APPENDIX A

Consultation Summary

Consultation Summary: Round 1

The first round of consultation introduced the study, process, and work to date. The goal of the first round of consultation was to gain preliminary input on roadway features of importance. Emphasis was also placed on a draft set of Evaluation Criteria to be used to evaluate alternative road designs later in the process.

1 Consultation Events & Notification

The first round of consultation included a Public Information Centre (PIC) for any interested members of the public. It also included meetings with each of the Technical Agencies Committee and the Stakeholder's Group. The PIC was held on June 25, 2013. The Technical Agencies Committee Workshop and the Stakeholder's Group Workshop were held on August 29, 2013.

A Notice of Study Commencement and invitation to the first PIC was published on June 10, 2013. The notice was made available on the Study Webpage (http://www.oakville.ca/residents/eas-burnhamthorpe.html) and was mailed to residents and property owners along the study corridor.

Early in the study process, the Project Team identified potential members of the Technicial Agencies Committee and Stakeholder's Group. These individuals or agencies were contacted via email and asked to attend the first round of Workshops.

In September 2013, a newsletter was sent to properties along the study corridor with a summary of consultation results and next steps in the study process. A copy of the newsletter follows this document.

2 Consultation Summary

2.1 Public Information Centre #1

The first Public Information Centre (PIC) for the Burnhamthorpe Road Character Study was held on June 25, 2013. At the PIC, participants were given the opportunity to learn about the study and give preliminary input. Information was presented on a series of display boards and members of the Project Team were available to gather input and answer questions. A total of 35 participants attended the first PIC.

Several methods were used to obtain input from participants at the first PIC. These methods are outlined below, along with their results.

Written Comments: Comment Cards

Method: Comment cards were provided for written comments. Participants were asked to submit their comment cards into a comment box.

Results: The majority of participants chose alternate methods of providing input. One comment card was submitted. The comment suggested that there was a lack of notice given prior to the PIC.

Spoken Comments: Note-Taking Form

Method: Many of the Project Team members at the PIC recorded participants' spoken comments on a form. The form included questions and topics to gain input on, including roadway features, key issues along the corridor, and the draft evaluation criteria.

Results: A range of spoken comments were recorded. General comment themes and participants' concerns included the following:

- Several participants voiced concerns regarding traffic associated with the New North Oakville Transportation Corridor (NNOTC), the existing Burnhamthorpe Road and the future Burnhamthorpe Road, and requested that traffic on future Burnhamthorpe Road be minimized;
- Concerns for the approved North Oakville Master Plan's land use designations and the impacts of these future land uses was apparent;
- One participant focused on the need to protect existing natural and cultural heritage features. Simple road designs are preferred to maximize protection of these features and preserve the existing character of the road. The participant brought attention to the existing floodplain at Eighth Line. The participant emphasized the importance of Evaluation Criteria related to cultural and natural heritage, and suggested that a criterion accounting for impacts to groundwater resources be added;
- A comment was made that many seniors currently live in the area and that landowners along the corridor wish to maximize land values prior to retirement;
- Access to farm properties is a concern. Accesses must be wide enough for large farm equipment to access fields;
- Several participants highlighted the importance of incorporating facilities for active transportation into the design for Burnhamthorpe Road. Particularly, the need for cycling facilities was expressed; and
- Participants indicated interest in ongoing involvement in the study process and participation in the second PIC.

Graffiti Board

Method: A large aerial map of the Study Corridor, overlaid with the conceptual road network of the North Oakville Master Plan, was provided on a table. Markers and sticky notes were also provided. Participants were asked to mark the "Graffiti Board" with any comments, particularly regarding key issues in specific areas along the corridor and areas where a certain roadway feature would be suitable.

Results: Comments primarily concerned impacts to individual properties, heritage properties, and aesthetics. There was also significant focus on the approved alignment of the New North Oakville Transportation Corridor (NNOTC), which is planned to be constructed adjacent to the Study Corridor. No comments were made regarding desired roadway features.

"Graffiti Board" comments included the following:

- Concerns about property infringement and inquiries about compensation that would be provided;

- Comments and concerns related to the approved New North Oakville Transportation Corridor (NNOTC). These included a comment on the NNOTC's alignment and concerns about traffic on portions of the NNOTC running through residential neighbourhoods;
- A comment regarding the negative visual impact of existing hydro poles on Neyagawa Blvd., and request to minimize the visual effects of utility infrastructure on Burnhamthorpe Road;
- Notes about existing heritage features along the Study Corridor and in adjacent areas; and
- Concerns about impacts to driveways and septic systems.

Draft Evaluation Criteria: "Dot-mocracy"

Method: A set of Draft Evaluation Criteria was provided on display boards for public review and comment. Draft Criteria were organized into six categories: Operational, Natural Environment, Urban Design, Socio-economic Environment, Cultural Environment, and Financial. PIC participants were each provided with four numbered "dot" stickers. Participants were asked to use the stickers to indicate which criteria they felt should be considered of highest priority, with "1" being highest and "4" being lowest.

Results: Participants generally rated Urban Design criteria highest. The criteria *Land Use Designations / Context* and *Planned Building Scale & Orientation* received the highest number of dot stickers (7 and 5 votes, respectively, with many votes assigned priorities "1" and "2"). *Community Features / Character*, a criterion under the Socio-economic Environment category, was also ranked highly with 5 votes, although all votes were assigned priorities of "3" and "4". Under the Operational criteria category, the *Transit* and *Cycling / Pedestrians* criteria each received 3 votes, with the latter assigned votes of priority "1" and "2" only. Natural Environment criteria were not rated highly, with the exception of the *Natural Heritage Features* criterion with 3 votes of mixed priority. Criteria under the Cultural Environment and Financial categories were generally not ranked highly.

Summary

The degree of interest shown at the first PIC appeared to be related to the Burnhamthorpe Road Character Study, as well as other studies or policies pertaining to North Oakville. A number of concerns were raised regarding the approved North Oakville Master Plan, particularly related to its land use designations and conceptual road network. Interest in and concerns regarding the NNOTC alignment were also noted.

Comments relating to the Burnhamthorpe Road Character Study emphasized the importance of aesthetics and preserving the existing natural heritage features and character of the area. Discussion and comments on desired roadway features highlighted the desire for provision of active transportation facilities including dedicated cycling lanes.

Many participants expressed interest in continued involvement in the study and participation in the second and final PIC. This highlighted the need to keep members of the public informed throughout the study.

PIC materials, including the display boards and a copy of the note-taking form, are provided following this document.

2.2 Technical Agencies Committee and Stakeholder's Group Workshop #1

In the initial stages of the study, a Technical Agencies Committee (TAC) and Stakeholder's Group were established. The role of the TAC is to provide specialized expertise to the project team, representing their

agency in identifying planning and design issues in the study, communicating study information within their agency and providing feedback on information and ideas presented by the project team. The Stakeholder's Group represents the interests of diverse groups within the local community; the role of its members is to help the project team develop an understanding of unique community values, issues and concerns. The Stakeholder's Group also reviews project information and materials as the study progresses, disseminates this information to their organizations or groups, and provides feedback on behalf of these groups.

Two workshops were held with each of the TAC and Stakeholders' Group at different points during the Study. The first of these workshops was held on August 29, 2013. The purpose of the first workshop was to keep TAC and Stakeholder's Group informed of work to date, gather ideas of the role of a Burnhamthorpe Road as a Character Road, and gain input on the set of draft Evaluation Criteria. Workshop format and results are described in the following sections.

2.2.1 Workshop Format

Presentation

Both of the TAC and Stakeholder's Group workshops began with a presentation and discussion about the purpose of the project and work to date. Special focus was placed on the results of the project team's corridor assessment in the areas of urban design, transportation, urban forestry, utilities and municipal servicing, and stormwater management considerations. Existing conditions, any relevant policies and plans, and implications of the results of the assessment were presented for each of these topics. The TAC and Stakeholder's Group were also advised of next steps in the study process.

Exercise #1: What is a Character Road?

The TAC and Stakeholder's Group members participated in the workshop's first exercise. To begin the exercise, the project team presented the NOESP's definition of Burnhamthorpe Road as a future Character Road:

> *Existing Burnhamthorpe serves an **Avenue/Transit Corridor** function in the **Trafalgar Urban Core Area**, and in the area outside the Trafalgar Urban Core Area will serve either an **Avenue/Transit Corridor** function or a **Connector/Transit Corridor** function to be determined through the area design plan process or required design study.*

Participants were then provided with "sticky notes" and encouraged to record their own ideas of the meaning of a Character Road, or what features and functions the future Burnhamthorpe Road should serve. Sticky notes were then grouped into general categories, and a group discussion was held regarding the responses.

Exercise #2: Draft Evaluation Criteria Dot-mocracy

The purpose of the second exercise was to gain input on the set of draft evaluation criteria that was developed at the outset of the study. Members of the public had previously given input on these draft criteria at the first PIC.

In this "dot-mocracy" exercise, participants were each given five "dot" stickers and encouraged to place the dots on the criteria that they felt were of highest priority. Prior to placing their dots, participants were given time to review the set of draft criteria, ask questions, and make suggestions for criteria to add or remove. Following the exercise, further discussion was held on the prioritization of criteria.

2.2.2 Technical Agencies Committee (TAC) Workshop Results

The first TAC workshop was held from 1:30 pm to 3:30 pm on August 29, 2013. Attendees at the TAC workshop are listed below.

Attendees:
Jane Devlin, MNR
Laureen Choi, Halton District School Board
Fabio Cabarcas, Halton Health
Doug Corbett, Halton Planning
Heinz Hecht, Town of Oakville

Regrets:
Jane DeVito, Conservation Halton
Jon Foreshew, Oakville Hydro
Marian Wright, Rogers Communications
Ann Newman, Enbridge
Wendy Botts, Bell
John Sawyer, Oakville Chamber of Commerce
Lisa Myslicki, Infrastructure Ontario

General Spoken Comments

Throughout the presentation and workshop discussions, members of the TAC provided input to the project team based on their professional expertise and general opinion. Spoken comments and topics of discussion that were raised are listed below:

- There is a need for cycling lanes. Burnhamthorpe Road presents an opportunity to be a precedent for cycling (like Ottawa, Vancouver, and Copenhagen) as well as for pedestrian infrastructure. It is time for a change from the typical "cookie-cutter" cycling lanes that are presently used in other areas of Oakville and Canada.
- Most of the current development applications are for residential on the south side of Burnhamthorpe Road – not many applications for the employment lands (intended for the north side in the NOESP) have been submitted yet.
- The Halton District School Board emphasizes reducing barriers to walking to school by meeting the following objectives:
    - Enhance walkability and bikeability;
    - Provide safe crossings; and,
    - Ensure connectivity through shorter pedestrian routes and connections to Burnhamthorpe Road.
- A proposed Halton District School Board elementary school is expected to be constructed within 20 years in the vicinity of Burnhamthorpe Road.
- Proposed Union Gas pipelines in the vicinity of the study corridor pose a new utility constraint for the study. The preferred pipeline route should be considered in the development of alternative road designs.
- Environmental comments and concerns include:
    - Stream crossings:
        - The design of culverts impacts fish habitat; and

        - Ditches and piping each have different impacts on water flowing into creeks and should be selected and designed with these considerations.
    - Impacts downstream, including impacts on Sixteen Mile Creek;
    - Endangered species (including Silver Shiner in Sixteen Mile Creek) – commitments for future detailed design;
    - Wildlife crossings should be planned or considered now; and
    - No provincially significant wetlands and woodlots fall within the corridor, but some are located relatively close.

Exercise #1: What is a Character Road?

In the first exercise, members of the TAC recorded their perception of Burnhamthorpe Road as a future Character Road. A group discussion was also held at this time. Participants expressed a strong preference for dedicated active transportation infrastructure with adequate separation of sidewalks and cycling paths from vehicle traffic. There was also discussion about transforming the study corridor into a "destination" where people come to walk, cycle, shop and socialize.

Written comments received from members of the TAC during this exercise are listed below. Comments are organized into the categories of creating a multi-modal corridor, maintaining existing character, relationship to land uses, traffic considerations, and environment. The most popular focus of the comments received was the multi-modal category: the majority of TAC workshop participants clearly expressed the need to integrate walking, cycling, transit and automobile infrastructure along Burnhamthorpe Road.

<u>Creating a Multi-modal Corridor</u>

- Provides a multi modal corridor
- Transit corridor and multi-user friendly design
- Low vehicle traffic generation
- Bike friendly – ideally, separate bike lanes and available bike parking
- Bikeable
    - Exclusive infrastructure
    - Bike parking
    - Separation from parked cars, moving motor vehicles, and pedestrians
    - Connected to other roads and adjacent land uses
    - Low motor vehicle speed
- Walkable
    - Sidewalks
    - Benches
    - Shade
    - Pedestrian crossing
    - Transit oriented
    - Connected to land uses, residential areas
    - Low motor vehicle speed

- Queen Street / Picton Street in Niagara-on-the-Lake as a Character Road and how it has become a tourist destination – creating an environment to facilitate an enjoyable pedestrian experience
- Pedestrian friendly with accessibility and interesting focal points (i.e. benches, greenspace)
- People friendly / accessible
- Safely built into the design
    - Lighting, visibility
    - Distinction between car space and pedestrian space

Maintaining Existing Character

- Considers the existing environment and character

Relationship to Land Uses

- Low density / medium mixed use development

Traffic Considerations

- Safely design transition to/from Character Road to Regional Road connections (Neyagawa, Trafalgar, & Ninth Line)
    - Speeds (road, operating)
    - Driver behaviour

Environment

- Community/people and fish & wildlife need to share the same environment – this new infrastructure will affect fish & wildlife populations. Build as low-impact as possible!
    - Fish & wildlife friendly crossings…

Exercise #2: Draft Evaluation Criteria Dot-mocracy

In the second workshop exercise, members of the TAC were presented with the draft evaluation criteria for assessing alternative road designs in the upcoming stages of the study. Prior to voting on preferred evaluation criteria, the TAC discussed any desired changes to the set of criteria. Particularly, the TAC agreed that the *Cycling/Pedestrians* criterion should be divided into two separate criteria to ensure that the needs of both pedestrians and cyclists are met in the selection of a preferred design.

Consistent with the comments received in Exercise #1 regarding the importance or creating a multi-modal corridor, the evaluation criteria *Transit* and *Cycling/Pedestrians* were among the most popular in the voting exercise, with 5 and 6 votes, respectively. The *Natural Heritage Features* criterion was also ranked highly, with 5 votes. A number of criteria received 2 votes, including *Number of Lanes, Local Street Connectivity, Access Management, Wildlife and Wildlife Habitat,* and *Boulevard Treatment*.

The remaining votes were scattered across the six evaluation criteria categories of Operational, Natural Environment, Urban Design, Socio-Economic, Cultural Environment, and Financial criteria. No votes were received for the criteria *Goods Movement, Utilities/Stormwater Management, Street Lighting, Community Features/Character, Business, Archaeology, Built Heritage,* and *Restoration Costs.*

Comments on Right-of-Way Width

The TAC workshop ended with a discussion on the desired future right-of-way width. Participants were asked whether they had any comments or concerns regarding this issue. Spoken comments included the following:

- The width of cycling lanes is important. Car doors can be a hazard to cyclists – try not to locate cycling lanes adjacent to on-street parking.
- Oakville's standard cross sections do not need to be followed in this study. Design a cross section that is unique to the future Burnhamthorpe Road.
- Motor vehicle speeds interfere with pedestrian activity and separation of pedestrians from traffic should be a priority.
- Shade and weather protection are important for pedestrians and cyclists.

2.2.3 Stakeholder's Group Workshop Results

The first Stakeholder's Group workshop was held from 7:00 pm to 9:00 pm on August 29, 2013. Attendees of the Stakeholder's Group workshop are listed below.

Attendees:
Nunzio Tumino
Leon Haas, Oakville Cycling Club
Karen Brock, Oakville Green
Joe Lynn, Ren's Pet Depot

Regrets:
Spencer Williams, King's Christian Collegiate
Robert Cohen, Markay Homes

General Spoken Comments

Throughout the presentation and workshop discussions, members of the Stakeholder's Group provided input to the project team based on their interests and general opinion. Spoken comments and topics of discussion that were raised are listed below:

- Passive recreational space is needed in North Oakville.
- Burnhamthorpe Road is used by many cyclists in the area mainly because it is currently the only safe way to get to Sixth Line. While it is also a nice route for training, safety is the primary reason that cyclists use the study corridor.
- Future traffic (beyond 2031) may not be adequately accommodated by a two-lane road due to the expected dramatic population growth in North Oakville.
- There is a need to change travel behaviour to shift toward a preference for walking, cycling and transit use.
- The majority of car trips are less than two kilometres long. Focus should be placed on making walking and cycling more attractive for these frequent, shorter trips.

Exercise #1: What is a Character Road?

Members of the Stakeholder's Group showed a high level of interest in the first exercise. A long discussion was held wherein participants spoke of their visions of Burnhamthorpe Road as a Character Road. Like the TAC, Stakeholder's Group members envisioned future Burnhamthorpe Road as a

destination where people go to walk, cycle and socialize. Maintenance of Burnhamthorpe Road's rural landscape and character is also desired, through providing shaded and naturalized areas, parks and markets, cedar fence posts, and other distinct features or characteristics. A safe walkable and bikeable corridor is desired, with dedicated pedestrian and cycling facilities buffered from busier areas and heavy traffic. One participant expressed a desire for a "winding" road for added interest, and the idea of curving the road where it results in the preservation of significant trees along the corridor was raised.

Written comments received from members of the Stakeholder's Group during this exercise are listed below. Comments are organized into the categories of creating a multi-modal corridor, maintaining existing character, relationship to land uses, and general streetscape features / design.

Creating a Multi-modal Corridor

- Allow for active transport (walk, cycle) and have characteristics that will make people want to linger

Maintaining Existing Character

- Retain some of the rural character that people enjoy – wire fences, large trees, laneways
- With increased residential areas, maintain a "rural" piece that would be a good place for a market

Relationship to Land Uses

- I would like to see this road to be a corridor of business, stores, restaurants, and pedestrians like some European towns with window shopping, little cafés, etc.

General Streetscape Features / Design

- Two lanes in each direction with a wide centre boulevard which has a winding, paved multi-use trail and landscaped with mature trees, bushes, & annual gardens
- Shady, interesting features that attract individuals or families
- Road – gentle wind, more interesting
- Cycle/pedestrian – winding, shaded trails
- Trees & shrubs / two lanes / some residential / fewer lights / pedestrian & bike paths / ease of access to urban core

International Precedents

During this exercise, the Stakeholder's Group was additionally asked for any international precedents that they feel exhibit features or characteristics that would be successful when applied to the future Burnhamthorpe Road. Participants identified the following streets or neighbourhoods as precedents:

- La Rambla – Barcelona, Spain
    - Wide roadway with central pedestrianized area separated from traffic
    - Abundant vegetation and appealing aesthetics
    - Safe crossings
    - A "destination"

- Lake District, England
    - Rural character roads
- Collins Avenue – Dublin, Ireland
    - Residential street with attractive pedestrian environment nice for walking
- Rattray Marsh – Mississauga, Ontario
- Mont Tremblant Village, Quebec

Exercise #2: Draft Evaluation Criteria Dot-mocracy

In the second exercise, members of the Stakeholder's Group voted on draft evaluation criteria that they felt should be prioritized. The most popular criterion was *Cycling/Pedestrians*, with three votes. Two votes were allotted to each of the criteria: *Street Lighting, Land Use Designations / Context, and Boulevard Treatment.* One vote was given to *Number of Lanes, Local Street Connectivity, Natural Heritage Features, Wildlife & wildlife habitat, Community Features / Character,* and *Cultural Heritage Landscape.* No votes were allotted to any criteria within the Financial category.

2.2.4 Summary

Members of the TAC and Stakeholder's Group participated actively in the workshops and provided the project team with a variety of comments and specialized insight. However, it was clear that creating a multi-modal future Burnhamthorpe Road is a priority for most of the agencies and community groups involved. Dedicated cycling lanes are desired on Burnhamthorpe Road, along with a safe and attractive pedestrian environment with wide sidewalks, shading, and street furniture. Transit is also a priority and should be given greater consideration in the forthcoming stages of the Burnhamthorpe Road Character Study.

Another prevalent theme in the workshops was the desire to preserve some aspects of Burnhamthorpe Road's current rural, rolling and vegetated character. This may be achieved through tree preservation and extensive street planting, maintenance of some naturalized areas, watercourses and habitats, preservation of the natural topography of the area, and preservation of existing heritage buildings and properties along the corridor.

Workshop materials, including agenda and presentation, are provided following this document.

Burnhamthorpe Road
CHARACTER STUDY

Newsletter # 1
September 2013

OUR STUDY HAS BEGUN!

North Oakville is poised for significant population and employment growth. To accommodate this growth a new regional road, the New North Oakville Transportation Corridor (NNOTC), is being built by Halton Region just north of Burnhamthorpe Road and will address future east-west travel demands in North Oakville.

Burnhamthorpe Road is currently designated as a regional arterial road under the jurisdiction of Halton Region. However, once completed, the future NNOTC will replace Burnhamthorpe Road's regional road function. The remaining portions of the existing Burnhamthorpe Road will be transferred to the Town and will become a "Character Road". This will allow Burnhamthorpe Road to transition into a vibrant and pedestrian-friendly street as development evolves along the corridor.

In the spring of 2013, the Town of Oakville initiated the Burnhamthorpe Road Character Study and Class Environmental Assessment.

STUDY PURPOSE

The purpose of the Burnhamthorpe Road Character Study is to determine appropriate road and streetscape design for the future Burnhamthorpe Road, including the required right-of-way width.

OUR STUDY PROGRESS:

PUBLIC INFORMATION CENTRE #1

A Public Information Centre (PIC) for the Burnhamthorpe Road Character Study was held on June 25, 2013. At the PIC, participants were given the opportunity to learn about the study and give preliminary input. Information was presented on a series of display boards and members of the Project Team were available to gather input and answer questions. A total of 35 participants attended the first PIC. PIC materials are available at **www.oakville.ca/residents/eas-burnhamthorpe.html.**

YOUR INPUT IS IMPORTANT!

The Town of Oakville appreciates your feedback and ideas and we encourage you to get involved.

To learn more about this study including meeting dates, presentation material, please see our website at **www.oakville.ca/residents/eas-burnhamthorpe.html.**

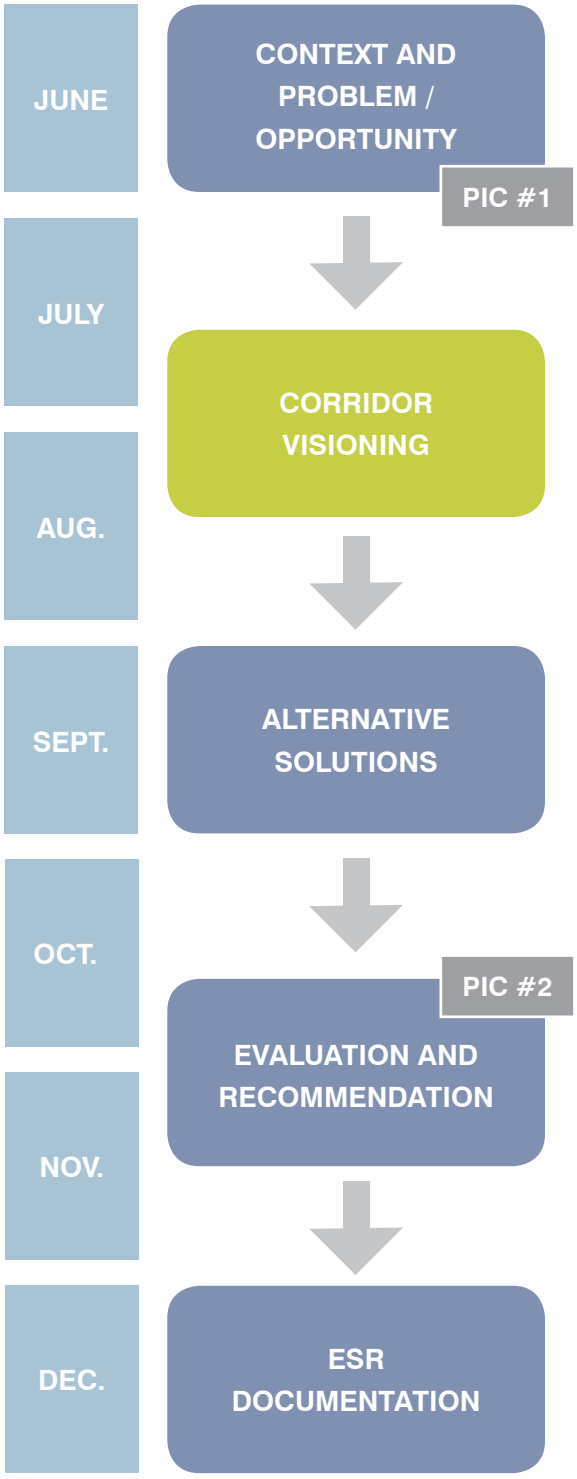
Contact us:

Lin Rogers, P. Eng
Project Manager
burnhamthorpe@oakville.ca
905-845-6601 ext. 3236

Participants at the first PIC

Burnhamthorpe Road
CHARACTER STUDY

2013:



OUR STUDY PROCESS

Following the input received at the first PIC, the Project Team is currently conducting a detailed assessment of the study corridor and developing a corridor vision, with special focus on the following considerations:

- Transit provisions
- Urban Design
- Context Sensitive Design
- Traffic Capacities Analysis
- Active Transportation Provisions
- Parking Provisions
- Accessibility Provisions
- Urban Forestry Requirements
- Utility Requirements
- Municipal Servicing Requirements
- Stormwater Management

A set of alternative solutions will be developed and evaluation criteria will be finalized based on the results of the first PIC, consultation with stakeholders, other input received, and the corridor assessment.

In the fall, a study tour of the corridor will be organized to highlight opportunities, constraints, key destinations, and design alternatives. An email invitation combined with a brief information package will be distributed to members of the Stakeholder Group in advance of the tour.

The Project Team will meet several times with the Burnhamthorpe Road Character Study's Technical Agencies Committee (TAC) and Stakeholders' Group to gather specific input. The TAC's role is to provide specialized expertise to the Project Team, while the Stakeholders' Group will help the Project Team to develop a strong understanding of unique community values, issues and concerns.

A second and final PIC will be held in the fall of 2013. At the second PIC, design alternatives will be presented and input will be gathered on those alternatives to select the preferred and inform the Recommended Design.

Finally, the project will be documented in an Environmental Study Report (ESR). The project is expected to be completed in December 2013.

Welcome

BURNHAMTHORPE ROAD
CHARACTER STUDY

Welcome to the first Public Information Centre (PIC) for the Burnhamthorpe Road Character Study Environmental Assessment.

North Oakville is poised for significant population and employment growth. To accommodate this growth a new regional road, the New North Oakville Transportation Corridor (NNOTC), is being built just north of Burnhamthorpe Road and will address future east-west travel demands in the area. This will allow the existing Burnhamthorpe Road to transition into a vibrant and pedestrian-friendly street as development evolves.

At this PIC, you will have the opportunity to:

- ❖ Learn about the study and process.
- ❖ Review various design features.
- ❖ Review draft Evaluation Criteria to assess alternative right-of-way configurations and design features.
- ❖ Provide us with your input and ask questions.

Study Corridor

Opportunities to provide meaningful input into the new character design for Burnhamthorpe Road will be provided throughout the Study.

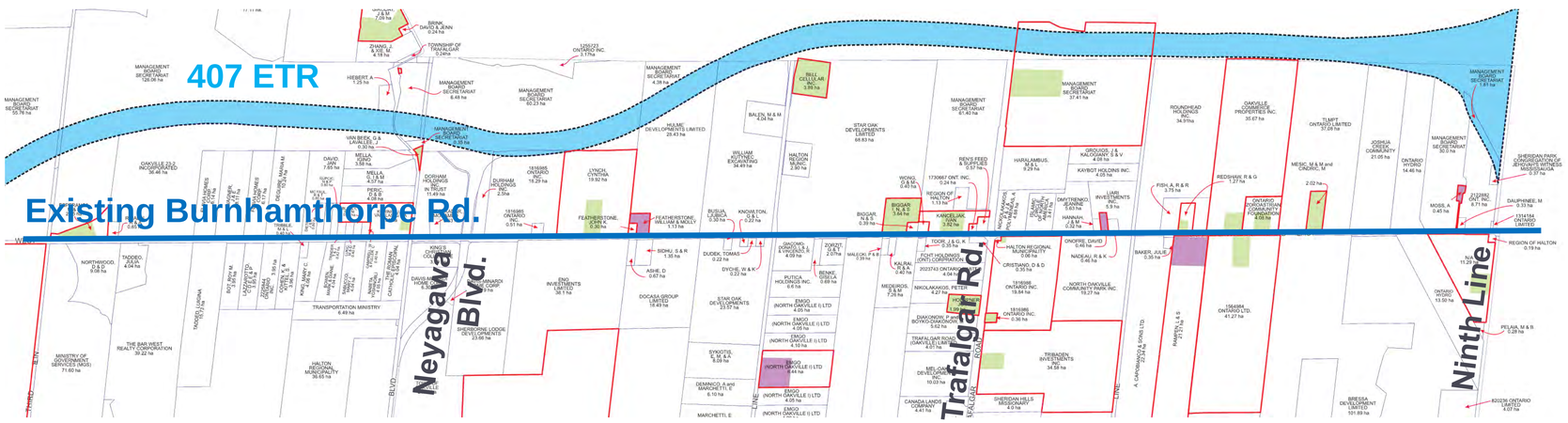
Please sign in at the front desk.
We encourage you to complete a comment sheet before leaving.

OAKVILLE

From Country Lane…..

Existing Land Uses and Features

Burnhamthorpe Road is currently designated as a Regional Road under the jurisdiction of Halton Region, functioning as a rural route. Farms and rural residential properties line the road, along with several commercial and institutional facilities.



Heritage Information

- Complete Heritage Parcel Location
- Listed
- Designated

Town of Oakville
Community & Development Commission
Strategic Business Support
Source Info: MPAC / SAS Provincial Database
Revised: JUNE 2013 Revised by: D.A.

0 m 250 m 500 m 1000 m 1500 m 2000 m
Scale 1:10,000
NORTH

Implementation of North Oakville's Master Plan will see the development of vibrant, compact communities along portions of the corridor. A new road design is needed to support this approved transition.

There is a need to protect natural heritage features and complement the existing character of the road, while supporting planned future development of the corridor and in the surrounding area.

….To Character Road

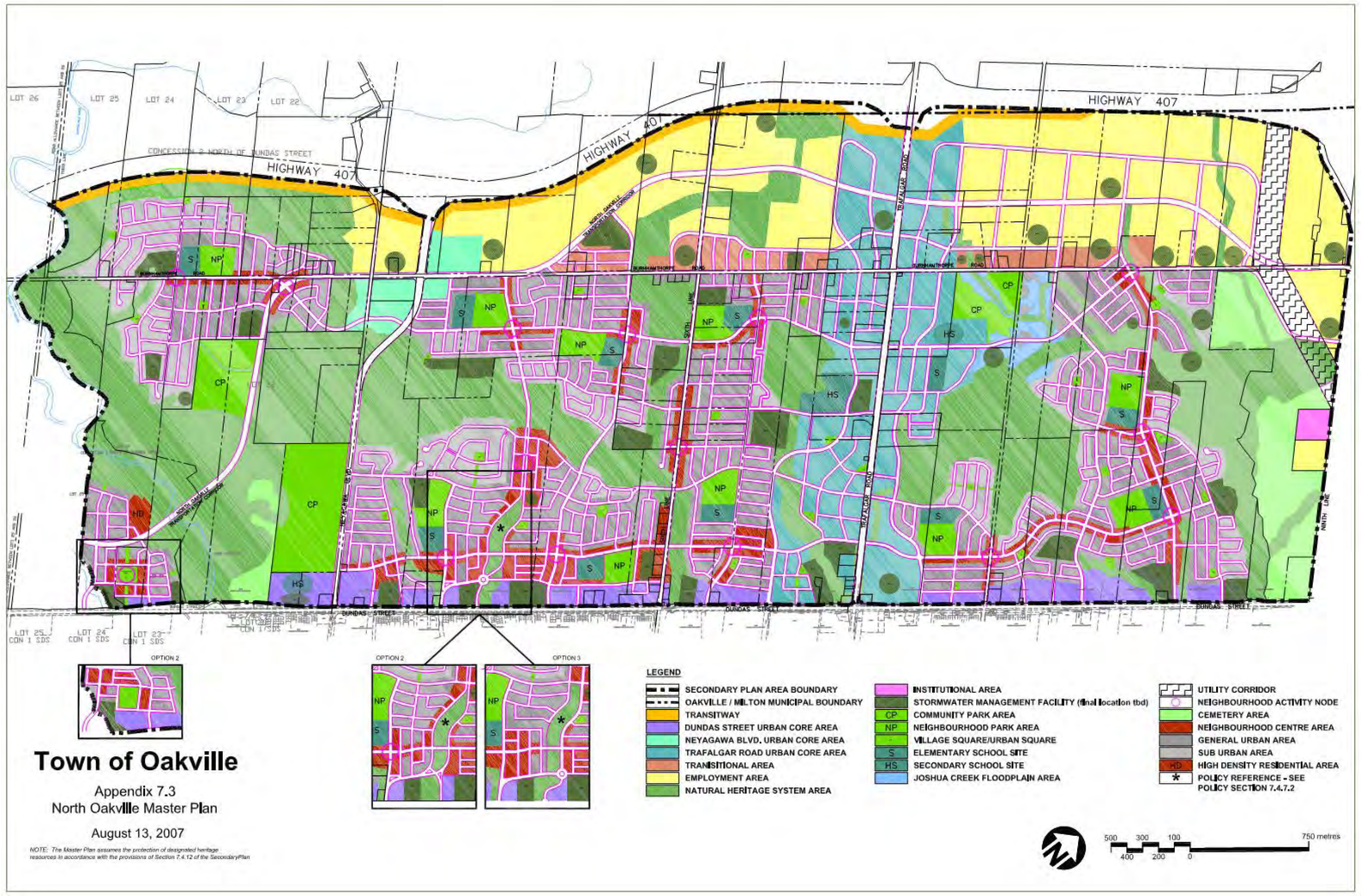
Approved North Oakville Master Plan

The North Oakville East Secondary Plan establishes a new vision for Burnhamthorpe Road as a *Character Road* – one that is vibrant, pedestrian-friendly and transit-supportive.

The Secondary Plan includes a Master Plan (shown at right). The Master Plan delineates planned Urban Core Areas, a Natural Heritage and Open Space system, Employment Areas, and Transitional Areas.

Burnhamthorpe Road traverses these unique planned areas. As the Master Plan is implemented and the population of North Oakville approaches its ultimate target of 45,000 to 55,000, the landscape surrounding Burnhamthorpe Road will evolve and become increasingly diverse.

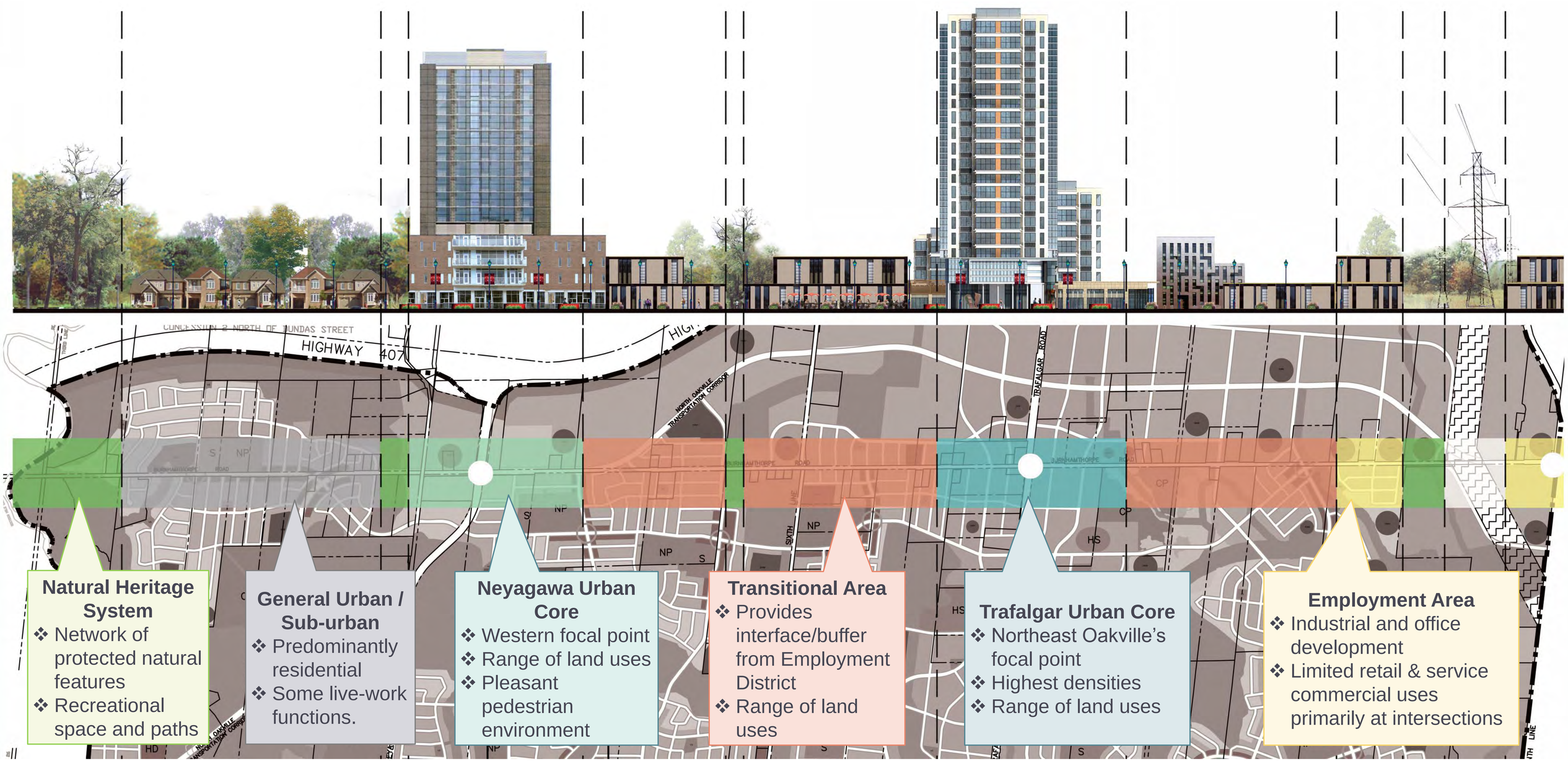
The Secondary Plan and Master Plan require a *Character Study* to address Burnhamthorpe Road's Right of Way width, number of traffic lanes, provision of on-street parking, and access lanes.



This study will support the Master Plan's vision by establishing appropriate road design(s) for the section of Burnhamthorpe Road between Ninth Line and Sixteen Mile Creek to serve the evolving needs of the North Oakville community.

Future Land Use Context

As North Oakville's Master Plan is implemented and neighbourhoods along Burnhamthorpe Road develop, the character of the corridor will become increasingly diverse. The figure below depicts the Master Plan's various **land use designations** along Burnhamthorpe Road, along with possible examples of land uses and built form that may be found within these areas in the future.



Natural Heritage System
- ❖ Network of protected natural features
- ❖ Recreational space and paths

General Urban / Sub-urban
- ❖ Predominantly residential
- ❖ Some live-work functions.

Neyagawa Urban Core
- ❖ Western focal point
- ❖ Range of land uses
- ❖ Pleasant pedestrian environment

Transitional Area
- ❖ Provides interface/buffer from Employment District
- ❖ Range of land uses

Trafalgar Urban Core
- ❖ Northeast Oakville's focal point
- ❖ Highest densities
- ❖ Range of land uses

Employment Area
- ❖ Industrial and office development
- ❖ Limited retail & service commercial uses primarily at intersections

The Problem / Opportunity

This study will determine both the **function** and **character** of Burnhamthorpe Road as development of the corridor evolves.

Function

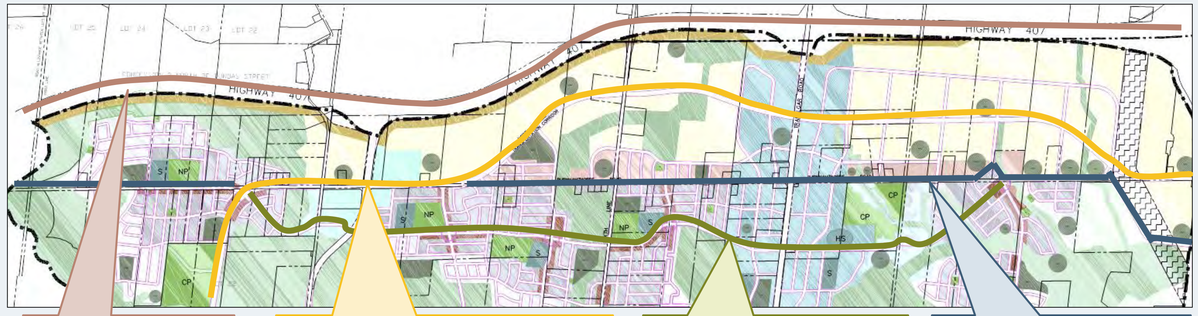
What is the role of Burnhamthorpe Road and who is going to use it?

Drivers

Cyclists

Pedestrians

Can parallel transportation facilities assume some functions?



407 ETR:
Inter-regional vehicle traffic

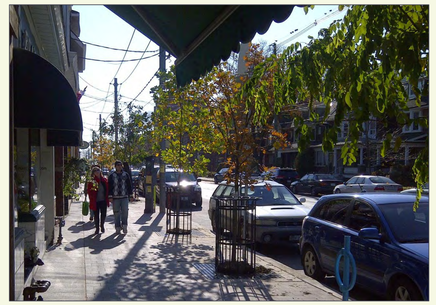
NNOTC:
Regional vehicle traffic

Planned parallel Avenue Road

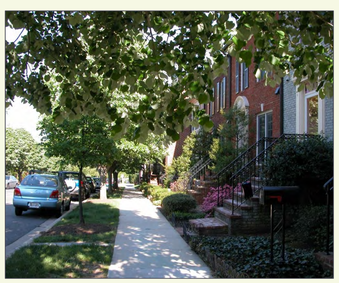
Burnhamthorpe Road

Character

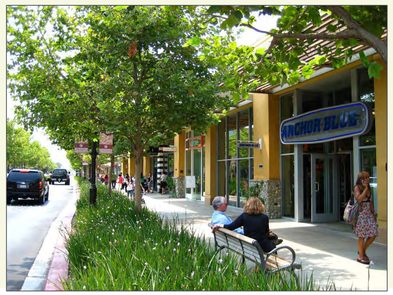
Will Burnhamthorpe Road be rural, urban, or both?

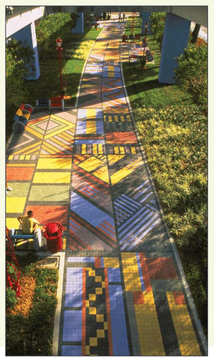


Will sections of the road be treated the same, or will the road character change along the corridor?



Should there be a common, distinct element along the length of the corridor?





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The Environmental Assessment Process

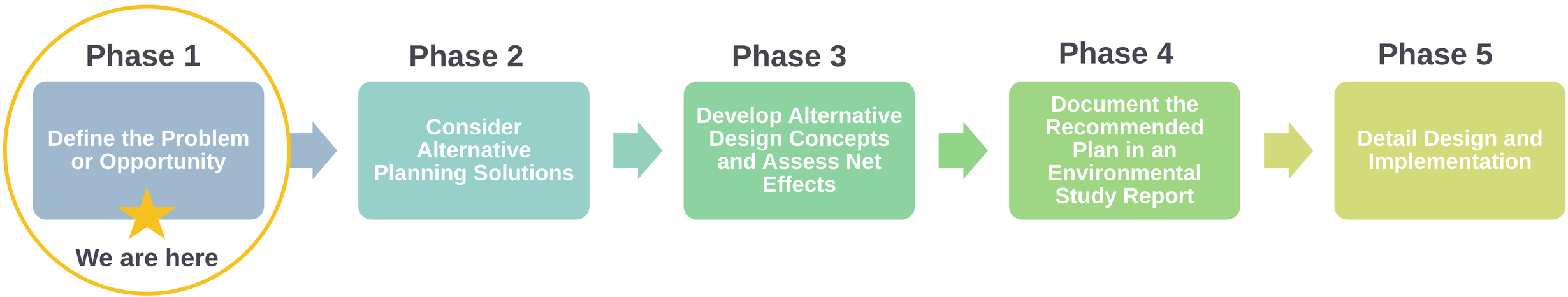
The **Municipal Class Environmental Assessment (EA) Process** is a regulated process that proponents must follow to meet the requirements of the *EA Act*. Ongoing consultation with the public and relevant agencies is a key aspect of the EA process. Four EA categories are available to be used based on the project's potential for environmental effects.

This project is a Schedule "C" project and is required to undergo a 5-phase process, which includes:

1. Defining the Problem or Opportunity
2. Considering Alternative Planning Solutions
3. Developing Alternative Design Concepts and Assessing Net Effects
4. Documenting the Recommended Plan in an Environmental Study Report (ESR)
5. Detail Design and Implementation

During the final stages of the study, an Environmental Study Report (ESR) is prepared to document the process and filed for a 30-day public review. If no "Part II Order" requests are submitted to the Minister of the Environment during this time, the project may proceed to Implementation.

Schedule "C" EA Phases



Our Study Process

The Schedule “C” Class EA process has been selected as it best serves the needs of the Burnhamthorpe Road Character Study. The Burnhamthorpe EA will involve the following steps:

1. Background review and Problem/Opportunity Statement
2. Corridor assessment and visioning
3. Development of alternative solutions and designs
4. Evaluation criteria and assessment of alternatives
5. Documentation (ESR)

Two PICs will be held over the course of the study, with additional opportunities for public input throughout the process.

2013: June | July | August | September | October | November | December

PIC #1
June 25, 2013

Context and Problem/Opportunity

Corridor Visioning

Alternatives Solutions

PIC #2
October 2013

Evaluation and Recommendation

ESR Documentation

The outcome of this process will be to determine the appropriate **Right of Way width** along Burnhamthorpe Road.

What Roadway Features Are Important to You?

BURNHAMTHORPE ROAD
CHARACTER STUDY

A variety of design features or elements can be used to enhance the **function** or **character** of a street.

Function

On-street and lay-by parking provides vehicle access to commercial buildings in urban areas.

Multi-use trails accommodate pedestrians, cyclists, and other recreational forms of active transportation.

Dedicated bike lanes reduce conflicts with traffic and enhance safety for cyclists.

Sidewalks promote walking and enhance pedestrian safety. Wide sidewalks and **boulevards** are often appropriate in urban settings.

Character

Street trees provide shade and aesthetic appeal.

Cultural and natural heritage features can be protected and enhanced as distinctive streetscape features.

Public art creates a sense of street identity.

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What Roadway Features Are Important to You?

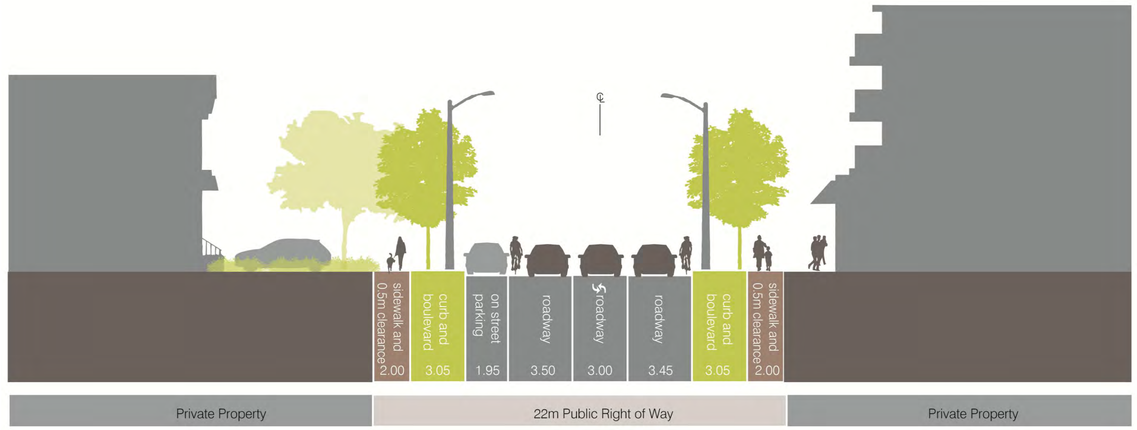
The final design for the corridor will be informed by the different land use designations along its length and the combination of elements within the public Right of Way.

The following cross sections demonstrate how elements such as travel lanes, parking lanes, different cycling facilities, and boulevards can be combined and substituted with one another, resulting in various possible arrangements.

Typical of Existing Burnhamthorpe Road (20m)

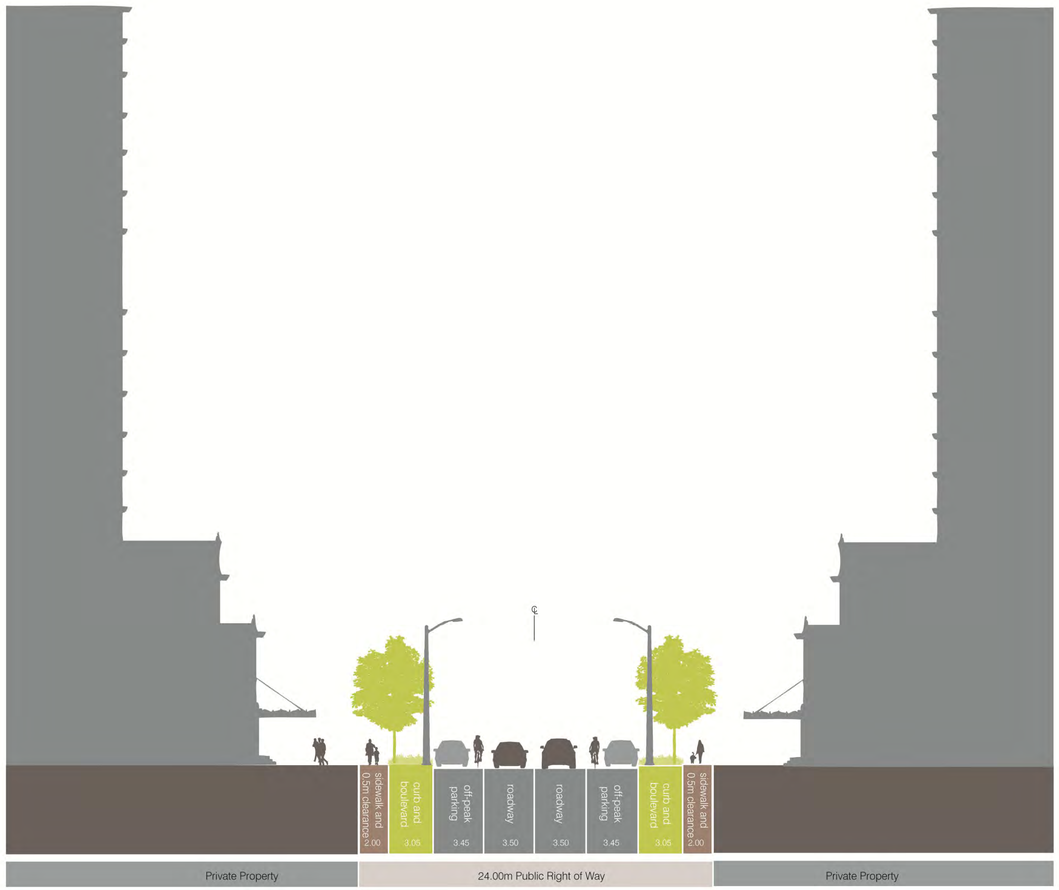
Typical of Rural Corridor with ditches (19m)

Typical of Rural Corridor with curb (19m)

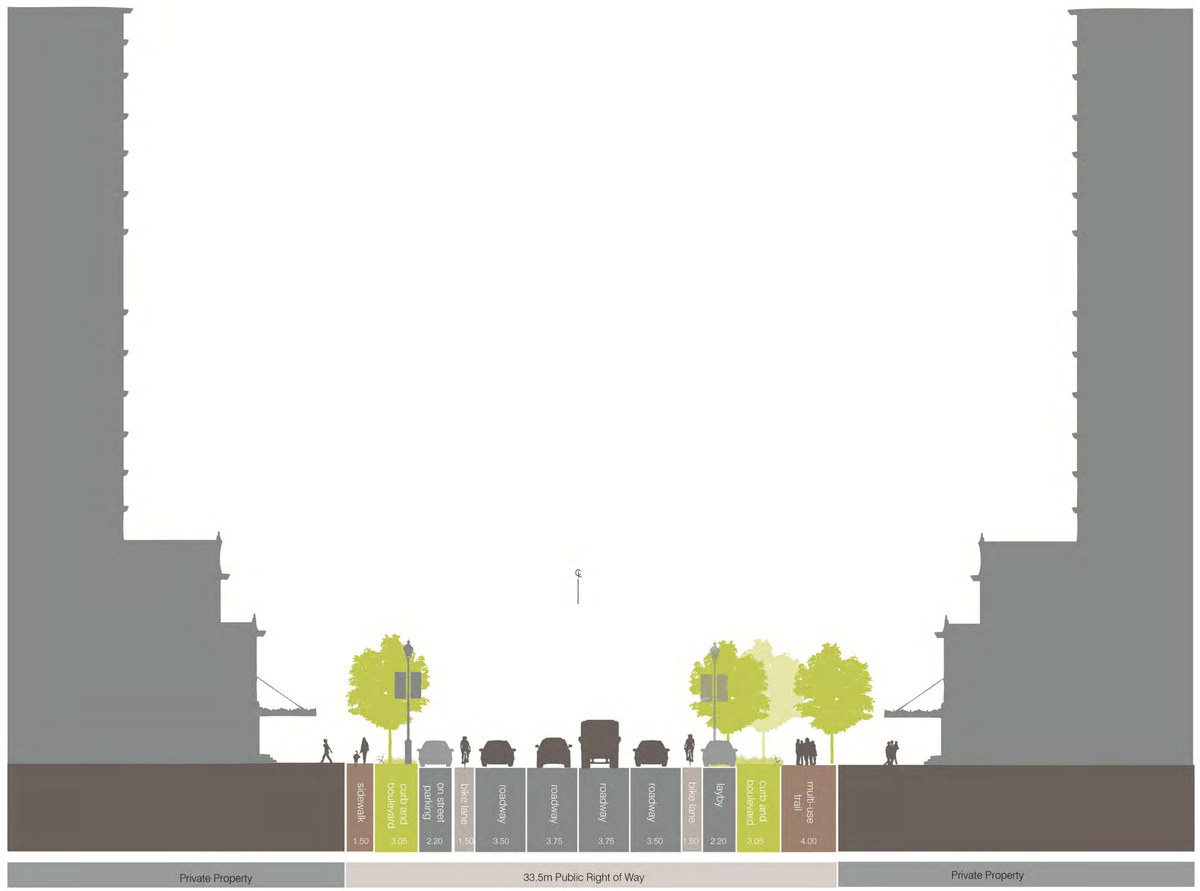


Typical of Urban Corridor with Limited Additional Elements (22m)

What Roadway Features Are Important to You?



Typical of Trafalgar Urban Core Corridor with Multiple Elements (24m)



Typical of Trafalagar Urban Core Corridor with All Elements (33.5m)

Evaluation Criteria

Phase 3 of the Class EA process involves the evaluation of potential effects of each of the Alternative Design Concepts. In order to evaluate alternatives, a set of **evaluation criteria** must be developed. A broad range of evaluation criteria is needed to effectively assess the potential environmental effects.

Alternative roadway designs will be developed based on the input that we receive through early consultation. At this time, a preliminary set of evaluation criteria to assess the net effects of these alternative designs has been prepared.

The draft evaluation criteria fall under six general categories as follows:

- **Operational Criteria**
- **Natural Environment Criteria**
- **Urban Design Criteria**
- **Socio-Economic Environment Criteria**
- **Cultural Environment Criteria**
- **Financial Criteria**

The outcome of the evaluation process will be the identification of the Recommended Design(s) and character principles for the future Burnhamthorpe Road. The Recommended Design(s) may be more “rural” in some areas and more “urban” in other areas. The selection of appropriate evaluation criteria ensures that the preferred design addresses both function and form needs.

Draft evaluation criteria are described on the following display boards. Please review these draft criteria and provide us with any comments that you may have. “Dot” stickers can be used to indicate which criteria you feel should be considered high priority.

Draft Evaluation Criteria

BURNHAMTHORPE ROAD
CHARACTER STUDY

Proposed OPERATIONAL Criteria	How important is this to you? Please rate each criterion by placing a sticky dot.
Right-of-Way (ROW) Width Range Is the width of the road within the maximum of 24 metres specified in the town's approved documents?	
Flow Characteristics Is traffic flow interrupted by passive traffic calming or is it uninterrupted?	
Travel Speeds Is traffic limited to an appropriate speed for the adjacent land uses?	
Number of Lanes Is the number appropriate in the context of adjacent land uses and traffic volumes?	
Local Street Connectivity Does the road network offer connectivity to local streets?	
Access Management Is direct access permitted for certain land uses or restricted for others?	
Transit Is the road able to accommodate transit use?	
Cycling/Pedestrians Does the design provide safe and attractive cycling and pedestrian facilities?	
Goods Movement Are restrictions on goods movement kept to a minimum?	
Parking Is sufficient on-street parking provided?	
Utilities / Stormwater Management Can all servicing be accommodated in the Right of Way?	
Street Lighting Is the level of lighting appropriate for the road function?	

Draft Evaluation Criteria

BURNHAMTHORPE ROAD
CHARACTER STUDY

Proposed NATURAL ENVIRONMENT Criteria	How important is this to you? Please rate each criterion by placing a sticky dot.
Designated Areas What is the impact on designated or protected environmental areas?	
Natural Heritage Features What is the impact on features such as woodlots, wetlands and valleylands?	
Wildlife and Wildlife Habitat What is the impact on terrestrial and aquatic species?	
Species at Risk (SAR) and SAR Habitat Are there any impacts to SAR or SAR habitat?	

Proposed URBAN DESIGN Criteria	How important is this to you? Please rate each criterion by placing a sticky dot.
Land Use Designations / Context Is the design appropriate for the planned future land use contexts along the corridor?	
Planned Building Scale & Orientation Is the design appropriate for the size, density and height of future buildings?	
Boulevard Treatment Is landscaping, street furniture and other amenities provided?	

Proposed SOCIO-ECONOMIC ENVIRONMENT Criteria	How important is this to you? Please rate each criterion by placing a sticky dot.
Property Does the design minimize displacement or disruption to adjacent properties?	
Community Features/Character What effect is there on the overall character of the local community?	
Business Will there be any short-term or long-term impacts to local businesses?	
Noise and Air Quality Are noise and/or air quality impacts manageable?	

Draft Evaluation Criteria

BURNHAMTHORPE ROAD
CHARACTER STUDY

Proposed CULTURAL ENVIRONMENT Criteria	How important is this to you? Please rate each criterion by placing a sticky dot.
Archaeology Will there be an impact on identified archaeological resources?	
Built Heritage Will there be an impact to built heritage resources or listed buildings?	
Cultural Heritage Landscape Are there any impacts to the cultural heritage landscape?	

Proposed FINANCIAL Criteria	How important is this to you? Please rate each criterion by placing a sticky dot.
Capital Costs How much will it cost to build?	
Operational Costs How much will it cost to operate and maintain?	
Property Costs How much will property acquisition cost?	
Restoration Costs How much will it cost to restore or rehabilitate certain areas after construction?	

Your input is vital to ensuring the preferred design for Burnhamthorpe Road appropriately addresses all potential opportunities and challenges. All comments will be considered in the development of a final set of evaluation criteria.

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Next Steps

Following this PIC, the Project Team will:

- Review and address comments received – look for a summary on the study website and in the summer newsletter;
- Further assess the existing conditions of the Study Corridor, including conducting a tree inventory and existing servicing assessment;
- Develop a set of roadway design alternatives; and
- Refine the set of Evaluation Criteria based on your feedback.

How to get involved:

- Visit the study website to stay up-to-date as the study progresses (http://www.oakville.ca/residents/eas-burnhamthorpe.html);
- Request that your name be added to the study mailing list;
- Participate in the next open house, scheduled in the fall of 2013; and/or
- Contact the study team directly, using the contact information at right.

Please complete a comment card or send comments directly to one of the Project Team contacts:

Town Staff

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905-845-6601 ext. 3236

Project Consultant

Bob Koziol
Manager, Municipal Transportation
MMM Group Limited
100 Commerce Valley Dr. W.
Thornhill, ON L3T 0A1
KoziolB@mmm.ca
905-882-7249

Thank you!

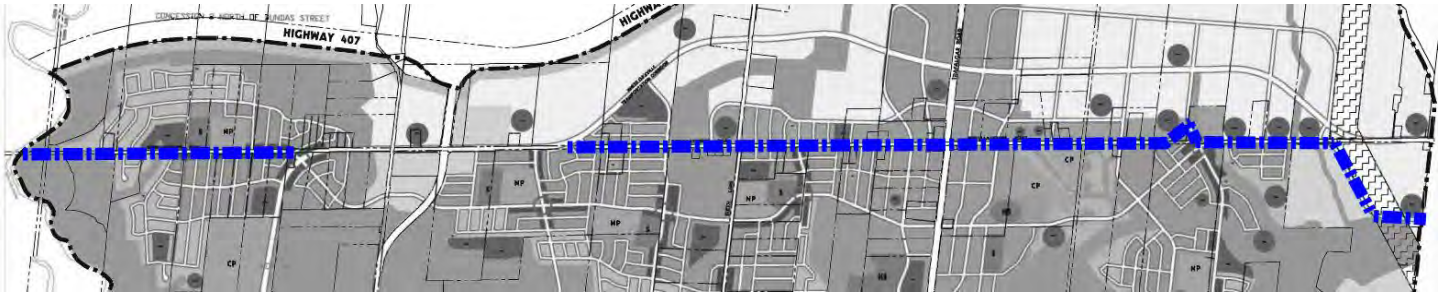
Your involvement is essential to the successful completion of this study.
We welcome your comments.

PIC #1 Spoken Comments **June 25, 2013**

Name: _____

Location / Affiliation: _____

Mark an “X” on the map to roughly indicate the participant’s property.



How did you hear about the study?

Are there any issues or topics of particular concern?

