downstream	0.54 m
Slope Type	Mild	Normal Depth	N/A m
Flow Regime	Subcritical	Critical Depth	0.51 m
Velocity Downstream	1.87 m/s	Critical Slope	0.015325 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.91 m
Section Size	900 mm	Rise	0.91 m
Number Sections	2		

Outlet Control Properties			
Outlet Control HW Elev.	222.03 m	Upstream Velocity Head	0.08 m
Ke	0.90	Entrance Loss	0.08 m

Inlet Control Properties			
Inlet Control HW Elev.	221.91 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	1.3 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 13+970 - Proposed

Peak Discharge Method: User-Specified			
Design Discharge	1.7410 m³/s	Check Discharge	2.3400 m³/s

Grades Model: Inverts			
Invert Upstream	219.50 m	Invert Downstream	218.90 m
Length	61.20 m	Slope	0.009804 m/m
Drop	0.60 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	222.03 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	219.45 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-915 mm Circular	1.7410 m³/s	220.98 m	3.46 m/s
	Trial-2	1-915 mm Circular	2.3400 m³/s	221.67 m	3.58 m/s

Culvert Design Report
Station 13+970 - Proposed

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	222.03 m	Storm Event	Design
Computed Headwater Elevation	220.98 m	Discharge	1.7410 m³/s
Headwater Depth/Height	1.59	Tailwater Elevation	219.45 m
Inlet Control HW Elev.	220.98 m	Control Type	Inlet Control
Outlet Control HW Elev.	220.91 m		

Grades			
Upstream Invert	219.50 m	Downstream Invert	218.90 m
Length	61.20 m	Constructed Slope	0.009804 m/m

Hydraulic Profile			
Profile	S2	Depth, Downstream	0.65 m
Slope Type	Steep	Normal Depth	0.64 m
Flow Regime	Supercritical	Critical Depth	0.77 m
Velocity Downstream	3.46 m/s	Critical Slope	0.006520 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	Corrugated HDPE (Smooth Interior)	Span	0.93 m
Section Size	915 mm	Rise	0.93 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	220.91 m	Upstream Velocity Head	0.43 m
Ke	0.50	Entrance Loss	0.21 m

Inlet Control Properties			
Inlet Control HW Elev.	220.98 m	Flow Control	N/A
Inlet Type	Square edge w/headwall	Area Full	0.7 m²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Culvert Design Report
Station 13+970 - Proposed

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	222.03 m	Storm Event	Check
Computed Headwater Elevation	221.67 m	Discharge	2.3400 m³/s
Headwater Depth/Height	2.34	Tailwater Elevation	219.45 m
Inlet Control HW Elev.	221.67 m	Control Type	Inlet Control
Outlet Control HW Elev.	221.41 m		

Grades			
Upstream Invert	219.50 m	Downstream Invert	218.90 m
Length	61.20 m	Constructed Slope	0.009804 m/m

Hydraulic Profile			
Profile	CompositeM2PressureProfile	Depth, Downstream	0.86 m
Slope Type	Mild	Normal Depth	N/A m
Flow Regime	Subcritical	Critical Depth	0.86 m
Velocity Downstream	3.58 m/s	Critical Slope	0.010405 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	Corrugated HDPE (Smooth Interior)	Span	0.93 m
Section Size	915 mm	Rise	0.93 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	221.41 m	Upstream Velocity Head	0.61 m
Ke	0.50	Entrance Loss	0.30 m

Inlet Control Properties			
Inlet Control HW Elev.	221.67 m	Flow Control	N/A
Inlet Type	Square edge w/headwall	Area Full	0.7 m²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Culvert Design Report
Station 14+177 - Proposed

Peak Discharge Method: User-Specified			
Design Discharge	2.3020 m³/s	Check Discharge	3.0640 m³/s

Grades Model: Inverts			
Invert Upstream	216.80 m	Invert Downstream	215.80 m
Length	48.30 m	Slope	0.020704 m/m
Drop	1.00 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	221.03 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	216.46 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-1200 mm Circular	2.3020 m³/s	218.19 m	4.60 m/s
	Trial-2	1-1200 mm Circular	3.0640 m³/s	218.50 m	4.90 m/s

Culvert Design Report
Station 14+177 - Proposed

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	221.03 m	Storm Event	Design
Computed Headwater Elevation	218.19 m	Discharge	2.3020 m³/s
Headwater Depth/Height	1.14	Tailwater Elevation	216.46 m
Inlet Control HW Elev.	218.12 m	Control Type	Entrance Control
Outlet Control HW Elev.	218.19 m		

Grades

Upstream Invert	216.80 m	Downstream Invert	215.80 m
Length	48.30 m	Constructed Slope	0.020704 m/m

Hydraulic Profile

Profile	S2	Depth, Downstream	0.54 m
Slope Type	Steep	Normal Depth	0.51 m
Flow Regime	Supercritical	Critical Depth	0.83 m
Velocity Downstream	4.60 m/s	Critical Slope	0.004157 m/m

Section

Section Shape	Circular	Mannings Coefficient	0.012
Section Material	Corrugated HDPE (Smooth Interior)	Span	1.22 m
Section Size	1200 mm	Rise	1.22 m
Number Sections	1		

Outlet Control Properties

Outlet Control HW Elev.	218.19 m	Upstream Velocity Head	0.37 m
Ke	0.50	Entrance Loss	0.19 m

Inlet Control Properties

Inlet Control HW Elev.	218.12 m	Flow Control	N/A
Inlet Type	Square edge w/headwall	Area Full	1.2 m²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Culvert Design Report
Station 14+177 - Proposed

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	221.03 m	Storm Event	Check
Computed Headwater Elevation	218.50 m	Discharge	3.0640 m³/s
Headwater Depth/Height	1.40	Tailwater Elevation	216.46 m
Inlet Control HW Elev.	218.50 m	Control Type	Inlet Control
Outlet Control HW Elev.	218.50 m		

Grades

Upstream Invert	216.80 m	Downstream Invert	215.80 m
Length	48.30 m	Constructed Slope	0.020704 m/m

Hydraulic Profile

Profile	S2	Depth, Downstream	0.64 m
Slope Type	Steep	Normal Depth	0.60 m
Flow Regime	Supercritical	Critical Depth	0.96 m
Velocity Downstream	4.90 m/s	Critical Slope	0.005235 m/m

Section

Section Shape	Circular	Mannings Coefficient	0.012
Section Material	Corrugated HDPE (Smooth Interior)	Span	1.22 m
Section Size	1200 mm	Rise	1.22 m
Number Sections	1		

Outlet Control Properties

Outlet Control HW Elev.	218.50 m	Upstream Velocity Head	0.49 m
Ke	0.50	Entrance Loss	0.25 m

Inlet Control Properties

Inlet Control HW Elev.	218.50 m	Flow Control	N/A
Inlet Type	Square edge w/headwall	Area Full	1.2 m²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Culvert Design Report
Station 15+156 - Proposed

Peak Discharge Method: User-Specified

Design Discharge	9.3960 m³/s	Check Discharge	12.1670 m³/s

Grades Model: Inverts

Invert Upstream	219.60 m	Invert Downstream	219.60 m
Length	50.90 m	Slope	0.000000 m/m
Drop	0.00 m		

Headwater Model: Maximum Allowable HW

Headwater Elevation	222.48 m

Tailwater Conditions: Constant Tailwater

Tailwater Elevation	220.68 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-6000 x 1800 mm Box	9.3960 m³/s	220.88 m	1.45 m/s
	Trial-2	1-6000 x 1800 mm Box	12.1670 m³/s	221.01 m	1.88 m/s

