GTA NETWORK CODING

STANDARD

2001 A.M. Peak

EMME/2 Integrated Road and Transit Network

Release 1.0/1.1

Data Management Group
Joint Program in Transportation
University of Toronto

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EMME/2 GTA Network Coding Standard

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Steering Committee

by the

Data Management Group
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City of Hamilton
City of Toronto
GO Transit
Ministry of Transportation of Ontario
Regional Municipality of Durham
Regional Municipality of Halton
Regional Municipality of Peel
Regional Municipality of York
Toronto Transit Commission

Preface

Development of the 2001 GTA-wide EMME/2 network has required some changes to the 1996 GTA Network Coding Standard (as was described in DMG report number 68[1]). Many of the Report 68 statements are still valid and have been transferred to this update with minimal alterations. Changes introduced for 2001 and described here are relevant to releases 1.0 and 1.1 of the 2001 GTA Integrated Road and Transit Network. Release 1.1 effects some corrections and modifications to the current (1.0) version (particularly with regard to screenlines), but the same coding principles and notation are followed for each except where it is explicitly noted. Both releases can be supplied with either of the 1996 or 2001 traffic zone systems. Information for both zone systems is given in this agreement.

The updated coding standard and the network itself have been jointly developed by the Data Management Group and the participating agencies listed on the preceding page.

The EMME/2 Network Coding Standards mentioned in this report are available from the Joint Program in Transportation website, at www.jpint.utoronto.ca. The networks are hosted on the DMG computer system. All inquiries related to the networks or the coding standards should be directed to:

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[1] All DMG reports are available from the Joint Program in Transportation web site at www.jpint.utoronto.ca

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1.0 Node Attributes

The 2001 EMME/2 Network has been released in both the 1996 and 2001 Greater Toronto Area (GTA) traffic zone systems, which are very similar and in some regions identical[2]. The tables in this report take both systems into account where necessary.

Many of the major applications of the networks are related to the data from the Transportation Tomorrow Survey (TTS). Some conversion tables between EMME/2 network centroid numbers and the TTS zone system are additionally provided in Appendix A. User node attributes (ui1, ui2, ui3 or extra attributes) are not used in this standard.

1.1 Centroid numbers

Numbers from 1 to 9,999 are reserved for centroid nodes. Current travel demand models in the GTA use centroid nodes for several purposes. In this standard, for both the 1996 and 2001 zone systems, centroid numbers are categorised into internal traffic zones, external traffic zones, and stations, as defined in Table 1.1.

Fig. 1 Centroid Number Categories for 1996 and 2001 Zone Systems

Centroid Type	Occupied Centroid Range in GTA Zone Systems	Reserved Number Range in both 2001 and 1996 Systems
Internal GTA Zones	1– 2,670	1– 3,999
External GTA Zones	4,000– 4,410	4,000 – 4,999
Durham	4,000– 4,005	4,000 – 4,099
York	4,100– 4,104	4,100 – 4,199
Peel	4,201– 4,202	4,200 – 4,299
Halton	4,301– 4,303	4,300 – 4,399
Hamilton	4,401– 4,410	4,400 – 4,499
Spare		4,500 – 8,999
Dummy (Spare)		9,000 – 9,999

The traffic zone number range of 1-4,999 is further categorised by regional municipality to define a traffic zone system. Appendix A lists the traffic zone numbers and ranges for each GTA region for both years considered, together with a more detailed breakdown of the external nodes and TTS zone comparisons.

[2] 1996 and 2001 centroid numbers remained the same for Durham, York and Hamilton.

1.2 Non-centroid node numbers

Non-centroid nodes in a network are assigned identifiers between 10,000 and 999,999[3]. There are two main classes of non-centroid nodes—regular nodes (numbered from 10,000 to 89,999) and special nodes to deal with particular characteristics of heavy rail and high-occupancy-vehicle travel (numbered from 90,000 to 999,999). Regular nodes are classified by the regional municipalities and cities that they fall in within the GTA, as shown in Table 1.2.

Fig. 2 Regular Node Number Categories

Regional Municipality/City	Node Range
Toronto	10,000-29,999
Durham	30,000-39,999
York	40,000-49,999
Peel	50,000-59,999
Halton	60,000-69,999
Hamilton	70,000-79,999
Externals	80,000-89,999

The 10,000 node numbers designated for external GTA areas are further segmented by node range and area coverage as shown in Table 1.3.