General comments:

Please record the participant's comments on the following topics:

Roadway Features	Key Issues along the Corridor
Parking/Laybys:	Traffic:
Cycling:	Walking:
Sidewalks:	Cycling:
Multi-Use Trails:	Urban Design/Aesthetics:
Trees:	Environment:
Heritage features:	

Draft Evaluation Criteria

Highest Ranked Criteria:

Lowest Ranked Criteria:

Missing Criteria:

Other Comments:

Burnhamthorpe Road
CHARACTER STUDY

Agenda

Topic: Burnhamthorpe Road Character Study – TAC Meeting #1
Date: Thurs. Aug. 29, 2013
Time: 1:30 pm
Location: Oakville Town Hall, Trafalgar Room

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1. **Introduction** (1:30-1:50)
    a. Introductions
    b. Project Overview/Purpose
    c. Meeting Objective
    d. Agenda

2. **Status of Technical Work** (1:50-2:10)
    a. Corridor specific considerations
    b. Agency by agency issue confirmation/discussion

3. **What is a Character Road?** (2:10-2:25)
    a. Interactive exercise

4. **Evaluation Criteria** (2:25-2:55)
    a. Process / risk review / discussion
    b. Dotmocracy exercise

5. **ROW Width** (2:55-3:15)
    a. Cross section review
    b. Process considerations

6. **Other Business** (3:15-3:30)

Burnhamthorpe Road
CHARACTER STUDY

Agenda

Topic: Burnhamthorpe Road Character Study – Stakeholder Group #1
Date: Thurs. Aug. 29, 2013
Time: 7 pm
Location: Sixteen Mile Creek Sports Complex – Community Room #1
3070 Neyagawa Rd., Oakville ON

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1. **Introduction** (7:00-7:20)
    a. Introductions
    b. Project Overview/Purpose
    c. Meeting Objective
    d. Agenda

2. **What is a Character Road?** (7:20-7:35)
    a. Interactive exercise

3. **Status of Technical Work** (7:35-8:00)
    a. Corridor specific considerations
    b. General discussion of issues

4. **ROW Width** (8:00-8:20)
    a. Cross section review
    b. General discussion

5. **Evaluation Criteria** (8:20-8:40)
    a. Why Evaluation Criteria?
    b. Discussion of draft criteria
    c. Dotmocracy exercise

6. **Other Business** (8:40-8:50)

Burnhamthorpe Road
CHARACTER STUDY

Stakeholders' Group / Technical Agencies Committee Workshop #1

August 29, 2013

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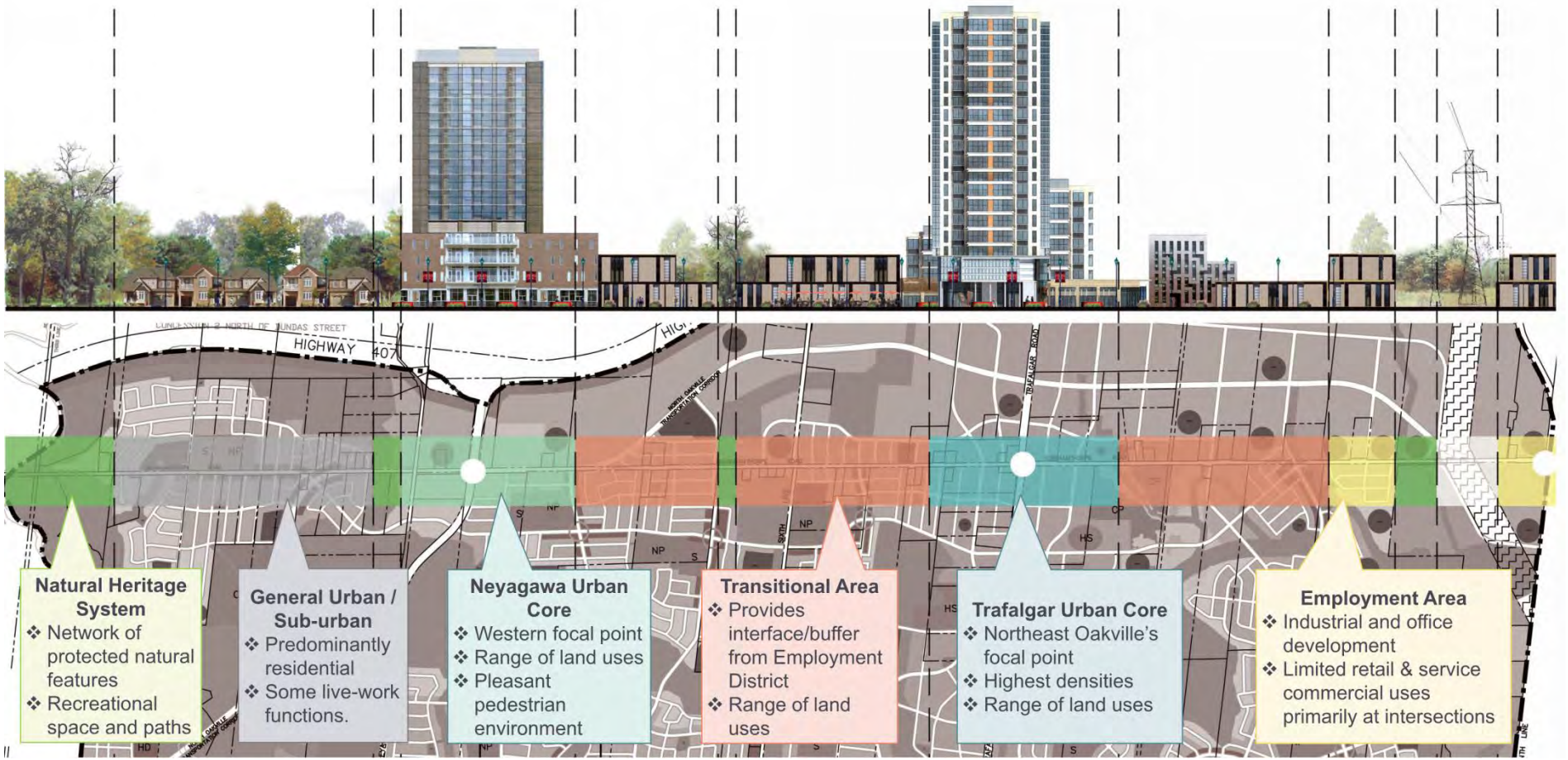
Technical Work Status Update

- Corridor Assessment:
  - Urban Design
    - Context Sensitive Design
    - Accessibility
    - Streetscape
    - Other
  - Transportation
    - Traffic
    - On-street Parking
    - Active Transportation
    - Transit
  - Urban Forestry
  - Utilities & Municipal Servicing
  - Stormwater Management

Urban Design: Existing Conditions

- Primarily agricultural landscape
- Scattered forest & cultural woodland
- Farms and rural properties; some commercial and institutional facilities
- Some farm complexes, barns, and residential properties listed or designated under the *Ontario Heritage Act*

Future Land Use Context



Urban Design: Implications

- Transition to higher density; diverse land uses & built form
- Two-lane rural road will no longer be appropriate in some sections
- Context Sensitive Design
  - Maintain integrity of built and cultural heritage landscape while accommodating new development and diverse modes of transportation
- Timeline to build out means lengthy transition
- New road and streetscape design needs meaningful phasing strategy

Transportation: Existing Conditions

- Two-lane paved road within ~ 20m right-of-way
- Vehicle-dominated environment
  - No heavy trucks permitted
- Traffic signals at key intersections
- Left-turn lane at intersections with Neyagawa Blvd. and Trafalgar Road
- No streetscape provisions for pedestrians, cyclists, or transit

Transportation: Existing Conditions

Burnhamthorpe Road in existing policy:

- Oakville **Transportation Master Plan** (TMP):
  - Two-lane Burnhamthorpe Road expected to operate well within capacity to 2031
- Oakville **Active Transportation Master Plan** (ATMP):
  - Recommends bike lanes along entire length of Burnhamthorpe Road
- **North Oakville East Secondary Plan** (NOESP):
  - Typical RoW: 20 metres
  - Maximum RoW: 24 metres
  - “Character Road” should function like an Avenue/Transit Corridor or Connector/Transit Corridor

Transportation: Implications

- The suggestion in policy to accommodate motorists, pedestrians, and cyclists as the corridor and surrounding areas grow and change may require additional right-of-way beyond 24 metres

- Complete Streets approach – competition for space within limited right-of-way:
  - Travel lanes
  - On-street parking
  - Bike lanes
  - Sidewalks
  - Street furniture
  - Landscaping
  - Utilities

Urban Forestry: Existing Conditions

- Trees and tree groupings are a mix of native and non-native species within the current right-of-way
  - Invasive species: Manitoba Maple & Norway Maple
  - No regionally rare or endangered species
- 12 significant trees found
  - Ecological benefits due to size
- Western portion of study corridor falls within Glenorchy Conservation Area

Urban Forestry: Implications

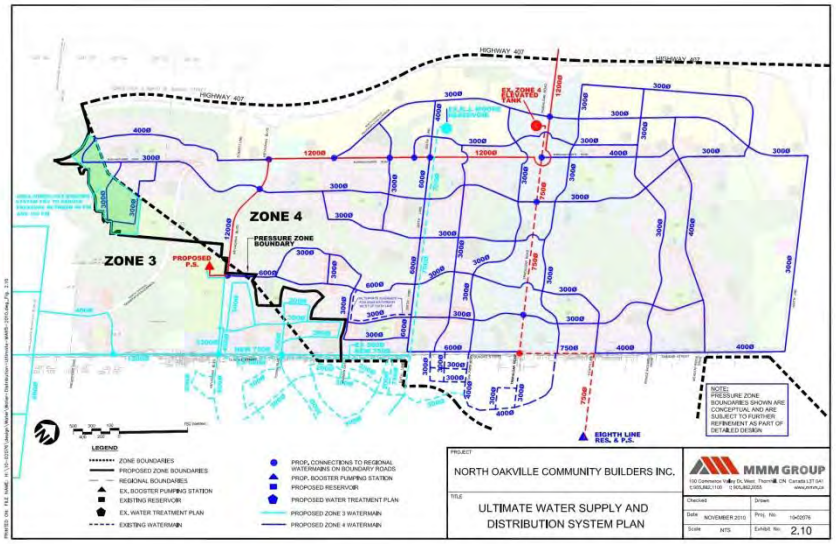
- Streetscape designs and right-of-way width should consider minimal impacts to ecologically sensitive areas:
  - Glenorchy Conservation Area
  - Adjacent to creeks
- Prioritize preservation of significant trees

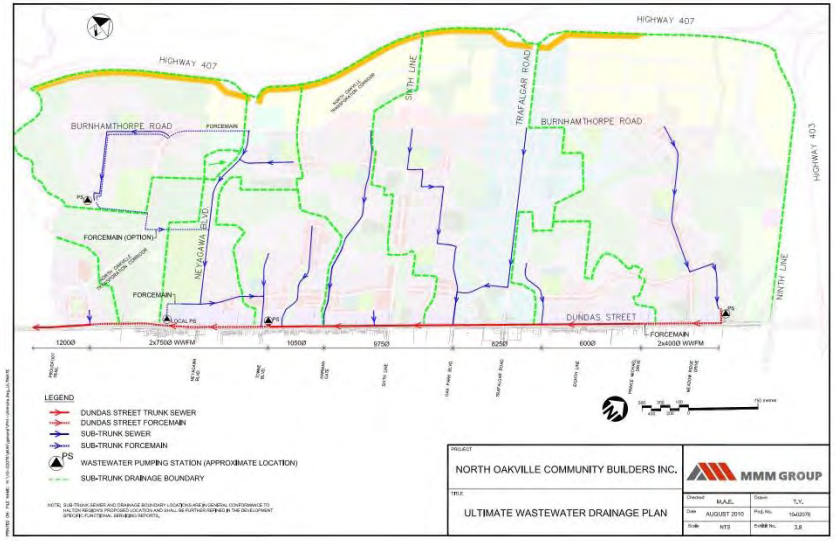
Utilities & Municipal Servicing: Existing Conditions

- Aerial hydro line along Burnhamthorpe Road corridor
- Aerial Bell line along corridor
- No gas, storm sewer or sanitary sewer

Utilities & Municipal Servicing: Proposed Conditions

- Watermains (300mm – 1200mm) proposed along entire Burnhamthorpe Road corridor
- No trunk sanitary sewers along east Burnhamthorpe corridor; Sub-trunk sewer along west Burnhamthorpe corridor
- Underground gas, telecommunications, and hydro plant to be installed along corridor to suit adjacent land uses





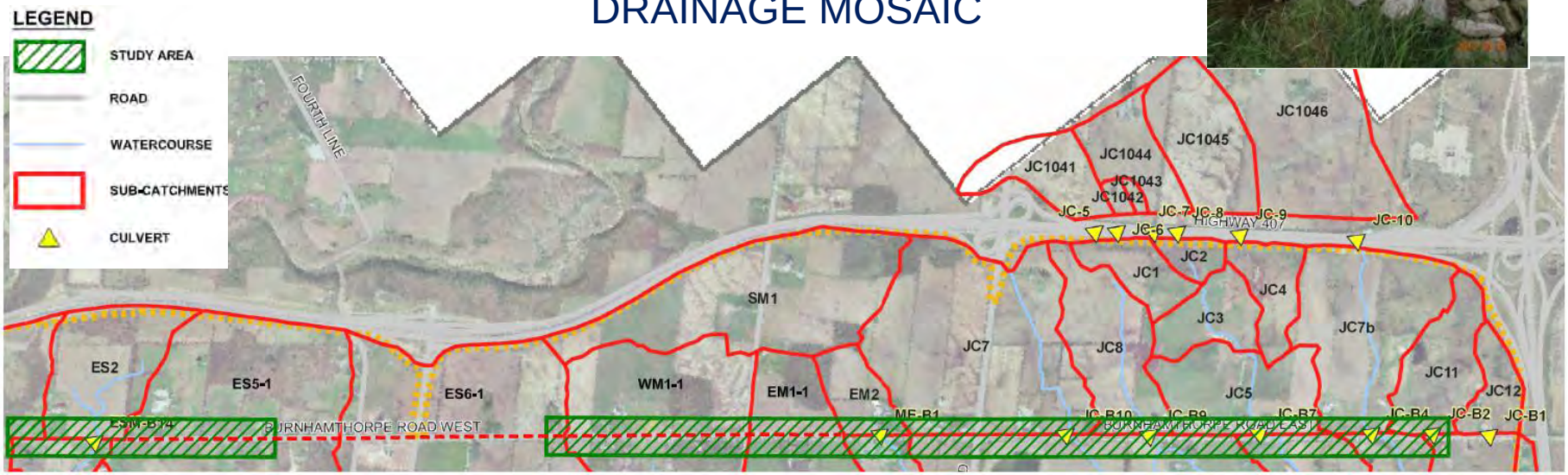
Utilities & Municipal Servicing: Implications

- Infrastructure will proceed in conjunction with adjacent developments and sized to accommodate full build out
- Watermain and gas need to be looped
- Sanitary sewers need to be tied into trunk system
- Stormwater management (quality & quantity) needs to be incorporated into private land development SWM

Stormwater Management: Existing Conditions

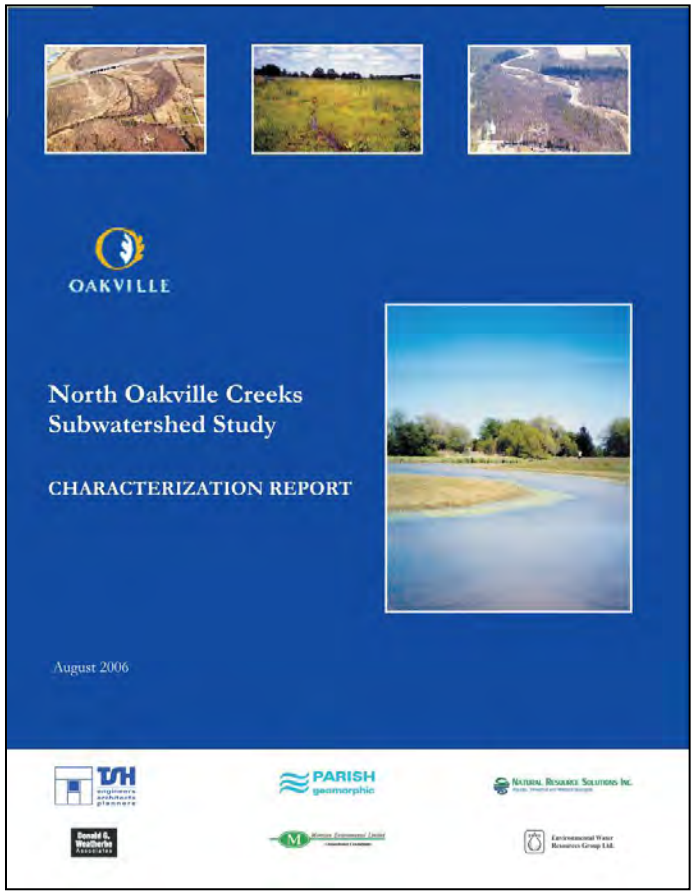
- Existing Drainage
  - Drained by Sixteen Mile Creek, East Morrison Creek, West Morrison Creek, & Joshua's Creek
  - Road side ditches & culvert/bridge crossings

DRAINAGE MOSAIC



Stormwater Management: Existing Conditions

- North Oakville Creek Subwatershed Study (NOCSS) (2006)
  - Supports NOESP
  - Management framework for future development within the watershed



Stormwater Management: Implications

- Where Burnhamthorpe Road converts to an urban road means transition to:
  - Curb and gutter
  - Storm sewers

- Site specific stormwater management strategy to be determined based on preferred road design

Next Steps

- Incorporate input
- Identify alternative solutions
- Selection of preferred alternative
- Documentation

Consultation Summary: Round 2

The second round of consultation provided an update on study progress and allowed stakeholders and interested members of the public to review and comment on the alternative road designs, the evaluation process, and the Preliminary Preferred Design.

1 Consultation Events

The second round of consultation included a Technical Agencies Committee Workshop and Stakeholder's Group Workshop which were held on November 20, 2013. It also included a Public Information Centre for any interested members of the public, held on April 30, 2014

2 Consultation Summary

2.1 Technical Agencies and Stakeholder's Group Workshop #2

The second and final Technical Agencies Committee (TAC) and Stakeholder's Group Workshops were held on November 20, 2013. The purpose of this round of workshops was to keep the TAC and Stakeholder's Group informed of work to date and to present the alternative road designs, evaluation strategy and Preliminary Preferred Design. Emphasis was placed on discussion and feedback on the evaluation strategy, evaluation results, and Preliminary Preferred Design. Workshops included an informal presentation and discussion about each of the items.

2.1.1 Technical Agencies Committee (TAC) Workshop Results

The second TAC workshop was held from 9:00 to 11:00 am on November 20, 2013. Attendees at the TAC workshop are listed below.

Attendees:
Philip Kelly, Town of Oakville
Matt Krusto, Halton Region
Melissa Green-Battiston, Halton Region
Doug Corbett, Halton Planning
Fabio Cabarcas, Halton Health
Jon Foreshew, Oakville Hydro
Gabe Charles, Town of Oakville
Paul Allen, Town of Oakville

Regrets:
Jane Devlin, MNR
Laureen Choi, HDSB
Heinz Hecht, Town of Oakville
Jane DeVito, Conservation Halton
Marian Wright, Rogers Communications
Ann Newman, Enbridge
Wendy Botts, Bell Canada
John Sawyer, Oakville Chamber of Commerce
Lisa Myslicki, Infrastructure Ontario

Spoken Comments

<u>Burnhamthorpe Road Corridor – West Section</u>

- Hydro infrastructure concerns:
    - Urbanized sections have 3.2m boulevards – minimum 4.05m needed for transformers

    - Potential solutions:
        - Bump outs could accommodate transformers
        - Underground is possible, but prefer to remain overhead
- Alternative West 4 should not lose points under the right-of-way width evaluation criterion – although wider than the other alternatives (22m rather than 20m), it still falls within the OMB settlement standards of 24m maximum
    - Project Team response: OMB settlement prefers 20m typical – this will be specified within the evaluation tables
- Sustainable transportation:
    - Accessibility – "minimal slopes" is irrelevant – revise wording
- Natural environment:
    - Being too hard on Alternative West 1 for urban design – give one point for natural environment criteria
        - Project Team response: Comparative method within each criterion used
- Alternative West 4 might be a hard sell in the west

<u>Burnhamthorpe Road Corridor – Core Section</u>

- Sustainable transportation:
    - Cycling: one point for multi-use path – bigger gap between multi-use path and cycling lanes
- Need to come up with new utilities solution – no bump outs for transformer location
    - Spacing of transformers is dependent on lighting supply
        - Commercial residential – would be on private property
        - Street lighting, traffic lights – need to place transformers within the right-of-way
        - Could use building setbacks, but would be difficult to get property owners to agree to an easement
        - Daylighting at north / south streets?

<u>Burnhamthorpe Road Corridor – Transitional Section</u>

- Cycling – same as previous
    - But multi-use path is on both sides
    - Driveways (if they are there) – conflict with multi-use path
    - Some options for negotiating driveways are currently being tested by the province

<u>Comments on Weighting</u>

- Transitional section: qualitative assessment, Transitional 2 was an easy decision even though the numerical scores did not significantly differentiate between T-1 & T-2
- Access – deliveries – was this considered?
    - Particularly important in the Core section

<u>Voting Exercise</u>

- West section:

    - West 1: 0 votes
    - West 2: 0 votes
    - West 3: 1 vote
    - West 4: 6 votes
- Core section:
    - Core 1: 2 votes
    - Core 2: 1 vote
    - Core 3: 4 votes
    - Core 4: 0 votes
- Transitional section:
    - Transitional 1: 0 votes
    - Transitional 2: 6 votes
    - Transitional 3: 0 votes
    - Transitional 4: 0 votes

2.1.2 Stakeholder's Group Workshop Results

The first Stakeholder's Group workshop was held from 1:30 pm to 3:30 pm on November 20, 2013. Attendees of the Stakeholder's Group workshop are listed below.

Attendees:
Nunzio Tumino
Leon Haas, Oakville Cycling Club
Karen Brock, Oakville Green
Spencer Williams, King's Christian Collegiate
Jinn Vanderkooy, King's Christian Collegiate

Regrets:
Joe Lynn, Ren's Pet Depot
Robert Cohen, Markay Homes

Spoken Comments

- Concern for interference with lighting in the Core
    - Trafalgar is ~3 lanes in each direction – long distance to cross, may be better to not have trees near intersection in order to improve visibility
- Use structural soils – Silva Cell
- Transitional section – no option with multi-use path on one side – seemed like a good compromise in Core and West
- Multi-use path only appropriate in low density / rural areas; not urban – against the principles of keeping pedestrians, cyclists, and traffic separate
- King's Christian Collegiate – located by NNOTC, but connections are important
    - West section is area of interest
    - Concern: getting 700 people to the school safely & efficiently
        - Preference = cycling, but also need car drop offs, buses
        - Many come up Neyagawa
    - Concern: cyclists not being separated from cars enough through use of the painted buffer
        - Preference for dedicated / physically separated bike lanes rather than painted buffer
    - Traffic will come from the south – need good tie-in from Neyagawa

    - Concern: noise from traffic – disruption to school
- West section: change wording from "dedicated" to "buffered" bike lanes for consistency
- Concerns for cyclist safety
- Suggestion to treat north and south sides of the right-of-way differently
    - South side will be more residential; north more commercial / mixed
    - Pedestrian boulevard on north side only; two-way cycling on south side only – to improve cyclists safety, visibility from cars
    - North side is better for pedestrians – sunnier, snow melts more quickly
- Cycling is very important – especially if planning for 25 + years in the future. Need to minimize focus on cars
- Joshua's Creek Arts & Culture Centre – east of Trafalgar
    - Farmhouse right on Burnhamthorpe; lots of frontage
- Would prefer west section to be 20m – especially if the critical 2m would take out mature trees
    - European model – "go around it"
    - Natural heritage – if want spaces to be used by people, need trees
- Bundling infrastructure, trees – example of Eglinton St.
- Need more usable spaces
- Dead straight road is not a Character Road – did not incorporate comments from previous session
- Agree that common element (cycling facility) is needed along entire corridor
- Suggestion – drainage strip separating cyclists from traffic
- Concern: bus route – how will drivers get past?
- Interaction between bus & bicycle
    - Concern for buses taking up cycling space
    - Could be a major problem is not well thought out
- Suggestion that more visuals be put together for PIC – plan view, photo examples
- Disappointed in west section – want 20m – was a close tie
- At PIC, need more descriptors – explain meaning of buffered bike lane, etc.

<u>Voting Exercise</u>

- West section:
    - West 1: 2 votes
    - West 2: 1 votes
    - West 3: 1 vote
    - West 4: 1 votes
- Core section:
    - Core 1: 3 votes
    - Core 2: 1 vote
    - Core 3: 0 votes
    - Core 4: 1 votes
- Transitional section:
    - Transitional 1: 1 votes
    - Transitional 2: 4 votes
    - Transitional 3: 0 votes

- Transitional 4: 0 votes

2.1.3 Summary

Members of the Technical Agencies Committee and Stakeholder's Group generally agreed with the evaluation strategy and results and provided some helpful feedback to be incorporated into the evaluation. Many of the participants stressed the need for safe cycling facilities and an attractive pedestrian environment.

There were some inconsistencies between the groups in their preferences for road designs in each of the West, Core, and Transitional sections of the corridor. Members of the Technical Agencies Committee preferred Alternatives West 4 and Core 3, while members of the Stakeholder's Group preferred Alternatives West 1 and Core 1. However, for the Transition section of Burnhamthorpe Road, both groups communicated a preference for Alternative Transitional 2.

Workshop materials, including agenda and presentation, are provided following this document.

2.2 Public Information Centre #2

The second and final Public Information Centre (PIC) for the Burnhamthorpe Road Character Study was held on April 30, 2014. A formal presentation was delivered at the PIC outlining the alternatives that were considered for evaluation, the evaluation process, and the resulting Preliminary Preferred Design. Information was also presented on a series of display boards and members of the Project Team were available to discuss the project with participants and answer any questions. A total of 25 participants attended the second PIC.

Participants were encouraged to submit written comments at the PIC. However, no written comments were received. Participants generally communicated to the Project Team during the PIC that they agreed with the evaluation results and view the Preliminary Preferred Design positively.

PIC display boards are provided following this document.

Burnhamthorpe Road
CHARACTER STUDY

Agenda

Topic: Burnhamthorpe Road Character Study – Technical Agencies Committee Meeting #2
Date: Wed. Nov. 20, 2013
Time: 9:00 am
Location: Oakville Town Hall, Palermo Room (Committee Room 2)

---

1. **Introduction** (10 min)
    a. Meeting Objective
    b. Agenda

2. **Alternative Road Designs** (30 min)
    a. Overview of full set of alternatives

3. **Evaluation of Alternatives** (60 min)
    a. Evaluation strategy
    b. Facilitated session of “carried forward” alternatives
    c. Evaluation results and discussion
    d. Preliminary Preferred Design

4. **Other Business**

Burnhamthorpe Road
CHARACTER STUDY

Agenda

Topic: Burnhamthorpe Road Character Study – Stakeholder's Group Meeting #2
Date: Wed. Nov. 20, 2013
Time: 1:30 pm
Location: Oakville Town Hall, Bronte Room

---

1. **Introduction** (10 min)
    a. Meeting Objective
    b. Agenda

2. **Update on Consultation Input** (10 min)

3. **Alternative Road Designs** (40 min)
    a. Overview of full set of alternatives

4. **Discussion of Alternatives** (60 min)
    a. Evaluation strategy
    b. Facilitated session of "carried forward" alternatives
    c. Evaluation results and discussion
    d. Preliminary Preferred Design

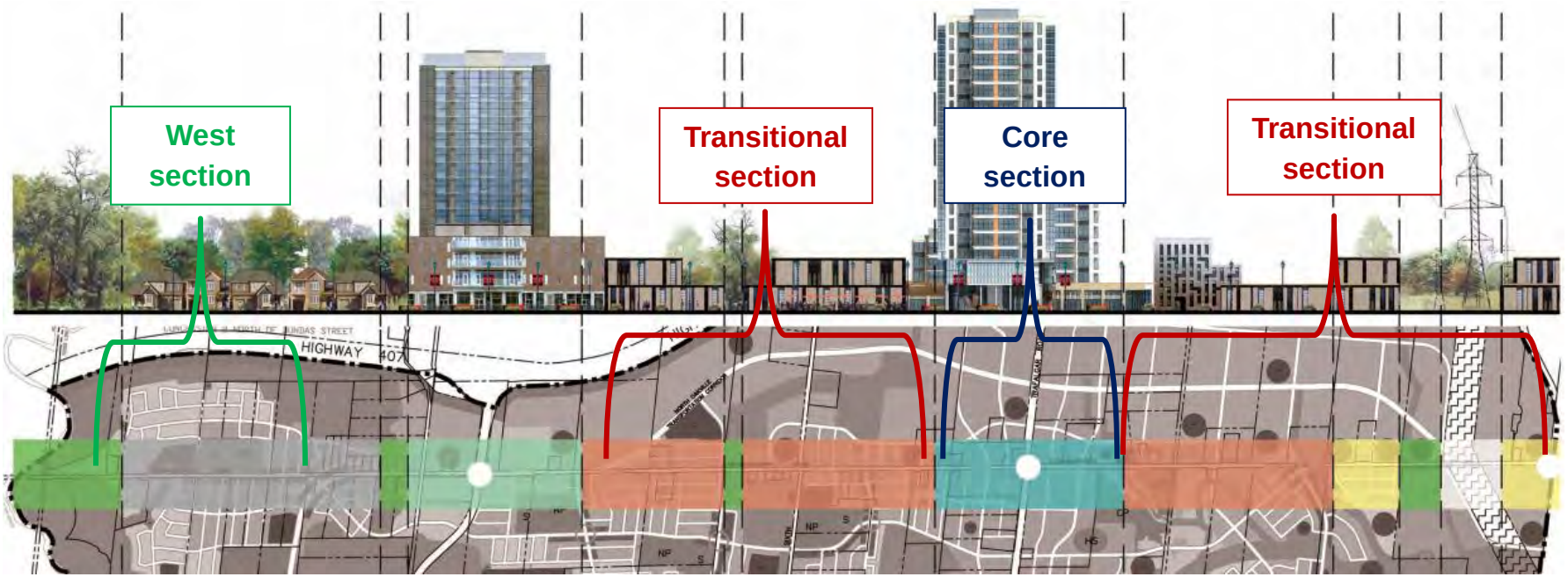
Burnhamthorpe Road
CHARACTER STUDY

Technical Agencies Committee Meeting #2

November 20, 2013

OAKVILLE

Burnhamthorpe Road Corridor



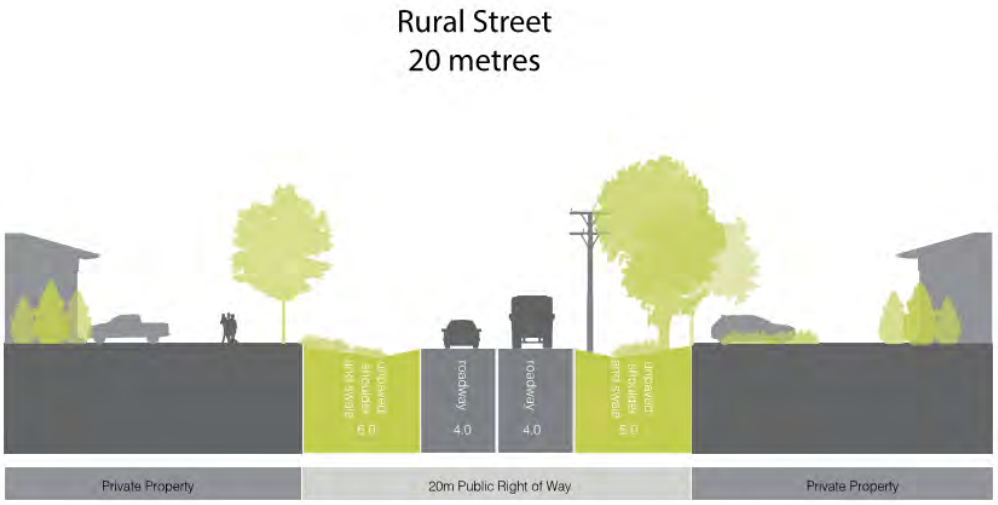
Road Design Alternatives

- Alternatives within each section evaluated separately:
  - West section
  - Core section
  - Transitional section

West Section

- Separated from eastern Burnhamthorpe Road corridor by NNOTC
- Designated Neighbourhood Centre Area and Sub-urban Area by NOESP
  - Low to medium density residential
  - Mixed use development (2 to 5 stories) fronting Burnhamthorpe Road within the eastern segment of this section

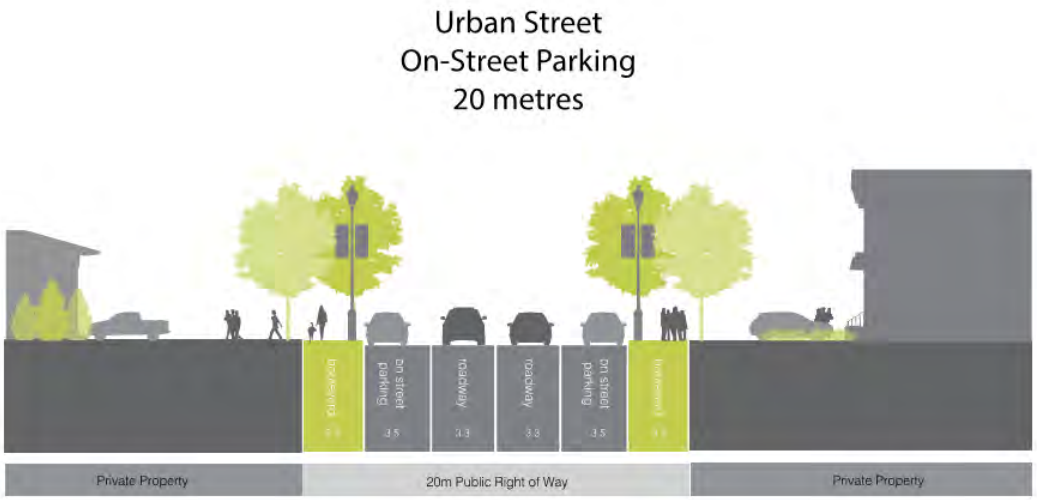
West Section Alternatives



West 1

- Rural road with 20m RoW
- Maintains current condition
  - Two lanes of traffic
  - 6m unpaved shoulders and swales
  - No parking, sidewalks, or dedicated cycling facilities

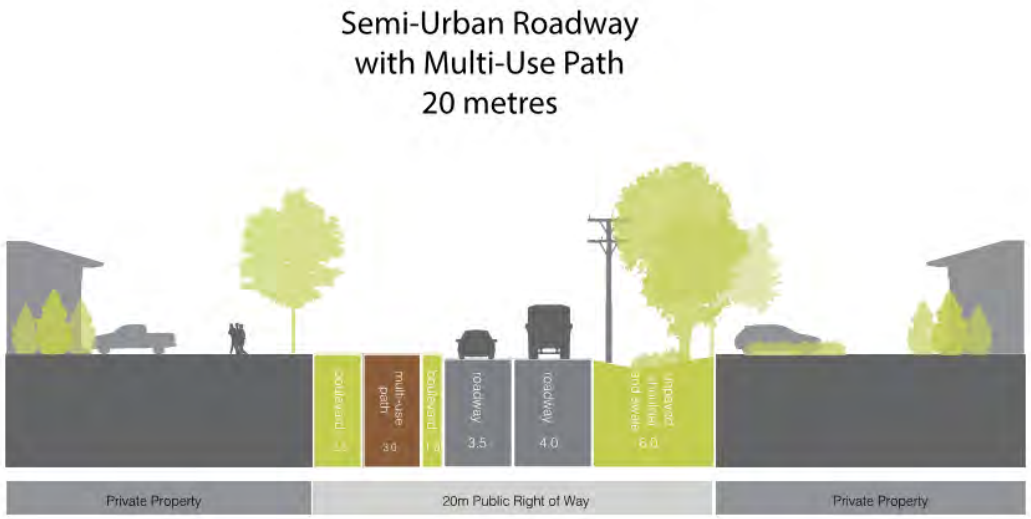
West Section Alternatives



West 2

- Urban street with 20m RoW
- On-street parking
- 3.2m pedestrian boulevards
- No dedicated cycling facilities

West Section Alternatives



West 3

- Semi-urban roadway with 20m RoW
- 6m unpaved shoulder & swale on one side
- 3m multi-use path and 2.5m boulevard on opposite side
- No on-street parking or dedicated cycling facilities

West Section Alternatives

West 4

- Urban street with 22m RoW
- Bump out parking
- Buffered bike lanes
- 3.2m pedestrian boulevards

Evaluation Criteria

- Evaluation Criteria have been finalized based on stakeholder and public input
- Organized into seven categories:
  - Operational
  - Sustainable Transportation
  - Natural Environment
  - Urban Design
  - Socio-Economic
  - Cultural Environment
  - Financial

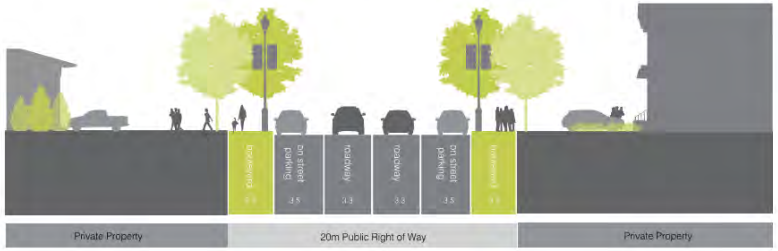
West Section Evaluation Results

West 1

Rural Street
20 metres

West 2

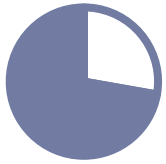
Urban Street
On-Street Parking
20 metres



West 3

Semi-Urban Roadway
with Multi-Use Path
20 metres

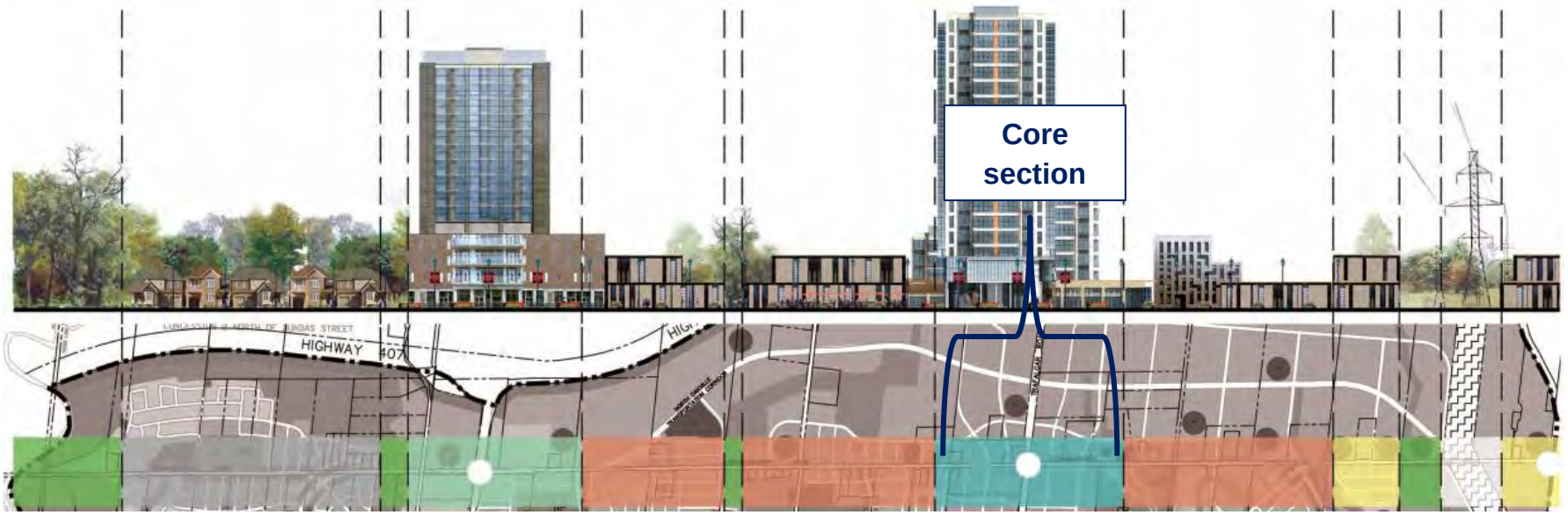
West 4



Urban Street
Bump Out Parking with
Dedicated Bike Lanes
22 metres

OAKVILLE

Core Section



- Extends east and west from Trafalgar Road intersection
- Designated Trafalgar Urban Core within NOESP
  - High density, mixed use, urban development
  - Up to 20 stories

Core Section Alternatives

Core 1

- 24m RoW
- 2 traffic lanes + 2 off-peak parking lanes
- Buffered bike lanes
- 3.4m pedestrian boulevards

Core Section Alternatives

Core 2

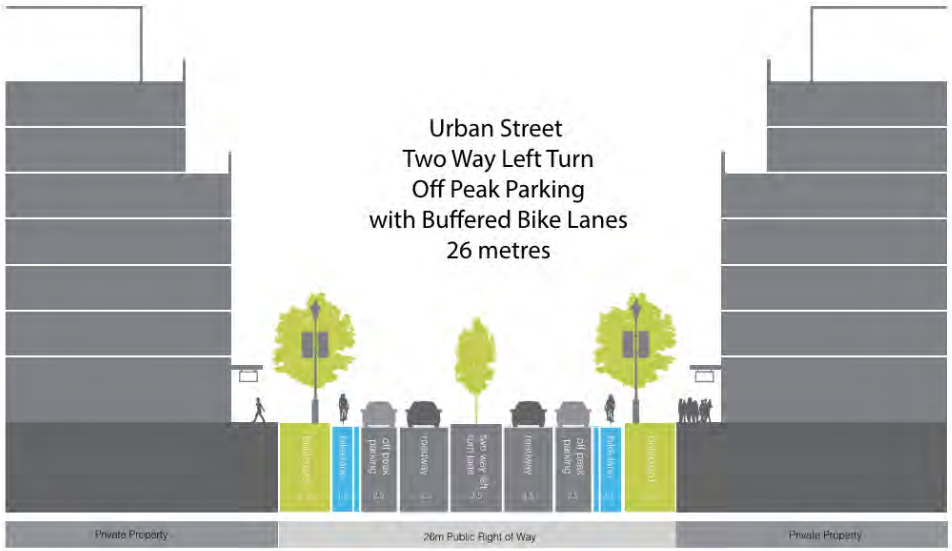
- 24m RoW
- 2 traffic lanes + 2 off-peak parking lanes
- Multi-use path on one side

Core Section Alternatives

Core 3

- 24m RoW
- 2 traffic lanes
- Median / two-way left turn lanes
- Buffered bike lanes
- 4.75m pedestrian boulevards
- No parking

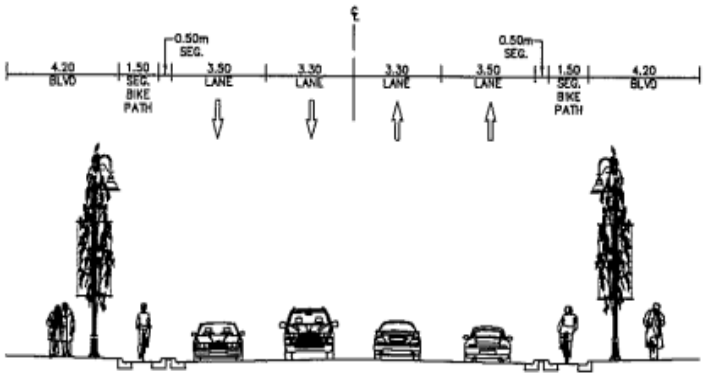
Core Section Alternatives



Core 4

- 26m RoW
- 2 traffic lanes
- 2 parking lanes
- Median / two-way left turn lanes
- 2.45m pedestrian boulevards
- Buffered bike lanes

Core Section Alternatives

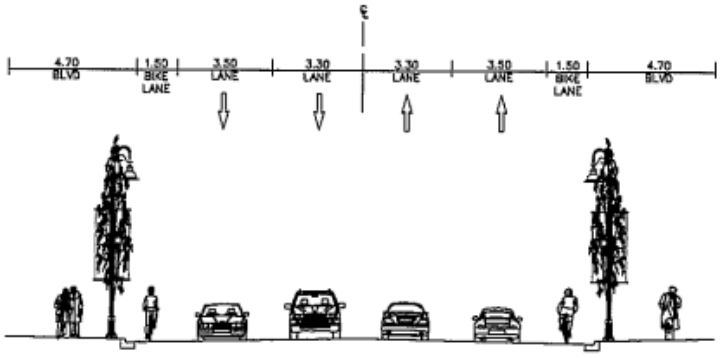


URBAN STREET
NO PARKING
WITH SEGREGATED BIKE LANES
26 METRES

Eliminated: Core 5

- 26m RoW with 4 traffic lanes
- Segregated bike lanes
- Not carried forward due to focus on vehicle traffic
  - Does not support Burnhamthorpe Road as a vibrant and pedestrian friendly Character Road

Core Section Alternatives

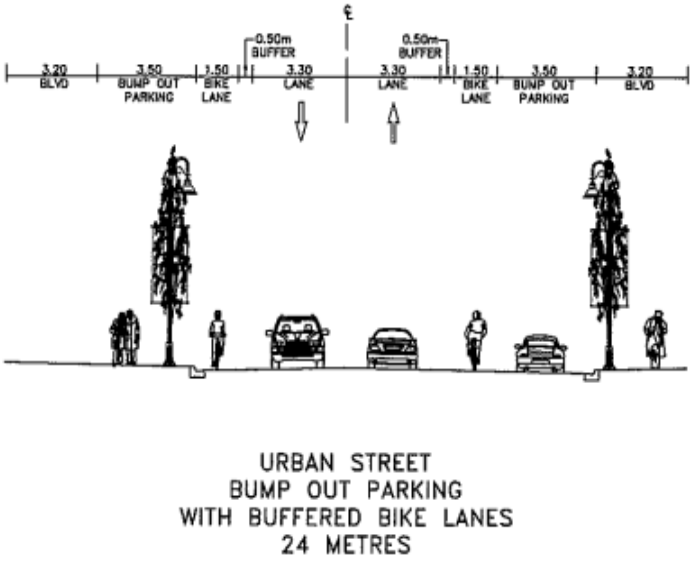


URBAN STREET
NO PARKING
WITH BIKE LANES
26 METRES

Eliminated: Core 6

- 26m RoW with 4 traffic lanes
- Bike lanes
- Not carried forward due to focus on vehicle traffic
  - Does not support Burnhamthorpe Road as a vibrant and pedestrian friendly Character Road

Core Section Alternatives

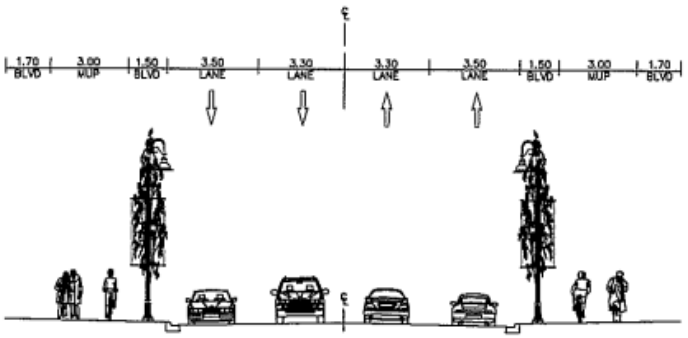


URBAN STREET
BUMP OUT PARKING
WITH BUFFERED BIKE LANES
24 METRES

Eliminated: Core 7

- 24m RoW with 2 traffic lanes + bump out parking
- Buffered bike lanes
- Not carried forward because permanent parking lanes not recommended in Core
  - Expected higher volumes of peak hour traffic

Core Section Alternatives

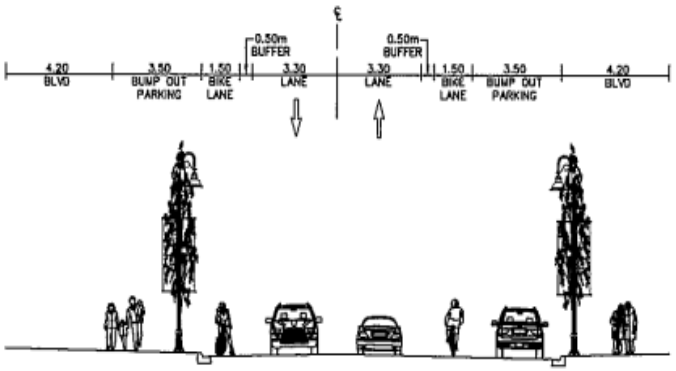


URBAN STREET
NO PARKING
WITH MULTI-USE PATH
26 METRES

Eliminated: Core 8

- 26m RoW with 4 traffic lanes
- Multi-use paths on both sides
- Not recommended due to focus on vehicle traffic
- Not carried forward because multi-use paths not recommended on both sides of an urban street
  - Interference with pedestrian space and commercial activity

Core Section Alternatives



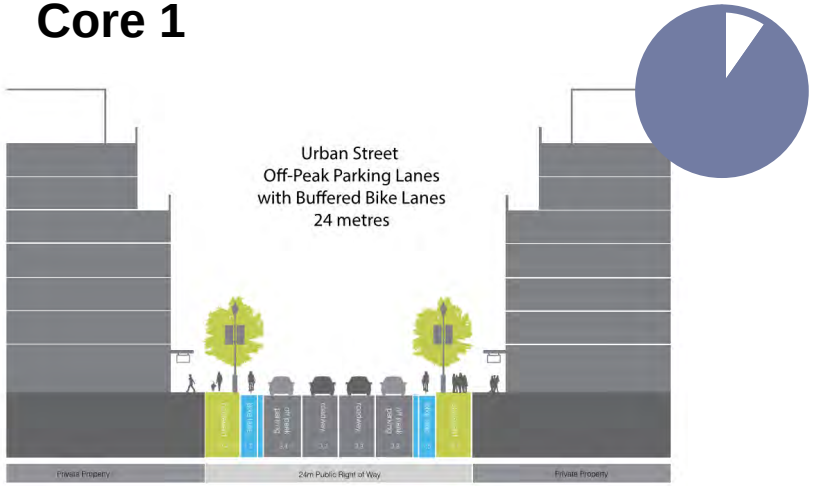
URBAN STREET
BUMP OUT PARKING
WITH BUFFERED BIKE LANES
26 METRES

Eliminated: Core 9

- 26m RoW with 2 traffic lanes + bump out parking
- Buffered bike lanes
- Not carried forward because permanent parking lanes not recommended in Core
  - Expected higher volumes of peak hour traffic

Core Section Evaluation Results

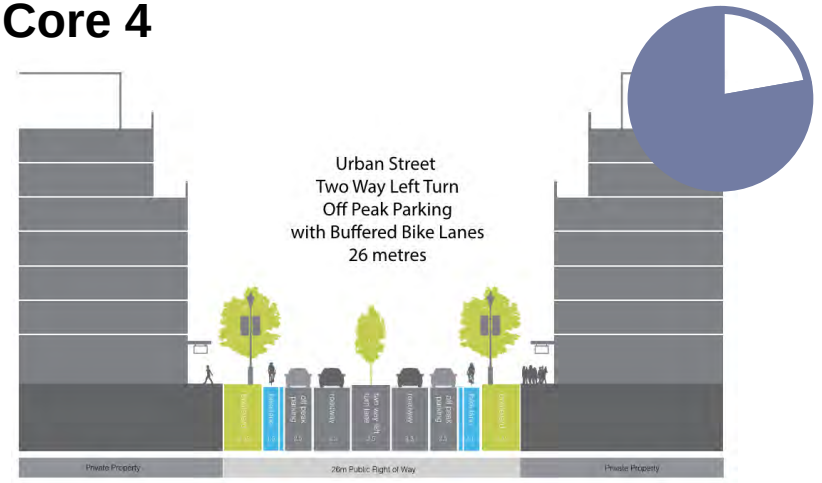
Core 1



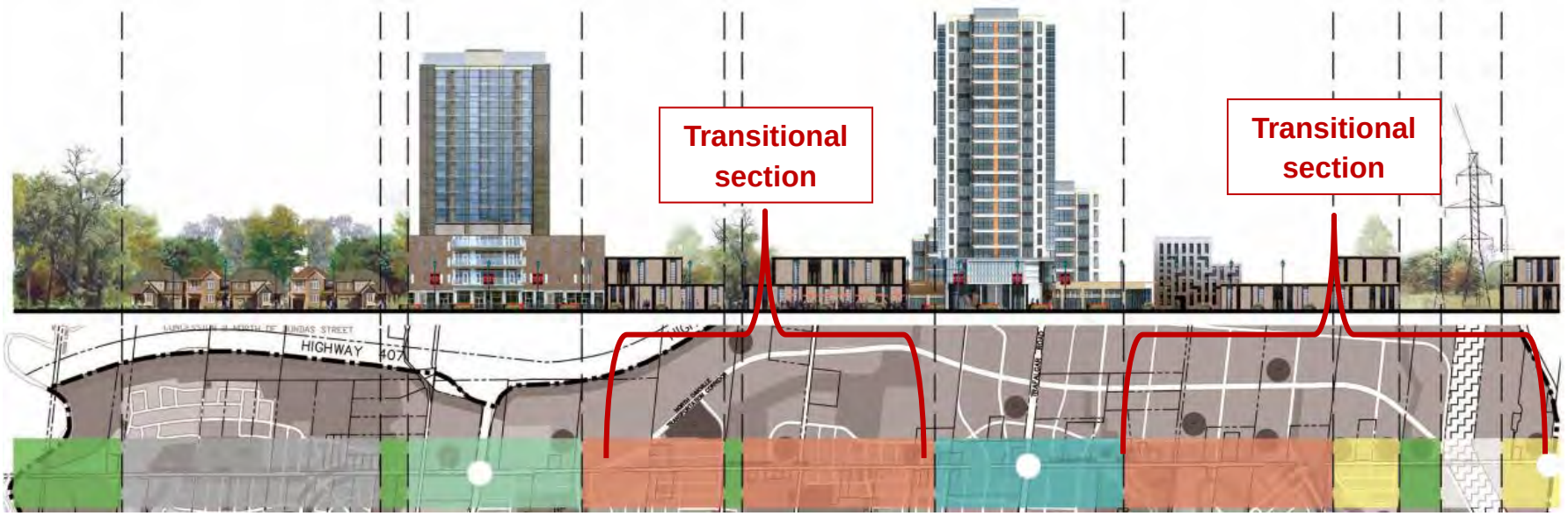
Core 2

Core 3

Core 4



Transitional Section



- Extends east and west from Core section
- Designated Transitional Area within NOESP
  - Allows for a range of land uses
  - Lower densities than Trafalgar Urban Core, but maintains urban and pedestrian-friendly environment

Transitional Section Alternatives

Transitional 1

- 22m RoW
- 2 traffic lanes
- On-street parking / sharrow for cyclists
- 4.2m boulevards

Transitional Section Alternatives

Transitional 2

- 24m RoW
- 2 traffic lanes
- Bump out parking
- Buffered bike lanes

Transitional Section Alternatives

Transitional 3

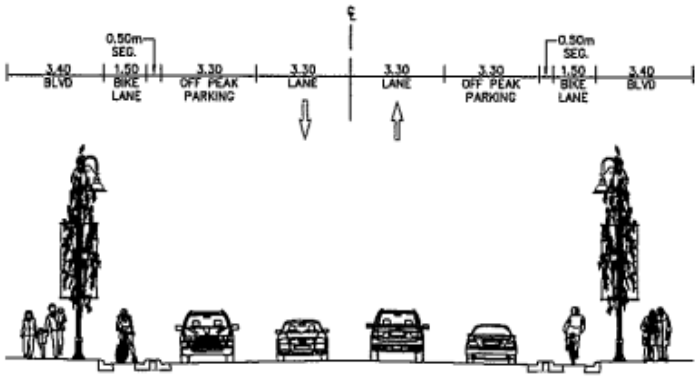
- 24m RoW
- 2 traffic lanes
- Bump out parking
- Multi-use paths

Transitional Section Alternatives

Transitional 4

- 24m RoW
- 2 traffic lanes
- On-street parking / sharrow for cyclists
- 5.2m boulevards

Transitional Section Alternatives

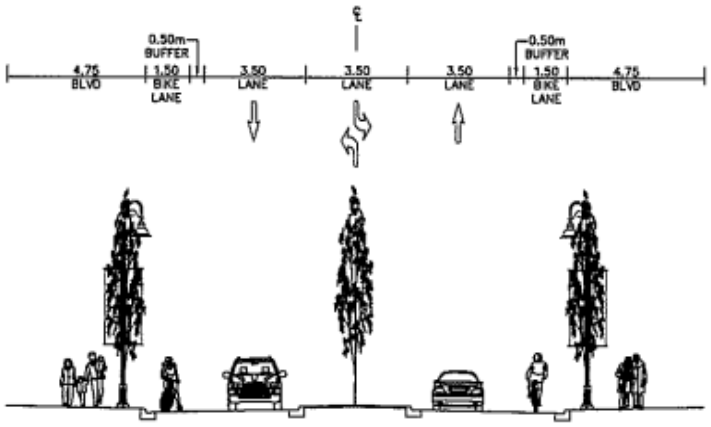


URBAN STREET
OFF–PEAK PARKING LANES
WITH SEGREGATED BIKE LANES
24 METRES

Eliminated: Transitional 5

- 24m RoW with 2 traffic lanes + 2 off-peak parking lanes
- Segregated bike lanes
- Not carried forward due to focus on vehicle traffic
  - On-street parking should be prioritized to support commercial development

Transitional Section Alternatives



URBAN STREET
TWO WAY LEFT TURN
WITH BUFFERED BIKE LANES
24 METRES

Eliminated: Transitional 6

- 24m RoW with 2 traffic lanes + median / two way left turn lane
- Buffered bike lanes
- Not carried forward due to focus on vehicle traffic
  - Left turn lanes not necessary within Transitional section
  - Prioritize pedestrian space over centre median

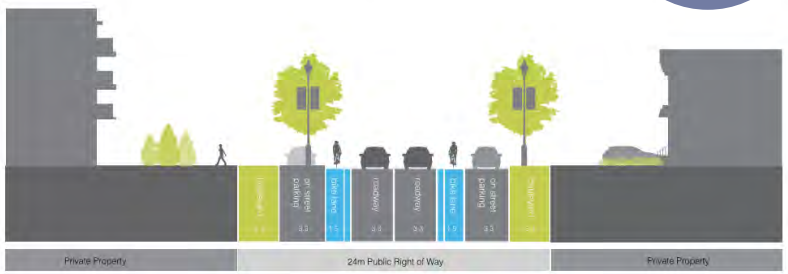
Transitional Section Evaluation Results

Transitional 1

Urban Street
On-Street Parking with
Sidewalk
22 metres

Transitional 2

Urban Street
Bump Out Parking Lanes
with Buffered Bike Lanes
24 metres



Transitional 3

Urban Street
Bump Out Parking Lanes
with Multi Use Path
24 metres

Transitional 4

Urban Street
On-Street Parking with
Sidewalk
24 metres

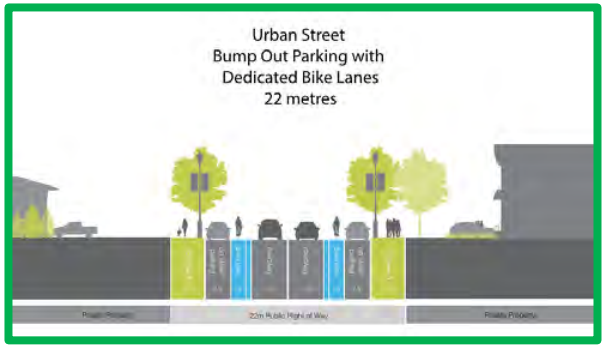
Weighted Evaluation

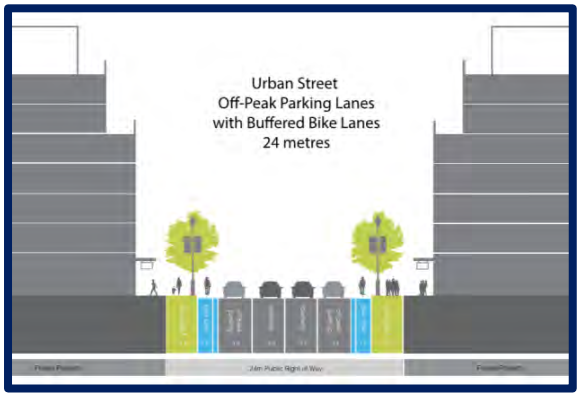
- Different weighting scenarios applied to evaluation categories based on priorities of each corridor section

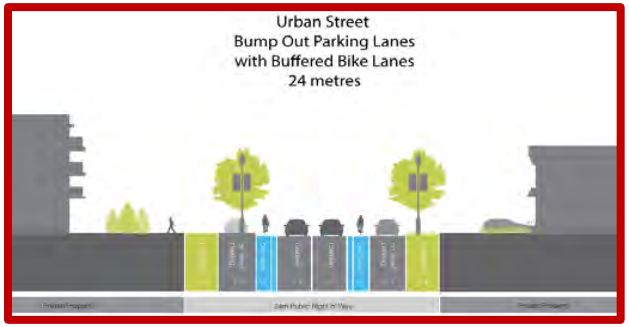
- West section:
  - **West 4** scores highest when Cultural Environment, Sustainable Transportation, Urban Design, Operational, Socio-Economic, and Financial criteria are weighted most heavily

- Core section:
  - **Core 1** scores highest in all weighting scenarios

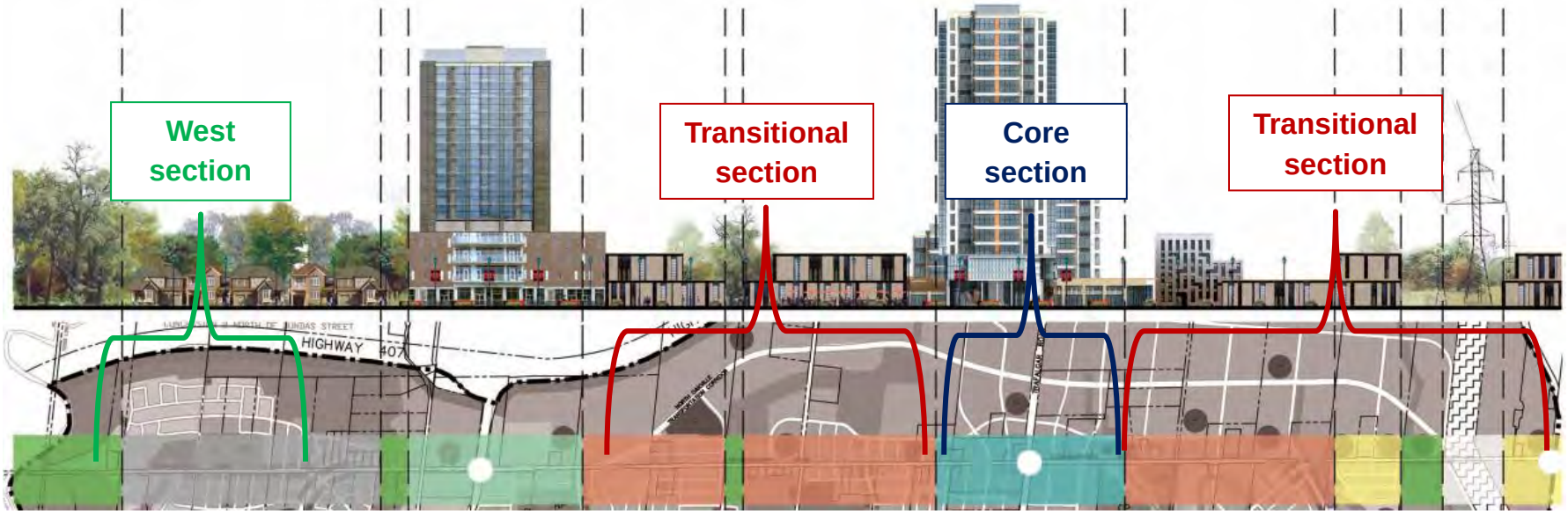
- Transitional section:
  - **Transitional 2** scores highest when Sustainable Transportation, Urban Design, and Socio-Economic criteria are weighted most heavily

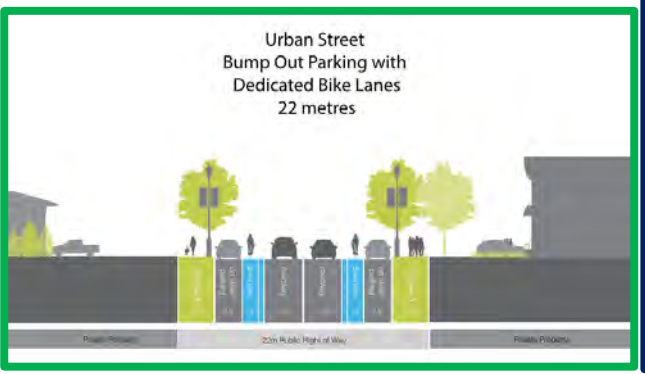


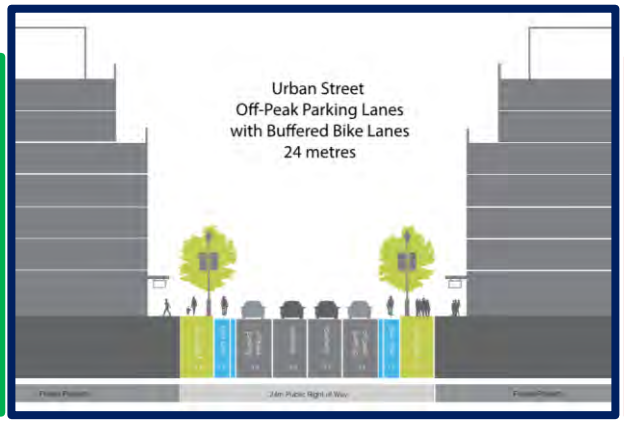


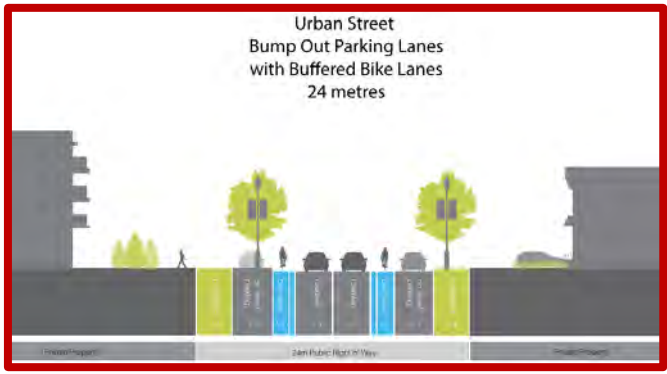


Preliminary Preferred Design









Discussion of Alternatives

- West
- Core
- Transitional

- Use the note pads to provide comments in addition to anything you want to share during the discussion

Next Steps

- Incorporate input
- Present evaluation process and preliminary Preferred Alternative at PIC #2
- Documentation

Welcome

BURNHAMTHORPE ROAD
CHARACTER STUDY

Welcome to the final Public Information Centre (PIC) for the Burnhamthorpe Road Character Study Environmental Assessment.

Through extensive consultation with stakeholders, technical agencies and members of the public, the project team has identified a preliminary Preferred Design for Burnhamthorpe Road between Ninth Line and Sixteen Mile Creek. The design will allow Burnhamthorpe Road to transition into a vibrant and pedestrian-friendly street as development evolves along the corridor.

At this PIC, you will have the opportunity to:

- ❖ Review the study process to date, including the development of alternatives and evaluation methodology.
- ❖ Review the preliminary Preferred Design.
- ❖ Ask questions and comment on the preliminary Preferred Design.

Study Process:

Please sign in at the front desk.
We encourage you to complete a comment sheet before leaving.

OAKVILLE

Defining Character

The **North Oakville East Secondary Plan** established a new vision for Burnhamthorpe Road as an urban corridor – one that is vibrant, pedestrian-friendly and transit-supportive.

The Secondary Plan included a Master Plan which delineated planned Urban Core Areas, a Natural Heritage and Open Space system, a large Employment District, and Transitional Areas. The Secondary Plan and Master Plan define Burnhamthorpe Road as a ***Character Road*****.**

The physical design of a road and its streetscape elements, as well as the built forms adjacent to it, defines the character of the roadway through the visual experiences they create.

As the area urbanizes according to the vision and framework set out in the Secondary Plan, the landscape that currently defines Burnhamthorpe Road will change. Streetscape elements such as sidewalks on both sides of the road; trees planted at regular intervals; signage; public art; street furniture and other elements within the public right-of-way, as well as the built form along the corridor will define the new character of Burnhamthorpe Road.

Key to maintaining the authenticity of the Burnhamthorpe Road corridor is ensuring that new elements are distinct and definable, and where appropriate, sensitive to the existing character of the corridor. New elements should not seek to create a false sense of heritage through nostalgic design.

