Traffic Modelling for PSP 1067 Donnybrook and PSP 1096 Woodstock

transportation planning, design and delivery

14M1555000 11/11/14

GTAconsultants

Traffic Modelling for

PSP 1067 Donnybrook and PSP 1096 Woodstock

Issue: A 11/11/14

Client: Metropolitan Planning Authority
Reference: 14M1555000
GTA Consultants Office: VIC

Quality Record

Issue	Date	Description	Prepared By	Checked By	Approved By	Signed
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1. Introduction

1.1 Background

The Donnybrook (67) and Woodstock (96) PSPs comprise over 1,800 hectares (gross) of land that is expected to accommodate over 13,500 residential lots. The two precincts will be serviced by the Lockerbie Principal Activity Centre (in the Lockerbie PSP, immediately abutting the west of the precinct), as well as local centres, community facility hubs, local active recreation and passive reserve and conservation areas.

The PSPs are located within the Northern Growth Corridor Plan (GCP) which includes a north-south and east-west arterial road network that links the precinct to the Outer Metropolitan Ring Road and the proposed train station adjacent to the Donnybrook Principal Town Centre.

As part of this study, four specific road projects have been identified for further analysis; two that cross the Sydney to Melbourne railway line and connect to the Lockerbie Principal Activity Centre, a crossing of the Merri Creek providing a connection to the northern section of the PSP, and a third crossing of the Sydney-Melbourne railway line that also connects the northern section of the PSP.

1.2 Purpose of this Report

GTA Consultants (GTA) has been engaged by the Metropolitan Planning Authority (MPA) to undertake strategic transport modelling and to determine the anticipated demands on the transport network. The outputs will be used to:

- inform the road cross sections for an interim (2026) and ultimate (2046) scenario
- understand the need for any or all of the proposed railway line or Merri Creek bridge crossings
- determine the functional intersection design requirements for an interim (2026) and ultimate (2046) scenario. The layouts will then be used as input into the preparation of the Development Contributions Plan (DCP).

This report sets out the methodology undertaken to determine the demand volumes and layout plans.

1.3 References

In preparing this report, reference has been made to a number of background documents, including:

- plans for the PSP prepared by Metropolitan Planning Authority
- Victorian Integrated Transport Model (VITM)
- VITM Northern Growth Corridor Model
- various technical data as referenced in this report
- other documents as nominated.

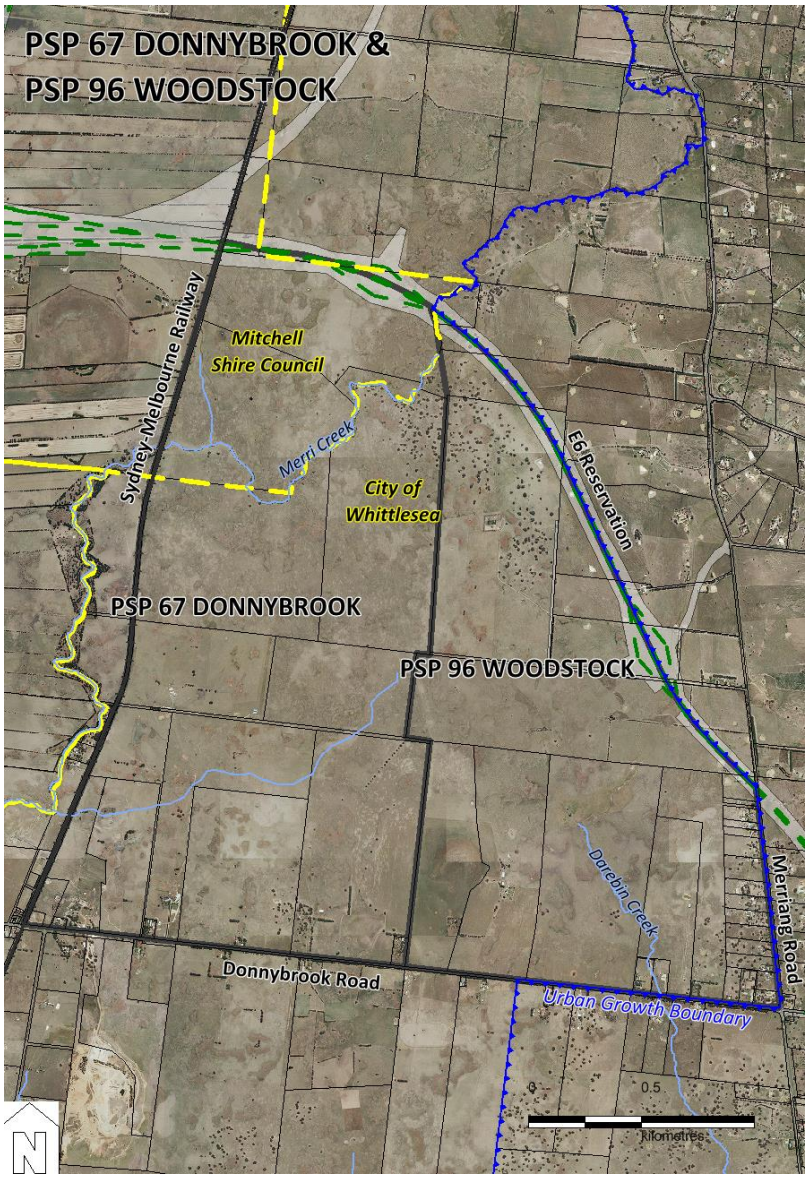
2. Site Context

2.1 Subject Site

The Donnybrook PSP is located in Donnybrook and is within the City of Whittlesea and Mitchell Shire Council municipal areas. The precinct is bounded by the Outer Metropolitan Ring Road (OMR) reservation to the north, the Sydney-Melbourne train line to the west, Donnybrook Road to the south, and the Woodstock PSP to the east.

The Woodstock PSP is located in Woodstock in the City of Whittlesea and is some 35km north of the Melbourne CBD. The PSP boundary is the OMR/E6 reservation to the north-east, Epping Road in the east, Donnybrook Road to the south, with the boundary of the Donnybrook PSP defining the western boundary of the PSP. PSP boundaries area shown in Figure 2.1.

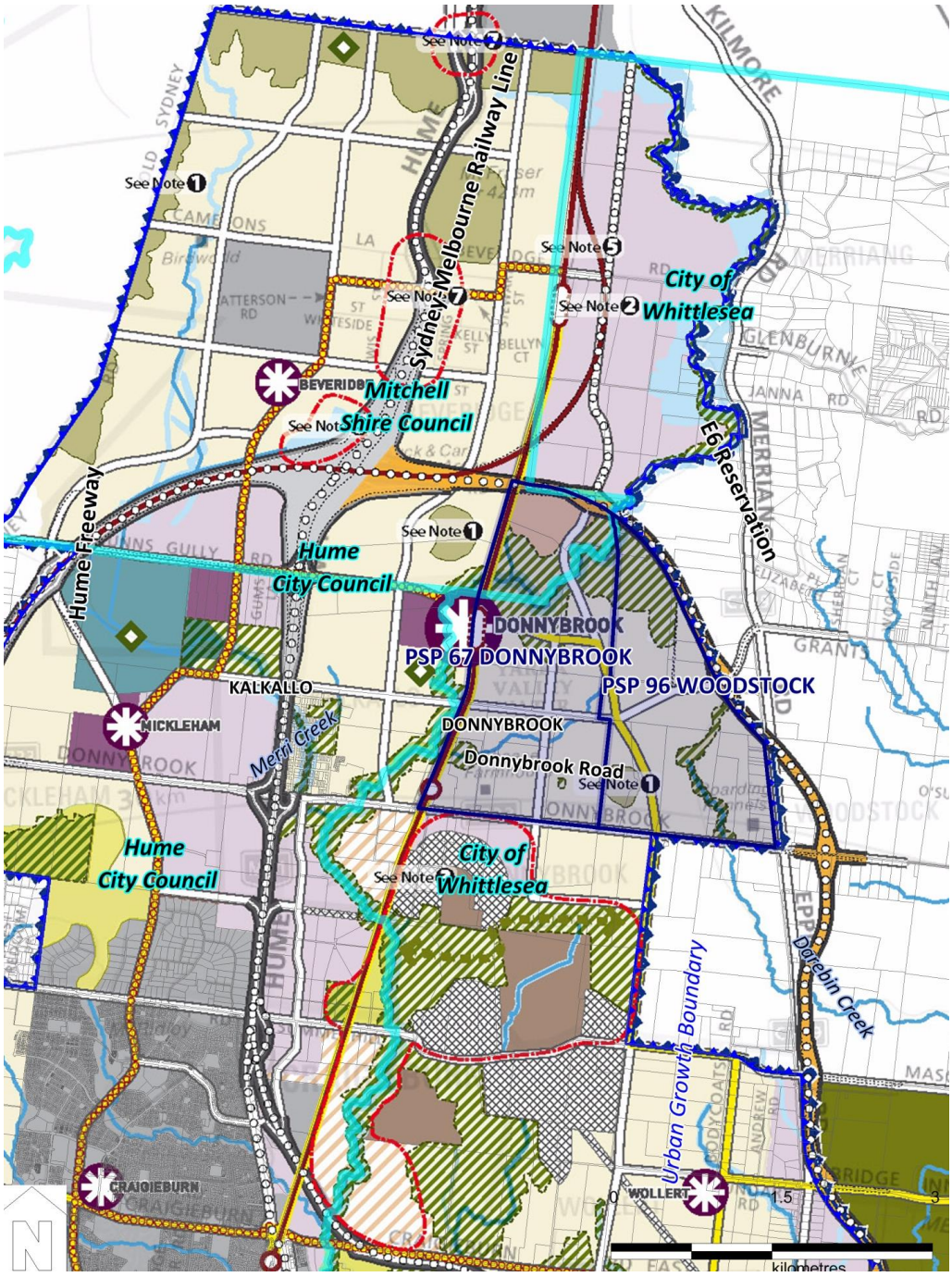
Figure 2.1: PSP Boundaries



2.2 Northern Growth Corridor

The location of the Donnybrook and Woodstock PSPs in relation to the wider Northern Growth Corridor and its local context are illustrated in Figure 2.2.

Figure 2.2: Donnybrook PSP and Woodstock PSP in the context of the Northern Growth Corridor



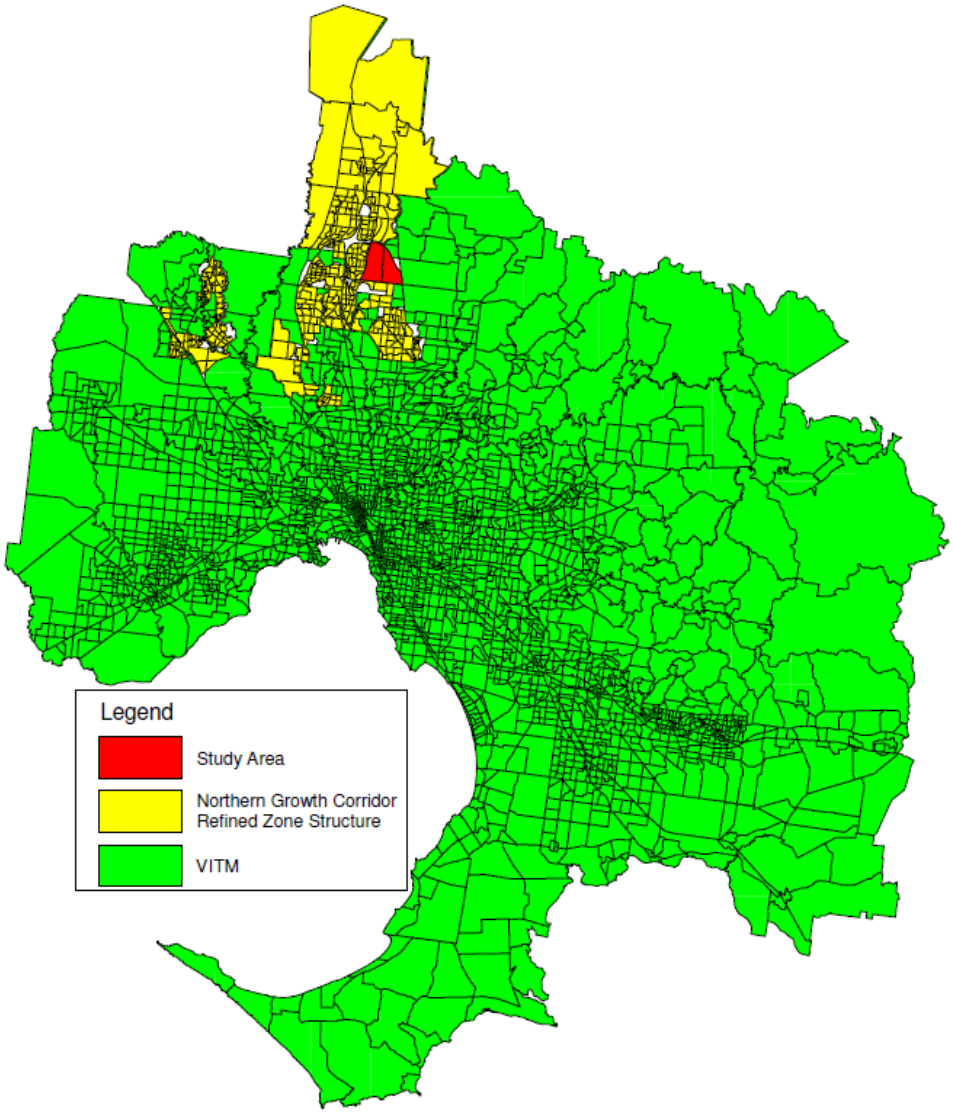
SKM was commissioned by MPA (formerly GAA) to calibrate and refine the Department of Transport's (now DTPLI) Victorian Integrated Transport Model (VITM) for Melbourne's North Growth Corridor. The refinements to VITM included the following:

- disaggregation of the zone system within the growth corridor
- updates to the future modelled land use yields to reflect the level of growth predicted by the MPA within the corridor
- updates to the road network within the corridor.

The purpose of the project was to provide a strategic model of the North Growth Corridor which could be to understand the transport needs of the MPA, Hume City Council, Sunbury City Council, Whittlesea City Council and VicRoads for projects (such as PSPs) within the corridor. This model is referred to as the NGC VITM hereafter.

The context of the study area as it relates to the northern growth area and the study area for Donnybrook and Woodstock PSPs is shown in Figure 2.3.

Figure 2.3: VITM Zone Structure in the context of the Northern Growth Corridor Model

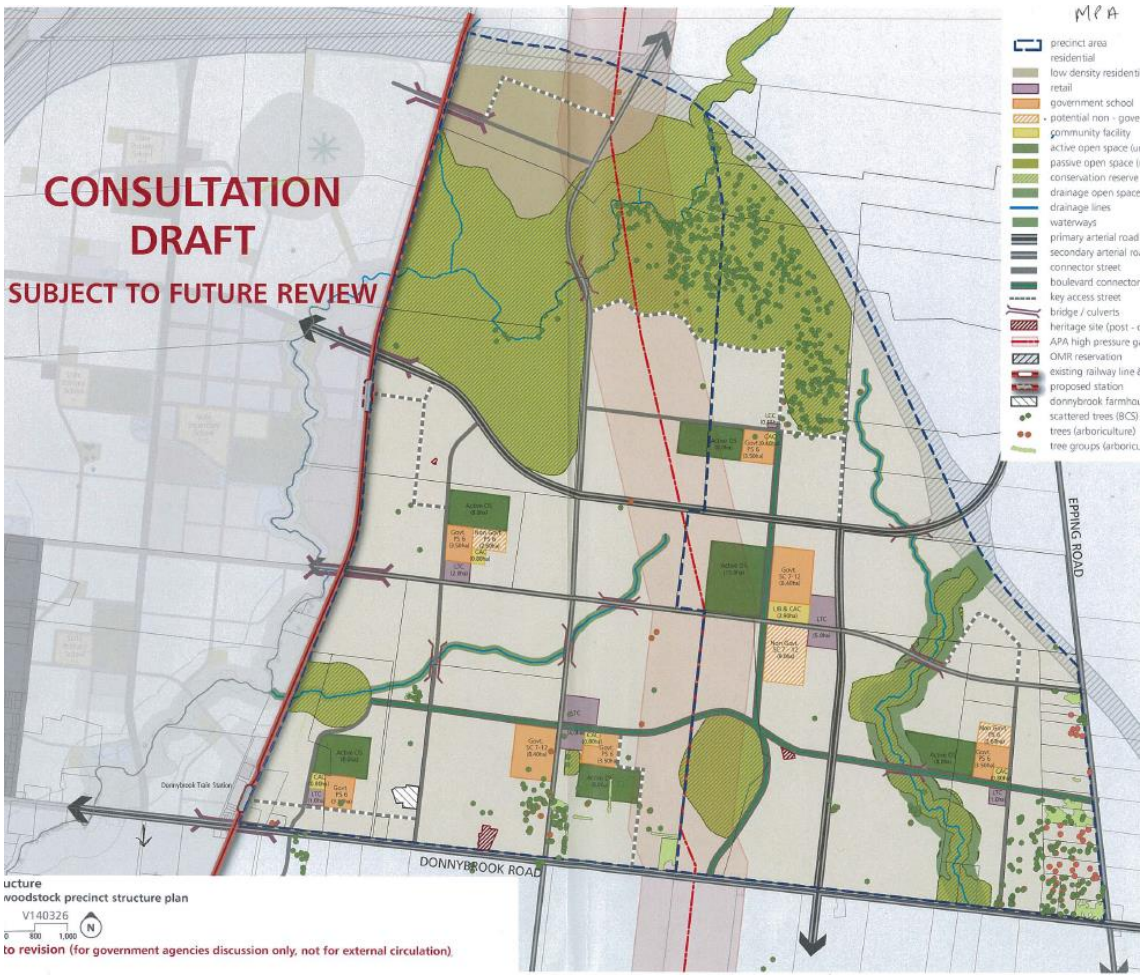


3. PSP Context

3.1 Urban Structure Plan

The indicative Urban Structure Plan for the Donnybrook and Woodstock PSPs is shown Figure 3.1. The plan was developed by MPA as part of the structure planning process.

Figure 3.1: Donnybrook/Woodstock Draft Future Urban Structure



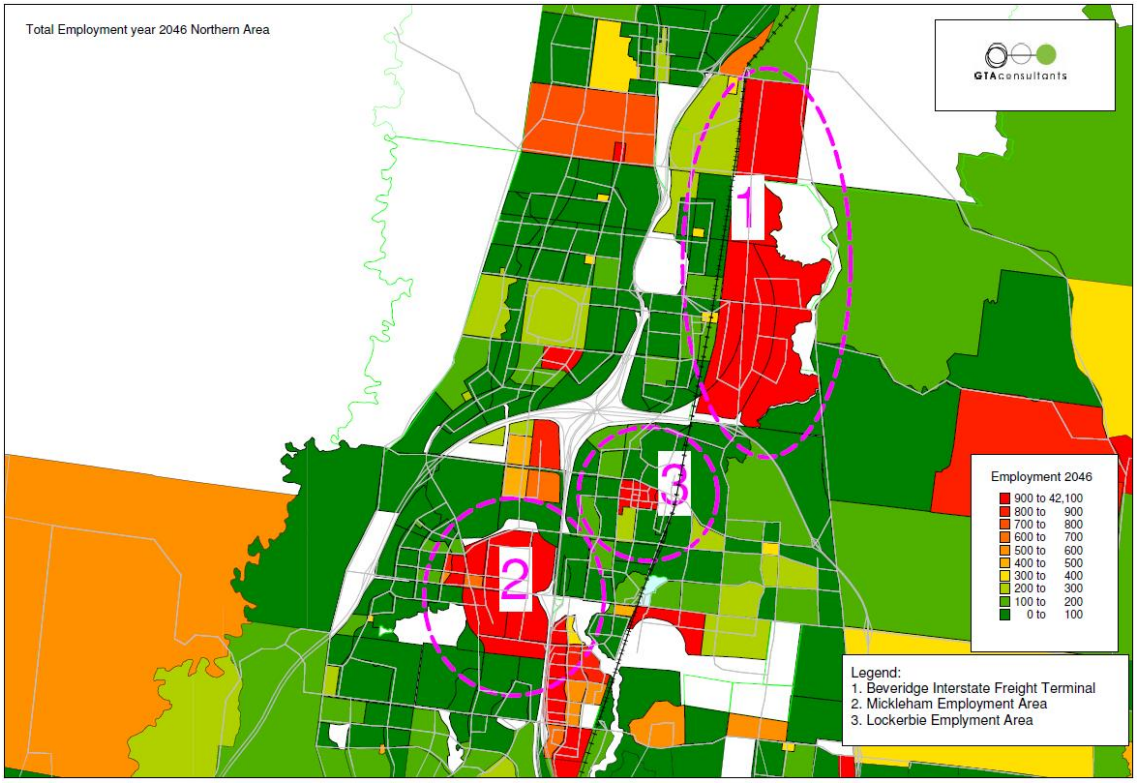
The two PSPs comprise of five Local Town Centres (LTCs) that include a mix of retail, school and community facilities. Access is provided via a number of connectors from Donnybrook Road as well as a series of east-west connectors. Further discussion on the road layout is provided in Section 4.

3.2 Surrounding Land Uses

The study area is surrounding by a range of proposed residential and economic land uses, as depicted in Figure 2.2. The Major Activity Centre of Donnybrook is located immediately west of the two PSPs which has forecast a high proportion of jobs (employment) as well as the Mickleham employment area located on Donnybrook Road, west of the Hume Highway.

Figure 3.2 has been prepared to demonstrate the employment forecast within the VITM zones in the surrounding employment areas as they relate to the study area.

Figure 3.2: Northern Growth Corridor – VITM Employment Characteristics



The areas depicted in Figure 3.2 highlight the influence that these are likely to have on the travel patterns across the network. Of note are the Mickleham Employment Area, Lockerbie Principal Activity Centre and the Beveridge Interstate Freight terminal, that are all forecast to exhibit high employment numbers thus influencing travel patterns in the region.

4. Existing and Future Road Network

4.1 Overview

The boundaries of the PSPs are bounded by the bounded by the OMR reservation to the north, the Sydney-Melbourne railway line to the west, Donnybrook Road to the south, and Epping Rd to the east. The existing and anticipated future characteristics of key roads in the vicinity of the PSP area are discussed below. This section describes some of the key arterials within or bounding the PSPs.

4.2 Arterial Road Network

4.2.1 Hume Freeway

The Hume Freeway corridor is located along the western boundary of the precinct, and is the most significant north-south corridor linking northern Victoria with the Melbourne CBD. The freeway cross section is generally configured with two traffic lanes and an emergency lane in each direction separated by a 30m central median. The 50 metre carriageway (approximately) is set within a 75 metre road reserve (approximately). The large road reserve allows for additional traffic lanes to be added to the corridor to cater for future growth.

Following development of the subject site, the following interchanges with the Hume Freeway will exist:

- proposed full diamond interchange with Gunns Gully Road
- proposed southbound exit ramp at the intersection with Camerons Road
- an upgrade of the existing full directional interchange at Donnybrook Road.

4.2.2 Donnybrook Road

Donnybrook Road is the south boundary of the site and provides a link between Mickleham to the west and Yan Yean to the east. Donnybrook Road is currently configured as a two lane rural cross-section (one lane in each direction) adjacent to the site and its intersection with the Hume Freeway has recently been upgraded to a '3/4' diamond overpass with a clover-leaf arrangement on the south-east corner, accommodating all movements.

Recent planning for Donnybrook Road to the west of the Hume Freeway and through the PSPs identifies an 'ultimate' six-lane divided cross section; with a similar upgrade expected to the east of the Hume Freeway (though yet to be committed by VicRoads). The future assessments assume that Donnybrook Road will ultimately be an arterial standard road with three lanes in each direction and will have full diamond interchanges with the Outer Metropolitan Ring Road to the west and the E6 to the east.

4.2.3 Gunns Gully Road

Gunns Gully Road is a two-lane road typically aligned in an east-west direction and located to the west of the Hume Freeway. It is currently configured with a two lane rural cross-section (one lane in each direction) and forms two give way controlled T-intersection connections with the western side of the Hume Freeway. One intersection permits left-in, left-out movements whilst the other intersection accommodates full turning movements with deceleration lanes provided along the Hume Freeway for right turning (or U-turning) vehicles.

Ultimately, Gunns Gully Road, west of Scanlon Drive, will be a six lane cross section (three lanes in each direction). East of Scanlon Drive, Gunns Gully Road will be a four lane cross section linking to the OMR.

4.2.4 Epping Road

Epping Rd is a two-way unsealed road aligned in a north-south direction and located to the west of the subject site. It provides direct access to Epping in the south and will ultimately consist of a four lane cross section (i.e. two lanes in each direction).

Epping Road forms a roundabout intersection with the Donnybrook Rd with full turning movements permitted.

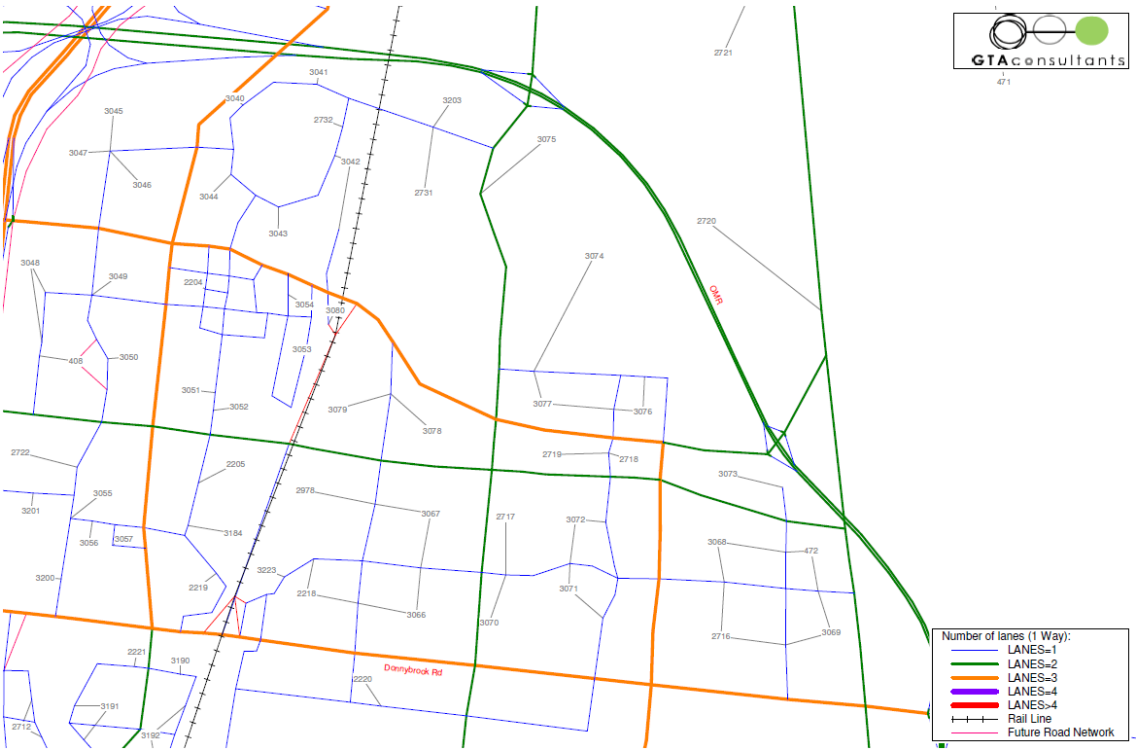
4.3 Internal Road Network

The internal road network is underpinned by a grid network of collector and boulevard road types that provide internal connectivity to local town centres as well as the external network. Key features of the network include:

- Grants Road, an east-west connector road linking Epping Road in the east to Lockerbie in the west. This road will ultimately consist of a four lane cross section.
- Scanlon Drive, a north south connector road linking Gunns Gully Road to Epping in the south. This road will ultimately consist of a six lane cross section south of Gunns Gully Road.
- A new north-south connector approximately 1.6km west of Scanlon Drive that will pass through the Donnybrook PSP connecting to the OMR at the northern end of the study area. This road will ultimately consist of a four lane cross section.
- A number of new east-west and north-south connectors will be placed at strategic locations between the collector road network that are aimed at providing local connectivity and access.

The road network as depicted in the VITM model is shown in Figure 4.1.

Figure 4.1: Donnybrook and Woodstock PSP VITM Road Network (2046)



Further discussion on the transport modelling is provided in Section 5.

5. Transport Modelling

5.1 Background

VITM is a tool developed by the Department of Transport Planning and Local Infrastructure (Formerly DoT) to assist in the planning of road and public transport infrastructure in Victoria. It is a multimodal strategic model that uses future population, employment and land use data projections to forecast travel behaviour and the impacts of changes to the road and public transport networks. VITM contains all major freeways, main arterials and connector roads within the Melbourne Statistical Division.

The model is a link-based traffic model which is implemented in the CUBE Voyager software environment (developed by Citilabs). The model version that used for this project was obtained from the DTPLI in May 2013, version VITM2012_V120110 GAA NGC. This is the latest release of the model from the DTPLI (DoT formerly).

The MPA commissioned a study to refine the Victorian Integrated Transport Model (VITM) for Melbourne's North Growth Corridor. The refinements to VITM included the following:

- disaggregation of the zone system within the growth corridor
- updates to the future modelled land use yields to reflect the level of growth predicted by the MPA within the corridor
- updates to the road network within the corridor.

The purpose of the project was to provide a strategic model of the North Growth Corridor which could be to understand the transport needs of the MPA, Hume City Council, Whittlesea City Council and VicRoads for projects (such as PSPs) within the corridor.

This model formed the basis for the VITM modelling undertaken as part of this package of work.

5.2 Design Years - Interim (2026) vs. Ultimate (2046)

Both interim and ultimate traffic volumes are presented in this report. The interim traffic volumes represent the +10 year scenario (~2026) and the ultimate volumes the 2046 scenario. The interim volumes are used to inform intersection works up to the interim scenario for inclusion into the Development Contributions Plan (DCP), whilst the ultimate volumes are used to validate the provision of ultimate road reserves including flaring requirements at intersections.

5.3 GTA Road Network Refinements

GTA refined a copy of the Northern Growth Corridor version of VITM (herein referred to as the NGCVITM) and has used it in the assessment of the Donnybrook and Woodstock PSP. For the purposes of this assessment the following network refinements were made to the NGC VITM (both the 2026 and 2046 models):

- additional and editing road network in the study area
- refinement of the zones
- refinement of the zone centroid connection location for the PSP.

The extent of the GTA network refinements are shown in Figure 5.1 and Figure 5.2.

Figure 5.1: NGC - VITM Road Network

Figure 5.2: Refined VITM Road Network

The GTA refinements were made to enhance how the NGC VITM reflected the likely access arrangements for the Donnybrook and Woodstock PSP. It is highlighted that the GTA refinements did not result in any noteworthy changes to the 2026 and 2046 VITM network beyond the bounds of the study area.

Plots of the road network characteristics (i.e. speeds, lanes, capacities etc.) are located in Appendix A.

5.4 Land use Refinements

In addition to the road network refinements, the zone configuration of the PSP was desegregated for the purpose of the traffic assessment. The zone system was based around the proposed urban structure plan's land uses and road network characteristics.

The zone refinements are shown graphically in Figure 5.3 and Figure 5.4, whilst Figure 5.5 provides details of the zone numbering adopted for the study area.

Figure 5.3: NGC VITM Zone Structure

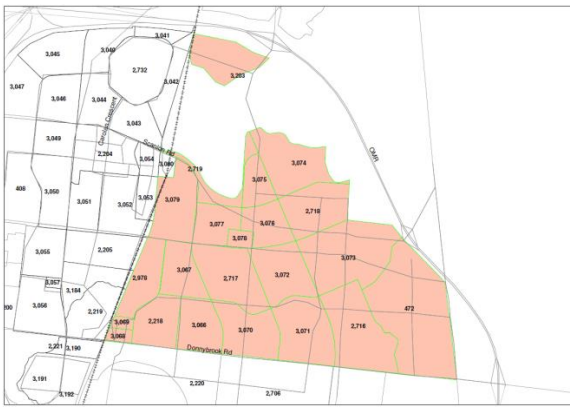
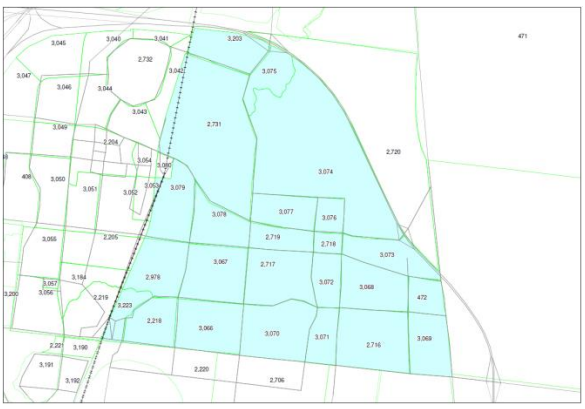


Figure 5.4: Refined VITM Zone Structure



In addition, the land use specifications for the zones have been provided from the MPA, and are shown and summarised in Figure 5.5 and Table 5.1.

Figure 5.5: Donnybrook and Woodstock PSP Zone Numbering

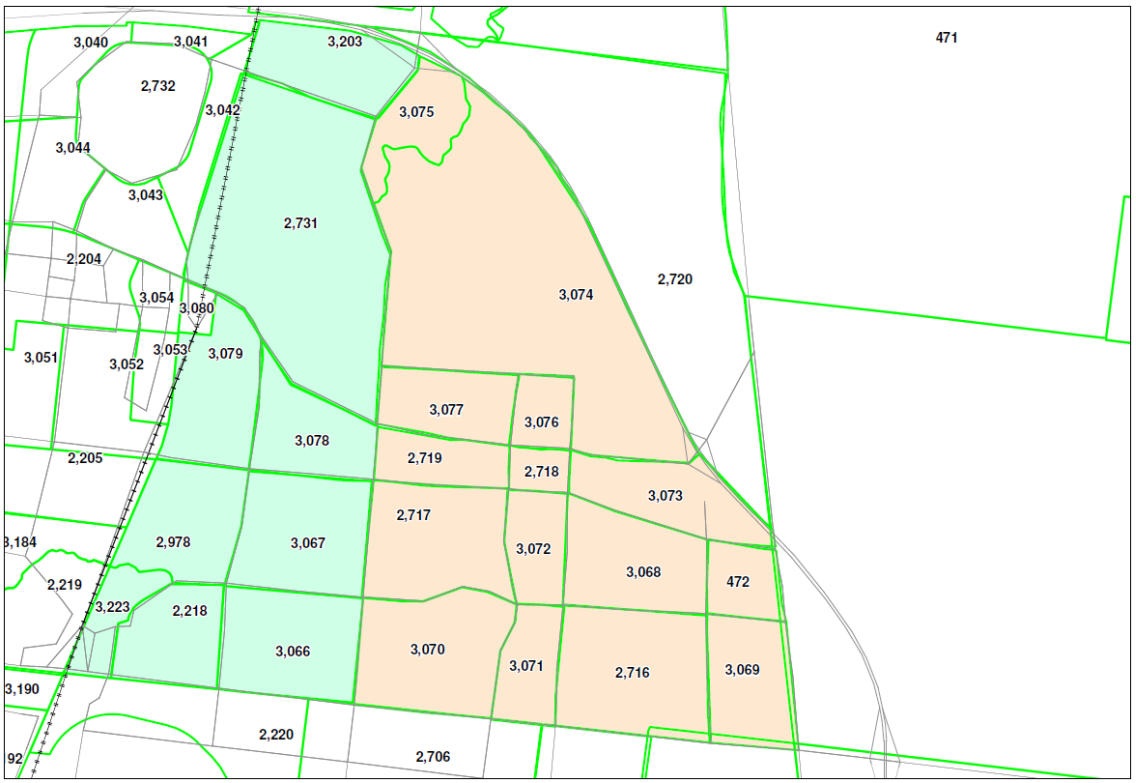


Table 5.1: Donnybrook and Woodstock PSPs land use summary (2026 and 2046)

Zone	2026				2046			
	Population	Dwelling	Employment	Enrolment	Population	Dwelling	Employment	Enrolment
2218	1,084	516	177	451	1,926	688	174	451
2731	235	335	34	-	1,251	447	45	-
2978	938	447	45	-	1,668	596	60	-
3066	1,354	645	154	1,100	2,408	860	186	1,100
3067	1,244	592	59	-	2,212	790	79	-
3078	1,312	625	172	451	2,333	833	298	851
3079	1,385	659	66	-	2,462	879	88	-
3203	270	385	39	-	1,438	514	71	-
3223	384	183	18	-	682	244	-	-
Donnybrook PSP	**8,205**	**4,388**	**764**	**2,002**	**16,380**	**5,850**	**1,001**	**2,402**
472	593	282	28	-	1,054	376	38	-
2716	1,285	612	81	-	2,284	816	122	-
2717	1,632	777	118	-	2,902	1,036	184	-
2718	546	260	216	-	970	347	385	1,100
2719	1,486	708	71	-	2,642	943	94	-
3068	1,136	541	189	851	2,019	721	207	851
3069	844	402	40	-	1,501	536	54	-
3070	1,732	825	227	451	3,080	1,100	295	451
3071	803	382	38	-	1,427	510	51	-
3072	730	348	75	-	1,298	463	216	1,500
3073	1,279	609	61	-	2,273	812	81	-
3074	1,401	667	67	-	2,490	889	104	-
3075	43	62	6	-	231	83	8	-
3076	1,324	631	63	-	2,354	841	84	-
3077	1,337	637	64	-	2,377	849	157	451
Woodstock PSP	**16,171**	**7,742**	**1,344**	**1,302**	**28,903**	**10,322**	**2,079**	**4,353**
Total	**24,376**	**12,129**	**2,108**	**3,304**	**45,283**	**16,172**	**3,080**	**6,755**

As shown in Table 5.1, the Woodstock PSP is to cater for almost double the population, dwelling and employment of the Donnybrook PSP in both 2026 and 2046 design years. Enrolments in the Woodstock PSP are to increase by 300% from 2026 to 2046. Ultimately, the PSPs will total a population over 45,200, including 16,100 households, 3,000 employments and 6,700 enrolments.