Fig. 3 External GTA Node Number Categories

Regional Municipality/City	Node Range	External GTA Areas
Durham	80,000-81,999	Victoria, Peterborough and Northumberland Counties
York	82,000-83,999	Simcoe County
Peel	84,000-85,999	Dufferin and Wellington Counties
Halton	86,000-87,999	Waterloo County
Hamilton	88,000-89,999	Brant, Haldimand-Norfolk and Niagara Counties

Separate node numbering ranges are given to nodes on rail and subway routes and on HOV lanes in order to facilitate network manipulations, as typically these services need to be modelled separately from other forms of transit. The ranges are listed in Table 1.4. Transfer (t) links, which are dedicated exclusively to the transfer mode, connect the rail (specially-numbered) nodes to the regular nodes representing the road or pedestrian access to a rail station in almost all cases.

[3] Due to the use of up to 6 digits for node numbers in GTA networks the default setting of the number of digits for nodes in EMME/2 should be changed from 4 to 6 (Module 1.23 option 7).

Fig. 4 Node Numbers for Rail Modes and HOV links[4]

Modes used on links	Node Range
Subway, LRT (TTC service only in 2001 network)	90,000 – 90,999
Commuter Rail (GO service only in 2001 network)	91,000 – 91,999
HOV	900,000 – 999,999

The node numbers of an HOV link are derived from the corresponding node number on an LOV link based on the following pattern:
9 <LOV node connected by an HOV ramp to the HOV link>

So, for example, if there is an HOV ramp with one end at node 10,637, the other end of the ramp (on the HOV link) will have node number 910,637. All nodes on HOV links have corresponding nodes on LOV links.

1.3 Coordinate system and projection

The coordinate system employed is the Universal Transverse Mercator (UTM) 6 Degree System. In order to accommodate coordinates within 6-digit integer fields, the UTM zone number (always 17 for the GTA) and the first digit of the north coordinate (always 4 for the GTA) are omitted. The origin point of the reference grid is 4,000 km north of the equator and 500 km west of longitude 81 degrees west. The vertical axis is parallel to true north at longitude 81 degrees west. All units are in metres.

To ease error checking of the network, an accepted comprehensive spatial database such as Statistics Canada's Street Network File (SNF) or Ontario Base Maps (OBM) is recommended as the spatial base to code the network.

To maintain historical consistency, a fixed projection datum for the spatial reference database should be used. The 2001 network is encoded in the NAD 83 projection. Previous years' EMME/2 networks hosted by the DMG, however, were developed in the NAD 27 projection. Spatial references for some of the applications frequently used are provided in Appendix B.

1.4 Metric system

The following table lists the units of measure used in this standard.

Fig. 5 Metric System

Measure	Unit
x, y co-ordinates	metres
Length	kilometres
Time	minutes
Speed	km/hr

[4] Street cars (s mode) use regular road network node numbers if encoded on the top of a road link, or are considered as LRT (l mode) if they use an exclusive right of way. A few links enable both s and l modes in order to deal with the situation of regular (shared right of way) streetcars running for a short segment of their routes on exclusive links shared only with LRTs.

2.0 Link Attributes

Spatially, a link is defined by a starting node and an ending node. Links have a set of basic network attributes and can have additional model-specific attributes as well. The basic link attributes as defined in this standard for all links are mode(s), number of lanes, length, functional class, volume delay function, speed, lane capacity and spatial classification.

2.1 Modes (mod)

Major technologies are defined with single-letter mode codes. There may be further refinements within each technology such as articulated bus. These refinements are reflected in the transit vehicle definitions in Part 3. The *mod* link attribute determines through use of these codes which mode(s) are permitted to be assigned to each link. Mode codes used in or available for the 2001 EMME/2 network and mode descriptions are provided in the following two tables.