Image Credit: Trafalgar Township Historical Society

yesterday

today

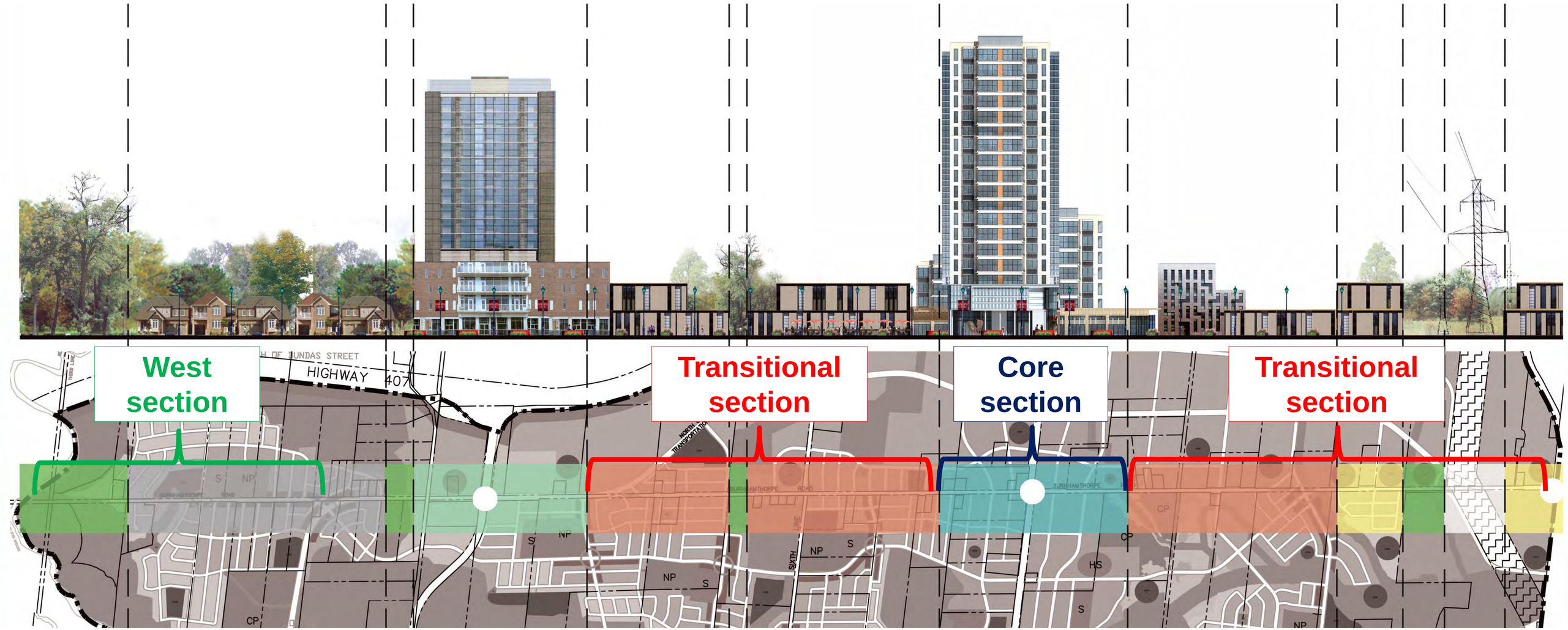
Image Credit: North Oakville Urban Design and Open Space Guidelines

tomorrow

Development of Alternative Designs

Due to the varied land uses and densities expected along the Burnhamthorpe Road corridor with implementation of the North Oakville East Secondary Plan (NOESP), three sections of the corridor were defined: the low to medium density, primarily residential **West section**; the high density and mixed-use **Core section**; and the medium density, mixed use **Transitional sections**. A distinct set of road design alternatives was developed for each of these sections to meet its unique needs.

The graphic below schematically illustrates the types of land uses and built form that may be found along the **West**, **Transitional**, and **Core** sections of the corridor as the lands are developed according to the NOESP.



Alternative Designs: West Section

The **West section** is bounded by Sixteen Mile Creek to the west and the New North Oakville Transportation Corridor (NNOTC) to the east. In this section of the corridor, NOESP land use designations primarily allow for low to medium density residential development. Some mixed use development fronting Burnhamthorpe Road is encouraged, with allowable building heights ranging from two to five storeys.

The cross sections below illustrate the alternative road designs that were considered for the West section. West section alternatives aim to minimize the environmental impact of the right-of-way while considering a range of on-street parking and active transportation options:

Rural Street
20 metres

West 1

Urban Street
On-Street Parking
20 metres

West 2

Semi-Urban Roadway
with Multi-Use Path
20 metres

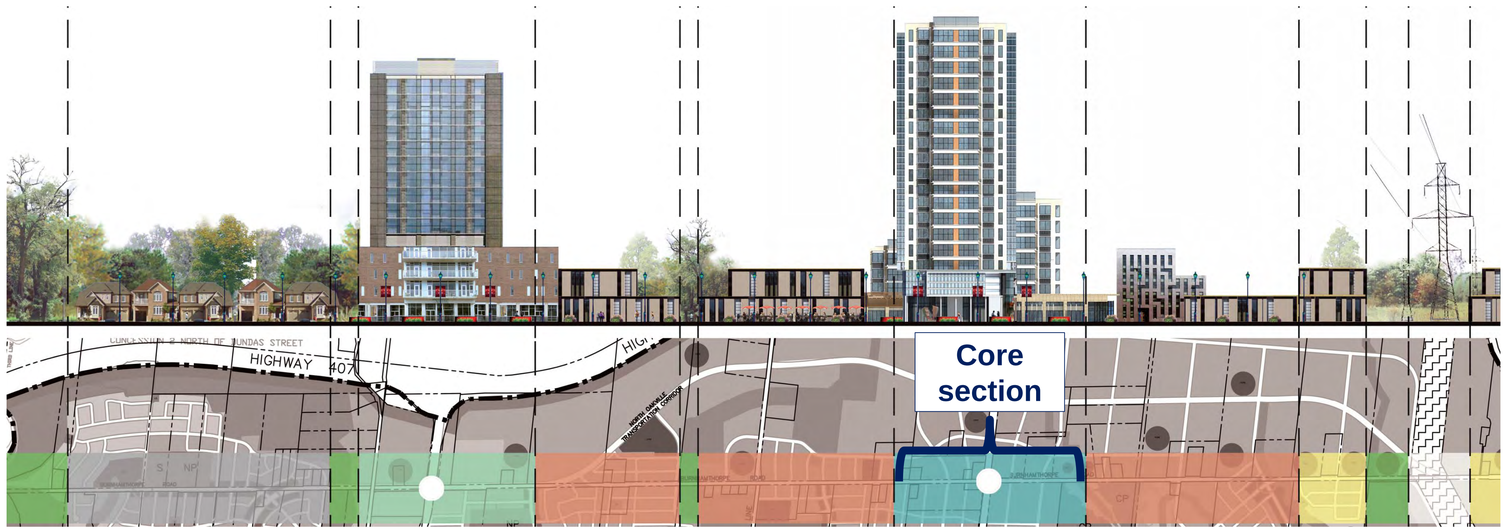
West 3

Urban Street
Bump Out Parking with
Dedicated Bike Lanes
22 metres

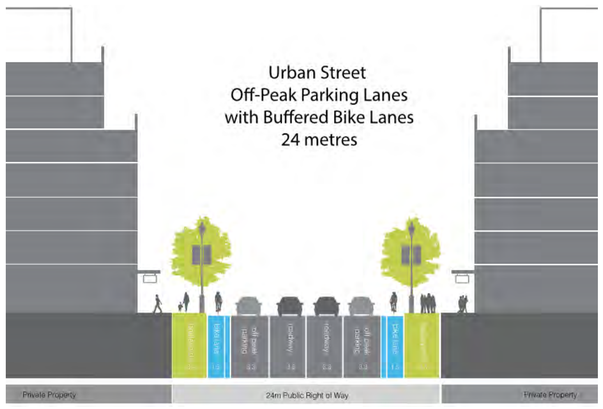
West 4

Alternative Designs: Core Section

The **Core section** is defined by the Trafalgar Urban Core land use designation within the NOESP. It extends east and west from Burnhamthorpe Road's intersection with Trafalgar Road, which is expected to experience high density urban development. The Trafalgar Urban Core designation allows for a range of land uses, including buildings of up to 20 storeys.



The cross sections below illustrate the alternative road designs that were considered for the Core section. Core section alternatives reflect the need for an urban cross section that provides an attractive pedestrian environment and safe cycling facilities while accommodating higher volumes of traffic:



Core 1

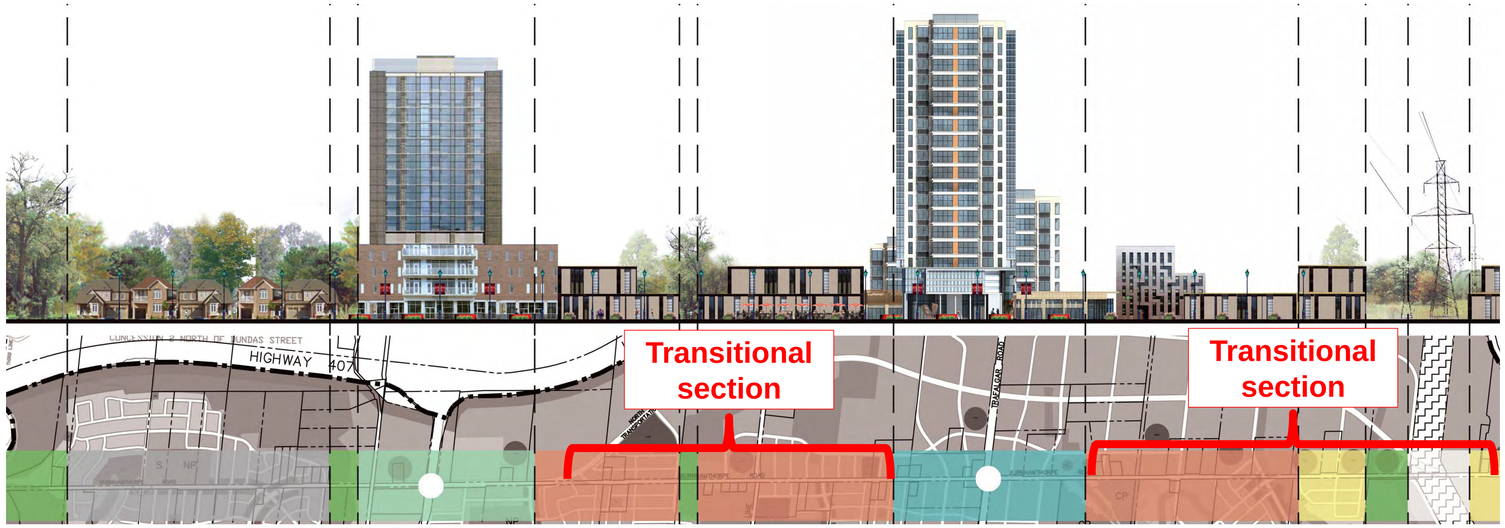
Core 2

Core 3

Core 4

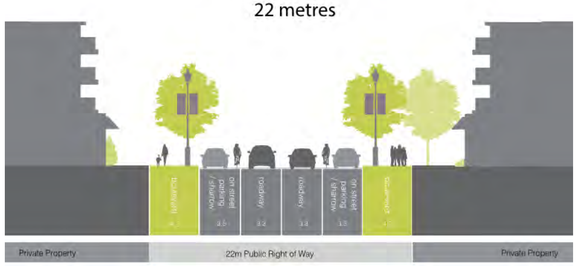
Alternative Designs: Transitional Section

The **Transitional sections** of the corridor are located directly east and west of the Core section. In the NOESP, these sections are primarily designated Transitional Area, allowing for a range of land uses. The density of development is expected to be lower than that of the Trafalgar Urban Core, while still providing an urban and pedestrian-friendly environment.



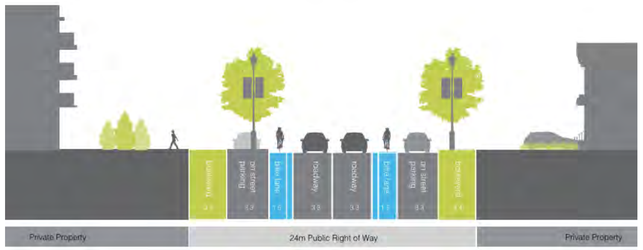
The cross sections below illustrate the alternative road designs that were considered for the Transitional section. Transitional section alternatives consider compatibility with the preferred Core section alternatives to ensure continuity in pedestrian, cycling, and traffic facilities.

Urban Street
On-Street Parking with Sidewalk
22 metres



Transitional 1

Urban Street
Bump Out Parking Lanes with Buffered Bike Lanes
24 metres



Transitional 2

Urban Street
Bump Out Parking Lanes with Multi Use Path
24 metres

Transitional 3

Urban Street
On-Street Parking with Sidewalk
24 metres

Transitional 4

Evaluation Process

At the first PIC, a set of draft Evaluation Criteria was presented. This set of criteria was refined through consultation. The final Evaluation Criteria are organized into seven categories as follows:

Operational
- Right-of-Way Width Range
- Traffic Calming
- Number of Lanes
- Parking
- Utililties/Stormwater Management

Sustainable Transportation
- Cycling
- Pedestrians
- Transit
- Accessibility

Natural Environment
- Natural Heritage Features and Designated Areas
- Wildlife and Wildlife Habitat
- Urban Forestry
- Natural Hazards

Urban Design
- Land Use Designations / Context
- Planned Building Scale & Orientation
- Boulevard Treatment

Socio-Economic
- Property
- Community Features / Character
- Air Quality

Cultural Environment
- Archaeology
- Built Heritage
- Cultural Heritage Landscape

Financial
- Capital Costs
- Operational Costs
- Property Costs

The alternative road designs for each of the West, Core, and Transitional sections were evaluated against these criteria to determine a preliminary Preferred Design. Discussions with members of the project team, technical agencies, and stakeholders helped to refine the results of the evaluation and determine which Evaluation Criteria and categories should be considered of most importance in the evaluation process. A number of different weighing scenarios were applied to provide further clarity.

Evaluation Process: Example

For each of the West, Core, and Transitional sections, alternatives were evaluated against one another using the Evaluation Criteria. Under each criterion, each alternative was assigned a score of 0, 1, 2, or 3 based on its expected net benefits.

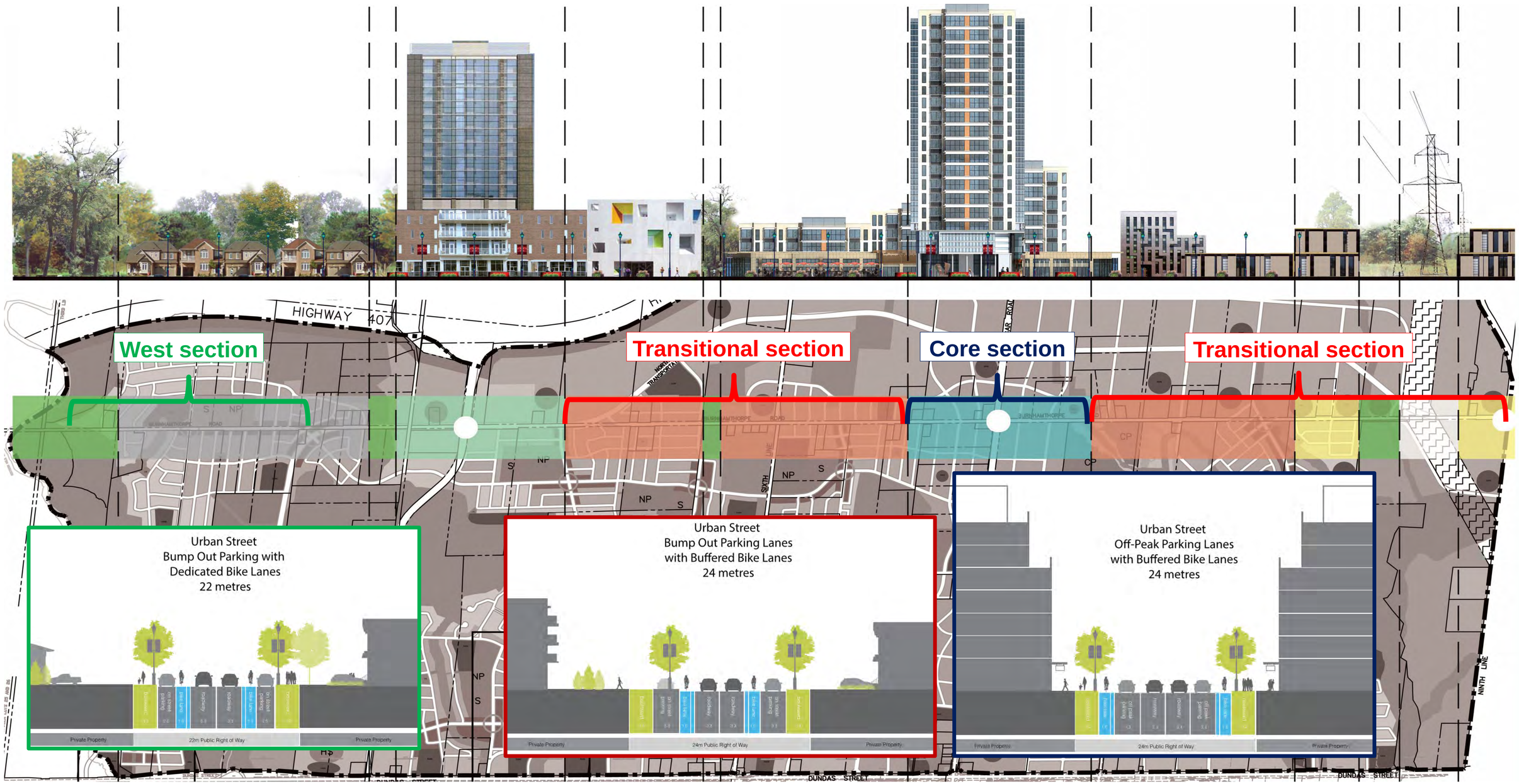
A sample evaluation is provided at right. This sample demonstrates the scores assigned to each of the West section alternatives for Evaluation Criteria under the Operational and Sustainable Transportation categories.

The evaluation resulted in the identification of a Preliminary Preferred Alternative for the length of the Burnhamthorpe Road corridor.

	Criteria	Description / Considerations	West 1	West 2	West 3	West 4
						
OPERATIONAL	**Right-of-Way (ROW) Width Range**	Compliance with the North Oakville East Secondary Plan OMB settlement: ROW "will be kept to a minimum and shall not exceed a maximum of 24 metres and more typically will have a ROW of 20 metres"				
	Traffic Calming	Slow vehicle speeds encouraged through traffic calming measures such as street trees, on-street parking, and narrow traffic lanes				
	Number of Lanes	Number of traffic lanes sufficient to accommodate projected traffic volumes through 2031				
	Parking	Sufficient on-street parking to support expected scale of commercial development				
	Utilities / Stormwater Management	Right-of-way is able to accommodate all necessary servicing (see John's comments at TAC – need 4.05 minimum for above ground)				
	SUMMARY	**TOTAL POINTS (maximum 15)**	**6**	**14**	**8**	**14**
SUSTAINABLE TRANSPORTATION	**Cycling**	Safe, dedicated cycling facilities provided that minimize interference/conflict with vehicles and pedestrians				
	Pedestrians	Attractive, safe and inviting environment for pedestrians with minimized walking distances to key community features				
	Transit	Accommodate planned transit use for future Burnhamthorpe Road as a Transit Corridor with service frequency of 10 to 15 minutes				
	Accessibility	Design provides universal access: minimal slopes, uninhibited access to transit stops, frequent pedestrian street crossings, and sidewalks wide enough for two wheelchairs to pass				
	SUMMARY	**TOTAL POINTS (maximum 12)**	**0**	**8**	**5**	**12**

Preliminary Preferred Alternative

BURNHAMTHORPE ROAD
CHARACTER STUDY



OAKVILLE

Preliminary Preferred Alternative: West

In the low to medium density, primarily residential West section, Alternative **West 4** was selected. An “urban” road design is preferred with wide boulevards, bump out parking, and buffered bike lanes. This design would promote active transportation and support the expected small-scale commercial land uses, while limiting the right-of-way to 22m to minimize adverse environmental impacts.

Urban Street
Bump Out Parking with
Dedicated Bike Lanes
22 metres

Preliminary Preferred Alternative: Core

In the high density, mixed use Core section, Alternative **Core 1** was selected. Buffered bike lanes and wide boulevards are preferred to create an inviting pedestrian environment and promote active forms of transportation. Off-peak parking lanes will provide flexibility in allowing four lanes of traffic during peak hours.

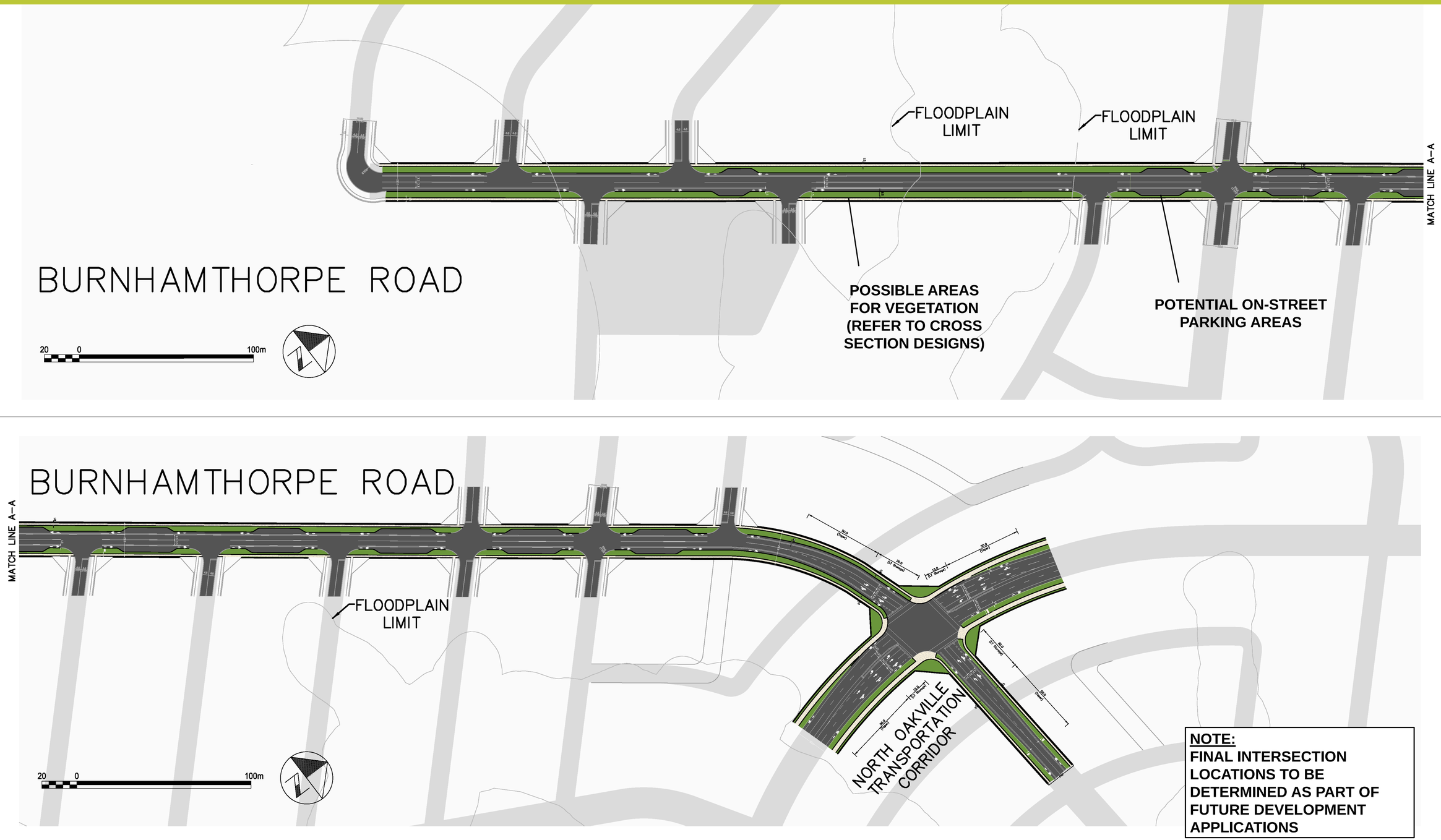
Preliminary Preferred Alternative: Transitional

In the medium density, mixed use Transitional section, Alternative **Transitional 2** is preferred. Bump out parking lanes will support adjacent commercial land uses, while the buffered bike lanes allow for consistency throughout the entire corridor.

Urban Street
Bump Out Parking Lanes
with Buffered Bike Lanes
24 metres

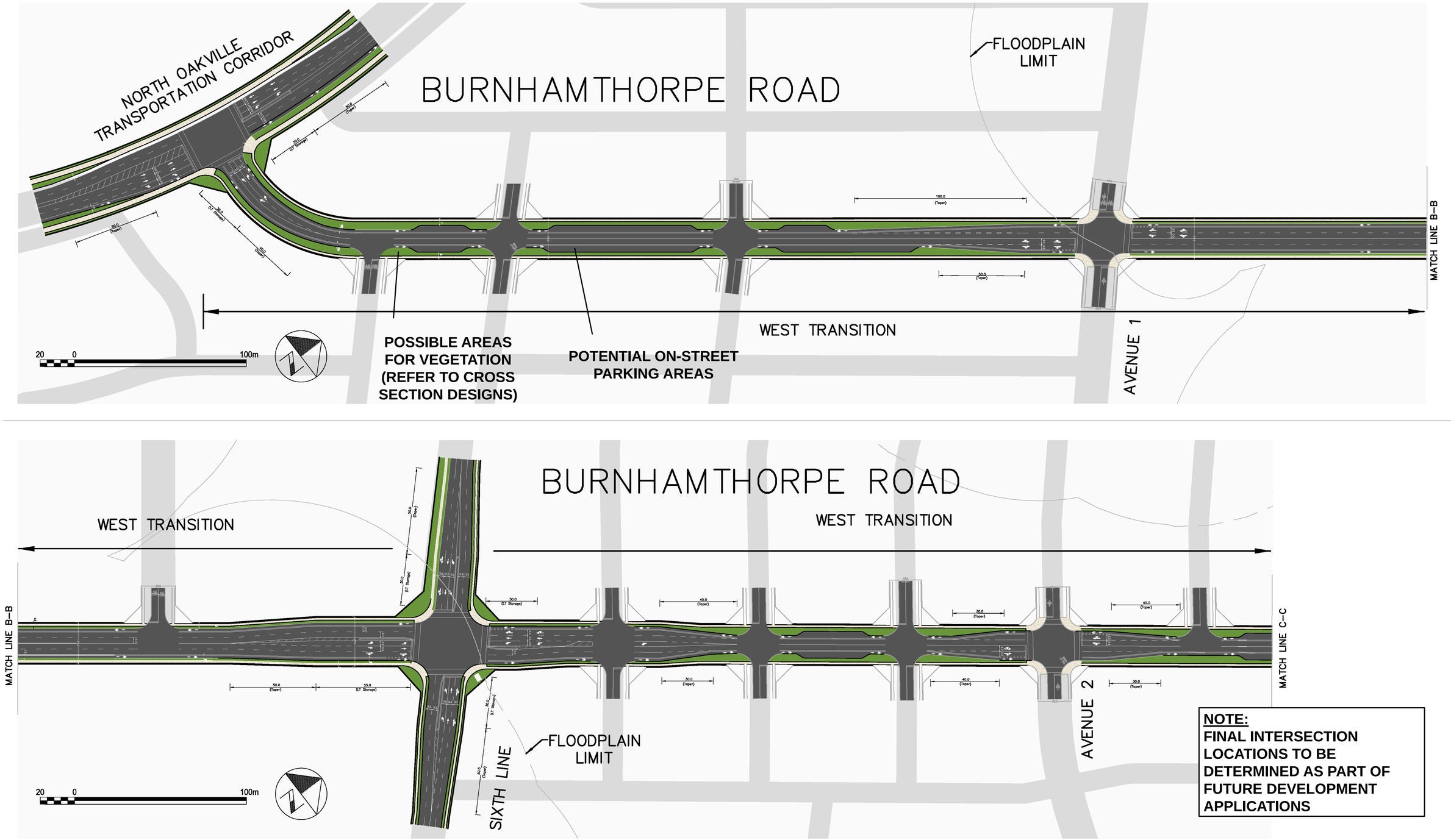
Preliminary Preferred Alternative: Plan View

BURNHAMTHORPE ROAD
CHARACTER STUDY



Preliminary Preferred Alternative: Plan View

BURNHAMTHORPE ROAD
CHARACTER STUDY



NOTE:
FINAL INTERSECTION LOCATIONS TO BE DETERMINED AS PART OF FUTURE DEVELOPMENT APPLICATIONS

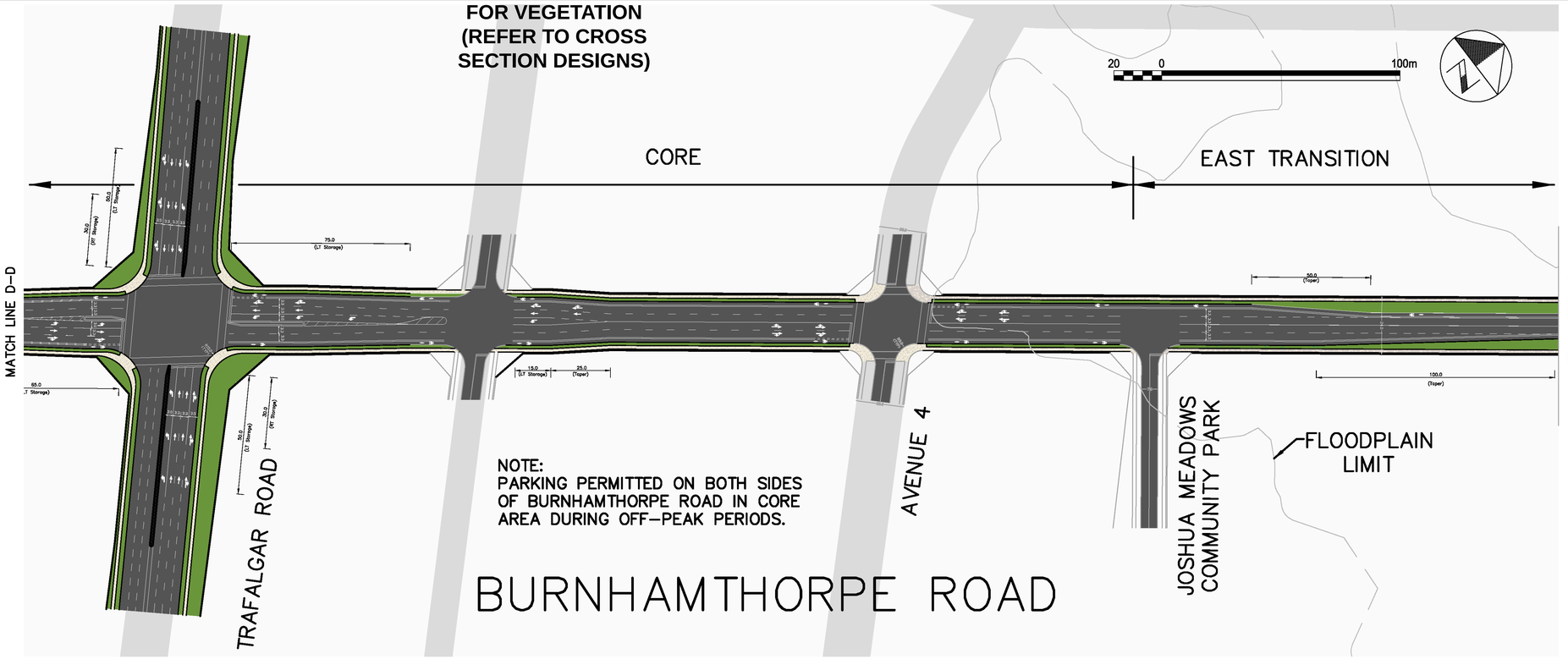
OAKVILLE

Preliminary Preferred Alternative: Plan View

BURNHAMTHORPE ROAD
CHARACTER STUDY

NOTE:
PARKING PERMITTED ON BOTH SIDES OF BURNHAMTHORPE ROAD IN CORE AREA DURING OFF–PEAK PERIODS.

POSSIBLE AREAS FOR VEGETATION (REFER TO CROSS SECTION DESIGNS)



NOTE:
PARKING PERMITTED ON BOTH SIDES OF BURNHAMTHORPE ROAD IN CORE AREA DURING OFF–PEAK PERIODS.

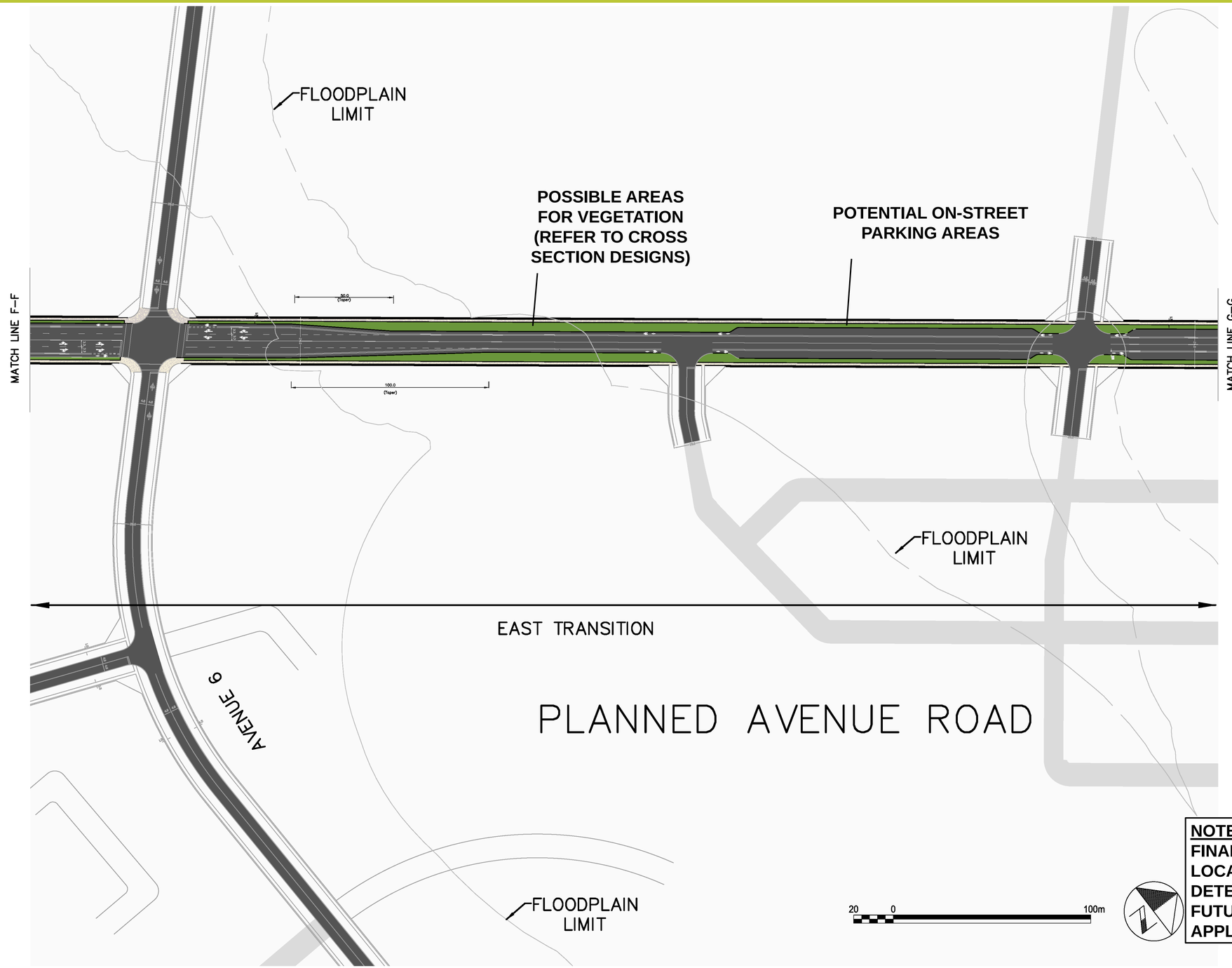
NOTE:
FINAL INTERSECTION LOCATIONS TO BE DETERMINED AS PART OF FUTURE DEVELOPMENT APPLICATIONS

OAKVILLE

Preliminary Preferred Alternative: Plan View

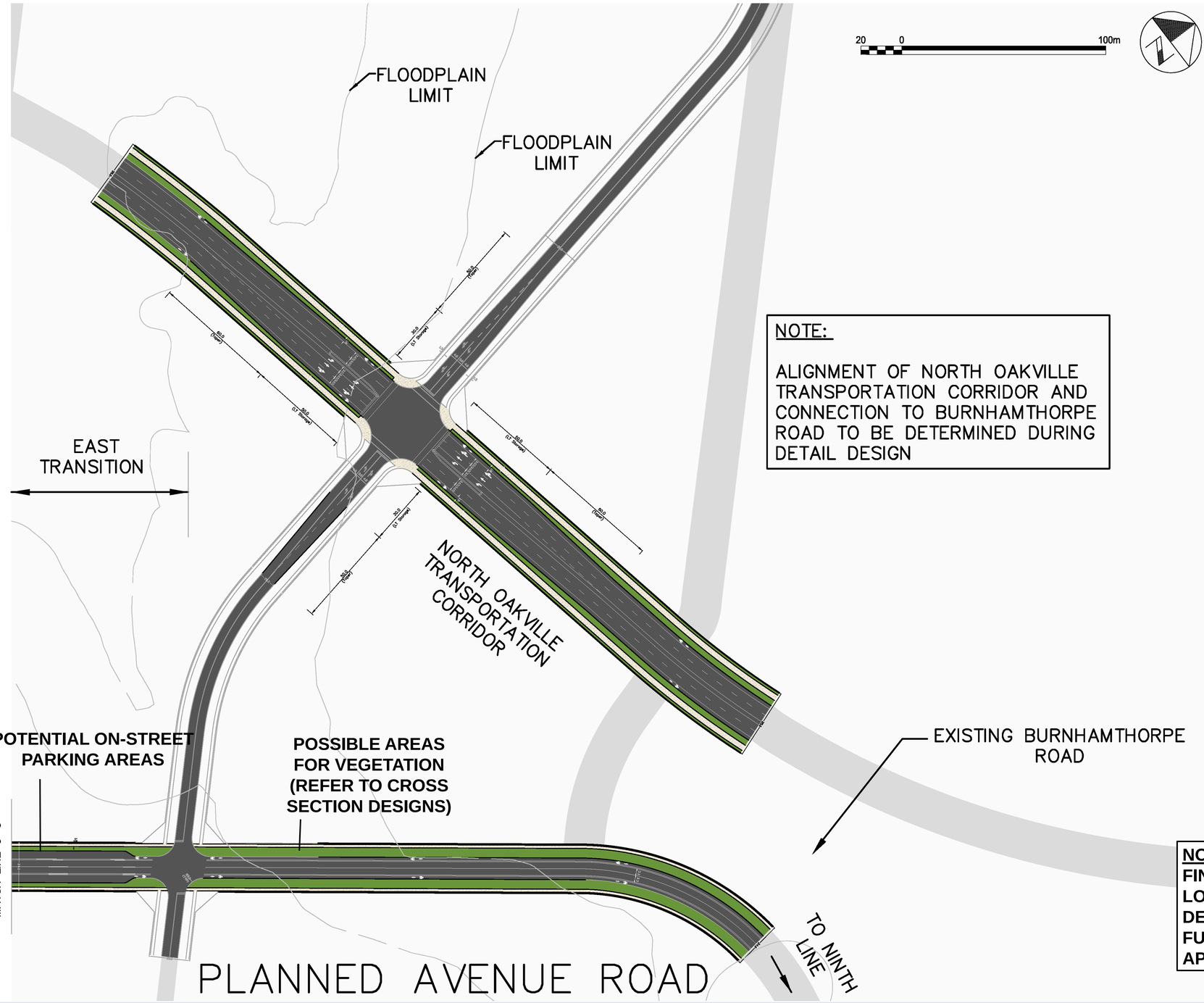
Preliminary Preferred Alternative: Plan View

BURNHAMTHORPE ROAD
CHARACTER STUDY



NOTE:
FINAL INTERSECTION LOCATIONS TO BE DETERMINED AS PART OF FUTURE DEVELOPMENT APPLICATIONS

Preliminary Preferred Alternative: Plan View



Next Steps

Following this PIC, the project team will:

- Review and address comments received – look for a summary on the study website and in an upcoming newsletter;
- Further refine the preliminary Preferred Design; and
- Document the study process in an Environmental Study Report (ESR), which will soon be available for public review.

How to get involved:

- Visit the study website to stay up-to-date as the study nears completion (http://www.oakville.ca/residents/eas-burnhamthorpe.html);
- Complete the online survey to provide input into the final Preferred Design and the detailed design stage of the project;
- Review and comment on the ESR, expected to be available on the study website in June 2014; and/or
- Contact the project team directly, using the contact information at right.

Please complete a comment card or send comments directly to one of the project team contacts:

Town Staff

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Transportation Engineer,
Town of Oakville
1255 Trafalgar Road
Oakville, ON L6H 0H3
burnhamthorpe@oakville.ca
905-845-6601 ext. 3236

Project Consultant

Bob Koziol
Manager, Municipal Transportation
MMM Group Limited
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Thornhill, ON L3T 0A1
KoziolB@mmm.ca
905-882-7249

Thank you!

Your involvement is essential to the successful completion of this study.
We welcome your comments.

APPENDIX B

Transportation Analysis

MMM GROUP

INTER-OFFICE MEMO

To:	Bob Koziol	Date:	February 14, 2014
From:	Derek Dalgleish	Job No.:	16-03055
Subject:	Burnhamthorpe Road Character Road Study, Transportation Analysis DRAFT	CC:	

As a Character Road, Burnhamthorpe Road, outside of the sections subject to the North Oakville Transportation Corridor (NNOTC), is intended to serve an Avenue or Connector/Transit Corridor function. This transportation analysis examines the potential infrastructure requirements for Burnhamthorpe Road, including number of travel lanes across the study area, and additional turn lanes at key intersections.

1.0 POLICY DIRECTION

Consistent with the North Oakville East Secondary Plan (NOESP), Burnhamthorpe Road is envisioned to generally provide two travel lanes with on-street parking, bike lanes, sidewalks on both sides, and direct access from abutting properties. Burnhamthorpe Road's design will strive to balance the Town's desire to preserve existing features and to establish a destination street that provides real choices in mobility. **Appendix A** provides a summary of the policy directions for Burnhamthorpe Road.

2.0 POTENTIAL TRAVEL LANE REQUIREMENTS

Based on the modeling completed for the Town of Oakville's approved Transportation Master Plan - Switching Gears (TMP), 2031 forecast PM peak hour, peak direction traffic volumes on Burnhamthorpe Road are in the order of 400 vehicles.

In the case of link volumes, a level of service (LOS) is assigned on the basis of volume-to-capacity (V/C) ratios, where the volume of traffic is compared to the ability of the roadway to accommodate traffic flow. The V/C ratio provides a measure of traffic volume demand to the available capacity, with a capacity condition represented by a V/C ratio of 1.0 (i.e., volume equals capacity). The corresponding levels of service (LOS) for various volume-to-capacity ratios are presented below:

Level of Service	
LOS A	<0.50 Free flow
LOS B	0.50 to 0.69 Stable flow
LOS C	0.70 to 0.79 Stable flow
LOS D	0.80 to 0.89 Approaching unstable flow
LOS E	0.90 to 1.0 Unstable flow
LOS F	>1.0 Forced Flow

Acceptable operations are generally considered to be LOS C or better, however, during peak hours in urban areas, LOS D is generally considered as the practical operating objective.

Table 1 summarizes the projected PM peak hour link volumes and forecast V/C ratios on Burnhamthorpe Road, under the TMP's base case and recommended strategy. **Appendix B** provides the TMP projected 2031 PM Peak Hour Total Volumes and V/C Ratios, reflecting the recommended strategy which incorporates high travel demand management (TDM) growth, high active transportation growth, high transit growth, infrastructure improvements, and road network strategies.

Table 1
Projected V/C Ratios on Burnhamthorpe Road

Description	Eastbound			Westbound		
	PM Volume	Total Capacity	V/C Ratio	PM Volume	Total Capacity	V/C Ratio
Base Case Trend						
West of Sixth Line	394	700	0.56	384	700	0.55
East of Sixth Line	308	700	0.44	464	700	0.66
East of Trafalgar Road	6	700	0.01	64	700	0.09
Recommended Strategy Widen Arterials + Midtown + New Barrier Crossings + High Transit + High TDM						
West of Sixth Line	396	700	0.57	289	700	0.41
East of Sixth Line	272	700	0.39	329	700	0.47
East of Trafalgar Road	2	700	0	17	700	0.02

Based on an assumed lane capacity of 700 vehicles per hour per lane (vphpl) in the TMP and TMP projected PM peak hour link volumes, forecast V/C ratios for various sections of Burnhamthorpe Road range from 0.60 in the Transitional Area to the west of the Trafalgar Urban Core to 0.20 in much of the remaining sections of the corridor. Therefore, on the basis of forecast traffic volumes, Burnhamthorpe Road is projected to operate at a highly acceptable LOS B or better with implementation of the North Oakville road network and TMP recommendations. This suggests **future traffic on Burnhamthorpe Road can generally be accommodated by two travel lanes (i.e., one in each direction).**

However, to maintain overall traffic flow as well as desired on-street parking, considerations for potential turning movements at side street intersections have also been taken into account. Additional lanes at key intersection locations are discussed in Section 3.

2.1 Trafalgar Urban Core

Based on the modelling completed for Switching Gears, projected volumes are relatively low in the Trafalgar Urban Core. However, it is anticipated that on-street parking will be provided, side street intersections along this part of the corridor will be closely spaced, and driveway access will be primarily, but not exclusively, from the side streets. With multiple side streets and some driveways, lane capacity may be reduced below the assumed 700 vphpl due to the presence and frequency of

turning movements. There is a propensity for left-turn movements at side streets and driveways to be impeded by opposing traffic flows. As a result of the relatively low volumes generated by the adjacent land uses, these situations have the potential to impede through traffic on Burnhamthorpe Road, particularly during peak hours. For these reasons, **Burnhamthorpe Road is recommended to be a four-lane road in the Trafalgar Urban Core, providing two travel lanes in each direction during the peak periods. During off-peak periods, this cross-section can accommodate the forecast traffic volumes and on-street parking on both sides of the road, and will have flexibility to accommodate anticipated turning movements.**

3.0 PONTENTIAL TURN LANE REQUIREMENTS

Intersection capacity and queuing analysis was completed for major intersections along Burnhamthorpe Road within the Study Area, based on traffic volume assumptions reflecting the ultimate build out of North Oakville in accordance with the North Oakville East Secondary Plan (NOESP). This section summarizes the analysis findings and the resulting recommendations with respect to intersection lane configuration and intersection control requirements at the study intersections.

3.1 Methodology

Since traffic forecasts for the study intersections are unavailable, the future traffic volumes were estimated based on limited data from traffic studies supplied to MMM by the Town of Oakville, and a series of assumptions. It should be emphasized that the future traffic volumes presented herein were developed for the purpose of a high-level assessment of potential road right-of-way and intersections requirements along Burnhamthorpe Road.

The future traffic volumes were estimated based on a review of the future total traffic forecasts contained in the following reports provided by the Town of Oakville:

- Transportation Impact Study, Star Oak Developments Limited, Town of Oakville, prepared by URS Canada Inc., April 2013
- Traffic Impact Study, Joshua's Creek Lands, North Oakville, prepared by Read Voorhees & Associates, August 2012
- Traffic Impact Study, Petgor Draft Plan, North Oakville, prepared by Read Voorhees & Associates, December 2012
- Transportation Impact Study, Sixth Line Developments, Town of Oakville, prepared by URS Canada Inc., November 2012
- Traffic Impact Study, Emgo Draft Plan, North Oakville, prepared by Read Voorhees & Associates, September 2012
- Traffic Impact Study, The Preserve Phase 2, North Oakville, prepared by Read Voorhees & Associates, September 2014

- Transportation Impact Study, Timsin Development, Town of Oakville, prepared by URS, April 2010

- New North Oakville Transportation Corridor and Crossing of Sixteen Mile Creek Class Environmental Assessment Study, Final Environmental Study Report, Regional Municipality of Halton, March 2010

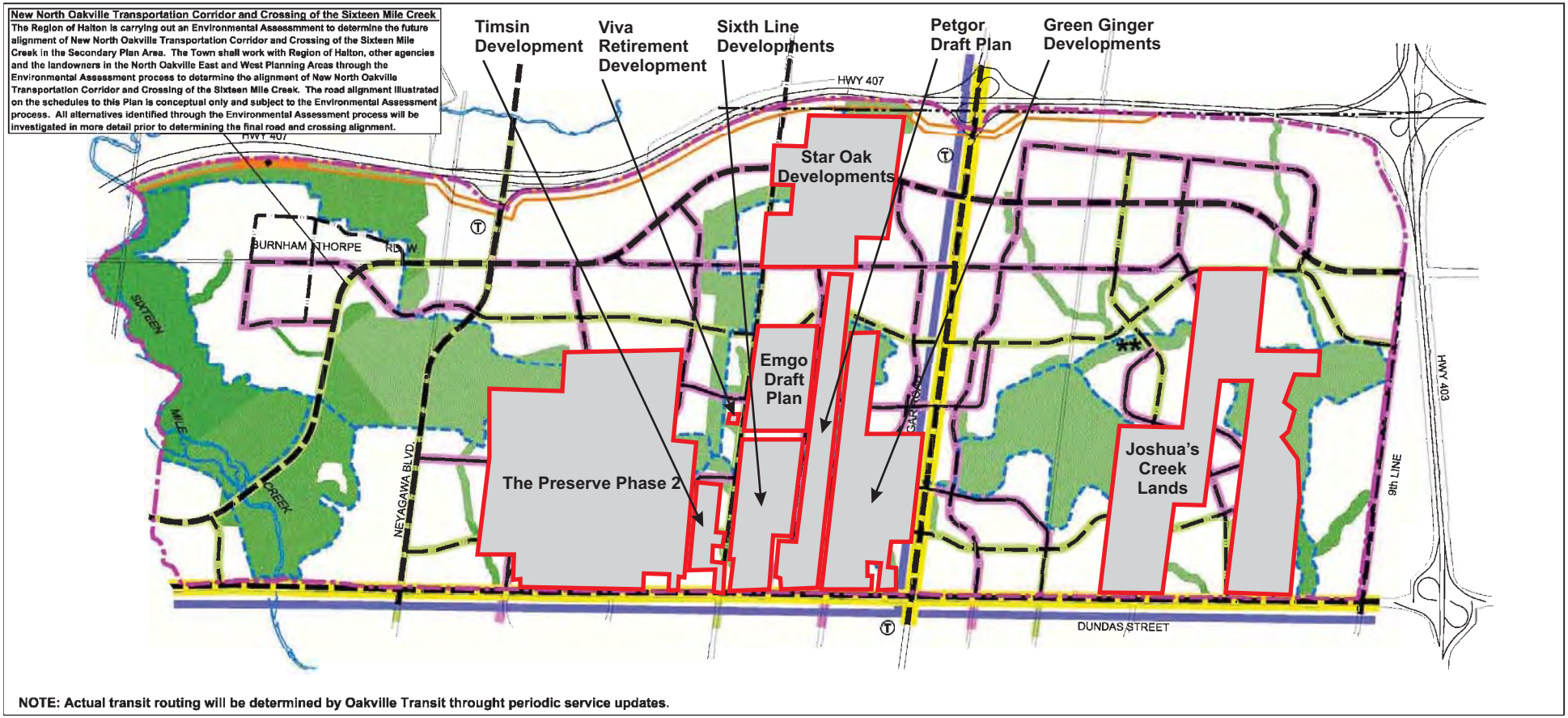
Future traffic volumes at key intersections were extracted directly from the traffic impact studies related to Star Oak Developments, Joshua's Creek Lands, and Petgor Draft Plan. The extracted future traffic volumes reflect the horizon years of 2022 or 2028, depending on the horizon year analyzed in the individual traffic impact studies. The extracted future traffic volumes represent the traffic generated by these three development proposals, as well as a number of other proposed developments that are included as part of the background traffic in the studies. **Figure 1** illustrates the developments included in the extracted future traffic volumes. **Table 2** summarizes the statistics for each development, as well as the horizon year the development is expected to be completed, that the extracted future traffic volumes represent.

Table 2
Planned Development Levels included in Traffic Impact Studies

Traffic Impact Study	Proposed Units	Horizon Year
Star Oak Developments Limited	434 units	2018 (2018 and 2028 analyzed)
Joshua's Creek Lands (Mattamy)	3,014 units	2022
Petgor Draft Plan (Mattamy)	780 units	2022
Sixth Line Developments	530 units	2016
Emgo Draft Plan	618 units	2017
The Preserve Phase 2	783 units	2019
Timsin Development	231 units + 8,000 ft^2 commercial	2015
Viva Retirement Development	251 units	2017
Green Ginger Developments	1,251 units	2016
Total	**7,892 units + 8,000 ft^2 commercial**	-

Based on a review of the available materials, it is estimated that a total of 7,892 residential units and 8,000 ft^2 of commercial uses are accounted for in the extracted future traffic volumes.

It should be noted that the studies did not provide all of the turning movements along the corridor. Where there were gaps in the data, traffic volumes were derived based on the upstream and downstream link volumes, with consideration for the 2031 PM Peak Hour Total Volumes (Preferred Scenario 31105) from the Oakville Transportation Master Plan (TMP) Model, and balancing of traffic throughout the corridor. The derived traffic volumes for the AM and PM peak hours are illustrated in **Figure 2**.



NOTE: Actual transit routing will be determined by Oakville Transit throught periodic service updates.

LEGEND

- SECONDARY PLAN AREA BOUNDARY
- OAKVILLE/MILTON MUNICIPAL BOUNDARY
- PROVINCIAL FREEWAY
- MAJOR ARTERIAL/TRANSIT CORRIDOR
- MINOR ARTERIAL/TRANSIT CORRIDOR
- AVENUE/TRANSIT CORRIDOR
- CONNECTOR/TRANSIT CORRIDOR
- TRANSITWAY CORRIDOR
- UNDERLYING LAND USE NOT DETERMINED subject to Section 7.4.7.1(b)(i)
- BUSWAY CORRIDOR
- MAJOR TRAIL SYSTEM
- Ⓣ TRANSIT TERMINAL
- NATURAL HERITAGE SYSTEM AREA
- ** SUBJECT TO SECTIONS 7.4.7. 3 c viii & 7.4.14.3 d)

TRANSIT SERVICE CONCEPT

- INTER-REGIONAL TRANSIT CORRIDOR SERVICE
- PRIMARY TRANSIT CORRIDOR SERVICE
- SECONDARY TRANSIT CORRIDOR SERVICE
- COMMUNITY SERVICE

Town of Oakville

North Oakville East of Sixteen Mile Creek Secondary Plan

FIGURE NOE 4
Transportation Plan

February 2008

500 300 100 750 metres
400 200 0

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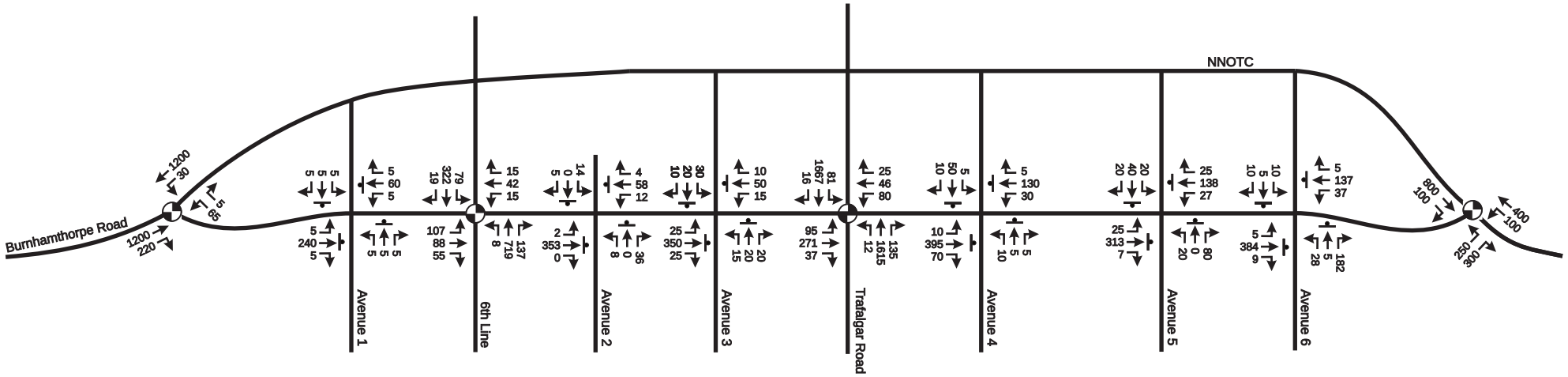
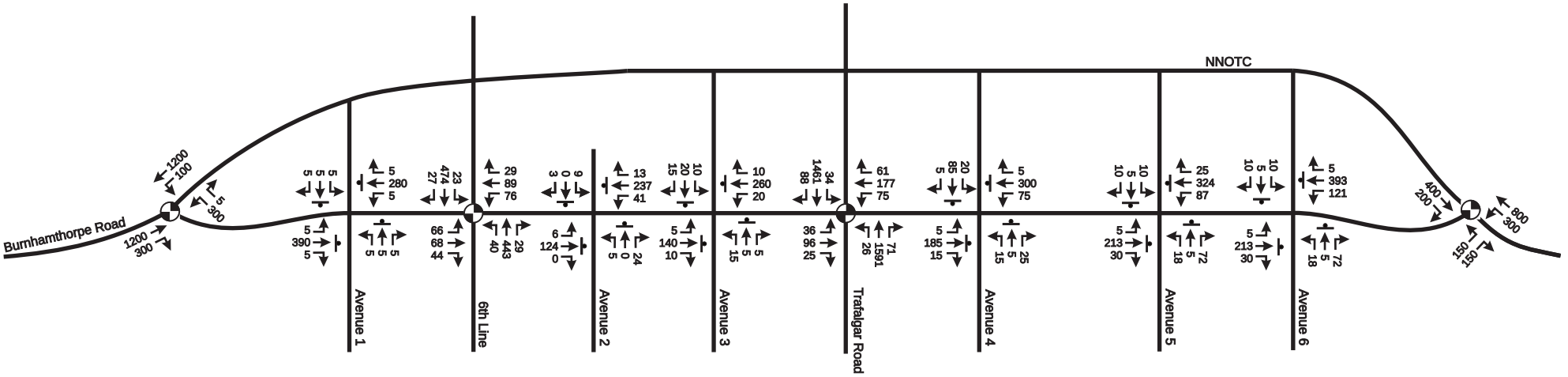
Figure 1
Proposed Developments Included in Extracted Future Traffic Volumes



Roadway A.M. Peak Hour



Roadway P.M. Peak Hour

Not to Scale

MMM GROUP

Stop Control

Signalized Intersection

Figure 2
Derived Interim Future Traffic Volumes

It is estimated that the derived traffic volumes illustrated in Figure 2 represent about half of the ultimate area residential development and a small portion of the ultimate employment development, based on the development levels included in the traffic impact study reports and the ultimate development levels anticipated by the NOESP. Employment trips were assumed to be either generated by the area residential (i.e., the other end of the same trip) or longer distance commuters on the major arterial roads (i.e., would not impact Burnhamthorpe Road).

- 7,892 proposed units x 2.9 persons per household = 22,887 population growth (approx. 22,900)
- Population growth of approximately 22,900 accounted for by traffic impact studies / population growth of 45,000 anticipated by the NOESP = 51% of the ultimate area residential development accounted for by traffic impact studies

To estimate the future traffic volumes reflecting the full build-out of North Oakville, the derived traffic volumes were increased by a factor of 2.0.

The factor of 2.0 was applied to all movements with the exception of the through movements along the major north-south roads (6th Line, Trafalgar Road) and the New North Oakville Transportation Corridor (NNOTC). It is assumed that significant proportions of those volumes are through traffic and would not be impacted by future growth in North Oakville. In fact, it is possible that much of the through traffic could be displaced (reduced) as a result of future development and traffic growth in North Oakville. Therefore, the growth factor was not applied to the through volumes. The estimated future traffic volumes for the AM and PM peak hours, reflecting the full build-out of North Oakville, are illustrated in **Figure 3**.

3.2 Intersection Capacity Analysis

The signalized and unsignalized intersections were analyzed based on the approach outlined in the Highway Capacity Manual, 2000 Edition, using *Synchro v8.0*.

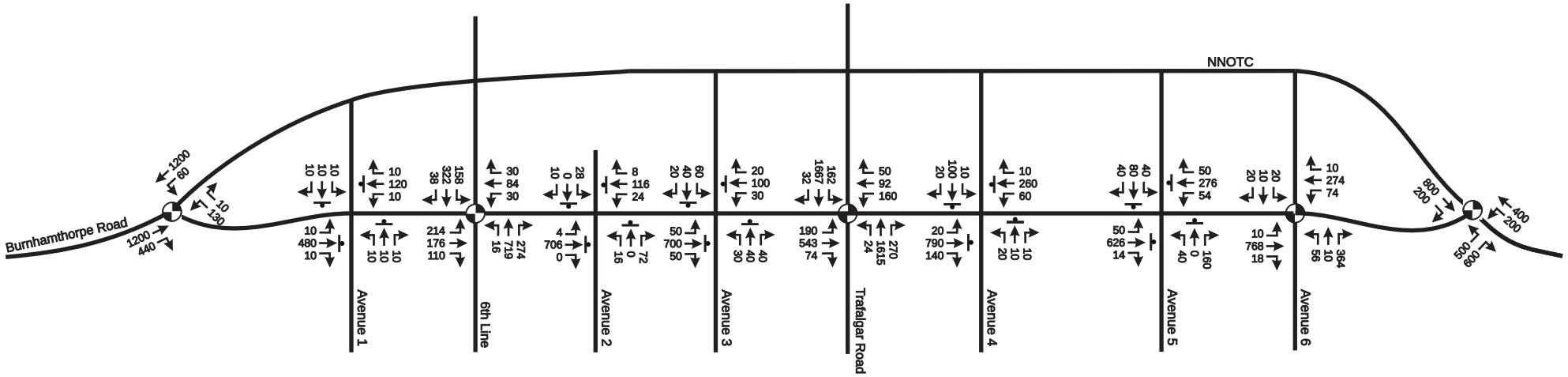
The analysis assumes the following basic intersection configurations along Burnhamthorpe Road, which were established based on input from Town of Oakville:

- Signalization at major intersections (i.e., NNOTC, Sixth Line, Trafalgar Road)
- All-way stop control at secondary intersections (i.e., Avenues)
- On Burnhamthorpe Road, one travel lane in each direction.
- On NNOTC, Sixth Line, Trafalgar Road, two peak hour travel lanes in each direction
- On Avenues, one travel lane in each direction

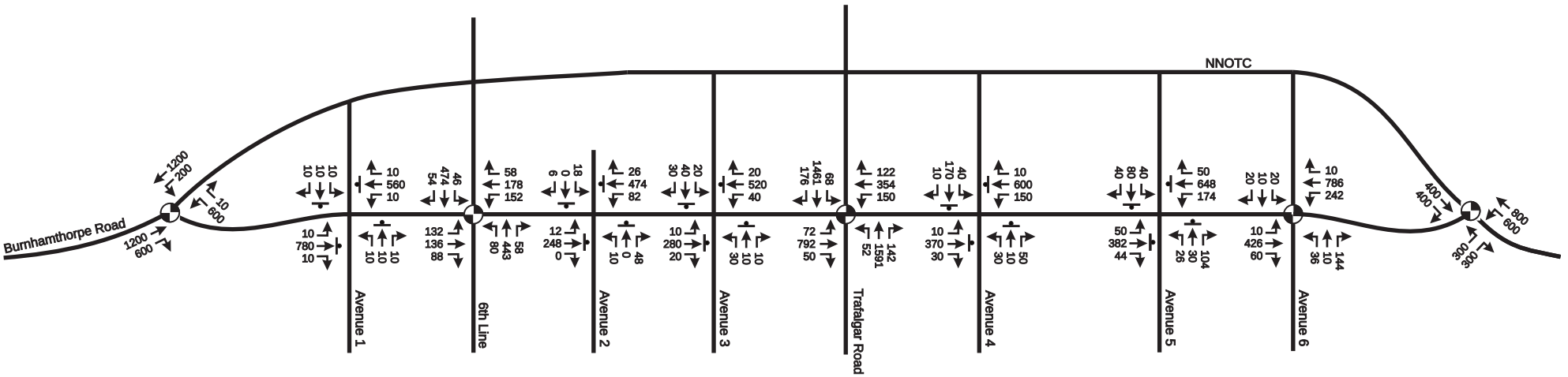
The requirements for improvements such as signalization and turn lanes at intersections were identified based on the intersection capacity analysis findings.

Based on the link volume analysis in Section 2, Burnhamthorpe Road is generally recommended to be one travel lane in each direction. Within the Trafalgar Urban Core, two travel lanes per direction are recommended along the entire road segment.

Based on the results of the intersection capacity analyses, additional turn lanes have been identified for Burnhamthorpe Road at Arterial and Avenue intersections).



Roadway A.M. Peak Hour



Roadway P.M. Peak Hour

Not to Scale

MMM GROUP

Stop Control

Signalized Intersection

Figure 3
Ultimate Future Traffic Volumes

The recommended lane configurations include additional infrastructure and signalizations to achieve an acceptable level of service at each intersection with forecast ultimate traffic volumes, and are illustrated in **Figure 4**. The level of service definitions, according to the Highway Capacity Manual 2000 are attached at the back of this document. The resulting levels of service are outlined in **Table 3.**

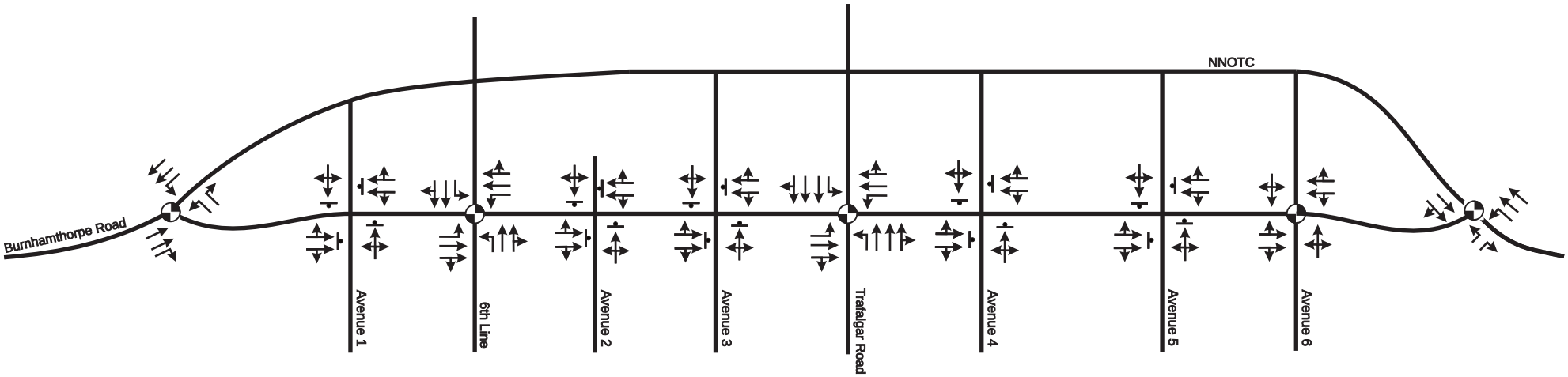
Table 3
Intersection Levels of Service
Based on Future Traffic Volumes

Burnhamthorpe Road Intersection	Control Type	A.M. Peak Hour		P.M. Peak Hour	
		LOS (delay in seconds) [overall V/C]	Critical Movement(s) [V/C]	LOS (delay in seconds) [overall V/C]	Critical Movement(s) [V/C]
NNOTC (West)	Signalized	B (15) [0.59]	-	D (41) [0.92]	EBT [0.96] WBL [0.90] NBL [0.90]
Avenue 1	AWSC	A (9) [0.31]	-	B (13) [0.39]	-
Sixth Line	Signalized	B (14) [0.73]	-	B (13) [0.66]	-
Avenue 2	AWSC	B (11) [0.36]	-	A (10) [0.38]	-
Avenue 3	AWSC	B (14) [0.44]	-	B (10) [0.41]	-
Trafalgar Road	Signalized	C (32) [0.89]	-	C (23) [0.78]	-
Avenue 4	AWSC	C (18) [0.55]	-	C (19) [0.56]	-
Avenue 5	AWSC	C (16) [0.55]	-	D (26) [0.62]	-
Avenue 6	Signalized	B (14) [0.75]	-	A (10) [0.70]	-
NNOTC (East)	Signalized	C (28) [0.81]	-	C (25) [0.87]	WBL [0.85]

(1) For signalized intersections, levels of service are based on the overall intersection delay.
(2) For two-way stop controlled intersections, levels of service are based on the delay associated with the critical movement.

