GENIVAR Inc. is pleased to submit the revised Draft Phase 2 Report for the Kitchener Zone 4 Trunk Watermain Environmental Assessment after incorporating your comments on the original draft submitted. We would appreciate any further comments that you, or any of the stakeholder groups within the Region, have regarding the project progress thus far.

We trust this meets with your approval. If you have any questions or comments, please do not hesitate to contact the undersigned at 519.827.1453.

Yours truly,

GENIVAR Inc.

James Witherspoon, P.Eng., LEED AP
Project Manager
Regional Director – Southcentral Ontario

/JW
# Table of Contents

Table of Contents .......................................................................................................................... 2
List of Tables .................................................................................................................................. 7
List of Figures .................................................................................................................................. 7
Appendices ...................................................................................................................................... 8

1. Introduction ................................................................................................................................ 1
   1.1 Purpose and Study Background .......................................................................................... 1
   1.2 Study Objectives and Scope of Work .............................................................................. 1
   1.3 Study Team ....................................................................................................................... 2
   1.4 Previous Studies ............................................................................................................... 3
      1.4.1 Tri-City Water Distribution Master Plan Final Report, 2009 ......................................... 3
      1.4.2 Kitchener Zone 2 & 4 Optimization Study, 2009 ....................................................... 3
      1.4.3 Kitchener Zone 4 Analysis, 2009 ............................................................................... 4
   1.5 Relevant Legislation and Regulations .............................................................................. 4
      1.5.1 The Planning Act, 1990 ............................................................................................. 4
      1.5.2 Ontario Planning and Development Act, 1994 .......................................................... 4
      1.5.3 Places to Grow Act, 2005 ....................................................................................... 4
      1.5.4 Endangered Species Act, 2007 ................................................................................ 5
      1.5.5 Conservation Authorities Act, 1990 ......................................................................... 5
   1.6 Policies .................................................................................................................................. 5
      1.6.1 Provincial Policy Statement ....................................................................................... 5
      1.6.2 Growth Plan for the Greater Golden Horseshoe ....................................................... 5
      1.6.3 Region of Waterloo Official Plan .............................................................................. 6
      1.6.4 City of Kitchener Official Plan .................................................................................. 6
   1.7 Other Related Documents and Projects ............................................................................ 6
      1.7.1 Kitchener Growth Management Plan, 2009 ............................................................... 6
      1.7.2 Region of Waterloo Greenland Network Implementation Guideline ...................... 7
      1.7.3 Rosenberg Secondary Plan, 2011 ............................................................................. 7
      1.7.4 The City of Kitchener Draft Natural Heritage Background Report, 2011 ................. 7
      1.7.5 City of Kitchener Multi-Use Pathways and Trails Master Plan, 2012 ..................... 7
      1.7.6 Alder Creek Watershed Study and Upper Strasburg Creek Subwatershed Plan Update, 2008 .......................................................... 8
      1.7.7 Upper Strasburg Creek Class Environmental Assessment, 2008 ............................. 8

2. Environmental Assessment Process ............................................................................................ 9
   2.1 Environmental Assessment Act ....................................................................................... 9
   2.2 Principles of Environmental Planning ............................................................................ 9
   2.3 Municipal Class Environmental Assessment ................................................................ 10
   2.4 Infrastructure Ontario Compliance ............................................................................... 13
   2.5 Canadian Environmental Assessment Act Compliance .............................................. 13
      2.5.1 Law List Regulations .............................................................................................. 13
      2.5.2 Permits and Approvals ............................................................................................ 14

3. Phase 1: Problem Definition ....................................................................................................... 15
   3.1 Definition of Problem/Opportunity .................................................................................. 15
   3.2 Need and Project Justification ....................................................................................... 15
   3.3 Project Class EA Schedule ............................................................................................ 15
   3.4 Public Review and Next Steps ....................................................................................... 15

4. Existing Conditions and Considerations .................................................................................... 17
   4.1 Service Area .................................................................................................................... 17
   4.2 Study Area ....................................................................................................................... 19
7.5.2 Component 2............................................................................................................... 100
7.5.3 Component 3............................................................................................................... 101
7.5.4 Component 4............................................................................................................... 101
7.5.5 Component 5............................................................................................................... 101
7.5.6 Component 6............................................................................................................... 101
7.5.7 Component 7............................................................................................................... 101
7.5.8 Component 8............................................................................................................... 102
7.5.9 Component 9............................................................................................................... 102
7.5.10 Component 10.......................................................................................................... 102
7.5.11 Component 11.......................................................................................................... 103
7.5.12 Component 12.......................................................................................................... 103
7.5.13 Component 13.......................................................................................................... 103
7.5.14 Component 14.......................................................................................................... 103
7.5.15 Component 15.......................................................................................................... 103
7.5.16 Component 16.......................................................................................................... 104
7.5.17 Component 17.......................................................................................................... 104
7.5.18 Component 18.......................................................................................................... 104
7.5.19 Component 19.......................................................................................................... 104
7.5.20 Component 20.......................................................................................................... 105
7.5.21 Component 21.......................................................................................................... 105
7.5.22 Component 22.......................................................................................................... 105
7.5.23 Summary of Natural and Physical Environment Evaluation .................................. 105

7.6 Social Environment Considerations............................................................................. 107
7.6.1 Component 1............................................................................................................... 107
7.6.2 Component 2............................................................................................................... 107
7.6.3 Component 3............................................................................................................... 107
7.6.4 Component 4............................................................................................................... 108
7.6.5 Component 5............................................................................................................... 108
7.6.6 Component 6............................................................................................................... 108
7.6.7 Component 7............................................................................................................... 108
7.6.8 Component 8............................................................................................................... 108
7.6.9 Component 9............................................................................................................... 109
7.6.10 Component 10......................................................................................................... 109
7.6.11 Component 11......................................................................................................... 109
7.6.12 Component 12......................................................................................................... 109
7.6.13 Component 13......................................................................................................... 109
7.6.14 Component 14......................................................................................................... 109
7.6.15 Component 15......................................................................................................... 110
7.6.16 Component 16......................................................................................................... 110
7.6.17 Component 17......................................................................................................... 110
7.6.18 Component 18......................................................................................................... 110
7.6.19 Component 19......................................................................................................... 110
7.6.20 Component 20......................................................................................................... 110
7.6.21 Component 21......................................................................................................... 111
7.6.22 Component 22......................................................................................................... 111
7.6.23 Summary of Social Consideration Evaluation....................................................... 111

7.7 Technical Considerations............................................................................................. 112
7.7.1 Component 1............................................................................................................... 112
7.7.2 Component 2............................................................................................................... 112
7.7.3 Component 3............................................................................................................... 112
7.7.4 Component 4............................................................................................................... 112
7.7.5 Component 5............................................................................................................... 113
7.7.6 Component 6............................................................................................................... 113
7.7.7 Component 7............................................................................................................... 113
7.7.8 Component 8............................................................................................................... 113
7.7.9 Component 9............................................................................................................... 113
7.7.10 Component 10........................................................................................................... 114
9.7 Transportation Considerations .............................................................. 134
  9.7.1 Traffic Considerations ................................................................. 135
  9.7.2 Property Access Considerations .................................................. 135
  9.7.3 Transit Considerations ................................................................. 135
  9.7.4 Pedestrians and Cyclists ............................................................. 135

9.8 Construction Costs ............................................................................. 136

9.9 Implementation and Scheduling .......................................................... 136
  9.9.1 Coordination with the Future Infrastructure Construction ............... 136
  9.9.2 Implementation Plan ................................................................. 136

10. Mitigation Measures ........................................................................... 136
  10.1 Natural Environment Mitigation Measures ......................................... 137
    10.1.1 Proximity to Natural Heritage Features and Vegetation ............... 137
    10.1.2 Groundwater & Subsurface Conditions ....................................... 138
    10.1.3 Crossing Natural Features .......................................................... 138
    10.1.4 Channel Crossings and Fish Habitat ........................................... 138
    10.1.5 Proximity to Valleylands and Flood Plains ................................. 138
  10.2 Social & Cultural Mitigation Measures ............................................. 138
    10.2.1 Impact on Recreation Areas ...................................................... 138
    10.2.2 Archaeological Features ............................................................ 138
    10.2.3 Proximity to Built-up Areas & Private Properties Affected ........... 139
    10.2.4 Proximity to Agricultural Land uses ......................................... 139
    10.2.5 Traffic Impacts during Construction .......................................... 139

11. Review Agencies and Approvals .......................................................... 140
  11.1 Ministry of the Environment ............................................................ 140
  11.2 Grand River Conservation Authority .............................................. 140
  11.3 Ministry of Natural Resources ........................................................ 140
  11.4 Ministry of Culture ........................................................................ 140
  11.5 Hydro One Networks Infrastructure .............................................. 140
  11.6 Kitchener-Wilmot Hydro Commission ............................................ 140
  11.7 Union Gas ...................................................................................... 140
  11.8 Utilities 140
  11.9 Approvals and Land Acquisition .................................................... 141
    11.9.1 Permanent and Temporary Working Easements ......................... 141
  11.10 Transportation Approvals ........................................................... 141

12. Public and Agency Consultation .......................................................... 141
  12.1 Public Notices ................................................................................ 141
    12.1.1 Notice of Study Commencement ............................................... 141
    12.1.2 Public Information Centre (PIC) ................................................ 141
    12.1.3 Notice of Study Completion ...................................................... 142
  12.2 Agency and Municipal Consultation ................................................ 142
  12.3 Public and Agency Comments and Responses .................................. 143
    12.3.1 Regulatory Agency Comments and Responses ......................... 143
List of Figures

Figure 4-1: Municipal Class EA Process ................................................................. 12
Figure 4-2: Flow Diagram of Pressure Zones Dependant on Kitchener Pressure Zone 4 ................. 17
Figure 4-3: Geographic location of Pressure Zone boundaries and current distribution .................. 18
Figure 4-4: Land Use within Study Area .................................................................. 20
Figure 4-5: Section A – Natural Area North, Hydro Corridor South of Crossing at Ottawa Street South .... 24
Figure 4-6: Section A – Natural Area South, Hydro Corridor south of Fischer Hallman Road Crossing ... 24
Figure 4-7: Section A – Natural Area South, Hydro Corridor South of Newcastle Drive (Future Connection of Strasburg Road) .................................................................................. 25
Figure 4-8: Section B – Residential Area North, Hydro Corridor North of Isaiah Drive Crossing .......... 26
Figure 4-9: Section B – Residential Area South, Hydro Corridor North of Parkvale Drive Crossing .... 26
Figure 4-10: Section C – Agricultural Area, Land Currently Utilized for Agriculture South of Huron Road 27
Figure 4-11: South Section of Hydro Corridor at Bleams Road Crossing ................................. 28
Figure 4-12: Bleams Road Westbound, Business Park and Residential Area ............................... 28
Figure 4-13: Location of Potential Contamination Sources ............................................... 31
Figure 4-14: Locations of Existing Infrastructure ............................................................ 33
Figure 4-15: Connection to Hydro Transformer Station, North of Huron Road Crossing .................. 35
Figure 4-16: Pressure Zone Connections, Demand and Capacity (adapted from Stantec, 2009) ............. 36
Figure 4-17: Illustration of Future Development Areas within the City of Kitchener ......................... 38
Figure 4-18: Location of Regional Wellhead Protection Areas .............................................. 44
Figure 4-19: Natural Heritage Feature Locations .................................................................. 55
Figure 4-20: Archaeological Conditions within Study Area .................................................. 57
Figure 4-21: Entrance to Laurentian Wetlands from Watercress Court ................................. 58
Figure 4-22: Borden Wetland and associated regional forest .................................................. 59
Figure 4-23: Hydro Corridor at South side of Parkvale Drive Crossing ...................................... 60
Figure 4-24: Hydro Corridor at South Side of Banffshire Street Crossing, Within Residential Land Use Section .................................................................................................................. 61
Figure 4-25: Open Spaces and Recreational Areas .................................................................. 62
Figure 4-26: Location of Future Projects within Study Area .................................................. 67
Figure 5-1: Schematic of Hydro One Design Constraint ..................................................... 70
Figure 6-1: Alignment Components ................................................................................. 77
Figure 7-1: Bridge Located at Wetland Crossing of Parkvale Drive ......................................... 114
Figure 7-2: Alternative Alignments to be Evaluated Further ............................................... 124
Figure 9-1: Preferred Alignment Based on Evaluation Criteria ............................................ 130
Appendices

Appendix A – Kitchener Zone 2 and 4 Optimization Study – Preliminary Design Report – March 2009
Appendix B – Kitchener Zone 4 Analysis – July 2009
Appendix C – Notice of Commencement
Appendix D – Stakeholder List
Appendix E – Zone 4 Trunk Watermain Hydrogeological Report - August 2011
Appendix F – Natural Heritage Evaluation Report – February 2012
Appendix H – Evaluation of Components
Appendix G – Stage 1 Archaeological Assessment – September 2011
Appendix I – Public Information Centre #1 – Letter to Stakeholders
Appendix J – Public Information Centre #1 – Sign-In-Sheet
Appendix K – Public Information Centre #1 – PowerPoint Presentation
Appendix L – Correspondence & Meeting Minutes
1. Introduction

A Municipal Class Environmental Assessment (Class EA) is being undertaken by the Region of Waterloo to determine the preferred water servicing upgrades to Kitchener Pressure Zone 2 and Pressure Zone 4 in order to support and strengthen the water supply of the two zones and convey more water to the south end of Kitchener Pressure Zone 4. This report follows the previously completed Phase 1 Report which outlined the purpose of the project and the Study Area. This Phase 2 report is built on the Phase 1 Report and presents the evaluation of Alignments comprised of various Components to determine a preferred Alignment. The report outlines the evaluation criteria and records comments from stakeholders and the public, in accordance with the requirements of a Schedule “B” Municipal Class Environmental Assessment Phase 2 Report.

1.1 Purpose and Study Background

The Region of Waterloo released the Tri-City Water Distribution Master Plan Final Report in May 2009. This report identified the existing distribution within the Cities of Waterloo, Kitchener and Cambridge. The report outlined areas for upgrades to the water distribution system to meet the demand of the Region of Waterloo through to the year 2031. One such recommendation was the evaluation of the Kitchener Pressure Zones 2 and 4.

In May, 2009, the Region of Waterloo completed the Kitchener Zone 2 and 4 Optimization Study (Appendix A) to identify potential solutions to low pressures within certain areas of the Kitchener Pressure Zone 2W and 4 water distribution system during periods of high demand. The report recommended improvements to infrastructure within Kitchener Pressure Zone 2W, including the installation of a 600 mm diameter trunk watermain along the proposed Strasburg Road alignment to facilitate the movement of more water into the southern section of Kitchener and the Kitchener Pressure Zone 2W.

As a follow-up to the May 2009 report, the Kitchener Zone 4 Analysis Report was published in July, 2009 (Appendix B). Among the findings of the Zone 4 analysis, the report recommended the installation of a 750 mm diameter watermain to connect from the discharge of the Mannheim Water Treatment Plant Zone 4 Pumping Station to the proposed 600 mm diameter trunk watermain at the intersection of the proposed Strasburg Road extension and Rockcliffe Drive. The 600mm Watermain is included with the Strasburg Road extension project, which is currently in the detailed design process and being undertaken by the City of Kitchener. The connection of these distribution components would alleviate the low pressure observed with the system during periods of high water demand and increase water conveyance capacity within south Kitchener to accommodate future growth in both Pressure Zones.

Based on the recommendation of the Kitchener Zone 4 Analysis Report, this Schedule B Class EA is being conducted in accordance with the Municipal Class Environmental Assessment planning process to find the preferred alignment for the 750 mm diameter trunk Watermain. The goal is to evaluate various Components to facilitate the transfer of water from the Mannheim Water Treatment Plant Zone 4 Pumping Station, to the planned Strasburg Road extension in the south end of Kitchener Pressure Zone 4 in order to increase conveyance of water and to normalize pressure in the area. The results of the Kitchener Zone 4 Analysis Report identified that the installation of a 750 mm diameter Trunk watermain will facilitate enough water transfer to successfully alleviate the current pressure variation issues in addition to meeting the future (2031) water demand for southern Kitchener.

1.2 Study Objectives and Scope of Work

This Class EA Study has three key objectives:

1. Identify Trunk Watermain Routing Alternatives

The Kitchener Zone 4 Analysis Report identified the preferred alignment location to be within the existing Hydro One Corridor. In order to complete a thorough Environmental Assessment, the Study Area was expanded in order to evaluate all potential alternatives. Each Alignment Alternative is to commence in the area of the Mannheim Water Treatment Plant Zone 4 Pumping Station and extend to...
a connection with Kitchener Pressure Zone 4 at the future extension of Strasburg Road. The objective of this study is to identify feasible alternative alignments in, or adjacent to, the Hydro One corridor and available road easements such as Ottawa Street South, Trussler Road, Huron Road, Fischer Hallman Road, Bleams Road and Strasburg Road. Most of the identified Alignments are comprised of Components, which were created to navigate identified areas of concern. An evaluation of the individual Components was completed prior to an evaluation of the Alignment Alternatives (which were comprised of the Components with the least negative impact).

2. **Evaluate the Impacts of each Trunk Watermain Alternative and Select the Preferred Alternative(s)**

Each of the Trunk Watermain Alternative identified have associated environmental, social, economic and technical impacts. The impacts associated with each Alternative have been assessed and evaluated to determine which solution has the least overall impact. Alternatives were developed to allow for the comparison of solution which completed the same task, connect the Mannheim Water Treatment Plant Zone 4 Pumping Station to Strasburg Road. This Report identifies the preferred alignment determined thorough an evaluation of each Alternative’s impacts on the Study Area.

A Public Information Centre and meetings with selected agencies were held to obtain essential stakeholders input. Technical feasibility and potential constructability issues were also identified in this Study and used to evaluate each Alternative.

3. **Develop the Preliminary Design of the Preferred Alternative**

Upon selection of the preferred Alternative, and following the Notice of Completion review period, the project will move into Phase 5 of the Class EA Process (Refer to Section 2 of this report). This will include the development of the preliminary design for the preferred Alternative including confirmation of pipe sizing, layout and system appurtenances. This phase of the project will be the development of the design to a point that the Region can plan for the detailed design and subsequent construction of this project.

1.3 **Study Team**

This Class EA Study was performed by GENIVAR on behalf of the Region of Waterloo. Meetings were held with Regional departments and committees throughout the process to provide technical and operation feedback and to ensure all Regional requirements were incorporated into the study.

Key Regional staff included;

- Nathan Morris, Project Coordinator
- Kevin Dolishny, P.Eng., Senior Project Engineer
- Kaoru Yajima, P.Eng., Senior Planning Engineer

Key GENIVAR staff that participated in the study included;

- James Witherspoon, P.Eng., LEED AP, Project Manager
- Andrew Tulk, P.Eng., Project Engineer
- Stan Holden, P.Eng., Project Engineer
- Jean-Luc Daviau, P.Eng., Project Engineer
- Paul Racher, Ph.D., Project Archaeologist
- Dan Reeves, M.Sc., Project Biologist
- Derek Brunner, P.Geo., Hydrogeologist
- Jean Guy Chauvin, GIS & Data Management
- Alexandra Grosse, E.I.T., Project Designer
Technical expertise related to the Stage 1 Archaeological Assessment was provided by Archaeological Research Associates Limited (ARA). Based on the findings of the Stage 1 Archaeological Assessment it was recommended that a Stage 2 Archaeological Assessment be completed in select sections of the Study Area.

1.4 Previous Studies

The sections below provide an overview of some of the key studies that have been completed or are underway that relate directly to the scope of this Study.

1.4.1 Tri-City Water Distribution Master Plan Final Report, 2009

As a result from recommendations in the 2003 Regional Growth Management Plan, the Tri-City Water Distribution Master Plan was updated to identify potential required upgrades to meet the projected 2031 water demands. This report outlined the projected populations, future water demands and potential deficiencies within the current distribution system. The Technical Memorandum, in Appendix D of the Tri-City Water Distribution Master Plan, reported low pressure situations in the Kitchener Pressure Zone 2W. This report recommended further studies be completed, resulting in the Kitchener Zone 2 and 4 Optimization Study and the Kitchener Zone 4 Analysis Study.

1.4.2 Kitchener Zone 2 & 4 Optimization Study, 2009

The focus of the Kitchener Zone 2 & 4 Optimization Study was to investigate existing concerns related to operational constraints within Kitchener Pressure Zones 2 and 4 during times of high demand, resulting in high head loss and reduced pressures in certain areas.

The Kitchener Zone 2 and 4 Optimization Study has identified deficiencies in the existing distribution system, including:

- Aging water mains;
- High and low pressure concerns in certain areas; and,
- A need for an additional distribution system south of Huron Road.

Some of the planned improvements which were recommended in the Optimization Study consist of:

- Adjustment of the boundary alignment between Kitchener Pressure Zone 2 West and Kitchener Pressure Zone 4, to maximize utilization of Water Treatment Plant K34;
- The installation of 600 mm diameter Regional Watermain along the Strasburg Road Extension; and,
- A new east-west transmission main to Kitchener Pressure Zone 2W.

This study addressed the increase in demand in the southwest section of the City of Kitchener, as recommended in the 2009 Tri-City Water Distribution Master Plan. A review of the existing water distribution system in Kitchener Pressure Zone 2W indicated that there was a lack of redundancy and looping within this Zone. Further, additional redundancy was determined to be necessary to ensure the reliability of the distribution system within the Pressure Zone in the event of a watermain break or if maintenance shut-down is required.

The report recommended improvements to the existing infrastructure within Kitchener Pressure Zone 2 to increase redundancies and decrease the length of time drinking water is held in the distribution system. The installation of a 600 mm diameter watermain along the proposed alignment of the Strasburg Road Extension was included in both Alternatives presented in this report for the increase of flow to the proposed developments located in the Southwest section of the City of Kitchener. Further recommendations were made to adjust the current boundaries between Pressure Zone 4 and Pressure Zone 2 to the north of Huron Road to provide the areas south of Huron Road with optimal service pressures. The total estimated cost of the recommended upgrades is between 7 and 8 million dollars, depending on the Alternative selected.
1.4.3 Kitchener Zone 4 Analysis, 2009

The purpose of the Kitchener Zone 4 Analysis report was to identify the areas of concern within Kitchener Pressure Zone 4, for existing and future demand conditions. The study identified a capacity deficiency during future (2031) demand conditions. Additional flow from the Mannheim Water Treatment Plant Zone 4 Pumping Station to southwest Kitchener was recommended, along with two Alternatives for future system upgrades.

Alternative 1 outlined the installation of a 750 mm diameter Trunk Watermain from the Mannheim Water Treatment Plant Zone 4 Pumping Station to the proposed 600 mm diameter watermain on Strasburg Road at the intersection of Rockcliffe Drive, via an alignment though an existing Hydro Corridor. The estimated cost of this project was reported to be $9.1 million. Being the most direct route and least expensive this was the preferred Alternative identified in this report. Alternative 2 involved the installation of the 750 mm diameter trunk watermain along existing roadways (Trussler Road and Huron Road) in the event that Alternative 1 is not constructible. The estimated cost identified for this Alternative was $12.8 million.

1.5 Relevant Legislation and Regulations

Legislation and Regulations guiding planning and development in the Study Area were reviewed during Phase 1 of this Study for pertinent information related to this EA. They are described in brief in the following subsections:

1.5.1 The Planning Act, 1990

The Planning Act establishes the mechanisms and rules for land use planning in Ontario, outlining how land uses may be controlled, and who may control them. The Act sets the basis for the preparation of official plans and planning policies for future development, and it provides municipalities with local autonomy to make decisions and streamline the planning process. The Act empowers local citizens to provide their input to their municipal council and, where permitted, to appeal decisions to the Ontario Municipal Board. Through the Act, the Province issues Provincial Policy Statements and plans (e.g. Growth Plan for the Greater Golden Horseshoe, 2006).

1.5.2 Ontario Planning and Development Act, 1994

The Ontario Planning and Development Act, 1994 establishes the general approach by which the Minister of Municipal Affairs and Housing may cause for Development Plans to be undertaken for development planning areas. The Development Plans may include policies for economic, social and physical development with relation to the distribution and density of population within the development area, the location of employment areas, the identification of land use areas, the management of land and water resources, the control of all forms of pollution of the natural environment, the location and development of servicing, communication and transportation systems and the development and maintenance of educational, cultural, recreational, health and other social facilities. There also may be policies relating to the financing and programming of public development projects and capital works, and policies to co-ordinate planning and development among municipalities or planning boards within an area or within separate areas, among other considerations.

1.5.3 Places to Grow Act, 2005

The Places to Grow Act 2005, provides a framework for the Provincial government to coordinate planning and decision-making for long-term growth and infrastructure renewal in Ontario. It gives the Province the authority to designate geographical growth areas, and to develop growth plans in collaboration with local officials and stakeholders to meet specific needs across the Province. Growth plans developed under the Places to Grow Act integrate and build upon other initiatives such as the Greenbelt Plan, the Niagara Escarpment Plan, the Provincial Policy Statement, the Planning Act, municipal infrastructure planning, and source water protection planning. Growth plans may include population projections and allocations, policies, goals and criteria relating to issues such as intensification and density, land supply, expansions and amendments to urban boundaries, location of industry and commerce, protection of sensitive and significant lands (including agricultural lands and water resources), infrastructure development, affordable housing and community design.
Municipalities are required to bring their official plans into conformity with the growth plan for their area. Decisions made under the Planning Act and Condominium Act are also required to conform to applicable growth plans.

1.5.4 Endangered Species Act, 2007

The Endangered Species Act (2007) was developed by the Ministry of Natural Resources (MNR) in 2007 and enacted in 2008 to replace the previous Endangered Species Act (1971). The purpose of this act is to identify, protect and promote recovery of species at risk and their habitats. “No person shall kill, harm, harass, capture...possess, transport, collect...a living or dead member of an extirpated, endangered or threatened species, or anything derived from (the species)...No person shall damage or destroy the habitat of an endangered or threatened species, nor an extirpated species if so specified in a regulation” (Section 9-10, ESA). All projects must be approved by the MNR before proceeding. The act allows MNR to expand its list of species at risk at any time and all are expected to comply with revisions of this list.

1.5.5 Conservation Authorities Act, 1990

Originally created in 1946, the Conservation Authorities Act was legislated by the Ministry of Natural Resources in response to growing concerns with the general health of renewable natural resources due to development and de-forestation which was causing erosion issues. This act was created to provide a framework to allow municipalities to work with the province of Ontario to protect local natural resources. Conservation Authorities were developed to steward natural resources on a watershed based level, this generally requires the Conservation Authority to regulate land across municipal boundaries. This project is under the jurisdiction of the Grand River Conservation Authority, their consultation and approval is required when there is potential for disruption of a watercourse, or significant feature within the watershed.

1.6 Policies

Provincial and local policies relevant to the Study Area were reviewed during Phase 1 of this Study. They are briefly described in the following subsections:

1.6.1 Provincial Policy Statement

The Provincial Policy Statement (PPS) is a key component of Ontario’s planning system as it sets policy direction on matters of provincial interest related to land use planning, growth management, environmental protection, and public health and safety. It aims to provide a stronger policy framework that guides communities in Ontario toward a higher quality of life and a better long-term future.

The PPS establishes the Region of Waterloo’s role in planning for growth, intensification and redevelopment. The PPS identifies that development within designated areas must proceed based on the extension of municipal water supply and wastewater collection systems. New settlement area policies will only permit expansions where it is demonstrated that opportunities for growth are not available through intensification, redevelopment or in previously designated areas. The PPS also requires municipalities to coordinate and provide direction on policies with cross municipal boundaries, such as natural heritage systems and resource management. It also provides the context for the City’s participation in the Growth Plan for the Greater Golden Horseshoe.

1.6.2 Growth Plan for the Greater Golden Horseshoe

The Growth Plan for the Greater Golden Horseshoe was prepared and approved under the Places to Grow Act, 2005. The Growth Plan for the Greater Golden Horseshoe contains a framework for implementing the Government of Ontario’s vision for building stronger, prosperous communities by better managing growth to 2031. The Plan has been built upon other government initiatives including: the Planning Act reform and the Provincial Policy Statement, 2005. Though the Plan is not meant to replace municipal official plans, it works within the existing planning framework to provide growth management policy direction for the Greater Golden Horseshoe.
Specifically, the Plan establishes growth forecasts, intensification policies and targets, and development density targets for urban and Greenfield areas. It also provides guidance on issues such as transportation, infrastructure planning, land-use planning, urban form, housing, natural heritage and resource protection with the goal of promoting economic prosperity to areas within the Greater Golden Horseshoe. In the 2006 plan Growth Plan for the Greater Golden Horseshoe, the City of Kitchener, as part of the Region of Waterloo, was identified as “built up area”.

1.6.3 Region of Waterloo Official Plan

The Region of Waterloo Official Plan is a statement of goals, objectives and policies intended to guide future land use activity and change that has been prepared and enacted in accordance with the provisions of the Planning Act. The policies of the Plan are intended to promote long-term community sustainability by promoting concepts and actions that are intended to achieve a sustainable social climate, economic vitality and environmental protection. It is intended to serve as a primary policy plan that sets City-wide policies. This being said, the Plan is meant to be interpreted as a statement of the Region’s aspirations as opposed to a regulatory document.

Of particular relevance to this project, the Region of Waterloo Official Plan Chapters 1 and 2 contain information pertaining to the Region’s population projections, land use designations and development policies. Chapter 6 identifies the location of the Countryside boundary which separates protected countryside and prime agricultural land from areas of current or future urbanization. According to the Official Plan, the projected population target for the Region of Waterloo is 712,000 by the year 2029. Additionally, Chapter 7 prescribed planning policies and mapping related to the Greenland’s network for a Natural Heritage System that is consistent with both the Provincial Policy Statement and conforms with the Growth Plan for the Greater Golden Horseshoe. Finally, Chapter 8 outlined policies pertaining to areas of source water protection. This is further discussed in Section 4.6.1.3 of this document.

1.6.4 City of Kitchener Official Plan

The City of Kitchener Official Plan was developed in conformance of the Region of Waterloo Official Plan, it is a statement of goals, objectives and policies intended to guide future land use activity and change that has been prepared and enacted in accordance with the provisions of the Planning Act. The policies of the Plan are intended to promote long-term community sustainability by promoting concepts and actions that are intended to achieve a sustainable social climate, economic vitality and environmental protection. It is intended to serve as a primary policy plan that sets City-wide policies. This being said, the Plan is meant to be interpreted as a statement of the City’s aspirations as opposed to a regulatory document.

With regard to the design of the Kitchener Zone 4 trunk Watermain, the City of Kitchener Official Plan outlines general policies related to Health and Safety (including servicing and utilities), Natural Resource Management, Transportation and Special Policy Areas such as the Huron Natural Area found within the Study Area.

1.7 Other Related Documents and Projects

Several related studies were completed prior to the commencement of this Class EA Study. During Phase 1 of this Study, each of these studies were reviewed for pertinent information related to this project. They are described in brief in the following subsections:

1.7.1 Kitchener Growth Management Plan, 2009

The City of Kitchener developed the Kitchener Growth Management Plan (KGMP) in conformance with the City of Kitchener Official Plan, to direct proper and orderly development within City boundaries. Through the study, the staging of developments within Kitchener from 2009-2010, and post 2010, was evaluated based on growth management criteria.

The KGMP was meant to be an annual static update of development documentation and the estimated land use inventory and intensification levels at the time of its publishing. The plan monitors how population growth will occur, that is, either in Greenfield areas or as infill and intensification
growth. The locations of proposed development within the City boundaries will pose additional strain on the current distribution system. Not only does the information provided by this plan support the purpose of the Kitchener Zone 4 Trunk Watermain, it identifies the developments which could potentially be impacted by the Kitchener Zone 4 Trunk Watermain. The developers involved should continue, therefore, to be consulted as stakeholders throughout the EA process.

1.7.2 Region of Waterloo Greenland Network Implementation Guideline

The purpose of this document is to provide guidance on how to implement the environmental policies of the 2009 Region of Waterloo Official Plan. This document also provided detailed guidance for the preparation of a Full Environmental Impact Statement which is required to refine the boundaries of elements of the Greenlands Network, identify potential impacts on such elements and minimize these impacts through avoidance and mitigation. For the purposes of this report, the Region of Waterloo Greenland Network Implementation Guideline was used to identify required buffers surrounding Regional Core Environmental Features.

1.7.3 Rosenberg Secondary Plan, 2011

The Rosenberg Secondary Plan was developed by the City of Kitchener. It pertains to the Rosenberg Development which will be a ‘green’ mixed use development located East of Trussler Road along Bleams Road to Fischer Hallman Road and south to Huron Road. This report outlined objectives and potential policies associated with the development of this parcel of land. The estimated total additional population of this development is approximately 55,000, within medium and low density residential dwellings. The community design is to be based on the five-minute-walk principal, using the Fischer Hallman Road as a transit supportive mixed use corridor. The community is to be designed to establish a focal point for the entire southwest Kitchener area and will include land uses such as commercial, office, institutional and residential. The design will incorporate a ground water infiltration strategy and a system of interconnected parks and open spaces.

1.7.4 The City of Kitchener Draft Natural Heritage Background Report, 2011

The purpose of the City of Kitchener Draft Natural Heritage Background Report was to update the City of Kitchener Official Plan, by recognizing local, regional and provincially significant natural heritage features and systems and to create an inventory of the Natural Heritage Features within the City of Kitchener Area. The features of the Natural Heritage Systems identified within this report are: Significant Habitat for endangered and Threatened Species, Wetlands, Woodlands, Valley lands, Significant Wildlife Habitat, Significant Landforms, Habitat for Fish, Corridors/Linkages, Ecological Restoration Areas and Recharge/Discharge Areas. The objective of identifying the Natural Heritage Features was to not only protect and conserve but too identify areas of improvement and restoration to strengthen the existing Natural Heritage System. Mapping of the various natural Heritage Features was completed in this report, which identifies the location of features within the Kitchener Zone 4 Trunk Watermain Study Area.

1.7.5 City of Kitchener Multi-Use Pathways and Trails Master Plan, 2012

This Report outlines the development and implementation of previous projects to link existing open spaces within the City of Kitchener. Due to public demand, the City developed this Master Plan to make recommendations as to the locations and types of trails to be installed to create a robust network of trails. The trails are important to connect neighbourhoods with places of recreation, shopping and employment. In addition, well developed multi-use pathway and trail systems provide a variety of other transportation, economic, environmental and community health benefits. This report identifies the Hydro Corridor within the Study Area as a proposed primary multi-use pathway within the multi-use pathway network. Primary pathways are described as a hard surface with four (4) season maintenance.
1.7.6 Alder Creek Watershed Study and Upper Strasburg Creek Subwatershed Plan Update, 2008

Completed by CH2M Hill, this report was initiated in conjunction with the *Upper Strasburg Creek Class EA* by the Grand River Conservation Authority, Regional Municipality of Waterloo, and the City of Kitchener to understand the issues related to sustainable development and the balancing of interest regarding resource use. This report provided recommendations to address: best management practices, aquatic system protection, land use management and management of natural heritage components.

1.7.7 Upper Strasburg Creek Class Environmental Assessment, 2008

The purpose of the *Upper Strasburg Creek Class Environmental Assessment* was to resolve the flood plain and major flow control issues under existing conditions, upstream of Fischer Hallman Road. This report developed Alternatives for the improvement of the culvert under the Fischer Hallman Road just north of the Hydro Corridor. The Study Area of the *Upper Strasburg Creek Class EA* encompassed approximately 60% of the Kitchener Zone 4 Study Area. Although the purpose of that EA is not relevant to this EA, the site specific information is relevant to Kitchener Zone 4 Project.
2. Environmental Assessment Process

This section describes the Environmental Assessment Process and the specific requirements associated with this Study.

2.1 Environmental Assessment Act

Ontario’s Environmental Assessment Act (henceforth referred to as “the Act”) was passed in 1975 and proclaimed in 1976. The Act requires proponents to examine and document the environmental effects that might result from major projects or activities. Municipal undertakings became subject to the Act in 1981.

The Act defines the environment broadly as:

1. Air, land or water;
2. Plant and animal life, including human;
3. The social, economic and cultural conditions that influence the life of man or a community;
4. Any building, structure, machine or other device or thing made by man;
5. Any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from activities of human; and,
6. Any part or combination of the foregoing and the interrelationships between any two or more of them.

The purpose of the Act is the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management of the environment in the Province (RSO1990, c. 18, s.2).

As set out in Section 5(3) of the Act, an EA document must include the following:

1. A description of the purpose of the undertaking including:
   - The undertaking;
   - The Alternative methods of carrying out the undertaking; and,
   - Alternatives to the undertaking.

2. A description of:
   - The environment that will be affected or that might reasonably be expected to be affected, directly or indirectly, by the undertaking or Alternatives to the undertaking;
   - The effects that will be caused or that might reasonably be expected to be caused to the environment by the undertaking or Alternatives to the undertaking;
   - The actions necessary or that may reasonably be expected to be necessary to prevent, change, mitigate or remedy the effects upon or the effects that might reasonably be expected upon the environment by the undertaking or Alternatives to the undertaking; and,
   - An evaluation of the advantages and disadvantages to the environment of the undertaking, the Alternative methods of carrying out the undertaking and the Alternatives to the undertaking.

2.2 Principles of Environmental Planning

The Act sets a framework for a systematic, rational and replicable environmental planning process that is based on five key principles, as follows:

- **Consultation with Affected Parties** - Consultation with the public and government review agencies is an integral part of the planning process. Consultation allows the
proponent to identify and address concerns cooperatively before final decisions are made. Consultation should begin as early as possible in the planning process.

→ **Consideration of a Reasonable Range of Alternatives** - Alternatives include functionally different solutions to the proposed undertaking and Alternative methods of implementing the preferred solution. The “do nothing” Alternative must also be considered.

→ **Identification and Consideration of the Effects of Each Alternative on all Aspects of the Environment** - This includes the natural, social, cultural, technical, and economic environments.

→ **Systematic Evaluation of Alternatives in Terms of their Advantages and Disadvantages, to Determine their Net Environmental Effects** - The evaluation shall increase in the level of detail as the study moves from the evaluation of Alternative to the proposed undertaking to the evaluation of Alternative methods.

→ **Provision of Clean and Complete Documentation of the Planning Process Followed** – This will allow traceability of decision-making with respect to the project. The planning process must be documented in such a way that it may be repeated with similar results.

### 2.3 Municipal Class Environmental Assessment

Class Environmental Assessments (EAs) were approved by the Minister of the Environment in 1987 for municipal projects having predictable and preventable impacts. The Municipal Class EA document was revised, updated or amended in 1993, 2000, 2007 and 2011. The Class EA Municipal Engineers Association (MEA) approach streamlines the planning and approvals process for municipal projects which have the following characteristics:

→ Recurring;
→ Similar in nature;
→ Usually limited in scale;
→ Predictable range of environmental impacts; and,
→ Environmental impacts are responsive to mitigation.

The Municipal Class Environmental Assessment document, prepared by MEA (October 2000, as amended in 2007), outlines the procedures to be followed to satisfy Class EA requirements for water, wastewater and road projects. The process includes five phases:

→ **Phase 1: Problem Definition**
→ **Phase 2: Identification and Evaluation of Alternative Solutions to Determine a Preferred Solution**
→ **Phase 3: Examination of Alternative Methods of Implementation of the Preferred Solution**
→ **Phase 4: Documentation of the Planning, Design and Consultation Process**
→ **Phase 5: Implementation and Monitoring**

Public and agency consultation is integral to the Class EA planning process. Projects subject to the Class EA process are classified into four possible “Schedules” depending on the degree of expected impacts. It is important to note that the Schedule assigned to a particular project is proponent-driven. For example, if a project has been designated as Schedule “A”, the proponent can decide to comply with the requirements of a Schedule “B” or “C” of the MEA process based on the magnitude of anticipated impacts or the special public and agency consultation requirements specific to that particular project.
For Schedule “B” and “C” projects, the public has the opportunity to request additional investigation by filing a Part II Order Request to the Ministry of the Environment.

The Class EA process flowchart is provided in Figure 2-1.

Schedule “A” Projects

Schedule “A” projects are minor operation and maintenance activities and are pre-approved without the need for further assessment. Projects with this designation are typically limited in scale and have minimal adverse environmental impacts. This type of project is pre-approved and the proponent may proceed without following the procedures set out in any other part of the Class EA process.

Schedule “A+” Projects

Schedule “A+” projects were introduced to MEAs in 2007. Similar to Schedule “A”, these projects are also pre-approved, however; the difference is that, for Schedule “A+” projects, the public must be advised prior to project implementation.

Schedule “B” Projects

Schedule “B” projects generally include improvements and minor expansions to existing facilities where there is potential for some adverse environmental impacts. These projects require the screening of Alternatives for their environmental impacts and the completion of Phases 1 and 2 of the Class EA planning process. If outstanding issues remain after the public review period, any party may request that the Minister of the Environment consider a Part II Order (also known as bumping-up the project) to elevate the project to a more stringent process (Schedule “C” or an Individual Environmental Assessment). Provided no significant impacts are identified and no requests for a Part II order are received, Schedule “B” projects are approved and may proceed directly to Phase 5: Implementation.