5.5 Public Transport

The public transport networks within the model are consistent with those provided by PTV that are embedded within the model. The routes were adjusted to reflect the road network changes outlined in Section 5.3.

Figures 5.6 and 5.7 show the resultant Public Transport Routes within the model for the interim (2026) and ultimate (2046) networks, whilst Table 5.2 provides a summary of the frequencies input for each route.

Figure 5.6: Public Transport Network – Design Year 2026

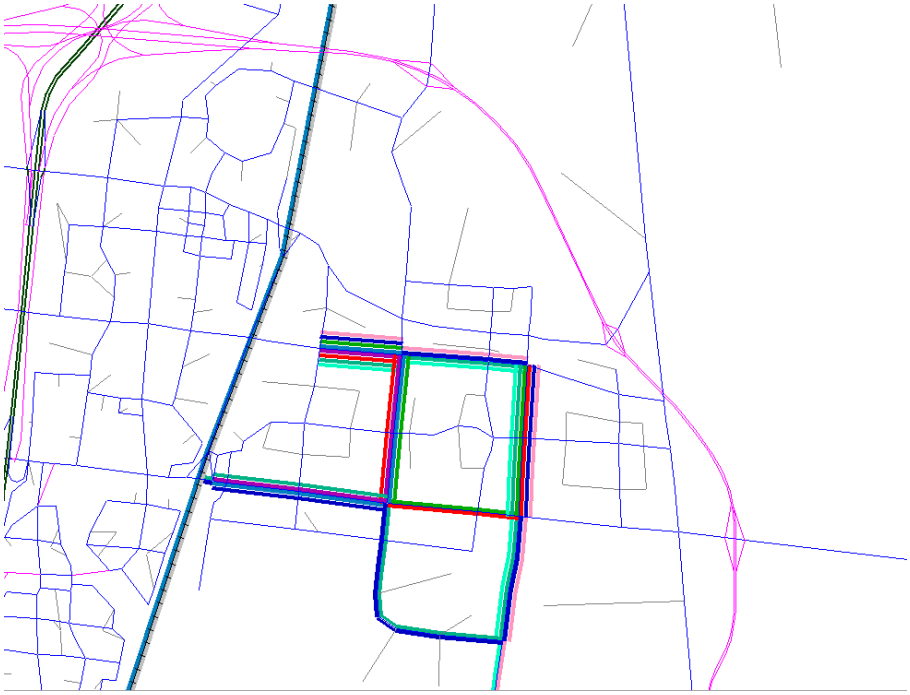


Figure 5.7: Public Transport Network – Design Year 2046

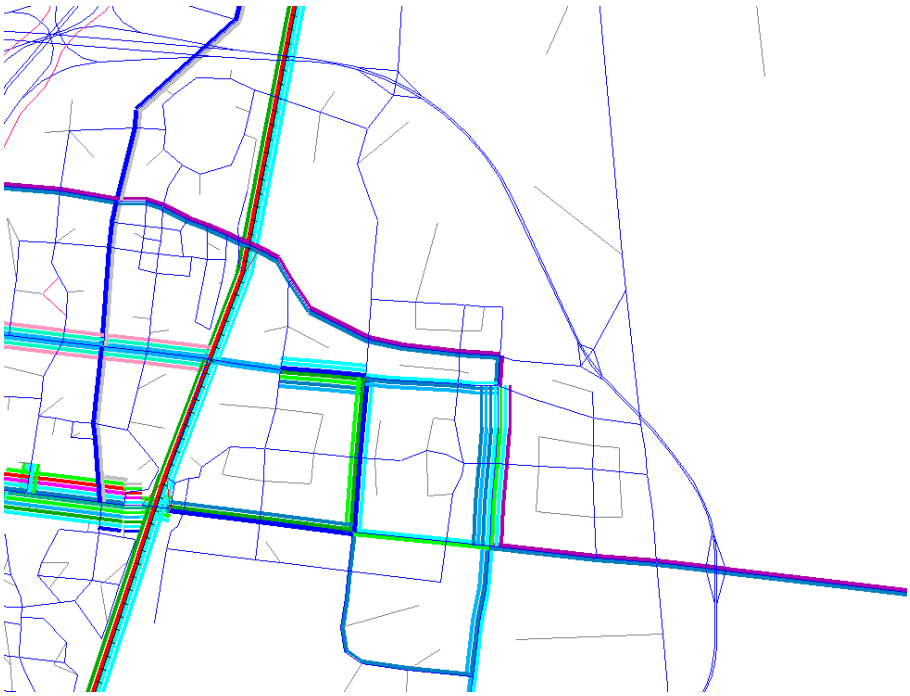


Table 5.2: Public Transport Description and Frequencies

Mode	Route Description	Direction	Frequencies	
			2026	2046
Train: Stopping all station	Sandringham – Donnybrook (Direct) All Stations	Northbound	-	Every 10 min
		Southbound	-	Every 10 min
V/Line Train	Southern Cross – Seymour	Northbound	Every 60 min	Every 60 min
		Southbound	Every 30min	Every 30min
Bus: SmartBus Service	Broadmeadows Whittlesea	Northbound	-	Every 10 min
		Southbound	-	Every 10 min
	Broadmeadows Lockerbie	Eastbound	-	Every 20 min
		Westbound	-	Every 20 min
Bus: Standard Service	Kalkallo – Donnybrook	Eastbound	Every 40 min	Every 40 min
		Westbound	Every 40 min	Every 40 min
	Donnybrook Loop (via Woodstock)	Eastbound	Every 40 min	Every 40 min
		Westbound	Every 40 min	Every 40 min
	Epping – Donnybrook	Northbound	Every 15 min	Every 15 min
		Southbound	Every 15 min	Every 15 min
	Donnybrook – Donnybrook North (via Donnybrook)	Northbound	Every 40 min	Every 40 min
		Southbound	Every 40 min	-

A key component of the public transport networks within the PSP is the electrification of the railway line to Donnybrook, which does not function within the 2026 model however operates at 10minute frequencies by 2046. Another feature of the network is the introduction of the SmartBus service which is also in operation by 2046.

5.6 Scenarios

A total of 19 scenarios have been tested as part of this project, including

- seven scenarios in 2046 with the Outer Metropolitan Ring Road (OMR)
- six scenarios in 2046 without the OMR
- six scenarios in 2026 without the OMR.

Each of the scenarios contains a combination of links that have been identified as part of this study. The links include two that cross the Sydney-Melbourne railway line that connect to the Lockerbie Principal Activity Centre, a crossing of the Merri Creek providing a connection to the northern section of the PSP, and a third crossing of the Sydney-Melbourne railway line that also connects the northern section of the PSP.

Table 5.3 summaries each of the scenarios tested, noting that each of the scenarios includes the same land uses identified in Table 5.1.

Table 5.3: Summary of Road Network Inclusions for each Scenario

No	Year	Scenario No	Scenario Inclusion (Refer to footnote)			
			1	2	3	4
1	2026 – without OMR and 2046 – with OMR	Base	✓	✓	✓	✓
2		1A	✓		✓	✓
3		1B		✓	✓	✓
4		1C			✓	✓
5		2A	✓	✓	✓	
6		2B	✓	✓		✓
7		2C	✓	✓		
8	2046 – without OMR	3A	✓		✓	✓
9		3B		✓	✓	✓
10		3C			✓	✓
11		4A	✓	✓	✓	
12		4B	✓	✓		✓
13		4C	✓	✓		

1. Gunns Gully Road
2. Grants Road
3. North South Secondary Arterial
4. Northern Railway Crossing

Scenarios 1A to 2C are the likely outcome for the 2026 and 2046 design years, whilst 3A to 4C have been developed to understand the network operation if the OMR is not completed by this date.

The location of the four links indicated in Table 5.3 is shown graphically in Figure 5.8.

Figure 5.8: Location of Links included for Scenarios Model

6. Anticipated Traffic Volumes

6.1 Introduction

An assessment of the PSP transport demands and network performance has been undertaken for the Base Scenario in this section of the report. The outcomes from the assessment of the Base Scenario will inform the road network requirements at full development, whilst the determination of a need for the four crossings previously identified is within Section 7.

6.2 GTA VITM Traffic Generation

Table 6.1 lists the inputs and outputs of the GTA VITM modelling. It shows the AM and PM 2-hour peak and daily traffic generation for the two PSPs along with the corresponding land use inputs.

Table 6.1: Updated VITM Traffic Generation – Base Scenario

Year	PSP	Land Use			AM 2 hr Trips	PM 2 Hr Trips	Daily Vehicle Trips
		Residential (hh)	Employment (jobs)	Schools (enrolments)			
2026	Donnybrook (67)	4,388	764	2,002	4,198	4,532	23,500
	Woodstock (96)	7,742	1,344	1,302	7,171	8,086	41,900
Total		**12,130**	**2,108**	**3,304**	**11,369**	**12,618**	**65,400**
2046	Donnybrook (67)	5,850	1,001	2,402	6,845	7,849	40,800
	Woodstock (96)	10,322	2,079	4,353	12,258	14,025	73,400
Total		**16,172**	**3,080**	**6,755**	**19,103**	**21,874**	**114,200**

The model outputs suggest that by 2046 the two PSPs are expected to generate traffic in the order of 114,200 vpd, and 19,103 and 21,874 vehicles for the AM and PM 2-hour peak periods respectively.

Adopting a typical (industry standard) two-hour to peak hour factor of 0.55, the combined PSPs are anticipated to generate in the order of 10,507 vehicles in the AM peak hour and 12,031 vehicles in the PM peak hour.

6.3 Validation of VITM Traffic Generation Rates

6.3.1 First Principles Generation Rates

A summary of the individual land uses and the resulting first principles traffic generation for the study area is provided in Table 6.2. This assessment compares the modelled traffic volume outputs to commonly used generation rates as confirmation that VITM is generating realistic traffic demands.

Table 6.2: First Principals Traffic Generation Assessment (2046) – Base Scenario

Area	Land Use	Yield	Traffic Generation Rate			Reduction Factor for Internal Trips	Resultant Trips		
			AM (1hr)	PM (1hr)	Daily		AM (1hr)	PM (1hr)	Daily
Donnybrook (67)	Residential [1]	5,850 dwellings	0.6 trips/hh	0.6 trips/hh	6.0 trips/hh	n/a	3,510	3,510	35,100
	Employment (jobs)	1,001 jobs	0.5 trips/ 3 jobs [2]	4.6 trips/3 jobs [2]	50 trips/ 3 jobs [2]	25% [3]	124	1,143	12,422
	School	2,402 enrolments	0.75 trips/ enrol [4]	0 trips/ enrol [4]	1.5 trips/ enrol [4]	n/a	1,802	-	3,603
Woodstock (96)	Residential [1]	10,322 dwellings	0.6 trips/hh	0.6 trips/hh	6.0 trips/hh	n/a	6,193	6,193	61,932
	Employment (jobs)	2,079 jobs	0.5 trips/ 3 jobs [2]	4.6 trips/3 jobs [2]	50 trips/ 3 jobs [2]	25% [3]	258	2,373	25,799
	School	4,353 enrolments	0.75 trips/ enrol [4]	0 trips/ enrol [4]	1.5 trips/ enrol [4]	n/a	3,265	-	6,530
Total							**15,152**	**13,219**	**145,385**

[1] Daily rate based on VISTA 09 data for the Whittlesea LGA, with the peak hour rates assumed to be 10% of the daily rate.

[2] Daily rate sourced from the RTANSW "Guide to Traffic Generating Developments" report (dated October 2002) with PM peak hour rate assumed to be 10% of the daily rate. An AM rate of 0.5 trips/100sqm has been adopted for service vehicle movements given that the LTC will not be fully operational during the AM peak hour. A rate of 3 jobs per 100sqm has been adopted for this assessment.

[3] Based on Section 3.3 of the RTANSW "Guide to Traffic Generating Developments" report. It is assumed that 25% of all trips within the PSP will be internal to the zone given that the PSP includes a number of LTC's and schools.

[4] Based on a first principals assessment

It is highlighted that the first principles assessment outlined in Table 6.2 takes into consideration the results of the Victorian Integrated Survey of Travel and Activity 2009 (VISTA09) undertaken by the DoT/DTPLI. VISTA09 is a comprehensive survey of how, when and why Victorians travel and is both more recent and locality specific than most other available empirical data sources. The average VISTA09 traffic generation rate of 6.0 movements per dwelling for the Whittlesea LGA is lower than other empirical data sources which generally have a daily generation rate in the order of 6.0 vehicle movements per dwelling. The lower VISTA 09 generation rate can be partially attributed to a shift in mode choice away from private vehicle use.

6.3.2 Comparison of VITM and First Principals Volume Analysis

A comparison of the GTA VITM generation and first principles generation assessment is provided in Table 6.3.

Table 6.3: VITM verses First Principles Assessment (2046) - Base Scenario

Traffic Volumes	AM Peak	PM Peak	Daily
VITM	10,507	12,031	114,200
First Principle Assessment	15,152	13,219	145,385
% Difference	144%	110%	127%

Table 6.3 show that the forecast GTA VTIM traffic demands are generally within 50% to those of a first principles assessment, noting that some of the land use rates and yields can vary depending on the ultimate mix and density of development, and the strategic nature of VITM. It is noted that the VITM generally produces low traffic demands when compared with the first principles assessment due to short trips (trips within zones) being excluded.

6.4 Daily Modelled Volumes

Ten key locations within the PSP have been identified in consultation with MPA to report on a range of outputs including volumes and capacity information. The ten locations are shown graphically in Figure 6.1.

Figure 6.1: Transport Network with Key Locations

Based on the outcomes of the VITM modelling, the expected two-way daily traffic volumes on key roads for 2046 are summarised in Table 6.4. The volumes reported are for the Base Scenario.

Table 6.4: Summary of Ultimate Daily Volumes on Key Roads (2046)

No.	Road Name	Expected Daily Traffic Volume	Proposed Classification and No. lanes	Daily Traffic Volume Limit Associated with Classification	Austroads Capacity Limit (based on No. lanes) [1]	Proposed Classification is Considered Appropriate?
1	Donnybrook Road (east of Donnybrook Station)	6,500	Primary Arterial (6 lanes)	Greater than 30,000vpd	54,000vpd	Yes
2	Donnybrook Road (west of OMR)	6,300	Primary Arterial (6 lanes)	Greater than 30,000vpd	54,000vpd	Yes
3	North South Connector	4,800	Connector Street (2 lanes)	3,000 to 7,000vpd	18,000vpd	Yes
4	Scanlon Dr	13,800	Primary Arterial (6 lanes)	Greater than 30,000vpd	54,000vpd	Yes
5	Grants Road	11,400	Secondary Arterial (4 lanes)	12,000 to 40,000vpd	18,000vpd	Yes
6	Gunns Gully Road (east of train-line)	45,400	Primary Arterial (6 lanes)	Greater than 30,000vpd	54,000vpd	Yes
7	Northern Railway Crossing	3,900	Connector Street (2 lanes)	3,000 to 7,000vpd	18,000vpd	Yes
8	North South Secondary Arterial	7,500	Secondary Arterial (4 lanes)	12,000 to 40,000vpd	18,000vpd	Yes
9	Gunns Gully Road (west of OMR)	24,400	Primary Arterial (6 lanes)	Greater than 30,000vpd	54,000vpd	Yes

[1] Capacity limits scoured from Austroads Standards "Guide to Traffic Management – Part 3 Traffic Studies and Analysis" document from Table 4.3 as follows: 2-lane road: 18,000vpd, 4–lane road: 36,000vpd, 6-lane road 54,000vpd.

As shown in Table 6.4 the proposed road classifications align with the daily traffic volume ranges associated with the classification and Austroads based road capacity limits.

6.5 Model Plots

In addition to the information presented in this section, a range of outputs have been extracted from the model. The intention of these is to assist in the understanding of travel demand for the two design years. These are located within Appendix B and include the following:

- Select Link Analysis Plots for the eight locations identified, for the AM and PM peak periods, and by direction
- Degree of saturation for the AM and PM peak
- Daily, AM and PM peak volume plots
- Travel speed plots for the AM and PM peak period.

The SLAs demonstrate that, as expected, there is a large proportion of traffic from the eastern zones, which have a large amount of residential dwellings, travelling across the two PSPs towards the employment areas in the west.

7. Scenario Assessment

7.1 Overview

A key component of the study is to understand the need for any or all of the proposed railway line or Merri Creek bridge crossings. Specifically, these include:

- two crossings of the Sydney-Melbourne railway line that connect to the Lockerbie Principal Activity Centre
- one crossing of the Merri Creek providing a connection to the northern parts of the PSP
- one crossing of the Sydney to Melbourne railway line that connects the northern part of the PSP to the external network.

A range of outputs have been extracted from the model and are reported in this section. These are:

- link volumes at key locations for the AM, PM and Daily periods. These have been reported for both the interim (2026) and ultimate design years (2046)
- volume to capacity or degree of saturation outputs for the respective peak periods and design years
- select link plots or assessments for the key locations previously identified
- Network Performance characteristics.

The outputs are discussed in the following sections with a summary provided thereafter.

7.2 Link Volumes

7.2.1 Interim (2026)

The interim (2026) link volumes for the key locations, as identified in Section 6 (Figure 6.1), have been extracted from the model and are summarised in Table 7.1 through to 7.3.

Table 7.1: AM Peak (two hour) Link Volumes 2026

No	Road Name	Base	Scenario 1A	Scenario 1B	Scenario 1C	Scenario 2A	Scenario 2B	Scenario 2C
1	Donnybrook Rd (east of Donnybrook Station) EB	557	713	595	892	566	566	568
	Donnybrook Rd (east of Donnybrook Station) WB	1,290	1,567	1,574	1,614	1,289	1,289	1,282
2	Donnybrook Rd (west of OMR) EB	496	565	528	625	494	501	498
	Donnybrook Rd (west of OMR) WB	541	575	519	610	542	536	538
3	North South Connector NB	268	222	225	212	261	262	261
	North South Connector SB	623	719	841	791	610	631	607
4	Scanlon Dr NB	262	245	277	263	259	259	264
	Scanlon Dr SB	546	596	702	585	567	548	558
5	Grants Road EB	653		1,107		662	641	644
	Grants Road WB	1,397		1,660		1,423	1,403	1,405
6	Gunns Gully Road (east of train-line) EB	890	1,085			918	1,041	1,004
	Gunns Gully Road (east of train-line) WB	1,302	1,721			1,321	1,313	1,307
7	Northern Railway Crossing EB	92	103	184	409		145	
	Northern Railway Crossing WB	113	171	463	871		194	
8	North South Secondary Arterial NB	99	131	423	817	165		
	North South Secondary Arterial SB	236	219	325	536	318		
9	Gunns Gully Road (west of OMR) EB	176	169	181	162	177	171	200
	Gunns Gully Road (west of OMR) WB	359	321	325	280	354	357	416

Table 7.2: PM Peak (two hour) Link Volumes 2026

No	Road Name	Base	Scenario 1A	Scenario 1B	Scenario 1C	Scenario 2A	Scenario 2B	Scenario 2C
1	Donnybrook Rd (east of Donnybrook Station) EB	1,451	1,569	1,518	1,609	1,458	1,454	1,458
	Donnybrook Rd (east of Donnybrook Station) WB	872	1,090	977	1,314	868	879	875
2	Donnybrook Rd (west of OMR) EB	570	639	621	741	585	579	581
	Donnybrook Rd (west of OMR) WB	597	659	621	748	607	605	595
3	North South Connector NB	714	929	749	1,005	700	713	700
	North South Connector SB	355	334	296	374	351	354	351
4	Scanlon Dr NB	696	641	714	622	712	722	735
	Scanlon Dr SB	431	407	418	392	435	433	441
5	Grants Road EB	1,562		1,756		1,591	1,583	1,588
	Grants Road WB	875		1,387		912	870	873
6	Gunns Gully Road (east of train-line) EB	1,661	1,842			1,692	1,679	1,686
	Gunns Gully Road (east of train-line) WB	1,267	1,420			1,281	1,370	1,345
7	Northern Railway Crossing EB	209	540	787	1,206		221	
	Northern Railway Crossing WB	123	160	344	677		181	
8	North South Secondary Arterial NB	265	282	501	801	377		
	North South Secondary Arterial SB	177	486	732	1,142	215		
9	Gunns Gully Road (west of OMR) EB	418	394	356	313	427	429	495
	Gunns Gully Road (west of OMR) WB	240	226	234	194	252	248	283

Table 7.3: Daily Link Volumes 2026

No	Road Name	Base	Scenario 1A	Scenario 1B	Scenario 1C	Scenario 2A	Scenario 2B	Scenario 2C
1	Donnybrook Rd (east of Donnybrook Station) EB	5,800	6,600	6,200	8,800	5,900	5,800	5,900
	Donnybrook Rd (east of Donnybrook Station) WB	6,400	7,700	7,400	9,700	6,500	6,500	6,500
2	Donnybrook Rd (west of OMR) EB	2,900	3,100	3,000	3,800	2,900	2,900	2,900
	Donnybrook Rd (west of OMR) WB	3,000	3,200	3,100	3,800	3,000	3,000	3,000
3	North South Connector NB	2,700	3,100	2,600	3,600	2,700	2,700	2,700
	North South Connector SB	2,700	3,100	2,700	3,800	2,700	2,700	2,700
4	Scanlon Dr NB	2,500	2,400	2,500	2,300	2,500	2,500	2,600
	Scanlon Dr SB	2,600	2,600	2,700	2,300	2,600	2,600	2,700
5	Grants Road EB	5,500		9,400		5,600	5,500	5,500
	Grants Road WB	5,800		9,800		5,900	5,700	5,700
6	Gunns Gully Road (east of train-line) EB	8,100	9,500			8,300	8,300	8,300
	Gunns Gully Road (east of train-line) WB	8,300	9,800			8,500	8,500	8,500
7	Northern Railway Crossing EB	800	1,300	2,000	3,900		1,100	
	Northern Railway Crossing WB	700	900	1,600	3,800		1,100	
8	North South Secondary Arterial NB	800	800	1,700	3,800	1,300		
	North South Secondary Arterial SB	800	1,200	1,900	3,700	1,200		
9	Gunns Gully Road (west of OMR) EB	1,400	1,400	1,300	1,200	1,500	1,400	1,600
	Gunns Gully Road (west of OMR) WB	1,500	1,400	1,400	1,100	1,500	1,500	1,700

7.2.2 Ultimate (2046)

The ultimate (2046) link volumes for the key locations, as identified in Section 6 (Figure 6.1), have been extracted from the model and are summarised in Table 7.4 through to 7.6.

Table 7.4: AM Peak (two hour) Link Volumes 2046

No	Road Name	Base	Scenario 1A	Scenario 1B	Scenario 1C	Scenario 2A	Scenario 2B	Scenario 2C
1	Donnybrook Rd (east of Donnybrook Station) EB	960	1,047	1,064	1,590	959	972	979
	Donnybrook Rd (east of Donnybrook Station) WB	2,834	3,085	3,287	4,580	2,829	2,876	2,845
2	Donnybrook Rd (west of OMR) EB	848	862	880	1,014	850	854	856
	Donnybrook Rd (west of OMR) WB	570	589	603	923	570	572	573
3	North South Connector NB	280	242	301	329	281	276	277
	North South Connector SB	585	685	591	855	585	583	580
4	Scanlon Dr NB	1,008	1,007	712	607	1,017	1,076	1,084
	Scanlon Dr SB	1,201	1,226	1,128	1,194	1,205	1,228	1,237
5	Grants Road EB	421		1,067		425	395	403
	Grants Road WB	1,165		2,547		1,171	1,118	1,136
6	Gunns Gully Road (east of train-line) EB	1,705	1,865			1,847	1,840	1,914
	Gunns Gully Road (east of train-line) WB	3,276	3,821			3,435	3,316	3,435
7	Northern Railway Crossing EB	278	286	427	517		281	
	Northern Railway Crossing WB	256	289	446	705		323	
8	North South Secondary Arterial NB	612	609	828	1,106	652		
	North South Secondary Arterial SB	615	571	746	814	672		
9	Gunns Gully Road (west of OMR) EB	1,493	1,485	1,277	1,144	1,536	1,781	1,882
	Gunns Gully Road (west of OMR) WB	1,863	1,827	1,336	805	1,897	2,055	2,196

Table 7.5: PM Peak (two hour) Link Volumes 2046

No	Road Name	Base	Scenario 1A	Scenario 1B	Scenario 1C	Scenario 2A	Scenario 2B	Scenario 2C
1	Donnybrook Rd (east of Donnybrook Station) EB	508	872	936	2,690	505	522	525
	Donnybrook Rd (east of Donnybrook Station) WB	146	213	171	628	145	147	146
2	Donnybrook Rd (west of OMR) EB	493	525	520	802	491	494	493
	Donnybrook Rd (west of OMR) WB	763	787	800	878	766	768	772
3	North South Connector NB	514	624	530	864	608	511	509
	North South Connector SB	388	315	291	495	418	370	360
4	Scanlon Dr NB	1,199	1,255	1,128	1,191	1,197	1,264	1,272
	Scanlon Dr SB	1,420	1,378	919	802	1,422	1,511	1,523
5	Grants Road EB	1,530		3,373		1,574	1,502	1,525
	Grants Road WB	936		2,385		940	906	919
6	Gunns Gully Road (east of train-line) EB	5,114	5,653			5,285	5,251	5,378
	Gunns Gully Road (east of train-line) WB	2,935	3,377			3,120	3,083	3,222
7	Northern Railway Crossing EB	380	408	1,029	1,288		433	
	Northern Railway Crossing WB	364	376	563	1,004		402	
8	North South Secondary Arterial NB	698	657	856	1,232	839		
	North South Secondary Arterial SB	832	855	1,170	1,752	919		
9	Gunns Gully Road (west of OMR) EB	2,406	2,253	1,106	829	2,435	2,631	2,798
	Gunns Gully Road (west of OMR) WB	2,103	2,050	1,673	1,261	2,166	2,402	2,565

Table 7.6: Daily Link Volumes 2046

No	Road Name	Base	Scenario 1A	Scenario 1B	Scenario 1C	Scenario 2A	Scenario 2B	Scenario 2C
1	Donnybrook Rd (east of Donnybrook Station) EB	2,500	3,300	3,400	8,100	2,500	2,500	2,500
	Donnybrook Rd (east of Donnybrook Station) WB	4,000	4,600	4,600	9,200	4,000	4,000	4,000
2	Donnybrook Rd (west of OMR) EB	3,200	3,400	3,400	4,100	3,200	3,300	3,300
	Donnybrook Rd (west of OMR) WB	3,100	3,300	3,300	4,000	3,200	3,200	3,200
3	North South Connector NB	2,200	2,300	2,400	3,800	2,400	2,200	2,200
	North South Connector SB	2,600	2,600	2,500	3,900	2,600	2,500	2,500
4	Scanlon Dr NB	6,700	6,800	5,200	4,900	6,800	7,100	7,100
	Scanlon Dr SB	7,100	7,100	5,200	5,100	7,200	7,400	7,500
5	Grants Road EB	5,400		16,700		5,500	5,200	5,300
	Grants Road WB	6,000		17,900		6,100	5,900	5,900
6	Gunns Gully Road (east of train-line) EB	22,800	25,100			23,800	23,600	24,400
	Gunns Gully Road (east of train-line) WB	22,600	25,700			23,700	23,100	24,000
7	Northern Railway Crossing EB	2,000	2,000	3,600	7,000		2,200	
	Northern Railway Crossing WB	1,900	2,000	3,200	7,100		2,200	
8	North South Secondary Arterial NB	3,700	3,600	5,000	8,100	4,300		
	North South Secondary Arterial SB	3,800	3,800	5,000	8,000	4,400		
9	Gunns Gully Road (west of OMR) EB	12,100	11,700	7,900	5,500	12,400	13,500	14,400
	Gunns Gully Road (west of OMR) WB	12,300	12,000	8,600	5,400	12,600	13,500	14,500

7.2.3 Ultimate (2046) – without OMR

The ultimate (2046) link volumes without OMR for the key locations, as identified in Section 6 (Figure 6.1), have been extracted from the model and are summarised in Table 7.7 through to 7.9.

Table 7.7: AM Peak (two hour) Link Volumes 2046 – without OMR

No	Road Name	Scenario 3A	Scenario 3B	Scenario 3C	Scenario 4A	Scenario 4B	Scenario 4C
1	Donnybrook Rd (east of Donnybrook Station) EB	1,127	1,287	1,898	1,018	1,029	1,038
	Donnybrook Rd (east of Donnybrook Station) WB	3,595	3,815	5,013	3,209	3,049	3,065
2	Donnybrook Rd (west of OMR) EB	747	784	934	717	712	709
	Donnybrook Rd (west of OMR) WB	672	795	1,006	652	649	647
3	North South Connector NB	263	317	341	295	290	290
	North South Connector SB	761	626	872	628	631	629
4	Scanlon Dr NB	1,425	1,024	934	1,435	1,337	1,424
	Scanlon Dr SB	1,909	1,803	1,853	1,930	1,725	1,807
5	Grants Road EB		1,164		434	386	398
	Grants Road WB		2,492		1,212	1,122	1,142
6	Gunns Gully Road (east of train-line) EB	2,021			2,058	2,121	2,061
	Gunns Gully Road (east of train-line) WB	3,683			3,408	3,423	3,359
7	Northern Railway Crossing EB	297	450	586		558	
	Northern Railway Crossing WB	294	393	694		743	
8	North South Secondary Arterial NB	1,083	1,322	1,653	1,171		
	North South Secondary Arterial SB	1,231	1,420	1,488	1,362		
9	Gunns Gully Road (west of OMR) EB	395	400	385	405	628	787
	Gunns Gully Road (west of OMR) WB	658	618	595	671	826	956

Table 7.8: PM Peak (two hour) Link Volumes 2046 – without OMR

No	Road Name	Scenario 3A	Scenario 3B	Scenario 3C	Scenario 4A	Scenario 4B	Scenario 4C
1	Donnybrook Rd (east of Donnybrook Station) EB	1,061	1,415	3,226	625	607	610
	Donnybrook Rd (east of Donnybrook Station) WB	314	292	944	239	242	240
2	Donnybrook Rd (west of OMR) EB	597	669	1,010	595	588	589
	Donnybrook Rd (west of OMR) WB	767	733	964	729	726	722
3	North South Connector NB	700	587	740	541	677	673
	North South Connector SB	351	291	540	423	408	395
4	Scanlon Dr NB	2,034	1,816	1,925	2,020	1,854	1,885
	Scanlon Dr SB	1,815	1,198	1,110	1,848	1,752	1,766
5	Grants Road EB		3,485		1,954	1,793	1,791
	Grants Road WB		2,600		1,063	935	936
6	Gunns Gully Road (east of train-line) EB	5,690			5,131	5,082	5,048
	Gunns Gully Road (east of train-line) WB	3,415			3,071	3,209	3,148
7	Northern Railway Crossing EB	517	947	1,319		822	
	Northern Railway Crossing WB	373	515	964		629	
8	North South Secondary Arterial NB	1,235	1,384	1,879	1,563		
	North South Secondary Arterial SB	1,253	1,789	2,205	1,370		
9	Gunns Gully Road (west of OMR) EB	625	529	528	662	872	941
	Gunns Gully Road (west of OMR) WB	399	366	363	404	659	708

Table 7.9: Daily Link Volumes 2046 – without OMR

No	Road Name	Scenario 3A	Scenario 3B	Scenario 3C	Scenario 4A	Scenario 4B	Scenario 4C
1	Donnybrook Rd (east of Donnybrook Station) EB	3,800	4,500	10,300	2,900	2,800	2,900
	Donnybrook Rd (east of Donnybrook Station) WB	5,300	5,500	11,400	4,600	4,500	4,500
2	Donnybrook Rd (west of OMR) EB	3,200	3,400	4,900	3,200	3,200	3,200
	Donnybrook Rd (west of OMR) WB	3,300	3,700	4,900	3,200	3,300	3,200
3	North South Connector NB	2,600	2,600	3,700	2,400	2,500	2,500
	North South Connector SB	2,900	2,600	4,100	2,800	2,700	2,700
4	Scanlon Dr NB	10,100	7,900	7,800	10,100	9,200	9,300
	Scanlon Dr SB	10,100	7,800	7,800	10,200	9,200	9,300
5	Grants Road EB		17,200		6,000	5,600	5,600
	Grants Road WB		18,600		6,400	5,900	5,800
6	Gunns Gully Road (east of train-line) EB	25,400			24,000	23,600	23,400
	Gunns Gully Road (east of train-line) WB	25,600			23,700	23,500	23,200
7	Northern Railway Crossing EB	2,300	3,600	6,700		3,900	
	Northern Railway Crossing WB	2,200	3,000	6,600		4,100	
8	North South Secondary Arterial NB	6,400	7,700	11,600	7,600		
	North South Secondary Arterial SB	6,400	8,100	11,300	7,400		
9	Gunns Gully Road (west of OMR) EB	2,700	2,400	2,300	2,800	3,900	4,300
	Gunns Gully Road (west of OMR) WB	2,600	2,300	2,200	2,700	3,700	4,000

7.3 Degree of Saturation

The volume to capacity ration (degree of saturation) is a good indicator as to the operation of the network at the specific link locations. The volume to capacity ratio (VCR) are also able to be correlated with the Level of Service Definitions as defined in Austroads outlined in Table 7.10.

Table 7.10: Level of Service Definitions

LOS	Definition	Volume to Capacity Ratio
A	Conditions of free flow, speed is controlled by driver's desires, speed limits or physical Roadway conditions	0.0-0.35
B	Conditions of stable flow, operating speeds begin to be restricted, little or no restrictions on manoeuvrability from other vehicles	0.35-0.50
C	Conditions of stable flow, speeds and manoeuvrability more closely restricted, occasional backups behind left-turning vehicles at intersections	0.50-0.75
D	Conditions approach unstable flow, tolerable speeds can be maintained but temporary restrictions may cause extensive delays, little freedom to manoeuvre	0.75-0.90
E	Conditions approach capacity, unstable flow with stoppages of momentary duration, manoeuvrability severely limited	0.90-1.00
F	Forced flow conditions, stoppages for long periods, low operating speeds	1.00 or >1.00

7.3.1 Interim (2026)

The interim (2026) VCR outputs for the key locations, as identified in Section 6 (Figure 6.1), have been extracted from the model and are summarised in Table 7.11 through to 7.12.

Table 7.11: AM Peak (two hour) Volume to Capacity Outputs and Level of Service 2026

No	Road Name	Base	Scenario 1A	Scenario 1B	Scenario 1C	Scenario 2A	Scenario 2B	Scenario 2C
1	Donnybrook Rd (east of Donnybrook Station) EB	0.33	0.42	0.35	0.53	0.33	0.33	0.33
	Donnybrook Rd (east of Donnybrook Station) WB	0.76	0.92	0.93	0.95	0.76	0.76	0.75
2	Donnybrook Rd (west of OMR) EB	0.29	0.33	0.31	0.37	0.29	0.29	0.29
	Donnybrook Rd (west of OMR) WB	0.32	0.34	0.31	0.36	0.32	0.32	0.32
3	North South Connector NB	0.19	0.16	0.16	0.15	0.19	0.19	0.19
	North South Connector SB	0.44	0.51	0.60	0.56	0.44	0.45	0.43
4	Scanlon Dr NB	0.15	0.14	0.16	0.15	0.15	0.15	0.16
	Scanlon Dr SB	0.32	0.35	0.41	0.34	0.33	0.32	0.33
5	Grants Road EB	0.38		0.65		0.39	0.38	0.38
	Grants Road WB	0.82		0.98		0.84	0.83	0.83
6	Gunns Gully Road (east of train-line) EB	0.52	0.64			0.54	0.61	0.59
	Gunns Gully Road (east of train-line) WB	0.77	1.01			0.78	0.77	0.77
7	Northern Railway Crossing EB	0.07	0.07	0.13	0.29		0.10	
	Northern Railway Crossing WB	0.08	0.12	0.33	0.62		0.14	
8	North South Secondary Arterial NB	0.06	0.08	0.25	0.48	0.10		
	North South Secondary Arterial SB	0.14	0.13	0.19	0.32	0.19		
9	Gunns Gully Road (west of OMR) EB	0.10	0.10	0.11	0.10	0.10	0.10	0.12
	Gunns Gully Road (west of OMR) WB	0.21	0.19	0.19	0.16	0.21	0.21	0.24

Table 7.12: PM Peak (two hour) Volume to Capacity Outputs and Level of Service 2026

No	Road Name	Base	Scenario 1A	Scenario 1B	Scenario 1C	Scenario 2A	Scenario 2B	Scenario 2C
1	Donnybrook Rd (east of Donnybrook Station) EB	0.85	0.92	0.89	0.95	0.86	0.86	0.86
	Donnybrook Rd (east of Donnybrook Station) WB	0.51	0.64	0.57	0.77	0.51	0.52	0.51
2	Donnybrook Rd (west of OMR) EB	0.34	0.38	0.37	0.44	0.34	0.34	0.34
	Donnybrook Rd (west of OMR) WB	0.35	0.39	0.37	0.44	0.36	0.36	0.35
3	North South Connector NB	0.51	0.66	0.54	0.72	0.50	0.51	0.50
	North South Connector SB	0.25	0.24	0.21	0.27	0.25	0.25	0.25
4	Scanlon Dr NB	0.41	0.38	0.42	0.37	0.42	0.42	0.43
	Scanlon Dr SB	0.25	0.24	0.25	0.23	0.26	0.25	0.26
5	Grants Road EB	0.92		1.03		0.94	0.93	0.93
	Grants Road WB	0.51		0.82		0.54	0.51	0.51
6	Gunns Gully Road (east of train-line) EB	0.98	1.08			1.00	0.99	0.99
	Gunns Gully Road (east of train-line) WB	0.75	0.84			0.75	0.81	0.79
7	Northern Railway Crossing EB	0.15	0.39	0.56	0.86		0.16	
	Northern Railway Crossing WB	0.09	0.11	0.25	0.48		0.13	
8	North South Secondary Arterial NB	0.16	0.17	0.29	0.47	0.22		
	North South Secondary Arterial SB	0.10	0.29	0.43	0.67	0.13		
9	Gunns Gully Road (west of OMR) EB	0.25	0.23	0.21	0.18	0.25	0.25	0.29
	Gunns Gully Road (west of OMR) WB	0.14	0.13	0.14	0.11	0.15	0.15	0.17

7.3.2 Ultimate (2046)

The ultimate (2046) VCR outputs for the key locations, as identified in Section 6 (Figure 6.1), have been extracted from the model and are summarised in Table 7.13 through to 7.14.