Culvert Design Report
Station 15+156 - Proposed

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	222.48 m	Storm Event	Design
Computed Headwater Elevation	220.88 m	Discharge	9.3960 m³/s
Headwater Depth/Height	0.71	Tailwater Elevation	220.68 m
Inlet Control HW Elev.	220.68 m	Control Type	Outlet Control
Outlet Control HW Elev.	220.88 m		

Grades

Upstream Invert	219.60 m	Downstream Invert	219.60 m
Length	50.90 m	Constructed Slope	0.000000 m/m

Hydraulic Profile

Profile	H2	Depth, Downstream	1.08 m
Slope Type	Horizontal	Normal Depth	N/A m
Flow Regime	Subcritical	Critical Depth	0.63 m
Velocity Downstream	1.45 m/s	Critical Slope	0.002493 m/m

Section

Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	6.00 m
Section Size	6000 x 1800 mm	Rise	1.80 m
Number Sections	1		

Outlet Control Properties

Outlet Control HW Elev.	220.88 m	Upstream Velocity Head	0.10 m
Ke	0.70	Entrance Loss	0.07 m

Inlet Control Properties

Inlet Control HW Elev.	220.68 m	Flow Control	N/A
Inlet Type	0° wingwall flares	Area Full	10.8 m²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Design Report
Station 15+156 - Proposed

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	222.48 m	Storm Event	Check
Computed Headwater Elevation	221.01 m	Discharge	12.1670 m³/s
Headwater Depth/Height	0.78	Tailwater Elevation	220.68 m
Inlet Control HW Elev.	220.87 m	Control Type	Outlet Control
Outlet Control HW Elev.	221.01 m		

Grades			
Upstream Invert	219.60 m	Downstream Invert	219.60 m
Length	50.90 m	Constructed Slope	0.000000 m/m

Hydraulic Profile			
Profile	H2	Depth, Downstream	1.08 m
Slope Type	Horizontal	Normal Depth	N/A m
Flow Regime	Subcritical	Critical Depth	0.75 m
Velocity Downstream	1.88 m/s	Critical Slope	0.002457 m/m

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	6.00 m
Section Size	6000 x 1800 mm	Rise	1.80 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	221.01 m	Upstream Velocity Head	0.16 m
Ke	0.70	Entrance Loss	0.11 m

Inlet Control Properties			
Inlet Control HW Elev.	220.87 m	Flow Control	N/A
Inlet Type	0° wingwall flares	Area Full	10.8 m²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Design Report
Station 15+249 - Proposed

Peak Discharge Method: User-Specified			
Design Discharge	0.7740 m³/s	Check Discharge	1.0390 m³/s

Grades Model: Inverts			
Invert Upstream	221.70 m	Invert Downstream	221.30 m
Length	46.80 m	Slope	0.008547 m/m
Drop	0.40 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	223.60 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	222.02 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-2	1-1200 mm Circular	0.7740 m³/s	222.48 m	1.08 m/s
	Trial-1	1-1200 mm Circular	1.0390 m³/s	222.61 m	1.45 m/s

Culvert Design Report
Station 15+249 - Proposed

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	223.60 m	Storm Event	Design
Computed Headwater Elevation	222.48 m	Discharge	0.7740 m³/s
Headwater Depth/Height	0.64	Tailwater Elevation	222.02 m
Inlet Control HW Elev.	222.39 m	Control Type	Outlet Control
Outlet Control HW Elev.	222.48 m		

Grades			
Upstream Invert	221.70 m	Downstream Invert	221.30 m
Length	46.80 m	Constructed Slope	0.008547 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.72 m
Slope Type	Mild	Normal Depth	0.52 m
Flow Regime	Subcritical	Critical Depth	0.47 m
Velocity Downstream	1.08 m/s	Critical Slope	0.012282 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.22 m
Section Size	1200 mm	Rise	1.22 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	222.48 m	Upstream Velocity Head	0.13 m
Ke	0.90	Entrance Loss	0.12 m

Inlet Control Properties			
Inlet Control HW Elev.	222.39 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	1.2 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 15+249 - Proposed

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	223.60 m	Storm Event	Check
Computed Headwater Elevation	222.61 m	Discharge	1.0390 m³/s
Headwater Depth/Height	0.75	Tailwater Elevation	222.02 m
Inlet Control HW Elev.	222.53 m	Control Type	Outlet Control
Outlet Control HW Elev.	222.61 m		

Grades			
Upstream Invert	221.70 m	Downstream Invert	221.30 m
Length	46.80 m	Constructed Slope	0.008547 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.72 m
Slope Type	Mild	Normal Depth	0.62 m
Flow Regime	Subcritical	Critical Depth	0.55 m
Velocity Downstream	1.45 m/s	Critical Slope	0.012711 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.22 m
Section Size	1200 mm	Rise	1.22 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	222.61 m	Upstream Velocity Head	0.16 m
Ke	0.90	Entrance Loss	0.14 m

Inlet Control Properties			
Inlet Control HW Elev.	222.53 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	1.2 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 15+454 - Proposed

Peak Discharge Method: User-Specified			
Design Discharge	0.2240 m^3/s	Check Discharge	0.2990 m^3/s

Grades Model: Inverts			
Invert Upstream	224.12 m	Invert Downstream	223.60 m
Length	47.80 m	Slope	0.010879 m/m
Drop	0.52 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	225.99 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	224.16 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-600 mm Circular	0.2240 m^3/s	224.63 m	0.80 m/s
	Trial-2	1-600 mm Circular	0.2990 m^3/s	224.73 m	1.07 m/s

Culvert Design Report
Station 15+454 - Proposed

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	225.99 m	Storm Event	Design
Computed Headwater Elevation	224.63 m	Discharge	0.2240 m^3/s
Headwater Depth/Height	0.84	Tailwater Elevation	224.16 m
Inlet Control HW Elev.	224.59 m	Control Type	Outlet Control
Outlet Control HW Elev.	224.63 m		

Grades			
Upstream Invert	224.12 m	Downstream Invert	223.60 m
Length	47.80 m	Constructed Slope	0.010879 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.56 m
Slope Type	Mild	Normal Depth	0.35 m
Flow Regime	Subcritical	Critical Depth	0.31 m
Velocity Downstream	0.80 m/s	Critical Slope	0.016618 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.61 m
Section Size	600 mm	Rise	0.61 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	224.63 m	Upstream Velocity Head	0.09 m
Ke	0.90	Entrance Loss	0.08 m

Inlet Control Properties			
Inlet Control HW Elev.	224.59 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.3 m^2
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 15+454 - Proposed

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	225.99 m	Storm Event	Check
Computed Headwater Elevation	224.73 m	Discharge	0.2990 m^3/s
Headwater Depth/Height	1.00	Tailwater Elevation	224.16 m
Inlet Control HW Elev.	224.69 m	Control Type	Outlet Control
Outlet Control HW Elev.	224.73 m		

Grades			
Upstream Invert	224.12 m	Downstream Invert	223.60 m
Length	47.80 m	Constructed Slope	0.010879 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.56 m
Slope Type	Mild	Normal Depth	0.42 m
Flow Regime	Subcritical	Critical Depth	0.35 m
Velocity Downstream	1.07 m/s	Critical Slope	0.018073 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.61 m
Section Size	600 mm	Rise	0.61 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	224.73 m	Upstream Velocity Head	0.10 m
Ke	0.90	Entrance Loss	0.09 m

Inlet Control Properties			
Inlet Control HW Elev.	224.69 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.3 m^2
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 15+693 - Proposed

Peak Discharge Method: User-Specified			
Design Discharge	0.1670 m^3/s	Check Discharge	0.2300 m^3/s