Schedule “C” Projects

Schedule “C” projects generally include the construction of new facilities and major expansions to existing facilities. These projects are typically more complex and have the potential for significant environmental effects. As a result they proceed under full planning and documentation procedures and satisfy all five phases of the Class EA planning process. Phase 3 involves the assessment of Alternative methods of carrying out the project, as well as public consultation on the preferred conceptual design. Phase 4 is the preparation of an Environmental Study Report which is filed for public review. Provided no significant impacts are identified and no requests for Part II Order or “bump-up” to an Individual Environmental Assessment are received, Schedule “C” projects are then approved and may proceed to Phase 5: Implementation.
Figure 2-1: Municipal Class EA Process

EXHIBIT A.2 MUNICIPAL CLASS EA PLANNING AND DESIGN PROCESS

NOTE: This flow chart is to be read in conjunction with Part A of the Municipal Class EA.
2.4 Infrastructure Ontario Compliance

Where acquisition of provincially owned lands is required, the Region will need to comply with the requirements of Infrastructure Ontario (I/O), which involves the application of the Ministry of Energy and Infrastructure (MEI) Class EA (amended September 2008) process. Should the I/O Class EA process be triggered, compliance can be achieved in a straightforward manner utilizing the results from the Kitchener Zone 4 Class EA. At this stage, contact has been made with Infrastructure Ontario; they have indicated that there are no provincially owned lands within the Study Area. Compliance with the Infrastructure Ontario Class Environment Process is, therefore, not required.

2.5 Canadian Environmental Assessment Act Compliance

The Federal Canadian Environmental Assessment Act (CEAA) process can be triggered in respect to the project, when:

- A federal authority is the proponent of a project;
- A federal authority provides financial assistance to the proponent;
- A federal authority makes federal lands available for the project; or,
- A federal authority issues a permit or license, or other form of approval pursuant to a statutory or regulatory provision referred to in the Law List Regulations.

The CEAA process is dependent on the specific trigger(s) by the project and the impacts on the environment. Unlike the Class EA process, the CEAA is much more project specific and requires an understanding of the particular components of the project. However, since there is overlap with the documentation for both EA processes, the requirements can be met by one document. The consultation requirements are not as stringent for the CEAA process, but an assessment of the cumulative effects of the project must be undertaken, which is not a requirement of the Municipal Class EA process.

At this point in the process, it is unlikely that the CEAA will be triggered as there are currently no identified direct triggers (i.e. railway or federal land crossing). Should the CEAA be triggered, the Kitchener Zone 4 Trunk Watermain Class EA will be conducted accordingly to satisfy CEAA requirements, which includes all required consultations with the appropriate federal authority(s) and other federal stakeholder agencies.

In some cases, a trigger may not be identified until the detailed design stage. Beginning consultation with federal regulatory authorities in the early stages of the study, however, will be essential to attaining input and addressing any concerns that may affect the granting of the required permits in a timely fashion.

2.5.1 Law List Regulations

Of the above four triggers listed, the only one that may be applicable to this project would be “a federal authority issues a permit or license, or other form of approval pursuant to a statutory or regulatory provision referred to in the Law List Regulations”. The following Law List Regulations may be applicable to projects within this Study Area.

2.5.1.1 Fisheries Act

The Fisheries Act contains habitat and pollution protection provisions which are compulsory for all levels of government and the public. Subsection 35(1) of this Act states “no person shall carry out any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat” unless authorized by the Minister of Fisheries and Oceans Canada. Authorization under Subsection 35(2) of the Fisheries Act may be issued to permit work when adverse effects cannot be avoided. Authorization under subsection 35(2) of the Fisheries Act is also a regulatory trigger for a federal environmental assessment under CEAA. As a result, requirements of the federal EA must be met before authorization is granted. The Grand River Conservation Authority (GRCA) will be consulted to determine whether authorization under the Fisheries Act is required. GRCA has a Memorandum of
Understanding and a Level III Agreement with Department of Fisheries and Oceans (DFO) which means that the Authority can screen and process some applications on behalf of DFO. During the detailed design of the Kitchener Zone 4 Trunk Watermain, a permit for each watercourse crossing is to be submitted to the GRCA to determine if there is a potential Harmful, Alteration, Disruption, or Destruction (HADD) of fish habitat.

2.5.1.2 Navigable Waters Protection Act

The Navigable Waters Protection Act (NWPA) protects the public right to navigation by ensuring that works constructed in navigable waterways are regulated to minimize impacts on navigation. Subsection 5(1)(a) and 6(4) of the Act define approvals that may trigger the requirements for a federal EA under CEAA. Subsection 5(1)(a) states “No work shall be built or placed in, on, over, under, though or across any navigable water without the Minister’s prior approval of the work, its site and the plans for it”. Subsection 6(4) essentially states that the Minister may approve a work after the start of its construction. Transport Canada will be consulted to determine if a permit under NWPA will be required. It is anticipated that a permit is not required as none of the water course crossings are likely to be defined as navigable waterways. However, the need for a permit is to be reviewed again during detailed design when a decision is made on the method of crossing of each watercourse.

2.5.2 Permits and Approvals

The following list identifies, in order of required approvals, the general permits and approvals which would apply to the construction of the Kitchener Zone 4 Trunk Watermain.

- **MNR Species-at-Risk Permit**: In the event that the project is identified by the Ministry of Natural Resources to potentially have adverse impacts to a locally found Species-at-Risk.

- **Working Easement Approvals**: the process required to gain access to and existing easement (Hydro One), or create a new construction easement is dependent on the ownership of the land (private or public).

- **Regional Work Permit**: This document is required for works within the Region of Waterloo. It identifies the work that is being done (excavation, restoration, and road closures) and also includes the certification of insurance. The original permit must be present at the work site.

- **Municipal Service Interruptions**: In the event that the construction will require the temporary interruption of services, the City of Kitchener will be informed and the appropriate notifications will be issued by the City.

- **City of Kitchener Road Closure Permits**: After the tender process, the City of Kitchener will be informed of future road closures required for the project. The City of Kitchener Transportation Planning department will be coordinated with for the required detours and publication of traffic closures. This will also ensure that emergency services are aware of road closures.

- **GRCA Schedule "A" - Application for Development, Interference with Wetlands and Alterations to Shorelines, Watercourses and Floodplains Permit**: this is required when work is planned near lakes, rivers, streams, wetlands, floodplains or slopes. The Study Area encompasses GRCA regulated wetlands, watercourses and floodplains, which may be impacted by the construction of the Kitchener Zone 4 Trunk Watermain.

- **Union Gas Crossing Permit**: In the event that a Union Gas Transmission Line is required to be crossed by the Kitchener Zone 4 trunk Watermain, a crossing agreement between the Region (or representative) and Union Gas is required to be completed. The agreement ensures that the Transmission line is protected during construction.
3. Phase 1: Problem Definition

3.1 Definition of Problem/Opportunity

As prescribed by the Kitchener Zone 4 Analysis Report, a new watermain connecting the Mannheim Water Treatment Plant Zone 4 Pumping Station directly to the southern end of Kitchener Pressure Zone 4, at the boundary of Kitchener Pressure Zone 2 West, will allow for higher capacity within the southwest section of the City of Kitchener.

The Problem/Opportunity Statement for the Kitchener Pressure Zone 4 Trunk Watermain, has been defined as follows:

To determine the preferred approach to provide a direct water supply connection from the Mannheim Water Treatment Plant Zone 4 Pumping Station to the southwest section of the City of Kitchener to service existing and future developments in a manner that is economical to implement, while minimizing impacts on the natural, cultural, social and agricultural features in the Study Area.

3.2 Need and Project Justification

The primary justification for this infrastructure is to provide adequate water supply capacity to service future growth planned for the southwest section of the City of Kitchener through the Integrated Urban System (IUS), in accordance with the Region of Waterloo Official Plan.

The Region of Waterloo has a two-tier water system, meaning it is responsible for the source, treatment, and trunk distribution of water within the Region while local distribution is the responsibility of the municipality. The current water supply and distribution system within the Region of Waterloo that comprises the IUS is a complex system consisting of multiple supplies feeding demands in several Pressure Zones. The conveyance of water through a demand zone via distribution mains rather than dedicated watermains results in a system that is more susceptible to pressure and flow impacts due to changing demands associated with the transfer of water into and out of the Zones. To alleviate this, the installation of dedicated trunk watermains that conveys water through a zone independent of the distribution system can be used to distribute the flows in and out of a zone more effectively.

This project is one such trunk watermain, conveying treated water from the Manheim Pumping Station through Kitchener Pressure Zone 4 to its southeastern corner and the adjacent pressure zone.

3.3 Project Class EA Schedule

The specific requirements of the Municipal Class Environmental Assessment process depend on the type of project, its complexity, and the significance of potential environmental impacts.

The Kitchener Zone 4 Trunk Watermain Class EA is designated as a Schedule “B” project since this is a water project which will “establish, extend or enlarge a water distribution system and all works necessary to connect the system to an existing system or water source, where such facilities are not in either an existing road allowance or an existing utility corridor” (Municipal Class Environmental Assessment, Municipal Engineers Association, June 2000, as amended in 2007).

Although the entire length of the trunk watermain may not lie within the existing road right of way and utility corridor, efforts will be made to ensure that the trunk watermain is constructed within existing disturbed areas where possible, and that the water crossings have low impact with respect to the surrounding environmental features. In the event that privately owned land is required for the construction or location of the proposed trunk watermain, all efforts will be made to work with the land owner(s) to minimize the impact to them and to the project itself.

3.4 Public Review and Next Steps

As this is a Schedule “B” project, Phases 1 and 2 of the Municipal Class EA process must be completed as previously indicated in Figure 2.1, before proceeding to implementation. These phases include:
Phase 1: Identification of the Problem or Opportunity

Phase 2: Identification and Evaluation of Alternative Solutions

The Notice of Commencement for this EA was published September 2011 (refer to Appendix C for a copy of this document). The Notice and covering letter (refer to Appendix C) were also prepared and submitted to the mandatory stakeholders by GENIVAR Inc on September 2nd, 2011 (refer to Appendix D for a list of stakeholders).

A Schedule “B” Class EA concludes with the Notice of Completion and placement of the Project File in a location accessible to the public for a mandatory 30-day review period to allow review and comment by the public and agencies which may have an interest in this project.

Upon approval of this Report, the next steps for this project are the development of the preliminary design of the preferred Alternative discussed in this report and the submission of the final deliverables.
4. Existing Conditions and Considerations

This section discusses the current conditions in the Overall Study Area, focusing primarily on features that may be affected by the proposed Trunk Watermain alignment. Components were created to allow for the effective evaluation of various alternative routes around individual features by looking only at the section of the study area which is impacted. The components which were determined to have the least negative impact on the identified features were compiled to form Alternatives which connect the Mannheim Water Treatment Plant Zone 4 Pumping Station to the planned connection to the Strasburg Road Extension.

4.1 Service Area

The Kitchener Zone 4 Trunk Watermain would transmit water from the Mannheim Water Treatment Plant Zone 4 Pumping Station to the southern section of Kitchener Pressure Zone 4. This would allow for greater supply to Kitchener Pressure Zone 2W from Kitchener Zone 4. This will also reduce the reliance on the existing Ottawa Street Feedermain, in Pressure Zone 4, which would be the main transmission line without the proposed project.

Figure 4-1 illustrates the interconnection between the primary Pressure Zones with the understanding that the influence of these zones may extend beyond Pressure Zone 4 and Pressure Zone 2W through intra-zone transfers.

![Flow Diagram of Pressure Zones Dependant on Kitchener Pressure Zone 4](image)

The purpose of the Kitchener Trunk Watermain is to create a direct connection from the Mannheim Water Treatment Plant Zone 4 Pumping Station to the southern section of Kitchener Pressure Zone 4 and Kitchener Pressure Zone 2W. This connection will alleviate the stresses on the existing conveyance system in Kitchener Pressure Zone 4 during high demands. The existing trunk water mains for the Kitchener Zone 4 distribution system is identified in Figure 4-2.
4.2 Study Area

The Study Area defines the boundaries in which servicing alternatives for The Kitchener Zone 4 Trunk Watermain were considered. As indicated in Figure 4-3, the project Study Area encompasses approximately 1,500 hectares bound by Ottawa Street South and Bleams Road to the north, Fischer Hallman Road and Strasburg Road to the east, Trussler Road to the west, and Huron Road to the south.

The Study Area, identified in Figure 4-3, was defined primarily based on the recommended alignments identified in the Kitchener Zone 4 Analysis Report, which recommended that the trunk watermain directly connect the Mannheim Water Treatment Plant Zone 4 Pumping Station to the southern section of Kitchener Pressure Zone 4, via Alignment 1 or 2 (refer to Section 1.4.3). The defined Study Area, however, allows for the consideration of additional alignments from the Mannheim Water Treatment Plant Zone 4 Pumping Station to Strasburg Road. Components are detailed in Section 6.3.3.
4.2.1 Existing Land Uses

Land use in the Study Area includes natural areas, residential, industrial, agricultural properties. Projected land uses within the Study Area, identified in the KGMP report, consist primarily of extensions to the current residential developments, or new developments. In order to differentiate the broad scope of the Study Area, the area has been generally divided into five (5) sections for this Study, which are outlined in Figure 4-4.
LAND USE WITHIN STUDY AREA

KITCHENER ZONE 4 TRUNK WATERMAIN CLASS ENVIRONMENTAL ASSESSMENT
Region of Waterloo

DATE: JUNE 14, 2012
PROJECT: 111-56128-00
FILE NO: Fig 4

Legend

- Road
- Provincially Significant Wetland
- Locally Significant Wetland
- Property Lines
- Section A - Natural Area North
- Section A - Natural Area South
- Section B - Residential North
- Section B - Residential South
- Section C - Agricultural
- Section D - Future Development
- Section E - Business Park

SCALE: 1:23000
4.2.1.1 Section A – Natural Area

Figure 4-4 identifies the locations of two separate Natural Areas within the Study Area, for the purposes of this report they will be identified as Section A North, referring to the area to the south of Ottawa Street south and east of Trussler Road, and Section A South, referring to the area that crosses Fischer Hallman Road and Strasburg Road.

Section A – Natural Area - North

There is a forested area along the south side of Ottawa Street South that has been designated as a core environmental feature; Regional Forest, as outlined in the Region of Waterloo Official Plan. This regionally significant natural area extends from the west of the existing Hydro Corridor, as identified in Figure 4-5, to the easement of David Bergey Drive, a residential street. This area is classified as an Open Space and is associated with the Laurentian West Wetland Complex, which is located approximately 120 metres south of Ottawa Street South. An additional forest designated as a core environmental feature is located to the east of Trussler Road. Refer to Section 4.6.2 for more information regarding the Terrestrial Environment.

It is important to note that as part of the maintenance of the existing Hydro Corridor, Hydro One periodically removes the vegetation which grows within the bounds of the Corridor. This is done to ensure that the growth of trees does not interfere with the operation of the hydro utility lines. Evidence of this is identified in Figure 4-5.

Within the Section of the Study Area there are also the following minor land uses:

- The Mannheim Water Treatment Plant, located South of Ottawa Street South to the east of the regional forest on Trussler Road. This facility is owned and operated by the Region of Waterloo to collect and treat surface water from the Grand River and combines with ground water from adjacent production wells. Refer to Section 4.2.4 for more information regarding the existing water infrastructure.

- The Mannheim Water Treatment Plant Zone 4 Pumping Station is located to the north of Ottawa Street South and west of the Hydro Corridor. This facility supplies water to the majority of Kitchener. Refer to Section 4.2.4 for more information regarding the existing water infrastructure.

- A residential area within this Section is located to the South of the Mannheim Water Treatment Plant Zone 4 Pumping Station on Ottawa Street South. The area is comprised of an existing condominium complex to the east of the Hydro Corridor and a planned development to the west of the Hydro Corridor. The existing housing complex contains several town home units with walking trails, a storm water retention pond, a vehicular entrance, and parking located within the Hydro Corridor.

- A residential subdivision comprised of two storey detached single family homes is located adjacent to this Section, to the west of the Trussler Road.
The Huron Natural Area is a significant natural area that is owned by the City of Kitchener and located within the Study Area. This area is located primarily to the east of Fischer Hallman Road, and surrounds Strasburg Creek and the associated wetland area adjacent to the Strasburg Creek. Directly south of Fischer Hallman Road (north of the Kitchener Portuguese Club) there is a small pond surrounded by undergrowth (Figure 4-6). This pond is approximately 120 metres by 80 metres in area and is a seasonal tributary to the Strasburg Creek. This natural area also has a host of recreational trails used by the public. The GRCA regulates this Section as it is classified as a Locally Significant Wetland, further details regarding this area are detailed in Section 4.6.7.2. A portion of this area is also designated as an MNR Species at Risk Habitat, requiring MNR approvals for work within this area. The boundaries of this habitat are identified in Figure 4-4. Due to regular maintenance of the Hydro Utility, vegetation is removed from within the corridor, this is identified in Figure 4-6.

Figure 4-5: Section A-Natural Area North, Hydro Corridor South of Crossing at Ottawa Street South

**Section A – Natural Area - South**

The Huron Natural Area is a significant natural area that is owned by the City of Kitchener and located within the Study Area. This area is located primarily to the east of Fischer Hallman Road, and surrounds Strasburg Creek and the associated wetland area adjacent to the Strasburg Creek. Directly south of Fischer Hallman Road (north of the Kitchener Portuguese Club) there is a small pond surrounded by undergrowth (Figure 4-6). This pond is approximately 120 metres by 80 metres in area and is a seasonal tributary to the Strasburg Creek. This natural area also has a host of recreational trails used by the public. The GRCA regulates this Section as it is classified as a Locally Significant Wetland, further details regarding this area are detailed in Section 4.6.7.2. A portion of this area is also designated as an MNR Species at Risk Habitat, requiring MNR approvals for work within this area. The boundaries of this habitat are identified in Figure 4-4. Due to regular maintenance of the Hydro Utility, vegetation is removed from within the corridor, this is identified in Figure 4-6.

Figure 4-6: Section A – Natural Area South, Hydro Corridor south of Fischer Hallman Road Crossing
There is an additional green space located to the west of the Strasburg Road, along the Strasburg Creek headwaters, known as North Branch. This green space contains linkages between existing storm water retention ponds within the business park. This area is also regulated by the GRCA and identified in Figure 4-7.

Figure 4-7: Section A – Natural Area South, Hydro Corridor South of Newcastle Drive (Future Connection of Strasburg Road)

4.2.1.2 Section B – Residential Area

Figure 4-4 identifies the locations of two residential areas within the Study Area, one located south of Ottawa Street South and north of Bleams, the second located north of Huron Road east of Fischer Hallman Road. For the purposes of this report they will be identified as Section B North, referring to the area to the south of Ottawa Street south, north of Bleams Road and west of Fischer Hallman Road, and Section B South, referring to the area east of Fischer Hallman Road and north of Huron Road.

Section B – Residential Area - North

The area south of Ottawa Street South and north of Bleams Road is primarily a residential development, identified in Figure 4-8. The residential properties along Ottawa Street South and Fischer Hallman Road to Bleams Road primarily consist of detached two storey single family homes within recent subdivisions. This area also has a number of commercial and mixed use properties, including a shopping plaza containing a grocery store, gas station and restaurants. Bleams Road runs adjacent to the back yards of detached single family homes located to the north of the roadway. There are also major entrances to this subdivision from Bleams Road.
There is another significant residential development in the southeast corner of Study Area, south of Strasburg Creek and east of Fischer Hallman Road to the Strasburg Road connection (with the exception of agricultural property to the southeast corner of the Huron Road and Fischer Hallman Road intersection). The land in this section is entirely residential with the Hydro Corridor bisecting the area. The residential area is comprised of semi-detached and detached homes, as shown in Figure 4-9.

4.2.1.3 Section C - Agricultural

The majority of the agricultural land in the Study Area is located in two main areas:

- Along the west side of Trussler Road, from Bleams Road to Huron Road; and,
- Along the south side of Huron Road, from Trussler Road to Bleams Road (identified in Figure 4-10).
In addition to agricultural practices, there are three (3) business and one (1) emergency service located in this Section of the Study Area:

- A farm equipment retail and repair shop, located on Huron Road close to the intersection of Trussler Road;
- A landscape mulch wholesale business, located on Huron Road close to the intersection of Fischer Hallman Road;
- An Aggregate Pit located to the west of the landscape business; and
- City of Kitchener Fire Station #7, located at 1441 Huron Road.

![Figure 4-10: Section C – Agricultural Area, Land Currently Utilized for Agriculture South of Huron Road](image)

**4.2.1.4 Section D - Future Development**

The area south of Bleams Road and west of Fischer Hallman Road from Trussler Road to Huron Road has been identified by the City of Kitchener to be the future location of the Rosenberg Development, identified in **Figure 4-11**. Additional developments are planned for the land south of Huron Road and east of Fischer Hallman Road. Refer to **Section 4.8.2** for more information on future development within the Study Area.

This land is currently utilized for agriculture or aggregate extraction. Two (2) aggregate pits are located south of Bleams Road. One is currently inactive and identified as retired, which is also crossed by the Hydro Corridor. The other is still in use, located approximately 200m east of Trussler Road. The location of these sites is identified in **Figure 4-13**.
4.2.1.5 Section E - Business Park

Immediately to the south of Bleams Road, between Fischer Hallman Road and Strasburg Road, is a business park with most buildings using Bleams Road as primary access (See Figure 4-12). The business park also extends along the west side of Strasburg Road to the Strasburg Road connection. At the northeast corner of the intersection of Strasburg Road with Huron Road is the location of the recently constructed Huron Heights Secondary School.
4.2.2 Potential Contaminant Sources

Through the EA process, areas are identified which could potentially contain contamination based on current or previous land uses. The potential presence of contamination within the Study Area is important to identify so that areas with a high potential for contamination may be avoided. It also allows remediation plans to be developed prior to construction, so that in the event avoidance is not possible, and contamination is encountered, the issue can be resolved in a timely and effective manner.

There are two ways that the presence of contamination could impact the Trunk Watermain; existing contamination would impact construction, while future contamination could impact the regular operation of the Trunk Watermain. At the time of construction, if contamination were to be encountered, under Ontario Regulation 153/04 the owner of the property may be required to remediate the contamination. This could result in delays of the completion of the project. If contamination were to occur during the operation of the Trunk Watermain, the impact of the most concern would be the potential for the contamination to jeopardize the quality of water within the Trunk Watermain.

Typical land uses which would indicate the potential for site contamination are:

- Manufacturing/Chemical Plants;
- Auto Wrecking Yard/ Scrap Metal/ Foundries;
- Coal, Oil, Fuel, Salt Storage;
- Barns, Agricultural Chemical Storage;
- Auto Service Stations; and,
- Historical Landfill Sites.

The existing road network within the Study Area can be a source of contamination through the accumulation or salt or fuel and metals within the surrounding soil due to the regular operation of roadways. There is also potential for transportation of contaminants to result in spills; however, with no known spills being identified or research to indicate a significant contamination issue, the overall risk would be low. The following sections outline the potential contaminant sources within the Study Area according to the identified land uses in Section 4.2.1.

4.2.2.1 Section A – Natural Area

Based on the land uses discussed in Section 4.2.1 there are limited sources of potential contaminants associated with land uses within Section A. The Mannheim Water Treatment Plant stores chemicals used to treat water from the Grand River and various wells. This site is operated by the Region of Waterloo, who utilize proper chemical containment practices. The potential for contamination to be encountered during the construction of the Kitchener Zone 4 Trunk Watermain is anticipated to be minimal.

Farms have the potential for the presence of above grade chemical and petroleum storage areas. These materials are usually stored in, or within, close proximity to barns. Figure 4-13 identifies the location of one barn, located at 2193 Ottawa Street South, within Section A. There is potential for tank leakage or spills associated with liquid transfers; however, the likely hood of any off site impact on the proposed transmission main is low. This farm is no longer surrounded by agricultural land, but there is a possibility that residual soil contamination from chemical or petroleum storage exists near the barn. Although, agricultural storage tanks can cause potential contamination, the likelihood of contamination being encountered during the installation of the Kitchener Zone 4 trunk watermain is low.

4.2.2.2 Section B – Residential

Based on the land uses discussed in Section 4.2.1, there are limited sources of potential contaminants within Section B. There are two (2) gas stations, located within Section B and identified in Figure 4-13. One gas station is located at the intersection of Fischer Hallman Road and Westmount Road East. The other gas station is located on Ottawa Street South near the intersection of Fischer Hallman Road. Gas stations are a concern due to the large petroleum storage tanks located below grade. These tanks can potentially leak petroleum into surrounding soil. There is some potential for the petroleum contaminated soil to negatively impact the water quality of the Kitchener Zone 4 Trunk Watermain. The two (2) gas

GENIVAR
stations are of little concern with regard to existing contamination, however, as they have both been constructed within the last 10 years.

**Figure 4-13** identifies the location of two (2) barns within the southern Section B. There is potential for contamination to be found within close proximity to these structures, however, similar to the barn located within Section A, it is likely to have little to no impact on the installation of the Kitchener Zone 4 Trunk Watermain.

### 4.2.2.3 Section C – Agricultural

Section C consists primarily of utilized agricultural land. There is the potential for the presence of chemical and petroleum storage areas as a result of conventional agricultural practices. These materials are usually stored in, or within, close proximity to barns. **Figure 4-13** identifies the location of four barns located in Section C.

A farm equipment supply business located within Section C, near the intersection of Trussler Road and Huron Road, presents potential for soil contamination due to petroleum and chemical storage. The potential contamination sources within Section C are considered to have limited impact to the Kitchener Zone 4 Trunk Watermain due to the separation between the contamination sources and the potential location of the Trunk Watermain.

### 4.2.2.4 Section D – Future Development

Currently, the land in Section D is utilized as agricultural land, however within the near future this land will be developed into the Rosenberg Community, containing commercial and residential land uses. There is the potential for the construction of new contamination sources such as gas stations, however, these potential contamination areas would be a low risk to the Kitchener Zone 4 Trunk Watermain. Section D should be monitored during and after construction of the Kitchener Zone 4 Trunk Watermain to ensure all future potential contaminant sources are known and monitored.

The location of the inactive aggregate site identified in Section 4.2.1 is identified as the farthest west aggregate site in **Figure 4-13**. An active aggregate site is identified as the farthest east aggregate site in **Figure 4-13**. These locations have the potential for petroleum storage based on the general operation of an aggregate site. Due to the pending development of this land, it can be assumed that, if required, the re-instatement of this site would be completed prior to the installation of the Kitchener Zone 4 Trunk Watermain. If this is not the case, further investigation related to this site should take place prior to the design of the Kitchener Zone 4 Trunk Watermain.

### 4.2.2.5 Section E – Business Park

Section E consists primarily of industry and large businesses. As a result, there is the potential for the presence of chemical and petroleum storage areas as a result of conventional industrial practices. These materials are usually stored in tanks which sit above ground and away from buildings. **Figure 4-13** identifies the location of many automotive service garages, a forklift factory, an industrial laundry facility, and gas stations. Of the many businesses and industries within the area, the most concerning areas for potential contamination are the older automotive sites and gas stations.
4.2.3 Existing Infrastructure

This section outlines the existing major infrastructure within the Study Area including the Hydro One Corridor. Figure 4-14 outlines the locations of the existing infrastructure within the Study Area. Local utilities and smaller existing infrastructure have not been explicitly identified or considered within this report; these services will be addressed within the preliminary design phase of this project.
4.2.3.1 Gas Pipe Line

Figure 4-14 indicates the location of a 300 mm diameter natural gas Transmission Line owned by Union Gas. This line bisects the Study Area along the Fischer Hallman Road easement, south of Bleams Road, and is located approximately 300 metres to the west, but parallel, to Fischer Hallman Road. The crossing of this pipe will require a crossing agreement with Union Gas and additional precautions when developing a construction concept report for the site. Precautions included within the crossing agreement include, but are not limited to:

- no mechanical digging within 1 metre of pipe location;
- Construction must be completed exactly in the manner identified by plans approved by Union Gas; and,
- Third party observation is required when excavating within 1.5 metres of the pipe.

4.2.3.2 Hydro One High Voltage Transmission Corridor

The Hydro Corridor, which is also an option for the location of the Kitchener Zone 4 Trunk Watermain has the following features:

- Easement width of approximately 45 metres;
- Overhead 230kV wires;
- Towers with 10 metre square base and that are approximately 35 metres in height; and,
- Towers located in the center of the easement every 330 metres.

The entire length of the easement within the Study Area is generally zoned and utilized as an open space. The easement within agricultural areas is currently used for agricultural purposes between the towers.

4.2.3.3 Kitchener-Wilmot Hydro Transformer Station

Approximately 100 metres north of the Huron Road crossing within the Hydro Corridor is the location of the connection to a Kitchener-Wilmot Hydro Transformer Station, as indicated in Figure 4-14. This infrastructure encompasses the majority of the Hydro Corridor at this location, as indicated in Figure 4-15, in addition to approximately 1.8 hectares of adjacent land to the west of the Hydro Corridor alignment. Within the corridor there are approximately seven metres of separation distance between the hydro infrastructure and the north edge of the Hydro Corridor easement. Towers within the easement are located on a hill with a slope of approximately 17% grade towards the north, and approximately 11% grade to the south. Based on Hydro One protection constraints, 15 metres of separation distance is required from their structures. The only way to satisfy this constraint within the easement would be to install the Trunk Watermain 15 metres below grade in this area, which would present significant technical difficulties. The existing Hydro infrastructure is further discussed in Section 5.1.3.

Within the adjacent Kitchener-Wilmot Hydro owned land, the Transmission Station includes a grounding grid throughout the entire property. After discussion with Kitchener-Wilmot Hydro it was identified that the required approvals to install the Kitchener, Zone 4 Pressure Trunk Watermain though this property would not be granted, in the event that this was determined to be the preferred Component.
4.2.3.4 Kitchener-Wilmot Hydro Secondary Distribution Easement

A 10 metre wide easement owned by Kitchener-Wilmot Hydro is located through the Hydro Corridor from Fischer Hallman Road to Strasburg Road. This easement is in place to allow for secondary Hydro distribution from the Transformer Station. The easement travels west from the Transformer Station to Fischer Hallman road along the north side of the Corridor. From the Transformer Station to Strasburg Road the easement follows the southern edge of the corridor. An additional easement located along the northern side of Huron Road is currently utilized for Hydro infrastructure, and should be avoided by the preferred alignment of the Kitchener Zone 4 Trunk Watermain, based on consultation with Kitchener-Wilmot Hydro.

The easement is designed to eventually, if not currently, allow for the installation of an underground hydro duct and accompanying overhead wire. Overhead wires are currently installed from a point 570 metres east of the crossing with Fischer Hallman Road to Newcastle Drive. The preferred alignment for the Kitchener Zone 4 Trunk Watermain should avoid construction within this easement.

4.2.3.5 Parkvale Bridge

Located on Parkvale Drive south of the intersection with Woodbine Avenue is a bridge structure which crosses a season creek. The bridge structure spans a wider area than required for the creek, to allow for the passage of wildlife. There is approximately 2.5 meters of earth between the top of the bridge structure and the road surface. Construction though this area will require the consideration of this bridge.

4.2.3.6 Unidentified Utility Line

A utility line, which bisects the Study Area, and was identified within the GIS data received from the Region of Waterloo, is shown in Figure 4-14. The ownership of this utility line has yet to be determined though consultation with the Region of Waterloo, the City of Kitchener and Union Gas. This utility line is identified to end under the currently location of the Conestoga Cold Storage facility. The unidentified utility line will be further examined though the preliminary design process.

4.2.3.7 Other Infrastructure

In addition to the infrastructure identified, there will other infrastructure located within the Study Area such as:

→ Communications ;

→ Regional and Municipal level Sanitary Sewers;
These utilities should be identified during the preliminary design and in field located be completed prior to construction of the Kitchener Zone 4 trunk Watermain.

4.2.4 Existing Water Infrastructure

Overview

The Region of Waterloo is responsible for supply and trunk distribution of drinking water within a two-tiered system, where the municipalities provide consumer level distribution. The Regional water system is divided into two areas; the Integrated Urban System (IUS), which includes Kitchener, Cambridge and Waterloo, and the Rural System which includes the selected zone outside of these urban areas (Elmira and St. Jacobs). The current Regional IUS is comprised of 19 interconnected Pressure Zones:

- Cambridge: Zones 1, 1A, 2E, 2W, 3
- Kitchener: Zones 2, 2A, 2W, 4, 4A, 5, 6, Breslau N, Breslau S
- Waterloo: Zones 4, 4B, 4C, 5, 6, 7, St. Agatha, Elmira E, Elmira W, St. Jacobs

The boundaries of these pressure zones, as identified in Figure 4-2, are generally determined by geographic location and the local hydraulic grade line. Various Pressure Zones are interconnected through Pressure Reducing Valves (PRVs) and or Motorized Throttle Valves (MTVs), allowing supply from one Zone to supply adjacent zones.

The primarily focus of this project are the Pressure Zones outlined in Figure 4-16 (Waterloo Pressure Zone 4, Kitchener pressure Zone 4 and 2 West).

**Figure 4-16: Pressure Zone Connections, Demand and Capacity (adapted from Stantec, 2009)**

Supply

Groundwater is the main water source for the Region of Waterloo (comprising approximately 80% of the total demand) which is pumped from over one hundred supply wells. The remaining 20% of water is drawn from the Grand River, treated at the Mannheim Water Treatment Plant, and distributed directly to Kitchener pressure Zone 4 and 5 and 6 via the Mannheim Water Treatment Plant Zone 4 Pumping Station. The Mannheim Water Treatment Plant is the largest supply in the Region and draws water from the Grand River, treats, disinfects, and mixes the surface water with water from surrounding ground water wells, as identified in Figure 4-14. The treated water is stored in the Mannheim reservoirs, which have a combined capacity of 15.28 million litres (Region of Waterloo Archives, Mannheim Water Treatment Plant...
and Pumping Station). From the reservoirs, the Mannheim Water Treatment Plant Zone 4 Pumping Station distributed the water to the Integrated Urban System. The Mannheim Treatment Plant and Pumping Station supplies 31% of the water required by the Region’s Integrated Urban System.

The Region of Waterloo completed the Aquifer Storage Recovery (ASR) System in 2005. This system allows for storage of surplus water collected and treated during times of low demand and high flows through the Grand Rive (fall, winter and spring). The surplus water is injected into a aquifer for storage. This system ensures that the supply of water to the Integrated Urban System during the summer months.

**Distribution**

There are three categories of watermains within the IUS. Regional watermains are described as trunk watermains wholly owned by the Region of Waterloo. Dual watermains are characterized as larger watermains that are used by the Region of Waterloo as distribution mains and also used by the local municipality for local water supply. Local watermains are owned and operated by the local municipalities for water supply within the municipality.

Currently, the water supply from the Mannheim Water Treatment Plant Zone 4 Pumping Station enters Kitchener Pressure Zone 4 via a 750mm diameter feedermain which is aligned along Ottawa Street South towards Fischer Hallman Road. The 750mm diameter watermain connects to a 600mm diameter watermain that loops through Kitchener Pressure Zone 4 to distribute the supply throughout the zone. This configuration results in high head loss and lower pressures during periods of high demand due to the size of the system and capacity limitations of existing feeder mains.

The locations of large diameter watermains throughout the Study Area are identified in Figure 4-14. This figure indicates that there is a 1200mm diameter raw watermain along the Bleams Road right of way, 900mm and 750mm diameter watermains under the Ottawa Street South starting from the Mannheim Water Treatment Plant Zone 4 Pumping Station, and a 450 mm diameter watermain along the Fischer Hallman Road Easement. The presence of these existing large diameter trunk watermains limit the construction of the Kitchener Zone 4 Trunk Watermain along the existing Ottawa Street South Road easement and may pose challenges to the construction of the watermain at the Ottawa Street South, Bleams Road and Fischer Hallman Road crossings. Subject to the selection of the preferred route, this will be dealt with at the preliminary design stage.

### 4.3 Land Use Projections

The *Kitchener Zone 2 and 4 Optimization Study* reported population projections for the year 2031 based on 2006 data. It was reported that the Kitchener Pressure Zone 2 West and Kitchener Pressure Zone 4 service population of 15,300 (year 2006) would grow to 36,700 by 2031. The 2031 projected growth of 21,400 includes a residential component of 18,500 and an employment component of 2,900. The *Kitchener Zone 4 Hydraulic Analysis Report* estimated the future supply/capacity required from Kitchener Pressure Zone 4 (using an average consumption of 255 L/cap/day and a peaking factor of 1.4), to be 2,941 L/s from Kitchener Zone 4 to all of the connected Pressure Zones indicated in Figure 4-1.

Based on the *Kitchener Official Plan* and KGMP, there are developments proposed within the Study Area. The KGMP outlines the area south of Huron Road and north of Highway 401 as a potential location of population intensification. It is reported that the development of Brigadoon (located south of Huron Road, outside of the Study Area) will increase the existing population density from 6.71 residents and jobs/ha (RJ/ha) to 22.06 RJ/ha, and the development of the Doon South Phase 1 area will increase the population from 22.45 RJ/ha to 44.78 RJ/ha. These developments are indicated in Figure 4-17; this figure also indicates the varying phases of plan approval, and the planned development within southern Kitchener.

The *Kitchener Zone 4 Analysis Report* determined the capacity of the existing system based on a water velocity of 1.5 m/s and a target head loss of 1.5m/km. Based on the previously identified existing demands, it was determined that the capacity of the existing 750mm diameter feedermain from the Mannheim Water Treatment Plant Zone 4 Pumping Station is deficient by approximately 247 L/s during peak hour conditions. A portion of the required flow to meet the peak hour demand, which exceeds the feedermain capacity, is conveyed by distribution pipes within the system, the remaining capacity deficiency results in high head loss and high pipe velocities though the distribution system.
4.4 Water Demand Projections

The Zone 4 Hydraulic Analysis Report identified that the current 750mm diameter connection from the Mannheim Water Treatment Plant Zone 4 Pumping Station to Kitchener Pressure Zone 4 is deficient by approximately 247L/s during peak hour conditions. The intent is to design the trunk watermain for the 2031 population projections, as reported in the Kitchener Zone 2 and 4 Boundary Optimization Study (Stantec, 2009), which utilized the projected populations of PLUM (Population Land Use Model) zones. The report projected the 2031 population to be approximately 36,700 within the service area, comprised of 32,250 residential and 4,450 employment positions. The Kitchener Zone 2 and 4 Boundary Optimization Study also projected the ultimate population (the maximum population the area will ever reach) of the service area, which was determined to be 39,600, representing only an 8% increase from the 2031 population.

Recommended demand values for the distribution system design are outlined in the Tri-City Distribution Master Plan Final Report. These values were determined based on billing records within the Region. It was recommended that a value of 209 L/cap/day be adopted for the average demand and a maximum day peaking factor of 1.4 be used. The Kitchener Zone 4 Analysis Report, however, used an average demand value of 255L/cap/d from the Draft Tri-City Distribution Master Plan, it is believed that this discrepancy is the result of the Kitchener Zone 4 Analysis Report being completed prior to the completion of the Tri-City Distribution Master Plan Final Report. Table 4-1 identifies the varying demand and peak hour values applicable to this project.

Table 4-1: Values of reported Daily Demand and Peaking Factor

<table>
<thead>
<tr>
<th>Source</th>
<th>Daily Demand (L/cap/d)</th>
<th>Peaking Factor</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kitchener Zone 4 Analysis (July 2009)</td>
<td>255</td>
<td>1.4</td>
<td>Used to calculate the majority of demands</td>
</tr>
<tr>
<td>Kitchener Zone 2 &amp; 4 Opt. Study (July 2009)</td>
<td>300</td>
<td>2.0</td>
<td>Used to calculate Zone Kit 2W demand, based on pressure zone boundary of Kitchener Zone 2 and 4 Optimization Study</td>
</tr>
<tr>
<td>Tri-City Water Distribution Master Plan (May 2009)</td>
<td>209</td>
<td>1.4 (average of all zones)</td>
<td>Daily Demand = total demand/total population</td>
</tr>
</tbody>
</table>

The Kitchener Zone 2 and 4 Optimization Study used a conservative water demand estimation of 300 L/cap/day, and peaking hour factor of 2 to determine the demand within the newly developed section of Kitchener Pressure Zone 2 West. Based on these conservative values, the Kitchener Zone 2 and 4 Optimization Study determined that the capacity of the current Kitchener Pressure Zone 4 750mm diameter feedemain from the Mannheim Pressure Zone 4 Pumping Station is deficient of approximately 247 L/s during current peak hour conditions.

Table 4-2 identifies the projected 2031 demands of the pressure zones dependant on Kitchener Pressure Zone 4, as identified in the Hydraulic Analysis section of the Kitchener Zone 4 Analysis Report. The bolded values represent the demand of the dependant zone required to be supplied by Kitchener Zone 4. This report projected a peak hour flow demand of 2,941 L/s for the Study Area in the year 2031; this is an increase of 50%, or 1,015 L/s, greater than the existing Kitchener Pressure Zone 4 maximum demand.