The auxiliary modes can be used in multiclass auto and transit assignments, such as for HOV lane modelling. For this case, a designated HOV link requires the auto mode (c) and appropriate HOV auxiliary mode both to be defined. To enable an HOV to travel on any less restrictive link as well, all links defined for the “any vehicle” auxiliary mode (j) will also be defined for the applicable HOV mode. This means that, for example, an HOV3+ link will be defined as ‘ci’, while an LOV link parallel to it will be defined as ‘cij’.

Fig. 6 Mode Definitions

Link mode code	Mode types permitted on link	Mode Type
C	Personal vehicle – all occupancy	auto
F	Heavy truck	auxiliary auto
H	HOV 2+ personal vehicle	auxiliary auto
I	HOV 3+ personal vehicle	auxiliary auto
J	LOV (<2 or <3 depending on HOV definition used)	auxiliary auto
B	Bus	transit
M	Heavy rail	transit
R	Commuter rail	transit
G	Highway Coach bus	transit
S	Streetcar	transit
L	LRT	transit
T	Transfer	auxiliary transit
W	Walk	auxiliary transit

Fig. 7 Mode Descriptions

Mode	Description
Personal vehicle	Personal vehicle (with or without passengers)
HOV 2+	Personal vehicle with 2 or more occupants.
HOV 3+	Personal vehicle with 3 or more occupants.
Heavy truck	Trucks not classified under one of the personal vehicle modes.
Bus	9m, 12m or articulated bus currently used for local transit service.
Highway coach bus	Highway coach type of bus. It is commonly used for inter-city routes. In the 2001 network, private carriers are not included and only GO Bus belongs to this category.
Streetcar	An electric-powered light-weight rail vehicle running almost exclusively in mixed traffic. Vehicles may be coupled together to form a maximum size “train” of two vehicles. Operation is not controlled, although traffic signal priority may be available. Stops may or may not have passenger platforms or “islands” in the road. Platforms are not full height (level access).
Light rail	An electric-powered rail vehicle of medium weight running primarily on a generally separate right-of-way. The right-of-way may have complete or partial physical separation from a road or crossroads. Operation may or may not be fully or partially controlled through signalling and/or communications links. Vehicles may operate singly, however the medium weight (greater impact strength) allows vehicles to be coupled together to form trains of any length. Stops always have passenger platforms. These may be full height (level access) or partial height.
Heavy rail	Electric-powered rail vehicles made up into trains of various lengths, generally not less than three/four cars per train. The right-of-way is completely separate and exclusively used by the heavy rail trains. Operation is controlled through signalling and/or communications links. Stations provide stops with full height platforms. “Advanced Light Rail (ALR)” should also be classified in this category because it is always on a completely separate right-of-way, operation is always controlled, stops are always made in stations and platforms are always full height.
Commuter rail	Rail vehicles operating on “traditional mainline” or “inter-city” rail corridors, usually in mixed operation with freight trains and other passenger trains. Rail vehicles may be self-propelled cars labelled as diesel multiple units (DMU or “Budd car”) or electric multiple units (EMU) which can operate singly or in trains. Rail vehicles may be locomotive-hauled by traditional diesel-electric units or electric units. Locomotive-hauled trains can be of various lengths, generally not less than three cars or more than fourteen cars. Operation is controlled through signalling and/or communications links. Stops are always made at stations. However, platforms may vary from very low (asphalt pad) to full height.
Walk	Walking
Transfer	Switching from one transit or auxiliary transit mode to another or from one transit line to another, sometimes by means of escalators, motorized walkways, automated people movers, etc.

2.2 Link length (len)

Euclidean or straight-line distances, calculated from the co-ordinates of the connecting nodes, are used for all links, except mode t links and HOV ramps connecting to the HOV lanes. The length for t links is set to 0.1 km. The length for HOV ramps is set to zero.

2.3 Number of lanes (lan)

The actual number of lanes available during the peak period are represented, except for walk, transfer and centroid connector links where a standard 2-lane configuration is used. Number of lanes is set to 0 for all links with “l” “m” “r” “t” modes.

2.4 Auto link speed (ul2)

Speed data used in volume-delay functions is stored in the ul2 link attribute. In general, posted speeds are used. There are some exceptions, though. Realistic speed on some CBD area links may be lower than the posted speed due to the number of traffic lights/intersections, pedestrians, and so on, and so data is adjusted to compensate. On freeways, rural highways, urban highways and controlled access urban arterial links; road types where traffic usually travels at a higher average than the posted speed, the link speed is usually set to that posted plus 10 km/hr. For centroid connectors, a link speed of 40 km/hr is used.