Grades Model: Inverts			
Invert Upstream	225.20 m	Invert Downstream	224.75 m
Length	49.40 m	Slope	0.009109 m/m
Drop	0.45 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	226.83 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	225.11 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-2	1-600 mm Circular	0.1670 m^3/s	225.63 m	0.93 m/s
	Trial-1	1-600 mm Circular	0.2300 m^3/s	225.72 m	1.28 m/s

Culvert Design Report
Station 15+693 - Proposed

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	226.83 m	Storm Event	Design
Computed Headwater Elevation	225.63 m	Discharge	0.1670 m³/s
Headwater Depth/Height	0.71	Tailwater Elevation	225.11 m
Inlet Control HW Elev.	225.59 m	Control Type	Outlet Control
Outlet Control HW Elev.	225.63 m		

Grades			
Upstream Invert	225.20 m	Downstream Invert	224.75 m
Length	49.40 m	Constructed Slope	0.009109 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.36 m
Slope Type	Mild	Normal Depth	0.31 m
Flow Regime	Subcritical	Critical Depth	0.26 m
Velocity Downstream	0.93 m/s	Critical Slope	0.015802 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.61 m
Section Size	600 mm	Rise	0.61 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	225.63 m	Upstream Velocity Head	0.07 m
Ke	0.90	Entrance Loss	0.06 m

Inlet Control Properties			
Inlet Control HW Elev.	225.59 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.3 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 15+693 - Proposed

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	226.83 m	Storm Event	Check
Computed Headwater Elevation	225.72 m	Discharge	0.2300 m³/s
Headwater Depth/Height	0.85	Tailwater Elevation	225.11 m
Inlet Control HW Elev.	225.68 m	Control Type	Outlet Control
Outlet Control HW Elev.	225.72 m		

Grades			
Upstream Invert	225.20 m	Downstream Invert	224.75 m
Length	49.40 m	Constructed Slope	0.009109 m/m

Hydraulic Profile			
Profile	M2	Depth, Downstream	0.36 m
Slope Type	Mild	Normal Depth	0.37 m
Flow Regime	Subcritical	Critical Depth	0.31 m
Velocity Downstream	1.28 m/s	Critical Slope	0.016719 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.61 m
Section Size	600 mm	Rise	0.61 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	225.72 m	Upstream Velocity Head	0.08 m
Ke	0.90	Entrance Loss	0.07 m

Inlet Control Properties			
Inlet Control HW Elev.	225.68 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.3 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Analysis Report
Station 15+885 and 15+955 - Propoosed

Analysis Component			
Storm Event	Check	Discharge	17.4860 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	13.2530 m³/s	Check Discharge	17.4860 m³/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	221.64 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-5480 x 1520 mm Box	17.4878 m³/s	222.37 m	2.38 m/s
Culvert-2	1-900 mm Circular	0.0000 m³/s	222.37 m	0.00 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	222.37 m	N/A
Total	----------------	17.4878 m³/s	222.37 m	N/A

Culvert Analysis Report
Station 15+885 and 15+955 - Propoosed

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	222.37 m	Discharge	17.4878 m³/s
Inlet Control HW Elev.	222.23 m	Tailwater Elevation	221.64 m
Outlet Control HW Elev.	222.37 m	Control Type	Entrance Control
Headwater Depth/Height	1.23		

Grades			
Upstream Invert	220.50 m	Downstream Invert	220.30 m
Length	50.40 m	Constructed Slope	0.003968 m/m

Hydraulic Profile			
Profile	CompositeS1S2	Depth, Downstream	1.34 m
Slope Type	Steep	Normal Depth	0.87 m
Flow Regime	N/A	Critical Depth	1.01 m
Velocity Downstream	2.38 m/s	Critical Slope	0.002510 m/m

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	5.48 m
Section Size	5480 x 1520 mm	Rise	1.52 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	222.37 m	Upstream Velocity Head	0.51 m
Ke	0.70	Entrance Loss	0.35 m

Inlet Control Properties			
Inlet Control HW Elev.	222.23 m	Flow Control	N/A
Inlet Type	0° wingwall flares	Area Full	8.4 m²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Analysis Report
Station 15+885 and 15+955 - Propoosed

Component:Culvert-2

Culvert Summary			
Computed Headwater Elevation	N/A m	Discharge	0.0000 m³/s
Inlet Control HW Elev.	N/A m	Tailwater Elevation	221.64 m
Outlet Control HW Elev.	N/A m	Control Type	Inlet Control
Headwater Depth/Height	0.00		

Grades			
Upstream Invert	222.60 m	Downstream Invert	221.10 m
Length	45.10 m	Constructed Slope	0.033259 m/m

Hydraulic Profile			
Profile	Dry	Depth, Downstream	0.00 m
Slope Type	Dry	Normal Depth	0.00 m
Flow Regime	Subcritical	Critical Depth	0.00 m
Velocity Downstream	0.00 m/s	Critical Slope	0.000000 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.91 m
Section Size	900 mm	Rise	0.91 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	N/A m	Upstream Velocity Head	0.00 m
Ke	0.90	Entrance Loss	0.02 m

Inlet Control Properties			
Inlet Control HW Elev.	N/A m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.7 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Analysis Report
Station 15+885 and 15+955 - Propoosed

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)			
Discharge	0.0000 m³/s	Allowable HW Elevation	222.37 m
Roadway Width	10.00 m	Overtopping Coefficient	1.60 SI
Length	50.00 m	Crest Elevation	223.28 m
Headwater Elevation	N/A m	Discharge Coefficient (Cr)	2.90
Submergence Factor (Kt)	1.00		

Sta (m)	Elev. (m)
0.00	223.28
50.00	223.28

Culvert Design Report
Station 16+327 - Proposed

Peak Discharge Method: User-Specified			
Design Discharge	0.2430 m³/s	Check Discharge	0.3250 m³/s

Grades Model: Inverts			
Invert Upstream	226.80 m	Invert Downstream	226.20 m
Length	38.50 m	Slope	0.015584 m/m
Drop	0.60 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	228.79 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	226.92 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-1200 mm Circular	0.2430 m³/s	227.23 m	0.34 m/s
	Trial-2	1-1200 mm Circular	0.3250 m³/s	227.30 m	0.45 m/s

Culvert Design Report
Station 16+327 - Proposed

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	228.79 m	Storm Event	Design
Computed Headwater Elevation	227.23 m	Discharge	0.2430 m³/s
Headwater Depth/Height	0.35	Tailwater Elevation	226.92 m
Inlet Control HW Elev.	227.15 m	Control Type	Entrance Control
Outlet Control HW Elev.	227.23 m		

Grades			
Upstream Invert	226.80 m	Downstream Invert	226.20 m
Length	38.50 m	Constructed Slope	0.015584 m/m

Hydraulic Profile			
Profile	CompositeS1S2	Depth, Downstream	0.72 m
Slope Type	Steep	Normal Depth	0.24 m
Flow Regime	N/A	Critical Depth	0.26 m
Velocity Downstream	0.34 m/s	Critical Slope	0.012307 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.22 m
Section Size	1200 mm	Rise	1.22 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	227.23 m	Upstream Velocity Head	0.09 m
Ke	0.90	Entrance Loss	0.08 m

Inlet Control Properties			
Inlet Control HW Elev.	227.15 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	1.2 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 16+327 - Proposed

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	228.79 m	Storm Event	Check
Computed Headwater Elevation	227.30 m	Discharge	0.3250 m³/s
Headwater Depth/Height	0.41	Tailwater Elevation	226.92 m
Inlet Control HW Elev.	227.21 m	Control Type	Entrance Control
Outlet Control HW Elev.	227.30 m		