Table 4-2: Summary of 2031 Demands, Stantec 2009

<table>
<thead>
<tr>
<th>Pressure Zone</th>
<th>Max Day Demand (L/s)</th>
<th>Peak Hour Demand (L/s)</th>
<th>Required Supply from Kitchener Zone 4 (L/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waterloo 4</td>
<td>691</td>
<td>1131</td>
<td>691</td>
</tr>
<tr>
<td>Kitchener 4</td>
<td>1102</td>
<td>1668</td>
<td>1668</td>
</tr>
<tr>
<td>Kitchener 2West</td>
<td>273</td>
<td>397</td>
<td>397</td>
</tr>
<tr>
<td>Kitchener 2East</td>
<td>135</td>
<td>186</td>
<td>135</td>
</tr>
<tr>
<td>Breslau</td>
<td>28</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>2941</td>
</tr>
</tbody>
</table>
The modeling results from the *Kitchener Zone 4 Hydraulic Analysis* (Stantec, 2009) identify that the installation of the 750 mm diameter Trunk Watermain from the Mannheim PS to south of Huron Road reduces current stress on the Ottawa Street feedermain by conveying 470 L/s during peak hour demands.

### 4.5 Trunk Watermain Capacity and System Requirements

The Kitchener Zone 4 Trunk Watermain is to have adequate capacity to accommodate water demand from existing and future development within its service area. It is good engineering practice to also provide sufficient capacity to meet servicing requirements beyond the current planning horizon of 2031. Efforts are to be made, therefore, to size the trunk watermain to meet the water demands projected for a full build-out scenario and the needs beyond the service area requirements.

Another significant consideration when determining the capacity requirements for the Kitchener Pressure Zone 4 Trunk Watermain is that the system must be able to integrate with the existing infrastructure and not negatively impact current operation of the overall system. For the purposes of the modeling conducted by the *Kitchener Zone 4 Analysis* it was assumed that the Mannheim Water Treatment Plant Zone 4 Pumping Station was capable of supplying the demanded volume of water to the IUS. This is due to the large potential capacity of the Mannheim Water Treatment Plant Zone 4 Pumping Station, as water is supplied to it from both ground water and surface water sources.

<table>
<thead>
<tr>
<th>Design Criteria</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Velocity</td>
<td>0.8 m/s</td>
</tr>
<tr>
<td>Maximum Velocity</td>
<td>1.5 m/s</td>
</tr>
<tr>
<td>Head Loss</td>
<td>1.5 m/km or less</td>
</tr>
<tr>
<td>Minimum Pressure</td>
<td>275 kPa (Min hourly demand)</td>
</tr>
<tr>
<td>Maximum Pressure</td>
<td>700 kPa (Peak hourly demand)</td>
</tr>
</tbody>
</table>

The design of the Trunk Watermain will be completed using the values identified in Table 4-3, from the *Region of Waterloo and Area Municipal Design Guidelines and Supplemental Specifications for Municipal Services*.

<table>
<thead>
<tr>
<th>Velocity (m/s)</th>
<th>Flow rate (L/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.9</td>
<td>397.61</td>
</tr>
<tr>
<td>1.0</td>
<td>441.79</td>
</tr>
<tr>
<td>1.1</td>
<td>485.97</td>
</tr>
<tr>
<td>1.2</td>
<td>530.05</td>
</tr>
<tr>
<td>1.3</td>
<td>574.32</td>
</tr>
<tr>
<td>1.4</td>
<td>618.50</td>
</tr>
<tr>
<td>1.5</td>
<td>662.68</td>
</tr>
</tbody>
</table>

Table 4-4 identifies that a 750 mm diameter Trunk Watermain is capable of transmitting 400L/s to 660L/s while maintaining the acceptable velocities of water though a distribution system. For this project, the required capacity is 470L/s to meet the estimated 2031 peak demand which will result in a velocity of 1.06m/s.

### 4.6 Natural Environment

An overview of the natural environment within the Study Area is discussed within this section.

#### 4.6.1 Physiography & Hydrogeological Conditions

The Hydrogeological assessment of the Study Area is provided in *Appendix E*. The following section summarizes the key findings. Further geotechnical evaluations, including water table elevation, depth to bedrock and soil depths should be completed prior to the completion of the detailed design.
4.6.1.1 Physiography

The Study Area is located within the Waterloo Hills physiographic region (Chapman and Putnam, 1984). The surface is composed of sandy hills, which are identified as sandy till ridges, kames or kame moraines with outwash sands occupying the intervening hollows. A distinctive feature of the Waterloo Hills is the amount of fine sand present at ground surface, which is similar to the Hillsburgh sandhills. These hills are connected to alluvial terraces of the Grand River spillway system, which consist of more uniform sand and gravel material. The topography in the area is gently rolling from east to west with several low-lying areas associated with streams and wetlands.

4.6.1.2 Regional Geology and Hydrogeology

The subsurface geology in the area has been characterized at length. Conceptually, the stratigraphy can be subdivided into the following components:

- Modern alluvium and organic deposits
- Ice Contact Stratified Deposits
- Port Stanley Till
- Outwash Sands
- Maryhill Till
- Catfish Creek Till
- Pre-Catfish Creek Till
- Bedrock

1. Modern Alluvium and Organic Deposits

Modern alluvium consists of gravel, sand, silt and clay associated with recent deposition of sediments within the floodplains of rivers and streams. It is associated with modern watercourses. In addition, in areas where water flow is sluggish, organic deposits associated with bogs and swamps tend to collect. Depending on the location, these deposits overlie till, outwash deposits, or bedrock, and are typically less than 5 metres in thickness. Generally, these materials are water-bearing and can be considered as aquifers in certain locations. However, they are not generally used for municipal supply.

2. Ice-Contact Stratified Deposits

Two types of ice-contact stratified deposits have been identified. Kames are glacial debris (gravel and sand) accumulated at the edge of ice. Eskers are thin, sinuous ridges of sand and gravel created by streams that flowed beneath glacial ice. These units are considered aquifers.

The Waterloo Moraine is a significant regional interlobate kame moraine. It consists of sand and gravel with intervening till layers. The moraine is a significant recharge area for the Mannheim well fields. It is located in the area to the west of the Grand River and mainly consists of sand and gravel. It is sometimes found to be overlain by Port Stanley or Maryhill Tills (Bajc, 2002). Many wellfields in the Region of Waterloo are screened within the moraine.

3. Port Stanley Till (sandy to silty till)

The Port Stanley Till is a sandy to silty till that was deposited beneath the glacial ice and is present throughout the area. It generally overlies outwash sands and gravel and older tills such as the Maryhill Till. It occasionally contains isolated lenses of sand and gravel. Previous reports suggest that the till is absent in some locations, and up to 30 metres thick in others. This is generally considered to be an aquitard. Sand lenses within the till may be sufficient for private water well supply.

4. Outwash Sands

Outwash deposits are materials that were carried out by water from melted glacial ice. They have a more level surface and are more evenly bedded and sorted and are composed of small boulders and cobbles that represent the materials that were too coarse to be transported very far (Karrow, 1987). These sands
and gravels are considered to be aquifers, and along with the ice contact stratified deposits, are found to be interbedded between the till units. Detailed mapping review has indicated that the Mannheim aquifer, located to the east of Alder Creek, is composed of outwash sands (CH2M Hill and North-South Environmental Inc., 2008b).

5. Maryhill Till (clay till)

The Maryhill Till is the middle clay till along the Grand River Valley near Kitchener found between the Catfish Creek Till and Port Stanley Till. This middle clay till consists mostly of clay and carbonates (Karrow, 1987). The thickness of Maryhill Till ranges from 3 metres to 15 metres when it is interbedded with lacustrine clay (Karrow, 1991). Due to the heavy clay content, it is generally considered to be an aquitard.

6. Catfish Creek Till (Stone Silt till)

The Catfish Creek Till is a stone silt till that is usually encountered at greater depths in the Waterloo area beneath the aforementioned till layers. Based on the limited available data, the thickness of the till is approximately three to six metres. There are also a few findings of the till at shallow depth along the interlobate zone of the Waterloo Moraine (Karrow, 1991). Compared to the heavy clay content of the Maryhill Till, only sections of the Catfish Creek Till are considered to be an aquitard.

7. Pre-Catfish Creek Till

Pre-Catfish Creek Till includes older layers beneath the Catfish Creek Till that are often found at the bottom of valleys. The Pre-Catfish Creek Till is sporadic in nature and the only named Pre-Catfish Creek Till found in the Conestoga-Stratford area is the Canning Till (Karrow, 1991). It is mostly silty clay or clayey silt till (Karrow, 1987).

8. Bedrock

The previous and current interpretations of the bedrock units are discussed below. Groundwater flow in the bedrock is generally towards the Speed River.

4.6.1.1 Local Surficial Geology

The surficial geology in the area was assessed through the use of existing mapping (Holden et al., 1993; Karrow, 1993; Miller et al., 1979) and related documentation (Appendix E). The material in the northern portion of the Study Area from Ottawa Street to Bleams Road is mostly silty to clayey till. Ice-contact stratified deposits dominate the central and southern portions of the area, broken up by areas of silty to sandy till. Minor sand and gravel outwash deposits are also found in limited locations, usually in the vicinity of recent alluvial materials. A shallow perched aquifer is present in the area, which supports the flow of Strasburg Creek. However, due to urban development within the Upper Strasburg Watershed, infiltration that previously fed the creeks is now being carried away as stormflow (CH2M Hill and North-South Environmental Inc., 2008a). In areas where there is little development and coarse grained materials are at surface, infiltration provides baseflow to creeks and recharges the underlying Mannheim aquifer.

4.6.1.2 Local MOE Water Wells

MOE water well records were obtained within a 500 metre buffer of the Study Area to further evaluate the subsurface materials (Appendix E). A cross-section was created from selected well records. The cross-section location is shown in Figure 5 of Appendix E, while the cross-section is provided in Figure 6 of Appendix E.

The cross-section details generally do not conform to the regional model, but agree somewhat with the understanding provided by the surficial geological mapping. Over most of the route, a layer of sand and gravel is present at ground surface. Some clay and silt were occasionally present in the top 10 metres. The coarser material likely corresponds to the glacial outwash deposits, while the clays may be localized occurrences of Maryhill Till or the Port Stanley Till. Bedrock was not identified in any of the well records.

4.6.1.3 Local Water Supply Wells

The northwest portion of the Study Area is located within the Mannheim East Well field while the southeast section of the Study Area is located near the Strasburg Well field (Regional Municipality of
Waterloo, 2008). Associated with these well fields is a Source Water Protection Area (SWPA). The wellfields and SWPA are discussed below.

1. Mannheim East and Strasburg Wellfields

The Mannheim aquifer is located within the Waterloo Moraine and consists of thick gravel and sand (Lake Erie Source Protection Regional Technical Team, 2008). It is mostly unconfined except in places where it is overlain by Port Stanley Till. It is recharged by surface waters and could be under possible influence of road maintenance operations such as salting. The wells are located north of Bleams Road, in the northern portion of the Study Area, identified in Figure 4-18. The wells are approximately 50 m in depth. Groundwater is taken from the sand and gravel layer approximately 23 to 36 m below ground surface.

The wells in the Strasburg Well Field, identified in Figure 4-18, Field are screened in the deep overburden aquifer overlain by an extensive confining to semi-confining aquitard. These aquitards are likely the Maryhill and Catfish Creek Tills (Lake Erie Region Source Protection Committee, 2010).

2. Source Water Protection

There are several municipal well heads within the Study Area. They are identified in the Region of Waterloo Official Plan and indicated in Figure 4-18. This figure also identifies the varying degrees of management required relative to the vulnerability of the underlying groundwater to contamination, the importance of the well to the capacity of the municipal drinking-water supply systems, and the length of time groundwater within the Wellhead Protection Sensitivity Areas (WPSA) will take to reach the municipal drinking-water supply well (time of travel). The following WPSAs are found within the Study Area:

- WPSA-1 delineates areas within a 100 metre radius of each municipal drinking-water supply well. It represents the highest sensitivity area with respect to the potential movement of contaminants and groundwater infiltration. This area requires the most restrictive management, including the consideration of land purchase or establishment of conservation easements, given its close proximity to the drinking-water supply wells;
- WPSA-2 delineates high sensitivity areas found within the two year time of travel to a municipal drinking-water supply well;
- WPSA-3 delineates high sensitivity areas found outside of the two year, but within the ten year time of travel to a municipal drinking-water supply well;
- WPSA-4 delineates medium sensitivity areas found within the two year time of travel to a municipal drinking-water supply well;
- WPSA-5 delineates medium sensitivity areas found outside of the two year, but within the ten year time of travel to a municipal drinking-water supply well;
- WPSA-6 delineates low sensitivity areas found within the two year time of travel to a municipal drinking-water supply well;
- WPSA-7 delineates low sensitivity areas found outside of the two year, but within the ten year time of travel to a municipal drinking-water supply well; and,
- WPSA 8 delineates the area outside of the ten year time of travel to the limit of the total land area contributing water to a municipal drinking-water supply well.

Figure 4-18 indicates that the northern portion of the Study Area falls within the (WHPA) for the Mannheim East Wellfield. The southern portion falls within the WHPA for the Strasburg wellfield. Since many of the surface materials are coarse grained, they should be considered to be vulnerable to contamination. This information is important to determine the mitigation measures if contamination were to accidentally occur or be discovered during construction.
4.6.2 Terrestrial Environment

Through the Natural Heritage Evaluation (completed in February 2012 and enclosed in Appendix F), the terrestrial environment in the Study Area was evaluated based on land use and a site inspection. Site visits were conducted on July 14, November 14, and November 21, 2011, to confirm the presence of Natural Heritage Features, map vegetation, and to determine general characteristics of the Study Area. During the July field visit, the Site was evaluated with respect to dominant vascular plants, site topography, wetland areas, incidental wildlife contacts, and aquatic and terrestrial habitat potential. During the November site visits, the unevaluated wetland adjacent to Parkvale Drive was delineated and verified in conjunction with GRCA staff. Prior to the site visits a review of background information, satellite images and topographic maps was conducted to identify potential Natural Heritage Features and species of conservation concern. Photographs of the Study Area were taken and observations of any wildlife, vegetation or natural features were recorded. A list of incidental species observed during the site visit can be found in Appendix D of the Natural Heritage Evaluation. This list is not exhaustive and more targeted surveys would be required to compile a comprehensive list of animal and plant species on and adjacent to the Study Area.

The entire Study Area, is located within the Mixed Plain Ecozone, the Manitoulin-Lake Simcoe Ecoregion and Stratford Ecodistrict 6E-1. Stratford Ecodistrict 6E-1 is characterized by gently rolling till moraines and smooth clay plains. More than three-quarters of the land in this ecodistrict has been converted for agricultural use as either cropland or pasture, while only 16% remains as natural forested and wetland areas. Approximately 6% of the ecodistrict is designated as conservation land, such as provincially significant wetlands, significant woodlands and provincially significant life science Areas of Natural and Scientific Interest (ANSI). Wetlands and woodlands in this area are known to support populations of rare vegetation communities and Species at Risk, including American Ginseng (Panax quinquefolius) and Jefferson-X Salamander (Ambystoma jeffersonianum). The till plains characteristic of this ecodistrict have given rise to over 14,000 hectares of gravel pits and quarries. Refer to the Natural Heritage Existing Conditions Report enclosed in Appendix F, for more information on the Mixed Plain Ecozone and Manitoulin-Lake Simcoe Ecoregion). The following Sections outline the Terrestrial Environment found within the Study Areas based on the previously identified Land Use sections defined in Section 4.2.1.

4.6.2.1 Section A – Natural Area

North

An agricultural field and a Regionally Significant Woodland exist south of the Mannheim Water Treatment Plant Zone 4 Pumping Station on Ottawa Street South. The woodland is a mixed deciduous forest dominated by Sugar Maple, Black Cherry, American Beech and White Ash. Raspberry, Staghorn Sumac, Hawthorn and assorted herbaceous plants form dense thickets in the cleared area immediately below the transmission lines. The lands within 150 metres of the south side of Ottawa Street South have been developed into a small residential area with manicured grounds and a parking lot within the existing Hydro Corridor. A small pond exists to the north of Ottawa Street South on the lands adjacent to the Mannheim Water Treatment Plant Zone 4 Pumping Station.

A woodland exists in the southeast corner of the Trussler Road-Ottawa Street South intersection contains an unnamed warm water watercourse associated with an unevaluated wetland. This woodland has been identified as a Core Environmental Feature within the Region of Waterloo Greenlands Network and the City of Kitchener Natural Heritage System.

South

In the southern natural area of the Study Area, identified in Section 4.2.1, several small wetland and woodland areas exist on either side of Fischer Hallman Road. The small wetland complex to the south of the Hydro Corridor at Fischer Hallman Road has been identified as a Provincially Significant Wetland and is likely associated with the Strasburg Creek Provincially Significant Wetland. Two unnamed ponds directly under and adjacent to the Hydro Corridor east of Fischer Hallman Road have also been designated as part of the Strasburg Creek PSW Complex. Large uninterrupted patches of woodland to the north and south of the hydro corridor have been identified as Regional Core Environmental Feature in the Region of Waterloo Official Plan (2011, under appeal). The woodland to the east of Fischer Hallman Road is a mixed deciduous forest of Sugar Maple (Acer saccharum), American Beech (Fagus grandifolia), Red Oak (Quercus rubra), White Ash (Fraxinus Americana) and Wild Black Cherry (Prunus serotina). Lower lying areas are dominated by White Spruce (Picea glauca), Staghorn Sumac (Rhus typhina),
Trembling Aspen (Populus tremuloides) and willows (Salix spp.), Raspberry (Rubus pubescens), Staghorn Sumac (Rhus typhina), Hawthorn (Crataegus sp.) and assorted herbaceous plants form dense thickets in the cleared area immediately below the transmission lines.

The Strasburg Provincially Significant Wetland lies approximately 350 to 550 metres north of the hydro corridor beyond a residential development. It is associated with the Huron Natural Area and is described in the Natural Heritage Information Centre (NHIC) database as 77% swamp and 23% marsh. The southwestern tributary of Strasburg Creek extends onto the Study Area at the Huron Park subdivision where it is associated with a small unevaluated locally significant wetland approximately 400 m northwest of Huron Road.

4.6.2.2 Section B – Residential

North
The Northern Residential Area contains a new housing development located north of Bleams Road and is dominated by dry disturbed soils supporting clovers, vetches, wildflowers, assorted graminoids and other vegetation characteristic of dry, disturbed areas.

Two wetland areas exist between Bleams Road and Ottawa Street South within the Laurentian West Community Plan Area. The Laurentian West Wetland Complex and the Borden Wetlands (refer to Section 4.2.1) have been identified as locally significant wetlands and have been identified as Core Environmental Features within the Region of Waterloo Greenlands Network and the City of Kitchener Natural Heritage System. The Laurentian West Wetland Complex, a non-provincially significant wetland complex made up of 14 individual wetlands, exists south of Ottawa Street South. The wetland is composed of approximately 50% marsh and 50% swamp wetland types and is a known waterfowl staging area. In addition, the wetland may provide suitable habitat for waterfowl breeding. Waterfowl staging and breeding areas are considered Significant Wildlife Habitat. The proposed alignment crosses unnamed watercourses associated with both wetland areas.

Several Regionally Significant Woodlands exist within the Laurentian West Community Plan Area, the largest of which is bordered by Ottawa Street South to the north, the Laurentian West Wetland Complex to the east and straddles the utility corridor to the southwest. Two others are part of, or adjacent to, the Borden and Laurentian West Wetlands.

South
The southern residential section of the Study Area has been recently developed leaving much of the area disturbed. A dirt road follows the hydro corridor towards the north from Huron Road, which is an access point to the Huron Natural Area (refer to Figure 4-19). Soils on and adjacent to the site in this area are loose sand and gravel and are dominated by clovers, vetches, wildflowers, assorted graminoids and other vegetation characteristic of dry, disturbed areas. Man-made catchment ponds in low-lying areas within the development have become naturalized forming small wetland areas fringed by cattails and other wetland plants.

This Section also includes the northern branch of the Strasburg Creek, a cold water system and a Regionally Significant Woodland associated with the Strasburg Creek Provincially Significant Wetland. The valleylands associated with the northern branch of the Strasburg Creek have been identified as Ecological Restoration Areas within the City of Kitchener Natural Heritage System. As part of the Kitchener Natural Heritage System no development is permitted within the land flanking these valleylands.

4.6.2.3 Section C – Agricultural

Two (2) warm water watercourses, identified as unnamed tributaries of Alder Creek cross Huron Road at two points approximately 500 m east of Trussler Road. Aerial photographs of this area indicate that the watercourse adjacent to Huron Road is likely intermittent; a well-defined channel was not visible and the area is likely tilled on a regular basis during agricultural operations in the immediate area. The background information available did not provide any information regarding the identification or presence of fish species within these watercourses. The City of Kitchener, in conjunction with the OMNR and GRCA, requires a minimum 30 metre vegetated buffer for warm water streams.

There were no Provincially Significant Wetlands located within this section of the Study Area, however, in addition to the small unevaluated wetland adjacent to Trussler Road, there is a locally significant wetland...
complex (Strasburg Complex 3) south of Huron Road. This wetland complex appears to fall within the headwater region of the unnamed intermittent tributary of Alder Creek in the southwest corner of the Study Area and is home to numerous significant reptile, amphibian and bird species. The valleylands associated with the two warm water watercourses have been identified as Ecological Restoration Areas within the City of Kitchener Natural Heritage System. As part of the Kitchener Natural Heritage System no development is permitted within the land flanking these valleylands.

4.6.2.4 Section D – Future Development

The Section of the Study Area is currently disturbed land, as it is predominantly agricultural land and contains limited terrestrial features.

4.6.2.5 Section E – Business Park

This Section of the Study Area is completely built up with limited natural terrestrial features contained within it. There are, however, storm water management ponds located within this area which are regulated by the GRCA.

4.6.3 Significant Wildlife Habitat

Wildlife habitat is defined as an area where plants, animals, and other organisms live and find adequate amounts of food, water, shelter, and space needed to sustain their populations. Specific wildlife habitats of concern may include areas where species concentrate at a vulnerable point in their annual life cycle; and areas which are important to migratory or non-migratory species (PPS 2005).

Wildlife habitat is referred to as significant if it is ecologically important in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or Natural Heritage System (PPS 2005).

Guidelines and criteria for the identification of significant wildlife are detailed in the Significant Wildlife Habitat Technical Guide (October 2000), the Natural Heritage Reference Manual (June 1999), and the Significant Wildlife Decision Support System (OMNR 2000). Significant wildlife habitat is described under four main categories:

→ Seasonal concentrations of animals;
→ Rare vegetation communities or specialized habitats for wildlife;
→ Wildlife movement corridors; and,
→ Habitats of species of conservation concern.

The City of Kitchener Draft Natural Heritage Background Report (2011), conducted by the City of Kitchener as a supporting study in the preparation of their Official Plan, reviewed potential habitat using the aforementioned resources and specified criteria and did not identify any Significant Wildlife Habitat on or adjacent to the Site. Amphibian breeding ponds have been identified in woodlands and wetlands east of Fischer Hallman Road. The Ministry of Natural Resources (MNR) has designated the ponds and wetland areas adjacent to the hydro corridor along Fischer Hallman Road as regulated Jefferson-X Salamander habitat.

4.6.4 Species at Risk

Since the implementation of the Endangered Species Act (ESA 2007) and its associated regulations, the MNR has been expanding its list of endangered (species facing imminent extinction) and threatened, (species that are likely to become endangered if not protected) species on an almost monthly basis. Newly listed threatened and endangered species receive general habitat protection effective from the date of listing. It is recommended that Table 4-5 remain up to date throughout the course of this project to ensure that the Kitchener Zone 4 Trunk Watermain can proceed on schedule. The Barn Swallow, Bobolink and Eastern Meadowlark have recently been under review by the MNR to be added to the list of Species At Risk. The Study Area contains habitat that could support all three bird species, if these species were encountered during the project, construction would not be permitted to continue in the area, until approval from the MNR is granted. This issue should be accounted for when determining the
preferred alignment of the Kitchener Zone 4 Trunk Watermain, and be further evaluated prior to construction of the Trunk Watermain.

4.6.5 Seasonal Concentration Areas

Areas of seasonal concentrations of animals are defined as “areas where animals occur in relatively high densities at specific periods in their life cycle and/or particular seasons.” At these times, species are vulnerable to ecological interferences or weather impacts. Areas of seasonal concentration are typically small in comparison to the larger habitat areas used by species at other times of the year. The identification of habitats associated with seasonal concentrations of species is typically based on known occurrences (Natural Heritage Reference Manual, June 1999). This will be further assessed during the upcoming seasons though the ongoing Natural Heritage Study.

4.6.6 Watersheds and Surface Water Features

4.6.6.1 Watershed Background

The Study Area is primarily situated within the Alder Creek watershed, from the crossing of Snowdrop Crescent, to Huron Road (Alder Creek Watershed Study Plan Update, 2008). The remaining Study Area, from Mannheim Water Treatment Plant Zone 4 Pumping Station to the crossing of Snowdrop Crescent is located within the Upper Strasburg Creek sub watershed. The Upper Strasburg Creek sub-watershed is composed primarily of hummocky topography. The hummocky terrain provides depression storage which supports significant infiltration to groundwater, local wetland features, municipal supply wells, and stream flow into Strasburg Creek. The alignment has two crossings of seasonal tributaries to Strasburg Creek, one located to the east of the crossing with the Fischer Hallman Road, and the other located north of Huron Road. There is also a potential crossing or close construction proximity to a small pond located east of Fischer Hallman Road.

4.6.6.2 Watercourses

Watercourses are important features, not only for local habitats but for the conveyance of water during rain events. The depending on the base flow of the watercourse, it could be identified as a navigable waterway by the Ministry of Transportation under the Navigable Waters Protection Act. The Navigable Waters Protection Act regulates construction within larger waterways to maintain the ability for the waterway to be used for transportation. The Study Area identified contains several small watercourses (creeks), identified in Figure 4-19. The majority of these creeks are small, seasonal watercourses meaning water only flows through them during the spring, or large rain events. As a result, none of the water courses are classified as a navigable waterway.

Other features of watercourses such as scour depth (the depth at which the water will remove the watercourse bed), pool and riffles and the meander belt should be maintained to minimize impacts to the watershed. These features dictate how the water flows through the watercourse which has a large impact on the quantity and quality of water experienced at the end of the watercourse.

4.6.6.3 Fish Communities

The Grand River Conservation Authority (GRCA) has classified the Upper Strasburg Creek and its tributaries as a cold water fish habitat which supports Brook Trout populations. Although the point of crossing consists of seasonal flows, special considerations will need to be taken when planning the construction of the alignment through these areas. The Natural Heritage Evaluation did not identify these wetland areas as fish habitat, as such, this will potentially have a limited impact on the project. However, there is potential for the creek crossings to impact construction by limiting the window of installation to dry periods.

4.6.6.4 Flood Plains

The City of Kitchener has identified policy areas for the maintenance of floodplains within the City of Kitchener Municipal Plan. These areas are regulated to limit the development within floodplains to limit the amount of damage in the event of flooding. The flood zones are categorized as two Flood Plain Policy Areas:

- **One Zone** - is the most restrictive within the Grand River watershed. Development is generally prohibited within these areas, unless the structure is required to be in the flood plain due to their use, such as a bridge or marina.
Two Zone – allow for some development within the flood plain to allow the growth of established communities, with restrictions as to the level of flood proofing the structure are built with. Although the flood risk is greater within these areas, due to the location with relation to the water bodies, the risk is mitigated through strict building regulations.

Within the Study Area, only the One-Zone Flood Plain Policy Area can be found, as identified in Figure 4-19. The location of the Flood plains is along the identified provincially significant wetlands, with the addition to the south west corner of Bleams Road and Fischer Hallman Road.

4.6.7 Natural Heritage Features

A Natural Heritage Evaluation was completed for the project area to identify the Significant Natural Features outlined below. Generic requirements for the evaluation of natural heritage features as part of an Environmental Impact Study are detailed under the City of Kitchener Official Plan (Part 2.8), the Region of Waterloo Official Plan (7.C.9), by the GRCA, and under the Greenbelt Plan. The following features were evaluated:

1. Significant Wildlife Habitat

These areas are established to protect and enhance the habitats of locally significant wildlife.

2. Significant Wetlands

Wetlands are defined in the Provincial Policy Statement as lands that are seasonally or permanently covered by shallow water, as well as lands where the water table is close to or at the surface. There are four major wetland types; which are classified as swamps, marshes, bogs, and fens. A significant wetland is defined as an area identified as provincially significant by the Ministry of Natural Resources using evaluation procedures established by the province, as amended from time to time. Accordingly, it is the responsibility of the MNR to both identify and classify wetlands as significant in Ontario.

3. Significant Woodlands

Significant Woodlands are defined as treed areas that provide environmental and economic benefits such as erosion prevention, water retention, and provision of habitat, recreation and the sustainable harvest of woodland products. Woodlands include treed areas, woodlots or forested areas and vary in their level of significance. The identification and assessment of significant woodlands is the responsibility of the local planning bodies, in this case the City of Kitchener and Regional Municipality of Waterloo. Woodland significance is typically determined by evaluating key criteria which relate to woodland size, ecological function, uncommon woodland species, and economic and social value.

Regionally Significant Woodlands are identified in the Region of Waterloo Official Plan 7.C.6, as woodlands that are greater than four hectares in size, consist of primarily native tree species and meet the criteria of woodland as defined by the Regional Woodland Conservation By-Law. The Region of Waterloo also identifies wooded areas that do not meet the requirements of a Regionally Significant Forest, as a Core Environmental Feature. This designation as a Core Environmental area requires a 10metre buffer to be provided from the drip line to the construction project. The City of Kitchener observes these Regionally Significant Woodlands, and further identifies Locally Significant Woodlands using similar criteria but considers woodlands less than four hectares in size.

4. Significant Habitat of Endangered or Threatened Species

A search for significant or endangered species presence and associated habitat was conducted using the Ontario Ministry of Natural Resources (MNR) Natural Heritage Information Centre (NHIC) database, outlined in the Natural Heritage Evaluation found in Appendix E. Forty (40) Endangered or Threatened species are known to be present within the Region; however, to date only four (4) species have been documented within the vicinity of the Study Area.

Thirteen significant species have been identified as the most likely to be found within the Study Area and are listed in Table 4-5. Two of these species are classified as species of Special Concern; meaning the species may become threatened or endangered due to a combination of biological characteristics and identified threats. Species are also listed as Threatened on the Species at Risk in Ontario (SARO) list; meaning the species are likely to become endangered if steps are not taken to address factors threatening them, or Endangered; meaning the species is facing extinction if steps are not taken to address factors endangering them. If these species are confirmed to live within the Study Area,
measures will be taken to mitigate the impact the construction of the alignment will have on the local habitat.

**Table 4-5: List of Significant Species Potentially Within Study Area**

<table>
<thead>
<tr>
<th>Species Name</th>
<th>Scientific name</th>
<th>Rank</th>
<th>Observed During Site Visits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butternut</td>
<td>Juglans cinerea</td>
<td>Endangered</td>
<td>Yes</td>
</tr>
<tr>
<td>Black Tern</td>
<td>Chlidonias niger</td>
<td>Special Concern</td>
<td>No</td>
</tr>
<tr>
<td>Cerulean Warbler</td>
<td>Dendroica cerulean</td>
<td>Threatened</td>
<td>No</td>
</tr>
<tr>
<td>Blanding's Turtle</td>
<td>Emydoidea blandingii</td>
<td>Threatened</td>
<td>No</td>
</tr>
<tr>
<td>Eastern Ribbonsnake</td>
<td>Thamnophis sauritus</td>
<td>Special Concern</td>
<td>No</td>
</tr>
<tr>
<td>Jefferson X Blue-spotted Salamander (Jefferson genome dominates)</td>
<td>Ambystoma hybrid pop. 1</td>
<td>Threatened</td>
<td>No</td>
</tr>
<tr>
<td>Swamp Damer</td>
<td>Epiaeschna heros</td>
<td>--</td>
<td>No</td>
</tr>
<tr>
<td>White-tinged Sedge</td>
<td>Carex albicans var. albicans</td>
<td>--</td>
<td>No</td>
</tr>
<tr>
<td>Ram's-head Lady's-slipper</td>
<td>Cypripedium arietinum</td>
<td>--</td>
<td>No</td>
</tr>
<tr>
<td>Scarlet Beebalm</td>
<td>Monarda didyma</td>
<td>--</td>
<td>No</td>
</tr>
<tr>
<td>Moss Phlox</td>
<td>Phlox subulata</td>
<td>--</td>
<td>No</td>
</tr>
<tr>
<td>Braun's Holly Fern</td>
<td>Polystichum braunii</td>
<td>--</td>
<td>No</td>
</tr>
<tr>
<td>Hairy Valerian</td>
<td>Valeriana edulis</td>
<td>--</td>
<td>No</td>
</tr>
<tr>
<td>Carolina Vetch</td>
<td>Vica caroliniana</td>
<td>--</td>
<td>No</td>
</tr>
<tr>
<td>Barn Swallow</td>
<td>Hirundo rustica</td>
<td>Threatened</td>
<td>No</td>
</tr>
<tr>
<td>Bobolink</td>
<td>Dolichonyx oryzivorus</td>
<td>Threatened</td>
<td>No</td>
</tr>
</tbody>
</table>

5. **Significant Valleylands**

Protection of Significant Valleylands is important for the support of flood protection, erosion control, and passive recreational activities within Significant Valleylands. The City of Kitchener and the Region of Waterloo Offical Plans do not allow development in identified Valleylands.

6. **Significant Natural Areas of Natural and Scientific Interest**

Significant Areas of Natural and Scientific Interest (ANSI) are defined as areas of land and water containing natural landscapes or features that have been identified as having life science or earth science values related to protection, scientific study or education.

A background search of the MNR NHIC database, and Regional and Municipal Official Plans was conducted to determine if there are any known Significant Wildlife Habitats, Significant Wetlands, Significant Woodlands, Significant Habitat of Endangered or Threatened Species, Significant Valleylands, or Significant ANSIs (Areas of Natural or Scientific Interest) on or within 120 metres of the Study Area. The results of this search are reported for each Land Use Section identified in Section 4.2.1.

4.6.7.2 **Section A – Natural Area**

1. **Significant Wildlife Habitat**

*North*

The Laurentian West Wetland complex, identified in Figure 4-19 may provide suitable habitat for waterfowl breeding. Waterfowl staging and breeding areas are considered Significant Wildlife Habitat.

*South*

The Upper Strasburg Creek Class Environmental Assessment (2008) identified the western portion of this small wetland complex as habitat for the Jefferson-X Salamander (*Ambystoma* hybrid population 1) (refer to Figure 4-19 for location of habitat) and a number of significant plant and bird species. None have been identified in or adjacent to the Study Area. Further surveys will be completed to confirm the
existence of amphibian breeding ponds, a significant wildlife habitat. Any development within this
designated area will require a permit as outlined in clause 17(2)(c) of the Endangered Species Act (2007).

Three wetlands identified as part of the Strasburg Creek PSW and one unevaluated wetland exists within
120 metres of the proposed alignment. The Strasburg Creek PSW supports Significant Wildlife Habitat
including nesting and feeding areas for colonial waterbirds, winter cover for White-tailed Deer and fish
spawning and rearing habitat for numerous fish species, including Brook Trout.

2. Significant Wetlands

North

The Laurentian West Wetland Complex within the Laurentian West Community Plan Area has been
identified as locally significant wetlands and have been identified as Core Environmental Features within
the Region of Waterloo Greenlands Network and the City of Kitchener Natural Heritage System. The
Laurentian West Wetland Complex, a non-provincially significant wetland complex made up of 14
individual wetlands, exists south of Ottawa Street South (refer to Figure 4-19). The wetland is composed
of approximately 50% marsh and 50% swamp wetland types and is a known waterfowl staging area. The
proposed alignment crosses unnamed watercourses associated with both wetland areas. In addition, a
small unnamed waterbody associated with a locally significant wetland exists on the north side of Ottawa
Street South, east of the Mannheim Water Treatment Plant Zone 4 Pumping Station.

South

Small wetland areas on either side of Fischer Hallman Road at the crossing of the hydro corridor have
been reported as PSW, as indicated in Figure 4-19. The northern tributary of Strasburg Creek originates
at an unnamed waterbody directly under the Hydro Corridor adjacent to Fischer Hallman Road. An
unevaluated wetland exists along the tributary of Strasburg Creek adjacent to Parkvale Drive, approximately 400 m northwest of Huron Road. The Strasburg Creek Provincey Significant Wetland
exists in excess of 350 metres north of the utility corridor and crosses the Strasburg Road easement, in
addition to several small wetland pockets near the intersection of the Hydro Corridor and Fischer Hallman
Road.

3. Significant Woodlands

North

Several Regionally Significant Woodlands exist within the Laurentian West Community Plan Area, the
largest of which is bordered by Ottawa Street South to the north, the Laurentian West Wetland Complex
to the east and straddles the utility corridor to the southwest.

A Regionally Significant Woodland exists in the southeast corner of the Trussler Road-Ottawa Street
South intersection and is associated with the unnamed warm water watercourse and unevaluated wetland
mentioned previously (Kitchener, 2008a). This woodland has been identified as a Core Environmental
Feature within the Region of Waterloo Greenlands Network (2011) and the City of Kitchener Natural
Heritage System (2011b).

South

There are several Regionally Significant Woodlots associated with the Huron Natural Area, which
encompasses most of this Study Area Section. A Regionally Significant Woodland also exists at the
south end of the section. A single Locally Significant Woodland exists to the west of Fischer Hallman
Road and is associated with part of the Strasburg Creek Provincey Significant Wetland Complex.

4. Significant Habitat of Endangered or Threatened Species

North

During the site visit, none of the Species at Risk listed in Table 4-5 were observed. The visit did identify
the location of two (2) Butternut trees found at the edge of an agricultural field and Regional Core
Environmental Woodland, identified in Figure 4-19. This species is designated as endangered in the
SARO list, and would require an assessment if it were determined to be within close proximity to the
Preferred Alignment.
**South**

The ponds and small wetlands adjacent to Fischer Hallman Road in the southern Natural Area Section have been identified as habitat for Jefferson-X Salamander and Blanding’s Turtle, both of which are listed as Threatened within Ontario. The area encompassing these ponds and wetlands has been formally designated as regulated Jefferson-X Salamander habitat by the MNR (refer to Figure 4-19). Butternut, an Endangered species in Ontario, is known to occur within the Huron Natural Area.

5. **Significant Valleylands**

The City of Kitchener’s Official Plan identifies Strasburg Creek and its tributaries as Locally Significant Valleylands. Two of these tributaries and associated valleylands exist in this Section, located to the northeast of the pond on Fischer Hallman Road.

6. **Significant Natural Areas of Natural and Scientific Interest**

Through a search of the Natural Heritage Information Centre database, it was determined that there are no ANSI present within this Section of the Study Area.

4.6.7.3 **Section B – Residential Area**

1. **Significant Wildlife Habitat**

No Significant Wildlife Habitats were identified within this Section of the Study Area.

2. **Significant Wetlands**

The Borden Wetlands have been identified as locally significant wetlands and have been identified as Core Environmental Features within the Region of Waterloo Greenlands Network and the City of Kitchener Natural Heritage System, refer to Figure 4-19 for location.

3. **Significant Woodlands**

Significant Woodlands are present within this Section as part of the Borden Wetlands Areas to the east of Fischer Hallman Road between Ottawa Street South and Bleams Road.

4. **Significant Habitat of Endangered or Threatened Species**

There were no Significant Habitats of Endangered or Threatened Species identified within this Section of the Study Area.

5. **Significant Valleylands**

There were no Significant Valleylands identified within the Residential Landuse section of the Study Area using the National Heritage Report.

6. **Significant Natural Areas of Natural and Scientific Interest**

Through a search of the Natural Heritage Information Centre database, it was determined that there are no ANSI present within this Section of the Study Area.

4.6.7.4 **Section C – Agricultural Area**

1. **Significant Wildlife Habitat**

No Significant Wildlife Habitats were identified within the Agricultural Landuse section of the Study Area.

2. **Significant Wetlands**

A locally significant wetland complex (Strasburg Complex 3) was determined to exist adjacent to the Study Area, south of Huron Road. This wetland complex appears to fall within the headwater region of the unnamed intermittent tributary of Alder Creek in the southwest corner of the Study Area and is home to numerous significant reptile, amphibian and bird species.

3. **Significant Woodlands**

Two (2) Regionally Significant Woodlands exist within this Section of the Study Area. Their locations are identified in Figure 4-19.
4. Significant Habitat of Endangered or Threatened Species

It was determined that there are no areas considered as Habitat of Endangered or Threatened Species currently identified within this Section of the Study Area.