2.5 Functional class and volume delay function index (vdf)

In this standard, the link functional class defines the volume delay function (vdf) applicable to that link. The standard functional classes are listed in Table 2.3. The vdf index is a 2-digit field. The first digit is used for the functional class number and the second digit is used to refer to the administrative jurisdiction of the link. The jurisdictional codes are listed in Table 2.4.

Fig. 8 Link Functional Classifications and Special Codes (first vdf index digit)

Code	Functional Class Description
0	Exclusive transit or auxiliary transit links which are not centroid connectors (one digit only)
1	Freeways
2	Freeway ramps
3	Controlled access or rural highways & arterial roads
4	High capacity arterial roads
5	Medium capacity arterial roads
6	Local arterial roads
9	Centroid connectors or an HOV ramp

Fig. 9 Jurisdictional and Special Codes (second vdf index digit)

Code	Jurisdiction
0	Centroid Connector
1	Federal
2	Provincial
3	Regional[5]
4	Area Municipal
5	Private sector
9	HOV ramp

[5] Release 1.1 redefines Toronto-jurisdiction links with 4 (municipal) as the second VDF digit instead of the 3 (regional) used in Release 1.0

In the 2001 network, function fd99 (vdf=99) has been added for all HOV ramps and HOV links. The functional form is the same BPR function as for arterial roads in the functions set supplied with the network. As the HOV ramps' lengths are set to zero they will cause no delay.

Function fd90 (vdf=90) is used on centroid connectors only. If a centroid connector is used by "w" mode only and is exclusively for auxiliary transit access, the volume delay function index is intended for identification purposes only.

All exclusively transit or auxiliary transit links which are not centroid connectors have their vdf index set to zero.

2.6 Lane capacity (ul3)

Lane capacity is stored in the user link attribute ul3. Road link lane capacity is defined as the a.m. peak-hour service capacity in auto vehicles per hour per lane. Empirical data was used where available. Otherwise, capacities were subjected to the following classification:

Fig. 10 Lane Capacities

Class Definition	Capacity	Examples
Freeways	1,800	Hwy 401, Hwy 427
Freeway ramps / controlled access highways	1,400	Hwy 35/115, Black Creek Drive, Allen Rd
Inter-urban arterial roads	1,200	Hwy 7 (Airport Rd to Hwy 27), Dundas St, Taunton Rd (Brock Rd to Pickering Town Line)
Two lane rural roads	1,000	Trafalgar Rd, Hwy 7 (in Halton)
High capacity arterial road	900-800	Brock Rd, Thickson Rd, Steeles Ave, Derry Rd
Medium capacity arterial roads	700-600	Ritson Rd, Anderson St, Bloor St, Upper Middle Rd
Low capacity arterial roads	550-500	Inner-city roads, gravel roads, rural collectors
Local streets	400	Local/residential roads
Centroid connectors	9,999	
Transfer links	0	
Exclusive transit links	0	

2.7 Spatial classification (type)

The 3-digit link type attribute is used to classify links by their location based on regional municipality and planning district/area. The first digit is as follows:

Fig. 11 Regional Municipal Codes

Code	Region
1	City of Toronto
2	Durham
3	York
4	Peel
5	Halton
6	City of Hamilton
7	External to the GTA

The second and third digits are used for distinguishing planning districts/areas within each of the regions. These planning area numerical codes are defined by the regions according to their individual needs. Planning areas with a numerical code of less than 10 have a zero as the second digit so that, for example, a network link in planning area 3 in York Region would have a link type code of 303.

There are some external-designated links which connect two internal-designated nodes. These links are aligned with the boundary of the GTA, where the boundary is taken as the centreline of the road along which they run, therefore making the links technically external despite their connecting two GTA internal nodes. The links going in the opposite direction are internal as they are on the other side of the centreline, and all nodes connected to an internal link are considered to be internal as well.

2.8 Traffic count station code (ul1)

Individual traffic count stations are encoded in link attribute ul1 for the links that feature them. The station identification codes that are contained in ul1 are described in table 2.7.