Grades			
Upstream Invert	226.80 m	Downstream Invert	226.20 m
Length	38.50 m	Constructed Slope	0.015584 m/m

Hydraulic Profile			
Profile	CompositeS1S2	Depth, Downstream	0.72 m
Slope Type	Steep	Normal Depth	0.28 m
Flow Regime	N/A	Critical Depth	0.30 m
Velocity Downstream	0.45 m/s	Critical Slope	0.012140 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.22 m
Section Size	1200 mm	Rise	1.22 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	227.30 m	Upstream Velocity Head	0.11 m
Ke	0.90	Entrance Loss	0.10 m

Inlet Control Properties			
Inlet Control HW Elev.	227.21 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	1.2 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 16+700 - Proposed

Peak Discharge Method: User-Specified			
Design Discharge	0.1370 m³/s	Check Discharge	0.1840 m³/s

Grades Model: Inverts			
Invert Upstream	229.00 m	Invert Downstream	228.44 m
Length	40.80 m	Slope	0.013725 m/m
Drop	0.56 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	230.66 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	228.80 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-2	1-600 mm Circular	0.1370 m³/s	229.40 m	0.76 m/s
	Trial-1	1-600 mm Circular	0.1840 m³/s	229.47 m	1.03 m/s

Culvert Design Report
Station 16+700 - Proposed

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	230.66 m	Storm Event	Design
Computed Headwater Elevation	229.40 m	Discharge	0.1370 m³/s
Headwater Depth/Height	0.65	Tailwater Elevation	228.80 m
Inlet Control HW Elev.	229.34 m	Control Type	Outlet Control
Outlet Control HW Elev.	229.40 m		

Grades			
Upstream Invert	229.00 m	Downstream Invert	228.44 m
Length	40.80 m	Constructed Slope	0.013725 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.36 m
Slope Type	Mild	Normal Depth	0.24 m
Flow Regime	Subcritical	Critical Depth	0.24 m
Velocity Downstream	0.76 m/s	Critical Slope	0.015476 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.61 m
Section Size	600 mm	Rise	0.61 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	229.40 m	Upstream Velocity Head	0.08 m
Ke	0.90	Entrance Loss	0.07 m

Inlet Control Properties			
Inlet Control HW Elev.	229.34 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.3 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 16+700 - Proposed

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	230.66 m	Storm Event	Check
Computed Headwater Elevation	229.47 m	Discharge	0.1840 m³/s
Headwater Depth/Height	0.76	Tailwater Elevation	228.80 m
Inlet Control HW Elev.	229.41 m	Control Type	Outlet Control
Outlet Control HW Elev.	229.47 m		

Grades			
Upstream Invert	229.00 m	Downstream Invert	228.44 m
Length	40.80 m	Constructed Slope	0.013725 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.36 m
Slope Type	Mild	Normal Depth	0.29 m
Flow Regime	Subcritical	Critical Depth	0.28 m
Velocity Downstream	1.03 m/s	Critical Slope	0.016004 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.61 m
Section Size	600 mm	Rise	0.61 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	229.47 m	Upstream Velocity Head	0.09 m
Ke	0.90	Entrance Loss	0.08 m

Inlet Control Properties			
Inlet Control HW Elev.	229.41 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.3 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 16+842 - Proposed

Peak Discharge Method: User-Specified			
Design Discharge	0.0580 m³/s	Check Discharge	0.0780 m³/s

Grades Model: Inverts			
Invert Upstream	229.49 m	Invert Downstream	229.41 m
Length	18.69 m	Slope	0.004280 m/m
Drop	0.08 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	230.91 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	229.77 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-2	1-600 mm Circular	0.0580 m³/s	229.80 m	0.32 m/s
	Trial-1	1-600 mm Circular	0.0780 m³/s	229.82 m	0.43 m/s

Culvert Design Report
Station 16+842 - Proposed

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	230.91 m	Storm Event	Design
Computed Headwater Elevation	229.80 m	Discharge	0.0580 m³/s
Headwater Depth/Height	0.51	Tailwater Elevation	229.77 m
Inlet Control HW Elev.	229.77 m	Control Type	Outlet Control
Outlet Control HW Elev.	229.80 m		

Grades			
Upstream Invert	229.49 m	Downstream Invert	229.41 m
Length	18.69 m	Constructed Slope	0.004280 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.36 m
Slope Type	Mild	Normal Depth	0.21 m
Flow Regime	Subcritical	Critical Depth	0.15 m
Velocity Downstream	0.32 m/s	Critical Slope	0.015291 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.61 m
Section Size	600 mm	Rise	0.61 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	229.80 m	Upstream Velocity Head	0.01 m
Ke	0.90	Entrance Loss	0.01 m

Inlet Control Properties			
Inlet Control HW Elev.	229.77 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.3 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 16+842 - Proposed

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	230.91 m	Storm Event	Check
Computed Headwater Elevation	229.82 m	Discharge	0.0780 m³/s
Headwater Depth/Height	0.54	Tailwater Elevation	229.77 m
Inlet Control HW Elev.	229.77 m	Control Type	Outlet Control
Outlet Control HW Elev.	229.82 m		

Grades			
Upstream Invert	229.49 m	Downstream Invert	229.41 m
Length	18.69 m	Constructed Slope	0.004280 m/m

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.36 m
Slope Type	Mild	Normal Depth	0.25 m
Flow Regime	Subcritical	Critical Depth	0.18 m
Velocity Downstream	0.43 m/s	Critical Slope	0.015192 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.61 m
Section Size	600 mm	Rise	0.61 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	229.82 m	Upstream Velocity Head	0.01 m
Ke	0.90	Entrance Loss	0.01 m

Inlet Control Properties			
Inlet Control HW Elev.	229.77 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.3 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 17+887 - Proposed Coleraine Drive

Peak Discharge Method: User-Specified			
Design Discharge	0.0730 m³/s	Check Discharge	0.1030 m³/s

Grades Model: Inverts			
Invert Upstream	229.38 m	Invert Downstream	229.51 m
Length	17.76 m	Slope	-0.007320 m/m
Drop	-0.13 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	230.57 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	229.87 m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-2	1-600 mm Circular	0.0730 m³/s	229.89 m	0.41 m/s
	Trial-1	1-600 mm Circular	0.1030 m³/s	229.92 m	0.57 m/s

Culvert Design Report
Station 17+887 - Proposed Coleraine Drive

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	230.57 m	Storm Event	Design
Computed Headwater Elevation	229.89 m	Discharge	0.0730 m³/s
Headwater Depth/Height	0.84	Tailwater Elevation	229.87 m
Inlet Control HW Elev.	229.87 m	Control Type	Outlet Control
Outlet Control HW Elev.	229.89 m		

Grades			
Upstream Invert	229.38 m	Downstream Invert	229.51 m
Length	17.76 m	Constructed Slope	-0.007320 m/m

Hydraulic Profile			
Profile	A2	Depth, Downstream	0.36 m
Slope Type	Adverse	Normal Depth	0.00 m
Flow Regime	Subcritical	Critical Depth	0.17 m
Velocity Downstream	0.41 m/s	Critical Slope	0.015204 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.61 m
Section Size	600 mm	Rise	0.61 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	229.89 m	Upstream Velocity Head	0.00 m
Ke	0.90	Entrance Loss	0.00 m

Inlet Control Properties			
Inlet Control HW Elev.	229.87 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.3 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Design Report
Station 17+887 - Proposed Coleraine Drive