5. Significant Valleylands

The Valleylands associated with the two warm water watercourses have been identified as Ecological Restoration Areas within the City of Kitchener Natural Heritage System. As part of the Kitchener Natural Heritage System no development is permitted within the land flanking these Valleylands.

6. Significant Natural Areas of Natural and Scientific Interest

Through a search of the Natural Heritage Information Centre database, it was determined that there are no ANSI present within this Section of the Study Area.

4.6.7.5 Section D – Future Development

1. Significant Wildlife Habitat

No Significant Wildlife Habitats were identified within this section of the Study Area, however, if hay or a similar low and dense crop were to be planted within the existing agricultural fields in the future, there would be potential for habitat for the Bobolink and Barn swallow to be present in this area.

2. Significant Wetlands

There is one (1) small unevaluated wetland complex located to between the two aggregate pits, identified in Figure 4-19. This wetland is regulated by the GRCA.

3. Significant Woodlands

There is a Core Environmental Woodlot located to the south east of the wetland complex, identified in Figure 4-19.

4. Significant Habitat of Endangered or Threatened Species

There were no Significant Habitats of Endangered or Threatened Species identified within this Section of the Study Area. As mentioned in the previous section there is potential for the habitat of the threatened Bobolink and Barn swallow to be present within this section, if the appropriate crops were planted.

5. Significant Valleylands

There were no Significant Valleylands identified within this section of the Study Area.

6. Significant Natural Areas of Natural and Scientific Interest

Through a search of the Natural Heritage Information Centre database, it was determined that there are no ANSI present within this Section of the Study Area.

4.6.7.6 Section E – Business Park

1. Significant Wildlife Habitat

No Significant Wildlife Habitats were identified within this Section of the Study Area.

2. Significant Wetlands

Existing stormwater management ponds found within this area of development are regulated by the Grand River Conservation Authority as a result of their proximity to the Strasburg Creek Wetlands and tributaries.

3. Significant Woodlands

There were no Significant Woodlots identified within this Section of the Study Area.
4. Significant Habitat of Endangered or Threatened Species

There were no Significant Habitats of Endangered or Threatened Species identified within this Section of The Study Area.

5. Significant Valleylands

There were no Significant Valleylands identified within this Section of the Study Area.

6. Significant Natural Areas of Natural and Scientific Interest

Through a search of the Natural Heritage Information Centre database, it was determined that there are no ANSI present within this Section of the Study Area.
4.7 Socio-Economic Environment

4.7.1 Archaeological and Cultural Heritage Features

Based on information from the Region of Waterloo’s Geographic Information System it was determined that the majority of roadways which could potentially be utilized for the alignment of the Kitchener Zone 4 trunk Watermain have been determined to not require Archaeological assessment. The existing Hydro Corridor within the Study Area, however, contains sections of land which required archaeological assessment. Refer to Figure 4-20 for identification of areas which require assessment.

A Stage 1 Archaeological Assessment of the areas within the existing Hydro Corridor located in the Study Area, which could potentially be affected by the proposed Kitchener Zone 4 Trunk Watermain, was completed by Archaeological Research Associates Ltd. (ARA) (Appendix G). The assessment was conducted in accordance with the provisions of the Ontario Heritage Act (R.S.O. 1990) and Draft Standards and Guidelines for Consultant Archaeologists (Ontario Ministry of Culture 2009). The report was submitted to the Ministry of Tourism and Culture for a review of the results and recommendations presented in the report, no comments have been received at the time of this report.

The Stage 1 Archaeological Assessment consisted of a literature search of all relevant historical, environmental, and archaeological data available for the Study Area. Sources used in the assessment included (but were not limited to) historic maps and archives, field surveys and geophysical mapping. An inventory detailing all known archaeological resources within the Hydro Corridor was identified from this assessment. This data can, in turn, be used to predict further zones of archaeological potential.

Based on the results of the Stage 1 Archaeological Assessment, the Hydro Corridor, if it were in its pristine state, has a high archaeological potential, with previous archaeological find locations identified in Figure 4-20. The results of the field survey, however, confirmed that much of the Study Area has been developed for infrastructural, commercial, residential and recreational purposes, which reduces the archaeological potential of the land. Nevertheless, it is possible that there may be some pockets within the Study Area that have been less disturbed, or missed entirely, by archaeologically-destructive undertakings.

Due to the possibility for high archaeological potential in the Hydro Corridor, it was recommended that a Stage 2 Archaeological Assessment be conducted prior to, or during, the Preliminary Design of the Kitchener Zone 4 Trunk Watermain. This assessment would confirm the presence or absence of materials with cultural heritage value or interest within the lands identified as requiring further evaluation within the preferred alignment. The Region has accepted this recommendation and will be proceeding with the Stage 2 Assessment as part of the Preliminary Design.

Based on information from the Region of Waterloo’s Geographic Information System and the City of Kitchener’s Index of Properties Designated under Part IV of the Ontario Heritage Act, cultural heritage features and properties were located within the Study Area for the Kitchener Zone 4 Trunk Watermain. Barns, homesteads, churches, cemeteries and an old school are located within the Study Area. These sites and structures are located far enough away from any of the Components that no physical impact to these cultural heritage features is anticipated during and post construction. Refer to Figure 4-20 for the locations of the cultural heritage features within the Study Area.
Open Spaces and Recreation Areas

Section A – Natural Area

North

1. Everglade SWM

The Everglade Stormwater Management Area is located at the intersection of Windflower Drive and Ottawa Street South. This green space consists of walking trails and a stormwater management pond. The area is used by the residents, which should be taken into consideration during the development of the preliminary design of the Kitchener Zone 4 Trunk Watermain.

2. Laurentian Wetlands

The Laurentian Wetlands are located to the south of the Ottawa Street South and on both sides of the David Bergey Drive intersection, refer to Figure 4-25. This space consists of walking trails, heavily wooded areas, ponds, and wetlands (refer to Figure 4-21). The area is used by local and regional residents, which should be taken into consideration during the development of the preliminary design of the Kitchener Zone 4 Trunk Watermain.

South

4. Huron Natural Area

The Hydro Corridor within the Study Area crosses a significant wetland to the east of the Fischer Hallman Road. At this location, the corridor is within close proximity to the southwest corner of the Huron Natural Area. The Huron Natural Area is owned by the City of Kitchener and operated by the City of Kitchener, the Waterloo Catholic District School Board and the Waterloo Region District School Board, with the purpose of educating park visitors about the indigenous ecosystems of the area. The location of the

Figure 4-21: Entrance to Laurentian Wetlands from Watercress Court

3. Weiss Playground

A planned playground consisting of a play structure and benches will be located within the Hydro One Corridor by the time of the installation of the Trunk Watermain south of Ottawa Street South within the Planned Weiss Development identified in Section 4.8.2. The playground will be used by the residents of the Weiss developments, which should be taken into consideration during the development of the preliminary design of the Kitchener Zone 4 Trunk Watermain.
Huron Natural Area is indicated in Figure 4-25 as the area south of Bleams Road and northwest of the Hydro Corridor. In addition to the recreational trails in the area, the Hydro Corridor runs adjacent to an access trail and crosses a hiking trail north of Woodbine Avenue. The construction of the trunk watermain could impact the access to recreational trails in the area.

4.7.2.1 Section B – Residential

North

1. Dinison Park and Play Structure

A local playground consisting of a play structure, walking trails, and benches is located at the intersection of Fischer Hallman Road and Activa Avenue. The park is used by the local residents, which should be taken into consideration during the development of the preliminary design of the Kitchener Zone 4 Trunk Watermain.

2. Borden Wetlands

The Borden Wetlands are located at the intersection of Fischer Hallman Road and Cotton Grass Street, refer to Figure 4-22. This green space consists of a walking trail, wooded areas and wetlands. The area is used by local and regional residents, which should be taken into consideration during the development of the preliminary design of the Kitchener Zone 4 Trunk Watermain.

3. Thistledown Green

Thistledown Green is located at the intersection of Thistledown Drive and Bleams Road. This green space consists of a walking trail and pond. The area is used by the residents in the local area, which should be taken into consideration during the development of the preliminary design of the Kitchener Zone 4 Trunk Watermain.

4. Highbrook Park

Highbrook Park is located across from the Borden Wetlands on Fischer Hallman Road. This green space consists of a walking trail and pond. The area is used by the local residents, which should be taken into consideration during the development of the preliminary design of the Kitchener Zone 4 Trunk Watermain.

South

5. Brigadoon Woods

The Brigadoon Woods are located at the southern most end of the existing Strasburg Road. This green space contains walking trails, wooded areas and a portion of the Strasburg Creek. The area is used by local and regional residents, which should be taken into consideration during the development of the preliminary design of the Kitchener Zone 4 Trunk Watermain.
preliminary design of the Kitchener Zone 4 Trunk Watermain. Construction of Kitchener Zone 4 Trunk Watermain should include mitigation measures to minimize impact to the Brigadoon Woods.

6. Municipal Playground B

A local playground consisting of a play structure and benches is located south of Parkvale Drive and west of the Hydro Corridor and is indicated in Figure 4-25 & Figure 4-23. The park is used by the residents in the local area, which should be taken into consideration during the development of the preliminary design of the Kitchener Zone 4 Trunk Watermain.

Figure 4-23: Hydro Corridor at South side of Parkvale Drive Crossing

7. Municipal Playground C

A local playground consisting of a play structure and benches is located within the Hydro One Corridor southeast of Huron Road. The playground is used by the residents of the Primeland Developments development, which should be taken into consideration during the preliminary design of the Kitchener Zone 4 Trunk Watermain. This playground is identified in Figure 4-24 and located in Figure 4-25.
4.7.2.1 Section C – Agricultural
There are no significant open spaces or recreational areas within Section C of the Kitchener Zone 4 Trunk Watermain Study Area.

4.7.2.2 Section D – Future Development
There are no significant open spaces or recreational areas within Section D of the Kitchener Zone 4 Trunk Watermain Study Area.

4.7.2.3 Section E – Business Park
There are no significant open spaces or recreational areas within Section E of the Kitchener Zone 4 Trunk Watermain Study Area.

Figure 4-24: Hydro Corridor at South Side of Banffshire Street Crossing, Within Residential Land Use Section
4.7.3 Emergency Services

The continued operation of the established emergency services is important to maintain throughout the duration of the project. Within the Study Area identified in Figure 4-3 the only emergency service identified is Fire Station No. 7 located at 1440 Huron Road, to the east of the intersection of Huron Road and Fischer Hallman Road. It is vital that access to this station is maintained during the construction of the Trunk Watermain, this will be included in the evaluation to determine the preferred alignment.

4.7.4 Traffic Flow Through Study Area

The Study Area identified in Figure 4-3 encompasses several Regional roadways, some of which are heavily utilized on a daily basis. There are two (2) potential ways that the construction of the Kitchener Zone 4 Trunk Watermain will impact the traffic within the Study Area:

→ The alignment is located along an existing roadway, which would require full or partial roadway closures for a length of time proportional to the length of required construction; or,
→ The alignment crosses an existing roadway, which would require a full road closure for a minimum of 3 working days.

The biggest impact to the local traffic patterns would be those which impact roadways with a high number of daily users or those which impact the use of the roadway for a long period of time. The roads within the Study Area which experience the highest amount of traffic, as identified by the 2010 Estimated Average Annual Daily Traffic Data (AADT), are as follows:

→ Ottawa Street South with AADT of 15,000 to 50,000 vehicles, depending on location within the Study Area;
→ Fisher Hallman Road with AADT of 16,000 to 50,000 vehicles, depending on location within the Study Area;
→ Bleams Road with AADT of 13,000 to 22,000 vehicles, depending on location within the Study Area; and,
→ Huron Road with AADT of 5,000 to 13,000 vehicles, depending on location within the Study Area.

In addition to the impacts to the major roadways, there are also potential impacts to the smaller roads within the Study Area. These impacts could include limited access for garbage services, public transit detours and access to homes. There are several residential roadways which are crossed by the existing Hydro Corridor such as:

→ Isaiah Drive
→ Snowdrop Crescent
→ Gehl Place
→ Woodbine Avenue
→ Parkvale Drive
→ Maitland Street
→ Banffshire Street
→ Newcastle Drive

The impacts to the smaller roadways would typically be shorter in duration when compared to the impacts of the main roadways, due to the amount of required traffic control and the extent of the construction in the area. Traffic considerations are further discussed in Section 7.6, though the evaluation of the Alignment Components.

4.7.5 Railways

There are no CN or privately owned railways present within the Study Area identified in Figure 4-3.
4.7.6 Agricultural Environment

There are currently several active agricultural areas within the Study Area, as identified in Section 4.2.1. The impacts to the agricultural activities within the site should be mitigated to create the least negative economical impact to the land owners. Impacts to the operation of the agricultural area during construction would be the physical disruption within the construction easement of the trunk watermain alignment. Construction will also create disturbances to mobility throughout these properties, which should be communicated and discussed with the land owners. The installation of the trunk watermain will not permanently impact the current agricultural land uses.

In accordance with the City of Kitchener and Region of Waterloo’s Official Plans for growth, as previously identified in Figure 4-17, most of this agricultural land will be developed in the future. The installation of the trunk watermain could affect the design of infrastructure of such a development. In this case, the development is in the preliminary design stages, and is outlined in Section 1.7.2 and Section 4.8.1. Since the Trunk Watermain is expected to be designed to be approximately three metres below grade, lower than the typical municipal infrastructure, the impact to the development infrastructure may be minimal provided adequate information is known regarding the future developments.

4.8 Future Infrastructure & Development Projects

This section identifies the future construction projects currently scheduled to be performed within the Study Area prior to the construction of the Kitchener Zone 4 Trunk Watermain in 2015. This includes works by the Region, The City and private developers.

4.8.1 Infrastructure

4.8.1.1 Municipal

1. South Strasburg Trunk Sanitary Sewer

This sanitary sewer will service the residences of the Becker Estates Development and the existing Huron South subdivision. It is designed for a peak flow rate of 1210 L/s. A Schedule B Environmental Assessment, titled South Strasburg Trunk Sanitary Sewer EA, was completed for this sanitary sewer project in 2008. The preferred alignment will follow the future roadways of the Becker Estates Development south of Plains Road to the future Strasburg extension.

2. Middle Strasburg Trunk Sanitary Sewer

All development land parcels north of Huron Road as designated on the Rosenberg Secondary Plan have been assigned to the completed Middle Strasburg Trunk Sanitary Sewer Watershed. This sanitary sewer was designed to manage a peak flow rate of 680 L/s. The alignment travels through the north end of the Rosenberg Development and crosses Fischer Hallman Road south of Bleams Road. This sanitary sewer will service approximately 55,000 residences.

3. Community Trails Master Plan

Multi-use trails can be used for community or recreation purposes, and they connect subdivisions and city centres to natural areas. The trails can be covered in loose granular material, concrete or asphalt depending on their intended use. The Multi-Use Pathways and Trails Master Plan and Implementation Strategy report outlines details for the expansion and upgrading of multi-use trail system within the City of Kitchener. Proposed multi-use trails stretch the entire length of the Kitchener Zone 4 Trunk Watermain Hydro Corridor.

There is potential for the proposed multi-use trail alignments to be reconfigured within close proximity to any of the Alignment Alternatives for the Kitchener Zone 4 Trunk Watermain, and the possibility to phase the construction of the trails with the construction of the Trunk Watermain.

4. Strasburg Road Extension

The Strasburg Road extension will connect the existing south end of Strasburg Road to New Dundee Road between Fischer Hallman Road and Reidel Drive, relieving future demand on surrounding major roads. The hydro easement crosses an area of the extension which contains paved and curbed roadways. The Kitchener Zone 4 Trunk Watermain would also be required to cross a 900mm diameter
reinforced concrete sanitary sewer pipe and a 600mm diameter concrete pressure pipe watermain which are incorporated into the Strasburg Road Extension. The Strasburg Road Extension is currently in the Environmental Assessment phase. A final environmental study report will be completed for City Council in 2012 outlining the next steps of the project.

5. **Huron Road Resurfacing and Infrastructure Installation**

Resurfacing and infrastructure updates are planned along Huron Road from the intersection of Strasburg Road to the intersection of Fischer Hallman Road. Construction on the Huron Road is planned to be completed in 2012, two years prior to the potential construction of the Kitchener Zone 4 Trunk Watermain. Depending on the preferred alignment selected, this newly constructed road may be affected as substantial reinstatement would be required along with further disruption to local residents and traffic.

### 4.8.1.2 Regional

1. **Fischer Hallman Road Widening**

An Environmental Assessment has been planned to evaluate the widening of Fischer Hallman Road. This report is in the planning stages and has yet to be initiated. As a result, the timeline and scope of the project is unknown, but will still be considered though this evaluation.

At the time of this report, the Region of Waterloo has no additional infrastructure projects scheduled for the Study Area within the potential construction timeline of the Kitchener Zone 4 Trunk Watermain.

### 4.8.1.3 Provincial

There are no planned Ministry of Transportation projects within the Study Area which directly impact the location or construction of the Kitchener Zone 4 Trunk Watermain. There are no roadways within the Study Area which are maintained by the Ministry of Transportation, which was confirmed by the Ministry of Transportation's *Southern Highways Program 2011 to 2015*.

### 4.8.2 Private Developments

#### 4.8.2.1 Deerfield Homes Limited Development

The Deerfield Homes Limited Development is located south of Ottawa Street South across from the Mannheim Water Pumping Station, within the north residential section of the Study Area. This 42,000 m² development is comprised of 21 buildings with a total of 164 townhome residential units. This development would impact the installation of the Kitchener Zone 4 Trunk Watermain along Ottawa Street South though the Hydro Corridor, as it lies parallel or under Ottawa Street South, and, during construction, could limit access to the Deer Field Homes Development. A stormwater management pond at the northeast corner of the development crosses into the Hydro One Corridor. It is recommended that, if possible, the Kitchener Zone 4 Trunk Watermain be limited to placement along the northern side of the Hydro One Corridor to avoid the stormwater management pond and planned storm water and sanitary infrastructure.

#### 4.8.2.2 Weiss Property

The Weiss Property is planned northwest of Isaiah Drive and will likely be installed prior to the Kitchener Zone 4 Trunk Watermain. This development is comprised of nine townhouse buildings, containing a total of 48 residential units. The northeast vehicle entrance, driveway, majority of the parking spaces for the development, in addition to a play area and recreational trails are contained within the Hydro Corridor easement. This development could impact the construction of the potential Kitchener Zone 4 Trunk Watermain due to the location of the Hydro Corridor within the site. Mitigation of impacts to the existing land uses at this site and reinstatement are important concerns in this area.

#### 4.8.2.3 Rosenberg Development Secondary Plan

The Rosenberg Development is located east of Trussler Road, along Bleams Road, to Fischer Hallman Road, and south to Huron Road. The estimated total additional population of this development is expected to be approximately 20,000, within high, medium, and low density residential dwellings. The community will include commercial, office, institutional and residential land uses. In July, 2011, the City of Kitchener released a draft secondary plan for the Rosenberg Development outlining planned land use designations. The existing Hydro Corridor will pass through future school yards and by a local library,
although the land within the Hydro Corridor is to remain undeveloped and is designated variously as both open space and as natural heritage areas. The hydro easement crosses a planned emergency overflow route for storm water (Section 5, Policy 12) in addition to five proposed secondary residential roads. No information on future watermains or sewers was provided within this secondary report. City council approved the Draft Rosenberg Secondary Plan in August 2011.

4.8.2.4 Huron Point Development

The Huron Point Development is located off of Maitland Street, within close proximity to the intersection of Parkvale Drive, as identified in Figure 4-26. This development is comprised of five condominium buildings, each containing eleven residential units. The majority of the parking spaces for the Huron Point development are contained within the existing Hydro Corridor. In addition to a 14 metre wide combined trail, a vegetated area is planned to follow the north edge of the Hydro Corridor, located within the existing Kitchener-Wilmot Hydro Easement identified in Section 4.2.3.3. Local utilities for the Huron Point development (i.e. sanitary sewer and watermain) cross the parking area between the buildings and would require crossing by the Kitchener Zone 4 Trunk Watermain. Mitigation of impacts to the existing land uses at this site and reinstatement are important concerns in this area.

4.8.2.5 Activa Holdings

The Activa Holdings Development is located Northeast of the intersection between Fischer Hallman Road and Huron Road, as identified in Figure 4-26. This 90 hectare development is nearing completion and is comprised of residential, institutional and commercial zones. Approximately 1400 residential units will exist within this development when completed. The majority of this development is completed, with the exception of the Maitland Street and Huron Point developments identified in Figure 4-26. The Hydro Corridor passes through the middle of this development. Within the development, the Kitchener Zone 4 Trunk Watermain would pass under three new roadways, walking trails, and open park spaces. Mitigation of impacts to the existing land uses at this site and reinstatement are important concerns in this area.

4.8.2.6 Becker Estates Inc. Development

The Becker Estates Inc. Development is located to the southeast of the intersection between Fisher Hallman Road and Huron Road. This development will be comprised of a variety of land uses and densities. It will contain 75-163 medium density residential units, approximately 400 semi-detached and detached homes, 80 townhomes, 6 parks, and a school. The planned road easements of this development have the potential to be utilized for the alignment of the Kitchener Zone 4 Trunk Watermain. The use of the planned residential roads would limit the extent of easements required and also mitigate possible impacts to private land in the area.

4.8.2.7 Primeland Developments Limited

The Primeland Developments Limited Development is located southeast of Huron Road and east of the planned Strasburg Road extension identified in Figure 4-26. This residential development is currently under construction and will be completing Stage 3 of 6 in February 2012. The Primeland Development is comprised of residential single, town, semi-detached, and detached homes. There are approximately 500 residential units planned to be located on the site, when completed. The existing Hydro Corridor bisects this development and contains a play structure and walking trails. Mitigation of impacts to the existing land uses at this site and reinstatement are important concerns in this area.
5. Evaluation Criteria

In order to determine the preferred Alignment of the Trunk Watermain, an evaluation must be completed by comparing various Alignment Alternatives against each other, for a fair comparison. Due to the number of areas of concern within the Study Area, various Components were developed to avoid or mitigate the impact on such areas of concern. Alternatives were made by combining the preferred Components; these Alternatives were then compared against each other. The following section identifies the evaluation criteria that will be used to select the Components for the preferred Alignments of the Zone 4 Trunk Watermain from the Mannheim Water Treatment Plant Zone 4 Pumping Station. Ultimately, good engineering, objective evaluation of Components, and stakeholder input will be assessed to determine the preferred Alternative.

5.1 Route Selection Considerations and Guidelines

5.1.1 Standards & Guidelines


5.1.1.1 The Ministry of the Environment Design Guidelines

The Ministry of the Environment Design Guidelines for Drinking-Water Systems (2008) will be used for the Kitchener Zone 4 Trunk Watermain design parameters. The alignment Components will be evaluated based on the ease of conformity to the provincial guidelines.

Chapter 10 of the document outlines the design, installation and operation of drinking water distribution systems.

→ Section 10.2 outlines hydraulic design parameters;
→ Section 10.3 identifies construction requirements, such as depth to cover and pipe materials;
→ Section 10.10 indicates that installation specifications should incorporate the provisions of the appropriate American Water Works Association (AWWA) standards and the Ontario Provincial Standard (OPS); this section also outlines pipe bedding and disinfection procedures;
→ Section 10.11 identifies the required separation distances from contamination sources such as sewers and contaminated water sources;
→ Section 10.12 should be utilized to design the appropriate crossing (in locations where the alignment might cross a surface water crossing); and,
→ Section 10.13 summarizes the requirements for back flow and cross-connection control within a drinking water distribution system.

5.1.1.2 The Region of Waterloo and Area Municipalities Design Guidelines and Supplemental Specifications for Municipal Services

This document is supplemental to the Ontario Ministry of the Environment Guidelines for drinking water systems, which are to be used as the minimum applicable standards. Sections that pertain specifically to the design and construction of watermains are Part B – Design Guidelines, and Part D – Construction Specifications.

→ Part B outlines design guidelines for municipal services, including watermains;
→ Sections B1.6 and B1.7 outline easement widths and general constructability of a project;
→ Section B2.3 identifies the required hydraulic parameters that the design must meet and requirements for hydraulic units such as pressure control valves;
→ Section B2.5 identifies restrictions for the design of pipework, such as materials, location, slope, high points and clearance to sewers;
Part D identifies guidelines that must be followed during the construction of the trunk watermain;

Section D.1 outlines the general construction guidelines, including: traffic control, safety requirements, layout, pre-condition surveys, site preparation, excavation and backfilling for the project; and,

Section D.2 is specific to the construction of watermains and outlines project coordination with existing utilities and requirements for watermain installation and commissioning.

This section will be developed further as the conceptual design progresses to address specific issues associated with the project.

5.1.2 Site Specific Considerations

The majority of the potential alignments associated with this project are going to be located within the Hydro Corridor or within existing road allowances. The installation within the Hydro Corridor could pose some challenges to implementation of the trunk watermain in terms of both construction and ongoing operation and maintenance compared to typical installation within a roadway. The primary site specific considerations, therefore, that will require evaluation include:

Location – The objective to construct the watermain using conventional methods, where practical, requires the watermain to be located where it does not interfere with existing infrastructure. The standard construction corridor width would be twelve metres wide (ten metres minimum) to allow for the pipe installation trench and vehicle access for pipe, granular delivery/removal.

Infrastructure Access – The watermain must be constructed with adequate access following construction to allow for monitoring and repair as necessary.

Appurtenance Access – Watermain appurtenances (valves, drain chambers, air releases) should be located where they are easily accessible for routine operations and maintenance.

5.1.3 Hydro-One Networks Design Constraints

Due to the location of the existing Hydro Corridor within the Study Area, discussions were held with Hydro One Networks Inc. (HONI) to communicate the project scope and gain feedback regarding the project.

The primary interest of HONI is to maintain the power supply to their customers. The failure of one tower within the hydro corridor could leave thousands of homes and businesses without power. It is critical that the installation and operation of the Trunk Watermain does not impact existing or future Hydro infrastructure. Additionally, it is important that HONI maintains access to their existing infrastructure for maintenance.

Based on a preliminary design meeting with Hydro One Networks Inc. (HONI) held September 28th, 2011, the following design constrains and criteria were identified by the HONI Staff:

Constraints

→ A minimum 15 metre radius should be maintained between the existing tower structures and the watermain installation, as per Figure 5-1;

→ In areas where conditions do not allow for the full separation, a steel carrier casing is required. The casing is required to extend approximately 30 metres on each side of the tower footings;

→ Watermain bends shall not be located adjacent to towers due to increased risk of rupture at these points;

→ Backfill and piping design must allow for regular maintenance work by HONI, including, but not limited, to large cranes and vehicles; and,

→ No stockpiling of materials is permitted where it will restrict the use of the land for HONI for emergency repair or maintenance.
Criteria

- Deeper infrastructure installations are preferred, to minimize the risk of washouts; and,
- Watermain infrastructure alignments may vary within the easement to maximize separation distance from the watermain from the transmission towers.

Figure 5-1: Schematic of Hydro One Design Constraint

These constraints and criteria are to be used in combination with other design criteria to determine the general location of the trunk watermain easement through the transmission corridor.

5.2 Construction

5.2.1 Construction Methods

The installation of the Kitchener Zone 4 Trunk Watermain will likely require a combination of various construction methods, including open-cut construction and the application of trenchless technologies, such as boring, to cross the elevation change at Isaiah Drive and wetland adjacent to Parkvale Drive. The following sections provide a general overview of the methods that may be employed.

5.2.1.1 Open Cut Construction

Watermain construction by open-cut is a common technique that involves the excavation of a trench from the surface utilizing excavators to the required depth, with the service being installed at the design grade with bedding, as required, and the trench being then backfilled and compacted. The use of open-cut trench construction is generally limited to excavations less than ten metres in depth due to equipment restrictions, safety concerns, and economic feasibility. As the depth of the trench increases, the
excavation is temporarily supported either using trench boxes or sheeting to prevent collapse of the trench walls. Trench boxes or sheeting can also be utilized to limit the width of an excavation where spatial constraints prohibit a wide trench.

In addition, when construction is within urbanized areas, consideration must be given to the protection and support of existing underground utilities that may be impacted by the excavation, or temporary services and/or bypasses provided to maintain services.

For open-cut excavations, the soil and groundwater conditions are important factors in determining what preparatory work is required. For example, if there is a high ground water table combined with sands, silts, or gravels, the ground may require stabilizing prior to excavation. The typical method for removing groundwater is the installation of a groundwater dewatering system using well points. Typically, temporary Permit-to-Take water for dewatering is required from the MOE, depending on the amount of water removed.

The ideal depth of the Kitchener Zone 4 Trunk Watermain is would provide at least three (3) metres of cover above the obvert of the Trunk Watermain, allowing the majority of the Kitchener Zone 4 Trunk Watermain to be constructed by open-cut construction. This depth is ideal as it would allow any future infrastructure (typically installed with 2.5 meters of cover) to be installed without interference to the Kitchener Zone 4 Trunk Watermain.

The rate of installation for the Kitchener Zone 4 Trunk Watermain, at a size of 750mm diameter, will be approximately 25 to 35 metres per day, assuming one construction crew is used. As excavation progresses, and the pipe is installed, the trench is backfilled, limiting the extent of the open excavation.

Where road crossings are required, the installation would generally be performed in two stages, half of the road at a time, to allow for continued traffic movement.

Open cut construction generates excess materials as the soil is excavated and replaced with the pipe. This material may sometimes be reused on site as backfill or for regrading, however, it is often required to be removed from the site and disposed of. This may be a concern where there is the potential for environmental impairment.

For the installation of the Trunk Watermain, the following general design/construction assumptions have been made where open cut construction is the preferred installation method:

- A minimum of three metres of cover will be maintained over the trunk watermain. 1.5 metres is the minimum acceptable depth for frost cover.
- The Trunk Watermain will have the interior diameter of 750mm
- Disturbance of existing utilities and services will be minimized.
- Newly installed services and roads will be protected and disturbance minimized.
- In accordance with Ministry of the Environment (MOE) guidelines, at least 2.5 metres separation will be provided between any sewers and the new trunk watermain. Where this is not possible, at least 0.5 metres vertical separation will be provided. At least 1.5 metres separation will be provided between all other services.
- In accordance with Hydro One limitations, 15 m minimum separation is required between the trunk watermain and existing Hydro One structures.
- The area affected by any excavation will be 10 to 12 metres wide, depending on the location.
- Adequate access for equipment will be possible, including clearances from overhead wires.
- Disruption to traffic will be minimized.

5.2.1.2 Trenchless Construction

At three (3) locations and at select road crossings (to be determined through preliminary design), the use of trenchless construction may be required to navigate obstacles. The obstacles include the large
elevation changes at the crossing of Isaiah Drive, the locally significant wetland located near Parkvale Drive and the existing K-W Hydro Transmission Station. Based on the Interpolated Formation Cross-Section identified in the Desktop Hydrogeological Assessment (Figure 6 of Appendix E) the soils found within the Study Area, at a depth of three metres from the surface is primarily sand with occasional sections of clay and silt. This must be confirmed through a geotechnical evaluation within the detailed design phase of the project.

Anticipated lengths for the crossings are as follows:

- Isaiah Drive: 200 m within Component 2
- Wetland crossing: 490 m within Component 9
- Hydro Utilities: 300 m within Component 15 & 16

Assuming AWWA C301 concrete pressure pipe is used, as per the Region’s approved products list for watermains with a diameter of 600mm or greater; the 750 mm diameter trunk watermain will have a maximum outside diameter of 966mm, measured at the pipe bells. With joint restrainers, these maximum outside diameters will be increased by approximately 73 mm to a total outside diameter of 1039 mm at the joints.

Typical trenchless construction methods for water pipeline crossings include:

- Auger Bore and Jack (ABJ) Tunnelling;
- Pipe Ramming;
- Horizontal Directional Drilling (HDD), and;
- Tunnel Boring Machine (TBM) Tunnelling.

Both ABJ and pipe ramming utilize a steel casing pipe as part of the installation process, that is, both are two-pass tunnelling methods where the steel casing pipe is jacked/rammed in place as the primary tunnel support with the product pipeline subsequently installed inside. HDD can install steel casing pipe (two pass system), but can also directly install the product pipeline provided it is of retrained-joint design (one pass system). TBM tunnelling does not require, but can accommodate, steel casing pipe.

5.2.1.3 Auger Bore and Jack (ABJ) Tunnelling

ABJ can be used to install steel casing pipes up to 2,100mm in diameter, however, typical installations are between 300mm and 1,500mm. ABJ can install lengths up to 100 to 150 metres. ABJ is also capable of installing pipelines in shale bedrock or in soil overburden. In soil overburden, ABJ is typically limited to tunnel alignments in stable soils located at or above the local groundwater table. There is potential for this type of construction method to be utilized for installation of the Kitchener Zone 4 Trunk watermain.

5.2.1.4 Pipe Ramming

Pipe ramming can be used to install steel casing pipes of similar diameters as ABJ and of similar lengths. Costs for pipe ramming are also similar to ABJ. However, pipe ramming is typically limited to soil conditions and is not considered feasible unweathered shale bedrock. The main advantage of pipe ramming over ABJ is that it can be used at or slightly below the local groundwater table, and in less stable ground conditions. There is potential for this type of construction method to be utilized for installation of the Kitchener Zone 4 Trunk Watermain.

5.2.1.5 Horizontal Directional Drilling (HDD)

HDD is typically used to install pipelines up to 1,050mm in diameter, and is capable of installing pipelines in shale bedrock or soil overburden and above or below the local groundwater table. For HDD to be considered feasible, the installation of the 1,050 mm welded steel casing would have to be installed. Depending on the determined site conditions this could be a feasible construction method to utilize for the installation of the Kitchener Zone 4 Trunk Watermain.
5.2.1.6 Tunnel Boring Machine (TBM) Tunnelling

TBM tunnelling requires manned access to the tunnel heading in addition to larger launching and receiving pits. As a result, TBM tunnelling is typically used to mine tunnels in excess of 1200mm in diameter. For this application a filler material would used to fill the space between the 1200mm diameter tunnel and the 1039mm (outside) diameter Trunk Watermain. TBM tunnelling can be configured for operation in both soil and bedrock conditions, as well as above or below the local groundwater table, however it is not ideal for the TBM to travel though a variety of materials at one time. If the site contains varying materials or large boulders, generally the elevation will be adjusted to avoid the obstacles. Unlike ABJ/pipe ramming, TBM tunnelling is not limited by installation length. However, TBM tunnelling is also significantly more expensive than ABJ/pipe ramming. As a result, TBM tunnelling is typically only used where installation length or other factors preclude ABJ/pipe ramming. Tunnel Boring is a feasible method of trenchless construction applicable to this pipe installation if trenchless construction is a requirement of the preferred alignment.

5.2.2 Pipe materials

Due to the potential location of the Trunk Watermain in relation to existing hydro infrastructure there is an elevated need for electrochemical corrosion resistance. Utilizing standard engineering practices throughout the design process, such as ensuring dissimilar metals are not in contact and the installation of sacrificial anodes at all installed fittings and valves.

Required pipe material to be utilized for the Kitchener Zone 4 Trunk Watermain as per the Region’s approved products list for water mains with a diameter of 600mm or greater will be concrete pressure pipe.

5.2.3 Reinstatement

The construction of the Trunk Watermain would, in most situations, cause only temporary disruptions to the existing land use within the Study Area. Once the Trunk Watermain construction is complete the previous land use will be reinstated, or in some cases improved with new trails or landscaping. In locations which were previously forested with large trees that were removed for construction, they would be unable to be reinstated to their previous land use. Not only to maintain access, but also, the presence of large trees, and their corresponding root systems, within close proximity to the Trunk Watermain could lead to serious damage to the pipe structure and would limit access.

5.2.4 Valve Chambers

The Kitchener Zone 4 trunk Watermain will require permanent operating and maintenance facilities such as valve chambers regardless of construction method and alignment location. In addition, the Kitchener Zone 4 trunk Watermain will be connected to existing water infrastructure at the Mannheim Water Treatment Plant Zone 4 Pumping Station, Strasburg Road and potentially at the crossing of Huron Road.

5.2.5 Stockpiling of Materials

Regardless of the preferred location of the Trunk Watermain, the construction process will require the storage of excavated soil, pipe sections and fittings. The space requirements of this and Hydro One design limitations should be considered when designing the Trunk Watermain.
6. Phase 2: Identification of Component Solutions

A primary objective of Phase 2 of this Study is the identification of solutions to the problems or opportunities described in Phase 1. During Phase 2, preliminary Trunk Watermain twenty two (22) alignment Components were identified and evaluated. The preferred components were then combined to form five (5) Alternative Alignments which were compared against each other. The comparison of alternatives which extend from the Mannheim Water Treatment Plant Zone 4 Pumping Station to the Strasburg Road extension connection was completed to evaluate solutions to the same problem. The Alternatives selected for comparison in Section 8 will be the alternatives which perform the best with respect to each evaluation category in Section 7 (environmental, social, technical and economic).

As part of Phase 2, meetings were conducted with key agencies to discuss approval requirements, examine potential environmental issues and provide general feedback on preliminary alignments. It also included conducting a Public Information Centre (PIC) to give interested stakeholders an opportunity to provide input regarding the Study.

The focus of the Study was to determine the preferred Watermain Alternative that optimize the water supply system and better serve existing and future users. Another focus of the work was to gain a better understanding of the Region’s water distribution to assess the previous recommendations to enhance the reliability, operational efficiency, and capacity of each system through the installation of the Kitchener Zone 4 Trunk Watermain.

The alignment Alternatives were identified in the early stages of the Class EA process following a detailed review of the Study Area, identified in Figure 4-3, including the land bounded to the north by Ottawa Street South and Bleams Road, bounded to the east by Fischer Hallman Road and Strasburg Road, bound to the south by Huron Road and bound to the west by Trussler Road. The Study Area includes the Mannheim Water Treatment Plant Zone 4 Pumping Station, located on the north side of Ottawa Street South between Trussler Road and Fischer Hallman Road and the proposed alignment of the Strasburg Road extension to meet Rockcliffe Drive, located South of Huron Road. Orthographic images, survey results and site visits were utilized to conceptually identify the Component routes. The possible routing Components included existing transportation corridors, open spaces, and utility corridors.

The alignments alternatives presented in the Kitchener Zone 4 Analysis Report were included in the Components assessed as part of this study.

6.1 Key Considerations for Trunk Watermain Alignment Alternatives

The primary justification for this infrastructure is to provide adequate capacity to service future growth planned for the southwest section of the City of Kitchener through the Integrated Urban System (IUS), in accordance with the Region of Waterloo Official Plan. The intent of the proposed trunk watermain is to provide a dedicated connection between the Mannheim Water Treatment Plant Zone 4 Pumping Station and Southwest Kitchener (connecting to the planned 600mm diameter watermain along the Strasburg Road extension) to alleviate existing pressure fluctuations and provide adequate capacity for the future population growth in the area.

Consideration should be given to future works including planned development, road expansions, infrastructure upgrades, etc, in the selection of the alignments.

The key considerations for the Kitchener Zone 4 Trunk Watermain alignments are:

- Alignments for new infrastructure should be, wherever possible, located in publicly owned land to minimize the requirement for purchasing or expropriating property;
- Conflicts with existing infrastructure, natural and man-made features, environmentally sensitive areas, species-at-risk, etc, should be minimized and existing utility corridors used where possible;
- Changes in alignment (bends, elbows, etc) should be minimized to optimize the hydraulic performance of the service;
- Alignments should provide for ease of access and operations and maintenance activities;
- Traffic disruptions are minimized on right of ways;
Adequate separation from other infrastructure should be provided to prevent damage in the event of a feedermain break; and,
Future construction should be considered to ensure new alignments do not cause conflicts with current or proposed works (and development municipal infrastructure).

6.2 Coordination with Future Works, Land Uses, and Project Synergy

Due to the size of the Trunk Watermain and the resulting width of the construction easement, it would be ideal for the construction schedule to consider and coordinate with future works in the area. Based on the information available at the time of this report, municipal, regional and provincial construction projects within the Study Area were investigated.

Future land uses and the construction schedule of the developments identified in Section 4.8.2 should be taken into consideration throughout the design of the trunk watermain, as more information is available.

Future road construction and infrastructure projects do not pose a risk to the project. Utility and road reconstruction on Huron Road will be completed in September 2012 before construction on the project would commence. The Official Plan for the City of Kitchener identifies the Hydro Corridor as an open space which is protected from construction during urban expansion within the Study Area. This means that the corridor will have limited development within the existing easement while the adjacent lands are developed.

The potential for phasing the construction of the Kitchener Zone 4 Trunk Watermain with the planned construction of private developments, road upgrades or trails identified in Section 4.8 will be taken into consideration when evaluating the alignment Components. The ability to phase with other construction projects in the Study Area will limit the disruption to the local residents and the required reinstatement of existing land uses.

6.3 Trunk Watermain Alternative Alignments

The key considerations described above were used in conjunction with the screening criteria detailed in Section 5 to develop servicing alternatives for the Kitchener Zone 4 Trunk Watermain. Within this, however, there are three possible alternatives. The first alternative is the ‘Do Nothing’ alternative, Secondly is the upgrade of existing infrastructure, such as replacement or twinning of existing supply mains and, thirdly, is the construction of a new watermain to provide independent supply to southern section of Kitchener Pressure Zone 4.