As indicated in Table 3, most intersections which were analyzed are expected to operate at acceptable Levels of Service (LOS) 'D' or better, during the weekday a.m. and p.m. peak hours.

The analysis shows that **signalization may be required at the intersection of Burnhamthorpe Road at Avenue 6**, at full build-out of North Oakville. It is suggested that the design of Burnhamthorpe Road



Not to Scale

MMM GROUP

Stop Control

Signalized Intersection

Figure 4
Recommended Ultimate Lane Configurations

consider protection for possible implementation of signals at this intersection at a future time. Traffic impact studies prepared for future area developments should provide updated assessments of these intersections, and confirm the need for signalization and identify the appropriate timing for the improvement.

3.3 Queuing Analysis

The potential queues lengths on Burnhamthorpe Road at signalized intersections were assessed using *Synchro v8.0* and the ultimate traffic volumes illustrated in Figure 1.

It should be noted that Synchro calculates one average queue length for lane groups, such as a shared through/left and through/right (LTTR). This does not allow for the specific assessment of design requirements for individual lanes approaching the Burnhamthorpe Road/Avenue 6 intersection. To overcome Synchro's software limitations, modified lane configurations that isolate left turns were thus developed, solely for the purpose of queuing analysis. All recommended shared through/left and through/right (LTTR) configurations were analyzed as left and shared through/right (L, TR). The signal timings have not been changed, so that consistency is maintained across the capacity and queuing analyses.

Table 4 summarizes the resulting 50^{th} and 95^{th} percentile queues.

Table 4
Queuing Assessment
Based on Future Traffic Volumes

Burnhamthorpe Road Signalized Intersection	Movement	A.M. Peak Hour		P.M. Peak Hour	
		50th Percentile Queue (m)	95th Percentile Queue (m)	50th Percentile Queue (m)	95th Percentile Queue (m)
NNOTC (West)	NBL	26	44	132	198
	NBR	0	5	<1	4
Sixth Line	EBL	24	44	10	21
	EBTTR	9	18	4	8
	WBL	3	9	11	24
	WBTTR	4	10	4	9
Trafalgar Road	EBL	32	51	12	23
	EBTR	71	92	13	21
	WBL	27	53	25	43
	WBTR	10	19	29	41
Avenue 6	EBTL	1	2	<1	2
	EBTR	74	114	19	43
	WBTL	8	27	10	29
	WBTR	18	30	41	92
NNOTC (East)	NBL	83	121	55	106
	NBR	48	92	0	23

As shown in Table 4, virtually all of the anticipated 50th and 95th percentile left-turn queues are under 55 metres. It is expected that sufficient storage and taper can be provided to accommodate the reported queue lengths.

The northbound left-turn lanes at the NNOTC East and West intersections are projected to have longer queues based on the estimated future traffic volumes. It is suggested that sufficient spacing between major intersections be provided so as to reasonably accommodate future queues and avoid potential intersection blockages during the peak periods.

The proposed storage lengths for approach lanes on Burnhamthorpe Road at the Avenue intersections exceed the Town's *STD. 9-21-A Neighborhood Avenue (22m R.O.W) 2 Lane Intersection Far Side Curb Extensions, Traffic Calming Design*, shown in **Appendix E**. The intersections have been designed to

accommodate the estimated future traffic volumes and projected queues in the event of future signalization of these Avenue intersections.

3.3 Interim Condition

To identify the infrastructure requirements for Burnhamthorpe Road in the interim, MMM reviewed the derived AM and PM peak hour traffic volumes illustrated in Figure 2. As previously noted, the derived volumes reflect the 2022 or 2028 horizon years, and about half of the ultimate area residential development and a small portion of the ultimate employment development. Up to 580 vehicles per hour per direction may be expected during the peak periods. Based on a typical lane capacity of 700 vehicles per lane per hour (as per the TMP model), it is suggested that one peak hour travel lane in each direction would be sufficient to accommodate the potential traffic volumes in the interim. Requirements for exclusive turn lanes at key intersections may be identified by traffic studies for future area developments. These improvements may be implemented on an as needed basis, based on the analysis results of development related traffic studies.

4.0 BICYCLE FACILITIES, SIDEWALKS AND TRANSIT STOPS

Based on anticipated traffic volumes and in accordance with the recommendations of Oakville's Active Transportation Master Plan (ATMP) and Ontario Traffic Manual (OTM) Book 18: Bicycle Facilities, bike lanes should be provided along the entire length of Burnhamthorpe Road. Provision of bike parking is also recommended in developed areas, recognizing that Burnhamthorpe Road will be a destination street.

In accordance with the NOESP, wider sidewalks should be considered within the Trafalgar Urban Core and Neighborhood Central Activity nodes. Within the sections of Burnhamthorpe Road crossing the Natural Heritage System, a sidewalk may be considered on the developed side only, subject to the availability of a trail on the other side of the street.

A transit stop should be provided at each Neighbourhood Central Activity Node.

5.0 LANE DIMENSIONS

The NOESP expresses a desire for the Burnhamthorpe Road's right-of-way (ROW) to be kept to the minimum, with a typical ROW of 20 metres and a maximum ROW of 24 metres. However, it may be appropriate to increase the maximum ROW to provide additional pedestrian amenities in the Trafalgar Urban Core Area. Following Oakville's Complete Streets approach, street and urban design elements will be incorporated to support the comfort of pedestrians, transit users and cyclists. Travel lanes, on-street parking, bike lanes, sidewalks, street furniture, landscaping, and utilities will compete for valuable space. Lane dimensions will be determined to ensure safety and efficient use of the right-of-way.

6.0 SUMMARY AND CONCLUSIONS

In summary, a cross-section for Burnhamthorpe Road that comprises two travel lanes (one in each direction) can generally accommodate the estimated future peak hour link (or mid-block) traffic volumes

along the corridor. The exception to this is Burnhamthorpe Road in the Trafalgar Urban Core, where it is recommended that Burnhamthorpe Road be designed as a four-lane road (i.e., two lanes in each direction). This cross-section is expected to accommodate the forecast peak hour traffic volumes, and anticipated turning movements, while providing flexibility to accommodate on-street parking on both sides of the street during off-peak periods.

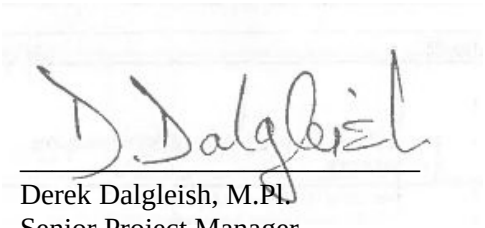
To identify intersection approach and turn lane requirements and potential intersection controls at key intersections along Burnhamthorpe Road, future intersection turning movements were estimated using limited data supplied by the Town, along with a series of assumptions.

At the full build-out of North Oakville, widening of Burnhamthorpe Road is recommended at intersections to accommodate turn lanes. The recommended lane configurations at intersections are illustrated in Figure 4. It is suggested that the design of Burnhamthorpe Road consider protection for possible implementation of signals at the intersection at Avenue 6.

Sufficient storage and taper should be provided to accommodate the potential 50th and 95th percentile left-turn queues, estimated to be under 55 metres at most signalized intersections, at the full build-out of North Oakville. Sufficient intersection spacing should be provided near the NNOTC intersections, so as to reasonably accommodate future queues and avoid potential intersection blockages.

Bike lanes and sidewalks on either side of the street are generally recommended based on a review of the policy directions for Burnhamthorpe Road provided by the NOESP. Wider sidewalks should be considered within the Trafalgar Urban Core and Neighborhood Central Activity nodes. Within the Natural Heritage System, a sidewalk may be considered on the developed side only.

We trust that this addresses the requirements. We would be pleased to respond to any questions, should they arise.



Derek Dalgleish, M.Pl.
Senior Project Manager
Transportation Planning
Associate

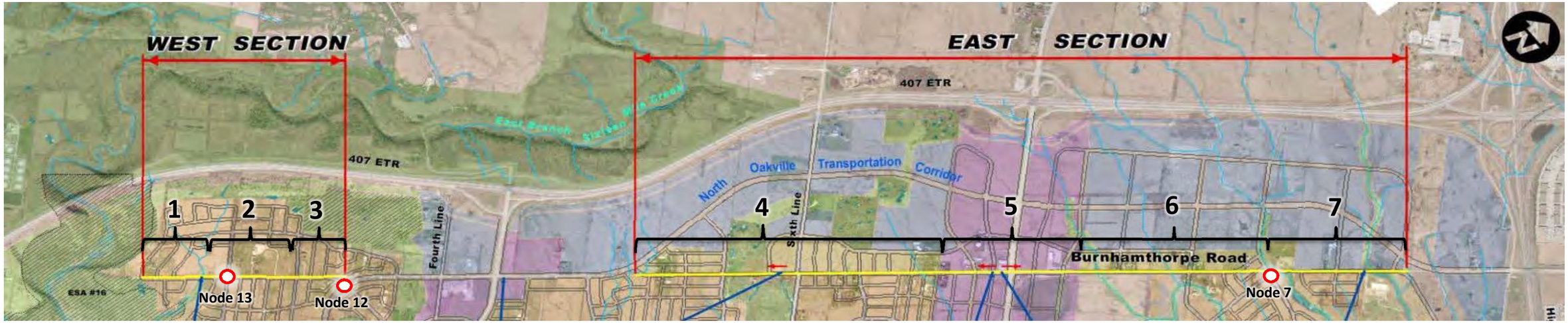
APPENDIX A

BURNHAMTHORPE ROAD POLICY DIRECTION SUMMARY

BURNHAMTHORPE ROAD CHARACTER ROAD STUDY
Summary of Applicable Policies and Standards

Reference Document		West Section			East Section			Description
		16 Mile Creek to NOTC (1, 2, 3)			*NOTC to Trafalgar Urban Core (4)*	*Trafalgar Urban Core (5)*	*Trafalgar Urban Core to Node #7 (6)*	*Node #7 to NOTC (7)*	
NOESP (2008)	**Land Uses**	Neighborhood Area			Transitional Area (N) Neighbourhood Area (S) Natural Heritage System	Trafalgar Urban Core	Transitional Area (N) Joshua Creek Community Park Joshua Creek Floodplain Neighbourhood Area Natural Heritage System	Employment District Cemetery Area Neighbourhood Area Transitional Area Natural Heritage System	**Land Use**
	Community Structure	Neighbourhood Nodes #12 and 13				Trafalgar Urban Core Sub Areas #1 (N) and #2 (S)	Neighbourhood Node #7		
	Road Classification	Avenue or Connector				Avenue	Avenue or Connector		**Road**
	ROW	Transit Corridor, Character Road							
	Travel Lanes	Typical 20m ROW, maximum 24m ROW							
	Access	2 travels lanes preferred, up to 4 travel lanes							
	On-Street Parking	Direct access from abutting properties permitted							
		On-street parking on two sides, wherever possible							
					No parking in Natural Heritage System		No parking in Natural Heritage System	On-street parking on one side in Employment District, no parking in Natural Heritage System	
	Sidewalks	Sidewalks on both sides except: - Character Roads, where a rural cross-section is being maintained, where sidewalks may not be required, provided that pedestrian and bicycle circulation is accommodated on a separate trail system; - Road flanking the Natural Heritage and Open Space System, where a sidewalk shall be provided on the developed side only, subject to the availability of a trail facility on the other side of the street							
			Wider sidewalks in Node #13	Wider sidewalks in Node #12		Wider sidewalks in Urban Core	Wider sidewalks in Node #7		
	Transit		Transit stop at Node #13	Transit stop at Node #12					**Transit**
Transit Plan (2009)		Community Service			Community Service Community Service/No Transit in some areas			Secondary Service with Transit Priority	
ATMP (2009)	**AT Classification**	None	Secondary AT Route		Primary AT Route			Secondary AT Route	**Active Transportation**
	AT Facilities		Multi-use Trail (off-road in blvd)	Signed Bike Route (on-road)	Bike lane on road				
Cycling Strategy (2008)			Multi-use Path	None	Bicycle facility to be determined			None	
Trails Plan (2013)		Major Trail							
Oakville TMP (2013)	**Capacity**	*n/a (different road network assumed)*			2 travel lanes with 700 vplvh capacity				**V/C Ratios**
	Road Link V/C Ratios 2031 PM Peak				V/C ratios: < 0.60	V/C ratios: < 0.20			
					Parallel streets V/C ratios: < 0.80 on NOTC and < 0.50 to the south		Parallel streets V/C ratios: < 0.60 on NOTC and < 0.10 to the south		
					Side streets V/C ratios: < 0.50				
Standard Street Section		*No Standard Street Section with a 20m ROW* STD 7-23: Connector/Transit Corridor, 19m ROW (2 travel lanes + 1 parking lane) STD 7-24A: Avenue/Transit Corridor, 22m ROW, General Urban and Sub-Urban Areas (2 travel lanes + centre turn lane + 1 parking lane)							**Standard Street Section**
						STD 7-25: Avenue/Transit Corridor, 24m ROW, Urban Core Area (2 travel lanes + 2 travel/off-peak parking lanes)		STD 7-24B: Avenue/Transit Corridor, 22m ROW, Employment Areas (2 travel lanes + 1 parking lane)	

BURNHAMTHORPE ROAD CHARACTER ROAD STUDY
Summary of Applicable Policies and Standards
Reference Map



APPENDIX B

TMP PROJECTED 2031 PEAK HOUR TOTAL VOLUMES AND V/C RATIOS

Oakville TMP Modelling

2031 PM Peak Hour Total Volumes
Scenario 31105

1

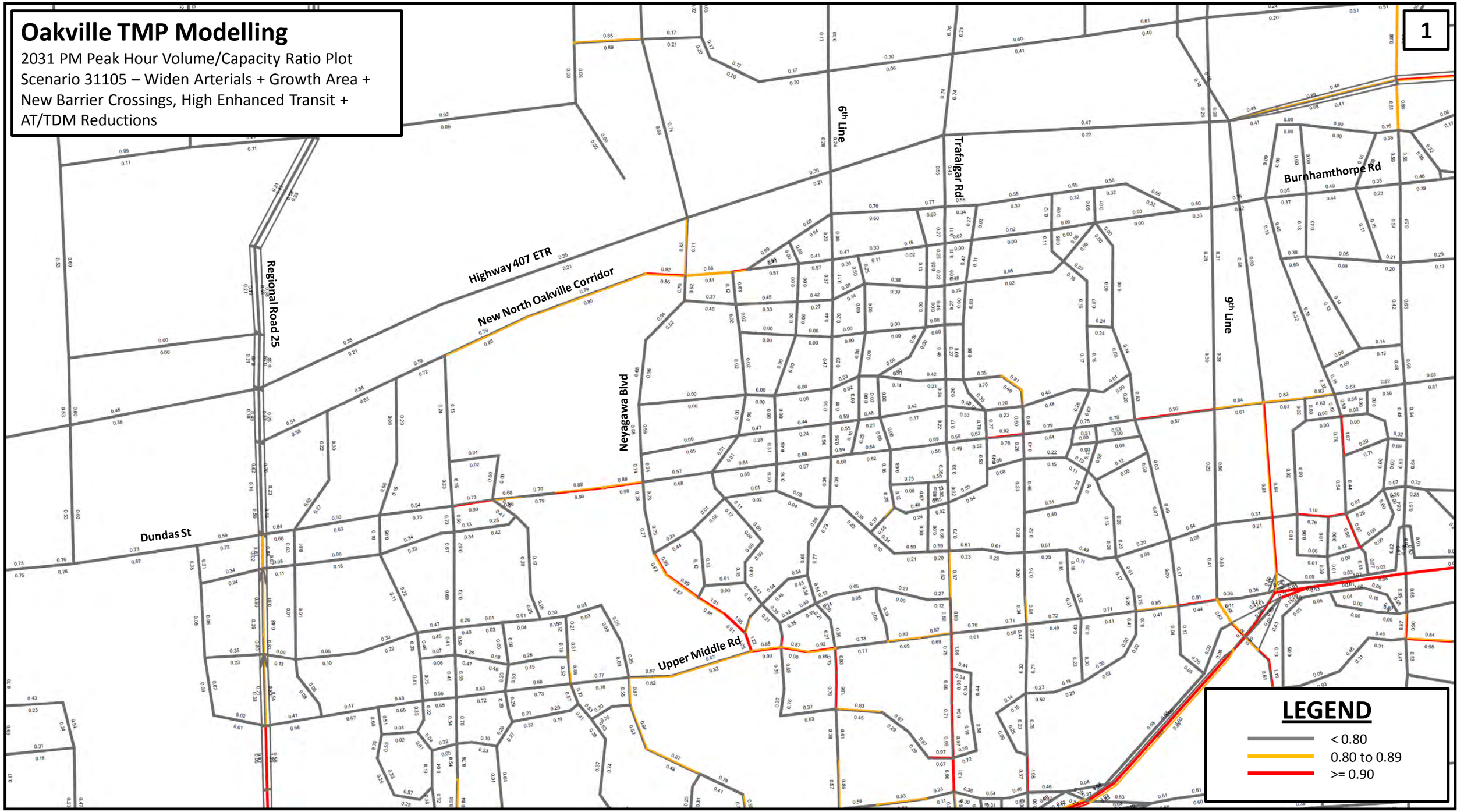
Highway 407 ETR
New North Oakville Corridor
Regional Road 25
6th Line
Trafalgar Rd
Burnhamthorpe Rd
9th Line
Neyagawa Blvd
Dundas St
Upper Middle Rd

LEGEND

- 2 Lanes (2-way)
- 4 Lanes (2-way)
- 6 Lanes (2-way)
- 8 Lanes (2-way)
- 10 Lanes (2-way)

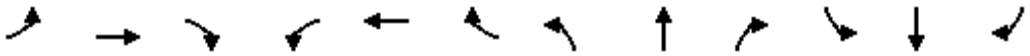
Oakville TMP Modelling

2031 PM Peak Hour Volume/Capacity Ratio Plot
Scenario 31105 – Widen Arterials + Growth Area + New Barrier Crossings, High Enhanced Transit + AT/TDM Reductions

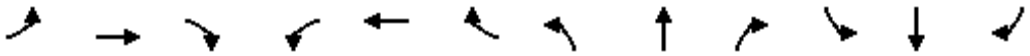


APPENDIX C

INTERSECTION CAPACITY ANALYSIS



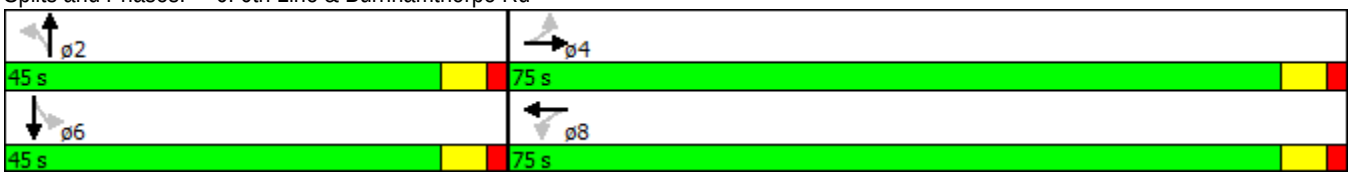
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	214	176	110	30	84	30	16	719	274	158	322	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	50.0		0.0	50.0		0.0	50.0		50.0	50.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	25.0			25.0			25.0			25.0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.942			0.961			0.959			0.984	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	3371	0	1789	3439	0	1789	3432	0	1789	3521	0
Flt Permitted	0.680			0.576			0.537			0.246		
Satd. Flow (perm)	1281	3371	0	1085	3439	0	1011	3432	0	463	3521	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		110			30			49			11	
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		429.3			205.6			1027.9			474.0	
Travel Time (s)		25.8			12.3			61.7			28.4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	214	176	110	30	84	30	16	719	274	158	322	38
Shared Lane Traffic (%)												
Lane Group Flow (vph)	214	286	0	30	114	0	16	993	0	158	360	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	

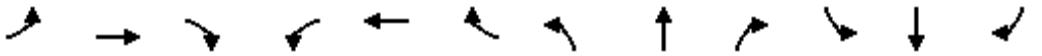


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0		22.0	22.0		22.0	22.0		22.0	22.0	
Total Split (s)	75.0	75.0		75.0	75.0		45.0	45.0		45.0	45.0	
Total Split (%)	62.5%	62.5%		62.5%	62.5%		37.5%	37.5%		37.5%	37.5%	
Maximum Green (s)	69.0	69.0		69.0	69.0		39.0	39.0		39.0	39.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	16.8	16.8		16.8	16.8		39.2	39.2		39.2	39.2	
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.58	0.58		0.58	0.58	
v/c Ratio	0.68	0.31		0.11	0.13		0.03	0.50		0.59	0.18	
Control Delay	34.4	13.0		19.9	14.8		8.3	10.0		23.8	7.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	34.4	13.0		19.9	14.8		8.3	10.0		23.8	7.7	
LOS	C	B		B	B		A	A		C	A	
Approach Delay		22.1			15.9			9.9			12.6	
Approach LOS		C			B			A			B	
Queue Length 50th (m)	24.4	9.3		2.9	4.3		0.8	32.3		11.3	9.5	
Queue Length 95th (m)	44.4	17.6		8.6	9.6		3.8	61.6		#46.0	20.4	
Internal Link Dist (m)		405.3			181.6			1003.9			450.0	
Turn Bay Length (m)	50.0			50.0			50.0			50.0		
Base Capacity (vph)	1251	3294		1059	3359		582	1998		266	2033	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.17	0.09		0.03	0.03		0.03	0.50		0.59	0.18	

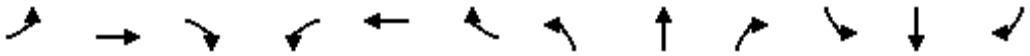
Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 68			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.68			
Intersection Signal Delay: 13.8		Intersection LOS: B	
Intersection Capacity Utilization 72.6%		ICU Level of Service C	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 6: 6th Line & Burnhamthorpe Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	190	542	74	160	92	50	24	1615	270	162	1667	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	50.0		50.0	50.0		50.0	50.0		50.0	50.0		50.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	25.0			25.0			25.0			25.0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.91	0.91	1.00	0.91	0.91
Frt		0.982			0.947			0.979			0.997	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	3514	0	1789	3389	0	1789	5034	0	1789	5126	0
Flt Permitted	0.550			0.206			0.089			0.067		
Satd. Flow (perm)	1036	3514	0	388	3389	0	168	5034	0	126	5126	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11			50			35			3	
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		187.9			395.2			1048.7			331.2	
Travel Time (s)		11.3			23.7			62.9			19.9	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	190	542	74	160	92	50	24	1615	270	162	1667	32
Shared Lane Traffic (%)												
Lane Group Flow (vph)	190	616	0	160	142	0	24	1885	0	162	1699	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	7	4		3	8		5	2		1	6	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	10.0	22.0		10.0	22.0		10.0	22.0		10.0	22.0	
Total Split (s)	20.0	33.0		13.0	26.0		10.0	60.0		14.0	64.0	
Total Split (%)	16.7%	27.5%		10.8%	21.7%		8.3%	50.0%		11.7%	53.3%	
Maximum Green (s)	16.0	27.0		9.0	20.0		6.0	54.0		10.0	58.0	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	Max		None	Max	
Walk Time (s)		5.0			5.0			5.0			5.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	38.6	24.4		30.7	19.7		61.9	54.1		69.5	61.7	
Actuated g/C Ratio	0.33	0.21		0.26	0.17		0.53	0.46		0.59	0.53	
v/c Ratio	0.44	0.83		0.77	0.23		0.14	0.80		0.78	0.63	
Control Delay	32.3	54.1		54.3	28.6		12.7	30.2		47.8	21.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	32.3	54.1		54.3	28.6		12.7	30.2		47.8	21.9	
LOS	C	D		D	C		B	C		D	C	
Approach Delay		48.9			42.2			30.0			24.2	
Approach LOS		D			D			C			C	
Queue Length 50th (m)	32.3	70.8		26.7	9.7		2.2	135.6		21.3	108.5	
Queue Length 95th (m)	51.1	91.7		#52.6	19.1		5.9	157.2		#54.4	126.5	
Internal Link Dist (m)		163.9			371.2			1024.7			307.2	
Turn Bay Length (m)	50.0			50.0			50.0			50.0		
Base Capacity (vph)	452	820		209	625		172	2344		217	2704	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.42	0.75		0.77	0.23		0.14	0.80		0.75	0.63	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 117			
Natural Cycle: 75			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.83			
Intersection Signal Delay: 31.7		Intersection LOS: C	
Intersection Capacity Utilization 89.1%		ICU Level of Service E	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

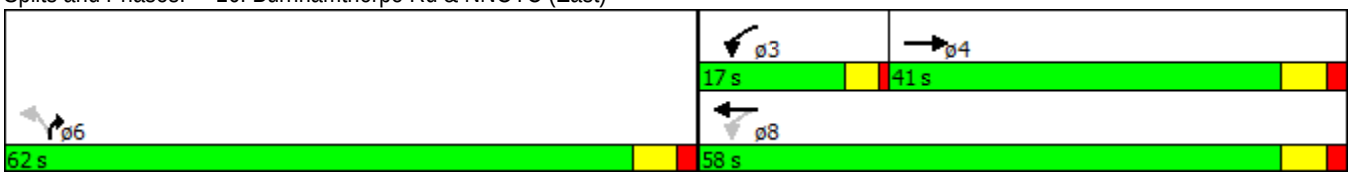
Splits and Phases: 9: Trafalgar Rd & Burnhamthorpe Rd

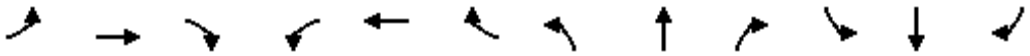
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	800	200	200	400	500	600
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)		0.0	50.0		50.0	0.0
Storage Lanes		0	1		1	1
Taper Length (m)			25.0		25.0	
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.970					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3471	0	1789	3579	1789	1601
Flt Permitted			0.112		0.950	
Satd. Flow (perm)	3471	0	211	3579	1789	1601
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	26					315
Link Speed (k/h)	60			60	60	
Link Distance (m)	1048.2			216.1	1059.2	
Travel Time (s)	62.9			13.0	63.6	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	800	200	200	400	500	600
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1000	0	200	400	500	600
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)		14	24		24	14
Number of Detectors	2		1	2	1	1
Detector Template	Thru		Left	Thru	Left	Right
Leading Detector (m)	30.5		6.1	30.5	6.1	6.1
Trailing Detector (m)	0.0		0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0		0.0	0.0	0.0	0.0
Detector 1 Size(m)	1.8		6.1	1.8	6.1	6.1
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(m)	28.7			28.7		
Detector 2 Size(m)	1.8			1.8		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA		pm+pt	NA	NA	custom
Protected Phases	4		3	8		6
Permitted Phases			8		6	
Detector Phase	4		3	8	6	6

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	22.0		10.0	22.0	22.0	22.0
Total Split (s)	41.0		17.0	58.0	62.0	62.0
Total Split (%)	34.2%		14.2%	48.3%	51.7%	51.7%
Maximum Green (s)	35.0		13.0	52.0	56.0	56.0
Yellow Time (s)	4.0		3.0	4.0	4.0	4.0
All-Red Time (s)	2.0		1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0		4.0	6.0	6.0	6.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	None	None
Walk Time (s)	5.0			5.0	5.0	5.0
Flash Dont Walk (s)	11.0			11.0	11.0	11.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	33.1		50.3	48.2	32.7	32.7
Actuated g/C Ratio	0.36		0.54	0.52	0.35	0.35
v/c Ratio	0.80		0.66	0.22	0.80	0.78
Control Delay	33.9		28.2	13.8	37.9	20.4
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	33.9		28.2	13.8	37.9	20.4
LOS	C		C	B	D	C
Approach Delay	33.9			18.6	28.4	
Approach LOS	C			B	C	
Queue Length 50th (m)	83.4		17.7	19.6	83.2	48.2
Queue Length 95th (m)	#143.1		#52.0	36.5	121.4	91.5
Internal Link Dist (m)	1024.2			192.1	1035.2	
Turn Bay Length (m)			50.0		50.0	
Base Capacity (vph)	1350		339	2043	1100	1105
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.74		0.59	0.20	0.45	0.54

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 93.2			
Natural Cycle: 55			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 28.2		Intersection LOS: C	
Intersection Capacity Utilization 80.6%		ICU Level of Service D	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 16: Burnhamthorpe Rd & NNOTC (East)





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	768	18	93	274	10	56	10	364	20	10	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	50.0		0.0	50.0		0.0	50.0		0.0	50.0		0.0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (m)	25.0			25.0			25.0			25.0		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.996			0.886			0.939	
Flt Protected		0.999			0.988			0.994			0.982	
Satd. Flow (prot)	0	3564	0	0	3521	0	0	1659	0	0	1737	0
Flt Permitted		0.948			0.617			0.954			0.817	
Satd. Flow (perm)	0	3382	0	0	2199	0	0	1592	0	0	1445	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			6			199			25	
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		406.5			1059.2			626.6			327.6	
Travel Time (s)		24.4			63.6			37.6			19.7	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	10	768	18	93	274	10	56	10	364	20	10	25
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	796	0	0	377	0	0	430	0	0	55	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	

Lanes, Volumes, Timings
21: Avenue 6 & Burnhamthorpe Rd 2/13/2014

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0		22.0	22.0		22.0	22.0		22.0	22.0	
Total Split (s)	94.0	94.0		94.0	94.0		26.0	26.0		26.0	26.0	
Total Split (%)	78.3%	78.3%		78.3%	78.3%		21.7%	21.7%		21.7%	21.7%	
Maximum Green (s)	88.0	88.0		88.0	88.0		20.0	20.0		20.0	20.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.0			6.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		18.2			18.2			19.7			19.7	
Actuated g/C Ratio		0.36			0.36			0.39			0.39	
v/c Ratio		0.64			0.47			0.57			0.09	
Control Delay		15.7			13.9			10.4			7.9	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		15.7			13.9			10.4			7.9	
LOS		B			B			B			A	
Approach Delay		15.7			13.9			10.4			7.9	
Approach LOS		B			B			B			A	
Queue Length 50th (m)		29.0			12.5			13.7			1.6	
Queue Length 95th (m)		44.1			22.0			40.0			7.5	
Internal Link Dist (m)		382.5			1035.2			602.6			303.6	
Turn Bay Length (m)												
Base Capacity (vph)		3382			2199			759			596	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.24			0.17			0.57			0.09	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 49.9			
Natural Cycle: 45			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.64			
Intersection Signal Delay: 13.6		Intersection LOS: B	
Intersection Capacity Utilization 75.5%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 21: Avenue 6 & Burnhamthorpe Rd

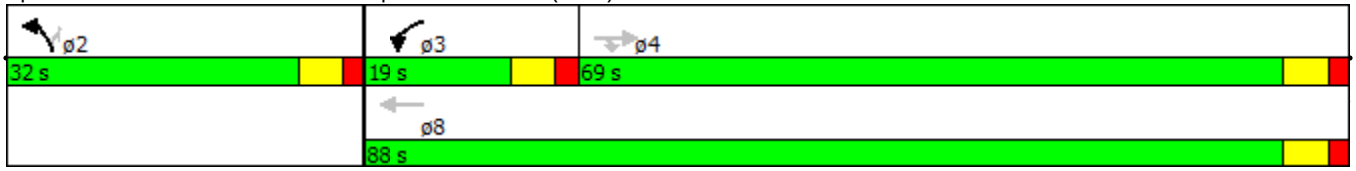
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1200	440	60	1200	130	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)		50.0	50.0		0.0	0.0
Storage Lanes		1	1		1	1
Taper Length (m)			25.0		0.0	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3579	1601	1789	3579	1789	1601
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	3579	1601	1789	3579	1789	1601
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		333				10
Link Speed (k/h)	60			60	60	
Link Distance (m)	213.8			669.9	622.4	
Travel Time (s)	12.8			40.2	37.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1200	440	60	1200	130	10
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1200	440	60	1200	130	10
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)		14	24		24	14
Number of Detectors	2	1	1	2	1	1
Detector Template	Thru	Right	Left	Thru	Left	Right
Leading Detector (m)	30.5	6.1	6.1	30.5	6.1	6.1
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	1.8	6.1	6.1	1.8	6.1	6.1
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)	28.7			28.7		
Detector 2 Size(m)	1.8			1.8		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA	custom	Prot	NA	NA	Perm
Protected Phases			3		2	
Permitted Phases	4	4		8		2
Detector Phase	4	4	3	8	2	2

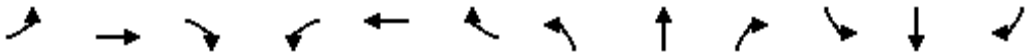
Lanes, Volumes, Timings
26: Burnhamthorpe Rd & NNOTC (West) 2/13/2014

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	10.0	22.0	22.0	22.0
Total Split (s)	69.0	69.0	19.0	88.0	32.0	32.0
Total Split (%)	57.5%	57.5%	15.8%	73.3%	26.7%	26.7%
Maximum Green (s)	63.0	63.0	13.0	82.0	26.0	26.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	Max	Max	Max
Walk Time (s)	5.0	5.0		5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0		0	0	0
Act Effct Green (s)	69.0	69.0	9.4	82.0	26.0	26.0
Actuated g/C Ratio	0.58	0.58	0.08	0.68	0.22	0.22
v/c Ratio	0.58	0.41	0.43	0.49	0.34	0.03
Control Delay	18.8	5.1	61.5	9.9	42.6	18.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.8	5.1	61.5	9.9	42.6	18.8
LOS	B	A	E	A	D	B
Approach Delay	15.1			12.3	40.9	
Approach LOS	B			B	D	
Queue Length 50th (m)	95.1	11.5	13.7	64.2	26.0	0.0
Queue Length 95th (m)	124.3	32.4	26.7	78.2	44.2	4.5
Internal Link Dist (m)	189.8			645.9	598.4	
Turn Bay Length (m)		50.0	50.0			
Base Capacity (vph)	2057	1061	193	2445	387	354
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.58	0.41	0.31	0.49	0.34	0.03

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.58			
Intersection Signal Delay: 15.1		Intersection LOS: B	
Intersection Capacity Utilization 58.7%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 26: Burnhamthorpe Rd & NNOTC (West)

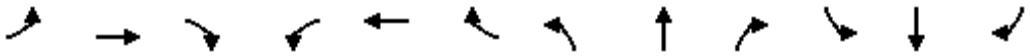




Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	20	790	140	60	260	10	20	10	10	10	100	20
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	20	790	140	60	260	10	20	10	10	10	100	20

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	415	535	190	140	40	130
Volume Left (vph)	20	0	60	0	20	10
Volume Right (vph)	0	140	0	10	10	20
Hadj (s)	0.06	-0.15	0.19	-0.02	-0.02	-0.04
Departure Headway (s)	5.6	5.4	6.4	6.2	6.6	6.3
Degree Utilization, x	0.64	0.80	0.34	0.24	0.07	0.23
Capacity (veh/h)	631	660	540	555	505	536
Control Delay (s)	16.8	24.9	11.5	10.0	10.2	11.2
Approach Delay (s)	21.4		10.8		10.2	11.2
Approach LOS	C		B		B	B

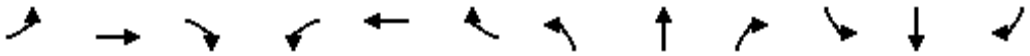
Intersection Summary				
Delay	17.7			
Level of Service	C			
Intersection Capacity Utilization	54.5%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	50	626	14	54	276	50	40	0	160	40	80	40
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	50	626	14	54	276	50	40	0	160	40	80	40

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	363	327	192	188	200	160
Volume Left (vph)	50	0	54	0	40	40
Volume Right (vph)	0	14	0	50	160	40
Hadj (s)	0.10	0.00	0.17	-0.15	-0.41	-0.07
Departure Headway (s)	6.5	6.4	7.0	6.7	6.4	6.9
Degree Utilization, x	0.66	0.58	0.37	0.35	0.36	0.31
Capacity (veh/h)	538	539	489	513	510	477
Control Delay (s)	19.9	16.8	13.0	12.0	12.9	12.9
Approach Delay (s)	18.4		12.5		12.9	12.9
Approach LOS	C		B		B	B

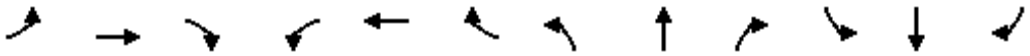
Intersection Summary				
Delay	15.5			
Level of Service	C			
Intersection Capacity Utilization	55.1%	ICU Level of Service	B	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	50	700	50	30	100	20	30	40	40	60	40	20
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	50	700	50	30	100	20	30	40	40	60	40	20

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	400	400	80	70	110	120
Volume Left (vph)	50	0	30	0	30	60
Volume Right (vph)	0	50	0	20	40	20
Hadj (s)	0.10	-0.05	0.22	-0.17	-0.13	0.03
Departure Headway (s)	5.5	5.4	6.4	6.0	5.9	6.1
Degree Utilization, x	0.61	0.60	0.14	0.12	0.18	0.20
Capacity (veh/h)	635	659	526	558	563	550
Control Delay (s)	15.8	14.9	9.3	8.6	10.2	10.6
Approach Delay (s)	15.3		9.0		10.2	10.6
Approach LOS	C		A		B	B

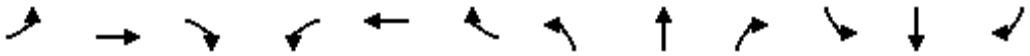
Intersection Summary				
Delay	13.6			
Level of Service	B			
Intersection Capacity Utilization	44.2%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	10	480	10	10	120	10	10	10	10	10	10	10
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	10	480	10	10	120	10	10	10	10	10	10	10

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	250	250	70	70	30	30
Volume Left (vph)	10	0	10	0	10	10
Volume Right (vph)	0	10	0	10	10	10
Hadj (s)	0.05	0.01	0.11	-0.07	-0.10	-0.10
Departure Headway (s)	4.8	4.8	5.2	5.0	5.1	5.1
Degree Utilization, x	0.34	0.33	0.10	0.10	0.04	0.04
Capacity (veh/h)	734	738	667	691	640	635
Control Delay (s)	9.1	9.0	7.6	7.4	8.4	8.4
Approach Delay (s)	9.0		7.5		8.4	8.4
Approach LOS	A		A		A	A

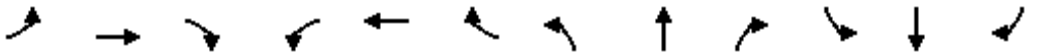
Intersection Summary					
Delay	8.7				
Level of Service	A				
Intersection Capacity Utilization	30.7%	ICU Level of Service		A	
Analysis Period (min)	15				



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	4	706	0	24	116	8	16	0	72	28	0	10
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	4	706	0	24	116	8	16	0	72	28	0	10

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	357	353	82	66	88	38
Volume Left (vph)	4	0	24	0	16	28
Volume Right (vph)	0	0	0	8	72	10
Hadj (s)	0.04	0.03	0.18	-0.05	-0.42	0.02
Departure Headway (s)	5.1	5.0	5.8	5.5	5.2	5.8
Degree Utilization, x	0.50	0.50	0.13	0.10	0.13	0.06
Capacity (veh/h)	703	702	594	618	634	567
Control Delay (s)	11.8	11.7	8.4	8.0	9.0	9.1
Approach Delay (s)	11.8		8.2		9.0	9.1
Approach LOS	B		A		A	A

Intersection Summary				
Delay	10.9			
Level of Service	B			
Intersection Capacity Utilization	35.7%	ICU Level of Service	A	
Analysis Period (min)	15			



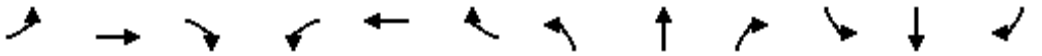
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	132	136	88	152	178	58	80	443	58	46	474	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	50.0		0.0	50.0		0.0	50.0		50.0	50.0		0.0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (m)	25.0			25.0			25.0			25.0		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	0.91	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.941			0.963				0.850		0.985	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	4838	0	1789	4952	0	1789	1883	1601	1789	1855	0
Flt Permitted	0.599			0.606			0.394			0.470		
Satd. Flow (perm)	1128	4838	0	1141	4952	0	742	1883	1601	885	1855	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		45			56				37		4	
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		429.3			205.6			1027.9			474.0	
Travel Time (s)		25.8			12.3			61.7			28.4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	132	136	88	152	178	58	80	443	58	46	474	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	132	224	0	152	236	0	80	443	58	46	528	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5	6.1	6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8	6.1	6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		
Detector Phase	4	4		8	8		2	2	2	6	6	

Lanes, Volumes, Timings
6: 6th Line & Burnhamthorpe Rd 2/13/2014

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	22.0	22.0		22.0	22.0		22.0	22.0	22.0	22.0	22.0	
Total Split (s)	90.0	90.0		90.0	90.0		30.0	30.0	30.0	30.0	30.0	
Total Split (%)	75.0%	75.0%		75.0%	75.0%		25.0%	25.0%	25.0%	25.0%	25.0%	
Maximum Green (s)	84.0	84.0		84.0	84.0		24.0	24.0	24.0	24.0	24.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None		None	None		Max	Max	Max	Max	Max	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0	0	0	
Act Effct Green (s)	11.6	11.6		11.6	11.6		24.1	24.1	24.1	24.1	24.1	
Actuated g/C Ratio	0.24	0.24		0.24	0.24		0.51	0.51	0.51	0.51	0.51	
v/c Ratio	0.48	0.19		0.55	0.19		0.21	0.47	0.07	0.10	0.56	
Control Delay	21.7	11.3		23.7	10.8		9.6	10.5	4.4	8.1	11.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	21.7	11.3		23.7	10.8		9.6	10.5	4.4	8.1	11.9	
LOS	C	B		C	B		A	B	A	A	B	
Approach Delay		15.1			15.8			9.8			11.6	
Approach LOS		B			B			A			B	
Queue Length 50th (m)	9.5	4.3		11.1	4.3		3.3	21.3	0.8	1.8	26.8	
Queue Length 95th (m)	21.3	8.4		24.4	8.6		11.6	48.3	5.6	6.9	60.8	
Internal Link Dist (m)		405.3			181.6			1003.9			450.0	
Turn Bay Length (m)	50.0			50.0			50.0		50.0	50.0		
Base Capacity (vph)	1128	4838		1141	4952		374	950	826	446	938	
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	
Reduced v/c Ratio	0.12	0.05		0.13	0.05		0.21	0.47	0.07	0.10	0.56	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 47.7			
Natural Cycle: 45			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.56			
Intersection Signal Delay: 12.6		Intersection LOS: B	
Intersection Capacity Utilization 65.7%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 6: 6th Line & Burnhamthorpe Rd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	72	192	50	150	354	122	52	1591	142	68	1461	176
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	50.0		50.0	50.0		50.0	50.0		50.0	50.0		50.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	25.0			25.0			25.0			25.0		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	0.91	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.969			0.962				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	4982	0	1789	4946	0	1789	3579	1601	1789	3579	1601
Flt Permitted	0.401			0.543			0.097			0.070		
Satd. Flow (perm)	755	4982	0	1023	4946	0	183	3579	1601	132	3579	1601
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		50			69				100			102
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		187.9			395.2			1048.7			331.2	
Travel Time (s)		11.3			23.7			62.9			19.9	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	72	192	50	150	354	122	52	1591	142	68	1461	176
Shared Lane Traffic (%)												
Lane Group Flow (vph)	72	242	0	150	476	0	52	1591	142	68	1461	176
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5	6.1	6.1	30.5	6.1
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8	6.1	6.1	1.8	6.1
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Detector Phase	7	4		3	8		5	2	2	1	6	6

Lanes, Volumes, Timings
9: Trafalgar Rd & Burnhamthorpe Rd 2/13/2014

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0		10.0	22.0		10.0	22.0	22.0	10.0	22.0	22.0
Total Split (s)	10.0	35.0		10.0	35.0		10.0	65.0	65.0	10.0	65.0	65.0
Total Split (%)	8.3%	29.2%		8.3%	29.2%		8.3%	54.2%	54.2%	8.3%	54.2%	54.2%
Maximum Green (s)	6.0	29.0		6.0	29.0		6.0	59.0	59.0	6.0	59.0	59.0
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0		4.0	6.0		4.0	6.0	6.0	4.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Max	Max	None	Max	Max
Walk Time (s)		5.0			5.0			5.0	5.0		5.0	5.0
Flash Dont Walk (s)		11.0			11.0			11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)		0			0			0	0		0	0
Act Effct Green (s)	21.5	13.5		22.4	15.8		66.0	59.4	59.4	66.0	59.4	59.4
Actuated g/C Ratio	0.21	0.13		0.22	0.15		0.64	0.58	0.58	0.64	0.58	0.58
v/c Ratio	0.33	0.35		0.56	0.58		0.25	0.77	0.15	0.38	0.71	0.18
Control Delay	35.0	33.4		42.0	38.3		9.4	21.0	4.7	13.7	19.1	5.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.0	33.4		42.0	38.3		9.4	21.0	4.7	13.7	19.1	5.8
LOS	C	C		D	D		A	C	A	B	B	A
Approach Delay		33.7			39.2			19.4			17.5	
Approach LOS		C			D			B			B	
Queue Length 50th (m)	11.6	13.1		25.3	29.2		3.2	127.5	3.7	4.2	109.8	6.6
Queue Length 95th (m)	22.9	20.9		42.5	40.5		7.9	173.7	13.2	10.6	150.0	17.8
Internal Link Dist (m)		163.9			371.2			1024.7			307.2	
Turn Bay Length (m)	50.0			50.0			50.0		50.0	50.0		50.0
Base Capacity (vph)	218	1451		268	1454		211	2069	967	182	2069	968
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.33	0.17		0.56	0.33		0.25	0.77	0.15	0.37	0.71	0.18

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 102.7			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.77			
Intersection Signal Delay: 22.5		Intersection LOS: C	
Intersection Capacity Utilization 78.0%		ICU Level of Service D	
Analysis Period (min) 15			

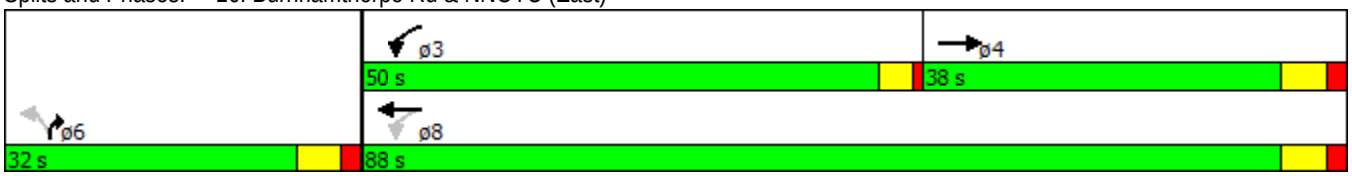
Splits and Phases: 9: Trafalgar Rd & Burnhamthorpe Rd

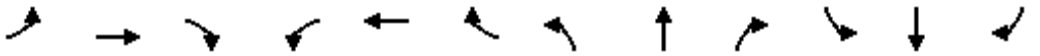
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	400	400	600	800	300	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)		0.0	50.0		50.0	0.0
Storage Lanes		0	1		1	1
Taper Length (m)			25.0		25.0	
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.925					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3310	0	1789	3579	1789	1601
Flt Permitted			0.136		0.950	
Satd. Flow (perm)	3310	0	256	3579	1789	1601
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	205					300
Link Speed (k/h)	60			60	60	
Link Distance (m)	1048.2			216.1	1059.2	
Travel Time (s)	62.9			13.0	63.6	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	400	400	600	800	300	300
Shared Lane Traffic (%)						
Lane Group Flow (vph)	800	0	600	800	300	300
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)		14	24		24	14
Number of Detectors	2		1	2	1	1
Detector Template	Thru		Left	Thru	Left	Right
Leading Detector (m)	30.5		6.1	30.5	6.1	6.1
Trailing Detector (m)	0.0		0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0		0.0	0.0	0.0	0.0
Detector 1 Size(m)	1.8		6.1	1.8	6.1	6.1
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(m)	28.7			28.7		
Detector 2 Size(m)	1.8			1.8		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA		pm+pt	NA	NA	custom
Protected Phases	4		3	8		6
Permitted Phases			8		6	
Detector Phase	4		3	8	6	6

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	22.0		10.0	22.0	22.0	22.0
Total Split (s)	38.0		50.0	88.0	32.0	32.0
Total Split (%)	31.7%		41.7%	73.3%	26.7%	26.7%
Maximum Green (s)	32.0		46.0	82.0	26.0	26.0
Yellow Time (s)	4.0		3.0	4.0	4.0	4.0
All-Red Time (s)	2.0		1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0		4.0	6.0	6.0	6.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	None	None
Walk Time (s)	5.0			5.0	5.0	5.0
Flash Dont Walk (s)	11.0			11.0	11.0	11.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	25.2		65.3	63.2	21.2	21.2
Actuated g/C Ratio	0.26		0.67	0.65	0.22	0.22
v/c Ratio	0.79		0.85	0.34	0.77	0.51
Control Delay	32.4		34.4	8.0	52.9	8.0
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	32.4		34.4	8.0	52.9	8.0
LOS	C		C	A	D	A
Approach Delay	32.4			19.3	30.4	
Approach LOS	C			B	C	
Queue Length 50th (m)	58.3		87.7	33.4	55.3	0.0
Queue Length 95th (m)	93.2		145.9	46.1	#105.9	22.4
Internal Link Dist (m)	1024.2			192.1	1035.2	
Turn Bay Length (m)			50.0		50.0	
Base Capacity (vph)	1293		950	2983	509	670
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.62		0.63	0.27	0.59	0.45

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 97.1			
Natural Cycle: 70			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.85			
Intersection Signal Delay: 25.4		Intersection LOS: C	
Intersection Capacity Utilization 87.1%		ICU Level of Service E	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 16: Burnhamthorpe Rd & NNOTC (East)





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	426	60	242	786	10	36	10	144	20	10	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	50.0		0.0	50.0		0.0	50.0		0.0	50.0		0.0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (m)	25.0			25.0			25.0			25.0		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.982			0.999			0.898			0.946	
Flt Protected		0.999			0.988			0.991			0.980	
Satd. Flow (prot)	0	3511	0	0	3532	0	0	1676	0	0	1746	0
Flt Permitted		0.931			0.724			0.921			0.831	
Satd. Flow (perm)	0	3272	0	0	2588	0	0	1558	0	0	1481	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		38			2			108			20	
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		406.5			1059.2			626.6			327.6	
Travel Time (s)		24.4			63.6			37.6			19.7	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	10	426	60	242	786	10	36	10	144	20	10	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	496	0	0	1038	0	0	190	0	0	50	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	

Lanes, Volumes, Timings
21: Avenue 6 & Burnhamthorpe Rd 2/13/2014

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0		22.0	22.0		22.0	22.0		22.0	22.0	
Total Split (s)	98.0	98.0		98.0	98.0		22.0	22.0		22.0	22.0	
Total Split (%)	81.7%	81.7%		81.7%	81.7%		18.3%	18.3%		18.3%	18.3%	
Maximum Green (s)	92.0	92.0		92.0	92.0		16.0	16.0		16.0	16.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.0			6.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		28.1			28.1			8.6			8.6	
Actuated g/C Ratio		0.57			0.57			0.17			0.17	
v/c Ratio		0.26			0.70			0.53			0.18	
Control Delay		5.2			10.6			16.5			16.5	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		5.2			10.6			16.5			16.5	
LOS		A			B			B			B	
Approach Delay		5.2			10.6			16.5			16.5	
Approach LOS		A			B			B			B	
Queue Length 50th (m)		8.3			27.1			6.2			2.2	
Queue Length 95th (m)		17.5			54.7			25.3			11.1	
Internal Link Dist (m)		382.5			1035.2			602.6			303.6	
Turn Bay Length (m)												
Base Capacity (vph)		3272			2588			604			520	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.15			0.40			0.31			0.10	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 49.4			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.70			
Intersection Signal Delay: 9.9		Intersection LOS: A	
Intersection Capacity Utilization 70.4%		ICU Level of Service C	
Analysis Period (min) 15			

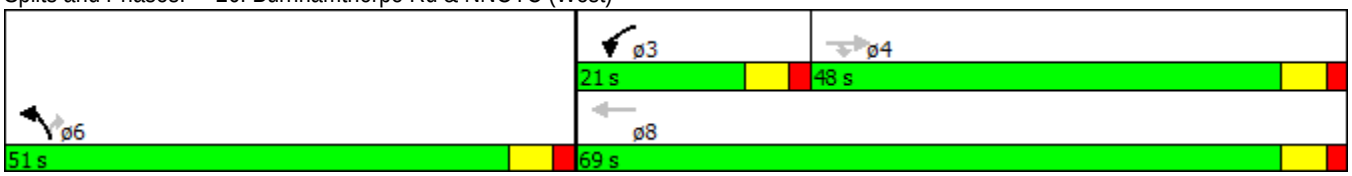
Splits and Phases: 21: Avenue 6 & Burnhamthorpe Rd

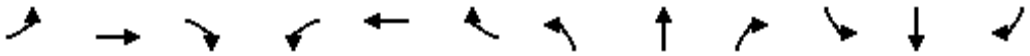
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1200	600	200	1200	600	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)		50.0	50.0		0.0	0.0
Storage Lanes		1	1		1	1
Taper Length (m)			25.0		50.0	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3579	1601	1789	3579	1789	1601
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	3579	1601	1789	3579	1789	1601
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		332				9
Link Speed (k/h)	60			60	60	
Link Distance (m)	213.8			669.9	622.4	
Travel Time (s)	12.8			40.2	37.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1200	600	200	1200	600	10
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1200	600	200	1200	600	10
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)		14	24		24	14
Number of Detectors	2	1	1	2	1	1
Detector Template	Thru	Right	Left	Thru	Left	Right
Leading Detector (m)	30.5	6.1	6.1	30.5	6.1	6.1
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	1.8	6.1	6.1	1.8	6.1	6.1
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)	28.7			28.7		
Detector 2 Size(m)	1.8			1.8		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA	custom	Prot	NA	NA	Perm
Protected Phases			3		6	
Permitted Phases	4	4		8		6
Detector Phase	4	4	3	8	6	6

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	10.0	22.0	22.0	22.0
Total Split (s)	48.0	48.0	21.0	69.0	51.0	51.0
Total Split (%)	40.0%	40.0%	17.5%	57.5%	42.5%	42.5%
Maximum Green (s)	42.0	42.0	15.0	63.0	45.0	45.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	Max	Max	Max
Walk Time (s)	5.0	5.0		5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0		0	0	0
Act Effct Green (s)	42.1	42.1	14.9	63.0	45.0	45.0
Actuated g/C Ratio	0.35	0.35	0.12	0.52	0.38	0.38
v/c Ratio	0.96	0.77	0.90	0.64	0.90	0.02
Control Delay	55.2	22.6	92.2	22.3	53.0	13.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.2	22.6	92.2	22.3	53.0	13.0
LOS	E	C	F	C	D	B
Approach Delay	44.3			32.3	52.4	
Approach LOS	D			C	D	
Queue Length 50th (m)	144.4	58.4	47.1	102.3	131.5	0.2
Queue Length 95th (m)	#189.4	107.2	#89.3	124.5	#197.8	3.7
Internal Link Dist (m)	189.8			645.9	598.4	
Turn Bay Length (m)		50.0	50.0			
Base Capacity (vph)	1256	777	223	1878	670	606
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.96	0.77	0.90	0.64	0.90	0.02

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.96			
Intersection Signal Delay: 41.2		Intersection LOS: D	
Intersection Capacity Utilization 92.5%		ICU Level of Service F	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 26: Burnhamthorpe Rd & NNOTC (West)

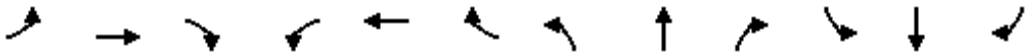




Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	10	370	30	150	600	10	30	10	50	40	170	10
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	10	370	30	150	600	10	30	10	50	40	170	10

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	195	215	450	310	90	220
Volume Left (vph)	10	0	150	0	30	40
Volume Right (vph)	0	30	0	10	50	10
Hadj (s)	0.06	-0.06	0.20	0.01	-0.23	0.04
Departure Headway (s)	6.8	6.7	6.5	6.3	7.0	6.8
Degree Utilization, x	0.37	0.40	0.81	0.54	0.17	0.41
Capacity (veh/h)	502	515	546	562	474	499
Control Delay (s)	12.6	12.9	30.7	15.4	11.4	14.5
Approach Delay (s)	12.8		24.5		11.4	14.5
Approach LOS	B		C		B	B

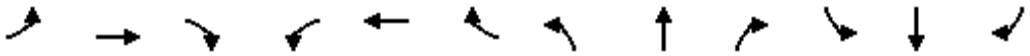
Intersection Summary				
Delay	18.9			
Level of Service	C			
Intersection Capacity Utilization	56.0%	ICU Level of Service	B	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	50	382	44	174	648	50	26	30	104	40	80	40
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	50	382	44	174	648	50	26	30	104	40	80	40

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	241	235	498	374	160	160
Volume Left (vph)	50	0	174	0	26	40
Volume Right (vph)	0	44	0	50	104	40
Hadj (s)	0.14	-0.10	0.21	-0.06	-0.32	-0.07
Departure Headway (s)	7.2	6.9	6.7	6.5	7.0	7.2
Degree Utilization, x	0.48	0.45	0.93	0.67	0.31	0.32
Capacity (veh/h)	482	506	498	549	494	476
Control Delay (s)	15.5	14.4	48.5	20.5	13.1	13.6
Approach Delay (s)	14.9		36.5		13.1	13.6
Approach LOS	B		E		B	B

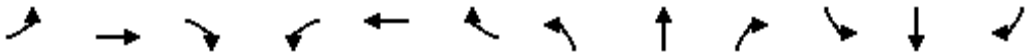
Intersection Summary				
Delay	25.9			
Level of Service	D			
Intersection Capacity Utilization	62.0%	ICU Level of Service	B	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	10	280	20	40	520	20	30	10	10	20	40	30
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	10	280	20	40	520	20	30	10	10	20	40	30

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	150	160	300	280	50	90
Volume Left (vph)	10	0	40	0	30	20
Volume Right (vph)	0	20	0	20	10	30
Hadj (s)	0.07	-0.05	0.10	-0.02	0.03	-0.12
Departure Headway (s)	5.6	5.5	5.4	5.3	6.0	5.7
Degree Utilization, x	0.23	0.25	0.45	0.41	0.08	0.14
Capacity (veh/h)	609	628	652	668	542	568
Control Delay (s)	9.2	9.1	11.5	10.7	9.5	9.7
Approach Delay (s)	9.1		11.1		9.5	9.7
Approach LOS	A		B		A	A

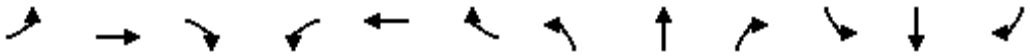
Intersection Summary				
Delay	10.3			
Level of Service	B			
Intersection Capacity Utilization	41.3%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	10	780	10	10	560	10	10	10	10	10	10	10
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	10	780	10	10	560	10	10	10	10	10	10	10

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	400	400	290	290	30	30
Volume Left (vph)	10	0	10	0	10	10
Volume Right (vph)	0	10	0	10	10	10
Hadj (s)	0.05	0.02	0.05	0.01	-0.10	-0.10
Departure Headway (s)	5.4	5.3	5.6	5.6	6.4	6.4
Degree Utilization, x	0.60	0.59	0.45	0.45	0.05	0.05
Capacity (veh/h)	651	663	623	628	519	514
Control Delay (s)	14.8	14.7	12.0	11.9	9.7	9.7
Approach Delay (s)	14.7		11.9		9.7	9.7
Approach LOS	B		B		A	A

Intersection Summary				
Delay	13.4			
Level of Service	B			
Intersection Capacity Utilization	38.9%	ICU Level of Service	A	
Analysis Period (min)	15			



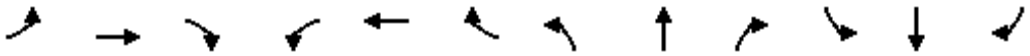
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	12	248	0	82	474	26	10	0	48	18	0	6
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	12	248	0	82	474	26	10	0	48	18	0	6

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	136	124	319	263	58	24
Volume Left (vph)	12	0	82	0	10	18
Volume Right (vph)	0	0	0	26	48	6
Hadj (s)	0.08	0.03	0.16	-0.04	-0.43	0.03
Departure Headway (s)	5.4	5.3	5.1	4.9	5.2	5.7
Degree Utilization, x	0.20	0.18	0.46	0.36	0.08	0.04
Capacity (veh/h)	650	652	685	714	626	562
Control Delay (s)	8.5	8.3	11.2	9.5	8.7	9.0
Approach Delay (s)	8.4		10.4		8.7	9.0
Approach LOS	A		B		A	A

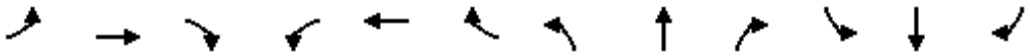
Intersection Summary				
Delay	9.7			
Level of Service	A			
Intersection Capacity Utilization	38.0%	ICU Level of Service	A	
Analysis Period (min)	15			

APPENDIX D

QUEUING ANALYSIS



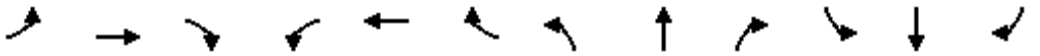
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	768	18	93	274	10	56	10	364	20	10	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	50.0		0.0	50.0		0.0	50.0		0.0	50.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	25.0			25.0			25.0			25.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.995			0.886			0.939	
Flt Protected	0.950			0.950				0.994			0.982	
Satd. Flow (prot)	1789	1878	0	1789	1874	0	0	1659	0	0	1737	0
Flt Permitted	0.585			0.156				0.951			0.828	
Satd. Flow (perm)	1102	1878	0	294	1874	0	0	1587	0	0	1464	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			4			199			25	
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		406.5			1059.2			626.6			327.6	
Travel Time (s)		24.4			63.6			37.6			19.7	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	10	768	18	93	274	10	56	10	364	20	10	25
Shared Lane Traffic (%)												
Lane Group Flow (vph)	10	786	0	93	284	0	0	430	0	0	55	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0		22.0	22.0		22.0	22.0		22.0	22.0	
Total Split (s)	94.0	94.0		94.0	94.0		26.0	26.0		26.0	26.0	
Total Split (%)	78.3%	78.3%		78.3%	78.3%		21.7%	21.7%		21.7%	21.7%	
Maximum Green (s)	88.0	88.0		88.0	88.0		20.0	20.0		20.0	20.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	33.0	33.0		33.0	33.0			20.3			20.3	
Actuated g/C Ratio	0.50	0.50		0.50	0.50			0.31			0.31	
v/c Ratio	0.02	0.83		0.63	0.30			0.68			0.12	
Control Delay	7.2	22.1		32.4	9.7			19.0			13.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.2	22.1		32.4	9.7			19.0			13.9	
LOS	A	C		C	A			B			B	
Approach Delay		21.9			15.3			19.0			13.9	
Approach LOS		C			B			B			B	
Queue Length 50th (m)	0.6	73.9		7.5	18.1			22.2			2.5	
Queue Length 95th (m)	2.3	114.1		#27.4	29.8			#76.9			11.8	
Internal Link Dist (m)		382.5			1035.2			602.6			303.6	
Turn Bay Length (m)	50.0			50.0								
Base Capacity (vph)	1102	1878		294	1874			630			471	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.01	0.42		0.32	0.15			0.68			0.12	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 65.5			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.83			
Intersection Signal Delay: 19.4		Intersection LOS: B	
Intersection Capacity Utilization 89.4%		ICU Level of Service E	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 21: Avenue 6 & Burnhamthorpe Rd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	426	60	242	786	10	36	10	144	20	10	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	50.0		0.0	50.0		0.0	50.0		0.0	50.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	25.0			25.0			25.0			25.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.981			0.998			0.898			0.946	
Flt Protected	0.950			0.950				0.991			0.980	
Satd. Flow (prot)	1789	1848	0	1789	1880	0	0	1676	0	0	1746	0
Flt Permitted	0.235			0.458				0.921			0.824	
Satd. Flow (perm)	443	1848	0	863	1880	0	0	1558	0	0	1468	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		18			2			108			20	
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		406.5			1059.2			626.6			327.6	
Travel Time (s)		24.4			63.6			37.6			19.7	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	10	426	60	242	786	10	36	10	144	20	10	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	10	486	0	242	796	0	0	190	0	0	50	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	

Lanes, Volumes, Timings
21: Avenue 6 & Burnhamthorpe Rd 2/13/2014

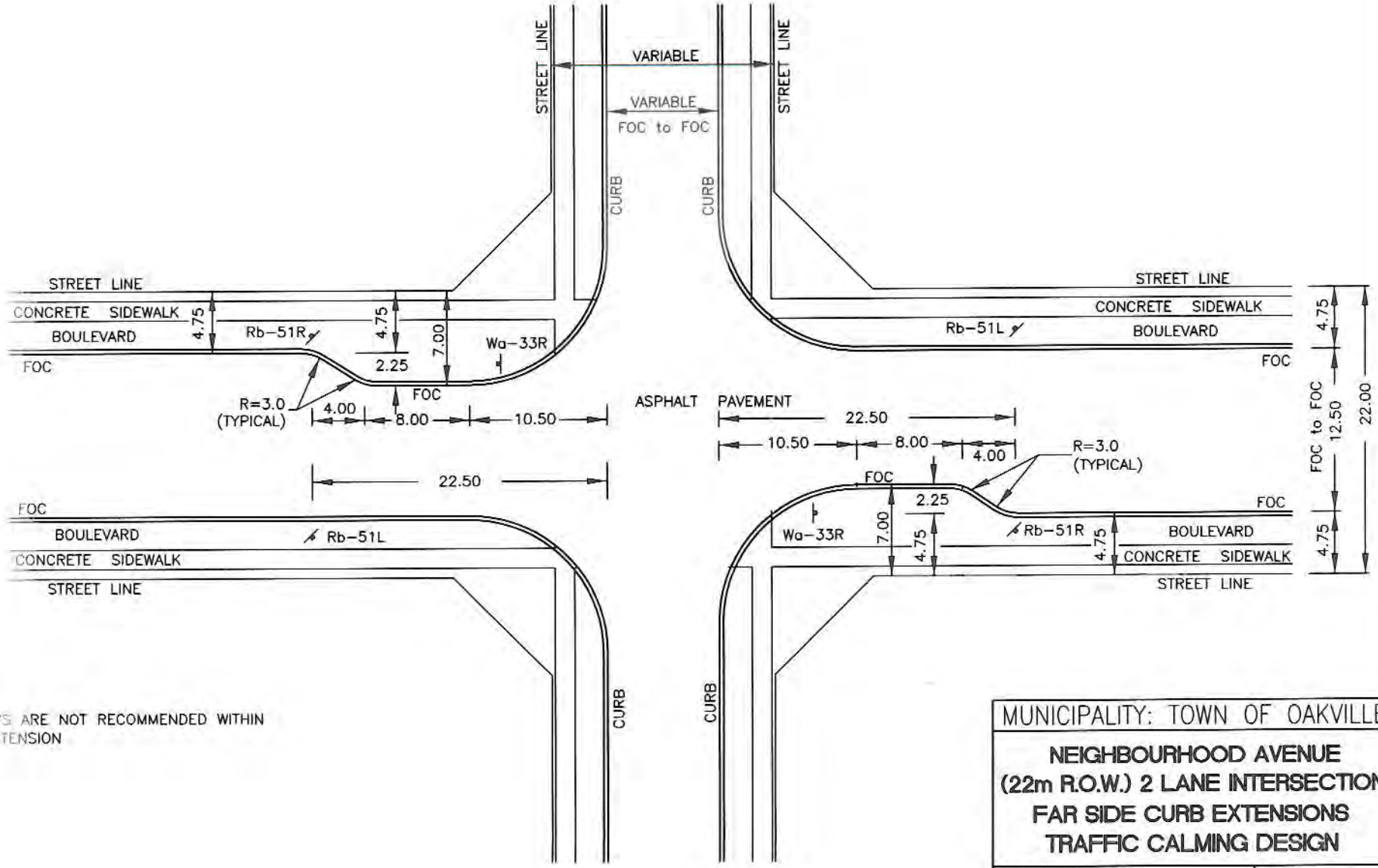
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0		22.0	22.0		22.0	22.0		22.0	22.0	
Total Split (s)	98.0	98.0		98.0	98.0		22.0	22.0		22.0	22.0	
Total Split (%)	81.7%	81.7%		81.7%	81.7%		18.3%	18.3%		18.3%	18.3%	
Maximum Green (s)	92.0	92.0		92.0	92.0		16.0	16.0		16.0	16.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	29.5	29.5		29.5	29.5			8.8			8.8	
Actuated g/C Ratio	0.58	0.58		0.58	0.58			0.17			0.17	
v/c Ratio	0.04	0.45		0.49	0.73			0.53			0.19	
Control Delay	5.1	7.3		10.1	12.4			17.3			17.5	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	5.1	7.3		10.1	12.4			17.3			17.5	
LOS	A	A		B	B			B			B	
Approach Delay		7.2			11.9			17.3			17.5	
Approach LOS		A			B			B			B	
Queue Length 50th (m)	0.3	18.8		10.1	41.4			6.4			2.3	
Queue Length 95th (m)	2.0	42.6		28.8	92.2			27.1			11.8	
Internal Link Dist (m)		382.5			1035.2			602.6			303.6	
Turn Bay Length (m)	50.0			50.0								
Base Capacity (vph)	443	1848		863	1880			593			505	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.02	0.26		0.28	0.42			0.32			0.10	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 51.1			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.73			
Intersection Signal Delay: 11.3		Intersection LOS: B	
Intersection Capacity Utilization 72.7%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 21: Avenue 6 & Burnhamthorpe Rd

APPENDIX E

Std. 9-21 Neighborhood Avenue (22m R.O.W.)
2 Lane Intersection Far Side Curb Extensions,
Traffic Calming Design



NOTE:

DRIVEWAYS ARE NOT RECOMMENDED WITHIN CURB EXTENSION

FOC DENOTES FACE OF CURB

DIMENSIONS IN METRES EXCEPT AS NOTED

MUNICIPALITY: TOWN OF OAKVILLE

NEIGHBOURHOOD AVENUE (22m R.O.W.) 2 LANE INTERSECTION FAR SIDE CURB EXTENSIONS TRAFFIC CALMING DESIGN

APPROVED

DIRECTOR OF PUBLIC WORKS

STD. 9-21-A

REVISED MAR. 1, 2011

APPENDIX C

Urban Forestry Report

Urban Forestry Report

Burnhamthorpe Road Character Study

Prepared for:

Town of Oakville

Prepared by:

MMM GROUP
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Tel: (905) 882-1100 Fax: (905) 882-0055

June 26, 2014

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Tables and Appendix

List of Drawings

Introduction

Burnhamthorpe Road is a rural two lane road currently designated as a regional arterial road. The Town of Oakville has requested that a Character Road Study to be completed for Burnhamthorpe Road to develop a new comprehensive design that will meet the infrastructure demands of future development within the Town and Region. This study will form part of an Environmental Study Report (ESR). The purpose of this report is to provide an assessment of the existing vegetation located within the right of way and provide recommendations for the preservation of trees to be retained and accommodated in the preferred alternative road design.