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	230.57 m	Storm Event	Check
Computed Headwater Elevation	229.92 m	Discharge	0.1030 m³/s
Headwater Depth/Height	0.88	Tailwater Elevation	229.87 m
Inlet Control HW Elev.	229.87 m	Control Type	Outlet Control
Outlet Control HW Elev.	229.92 m		

Grades			
Upstream Invert	229.38 m	Downstream Invert	229.51 m
Length	17.76 m	Constructed Slope	-0.007320 m/m

Hydraulic Profile			
Profile	A2	Depth, Downstream	0.36 m
Slope Type	Adverse	Normal Depth	0.00 m
Flow Regime	Subcritical	Critical Depth	0.20 m
Velocity Downstream	0.57 m/s	Critical Slope	0.015236 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.61 m
Section Size	600 mm	Rise	0.61 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	229.92 m	Upstream Velocity Head	0.01 m
Ke	0.90	Entrance Loss	0.01 m

Inlet Control Properties			
Inlet Control HW Elev.	229.87 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.3 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Analysis Report
Station 11+800 and 11+812 - Ex Regulatory

Analysis Component			
Storm Event	Check	Discharge	43.4180 m^3/s

Peak Discharge Method: User-Specified			
Design Discharge	0.0000 m^3/s	Check Discharge	43.4180 m^3/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	222.02 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-750 mm Circular	1.3171 m^3/s	223.82 m	3.05 m/s
Culvert-2	1-3660 x 1830 mm Box	21.2507 m^3/s	223.82 m	3.85 m/s
Weir	Roadway (Constant Elevation)	20.8611 m^3/s	223.82 m	N/A
Total	----------------	43.4288 m^3/s	223.82 m	N/A

Culvert Analysis Report
Station 11+800 and 11+812 - Ex Regulatory

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	223.82 m	Discharge	1.3171 m^3/s
Inlet Control HW Elev.	223.51 m	Tailwater Elevation	222.02 m
Outlet Control HW Elev.	223.82 m	Control Type	Outlet Control
Headwater Depth/Height	2.93		

Grades			
Upstream Invert	221.59 m	Downstream Invert	221.38 m
Length	20.60 m	Constructed Slope	0.010194 m/m

Hydraulic Profile			
Profile	CompositeM2PressureProfile	Depth, Downstream	0.69 m
Slope Type	Mild	Normal Depth	N/A m
Flow Regime	Subcritical	Critical Depth	0.69 m
Velocity Downstream	3.05 m/s	Critical Slope	0.038582 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.76 m
Section Size	750 mm	Rise	0.76 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	223.82 m	Upstream Velocity Head	0.43 m
Ke	0.90	Entrance Loss	0.38 m

Inlet Control Properties			
Inlet Control HW Elev.	223.51 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.5 m^2
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Analysis Report
Station 11+800 and 11+812 - Ex Regulatory

Component:Culvert-2

Culvert Summary			
Computed Headwater Elevation	223.82 m	Discharge	21.2507 m^3/s
Inlet Control HW Elev.	223.82 m	Tailwater Elevation	222.02 m
Outlet Control HW Elev.	223.62 m	Control Type	Inlet Control
Headwater Depth/Height	1.59		

Grades			
Upstream Invert	220.91 m	Downstream Invert	220.92 m
Length	29.40 m	Constructed Slope	-0.000340 m/m

Hydraulic Profile			
Profile	CompositeA2PressureProfile	Depth, Downstream	1.51 m
Slope Type	Adverse	Normal Depth	N/A m
Flow Regime	Subcritical	Critical Depth	1.51 m
Velocity Downstream	3.85 m/s	Critical Slope	0.003223 m/m

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	3.66 m
Section Size	3660 x 1830 mm	Rise	1.83 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	223.62 m	Upstream Velocity Head	0.51 m
Ke	0.70	Entrance Loss	0.36 m

Inlet Control Properties			
Inlet Control HW Elev.	223.82 m	Flow Control	N/A
Inlet Type	0° wingwall flares	Area Full	6.7 m^2
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Analysis Report
Station 11+800 and 11+812 - Ex Regulatory

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)			
Discharge	20.8611 m^3/s	Allowable HW Elevation	223.82 m
Roadway Width	10.00 m	Overtopping Coefficient	1.68 SI
Length	50.00 m	Crest Elevation	223.43 m
Headwater Elevation	223.82 m	Discharge Coefficient (Cr)	3.04
Submergence Factor (Kt)	1.00		

Sta (m)	Elev. (m)
0.00	223.43
50.00	223.43

Culvert Analysis Report
Station 12+300 - Ex Regulatory

Analysis Component			
Storm Event	Check	Discharge	46.5000 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	0.0000 m³/s	Check Discharge	46.5000 m³/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	218.33 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-5500 x 1950 mm Box	46.4993 m³/s	221.39 m	4.36 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	221.39 m	N/A
Total	----------------	46.4993 m³/s	221.39 m	N/A

Culvert Analysis Report
Station 12+300 - Ex Regulatory

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	221.39 m	Discharge	46.4993 m³/s
Inlet Control HW Elev.	221.39 m	Tailwater Elevation	218.33 m
Outlet Control HW Elev.	220.93 m	Control Type	Inlet Control
Headwater Depth/Height	2.16		

Grades			
Upstream Invert	217.18 m	Downstream Invert	217.16 m
Length	37.90 m	Constructed Slope	0.000528 m/m

Hydraulic Profile			
Profile	CompositeM2PressureProfile	Depth, Downstream	1.94 m
Slope Type	Mild	Normal Depth	N/A m
Flow Regime	Subcritical	Critical Depth	1.94 m
Velocity Downstream	4.36 m/s	Critical Slope	0.002707 m/m

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	5.50 m
Section Size	5500 x 1950 mm	Rise	1.95 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	220.93 m	Upstream Velocity Head	0.96 m
Ke	0.70	Entrance Loss	0.67 m

Inlet Control Properties			
Inlet Control HW Elev.	221.39 m	Flow Control	N/A
Inlet Type	0° wingwall flares	Area Full	10.7 m²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Analysis Report
Station 12+300 - Ex Regulatory

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)			
Discharge	0.0000 m³/s	Allowable HW Elevation	221.39 m
Roadway Width	10.00 m	Overtopping Coefficient	1.60 SI
Length	50.00 m	Crest Elevation	222.88 m
Headwater Elevation	N/A m	Discharge Coefficient (Cr)	2.90
Submergence Factor (Kt)	1.00		

Sta (m)	Elev. (m)
0.00	222.88
50.00	222.88

Culvert Analysis Report
Station 12+500 - Ex Regulatory

Analysis Component			
Storm Event	Check	Discharge	11.6610 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	0.0000 m³/s	Check Discharge	11.6610 m³/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	219.44 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-1800 mm Circular	11.6607 m³/s	223.36 m	4.69 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	223.36 m	N/A
Total	----------------	11.6607 m³/s	223.36 m	N/A

Culvert Analysis Report
Station 12+500 - Ex Regulatory

Component:Culvert-1

Culvert Summary					
Computed Headwater Elevation	223.36	m	Discharge	11.6607	m^3/s
Inlet Control HW Elev.	223.33	m	Tailwater Elevation	219.44	m
Outlet Control HW Elev.	223.36	m	Control Type	Outlet Control	
Headwater Depth/Height	2.50				

Grades					
Upstream Invert	218.78	m	Downstream Invert	218.36	m
Length	41.60	m	Constructed Slope	0.010096	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	1.64	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	1.64	m
Velocity Downstream	4.69	m/s	Critical Slope	0.028428	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.83	m
Section Size	1800 mm		Rise	1.83	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	223.36	m	Upstream Velocity Head	1.00	m
Ke	0.90		Entrance Loss	0.90	m