Table 7.13: AM Peak (two hour) Volume to Capacity Outputs and Level of Service 2046

No	Road Name	Base	Scenario 1A	Scenario 1B	Scenario 1C	Scenario 2A	Scenario 2B	Scenario 2C
1	Donnybrook Rd (east of Donnybrook Station) EB	0.16	0.17	0.18	0.27	0.16	0.16	0.16
	Donnybrook Rd (east of Donnybrook Station) WB	0.47	0.51	0.55	0.76	0.47	0.48	0.47
2	Donnybrook Rd (west of OMR) EB	0.14	0.14	0.15	0.17	0.14	0.14	0.14
	Donnybrook Rd (west of OMR) WB	0.09	0.10	0.10	0.15	0.10	0.10	0.10
3	North South Connector NB	0.20	0.17	0.22	0.23	0.20	0.20	0.20
	North South Connector SB	0.42	0.49	0.42	0.61	0.42	0.42	0.41
4	Scanlon Dr NB	0.17	0.17	0.12	0.10	0.17	0.18	0.18
	Scanlon Dr SB	0.20	0.20	0.19	0.20	0.20	0.20	0.21
5	Grants Road EB	0.12		0.31		0.12	0.12	0.12
	Grants Road WB	0.34		0.75		0.34	0.33	0.33
6	Gunns Gully Road (east of train-line) EB	0.28	0.31			0.31	0.31	0.32
	Gunns Gully Road (east of train-line) WB	0.55	0.64			0.57	0.55	0.57
7	Northern Railway Crossing EB	0.20	0.20	0.31	0.37		0.20	
	Northern Railway Crossing WB	0.18	0.21	0.32	0.50		0.23	
8	North South Secondary Arterial NB	0.18	0.18	0.24	0.33	0.19		
	North South Secondary Arterial SB	0.18	0.17	0.22	0.24	0.20		
9	Gunns Gully Road (west of OMR) EB	0.37	0.37	0.32	0.29	0.38	0.45	0.47
	Gunns Gully Road (west of OMR) WB	0.47	0.46	0.33	0.20	0.47	0.51	0.55

Table 7.14: PM Peak (two hour) Volume to Capacity Outputs and Level of Service 2046

No	Road Name	Base	Scenario 1A	Scenario 1B	Scenario 1C	Scenario 2A	Scenario 2B	Scenario 2C
1	Donnybrook Rd (east of Donnybrook Station) EB	0.08	0.15	0.16	0.45	0.08	0.09	0.09
	Donnybrook Rd (east of Donnybrook Station) WB	0.02	0.04	0.03	0.10	0.02	0.02	0.02
2	Donnybrook Rd (west of OMR) EB	0.08	0.09	0.09	0.13	0.08	0.08	0.08
	Donnybrook Rd (west of OMR) WB	0.13	0.13	0.13	0.15	0.13	0.13	0.13
3	North South Connector NB	0.37	0.45	0.38	0.62	0.43	0.36	0.36
	North South Connector SB	0.28	0.23	0.21	0.35	0.30	0.26	0.26
4	Scanlon Dr NB	0.20	0.21	0.19	0.20	0.20	0.21	0.21
	Scanlon Dr SB	0.24	0.23	0.15	0.13	0.24	0.25	0.25
5	Grants Road EB	0.45		0.99		0.46	0.44	0.45
	Grants Road WB	0.28		0.70		0.28	0.27	0.27
6	Gunns Gully Road (east of train-line) EB	0.85	0.94			0.88	0.88	0.90
	Gunns Gully Road (east of train-line) WB	0.49	0.56			0.52	0.51	0.54
7	Northern Railway Crossing EB	0.27	0.29	0.74	0.92		0.31	
	Northern Railway Crossing WB	0.26	0.27	0.40	0.72		0.29	
8	North South Secondary Arterial NB	0.21	0.19	0.25	0.36	0.25		
	North South Secondary Arterial SB	0.24	0.25	0.34	0.52	0.27		
9	Gunns Gully Road (west of OMR) EB	0.60	0.56	0.28	0.21	0.61	0.66	0.70
	Gunns Gully Road (west of OMR) WB	0.53	0.51	0.42	0.32	0.54	0.60	0.64

The information presented in Table 7.12 to 7.14 indicate that the exclusion of Gunns Gully Road and Grants Road from the network (i.e. Scenarios 1A and 1B) but significant pressure on one another. This is considered to be due to the attractor of the Lockerbie Principal Activity Centre which is located immediately west of the Donnybrook PSP.

The Merri Creek Crossing (Crossing No. 3) experience a level of service of "C" or better in each of the scenarios, indicating that it will function well regardless of the combination of east-west connections. This highlights a demand to the northern destinations outside of the PSPs as well as the OMR. Its removal in Scenarios 2B and 2C shift traffic throughout the network again highlighting the strategic nature it plays to destinations north of the PSP areas.

Overall, the network demonstrates that generally, capacity exists on all road within the network, demonstrating that opportunities could exist to initially provide less capacity (i.e. number of lanes). In particular all roads, except for Grants Road and Gunns Gully Road, demonstrate excellent levels of service and low degrees of saturation, indicating that less capacity could be provided initially. Finally, should Gunns Gully Road and Grants Road both be constructed, in the short term, a 'balancing' of capacities could be introduced as development is realised.

Of all options that include only three of the four crossings, Option 2A represents the best network performance, with spare capacity existing on the majority of roads within the PSP.

It is noted that the modelling undertaken in this assessment only considers the likely transport demands and does not consider the strategic function or nature of the road, which is also a key input into determining its cross sectional layout and requirements.

7.3.3 Ultimate (2046) – without OMR

The ultimate (2046) VCR outputs without OMR for the key locations, as identified in Section 6 (Figure 6.1), have been extracted from the model and are summarised in Table 7.15 through to 7.16.

Table 7.15: AM Peak (two hour) Volume to Capacity Outputs and Level of Service 2046 – without OMR

No	Road Name	Scenario 3A	Scenario 3B	Scenario 3C	Scenario 4A	Scenario 4B	Scenario 4C
1	Donnybrook Rd (east of Donnybrook Station) EB	0.19	0.21	0.32	0.17	0.17	0.17
	Donnybrook Rd (east of Donnybrook Station) WB	0.60	0.64	0.84	0.53	0.51	0.51
2	Donnybrook Rd (west of OMR) EB	0.12	0.13	0.16	0.12	0.12	0.12
	Donnybrook Rd (west of OMR) WB	0.11	0.13	0.17	0.11	0.11	0.11
3	North South Connector NB	0.19	0.23	0.24	0.21	0.21	0.21
	North South Connector SB	0.54	0.45	0.62	0.45	0.45	0.45
4	Scanlon Dr NB	0.24	0.17	0.16	0.24	0.22	0.24
	Scanlon Dr SB	0.32	0.30	0.31	0.32	0.29	0.30
5	Grants Road EB		0.34		0.13	0.11	0.12
	Grants Road WB		0.73		0.36	0.33	0.34
6	Gunns Gully Road (east of train-line) EB	0.34			0.34	0.35	0.34
	Gunns Gully Road (east of train-line) WB	0.61			0.57	0.57	0.56
7	Northern Railway Crossing EB	0.21	0.32	0.42		0.40	
	Northern Railway Crossing WB	0.21	0.28	0.50		0.53	
8	North South Secondary Arterial NB	0.32	0.39	0.49	0.34		
	North South Secondary Arterial SB	0.36	0.42	0.44	0.40		
9	Gunns Gully Road (west of OMR) EB	0.10	0.10	0.10	0.10	0.16	0.20
	Gunns Gully Road (west of OMR) WB	0.16	0.15	0.15	0.17	0.21	0.24

Table 7.16: PM Peak (two hour) Volume to Capacity Outputs and Level of Service 2046 – without OMR

No	Road Name	Scenario 3A	Scenario 3B	Scenario 3C	Scenario 4A	Scenario 4B	Scenario 4C
1	Donnybrook Rd (east of Donnybrook Station) EB	0.18	0.24	0.54	0.10	0.10	0.10
	Donnybrook Rd (east of Donnybrook Station) WB	0.05	0.05	0.16	0.04	0.04	0.04
2	Donnybrook Rd (west of OMR) EB	0.10	0.11	0.17	0.10	0.10	0.10
	Donnybrook Rd (west of OMR) WB	0.13	0.12	0.16	0.12	0.12	0.12
3	North South Connector NB	0.50	0.42	0.53	0.39	0.48	0.48
	North South Connector SB	0.25	0.21	0.39	0.30	0.29	0.28
4	Scanlon Dr NB	0.34	0.30	0.32	0.34	0.31	0.31
	Scanlon Dr SB	0.30	0.20	0.19	0.31	0.29	0.29
5	Grants Road EB		1.03		0.57	0.53	0.53
	Grants Road WB		0.76		0.31	0.28	0.28
6	Gunns Gully Road (east of train-line) EB	0.95			0.86	0.85	0.84
	Gunns Gully Road (east of train-line) WB	0.57			0.51	0.53	0.52
7	Northern Railway Crossing EB	0.37	0.68	0.94		0.59	
	Northern Railway Crossing WB	0.27	0.37	0.69		0.45	
8	North South Secondary Arterial NB	0.36	0.41	0.55	0.46		
	North South Secondary Arterial SB	0.37	0.53	0.65	0.40		
9	Gunns Gully Road (west of OMR) EB	0.16	0.13	0.13	0.17	0.22	0.24
	Gunns Gully Road (west of OMR) WB	0.10	0.09	0.09	0.10	0.16	0.18

It is noted that as with the scenarios with the OMR, both Gunns Gully Road and Grants Road will experience undesirable levels of service should one or the other be removed from the network, as indicated in Scenario 1A and 1B. When both are removed from the network in Scenario 1C, the traffic demands shift towards the northern railway crossing link. This provides a clear indication that there is a large demand for east –west traffic through the PSP.

The results also demonstrate that it does not play a strategic function with the northern the Merri Creek Crossing (Crossing No. 3) as the network is able to accommodate the redistribution of demands with its removal.

The results also demonstrate that with and without the OMR, the demand volumes demonstrate that the network capacity generally has sufficient capacity to cater for the likely demands.

7.4 Road Network Performance

The VKT, VHT and average speeds for the wider study area are provided in Table 7.17.

Table 7.17: Network Statistic within PSP

Scenario	AM			PM		
	Vehicle Kilometres Travelled (VKT)	Vehicle Hours Travelled (VHT)	Average Speed (km/hr)	Vehicle Kilometres Travelled (VKT)	Vehicle Hours Travelled (VHT)	Average Speed (km/hr)
2026_Base	34,590	1,017	34.01	39,117	1,072	36.51
2026_Scen1A	34,478	1,031	33.46	40,023	1,217	32.87
2026_Scen1B	32,694	988	33.11	37,836	1,095	34.57
2026_Scen1C	33,924	1,082	31.36	39,467	1,346	29.32
2026_Scen2A	34,362	973	35.30	39,537	1,097	36.03
2026_Scen2B	33,044	941	35.13	34,471	951	36.26
2026_Scen2C	33,272	945	35.22	37,754	1,049	35.98
2046_Base	140,761	2,685	52.43	157,291	3,301	47.65
2046_Scen1A	123,144	2,392	51.49	140,946	3,089	45.63
2046_Scen1B	121,686	2,468	49.30	119,962	2,797	42.90
2046_Scen1C	105,055	2,159	48.65	112,536	2,881	39.06
2046_Scen2A	141,443	2,677	52.84	158,873	3,342	47.53
2046_Scen2B	126,614	2,458	51.51	145,243	3,141	46.24
2046_Scen2C	126,458	2,435	51.92	148,203	3,229	45.90
2046_Scen3A	173,117	3,320	52.15	189,152	4,113	45.99
2046_Scen3B	156,107	3,194	48.88	160,155	3,931	40.74
2046_Scen3C	159,281	3,235	49.23	163,494	4,036	40.51
2046_Scen4A	173,967	3,342	52.05	164,675	3,884	42.40
2046_Scen4B	155,601	3,001	51.84	173,490	3,656	47.46
2046_Scen4C	156,501	2,997	52.22	172,995	3,619	47.81

Scenarios with a higher VKT demonstrate a model network where vehicles generally travel longer distances to reach their destinations whilst the VHT is a representation of the time taken to reach their destination. The average speed is a good way to compare the operation of the network against one another.

As the land uses are the same between each of the scenarios, The Base Scenario features all of the road links and is expected to demonstrate the highest values of VKT. In both the interim and ultimate design years, Scenario 2A exhibit VKT values similar to that of the Base, indicating that the removal of the northern railway crossing does not alter travel patterns that significantly.

The average speed of Scenario 2A is the highest when compared to the remaining scenarios indicating that it performs quite well from a network perspective.

7.5 Plots

A range of pots for the Modelled Scenarios have been prepared and are located in Appendix C and Appendix D. These include:

- Daily, AM and PM Peak Period Link Volumes
- AM and PM Peak Period Travel Speeds
- AM and PM Peak Period Degree of Saturation.

8. Intersection Volumes

8.1 Methodology

VITM is a strategic network model and hence care should be exercised when extracting individual links or turning movement flows. It typically is not used for determining intersection turning movements as it is not used for this purpose, and turning movements are influenced by a number of factors not included in VITM.

Nevertheless, a requirement of the brief is to develop intersection turning movements to assist in determining the infrastructure requirements for the PSP. As such, we have developed an approach that seeks to provide a balanced outcome for each intersection.

The approach adopted in arriving at future turning flows for the purpose of assessing the PSPs is summarised as follows:

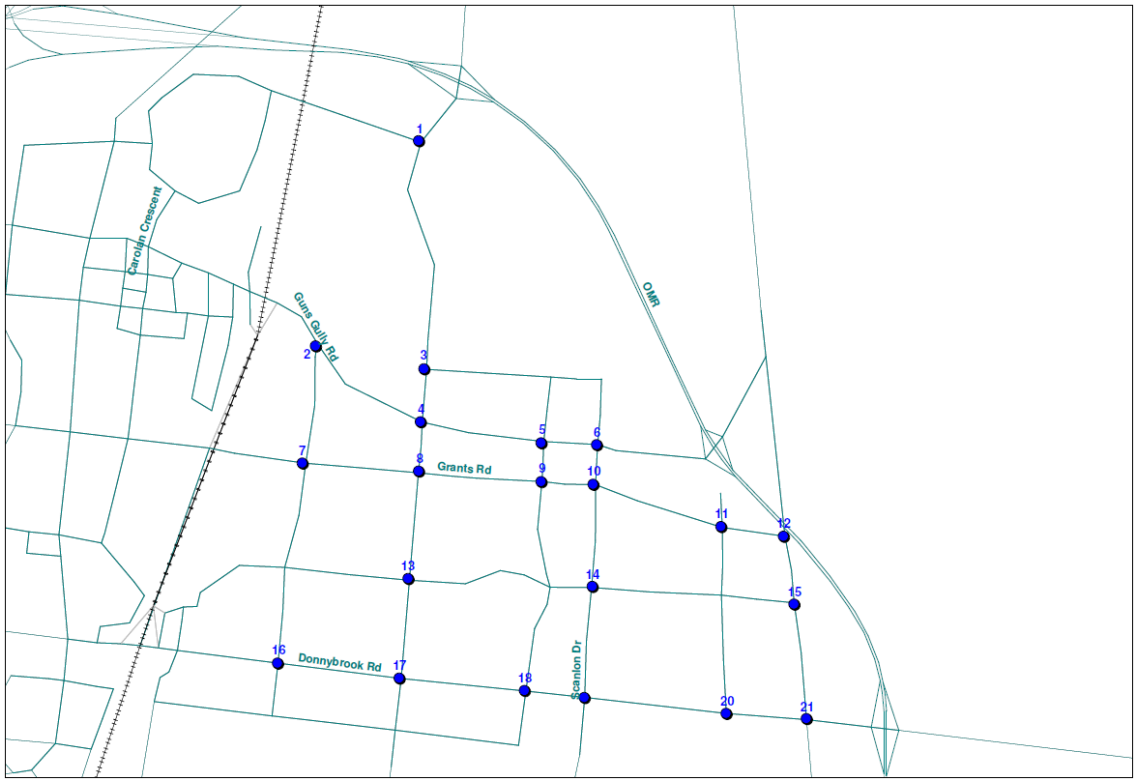
- Extract AM and PM peak period (2-hour) intersection turning movements from VITM for key intersections and covert to peak hour flows using the 0.55 factor.
- Assess each intersection individually to ensure that turn flows are reasonable having regard for the arterial and local road networks and adjacent activity centre and schools and make refinements where appropriate.
- Factor the VITM traffic volumes to achieve consistency with the anticipated first principles traffic generation assessment.
- Engineering 'judgement' has been applied to turning movements that exhibit low or unrealistic movements based on the network layout and accounting for individual.

In terms of the quantum of intersection turning movements, the results provided in Appendix E are for Scenario 2A, as this represents the best performing scenario.

8.2 Intersections Assessed

A total of 21 intersections have been selected within the study area, as depicted in Figure 8.1.

Figure 8.1: Key Intersection Locations



The resultant intersection turning movements, for the AM and PM peak periods for the interim (2026) and ultimate (2046) scenarios are located in Appendix E.

9. Conclusion

Strategic transport modelling of the Donnybrook and Woodstock PSPs has been undertaken using the Victoria Integrated Transport Model (VITM). The information presented within this report outlines the land use inputs, assumptions and resultant transport demands for the proposed road network.

Four specific road projects have been identified for further analysis, two that cross the Sydney-Melbourne railway line and connects to the Lockerbie Principal Activity Centre, a crossing of the Merri Creek providing a connection to the northern section of the PSP, and a third crossing of the Sydney-Melbourne railway line that also connects the northern section of the PSP.

In total, 19 scenarios were developed to inform the need for the four crossings to assist with understanding the need for the four road projects. The results demonstrated that:

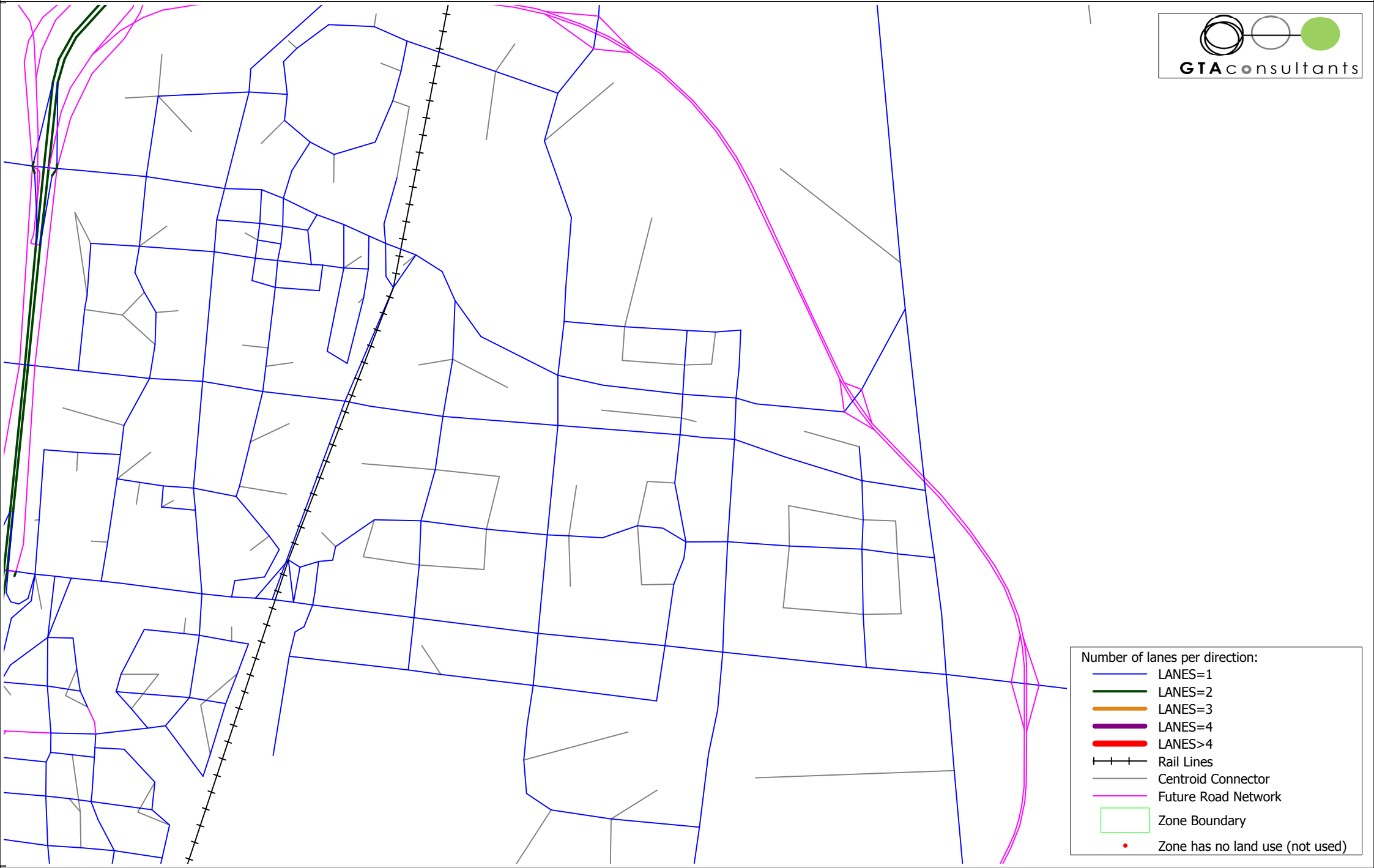
- The Gunns Gully Road connection (connection No. 1) provides a direct connection to the Lockerbie Principal Activity Centre and when removed, the network operates at undesirable levels, particularly on the adjacent east west routes.
- The Grants Road railway crossing (connection No. 2) is similar to the Gunns Gully Road crossing in that it plays an important function for east west traffic, and when removed, places undesirable operating levels on adjacent road links.
- The north south Merri Creek crossing (connection No. 3) provides an important link to destinations north of the PSP areas, however the low volume of traffic is able to be absorbed by the network when it is removed.
- The northern railway crossing (connection No. 4) provides a localised connection to the northern sections of the PSP however its removal does not significantly alter travel patterns in the study area, thus demonstrating its low reliance from a strategic level.

In summary, the outcomes presented in this report deem that Scenario 2A, which did not support the need for the northern crossing of the Sydney to Melbourne Railway Line, does not impact on the operation of the road network when compared to the remaining scenarios, providing the best network performance.

Appendix A

Interim (2026) and Ultimate (2046) Modelled Road Networks

VITM Northern Growth Coridor Model
14M1555000 Number of Lanes 2046



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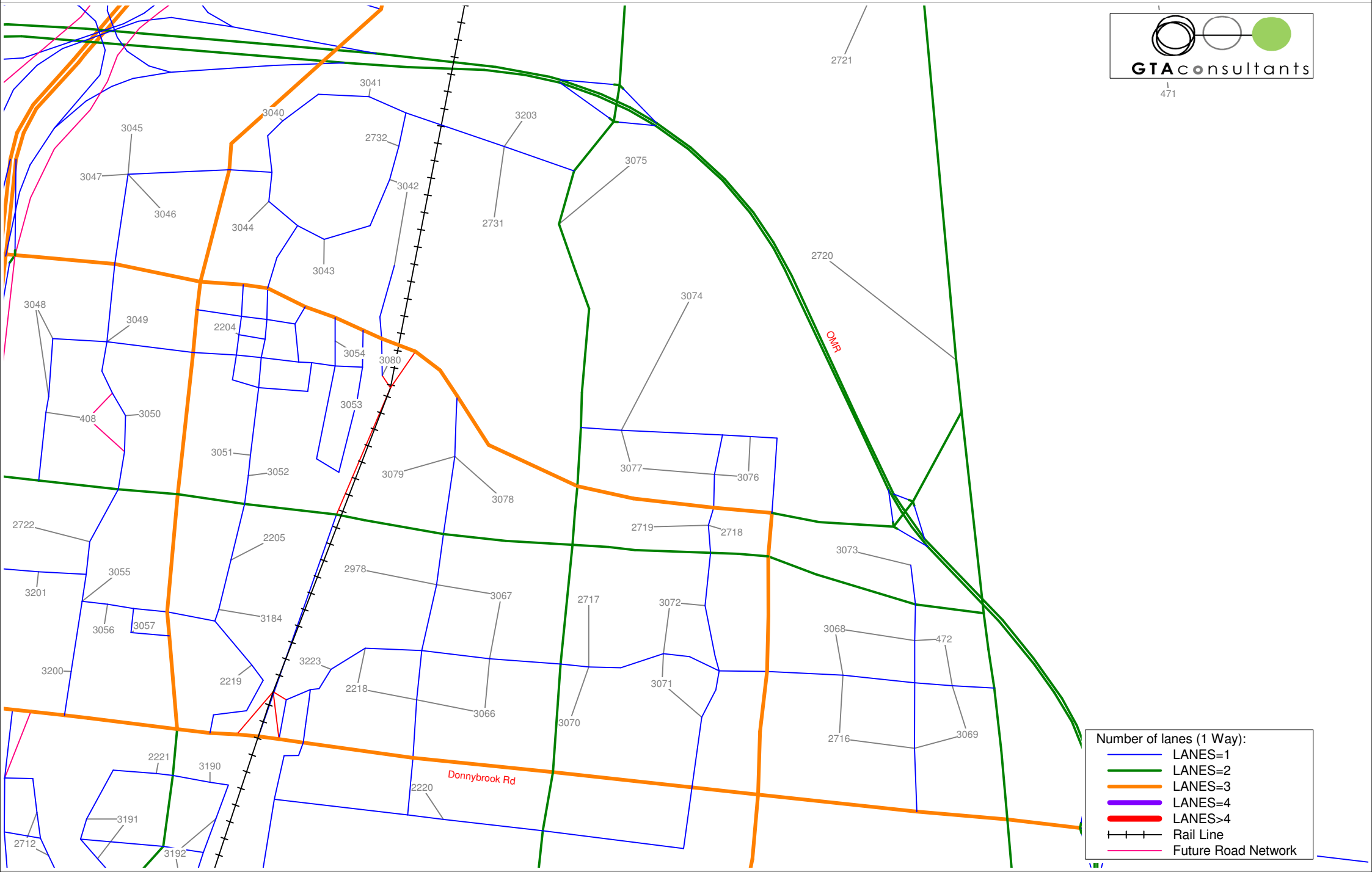
VITM Northern Growth Corridor Model
14M1555000 - Number of Lanes AM Year 2046



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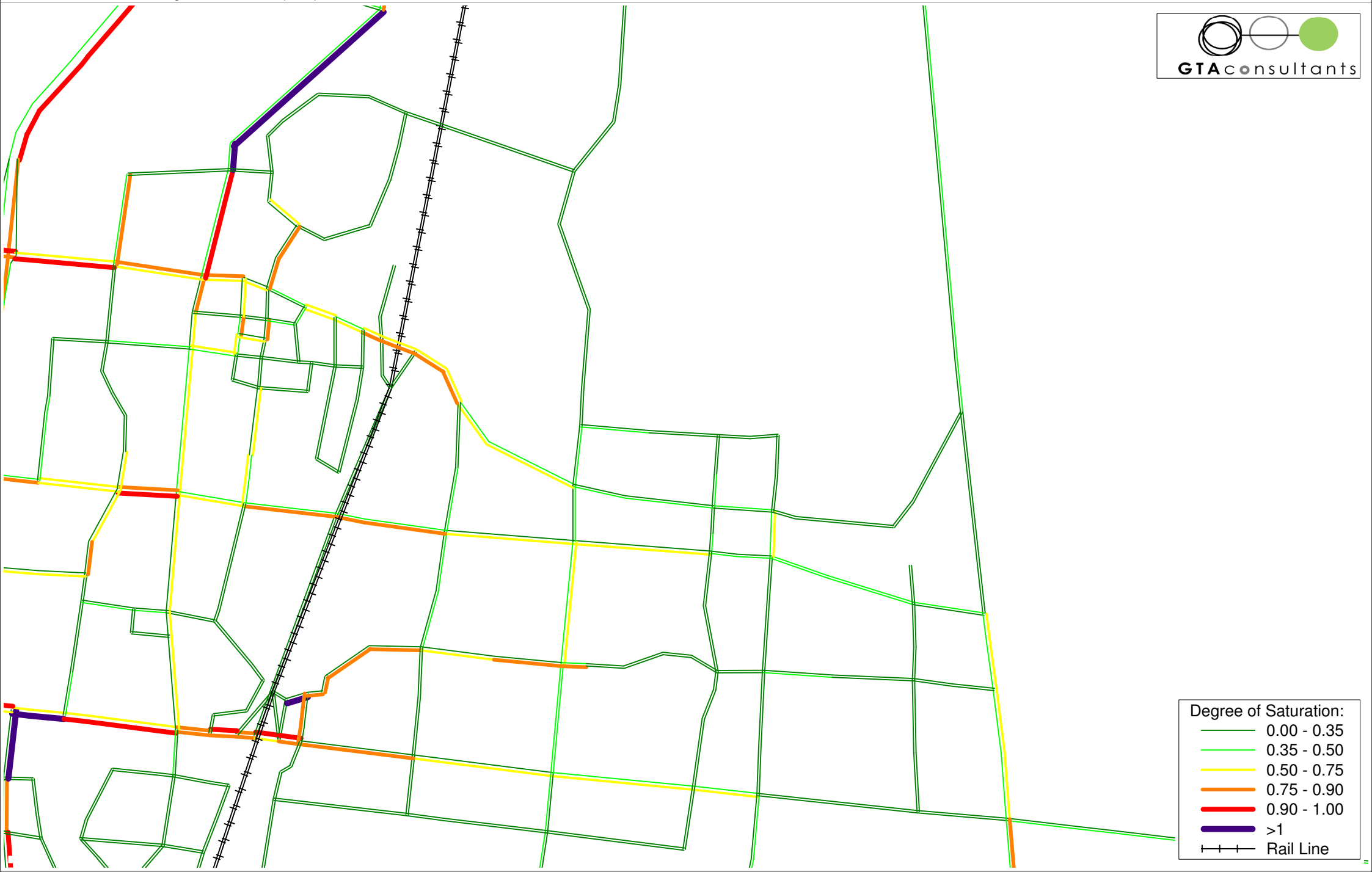
Appendix B

Interim (2026) and Ultimate (2046) Base Network Output Plots

VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Degree of Saturation (DOS) Year 2026 Base



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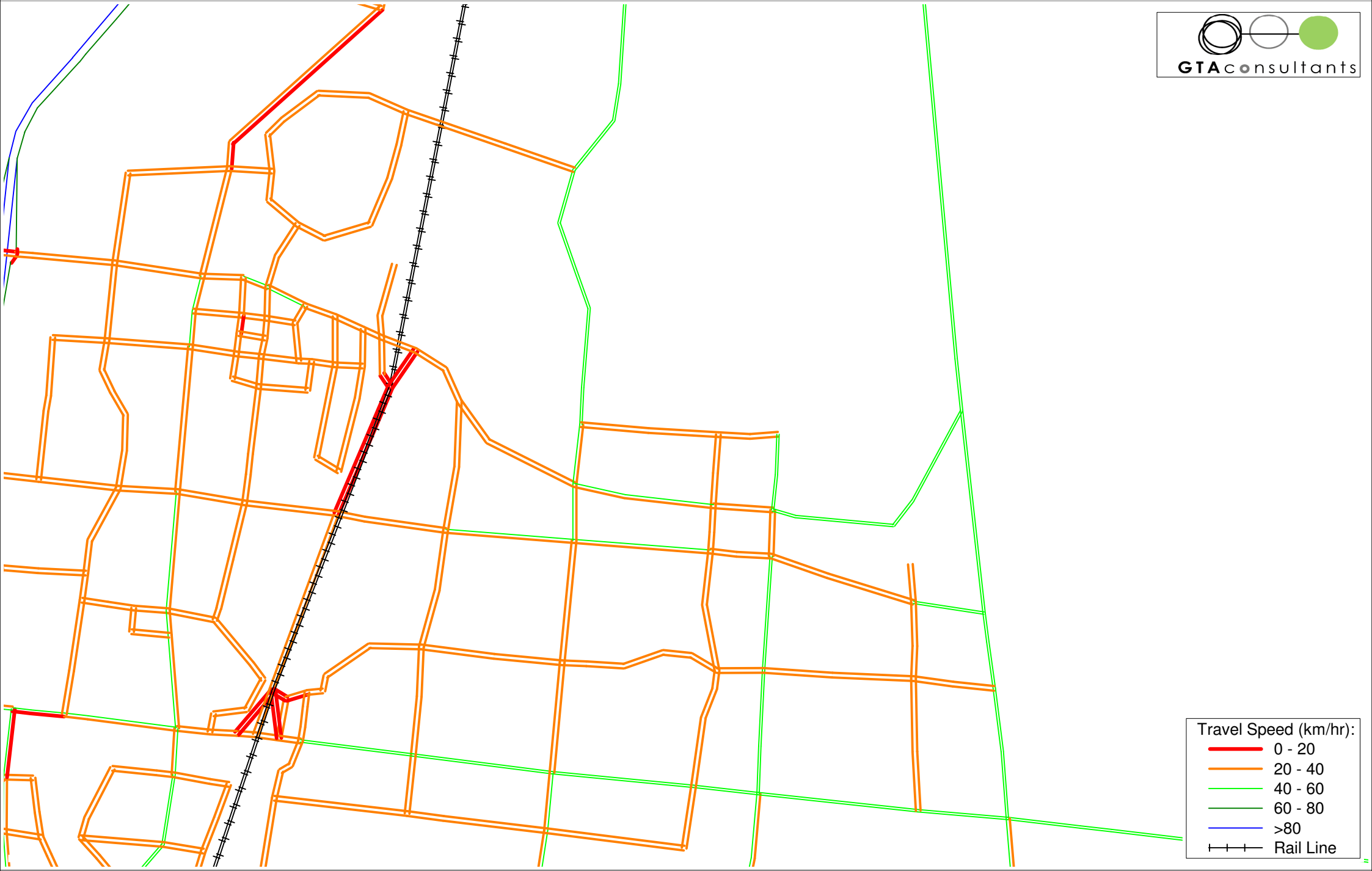
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Travel Speed (km/hr) Year 2026 Base



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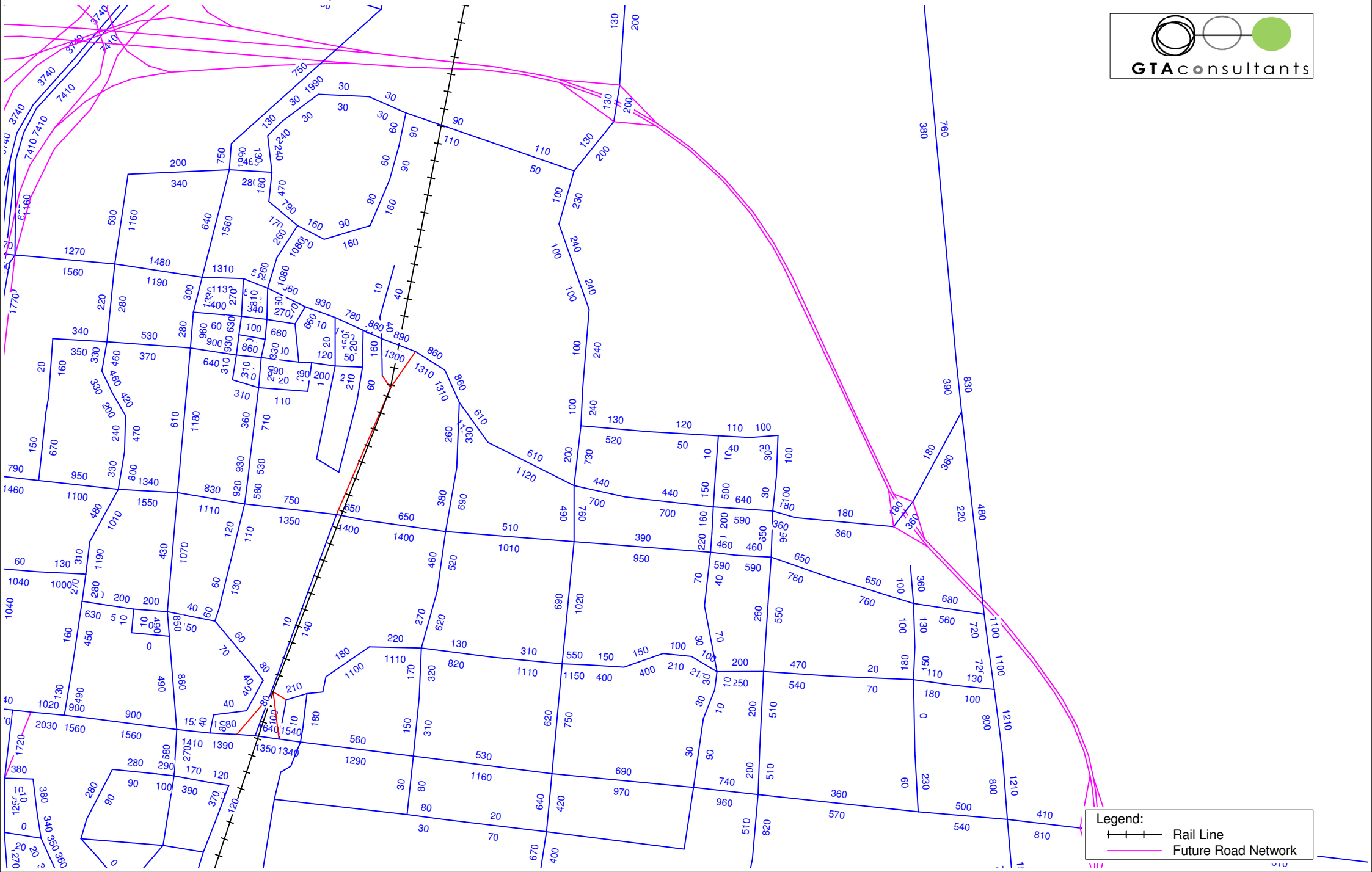
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Peak Total PCU Year 2026 Option Base