Details of each alternative are presented below:

6.3.1 Do Nothing

With this option, there are no impacts to natural features resulting from construction activities; however, this option does not provide a solution to the pressure variations during peak demand times or the difficulty between the distribution capacity and the projected future demand.

Ultimately, this option does not satisfy the Study objectives.

6.3.2 Upgrades of Existing Infrastructure

This option, involves the replacement or twinning of the existing water supply mains along the existing watermain alignments. Construction of this option would significantly impact local residents, as the location of existing infrastructure is located within existing developed areas of the City.

The reconstructed or twinned watermains, combined with the existing water supply system, would provide capacity for current and future flow demands. This option would also address the pressure fluctuations experienced within the system during peak demand times. The upgrade of existing infrastructure does not, however, provide an independent supply to the southern end of the Kitchener Pressure Zone 4, as discussed in Section 4.1.
6.3.3 Construction of New Watermain

This option also impacts the residents in the same manner as the upgrade of existing infrastructure option; however, the level of impact is dependent on the alignment of the watermain. The construction of a new watermain would provide the capacity required for the projected population of southwestern Kitchener. In addition, the increased supply would alleviate the pressure fluctuations currently experienced at peak demand times. The installation of a new watermain connecting the Mannheim PS (located in Kitchener Pressure Zone 4) directly to the Southern end of Kitchener Pressure Zone 4 would provide an independent supply to southwestern Kitchener, the location of identified future growth within the Region of Waterloo.

Twenty-two (22) components have been identified within the Study Area. Components combine to create various Alternatives to connect the Mannheim Water Pumping Station to the future extension of the Strasburg Road. The preferred alternatives will consist of a combination of a sub-set of the twenty-two components with the least overall impact identified in Figure 6-1 and outlined in the following section.
### 6.3.3.1 Component 1

<table>
<thead>
<tr>
<th>Start</th>
<th>Mannheim Water Treatment Plant Zone 4 Pumping Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finish</td>
<td>Connection to Strasburg Road Watermain</td>
</tr>
<tr>
<td>Length</td>
<td>8,000 metres along existing roadways</td>
</tr>
<tr>
<td>Description</td>
<td>Follows Ottawa Street South eastward to Fischer Hallman Road, South on Fischer Hallman Road to Bleams Road, east on Bleams road to Strasburg Road and South on Strasburg Road to the connection on Strasburg Road.</td>
</tr>
<tr>
<td>Land Use Crossed</td>
<td>Section A North, a natural area</td>
</tr>
<tr>
<td></td>
<td>Section B North, an existing residential area</td>
</tr>
<tr>
<td></td>
<td>Section E, a business park</td>
</tr>
<tr>
<td></td>
<td>Section B South, an existing residential area</td>
</tr>
<tr>
<td>Features Impacted</td>
<td>This Component comes within the vicinity of the following:</td>
</tr>
<tr>
<td></td>
<td>• Laurentian and Borden Wetland Complexes,</td>
</tr>
<tr>
<td></td>
<td>• Two (2) gas stations,</td>
</tr>
<tr>
<td></td>
<td>• Crosses Strasburg Creek along the existing Strasburg roadway.</td>
</tr>
</tbody>
</table>

### 6.3.3.2 Component 2

<table>
<thead>
<tr>
<th>Start</th>
<th>Mannheim Water Treatment Plant Zone 4 Pumping Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finish</td>
<td>South of Bleams Road crossing with Hydro Corridor</td>
</tr>
<tr>
<td></td>
<td>Start of Component 4 &amp; 5</td>
</tr>
<tr>
<td>Length</td>
<td>2,000 metres in exiting Hydro Corridor</td>
</tr>
<tr>
<td>Description</td>
<td>Located within the Hydro Corridor from Mannheim Water Treatment Plant Zone 4 Pumping Station to South of Bleams Road. Crosses Ottawa Street South, Isaiah Drive and Bleams Road. There is potential to phase with the construction of the Kitchener Multi Use Trail system.</td>
</tr>
<tr>
<td>Land Use Crossed</td>
<td>Section A North, a natural area (including two residential developments)</td>
</tr>
<tr>
<td></td>
<td>Section B North, an existing residential area</td>
</tr>
<tr>
<td></td>
<td>Section D, area of future development</td>
</tr>
<tr>
<td>Features Impacted</td>
<td>This Component comes within the vicinity of the following:</td>
</tr>
<tr>
<td></td>
<td>• Residential developments;</td>
</tr>
<tr>
<td></td>
<td>• Core Environmental Feature (within a 10 metre opening between required construction buffers); and</td>
</tr>
<tr>
<td></td>
<td>• Inactive Aggregate Pit.</td>
</tr>
</tbody>
</table>
### 6.3.3.3 Component 3

| Start | Mannheim Water Treatment Plant Zone 4 Pumping Station |
| Finish | Intersection of Huron Road and Amand Drive |
| Length | 5,500 metres along existing Roadways |
| Description | Follows Ottawa Street South west bound to intersection with Trussler Road, travels south on Trussler Road to Huron Road and east on Huron Road to Amand Drive. |
| Land Use Crossed | Section A North, a natural area |
| | Section C, agricultural land |
| | Section D, area of future development |
| Features Impacted | This Component comes within the vicinity of the following: |
| | • Residential developments; |
| | • Rural Residence; |
| | • Veterinary Practice; |
| | • Core Environmental Feature, forest south of Ottawa Street South, east of Trussler Road; and, |
| | • Small wetland located south of Huron Road. |

### 6.3.3.1 Component 4

| Start | End of Component 2 or Start of Component 5 |
| Finish | Intersection of Huron Road and Amand Drive. |
| Length | 2,400 metres along proposed roadway, currently private agricultural land. |
| Description | Located within a portion of the Hydro Corridor and follow the planned alignment of the expansion of Amand Drive from Huron Road to Bleams Road. |
| Land Use Crossed | Section C, agricultural land |
| | Section D, area of future development |
| Features Impacted | This Component comes within the vicinity of the following: |
| | • Residential developments; |
| | • Regional Core Environmental Forest,
### 6.3.3.2 Component 5

<table>
<thead>
<tr>
<th>Start</th>
<th>End of Component 2 or Start of Component 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finish</td>
<td>East of Fischer Hallman Road</td>
</tr>
<tr>
<td></td>
<td>Start of Component 7, 8, 9, 10</td>
</tr>
<tr>
<td>Length</td>
<td>1,300 metres in exiting Hydro Corridor</td>
</tr>
<tr>
<td>Description</td>
<td>Located within The Hydro Corridor</td>
</tr>
<tr>
<td></td>
<td>Within planned Rosenberg Development</td>
</tr>
<tr>
<td></td>
<td>There is potential to phase with the construction of the Kitchener Multi Use Trail system</td>
</tr>
<tr>
<td>Land Use Crossed</td>
<td>Section A South, a natural area</td>
</tr>
<tr>
<td></td>
<td>Section D, area of future development</td>
</tr>
<tr>
<td>Features Impacted</td>
<td>This Component comes within the vicinity of the following:</td>
</tr>
<tr>
<td></td>
<td>• Planned Rosenberg Development;</td>
</tr>
<tr>
<td></td>
<td>• Inactive Aggregate Site;</td>
</tr>
<tr>
<td></td>
<td>• Stops just before the MNR Species at Risk Area;</td>
</tr>
<tr>
<td></td>
<td>• GRCA regulated wetland buffer area;</td>
</tr>
<tr>
<td></td>
<td>• Crosses 300mm diameter Union Gas Transmission Pipeline.</td>
</tr>
</tbody>
</table>

See Section 4.8.2
See Section 4.2.1
See Section 4.8.2
See Section 4.6.2
See Section 4.2.3

### 6.3.3.3 Component 6

| Start                  | Intersection of Huron Road and Armand Drive. |
|                        | End of Component 3 & 4                      |
| Finish                 | Intersection of Huron Road and Fischer Hallman Road |
|                        | End of Component 10, Start of Component 11 |
| Length                 | 940 metres along existing Roadways          |
| Description            | Located within and follow the road allowance of Huron Road |
| Land Use Impacted      | Section C, agricultural land                |
|                        | Section D, area of future development       |
| Features Impacted      | This Component comes within the vicinity of the following: |
|                        | • Rural residence;                          |
|                        | • Barns;                                   |
|                        | • Farm Equipment Supply Business; and,      |
|                        | • Crosses 300mm diameter Union Gas Transmission Pipeline. |

See Section 4.8.2
See Section 4.6.2
### 6.3.3.4 Component 7

<table>
<thead>
<tr>
<th>Start</th>
<th>Intersection of Hydro Corridor with Fischer Hallman Road. End of Component 5 or Start of Component 8, 9, 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finish</td>
<td>500 meters east of Fischer Hallman Road Start of Component 12</td>
</tr>
<tr>
<td>Length</td>
<td>600 metres within exiting Road easement, privately owned property and Hydro Corridor.</td>
</tr>
<tr>
<td>Description</td>
<td>Initially located within the Hydro Corridor then follows the Fischer Hallman Road allowance south until it passes through the Species at Risk area, at which point it crosses to the east along the south edge of a locally significant forest east to the Hydro Corridor. There is potential to phase with the construction of the Kitchener Multi Use Trail system. See Section 4.8.2</td>
</tr>
<tr>
<td>Land Use Crossed</td>
<td>Section A South, a natural area See Section 4.2.1</td>
</tr>
<tr>
<td>Features Impacted</td>
<td>This Component comes within the vicinity of the following:</td>
</tr>
<tr>
<td></td>
<td>• Planned Rosenberg Development;</td>
</tr>
<tr>
<td></td>
<td>• MNR Species at Risk Area; and,</td>
</tr>
<tr>
<td></td>
<td>• GRCA regulated wetland buffer area.</td>
</tr>
<tr>
<td></td>
<td>See Section 4.8.2</td>
</tr>
<tr>
<td></td>
<td>See Section 4.6.2</td>
</tr>
</tbody>
</table>

### 6.3.3.5 Component 8

<table>
<thead>
<tr>
<th>Start</th>
<th>Intersection of Hydro Corridor with Fischer Hallman Road. End of Component 5 or Start of Component 7, 9, 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finish</td>
<td>500 meters east of Fischer Hallman Road Start of Component 12</td>
</tr>
<tr>
<td>Length</td>
<td>550 metres. Through Privately owned property, planned to be developed into high density residential units and exiting Hydro Corridor</td>
</tr>
<tr>
<td>Description</td>
<td>Initially located within the Hydro Corridor then crosses east along the border of the Species at Risk area through a locally significant forest then south to the Hydro Corridor. There is potential to phase with the construction of the Kitchener Multi Use Trail system. See Section 4.8.2</td>
</tr>
<tr>
<td>Land Use Crossed</td>
<td>Section A South, a natural area See Section 4.2.1</td>
</tr>
<tr>
<td>Features Impacted</td>
<td>This Component comes within the vicinity of the following:</td>
</tr>
<tr>
<td></td>
<td>• Planned Residential development;</td>
</tr>
<tr>
<td></td>
<td>• MNR Species at Risk Area;</td>
</tr>
<tr>
<td></td>
<td>• GRCA regulated wetland buffer area;</td>
</tr>
<tr>
<td></td>
<td>• Regional Core Environmental Forest; and,</td>
</tr>
<tr>
<td></td>
<td>• Huron Natural Area.</td>
</tr>
<tr>
<td></td>
<td>See Section 4.6.2</td>
</tr>
<tr>
<td></td>
<td>See Section 4.7.2</td>
</tr>
</tbody>
</table>
### 6.3.3.6 Component 9

| Start | Intersection of Hydro Corridor with Fischer Hallman Road.  
End of Component 5 or Start of Component 7, 8, 10 |
| Finish | 500 meters east of Fischer Hallman Road  
Start of Component 12 |
| Length | 490 metres through exiting Hydro Corridor |
| Description | Located within the Hydro Corridor easement requiring tunnelling under the existing pond, crossing through a Species at Risk area and passing through a wetland that is significantly vegetated, which connects two portions of a regional forest.  
There is potential to phase with the construction of the Kitchener Multi Use Trail system. |
| Land Use Crossed | Section A South, a natural area |
| Features Impacted | This Component comes within the vicinity of the following:  
- MNR Species at Risk Area;  
- GRCA regulated wetland buffer area;  
- Regional Core Environmental Forest; and,  
- Huron Natural Area. |

*See Section 4.8.2*

*See Section 4.2.1*

*See Section 4.6.2*

*See Section 4.7.2*

### 6.3.3.7 Component 10

| Start | Intersection of Hydro Corridor with Fischer Hallman Road  
End of Component 5 or Start of Component 7, 8, 9 |
| Finish | Intersection of Huron Road and Fischer Hallman Road  
End of Component 10, Start of Component 11 |
| Length | 1,300 metres along existing Roadway |
| Description | Located within Fischer Hallman Road allowance.  
There is potential to phase with the planned widening of the Fischer Hallman Road. |
| Land Use Impacted | Section A South, a natural area  
Section D, area of future development |
| Features Impacted | This Component comes within the vicinity of the following:  
- Future Rosenberg Development;  
- Crosses MNR Species at Risk Habitat; and,  
- Local traffic impacts. |

*See Section 4.8.2*

*See Section 4.6.4*

*See Section 4.7.3*
### 6.3.3.8 Component 11

| Start | Intersection of Huron Road and Fischer Hallman Road  
| End of Component 10 & 6 |
| Finish | Intersection of Huron Road and Plains Road  
| End of Component 17, Start of Component 20 |
| Length | 900 metres along existing Roadway |
| Description | Located within Huron Road allowance from Fischer Hallman Road to Plains Road.  
This section of Huron Road is planned to be resurfaced prior to Kitchener Zone 4 Trunk Watermain construction, reinstatement would be required. |
| Land Use Impacted | Section B South, a residential area  
See Section 4.2.1 |
| Features Impacted | This Component comes within the vicinity of the following:  
- Residential Developments;  
- Local traffic impacts.  
See Section 4.7.2.1  
See Section 4.7.3 |

### 6.3.3.9 Component 12

| Start | End of Component 7, 8, 9 |
| Finish | North side of Parkvale Drive easement  
Start of Component 13, 14, 15, 16, 17, 18 or 19 |
| Length | 500 metres, in existing Hydro Corridor |
| Description | Located within the Hydro Corridor.  
Bordered by existing and future residential development.  
There is potential to phase with the construction of the Kitchener Multi Use Trail system.  
See Section 4.8.2 |
| Land Use Crossed | Section B South, a residential area  
Section D, area of future development  
See Section 4.2.1 |
| Features Impacted | This Component comes within the vicinity of the following:  
- Residential Developments.  
See Section 4.7.2.1 |
### 6.3.3.10 Component 13

| Start | North side of Parkvale Drive easement  

End of Component 12 |
|---|---|
| Finish | South side of Huron Road easement, within Hydro Corridor  

Start of Component 21 |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>860 metres, in existing Hydro Corridor and road easements</td>
</tr>
</tbody>
</table>
| Description | Located within a portion of the Hydro Corridor to the intersection with Parkvale Drive, along the road allowance of Parkvale Drive to the south side of Huron Road, then follows along the south side of Huron Road to the intersection with the Hydro Corridor  

There is potential to phase with the construction of the Kitchener Multi Use Trail system. |
| Land Use Crossed | Section B South, a residential area |
| Features Impacted | This Component comes within the vicinity of the following:  

- Residential Developments;  

- Playground; and,  

- GRCA wetland and Strasburg Creek tributary. |

---

### 6.3.3.11 Component 14

| Start | North side of Parkvale Drive easement  

End of Component 12 |
|---|---|
| Finish | South side of Huron Road easement, within Hydro Corridor  

Start of Component 21 |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>910 metres, in existing Hydro Corridor and road easements</td>
</tr>
</tbody>
</table>
| Description | Located within the Hydro Corridor easement crossing under the overhead wires occasionally to avoid residential structures, existing easements and Hydro One Towers. Component 14 would then follow along the road allowances of Maitland Drive, Parkvale Drive to the south shoulder of Huron Road, then follow along the road allowances of Huron Road to the intersection with the Hydro Corridor.  

There is potential to phase with the construction of the Kitchener Multi Use Trail system. |
| Land Use Crossed | Section B South, a residential area |
| Features Impacted | This Component comes within the vicinity of the following:  

- Residential Developments;  

- Playground;  

- GRCA wetland and Strasburg Creek tributary; and,  

- Planned Huron Point development within Hydro Corridor. |
### 6.3.3.12 Component 15

<table>
<thead>
<tr>
<th>Start</th>
<th>North side of Parkvale Drive easement</th>
<th>End of Component 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finish</td>
<td>South side of Huron Road easement, within Hydro Corridor</td>
<td>Start of Component 21</td>
</tr>
<tr>
<td>Length</td>
<td>750 metres, in existing Hydro Corridor and road easements</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>This Component would require directional drilling along the north side of</td>
<td></td>
</tr>
<tr>
<td></td>
<td>the Hydro Corridor. Due to space limitations resulting from the location</td>
<td></td>
</tr>
<tr>
<td></td>
<td>of the Kitchener-Wilmont Hydro Transmission Station, directional</td>
<td></td>
</tr>
<tr>
<td></td>
<td>drilling at a depth of approximately 20 metres below grade to maintain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>separation requirements from the existing Hydro One tower.</td>
<td></td>
</tr>
<tr>
<td>Land Use Crossed</td>
<td>Section B South, a residential area</td>
<td></td>
</tr>
<tr>
<td>Features Impacted</td>
<td>This Component comes within the vicinity of the following:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Residential Developments;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Playground;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• GRCA wetland and Strasburg Creek tributary; and,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Planned Huron Point development within Hydro Corridor.</td>
<td></td>
</tr>
</tbody>
</table>

### 6.3.3.13 Component 16

<table>
<thead>
<tr>
<th>Start</th>
<th>North side of Parkvale Drive easement</th>
<th>End of Component 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finish</td>
<td>South side of Huron Road easement, within Hydro Corridor</td>
<td>Start of Component 21</td>
</tr>
<tr>
<td>Length</td>
<td>750 metres, in existing Hydro Corridor and road easements</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>This Component would be located in the centre of the Hydro Corridor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>and would require directional drilling for installation. Due to space</td>
<td></td>
</tr>
<tr>
<td></td>
<td>limitations resulting from the location of the Kitchener-Wilmont Hydro</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transmission Station, directional drilling at a depth of approximately 20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>metres below grade to maintain separation requirements from the existing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hydro One tower at the same location.</td>
<td></td>
</tr>
<tr>
<td>Land Use Crossed</td>
<td>Section B South, a residential area</td>
<td></td>
</tr>
<tr>
<td>Features Impacted</td>
<td>This Component comes within the vicinity of the following:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Residential Developments;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Playground;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• GRCA wetland and Strasburg Creek tributary; and,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Planned Huron Point development within Hydro Corridor.</td>
<td></td>
</tr>
</tbody>
</table>
### Component 17

<table>
<thead>
<tr>
<th>Start</th>
<th>North side of Parkvale Drive easement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>End of Component 12</td>
</tr>
<tr>
<td>Finish</td>
<td>South side of Huron Road easement, within Hydro Corridor</td>
</tr>
<tr>
<td></td>
<td>Start of Component 20</td>
</tr>
<tr>
<td>Length</td>
<td>910 metres, though property owned by the City of Kitchener</td>
</tr>
<tr>
<td>Description</td>
<td>Component 17 would leave the Hydro Corridor at Parkvale Drive, south between the existing stormwater management pond and GRCA regulated wetland then follow along currently open residential land and road easements until the intersection of Huron Road. There is potential to phase with the construction of the Kitchener Multi Use Trail system.</td>
</tr>
<tr>
<td>Land Use Crossed</td>
<td>Section B South, a residential area</td>
</tr>
<tr>
<td>Features Impacted</td>
<td>This Component comes within the vicinity of the following:</td>
</tr>
<tr>
<td></td>
<td>• Residential Developments;</td>
</tr>
<tr>
<td></td>
<td>• Playground; and,</td>
</tr>
<tr>
<td></td>
<td>• GRCA wetland and Strasburg Creek tributary.</td>
</tr>
</tbody>
</table>

### Component 18

<table>
<thead>
<tr>
<th>Start</th>
<th>North side of Parkvale Drive easement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>End of Component 12</td>
</tr>
<tr>
<td>Finish</td>
<td>South side of Huron Road easement, within Hydro Corridor</td>
</tr>
<tr>
<td></td>
<td>Start of Component 21</td>
</tr>
<tr>
<td>Length</td>
<td>900 metres, in existing Hydro Corridor and Kitchener-Wilmot Hydro property.</td>
</tr>
<tr>
<td>Description</td>
<td>This Component would travel through the existing Hydro Corridor to the Transmission Station, the watermain would be located within, but along the edge of, the Kitchener-Wilmot Hydro Property to the intersection of Huron Road with the Hydro Corridor, at this point it would cross Huron road.</td>
</tr>
<tr>
<td>Land Use Crossed</td>
<td>Section B South, a residential area</td>
</tr>
<tr>
<td>Features Impacted</td>
<td>This Component comes within the vicinity of the following:</td>
</tr>
<tr>
<td></td>
<td>• Residential Developments;</td>
</tr>
<tr>
<td></td>
<td>• Playground;</td>
</tr>
<tr>
<td></td>
<td>• GRCA wetland and Strasburg Creek tributary; and,</td>
</tr>
<tr>
<td></td>
<td>• Planned Huron Point development within Hydro Corridor.</td>
</tr>
</tbody>
</table>

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Kitchener Zone 4 Trunk Watermain Class Environmental Assessment Class Environmental Assessment Draft Phase 2 Report

GENIVAR  86
### 6.3.3.16 Component 19

| Start                        | North side of Parkvale Drive easement  
|                             | End of Component 12                  |
| Finish                      | South side of Huron Road easement, within Hydro Corridor  
|                             | Start of Component 21                |
| Length                      | 1,000 metres, in existing Hydro Corridor and Private property |
| Description                 | This Component would travel through the existing Hydro Corridor to the Transmission Station, the watermain will then be aligned 5 meters away from the edge of the Kitchener-Wilmot Hydro Property Huron Road, cross Huron road and through the south easement of Huron Road to the intersection with the Hydro Corridor. See Section 4.8.2 |
| Land Use Crossed            | Section B South, a residential area  |
| Features Impacted           | This Component comes within the vicinity of the following:  
|                             | • Residential Developments;  
|                             | • Playground;  
|                             | • GRCA wetland and Strasburg Creek tributary; and,  
|                             | • Planned development. See Section 4.7.2.1  
|                             | See Section 4.6.7  
|                             | See Section 4.8.2 |

### 6.3.3.17 Component 20

| Start                        | Intersection of Huron Road and Plains Road  
|                             | End of Component 11 & 17                  |
| Finish                      | Intersection of Huron Road and Hydro Corridor  
|                             | End of Component 13, 14, 15, 16, 18, 19.  
|                             | Start of Component 21                    |
| Length                      | 480 metres along existing Roadway        |
| Description                 | Located within Huron Road allowance from Plains Road to the Hydro Corridor.  
|                             | This section of Huron Road was resurfaced in the summer of 2011, reinstatement would be required. |
| Land Use Impacted           | Section B South, a residential area       |
| Features Impacted           | This Component comes within the vicinity of the following:  
|                             | • Residential Developments;  
|                             | • Local traffic impacts. See Section 4.7.2.1  
|                             | See Section 4.7.3 |
### 6.3.3.18 Component 21

| Start | Intersection of Huron Road and Hydro Corridor  
End of Component 13, 14, 15, 16, 18, 19, 20 |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Finish</td>
<td>Connection with Strasburg Road extension</td>
</tr>
<tr>
<td>Length</td>
<td>450 metres, in existing Hydro Corridor</td>
</tr>
</tbody>
</table>
| Description| Located within the Hydro Corridor from Huron Road to the connection with the Strasburg Road extension.  
Bordered by existing and future residential development.  
Hydro Corridor is not wide enough to allow for required separation, steel casing may be required.  
There is potential to phase with the construction of the Kitchener Multi Use Trail system. || *See Section 4.8.2*
| Land Use Crossed| Section B South, a residential area || *See Section 4.2.1*
| Features Impacted| This Component comes within the vicinity of the following:  
- Residential Developments;  
- Playground structure. | *

### 6.3.3.19 Component 22

| Start | Intersection of Huron Road and Fischer Hallman Road  
End of Component 6 and 10 |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Finish</td>
<td>Connection with Strasburg Road extension</td>
</tr>
<tr>
<td>Length</td>
<td>2,000 metres, in existing and planned roadways</td>
</tr>
</tbody>
</table>
| Description| Component 22 would begin at the intersection of Fischer Hallman Road and Huron Road, follow Fischer Hallman road to the planned Becker Estates Entrance and follow planned street of the Becker Estates and Primeland Developments to the Future Connection to Strasburg Road  
This Component is bordered by existing and future residential development.  
There is potential to phase with the construction of the planned residential developments. || *See Section 4.8.2*
| Land Use Crossed| Section B South, a residential area  
Section D an area of future development | *
| Features Impacted| This Component comes within the vicinity of the following:  
- Residential Developments;  
- Planned development. | *

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*GENIVAR*
7. Evaluation of Components

7.1 Approach to Evaluation of Components

The Trunk Watermain Alignment Components were evaluated to determine the preferred servicing Components for the Kitchener Zone 4 Trunk Watermain. The Components were assessed according to their environmental, social, economic, impacts as well as technical and operational merit. The criteria are included in an evaluation matrix in Appendix H to objectively assess the identified impacts with respect to environmental, social, technical and economical considerations to determine the preferred solution. Combinations of the components with the least impact identified in Section 7 were assembled to create Alternatives. Comparative assessment of the Trunk Watermain Alternatives was conducted in Section 8 to determine which solution has the least overall impact.

The approach used to determine the preferred solution for the Kitchener Zone 4 Trunk Watermain is explained below:

Step 1: Determine Evaluation Criteria – Criteria must be defined upon which the Components will be evaluated. As indicated above, evaluation categories for this study will include (1) impact on the natural environment, (2) impact on the social and cultural environments, (3) technical & operational merit, and (4) financial & economic impact. The individual impacts will typically fit into these four general categories. A breakdown of the impacts included under each criterion is defined in Section 7.2 of this report.

Step 2: Create an Evaluation System – An evaluation system was required to evaluate each of the Components. This system was developed prior to determining the potential impacts associated with each Component. During the evaluation, each of the Components were assigned a number to reflect the impact the Component would have with respect to that criterion:

- Four (4) for “Significant positive impact”;
- Three (3) for “Slight positive Impact”;
- Two (2) for “No Impact”;
- One (1) for “Slight Negative Impact, and;
- Zero (0) for Significant Negative Impact

The four evaluation categories were weighted based on the conditions of the Study Area and the scope of the Kitchener Zone 4 Trunk Watermain Project as follows:

<table>
<thead>
<tr>
<th>Consideration</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental</td>
<td>25 %</td>
</tr>
<tr>
<td>Social</td>
<td>25 %</td>
</tr>
<tr>
<td>Technical</td>
<td>25 %</td>
</tr>
<tr>
<td>Economic</td>
<td>25 %</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100 %</strong></td>
</tr>
</tbody>
</table>

Environmental Considerations (25%) reflect the potential impacts the various Components will have on the surrounding environment. This is an important consideration, as there is a large quantity of significant natural features within the Study Area.

Social Considerations (25%) were evaluated to determine the impact the on the local residents. The impacts experienced within the Study Area would be a result of the construction of the Trunk Watermain, and not the regular operation of the Watermain, therefore only having temporary or intermittent impacts. Temporary or intermittent impacts would include dust, noise, trucking of materials and traffic delays due to the construction of
the Trunk Watermain. Mitigation measures for these temporary impacts will be identified through the EA report. In this case, temporary is considered to be less than the time span of one year, although impacts to social considerations are generally expected to be no more than a few months at any section of the Study Area. In areas where impacts to the landscape are anticipated, complete reinstatement of the site to the conditions prior to construction is assumed to be standard practice. Based on this, there are no anticipated permanent (including seasonal or reoccurring) impacts to the water table, traffic, future land uses and utilities.

Technical Consideration (25%) reflects the required resources to install and operate the Trunk Watermain. There are areas that may require more technical focus such as trenchless construction, existing infrastructure, and maintaining separation from Hydro Infrastructure etc. Higher technical impacts also, usually results in additional economic resources being required.

Economical Considerations (25%) are weighted the same as Environmental, Social and Technical Considerations, as they are equally important to the feasibility of project implementation. In addition, concerns raised in the other categories are generally also reflected by economics, as additional time and/or resources may be required to overcome obstacles.

Step 3: Document Potential Impacts - The individual impacts associated with each Component were determined and documented. These impacts were categorized under one of the four evaluation categories described above. Matrices (located in Appendix H) were created to document the impacts, to weight the Components qualitatively, and to ultimately determine the preferred alternative. The matrices have the Components listed along columns and the evaluation criteria along rows. Components which were identified to be not feasible are highlighted in red and not considered further through the evaluation.

Step 4: Evaluate the Components - Each of the Components was assigned an impact number for each of the evaluation categories using the methodology established in Step 2. The evaluation was based on a quantitative assessment of the individual impacts documented in the table created during Step 3. The impact number was multiplied by the weight for each criterion to establish a quantitative means of comparison between Components. The numbers determined for each criterion were then summed to determine the overall numerical value for each Component. The Components with low values (around 100) are less preferred, while the Component with high overall values (300 to 400) are the most preferred.

Step 5: Determine the Preferred Component Alignments - The Components with the least overall environmental, social technical and economic impact (with the highest numbers), were combined to create five (5) Alternatives to complete a comparative evaluation.

Step 6: Determine the Preferred Alternative – The five (5) Alternatives were compared against each other the Alternative with the least overall impact on the Study Area was recommended for implementation as the preferred Alignment.

7.2 Evaluation Approach

As indicated above, the evaluation approach involves the assessment of the impacts associated with the Kitchener Zone 4 Trunk Watermain Components on the four main evaluation criteria categories. Evaluation criteria for this project included impact on the Natural Environment, impact on the Social and Cultural Environments, Technical and Operational Merit and Economic Impact. A more detailed breakdown of the impacts in their respective criterion category is identified in Section 7.2.1 to Section 7.2.4.

Screening criteria were developed as a filtering mechanism to ensure that the Component routes selected are feasible, given the preliminary understanding of the Study Area. The screening criteria used include the following:

→ Utilize existing utility corridors, open spaces, and road allowances, as much as possible.
Minimize impact on natural environment, such as watercourses, green spaces, and other known features.

Minimize impact on social and cultural environments.

Preliminary screening criteria guided the identification of Components in conjunction with the key considerations described below. Components were selected to avoid impacts entirely or to reduce them to the greatest extent possible. It is important to note that although Components were selected to minimize impacts, it is typically not feasible to mitigate all impacts for all Components. Each of the Components had different advantages as well as some negative impacts. A comprehensive assessment of the impacts was conducted during the *Class EA Study* to select the solution with the best balance. Upon study conclusion, an Alternative developed from Components deemed to have the least impact will be recommended for implementation.
### 7.2.1 Environmental Considerations - 25%

<table>
<thead>
<tr>
<th>Consideration</th>
<th>Criteria</th>
<th>Weight</th>
<th>Impact</th>
<th>Total</th>
</tr>
</thead>
</table>
| Natural Features General | Does the project (construction or ongoing operation) impact the following:  
- Areas of Natural and Scientific Interest (as identified by the MNR)  
- Environmentally Significant Areas (as identified by the Region of Waterloo or the City of Kitchener).  
The impact is defined by the overall impact to the feature (i.e. if the alignment bisects a feature it has a more significant impact than impacting an edge of a feature.) Significant construction impacts (i.e. removal of vegetation) that can be rehabilitated to original condition with no permanent changes would have a lower impact than construction impacts that had a need for permanent vegetation removal. | 3 | | |
| Wildlife and Species at Risk (MNR or 'Committee on the Status of Endangered Wildlife in Canada’ Status) | Does the construction, operation and maintenance of the Trunk Watermain impact locally significant wildlife by effecting the function or usefulness of Habitat for Endangered or Threatened Species, consisting of:  
- Nesting sites  
- Hibernation areas  
- Foraging areas  
- Areas of wildlife travel  
- Migratory birds/paths  
The scoring of the impact will be based on the criticality of the habitat, likelihood of achieving an acceptable mitigation of risk, approval potential and timing. | 4 | | |
| Floodplains | In the event of flood conditions, does the construction, operation and maintenance of the Trunk Watermain impact the following:  
- The ability of the floodplain to convey floodwater  
- Built up areas adjacent to the floodplain  
- Water Quality  
A significant impact would be an area where the construction would permanently fill or result in the channelization of the floodplain. A minor impact would be construction within the flood plain that was completed outside of periods where flooding would be expected and where floodplain volumes were reinstated to original conditions. | 3 | | |
| Woodlots and Trees | Does the construction, operation and maintenance of the Trunk Watermain impact  
- Significant woodlots (Regionally and Locally significant woodlands)  
- Endangered/threatened tree species  
Conditions that will have a temporary impact (i.e. removal of juvenile trees which can be replanted) will have less of an impact than a situation where the final conditions are permanently altered (i.e. the removal of trees which cannot be replaced to allow for Watermain operation and maintenance or mature trees that cannot be regenerated within a generational cycle). | 3 | | |
<table>
<thead>
<tr>
<th>Consideration</th>
<th>Criteria</th>
<th>Weight</th>
<th>Impact</th>
<th>Total</th>
</tr>
</thead>
</table>
| Aquatic and Terrestrial      | Does the construction, operation and maintenance of the Trunk Watermain impact:  
  • Significant Wetlands (Locally or Provincially Significant, Identified by conservation Authority and Province)  
  • Significant Wildlife Habitat, Identified by Municipality in Natural Heritage System Background Report.  
  • Significant Valleylands, Identified by Municipality  
  Conditions that will have a temporary impact will have less of an impact (i.e. the disruption of water way during low flow or off-season) than a situation where the final conditions are permanently altered (i.e. the altering of existing stream or wildlife features in such a way that they no longer interact with the surroundings in their existing manner).  
  The impact is defined by the overall impact to the Resource (i.e. if the alignment bisects a section of the resource it has a more significant impact than impacting an edge of the resource.)  
  Significant construction impacts (i.e. removal of vegetation) that can be rehabilitated to original condition with no permanent changes would have a lower impact than a smaller impacted area with permanent effects (i.e. the altering of existing stream or wildlife features in such a way that they no longer interact with the surroundings in their existing manner). | 3      |        |       |
| Watercourse Crossings and     | Does the construction, operation and maintenance of the Trunk Watermain impact the:  
  • Fish Habitats (spawning grounds, nursery, rearing, food supply and migration areas)  
  • Watercourse features (Scour depth, pools and riffles, meander belt)  
  • Navigable waterways  
  • Base flow levels  
  Conditions that will have a temporary or minimal impact (i.e. undercrossing of waterway using a trenchless method) will have less of an impact than a situation where the final condition were either permanent or that the temporary impact resulted in a significant potential offsite impact (open cut construction resulting in downstream sediment transfer). | 3      |        |       |
| Fisheries                     | Does the construction, operation and maintenance of the Trunk Watermain impact the ground water by impacting the:  
  • Existing Water table level  
  • Quality of ground water  
  • Function of Regional wells.  
  Impacts will be assessed by the duration of time, location within the identified WHPA reach and severity of the potential impact.  
  Conditions that will have a temporary impact (i.e. dewatering during construction with a recovering aquifer) will have less of an impact than a situation where the final condition were either permanent or that the temporary impact resulted in a potential offsite impact (i.e. contamination of ground water with contaminated surface water runoff). | 3      |        |       |
<table>
<thead>
<tr>
<th>Consideration</th>
<th>Criteria</th>
<th>Weight</th>
<th>Impact</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Contaminant Sources</td>
<td>Does the construction, operation and maintenance of the Trunk Watermain impact potential contaminant sources by:</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Exposing or spreading new or existing contaminants.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Being within close proximity to contaminant source to impact water quality within trunk watermain.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Conditions that will have a temporary impact will have less of an impact than a situation where the impact permanently alters the existing conditions of the Study Area or incurs a temporary but severe impact to a large area or amount of residence.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Natural Environment Consideration Score For Alignment**

### 7.2.2 Social Considerations – 25%

<table>
<thead>
<tr>
<th>Consideration</th>
<th>Criteria</th>
<th>Weight</th>
<th>Impact</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proximity to Built-Up Areas / Private Properties Affected</td>
<td>Does the construction, operation and maintenance of the Trunk Watermain impact existing built up areas (Business, residential or Commercial Land uses) or Private Property by:</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Creating Noise</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Creating Dust</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Creating Vibrations due to drilling or compacting</td>
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<td></td>
<td>• Limiting access to said property (this would be evaluated as a temporary impact)</td>
<td></td>
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<tr>
<td></td>
<td>• Impacting the ability of the property owner to utilize property in the same manner they did prior to pipe installation (this would be evaluated as a permanent impact)</td>
<td></td>
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<tr>
<td></td>
<td>Conditions that will have a short term impact (i.e. disruption for a few days) will have less of an impact than a situation where the impact permanently alters the existing conditions (i.e. easement, expropriation, change of use).</td>
<td></td>
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</tbody>
</table>

<p>| Traffic Impacts                      | Does the construction, operation and maintenance of the Trunk Watermain impact traffic by:                                                                                                               | 5      |        |       |
|                                      | • Reduction in the width of a roadway (this would be considered to have no impact)                                                                                                                                 |        |        |       |
|                                      | • Closing of one or more lanes of traffic, still allowing movement of a portion of existing traffic volumes (this would be considered a slight negative impact)                                             |        |        |       |
|                                      | • Complete closure of a road way (this would be considered a significant negative impact)                                                                                                               |        |        |       |
|                                      | Conditions that will have a low impact will have less of an impact than a situation where the impact to the Study Area is high or incurs a moderate impact to a large area or amount of residence (i.e. closing one lane of a arterial roadway for several weeks will have more of a negative impact than closing a residential street for a day). |        |        |       |</p>
<table>
<thead>
<tr>
<th>Consideration</th>
<th>Criteria</th>
<th>Weight</th>
<th>Impact</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Archaeological Features</strong></td>
<td>Does the construction, operation and maintenance of the Trunk Watermain impact: • Areas previously determined to have high archaeological potential (high impact) • An area of unknown archaeological potential (moderate impact) • Areas previously determined to have no archaeological potential or have been previously disturbed (low impact) Impacts to Archaeological Features will be evaluated based on the potential for archaeological material to be disturbed during construction.</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cultural Heritage Features</strong></td>
<td>Does the construction, operation and maintenance of the Trunk Watermain impact: • A structure, property or district which has been previously identified to be of cultural heritage value or interest by the Heritage Kitchener Committee Impacts that temporarily affect a cultural heritage feature (i.e. access to the feature) will have less of an impact that a situation where the final conditions of the heritage feature is permanently altered from the existing conditions (i.e. changing an existing feature for the operation or maintenance of the Trunk Watermain).</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Compatibility with Current and Future Land Uses</strong></td>
<td>Does the construction, operation and maintenance of the Trunk Watermain impact: • The ability for property to be utilized in the same manner, prior to pipe installation • The ability for land to be utilized as currently zoned/Planned by the City • Features of future land uses (parks, trails, storm water pond) Compatibility with future land uses will be evaluated based on scale of impact (i.e. area of land impacted, number of residence impacted) Compatibility with current land uses will be evaluated based on scale of impact in addition to the length of time of the impact, i.e. temporary (low impact), long term (moderate impact) or permanent (high impact). This will include addressing development that will occur during the period between the EA and construction and the impact on the planning requirements.</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Impacts to Public Recreation Areas</strong></td>
<td>Does the construction, operation and maintenance of the Trunk Watermain impact formal or informal: • Parks • Biking Routes • Community Walking Trails Conditions that will have a temporary impact (i.e. disruption of trail access, with full reinstatement to existing conditions post Trunk Watermain Construction) will have less of an impact than a situation where the impact is permanent (i.e. removal or disturbance of existing recreational area).</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Social Consideration Score For Alignment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 7.2.3 Technical Considerations – 25%

<table>
<thead>
<tr>
<th>Consideration</th>
<th>Criteria</th>
<th>Weight</th>
<th>Impact</th>
<th>Total</th>
</tr>
</thead>
</table>
| Soil and Ground Water Conditions | Do the existing soil and ground water conditions impact the construction or regular operation of the Trunk Watermain.  
  - Soil Type and distribution  
  - Impact of water table  
  Conditions that will have a temporary impact (i.e. soil conditions which limit construction techniques) will have less of an impact than a situation where the impact is permanent (i.e. the presence of a high water table which impacts the potential quality of water though the Trunk Watermain due to the possibility of untreated ground water entering the Trunk Watermain). | 3      |        |       |
| Impacts to Utilities          | Does the installation or operation of the Trunk Watermain impact the existing utilities in the area:  
  - Hydro (interruption in service, infringement on existing easements)  
  - Sanitary (interruption in service, separation requirements)  
  - Storm (interruption in service, separation requirements)  
  - Water (interruption in service, separation requirements)  
  - Natural Gas (interruption in service, separation requirements)  
  - Communications Infrastructure, Phone, Cable (interruption in service, separation requirements)  
  Conditions that will have a temporary impact (i.e. disruption of service) will have less of an impact than a situation where the impact is permanent (i.e. safety concerns in the event that full separation from existing services is not possible). | 5      |        |       |
| Ability to Phase with Other Infrastructure Upgrades | Is the construction of the Trunk Watermain able to be incorporated with other planned Infrastructure upgrades such as:  
  - Sanitary  
  - Water  
  - Communications  
  - Transportation  
  Phasing with projects that are planned to be in construction during the construction of the Trunk Watermain could be utilized to limit the impact to the local residents, this would be evaluated as a positive impact. Areas where construction has been recently completed prior to the installation of the Trunk Watermain would be evaluated as a negative impact, as this would create further disruption and required reinstatement to the area. | 2      |        |       |
<table>
<thead>
<tr>
<th>Consideration</th>
<th>Criteria</th>
<th>Weight</th>
<th>Impact</th>
<th>Total</th>
</tr>
</thead>
</table>
| Hydraulic Characteristics           | Does the Trunk Watermain Alignment contain optimal Hydraulic characteristics, such as:  
• Minimal corners  
• Minimal elevation changes  
• Minimal length of pipe  
• Considers transient loading  
The existence of optimal hydraulic characteristics will have a lower impact on the required operation and maintenance of the Trunk watermain. While corners, elevation changes and length of the overall pipe will negatively impact the operation and maintenance of the Trunk watermain. | 4      |        |       |
| Constructability                    | The construction of the Trunk Watermain will be evaluated on the following criteria:  
• Time required to complete construction  
• Complexity of installation method  
• Size of construction site and impact to surrounding area  
• Staging requirements (based on the size of staging areas required and the proximity of the alignment to potential staging sites) | 3      |        |       |
| Ability to Phase with Future Development | Is the construction of the Trunk Watermain able to be incorporated with planned areas of development, such as:  
• Commercial Sites  
• Business Parks  
• Residential Neighbourhoods  
Phasing with project that are planned to be in construction during the construction of the Trunk Watermain could be utilized to limit the impact to the local residence, this would be evaluated as a positive impact. Areas where construction has been completed prior to the installation of the Trunk Watermain would be evaluated as a negative impact, as this would create further disruption and reinstatement to the area. | 3      |        |       |
| Approvals                           | Does the installation of the Trunk Watermain require approvals from:  
• CN Rail  
• Ministry of Transportation  
• Private Railway  
• Private Utility Company  
• Road Closure Permits  
• Grand River Conservation Authority  
• Ministry of Natural Resources  
Evaluation will be based on number of approvals required in addition to the estimated resources (Time and money) required to complete the approval process. The greater the resources required for the approval, the greater impact to the Trunk Watermain. | 5      |        |       |

Total Technical Consideration Score For Alignment
### 7.2.4 Economic Considerations – 25%

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Comments</th>
<th>Weight</th>
<th>Impact</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Capital Costs/Life Cycle Costs</td>
<td>Numerical value determined based on the capital, operational and maintenance cost of the Trunk Watermain and the estimated lifespan of the Trunk Watermain. Note that this includes the cost and time of any additional studies required to be completed prior to construction.</td>
<td>12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Useful Life of Existing Infrastructure | Does the construction of the Trunk Watermain require the reinstatement of recently constructed infrastructure such as:  
• Roadways  
• Utilities | 2      |        |       |
| Operating and Maintenance             | Do the different alignments of the watermain require:  
• Additional pumping due to hydraulic conditions  
• Additional regular maintenance | 5      |        |       |
| Land Acquisition Requirements         | Does the construction, operation and maintenance of the Trunk Watermain require:  
• Expropriation of land / Land purchase (High impact)  
• Permanent easements (High Impact)  
• Temporary easements/ Construction easements (Moderate impact)  
• Land leasing fees (Moderate impact) | 6      |        |       |

Total Economic Consideration Score For Alignment
7.3 Evaluation Methodology

In order to qualitatively evaluate the Components, each of the criteria presented in Section 7.2 of this report, were assessed in a descriptive manner in addition to a quantitative manner. This evaluation incorporates qualitative results by utilizing a numerical ranking system with an accompanying description of the strengths and weaknesses of each Component to clearly identify the preferred Component. For each evaluation criterion and for each Trunk Watermain Component, the potential effects were identified and evaluated relative to the overall impact on the Study Area by having a positive impact, no impact or a negative impact. The evaluation is based on the relative advantages and disadvantages of the potential effects for each Component and the availability and effectiveness of mitigation measures.