Inlet Control Properties					
Inlet Control HW Elev.	223.33	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	2.6	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Analysis Report
Station 12+500 - Ex Regulatory

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)					
Discharge	0.0000	m^3/s	Allowable HW Elevation	223.36	m
Roadway Width	10.00	m	Overtopping Coefficient	1.60	SI
Length	50.00	m	Crest Elevation	225.33	m
Headwater Elevation	N/A	m	Discharge Coefficient (Cr)	2.90	
Submergence Factor (Kt)	1.00				

Sta (m)	Elev. (m)
0.00	225.33
50.00	225.33

Culvert Analysis Report
Station 14+177 - Ex Regulatory

Analysis Component					
Storm Event	Check		Discharge	8.5000	m^3/s

Peak Discharge Method: User-Specified					
Design Discharge	0.0000	m^3/s	Check Discharge	8.5000	m^3/s

Tailwater Conditions: Constant Tailwater		
Tailwater Elevation	215.16	m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-1050 mm Circular	5.2620 m^3/s	221.14 m	7.07 m/s
Weir	Roadway (Constant Elevation)	3.2418 m^3/s	221.14 m	N/A
Total	----------------	8.5038 m^3/s	221.14 m	N/A

Culvert Analysis Report
Station 14+177 - Ex Regulatory

Component:Culvert-1

Culvert Summary					
Computed Headwater Elevation	221.14	m	Discharge	5.2620	m^3/s
Inlet Control HW Elev.	221.14	m	Tailwater Elevation	215.16	m
Outlet Control HW Elev.	219.64	m	Control Type	Inlet Control	
Headwater Depth/Height	4.89				

Grades					
Upstream Invert	215.92	m	Downstream Invert	214.50	m
Length	30.70	m	Constructed Slope	0.046254	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.83	m
Slope Type	Steep		Normal Depth	0.72	m
Flow Regime	Supercritical		Critical Depth	1.05	m
Velocity Downstream	7.07	m/s	Critical Slope	0.026426	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	Corrugated HDPE (Smooth Interior)		Span	1.07	m
Section Size	1050 mm		Rise	1.07	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	219.64	m	Upstream Velocity Head	1.78	m
Ke	0.50		Entrance Loss	0.89	m

Inlet Control Properties					
Inlet Control HW Elev.	221.14	m	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	0.9	m^2
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Analysis Report
Station 14+177 - Ex Regulatory

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)			
Discharge	3.2418 m³/s	Allowable HW Elevation	221.14 m
Roadway Width	10.00 m	Overtopping Coefficient	1.65 SI
Length	50.00 m	Crest Elevation	221.02 m
Headwater Elevation	221.14 m	Discharge Coefficient (Cr)	2.99
Submergence Factor (Kt)	1.00		

Sta (m)	Elev. (m)
0.00	221.02
50.00	221.02

Culvert Analysis Report
Station 15+156 - Ex Regulatory

Analysis Component			
Storm Event	Check	Discharge	60.0070 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	0.0000 m³/s	Check Discharge	60.0070 m³/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	220.37 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-6000 x 1250 mm Box	30.1676 m³/s	222.89 m	4.02 m/s
Weir	Roadway (Constant Elevation)	29.8527 m³/s	222.89 m	N/A
Total	----------------	60.0203 m³/s	222.89 m	N/A

Culvert Analysis Report
Station 15+156 - Ex Regulatory

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	222.89 m	Discharge	30.1676 m³/s
Inlet Control HW Elev.	222.89 m	Tailwater Elevation	220.37 m
Outlet Control HW Elev.	222.41 m	Control Type	Inlet Control
Headwater Depth/Height	2.69		

Grades			
Upstream Invert	219.53 m	Downstream Invert	219.62 m
Length	20.70 m	Constructed Slope	-0.004348 m/m

Hydraulic Profile			
Profile	PressureProfile	Depth, Downstream	1.25 m
Slope Type	N/A	Normal Depth	N/A m
Flow Regime	N/A	Critical Depth	1.25 m
Velocity Downstream	4.02 m/s	Critical Slope	0.006586 m/m

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	6.00 m
Section Size	6000 x 1250 mm	Rise	1.25 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	222.41 m	Upstream Velocity Head	0.82 m
Ke	0.70	Entrance Loss	0.58 m

Inlet Control Properties			
Inlet Control HW Elev.	222.89 m	Flow Control	N/A
Inlet Type	0° wingwall flares	Area Full	7.5 m²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Analysis Report
Station 15+156 - Ex Regulatory

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)			
Discharge	29.8527 m³/s	Allowable HW Elevation	222.89 m
Roadway Width	10.00 m	Overtopping Coefficient	1.67 SI
Length	50.00 m	Crest Elevation	222.39 m
Headwater Elevation	222.89 m	Discharge Coefficient (Cr)	3.03
Submergence Factor (Kt)	1.00		

Sta (m)	Elev. (m)
0.00	222.39
50.00	222.39

Culvert Analysis Report
Station 15+885 and 15+955 - Ex Regulatory

Analysis Component			
Storm Event	Check	Discharge	71.8880 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	0.0000 m³/s	Check Discharge	71.8880 m³/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	221.57 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-900 mm Circular	2.5422 m³/s	223.77 m	5.06 m/s
Culvert-2	1-4575 x 1520 mm Box	25.0389 m³/s	223.77 m	4.25 m/s
Weir	Roadway (Constant Elevation)	44.3234 m³/s	223.77 m	N/A
Total	----------------	71.9045 m³/s	223.77 m	N/A

Culvert Analysis Report
Station 15+885 and 15+955 - Ex Regulatory

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	223.77 m	Discharge	2.5422 m³/s
Inlet Control HW Elev.	223.77 m	Tailwater Elevation	221.57 m
Outlet Control HW Elev.	223.27 m	Control Type	Inlet Control
Headwater Depth/Height	2.79		

Grades			
Upstream Invert	221.21 m	Downstream Invert	220.29 m
Length	30.30 m	Constructed Slope	0.030363 m/m

Hydraulic Profile			
Profile	CompositePressureProfileS1	Depth, Downstream	0.65 m
Slope Type	N/A	Normal Depth	0.60 m
Flow Regime	Subcritical	Critical Depth	0.87 m
Velocity Downstream	5.06 m/s	Critical Slope	0.015684 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	0.91 m
Section Size	900 mm	Rise	0.91 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	223.27 m	Upstream Velocity Head	0.80 m
Ke	0.50	Entrance Loss	0.38 m

Inlet Control Properties			
Inlet Control HW Elev.	223.77 m	Flow Control	N/A
Inlet Type	Square edge w/headwall	Area Full	0.7 m²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Culvert Analysis Report
Station 15+885 and 15+955 - Ex Regulatory

Component:Culvert-2

Culvert Summary			
Computed Headwater Elevation	223.77 m	Discharge	25.0389 m³/s
Inlet Control HW Elev.	223.77 m	Tailwater Elevation	221.57 m
Outlet Control HW Elev.	223.41 m	Control Type	Inlet Control
Headwater Depth/Height	1.99		

Grades			
Upstream Invert	220.73 m	Downstream Invert	220.62 m
Length	21.65 m	Constructed Slope	0.005081 m/m

Hydraulic Profile			
Profile	S2	Depth, Downstream	1.29 m
Slope Type	Steep	Normal Depth	1.18 m
Flow Regime	Supercritical	Critical Depth	1.45 m
Velocity Downstream	4.25 m/s	Critical Slope	0.002818 m/m

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	4.57 m
Section Size	4575 x 1520 mm	Rise	1.52 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	223.41 m	Upstream Velocity Head	0.73 m
Ke	0.70	Entrance Loss	0.51 m