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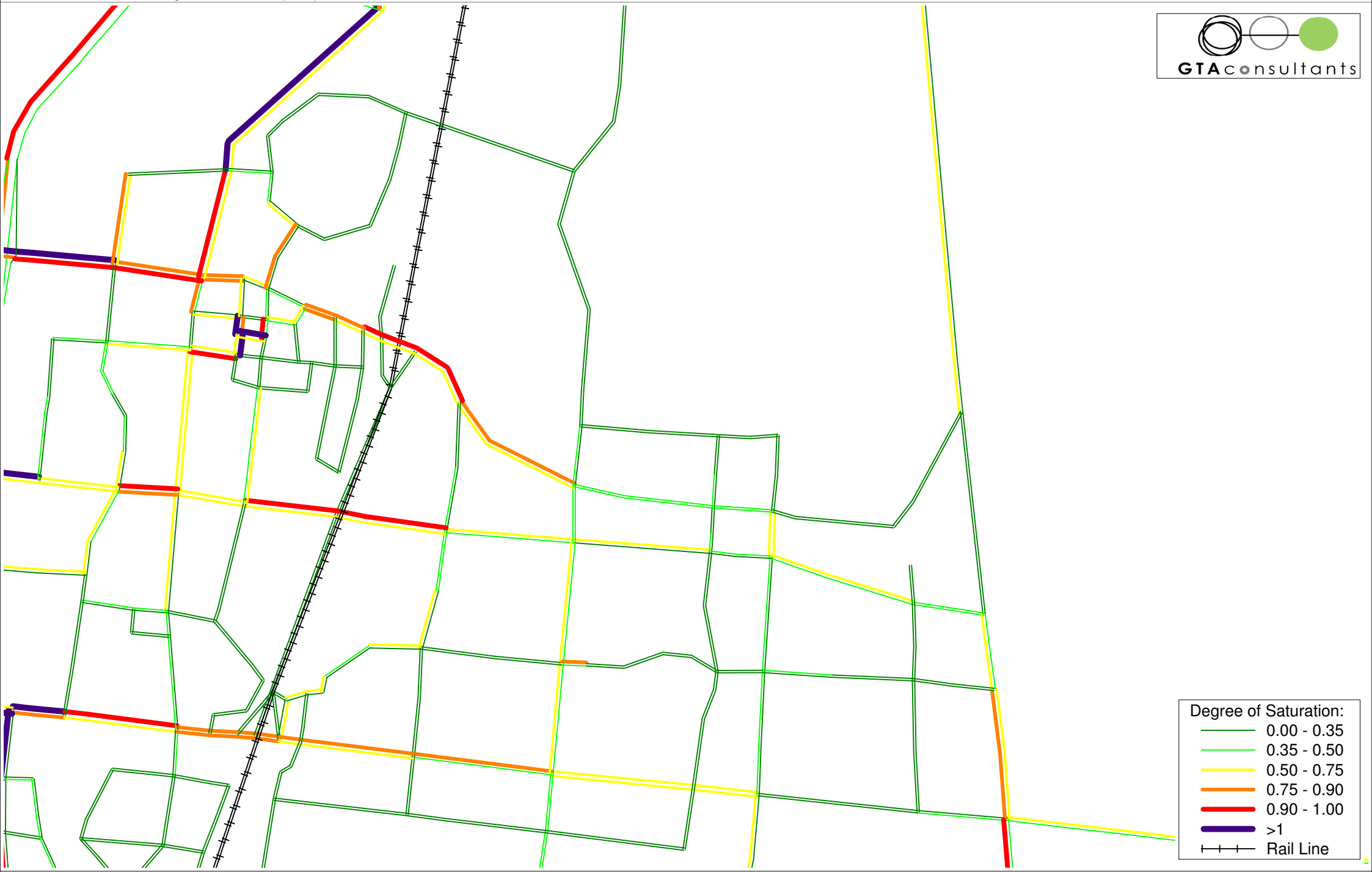
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Degree of Saturation (DOS) Year 2026 Base



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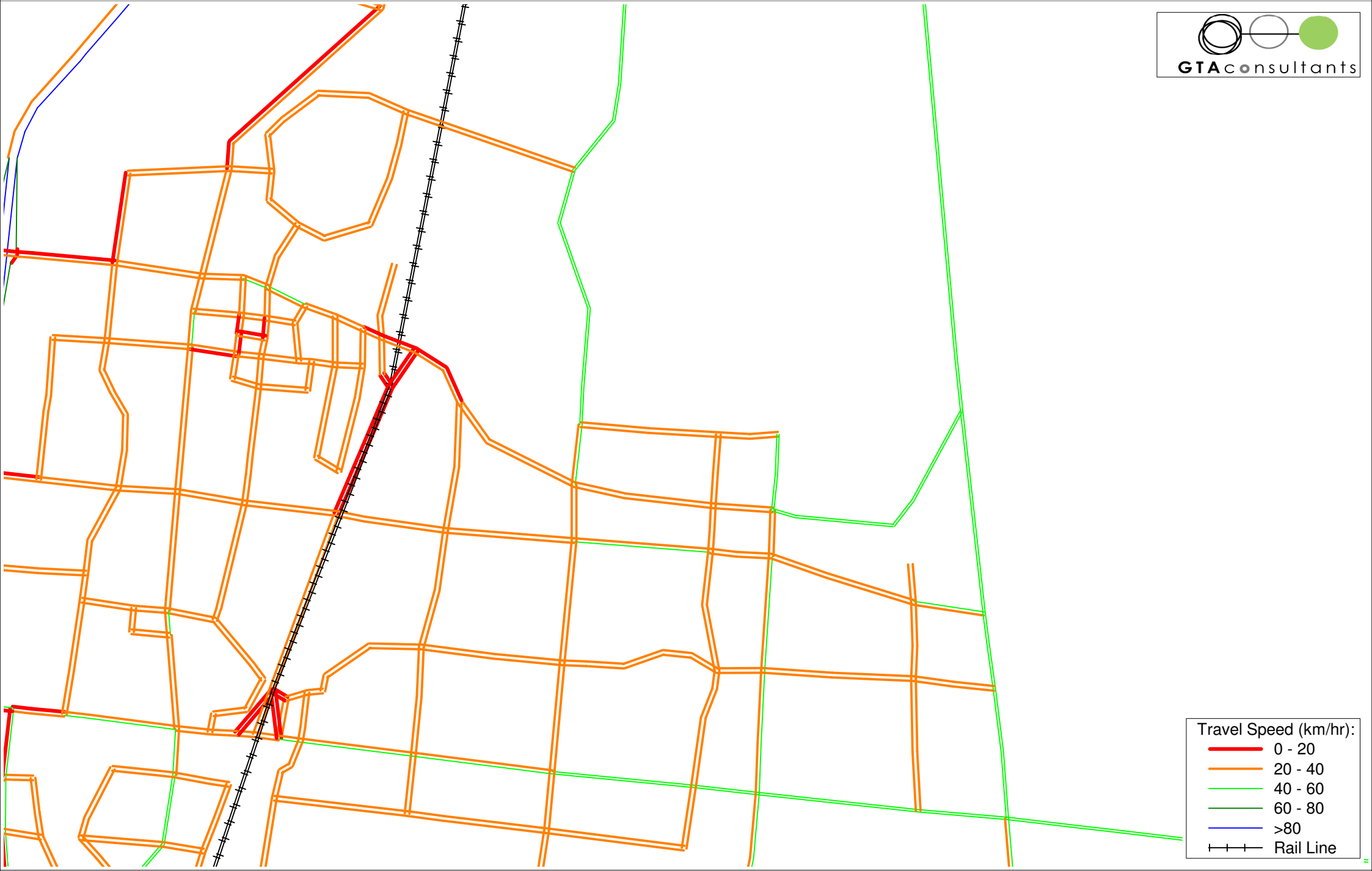
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Travel Speed (km/hr) Year 2026 Base



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2/06/2014

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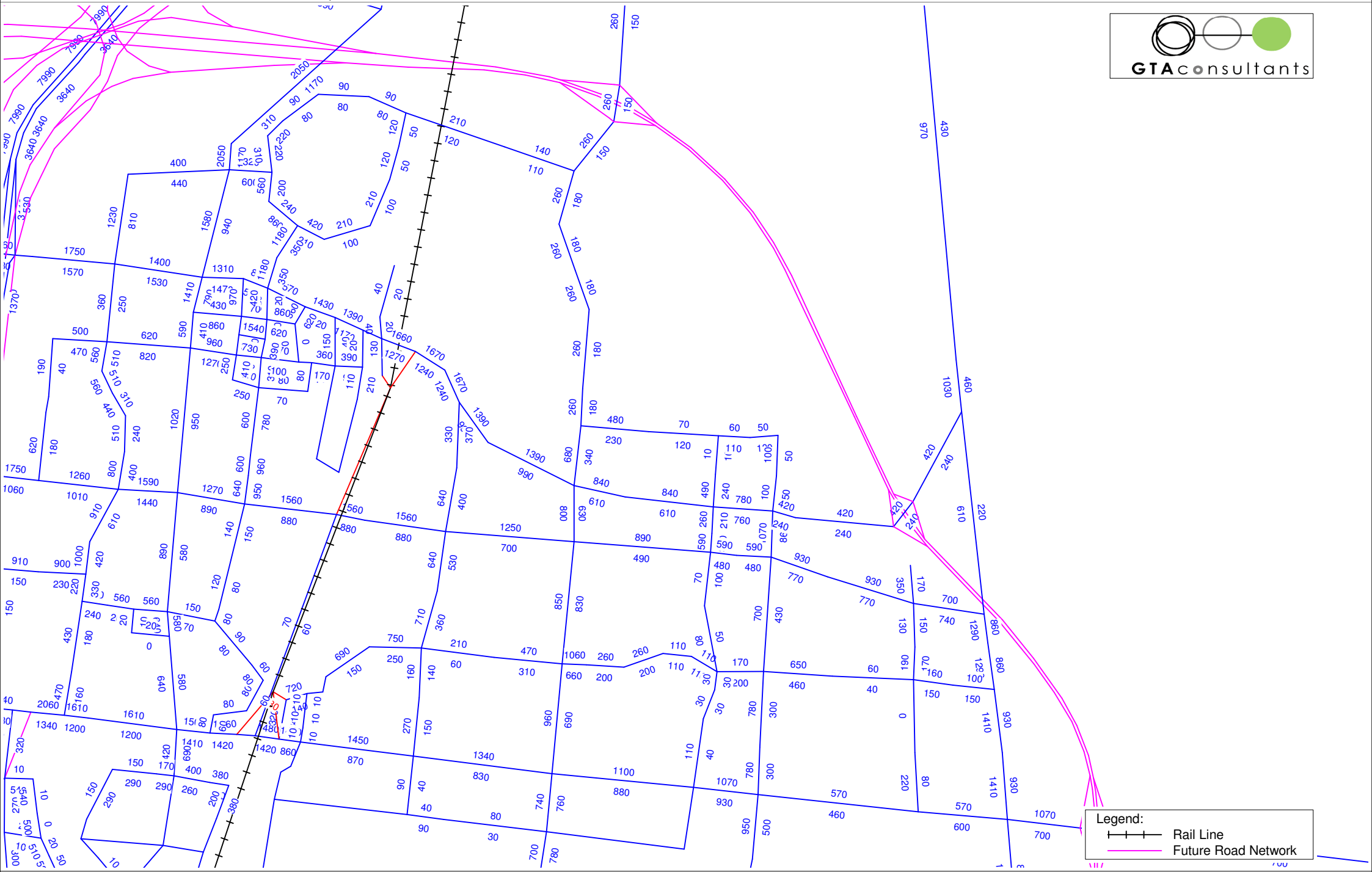
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Peak Total PCU Year 2026 Option Base



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2/06/2014

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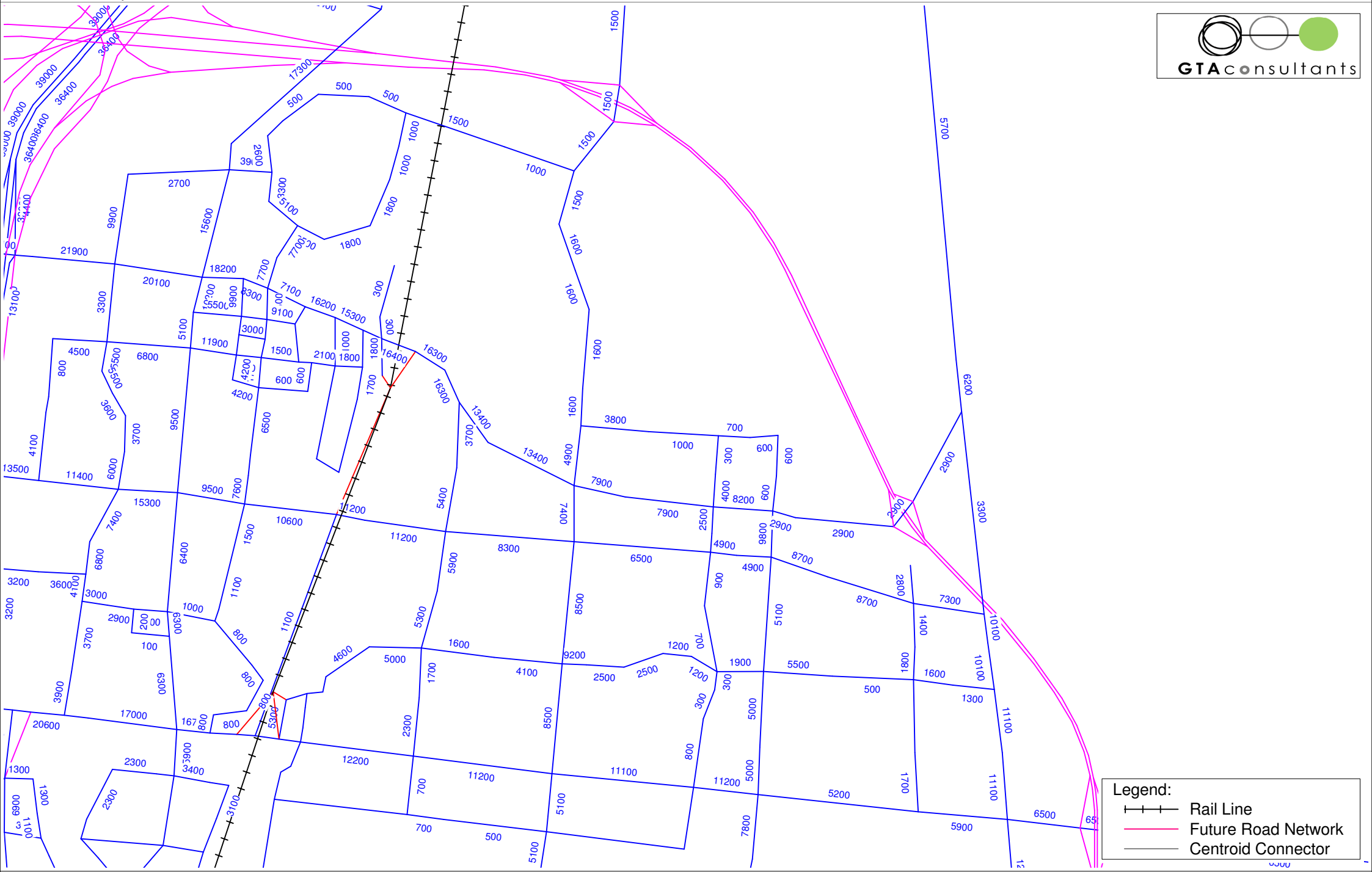
VITM Northern Growth Corridor Model
14M1555000 - Daily Volume Total PCU Year 2026 Base



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2/06/2014

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VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 1 EB year 2026 Base

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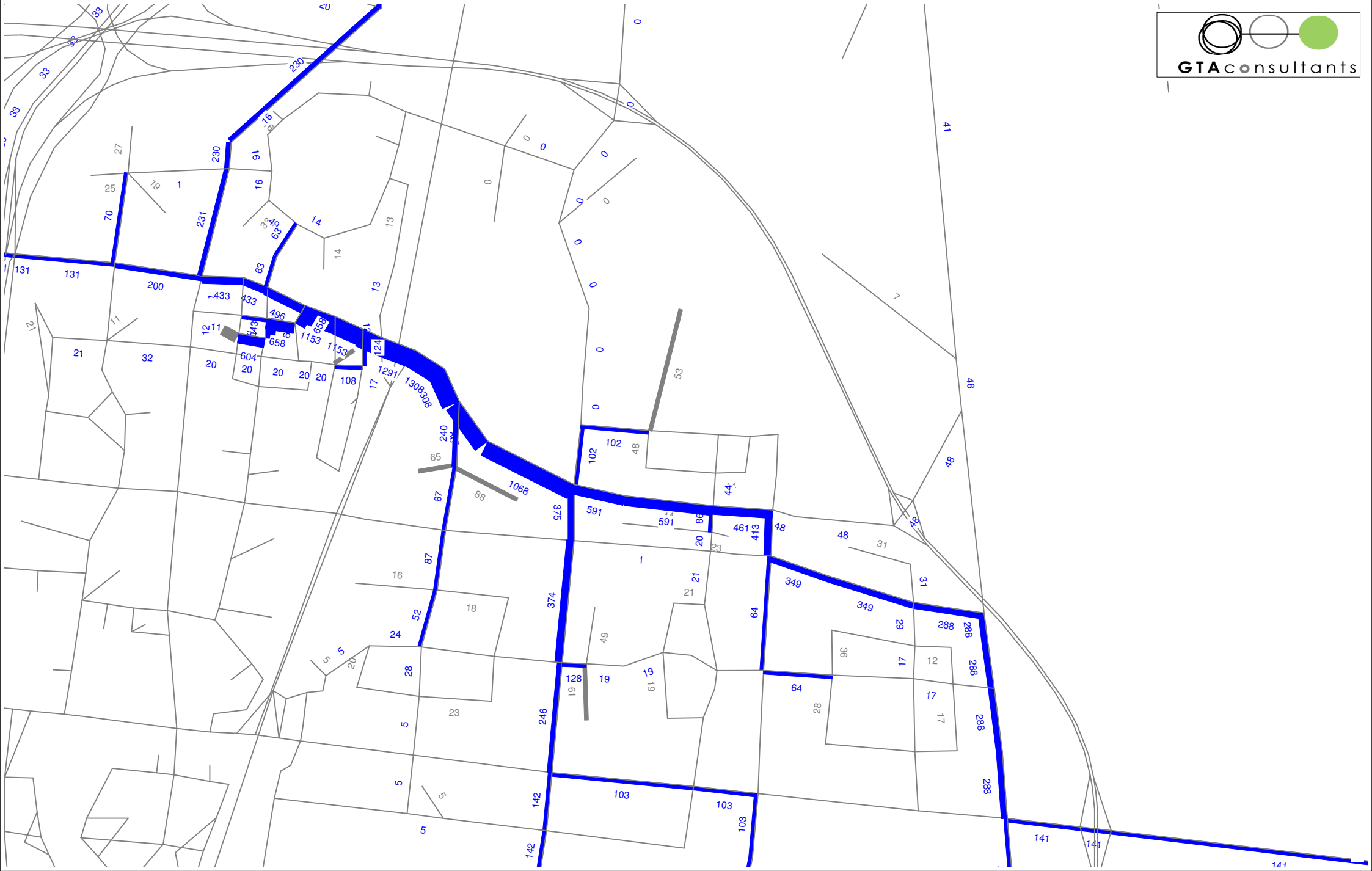
VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 1 WB year 2026 Base



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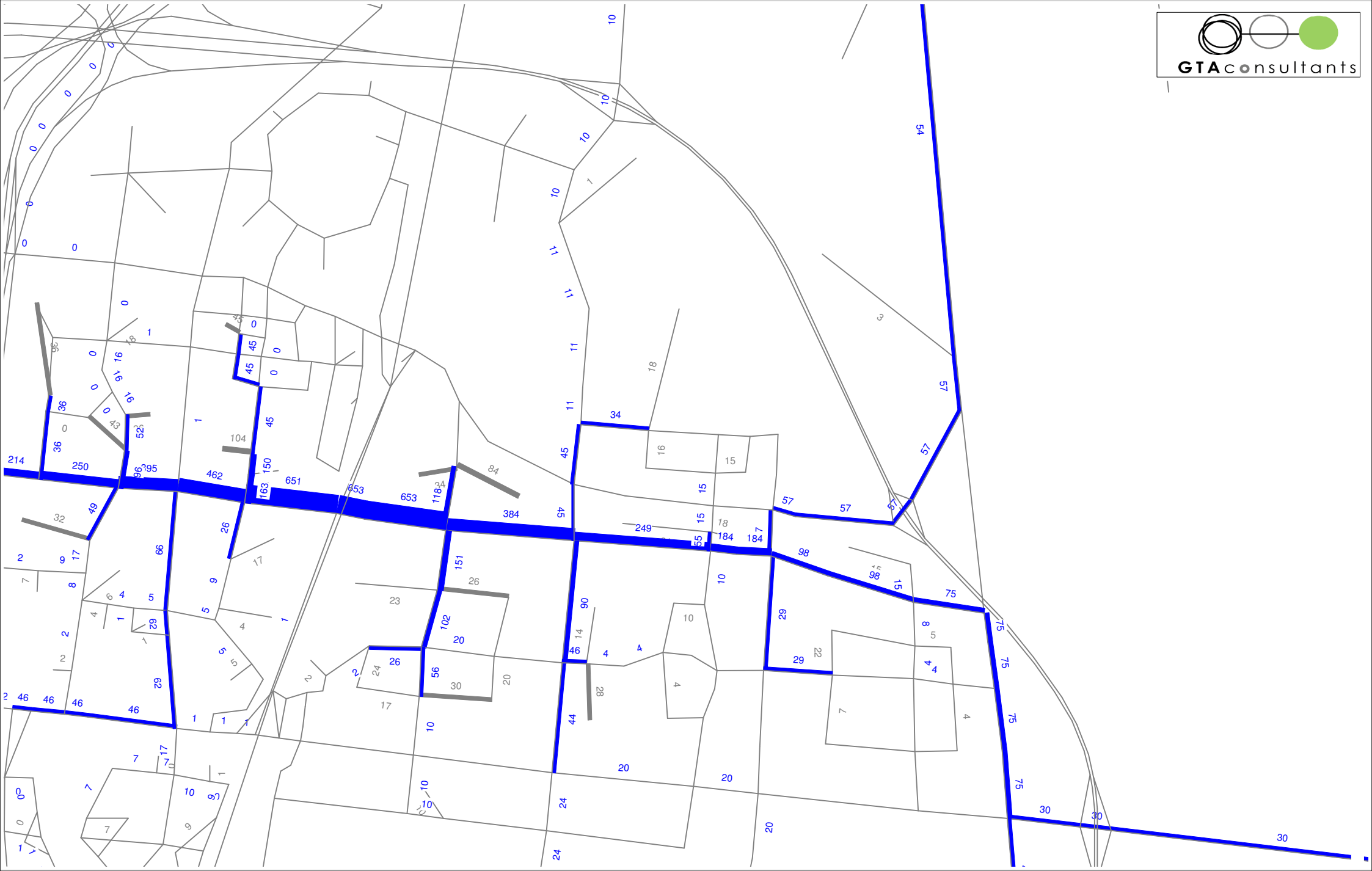
VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 2 EB year 2026 Base



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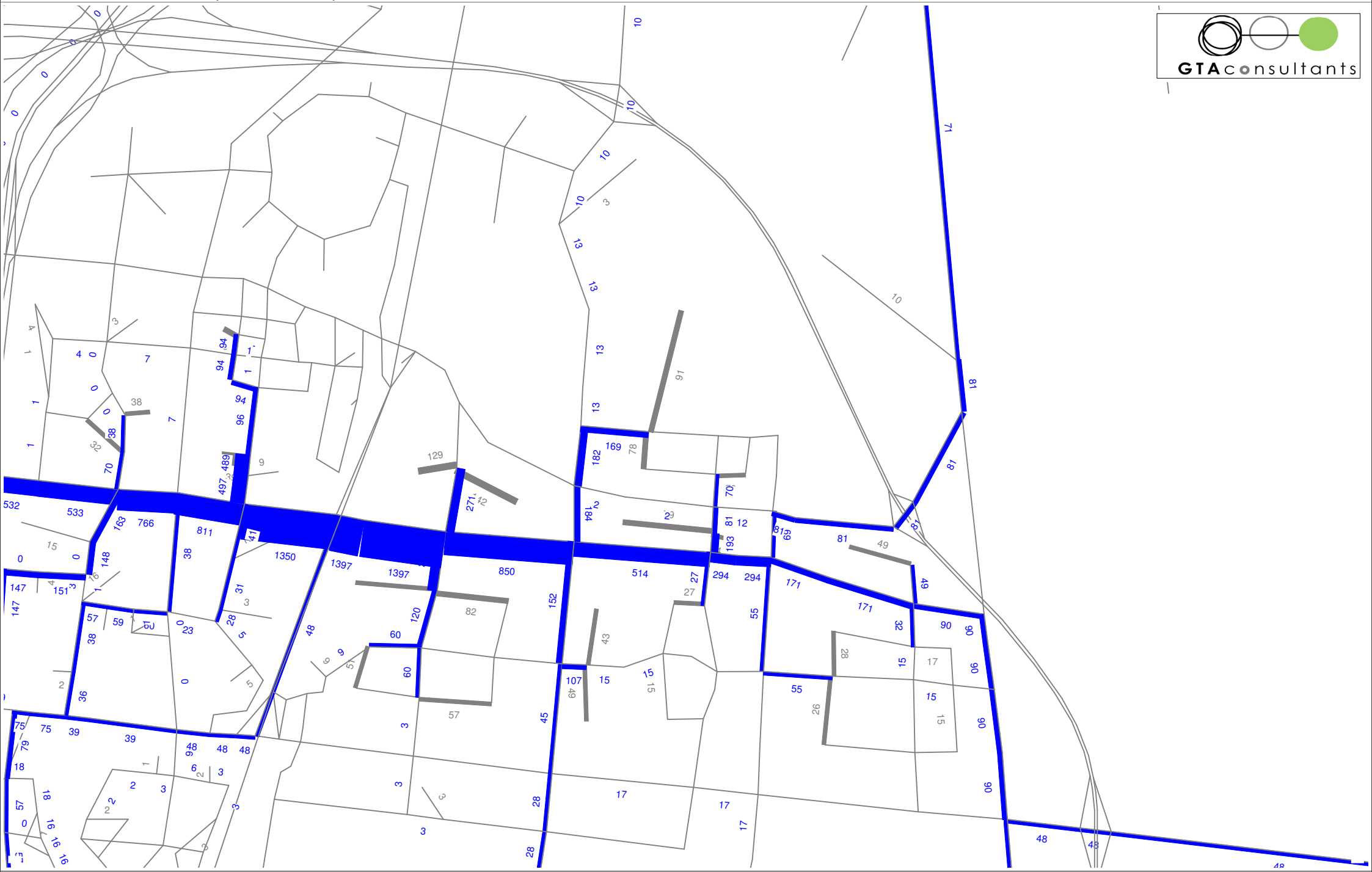
VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 2 WB year 2026 Base



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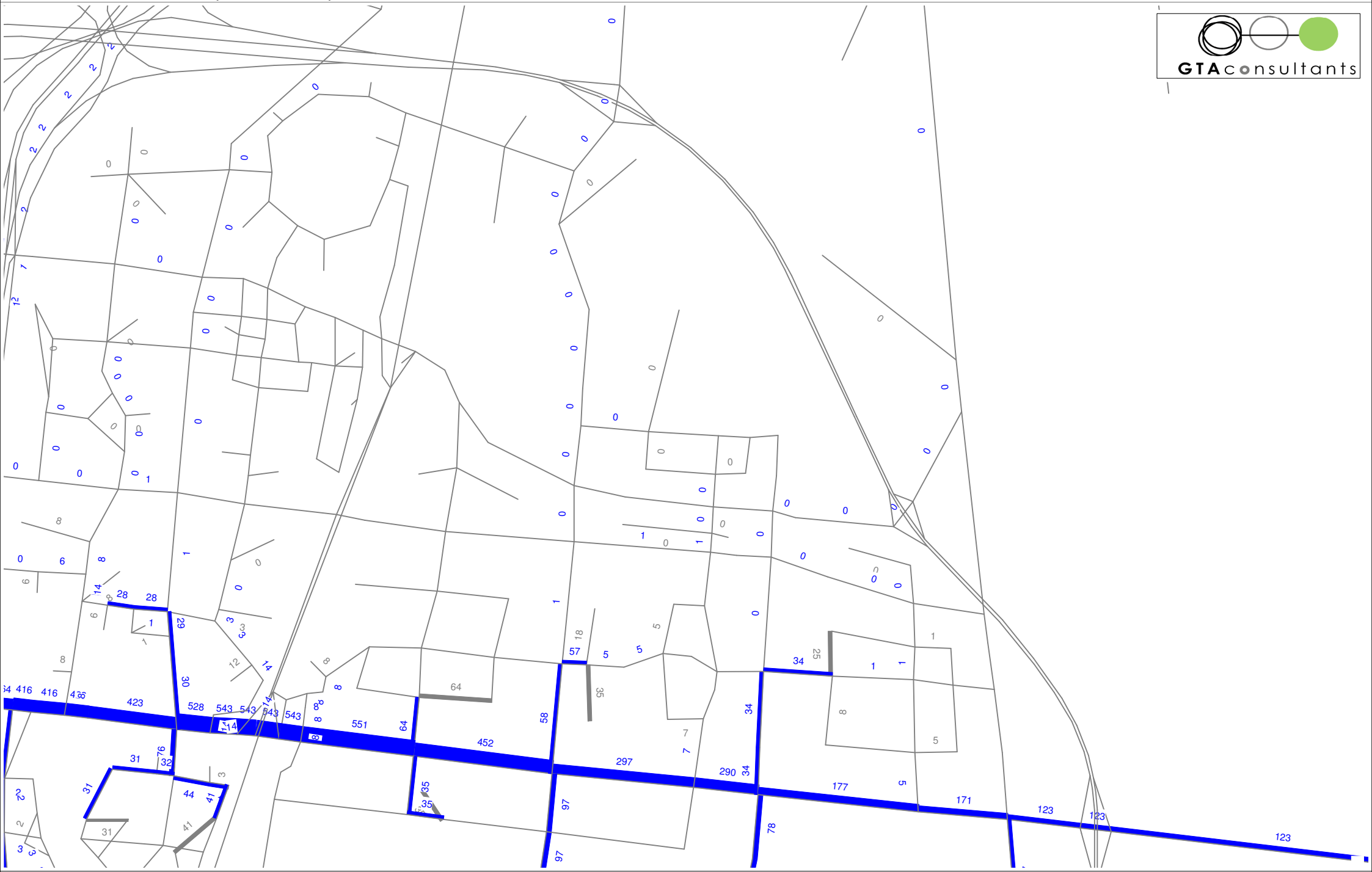
VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 3 EB year 2026 Base



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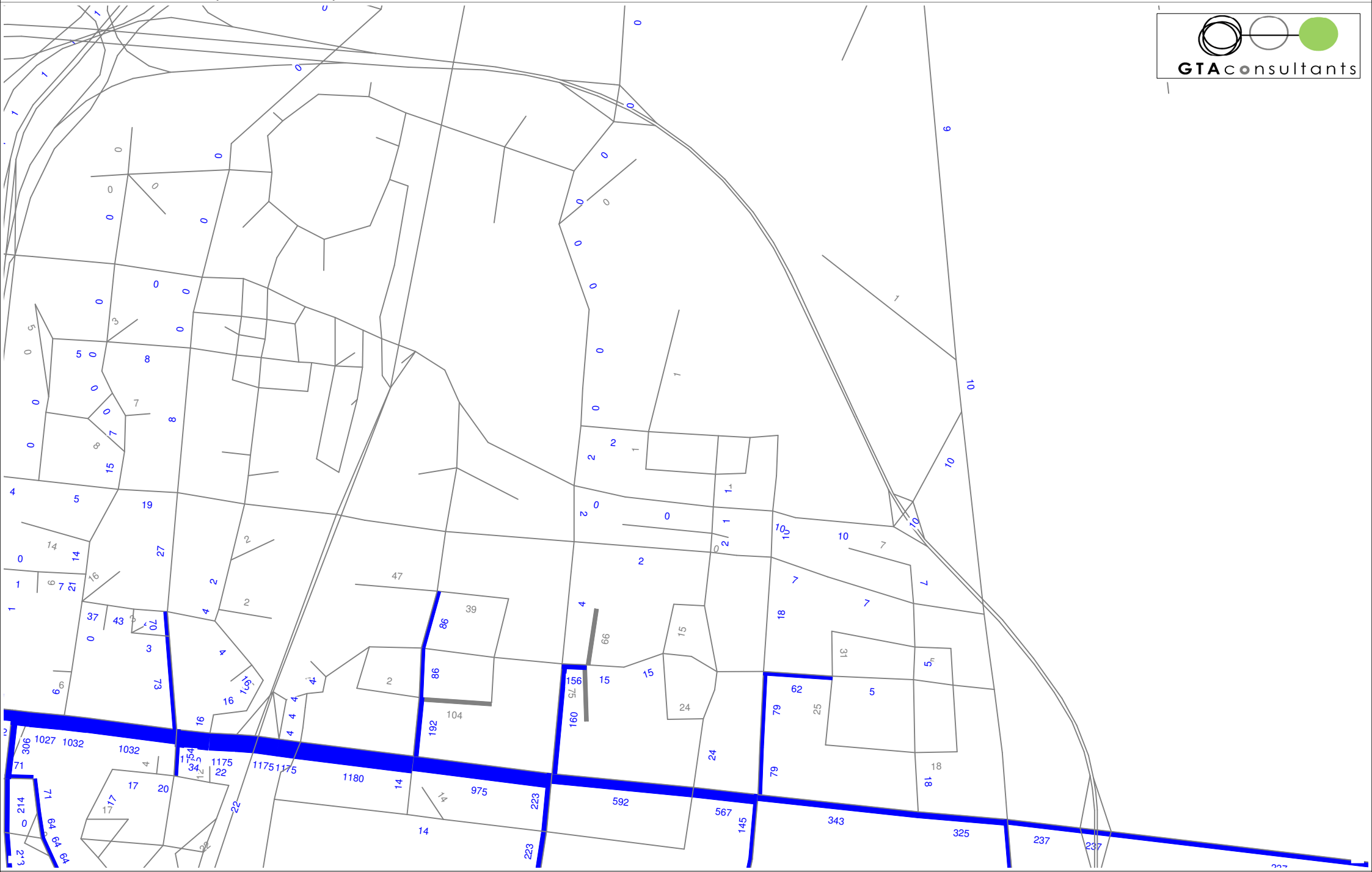
VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 3 WB year 2026 Base



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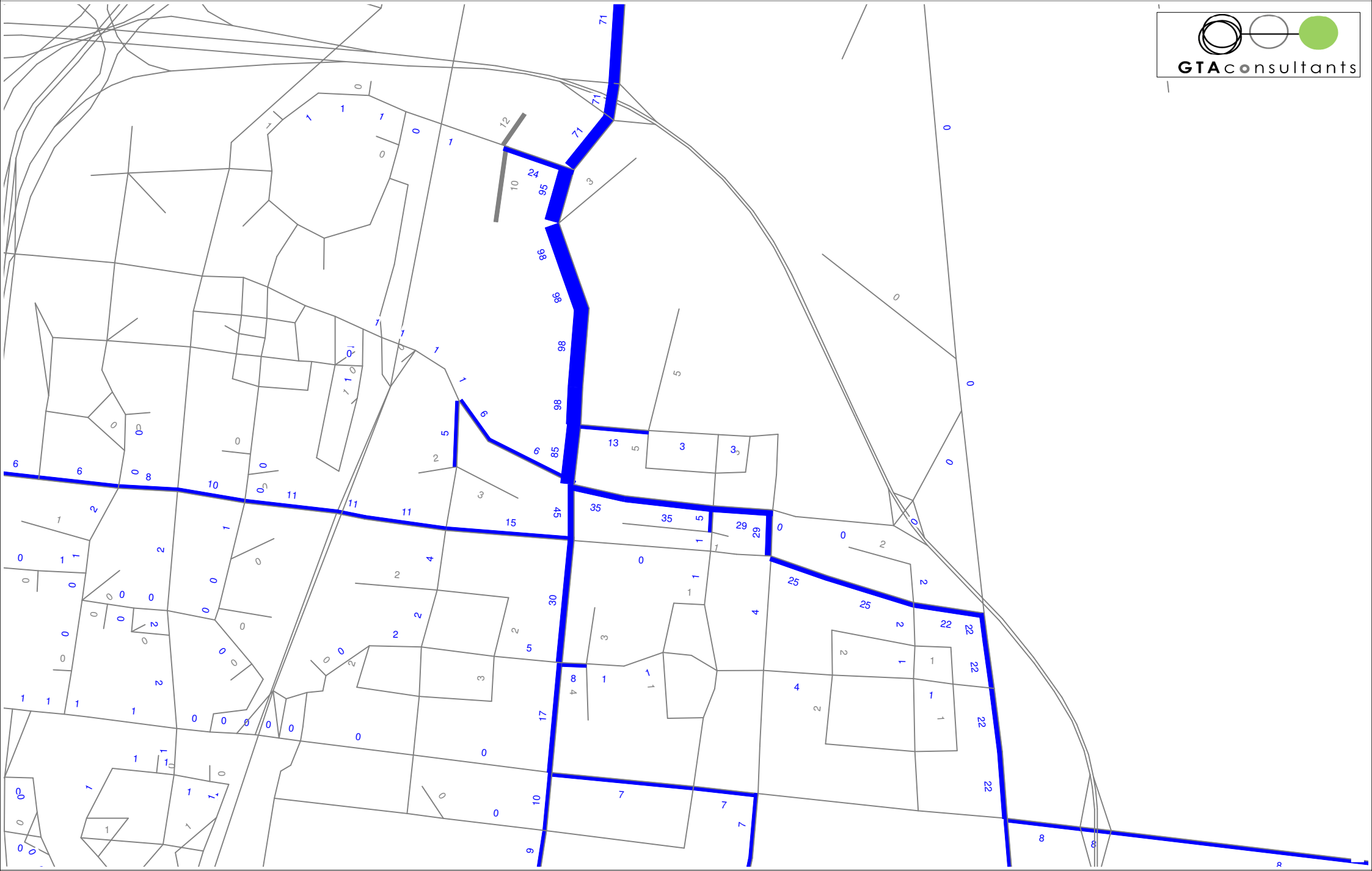
VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 4 NB year 2026 Base