The Components were compared on the basis of each evaluation criterion. In addition, the intent of comparing Components based on a variety of criteria was to identify and assess the potential impacts. The Components were rated by number in Appendix H. The Table below identifies the rating system used for the evaluation of each of the identified criterion outlined in Section 7.2:

Table 7-1: Impact Evaluation

<table>
<thead>
<tr>
<th>Identified Level of Impact</th>
<th>Numerical Ranking (Appendix H)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant positive impact</td>
<td>Four (4)</td>
</tr>
<tr>
<td>Slight positive Impact</td>
<td>Three (3)</td>
</tr>
<tr>
<td>No Impact</td>
<td>Two (2)</td>
</tr>
<tr>
<td>Slight Negative Impact</td>
<td>One (1)</td>
</tr>
<tr>
<td>Significant Negative Impact</td>
<td>Zero (0)</td>
</tr>
</tbody>
</table>

7.4 Evaluation of Trunk Watermain Components

Sections 7.5 to 7.8 present the assessment of the various Trunk Watermain Components for each of the criteria listed in Section 7.2. The assessment is based on a set of developed evaluation criteria. A summary of the key considerations for each evaluation criteria category are presented in each section. Appendix H presents the evaluation matrix utilized to determine the preferred components.

7.5 Natural and Physical Environment Evaluation

The natural and physical environmental aspects of the Trunk Watermain Components were evaluated with respect to impacts to natural features and areas, impacts to floodplains, in addition to watercourse crossings and groundwater, as per the evaluation criteria presented in Section 7.2. Details of the natural and physical environmental impacts and evaluation for each Component within the Study Area are presented below.

7.5.1 Component 1

Component 1 extends from the Mannheim Water Treatment Plant Zone 4 Pumping Station to the connection with Strasburg Road along existing roadways, as identified in Section 6.3.3. There is an unnamed water body located directly east of the Mannheim Water Treatment Plant Zone 4 Pumping Station north of Ottawa Street South. This water body is set far enough back from the existing roadway that limited impacts from construction are anticipated. Schedule A approval from the GRCA, however, may still be required within this area due to the identified limits of the GRCA regulated land. Component 1 utilizes the Ottawa Street South easement from the Mannheim Water Treatment Plant Zone 4 Pumping Station to Fischer Hallman Road. Within this area the Alignment is within close proximity to the northern boundary of the Laurentian Wetland Complex and associated forest. This forest is also classified as a Core Environmental Feature by the Region of Waterloo. The construction of the Trunk Watermain within this area may cause further encroachment into this forest and Wetland Complex. Schedule A approvals from the GRCA and the Region of Waterloo would be required to complete construction within this section.

From Ottawa Street South to Bleams Road, this Component is located within the Fischer Hallman Road right of way. Within this section, Component 1 crosses a portion of the Borden Wetland and associated
forest located to the west of Fischer Hallman Road. In this area the existing Fischer Hallman roadway also bisects GRCA regulated land surrounding a local watercourse which enters the Borden Wetland.

Several other GRCA regulated areas are crossed by the Strasburg Road easement. These areas are located within an existing business park and appear to be primarily utilized for storm water management. Their location with respect to the Strasburg Creek, a cold water system, would make them significant water bodies to the Grand River Watershed system. The Strasburg Creek and its corresponding wetlands, floodplain and regional forest are crossed by this alignment on Strasburg Road south of Huron Road. Approvals from the GRCA would also be required at this location. Refer to Section 4.6 for more information regarding the Natural Environment of the Study Area.

Although there are no identified Species at Risk locations crossed by this alignment, there is potential for Water Fowl, White-Tailed Deer, Bobolink and Barn Swallow to be found within the Study Area. The Laurentian Wetland Complex has been reported to potentially be a significant habitat for water fowl, colonial water birds, white tailed deer and brook trout. There are no Areas of Natural and Scientific Interest within close proximity to Component 1.

Due to the location of this Component through built up areas of the Study Area, there are some locations where potential contamination due to existing land uses is possible (refer to Section 4.2.2). There is potential for hydrocarbon contamination resulting from two petroleum stations, one located at the corner of Ottawa Street South and Fischer Hallman Road, the other located at Fischer Hallman Road and Westmount Road East. Since these petroleum stations are set several metres back from the existing roadways and have been constructed within the past five years, it is anticipated that no contamination will be encountered during the construction of the Trunk Watermain. Several other potential contamination sources have been identified within the land use Section E, including a business development to the west of Strasburg Road. Within this section there are several existing automotive service locations, identified in Section 4.2.2. The soils on these sites could contain contamination resulting from previous and existing land uses, however, most of the locations are not located within close proximity to Component 1 and can be assumed to not significantly impact the Kitchener Zone 4 Trunk Watermain.

7.5.2 Component 2

Component 2 connects to the Mannheim Water Treatment Plant Zone 4 Pumping Station and crosses Ottawa Street South to enter into the existing Hydro Corridor. The Hydro Corridor bisects a Core Environmental Forest identified by the Region of Waterloo as part of the Laurentian Wetland Complex in Section 4.6.2. There is also an unnamed water body located to the east of the Mannheim Water Treatment Plant Zone 4 Pumping Station and north of Ottawa Street South. This water body is within GRCA regulated land, but should not be impacted by the installation of the Kitchener Zone 4 Trunk Watermain. This Component is located within the 1 year Wellhead protection area of the K25 and K29 wells located to the south of Isaiah Drive, identified in Section 4.6.1.3. This area is currently developed and it is anticipated that the construction of the trunk Watermain will have no negative impact on the operation of these wells. A contingency plan should be developed in the event of a spill within this area during construction.

There is potential for the Species at Risk, identified in Section 4.6.4, to be present within this area. Since the land in which the Trunk Watermain would be installed is currently disturbed, it is not anticipated to be a habitat for any significant species. The agricultural land was identified as the potential to be a habitat for the Bobolink and Barn Swallow, which are threatened species, dependant of the crops planted. A Butternut tree was identified to exist within 120 metres of the Hydro Corridor. If there is potential to impact this tree with the installation of the Kitchener Zone 4 Trunk Watermain, an MNR assessment must be completed to assess the condition of the specimen, followed by impact mitigation measures during construction.

As part of the Region of Waterloo’s approval of the Rosenberg Secondary Plan Official Plan Amendment dated February 15th, 2012 it was proposed that prior to any site alterations, a bio-physical survey for the entirety of the Special Policy Area must be completed. This survey would determine the extent of the significant habitat, if any, for Endangered and Threatened Species to the satisfaction of the Ministry of Natural Resources, the Region and the City. This recommendation is under review by the Region of Waterloo planning department due to appeals from developers in the area. In the event that the recommendation stands a bio-physical survey must be complete to the entire Rosenberg Development area prior to construction of the Trunk Watermain, ideally this survey would be completed as a joint
project between all parties which own land within the area. This could present scheduling issues and delay the planned installation of the Kitchener Zone 4 Trunk Watermain in 2015.

7.5.3 Component 3

Component 3 is located within the alignments of Ottawa Street South, Trussler Road and Huron Road. South of the intersection of Ottawa Street South and Trussler Road, Component 3 runs adjacent to a forest classified as a Core Environmental Feature which also contains a small section of GRCA regulated land. This Alignment crosses two (2) warm watercourses which have been identified as tributaries to the Alder Creek Watershed and a small unnamed wetland located to the south of Huron Road (refer to Section 4.6.2).

There is potential for the Species at Risk, identified in Section 4.6.4, to be present within this area. It has been identified that the Alder Creek Watershed could be a habitat for amphibians, reptiles and bird species. This Component is not located within, or adjacent, to any identified floodplains. There are no sources of potential contamination anticipated to impact the installation or operation of the Trunk Watermain. This Component is within the 3, 5 and 8 year Wellhead Protection Areas of the Mannheim well field.

7.5.4 Component 4

This Component is within the planned road easement of Amand Drive through the proposed Rosenberg Development. The currently planned alignment for this roadway potentially crosses several linkages between existing wetlands and Core Environmental Forests in an attempt to avoid bisecting large natural features in the area.

There is potential for the Species at Risk, identified in Section 4.6.4, to be present within this area. There is also potential for this Component to impact the habitat of Colonial Water Birds and White Tailed Deer. The agricultural land was identified as the potential to be a habitat for the Bobolink and Barn Swallow, which are threatened species, dependant of the crops planted. This Component does not cross any previously identified watercourses or flood plains. The 3 and 4 year Wellhead Protection Areas for the Mannheim well field are crossed by this Component.

7.5.5 Component 5

Component 5 is located within the Hydro Corridor from the end of Component 2 to the west side of the Fischer Hallman Road easement. This Component does not cross or run adjacent to any previously identified woodland, wetland, watercourses or flood plains. The agricultural land was identified as the potential to be a habitat for the Bobolink and Barn Swallow, which are threatened species, dependant of the crops planted. This Component is within the 7 and 8 year Wellhead Protection Areas for the Mannheim well field. There is potential for the Species at Risk, identified in Section 4.6.4, to be present within this area.

7.5.6 Component 6

This Component is located within the existing Huron Road easement from the end of Component 3 to the intersection of Fischer Hallman Road. This Component does not cross or run adjacent to any previously identified woodland, wetland, watercourses or flood plains. This Component is within the 8 year Wellhead Protection Area for the Mannheim well field. There is also potential for the Species at Risk, identified in Section 4.6.4, to be present within this area.

7.5.7 Component 7

Component 7 is located within the existing Fischer Hallman Road easement from the northern border of the Species at Risk habitat through to the southern border of the Species at Risk habitat. The Component is then located along the southern border of the species at risk area from the Fischer Hallman Road to the Hydro Corridor. In addition to the Jefferson-X Salamander, there is potential for the Species at Risk, identified in Section 4.6.4, to be present within this area. The area surrounding this Component has previously been identified as a significant habitat for Colonial Water Birds, White Tailed Deer and Brook Trout. This Component will require the crossing of a small wooded area where there is the potential for Butternut trees to be present. By passing through this small wooded area, a forest located to the north of the Species at Risk area, which is classified as a Core Environmental Feature, is avoided.
Component 7 is adjacent to the “One Zone Flood Plain” as per the City of Kitchener Official Plan. Component 7 crosses GRCA regulated land via Fischer Hallman Road; however, it does not cross any wetlands or ponds in the area. This Component is within the 8 year Wellhead Protection Area of the Mannheim well field and no permanent or major impacts to the Regional wells are anticipated. There are no sources of potential contamination that are anticipated to impact the installation or operation of the Trunk Watermain.

7.5.8 Component 8

From the end of Component 5, Component 8 crosses Fischer Hallman Road outside of the northern border of the Species at Risk habitat. The alignment remains adjacent to the Species at Risk habitat until the intersection of the southeast corner of the Species at Risk habitat within the Hydro Corridor. There is potential for the Species at Risk, identified in Section 4.6.4, to be present within this area. The area surrounding this Component is a significant habitat for Colonial Water Birds, White Tailed Deer and Brook Trout. This Component will be located through a portion of the Huron Natural Area, which is a Regional Core Environmental Forest. There is also potential for Butternut trees to be present in this area.

Component 8 is adjacent to the “One Zone Flood Plain” as per the City of Kitchener Official Plan and located within the 8 year wellhead protection area of the Mannheim well field. No permanent or major impacts to Regional or private wells are anticipated. This Component crosses two (2) tributaries of the Strasburg Creek, a cold water system. Wetlands associated with these tributaries are regulated by the GRCA. Construction in this area would require GRCA and Region of Waterloo Approvals. There are no sources of potential contamination that are anticipated to impact the installation or operation of the Trunk Watermain.

7.5.9 Component 9

Component 9 is located completely within the Hydro Corridor. This Component uses Tunneling to cross under a local pond located to the east of the Fischer Hallman Road, through a Regional Core Environmental Forest and through the MNR Species at Risk habitat within the Hydro Corridor. Approvals from the GRCA, MNR and Region of Waterloo would be required for this Component. There is also potential for the Species at Risk, identified in Section 4.6.4, to be present within this area. The area surrounding this Component has been identified as a significant habitat for Colonial Water Birds, White Tailed Deer and Brook Trout. There is also potential for tree removal to be required as the Component crosses the edge of a Regionally Significant forest.

Component 9 crosses the “One Zone Flood Plain” as per the City of Kitchener Official Plan. It is also located within the 8 year Wellhead Protection Area of the Mannheim well field. No permanent or major impacts to Regional or private wells are anticipated. This Component crosses two (2) tributaries of the Strasburg Creek which is a cold water system within the Grand River Watershed. Wetlands associated with these tributaries are regulated by the GRCA. There are no sources of potential contamination that are anticipated to impact the installation or operation of the Trunk Watermain.

7.5.10 Component 10

This Component is located within the existing allowance of Fischer Hallman Road from its intersection with the Hydro Corridor, to its intersection with Huron Road. Component 10 crosses through the identified Species at Risk habitat via the existing Fischer Hallman Road easement. This area will require MNR approval prior to construction. The Species at Risk identified in Section 4.6.4 also have the potential to be present within the vicinity of this Component. The area surrounding this Component is a significant habitat for Colonial Water Birds, White Tailed Deer and Brook Trout. No woodlots or trees are permanently impacted by this Component as it is situated within an existing road allowance.

Component 10 is not within or adjacent to any previously identified floodplains. Component 10 is located within the 7 and 8 year Wellhead Protection Area for the Strasburg well field. The Component also crosses GRCA regulated land within the Fischer Hallman Road allowance. No permanent or major impacts to regional or private wells are anticipated. Component 10 does not cross any wetlands or watercourses. There are no sources of potential contamination that are anticipated to impact the installation or operation of the Trunk Watermain.
7.5.11 Component 11

Component 11 is located along Huron Road from Fischer Hallman Road to Plains Road. As this Component is contained within the road allowance for Huron Road, and through a developed residential area, there are no significant environmental concerns associated with the Component. Component 11 is not within or adjacent to any previously identified floodplains. Component 11 is located within the 7 year Wellhead Protection Area for the Strasburg well field, and is anticipated not to have a major or permanent impact on the regional or private wells. There are no sources of potential contamination that are anticipated to impact the installation or operation of the Trunk Watermain.

7.5.12 Component 12

Located within the Hydro Corridor through developed residential land, Component 12 poses no significant environmental concerns. Component 12 is not within or adjacent to any previously identified floodplains. This Component is located within a 7 and 8 year Wellhead Protection area and is anticipated to have no permanent or major impact to the local Mannheim and Strasburg well fields. There are no potential sources of contamination that are anticipated to impact the installation or operation of the Trunk Watermain in this area.

7.5.13 Component 13

Component 13 follows existing road allowances of Parkvale Drive, Featherstone Street and Huron Road. The majority of this Component is surrounded by existing residential developments; however, this Component crosses a wetland via an existing bridge. The area surrounding this bridge is a significant habitat for Colonial Water Birds, White Tailed Deer and Brook Trout.

Component 13 is not within or adjacent to any previously identified floodplains. Valleylands identified in Section 4.6.7 are located to the north of this Component and will not impact the identified Valleyland area. The midsection of this Component crosses a seasonal tributary of Strasburg Creek via an existing bridge on Parkvale Drive. The crossing of this seasonal tributary would require GRCA approval as the feature may be temporarily impacted by construction. This Component is located within a 7 year Wellhead Protection Area of the Strasburg well field. No permanent or major impacts to regional or private wells are anticipated. There are no potential sources of contamination that are anticipated to impact the installation or operation of the Trunk Watermain.

7.5.14 Component 14

Component 14 follows the Hydro Corridor and the road allowances of Maitland Drive, Featherstone Street and Huron Road. The majority of this Component is surrounded by an existing residential development, however, the Component crosses a GRCA regulated wetland to the west of Parkvale Drive. The wetland contains a seasonal tributary of the Strasburg Creek and is regulated by the GRCA. Approval from the GRCA would be required construct this Component. The area surrounding this Component is a significant habitat for Colonial Water Birds, White Tailed Deer and Brook Trout.

Component 14 is not within or adjacent to any previously identified floodplains. Valleylands identified in Section 4.6.7 are located to the north of this Component and will not impact the identified Valleyland area. This Component is located within the 7 year Wellhead Protection Area for the Strasburg well field. No permanent or major impacts to regional or private wells are anticipated. There are no potential sources of contamination that are anticipated to impact the installation or operation of the Trunk Watermain.

7.5.15 Component 15

This Component is located completely within the Hydro Corridor from Parkvale Drive to Huron Road. This alignment, however, is located to avoid interference with the Kitchener-Wilmot Hydro Transformer Station identified in Section 4.2.3.3. This Component is surrounded by developed land; however, the Component crosses a GRCA regulated wetland within the Hydro Corridor to the west of Parkvale Drive. The wetland contains a seasonal tributary of the Strasburg Creek and is regulated by the GRCA. Approval from the GRCA would be required construct this Component. The area surrounding this Component is a significant habitat for Colonial Water Birds, White Tailed Deer and Brook Trout.
Component 15 is not within or adjacent to any previously identified floodplains. This Component is located within a 7 year Wellhead Protection Area of the Strasburg well field. No permanent or major impacts to Regional or private wells are anticipated. There are no potential sources of contamination that are anticipated to impact the installation or operation of the Trunk Watermain.

### 7.5.16 Component 16

Component 16 is located entirely within the Hydro Corridor from Parkvale Drive to Huron Road. The area surrounding this Component is a significant habitat for Colonial Water Birds, White Tailed Deer and Brook Trout. There are no significant woodlots within the vicinity of this Component.

Component 16 is not within or adjacent to any previously identified floodplains. The midsection of Component 16 crosses a GRCA regulated wetland and construction of this Component would require GRCA approval and may be limited to dry seasons. The midsection of this Component also crosses a seasonal tributary of the Strasburg Creek. This Component is located within a 7 year wellhead protection area. No permanent or major impacts to Local regional or Private Wells are anticipated. There are no sources of potential contamination that are anticipated impact the installation or operation of the Trunk Watermain.

### 7.5.17 Component 17

Component 17 is located within the City of Kitchener land between the existing storm water retention pond and the GRCA regulated wetland. The area surrounding this Component is a significant habitat for Colonial Water Birds, White Tailed Deer and Brook Trout. There are no identified significant woodlots within the vicinity of this Component.

Component 17 is not within or adjacent to any previously identified floodplains. The midsection of this Component crosses a seasonal tributary which conveys water from the storm water pond to the Strasburg Creek via the identified GRCA wetland. This Component is located within the 7 year Wellhead Protection Area of the Strasburg well field. No permanent or major impacts to the regional or private wells are anticipated. There are no sources of potential contamination that are anticipated to impact the installation or operation of the Trunk Watermain.

### 7.5.18 Component 18

Component 18 is located within the existing Hydro Corridor and land owned by the Kitchener-Wilmot Hydro Commission. This Component passes south of a Hydro Transformer Station to avoid conflict with existing infrastructure located within the Hydro Corridor. The area surrounding this Component is a significant habitat for Colonial Water Birds, White Tailed Deer and Brook Trout. There are no significant woodlots identified within the vicinity of this Component.

Component 18 is not within or adjacent to any previously identified floodplains. The midsection of Component 18 crosses the GRCA regulated wetland and construction of this Component would require GRCA approval and may be limited to dry seasons. This Component is located within a 7 year Wellhead Protection Area of the Strasburg well field. No permanent or major impacts to private or regional wells are anticipated. There are no potential sources of contamination that are anticipated to impact the installation or operation of the Trunk Watermain.

### 7.5.19 Component 19

Component 19 is located within the existing Hydro Corridor and privately owned property adjacent to the Transmission Station. The area surrounding this Component is a significant habitat for Colonial Water Birds, White Tailed Deer and Brook Trout. There are no significant woodlots within the vicinity of this Component.

Component 19 is not within or adjacent to any previously identified floodplains. The midsection of Component 19 crosses the GRCA regulated wetland within the Hydro Corridor and construction of this Component would require GRCA approvals and may be limited to dry seasons. This Component is located within a 7 year Wellhead Protection Area of the Strasburg well field. No permanent or major impacts to regional or private wells are anticipated resulting from this Component. There are no potential sources of contamination anticipated to impact the installation or operation of the Trunk Watermain.
7.5.20 Component 20

This Component follows the road allowance of Huron Road from Plains Road to the Hydro Corridor. Component 20 is not within or adjacent to any previously identified floodplains. A small GRCA regulated pond is located to the south of this Component, however, no permanent impacts are anticipated. There are no significant wildlife habitats or woodlots within the vicinity of this Component. There are also no existing sources of potential contamination that are anticipated to impact the installation or operation of the Trunk Watermain. This Component is located within a 7 year Wellhead Protection Area if the Strasburg well field. No permanent or major impacts to the existing regional or private wells are anticipated.

7.5.21 Component 21

Component 21 is located within the existing Hydro Corridor from Huron Road to the connection with Strasburg Road. There are no significant wildlife habitats or woodlots within the vicinity of this Component.

Component 21 is not within or adjacent to any previously identified floodplains. This Component is located within 4 and 7 year Wellhead Protection Areas of the Strasburg well field. No permanent or major impacts to the local regional or private wells are anticipated. There are no existing sources of potential contamination that are anticipated to impact the installation or operation of the Trunk Watermain.

7.5.22 Component 22

Component 22 follows road allowances within future residential developments located southeast of Huron Road to the intersection with Strasburg Road. There are no significant wildlife habitats or woodlots within the vicinity of this Component.

Component 22 is not within or adjacent to any previously identified floodplains. This Component is located within 4, 7 and 8 year Wellhead Protection Areas of the Strasburg well field. No permanent or major impacts to the regional or private wells are anticipated. A small GRCA regulated pond is located to the south of Huron Road, however, no permanent impacts are anticipated as this component is located within planned road right of ways. There are no existing sources of potential contamination that are anticipated to impact the installation or operation of the Trunk Watermain.

7.5.23 Summary of Natural and Physical Environment Evaluation

Based on the evaluation of the various Components against the criteria identified in Section 7.2 and Appendix H, the preferred Alternative, with respect to impacts on the Natural and Physical Environment, is comprised of the following Components:

- **Component 3** - From the Mannheim Water Treatment Plant Zone 4 Pumping Station, through easement of the existing Ottawa Street South, Trussler Road and Huron Road to the intersection of Huron Road with Amand Drive.

- **Component 6** – Located within Huron Road from Amand Drive to the intersection with Fischer Hallman Road

- **Component 11** – Located within the existing Huron Road easement from Fischer Hallman Road to Plains Road;

- **Component 20** – Is within the existing Huron Road easement from Plains Road to the crossing of the Hydro Corridor; and,

- **Component 21** – Located within the Hydro Corridor from the crossing of the Huron Road to the connection with the future Strasburg Road extension.

The combination of these Components would provide the Kitchener Zone 4 Trunk Watermain alignment with the least amount of negative impact on the local Natural and Physical Environment. The average score of this Alternative was found to be 46.20 while the next highest Environmental score was found to be 44.83 for the Alternative 2, 5, 10, 11, 20, 21 as identified in Appendix H. It is important to note that the Alternative 2, 4, 6, 11, 20, 21 was determined to have a score of 45.83, which would rank it in terms of
least Environmental impact, however, due to the identified requirements necessary to make Component 4 feasible, this alternative was not considered for further evaluation.

This Alternative is successful in avoidance of many Natural Heritage Features such as Core Environmental Forests, significant wetlands and water crossings. The alignment is located within existing Road easements though mostly rural areas which are generally not within close proximity to environmental features.
7.6 Social Environment Considerations

The Social and Cultural aspects of the Trunk Watermain alignment Components were evaluated with respect to land use, impacts to recreational areas, heritage features, impacts to private properties, etc., as per the evaluation criteria presented in Section 7.2. Details of the social and cultural impacts are presented below.

7.6.1 Component 1

This Component is located within existing built up areas identified in Figure 6-1, including residential, commercial and industrial land uses. As such, the potential impacts to the social environment resulting from the construction of Component 1 are substantial. The Component follows the easements of existing major roadways though this developed area. As a result, there would be substantial temporary impacts to the flow of traffic though the area. The construction process would require the closure of Ottawa Street South, Fischer Hallman Road, Bleams Road, Strasburg Road and Huron Road at different stages of construction, for a time period of a few days to several weeks. This would have significant negative impacts on not only the flow of traffic through southwestern Kitchener, but also to the access of business and homes along these major roadways. Construction in this area will also impact the Grand River Transit Bus Routes #22, #201 Green iXpress, #33 and #16.

There have been no archaeological sites or areas with high archaeological potential previously identified within close proximity to this Component. The City of Kitchener has identified several Cultural Heritage sites within close proximity to this Component, as identified in Figure 4-20, however, no impact is anticipated at these locations. The installation of the Kitchener Zone 4 Trunk Watermain within this area does not pose any permanent impacts to the existing or planned land use. The construction of the Trunk Watermain may temporarily impact the access to some recreational trails identified in Section 4.7.2.

7.6.2 Component 2

Component 2 crosses Ottawa Street South, an existing parking area of a residential development and is located though a residential development to the north of Bleams Road. Approximately half of this Component is within an existing built up area. Temporary traffic impacts would occur as a result of the crossing of Ottawa Street South and Bleams Road, which are busy throughfares. Additional traffic impacts would occur at the crossing of residential streets such as Isaiah Drive and Snowdrop Crescent, although these impacts would be minimal. There are no public transit routes impacted by this Component. The Component is compatible with the current and future land uses within the area. The land within the Hydro Corridor is zoned as “open space” limiting the amount of development which can occur on the site in the future.

Private properties adjacent to the working easement of the Trunk Watermain would temporarily be impacted by the noise, dust and vibrations resulting from the installation of the Kitchener Zone 4 Trunk Watermain. The planned Wiess Property Development, discussed in Section 4.8.2, will utilize the land within the Hydro Corridor for parking and a play structure. These land uses will temporarily be disturbed during construction. The recreational trail which spans the length of the hydro corridor in this area will also be temporarily disturbed during construction, but reinstatement afterwards can be potentially completed in conjunction with the planned trail upgrades identified in Section 4.8.

The Stage 1 Archaeological Assessment completed for this report identified that this Component bisects an area of uncertain Archaeological potential, requiring further Archaeological evaluation in the form of a Stage 2 Archaeological Assessment. There are no identified Cultural Heritage sites located within close proximity to this Component.

7.6.3 Component 3

This Component follows the easements of Ottawa Street South, Trussler Road and Huron Road which are not located within existing built up areas. The construction of this Component would impact the flow of traffic through this area in addition to access to local residences and business. There are no identified sites of high archaeological potential within this Component, as it is within existing roadways. There are several classified cultural heritage sites located close to this Component, however, minimal impact to these sites is anticipated. The location and operation of the Trunk Watermain in this location would have
no permanent impacts on the current or planned land uses of this area. The Component does not impact any identified recreational areas.

7.6.4 Component 4

Component 4 is located within the alignment of Amand Drive, a planned roadway included within the Rosenberg development. Currently, however, the land in which the Trunk Watermain is planned to pass through is privately owned properties and will likely still be privately owned at the time of the construction of the Kitchener Zone 4 Trunk Watermain. Currently this land is used for agriculture or aggregate practices. The operation of several agricultural properties would be greatly impacted by this Component. There would be minimal traffic impact resulting from the construction of the Trunk Watermain in this area. If the construction of this Component were to occur prior to the construction of Amand Drive, multiple land acquisitions or easement would be required, greatly interfering with the current land uses in this area.

A large portion of this Component requires further archaeological assessment to be completed, as identified in Section 4.7.1. There are no cultural heritage features which would be impacted by the installation of the Trunk Watermain within this area. There are no impacts to recreational facilities or trails.

7.6.5 Component 5

This Component is located within the Hydro Corridor bisecting agricultural property. There are a total of 3 private properties impacted by this Component, and minimal impacts to traffic in the area. No further Archaeological Assessments are required within this area and there are no cultural heritage features impacted by this Component. There is no permanent impact to the current or future land use with the installation of the Trunk watermain at this location. There are also no recreational areas impacted by this Component.

7.6.6 Component 6

Component 6 is located within the Huron Road easement though a rural section of the Study Area. The installation of the Trunk Watermain at this location would cause temporary impacts to local residences and businesses along this section of Huron Road. Traffic would be temporarily impacted during construction. It is important that access be maintained to the fire station located in this area, identified in Section 4.2.1. The installation of the Trunk Watermain in this area does not negatively impact the current or planned land use in this area. There is also no impact to recreational features in this area.

7.6.7 Component 7

This Alignment is located within the Fischer Hallman Road easement and privately owned land. Component 7 is adjacent to planned residential areas. Fischer Hallman Road is used by many local residents in this area and the construction of the Trunk Watermain along this Component would cause temporary impacts to traffic flow on Fischer Hallman Road. This Component is located within land that is currently forested. The future land use plans for this land are currently unknown, however, the installation of the Trunk Watermain in this area would limit future construction. A section of this area requires further archaeological assessments to be completes prior to construction. There are no identified Cultural Heritage Features located within close proximity to this Component. The construction of the Trunk Watermain would limit access to the Huron Natural Area located to the north of this Component in addition to walking trail located through the Hydro Corridor.

7.6.8 Component 8

Component 8 is located within private and municipal land to avoid the Species at Risk Habitat identified in Section 4.6.4. Traffic would be temporarily impacted during the construction of the Trunk Watermain across Fischer Hallman Road. There are no areas of uncertain or high archaeological potential or Cultural Heritage Features within this section. The privately owned land is planned to become high density residential units, which would be permanently impacted by the installation of the Trunk Watermain in this area. The Huron Natural Area is owned by the City of Kitchener. The construction of the Trunk Watermain would require tree removal and, due to operational parameters, the trees removed would not be able to be reinstated. The installation of the Trunk Watermain along this Component would permanently impact the private land uses and the appearance of the Huron Natural Area.
7.6.9 Component 9

Component 9 is located within the Hydro Corridor through the Species at Risk area. The construction of the Trunk Watermain across the Fischer Hallman Road would cause temporary traffic impacts. There are no impacts to private properties within the area. There are no areas of uncertain or high archaeological potential or Cultural Heritage features within this section. This Component is compatible with the current and future land use. The installation of this Component would limit access to the Huron Natural Area and recreational trail though the Hydro Corridor in this section.

7.6.10 Component 10

The Component would require approximately 1,200 metres of construction along the existing Fischer Hallman Road. This construction would temporarily impact the flow of traffic along the Fischer Hallman Road, in addition to access to residential developments located to the east of Fischer Hallman road. Disruptions, in the form of noise and dust, would also temporarily impact the residences which back onto this section of road. There are no areas within the Component which would require further archaeological assessment prior to construction. There are also no identified Cultural Heritage Features within close proximity to this Component. This Component is compatible with the current and future land uses identified within this report and does not impact any recreational activities.

7.6.11 Component 11

Component 11 would require 1,000 meters of construction along Huron Road. This construction would temporarily impact the flow of traffic along the Huron Road, in addition to access to residential developments located to the north of Huron Road. Disruptions, in the form of noise and dust, would also temporarily impact the residences which back onto this section of road. There are no areas within the Component which would require further Archaeological Assessment prior to construction. There are also no identified Cultural Heritage Features within close proximity to this Component. This Component is compatible with the current and future land uses identified within this report and does not impact any recreational areas. This section of Huron Road was recently re-constructed in 2011/2011, continued disruption to the this area will have an increased impact to the local residence.

7.6.12 Component 12

This Component is located within the Hydro Corridor bisecting a future and existing residential development. There are no impacts to traffic in the area. No further Archaeological Assessments are required within this area and there are no cultural heritage features impacted by this Component. There is no anticipated permanent impact to the current or future land use with the installation of the Trunk Watermain at this location. This Component will temporally impact the use of the recreational trails within the Hydro Corridor during construction.

7.6.13 Component 13

Component 13 would have a large impact to the residents of Parkvale Drive, Featherstone Street and Cranshaw Street. The construction of this Component will cause temporary disruptions in access to their homes in addition to disruptions due to dust, noise and vibrations. Additional temporary disruptions to traffic will occur when crossing Huron Road at Featherstone Street. No further Archaeological Assessments are required within this area and there are no Cultural Heritage Features impacted by this Component. There is no permanent impact to the current land use with the installation of the Trunk watermain at this location. This Component will temporally impact the use of the recreational trails within the Hydro Corridor and the playground located to the south of Parkvale Drive.

7.6.14 Component 14

This Component is located within the existing Hydro Corridor from Parkvale Drive to Maitland Street, then through the existing alignments of Maitland Street, Parkvale Drive, Featherstone Street and Huron road.Access to private properties located on these streets will be disrupted during construction, in addition to impacts due to noise, dust and vibrations. No further Archaeological Assessments are required within this area and there are no Cultural Heritage Features impacted by this Component. There is no permanent impact to the current land use with the installation of the Trunk watermain at this location. This Component will temporally impact the use of the recreational trails within the Hydro Corridor and the playground located to the south of Parkvale Drive.
7.6.15  Component 15

Component 15 is located within the existing Hydro Corridor from Parkvale Drive to the south side of the Huron Road easement. Temporary traffic impact would occur at the crossings of Parkvale Drive, Maitland Street, Huron Road and Cranshaw Street. Additional impacts to local residents would occur in the form of noise and dust resulting from construction. No further Archaeological Assessments are required within this area and there are no Cultural Heritage Features impacted by this Component. There is no permanent impact to the current land use with the installation of the Trunk Watermain at this location. This Component will temporarily impact the use of the recreational trails within the Hydro Corridor and the playground located to the south of Parkvale Drive.

7.6.16  Component 16

This Component is located within the existing Hydro Corridor from Parkvale Drive to the south side of Huron Road. Temporary traffic impact would occur at the crossings of Parkvale Drive, Maitland Street, Huron Road and Cranshaw Street. Additional impacts to local residents would occur in the form of noise and dust resulting from construction. No further Archaeological Assessments are required within this area and there are no Cultural Heritage Features impacted by this Component. There is no permanent impact to the current land use with the installation of the Trunk Watermain at this location. This Component will temporarily impact the use of the recreational trails within the Hydro Corridor and the playground located to the south of Parkvale Drive.

7.6.17  Component 17

The construction of Component 17 would have temporary impacts to traffic during the crossing of Parkvale Drive and Huron Road. Additional impacts would occur to the residents of the planned development if the construction of the Trunk Watermain cannot be phased with the development. No further Archaeological Assessments are required within this area and there are no Cultural Heritage Features impacted by this Component. There is no permanent impact to the current land use with the installation of the Trunk Watermain at this location. This Component will temporarily impact the use of the recreational trails located adjacent to the stormwater retention pond.

7.6.18  Component 18

This Component will have temporary impacts to traffic at the crossing of Parkvale Drive, Maitland Street and Huron Road. This Component would impact the Kitchener-Wilmot Hydro Transmission Station, as it is located within this property. No further Archaeological Assessments are required within this area and there are no Cultural Heritage Features impacted by this Component. This Component will temporarily impact the use of the recreational trails within the Hydro Corridor and the playground located to the south of Parkvale Drive.

7.6.19  Component 19

Component 18 would have temporary impacts to traffic with the crossing of Parkvale Drive, Maitland Street and Huron Road. There would also be temporary impacts to the residents of the development adjacent to the Transmission Station, if the development is completed prior to the installation of the Trunk Watermain. No further Archaeological Assessments are required within this area and there are no Cultural Heritage Features impacted by this Component. There is potential for the Trunk Watermain to impact the future land use, as the alignment is located within privately owned properties. This Component will temporarily impact the use of the recreational trails within the Hydro Corridor and the playground located to the south of Parkvale Drive. Due to the development within this area, and the permanent impact this Component would have on future land uses this component is considered to not feasible.

7.6.20  Component 20

The construction of Component 20 would impact the flow of traffic along the Huron Road between Plains Road and the Hydro Corridor. It may also impact the access to local residential developments. Disruptions due to noise, dust and vibrations may temporarily impact the use of adjacent outdoor areas of residential properties. No further Archaeological Assessments are required within this area and there are no Cultural Heritage Features impacted by this Component. The Component does not impact the current
land use within this section of the Study Area. The construction of this Component may impact the use of the recreational trail located throughout the Hydro Corridor.