This report is to be read in conjunction with:

- Tree Inventory Plans
- Tree Preservation Plans
- Tree Inventory Charts

General Overview

The Character Road Study limit is ±6km between 9th Line and the 16 Mile Creek Watershed. The existing road profile is a 2 lane rural cross section with rolling terrain bordered by active and inactive agricultural activities, rural residential, horse stables / farms and sporadic commercial / institutional located adjacent to the intersections at Trafalgar Road and Neyagawa Boulevard. Several branches of Morrison Creek and watercourses cross the road at various points. Within the right of way vegetation between residential properties adjacent to inactive and active agricultural fields consists of immature native and non-native hedgerows disturbed from past and present agricultural activities. Some significant mature trees likely remnants from a larger forest community that was removed for agriculture are present in some of these hedgerows. Vegetation is dense along the edges of watercourses that run adjacent to or cross Burnhamthorpe Road. Along frontages of rural residential properties vegetation consists of a mixture of ornamental, native and non-native trees a majority of which are immature to semi-mature.

Vegetation Summary

Individual tree and trees in groupings were found to be a mixture of native and non-native species. Higher concentrations of native species were observed adjacent to Morrison Creek. Vegetation is less dense adjacent to farm fields or within the frontage of residential, institutional and commercial properties. A majority of vegetation within the right of way has either been planted, established by seed or established naturally, or are remnants of hedgerows or forests and ranging in size between 5 to 100cm DBH and 4 to 20m in height. Non-native and invasive Manitoba Maple, Norway Maple and Buckthorn were observed with the right of way and regionally rare Eastern Red Cedar was observed west of Neyagawa Boulevard. No endangered species were observed.

Species between 9th Line and ±700m east of Neyagawa Boulevard consist of: an abundance of Apple (*Malus sp*.), Pear (*Pyrus sp*.), Cherry (*Prunus sp*.), Ash (*Fraxinus sp*.); frequent amounts of Manitoba Maple (*Acer negundo*); the occasional Elm (*Umus sp*.), Silver Maple (*Acer saccharinum*), Hackberry (*Celtis occidentalis*), Black Cherry (*Prunus serotina*), Bur Oak (*Quercus macrocarpa*), Norway Maple (*Acer platanoides*), Basswood (*Tilia americana*), Cedar (*Thuja occidentalis*), Lilac (*Syringa vulgaris*); and to a lesser extent White Oak (*Quercus alba*),

Red Pine (*Pinus resinosa*), Willow (*Salix sp*.), Sugar Maple (Acer saccharum), Colorado Blue Spruce (*Picea pungens 'Glauca*'), Black Walnut (*Juglans nigra*), White Pine (*Pinus strobus*), American Beech (*Fagus grandifolia*), Red Maple (*Acer rubrum*), Aspen (*Populus sp*.), Witch Hazel (*Hamamalis virginiana*), Bitternut Hickory (*Carya cordiformis*), White Birch (*Betula papyrifera*), Austrian Pine (*Pinus nigra*) and White Spruce (*Picea glauca*).

Between the terminus of Burnhamthorpe Road at the 16 Mile Creek watershed and ±470m west of Neyagawa Boulevard vegetation are primarily native deciduous predominantly young trees with some mature specimens ranging in size between 10-100cm DBH and 4-20m in height. Species consist of an abundance of Ash (*Fraxinus spp*.), Bur Oak (*Quercus macrocarpa*), Bitternut Hickory (*Carya cordiformis*) and Manitoba Maple (*Acer negundo*). To a lesser extent there is Elm (*Ulmus spp*.), Norway Spruce (*Picea abies*), Scots Pine (*Pinus slyvestris*), Horsechesnut (*Aesculus hippocastanum*), Eastern Red Cedar (*Juniperus virginiana*), Buckthorn (*Rhamnus cathartica*), Poplar (Populus spp.), Red Oak (Quercus rubra), Silver Maple (*Acer saccharinum*) and Alder (*Alnus spp*.).

Discussion:

An inventory of vegetation was undertaken up to the limits of the existing regional right of way during the week of August 19th to 23rd within the Burnhamthorpe Road Character Study areas to identify tree species, size, condition, significance, regionally rare and endangered species. Species name, size and condition are listed in Table 1: Tree Inventory Charts.

The preferred road design will likely involve the widening and urbanization of the road incorporating sidewalks, bus pads, on street parking, boulevards and hard and soft landscaping features. It is expected that vegetation will be impacted when the road design is implemented. It will not be feasible to retain a majority of the vegetation within the right of way however there are trees that should be given consideration to be preserved. These trees are discussed in the following sections. Refer to the Tree Inventory Plans for locations of existing vegetation and Tree Preservation Plans for the location of trees recommended to be preserved.

Tree Preservation

Native trees found to be in good condition are recommended to be preserved and incorporated into the road design as these trees will provide shade for pedestrians and a connection to the past history of the road. Vegetation within the Glenorchy Conservation Area, along the branches of Morrison Creek and watercourses should be preserved and streetscape designs should consider minimal impacts to these areas.

Regionally rare trees such as Eastern Red Cedar were observed along the hedgerows west of 4ht line to 16 Mile Creek and are recommended where to be preserved. Should preservation not be feasible then transplanting should also be considered. This will be determined at the detailed design stage.

40 Significant trees in good condition were observed within the study areas. Priority should be given to the preservation of these trees due to the ecological benefits they provide from taking in pollutants and releasing clean air, the shade cast from the vast canopy keeping asphalt cool in summer reducing the urban heat island to providing a heritage connection to the past character of the road. Future streetscape designs should incorporate these trees into the design and minimize impacts. Tree preservation has been separated into two sections: Burnhamthorpe Road between 9th Line and ±700m east of Neyagawa Boulevard; and between the terminus of Burnhamthorpe Road at the 16 Mile Creek watershed and ±470m west of Neyagawa Boulevard.

Trees are listed by tree number, species and size shown in centimetres taken at breast height. Refer to Table 1: Tree Inventory Charts for botanical names, condition and driplines.

Burnhamthorpe Road between 9th Line and ±700m east of Neyagawa Boulevard

- T-32: Bur Oak (81cm)
- T-33: White Pine (40cm)
- T-35: White Pine (51cm)
- T-72: White Pine (40cm)
- T-75: Bur Oak (77cm)
- T-80: American Elm (50cm)
- T-109: Hackberry (51cm)
- T-128: Hackberry (51cm)
- T-142: White Pine (36cm)
- T-150: Hackberry (35cm)
- T-158: Silver Maple (49cm)
- T-159: Silver Maple (39cm)
- T-193: Bur Oak (38cm)
- T-211: Bitternut Hickory (37cm)
- T-213: Bur Oak (50cm)
- T-215: Bur Oak (70cm)
- T-219: Bur Oak (45cm)
- T-222: Bur Oak (42cm)
- T-231: Bur Oak (55cm)
- T-238: Hickory (60cm)
- T-247: Austrian Pine (70cm)
- T-248: Hickory (44cm)
- T-249: Hickory (45cm)

Burnhamthorpe Road between the 16 Mile Creek watershed and ±470m west of Neyagawa Boulevard.

- T-256: Silver Maple (30cm)
- T-257: White Pine (25cm)
- T-258: Bur Oak (45cm)
- T-259: Bur Oak (45cm)
- T-261: Bur Oak (80cm)
- T-263: Bur Oak (60cm)
- T-270: Norway Spruce (25cm, 10m ht.)
- T-273: Eastern Red Cedar (10cm, 5m ht.)
- T-274: Eastern Red Cedar (25 & 20cm)
- T-275: Red Oak (40 & 40cm)
- T-276: Red Oak (10cm)
- T-277: Bur Oak (65cm)
- T-278: Bur Oak (50cm)
- T-281: Bur Oak (45cm)
- T-283: Hickory (50cm)
- T-288: Bur Oak (80cm)
- T-289: Bur Oak (50cm)

Mitigation

The preservation of the above mentioned trees and incorporation into the preferred road design may require some mitigation measures. These measures include meandering of proposed sidewalks around trees, retaining walls or curbs to be constructed to minimize the impacts of cut / fill within the critical root zones of trees, relocation of the boulevard and transplanting of trees below 30cm DBH

Buckthorn was observed along edges of disturbed hedgerow. Buckthorn is a non-native invasive shrub / small tree that establishes along edges of hedgerows, forests etc. and begins to spread into the interior of these communities crowding out and limiting growth of native species. Where present within the proposed right of way limit Buckthorn should be removed.

Edge Management

Where clearing of trees will occur within densely vegetation areas such as forests, adjacent to watercourses and rivers a new edge is created. When trees are removed from a wooded edge, the remaining trees that form the new edge of the woodland could develop health issues. Due to the change in their environment, trees at the new edge can be exposed to more sun, wind and other altered growing conditions. As a result, they may be more likely to be desiccated, and vulnerable to competition from invasive species and to human encroachment. The changes in conditions can negatively affect their health and stability. Their condition could decline, and potentially create a hazardous tree where it could fall on a target (eg. cars, people, and structures). Existing trees that are located at the new edge and are in poor condition could be hazardous trees. To manage this situation, the following measures are typically recommended at the construction stage:

- An inspection of the remaining trees at the new to identify any hazardous trees, after the initial tree removal has been completed. Trees identified as being in poor health and/or having poor or unstable structure are to be removed.

- After the secondary tree removal, new tree and shrub planting is to be undertaken to buffer the new edge and fill in holes.

- An Edge Management Plan is to be prepared by a Registered Professional Forester (RPF), prior to approval, or the above recommendations to be co-signed by a RPF.

By-laws / Permits:

At the detailed design and construction stages, any trees scheduled to be removed would be subject to current Town of Oakville tree protection by-laws. These by-laws are described below:

Town of Oakville Private Tree Protection By-Law (2008-156)

The Town of Oakville's Private Tree Protection By-Law applies to the removal of five or more trees between 20-76cm diameter in one calendar year.

Town of Oakville Municipal Tree By-Law (2009-025)

The Town of Oakville's Municipal Tree by-law regulates the planting, care, maintenance and removal of trees on Town property.

Halton Region By-Law (121-05)

The Regional Municipality of Halton has a by-law that prohibits or regulates that destruction or injuring of trees in the Regional Municipality of Halton (By-Law 121-05). This by-law applies to the following:

1. All Woodlands having an area of land 1 ha. and above;
2. All Woodlands having an area of land between 0.5 ha and 1 ha., upon delegation of such authority by each Local Municipality to the Region, under Section 135(10) of the Municipal Act; and
3. All Greenlands outside of the Woodlands 0.5 ha. or larger, upon delegation of such authority by each Local Municipality to the Region, under Section 135(10) of the Municipal Act. (By-Law 121-05)

CFIA Directive (D-03-08): Phytosanitary Requirements to Prevent the Introduction Into and Spread within Canada of the Emerald Ash Borer, Agrilus planipennis (Fairmaire)

The current CFIA directive as it pertains to the Emerald Ash Borer is described below. This directive is subject to change. The Canadian Food Inspection Agency issues a prohibition of movement where the emerald ash borer (EAB) has been confirmed. EAB has been found in Halton Region and thus the Region has been identified as part of the EAB Regulated Area encompassing most of southern Ontario. The subject property is within identified areas prohibiting the movement of regulated materials (including but not limited to ash wood or bark and ash wood chips or bark chips) from a regulated area. EAB regulated articles moving out of a regulated area must be accompanied by a Movement Certificate issued by the CFIA. Refer to the EAB Regulated Areas of Canada found on the CFIA website.

Preservation and Protection Recommendations

The survival rates for trees, which are in proximity to construction, are dependent on the resultant changes to a variety of environmental and anthropogenic factors. These construction activities bring about changes to a variety of environmental features including the existing microclimate including winds, temperature, soil moisture, amount of available sunlight, soil quality, and the level of the water table. Increased human activities may also damage the structure and/or physiological activities of the trees. The full effects of the damage may not appear until several years after its occurrence. Thus, it is essential that both vegetative clearing and preservation methods follow the guidelines below and those generally accepted as keeping with good horticultural and construction practices. The guidelines are subject to adjustments deemed reasonable and appropriate considering the proximity and number of trees involved and the site-specific servicing requirements

General Recommendations

The following is a list of practical considerations for the construction phase of the project that applies to all trees that may be impacted by the construction.

- No tree removals will be permitted within the nesting season (May 1 to August 8) unless a visual survey has been undertaken by an ornithologist to ascertain that there are no

nests present within the nesting season. All removals must be felled into the work area to ensure that damage does not occur to the trees within the tree preservation zone;

- Upon completion of the tree removals, all felled trees are to be removed from the site, and all brush chipped. All brush, roots and wood debris must be shredded into pieces that are smaller than 25 mm in size to ensure that any insect pests that could be present within the wood are destroyed. This work must be completed outside of the nesting season, May 1 to August 8, or a visual survey must be undertaken by an ornithologist to ascertain that there are no nests present within the nesting season;

- Halton Region is within the 'EAB Regulated Areas of Canada' covering most of southern Ontario. The removal and disposal of Ash (*Fraxinus sp*.) is subject to the Canadian Food and Inspections Agencies (CFIA) regulations. As mandated by the Canadian Food Inspection Agency a ***prohibition of movement will be issued for properties where the emerald ash borer (EAB) has been confirmed***. This measure prohibits the movement of regulated materials from the specific property. Regulated materials include: ash trees (whole or parts), ash nursery stock, ash logs and branches, ash lumber, wood, packaging materials with an ash component, ash wood or bark, ash wood chips or bark chips, firewood from all tree species. EAB regulated articles moving out of a regulated area must be accompanied by a ***Movement Certificate issued by the CFIA***. All vehicles used to transport regulated articles must be cleaned of debris prior to loading at origin and prior to departure from the receiving facility. The required treatment will depend upon the regulated article transported, but may include sweeping or power washing. Should it be necessary to dispose of materials on site methods of disposal include incineration or deep burial. For more information about transporting regulated articles and disposal contact your local CFIA office.

Pruning Practices:

- All limbs damaged or broken during the course of construction should be pruned cleanly, utilising by-pass secateurs in accordance with approved horticultural practices. Should there be a potential risk of transfer of disease from infected to non-infected trees; tools must be disinfected after pruning each tree by dipping in methyl hydrate. This practice is particularly important during periods of tree stress and when pruning many members of the same genera, within which a disease could be spread quickly (i.e., Verticillium Wilt on Maples or Fireblight on genera of the Rosacea family).

- During excavation operations in which the root area is affected, the contractor is to prune all exposed roots cleanly. Pruned root ends are to be neatly and squarely trimmed and the area is to be backfilled with clean native fill as soon as possible to prevent desiccation and promote root growth. The exposed roots should not be allowed to dry out, and the contractor shall discuss watering of the roots with the consulting arborist so that the roots shall maintain optimum soil moisture during construction and backfilling operations, yet so not to interfere with construction operations. Backfilling must be with clean uncontaminated topsoil from an approved source. Texture must be coarser than existing soils, and to come into clean contact with existing soils (remove air pockets, sod, etc.)

- Root prune prior to construction. Vacuum excavate to expose roots. Cut cleanly and backfill immediately.

- All pruning cuts should be made to a growing point such as a bud, twig or branch, cut just outside the branch collar (the swollen area at the base of the branch that sometimes has a bark ridge), and perpendicular to the branch being pruned rather than as close to the trunk as possible. This minimizes the site of the wound. No stubs should be left. Poor cut location, poor cut angle and torn cuts are not acceptable.

- Tree roots should not be excavated within the critical structural rooting area. This is the minimum area of the root system necessary to maintain vitality or stability of the tree. Typically this area extends to the dripline of the tree. The severing of one root can cause approximately 5-20% loss of the root system. A reduction of this area by greater than 30% can pose stability concerns for the tree.

- Extensive pruning is best completed before plants break dormancy. Pruning should be limited to the removal of no more than one third (1/3) of the total bud and leaf bearing branches. Pruning should include the careful removal of:
    - deadwood,
    - branches that are weak, damaged, diseased and those which will interfere with construction activity,
    - secondary leaders of conifers,
    - trunk and root suckers,
    - trunk waterspouts, and
    - tight V-shaped or weak crotches (included unions).

Conclusion

Trees provide aesthetic value, economic value, social benefits through connections between people and trees, communal benefits through improving air quality, providing homes for wildlife, shade, reduction of the urban heat island effect and regulating wind speed. As the preferred road design is intended to incorporate a pedestrian friendly design the preservation and incorporation of trees will provide these benefits as well as a connection from the past to the present.

MMM GROUP LIMITED

Peter McNamara, BA
Landscape Designer | ISA Certified Arborist ON-1140A

Appendix 1

Limitations of Assessment

It is our policy to attach the following clause regarding limitations. We do this to ensure that the client is aware of what is technically and professionally realistic in retaining trees.

The assessment of the trees presented in this report has been made using accepted arboricultural techniques. These include a visual examination of all the above ground parts of the tree for structural defects, scars, external indications of decay such as fungal fruiting bodies, evidence of attack by insects, discoloured foliage, the condition of any visible root structures, the degree and direction of lean (if any), the general condition of the trees and the surrounding site, and the proximity of property and people. Except where specifically noted, the trees were not cored, probed or climbed and there was no detailed inspection of the root crowns involving excavations.

Notwithstanding the recommendations and conclusions made in this report, it must be recognized that trees are living organisms, and their health and vigour constantly change over time. They are not immune to changes in site conditions or seasonal variations in the weather conditions.

While reasonable efforts have been made to ensure that the subject trees are healthy, no guarantees are offered, or implied, that these trees or any of their parts will remain standing. It is both professionally and practically impossible to predict with absolute certainty the behaviour of any single tree or its component parts under all circumstances. Inevitably, a standing tree will always pose some level of risk. Most trees have the potential for failure under adverse weather conditions, and the risk can only be eliminated if the tree is removed.

Although every effort has been made to ensure that this assessment is reasonably accurate, the trees should be re-assessed periodically. The assessment presented in this report is valid at the time of inspection.

Definitions

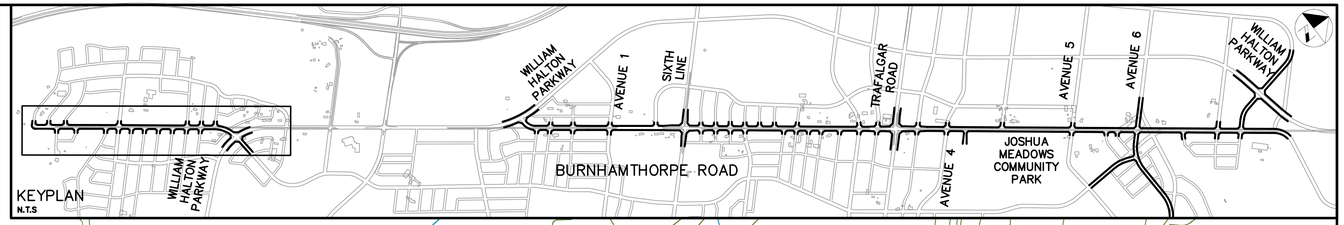
The following are the definitions of the assessment categories utilized in our tree assessment:

Tree Number	this number refers to the number on the reference plan.
Species	the botanical and common names are provided for each tree.
DBH	this refers to diameter (in centimetres) at breast height and is measured at 1.3 m above the ground for each tree.
Trunk Integrity (T.I.)	this is an assessment of the trunk for any defects or weaknesses. It is measured on a scale of poor, fair, good.
Canopy Structure (C.S)	this is an assessment of the scaffold branches, unions and the canopy of the tree. This is measured on a scale of poor, fair, good.
Canopy Vigour (C.V.)	this is an assessment of the health of the tree and assesses the amount of deadwood and live growth in the crown as compared to a

	100% healthy tree. The size, colour and amount of foliage are also considered in this category. This is measured on a scale of poor, fair, good.
Dripline Radius	Measurement of the tree canopy from its trunk to its dripline, recorded as a radius.
Suppressed	Refers to trees that have their crowns completely overtopped by adjacent trees and received limited to very limited sunlight.
Codominant Stem	Stems equal in size and relative importance, usually associated with either the trunks and stems or scaffold limbs and branches in the crown.
Union	Junction point where two or more stems meet. A 'U' shaped junction indicates a well formed union. A 'V' shaped junction indicates a weakly formed union, whereas stems grow and increase in girth, weak bark called 'included bark' forms within the junction and stems start to push apart causing vertical cracks and loss of structure.

Condition Assessments (G,F,P):

GOOD -	tree displays less than 15% deficiency/defect within the given tree assessment criteria (TI, CS, CV).
FAIR -	tree displays 15%-40% deficiency/defect within the given tree assessment criteria (TI, CS, CV).
POOR -	tree displays greater than 40% deficiency/defect within the given tree assessment criteria (TI, CS, CV).
Tree Protection Zone -	this refers to the preservation area of the tree to be protected with tree protection measures. No construction activities are to be undertaken within this zone.



PLAN A

1441 & 1443 Burnhamthorpe Road

1495 Burnhamthorpe Road

T-275 G-45 G-44 G-43 T-274 T-273 G-42 T-272 G-41 G-40

BURNHAMTHORPE ROAD

G-46 T-276 G-47 G-48

FLOODPLAIN LIMIT

FLOODPLAIN LIMIT

Cedar Ridge

MATCH LINE – SEE PLAN B

MATCH LINE SEE PLAN A

1275 Burnhamthorpe Road

1205 Burnhamthorpe Road

1231 Burnhamthorpe Road

1111 Burnhamthorpe Road

1099 Burnhamthorpe Road

1093 Burnhamthorpe Road

1075 Burnhamthorpe Road

1065 Burnhamthorpe Road

T-271 T-270 T-269 T-268 T-267

Silver Springs Stables

T-266 T-265 T-264 G-39 T-263 T-262 T-261 G-38 G-37 G-36 G-35 G-34 T-260 T-257 T-258 T-259 1125 Burnhamthorpe Road T-256 T-255

Study area, ±460m west of 4th Line

BURNHAMTHORPE ROAD

G-49 G-50 T-277 T-278 T-279 G-51 T-280 G-52 T-281 G-53 G-54 G-55 T-282 T-283 T-284 T-285 T-286 T-287 T-288 T-289

English Riding Lessons / Camp

Trilliumview Stables

1176 Burnhamthorpe Road

1156 Burnhamthorpe Road

1130 Burnhamthorpe Road / sold sign (Century 21)

1106 Burnhamthorpe Road

1060 Burnhamthorpe Road

FLOODPLAIN LIMIT

MATCH LINE – PLAN C ON SHEET 2

PLAN B

MMM GROUP

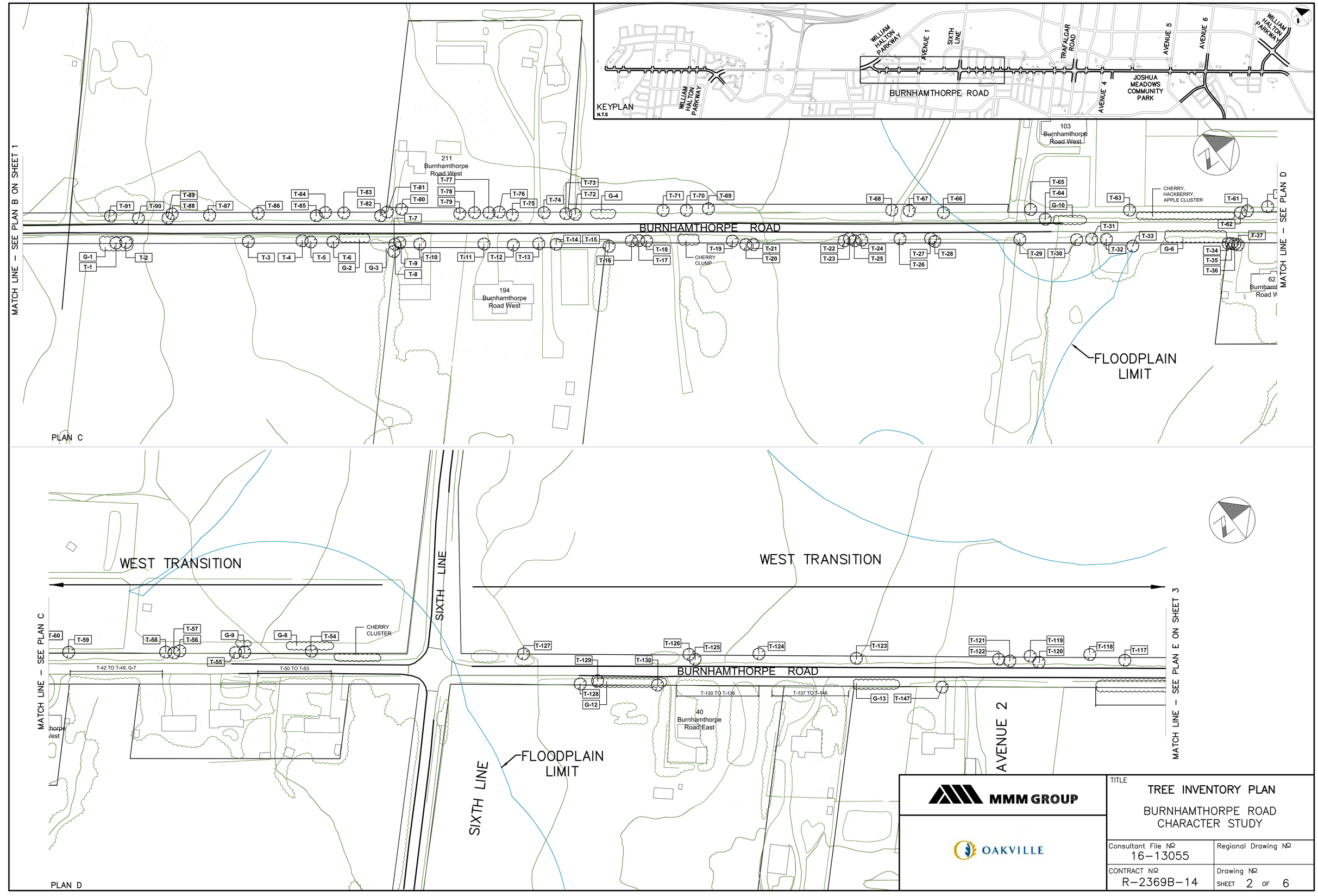
OAKVILLE

TITLE

TREE INVENTORY PLAN

BURNHAMTHORPE ROAD CHARACTER STUDY

Consultant File №	Regional Drawing №
16-13055	
CONTRACT №	Drawing №
R-2369B-14	SHEET 1 OF 6



MMM GROUP

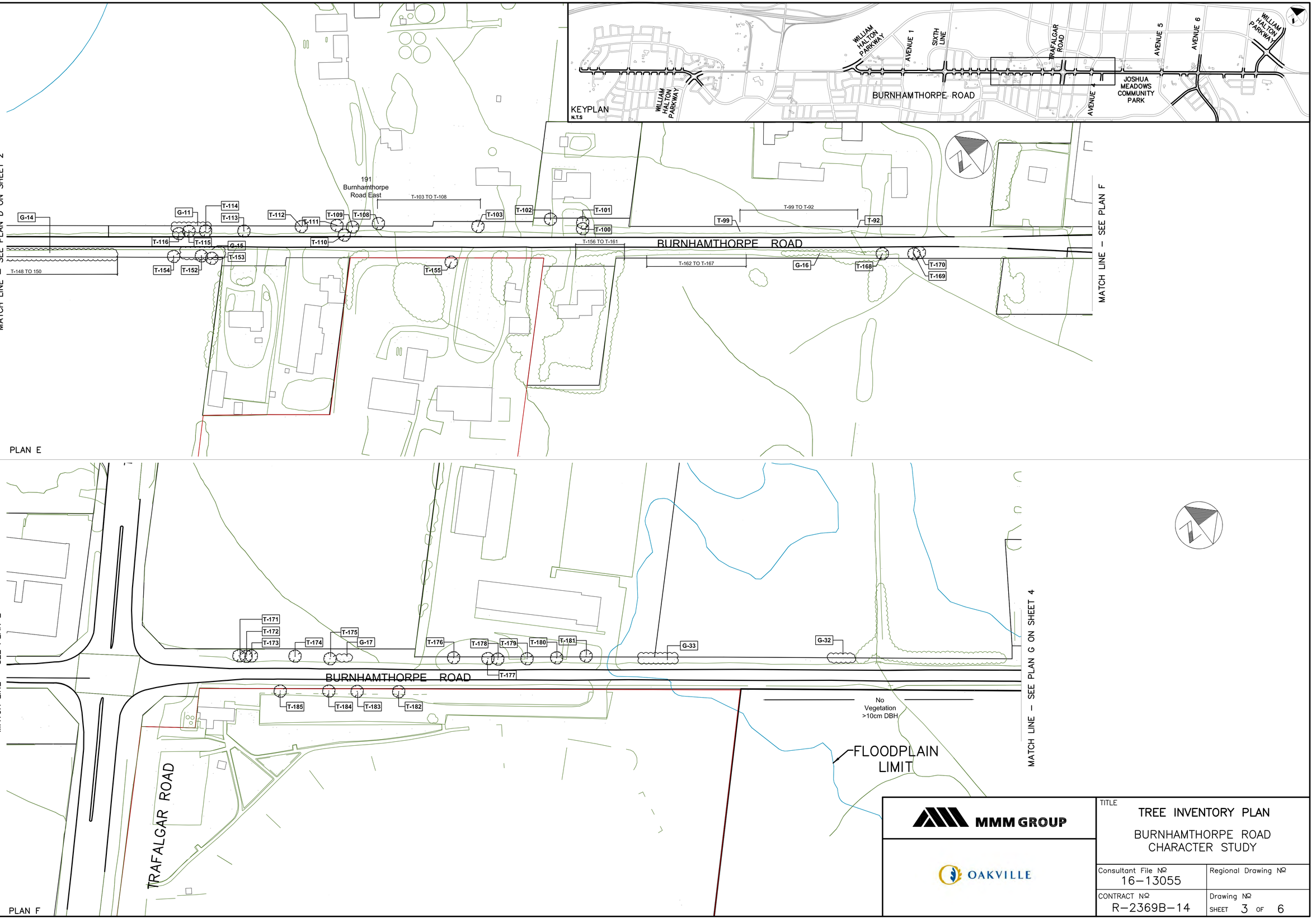
OAKVILLE

TITLE

TREE INVENTORY PLAN

BURNHAMTHORPE ROAD CHARACTER STUDY

Consultant File No	Regional Drawing No
16-13055	
CONTRACT No	Drawing No
R-2369B-14	SHEET 2 OF 6



MMM GROUP

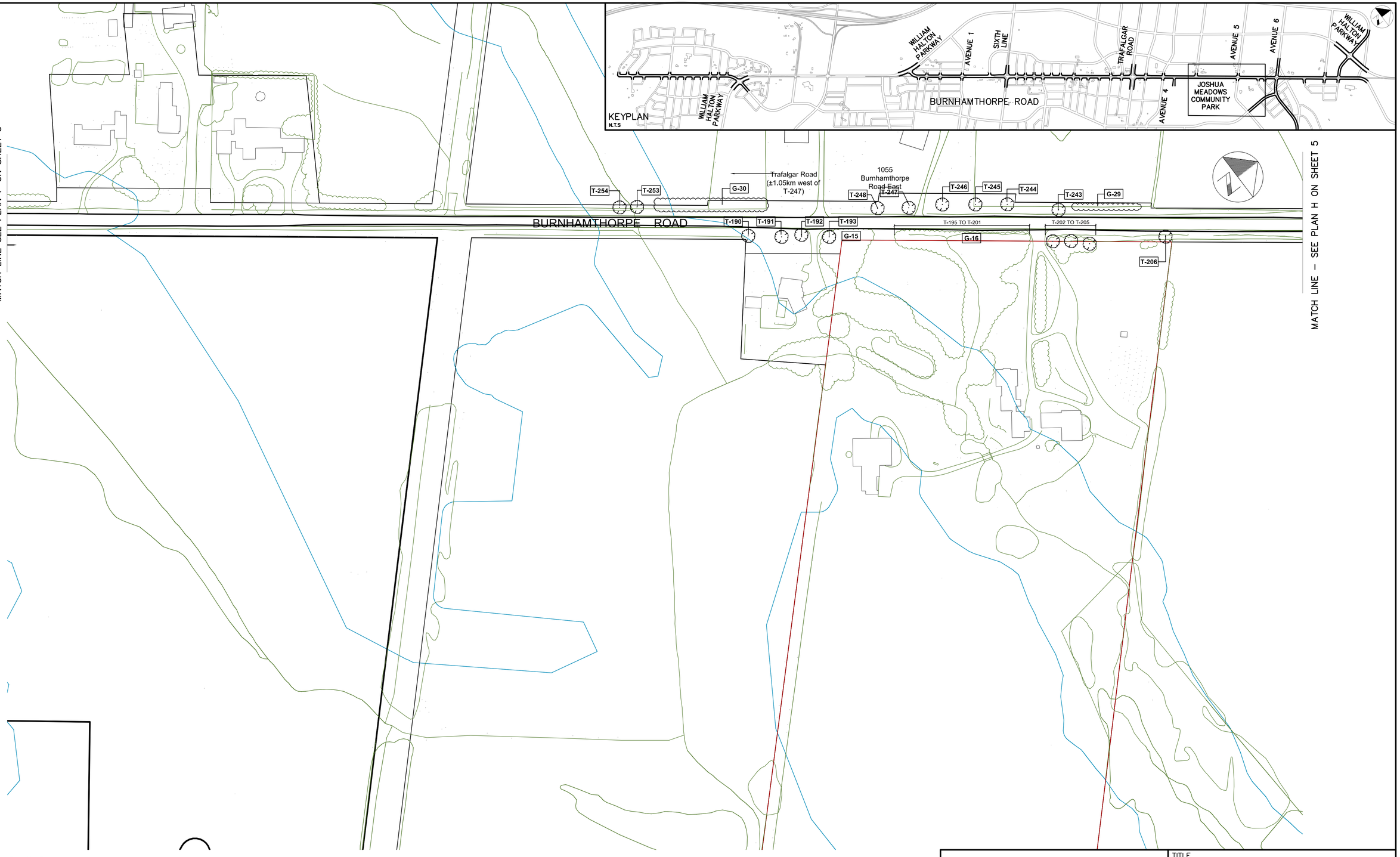
OAKVILLE

TITLE

TREE INVENTORY PLAN

BURNHAMTHORPE ROAD CHARACTER STUDY

Consultant File №	Regional Drawing №
16-13055	
CONTRACT №	Drawing №
R-2369B-14	SHEET 3 OF 6



MMM GROUP

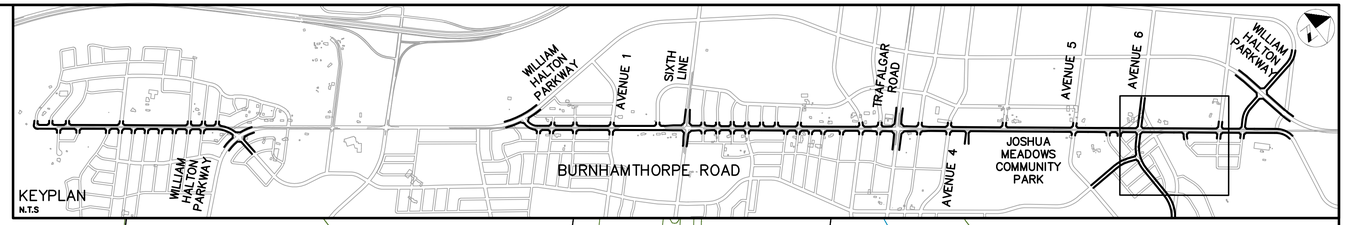
OAKVILLE

TITLE

TREE INVENTORY PLAN

BURNHAMTHORPE ROAD
CHARACTER STUDY

Consultant File №	Regional Drawing №
16-13055	
CONTRACT №	Drawing №
R-2369B-14	SHEET 4 OF 6



FLOODPLAIN LIMIT

1141 Burnhamthorpe Road East

1187 Burnhamthorpe Road East

BURNHAMTHORPE ROAD

T-242 T-243 T-241 T-240 T-239 T-238 T-237 T-236 T-235 T-234 T-233 T-231 T-232 G-22 T-211 T-208 T-212 T-214 T-213 T-215 G-18 G-20 T-216 T-217 T-218 T-219 T-220 T-221 T-222 T-230 G-27 G-21

MATCH LINE – SEE PLAN G ON SHEET 4

MATCH LINE – SEE PLAN I ON SHEET 6

FLOODPLAIN LIMIT

FLOODPLAIN LIMIT

PLAN H

MMM GROUP

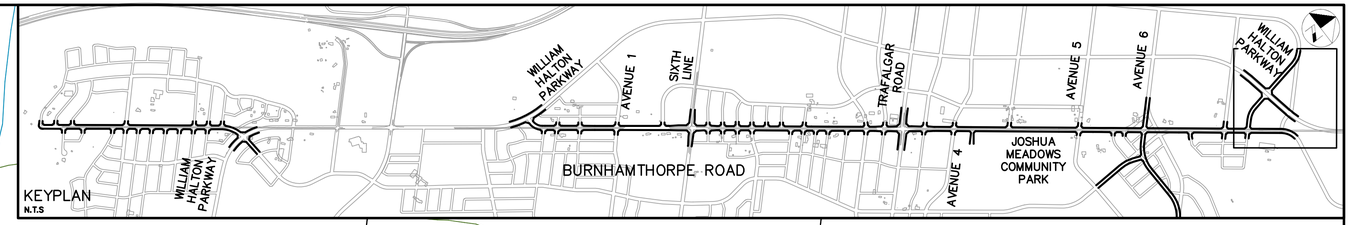
OAKVILLE

TITLE

TREE INVENTORY PLAN

BURNHAMTHORPE ROAD CHARACTER STUDY

Consultant File № 16–13055	Regional Drawing №
CONTRACT № R–2369B–14	Drawing № SHEET 5 OF 6



FLOODPLAIN LIMIT

FLOODPLAIN LIMIT

MATCH LINE – SEE PLAN H ON SHEET 5

G-26

T-224

G-22

T-223

G-23

T-225

Merrison Creek

Wetland / Creek

No Vegetation >10cm DBH

G-25

T-229

BURNHAMTHORPE ROAD

TO NINTH LINE

PLAN I

MMM GROUP

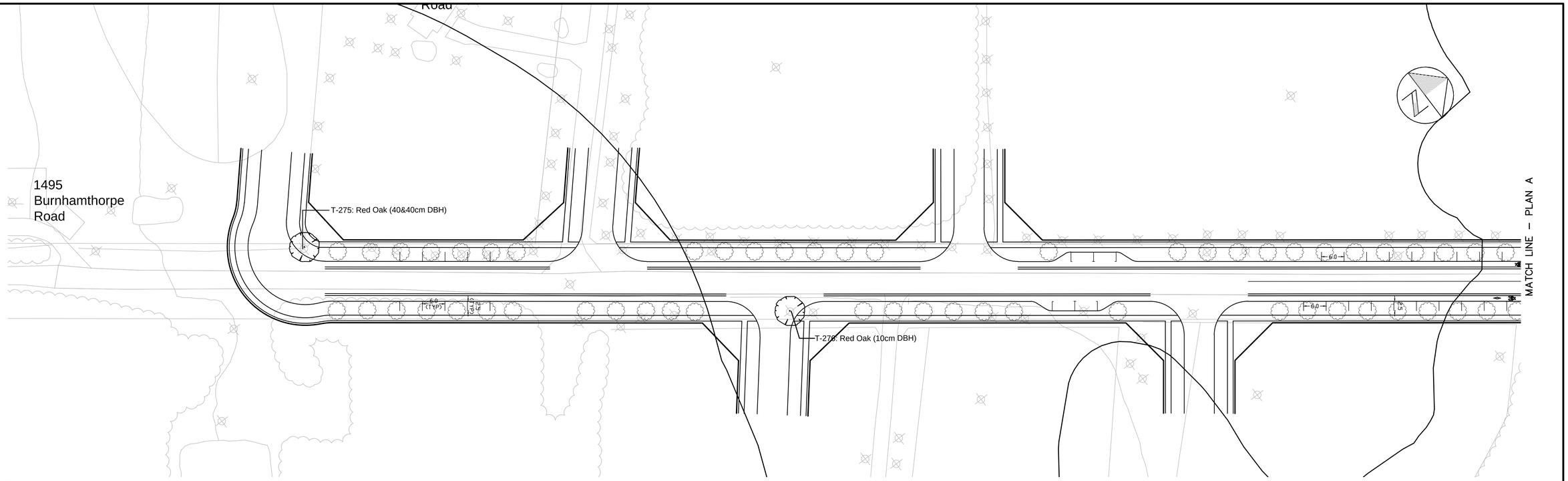
OAKVILLE

TITLE

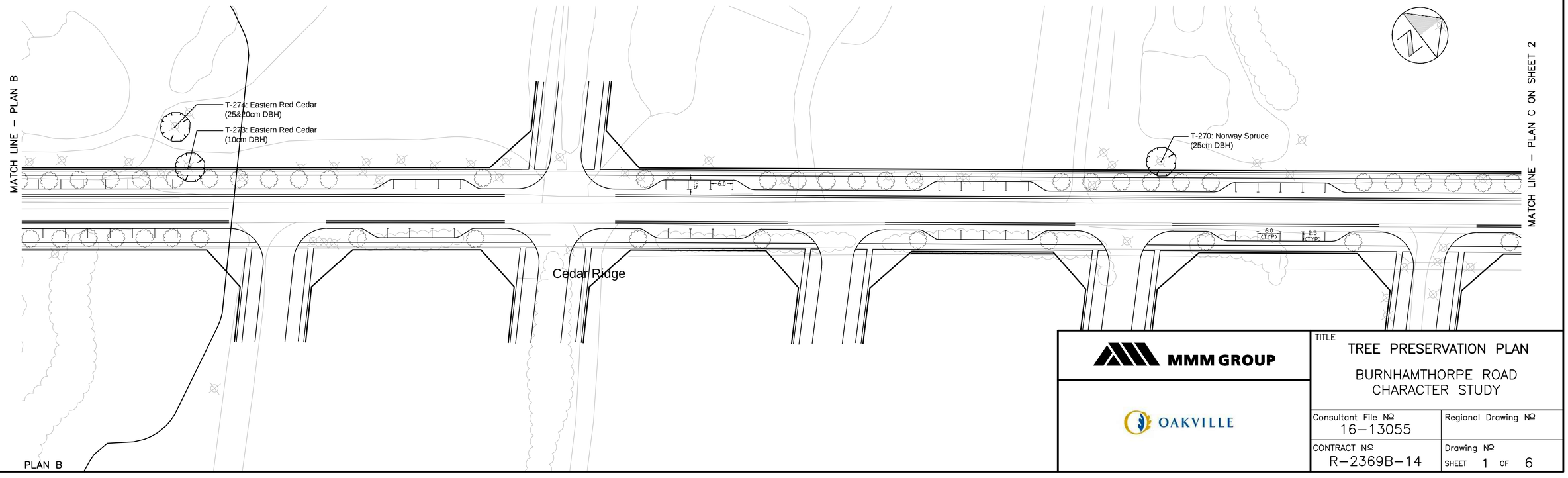
TREE INVENTORY PLAN

BURNHAMTHORPE ROAD CHARACTER STUDY

Consultant File № 16–13055	Regional Drawing №
CONTRACT № R–2369B–14	Drawing № SHEET 6 OF 6



PLAN A



PLAN B

MMM GROUP

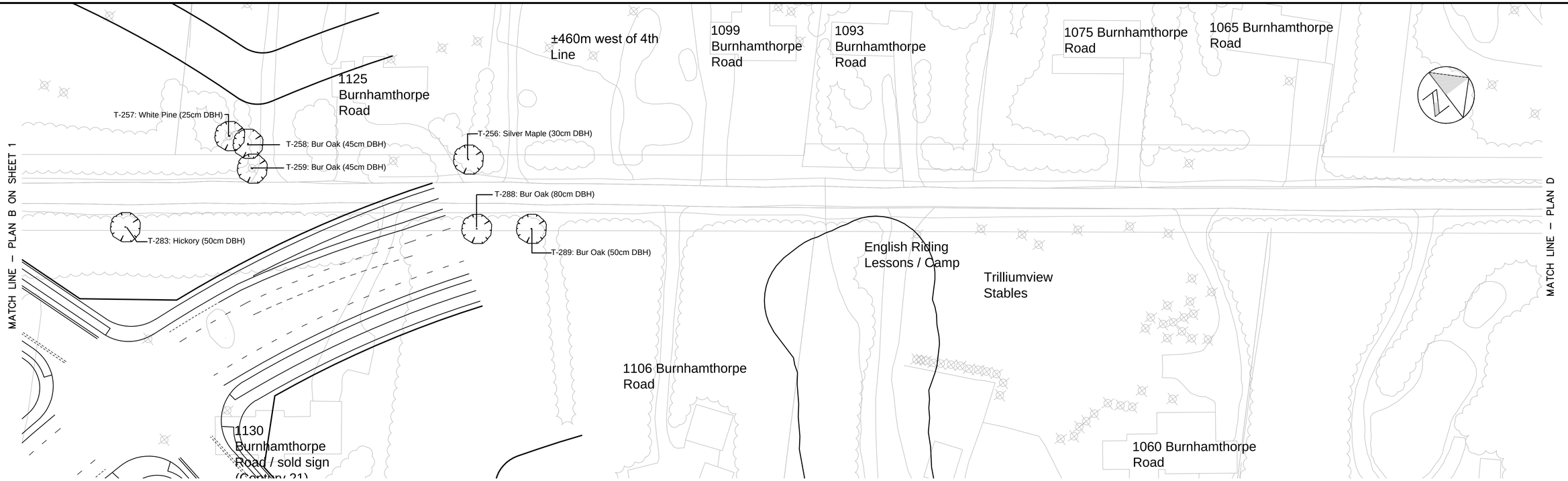
OAKVILLE

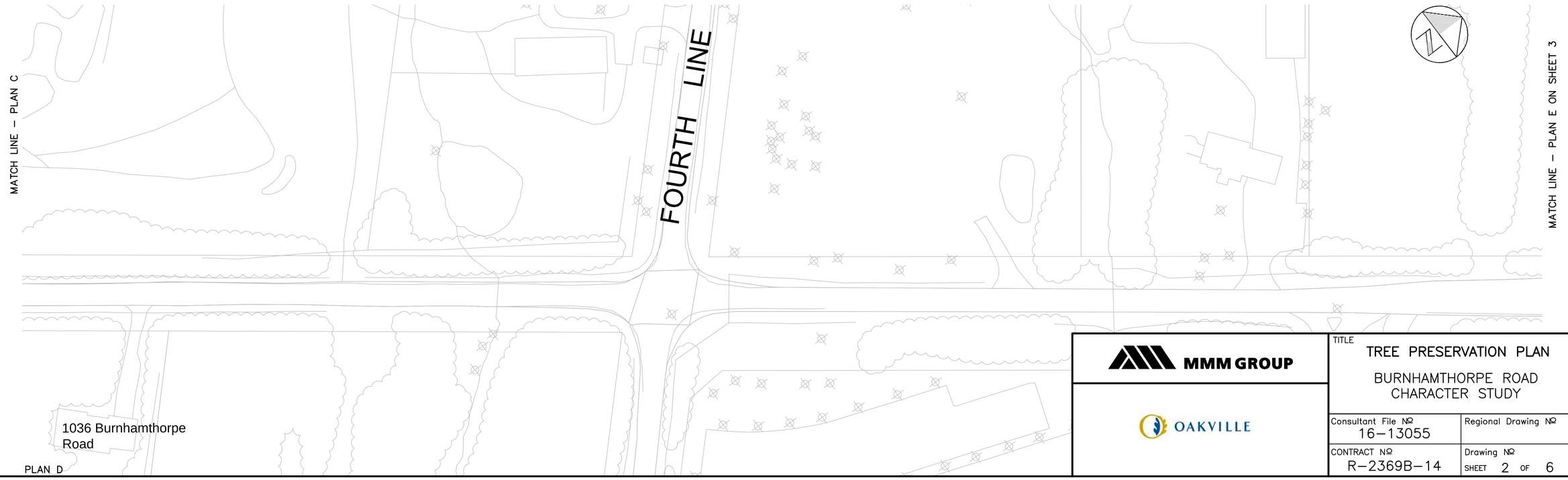
TITLE

TREE PRESERVATION PLAN

BURNHAMTHORPE ROAD
CHARACTER STUDY

Consultant File №	Regional Drawing №
16–13055	
CONTRACT №	Drawing №
R–2369B–14	SHEET 1 OF 6





MMM GROUP

OAKVILLE

TITLE

TREE PRESERVATION PLAN

BURNHAMTHORPE ROAD CHARACTER STUDY

Consultant File №	Regional Drawing №
16–13055	
CONTRACT №	Drawing №
R–2369B–14	SHEET 2 OF 6

211
Burnhamthorpe
Road West

185
Burnhamthorpe
Road West

Neyagawa Boulevard
(±930m from T-80)

T-80: American Elm (50cm DBH)

T-75: Bur Oak (77cm DBH)

T-72: White Pine (40cm DBH)

Sixth Line

BURNHAMTHORPE ROAD

2.5
(TYP.)

(Taper)

MATCH LINE – PLAN F

194 Burnhamthorpe
Road West

PLAN E

MATCH LINE – PLAN E

BURNHAMTHORPE ROAD

T-33: White Pine (40cm DBH)

T-32: Bur Oak (81cm DBH)

T-35: White Pine (51cm DBH)

62 Burnhamthorpe
Road West

38 Burnhamthorpe
Road West

14 Burnhamthorpe
Road West

SIXTH LINE

MATCH LINE – PLAN G ON SHEET 4

PLAN F

MMM GROUP

OAKVILLE

TITLE

TREE PRESERVATION PLAN

BURNHAMTHORPE ROAD
CHARACTER STUDY

Consultant File No.	Regional Drawing No.
16-13055	
CONTRACT No.	Drawing No.
R-2369B-14	SHEET 3 OF 6

MATCH LINE – PLAN F – ON SHEET 3

BURNHAMTHORPE ROAD

MATCH LINE – PLAN H

T-123: Hackberry (51cm DBH)

T-142: White Pine (36cm DBH)

40 Burnhamthorpe Road East

64 Burnhamthorpe Road East

86 Burnhamthorpe Road East

PLAN G

191 Burnhamthorpe Road East

205 Burnhamthorpe Road East

215 Burnhamthorpe Road East

MATCH LINE – PLAN F

MATCH LINE – PLAN I – ON SHEET 5

T-109: Hackberry (51cm DBH)

Trafalgar Road (±220m east)

BURNHAMTHORPE ROAD

T-150: Hackberry (35cm DBH)

T-159: Silver Maple (49cm DBH)

T-158: Silver Maple (39cm DBH)

180 Burnhamthorpe Road East

210 Burnhamthorpe Road East

220 Burnhamthorpe Road East

140 Burnhamthorpe Road East

PLAN H

MMM GROUP

OAKVILLE

TITLE

TREE PRESERVATION PLAN

BURNHAMTHORPE ROAD CHARACTER STUDY

Consultant File № 16–13055

Regional Drawing №

CONTRACT № R–2369B–14

Drawing № SHEET 4 OF 6

MATCH LINE – PLAN H ON SHEET 4

1053
Burnhamthorpe
Road East

1055
Burnhamthorpe
Road East

Trafalgar Road
(±1.05km west of T-247)

T-249: Hickory
(45cm DBH)

T-248: Hickory (44cm
DBH)

T-247: Austrian Pine (70cm DBH)

BURNHAMTHORPE ROAD

T-193: Bur Oak
(38cm DBH)

(Taper)

1054
Burnhamthorpe
Road East

MATCH LINE – PLAN J

PLAN I

MATCH LINE – PLAN I

1141
Burnhamthorpe
Road East

T-238: Hickory (60cm DBH)

(Taper)

1187
Burnhamthorpe
Road East

T-231: Bur Oak (55cm DBH)

T-211: Bitternut Hickory (37cm
DBH)

BURNHAMTHORPE ROAD

T-213: Bur Oak (50cm DBH)

T-215: Bur Oak (70cm DBH)

MATCH LINE – PLAN K ON SHEET 6

PLAN J

MMM GROUP

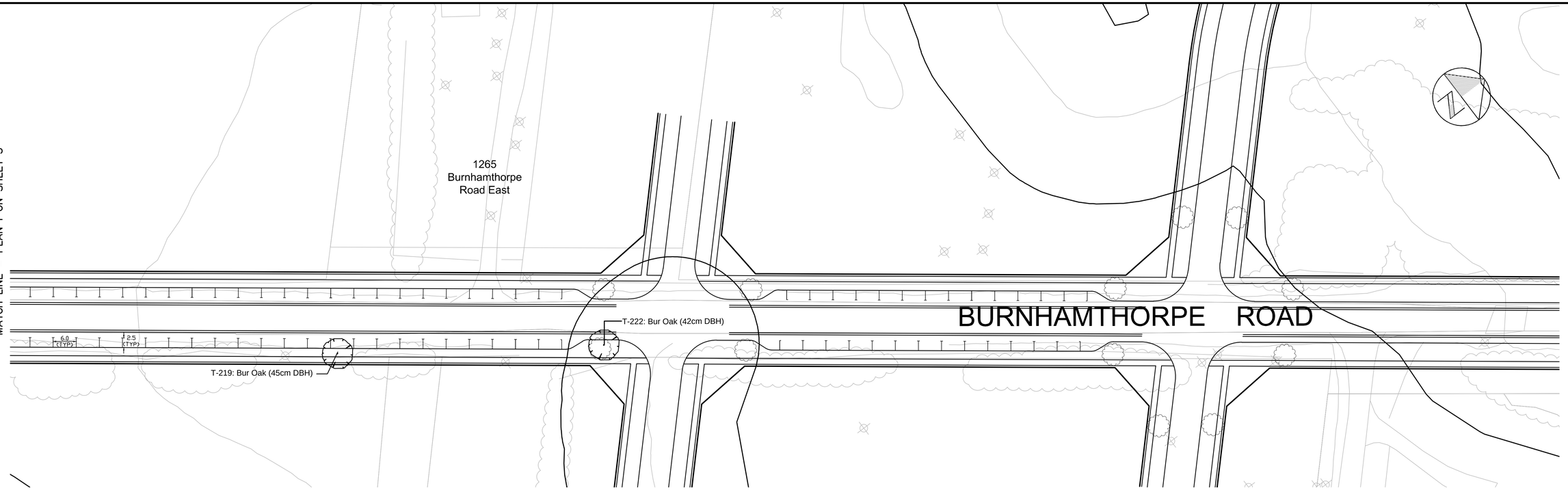
OAKVILLE

TITLE

TREE PRESERVATION PLAN

BURNHAMTHORPE ROAD
CHARACTER STUDY

Consultant File №	Regional Drawing №
16–13055	
CONTRACT №	Drawing №
R–2369B–14	SHEET 5 OF 6



MMM GROUP

OAKVILLE

TITLE

TREE PRESERVATION PLAN

BURNHAMTHORPE ROAD
CHARACTER STUDY

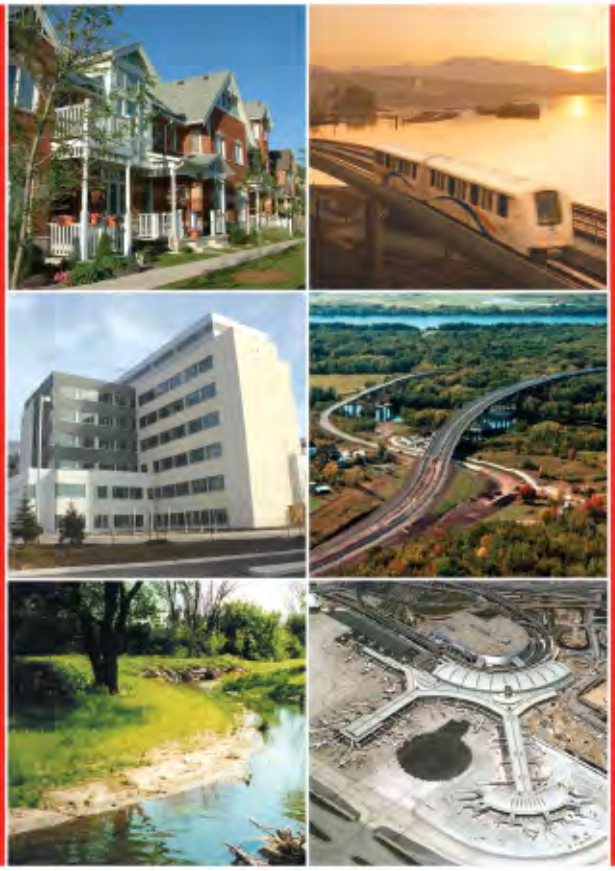
Consultant File №	Regional Drawing №
16–13055	
CONTRACT №	Drawing №
R–2369B–14	SHEET 6 OF 6

APPENDIX D

Stormwater Management Report

OAKVILLE

MMM Group Limited



Stormwater Management Report

Burnhamthorpe Road Character Study

Town of Oakville
16-13055-001-SW1

COMMUNITIES
TRANSPORTATION
BUILDINGS
INFRASTRUCTURE

MMM GROUP

August, 2014

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LIST OF APPENDICES

1.0 INTRODUCTION

MMM Group Ltd was retained by the town of Oakville review the function and role for Burnhamthorpe Road as part of the future road network in North Oakville. The proposed design of Burnhamthorpe Road also recognizes the implementation of the New North Oakville Transportation Corridor (NNOTC) to be known as William Halton Parkway.in the future. A key objective of the Burnhamthorpe Road Character Study is to provide a comfortable and inviting streetscape.

This stormwater management report examines the potential impacts of the proposed design for Burnhamthorpe Road on the receiving watercourses in terms of water quality and quantity and summarises how each will address the various requirements of the town of Oakville, Halton Region Conservation Authority (CH), the Ministry of the Environment (MOE), Stormwater Management Planning and Design Manual (2003), and the Ministry of Transportation (MTO).

1.1 *Site Location*

The proposed road improvements for Burnhamthorpe Road will occur from Ninth Line to Sixteen Mile Creek (approximately 6 km), excluding an approximately 2.2 km section of the NNOTC that overlaps Burnhamthorpe Road. The study area is shown in Figure 1.

1.2 *Stormwater Management Plan Objectives*

The objectives of this stormwater management report are outlined below:

- Determine site specific stormwater management requirements to ensure that the proposed development is in conformance with the MOE *Stormwater Management Planning and Design Manual* (MOE, March 2003) and requirements from MTO, municipality and CH;
- Recommend stormwater management strategies and practices that are feasible for the study area and satisfy the project's requirements; and,
- Prepare a stormwater management report documenting the existing available technical information along with the stormwater management strategies and practices to be implemented for the proposed development.

1.3 *Background Information*

The background information reviewed as a part of this study includes the following:

1. ***North Oakville Creek Subwatershed Study (NOCSS) (August 25, 2006)***

The North Oakville Creek Subwatershed Study (NOCSS) was prepared to plan for future urban development in the North Oakville Development Area (north of Dundas Street), in the town of Oakville. The North Oakville Development Area is bounded by Dundas Street to the south, Highway 407 to the north, Ninth Line to the east and Tremaine Road to the west. The NOCSS was prepared in support of the North Oakville East Secondary Plan and provided a management framework to determine policies for

future development within the watershed. The goal of the NOCSS was to develop a subwatershed plan that allowed sustainable development while simultaneously ensuring benefits to both natural and human environments on a watershed basis.

2. **North Oakville East Secondary Plan (NOESP 2008)**

The NOESP was approved in 2008 as Town of Oakville Official Plan Amendment 272. The purpose of the NOESP was to establish a detailed planning framework for the future urban development of the North Oakville East Planning Area. It was intended for the planning period to 2021 and will be reviewed every five years. According to the NOESP's predicted target population, the North Oakville area will experience significant growth and changes in land use. Subsequently, these land use changes will have unique implications on the future Burnhamthorpe Road. The NOESP was used as the main guiding document informing the outcome of this study.