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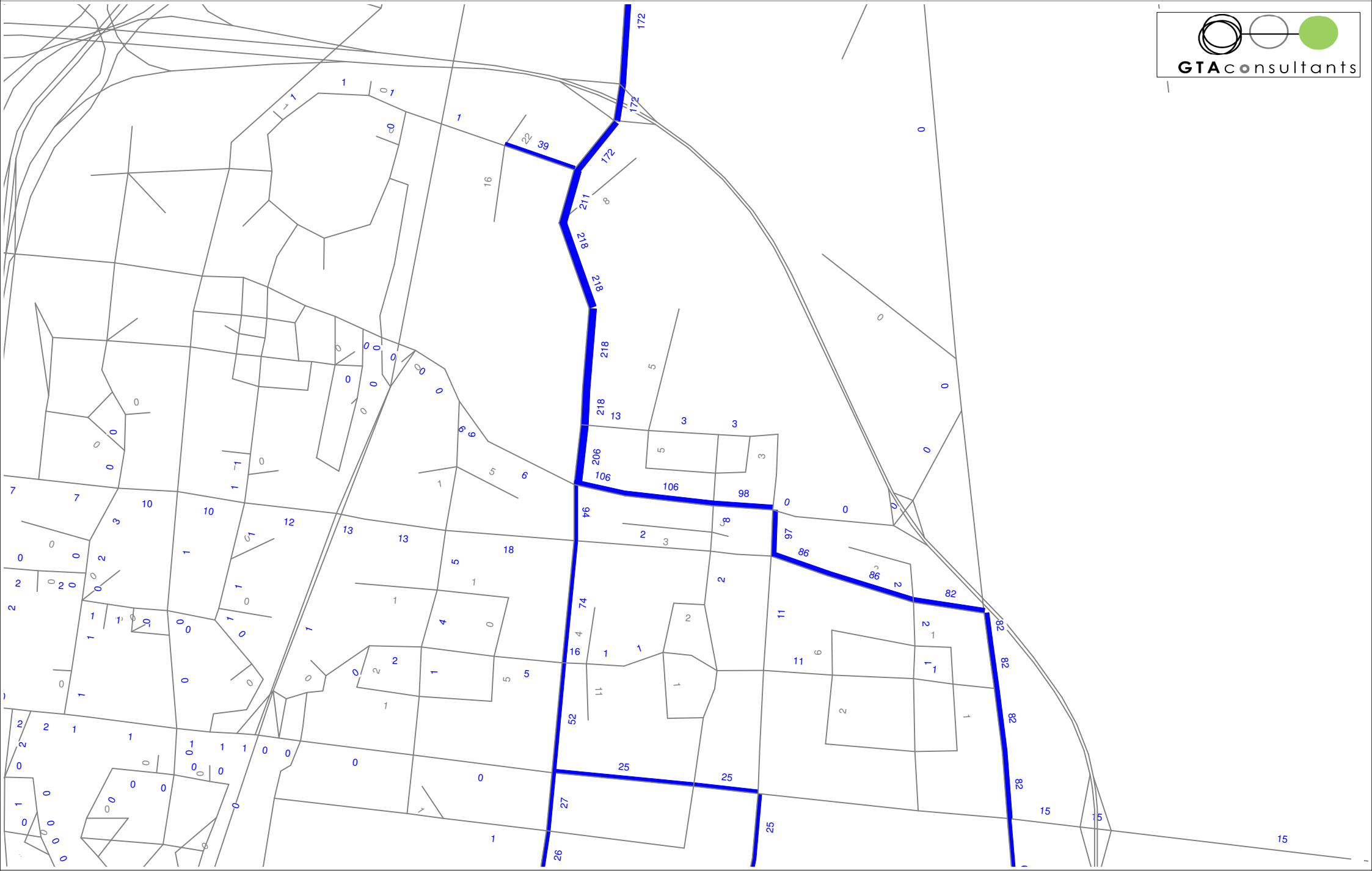
VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 4 SB year 2026 Base



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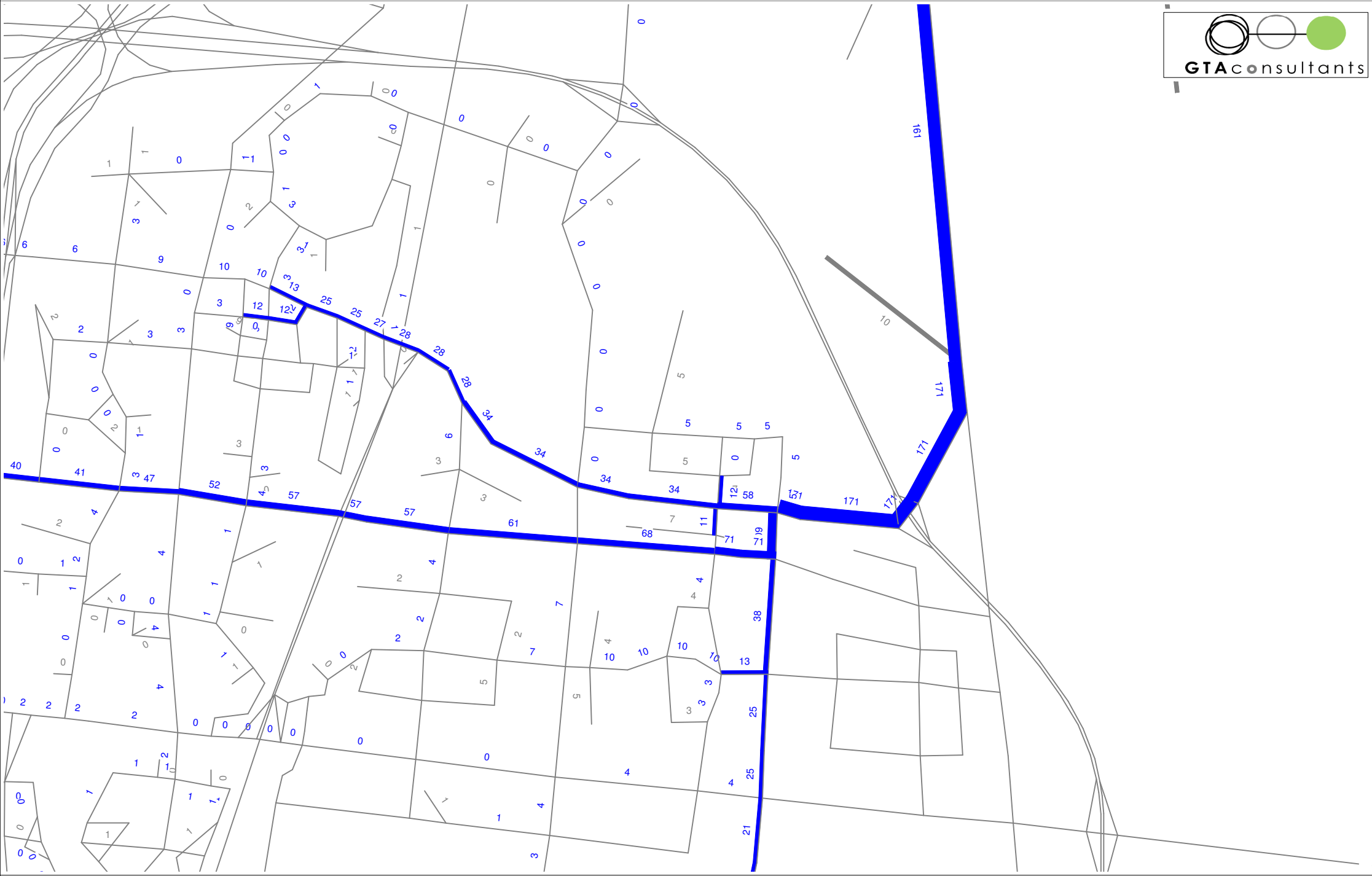
VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 5 EB year 2026 Base



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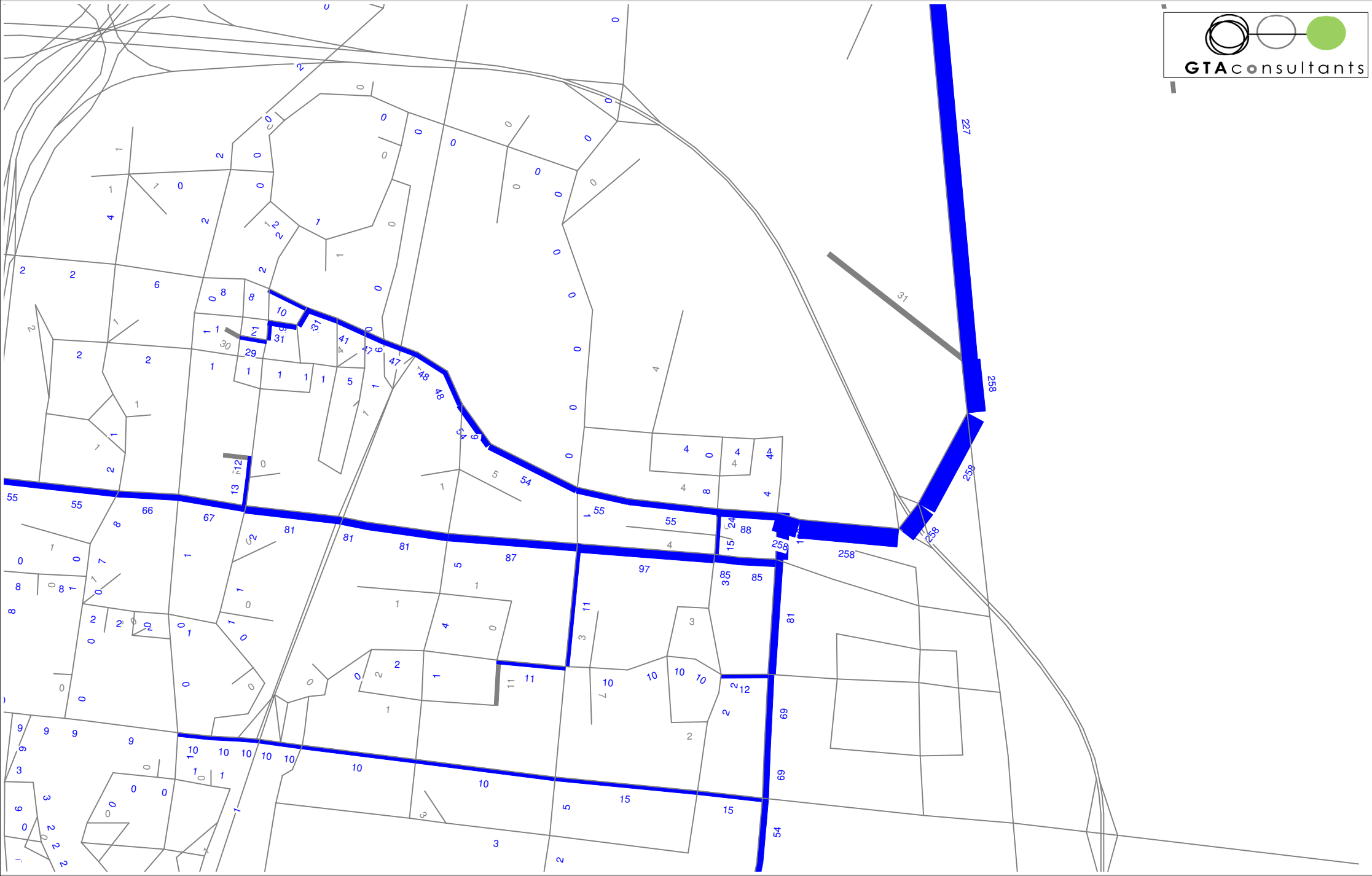
VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 5 WB year 2026 Base



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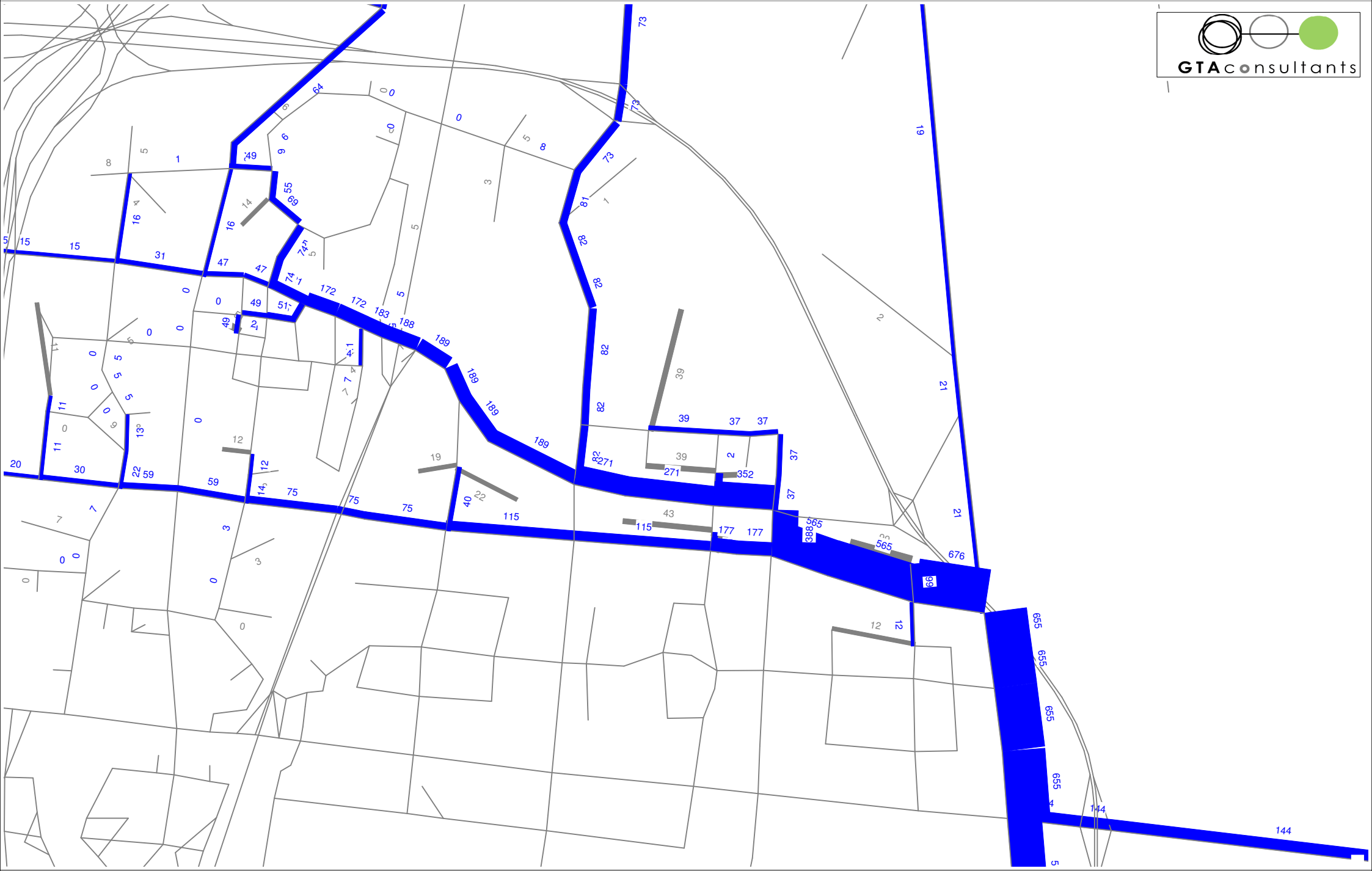
3/06/2014

VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 6 EB year 2026 Base



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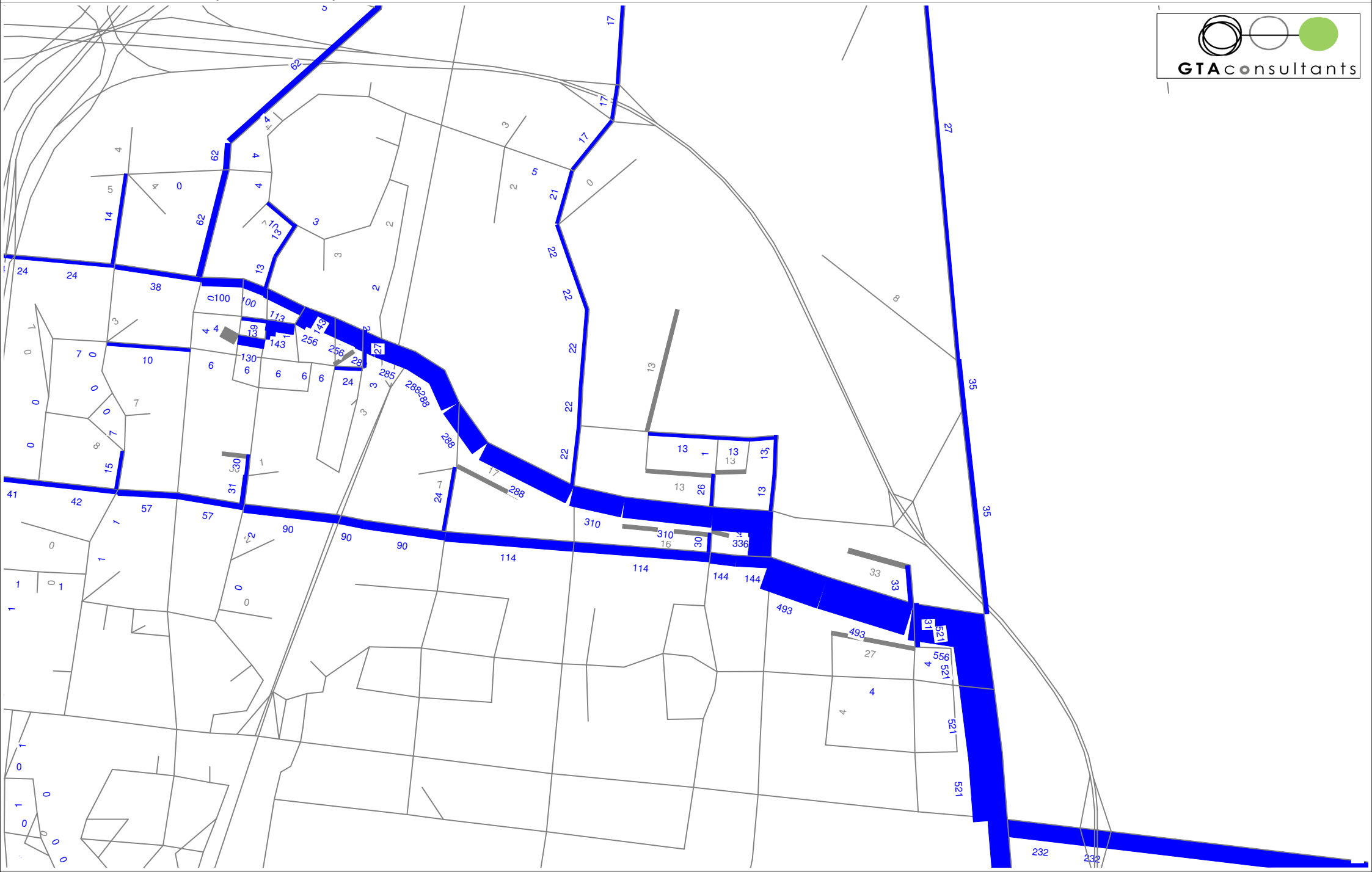
VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 6 WB year 2026 Base



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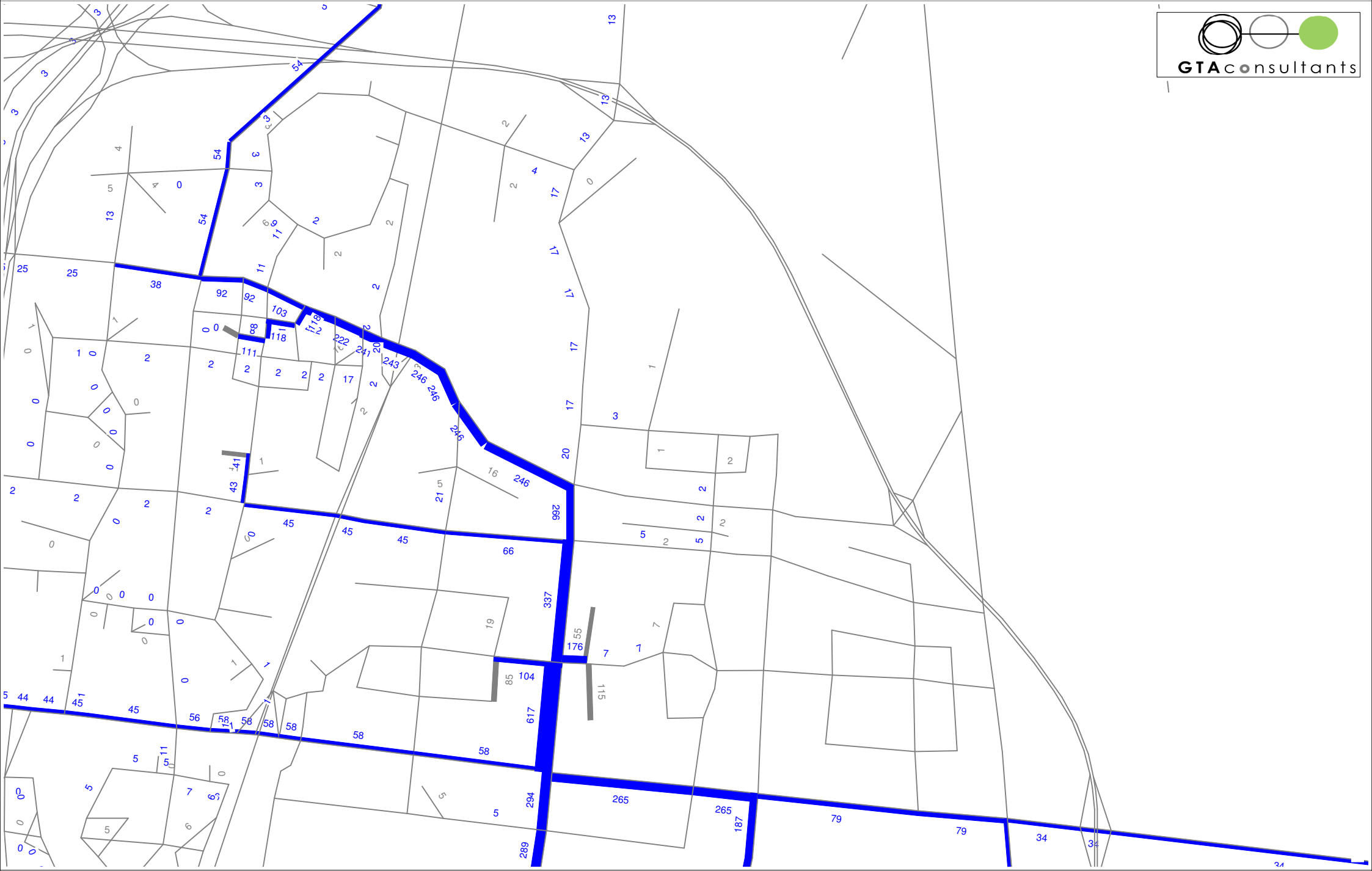
VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 7 NB year 2026 Base



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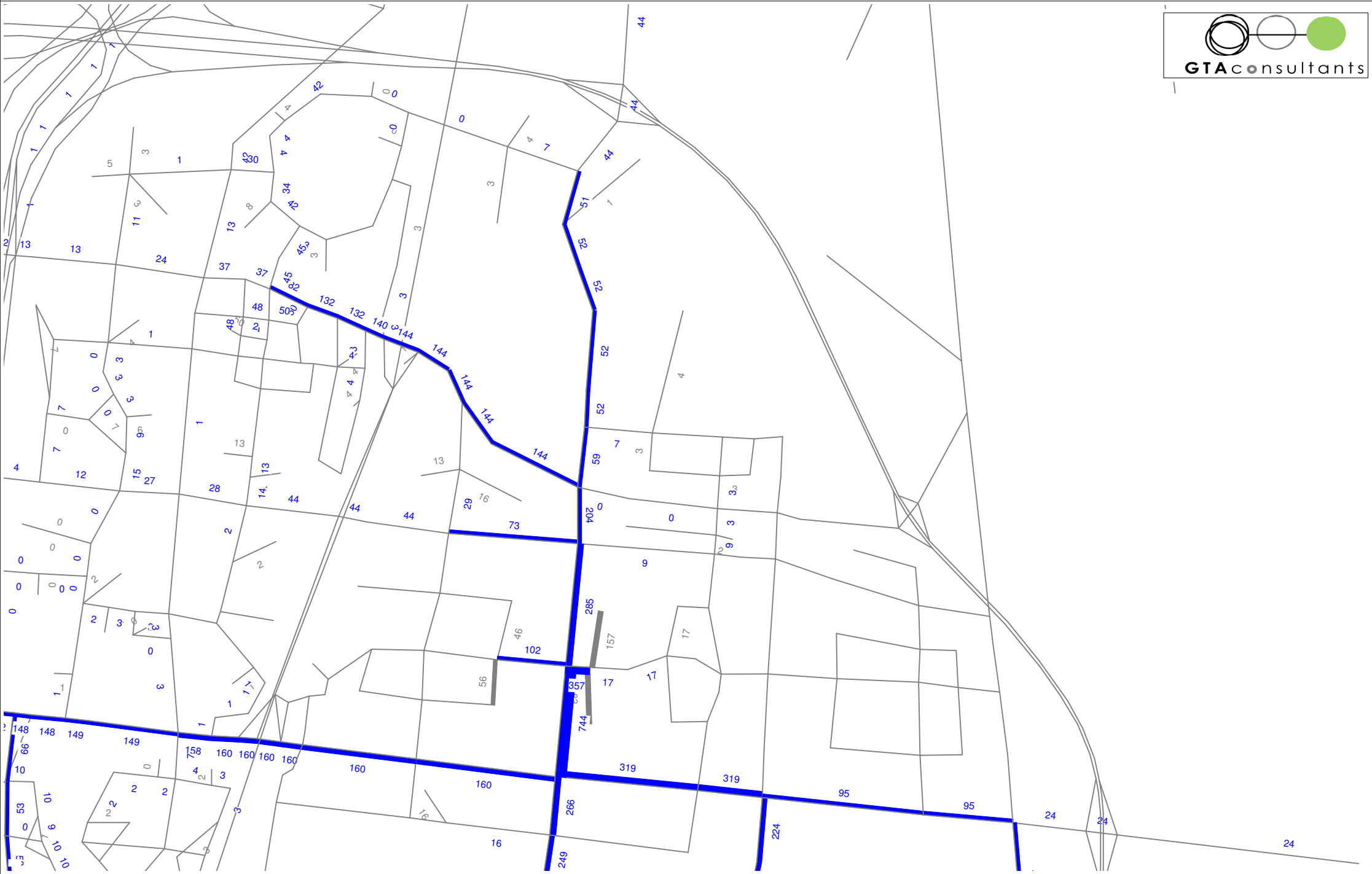
VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 7 SB year 2026 Base



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4/06/2014

VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 8 EB year 2026 Base

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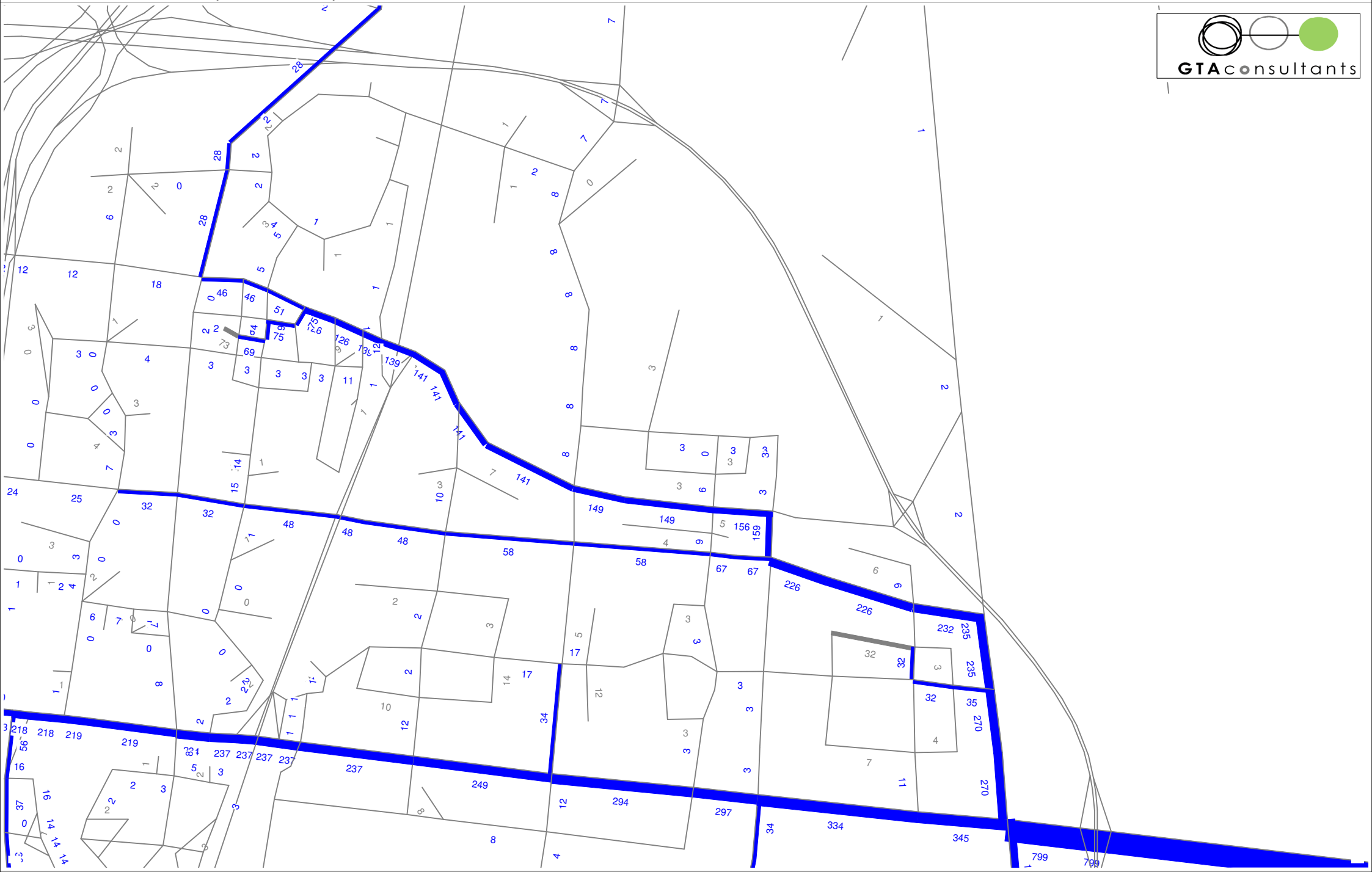
VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 8 WB year 2026 Base



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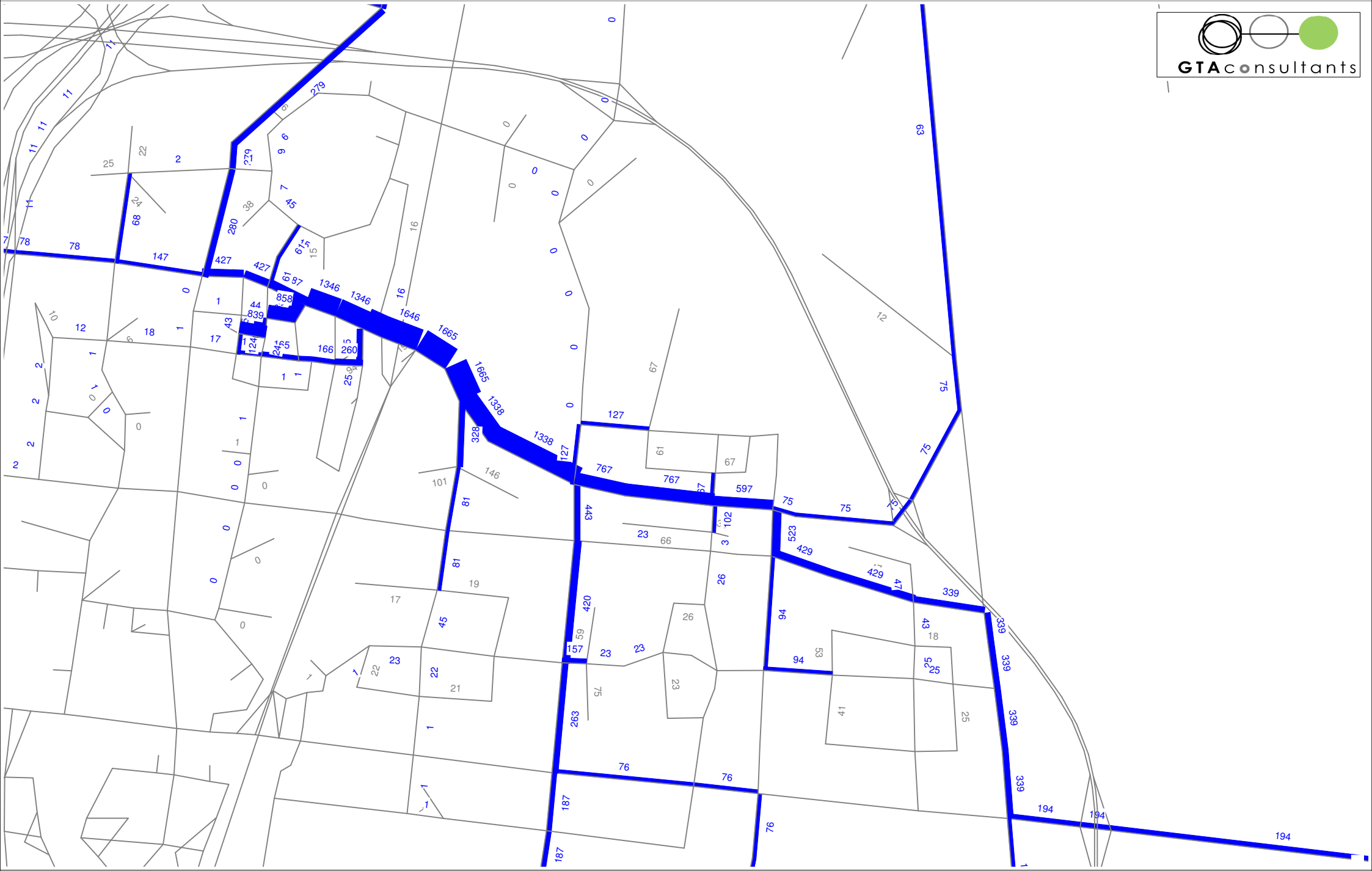
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 1 EB year 2026 Base