Fig. 12 Definition of Count Station Codes

Digit	Description
1st	Regional municipality (1-Toronto, 2-Durham, 3-York, 4-Peel, 5-Halton, 6-Hamilton)
2nd-5th	Regional station number based on screen line identifier
6th	Traffic flow direction across screen line (1-North, 2-South, 3-East, 4-West)

3.0 Transit Line Attributes

A transit line is defined through two components:

a *header section* that defines attributes applied to the entire line
a *route itinerary section* defined by a sequence of segments

Each segment is further defined by several attributes. The header attributes are line name, line description, headway and default operating speed. Each segment is defined by a *from* and a *to* node and a set of attributes including dwell time, layover time and transit time function.

3.1 Line name (lin)

The line name field is used to distinguish transit lines and is a unique alphanumeric identifier of up to 6 characters in length. The 6 characters are to be used as follows:

Fig. 13 Municipal Transit Agency Codes

<table>
<tr><td>Character order from left</td><td>Significance</td></tr>
<tr><td>1st</td><td>D – Durham
H – Halton
P – Peel
W- Hamilton (former Hamilton-Wentworth)
Y – York</td></tr>
<tr><td>2nd</td><td>Municipal/transit property code for municipal transit as follows:

<table>
<tr><td>Municipal Code</td><td>Transit Agency</td><td>Region</td></tr>
<tr><td>P</td><td>Pickering</td><td rowspan="4">Durham</td></tr>
<tr><td>A</td><td>Ajax</td></tr>
<tr><td>W</td><td>Whitby</td></tr>
<tr><td>O</td><td>Oshawa</td></tr>
<tr><td>O</td><td>Oakville</td><td rowspan="3">Halton</td></tr>
<tr><td>M</td><td>Milton</td></tr>
<tr><td>B</td><td>Burlington</td></tr>
<tr><td>M</td><td>Mississauga</td><td rowspan="2">Peel</td></tr>
<tr><td>B</td><td>Brampton</td></tr>
<tr><td>W</td><td>HSR</td><td>Hamilton</td></tr>
<tr><td>M</td><td>Markham</td><td rowspan="5">York</td></tr>
<tr><td>V</td><td>Vaughan</td></tr>
<tr><td>R</td><td>Richmond Hill</td></tr>
<tr><td>A</td><td>Aurora</td></tr>
<tr><td>N</td><td>Newmarket</td></tr>
</table></td></tr>
<tr><td>3rd-5th</td><td>Digits of route number, (right justified, pad with zeros)</td></tr>
<tr><td>6th</td><td>Route branch code (usually A-Z)</td></tr>
</table>

Fig. 14 TTC, GO and non-municipal Transit Agency Codes

Character order from left	Significance
1st	T – TTC G – GO
2nd-5th	Characters of route number, including branch code (right justified, pad with zeros)
6th	Special code

3.2 Line description (descr)

A textual description, up to 20 characters, of the line/route is provided in this field.

3.3 Line headway (hdw)

The line headway is the average time between buses or trains for the service schedule of the line, for the AM peak period of 6 to 9. For lines where this varies across the 3 hour peak, calculated "combined" headways are used. "Effective headways" are to be used for transit routes with infrequent numbers of runs such that the calculated headway is more than 60 minutes. The headways used for the different types of services are described below.

Local transit: The scheduled operating headway corresponding to the peak period is used.

GO Bus and GO Rail: For services that operate multiple times during the AM peak period (both bus and rail), the average time between runs is used. For example, a route that operates two trains half an hour apart uses 30 minutes. For infrequent routes that run only once during the AM peak or that have a between-departure average time greater than 60 minutes, an effective headway of 60 minutes is used.

Routes (such as northbound train lines) that do not operate during the AM peak are not included in the network.

The maximum headways are used to indicate that service is available during the AM peak period, without making any assumptions or suggestions regarding wait time factors. Individual station headways vary over the length of a route due to the presence of parallel express and regular lines.

3.4 Line speed (spd)

Transit line speeds can be defined in two ways: the default operating speed for the entire line or segment speeds implied by transit time functions. The default speed is used to calculate the travel time between stops (nodes) for line segments where no transit time function (ttf) is defined. The transit time function, where it is defined, changes the default travel time for all subsequent line segments up to the end of the route or (if there is one) the next ttf definition.