3. **New North Oakville Transportation Corridor Study (NNOTC 2010)**

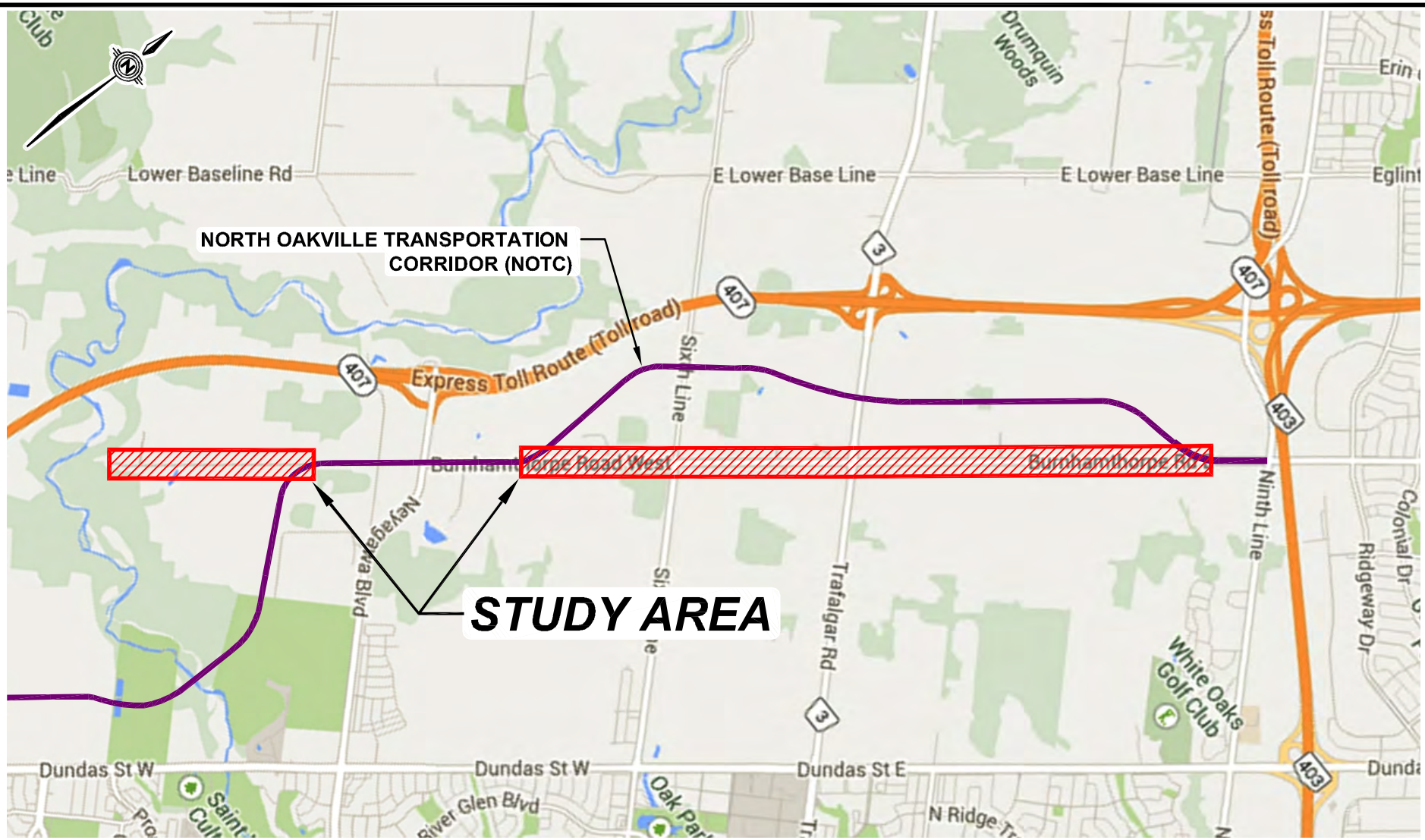
The New North Oakville Transportation Corridor Environmental Assessment (EA) Study was completed by Halton Region to identify existing and future transportation problems and opportunities in the North Oakville area. Based on this study, the preferred alignment of a new transportation corridor was determined. Portions of the proposed transportation corridor run along the Burnhamthorpe Road.

4. **Town of Oakville, *Development Engineering Procedures and Guidelines*, October 2009.**

5. **Ministry of Transportation, *Highway Drainage Design Standards* (MTO HDDS), January 2008.**

6. **Ministry of Environment *Stormwater Management Planning and Design Manual*, 2003.**

7. **Conservation Halton, *Policies, Procedures and Guidelines for the Administration of Ontario Regulation 162/06 and Land Use Planning Policy Document*, April 27, 2006.**



@2013 Google - Map data @2013 Tele Atlas

0 0.5 1.0 1.5 2.5km

CLIENT

TOWN OF OAKVILLE

TITLE

BURNHAMTHORPE ROAD CHARACTER STUDY

STUDY AREA

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100 Commerce Valley Dr. W.
Thornhill, ON L3T 0A1
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f. 905.882.1857
mmm@mmm.ca

Checked A.Q.	Drawn AutoCAD/B.K.B.	
Date AUGUST 2013	Proj. No. 16-13055-001-SW1	
Scale AS SHOWN	Figure No. 1	Gr.No. 001

1.4 *Site Visit*

Field investigations of the existing drainage features were conducted on August 4, 2013 to collect and confirm the existing culvert sizes and types, culvert conditions, depth of sediment accumulations, any flow obstructions, drainage divides, and drainage pattern. Photos of the culvert crossings within the study area are provided in Appendix A.

1.5 *Stormwater Management Criteria*

Based on the guidelines outlined in the MOE Design Manual, the MTO, town of Oakville and HRCA regarding the proposed development, a summary of the stormwater management criteria applicable to this project follows:

- Water Quality – Provide a long-term removal of 80% of total suspended solids (TSS) on an annual loading basis.
- Water Quantity Control – Peak flow rates resulting from the proposed development should match the unit area target flow rates specified in NOCSS and mediation items.
- Water Balance – According to NOCSS, the water balance should be maintained, which includes maintaining infiltration to groundwater and natural runoff at low rates. NOCSS requires that best efforts be taken with respect to infiltration in order to maintain the existing water balance to the extent possible.

2.0 EXISTING CONDITION

2.1 *Existing Drainage*

Historically the study area is within the South Slope physiographic region of Southern Ontario (Chapman and Putman, 1984). The South Slope includes a strip of land between the Lake Iroquois shoreline to the south and the Peel Plain to the north. The existing land use adjacent to the study area is primarily agricultural, with a few scattered wooded areas, and some residential developments.

The study area for the Burnhamthorpe Road Character Study is drained by the Sixteen Mile Creek, East Morrison Creek, West Morrison Creek, and Joshua's Creek. The study area drains from a north-west to south-east direction. These watersheds cross existing Burnhamthorpe Road via numerous culverts and bridge crossings.

Existing Burnhamthorpe Road is a two-lane rural roadway. Runoff from the road drains in open drainage systems consisting of road side ditches and culvert/bridge crossings. The external areas located north of Burnhamthorpe Road drain from north to south and are conveyed by the culvert/bridge crossings across Burnhamthorpe Road. The existing condition drainage mosaic is shown in Figure 2. A description of the culvert/bridge crossings is provided in the following section.

2.2 *Culvert/Bridge Crossings*

There are a total of seven existing culverts that are located within the study limits (shown in Figure 2). These existing culverts were identified in the field (also mentioned in the NOCSS). A brief description of these culverts is provided in Table 1. Culverts JC-B2, JC-B4, JC-B7, JC-B9, and JC-B10 are part of the Joshua's Creek watershed. Culvert EM-B1 is a part of the East Morrison Creek watershed. Finally, Culvert ESM-B14 is a part of the Sixteen Mile Creek watershed. It should be noted that the JC-B4 crossing is a bridge crossing. The conditions of these culverts observed during the field investigations are described in Table 1.

A review of the drawings received from Halton Region indicated that there are additional culvert crossings draining the JC7, EM1-1, and WM1-1 (West Morrison Creek) drainage areas. However, these culvert crossings were not identified in the NOCSS and their hydraulic assessments are outside the scope of this report. These culverts were also observed during the site visit.

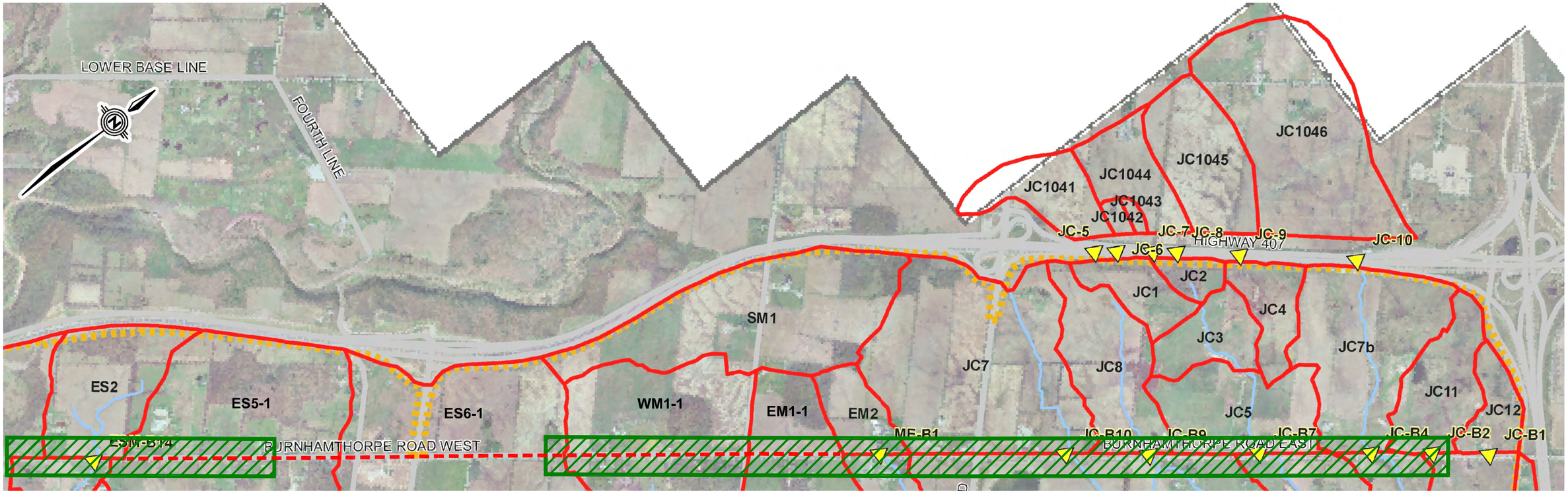
It should be noted that the drawings received from Halton Region did not contain the lengths and inverts of the culverts located within our study limits. The hydraulic assessment of the existing culverts was completed using the available information (see Section 2.4).

Table 1: Existing Culvert/Bridge Crossings Condition Assessment

No.	Culvert ID	Size (mm)	Material	Type of Structure	Condition
1	JC-B2	600	CSP	Circular Culvert	Significant sediment deposition both u/s and d/s of culvert
2	JC-B4	4570x914	Concrete	Bridge	Bridge crossing. The structure was found to be in good condition.
3	JC-B7	3048x1524	Concrete	Box Culvert	Bottom of the concrete culvert has eroded away, exposing local soil.
4	JC-B9	600	CSP	Circular Culvert	u/s side buried. Significant sediment deposition on d/s side of culvert.
5	JC-B10	600	CSP	Circular Culverts	Two culverts located in parallel. The d/s side of 450 mm culvert is deformed.
		450	CSP	Circular Culverts	
6	ME-B1	450	CSP	Circular Culvert	Good condition
7	ESM-B14	1825	CSP	Circular Culvert	Good condition

Notes:

1. u/s refers to upstream side.
2. d/s refers to downstream side.



LEGEND

- STUDY AREA
- ROAD
- WATERCOURSE
- SUB-CATCHMENTS
- CULVERT

SOURCE:
NORTH OAKVILLE CREEKS SUBWATERSHED STUDY (2006).

0 0.2 0.4 0.6 0.8 1.0km

CLIENT
TOWN OF OAKVILLE

TITLE
BURNHAMTHORPE ROAD CHARACTER STUDY

EXISTING CONDITION DRAINAGE MOSAIC

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f. 905.882.1857
mmm@mmm.ca

Checked	Drawn	
A.Q.	AutoCAD/B.K.B.	
Date: AUGUST 2013	Proj. No. 16-13055-001-SW1	
Scale: AS SHOWN	Figure No. 2	Gr.No. 001

2.3 *Existing Hydrologic Modeling*

The existing condition hydrologic modelling was conducted with the Guelph All-Weather Storm Event Runoff computer simulation model (GASWER). The GAWSER model was used in the NOCSS. The original GAWSER model received from CH was modified by making minor adjustments to the contributing drainage areas to reflect current contour information for the Burnhamthorpe Road Character Study. The contributing drainage areas for the culvert crossings within the study limits are shown in Table 2. The GAWSER model was used for single event simulations. The 24hr Keifer and Chu (Chicago) design storms, as required by the ***Development Engineering Procedures and Guidelines Manual*** (town of Oakville, 2009) and also used in NOCSS, were used for the single events simulations.

The hydrologic modelling parameters were obtained from the existing condition hydrologic model received from CH. The peak flow rates from the existing condition hydrologic model for the 2-yr, 5-yr, 10-yr, 25-yr, 50-yr, 100-yr, and Regional storms at the different culvert crossings, are shown in Table 2. Summary of the GAWSER model output is provided in Appendix B.

Table 2: Results of Existing Condition Hydrologic Analysis

			Peak Flows (m3/s)							
Watershed	Catchment	Culvert ID	Drainage Area (ha)	2yr	5yr	10yr	25yr	50yr	100yr	Regional
Sixteen Mile Creek	ES2	ESM-B14	39.3	0.31	0.52	0.65	0.84	0.97	1.11	2.47
	ES5-1	-	63.72	0.28	0.49	0.62	0.82	0.96	1.10	2.91
West Morrison	WM1-1	-	47.09	0.39	0.61	0.74	0.93	1.07	1.20	2.74
East Morrison	EM2	ME-B1	14.62	0.16	0.25	0.30	0.38	0.43	0.49	0.99
	EM1-1	-	17.72	0.01	0.15	0.19	0.24	0.27	0.30	0.80
Joshua's Creek	JC7	JC-B10	98.95	0.73	1.15	1.38	1.75	1.99	2.24	5.33
	JC8	JC-B9	38.74	0.28	0.43	0.52	0.66	0.76	0.85	2.05
	JC5	JC-B7	180.13	1.81	2.82	3.40	4.29	4.88	5.51	11.34
	JC7B	JC-B4	150	0.94	1.44	1.74	2.19	2.49	2.80	6.94
	JC11	JC-B2	26.65	0.25	0.39	0.47	0.60	0.68	0.76	1.68

Table 2 shows the peak flow rates for the culvert crossings identified in NOCSS. It also shows the peak flow rates at the Burnhamthorpe Road crossings for subcatchments EM1-1, WM1-1, and ES5-1.

2.4 *Existing Culvert Hydraulic Assessment*

The hydraulic assessment of the existing culverts was completed based on limited available information. The culvert inverts were determined from Ontario Base Mapping (OBM) and the lengths of the culverts were determined from aerial photography.

According to the MTO Highway Drainage Design Standards (HDDS) (January 2008), the hydraulic performance of the culverts should be analysed to meet a number of criteria in terms of their design flows, freeboard, clearance, and the headwater depth to culvert diameter (H/D) ratio.

According to Standard WC-1, Design Flows of the MTO HDDS, crossings under Undivided Rural Arterial and Collector Roads with spans less than or equal to 6.0 m should be sized to convey the design flow with a return period of 25 years. Standard WC-7, Culvert Crossing on a Watercourse of the MTO HDDS, states that for crossings under Arterial and Collector Roads the minimum freeboard as measured vertically from the High Water Level for the Design Flow to the edge of travelled lane shall be equal to greater than 1.0 m. For local roads, the minimum freeboard shall be equal to or greater than 0.3 m. Standard WC-7 also states that for crossings under Arterial and Collector Roads, the ratio of Flood Depth at the upstream face of the culvert to the diameter or rise of the culvert (H/D) shall be less than or equal to 1.5 for culverts with diameter or rise less than 3.0 m.

Table 3 shows the results of the hydraulic assessment of the existing culverts as per MTO HDDS. Table 3 shows that the existing culverts identified in NOCSS and located on existing Burnhamthorpe Road, do not meet the MTO HDDS requirements. Only Culvert JC-B4 was found to meet the standard for the H/D ratio, and 0.3 m freeboard. However, these results should be verified during the future Environmental Implementation Report / Functional Servicing Study (EIR/FSS) when more accurate information will be available.

Table 3: Existing Culvert Hydraulic Assessment

Culvert ID	Structure Type	Culvert Dimension (m)		Q_p (m^3/s)	Invert Elevation (m)[2]		Tailwater Elevation[1] (m)	WSEL (m)	H/D of Culvert	Road LPE (m)	Minimum Elevation of edge of Travelled Lane (m)	Freeboard from edge of Travelled Lane [3] (m)	Performance Criteria Satisfied (25-yr)?		
		Length	Diameter/Size	25-yr	U/S	D/S		25-yr	25-yr				H/D ≤ 1.5	Freeboard ≥ 0.3m	Freeboard ≥ 1.0m
JC-B2	CSP	31	0.6	0.6	177.15	177	0.00	178.89	2.90	177.80	177.73	Overtopped	No	No	No
JC-B4	Concrete	8.2	4.57x0.91	2.19	175.04	175	175.55	175.6	0.62	176	175.93	0.33	Yes	Yes	No
JC-B7	Concrete	23.71	3.05x1.52	4.29	174.62	174.5	175.53	175.67	0.69	176	175.93	0.26	Yes	No	No
JC-B9	CSP	14.78	0.6	0.66	178.07	178	0	179.6	2.55	178.5	178.43	Overtopped	No	No	No
JC-B10	CSP	17	0.6 & 0.4	1.75	179.085	179	0	182.49	5.68	179.6	179.53	Overtopped	No	No	No
ME-B1	CSP	12.5	0.45	0.38	187.56	187.5	0	189.15	3.53	188	187.93	Overtopped	No	No	No
ESM-B14	CSP	17.2	1.825	0.84	166.09	166	0	166.79	0.38	167	166.93	0.14	Yes	No	No

Note:

1. Tailwater elevation assumed as 0 for ephemeral streams. In the two remaining culverts, the tailwater elevation was assumed as 60% of the depth of the culvert.
2. Culvert inverts determined from OBM.
3. Edge of travelled lane elevation determined from one lane wdith (3.5 m) and 2% slope.
4. Road Low Point elevation (LPE) determined from contour mapping.

3.0 PROPOSED CONDITIONS

3.1 *Proposed Drainage*

According to the NOESP (2008) and NNOTC Study (2010), there will be considerable changes (e.g. population density, land use, traffic load etc.) in the North Oakville area. Hence, the characteristics of the existing Burnhamthorpe Road will need to be modified to allow the proposed road to adapt to the proposed developments in the North Oakville area.

Under the proposed conditions, Burnhamthorpe Road will become a “character road” facility. A character road serves an Avenue/Transit Corridor function in the Trafalgar Urban Core Area and serves on Avenue/Transit/Connector function outside the Trafalgar Urban Core Area. In the proposed conditions the existing Burnhamthorpe Road will be converted from a rural to an urban collector road, which will have curb and gutters and be serviced by storm sewers.

At this stage of the study, the preliminary plan for proposed Burnhamthorpe Road has been prepared and the profile is not available. It is expected that the future profile will be very similar to the existing profile. The preferred plan for the proposed Burnhamthorpe Road includes wide boulevards, on-street parking, and buffered bike lanes. Assuming that the existing road profile is maintained, the runoff from the proposed roadway will be picked up by catchbasins (CB) and conveyed by storm sewers to the watercourses. The peak flow rates generated from the proposed Burnhamthorpe Road and the external areas will be conveyed by the existing or new culvert crossings, the number and location of which cannot be confirmed at this stage of the study. However, the proposed peak flow rates will need to be controlled to the pre-development unit flow rates, as specified in the NOCSS.

3.2 *Proposed Culvert Hydraulic Assessment*

Under the proposed conditions, the exact number and location of the culvert crossings cannot be confirmed at this stage of the study, as the extent and nature of the future developments is unknown. However, as Burnhamthorpe Road is an urban section, the proposed storm sewers will need to convey the runoff to proposed upgraded culverts (with larger diameters and lengths) with higher conveyance capacities. The hydraulic assessment of the proposed culverts will be completed in the future EIR/FSS.

In the future EIR/FSS, the proposed culverts should also be designed to meet fluvial geomorphological considerations. At a minimum, the assessment should verify that the future culverts will allow for natural channel migration, fish/terrestrial passage, and sediment transport, so the risk to future infrastructure will be minimized. Additional fluvial geomorphic considerations include, potential changes in channel alignment and bank erosion in upstream and downstream reaches; appropriate bankfull flows, water depth and channel velocities; natural bottom substrate matching on the upstream and downstream sides; prevention of bedload conveyance, ice jams, and woody debris accumulation on the upstream and downstream sides.

3.3 *Proposed Hydrologic Modelling*

Following the proposed development as per the NOESP (2008), there will be significant changes in the land use condition and degree of imperviousness of the external areas within the study limits. The hydrologic assessment of the proposed conditions will be conducted in the future EIR/FSS. The peak flow rates generated in the proposed condition should be less than or equal to the unit flow rates specified by NOCSS.

4.0 STORMWATER MANAGEMENT

4.1 *Quantity Control*

The peak flow rates generated in the proposed condition can be controlled to the existing unit flow rates using appropriate end-of-pipe stormwater management facilities located in the external areas. These stormwater management facilities are to be designed and constructed by the land owners/developers of the external areas and will also service the proposed Burnhamthorpe Road. The design of the proposed end-of-pipe stormwater management facilities will be completed in the future EIR/FSS.

4.2 *Quality Control*

The runoff generated from the proposed Burnhamthorpe Character Road will be treated by the end-of-pipe proposed stormwater management facilities located in the external areas. These proposed stormwater management facilities should be designed to provide enhanced level treatment. The design of the proposed end-of-pipe stormwater management facilities will be completed in the future EIR/FSS.

4.3 *Water Balance*

Best efforts should be adopted with respect to infiltration in order to maintain the existing water balance to the extent possible. Therefore, potential LID measures such as improved landscaping, infiltration galleries, porous pavements should be designed within the road right of way (ROW). The development and design of the LID measures will be completed in the future EIR/FSS.

5.0 CONCLUSIONS

Based on the preceding findings, the following conclusions can be made:

1. The existing Burnhamthorpe Road will change from a rural section to an urban section as a part of NOESP (2008) and become a Character Road.
2. The proposed Burnhamthorpe Character Road will have wide boulevards, on-street parking, and bike lanes.

3. The existing culverts and bridges crossing Burnhamthorpe Road are inadequate from a freeboard perspective.
4. The exact number, location and hydraulic assessment of the proposed culvert crossings of the proposed Burnhamthorpe Road will be determined in the future EIR/FSS.
5. The hydrologic impact of the proposed Burnhamthorpe Character Road will be determined in the future EIR/FSS.
6. The design of appropriate quality and quantity control measures for stormwater management purposes, located in the external areas, outside the road ROW, will be undertaken in the future EIR/FSS.
7. Appropriate LID measures should be designed to meet the water balance requirements in the future EIR/FSS.

APPENDIX A – Supporting Documents

Figure 1: u/s end of Culvert JC-B2

Figure 2: d/s end of Culvert JC-B2

Figure 3: u/s end of Bridge JC-B4

Figure4: d/s end of Bridge JC-B4

Figure 5: u/s end of Culvert JC-B7

Figure 6: d/s end of Culvert JC

Figure 7: d/s side of Culvert JC-B9

Figure 8: u/s side of Culvert JC-B10

Figure9: u/s side of Culvert ME-B1

Figure 10: d/s side of Culvert ME-B1

Figure 11: u/s side of Culvert ESM-B14

Figure 12: d/s side of Culvert ESM-B14

APPENDIX B – GAWSER Model Output

24-Hr Chicago Distribution

1	2113	0.0089	45.26	0.0242	0.	RCFLAGS	0	0	2yr5.dat ExstE1.wat
1	2114	0.3841	15.73	0.2851	0.	RCFLAGS	0	0	
1	2914	0.3930	16.40	0.3079	0.	RCFLAGS	0	0	
1	2155	0.0290	44.42	0.0260	0.	RCFLAGS	0	0	
1	2156	1.6087	17.51	0.6150	0.	RCFLAGS	0	0	
1	2157	1.6377	17.98	0.6410	0.	RCFLAGS	0	0	
1	2158	0.0071	45.07	0.0217	0.	RCFLAGS	0	0	
1	2159	0.1391	19.20	0.1348	0.	RCFLAGS	0	0	
1	2160	0.1462	20.45	0.1551	0.	RCFLAGS	0	0	
1	2178	0.0001	0.00	0.0000	0.	RCFLAGS	0	0	
1	2179	0.2047	21.80	0.2179	0.	RCFLAGS	0	0	
1	1041	0.2048	21.79	0.2179	0.	RCFLAGS	0	0	
1	2180	0.0001	23.76	0.0003	0.	RCFLAGS	0	0	
1	2181	0.0216	20.70	0.0468	0.	RCFLAGS	0	0	
1	1042	0.0217	20.71	0.0471	0.	RCFLAGS	0	0	
1	2182	0.0001	23.76	0.0003	0.	RCFLAGS	0	0	
1	2183	0.0143	21.77	0.0326	0.	RCFLAGS	0	0	
1	1043	0.0144	21.78	0.0329	0.	RCFLAGS	0	0	
1	2184	0.0361	21.14	0.0801	0.	RCFLAGS	0	0	
1	2185	0.0048	43.65	0.0134	0.	RCFLAGS	0	0	
1	2186	0.1933	21.80	0.2286	0.	RCFLAGS	0	0	
1	1044	0.1981	22.33	0.2414	0.	RCFLAGS	0	0	
1	2187	0.2342	22.15	0.3166	0.	RCFLAGS	0	0	
1	2188	0.0273	45.80	0.1141	0.	RCFLAGS	0	0	
1	2189	0.1139	15.51	0.1033	0.	RCFLAGS	0	0	
1	2190	0.1412	21.36	0.2103	0.	RCFLAGS	0	0	
1	2191	0.3754	21.85	0.5231	0.	RCFLAGS	0	0	
1	2192	0.5802	21.83	0.7370	0.	RCFLAGS	0	0	
1	2193	0.0084	45.36	0.0242	0.	RCFLAGS	0	0	
1	2194	0.1589	19.85	0.2212	0.	RCFLAGS	0	0	
1	2195	0.1673	21.13	0.2449	0.	RCFLAGS	0	0	
1	2196	0.7475	21.68	0.9819	0.	RCFLAGS	0	0	
1	2197	0.7475	21.68	0.9795	0.	RCFLAGS	0	0	
1	2198	0.0001	0.00	0.0000	0.	RCFLAGS	0	0	
1	2199	0.1787	20.07	0.1842	0.	RCFLAGS	0	0	
1	2200	0.1788	20.06	0.1842	0.	RCFLAGS	0	0	
1	2201	0.9263	21.36	1.1637	0.	RCFLAGS	0	0	
1	2202	0.0027	41.55	0.0061	0.	RCFLAGS	0	0	
1	2203	0.3346	21.80	0.2974	0.	RCFLAGS	0	0	
1	1045	0.3373	21.96	0.3032	0.	RCFLAGS	0	0	
1	2205	0.3373	21.98	0.3020	0.	RCFLAGS	0	0	
1	2206	0.0042	43.08	0.0110	0.	RCFLAGS	0	0	
1	2207	0.1639	21.80	0.1418	0.	RCFLAGS	0	0	
1	2208	0.1681	22.33	0.1519	0.	RCFLAGS	0	0	
1	2209	0.5054	22.10	0.4516	0.	RCFLAGS	0	0	
1	2210	1.4317	21.62	1.5880	0.	RCFLAGS	0	0	
1	2211	1.4317	21.62	1.5814	0.	RCFLAGS	0	0	2yr5.dat ExstE1.wat
1	2212	0.0100	45.71	0.0318	0.	RCFLAGS	0	0	
1	2213	0.3596	21.17	0.1953	0.	RCFLAGS	0	0	
1	2214	0.3696	21.84	0.2200	0.	RCFLAGS	0	0	
1	2215	1.8013	21.67	1.8011	0.	RCFLAGS	0	0	
1	2220	0.0255	45.73	0.0524	0.	RCFLAGS	0	0	
1	2221	0.9640	20.69	0.6844	0.	RCFLAGS	0	0	
1	2222	0.9895	21.34	0.7345	0.	RCFLAGS	0	0	
1	2223	0.0051	42.44	0.0094	0.	RCFLAGS	0	0	
1	2224	0.3649	20.90	0.2559	0.	RCFLAGS	0	0	
1	2225	0.3700	21.20	0.2649	0.	RCFLAGS	0	0	
1	2226	1.3595	21.30	0.9993	0.	RCFLAGS	0	0	
1	2232	0.0119	44.63	0.0210	0.	RCFLAGS	0	0	
1	2233	0.7988	21.47	0.4031	0.	RCFLAGS	0	0	
1	1046	0.8107	21.81	0.4226	0.	RCFLAGS	0	0	
1	2234	0.8107	21.81	0.4208	0.	RCFLAGS	0	0	
1	2235	0.0406	45.75	0.0851	0.	RCFLAGS	0	0	
1	2236	0.6429	20.50	0.5298	0.	RCFLAGS	0	0	
1	2237	0.6835	22.00	0.6127	0.	RCFLAGS	0	0	
1	2238	1.4942	21.90	0.9894	0.	RCFLAGS	0	0	
1	2250	0.0014	39.76	0.0030	0.	RCFLAGS	0	0	
1	2251	0.2656	21.15	0.2495	0.	RCFLAGS	0	0	
1	2252	0.2670	21.25	0.2524	0.	RCFLAGS	0	0	
2	2113	0.0089	57.95	0.0333	0.	RCFLAGS	0	0	5yr5.dat ExstE1.wat
2	2114	0.3841	26.63	0.4864	0.	RCFLAGS	0	0	
2	2914	0.3930	27.34	0.5181	0.	RCFLAGS	0	0	
2	2155	0.0290	57.00	0.0354	0.	RCFLAGS	0	0	
2	2156	1.6087	28.57	0.9971	0.	RCFLAGS	0	0	
2	2157	1.6377	29.07	1.0324	0.	RCFLAGS	0	0	
2	2158	0.0071	57.76	0.0300	0.	RCFLAGS	0	0	
2	2159	0.1391	30.98	0.2171	0.	RCFLAGS	0	0	
2	2160	0.1462	32.28	0.2454	0.	RCFLAGS	0	0	
2	2178	0.0001	29.26	0.0003	0.	RCFLAGS	0	0	
2	2179	0.2047	34.32	0.3405	0.	RCFLAGS	0	0	
2	1041	0.2048	34.32	0.3407	0.	RCFLAGS	0	0	
2	2180	0.0001	34.25	0.0005	0.	RCFLAGS	0	0	

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2 2181	0.0216	32.59	0.0735	0. RCFLAGS	0	0		
2 1042	0.0217	32.60	0.0739	0. RCFLAGS	0	0		
2 2182	0.0001	34.25	0.0005	0. RCFLAGS	0	0		
2 2183	0.0143	34.28	0.0512	0. RCFLAGS	0	0		
2 1043	0.0144	34.28	0.0516	0. RCFLAGS	0	0		
2 2184	0.0361	33.27	0.1256	0. RCFLAGS	0	0		
2 2185	0.0048	56.21	0.0187	0. RCFLAGS	0	0		
2 2186	0.1933	34.32	0.3571	0. RCFLAGS	0	0		
2 1044	0.1981	34.85	0.3751	0. RCFLAGS	0	0		
2 2187	0.2342	34.61	0.4933	0. RCFLAGS	0	0		
2 2188	0.0273	58.42	0.1579	0. RCFLAGS	0	0		
2 2189	0.1139	26.42	0.1783	0. RCFLAGS	0	0		
2 2190	0.1412	32.60	0.3268	0. RCFLAGS	0	0		
2 2191	0.3754	33.85	0.8152	0. RCFLAGS	0	0		
2 2192	0.5802	34.02	1.1493	0. RCFLAGS	0	0		
2 2193	0.0084	58.04	0.0333	0. RCFLAGS	0	0		
2 2194	0.1589	31.87	0.3552	0. RCFLAGS	0	0		
2 2195	0.1673	33.18	0.3882	0. RCFLAGS	0	0		
2 2196	0.7475	33.83	1.5366	0. RCFLAGS	0	0		
2 2197	0.7475	33.83	1.5334	0. RCFLAGS	0	0		
2 2198	0.0001	29.90	0.0003	0. RCFLAGS	0	0		
2 2199	0.1787	31.86	0.2909	0. RCFLAGS	0	0		
2 2200	0.1788	31.86	0.2912	0. RCFLAGS	0	0		
2 2201	0.9263	33.45	1.8243	0. RCFLAGS	0	0		
2 2202	0.0027	53.84	0.0085	0. RCFLAGS	0	0		
2 2203	0.3346	34.31	0.4638	0. RCFLAGS	0	0		
2 1045	0.3373	34.47	0.4719	0. RCFLAGS	0	0		
2 2205	0.3373	34.50	0.4697	0. RCFLAGS	0	0		
2 2206	0.0042	55.65	0.0153	0. RCFLAGS	0	0		
2 2207	0.1639	34.31	0.2212	0. RCFLAGS	0	0		
2 2208	0.1681	34.84	0.2352	0. RCFLAGS	0	0		
2 2209	0.5054	34.62	0.7012	0. RCFLAGS	0	0		
2 2210	1.4317	33.86	2.4783	0. RCFLAGS	0	0		
2 2211	1.4317	33.86	2.4704	0. RCFLAGS	0	0	5yr5.dat	ExstE1.wat
2 2212	0.0100	58.32	0.0438	0. RCFLAGS	0	0		
2 2213	0.3596	33.39	0.3047	0. RCFLAGS	0	0		
2 2214	0.3696	34.06	0.3386	0. RCFLAGS	0	0		
2 2215	1.8013	33.90	2.8084	0. RCFLAGS	0	0		
2 2220	0.0255	58.34	0.0717	0. RCFLAGS	0	0		
2 2221	0.9640	32.84	1.0773	0. RCFLAGS	0	0		
2 2222	0.9895	33.50	1.1456	0. RCFLAGS	0	0		
2 2223	0.0051	55.03	0.0131	0. RCFLAGS	0	0		
2 2224	0.3649	33.18	0.4027	0. RCFLAGS	0	0		
2 2225	0.3700	33.48	0.4152	0. RCFLAGS	0	0		
2 2226	1.3595	33.50	1.5604	0. RCFLAGS	0	0		
2 2232	0.0119	57.20	0.0289	0. RCFLAGS	0	0		
2 2233	0.7988	33.80	0.6274	0. RCFLAGS	0	0		
2 1046	0.8107	34.14	0.6540	0. RCFLAGS	0	0		
2 2234	0.8107	34.15	0.6504	0. RCFLAGS	0	0		
2 2235	0.0406	58.39	0.1165	0. RCFLAGS	0	0		
2 2236	0.6429	32.54	0.8351	0. RCFLAGS	0	0		
2 2237	0.6835	34.08	0.9482	0. RCFLAGS	0	0		
2 2238	1.4942	34.12	1.5232	0. RCFLAGS	0	0		
2 2250	0.0014	52.07	0.0043	0. RCFLAGS	0	0		
2 2251	0.2656	33.30	0.3894	0. RCFLAGS	0	0		
2 2252	0.2670	33.39	0.3935	0. RCFLAGS	0	0		
3 2113	0.0089	66.57	0.0390	0. RCFLAGS	0	0	10yr5.DAT	ExstE1.wat
3 2114	0.3841	34.30	0.6133	0. RCFLAGS	0	0		
3 2914	0.3930	35.03	0.6506	0. RCFLAGS	0	0		
3 2155	0.0290	65.54	0.0408	0. RCFLAGS	0	0		
3 2156	1.6087	36.17	1.2252	0. RCFLAGS	0	0		
3 2157	1.6377	36.69	1.2659	0. RCFLAGS	0	0		
3 2158	0.0071	66.37	0.0352	0. RCFLAGS	0	0		
3 2159	0.1391	39.04	0.2661	0. RCFLAGS	0	0		
3 2160	0.1462	40.37	0.2993	0. RCFLAGS	0	0		
3 2178	0.0001	34.98	0.0003	0. RCFLAGS	0	0		
3 2179	0.2047	42.73	0.4096	0. RCFLAGS	0	0		
3 1041	0.2048	42.73	0.4100	0. RCFLAGS	0	0		
3 2180	0.0001	40.15	0.0005	0. RCFLAGS	0	0		
3 2181	0.0216	40.58	0.0903	0. RCFLAGS	0	0		
3 1042	0.0217	40.58	0.0909	0. RCFLAGS	0	0		
3 2182	0.0001	40.15	0.0005	0. RCFLAGS	0	0		
3 2183	0.0143	42.70	0.0630	0. RCFLAGS	0	0		
3 1043	0.0144	42.68	0.0635	0. RCFLAGS	0	0		
3 2184	0.0361	41.42	0.1544	0. RCFLAGS	0	0		
3 2185	0.0048	64.56	0.0220	0. RCFLAGS	0	0		
3 2186	0.1933	42.73	0.4314	0. RCFLAGS	0	0		
3 1044	0.1981	43.26	0.4523	0. RCFLAGS	0	0		
3 2187	0.2342	42.98	0.5973	0. RCFLAGS	0	0		
3 2188	0.0273	67.05	0.1852	0. RCFLAGS	0	0		
3 2189	0.1139	34.12	0.2268	0. RCFLAGS	0	0		
3 2190	0.1412	40.49	0.4037	0. RCFLAGS	0	0		

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3 2191	0.3754	42.04	0.9945	0. RCFLAGS	0	0		
3 2192	0.5802	42.28	1.3965	0. RCFLAGS	0	0		
3 2193	0.0084	66.66	0.0391	0. RCFLAGS	0	0		
3 2194	0.1589	40.06	0.4388	0. RCFLAGS	0	0		
3 2195	0.1673	41.40	0.4777	0. RCFLAGS	0	0		
3 2196	0.7475	42.08	1.8728	0. RCFLAGS	0	0		
3 2197	0.7475	42.08	1.8639	0. RCFLAGS	0	0		
3 2198	0.0001	35.41	0.0004	0. RCFLAGS	0	0		
3 2199	0.1787	39.84	0.3528	0. RCFLAGS	0	0		
3 2200	0.1788	39.84	0.3532	0. RCFLAGS	0	0		
3 2201	0.9263	41.65	2.2170	0. RCFLAGS	0	0		
3 2202	0.0027	61.94	0.0100	0. RCFLAGS	0	0		
3 2203	0.3346	42.72	0.5565	0. RCFLAGS	0	0		
3 1045	0.3373	42.87	0.5659	0. RCFLAGS	0	0		
3 2205	0.3373	42.91	0.5636	0. RCFLAGS	0	0		
3 2206	0.0042	64.00	0.0180	0. RCFLAGS	0	0		
3 2207	0.1639	42.72	0.2654	0. RCFLAGS	0	0		
3 2208	0.1681	43.25	0.2817	0. RCFLAGS	0	0		
3 2209	0.5054	43.03	0.8412	0. RCFLAGS	0	0		
3 2210	1.4317	42.14	2.9887	0. RCFLAGS	0	0		
3 2211	1.4317	42.14	2.9778	0. RCFLAGS	0	0	10yr5.DAT	ExstE1.wat
3 2212	0.0100	66.93	0.0513	0. RCFLAGS	0	0		
3 2213	0.3596	41.60	0.3667	0. RCFLAGS	0	0		
3 2214	0.3696	42.29	0.4056	0. RCFLAGS	0	0		
3 2215	1.8013	42.17	3.3817	0. RCFLAGS	0	0		
3 2220	0.0255	66.96	0.0832	0. RCFLAGS	0	0		
3 2221	0.9640	41.06	1.2995	0. RCFLAGS	0	0		
3 2222	0.9895	41.73	1.3775	0. RCFLAGS	0	0		
3 2223	0.0051	63.39	0.0153	0. RCFLAGS	0	0		
3 2224	0.3649	41.47	0.4857	0. RCFLAGS	0	0		
3 2225	0.3700	41.77	0.5002	0. RCFLAGS	0	0		
3 2226	1.3595	41.74	1.8776	0. RCFLAGS	0	0		
3 2232	0.0119	65.71	0.0335	0. RCFLAGS	0	0		
3 2233	0.7988	42.06	0.7544	0. RCFLAGS	0	0		
3 1046	0.8107	42.41	0.7847	0. RCFLAGS	0	0		
3 2234	0.8107	42.42	0.7811	0. RCFLAGS	0	0		
3 2235	0.0406	67.02	0.1354	0. RCFLAGS	0	0		
3 2236	0.6429	40.68	1.0074	0. RCFLAGS	0	0		
3 2237	0.6835	42.25	1.1393	0. RCFLAGS	0	0		
3 2238	1.4942	42.34	1.8312	0. RCFLAGS	0	0		
3 2250	0.0014	60.23	0.0050	0. RCFLAGS	0	0		
3 2251	0.2656	41.45	0.4680	0. RCFLAGS	0	0		
3 2252	0.2670	41.55	0.4728	0. RCFLAGS	0	0		
4 2113	0.0089	79.28	0.0462	0. RCFLAGS	0	0	25yr5.DAT	ExstE1.wat
4 2114	0.3841	45.46	0.7974	0. RCFLAGS	0	0		
4 2914	0.3930	46.22	0.8412	0. RCFLAGS	0	0		
4 2155	0.0290	78.14	0.0492	0. RCFLAGS	0	0		
4 2156	1.6087	47.37	1.5748	0. RCFLAGS	0	0		
4 2157	1.6377	47.92	1.6239	0. RCFLAGS	0	0		
4 2158	0.0071	79.08	0.0416	0. RCFLAGS	0	0		
4 2159	0.1391	50.95	0.3388	0. RCFLAGS	0	0		
4 2160	0.1462	52.32	0.3781	0. RCFLAGS	0	0		
4 2178	0.0001	44.32	0.0004	0. RCFLAGS	0	0		
4 2179	0.2047	55.29	0.5166	0. RCFLAGS	0	0		
4 1041	0.2048	55.29	0.5170	0. RCFLAGS	0	0		
4 2180	0.0001	49.89	0.0006	0. RCFLAGS	0	0		
4 2181	0.0216	52.51	0.1115	0. RCFLAGS	0	0		
4 1042	0.0217	52.50	0.1121	0. RCFLAGS	0	0		
4 2182	0.0001	49.89	0.0006	0. RCFLAGS	0	0		
4 2183	0.0143	55.26	0.0777	0. RCFLAGS	0	0		
4 1043	0.0144	55.22	0.0783	0. RCFLAGS	0	0		
4 2184	0.0361	53.58	0.1905	0. RCFLAGS	0	0		
4 2185	0.0048	77.04	0.0261	0. RCFLAGS	0	0		
4 2186	0.1933	55.29	0.5421	0. RCFLAGS	0	0		
4 1044	0.1981	55.82	0.5671	0. RCFLAGS	0	0		
4 2187	0.2342	55.47	0.7462	0. RCFLAGS	0	0		
4 2188	0.0273	79.74	0.2193	0. RCFLAGS	0	0		
4 2189	0.1139	45.32	0.2943	0. RCFLAGS	0	0		
4 2190	0.1412	51.97	0.5001	0. RCFLAGS	0	0		
4 2191	0.3754	54.16	1.2401	0. RCFLAGS	0	0		
4 2192	0.5802	54.55	1.7471	0. RCFLAGS	0	0		
4 2193	0.0084	79.47	0.0463	0. RCFLAGS	0	0		
4 2194	0.1589	52.20	0.5517	0. RCFLAGS	0	0		
4 2195	0.1673	53.57	0.5974	0. RCFLAGS	0	0		
4 2196	0.7475	54.33	2.3445	0. RCFLAGS	0	0		
4 2197	0.7475	54.33	2.3391	0. RCFLAGS	0	0		
4 2198	0.0001	44.55	0.0004	0. RCFLAGS	0	0		
4 2199	0.1787	51.71	0.4458	0. RCFLAGS	0	0		
4 2200	0.1788	51.70	0.4462	0. RCFLAGS	0	0		
4 2201	0.9263	53.83	2.7853	0. RCFLAGS	0	0		
4 2202	0.0027	74.27	0.0120	0. RCFLAGS	0	0		
4 2203	0.3346	55.27	0.7040	0. RCFLAGS	0	0		

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4 1045	0.3373	55.43	0.7154	0. RCFLAGS	0	0		
4 2205	0.3373	55.47	0.7120	0. RCFLAGS	0	0		
4 2206	0.0042	76.29	0.0213	0. RCFLAGS	0	0		
4 2207	0.1639	55.27	0.3358	0. RCFLAGS	0	0		
4 2208	0.1681	55.79	0.3552	0. RCFLAGS	0	0		
4 2209	0.5054	55.58	1.0617	0. RCFLAGS	0	0		
4 2210	1.4317	54.44	3.7737	0. RCFLAGS	0	0		
4 2211	1.4317	54.44	3.7602	0. RCFLAGS	0	0	25yr5.DAT	ExstE1.wat
4 2212	0.0100	79.65	0.0607	0. RCFLAGS	0	0		
4 2213	0.3596	53.86	0.4643	0. RCFLAGS	0	0		
4 2214	0.3696	54.55	0.5105	0. RCFLAGS	0	0		
4 2215	1.8013	54.47	4.2698	0. RCFLAGS	0	0		
4 2220	0.0255	79.67	0.0994	0. RCFLAGS	0	0		
4 2221	0.9640	53.28	1.6509	0. RCFLAGS	0	0		
4 2222	0.9895	53.96	1.7456	0. RCFLAGS	0	0		
4 2223	0.0051	75.66	0.0184	0. RCFLAGS	0	0		
4 2224	0.3649	53.82	0.6172	0. RCFLAGS	0	0		
4 2225	0.3700	54.12	0.6347	0. RCFLAGS	0	0		
4 2226	1.3595	54.00	2.3797	0. RCFLAGS	0	0		
4 2232	0.0119	78.43	0.0402	0. RCFLAGS	0	0		
4 2233	0.7988	54.41	0.9541	0. RCFLAGS	0	0		
4 1046	0.8107	54.76	0.9907	0. RCFLAGS	0	0		
4 2234	0.8107	54.77	0.9858	0. RCFLAGS	0	0		
4 2235	0.0406	79.69	0.1616	0. RCFLAGS	0	0		
4 2236	0.6429	52.79	1.2796	0. RCFLAGS	0	0		
4 2237	0.6835	54.39	1.4364	0. RCFLAGS	0	0		
4 2238	1.4942	54.60	2.3098	0. RCFLAGS	0	0		
4 2250	0.0014	71.62	0.0060	0. RCFLAGS	0	0		
4 2251	0.2656	53.63	0.5909	0. RCFLAGS	0	0		
4 2252	0.2670	53.73	0.5967	0. RCFLAGS	0	0		
5 2113	0.0089	86.51	0.0516	0. RCFLAGS	0	0	50yr5.DAT	ExstE1.wat
5 2114	0.3841	52.22	0.9252	0. RCFLAGS	0	0		
5 2914	0.3930	52.99	0.9744	0. RCFLAGS	0	0		
5 2155	0.0290	85.30	0.0546	0. RCFLAGS	0	0		
5 2156	1.6087	54.00	1.8075	0. RCFLAGS	0	0		
5 2157	1.6377	54.55	1.8620	0. RCFLAGS	0	0		
5 2158	0.0071	86.31	0.0465	0. RCFLAGS	0	0		
5 2159	0.1391	57.92	0.3886	0. RCFLAGS	0	0		
5 2160	0.1462	59.30	0.4325	0. RCFLAGS	0	0		
5 2178	0.0001	49.89	0.0004	0. RCFLAGS	0	0		
5 2179	0.2047	62.47	0.5883	0. RCFLAGS	0	0		
5 1041	0.2048	62.47	0.5887	0. RCFLAGS	0	0		
5 2180	0.0001	55.87	0.0007	0. RCFLAGS	0	0		
5 2181	0.0216	59.34	0.1273	0. RCFLAGS	0	0		
5 1042	0.0217	59.32	0.1280	0. RCFLAGS	0	0		
5 2182	0.0001	55.87	0.0007	0. RCFLAGS	0	0		
5 2183	0.0143	62.44	0.0887	0. RCFLAGS	0	0		
5 1043	0.0144	62.39	0.0894	0. RCFLAGS	0	0		
5 2184	0.0361	60.55	0.2174	0. RCFLAGS	0	0		
5 2185	0.0048	84.25	0.0292	0. RCFLAGS	0	0		
5 2186	0.1933	62.47	0.6177	0. RCFLAGS	0	0		
5 1044	0.1981	63.00	0.6455	0. RCFLAGS	0	0		
5 2187	0.2342	62.62	0.8496	0. RCFLAGS	0	0		
5 2188	0.0273	86.94	0.2450	0. RCFLAGS	0	0		
5 2189	0.1139	52.12	0.3422	0. RCFLAGS	0	0		
5 2190	0.1412	58.85	0.5720	0. RCFLAGS	0	0		
5 2191	0.3754	61.21	1.4150	0. RCFLAGS	0	0		
5 2192	0.5802	61.65	1.9935	0. RCFLAGS	0	0		
5 2193	0.0084	86.78	0.0517	0. RCFLAGS	0	0		
5 2194	0.1589	59.26	0.6324	0. RCFLAGS	0	0		
5 2195	0.1673	60.65	0.6834	0. RCFLAGS	0	0		
5 2196	0.7475	61.43	2.6769	0. RCFLAGS	0	0		
5 2197	0.7475	61.43	2.6707	0. RCFLAGS	0	0		
5 2198	0.0001	57.92	0.0006	0. RCFLAGS	0	0		
5 2199	0.1787	58.55	0.5092	0. RCFLAGS	0	0		
5 2200	0.1788	58.55	0.5097	0. RCFLAGS	0	0		
5 2201	0.9263	60.87	3.1804	0. RCFLAGS	0	0		
5 2202	0.0027	81.20	0.0134	0. RCFLAGS	0	0		
5 2203	0.3346	62.46	0.8015	0. RCFLAGS	0	0		
5 1045	0.3373	62.61	0.8142	0. RCFLAGS	0	0		
5 2205	0.3373	62.65	0.8099	0. RCFLAGS	0	0		
5 2206	0.0042	83.50	0.0239	0. RCFLAGS	0	0		
5 2207	0.1639	62.45	0.3822	0. RCFLAGS	0	0		
5 2208	0.1681	62.97	0.4039	0. RCFLAGS	0	0		
5 2209	0.5054	62.76	1.2075	0. RCFLAGS	0	0		
5 2210	1.4317	61.54	4.3006	0. RCFLAGS	0	0		
5 2211	1.4317	61.54	4.2854	0. RCFLAGS	0	0	50yr5.DAT	ExstE1.wat
5 2212	0.0100	86.87	0.0677	0. RCFLAGS	0	0		
5 2213	0.3596	60.89	0.5282	0. RCFLAGS	0	0		
5 2214	0.3696	61.59	0.5799	0. RCFLAGS	0	0		
5 2215	1.8013	61.55	4.8621	0. RCFLAGS	0	0		
5 2220	0.0255	86.89	0.1107	0. RCFLAGS	0	0		

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5	2221	0.9640	60.33	1.8831	0. RCFLAGS	0	0	
5	2222	0.9895	61.01	1.9885	0. RCFLAGS	0	0	
5	2223	0.0051	82.66	0.0205	0. RCFLAGS	0	0	
5	2224	0.3649	60.93	0.7039	0. RCFLAGS	0	0	
5	2225	0.3700	61.23	0.7233	0. RCFLAGS	0	0	
5	2226	1.3595	61.07	2.7115	0. RCFLAGS	0	0	
5	2232	0.0119	85.65	0.0448	0. RCFLAGS	0	0	
5	2233	0.7988	61.48	1.0845	0. RCFLAGS	0	0	
5	1046	0.8107	61.84	1.1253	0. RCFLAGS	0	0	
5	2234	0.8107	61.85	1.1194	0. RCFLAGS	0	0	
5	2235	0.0406	86.91	0.1799	0. RCFLAGS	0	0	
5	2236	0.6429	59.78	1.4599	0. RCFLAGS	0	0	
5	2237	0.6835	61.39	1.6349	0. RCFLAGS	0	0	
5	2238	1.4942	61.64	2.6239	0. RCFLAGS	0	0	
5	2250	0.0014	78.39	0.0067	0. RCFLAGS	0	0	
5	2251	0.2656	60.60	0.6729	0. RCFLAGS	0	0	
5	2252	0.2670	60.69	0.6794	0. RCFLAGS	0	0	
6	2113	0.0089	95.79	0.0570	0. RCFLAGS	0	0	100yr5.DAT ExstE1.wat
6	2114	0.3841	60.35	1.0567	0. RCFLAGS	0	0	
6	2914	0.3930	61.15	1.1107	0. RCFLAGS	0	0	
6	2155	0.0290	94.39	0.0604	0. RCFLAGS	0	0	
6	2156	1.6087	62.09	2.0528	0. RCFLAGS	0	0	
6	2157	1.6377	62.66	2.1131	0. RCFLAGS	0	0	
6	2158	0.0071	95.59	0.0513	0. RCFLAGS	0	0	
6	2159	0.1391	66.50	0.4398	0. RCFLAGS	0	0	
6	2160	0.1462	67.92	0.4882	0. RCFLAGS	0	0	
6	2178	0.0001	64.71	0.0006	0. RCFLAGS	0	0	
6	2179	0.2047	71.47	0.6622	0. RCFLAGS	0	0	
6	1041	0.2048	71.47	0.6628	0. RCFLAGS	0	0	
6	2180	0.0001	62.25	0.0008	0. RCFLAGS	0	0	
6	2181	0.0216	67.89	0.1433	0. RCFLAGS	0	0	
6	1042	0.0217	67.86	0.1441	0. RCFLAGS	0	0	
6	2182	0.0001	62.25	0.0008	0. RCFLAGS	0	0	
6	2183	0.0143	71.44	0.0998	0. RCFLAGS	0	0	
6	1043	0.0144	71.37	0.1006	0. RCFLAGS	0	0	
6	2184	0.0361	69.26	0.2447	0. RCFLAGS	0	0	
6	2185	0.0048	93.31	0.0323	0. RCFLAGS	0	0	
6	2186	0.1933	71.47	0.6953	0. RCFLAGS	0	0	
6	1044	0.1981	72.00	0.7261	0. RCFLAGS	0	0	
6	2187	0.2342	71.58	0.9557	0. RCFLAGS	0	0	
6	2188	0.0273	96.08	0.2705	0. RCFLAGS	0	0	
6	2189	0.1139	60.29	0.3910	0. RCFLAGS	0	0	
6	2190	0.1412	67.21	0.6445	0. RCFLAGS	0	0	
6	2191	0.3754	69.93	1.5930	0. RCFLAGS	0	0	
6	2192	0.5802	70.48	2.2449	0. RCFLAGS	0	0	
6	2193	0.0084	95.88	0.0570	0. RCFLAGS	0	0	
6	2194	0.1589	68.00	0.7148	0. RCFLAGS	0	0	
6	2195	0.1673	69.40	0.7710	0. RCFLAGS	0	0	
6	2196	0.7475	70.24	3.0159	0. RCFLAGS	0	0	
6	2197	0.7475	70.24	3.0087	0. RCFLAGS	0	0	
6	2198	0.0001	65.13	0.0006	0. RCFLAGS	0	0	
6	2199	0.1787	67.08	0.5743	0. RCFLAGS	0	0	
6	2200	0.1788	67.08	0.5749	0. RCFLAGS	0	0	
6	2201	0.9263	69.63	3.5836	0. RCFLAGS	0	0	
6	2202	0.0027	89.84	0.0148	0. RCFLAGS	0	0	
6	2203	0.3346	71.44	0.9024	0. RCFLAGS	0	0	
6	1045	0.3373	71.59	0.9165	0. RCFLAGS	0	0	
6	2205	0.3373	71.64	0.9118	0. RCFLAGS	0	0	
6	2206	0.0042	92.40	0.0264	0. RCFLAGS	0	0	
6	2207	0.1639	71.44	0.4303	0. RCFLAGS	0	0	
6	2208	0.1681	71.96	0.4543	0. RCFLAGS	0	0	
6	2209	0.5054	71.75	1.3591	0. RCFLAGS	0	0	
6	2210	1.4317	70.38	4.8454	0. RCFLAGS	0	0	
6	2211	1.4317	70.37	4.8281	0. RCFLAGS	0	0	100yr5.DAT ExstE1.wat
6	2212	0.0100	95.98	0.0748	0. RCFLAGS	0	0	
6	2213	0.3596	69.66	0.5954	0. RCFLAGS	0	0	
6	2214	0.3696	70.38	0.6522	0. RCFLAGS	0	0	
6	2215	1.8013	70.37	5.4767	0. RCFLAGS	0	0	
6	2220	0.0255	96.00	0.1222	0. RCFLAGS	0	0	
6	2221	0.9640	69.11	2.1249	0. RCFLAGS	0	0	
6	2222	0.9895	69.80	2.2412	0. RCFLAGS	0	0	
6	2223	0.0051	91.57	0.0227	0. RCFLAGS	0	0	
6	2224	0.3649	69.80	0.7943	0. RCFLAGS	0	0	
6	2225	0.3700	70.10	0.8158	0. RCFLAGS	0	0	
6	2226	1.3595	69.88	3.0566	0. RCFLAGS	0	0	
6	2232	0.0119	94.83	0.0495	0. RCFLAGS	0	0	
6	2233	0.7988	70.32	1.2222	0. RCFLAGS	0	0	
6	1046	0.8107	70.68	1.2672	0. RCFLAGS	0	0	
6	2234	0.8107	70.69	1.2610	0. RCFLAGS	0	0	
6	2235	0.0406	96.05	0.1986	0. RCFLAGS	0	0	
6	2236	0.6429	68.48	1.6472	0. RCFLAGS	0	0	
6	2237	0.6835	70.12	1.8402	0. RCFLAGS	0	0	

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6	2238	1.4942	70.43	2.9570	0.	RCFLAGS	0	0	
6	2250	0.0014	87.16	0.0075	0.	RCFLAGS	0	0	
6	2251	0.2656	69.32	0.7576	0.	RCFLAGS	0	0	
6	2252	0.2670	69.41	0.7648	0.	RCFLAGS	0	0	
7	2113	0.0089	281.91	0.0774	0.	RCFLAGS	0	0	regional.DAT ExstE1.wat
7	2114	0.3841	217.85	2.3904	0.	RCFLAGS	0	0	
7	2914	0.3930	219.30	2.4663	0.	RCFLAGS	0	0	
7	2155	0.0290	281.85	0.1341	0.	RCFLAGS	0	0	
7	2156	1.6087	228.61	6.0162	0.	RCFLAGS	0	0	
7	2157	1.6377	229.55	6.1495	0.	RCFLAGS	0	0	
7	2158	0.0071	281.91	0.0649	0.	RCFLAGS	0	0	
7	2159	0.1391	233.88	0.9241	0.	RCFLAGS	0	0	
7	2160	0.1462	236.21	0.9874	0.	RCFLAGS	0	0	
7	2178	0.0001	98.10	0.0007	0.	RCFLAGS	0	0	
7	2179	0.2047	245.55	1.3615	0.	RCFLAGS	0	0	
7	1041	0.2048	245.47	1.3623	0.	RCFLAGS	0	0	
7	2180	0.0001	145.72	0.0010	0.	RCFLAGS	0	0	
7	2181	0.0216	242.35	0.2028	0.	RCFLAGS	0	0	
7	1042	0.0217	241.91	0.2038	0.	RCFLAGS	0	0	
7	2182	0.0001	145.72	0.0010	0.	RCFLAGS	0	0	
7	2183	0.0143	245.51	0.1342	0.	RCFLAGS	0	0	
7	1043	0.0144	244.82	0.1352	0.	RCFLAGS	0	0	
7	2184	0.0361	243.07	0.3390	0.	RCFLAGS	0	0	
7	2185	0.0048	281.84	0.0428	0.	RCFLAGS	0	0	
7	2186	0.1933	245.55	1.3586	0.	RCFLAGS	0	0	
7	1044	0.1981	246.43	1.4014	0.	RCFLAGS	0	0	
7	2187	0.2342	245.91	1.7404	0.	RCFLAGS	0	0	
7	2188	0.0273	281.98	0.2775	0.	RCFLAGS	0	0	
7	2189	0.1139	216.47	0.7966	0.	RCFLAGS	0	0	
7	2190	0.1412	229.14	1.0741	0.	RCFLAGS	0	0	
7	2191	0.3754	239.60	2.8145	0.	RCFLAGS	0	0	
7	2192	0.5802	241.67	4.1733	0.	RCFLAGS	0	0	
7	2193	0.0084	281.91	0.0749	0.	RCFLAGS	0	0	
7	2194	0.1589	236.53	1.2536	0.	RCFLAGS	0	0	
7	2195	0.1673	238.80	1.3285	0.	RCFLAGS	0	0	
7	2196	0.7475	241.03	5.5018	0.	RCFLAGS	0	0	
7	2197	0.7475	241.03	5.4761	0.	RCFLAGS	0	0	
7	2198	0.0001	98.55	0.0008	0.	RCFLAGS	0	0	
7	2199	0.1787	239.00	1.2115	0.	RCFLAGS	0	0	
7	2200	0.1788	238.92	1.2123	0.	RCFLAGS	0	0	
7	2201	0.9263	240.62	6.6884	0.	RCFLAGS	0	0	
7	2202	0.0027	281.39	0.0224	0.	RCFLAGS	0	0	
7	2203	0.3346	245.55	2.0077	0.	RCFLAGS	0	0	
7	1045	0.3373	245.83	2.0298	0.	RCFLAGS	0	0	
7	2205	0.3373	245.83	2.0190	0.	RCFLAGS	0	0	
7	2206	0.0042	281.81	0.0365	0.	RCFLAGS	0	0	
7	2207	0.1639	245.54	0.9678	0.	RCFLAGS	0	0	
7	2208	0.1681	246.45	1.0036	0.	RCFLAGS	0	0	
7	2209	0.5054	246.04	3.0108	0.	RCFLAGS	0	0	
7	2210	1.4317	242.53	9.6756	0.	RCFLAGS	0	0	
7	2211	1.4317	242.53	9.6056	0.	RCFLAGS	0	0	regional.DAT ExstE1.wat
7	2212	0.0100	281.93	0.0926	0.	RCFLAGS	0	0	
7	2213	0.3596	243.91	1.5810	0.	RCFLAGS	0	0	
7	2214	0.3696	244.94	1.6640	0.	RCFLAGS	0	0	
7	2215	1.8013	243.03	11.2696	0.	RCFLAGS	0	0	
7	2220	0.0255	281.95	0.1938	0.	RCFLAGS	0	0	
7	2221	0.9640	240.91	5.1461	0.	RCFLAGS	0	0	
7	2222	0.9895	241.96	5.3313	0.	RCFLAGS	0	0	
7	2223	0.0051	281.76	0.0380	0.	RCFLAGS	0	0	
7	2224	0.3649	241.54	1.9219	0.	RCFLAGS	0	0	
7	2225	0.3700	242.09	1.9583	0.	RCFLAGS	0	0	
7	2226	1.3595	242.00	7.2896	0.	RCFLAGS	0	0	
7	2232	0.0119	281.89	0.0843	0.	RCFLAGS	0	0	
7	2233	0.7988	245.55	3.2967	0.	RCFLAGS	0	0	
7	1046	0.8107	246.08	3.3758	0.	RCFLAGS	0	0	
7	2234	0.8107	246.08	3.3697	0.	RCFLAGS	0	0	
7	2235	0.0406	281.97	0.3118	0.	RCFLAGS	0	0	
7	2236	0.6429	240.27	3.7828	0.	RCFLAGS	0	0	
7	2237	0.6835	242.75	4.0926	0.	RCFLAGS	0	0	
7	2238	1.4942	244.56	7.3107	0.	RCFLAGS	0	0	
7	2250	0.0014	213.98	0.0116	0.	RCFLAGS	0	0	
7	2251	0.2656	243.64	1.6762	0.	RCFLAGS	0	0	
7	2252	0.2670	243.49	1.6876	0.	RCFLAGS	0	0	

APPENDIX C – Calculations

Culvert Designer/Analyzer Report
JCB2

Peak Discharge Method: User-Specified					
Design Discharge	0.6000	m³/s	Check Discharge	0.7600	m³/s

Grades Model: Inverts					
Invert Upstream	177.15	m	Invert Downstream	177.00	m
Length	31.00	m	Slope	0.004839	m/m
Drop	0.15	m			

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater		
Tailwater Elevation	0.00	m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-600 mm Circular	0.6000 m³/s	178.89 m	2.33 m/s
	Trial-2	1-600 mm Circular	0.7600 m³/s	179.73 m	2.74 m/s

Culvert Designer/Analyzer Report
JCB2

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	m	Storm Event	Design	
Computed Headwater Elev	178.89	m	Discharge	0.6000	m³/s
Headwater Depth/Height	2.86		Tailwater Elevation	0.00	m
Inlet Control HW Elev.	178.24	m	Control Type	Outlet Control	
Outlet Control HW Elev.	178.89	m			

Grades					
Upstream Invert	177.15	m	Downstream Invert	177.00	m
Length	31.00	m	Constructed Slope	0.004839	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.50	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.50	m
Velocity Downstream	2.33	m/s	Critical Slope	0.029611	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	178.89	m	Upstream Velocity Head	0.22	m
Ke	0.90		Entrance Loss	0.19	m

Inlet Control Properties					
Inlet Control HW Elev.	178.24	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Designer/Analyzer Report
JCB2

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	m	Storm Event	Check	
Computed Headwater Eleva	179.73	m	Discharge	0.7600	m³/s
Headwater Depth/Height	4.23		Tailwater Elevation	0.00	m
Inlet Control HW Elev.	178.71	m	Control Type	Outlet Control	
Outlet Control HW Elev.	179.73	m			

Grades					
Upstream Invert	177.15	m	Downstream Invert	177.00	m
Length	31.00	m	Constructed Slope	0.004839	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.55	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.55	m
Velocity Downstream	2.74	m/s	Critical Slope	0.042146	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	179.73	m	Upstream Velocity Head	0.35	m
Ke	0.90		Entrance Loss	0.31	m

Inlet Control Properties					
Inlet Control HW Elev.	178.71	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Designer/Analyzer Report
JCB4

Peak Discharge Method: User-Specified					
Design Discharge	2.1900	m³/s	Check Discharge	2.8000	m³/s

Grades Model: Inverts					
Invert Upstream	175.04	m	Invert Downstream	175.00	m
Length	8.20	m	Slope	0.004878	m/m
Drop	0.04	m			