Inlet Control Properties			
Inlet Control HW Elev.	223.77 m	Flow Control	N/A
Inlet Type	0° wingwall flares	Area Full	7.0 m²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Analysis Report
Station 15+885 and 15+955 - Ex Regulatory

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)			
Discharge	44.3234 m³/s	Allowable HW Elevation	223.77 m
Roadway Width	10.00 m	Overtopping Coefficient	1.67 SI
Length	50.00 m	Crest Elevation	223.11 m
Headwater Elevation	223.77 m	Discharge Coefficient (Cr)	3.02
Submergence Factor (Kt)	1.00		

Sta (m)	Elev. (m)
0.00	223.11
50.00	223.11

Culvert Analysis Report
Station 11+800 and 11+812 - Proposed Regulatory

Analysis Component			
Storm Event	Check	Discharge	43.4180 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	0.0000 m³/s	Check Discharge	43.4180 m³/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	221.70 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-750 mm Circular	1.0425 m³/s	223.64 m	2.29 m/s
Culvert-2	2-3660 x 1830 mm Box	42.3770 m³/s	223.64 m	3.84 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	223.64 m	N/A
Total	----------------	43.4195 m³/s	223.64 m	N/A

Culvert Analysis Report
Station 11+800 and 11+812 - Proposed Regulatory

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	223.64 m	Discharge	1.0425 m³/s
Inlet Control HW Elev.	223.15 m	Tailwater Elevation	221.70 m
Outlet Control HW Elev.	223.64 m	Control Type	Outlet Control
Headwater Depth/Height	2.41		

Grades			
Upstream Invert	221.80 m	Downstream Invert	220.80 m
Length	52.20 m	Constructed Slope	0.019157 m/m

Hydraulic Profile			
Profile	PressureProfile	Depth, Downstream	0.90 m
Slope Type	N/A	Normal Depth	N/A m
Flow Regime	N/A	Critical Depth	0.63 m
Velocity Downstream	2.29 m/s	Critical Slope	0.027306 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.76 m
Section Size	750 mm	Rise	0.76 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	223.64 m	Upstream Velocity Head	0.27 m
Ke	0.90	Entrance Loss	0.24 m

Inlet Control Properties			
Inlet Control HW Elev.	223.15 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.5 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Analysis Report
Station 11+800 and 11+812 - Proposed Regulatory

Component:Culvert-2

Culvert Summary			
Computed Headwater Elevation	223.64 m	Discharge	42.3770 m³/s
Inlet Control HW Elev.	223.64 m	Tailwater Elevation	221.70 m
Outlet Control HW Elev.	223.49 m	Control Type	Inlet Control
Headwater Depth/Height	1.58		

Grades			
Upstream Invert	220.75 m	Downstream Invert	220.60 m
Length	55.50 m	Constructed Slope	0.002703 m/m

Hydraulic Profile			
Profile	M2	Depth, Downstream	1.51 m
Slope Type	Mild	Normal Depth	N/A m
Flow Regime	Subcritical	Critical Depth	1.51 m
Velocity Downstream	3.84 m/s	Critical Slope	0.003222 m/m

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	3.66 m
Section Size	3660 x 1830 mm	Rise	1.83 m
Number Sections	2		

Outlet Control Properties			
Outlet Control HW Elev.	223.49 m	Upstream Velocity Head	0.67 m
Ke	0.70	Entrance Loss	0.47 m

Inlet Control Properties			
Inlet Control HW Elev.	223.64 m	Flow Control	N/A
Inlet Type	0° wingwall flares	Area Full	13.4 m²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Analysis Report
Station 11+800 and 11+812 - Proposed Regulatory

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)			
Discharge	0.0000 m³/s	Allowable HW Elevation	223.64 m
Roadway Width	10.00 m	Overtopping Coefficient	1.60 SI
Length	50.00 m	Crest Elevation	224.21 m
Headwater Elevation	N/A m	Discharge Coefficient (Cr)	2.90
Submergence Factor (Kt)	1.00		

Sta (m)	Elev. (m)
0.00	224.21
50.00	224.21

Culvert Analysis Report
Station 12+300 - Proposed Regulatory

Analysis Component			
Storm Event	Check	Discharge	46.5370 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	0.0000 m³/s	Check Discharge	46.5370 m³/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	218.06 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-Custom 6.10 x 2.13m Box	46.5351 m³/s	220.42 m	4.21 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	220.42 m	N/A
Total	----------------	46.5351 m³/s	220.42 m	N/A

Culvert Analysis Report
Station 12+300 - Proposed Regulatory

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	220.42 m	Discharge	46.5351 m³/s
Inlet Control HW Elev.	220.42 m	Tailwater Elevation	218.06 m
Outlet Control HW Elev.	220.19 m	Control Type	Inlet Control
Headwater Depth/Height	1.65		

Grades			
Upstream Invert	216.90 m	Downstream Invert	216.80 m
Length	48.00 m	Constructed Slope	0.002083 m/m

Hydraulic Profile			
Profile	M2	Depth, Downstream	1.81 m
Slope Type	Mild	Normal Depth	N/A m
Flow Regime	Subcritical	Critical Depth	1.81 m
Velocity Downstream	4.21 m/s	Critical Slope	0.002531 m/m

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	6.10 m
Section Size	Custom 6.10 x 2.13m	Rise	2.13 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	220.19 m	Upstream Velocity Head	0.81 m
Ke	0.70	Entrance Loss	0.57 m

Inlet Control Properties			
Inlet Control HW Elev.	220.42 m	Flow Control	Submerged
Inlet Type	0° wingwall flares	Area Full	13.0 m²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Analysis Report
Station 12+300 - Proposed Regulatory

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)			
Discharge	0.0000 m³/s	Allowable HW Elevation	220.42 m
Roadway Width	10.00 m	Overtopping Coefficient	1.60 SI
Length	50.00 m	Crest Elevation	223.22 m
Headwater Elevation	N/A m	Discharge Coefficient (Cr)	2.90
Submergence Factor (Kt)	1.00		

Sta (m)	Elev. (m)
0.00	223.22
50.00	223.22

Culvert Design Report
Station 12+500 - Proposed Regulatory

Peak Discharge Method: User-Specified			
Design Discharge	0.0000 m³/s	Check Discharge	11.6610 m³/s

Grades Model: Inverts			
Invert Upstream	219.40 m	Invert Downstream	217.90 m
Length	68.50 m	Slope	0.021898 m/m
Drop	1.50 m		

Headwater Model: Maximum Allowable HW	
Headwater Elevation	225.30 m

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	219.07 m

Name	Description	Discharge	HW Elev.	Velocity
x Trial-1	1-1950 mm Circular	11.6610 m³/s	223.04 m	4.40 m/s

Culvert Design Report
Station 12+500 - Proposed Regulatory

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	225.30 m	Storm Event	Check
Computed Headwater Elevation	223.04 m	Discharge	11.6610 m³/s
Headwater Depth/Height	1.84	Tailwater Elevation	219.07 m
Inlet Control HW Elev.	223.04 m	Control Type	Inlet Control
Outlet Control HW Elev.	222.80 m		

Grades			
Upstream Invert	219.40 m	Downstream Invert	217.90 m
Length	68.50 m	Constructed Slope	0.021898 m/m

Hydraulic Profile			
Profile	S2	Depth, Downstream	1.59 m
Slope Type	Steep	Normal Depth	1.59 m
Flow Regime	Supercritical	Critical Depth	1.65 m
Velocity Downstream	4.40 m/s	Critical Slope	0.020509 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.98 m
Section Size	1950 mm	Rise	1.98 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	222.80 m	Upstream Velocity Head	0.92 m
Ke	0.90	Entrance Loss	0.83 m