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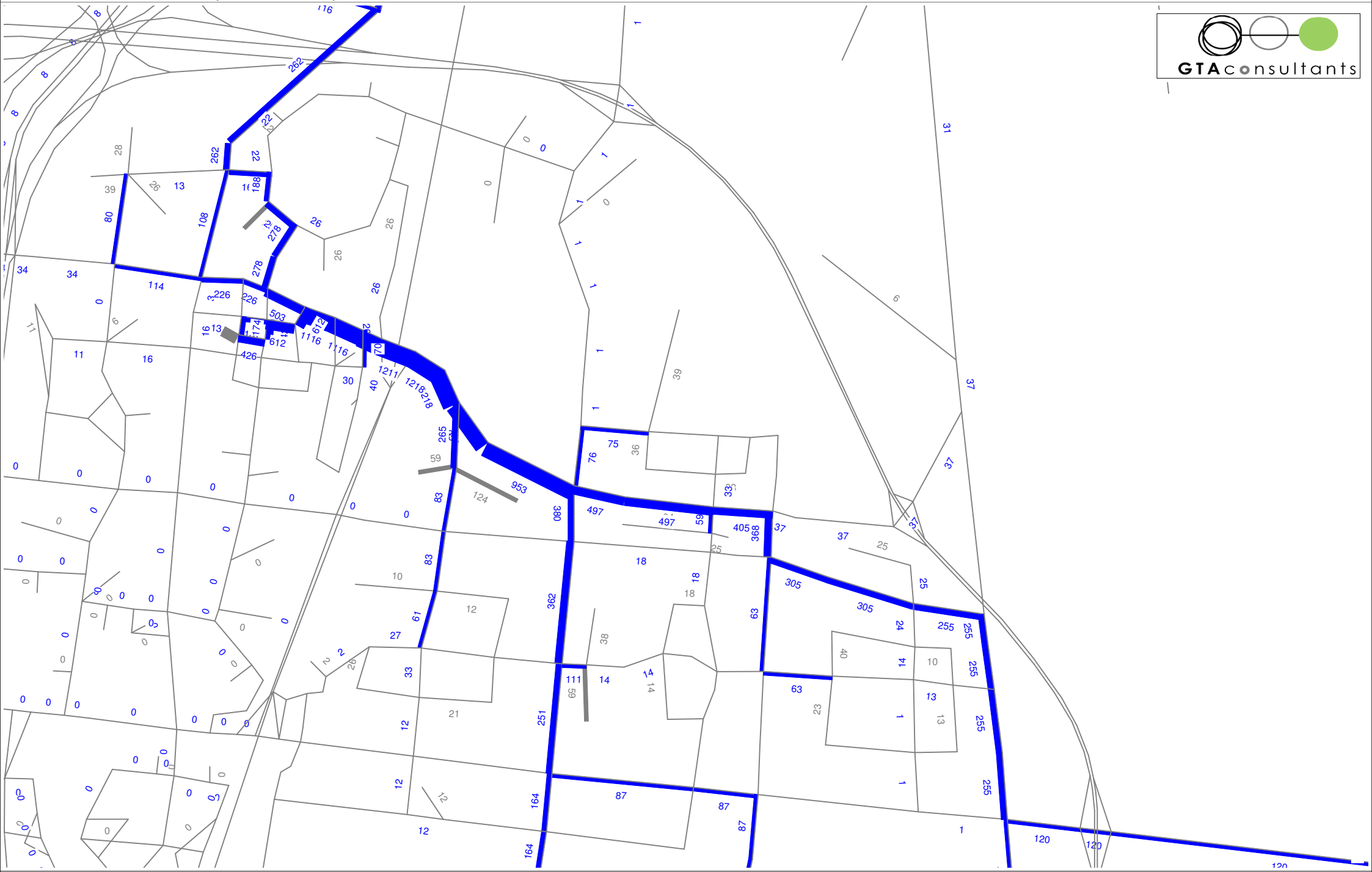
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 1 WB year 2026 Base



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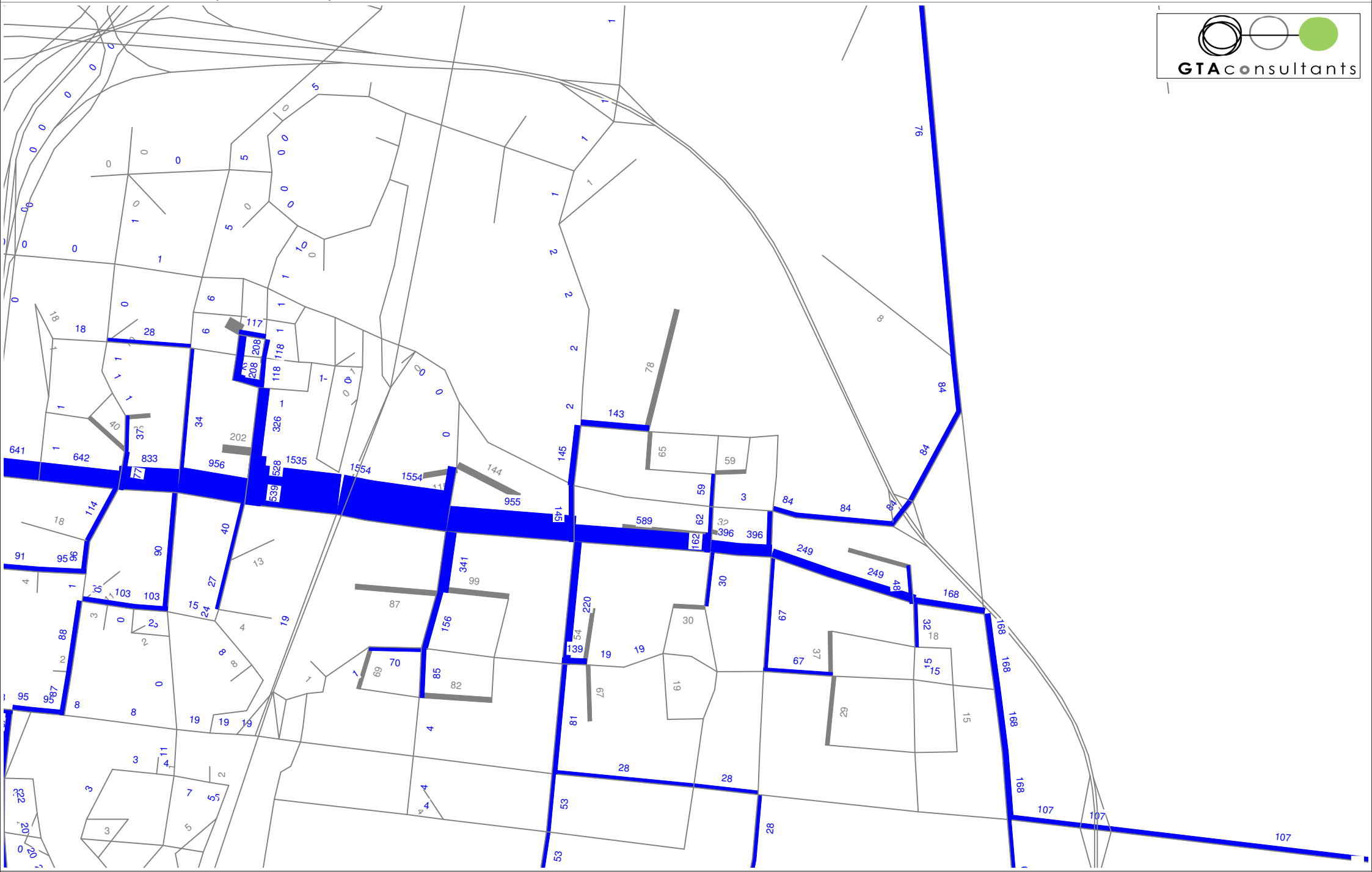
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 2 EB year 2026 Base



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4/06/2014

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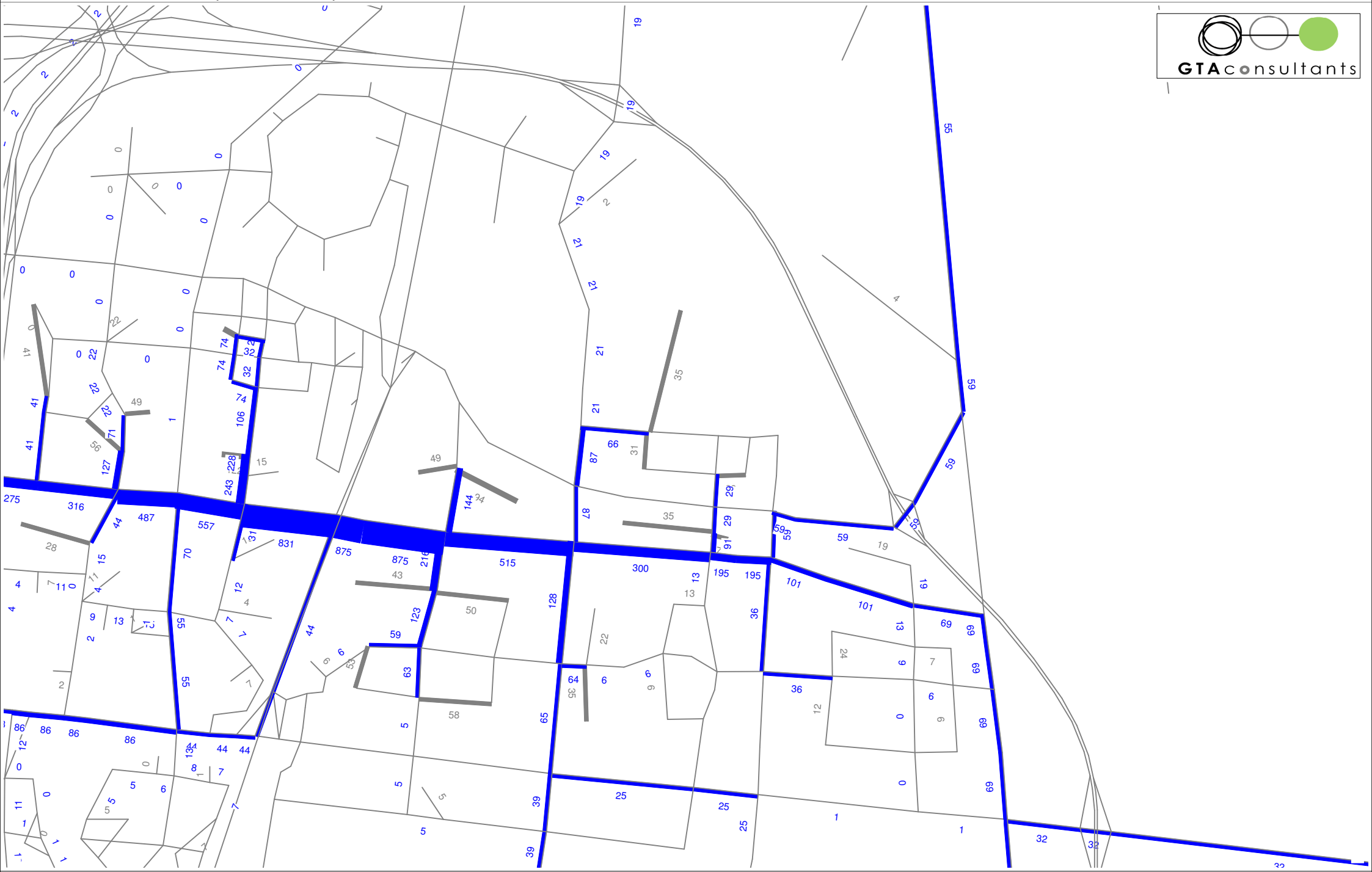
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 2 WB year 2026 Base



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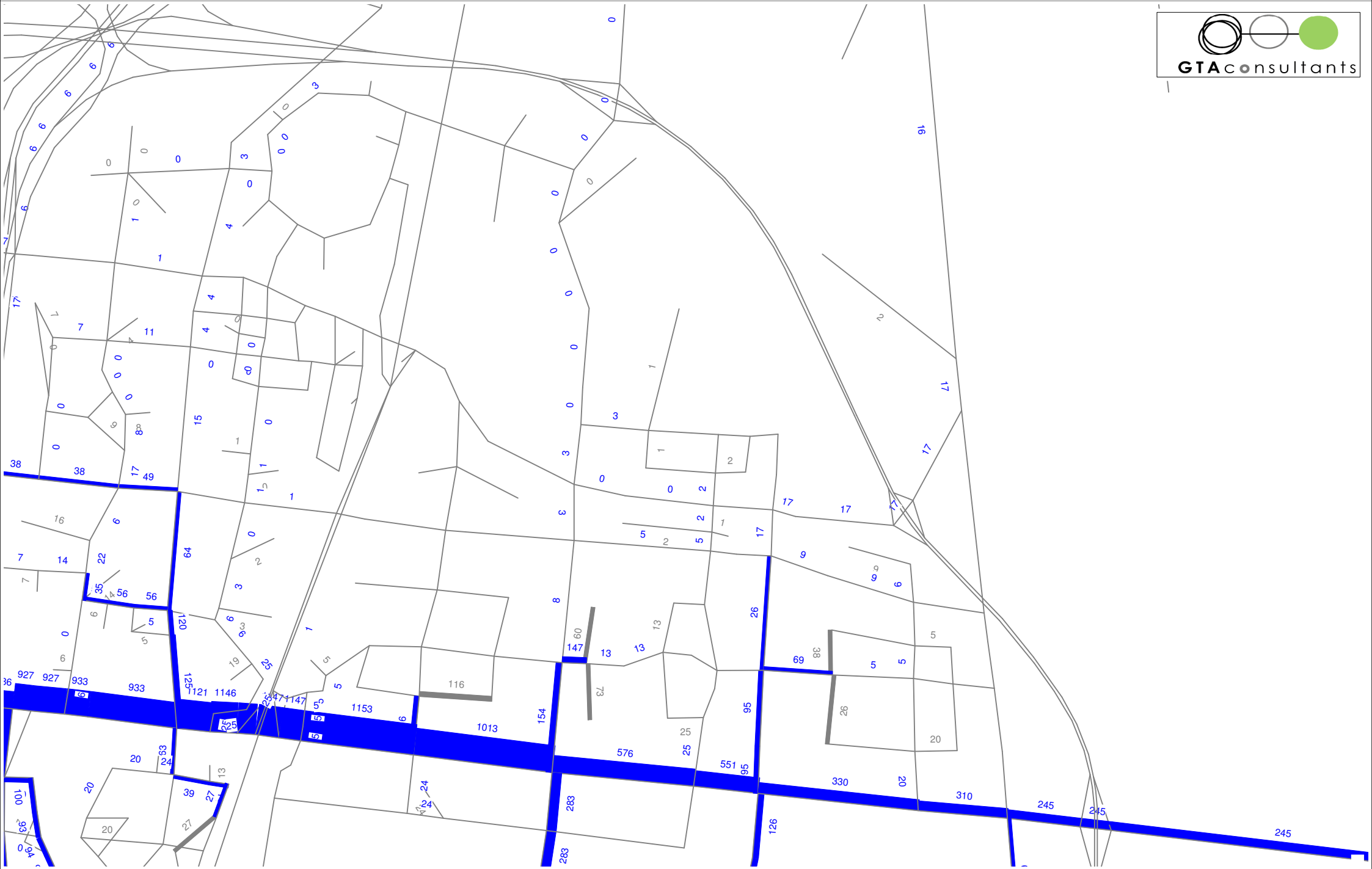
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 3 EB year 2026 Base



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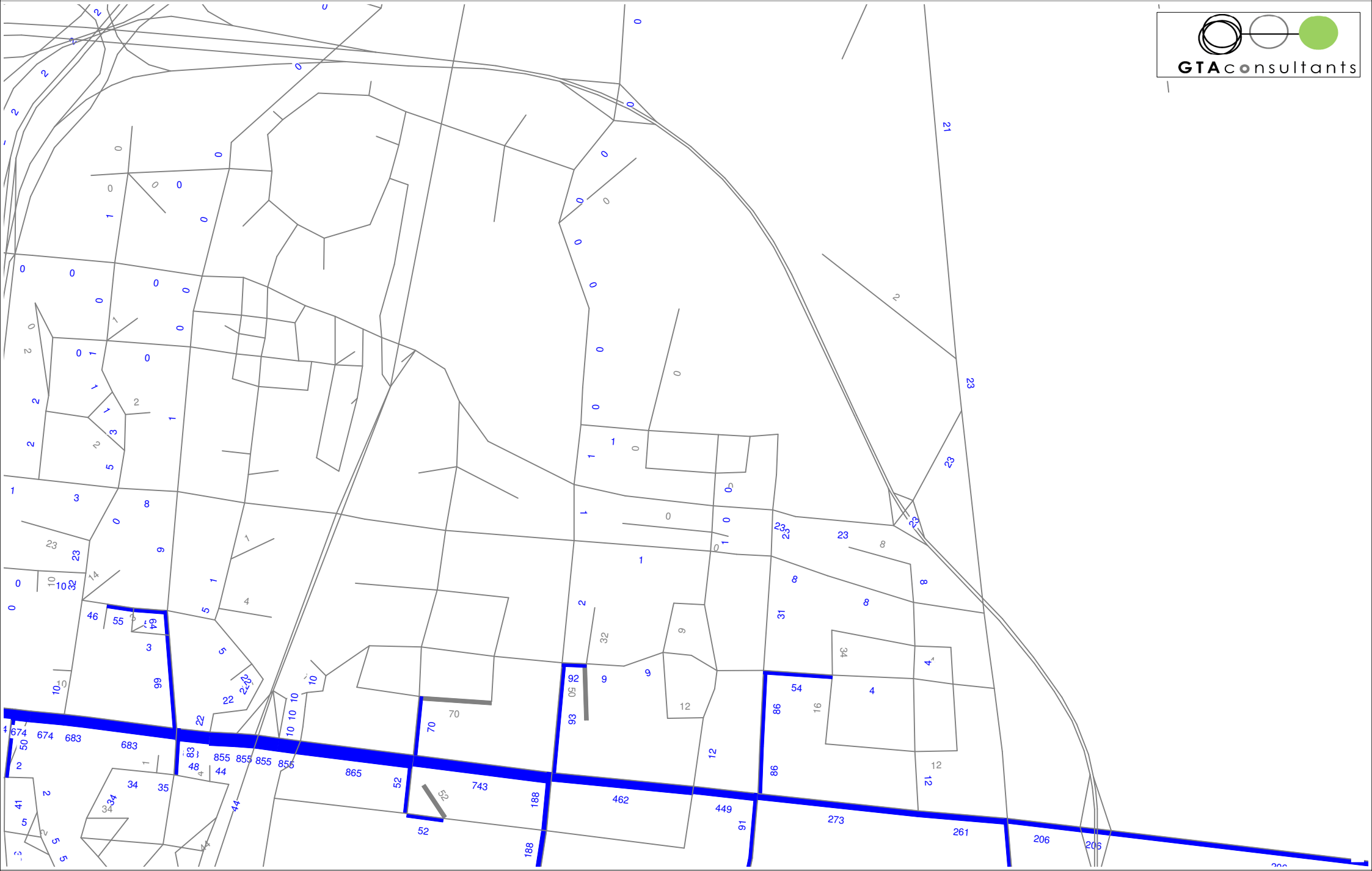
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 3 WB year 2026 Base



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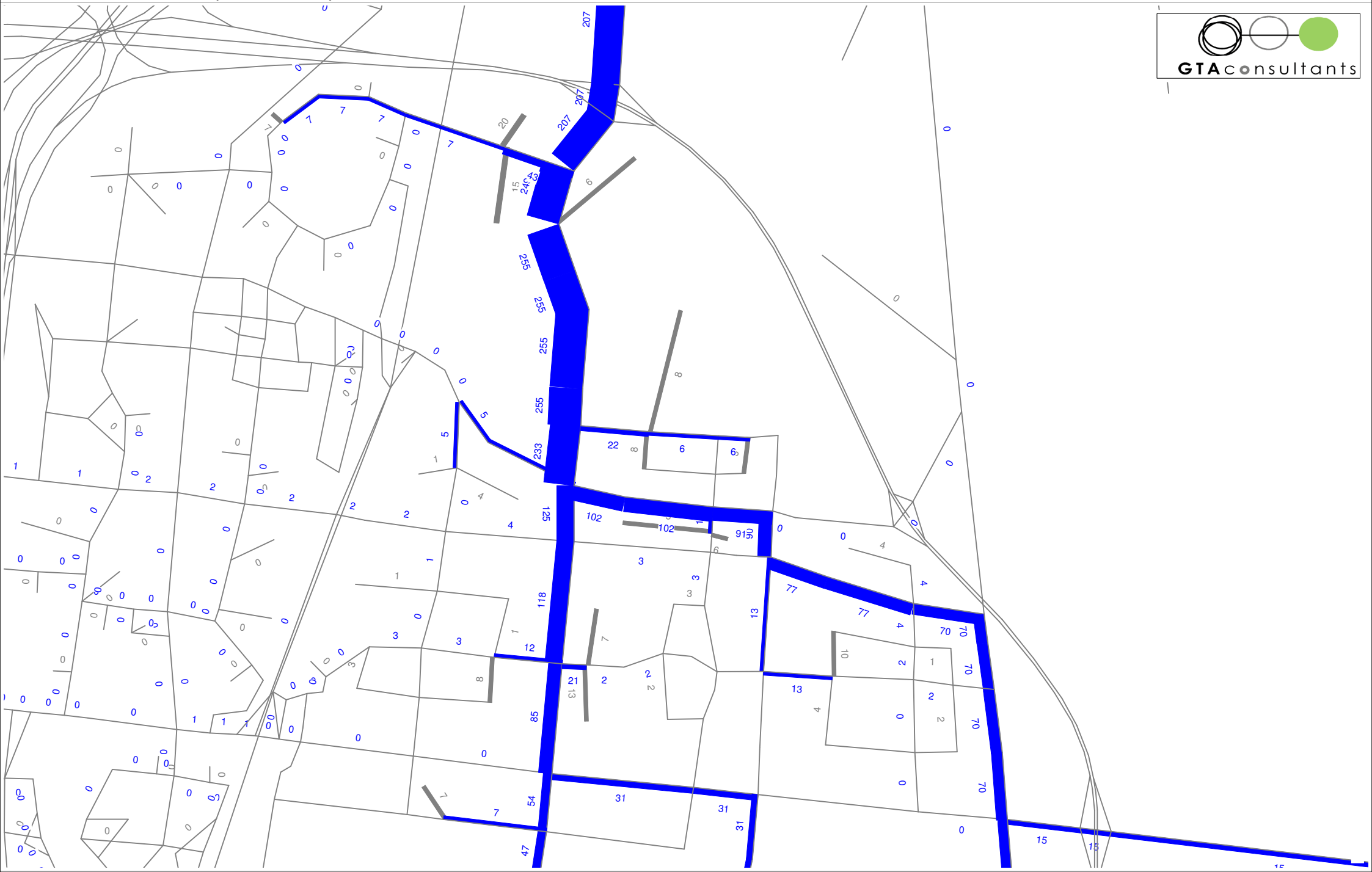
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 4 NB year 2026 Base



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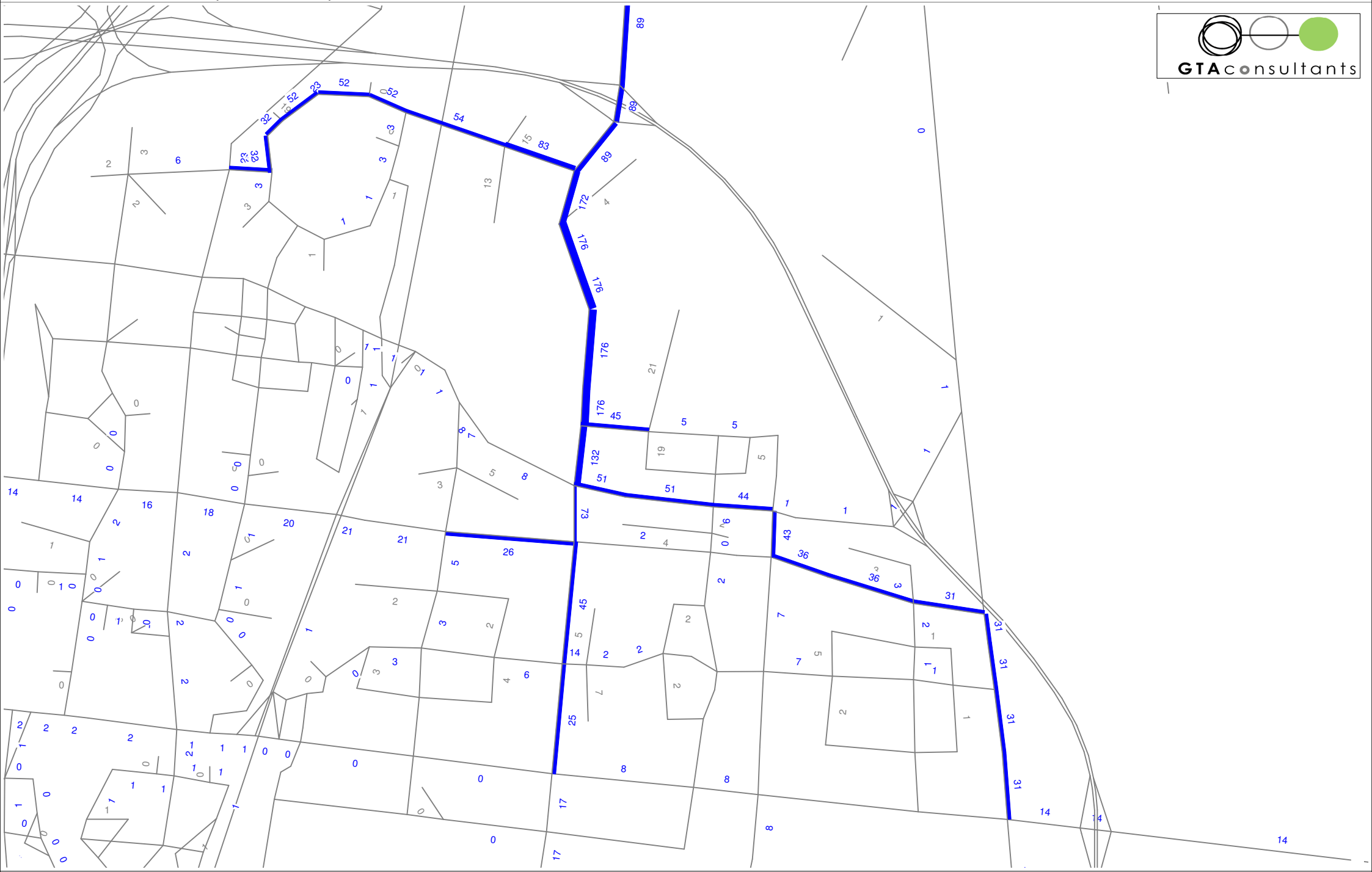
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 4 SB year 2026 Base



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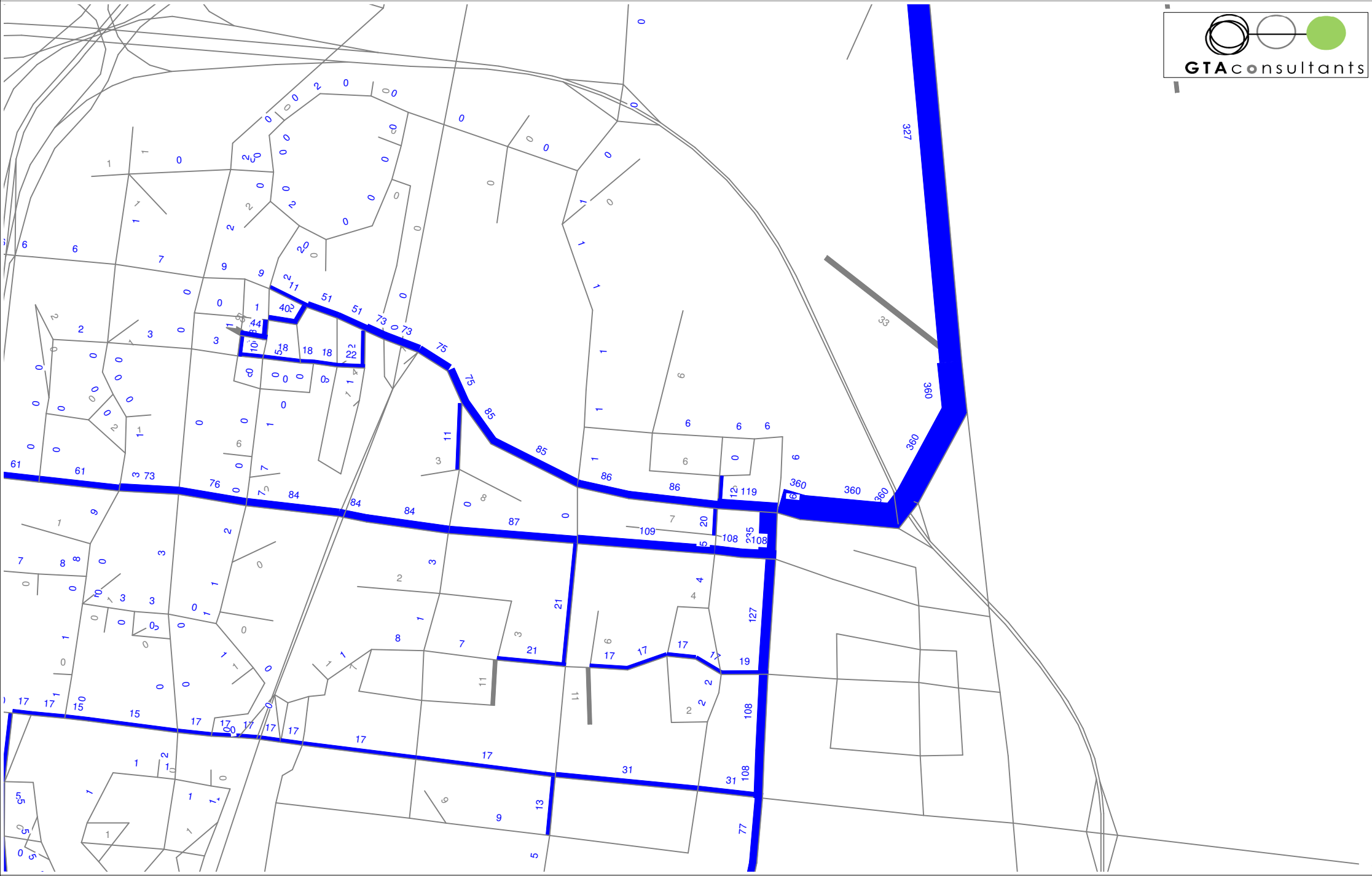
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 5 EB year 2026 Base



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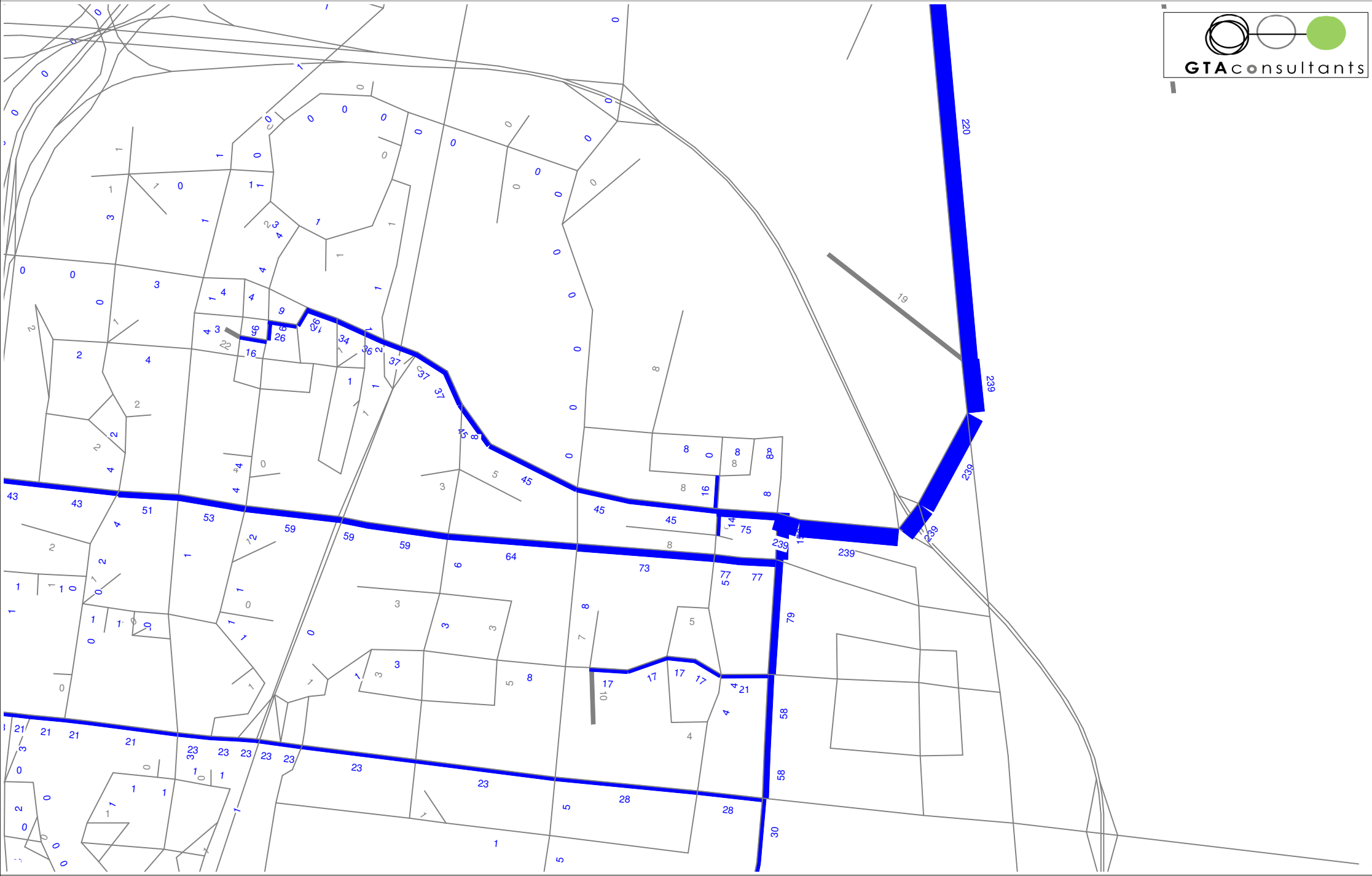
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 5 WB year 2026 Base



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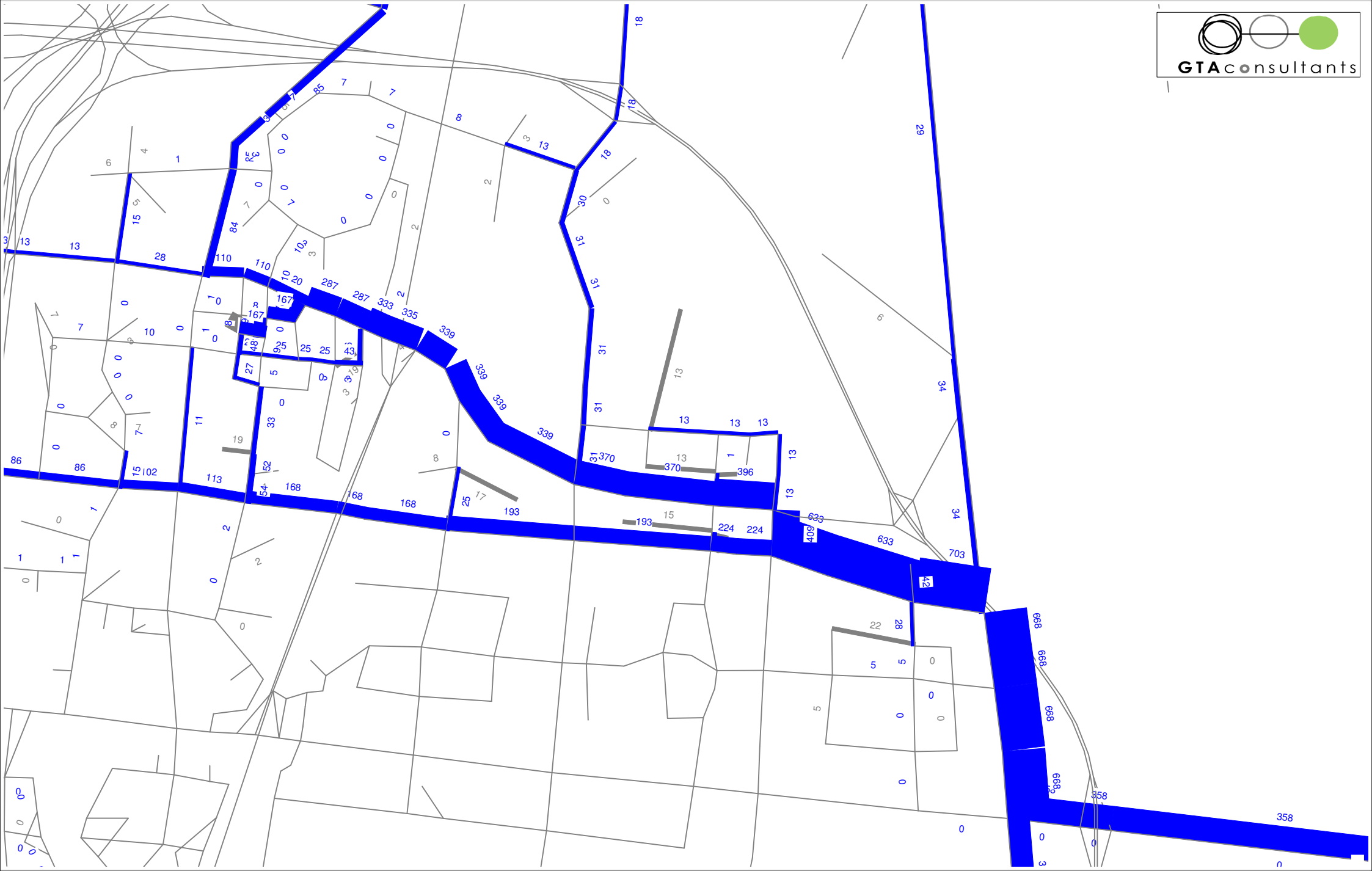
4/06/2014

VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 6 EB year 2026 Base



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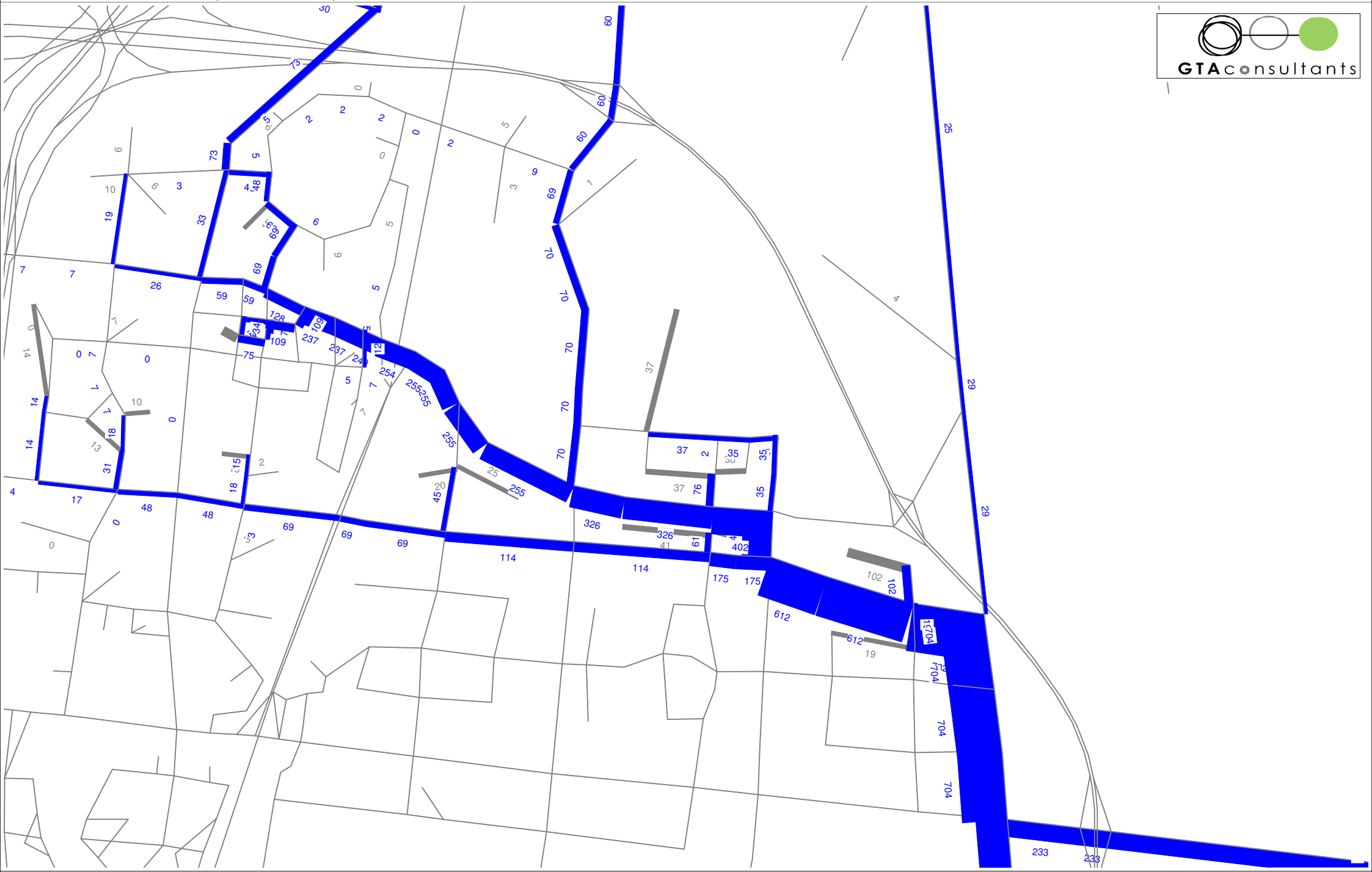
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 6 WB year 2026 Base



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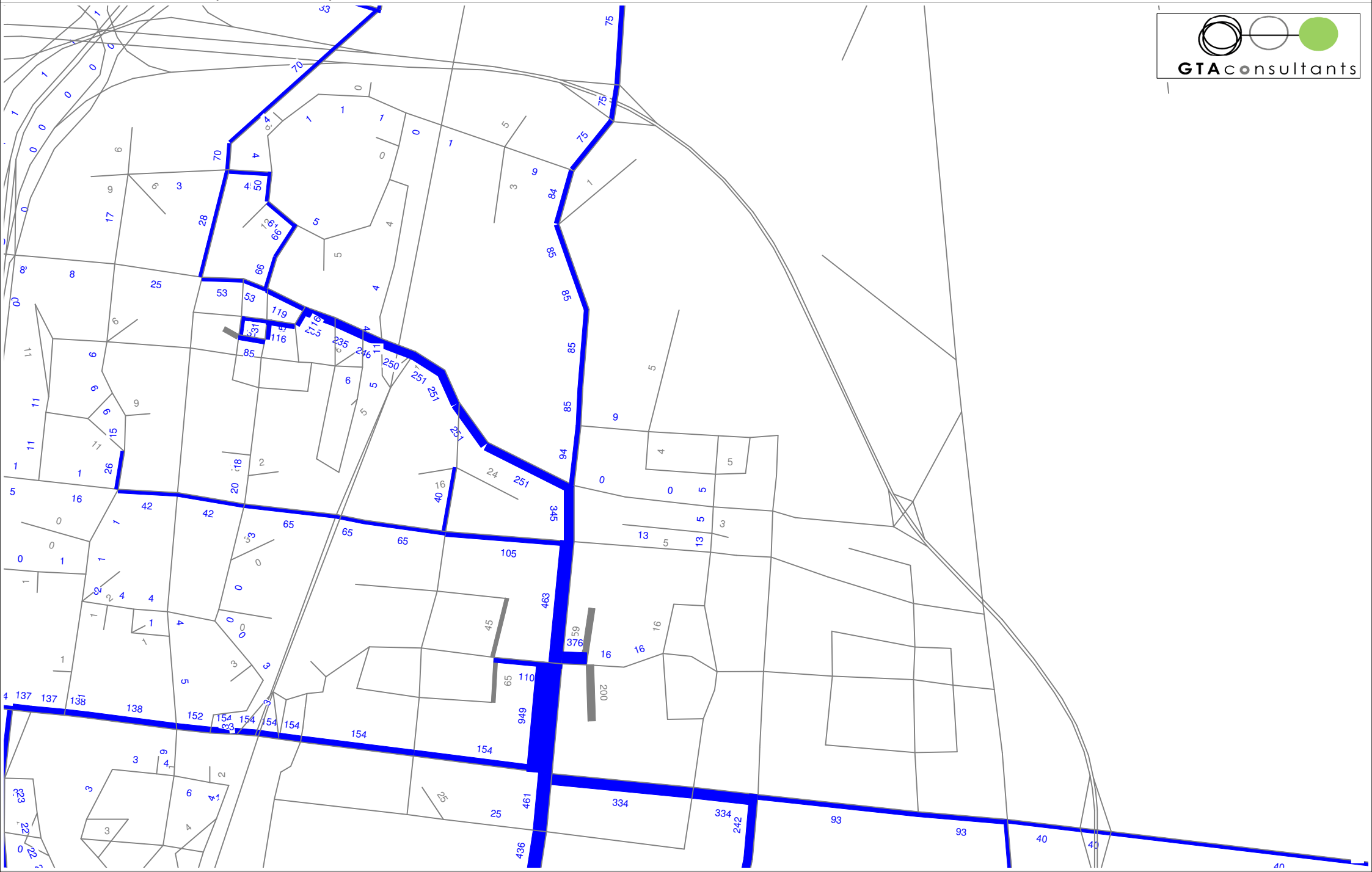
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 7 NB year 2026 Base



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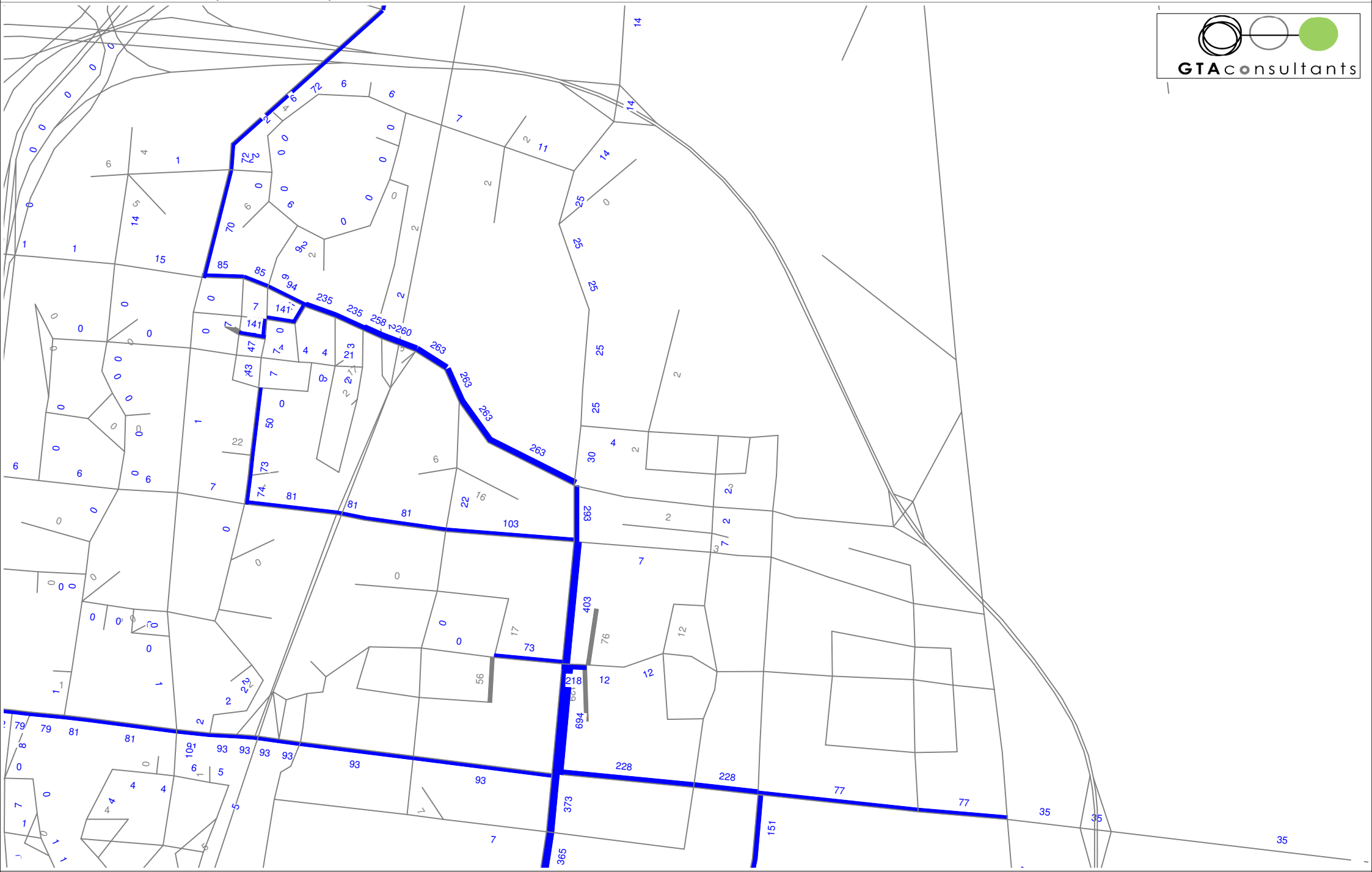
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 7 SB year 2026 Base



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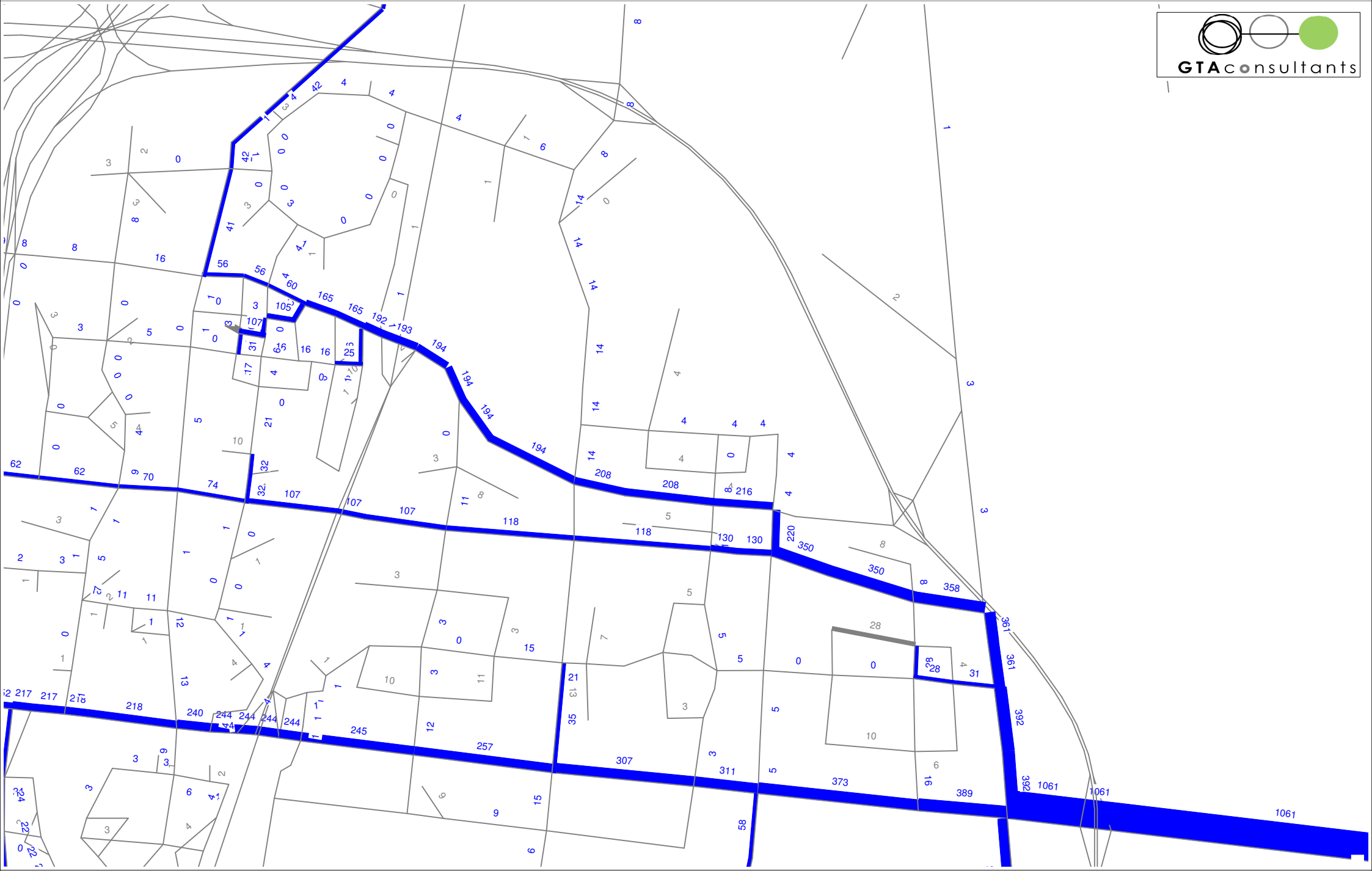
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 8 EB year 2026 Base



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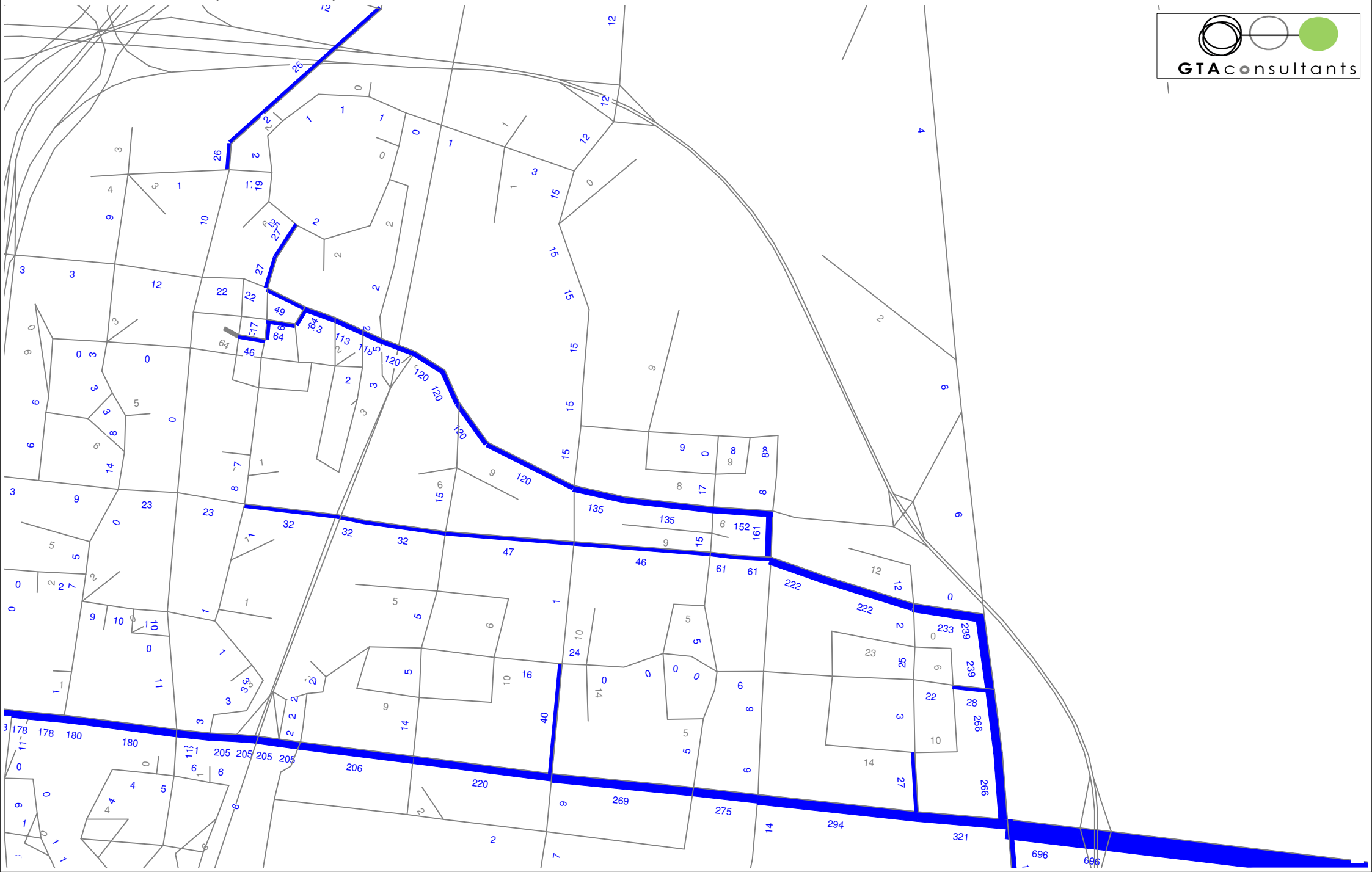
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 8 WB year 2026 Base



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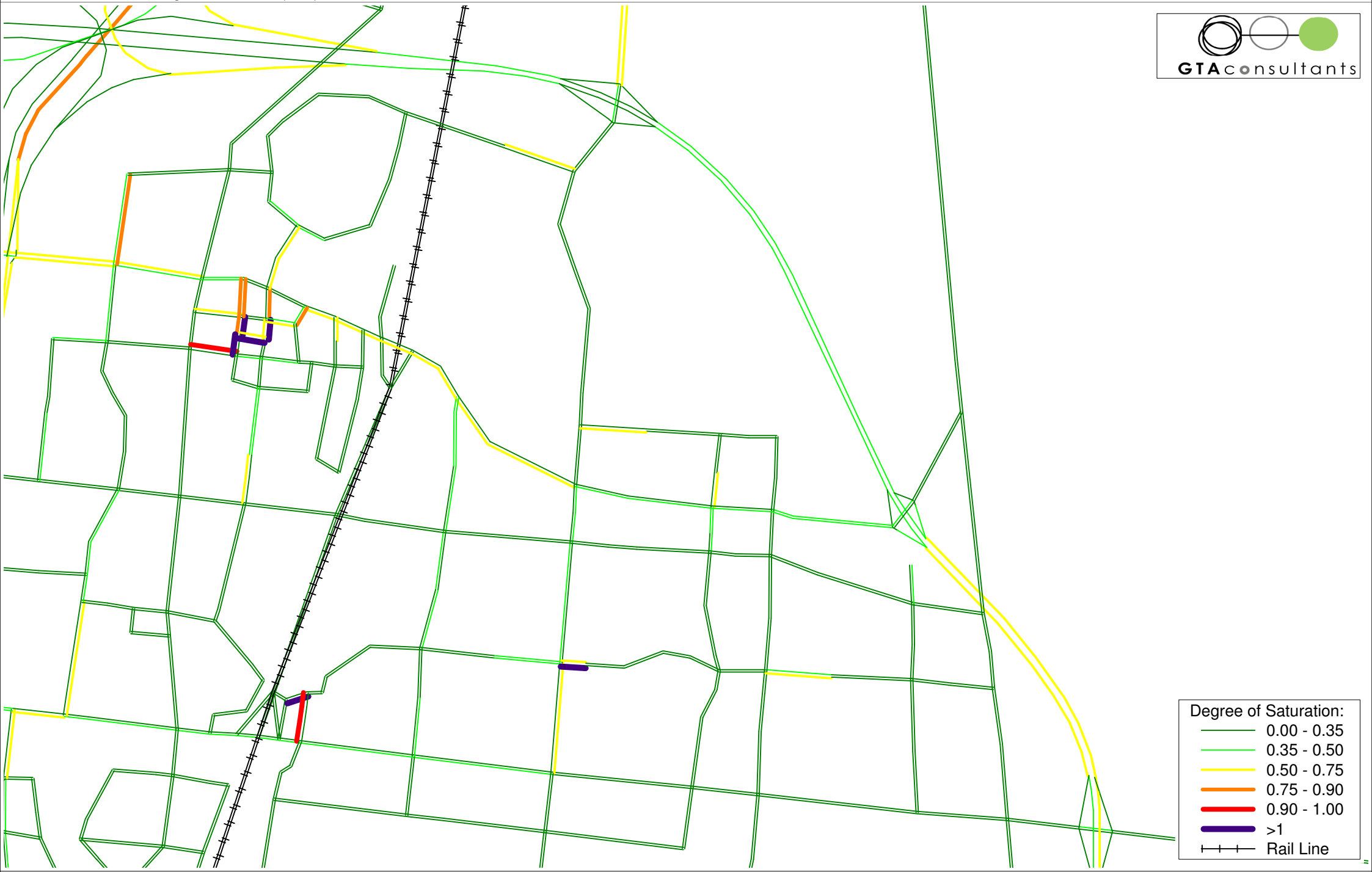
4/06/2014

VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Degree of Saturation (DOS) Year 2046 Base



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5/6/2014

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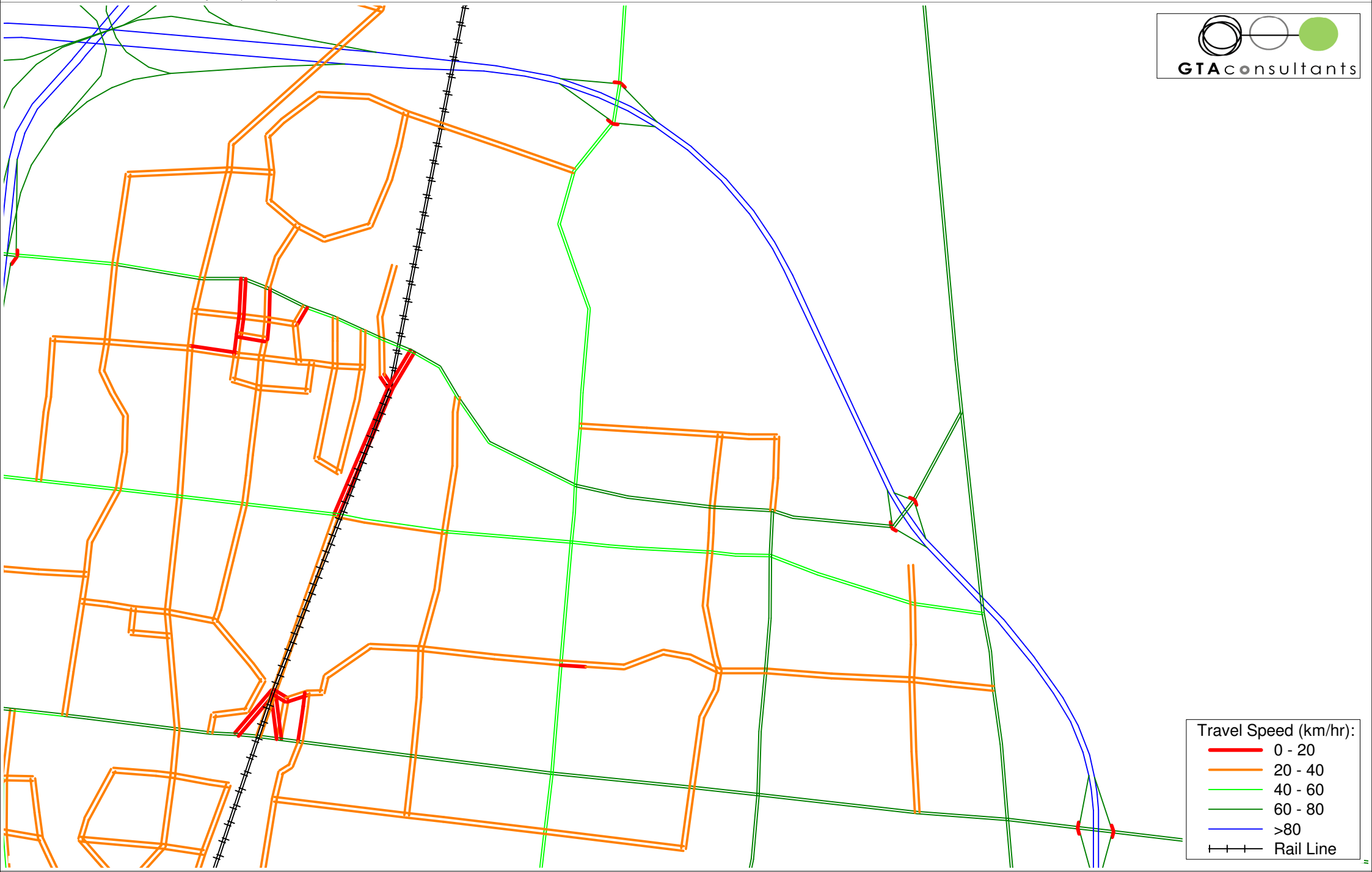
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Travel Speed (km/hr) Year 2046 Base



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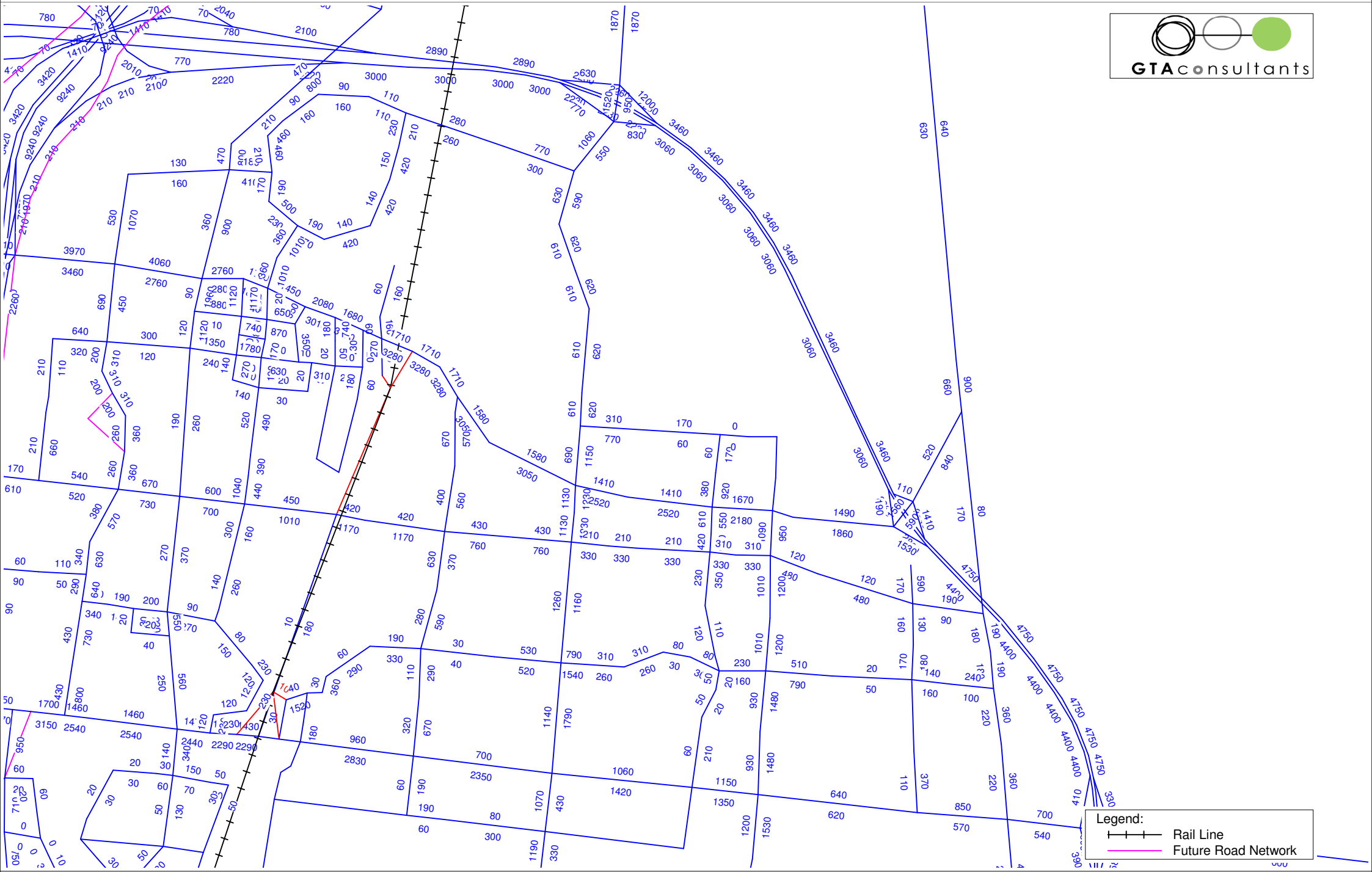
5/6/2014

cube

VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Peak Total PCU Year 2046 Base



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5/6/2014

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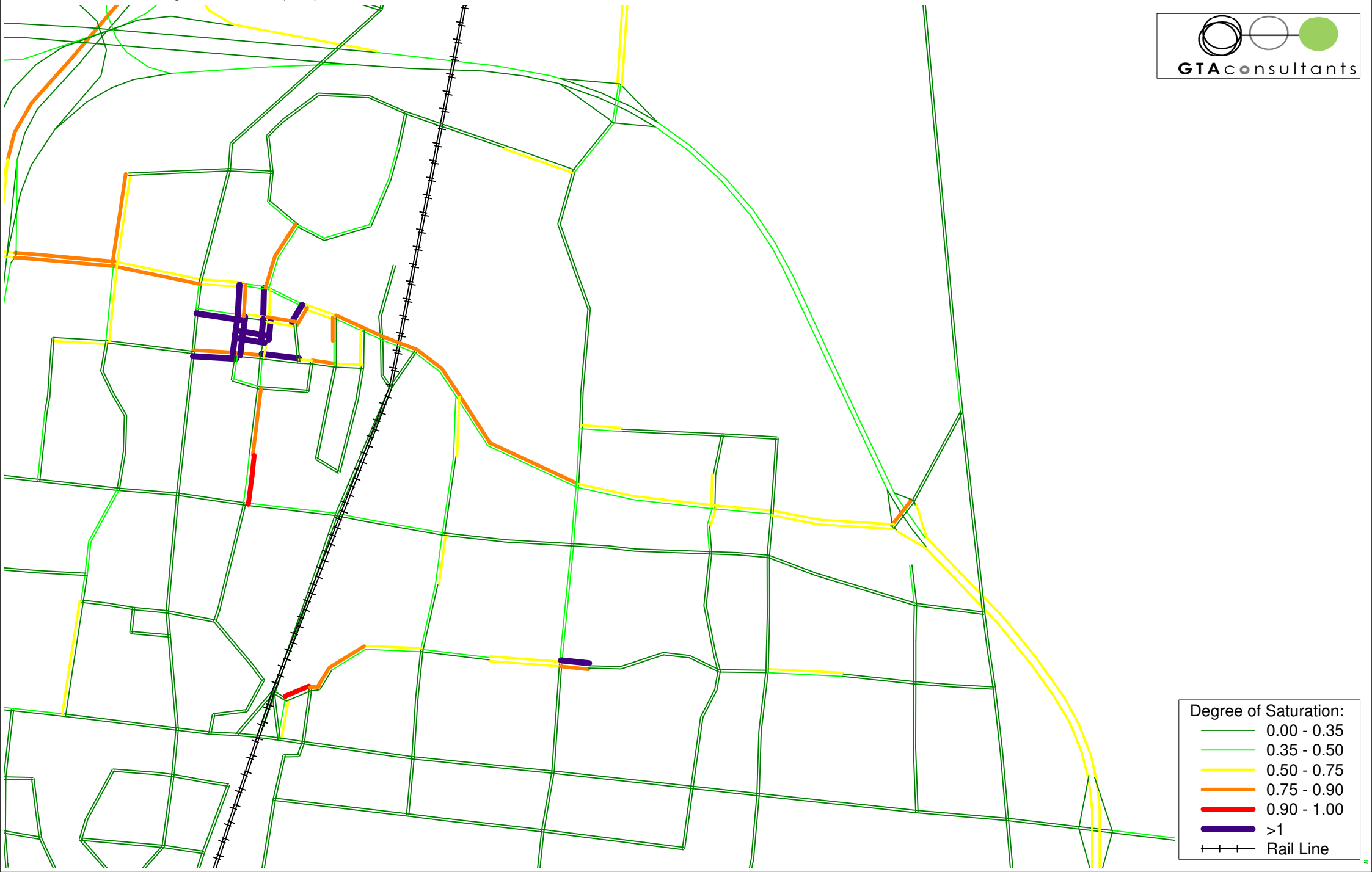
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Degree of Saturation (DOS) Year 2046 Base



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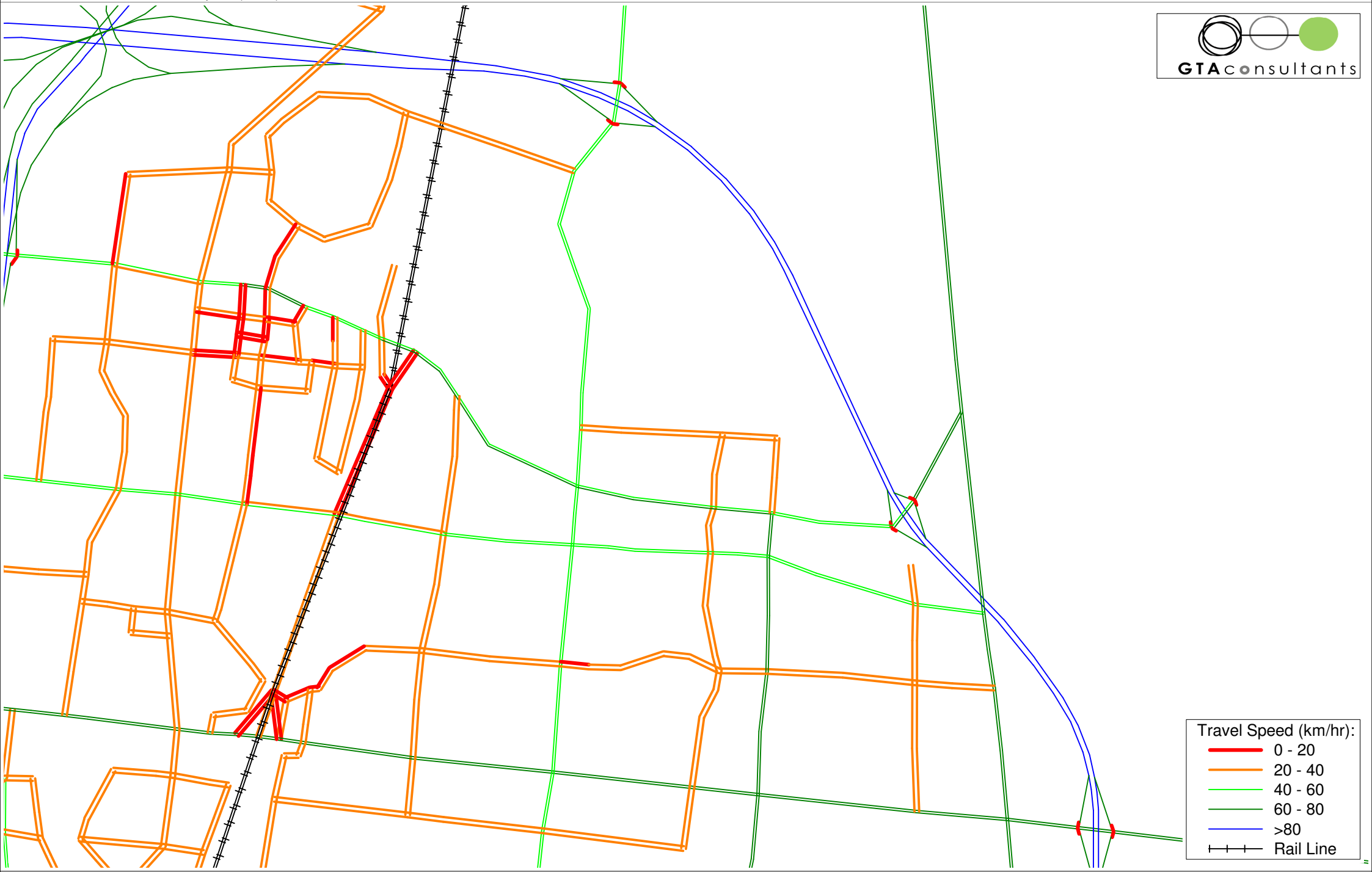
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Travel Speed (km/hr) Year 2046 Base