7.6.21 Component 21

Component 21 is located within the existing Hydro Corridor from the south edge of Huron Road to the future connection with Strasburg Road. This Component will incur temporary impacts to the residents located adjacent to the Hydro Corridor, such as noise, dust and vibrations. There will also be temporary impacts to the traffic though this residential area, at the crossing of Banffshire Street and Newcastle Drive. No further Archaeological Assessments are required within this area and there are no Cultural Heritage Features impacted by this Component. The Component does not impact the current land use within this section of the Study Area. The construction of this Component will impact the use of the recreational trail located throughout the Hydro Corridor and a playground located to the south of Banffshire Street.

7.6.22 Component 22

Component 22 has the potential to be coordinated with the installation of the Becker Estates and Primeland residential developments to the South of Huron Road, identified in Section 4.8.2. If the timing of these projects coincide, there would be substantially less impact to the local community, compared to the installation of the Trunk Watermain prior to the completion of the development. Impacts to traffic would be limited to temporary impacts to Huron Road and Rockcliffe Drive. No further Archaeological Assessments are required within this area and there are no Cultural Heritage Features impacted by this Component. This Component does not impact the current of future land use within this section of the Study Area. There are no identified recreational features impacted by the Component.

7.6.23 Summary of Social Consideration Evaluation

Based on the evaluation of the various Components against the criteria identified in Section 7.2 the preferred Alternative with respect to impacts on the Social Environment is comprised of the following Components:

- Component 2 - From the Mannheim Water Treatment Plant Zone 4 Pumping Station, through the Hydro Corridor to the south side of Bleams Road;
- Component 5 – Located within the Hydro Corridor from the end of Component 2 to the crossing of Fischer Hallman Road;
- Component 7 – Located within the Fischer Hallman Road Easement from the end of Component 5 to south of the Species at Risk Area where it crosses private property back to the Hydro Corridor.
- Component 12 – Located within the Hydro Corridor from the end of Component 7 to the north side of Parkvale Drive.
- Component 13 or 14 – Located within the Hydro Corridor or existing roadways from the north side of Parkvale Drive to the to the south side of Huron Road. These Components avoid private property and the Transmission Station.
- Component 21 – Located within the Hydro Corridor from the crossing of the Huron Road to the connection with the future Strasburg Road extension.

This Alignment provides the least negative permanent impact to the Social Environment within the Study Area, with an average score of 49.50. This is due to the avoidance of built up areas and limited construction along existing busy roadways. The largest social impact would be temporary impacts to the residents of Parkvale Drive, Maitland Drive and Featherstone Street during construction. The Alternative with the next highest score is Alternative 2, 5, 9, 12, 13, 21 with a score of 48.83, as identified in Appendix H.
7.7 Technical Considerations

The Technical and Operational aspects of the Kitchener Zone 4 Trunk Watermain Components were evaluated with respect to soil and ground conditions, impacts to utilities, constructability and the ability to phase with other projects, as per the evaluation criteria presented in Section 7.2. Details of the Technical and Operational impacts and evaluation for each Component are presented below.

7.7.1 Component 1

Component 1 would be installed using open cut construction along existing roadways. The soils encountered by this Component are Glaciolacustrine – derived silty to clayey till, Modern alluvial deposits and stone-poor, carbonate derived silty to sandy till which will not impact the construction of the Trunk Watermain. This alignment will be located adjacent to existing major utilities located along:

- Ottawa Street South easement, such as a 1200mm diameter, 750mm diameter and 450mm diameter watermain from the Mannheim Water Treatment Plant Zone 4 Pumping Station;
- Fischer Hallman Road, such as a 450mm diameter watermain and 300mm diameter natural gas transmission pipeline;
- Bleams Road, such as 1200mm diameter and 450mm diameter watermain; and,
- Strasburg Road, a 600mm diameter watermain.

This Component would also cross local sanitary sewers, storm water sewers, natural gas lines and communication conduits along the above mentioned roadways. The large number of existing utilities along the easement of Ottawa Street South increases the technical difficulty of constructing the Kitchener Zone 4 Trunk Watermain in this area. This Component has limited opportunity to be phased with planned infrastructure upgrades or development, as the Component is within existing built up areas. There is, however, the potential for this Component to be phased with the widening of the Fisher Hallman Road. The hydraulic characteristic of the Component are not optimal due to its length.

7.7.2 Component 2

This Component would be installed using primarily open cut construction, with the potential of direction drilling to be utilized at the crossing of Isaiah Drive. The soils in this area are Glaciolacustrine – derived silty to clayey till, Sandy deposits and stone-poor, carbonate derived silty to sandy till which should not impact the contractibility of the Trunk Watermain. This Component will cross major water utilities located along the Ottawa Street South easement, such as a 1200mm diameter, 750mm diameter and 450mm diameter watermains from the Mannheim Water Treatment Plant Zone 4 Pumping Station. This Component will also cross local sanitary sewers, stormwater sewers, natural gas lines and communication conduits at the crossing of Ottawa Street South, Isaiah Drive, Snowdrop Crescent and Bleams Road. There are no planned infrastructure upgrades or developments currently planned that would be able to phase with the construction of this Component. The hydraulics of this Alternative are optimal in the sense that it is the shortest route, however, the large elevation change within the Hydro Corridor at Isaiah Drive creates less than optimal hydraulic conditions within this Component.

7.7.3 Component 3

Component 3 would be installed using open cut construction along existing road easements. The soils in this area are ice-contact stratified deposits, sandy deposits and stone-poor, carbonate-derived silty to sandy till. The alignment would be located adjacent to major water utilities, such as the 1200mm diameter, 750mm diameter and 450mm diameter watermains along Ottawa Street South, in addition to local utilities such as sanitary sewers, stormwater sewers, natural gas lines and communication conduits. There are no infrastructure upgrades or future developments planned at this time which could be phased with the construction of this Component. The hydraulic characteristics of this Component are not optimal due to its length.

7.7.4 Component 4

This Component would utilize open cut construction along the planned alignment of Amand Drive, in the Rosenberg Development. The soils encountered along this Component are ice-contact stratified deposits and stone-poor, carbonate derived silty to sandy till. This Component poses no impact to existing utilities.
Ideally, this Component would be constructed in conjunction with the construction of Amand Drive; however, the road construction is likely to occur after the scheduled installation of the Kitchener Zone 4 Trunk Watermain. Additionally, a separate Environmental Assessment would be required to determine the preferred location of this roadway, which would result in the Kitchener Zone 4 Trunk Watermain construction to be delayed. If this Component were to be preferred, and construction was to occur prior to the completion of the Amand Drive EA, a large number of approvals, land acquisitions and easements would be required which would cause extensive delays in the project. The hydraulic characteristics of this Component are optimal.

7.7.5 Component 5
Component 5 would be installed using open cut construction within the existing Hydro Corridor. The soils found within this area are ice-contact stratified deposits and stone-poor, carbonate derived silty to sandy till which would not impact the installation of the Watermain. This Component crosses the alignment of a 300mm diameter natural gas high pressure transmission pipeline, located to the west of Fischer Hallman Road. There are no additional impacts to existing utilities, as this Component is within agricultural land (planned for future development) and a licensed inactive aggregate pit. There is no potential for the construction of this Component to be phased with future infrastructure or development projects, as they will not be occurring within the Trunk Watermain project timeline. The hydraulic characteristics of this Component are optimal.

7.7.6 Component 6
This Component utilizes open cut construction along the existing road easement of Huron Road. The soils encountered in this area are ice-contact stratified deposits and Sandy deposits. This Component has the potential to impact the service of local utilities, such as sanitary sewer, Hydro, and communications. There are plans to develop the land to the north of this Component, however, at his point, it does not appear that these project timelines will coincide. There are no additional infrastructure upgrades planned for this section of the Study Area. The hydraulic characteristics of this Component are optimal.

7.7.7 Component 7
Component 7 would be constructed using open cut installation along a portion of the Fischer Hallman Road and also though privately owned property. The soil found in this area is ice-contact stratifies deposits. This Component may impact the 400mm diameter watermain or local utilities located along Fischer Hallman Road. It also will be required to cross the existing 10 metre wide Kitchener-Wilmot Hydro Easement located within the Hydro Corridor (refer to Section 4.2.3). There is potential for this Component to be phased with the planed widening of Fischer Hallman Road. The hydraulic characteristics of this Component are not optimal.

7.7.8 Component 8
Component 8 uses primarily open cut construction through the land to the north of the SAR area identified in Section 4.6.4. The soil found in this area is primarily ice-contact stratified deposits. This Component may impact the service of the 400mm diameter watermain or local utilities located along Fischer Hallman Road. This Component passes through private land which is planned to become a high density residential area. There is the potential for construction limitations (i.e. it may be required to directionally drill) within the forest classified as a Regional Core Environmental Feature, located in this area, to avoid disruption to the existing land use. There is potential for this Component to be phased with the planned widening of Fischer Hallman Road. The hydraulic characteristics of this Component are not optimal.

7.7.9 Component 9
This Component is completely located within the existing Hydro Corridor to avoid infringement on privately owned property. This Component would require tunnelling underneath the existing water body and Regional Forest located to the east of Fischer Hallman Road. This would be an impractical construction technique in this area. The soil found in this area is primarily ice-contact stratified deposits. This Component may impact the service of the 400mm diameter watermain or local utilities located along Fischer Hallman Road. There is potential for this Component to be phased with the planned widening of Fischer Hallman Road. The hydraulic characteristics of this Component are optimal.
7.7.10 Component 10

Component 10 would be installed using open cut construction along the Fischer Hallman Road easement from the Hydro Corridor, though the Species-at-Risk habitat, to the intersection with Huron Road. The soils encountered by this Component are ice-contact stratified deposits and stone-poor carbonate-derived silty to sandy till. This Component may impact the service of the 400mm diameter watermain or local utilities located along Fischer Hallman Road. There is potential for this Component to be phased with the planned widening of Fischer Hallman Road. This is Component has close to optimal hydraulic characteristics.

7.7.11 Component 11

This Component would be installed using open cut construction along the existing Huron Road easement from Fischer Hallman Road to the intersection with Plains Road. The soil in this section of the Study Area is stone-poor, carbonate-derived silty to sandy till. Local utility services may be impacted during the construction of the Kitchener Zone 4 Trunk Watermain. This section of the Huron Road is planned to be upgraded during the summer of 2012, it is not possible to phase the installation of the Trunk Watermain with this project. It is not ideal to reinstate infrastructure which has recently been re-constructed. The hydraulic characteristics of this Component are considered to be optimal.

7.7.12 Component 12

Component 12 would be installed using open cut construction though the existing Hydro Corridor. The soil in this section of the Study Area is stone-poor, carbonate-derived silty to sandy till. An existing Kitchener-Wilmot Hydro easement is located along the northern side of the Hydro Corridor in this area, which must be avoided by the Kitchener Zone 4 Trunk Watermain. There are no infrastructure upgrades or future developments planned within this area that would be impacted or phased with the installation of the Trunk Watermain. The hydraulic characteristics of this Component are considered to be optimal.

7.7.13 Component 13

Component 13 would be installed using open cut construction from the Hydro Corridor, along Parkvale Drive, Featherstone Street, and across Huron Road to the intersection of Huron Road with the Hydro Corridor. The soil in this area is stone-poor, carbonate-derived silty to sandy till. This Component may also cross local utilities such as sanitary sewers, stormwater sewers, watermain, natural gas lines and communications. There are no planned upgrades within this section of the Study Area as it is a recently constructed residential development. There will be technical considerations to be addressed when crossing a bridge located on Parkvale Drive, identified in Figure 7-1. Such consideration could include the need for pipe insulation. The hydraulic characteristics of this Component are close to optimal.

Figure 7-1: Bridge Located at Wetland Crossing of Parkvale Drive.

7.7.14 Component 14

This Component would be installed using open cut construction through the existing Hydro Corridor and the easements of Maitland Street, Parkvale Drive, Featherstone Street and Huron Road to the
intersection with the Hydro Corridor. The soil in this area is stone-poor, carbonate-derived silty to sandy till. Service of local utilities such as sanitary sewers, stormwater sewers, watermain, natural gas lines and communications may be impacted during the construction of the Trunk Watermain. There are no planned upgrades within this section of the Study Area, as it is a recently constructed residential development. There may be technical consideration to be made at the crossing of the wetland located to the west of Parkvale Drive. The hydraulic characteristics of this Component are close to optimal.

7.7.15 Component 15

Component 15 would be installed using both open cut and trenchless construction methods. Open cut construction would be though the existing Hydro Corridor to the location of the transmission station identified in Section 4.2.3. Direction drilling 5m from the north edge of the Hydro Corridor, at a depth of approximately 17 metres below grade, would be required to cross this section of the Hydro Corridor in order to maintain the design constants identified by Hydro One. The soil in this area is identified as stone-poor carbonate-derived silty to sandy till. There are no planned infrastructure upgrades outside of the expansion of the existing Transformer Station in this area, however, the local utilities of the planned Huron Point development may be impacted during the construction. The hydraulic conditions of this alignment would not be ideal due to the elevation changes present as a result of the depth to clear the existing Hydro Corridor infrastructure. This Component is identified as a non-feasible option due to the construction methods required to maintain the design constraints of Hydro One and the Kitchener-Wilmot Hydro Commission.

7.7.16 Component 16

Component 16 would be installed using both open cut and trenchless construction methods. Open cut construction would be though the existing Hydro Corridor to the location of the transmission station identified in Section 4.2.3. Direction drilling though the centre of the Hydro Corridor, at a depth of approximately 17 metres below grade, would be required to cross this section of the Hydro Corridor in order to maintain the design constraints identified by Hydro One. The soil in this area is identified as stone-poor, carbonate-derived silty to sandy till. There are no planned infrastructure upgrades outside of the expansion of the existing Transformer Station in this area; however, the local utilities of the planned Huron Point development may be impacted during the construction. The hydraulic conditions of this alignment would not be ideal due to the elevation changes present as a result of the depth to clear the Hydro Corridor infrastructure. This Component is identified as a non-feasible option due to the construction methods required to maintain the design constraints of Hydro One and the Kitchener-Wilmot Hydro Commission.

7.7.17 Component 17

This Component would be installed using open cut construction within open spaces and existing roadways, from the crossing of Parkvale Drive to the intersection of Huron Road and Plains Road. This section of the Study Area requires the alignment to pass between an existing storm water retention pond and wetland area. There is also a location were the Component would be required to pass along an existing pedestrian 5 metre wide walkway between two homes, which would be technically difficult to accomplish due to space restrictions. The soil in this area is identified as stone-poor, carbonate-derived silty to sandy till. Local services, such as sanitary, storm sewers, watermain, hydro and communications may potentially be impacted during the construction of the Trunk Watermain. There are no planned infrastructure upgrades within this area. The Component may utilize planned roads with the future Maitland development north of Huron Road. The hydraulic characteristics of this Component are close to optimal.

7.7.18 Component 18

Component 18 would be installed using open cut construction though the existing Hydro Corridor and within Kitchener-Wilmot Hydro property. The soil in this area is identified as stone-poor, carbonate-derived silty to sandy till. There are no planned infrastructure upgrades in this area. The local utilities of Parkvale Drive, Maitland and the planned Huron Point development may be impacted during the construction. This alignment also crosses a Kitchener-Wilmot Hydro utility easement, located along the north side of Huron Road. The hydraulic conditions of this alignment would not be ideal due to the number of bends present. Due to the existing Kitchener-Wilmot electrical grounding grid present within this area, this Component is not feasible.
7.7.19 Component 19
This Component would be installed using open cut construction though the existing Hydro Corridor and within privately owned property which is currently in the process of being developed. The soil in this area is identified as stone-poor, carbonate-derived silty to sandy till. There are no planned infrastructure upgrades in this area. This Component would permanently impact the residential lots planned on the land surrounding the Transmission Station. At the time of construction of the Trunk Watermain, this development will be completed and land acquisition would be required from all residential properties. This alignment crosses a Kitchener-Wilmot Hydro utility easement, located along the north side of Huron Road. The hydraulic conditions of this alignment are not considered to be ideal. It was determined that this Component was not feasible due to the number of required land acquisitions and the permanent impact to the future land use in this area.

7.7.20 Component 20
Component 20 would be installed using open cut construction within the existing Huron Road easement from the intersection of Plains Road to the Hydro Corridor crossing. The soil in this area is identified as stone-poor carbonate-derived silty to sandy till. Local utilities along Huron Road may be impacted during the construction of the Trunk Watermain in this area. This section of Huron Road was reconstructed in 2011, and would require reinstatement following the installation of the Trunk Watermain. There are no planned infrastructure upgrades within the timeline of this project. The hydraulic conditions of this Component are close to optimal.

7.7.21 Component 21
This Component would be installed using open cut construction though the Hydro Corridor from Huron Road to the planned connection with Strasburg Road. The soil in this area is identified as stone-poor carbonate-derived silty to sandy till. The Kitchener-Wilmot Hydro easement is locate along the south side of the Hydro Corridor within this section and should be avoided by the Trunk Watermain. There may be impacts to local utilities at the crossings of Banffshire Court and Newcastle Drive. There are no planned upgrades within this area, excluding the planned Strasburg Road extension. The Hydraulic conditions of this section are considered to be optimal. Due to the width of the existing corridor in this section, structural steel casing may be required to comply with Hydro One design criteria.

7.7.22 Component 22
Component 22 utilizes open cut construction within residential streets of planned development identified in Section 4.8. The soil in this area is identified as stone-poor, carbonate-derived silty to sandy till. There is potential for the installation of the Component in conjunction with the planned developments and the South Strasburg Trunk Sanitary Sewer project. There may be impacts to local utilities on Fischer Hallman Road or the future residential streets. The hydraulic characteristics of this Component are close optimal.

7.7.23 Summary of Technical Evaluation
Based on the evaluation of the various Components against the criteria identified in Section 7.2 the preferred Alternative with respect to Technical Considerations is comprised of the following Components:

- Component 2 - From the Mannheim Water Treatment Plant Zone 4 Pumping Station, through the Hydro Corridor to the south side of Bleams Road;
- Component 5 – Located within the Hydro Corridor from the end of Component 2 to the crossing of Fischer Hallman Road;
- Component 10 – Located within the Fischer Hallman Road Easement from the end of Component 5 to the intersection with Huron Road.
- Component 22 – Located within the Fisher Hallman Road from the end of Component 10 to the entrance to the proposed Becker Estates Development. Located within planned road ways of the Becker Estates and Primeland developments to the connection to the extension of the Strasburg Road.
This alignment for the Kitchener Zone 4 Trunk Watermain could be constructed with the least amount of technical difficulty and required approvals. The score for this Alternative was determined to be 49.00 while the next highest score was 48.50 of Alternative 2, 5, 7, 12, 13, 21.
7.8  Financial Considerations

The Financial and Economic aspects of the Kitchener Zone 4 Trunk Watermain Components were evaluated with respect to estimated capital costs, useful life of existing infrastructure, operating and maintenance costs, the need for land acquisition costs and approval requirements, as per the evaluation criteria presented in **Section 7.2**. Details of the Financial and Economic impacts and evaluation for each Component are presented below.

7.8.1  Component 1

This Component is located within planned municipal right of ways. There are no required additional easements or land acquisition anticipated. Approval from the GRCA, Region of Waterloo and Union Gas will be required in addition to road closure permits. The construction of this Component would require re construction of some infrastructure which was installed 5-10 years ago, which is not ideal.

With this Component, there are minimal additional operations and maintenance requirements or associated costs beyond regular maintenance required by the Region of Waterloo, due to the hydraulic characteristics of this Component.

The estimate cost for this Component, which is 8.0 km in length, is $15.5 million, or, $1,900 per metre.

7.8.2  Component 2

This Component is located within an existing easement on municipally owned land. No additional easements or land acquisitions are anticipated to be required. Approval from the GRCA and Hydro One is required, in addition to road closure permits and Region of Waterloo Environmental Impact statement. The installation of this Component would require the disruption and reinstatement of existing road ways within the townhouse complex located at 1920 Ottawa Street South, Weiss property and roadways within the Activa Development.

This Component has no additional operations and maintenance requirements or associated cost beyond regular maintenance required by the Region of Waterloo.

The estimate cost for this Component, which is 2.0 km in length, is $3.5 million, or, $1,700 per metre.

7.8.3  Component 3

This Component is located within planned municipal right of ways and no additional easements or land acquisition is anticipated. Permits from the GRCA may be required in addition to road closure permits. The installation of this Component would require the reinstatement of infrastructure installed within the last 15 years.

With this Component, there are minimal additional operations and maintenance requirements, or associated costs beyond regular maintenance required by the Region of Waterloo.

The estimate cost for this Component, which is 5.5 km in length, is $10.3 million, or, $1,900 per metre.

7.8.4  Component 4

This Component is within private property, and multiple additional easements or land acquisitions would be required. Approvals from the GRCA may also be required. There is no recently constructed infrastructure which would be disrupted by this Component.

With this Component, there are minimal additional operations and maintenance requirement, or associated costs beyond regular maintenance required by the Region of Waterloo, due to the hydraulic characteristics of this Component.

The estimate cost for this Component, which is 2.4 km in length, is $3.0 million, or, $1,320 per metre.

7.8.5  Component 5

This Component is located within an existing easement on municipally owned land. No additional easements or land acquisitions are anticipated; however, approval from Hydro One and Union Gas is
required, in addition to road closure permits. There is no recently constructed infrastructure which would be disrupted by this Component.

With this Component, there are no additional operations and maintenance requirement, or associated costs beyond regular maintenance required by the Region of Waterloo.

The estimate cost for this Component, which is 1.3 km in length, is $1.9 million, or, $1,500 per metre.

7.8.6 Component 6

This Component is located within a municipal right of way and no additional easements or land acquisition is anticipated. Permits from the GRCA and the Ministry of Natural Resources would be required in addition to a road closure permit. The installation of this Component would require the reinstatement of infrastructure installed within the last 15 years.

With this Component, there are no additional operations and maintenance requirement, or associated cost beyond regular maintenance required by the Region of Waterloo.

The estimate cost for this Component, which is 0.95 km in length, is $1.8 million, or, $1,900 per metre.

7.8.7 Component 7

This Component is located within a municipal right of way and privately owned land, and an easement or land acquisition would be required. Approvals from the GRCA and the Ministry of Natural Resources are required, in addition to a road closure permit. There is no recently constructed infrastructure which would be disrupted by this Component.

With this Component, there are minimal additional operations and maintenance requirements, or associated costs beyond regular maintenance required by the Region of Waterloo, due to the hydraulic characteristics of this Component.

The estimate cost for this Component, which is 0.6 km in length, is $1.8 million, or, $3,000 per metre.

7.8.8 Component 8

This Component is located within a privately owned land, and an easement or land acquisition would be required. Approval from the GRCA would be required, in addition to a road closure permit. There is no recently constructed infrastructure which would be disrupted by this Component.

With this Component, there are minimal additional operations and maintenance requirements, or associated costs beyond regular maintenance required by the Region of Waterloo, due to the hydraulic characteristics of this Component.

The estimate cost for this Component, which is 0.5 km in length, is $0.7 million, or, $1,300 per metre.

7.8.9 Component 9

This Component is located within an existing easement on municipally owned land, and no additional easements or land acquisitions are anticipated. Approval from, GRCA and the Ministry of Natural Resources are required, in addition to a road closure permit. There is no recently constructed infrastructure which would be disrupted by this Component.

With this Component, there are minimal additional operations and maintenance requirements or associated costs beyond regular maintenance, required by the Region of Waterloo, due to the hydraulic characteristics of this Component.

The estimate cost for this Component, which is 0.5 km in length, is $3.0 million, or, $6,000 per metre.

7.8.10 Component 10

This Component is located within planned municipal right of ways, and no additional easements or land acquisition is anticipated. Permits from the GRCA and the Ministry of Natural Resources would be required in addition to a road closure permit. There is no recently constructed infrastructure which would be disrupted by this Component.
With this Component, there are minimal additional operations and maintenance requirement, or associated costs beyond regular maintenance required by the Region of Waterloo, due to the hydraulic characteristics of this Component.

The estimate cost for this Component, which is 1.3 km in length, is $2.5 million, or, $1.900 per metre.

7.8.11 Component 11

This Component is located within a municipal right of way, and no additional easements or land acquisition is anticipated. Permits from the GRCA may be required in addition to a road closure permit. This Component is located within the newly constructed Huron Road right of way, completed in summer of 2012. Additional construction and reinstatement of this area is recommended after consultation with the City of Kitchener.

With this Component there are no additional operational and maintenance requirements, or associated costs beyond regular maintenance, required by the Region of Waterloo.

The estimate cost for this Component, which is 0.9 km in length, is $1.8 million or $2.000 per metre.

7.8.12 Component 12

This Component is located within an existing easement on municipally owned land, no additional easements or land acquisitions are anticipated. Approval from Hydro One and Kitchener-Wilmot Hydro are required. There is no recently constructed infrastructure which would be disrupted by this Component.

With this Component there are no additional operations and maintenance requirements or associated costs beyond regular maintenance required by the Region of Waterloo.

The estimate cost for this Component, which is 0.5 km in length, is $0.6 million, or, $1,200 per metre.

7.8.13 Component 13

This Component is located within planned municipal right of ways, and no additional easements or land acquisition is anticipated. GRCA, Hydro One and Kitchener-Wilmot Hydro approvals would be required in addition to a road closure permit. The installation of this Component would require the reinstatement of Parkvale Drive, which was installed within the last 15 years.

With this Component there are no additional operation and maintenance requirements, or associated costs beyond regular maintenance required by the Region of Waterloo.

The estimate cost for this Component, which is 0.86 km in length, is $1.8 million, or, $2,100 per metre.

7.8.14 Component 14

This Component is located within an existing easement on municipally owned land or within municipal right of ways, and no additional easements or land acquisitions are anticipated. GRCA, Hydro One and Kitchener-Wilmot Hydro approvals would be required in addition to a road closure permit. The installation of this Component would require the reinstatement of infrastructure installed within the last 15 years.

With this Component, there are minimal additional operations and maintenance requirement or associated cost beyond regular maintenance would be required by the Region of Waterloo, due to the hydraulic characteristics of this Component.

The estimate cost for this Component, which is 0.9 km in length, is $1.5 million, or, $1,700 per metre.

7.8.15 Component 15

This Component is located within an existing easement on municipally owned land, and no additional easements or land acquisitions are anticipated. GRCA, Hydro One and Kitchener-Wilmot Hydro approvals would be required in addition to a road closure permit. The installation of this Component would require the reinstatement of infrastructure installed within the last 5 years.

With this Component, there are minimal additional operations and maintenance requirements or associated costs beyond regular maintenance would be required by the Region of Waterloo, due to the hydraulic characteristics of this Component.
The estimate cost for this Component, which is 0.7 km in length, is $2.1 million, or, $3,000 per metre.

7.8.16  Component 16

This Component is located within an existing easement on municipally owned land, and no additional easements or land acquisitions are anticipated. GRCA, Hydro One and Kitchener-Wilmot Hydro approvals would be required in addition to a road closure permit. The installation of this Component would require the reinstatement of infrastructure installed within the last 5 years.

With this Component, there are minimal additional operations and maintenance requirements or associated costs beyond regular maintenance required by the Region of Waterloo, due to the hydraulic characteristics of this Component.

The estimate cost for this Component, which is 0.7 km in length, is $2.1 million, or, $3,000 per metre.

7.8.17  Component 17

This Component is within open spaces and municipally owned right of ways, potentially, and no additional easements of land acquisition are anticipated. Approval from the GRCA is also required in addition to a road closure permit. The installation of this Component would require the reinstatement of infrastructure installed within the last 5 years.

With this Component, there are minimal additional operations and maintenance requirements or associated costs beyond regular maintenance required by the Region of Waterloo, due to the hydraulic characteristics of this Component.

The estimate cost for this Component, which is 0.8 km in length, is $1.4 million, or, $1,800 per metre.

7.8.18  Component 18

This Component is located within an existing easement on municipally owned land and within Kitchener-Wilmot Hydro property. Additional easements would be required through Kitchener-Wilmot Hydro property, correspondence with Kitchener-Wilmot Hydro as indicates that this is not a feasible Component. GRCA, Hydro One and Kitchener-Wilmot Hydro approvals would also be required in addition to a road closure permit. The installation of this Component would require the reinstatement of infrastructure installed within the last 5 years.

With this Component, there are minimal additional operations and maintenance requirements or associated costs beyond regular maintenance required by the Region of Waterloo, due to the hydraulic characteristics of this Component.

The estimate cost for this Component, which is 0.9 km in length, is $1.2 million, or, $1,400 per metre.

7.8.19  Component 19

This Component is located within an existing easement on municipally owned land and within private property. Several additional easements or land acquisitions are anticipated to be required. GRCA, Hydro One and Kitchener-Wilmot Hydro approvals would be required in addition to a road closure permit. The installation of this Component would require the reinstatement of infrastructure installed within the last 5 years.

With this Component, there are minimal additional operations and maintenance requirements or associated costs beyond regular maintenance required by the Region of Waterloo, due to the hydraulic characteristics of this Component.

The estimate cost for this Component, which is 1.0 km in length, is $1.3 million, or, $1,300 per metre.

7.8.20  Component 20

This Component is located within existing municipal right of ways, and no additional easements or land acquisition are anticipated. Approval from Hydro One would be required in addition to a road closure permit. The installation of this Component would require the reinstatement of Huron Road installed within the last 5 years.
With this Component there are no additional operations and maintenance requirement, or associated costs beyond regular maintenance required by the Region of Waterloo.

The estimated cost for this Component, which is 0.48 km in length, is $1.0 million, or $2,100 per metre.

7.8.21 Component 21

This Component is located within an existing easement on municipally owned land, no additional easements or land acquisitions are anticipated. No additional permit or approvals are required, notwithstanding approval from Hydro One. The installation of this Component would require the minor reinstatement of infrastructure installed within the last 5 years.

With this Component there are no additional operations and maintenance requirement, or associated costs beyond regular maintenance required by the Region of Waterloo.

The estimated cost for this Component, which is .45 km in length, is $0.7 million, or $1,600 per metre.

7.8.22 Component 22

This Component is located within planned municipal right of ways, and no additional easements or land acquisitions are anticipated. Permits from the GRCA may be required in addition to a road closure permit. There is no recently constructed infrastructure which would be disrupted by this Component.

With this Component, minimal additional operations and maintenance requirement, or associated costs beyond regular maintenance would be required by the Region of Waterloo, due to the hydraulic characteristics of this Component.

The estimated capital cost for this Component, which is 2.0 km in length, is $2.8 million, or $1,400 per metre.

7.8.23 Summary of Economic Evaluation

Based on the evaluation of the various Components against the criteria identified in Section 7.2 the preferred Component with respect to economic consideration is comprised of the following Components:

→ **Component 2** - From the Mannheim Water Treatment Plant Zone 4 Pumping Station, through the Hydro Corridor to the south side of Bleams Road ($3.5 million);

→ **Component 5** – Follows through the Hydro Corridor from the end of Component 2 to the crossing of Fischer Hallman Road ($1.9 million);

→ **Component 10** – Located within the Fischer Hallman Road Easement from the end of Component 5 to intersection with Huron Road ($2.5 million);

→ **Component 22** – Located within the Fisher Hallman Road from the end of Component 10 to the entrance to the proposed Becker Estates Development. Located within planned road ways of the Becker Estates and Primeland developments to the connection to the extension of the Strasburg Road. ($2.8 million).

The total estimated cost for this Alternative would be approximately $10.7 million dollars for capital cost, plus applicable taxes engineering and contingency fees. This Alternative is not strictly the least expensive alternative, however once the need for land acquisitions or approvals and the disruption or required reinstatement to existing infrastructure was factored into the evaluation it was determined to be preferred. This Alternative would be the most economical way to install the Kitchener Zone 4 Trunk Watermain from the Mannheim Water Treatment Plant Zone 4 Pumping Station to the Connection with the Strasburg Road extension.
7.9 Kitchener Zone 4 Trunk Watermain Evaluation Summary

Based on the Natural and Physical, Social and Cultural, Technical, and Economic Environmental considerations detailed above, the preferred Alternative with respect to each evaluation criteria has been determined. These alternatives were comparatively evaluated against each other in Section 8 to determine the preferred alignment for the Kitchener Zone 4 Trunk Watermain.

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Preferred Consideration</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Environmental (Page 106)</td>
<td>3, 6, 11, 20, 21</td>
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<tr>
<td>B</td>
<td>Social (Page 111)</td>
<td>2, 5, 7, 12, 13, 21</td>
</tr>
<tr>
<td>C</td>
<td>Technical (Page 116) and Economical (Page 121)</td>
<td>2, 5, 10, 22</td>
</tr>
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</table>

Table 7-2: Preferred Alternatives based on each evaluation criteria

In addition to the three (3) Alternatives identified in Table 7-2 the following additional Alternatives were also evaluated for comparison purposes, Alternative D ranked high overall, without being the highest in any one evaluation criteria. Alternative E is included as it was recommended as an alternative alignment in the Kitchener Zone 4 Analysis Report.

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Components</th>
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<tbody>
<tr>
<td>D</td>
<td>2, 5, 10, 11, 20, 21</td>
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<tr>
<td>E</td>
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Table 7-3: Additional Alignments for evaluation in Section 8.

The identified Alignments were evaluated against each other to determine the preferred alignment.
8. Evaluation of Alternatives

The following Alternatives were identified in Section 7.9 as the five (5) alternatives for further evaluation to determine the preferred alignment of the Kitchener Zone 4 Trunk Watermain.

Table 8-1: Alternatives

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Preferred Consideration</th>
<th>Components</th>
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<tbody>
<tr>
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<tr>
<td>D</td>
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<td>2, 5, 10, 11, 20, 21</td>
</tr>
<tr>
<td>E</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>

8.1 Overview of Alternatives

The following section outlines the Alternatives that were compared.

8.1.1 Alternative A

Alternative A is located within the Ottawa Street South, Trussler Road and Huron Road to connect the Mannheim Water Treatment Plant Zone 4 Pumping Station to the future extension of the future Strasburg Road. From the intersection of Huron Road with the Hydro Corridor to the connection of the Strasburg Road the alternative is located within the Hydro Corridor.

8.1.2 Alternative B

This Alternative is located within the existing Hydro Corridor from the connection to the Mannheim Water Treatment Plant Zone 4 Pumping Station to the intersection of the Fischer Hallman Road. The Alternative is located within the Fischer Hallman Road easement from the Hydro Corridor to the southern limit of the Species at Risk Habitat at which point the alternative is located within private property along the southern border of the Species at Risk Habitat until the Hydro Corridor. The Alternative is then located with the Hydro Corridor until the intersection of the Parkvale Drive. This alternative is located within the Parkvale Drive, Featherstone Street and Huron road easements until the intersection of the Hydro Corridor. This Alternative is located within the existing Hydro Corridor from Huron Road to the intersection of the Fischer Hallman Road.

8.1.3 Alternative C

Alternative C is located within the existing Hydro Corridor from the connection to the Mannheim Water Treatment Plant Zone 4 Pumping Station to the intersection of the Fischer Hallman Road. The alternative is located within the road easement of Fischer Hallman Road south of Huron Road to the planned entrance of the Becker Estates development. The Alternative will then be located within planned road right of ways to the connection with the Strasburg Road extension.

8.1.4 Alternative D

This Alternative is located within the existing Hydro Corridor from the connection to the Mannheim Water Treatment Plant Zone 4 Pumping Station to the intersection of the Fischer Hallman Road. The alternative is located within the road easement of Fischer Hallman Road south to Huron Road, and Huron Road east to the interaction of the Hydro Corridor. The alternative is located with the existing Hydro Corridor from Huron Road to the connection with the future Strasburg Road extension.

8.1.5 Alternative E

Alternative E is located within existing road allowances to connect the Mannheim Water Treatment Plant Zone 4 Pumping Station to the future extension of the future Strasburg Road. The roadways utilized within this Alternative are: Ottawa Street South, Fischer Hallman Road, Bleams Road, and Strasburg Road to the Future Strasburg Road Connection. From the intersection of Huron Road with the Hydro Corridor to the connection of the Strasburg Road the alternative is located within the Hydro Corridor.
8.2 Comparative Evaluation

Using the numerical evaluations determined for each of the Components, the numerical evaluation for each Alternative was determined by taking of the average of the scores for the components within the Alternative. The averages of the scores were used due to the varying number of components within the Alternatives. Based on the numerical evaluation of the Alternative for each Evaluation category the Alternatives were ranked based on level of preference. Table 8-2 identifies the graphics used to illustrate the ranking of the Alternatives with relation to each other.

Table 8-2: Symbols for Evaluation of Alternatives

<table>
<thead>
<tr>
<th>Preference</th>
<th>Summary Symbol</th>
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<tr>
<td>Very Preferred</td>
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</tr>
<tr>
<td>Least Preferred</td>
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</tbody>
</table>

Table 8-3 below identifies the results of the evaluation of the five selected alternatives.

Table 8-3: Comparative Evaluation of Alternatives

<table>
<thead>
<tr>
<th>Comparative Evaluation of Alternatives</th>
<th>Environmental (25%)</th>
<th>Social (25%)</th>
<th>Technical (25%)</th>
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<td>Alternative B</td>
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<td>Alternative E</td>
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</tr>
</tbody>
</table>

Based on the comparative evaluation of the numerical results, the preferred alternative was determined to be Alternative C. This Alternative was the preferred alternative based on the Technical and Economical evaluation criteria.
9. Preferred Trunk Watermain Alignment

Based on the Environmental, Social, Technical and Economic considerations detailed in Sections 7 and Section 8, the preferred alignment has been identified as Alternative C.

Figure 9-1 presents the preferred alignment route measuring approximately 5.8km in total length, which is also described in the section below.

9.1 Detailed Overview of the Preferred Trunk Watermain Alignment and Rationale

The components which comprise the preferred Kitchener Zone 4 Trunk Watermain preferred alignment are as follows:

**Component 2**

This Component is located with the existing Hydro Corridor from the Mannheim Water Treatment Plant Zone 4 Pumping Station to south of Bleams Road.

This was selected as the preferred Component as it:
- Is located within an existing Hydro Corridor;
- Has a minimal length of pipe adjacent to existing utilities located on Ottawa Street South;
- Has minimal impact on privately owned property; and,
- Has minimal impact on local residents.

This was selected over the other Components presented as they:
- Significantly impacted traffic on major roadways;
- Presented potential conflicts with existing utilities;
- Had higher capital costs, due to additional length, and;
- Had more impacts to Natural Heritage Features such as identified Core Environmental Forests and Wetland Complexes.

**Component 5**

The Component continues from the end of Component 2, within the Existing Hydro Corridor to the west side of the Fischer Hallman Road.

This was selected as the preferred Component as it:
- Is located within an existing Hydro Corridor;
- Has a minimal length of pipe;
- Has minimal impact of local residents;

This was selected over the other Components presented as they:
- Would require a large number of land acquisitions and easements if phasing with other infrastructure projects was not possible; and,
- Would require further investigation to determine preferred Component though previously undeveloped land.

**Component 10**

This Component goes from the intersection of the Hydro Corridor with the Fischer Hallman Road, south along Fisher Hallman Road to the intersection of Huron Road.
This was selected as the preferred Component as it:

→ Is located within an existing road easement;
→ Avoids small pond and wetland located to the east of Fischer Hallman Road;
→ Avoids impacts to Regional Core Environmental Forest and Huron Natural Area;
→ Crosses Species at risk Habitat along existing road easement, to mitigate impacts.

This was selected over the other Components presented as they:

→ Are not feasible for construction (Component 9, through pond);
→ Impact private properties planned for development (Component 8, and potentially Component 7);
→ Had a more significant impact on the identified Species at Risk Habitat;
→ Had more impacts to Natural Heritage Features such as identified Core Environmental Forests and Wetland Complexes; and,
→ Crossed tributaries to the Strasburg Creek, a cold water system.

Component 22

This Component is located within the easement of the Fischer Hallman Road south of Huron Road to the planned entrance of the Becker Estates Development, though the Becker Development and adjacent Primeland development to the East to the connection with the planned Strasburg Road extension.

This was selected as the preferred Component as it:

→ Is located within existing and planned road easement;
→ required minimal additional impact to residents; and,
→ Is able to be phased with planned construction.

This was selected over the other Components presented as they:

→ Require reconstruction of recently installed infrastructure (Component 11)

There is potential for both open cut construction and trenchless construction to be required along the route, at a ratio of approximately 97 per cent open cut to 3 per cent trenchless, if it is determined during the detailed design that trenchless construction is required at the crossing of Isaiah Drive. Open cut construction along existing roadways will require temporary lane closure that advance as the watermain is installed. Trenchless construction will require the construction of launching and receiving pits on either end of the shaft.

The advantages provided by the preferred alignment include:

→ Minimized social disruption by avoiding construction along existing roadways was possible (i.e. Ottawa Street South, Bleams Road, Strasburg Road and Fischer Hallman Road between Ottawa Street South to Bleams Road);
→ Avoids major disruption to Species at Risk Habitat, several locally significant wetlands, and crossings of watercourses and Regional Core Environmental Features which minimizes the required resources to mitigate potential impacts to these features;
→ Provides close to optimal hydraulic characteristics due to minimal length of the Alignment;
→ Avoids major constriction within the recently reconstructed Huron Road easement;
→ Avoids concerns associated with the installation of the Trunk Watermain within close proximity to the Kitchener-Wilmot Hydro Transformer Station;
Minimizes materials needed due to a shorter length of alignment; and,

Minimal dependence on the schedule and planning of the Rosenberg Development, more specifically the design of Amand Drive.
This following details the preferred route for the Kitchener Zone 4 Trunk Watermain from the Mannheim Water Treatment Plant Zone 4 Pumping Station to the planned extension of the Strasburg Road and corresponding watermain.