Inlet Control Properties			
Inlet Control HW Elev.	223.04 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	3.1 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Analysis Report
Station 14+177 - Proposed Regulatory

Analysis Component			
Storm Event	Check	Discharge	8.5180 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	0.0000 m³/s	Check Discharge	8.5180 m³/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	216.46 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-1200 mm Circular	4.8503 m³/s	221.00 m	4.28 m/s
Weir	Roadway (Constant Elevation)	3.6737 m³/s	221.00 m	N/A
Total	----------------	8.5240 m³/s	221.00 m	N/A

Culvert Analysis Report
Station 14+177 - Proposed Regulatory

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	221.00 m	Discharge	4.8503 m³/s
Inlet Control HW Elev.	220.58 m	Tailwater Elevation	216.46 m
Outlet Control HW Elev.	221.00 m	Control Type	Outlet Control
Headwater Depth/Height	3.44		

Grades			
Upstream Invert	216.80 m	Downstream Invert	215.80 m
Length	48.30 m	Constructed Slope	0.020704 m/m

Hydraulic Profile			
Profile	CompositeM2PressureProfile	Depth, Downstream	1.14 m
Slope Type	Mild	Normal Depth	N/A m
Flow Regime	Subcritical	Critical Depth	1.14 m
Velocity Downstream	4.28 m/s	Critical Slope	0.041901 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.22 m
Section Size	1200 mm	Rise	1.22 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	221.00 m	Upstream Velocity Head	0.88 m
Ke	0.90	Entrance Loss	0.79 m

Inlet Control Properties			
Inlet Control HW Elev.	220.58 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	1.2 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Analysis Report
Station 14+177 - Proposed Regulatory

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)			
Discharge	3.6737 m³/s	Allowable HW Elevation	221.00 m
Roadway Width	10.00 m	Overtopping Coefficient	1.65 SI
Length	50.00 m	Crest Elevation	220.87 m
Headwater Elevation	221.00 m	Discharge Coefficient (Cr)	3.00
Submergence Factor (Kt)	1.00		

Sta (m)	Elev. (m)
0.00	220.87
50.00	220.87

Culvert Analysis Report
Station 15+156 - Proposed Regulatory

Analysis Component			
Storm Event	Check	Discharge	60.0070 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	0.0000 m³/s	Check Discharge	60.0070 m³/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	220.68 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-6000 x 1800 mm Box	39.0656 m³/s	222.89 m	4.00 m/s
Weir	Roadway (Constant Elevation)	20.9526 m³/s	222.89 m	N/A
Total	----------------	60.0181 m³/s	222.89 m	N/A

Culvert Analysis Report
Station 15+156 - Proposed Regulatory

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	222.89 m	Discharge	39.0656 m³/s
Inlet Control HW Elev.	222.89 m	Tailwater Elevation	220.68 m
Outlet Control HW Elev.	222.68 m	Control Type	Inlet Control
Headwater Depth/Height	1.83		

Grades			
Upstream Invert	219.60 m	Downstream Invert	219.60 m
Length	50.90 m	Constructed Slope	0.000000 m/m

Hydraulic Profile			
Profile	CompositeH2PressureProfile	Depth, Downstream	1.63 m
Slope Type	Horizontal	Normal Depth	N/A m
Flow Regime	Subcritical	Critical Depth	1.63 m
Velocity Downstream	4.00 m/s	Critical Slope	0.002511 m/m

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	6.00 m
Section Size	6000 x 1800 mm	Rise	1.80 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	222.68 m	Upstream Velocity Head	0.67 m
Ke	0.70	Entrance Loss	0.47 m

Inlet Control Properties			
Inlet Control HW Elev.	222.89 m	Flow Control	N/A
Inlet Type	0° wingwall flares	Area Full	10.8 m²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Analysis Report
Station 15+156 - Proposed Regulatory

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)			
Discharge	20.9526 m³/s	Allowable HW Elevation	222.89 m
Roadway Width	10.00 m	Overtopping Coefficient	1.68 SI
Length	50.00 m	Crest Elevation	222.50 m
Headwater Elevation	222.89 m	Discharge Coefficient (Cr)	3.04
Submergence Factor (Kt)	1.00		

Sta (m)	Elev. (m)
0.00	222.50
50.00	222.50

Culvert Analysis Report
Station 15+885 and 15+955 - Propoosed Regulatory

Analysis Component			
Storm Event	Check	Discharge	71.8880 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	0.0000 m³/s	Check Discharge	71.8880 m³/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	221.64 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-5480 x 1520 mm Box	30.9452 m³/s	223.65 m	3.71 m/s
Culvert-2	1-900 mm Circular	0.9690 m³/s	223.65 m	2.87 m/s
Weir	Roadway (Constant Elevation)	39.9896 m³/s	223.65 m	N/A
Total	----------------	71.9038 m³/s	223.65 m	N/A

Culvert Analysis Report
Station 15+885 and 15+955 - Propoosed Regulatory

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	223.65 m	Discharge	30.9452 m³/s
Inlet Control HW Elev.	223.65 m	Tailwater Elevation	221.64 m
Outlet Control HW Elev.	223.24 m	Control Type	Inlet Control
Headwater Depth/Height	2.07		

Grades			
Upstream Invert	220.50 m	Downstream Invert	220.30 m
Length	50.40 m	Constructed Slope	0.003968 m/m

Hydraulic Profile			
Profile	S2	Depth, Downstream	1.52 m
Slope Type	Steep	Normal Depth	N/A m
Flow Regime	Supercritical	Critical Depth	1.48 m
Velocity Downstream	3.71 m/s	Critical Slope	0.002587 m/m

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	5.48 m
Section Size	5480 x 1520 mm	Rise	1.52 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	223.24 m	Upstream Velocity Head	0.74 m
Ke	0.70	Entrance Loss	0.52 m

Inlet Control Properties			
Inlet Control HW Elev.	223.65 m	Flow Control	N/A
Inlet Type	0° wingwall flares	Area Full	8.4 m²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Analysis Report
Station 15+885 and 15+955 - Propoosed Regulatory

Component:Culvert-2

Culvert Summary			
Computed Headwater Elevation	223.65 m	Discharge	0.9690 m³/s
Inlet Control HW Elev.	223.56 m	Tailwater Elevation	221.64 m
Outlet Control HW Elev.	223.65 m	Control Type	Entrance Control
Headwater Depth/Height	1.15		

Grades			
Upstream Invert	222.60 m	Downstream Invert	221.10 m
Length	45.10 m	Constructed Slope	0.033259 m/m

Hydraulic Profile			
Profile	S2	Depth, Downstream	0.47 m
Slope Type	Steep	Normal Depth	0.47 m
Flow Regime	Supercritical	Critical Depth	0.58 m
Velocity Downstream	2.87 m/s	Critical Slope	0.016892 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.91 m
Section Size	900 mm	Rise	0.91 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	223.65 m	Upstream Velocity Head	0.25 m
Ke	0.90	Entrance Loss	0.22 m

Inlet Control Properties			
Inlet Control HW Elev.	223.56 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.7 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Analysis Report
Station 15+885 and 15+955 - Propoosed Regulatory

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)			
Discharge	39.9896 m³/s	Allowable HW Elevation	223.65 m
Roadway Width	10.00 m	Overtopping Coefficient	1.67 SI
Length	50.00 m	Crest Elevation	223.04 m
Headwater Elevation	223.65 m	Discharge Coefficient (Cr)	3.03
Submergence Factor (Kt)	1.00		

Sta (m)	Elev. (m)
0.00	223.04
50.00	223.04