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater		
Tailwater Elevation	175.55	m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-4570x910mm Box	2.1900 m³/s	175.60 m	0.87 m/s
	Trial-2	1-4570x910mm Box	2.8000 m³/s	175.63 m	1.11 m/s

Culvert Designer/Analyzer Report
JCB4

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	m	Storm Event	Design	
Computed Headwater Elev	175.60	m	Discharge	2.1900	m³/s
Headwater Depth/Height	0.62		Tailwater Elevation	175.55	m
Inlet Control HW Elev.	175.55	m	Control Type	Outlet Control	
Outlet Control HW Elev.	175.60	m			

Grades					
Upstream Invert	175.04	m	Downstream Invert	175.00	m
Length	8.20	m	Constructed Slope	0.004878	m/m

Hydraulic Profile					
Profile	S1		Depth, Downstream	0.55	m
Slope Type	Steep		Normal Depth	0.24	m
Flow Regime	Subcritical		Critical Depth	0.29	m
Velocity Downstream	0.87	m/s	Critical Slope	0.002944	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	4.57	m
Section Size	4570x910mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	175.60	m	Upstream Velocity Head	0.05	m
Ke	0.20		Entrance Loss	0.01	m

Inlet Control Properties					
Inlet Control HW Elev.	175.55	m	Flow Control	N/A	
Inlet Type	90° headwall w 3/4 inch chamfers		Area Full	4.2	m²
K	0.51500		HDS 5 Chart	10	
M	0.66700		HDS 5 Scale	1	
C	0.03750		Equation Form	2	
Y	0.79000				

Culvert Designer/Analyzer Report
JCB4

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	m	Storm Event	Check	
Computed Headwater Elev	175.63	m	Discharge	2.8000	m³/s
Headwater Depth/Height	0.65		Tailwater Elevation	175.55	m
Inlet Control HW Elev.	175.59	m	Control Type	Outlet Control	
Outlet Control HW Elev.	175.63	m			

Grades					
Upstream Invert	175.04	m	Downstream Invert	175.00	m
Length	8.20	m	Constructed Slope	0.004878	m/m

Hydraulic Profile					
Profile	S1		Depth, Downstream	0.55	m
Slope Type	Steep		Normal Depth	0.28	m
Flow Regime	Subcritical		Critical Depth	0.34	m
Velocity Downstream	1.11	m/s	Critical Slope	0.002861	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	4.57	m
Section Size	4570x910mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	175.63	m	Upstream Velocity Head	0.08	m
Ke	0.20		Entrance Loss	0.02	m

Inlet Control Properties					
Inlet Control HW Elev.	175.59	m	Flow Control	N/A	
Inlet Type	90° headwall w 3/4 inch chamfers		Area Full	4.2	m²
K	0.51500		HDS 5 Chart	10	
M	0.66700		HDS 5 Scale	1	
C	0.03750		Equation Form	2	
Y	0.79000				

Culvert Designer/Analyzer Report
JCB7

Peak Discharge Method: User-Specified					
Design Discharge	4.2900	m³/s	Check Discharge	5.5100	m³/s

Grades Model: Inverts					
Invert Upstream	174.62	m	Invert Downstream	174.50	m
Length	23.71	m	Slope	0.005061	m/m
Drop	0.12	m			

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater		
Tailwater Elevation	175.53	m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-3050 x 1520 mm Box	4.2900 m³/s	175.67 m	1.37 m/s
	Trial-2	1-3050 x 1520 mm Box	5.5100 m³/s	175.76 m	1.76 m/s

Culvert Designer/Analyzer Report
JCB7

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	m	Storm Event	Design	
Computed Headwater Eleva	175.67	m	Discharge	4.2900	m³/s
Headwater Depth/Height	0.69		Tailwater Elevation	175.53	m
Inlet Control HW Elev.	175.58	m	Control Type	Outlet Control	
Outlet Control HW Elev.	175.67	m			

Grades					
Upstream Invert	174.62	m	Downstream Invert	174.50	m
Length	23.71	m	Constructed Slope	0.005061	m/m

Hydraulic Profile					
Profile	S1		Depth, Downstream	1.03	m
Slope Type	Steep		Normal Depth	0.50	m
Flow Regime	Subcritical		Critical Depth	0.59	m
Velocity Downstream	1.37	m/s	Critical Slope	0.003056	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.05	m
Section Size	3050 x 1520 mm		Rise	1.52	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	175.67	m	Upstream Velocity Head	0.13	m
Ke	0.20		Entrance Loss	0.03	m

Inlet Control Properties					
Inlet Control HW Elev.	175.58	m	Flow Control	N/A	
Inlet Type	90° headwall w 3/4 inch chamfers		Area Full	4.6	m²
K	0.51500		HDS 5 Chart	10	
M	0.66700		HDS 5 Scale	1	
C	0.03750		Equation Form	2	
Y	0.79000				

Culvert Designer/Analyzer Report
JCB7

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	m	Storm Event	Check	
Computed Headwater Eleva	175.76	m	Discharge	5.5100	m³/s
Headwater Depth/Height	0.75		Tailwater Elevation	175.53	m
Inlet Control HW Elev.	175.76	m	Control Type	Outlet Control	
Outlet Control HW Elev.	175.76	m			

Grades					
Upstream Invert	174.62	m	Downstream Invert	174.50	m
Length	23.71	m	Constructed Slope	0.005061	m/m

Hydraulic Profile					
Profile	S1		Depth, Downstream	1.03	m
Slope Type	Steep		Normal Depth	0.59	m
Flow Regime	Subcritical		Critical Depth	0.69	m
Velocity Downstream	1.76	m/s	Critical Slope	0.003087	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.05	m
Section Size	3050 x 1520 mm		Rise	1.52	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	175.76	m	Upstream Velocity Head	0.21	m
Ke	0.20		Entrance Loss	0.04	m

Inlet Control Properties					
Inlet Control HW Elev.	175.76	m	Flow Control	N/A	
Inlet Type	90° headwall w 3/4 inch chamfers		Area Full	4.6	m²
K	0.51500		HDS 5 Chart	10	
M	0.66700		HDS 5 Scale	1	
C	0.03750		Equation Form	2	
Y	0.79000				

Culvert Designer/Analyzer Report
JCB9

Peak Discharge Method: User-Specified					
Design Discharge	0.6600	m³/s	Check Discharge	0.8500	m³/s

Grades Model: Inverts					
Invert Upstream	178.07	m	Invert Downstream	178.00	m
Length	14.78	m	Slope	0.004736	m/m
Drop	0.07	m			

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater		
Tailwater Elevation	0.00	m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-600 mm Circular	0.6600 m³/s	179.60 m	2.48 m/s
	Trial-2	1-600 mm Circular	0.8500 m³/s	180.30 m	3.00 m/s

Culvert Designer/Analyzer Report
JCB9

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	m	Storm Event	Design	
Computed Headwater Elev	179.60	m	Discharge	0.6600	m³/s
Headwater Depth/Height	2.51		Tailwater Elevation	0.00	m
Inlet Control HW Elev.	179.33	m	Control Type	Outlet Control	
Outlet Control HW Elev.	179.60	m			

Grades					
Upstream Invert	178.07	m	Downstream Invert	178.00	m
Length	14.78	m	Constructed Slope	0.004736	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.52	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.52	m
Velocity Downstream	2.48	m/s	Critical Slope	0.033631	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	179.60	m	Upstream Velocity Head	0.26	m
Ke	0.90		Entrance Loss	0.23	m

Inlet Control Properties					
Inlet Control HW Elev.	179.33	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Designer/Analyzer Report
JCB9

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	m	Storm Event	Check	
Computed Headwater Eleva	180.30	m	Discharge	0.8500	m³/s
Headwater Depth/Height	3.66		Tailwater Elevation	0.00	m
Inlet Control HW Elev.	179.94	m	Control Type	Outlet Control	
Outlet Control HW Elev.	180.30	m			

Grades					
Upstream Invert	178.07	m	Downstream Invert	178.00	m
Length	14.78	m	Constructed Slope	0.004736	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.57	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.57	m
Velocity Downstream	3.00	m/s	Critical Slope	0.051898	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	180.30	m	Upstream Velocity Head	0.43	m
Ke	0.90		Entrance Loss	0.39	m

Inlet Control Properties					
Inlet Control HW Elev.	179.94	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Designer/Analyzer Report
JCB10

Peak Discharge Method: User-Specified					
Design Discharge	1.7500	m³/s	Check Discharge	2.2400	m³/s

Grades Model: Inverts					
Invert Upstream	179.09	m	Invert Downstream	179.00	m
Length	17.00	m	Slope	0.005000	m/m
Drop	0.09	m			

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater		
Tailwater Elevation	0.00	m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-750 mm Circular	1.7500 m³/s	182.49 m	3.89 m/s
	Trial-2	1-750 mm Circular	2.2400 m³/s	184.25 m	4.93 m/s

Culvert Designer/Analyzer Report
JCB10

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	m	Storm Event	Design	
Computed Headwater Elev	182.49	m	Discharge	1.7500	m³/s
Headwater Depth/Height	4.47		Tailwater Elevation	0.00	m
Inlet Control HW Elev.	182.17	m	Control Type	Outlet Control	
Outlet Control HW Elev.	182.49	m			

Grades					
Upstream Invert	179.09	m	Downstream Invert	179.00	m
Length	17.00	m	Constructed Slope	0.005000	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.73	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.73	m
Velocity Downstream	3.89	m/s	Critical Slope	0.067512	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.76	m
Section Size	750 mm		Rise	0.76	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	182.49	m	Upstream Velocity Head	0.75	m
Ke	0.90		Entrance Loss	0.68	m

Inlet Control Properties					
Inlet Control HW Elev.	182.17	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.5	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Designer/Analyzer Report
JCB10

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	m	Storm Event	Check	
Computed Headwater Eleva	184.25	m	Discharge	2.2400	m³/s
Headwater Depth/Height	6.78		Tailwater Elevation	0.00	m
Inlet Control HW Elev.	183.87	m	Control Type	Outlet Control	
Outlet Control HW Elev.	184.25	m			

Grades					
Upstream Invert	179.09	m	Downstream Invert	179.00	m
Length	17.00	m	Constructed Slope	0.005000	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.75	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.75	m
Velocity Downstream	4.93	m/s	Critical Slope	0.115010	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.76	m
Section Size	750 mm		Rise	0.76	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	184.25	m	Upstream Velocity Head	1.23	m
Ke	0.90		Entrance Loss	1.11	m

Inlet Control Properties					
Inlet Control HW Elev.	183.87	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.5	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Designer/Analyzer Report
MEB1

Peak Discharge Method: User-Specified					
Design Discharge	0.3800	m³/s	Check Discharge	0.4900	m³/s

Grades Model: Inverts					
Invert Upstream	187.56	m	Invert Downstream	187.50	m
Length	12.50	m	Slope	0.004800	m/m
Drop	0.06	m			

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater		
Tailwater Elevation	0.00	m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-450 mm Circular	0.3800 m³/s	189.15 m	2.42 m/s
	Trial-2	1-450 mm Circular	0.4900 m³/s	189.97 m	3.02 m/s

Culvert Designer/Analyzer Report
MEB1

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	m	Storm Event	Design	
Computed Headwater Eleva	189.15	m	Discharge	0.3800	m³/s
Headwater Depth/Height	3.49		Tailwater Elevation	0.00	m
Inlet Control HW Elev.	188.78	m	Control Type	Outlet Control	
Outlet Control HW Elev.	189.15	m			

Grades					
Upstream Invert	187.56	m	Downstream Invert	187.50	m
Length	12.50	m	Constructed Slope	0.004800	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.42	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.42	m
Velocity Downstream	2.42	m/s	Critical Slope	0.048583	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.46	m
Section Size	450 mm		Rise	0.46	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	189.15	m	Upstream Velocity Head	0.27	m
Ke	0.90		Entrance Loss	0.25	m

Inlet Control Properties					
Inlet Control HW Elev.	188.78	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Designer/Analyzer Report
MEB1

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	m	Storm Event	Check	
Computed Headwater Eleva	189.97	m	Discharge	0.4900	m³/s
Headwater Depth/Height	5.27		Tailwater Elevation	0.00	m
Inlet Control HW Elev.	189.42	m	Control Type	Outlet Control	
Outlet Control HW Elev.	189.97	m			

Grades					
Upstream Invert	187.56	m	Downstream Invert	187.50	m
Length	12.50	m	Constructed Slope	0.004800	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.44	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.44	m
Velocity Downstream	3.02	m/s	Critical Slope	0.080745	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.46	m
Section Size	450 mm		Rise	0.46	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	189.97	m	Upstream Velocity Head	0.45	m
Ke	0.90		Entrance Loss	0.41	m

Inlet Control Properties					
Inlet Control HW Elev.	189.42	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Designer/Analyzer Report
ESMB14

Peak Discharge Method: User-Specified					
Design Discharge	0.8400	m³/s	Check Discharge	1.1100	m³/s

Grades Model: Inverts					
Invert Upstream	166.09	m	Invert Downstream	166.00	m
Length	17.20	m	Slope	0.005233	m/m
Drop	0.09	m			

Headwater Model: Unspecified

Tailwater Conditions: Constant Tailwater		
Tailwater Elevation	0.00	m

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-1800 mm Circular	0.8400 m³/s	166.79 m	1.74 m/s
	Trial-2	1-1800 mm Circular	1.1100 m³/s	166.90 m	1.88 m/s

Culvert Designer/Analyzer Report
ESMB14

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	m	Storm Event	Design	
Computed Headwater Elev	166.79	m	Discharge	0.8400	m³/s
Headwater Depth/Height	0.38		Tailwater Elevation	0.00	m
Inlet Control HW Elev.	166.69	m	Control Type	Outlet Control	
Outlet Control HW Elev.	166.79	m			

Grades					
Upstream Invert	166.09	m	Downstream Invert	166.00	m
Length	17.20	m	Constructed Slope	0.005233	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.44	m
Slope Type	Mild		Normal Depth	0.52	m
Flow Regime	Subcritical		Critical Depth	0.44	m
Velocity Downstream	1.74	m/s	Critical Slope	0.010630	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.83	m
Section Size	1800 mm		Rise	1.83	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	166.79	m	Upstream Velocity Head	0.10	m
Ke	0.90		Entrance Loss	0.09	m

Inlet Control Properties					
Inlet Control HW Elev.	166.69	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	2.6	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Designer/Analyzer Report
ESMB14

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	N/A	m	Storm Event	Check	
Computed Headwater Eleva	166.90	m	Discharge	1.1100	m³/s
Headwater Depth/Height	0.44		Tailwater Elevation	0.00	m
Inlet Control HW Elev.	166.80	m	Control Type	Outlet Control	
Outlet Control HW Elev.	166.90	m			

Grades					
Upstream Invert	166.09	m	Downstream Invert	166.00	m
Length	17.20	m	Constructed Slope	0.005233	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.50	m
Slope Type	Mild		Normal Depth	0.60	m
Flow Regime	Subcritical		Critical Depth	0.50	m
Velocity Downstream	1.88	m/s	Critical Slope	0.010534	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.83	m
Section Size	1800 mm		Rise	1.83	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	166.90	m	Upstream Velocity Head	0.12	m
Ke	0.90		Entrance Loss	0.10	m

Inlet Control Properties					
Inlet Control HW Elev.	166.80	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	2.6	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

APPENDIX E

Weighted Evaluation of Alternatives

Weighted Evaluation of Alternatives

The following tables demonstrate the results of the evaluation of West section, Core section and Transitional section alternatives when various weighting scenarios are applied.

WEST SECTION

		Raw Score			
Category	**Max Points**	**W-1**	**W-2**	**W-3**	**W-4**
Operational	15	6	14	8	14
Sustainable Transportation	12	0	8	5	12
Natural Environment	12	12	4	8	4
Urban Design	9	1	6	5	8
Socio-Economic	9	8	6	9	7
Cultural Environment	9	9	6	7	6
Financial	9	9	5	7	4
TOTAL	75	45	49	49	55
RANK		**4**	**2**	**2**	**1**

Weighting #1					
Category	**Weighting**	**W-1**	**W-2**	**W-3**	**W-4**
Operational	10	4.00	9.33	5.33	9.33
Sustainable Transportation	15	0.00	10.00	6.25	15.00
Natural Environment	35	35.00	11.67	23.33	11.67
Urban Design	15	1.67	10.00	8.33	13.33
Socio-Economic	5	4.44	3.33	5.00	3.89
Cultural Environment	15	15.00	10.00	11.67	10.00
Financial	5	5.00	2.78	3.89	2.22
TOTAL	**100**	**65.11**	**57.11**	**63.81**	**65.44**
RANK		**2**	**4**	**3**	**1**

Weighting #2					
Category	**Weighting**	**W-1**	**W-2**	**W-3**	**W-4**
Operational	10	4.00	9.33	5.33	9.33
Sustainable Transportation	15	0.00	10.00	6.25	15.00
Natural Environment	15	15.00	5.00	10.00	5.00
Urban Design	15	1.67	10.00	8.33	13.33
Socio-Economic	5	4.44	3.33	5.00	3.89
Cultural Environment	35	35.00	23.33	27.22	23.33
Financial	5	5.00	2.78	3.89	2.22
TOTAL	**100**	**65.11**	**63.78**	**66.03**	**72.11**
RANK		**3**	**4**	**2**	**1**

Weighting #3					
Category	**Weighting**	**W-1**	**W-2**	**W-3**	**W-4**
Operational	10	4.00	9.33	5.33	9.33
Sustainable Transportation	35	0.00	23.33	14.58	35.00
Natural Environment	15	15.00	5.00	10.00	5.00
Urban Design	15	1.67	10.00	8.33	13.33
Socio-Economic	5	4.44	3.33	5.00	3.89
Cultural Environment	15	15.00	10.00	11.67	10.00
Financial	5	5.00	2.78	3.89	2.22
TOTAL	**100**	**45.11**	**63.78**	**58.81**	**78.78**
RANK		**4**	**2**	**3**	**1**

Weighting #4					
Category	**Weighting**	**W-1**	**W-2**	**W-3**	**W-4**
Operational	10	4.00	9.33	5.33	9.33
Sustainable Transportation	15	0.00	10.00	6.25	15.00
Natural Environment	15	15.00	5.00	10.00	5.00
Urban Design	35	3.89	23.33	19.44	31.11
Socio-Economic	5	4.44	3.33	5.00	3.89
Cultural Environment	15	15.00	10.00	11.67	10.00
Financial	5	5.00	2.78	3.89	2.22
TOTAL	**100**	**47.33**	**63.78**	**61.58**	**76.56**
RANK		**4**	**2**	**3**	**1**

Weighting #5					
Category	**Weighting**	**W-1**	**W-2**	**W-3**	**W-4**
Operational	35	14.00	32.67	18.67	32.67
Sustainable Transportation	15	0.00	10.00	6.25	15.00
Natural Environment	15	15.00	5.00	10.00	5.00
Urban Design	10	1.11	6.67	5.56	8.89
Socio-Economic	5	4.44	3.33	5.00	3.89
Cultural Environment	15	15.00	10.00	11.67	10.00
Financial	5	5.00	2.78	3.89	2.22
TOTAL	**100**	**54.56**	**70.44**	**61.03**	**77.67**
RANK		**4**	**2**	**3**	**1**

Weighting #6					
Category	**Weighting**	**W-1**	**W-2**	**W-3**	**W-4**
Operational	5	2.00	4.67	2.67	4.67
Sustainable Transportation	15	0.00	10.00	6.25	15.00
Natural Environment	15	15.00	5.00	10.00	5.00
Urban Design	10	1.11	6.67	5.56	8.89
Socio-Economic	35	31.11	23.33	35.00	27.22
Cultural Environment	15	15.00	10.00	11.67	10.00
Financial	5	5.00	2.78	3.89	2.22
TOTAL	**100**	**69.22**	**62.44**	**75.03**	**73.00**
RANK		**3**	**4**	**1**	**2**

Weighting #7					
Category	**Weighting**	**W-1**	**W-2**	**W-3**	**W-4**
Operational	5	2.00	4.67	2.67	4.67
Sustainable Transportation	15	0.00	10.00	6.25	15.00
Natural Environment	15	15.00	5.00	10.00	5.00
Urban Design	10	1.11	6.67	5.56	8.89
Socio-Economic	5	4.44	3.33	5.00	3.89
Cultural Environment	15	15.00	10.00	11.67	10.00
Financial	35	35.00	19.44	27.22	15.56
TOTAL	**100**	**72.56**	**59.11**	**68.36**	**63.00**
RANK		**1**	**4**	**2**	**3**

CORE SECTION

		Raw Score			
Category	**Max Points**	**C-1**	**C-2**	**C-3**	**C-4**
Operational	15	14	15	10	14
Sustainable Transportation	12	10	8	12	10
Natural Environment	12	11	11	12	11
Urban Design	9	8	6	5	6
Socio-Economic	9	9	9	8	6
Cultural Environment	9	9	9	9	8
Financial	9	8	8	9	6
TOTAL	75	69	66	65	61
RANK		**1**	**2**	**3**	**4**

Weighting #1					
Category	**Weighting**	**C-1**	**C-2**	**C-3**	**C-4**
Operational	15	14.00	15.00	10.00	14.00
Sustainable Transportation	15	12.50	10.00	15.00	12.50
Natural Environment	10	9.17	9.17	10.00	9.17
Urban Design	35	31.11	23.33	19.44	23.33
Socio-Economic	10	10.00	10.00	8.89	6.67
Cultural Environment	10	10.00	10.00	10.00	8.89
Financial	5	4.44	4.44	5.00	3.33
TOTAL	**100**	**91.22**	**81.94**	**78.33**	**77.89**
RANK		**1**	**2**	**3**	**4**

Weighting #2					
Category	**Weighting**	**C-1**	**C-2**	**C-3**	**C-4**
Operational	15	14.00	15.00	10.00	14.00
Sustainable Transportation	35	29.17	23.33	35.00	29.17
Natural Environment	10	9.17	9.17	10.00	9.17
Urban Design	15	13.33	10.00	8.33	10.00
Socio-Economic	10	10.00	10.00	8.89	6.67
Cultural Environment	10	10.00	10.00	10.00	8.89
Financial	5	4.44	4.44	5.00	3.33
TOTAL	**100**	**90.11**	**81.94**	**87.22**	**81.22**
RANK		**1**	**3**	**2**	**4**

Weighting #3					
Category	**Weighting**	**C-1**	**C-2**	**C-3**	**C-4**
Operational	35	32.67	35.00	23.33	32.67
Sustainable Transportation	15	12.50	10.00	15.00	12.50
Natural Environment	10	9.17	9.17	10.00	9.17
Urban Design	15	13.33	10.00	8.33	10.00
Socio-Economic	10	10.00	10.00	8.89	6.67
Cultural Environment	10	10.00	10.00	10.00	8.89
Financial	5	4.44	4.44	5.00	3.33
TOTAL	**100**	**92.11**	**88.61**	**80.56**	**83.22**
RANK		**1**	**2**	**4**	**3**

Weighting #4					
Category	**Weighting**	**C-1**	**C-2**	**C-3**	**C-4**
Operational	15	14.00	15.00	10.00	14.00
Sustainable Transportation	15	12.50	10.00	15.00	12.50
Natural Environment	10	9.17	9.17	10.00	9.17
Urban Design	15	13.33	10.00	8.33	10.00
Socio-Economic	35	35.00	35.00	31.11	23.33
Cultural Environment	5	5.00	5.00	5.00	4.44
Financial	5	4.44	4.44	5.00	3.33
TOTAL	**100**	**93.44**	**88.61**	**84.44**	**76.78**
RANK		**1**	**2**	**3**	**4**

Weighting #5					
Category	**Weighting**	**C-1**	**C-2**	**C-3**	**C-4**
Operational	15	14.00	15.00	10.00	14.00
Sustainable Transportation	15	12.50	10.00	15.00	12.50
Natural Environment	35	32.08	32.08	35.00	32.08
Urban Design	15	13.33	10.00	8.33	10.00
Socio-Economic	10	10.00	10.00	8.89	6.67
Cultural Environment	5	5.00	5.00	5.00	4.44
Financial	5	4.44	4.44	5.00	3.33
TOTAL	**100**	**91.36**	**86.53**	**87.22**	**83.03**
RANK		**1**	**3**	**2**	**4**

Weighting #6					
Category	**Weighting**	**C-1**	**C-2**	**C-3**	**C-4**
Operational	15	14.00	15.00	10.00	14.00
Sustainable Transportation	15	12.50	10.00	15.00	12.50
Natural Environment	5	4.58	4.58	5.00	4.58
Urban Design	15	13.33	10.00	8.33	10.00
Socio-Economic	10	10.00	10.00	8.89	6.67
Cultural Environment	35	35.00	35.00	35.00	31.11
Financial	5	4.44	4.44	5.00	3.33
TOTAL	**100**	**93.86**	**89.03**	**87.22**	**82.19**
RANK		**1**	**2**	**3**	**4**

Weighting #7					
Category	**Weighting**	**C-1**	**C-2**	**C-3**	**C-4**
Operational	15	14.00	15.00	10.00	14.00
Sustainable Transportation	15	12.50	10.00	15.00	12.50
Natural Environment	5	4.58	4.58	5.00	4.58
Urban Design	15	13.33	10.00	8.33	10.00
Socio-Economic	10	10.00	10.00	8.89	6.67
Cultural Environment	5	5.00	5.00	5.00	4.44
Financial	35	31.11	31.11	35.00	23.33
TOTAL	**100**	**90.53**	**85.69**	**87.22**	**75.53**
RANK		**1**	**3**	**2**	**4**

TRANSITIONAL SECTION

		Raw Score			
Category	**Max Points**	**T-1**	**T-2**	**T-3**	**T-4**
Operational	15	15	14	14	14
Sustainable Transportation	12	9	11	8	9
Natural Environment	12	12	11	11	12
Urban Design	9	7	8	4	7
Socio-Economic	9	7	8	8	6
Cultural Environment	9	9	8	8	8
Financial	9	9	6	6	7
TOTAL	75	68	66	59	63
RANK		**1**	**2**	**4**	**3**

Weighting #1					
Category	**Weighting**	**T-1**	**T-2**	**T-3**	**T-4**
Operational	15	15.00	14.00	14.00	14.00
Sustainable Transportation	35	26.25	32.08	23.33	26.25
Natural Environment	15	15.00	13.75	13.75	15.00
Urban Design	15	11.67	13.33	6.67	11.67
Socio-Economic	10	7.78	8.89	8.89	6.67
Cultural Environment	5	5.00	4.44	4.44	4.44
Financial	5	5.00	3.33	3.33	3.89
TOTAL	**100**	**85.69**	**89.83**	**74.42**	**81.92**
RANK		**2**	**1**	**4**	**3**

Weighting #2					
Category	**Weighting**	**T-1**	**T-2**	**T-3**	**T-4**
Operational	35	35.00	32.67	32.67	32.67
Sustainable Transportation	15	11.25	13.75	10.00	11.25
Natural Environment	15	15.00	13.75	13.75	15.00
Urban Design	15	11.67	13.33	6.67	11.67
Socio-Economic	10	7.78	8.89	8.89	6.67
Cultural Environment	5	5.00	4.44	4.44	4.44
Financial	5	5.00	3.33	3.33	3.89
TOTAL	**100**	**90.69**	**90.17**	**79.75**	**85.58**
RANK		**1**	**2**	**4**	**3**

Weighting #3					
Category	**Weighting**	**T-1**	**T-2**	**T-3**	**T-4**
Operational	15	15.00	14.00	14.00	14.00
Sustainable Transportation	15	11.25	13.75	10.00	11.25
Natural Environment	15	15.00	13.75	13.75	15.00
Urban Design	35	27.22	31.11	15.56	27.22
Socio-Economic	10	7.78	8.89	8.89	6.67
Cultural Environment	5	5.00	4.44	4.44	4.44
Financial	5	5.00	3.33	3.33	3.89
TOTAL	**100**	**86.25**	**89.28**	**69.97**	**82.47**
RANK		**2**	**1**	**4**	**3**

Weighting #4					
Category	**Weighting**	**T-1**	**T-2**	**T-3**	**T-4**
Operational	15	15.00	14.00	14.00	14.00
Sustainable Transportation	15	11.25	13.75	10.00	11.25
Natural Environment	35	35.00	32.08	32.08	35.00
Urban Design	15	11.67	13.33	6.67	11.67
Socio-Economic	10	7.78	8.89	8.89	6.67
Cultural Environment	5	5.00	4.44	4.44	4.44
Financial	5	5.00	3.33	3.33	3.89
TOTAL	**100**	**90.69**	**89.83**	**79.42**	**86.92**
RANK		**1**	**2**	**4**	**3**

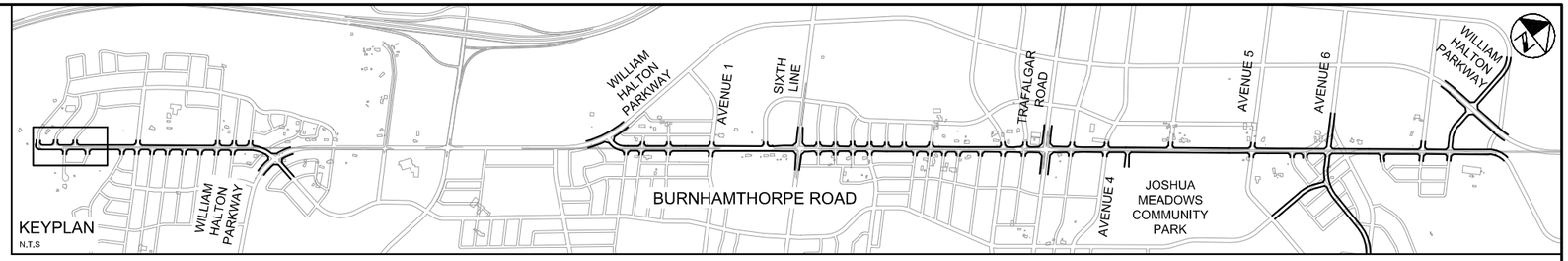
Weighting #5					
Category	**Weighting**	**T-1**	**T-2**	**T-3**	**T-4**
Operational	15	15.00	14.00	14.00	14.00
Sustainable Transportation	15	11.25	13.75	10.00	11.25
Natural Environment	10	10.00	9.17	9.17	10.00
Urban Design	15	11.67	13.33	6.67	11.67
Socio-Economic	35	27.22	31.11	31.11	23.33
Cultural Environment	5	5.00	4.44	4.44	4.44
Financial	5	5.00	3.33	3.33	3.89
TOTAL	**100**	**85.14**	**89.14**	**78.72**	**78.58**
RANK		**2**	**1**	**3**	**4**

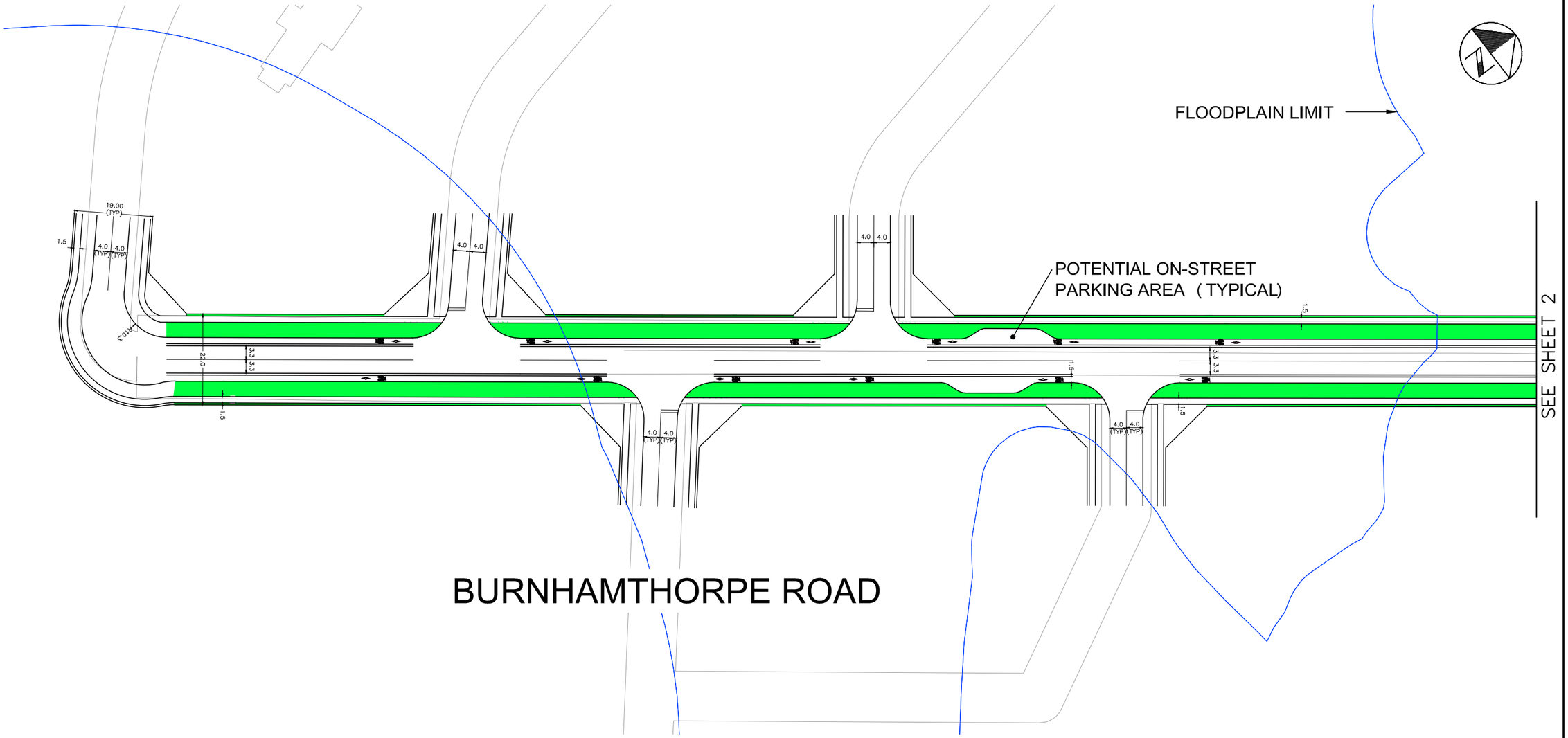
Weighting #6					
Category	**Weighting**	**T-1**	**T-2**	**T-3**	**T-4**
Operational	15	15.00	14.00	14.00	14.00
Sustainable Transportation	15	11.25	13.75	10.00	11.25
Natural Environment	10	10.00	9.17	9.17	10.00
Urban Design	15	11.67	13.33	6.67	11.67
Socio-Economic	5	3.89	4.44	4.44	3.33
Cultural Environment	35	35.00	31.11	31.11	31.11
Financial	5	5.00	3.33	3.33	3.89
TOTAL	**100**	**91.81**	**89.14**	**78.72**	**85.25**
RANK		**1**	**2**	**4**	**3**

Weighting #7					
Category	**Weighting**	**T-1**	**T-2**	**T-3**	**T-4**
Operational	15	15.00	14.00	14.00	14.00
Sustainable Transportation	15	11.25	13.75	10.00	11.25
Natural Environment	10	10.00	9.17	9.17	10.00
Urban Design	15	11.67	13.33	6.67	11.67
Socio-Economic	5	3.89	4.44	4.44	3.33
Cultural Environment	5	5.00	4.44	4.44	4.44
Financial	35	35.00	23.33	23.33	27.22
TOTAL	**100**	**91.81**	**82.47**	**72.06**	**81.92**
RANK		**1**	**2**	**4**	**3**

APPENDIX F

Preferred Design





NOTE:

INTERSECTIONS ARE BASED ON NORTH OAKVILLE EAST SECONDARY PLAN AND WILL BE CONFIRMED AS PART OF DEVELOPMENT APPLICATIONS.

MMM GROUP

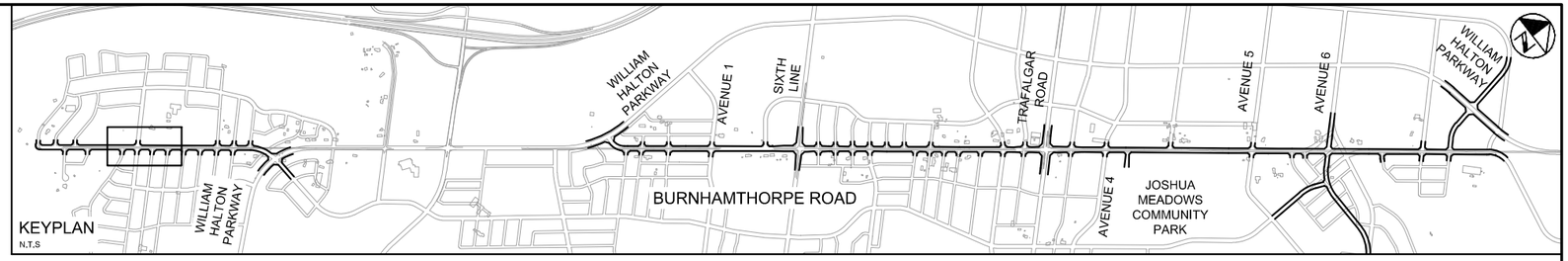
OAKVILLE

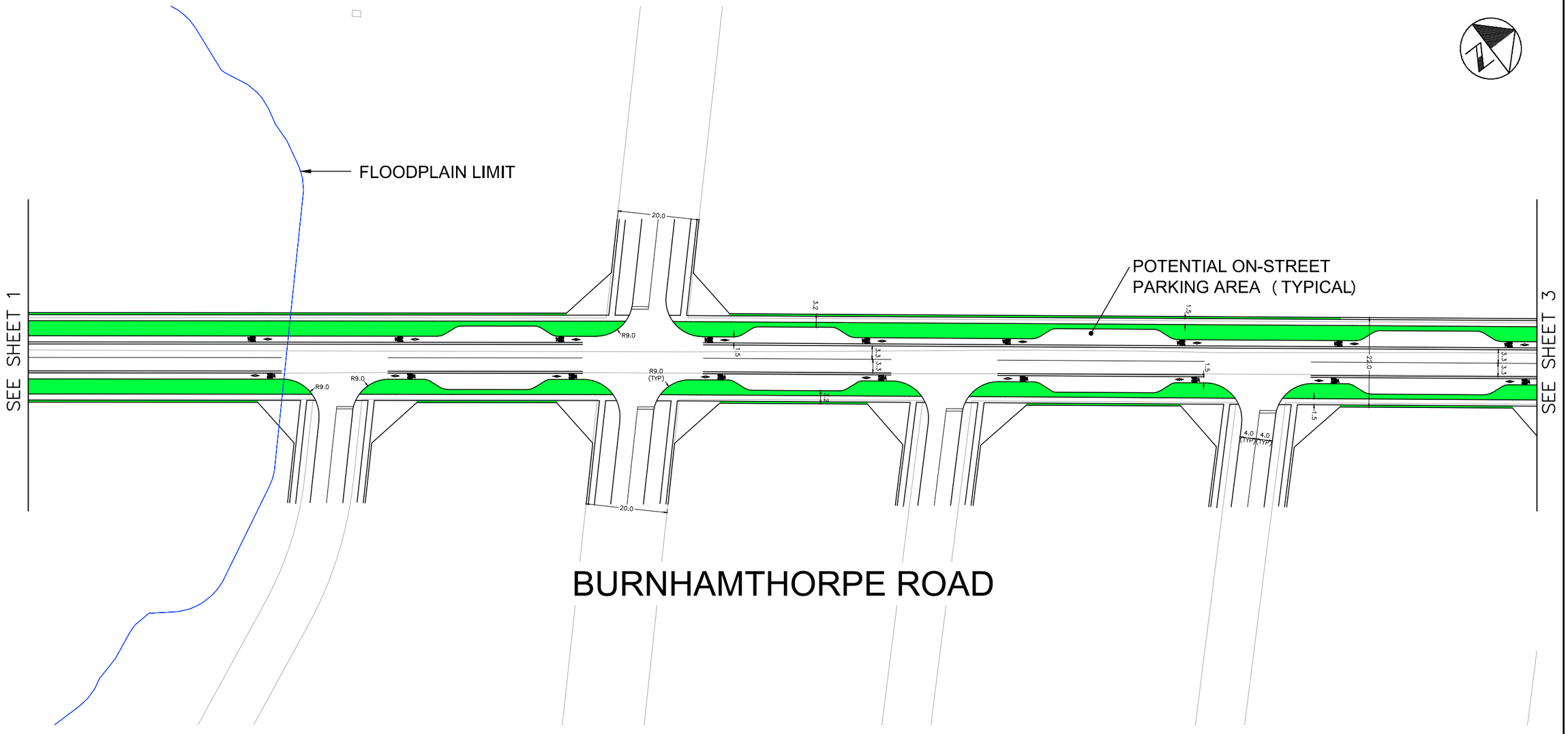
TITLE

LAYOUT PLAN

BURNHAMTHORPE ROAD CHARACTER STUDY

Consultant File № 16–13055	SCALE 1 : 1000
CONTRACT № R–2369B–14	Drawing № SHEET 1 OF 20





BURNHAMTHORPE ROAD

NOTE:

INTERSECTIONS ARE BASED ON NORTH OAKVILLE EAST SECONDARY PLAN AND WILL BE CONFIRMED AS PART OF DEVELOPMENT APPLICATIONS.

MMM GROUP

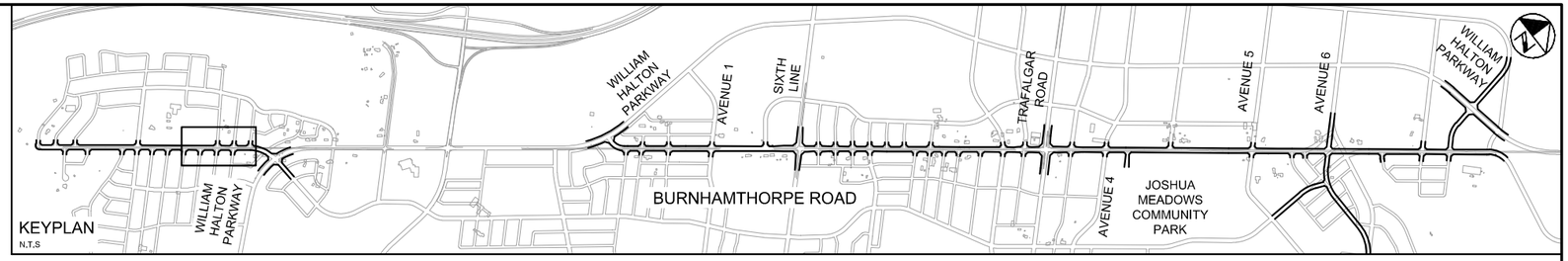
OAKVILLE

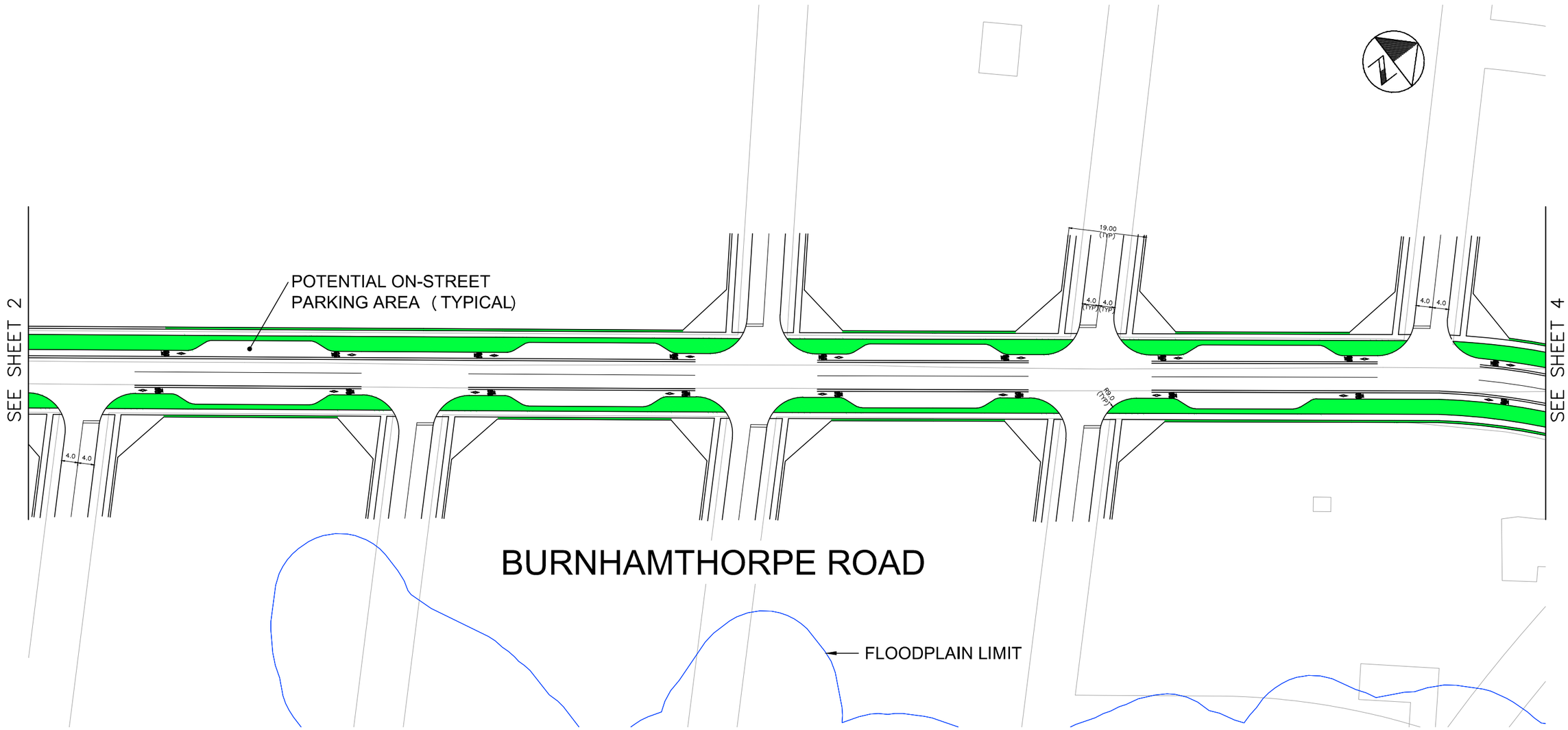
TITLE

LAYOUT PLAN

BURNHAMTHORPE ROAD
CHARACTER STUDY

Consultant File № 16–13055	SCALE 1 : 1000
CONTRACT № R–2369B–14	Drawing № SHEET 2 OF 20





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MMM GROUP

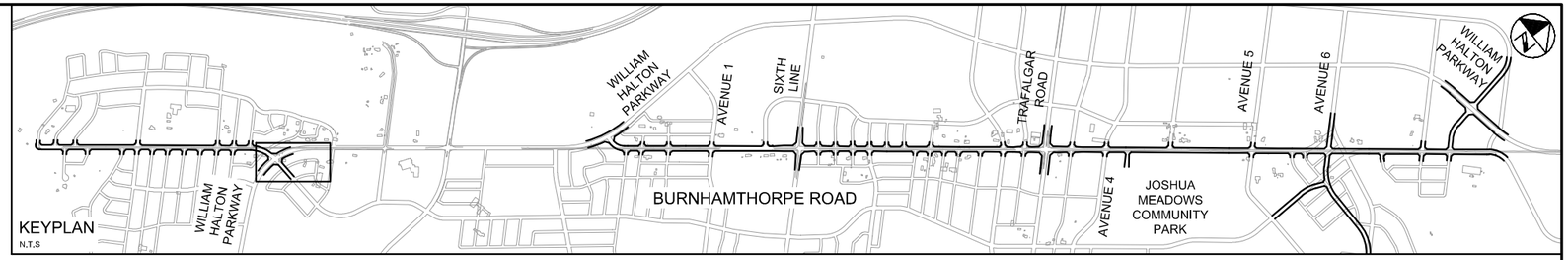
OAKVILLE

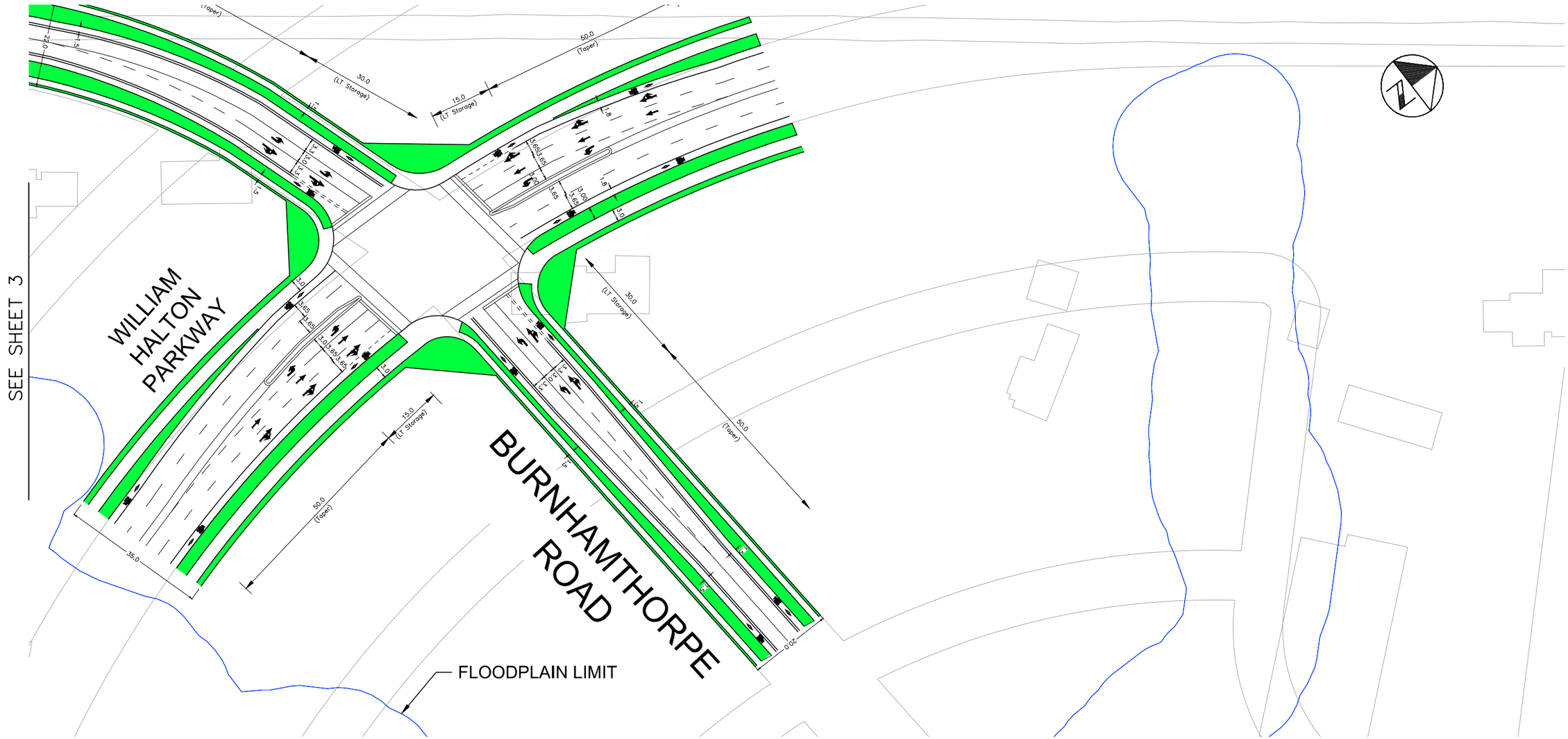
TITLE

LAYOUT PLAN

BURNHAMTHORPE ROAD
CHARACTER STUDY

Consultant File № 16–13055	SCALE 1 : 1000
CONTRACT № R–2369B–14	Drawing № SHEET 3 OF 20





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MMM GROUP

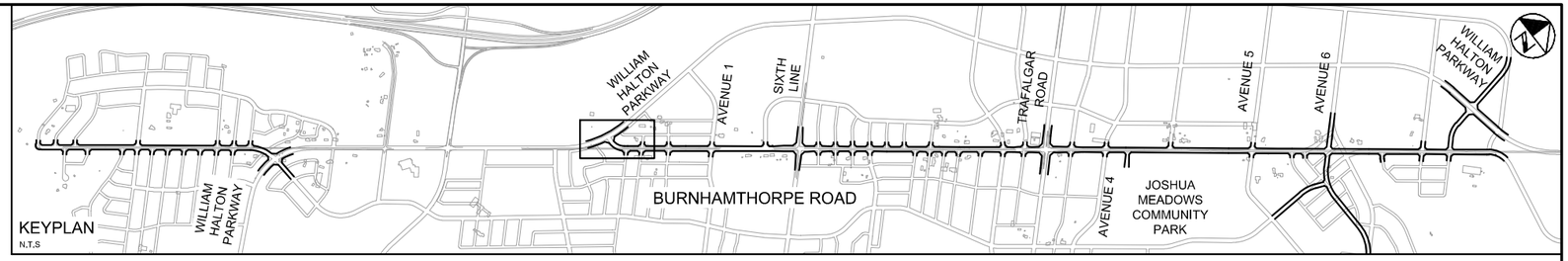
OAKVILLE

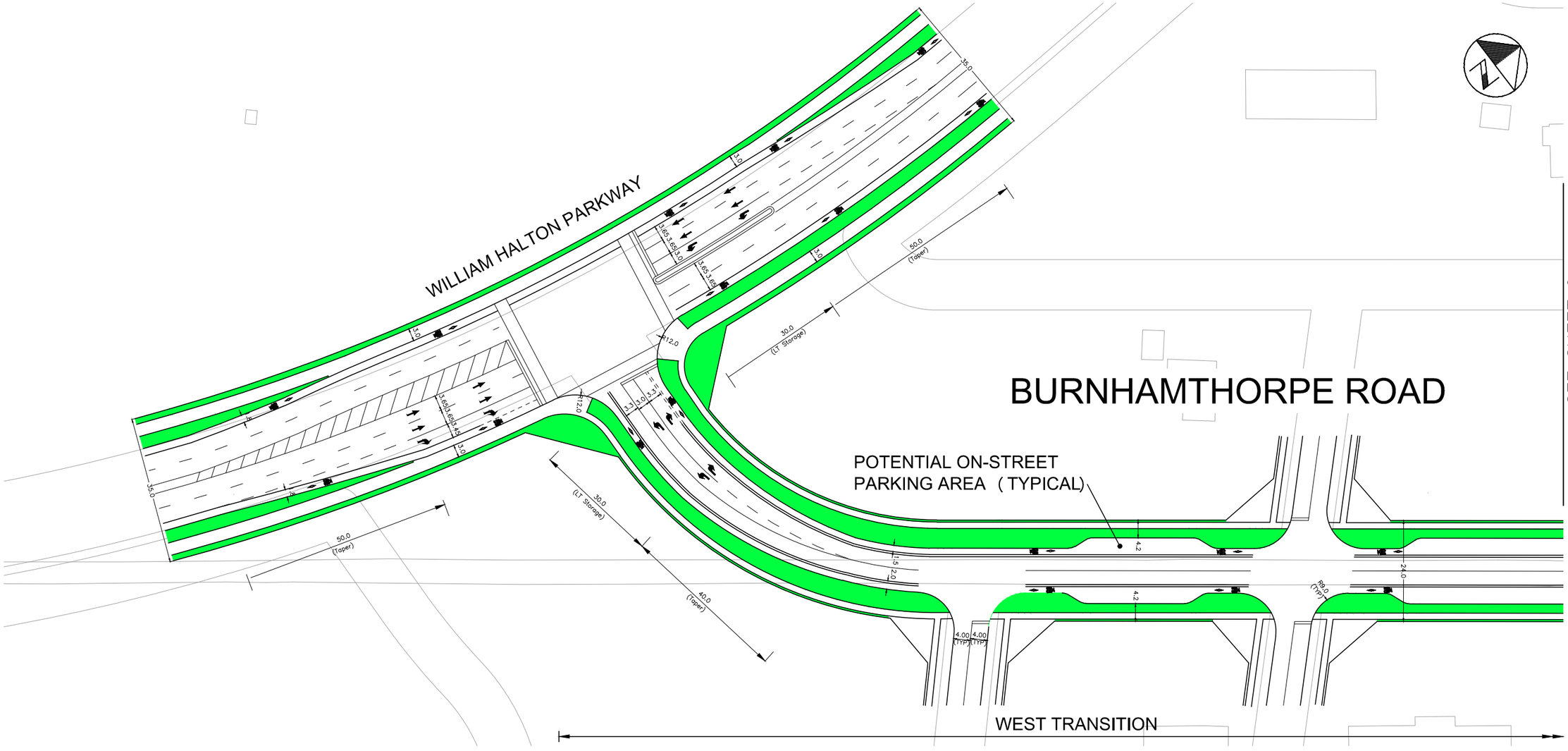
TITLE

LAYOUT PLAN

BURNHAMTHORPE ROAD
CHARACTER STUDY

Consultant File № 16–13055	SCALE 1 : 1000
CONTRACT № R–2369B–14	Drawing № SHEET 4 OF 20





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MMM GROUP

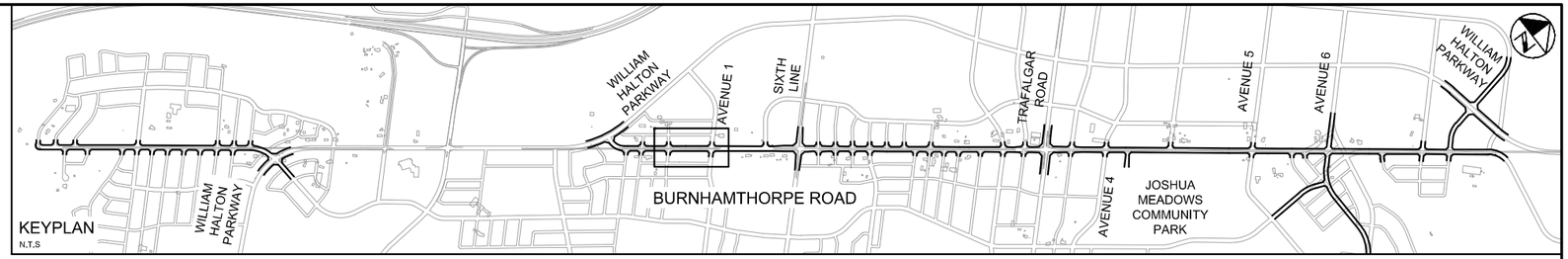
OAKVILLE

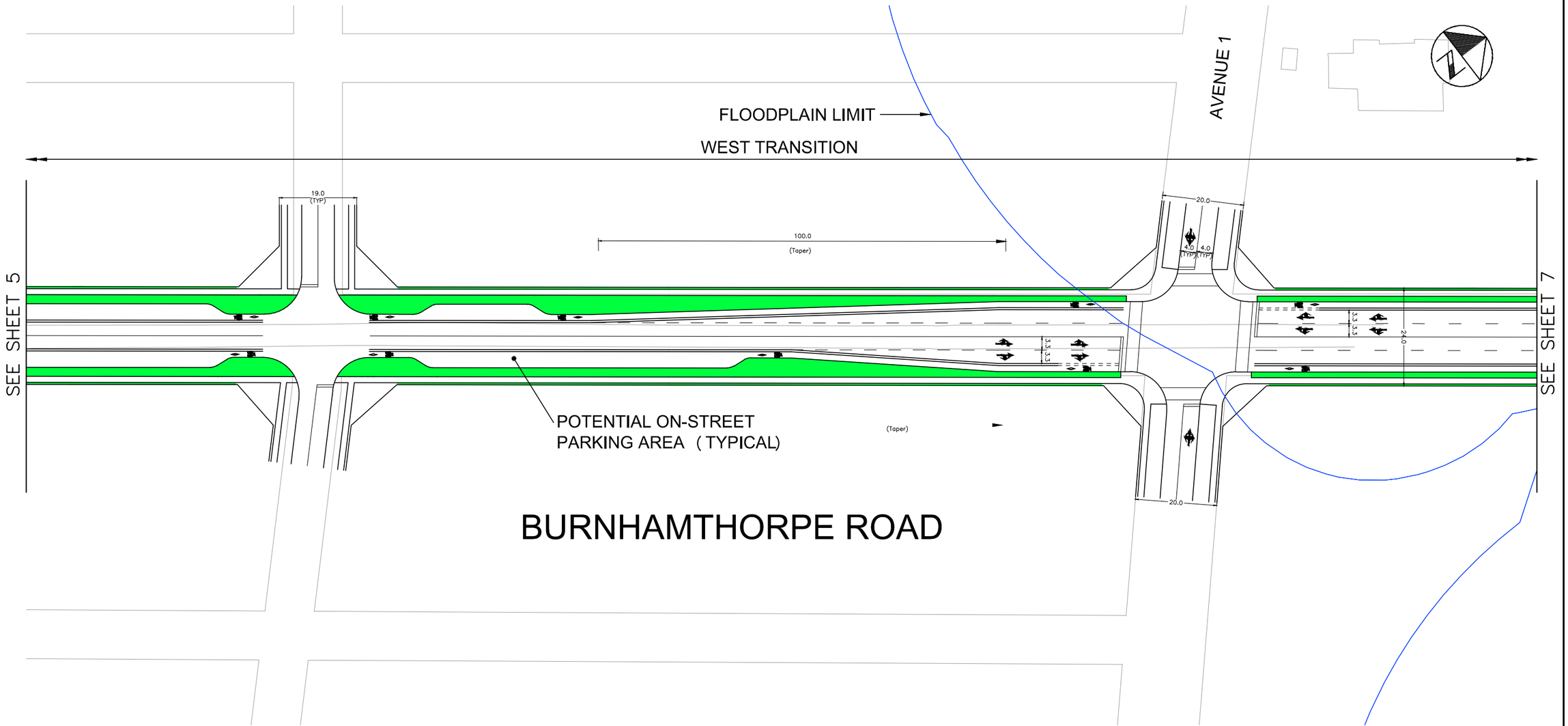
TITLE

LAYOUT PLAN

BURNHAMTHORPE ROAD CHARACTER STUDY

Consultant File № 16–13055	SCALE 1 : 1000
CONTRACT № R–2369B–14	Drawing № SHEET 5 OF 20





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MMM GROUP

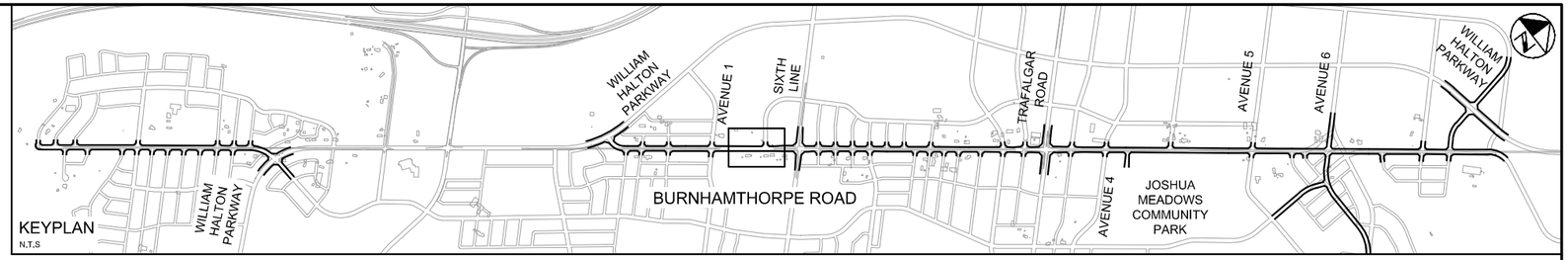
OAKVILLE

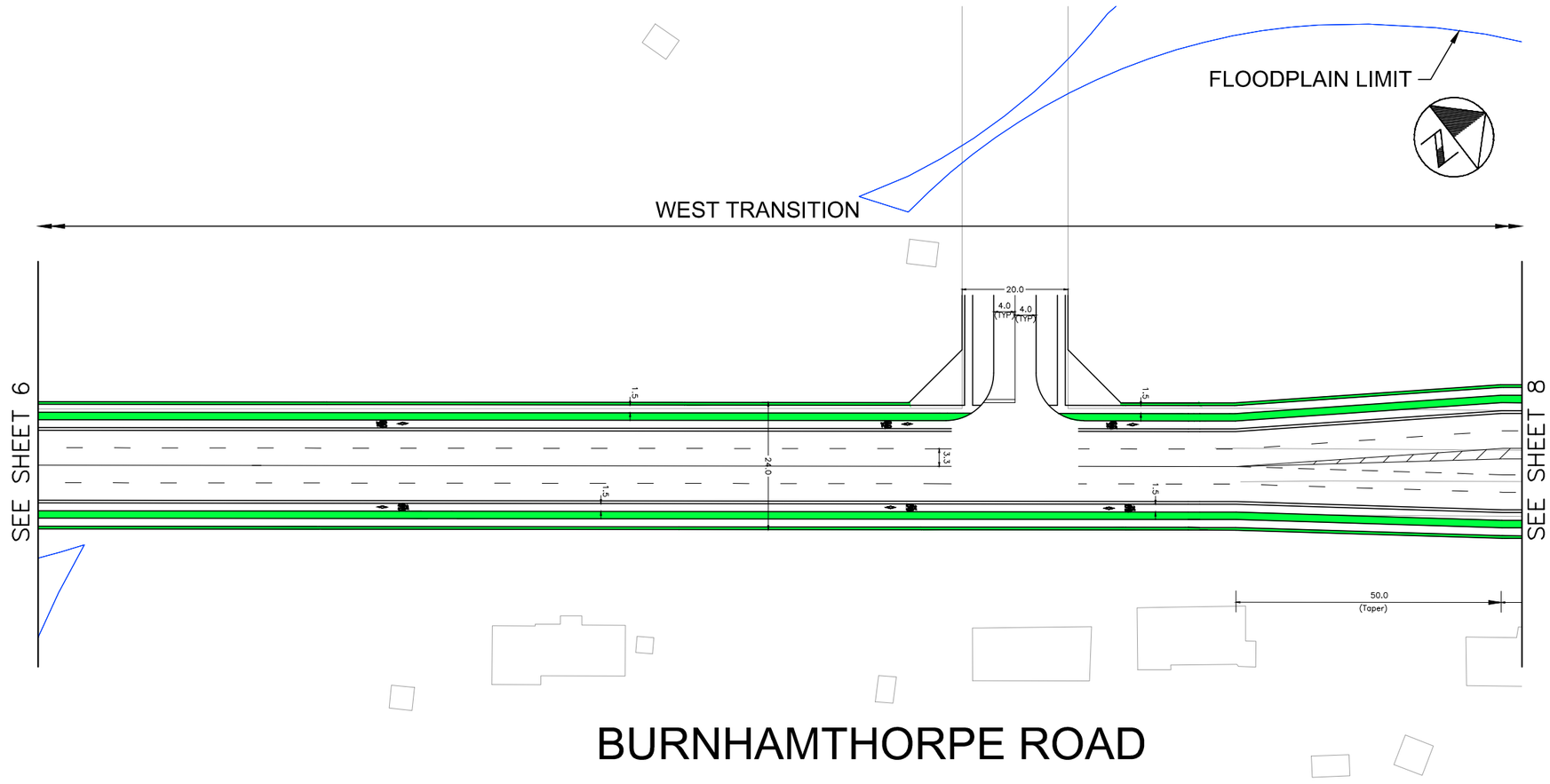
TITLE

LAYOUT PLAN

BURNHAMTHORPE ROAD CHARACTER STUDY

Consultant File № 16–13055	SCALE 1 : 1000
CONTRACT № R–2369B–14	Drawing № SHEET 6 OF 20





BURNHAMTHORPE ROAD

NOTE:

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MMM GROUP

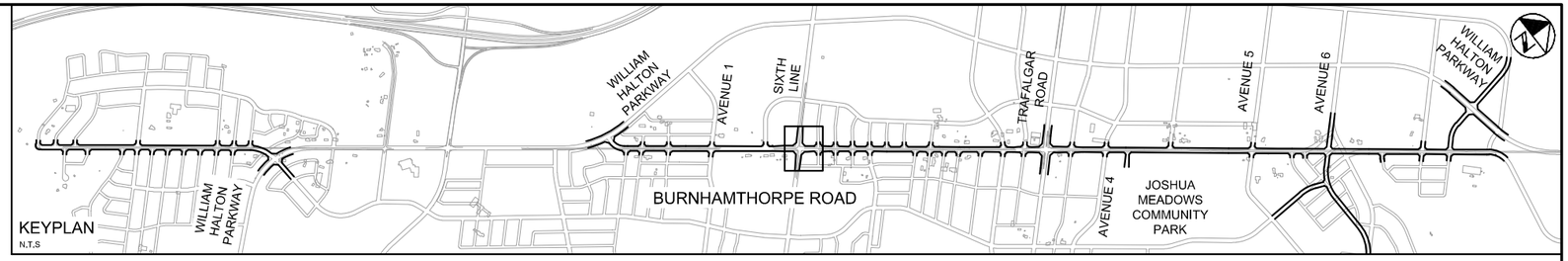
OAKVILLE

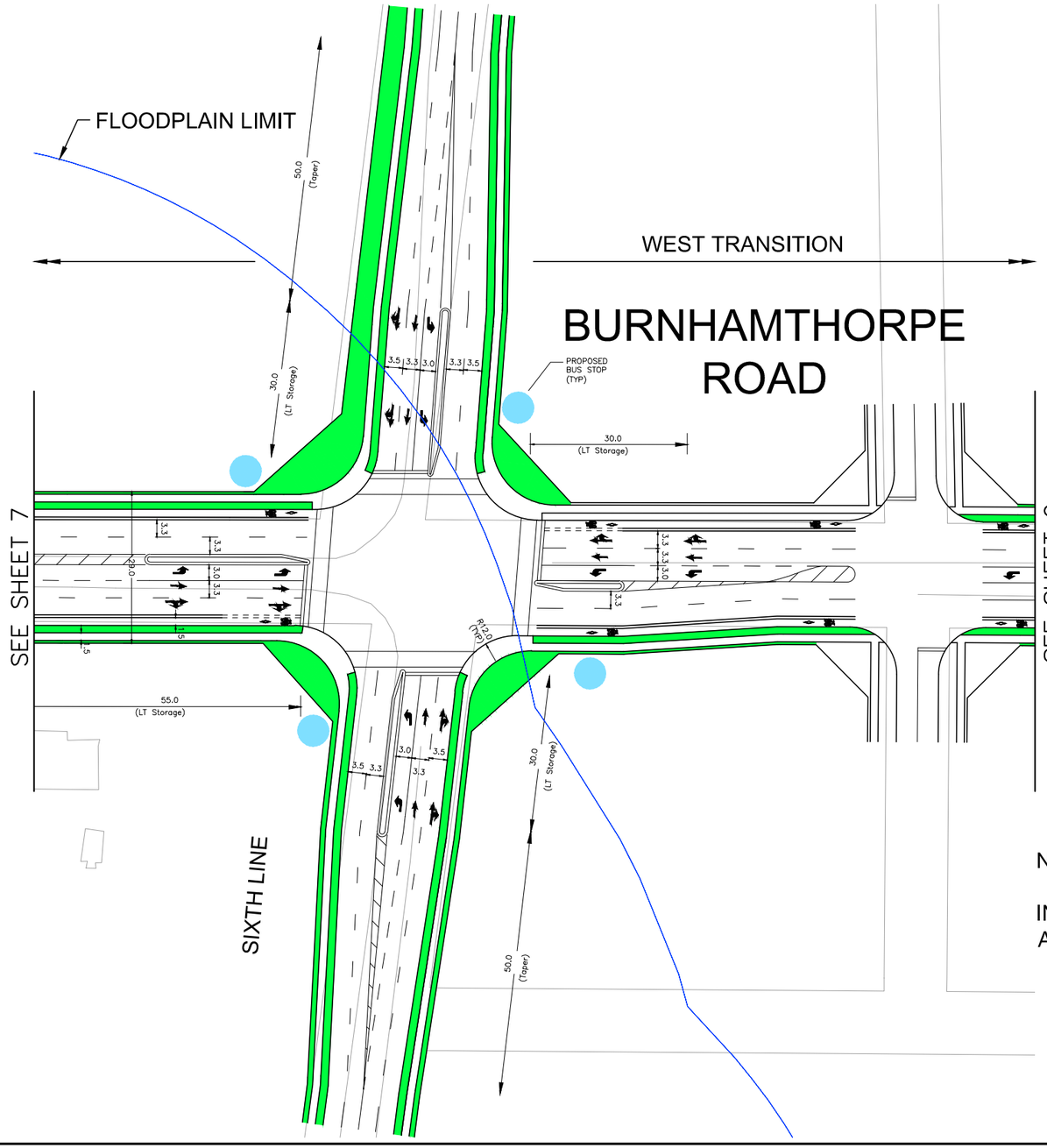
TITLE

LAYOUT PLAN

BURNHAMTHORPE ROAD CHARACTER STUDY

Consultant File № 16-13055	SCALE 1 : 1000
CONTRACT № R-2369B-14	Drawing № SHEET 7 OF 20





NOTE:

INTERSECTIONS ARE BASED ON NORTH OAKVILLE EAST SECONDARY PLAN AND WILL BE CONFIRMED AS PART OF DEVELOPMENT APPLICATIONS.