The connection to the Mannheim Water Treatment Plant Zone 4 Pumping Station be made to the existing 750 mm diameter outlet watermain located on the east side of the facility. This connection should be followed by two (2) 45 degree elbows allowing the Watermain to cross Ottawa Street South perpendicularly.

The crossing of Ottawa Street South would be completed by open cut construction methods, requiring the closure of the roadway and traffic control measures to be implemented. Depending on the construction conditions surrounding the existing utilities, it is possible that this road crossing could be completed by only closing one lane of traffic at a time, this should be determined during the detailed design of the Trunk Watermain. It is also important to maintain access to the residential townhouse condominium complex located to the southeast of the crossing location. Adequate supports will be required at the crossing of the existing utilities within the Ottawa Street South easement. These utilities consist of 1200mm, 750mm, and 450mm diameter watermains, in addition to local sanitary, and storm sewers.

To the south of Ottawa Street, the Kitchener Zone 4 Trunk Watermain will pass between an existing condominium complex (1920 Ottawa Street South) and a planned single family home development (1989 Ottawa Street South). The majority of the land which the alignment will pass though is owned by the City of Kitchener, while a small section of the alignment will cross into the existing condominium property, temporarily impacting the existing recreational trails on the site. At this location, there is existing capped infrastructure which the planned development will be required to connect to. The Kitchener Zone 4 Trunk Watermain will be required to avoid this infrastructure by going under or between it. This will be further defined through the preliminary design phase of the project.

Once the alignment passes the existing condominium development it then is located within the existing Hydro corridor, which is primarily owned by the City of Kitchener. At this location, the Kitchener Zone 4 Trunk Watermain would be within a section of the corridor which bisects a regionally identified Core Environmental Forest. Since the Hydro Corridor is within a 30 metre cleared section of the forest, a 10 metre buffer is required by the Region to protect this natural feature, leaving 10 metres of available space for the Kitchener Zone 4 Trunk Watermain to be installed. Due to this restriction on the location of the Trunk Watermain in this area, steel casing may be required if the required separation between the existing Hydro Tower and the Kitchener Zone 4 Trunk Watermain is not possible. A Stage 2 Archaeological Assessment will also be required in this area prior to initiation of construction.

South of this section, the Alignment is located through the parking lot of the planned Weiss Development by Activa. This land within the Hydro Corridor would require an easement to be established within the existing Hydro One easement. The planned land use of this development within the Hydro Corridor is parking, driveways, trails and a play structure. It is anticipated that this development will be constructed prior to the initiation of the Kitchener Zone 4 Trunk Watermain construction. Temporary disruptions to the residents of this building complex, such as access, parking, noise and dust, will occur during construction. There will, however, be no permanent impacts to the site once reinstatement is completed.

The next section of the Hydro Corridor, and the Kitchener Zone 4 Trunk Watermain, is located within an existing residential development consisting of two storey single family homes. Surrounding Isaiah Drive, there is large elevation differential between the surrounding developed land and the Hydro Tower foundations. This may pose some difficulty when constructing the Kitchener Zone 4 Trunk Watermain, however, for the purpose of this report trenchless construction is assumed as the construction method in this area. This assumption of construction technique, results in a conservative cost estimate for this area. The work in the remainder of the Hydro Corridor, north of Bleams Road, can be constructed using open cut methods. There are few areas of anticipated conflict within this section. There are existing recreational trails located within this section of the Hydro Corridor which will be temporary impacted, however, there is potential for the reinstatement of the Kitchener Zone 4 Trunk Watermain to include the installation of the planned City of Kitchener Multi-Use trails.

The installation of the Trunk Watermain across Bleams Road would also be completed using open cut construction, which would require road closures, traffic controls and detours. This crossing is within close proximity to the intersection of Gelhi Place and Bleams Road and would also impact traffic flow along this laneway. The Bleams Road easement is the location of an existing 1200mm diameter and 600mm
diameter watermain, in addition to local communications utilities, which will require proper support during construction in this area.

To the south of Bleams Road is the location of an inactive aggregate pit and the proposed location of the Rosenberg Development. Decommissioning and reinstatement of the aggregate site would be completed prior to the development of the land into the Rosenberg Development. The final grade of the land within this area should be verified through the design process of the Kitchener Zone 4 Trunk Watermain. The alignment also crosses an existing 300mm diameter natural gas transmission pipeline owned by Union Gas, requiring a crossing agreement to be completed for construction within this area.

To the east of the natural gas transmission line is the location of a GRCA regulated wetland area as per the Ontario Conservation Authorities Act (1990), in addition to an MNR Species at Risk habitat for the Jefferson-X Salamander regulated under the Endangered Species Act (2007). With respect to both of these regulated features, the applicable governing body would prefer an alternative which avoids the feature in question. If avoidance is not possible, as in this case, mitigation measures and approvals are required for construction of occur within these areas. The alignment in this area is located within the Hydro Corridor and the Fischer Hallman Road easement. The construction in this area will be completed through open cut methods and remain within the existing Hydro Corridor and road easements to minimize impacts on local natural features. Approvals from the GRCA and MNR would both be required to complete construction in this area, and appropriate mitigation measures shall be utilized to limit impact to these features.

Construction along the existing Fischer Hallman Road will be performed by open cut methods which will require lane closures and traffic control measures to be implemented. There is the potential for this construction to be phased with the planned widening of the existing road way to lessen traffic impacts. There is no Grand River Transit Routes along this section of the Fischer Hallman Road that would be impacted. An existing 450mm diameter watermain is located along the eastern shoulder of the Fischer Hallman Road. The location of the Kitchener Zone 4 trunk Watermain, therefore, would likely be located along the west side of the road way. This will be clarified through the preliminary design of the Trunk Watermain.

To the south of the intersection of Fischer Hallman Road and Seabrook Drive, an unknown utility line has been identified by provided GIS information and may be impacted. Further investigation into this utility line will be completed during the preliminary design.

The preferred alignment continues within the Fischer Hallman Road easement from Huron Road to the planned entrance to the Becker Estates, currently identified as Street One within the development plans. The preferred alignment will be located within the planned road ways of the Becker Estates (Street One and Street Fourteen) and adjacent Primeland developments (Tartan Avenue and existing Rockcliffe Drive) to a connection with the extension of the Strasburg Road.

Construction within this area will be completed by open cut methods. Due to the large amount of grading required prior to the construction of the Becker Estates development, it would be ideal to construct the Trunk Watermain in conjunction with the construction of the development or at least after the final grades are set for the site and before the infrastructure is installed.
9.2 Permanent and Temporary Easement Requirements

The majority of the preferred alignment is within the existing Hydro Corridor or municipal road rights of way. A permanent easement would be created within the existing Hydro One easement. Where alignments are proposed outside of the existing easements, a new permanent easement from the landowner or public agency that administers the land will be required. A permanent easement is registered against the property title and restricts development within the area.

Where work may be required on neighboring properties during construction (staging, horizontal direction drilling staging and receiving pits, etc) a temporary easement will be required to be arranged with the property owner.

Based on the preferred alignments for the Kitchener Zone 4 Trunk Watermain, the following permanent easements are anticipated to be required:

- An easement would be required through the property across from the Mannheim Water Treatment Plant Zone 4 Pumping Station. This land is outside of the existing hydro one easement and is owned by the City of Kitchener, and adjacent to private development lands.
- A small section of land owned by the condominium complex located at 1941 Ottawa Street South.
- Within the Hydro Corridor through the Weiss development, which is not owned by the City of Kitchener.
- Through the planned location of the Rosenberg Development, land is currently privately owned by four different land owners.

A temporary easement may be required to perform the horizontal directional drilling undercrossing of Isaiah Drive, depending on the site specific requirements. Typically, launching and receiving pits are 15 metres by 10 metres in size.

9.3 Land Acquisition Requirements

The preferred alignment does not require any land acquisition.

9.4 Staging Areas

It is expected that staging and storage areas will be required for the installation of the Trunk Watermain. For the most part, these can likely be located within park areas, other municipally or regionally owned properties, or rented agricultural land.

The location of potential staging areas will be confirmed during the detailed design phase.

9.5 Hydrogeological and Geotechnical Considerations

As part of this EA report, a Desktop Hydrogeological Assessment was completed to assist in the evaluation of the identified Components (refer to Appendix E). Additional hydrogeological assessments will be completed as part of the preliminary design of the preferred alignment. These assessments will verify the potential ground/surface water impacts and soil conditions discussed in the following section. It is recommended that a full geotechnical assessment be completed as part of the detailed design.

9.5.1 Hydrogeological Considerations

9.5.1.1 Potential Impacts to Groundwater and Surface Water

Open cut construction is the recommended construction method for the installation of most of the Kitchener Zone 4 Trunk Watermain. Dewatering may be required in some areas. The detailed geotechnical investigation will determine where dewatering will be required. Should it be found that water-taking is required extensively, which is unlikely, an alternate construction method may be desired to be examined.
9.5.1.2 Potential Impacts to Private and Regional Wells

Some reductions in groundwater baseflow are possible with dewatering. There may be some impact to the K25 and K29 wells located to the east of the Hydro Corridor between Isaiah Drive and Snowdrop Crescent. The preferred alignment is located within the 1 year WHPA for these wells. Further evaluation of the impact to these wells should be completed prior to the final design of the Kitchener Zone 4 Trunk Watermain Alignment.

9.5.2 Geotechnical and Environmental Considerations

As part of the detailed geotechnical assessment in detailed design, boreholes should be advanced along the length of the alignment to a depth of at least one metre below the bottom elevation of the service to assess the in-situ condition of the soil across the area of work. For the purposes of the preliminary design the Hydrogeological Evaluation completed in Appendix E will be used for information regarding the geotechnical conditions, this report has compiled soil information from existing wells to identify existing conditions.

9.5.2.1 Open Cut Construction

The soils in the Study Area have been identified as being sands and gravels associated with outwash deposits or recent alluvial activity. This should not present any significant technical concerns with respect to construction.

Soil types are expected to vary across the area of work. An investigation into the extent and composition and presents of contamination of the soils will require to be performed during the detailed design investigations.

9.5.2.2 Trenchless Construction

As previously indicated, the crossing of Isaiah Drive may be performed by trenchless construction methods. The geotechnical investigation will confirm the soil conditions in this area, however, if large rocks or other obstacles are found to be present, which is unlikely, the installation methodology may require to be revised.

9.6 Natural Environmental Considerations

The installation of the Kitchener Zone 4 Trunk Watermain will have possible impacts to the natural environment, particularly plant and animal habitats.

Depending on the results of the assessment of Butternut trees located to the east of the Hydro Corridor a Butternut tree management plan may be required, including protection measures or compensatory planting guidance. Protection measures could include fencing and root pruning. Working distance from the tree and the extent of any encroachment within the required setback will need to be assessed during detailed design. Alternatively, the tree may be removed with approval of the MNR.

Ministry of Natural Resources consultation will be required to identify timing constraints and windows of time where construction proximate to potential species at risk habitats may, or may not be allowed.

Detailed inventories of plants and trees will be required to be performed and compensatory planting plans developed during the detailed design phase. If relocation of existing trees is possible, this should be considered in the development of the plan and would require the submission of an Environmental Impact Statement to the GRCA. Ultimately, however, the avoidance of trees should be considered during detailed design.

Animal crossing zones within the area of work should be protected and alternate facilities provided, where possible.

9.7 Transportation Considerations

It is anticipated that the construction of the Kitchener Zone 4 Trunk Watermain will impact transportation operations along the roadways, and intersecting roadways of the preferred alignment. The majority of the transportation impacts expected would be due to the open cut construction of the Trunk Watermain,
requiring lane reductions or optional detours. In some locations, complete closure of a road will be required for crossing with open cut construction.

It is recommended that a traffic impact assessment and traffic management plan be developed prior to the detailed design of the project. This will assess potential impacts to traffic operations, such as traffic congestion and delays at key locations within the study area, including major intersections and entrances to adjacent land uses.

9.7.1 Traffic Considerations

The installation of the Kitchener Zone 4 Trunk Watermain will impact transportation on Fischer Hallman Road and Huron Road. This may, to a certain extent, be mitigated if the work is performed in tandem with the proposed widening of Fischer Hallman Road. The open cut construction along and across roadways will cause temporary traffic disruption which will result in lane closures, traffic marshalling, and, potentially, detours.

Major road crossings are required at:

→ Ottawa Street South;
→ Bleams Road; and,
→ Huron Road.

Other impacts, directly related to construction activities, will be construction vehicle access to the area of work, particularly in the residential areas, which would be accessed off of major roads (Ottawa Street South, Bleams Road and Huron Road).

Traffic management plans will be required to be developed in the detailed design phase to determine how construction within roadways will be phased and performed to minimize impact associated with lane closures and construction traffic.

9.7.2 Property Access Considerations

Construction staging and traffic management plans should ensure that vehicular access to businesses, residences and institutions is maintained at all times.

Based on the preferred alignment, this will have the greatest impact on Fischer Hallman Road. If access to properties cannot be maintained, alternate access points should be provided, or the work scheduled around times of use.

Hydro One requires that access be maintained to all existing Hydro infrastructure during construction, in the event regular or emergency maintenance is required, this is included in their design criteria identified in Section 5.1.3.

Consideration should also be taken regarding access to the Fire Station located to the west of the intersection of Fischer Hallman Road and Huron Road.

9.7.3 Transit Considerations

Lane closures for road crossings may cause delays to public transit, such as the number 33 Huron Bus Route, which should be reviewed with Grand River Transit during the detailed design stage and incorporated into the traffic management plan. Discussion should also include the temporary relocation of bus stops, as required.

9.7.4 Pedestrians and Cyclists

Pedestrian and cyclist routes should be maintained while construction is underway. This will be a significant consideration in the hydro corridor and intersections.

Construction on Huron Road should be phased so that a sidewalk is always available and access and signage provided to promote their use. Hoarding and construction fences should be installed both for public safety and to provide temporary access around areas of work to maintain existing routes.
9.8 Construction Costs

The base capital cost estimate for the construction of the Kitchener Zone 4 Trunk Watermain is estimated at $10.7 million, plus an additional 20% for engineering design and contingency to address unforeseen issues during construction, making the total cost for the Kitchener Zone 4 Trunk Watermain project, $12.9 million.

9.9 Implementation and Scheduling

Construction is anticipated to commence in the spring of 2014. It is expected that construction will proceed in phases, determined by both seasonal limitation on work (dry season for wetland crossings, peak-use periods of park use, etc) in addition to the possibility of performing the work in tandem with other infrastructure upgrades, as detailed below.

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9.9.1 Coordination with the Future Infrastructure Construction

Optimally, the work should be performed in conjunction with other upgrades to minimize overall construction impacts. The only planned work which could have a chance to be phased with the installation of the Kitchener Zone 4 Trunk Watermain, planned to occur in 2014 to 2015, is the widening of Fischer Hallman Road. At this point the Environmental Assessment for the project is planned but has yet to commence. It would be ideal to include the installation of the Kitchener Zone 4 Trunk Watermain with the reconstruction of the Fischer Hallman Road, there is potential to phase the construction of the Trunk Watermain into sections to allow for the twinning of these two projects.

9.9.2 Implementation Plan

Due to the extent of the construction, windows of construction, and yearly budgets available, the project will likely be required to be phased over several contracts. Since this is a new works project, there is no additional demand on the distribution system during the construction of the Kitchener Zone 4 Trunk Watermain.

10. Mitigation Measures

To construct various components of the Kitchener Zone 4 Trunk Watermain, some environmental impacts will be unavoidable. In such situations, measures must be taken to either minimize or offset these effects.

It is a key objective to avoid, prevent or minimize any adverse environmental impacts. The Class EA process requires development of mitigating measures after identification of the magnitude of the net negative impacts of the preferred Component solution. These measurements are to allow the project to be undertaken at a reasonable cost while, at the same time, protecting the environment against net negative impacts. General mitigation measures for potential adverse environmental effects specific to this project are described below.

Construction of the Trunk Watermain will have the potential for environmental impacts, and where these can be anticipated in the design stage, special provisions should be written into the construction package.
The provisions will dictate the construction methods that are permitted and more importantly the construction methods that are not allowed during specific operations. Unforeseen problems that arise during construction will be addressed on the site, and the engineering contractor's best judgement used will ensure that changes to the contract do not cause negative environmental impacts.

Staff responsible for inspecting the contractor's work must be made aware of such provisions in order to ensure compliance during construction. It will be the responsibility of the proponent to ensure that inspectors enforce compliance with the environmental provisions, in addition to traditional engineering provisions of the construction package.

The Kitchener Zone 4 Trunk Watermain is to be primarily constructed within an existing Hydro Corridor or roadways, which will have minimal environmental impacts. Careful planning is to be conducted during the detailed design and construction phases for the Kitchener Zone 4 Trunk Watermain.

10.1 Natural Environment Mitigation Measures

10.1.1 Proximity to Natural Heritage Features and Vegetation

10.1.1.1 Vegetation

A key mitigation measure to be implemented in the open spaces of the corridor is to use natural heritage area buffers as setbacks. Impacts to vegetation will, for the most part, be limited to trees located in open spaces or along the existing roadways utilized by the preferred alignment. Where possible, mature trees will be protected with temporary construction fencing around their driplines to ensure that they are not damaged during construction. It is expected that vegetation restoration will be coordinated with the Region of Waterloo and the GRCA. A Species-at-Risk, a Butternut tree has been identified within the Regional Forest associated with the Laurentian Wetlands, adjacent to the preferred Trunk Watermain alignment. Evaluation of the tree must be completed by the MNR to determine the status and required setbacks in this area. The habitat for an additional Species at Risk, the Jefferson-X Salamander, is located within the preferred alignment of the Trunk Watermain. The crossing will occur along an existing roadway, however, MNR approval is required.

10.1.1.2 Wildlife and Wildlife Habitats

As previously identified in Table 4-5, there were no regulated significant species (other than the Butternut Tree) found during site investigations, however, since a considerable length of the Kitchener Zone 4 Trunk Watermain is to be located within open areas, it is likely that there will be an impact on wildlife inhabiting the area along the work corridor. In order to minimize the impacts to species in the area along the working corridor, particularly Species at Risk, various mitigation strategies at both the planning and construction stage will need to be implemented. During all stages of the Class EA process, the routing of the Trunk Watermain has been planned with consideration to wildlife and wildlife habitat area information. The alignment was planned to minimize the impact to Species at Risk in accordance with the Species at Risk Act. Prior to the construction of the Trunk Watermain, it will be necessary to develop a detailed construction phasing plan to ensure that construction is undertaken during the timing windows recommended by the MNR. Due to the crossing of the identified Species at Risk habitat by the Preferred Alignment, MNR approvals will be required, however it is anticipated impact will be mitigated due to the location of the Alignment within existing roadways. Additional mitigative measures used during the construction phase include the installation of hoarding and construction fencing to prevent wildlife from entering active work areas.

10.1.1.3 Aquatic Habitats and Communities

During construction of the Trunk Watermain there is the potential for aquatic habitat to be impacted due to their close proximity to construction. Impacts to aquatic habitats and communities can be minimized by restricting construction to suitable timing windows and implementing erosion and sedimentation control measures. Specific mitigation measures include:

- Minimizing removal of riparian vegetation and renaturalization of the disturbed areas using native vegetation that supports existing wildlife species,
- Minimising erosion and sedimentation by using effective sediment barriers downstream of the work area and using erosion control blankets where necessary.
10.1.2 Groundwater & Subsurface Conditions

To maintain, or improve, the existing integrity of the groundwater and soil conditions within the site of the future Kitchener Zone 4 Trunk Watermain, several mitigation measures can be implemented at the planning design and construction stages. At the planning stage, several Component alignments have been developed to provide options for the routing of the infrastructure, in order to avoid high impact areas. At the design stage, the groundwater regime can be maintained though careful engineering design. For instance, once the pipe is installed, there would be provisions for backfilling to match existing conditions. The construction phase is the stage of the implementation process that requires increased care to mitigate adverse effects to groundwater and soil. The key mitigation measures include:

- Scheduling the construction activities during seasons in which groundwater levels are typically lower;
- Employing environmental management practices during construction, specifically in terms of the operation and storage of equipment;
- Locating the construction activities away from water bearing formations, where possible; and,
- Using proper dewatering techniques, including options to minimize necessary water taking.

10.1.3 Crossing Natural Features

To minimize the impacts to natural environmental features within the Trunk Watermain alignment, mitigation measures were considered during the planning phase. The alignment of the Trunk Watermain was designed to minimize the number of water crossings and areas of encroachment on wetland areas. Mitigation measures to be implemented post-construction include:

- Renaturalization of construction zones; and,
- The maintenance of existing wildlife habitats.

10.1.4 Channel Crossings and Fish Habitat

There are no watercourses or fish habitats crossed by the preferred alignment.

10.1.5 Proximity to Valleylands and Flood Plains

The identified Preferred Alignment does not come within close proximity, and therefore does not impact the identified flood plains or valleylands within the Study Area.

10.2 Social & Cultural Mitigation Measures

10.2.1 Impact on Recreation Areas

Since a large portion of the preferred alignment for the Kitchener Zone 4 Trunk Watermain impacts areas utilized for recreation, it is important that consideration is made to the staging of construction activities to minimize the disruption to local trails. That being said, construction would be better suited to take place from early October to early May, when the recreational areas are used less. Once construction is complete, all disrupted trails and playgrounds will be reinstated as quickly as possible and as per the reinstatement plan developed in coordination with the Region of Waterloo. Upgrades to existing trails are a currently planned project which could be phased with the installation of the Trunk Watermain.

10.2.2 Archaeological Features

The Stage 1 Archaeological Assessment conducted for this study identified general areas of potential archaeological significance within the Study Area. With this in mind, a Stage 2 Archaeological Assessment will have to be conducted prior to the design and construction of the Trunk Watermain to identify any specific archaeological artefact or feature that may require a new alignment. A Stage 2 Archaeological Assessment involves a test-pit survey of wood lots and non-cultivated lands. Test pits are excavated by hand to subsoil in order to facilitate the identification of any subsurface cultural deposits.

Should the results from the Stage 2 Archaeological Assessment identify any areas of high archaeological potential; a Stage 3 Archaeological Assessment will be required. This involves further controlled surface...
collection, typically using larger and deeper test pits than are used in the Stage 2 Archaeological Assessment. Upon gathering further information regarding the archaeological potential in the Study Area, the alignment for the Kitchener Zone 4 Trunk Watermain may require alterations to avoid sites of high archaeological potential.

10.2.3 Proximity to Built-up Areas & Private Properties Affected

To minimize disruption to residents and business owners in close proximity to construction areas, necessary measures to decrease harmful environmental impacts should be employed. For instance, noise and dust control measures will be implemented to maintain lower decibel levels in the area to eliminate the risk of causing hearing damage and lower the chance of annoying nearby residents, business owners, and pedestrians and cyclists passing by. Techniques for noise and dust mitigation may include: using machinery with exhaust mufflers and well maintained tools and equipment with appropriate noise reduction devices to reduce noise; creating barriers with acoustical fences, fixed barriers or enclosures to ensure pedestrian path control and to reduce dust propagation outside the immediate construction area. Additionally, pedestrian walkways should be maintained by providing temporary detours around construction sites in areas where pedestrian traffic is disrupted.

10.2.4 Proximity to Agricultural Land uses

The impacts to agricultural practices located within the Study Area should be identified and discussed with land owners and operators. This will ensure that necessary mitigation measures are developed to lessen the impact on this land use during construction of the Kitchener Zone 4 Trunk Watermain. Potential mitigation measures could include, but are not limited to:

- Timing of construction before or after the growing seasons;
- Topsoil stripping, storage, and replacement; and,
- A survey of existing drainage systems (grading, tiles, etc.) for accurate reinstatement.

10.2.5 Traffic Impacts during Construction

The impacts to traffic will be minimized by virtue of the construction being primarily completed within an existing Hydro Corridor. The section of the Trunk Watermain that will pose the greatest impact to traffic is located on Fischer Hallman Road and Huron Road. Additionally, the section of the watermain south of the Mannheim Water Treatment Plant Zone 4 Pumping Station will have localized traffic impacts within the residential development in locations where roadways cross the Preferred Alignment. An additional impact to traffic, other than the closure of roadways, will be the increase in construction traffic for delivery of material and equipment and haulage of surplus material. In order to mitigate these impacts:

- Construction signage will be posted on the impacted roads to make motorists aware of the construction entrances;
- The location of the compound entrances for the tunneling activity will be selected to ensure the least disruption to traffic;
- Where compounds are located in close proximity to intersections, entrances will generally be located off the secondary road;
- Pedestrian walkways and bicycle lanes will be hoarded off and temporary road crossings provided;
- During detailed design haulage routes will be identified that will limit the construction traffic to major roads to mitigate heavy trucks travelling on secondary roads where the impacts are magnified; and,
- Traffic management plans will be developed with the City of Kitchener.

In order to reduce the prevalence of traffic impacts, proper scheduling and communication with the public and the Regional and Municipal departments will be required. Firstly, the schedule for the construction should be phased with other capital projects to avoid the duplication of disruptions within the Study Area. The construction phasing should also be planned such that it minimizes the period of disruption. Secondly, communication with Region and public services that make use of affected roadways will have to be consulted to inform them of temporary access routes. This includes consulting with Emergency Services, Canada Post, the Region of Waterloo Waste Management, Grand River Transit, and the City of
11. Review Agencies and Approvals

11.1 Ministry of the Environment

An Environmental Compliance Approval (formally known as a Certificate of Approval) from the MOE will be required for the construction of the Kitchener Zone 4 Trunk Watermain as well as a revision of the Drinking Water License for the water distribution system in accordance with the Environmental Protection Act (1990) and the Ontario Water Resources Act (1990).

11.2 Grand River Conservation Authority

The Grand River Conservation Authority (GRCA) will have to be consulted during the detailed design stage of the Trunk Watermain to coordinate the issuance of permits for each wetland crossing in accordance with the Conservation Authorities Act (1990).

11.3 Ministry of Natural Resources

The project team has had meetings with the MNR regarding endangered species within the Study Area. After conducting a Natural Heritage Survey of the Study Area, a Jefferson-X Salamander, a Species at Risk, habitat and a Butternut tree was identified to be within close proximity to the preferred Trunk Watermain Component. It was also identified that sections of the Study Area have the potential to be the habitat for the Bobolink and Barn Swallow (two bird species recently classified as a threatened species), however none were identified during sight visits. Further consultation with the Ministry of Natural Resources will be required to coordinate approvals within the Species at Risk Habitat in addition to evaluate the Butternut tree and to ensure that the proper mitigation strategies are implemented to avoid further impacts these features in accordance with the Endangered Species Act (2007).

11.4 Ministry of Culture

As part of the preliminary design, a Stage 2 Archaeological Assessment will be completed in areas identified by the Stage 1 Archaeological Assessment. Ministry of Culture approval will be required prior to construction of the proposed work in accordance with the Ontario Heritage Act (1990).

11.5 Hydro One Networks Infrastructure

Hydro One will have to be consulted during the detailed design of the Trunk Watermain to develop a occupancy permit or agreement between the Region of Waterloo and Hydro One, since a large portion of the preferred alignment is within an existing Hydro Corridor. The majority of the Corridor is not owned by Hydro One, but an easement is used by Hydro One to limit land owner’s use of the Corridor space. Approvals from Hydro One will be based on the coherence of the design to the previously identified Hydro One design criteria.

11.6 Kitchener-Wilmot Hydro Commission

The Kitchener-Wilmot Hydro Commission has a 10 metre wide utility easement through the existing Hydro Corridor south of Huron Road. Approvals or the development of a occupancy permit/agreement will be required for the crossing of this easement within the Hydro Corridor near the Huron Road crossing.

11.7 Union Gas

A required crossing of a 300mm diameter Union Gas Transmission Pipeline occurs to the west of Fischer Hallman Road along the preferred alignment. A crossing agreement with Union Gas will be required to complete construction in this area.

11.8 Utilities

For some areas of the alignment, various existing utilities (e.g. Bell, Rogers, etc.) will have to be relocated in order to accommodate the Trunk Watermain. Preliminary plan and profile drawings of the preferred
11.9 Approvals and Land Acquisition

11.9.1 Permanent and Temporary Working Easements

Final approval of the design will be required from municipal authorities, Hydro One Networks and regulatory agencies prior to commencing construction. During the detailed design phase of the project, consultation with these approval authorities will ensure that their requirements are adequately address on the design drawings and restrictions are included in the contract specifications.

11.10 Transportation Approvals

Transportation approvals from the City of Kitchener or Region of Waterloo road department will be required to be completed for all road closures during the construction of the Trunk Watermain. These approvals will be required to be submitted to the government owner of the road way. Generally the approvals include the installation of detour signage, notification of emergency services in addition to the assurance to the owner that the planned construction will permanently impact the condition of the road way.

12. Public and Agency Consultation

Consultation with the public (which includes stakeholders and interested parties) and government review agencies is a necessary and important component of the Municipal Class Environmental Assessment (EA) process. To meet the Class EA consultation requirements for this Schedule B project, the Region of Waterloo ensured that the public and review agencies were informed of the Study and given the opportunity to provide input (both written and verbal) on the assessment and evaluation process for the Trunk Watermain Alignment Alternatives. The following section provides a summary of the key points of contact that were undertaken throughout the course of the project, as well as a summary of comments received.

12.1 Public Notices

12.1.1 Notice of Study Commencement

The Notice of Study Commencement was developed to target the public, ministries, organizations, agencies and other stakeholders that may be affected by the Kitchener Zone 4 Trunk Watermain project.

The Notice of Study Commencement, dated September 5th, 2012, was published in local newspapers and mailed directly to identified stakeholders, with the objective of informing the general public and other stakeholders of the Study. The notice briefly outlined the purpose of the study and gave a brief background on the proposed project.

The Notice of Study Commencement can be found in Appendix C.

12.1.2 Public Information Centre (PIC)

The purpose of the Public Information Centre (PIC) was to update the public and relevant stakeholders on the status of the study, and to address any concerns they may have. Notice of the PIC was published in the local newspaper and sent to stakeholders on the mailing list on November 24th, 2012. Stakeholders remained on the mailing list for the duration of the public consultation process unless they requested to be removed. Individuals attending the PIC were asked to identify themselves on the sign-in sheet and to complete a comment sheet to ensure that their input was documented. A copy of the letter distributed to all stakeholders is presented in Appendix I.

For the Kitchener Zone 4 Trunk Watermain EA, the PIC was held on December 13th, 2011 at Huron Heights Secondary School from 5:00pm to 8:30pm, to present an overview of the project background, the potential Alternative solutions and to provide a forum for discussion with the public regarding the Study. The purpose of the PIC was to familiarize the public with the study and provide an opportunity to receive comments on the alignment Alternative. Eleven (11) attendees were recorded, primarily representing development interests within the Study Area.
The sign-in sheet from this information centre is presented in Appendix J. A copy of the presentation materials from the PIC is included in Appendix K.

12.1.3 Notice of Study Completion

This Notice is relevant for two reasons: it provides the public and relevant agencies with a final period of thirty (30) days to review the final conclusions of the Study, and it informs the general public of the outcome of the Study and the nature of the resulting project. The Notice of Study Completion will be filed in the fall of 2012.

12.2 Agency and Municipal Consultation

Various means of consultation were conducted with regulatory agencies, stakeholders, and municipalities during the Class EA Study process. Copies of the correspondence exchanged between the project team and the agencies and municipalities are provided in Appendix L. The project team held meeting with the Grand River Conservation Authority, the Ministry of Natural Resources, Hydro One Networks Infrastructure, The Kitchener-Wilmot Hydro Commission, The City of Kitchener and Private Developers such as Deerfeild Holmes and Activa.

As part of the EA consultation process, there is a necessity beyond general public consultation to solicit input from government agencies, non-governmental organizations (NGOs) and large water users in the municipality. This is done in accordance with the EA requirements by notification and provision of project documentation for review. Agencies are provided with the opportunity to comment at the start of the project and will only be removed from the circulation list if they so request. A copy of the mandatory contact list is presented in Appendix D. A copy of the Letter sent to the mandatory contacts is included in Appendix C. All of these agencies will be asked to review the completed Phase 1 & 2 report for comments prior to the close of the 30 day review period.

Table 12-1: Mandatory Agency and Industry Contacts

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<tr>
<th>Local Agency</th>
<th>Provincial Agency</th>
<th>Federal Agency</th>
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<tbody>
<tr>
<td>Residents</td>
<td>Ministry of the Environment</td>
<td>Environment Canada</td>
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<td></td>
<td>Ministry of Natural Resources</td>
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<td>Ministry of Culture</td>
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<td></td>
<td>Ministry of Agriculture and Rural Affairs</td>
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</tbody>
</table>

All correspondence received via the mandatory contacts, or though the public consultation, is presented in Appendix K. Their comments have been incorporated into the analysis and preliminary design of the Preferred Component identified in Section 9.1.
12.3 Public and Agency Comments and Responses

A summary of the comments received from agencies and the public during the Class EA process are included below. Please note that not all comments were provided in writing, but copies of the actual written correspondence received are provided in Appendix L.

12.3.1 Regulatory Agency Comments and Responses

Government and agency responses have been received predominantly by regular mail. Responses received to date are documented below:

**Ministry of Aboriginal Affairs**

Comment: Confirmed their receipt of the Notice of Study Commencement for the project.
- Identified potential First Nations groups which may have existing or asserted rights or land claims within the Study Area.
- Identified contacts to be included in future correspondence regarding the project.

Response: No response on record

**Ministry of the Environment**

Comment: Confirmed their receipt of the Notice of Study Commencement for the project.
- Confirmed that the work planned for through the current Class EA will address the need to improve water supply.
- Noted the documentation requirements of a Class EA, and the avenues stakeholders could follow if their concerns are not addressed though the Project File.
- Noted that as part of the required stakeholder and agency consultation, proponents are advised to contact potentially affected Aboriginal communities in the project area. Also provided an internet link to agencies that can be contacted to identify which Aboriginal communities may be potentially affected in the project area.
- Requested a copy of the Project File upon EA completion.

Response: No response on record

**Infrastructure Ontario (Formerly the Ontario Realty Corporation)**

Comment: Confirmed their receipt of the Notice of Study Commencement for the project.
- Confirmed that Infrastructure Ontario managed property is not within Study Area.
- Noted that they have no other concerns with this project undertaking and have asked to be removed from the circulation list with respect to this project.

Response: No response on record

**Ministry of Municipal Affairs and Housing**

Comment: Confirmed their receipt of the Notice of Study Commencement for the project.
- Confirmed that the work planned for through the current Class EA will address the need to improve water supply.
- Noted that consideration should be given to current policy on land use planning matters for Ontario, and specific to the City of Kitchener, the Provincial Policy Statement 2005 (PPS) and the Growth Plan.
- Noted that where there is a conflict between the Growth Plan and the Provincial Policy...
Statement, the Growth Plan prevails unless the conflict is between policies relating to the natural environment or human health. In these situations, the policies that provide more protection to the natural environment or human health prevail.

Noted that their comments on this undertaking should not be considered as approval for any other related applications under the Planning Act or other provincial legislation that may be required, may be related to, or may result from this project.

Response: No response on record

Grand River Conservation Authority (September 14, 2011)

Comment: Confirmed their receipt of the Notice of Study Commencement for the project.

Noted their interest and concern in a number of features within the Study Area including, but not limited to, multiple tributaries of Strasburg Creek and several wetlands.

Noted that they would like to have the opportunity to provide comments during the Class Environmental Assessment process to ensure that their interests are considered in a manner that addresses their policy requirements.

Noted a permit from GRCA will likely be required under Ontario Regulation 150/06 for the implementation of the Preferred Component.

Response: Meeting Held October 28th, 2011 with GRCA, Region of Waterloo and GENIVAR Inc., Meeting minutes in Appendix L.

Ministry of Natural Resources (November 10, 2012)

Meeting Organized to discuss the project.

Comment: Jefferson Salamander Habitat located within the Study Area will require a permit if crossed by the Trunk Watermain. Guidelines of the permitting process are: 1) avoidance 2) impact on the species at risk and 3) overall benefit to species at completion of project. The permitting process can take 6-12 months to complete.

Response: Information was taken into consideration throughout project process. Meeting minutes in Appendix L.

Heathshore Homes (December 12, 2011)

Comment: Heathshore Homes owns the property surrounding the Transformer Station to the north of Huron Road. Concerns with the potential easement from the property surrounding the Transformer Station.

Response: Response included the potential to avoid private property by utilizing Kitchener-Wilmot Hydro Property. A meeting occurred to discuss this option with Kitchener-Hydro, which was determined to not be feasible. Additional Components were discussed at added to the evaluation. Meeting minutes in Appendix L.

Grand River Conservation Authority (December 19, 2011)

Comment: Confirmed their review of the first draft of the Natural Heritage Evaluation related to the project.

Noted that the GENIVAR report does not provide an assessment of impacts associated with the preferred Component and does not provide an evaluation of routing Components, which could have a direct impact on an unevaluated wetland and cold water tributary of Strasburg Creek east of Fischer Hallman Road.

Requested that an assessment of fish habitat at the location where the cold water tributary could be impacted be provided.

Recommended consulting with the Ministry of Natural Resources on any records they
may have with regard to the fish community within the southern tributary of Strasburg Creek to help determine an appropriate construction timing windows.

Noted a more detailed assessment of site-specific impacts on wetlands, watercourses and fish habitat is required. It will be necessary to avoid interfering with shallow groundwater flows that sustain ecological features and functions within the broader Study Area and within the area regulated by the GRCA.

Recommend that the Ministry of Natural Resources be contacted prior to field work being undertaken to determine the presence of Species at Risk.

Response: No response on record. Study Area was expanded to include Component routing options for the Kitchener Zone 4 Trunk Watermain. Recommended assessments were completed though the Natural Heritage Assessment

MTE Consultants Inc. (January 2, 2012)

Comment: Concerns with the timing of the Kitchener Zone 4 Trunk Watermain and the competition of Eby Estates subdivision at Isaiah Drive. For the completion of the subdivision a trail is required to be installed through the Hydro Corridor.

Request to have a dialog to confirm the impacts of the Trunk Watermain to their project.

Response: Responded with the preliminary timeline of the project. Ensured that MTE is on the stakeholders list. Later a meeting was held with MTE, Activa and MHBC on February 21st, 2012.

May 4th 2012 – Additional meeting with Steve Roorda of MTE and Tim O’Brien of the City of Kitchener to discuss restoration around Isaiah Drive. MTE and the Region of Waterloo agreed that MTE will provide a letter of credit for remaining works within the Hydro Corridor to be completed with construction of the Trunk Watermain.

Kitchener-Wilmot Hydro Commission (January 17, 2012)

Meeting Organized to discuss the project.

Comment: Construction of the Kitchener Zone 4 Trunk Watermain though existing Transformer Station property is not feasible. Identified locations of existing and planned easements within the Hydro Corridor for Secondary Distribution.

Response: Information was taken into consideration throughout project process; Components utilizing Kitchener-Wilmot Hydro Commission property were removed from further evaluation and alignments were moved to avoid the identified Secondary Hydro easement. Meeting minutes in Appendix L.

Weiss Development Representatives (February 21, 2012)

Meeting Organized to discuss the project.

Comment: Discussion of the planned Weiss development. Land within this development is not owned by the City of Kitchener, a permanent easement would be required in this area. This development is likely be constructed at the time of the installation of the Kitchener Zone 4 Trunk Watermain.

Response: Information was taken into consideration throughout project process. Meeting minutes in Appendix L.
Ottawa Street South Development Representatives (March 19, 2012)

Meeting Organized to discuss the project.

Comment: Discussion of the impact the Kitchener Zone 4 trunk Watermain will have on the planned development located at 1994 Ottawa Street South. The Trunk Watermain will impact the south east corner of the property where connections to existing infrastructure are planned to be located.

Response: Information was taken into consideration throughout project process. Meeting minutes in Appendix L.

City of Kitchener (July 10, 2012)

Meeting Organized to discuss the project.

Comment: Discussion of the project components located within City of Kitchener Road Right of Ways (Parkvale Drive and Huron Road). Phasing with the Becker Estates development was suggested as an alternative to construction within the newly constructed Huron Road.

Response: Information was taken into consideration throughout project process. Meeting minutes in Appendix L.

Becker Estates Representatives (July 30, 2012)

Meeting Organized to discuss the project.

Comment: Discussion of the potential for phasing the installation of the Kitchener Zone 4 Trunk Watermain with the construction of the Becker Development. It was determined that this is possible if scheduling of the various projects aligns.

Response: Information was taken into consideration throughout project process. Meeting minutes in Appendix L.

Any comments or concerns, within the prescribed 30 day period can be directed to:

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