For transit routes with exclusive right-of-way, the line segment user data 1 (us1) field is reserved for the segment speed. Therefore, such lines may be coded to use the default line speed or individual segment speeds. For other transit routes the default line speed is used for all segments.

Speed values are used to calculate segment travel times. With an integrated auto and transit network, auto link/segment travel times can also be used with the appropriate definition of transit time functions.

3.5 Transit vehicle mode and type (mod and veh)

Each transit line must be associated with a mode and transit vehicle type, together with a 10-character description. Below is the list of transit vehicles in use in the GTA and defined in the 2001 network.

Fig. 15 Transit Vehicle Definitions

Vehicle Type	Description	Code description	Mode	Seated Capacity	Total Capacity	Auto Equiv.
1	GO Rail	GO_Rail	r	1,600	2,000	-
2	Subway	Subway	m	480	1,200	-
3	Advanced LRT	SubwayLRT	m	120	320	-
4	LRT (separate R/W)	LRT-exROW	l	50	75	-
5	Streetcar (shared R/W)	Streetcar	s	50	75	3.0
6	Streetcar (articulated)	SC-artic.	S	60	110	3.5
7	Bus (articulated)	Bus-artic	b	60	90	3.0
8	Bus (40 ft/12 metre)	Bus-40ft	b	40	60	2.5
9	Bus (30 ft/9 metre)	Bus-30ft	b	30	40	2.5
10	Coach bus	Coach	g	45	60	2.5

3.6 Segment attributes

Line segments are used to make up the transit line itinerary. Each segment may be described by some or all of the following attributes. Segment-specific attributes apply only to the segment immediately following them, while other attributes continue to apply until they are redefined.

Fig. 16 Transit Line Segment Attribute Summary

Keyword	Description	Default
dwt	Dwell time per line segment in minutes	0.01
dwf	Dwell time factor in minutes per length unit	Not used
path (yes or no)	Nodes on line can or cannot be omitted	Yes
ttf	Transit time function on links and turns	0 (use line speed)
ttfl	Transit time function on links only	0
ttft	Transit time function on turns only	0
us1, us2, us3	Segment user data storage (us1 is for speed)	Not used
lay	Layover time (segment specific, can be used for one intermediate segment)	0
tdwt	Temporary dwell time (segment specific)	0
tus1, tus2, tus3	Temporary segment user data storage (not used)	Not used

The dwell time attributes (dwt, dwf, tdwt), may be marked with one or more of the following symbols:
* dwell time factor
< boarding only
> alighting only
non-stop (no boarding and no alighting)
+ boarding and alighting are allowed

3.7 Line user attributes

Each transit line can also include up to three user-defined attributes (ut1, ut2 and ut3). These can be used to provide extra information about the route. For the 2001 network, the first field (ut1) is used to store a code indicating the line operator. These codes are as follows:

Fig. 17 Transit Line Operator Attribute Codes

Transit line code	Transit agency	User attribute code
DA	Ajax	84
DO	Oshawa	88
DP	Pickering	82
DW	Whitby	86
G	GO Bus	65
G	GO Rail	90
HB	Burlington	46
HM	Milton	44
HO	Oakville	42
PB	Brampton	24
PM	Mississauga	20
T	TTC	26
WW	HSR	60
YA	Aurora	79
YM	Markham	72
YN	Newmarket	78
YR	Richmond Hill	78
YV	Vaughan	74

The other two user-defined line attributes are not used in the 2001 network.

Appendix A

1996 and 2001 GTA Traffic Zone Systems

These were developed collectively by the six regions of the GTA to coincide with the 1996 and 2001 Transportation Tomorrow Surveys. The 2001 network can be used with either. Data from the surveys were assigned and made available in the following zone systems:

Fig. 18 1996 GTA Traffic Zone System

Region	Zone numbers	Zone count	Range allotted
Internal GTA Zones		1,677	1 – 3,999
Toronto	1-463	463	1 – 500
Durham	501- 765	265	501 – 1,000
York	1,001-1,353	353	1,001 – 1,500
Peel	1,501-1,715, 1,717-1,749	248	1,501 – 2,000
Halton	2,001-2,179	179	2,001 – 2,500
Hamilton	2,501-2,656, 2,658–2,670	169	2,501 – 3,000
External GTA Zones		26	4,000 – 4,999
Durham	4,000-4,005	6	4,000 – 4,099
York	4,100-4,104	5	4,100 – 4,199
Peel	4,201-4,202	2	4,200 – 4,299
Halton	4,301-4,303	3	4,300 – 4,399
Hamilton	4,401-4,410	10	4,400 – 4,499
Total Zones		1,703	1 – 4,999

Fig. 19 2001 GTA Traffic Zone System

Region	Zone numbers	Zone count	Range allotted
Internal GTA Zones		1,717	1 – 3,999
Toronto	1-481	481	1 – 500
Durham	501- 765	265	501 – 1,000
York	1,001-1,353	353	1,001 – 1,500
Peel	1,501-1,753	253	1,501 – 2,000
Halton	2,001-2,145, 2,147-2,197	145	2,001 – 2,500
Hamilton	2,501-2,656, 2,658-2,670	169	2,501 – 3,000
External GTA Zones		26	4,000 – 4,999
Durham	4,000-4,005	6	4,000 – 4,099
York	4,100-4,104	5	4,100 – 4,199
Peel	4,201-4,202	2	4,200 – 4,299
Halton	4,301-4,303	3	4,300 – 4,399
Hamilton	4,401-4,410	10	4,400 – 4,499
Total Zones		1,743	1 – 4,999

Fig. 20 External Zone Centroid - TTS Zone Conversion (1996 and 2001)

TTS Survey Agency	2001 TTS Zones Number Range	1996 TTS Zones Number Range	Network Centroid (1996 or 2001)	Centroid Spatial Coverage
Niagara	3,001-3,085	3,001-3,364	4,405 4,406 4,407 4,408 4,410	Grimsby, Lincoln St Catharines, Niagara-on-the-lake, Niagara Falls, Thorold, Fort Erie Welland , Pt Colbourne Rest of Niagara USA Gateway
Waterloo	N/A	3,401-3,675	4,401 4,402	Cambridge (1996) Rest of Waterloo (1996)
Guelph	3,601-3,650	3,701-3,706	4,301	Guelph (City & Town), Puslinch
Wellington	3,707-3,716	3,707-3,716	4,302	Erin, Eramosa
Orangeville	3,721-3,726	3,721-3,726	4,201	Orangeville
Orillia	3,731-3,735	3964	4,104	City of Orillia (2001)
Simcoe	3,741-3,793	3,751-3,778	4,100 4,101 4,103	Innsfil, Bradford-West Gwillimbury Essa, Adjala-Tosorontio, Tecumseth Rest of Simcoe (2001)
Barrie	3,801-3,832	3,801-3,832	4,102	City of Barrie
Kawartha Lakes	3,841-3,857	3,841-3,865	4,003 4,004 4,005	Manvers, Emily Mariposa, Ops Fenelon, Verulam
Peterborough	3,871-3,925	3,871-3,925	4,002	City of Peterborough
Northumberland	3,931-3,946	3,931-3,946	4,000 4,001	Trenton Cobourg
External and External Undefined	3,847-4000	3,847-4,000	4,103 4,104 4,202 4,303 4,403 4,404 4,409	Rest of Simcoe (1996) Orillia & Ramara (1996) Rest of Dufferin Rest of Wellington County of Brant Haldimand-Norfolk 401 Gateway

Appendix B

Spatial Reference of Related GTA Databases

Travel demand modelling requires the use of several other spatial data in addition to network data. It would be best if these various data sets are all spatially referenced to a common datum. That, however, is not always the case. The table below lists some of the sets and the datum to which they are referenced.

Fig. 21 Spatial References

Application	Datum
TTS 1986 and 1991	NAD 27
TTS 1996	NAD 27
TTS 2001	NAD 83
Pre-2001 EMME/2 Networks	NAD 27
2001 EMME/2 Network	NAD 83
1991 GTA Traffic Zone Boundaries	NAD 27
1996 GTA Traffic Zone Boundaries	NAD 27 and NAD 83
2001 GTA Traffic Zone Boundaries	NAD 83