MMM GROUP

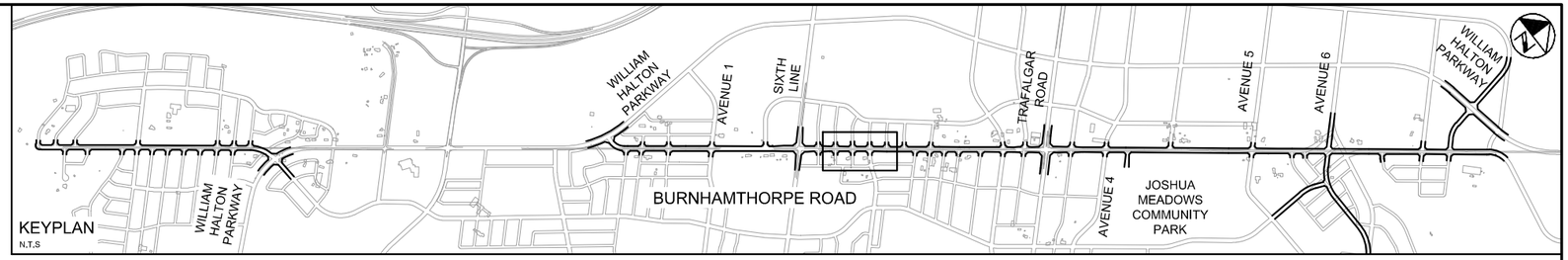
OAKVILLE

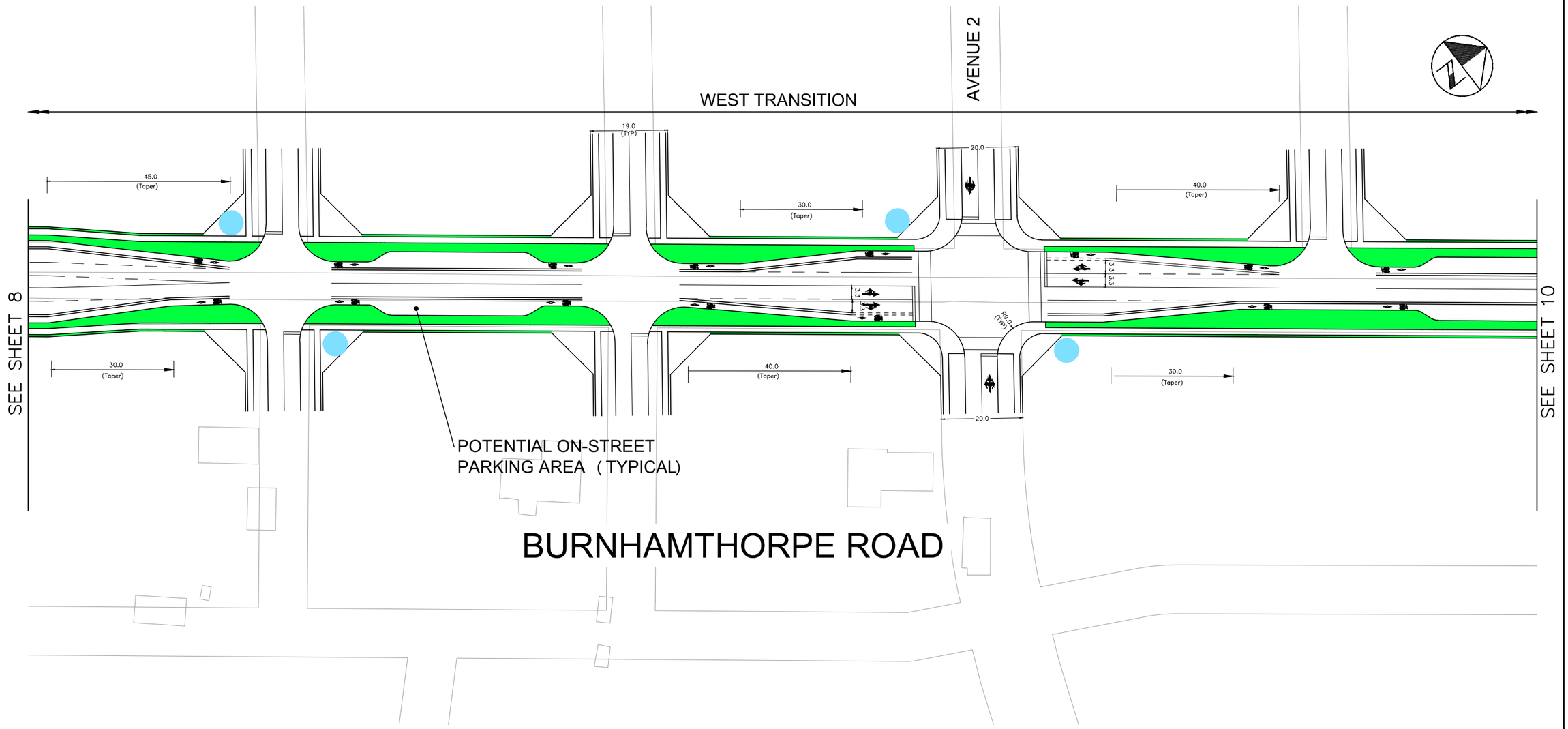
TITLE

LAYOUT PLAN

BURNHAMTHORPE ROAD
CHARACTER STUDY

Consultant File № 16-13055	SCALE 1 : 1000
CONTRACT № R-2369B-14	Drawing № SHEET 8 OF 20





NOTE:

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MMM GROUP

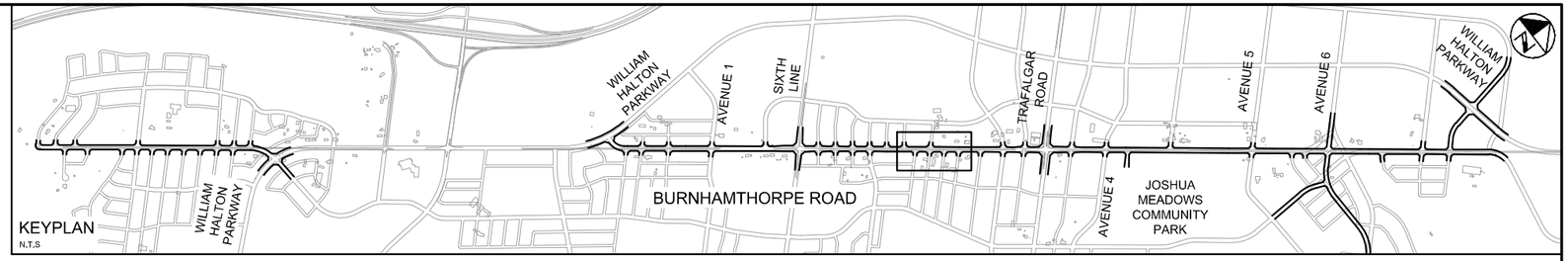
OAKVILLE

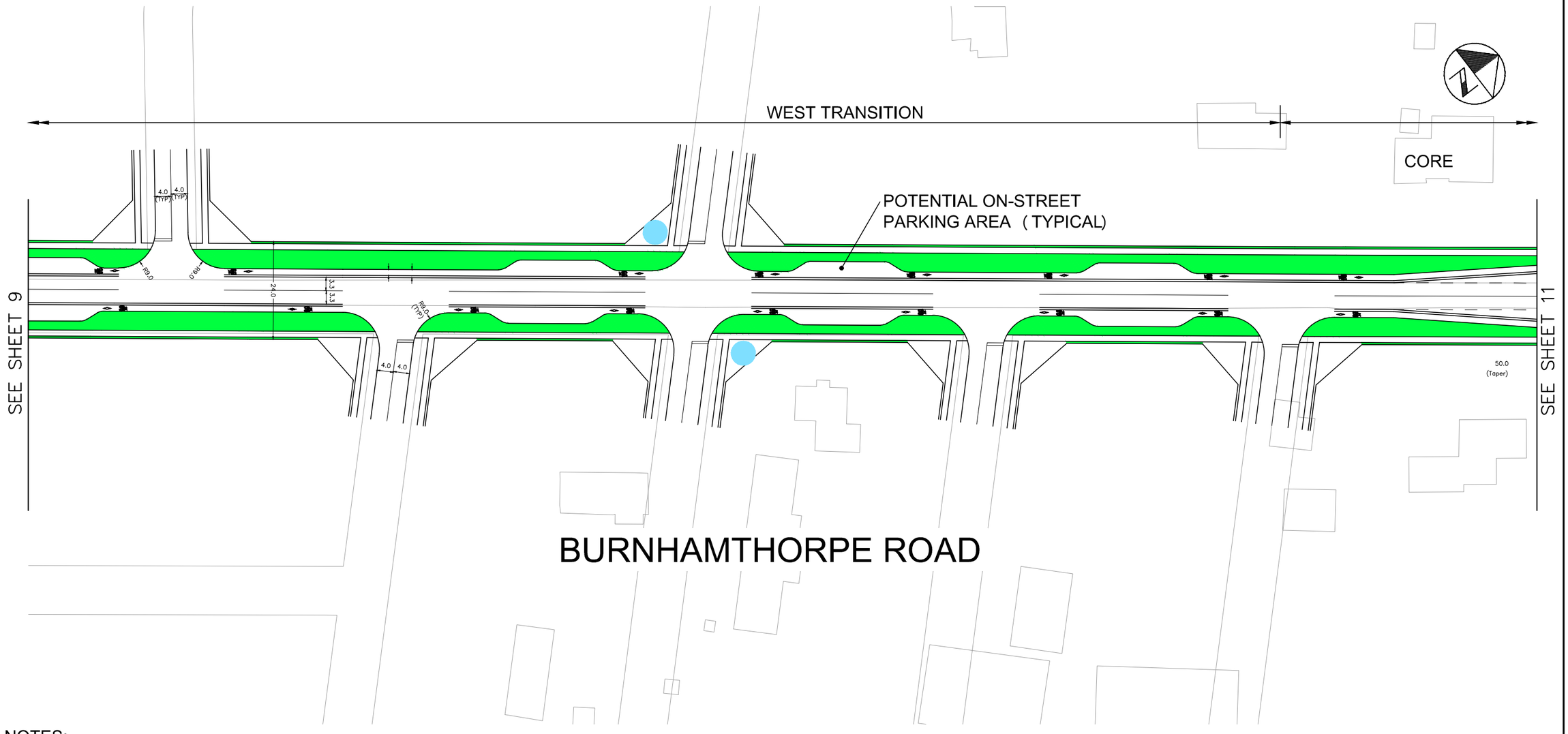
TITLE

LAYOUT PLAN

BURNHAMTHORPE ROAD
CHARACTER STUDY

Consultant File № 16–13055	SCALE 1 : 1000
CONTRACT № R–2369B–14	Drawing № SHEET 9 OF 20





NOTES:

1. INTERSECTIONS ARE BASED ON NORTH OAKVILLE EAST SECONDARY PLAN AND WILL BE CONFIRMED AS PART OF DEVELOPMENT APPLICATIONS.

2. PARKING PERMITTED ON BOTH SIDES OF BURNHAMTHORPE ROAD IN CORE AREA DURING OFF-PEAK PERIODS.

MMM GROUP

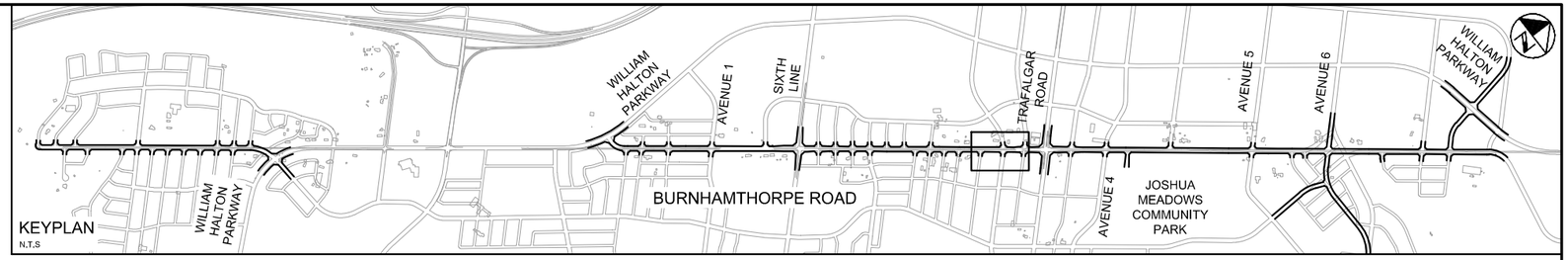
OAKVILLE

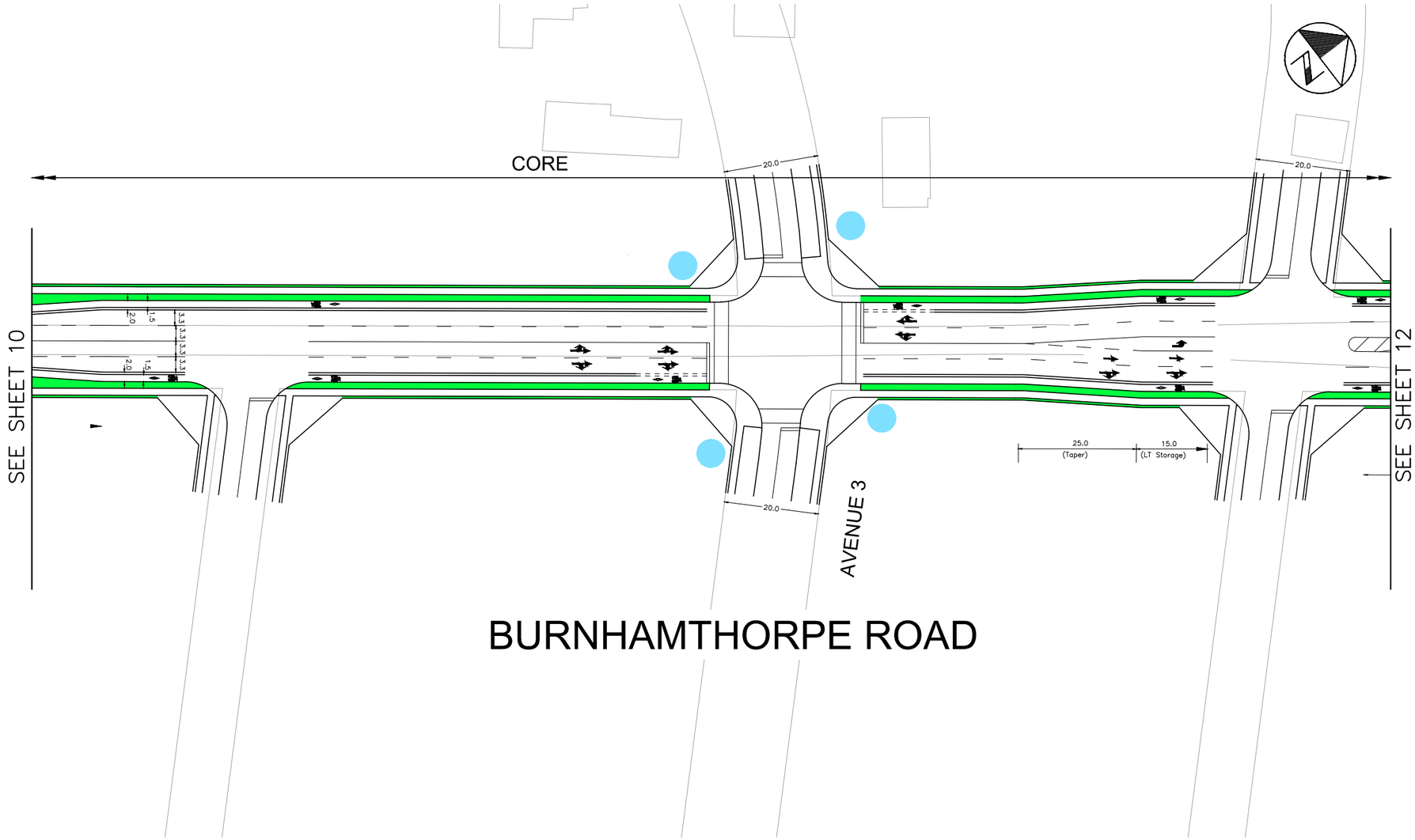
TITLE

LAYOUT PLAN

BURNHAMTHORPE ROAD CHARACTER STUDY

Consultant File № 16–13055	SCALE 1 : 1000
CONTRACT № R–2369B–14	Drawing № SHEET 10 OF 20





BURNHAMTHORPE ROAD

NOTES:

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2. PARKING PERMITTED ON BOTH SIDES OF BURNHAMTHORPE ROAD IN CORE AREA DURING OFF-PEAK PERIODS.

MMM GROUP

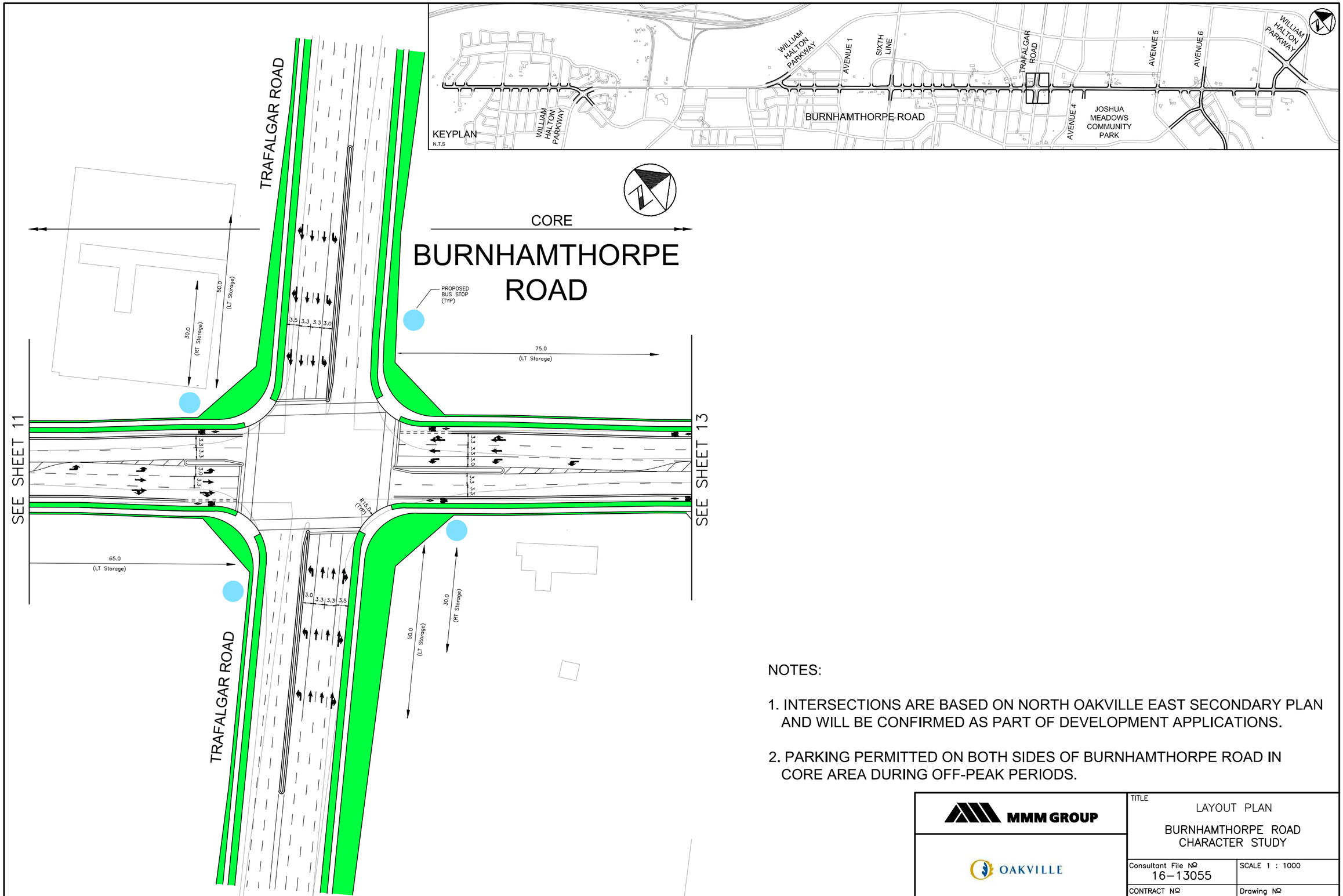
OAKVILLE

TITLE

LAYOUT PLAN

BURNHAMTHORPE ROAD
CHARACTER STUDY

Consultant File № 16–13055	SCALE 1 : 1000
CONTRACT № R–2369B–14	Drawing № SHEET 11 OF 20



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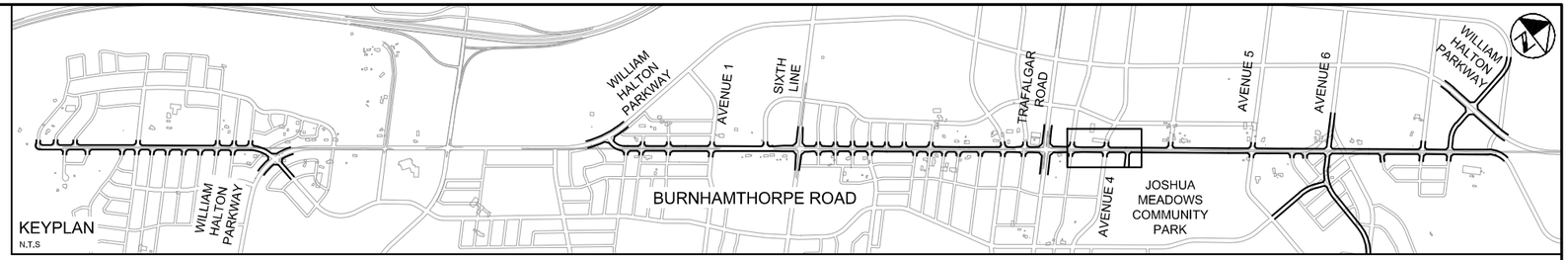
2. PARKING PERMITTED ON BOTH SIDES OF BURNHAMTHORPE ROAD IN CORE AREA DURING OFF-PEAK PERIODS.

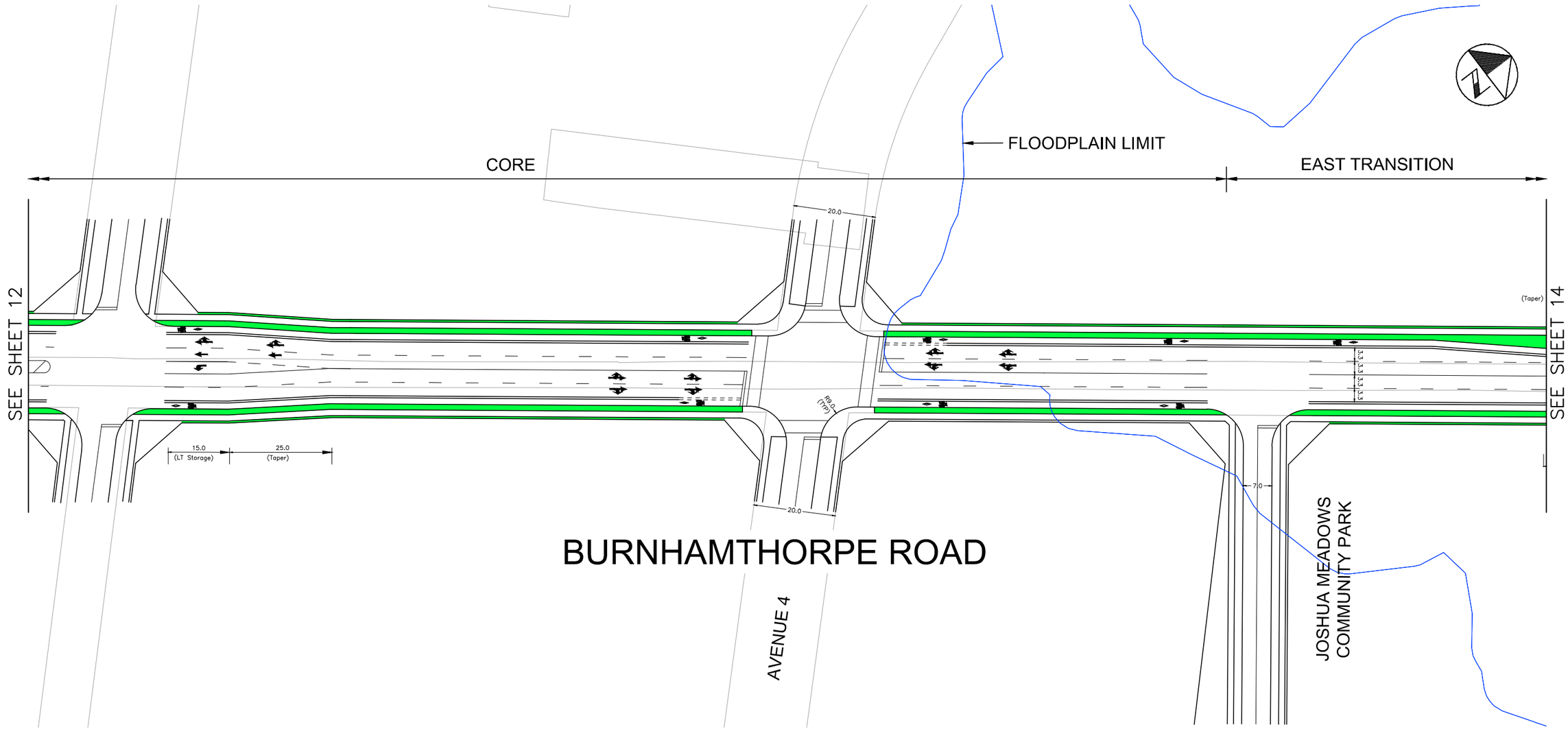
MMM GROUP

OAKVILLE

TITLE
LAYOUT PLAN
BURNHAMTHORPE ROAD
CHARACTER STUDY

Consultant File № 16–13055	SCALE 1 : 1000
CONTRACT № R–2369B–14	Drawing № SHEET 12 OF 20





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MMM GROUP

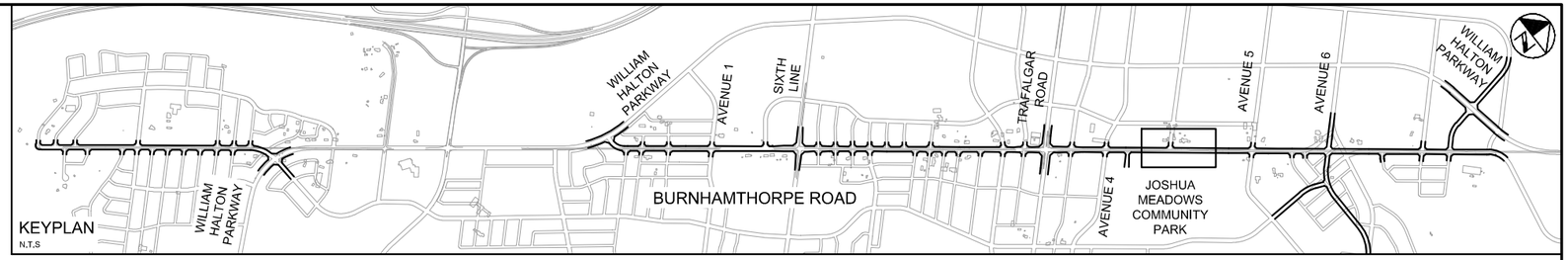
OAKVILLE

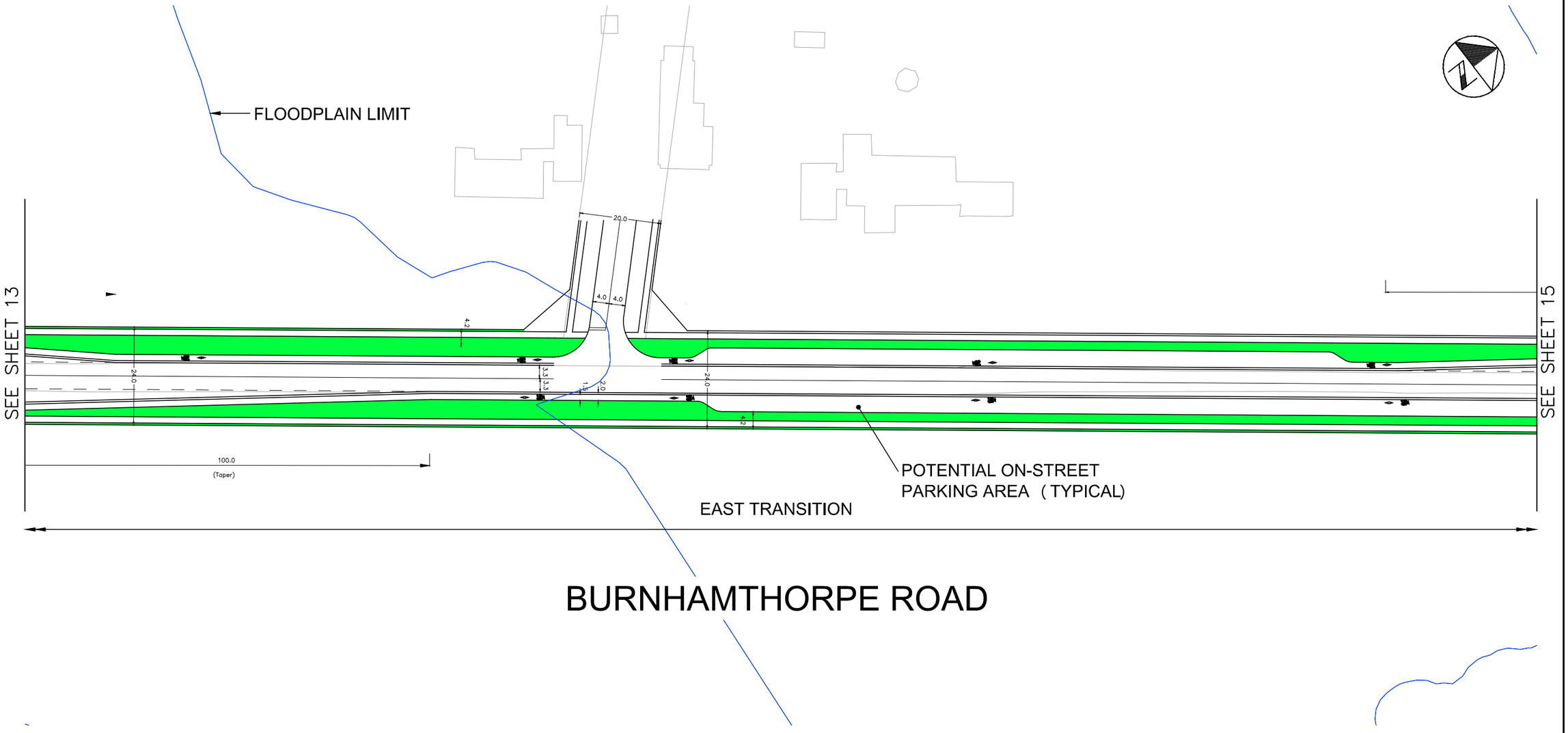
TITLE

LAYOUT PLAN

BURNHAMTHORPE ROAD CHARACTER STUDY

Consultant File № 16–13055	SCALE 1 : 1000
CONTRACT № R–2369B–14	Drawing № SHEET 13 OF 20





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MMM GROUP

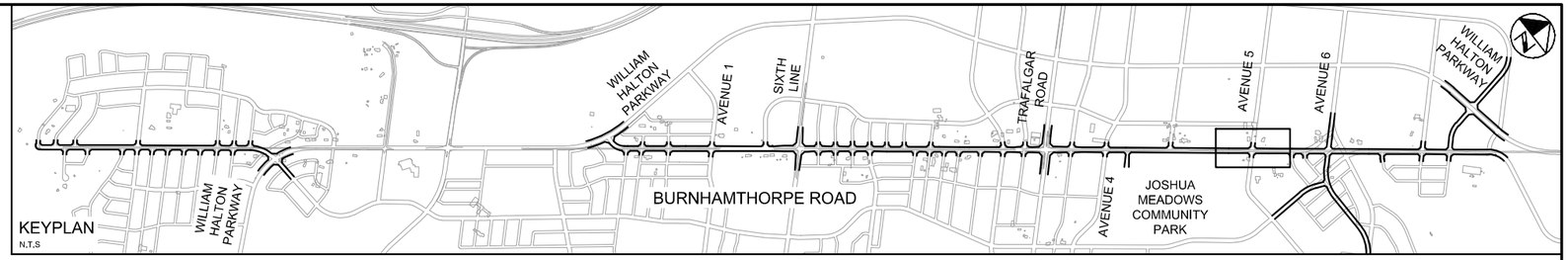
OAKVILLE

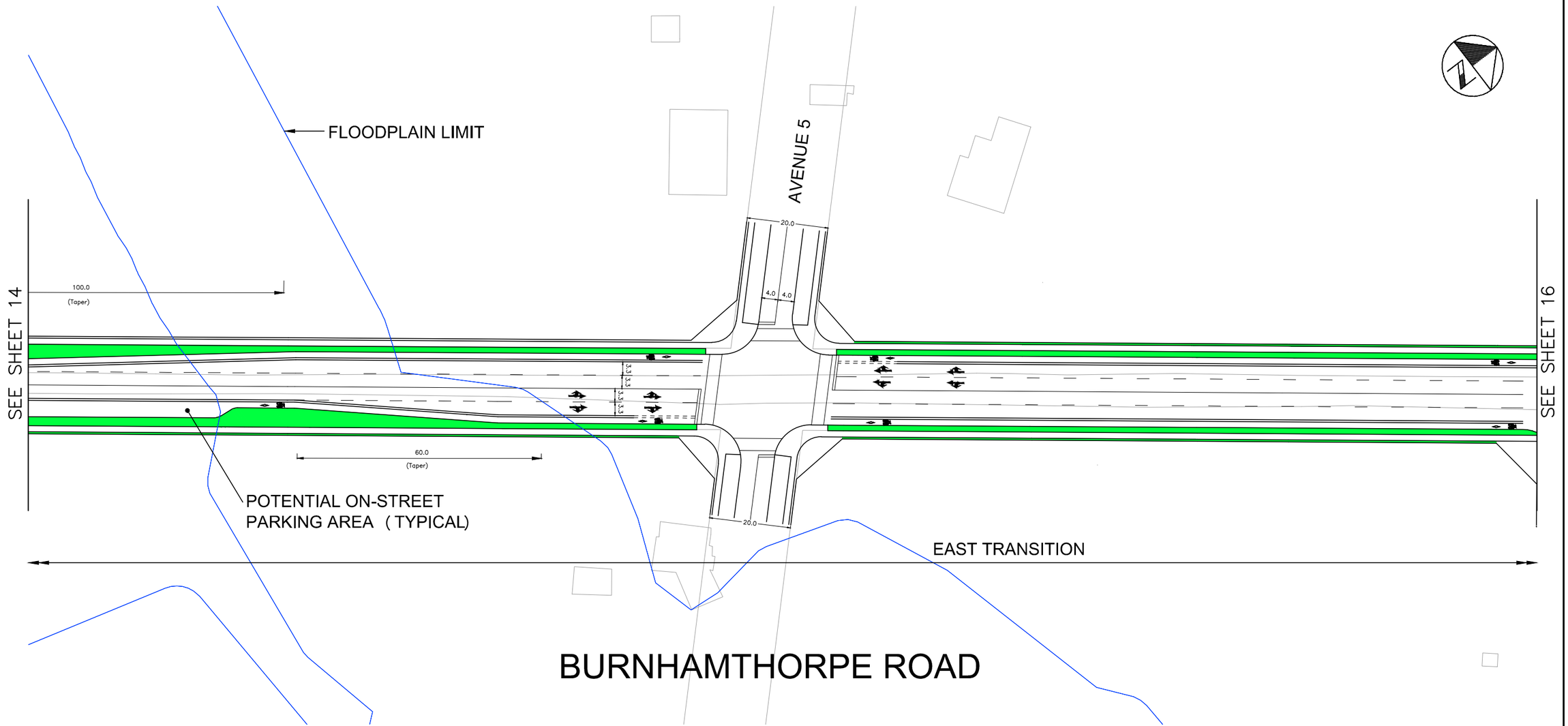
TITLE

LAYOUT PLAN

BURNHAMTHORPE ROAD
CHARACTER STUDY

Consultant File № 16–13055	SCALE 1 : 1000
CONTRACT № R–2369B–14	Drawing № SHEET 14 OF 20





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MMM GROUP

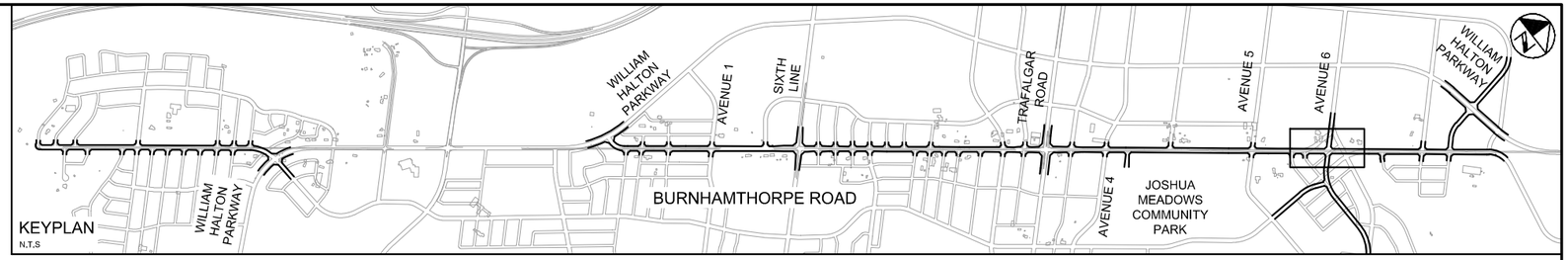
OAKVILLE

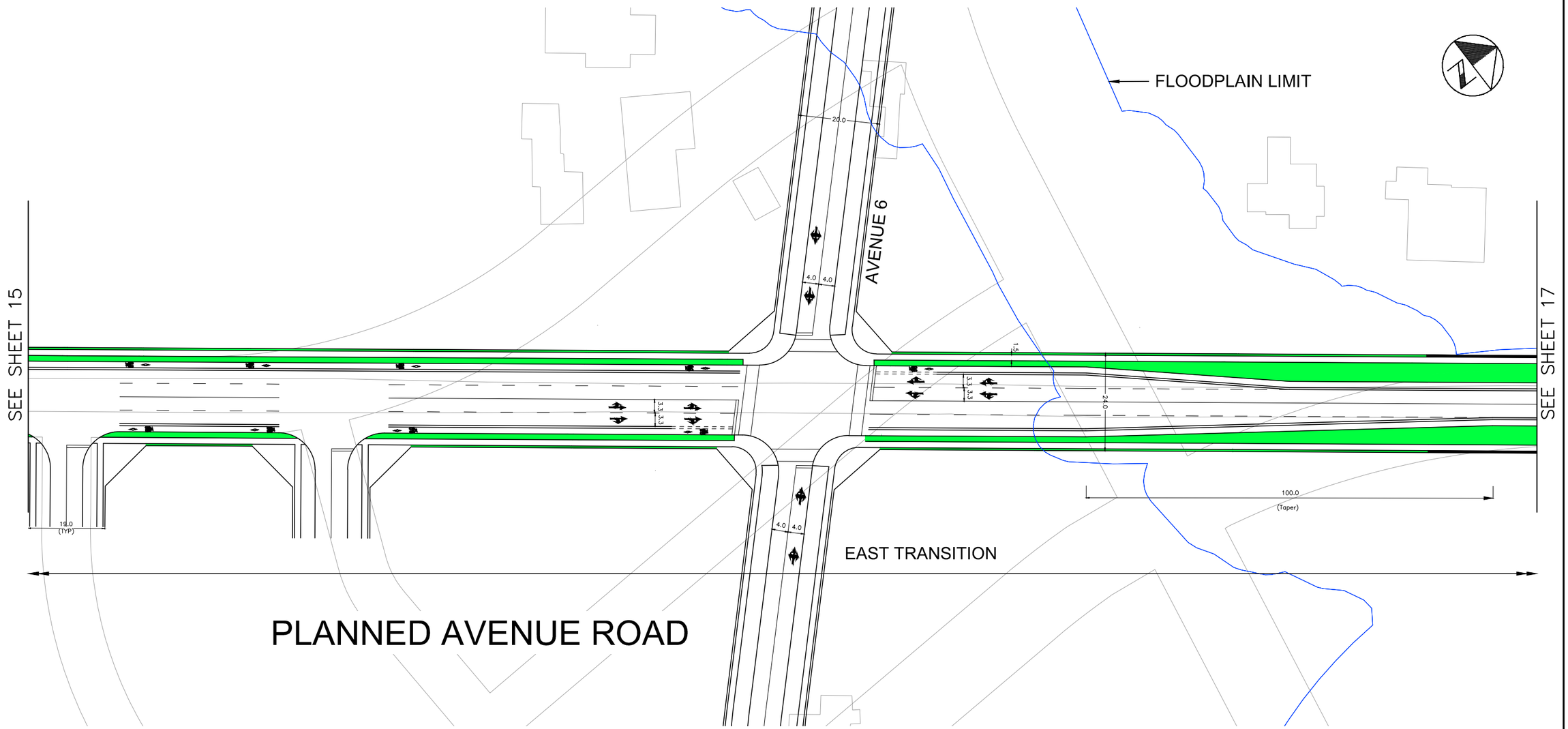
TITLE

LAYOUT PLAN

BURNHAMTHORPE ROAD
CHARACTER STUDY

Consultant File № 16–13055	SCALE 1 : 1000
CONTRACT № R–2369B–14	Drawing № SHEET 15 OF 20





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MMM GROUP

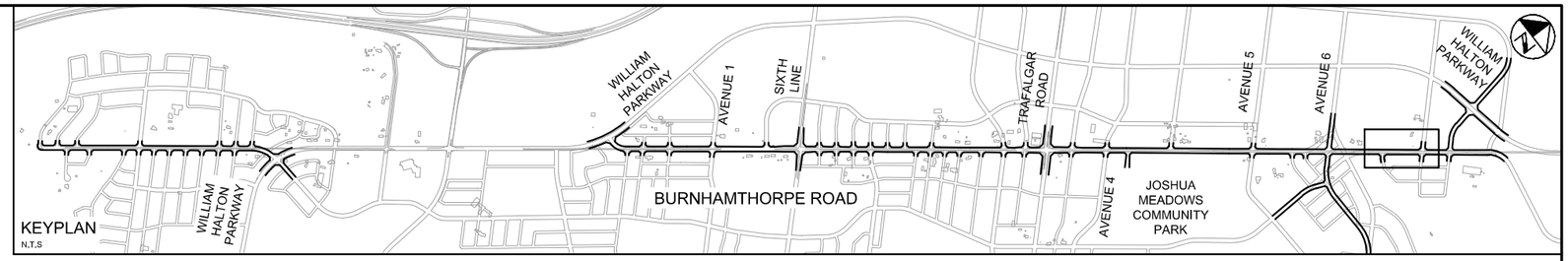
OAKVILLE

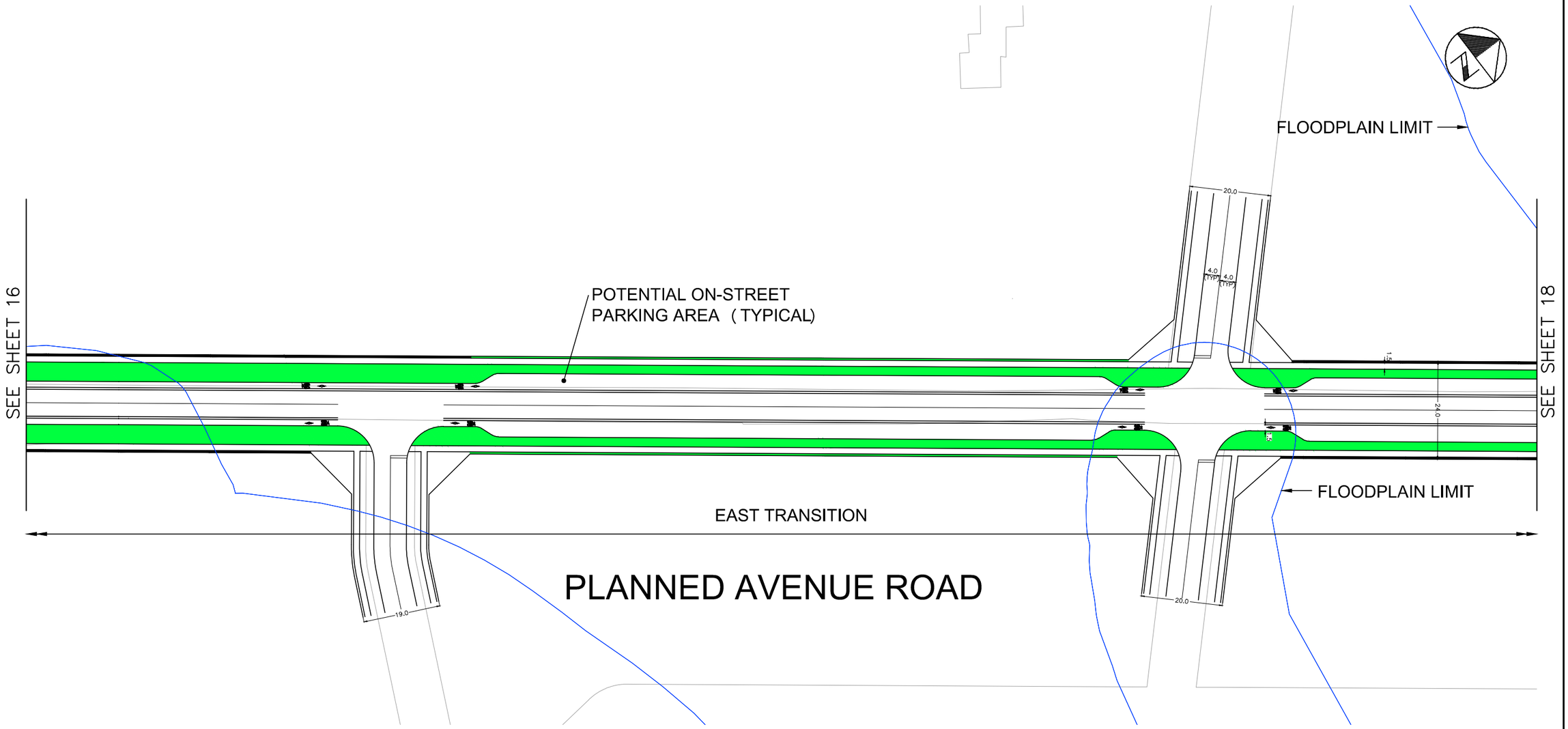
TITLE

LAYOUT PLAN

BURNHAMTHORPE ROAD
CHARACTER STUDY

Consultant File № 16–13055	SCALE 1 : 1000
CONTRACT № R–2369B–14	Drawing № SHEET 16 OF 20





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MMM GROUP

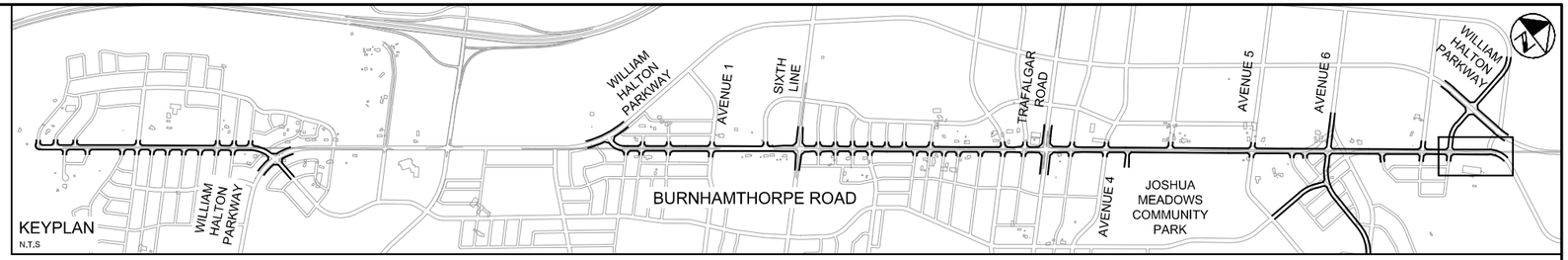
OAKVILLE

TITLE

LAYOUT PLAN

BURNHAMTHORPE ROAD CHARACTER STUDY

Consultant File № 16-13055	SCALE 1 : 1000
CONTRACT № R-2369B-14	Drawing № SHEET 17 OF 20



FLOODPLAIN LIMIT

EXISTING BURNHAMTHORPE ROAD

PLANNED AVENUE ROAD

FLOODPLAIN LIMIT

SEE SHEET 17

POTENTIAL ON-STREET PARKING AREA (TYPICAL)

EAST TRANSITION

TO NINTH LINE

NOTE:

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MMM GROUP

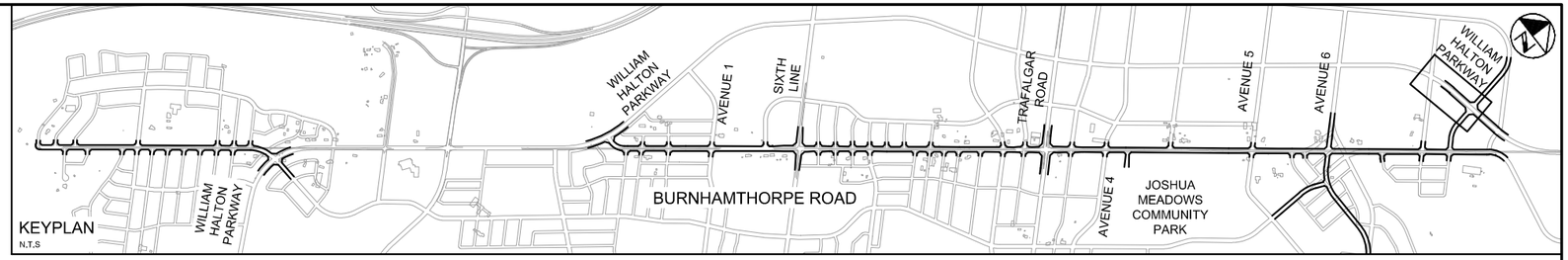
OAKVILLE

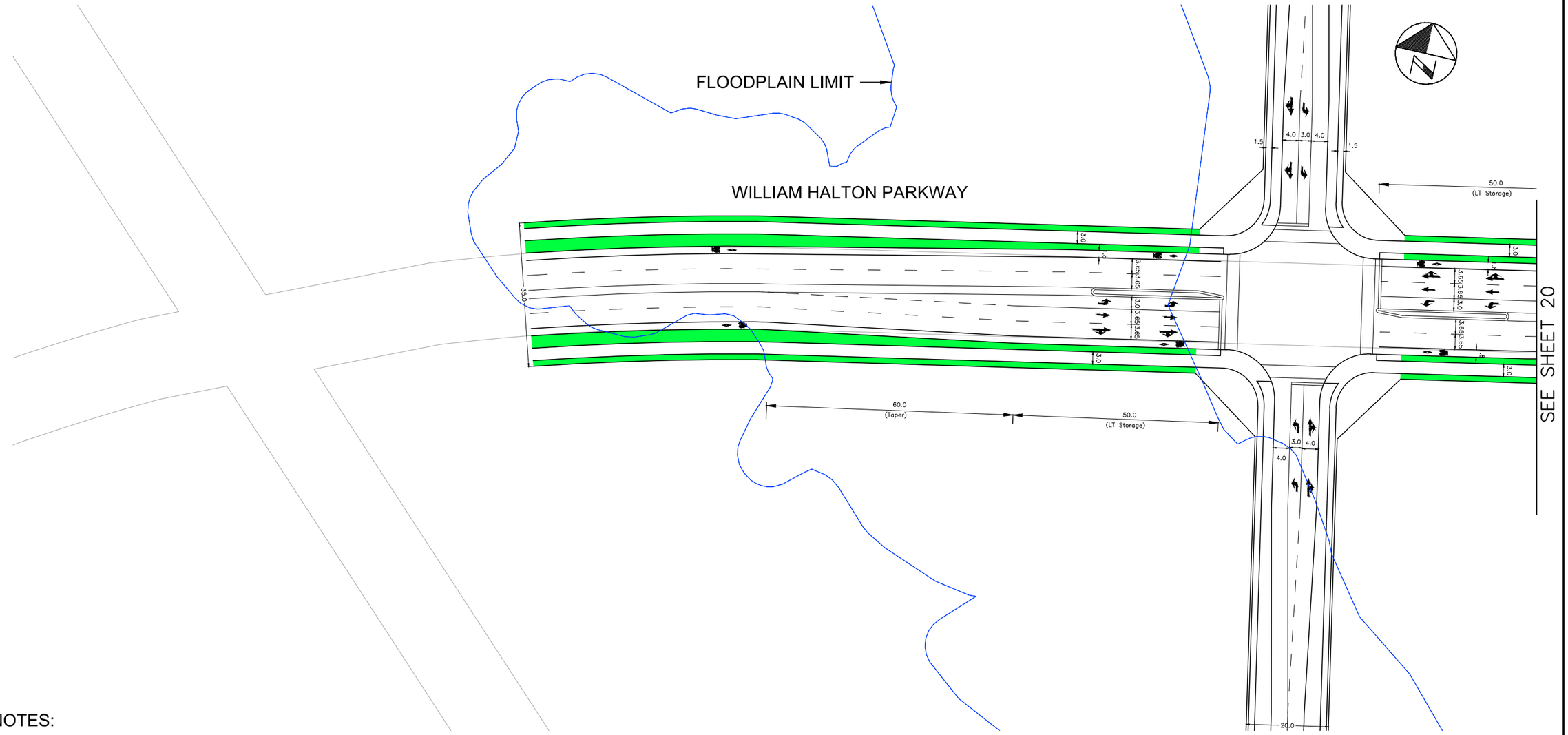
TITLE

LAYOUT PLAN

BURNHAMTHORPE ROAD CHARACTER STUDY

Consultant File № 16–13055	SCALE 1 : 1000
CONTRACT № R–2369B–14	Drawing № SHEET 18 OF 20





NOTES:

1. INTERSECTIONS ARE BASED ON NORTH OAKVILLE EAST SECONDARY PLAN AND WILL BE CONFIRMED AS PART OF DEVELOPMENT APPLICATIONS.

2. ALIGNMENT OF NORTH OAKVILLE TRANSPORTATION CORRIDOR AND CONNECTION TO BURNHAMTHORPE ROAD TO BE DETERMINED DURING DETAIL DESIGN.

MMM GROUP

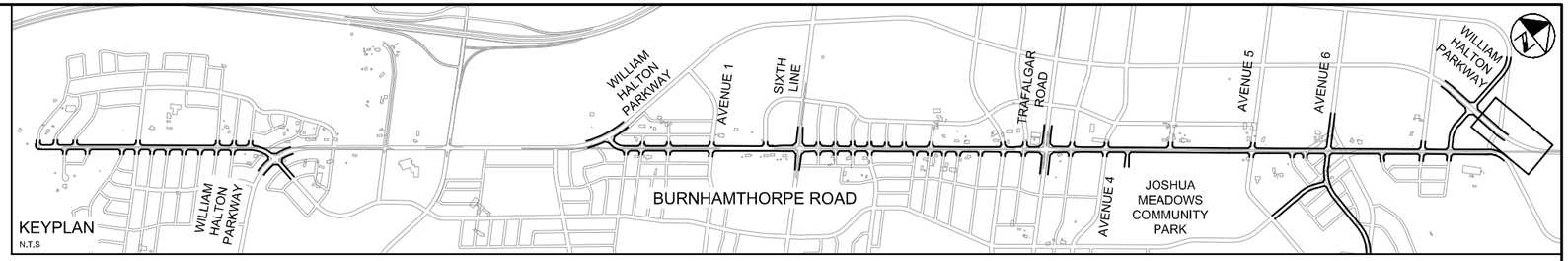
OAKVILLE

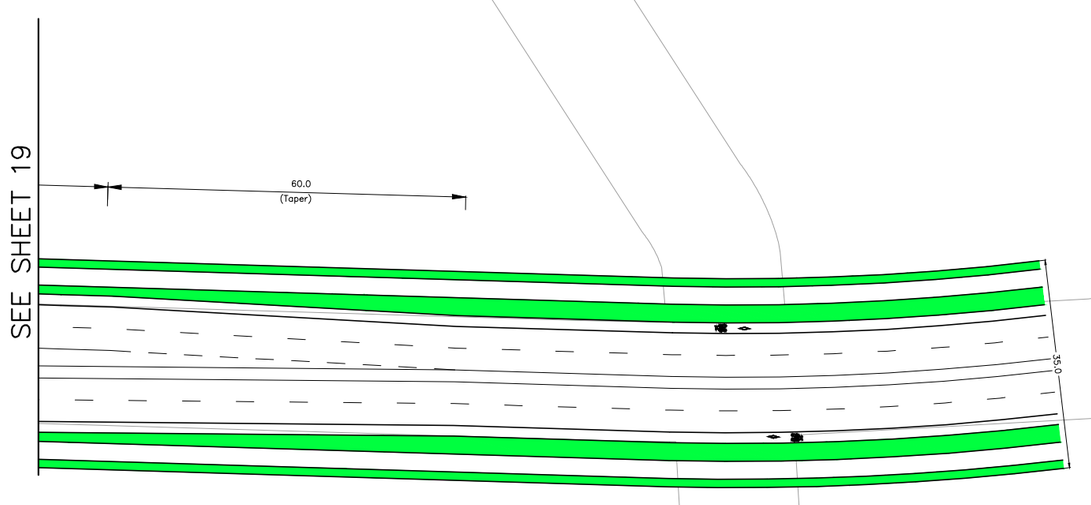
TITLE

LAYOUT PLAN

BURNHAMTHORPE ROAD
CHARACTER STUDY

Consultant File № 16–13055	SCALE 1 : 1000
CONTRACT № R–2369B–14	Drawing № SHEET 19 OF 20





WILLIAM HALTON PARKWAY

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MMM GROUP

OAKVILLE

TITLE

LAYOUT PLAN

BURNHAMTHORPE ROAD
CHARACTER STUDY

Consultant File № 16–13055	SCALE 1 : 1000
CONTRACT № R–2369B–14	Drawing № SHEET 20 OF 20

APPENDIX G

Preliminary Cost Estimate

BURNHAMTHORPE ROAD CHARACTER STUDY
ROADWORK (NEW CONSTRUCTION)
HALTON REGION

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY	ESTIMATED UNIT PRICE	ESTIMATED PRICE
1	Earth Excavation (Grading)	m^3	69,000	15.00	1,035,000.00
2	Granular 'B' Type II	t	72,500	15.00	1,087,500.00
3	Granular 'A'	t	35,000	18.00	630,000.00
4	Tack Coat	m^2	89,900	0.50	44,950.00
5	Heavy Duty Binder Course (HDBC)	t	25,000	80.00	2,000,000.00
	HL3 High Stability Surface Course	t	10,000	110.00	1,100,000.00
7	Concrete Curb and Gutter, All Types	m	11,700	60.00	702,000.00
8	Concrete Sidewalk	m2	17,600	70.00	1,232,000.00
9	Traffic Signals	ea	2	150,000.00	300,000.00
10	Full Illumination	ls	1	600,000.00	600,000.00
	SUB-TOTAL MAJOR ITEMS				**6,599,450.00**
	20% MINOR ITEMS				1,319,890.00
	15% DRAINAGE				989,917.50
	10% URBAN DESIGN				659,945.00
	15% ENGINEERING				989,917.50
	SUB-TOTAL				10,559,120.00
	25% CONTINGENCY				2,639,780.00
	TOTAL				13,198,900.00