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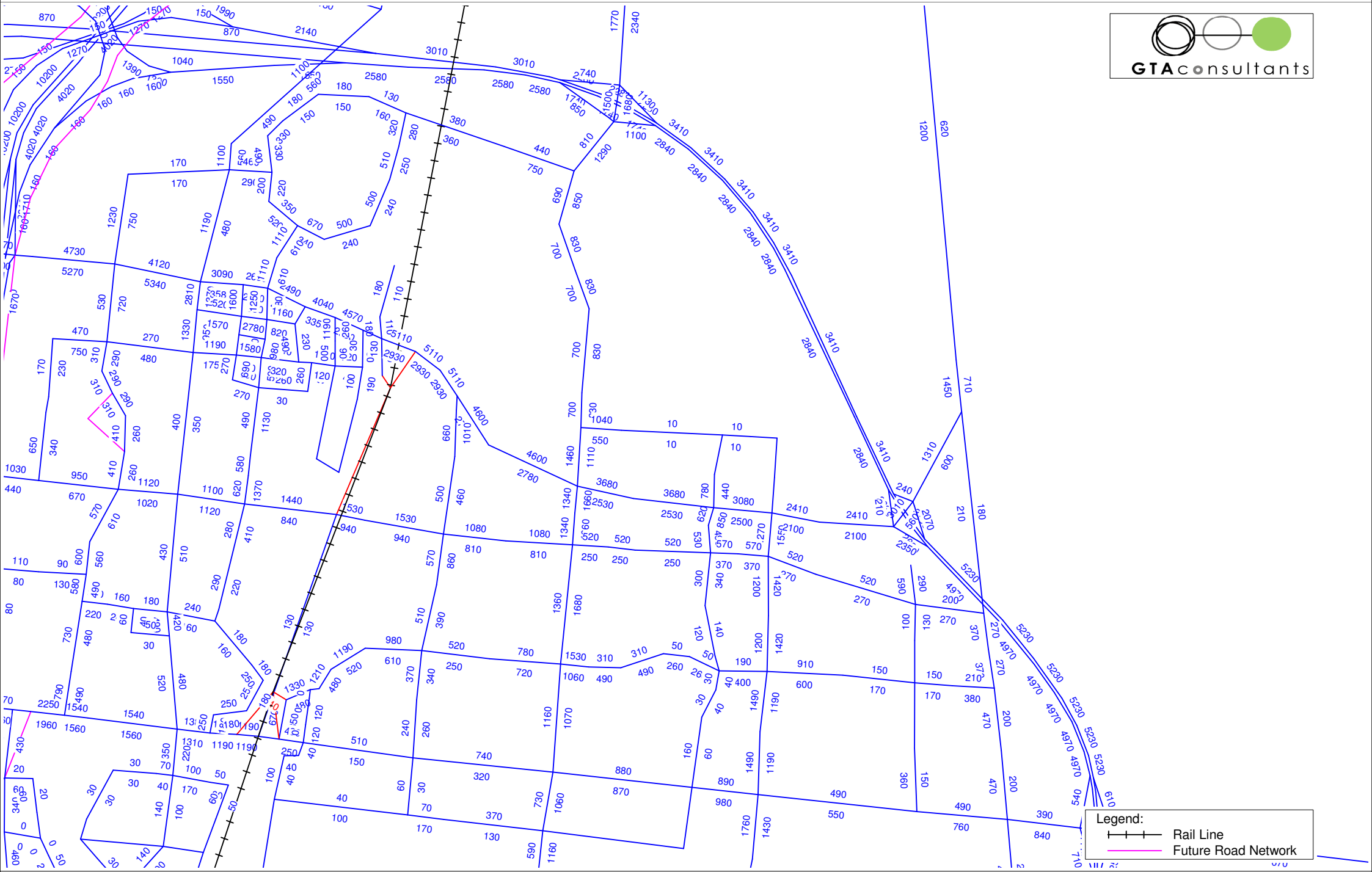
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Peak Total PCU Year 2046 Base



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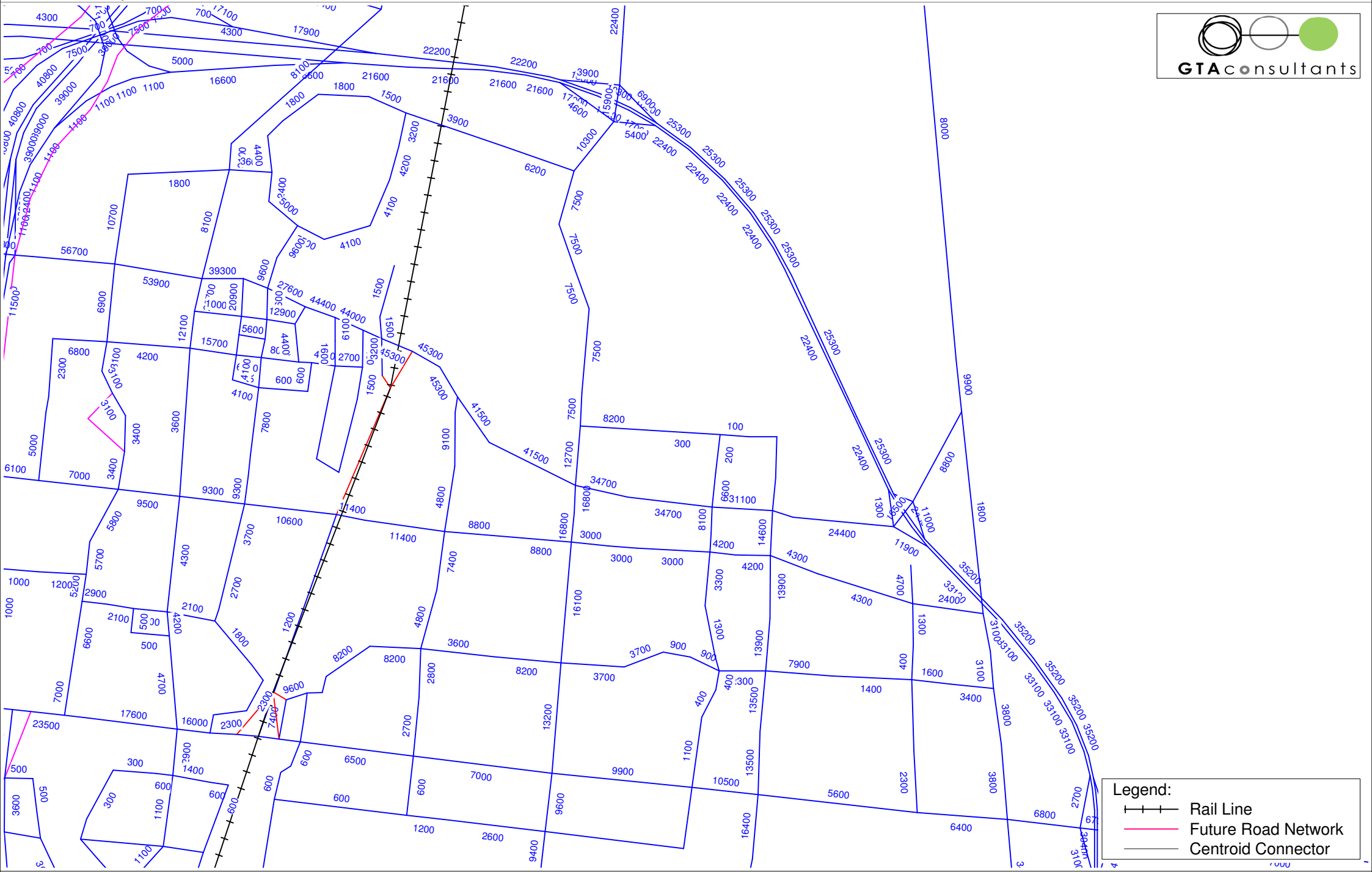
cube

VITM Northern Growth Corridor Model
14M1555000 - Daily Volume Total PCU Year 2046 Base



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VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 1 EB year 2046 Base

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12/05/2014

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VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 1 WB year 2046 Base

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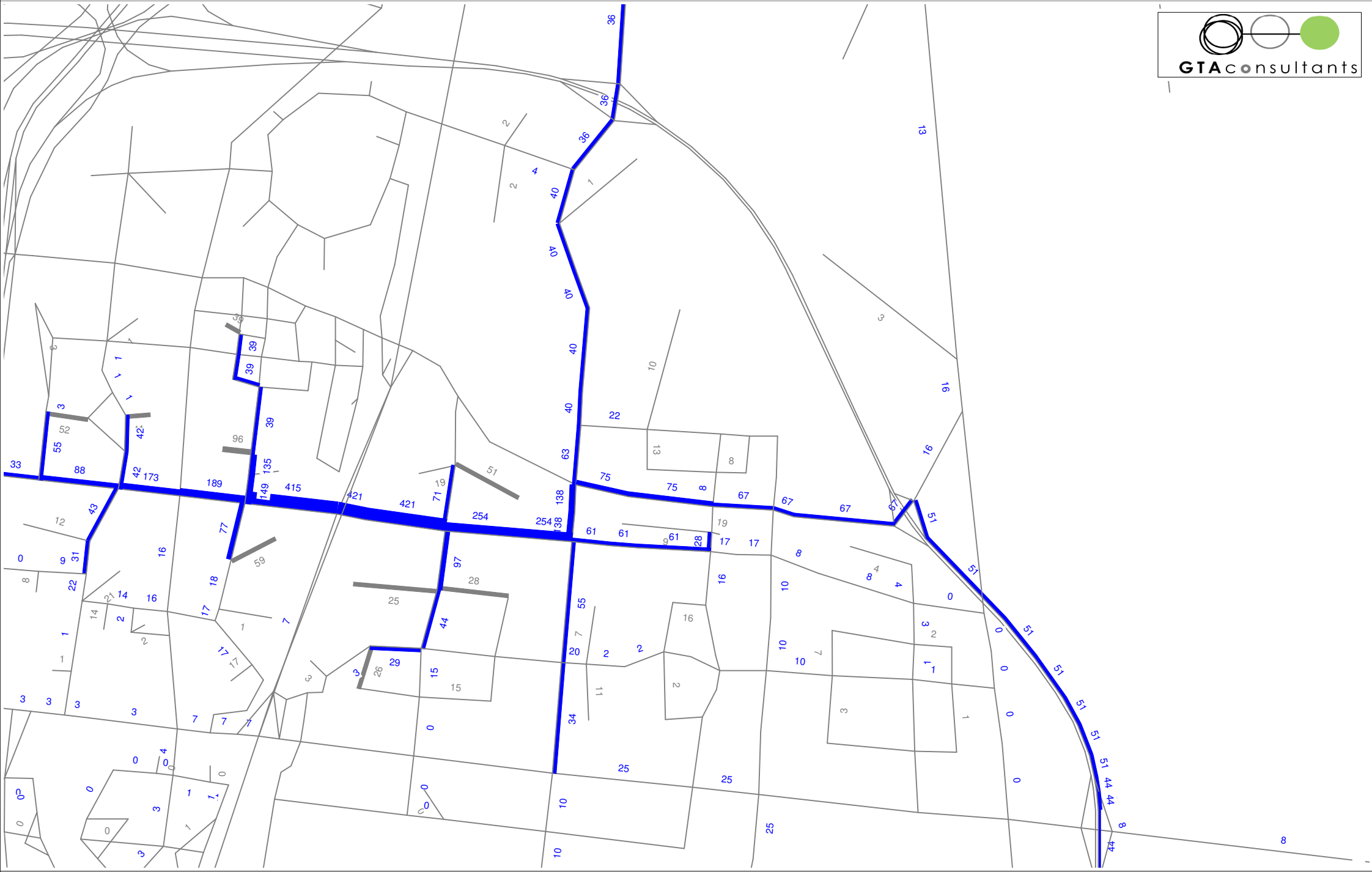
VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 2 EB year 2046 Base



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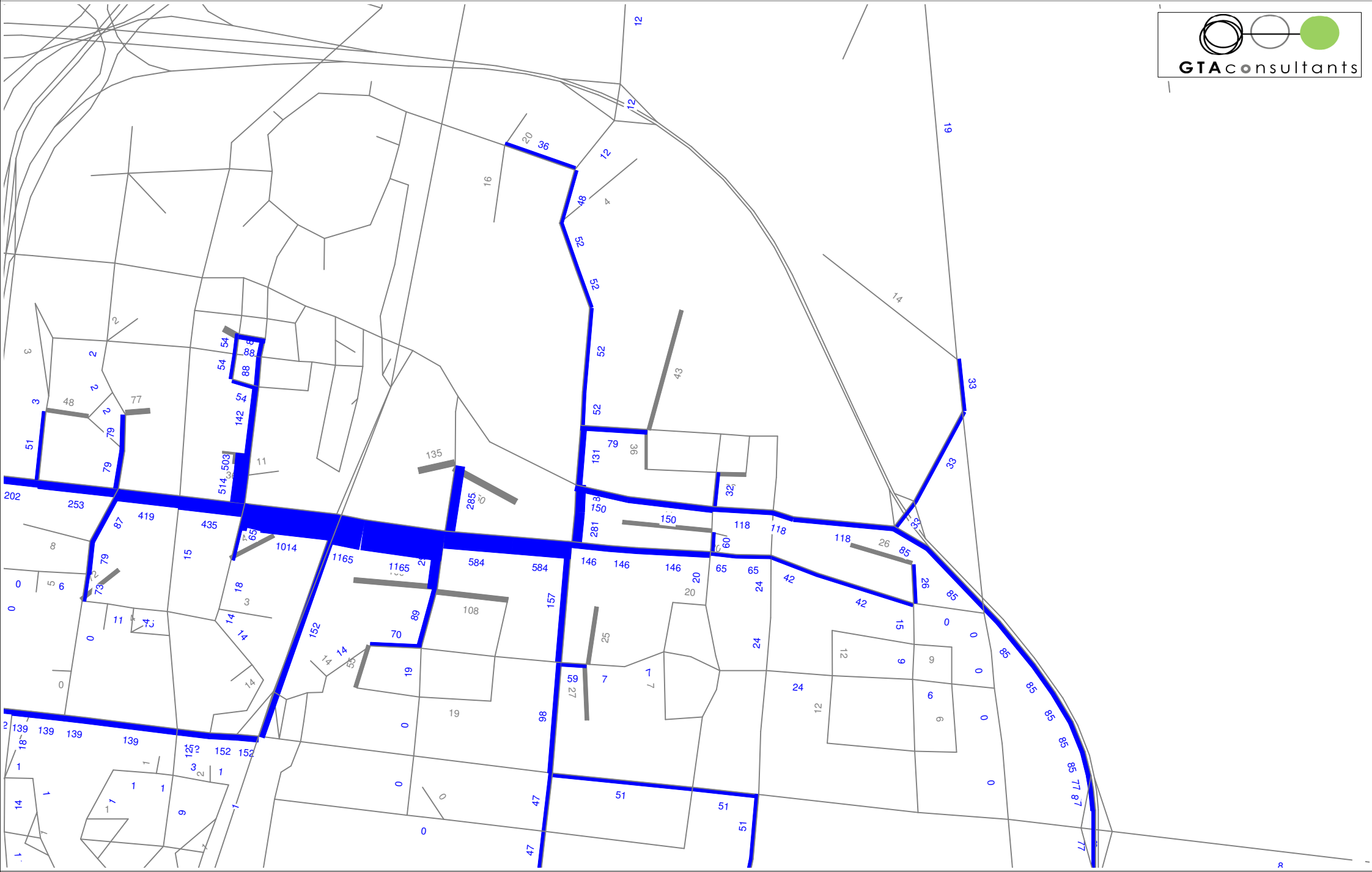
VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 2 WB year 2046 Base



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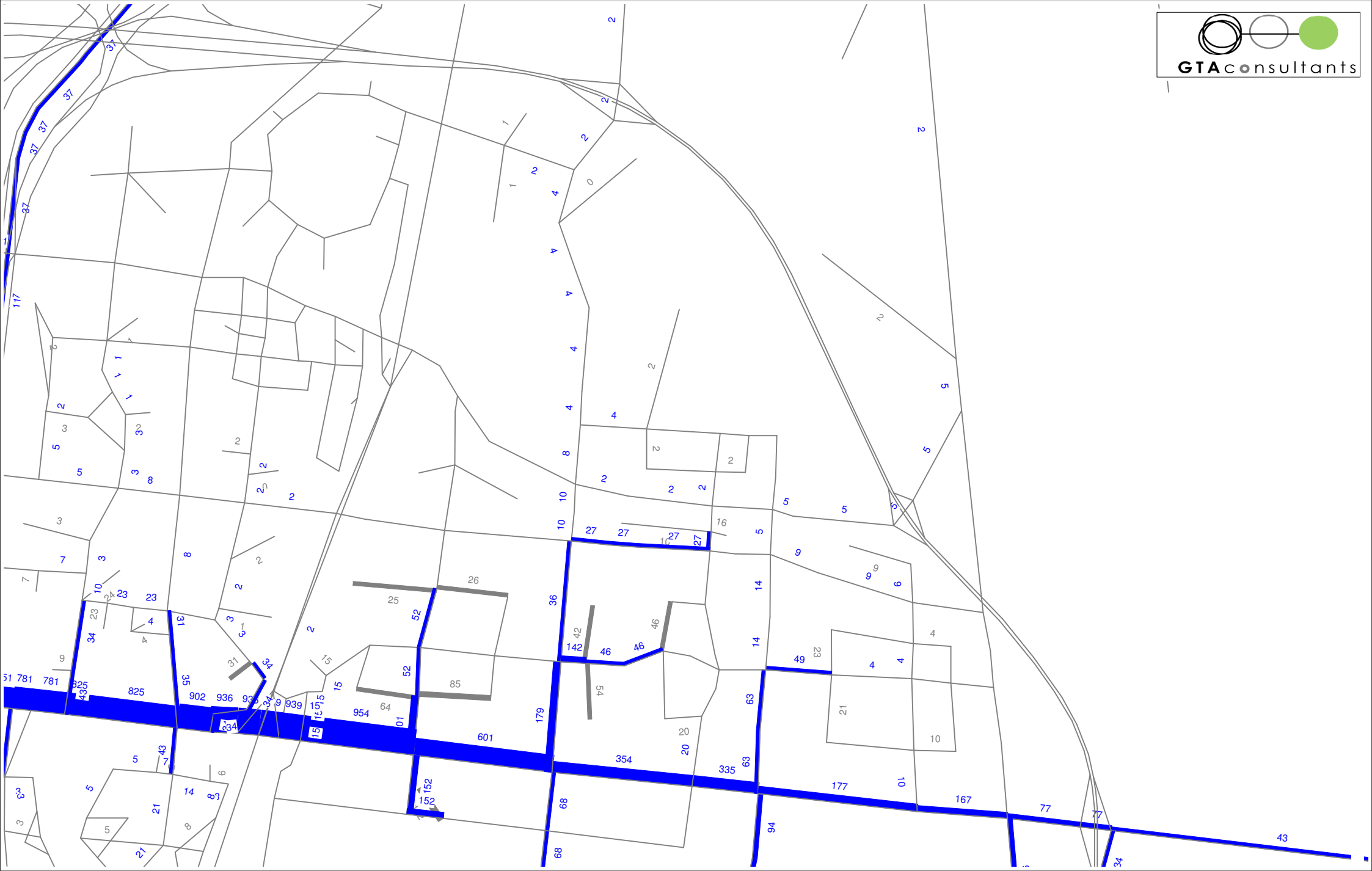
VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 3 EB year 2046 Base



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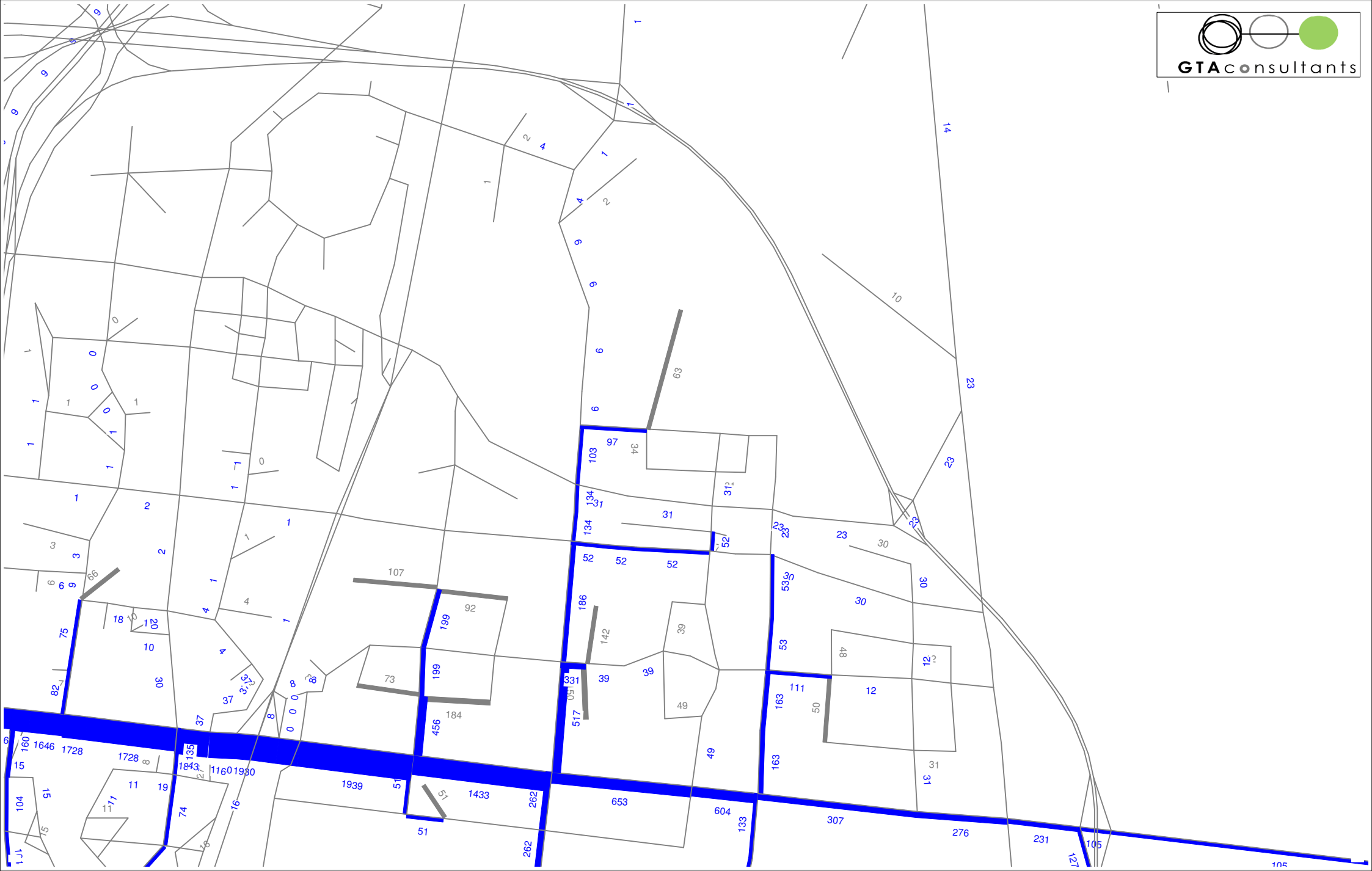
VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 3 WB year 2046 Base



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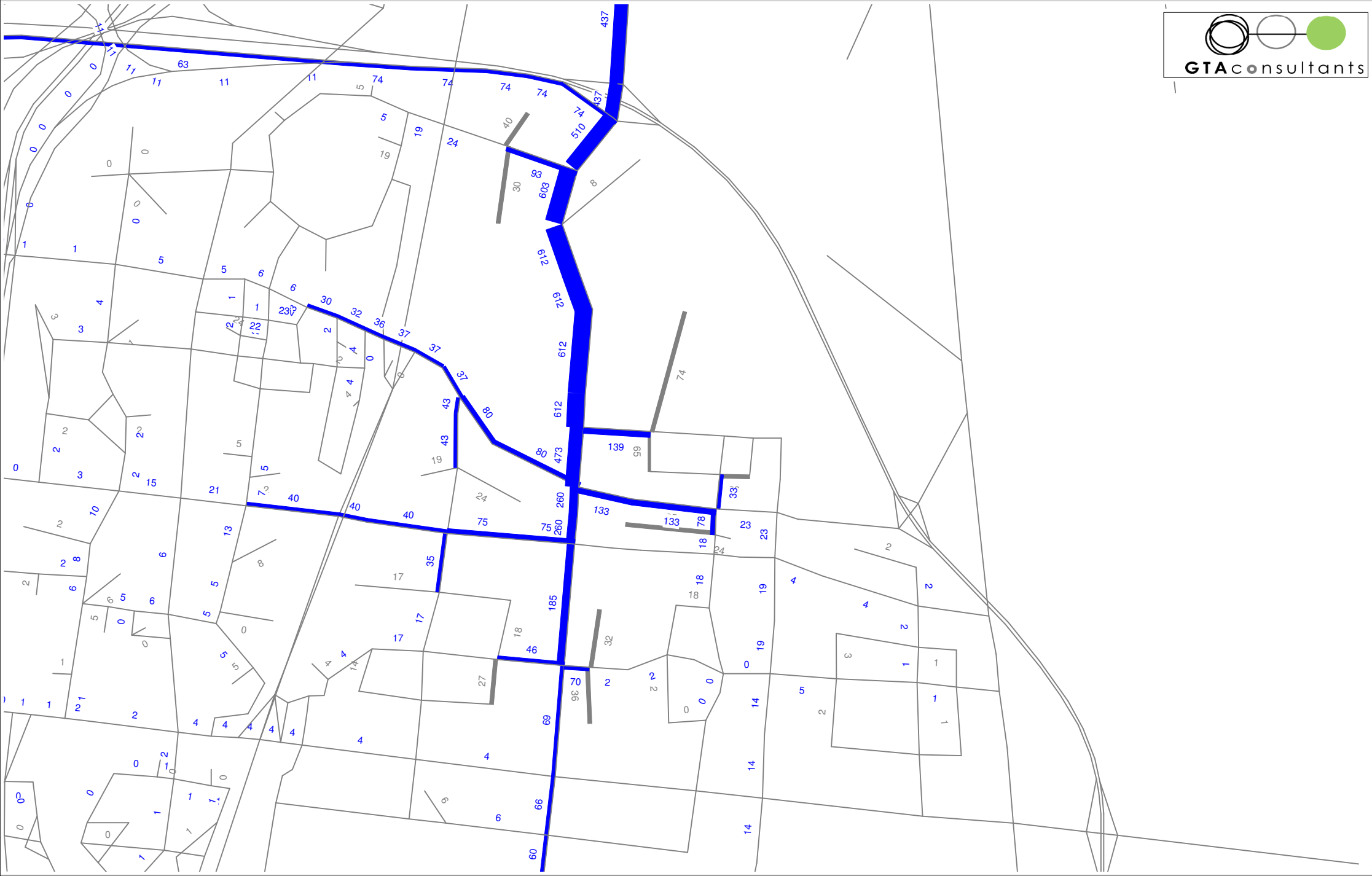
12/05/2014

VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 4 NB year 2046 Base



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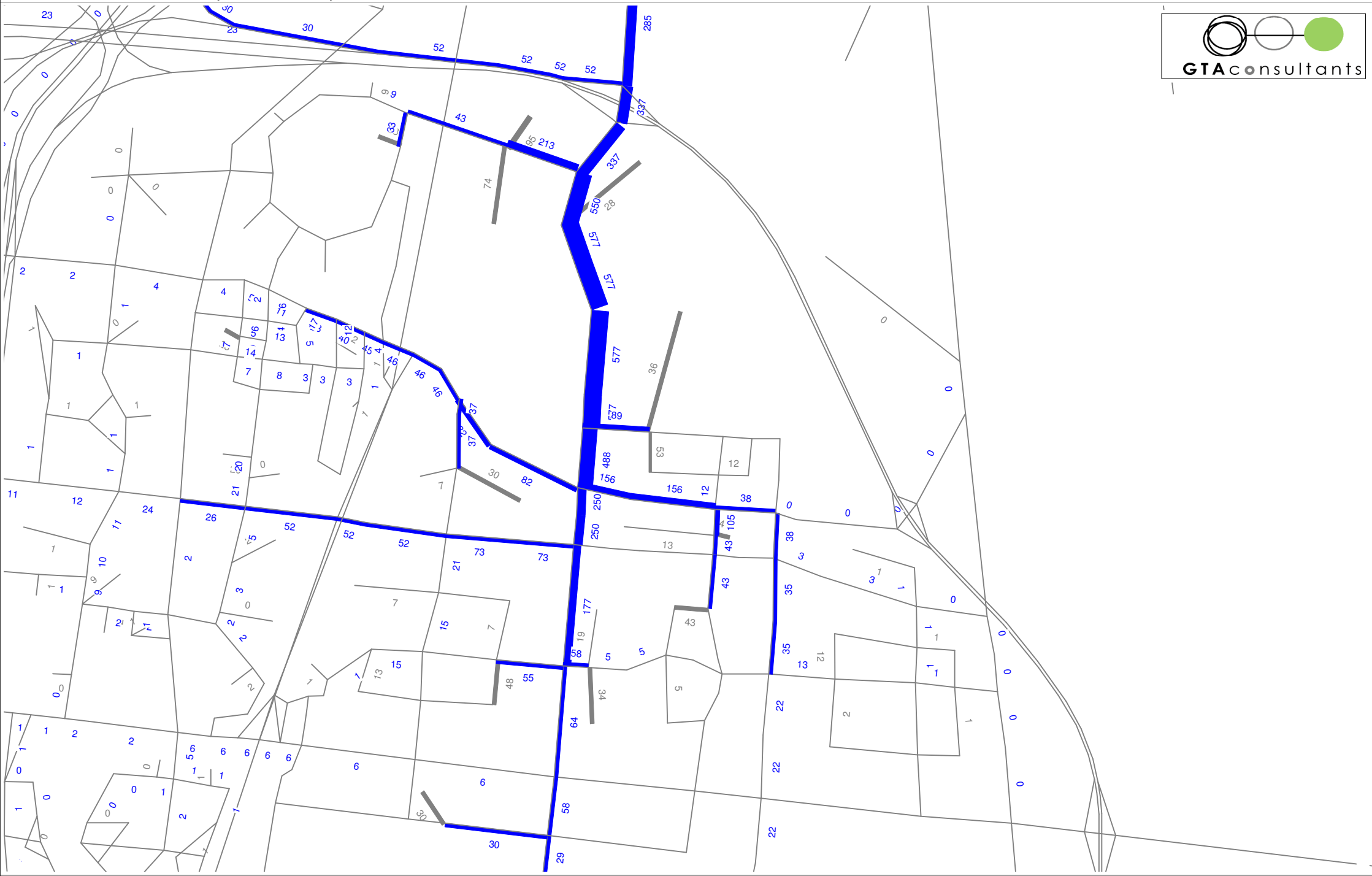
VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 4 SB year 2046 Base



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VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 5 EB year 2046 Base

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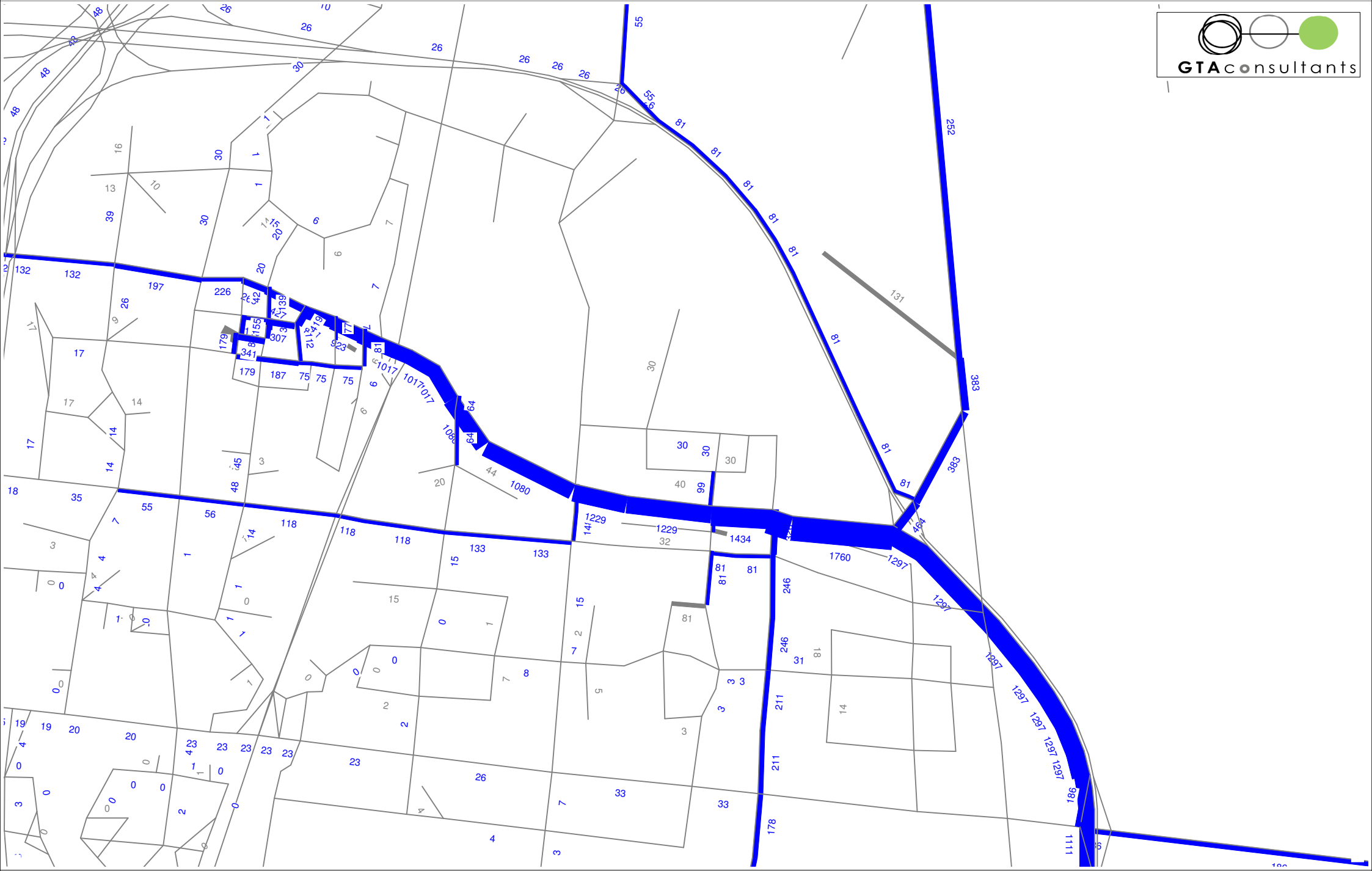
14M1555000 - AM Select Link Analysis Location 5 WB year 2046 Base



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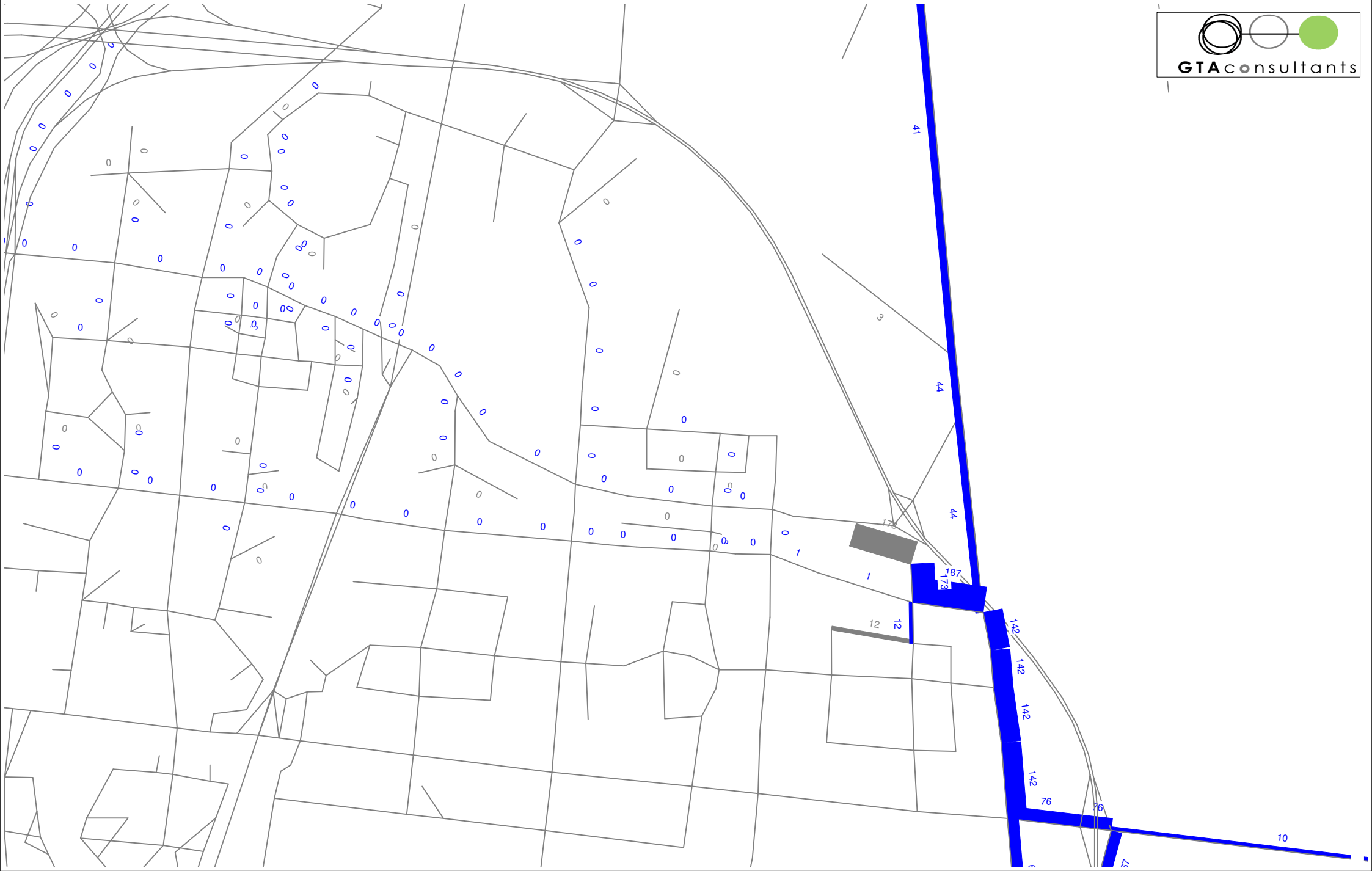
VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 6 EB year 2046 Base



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VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 6 WB year 2046 Base

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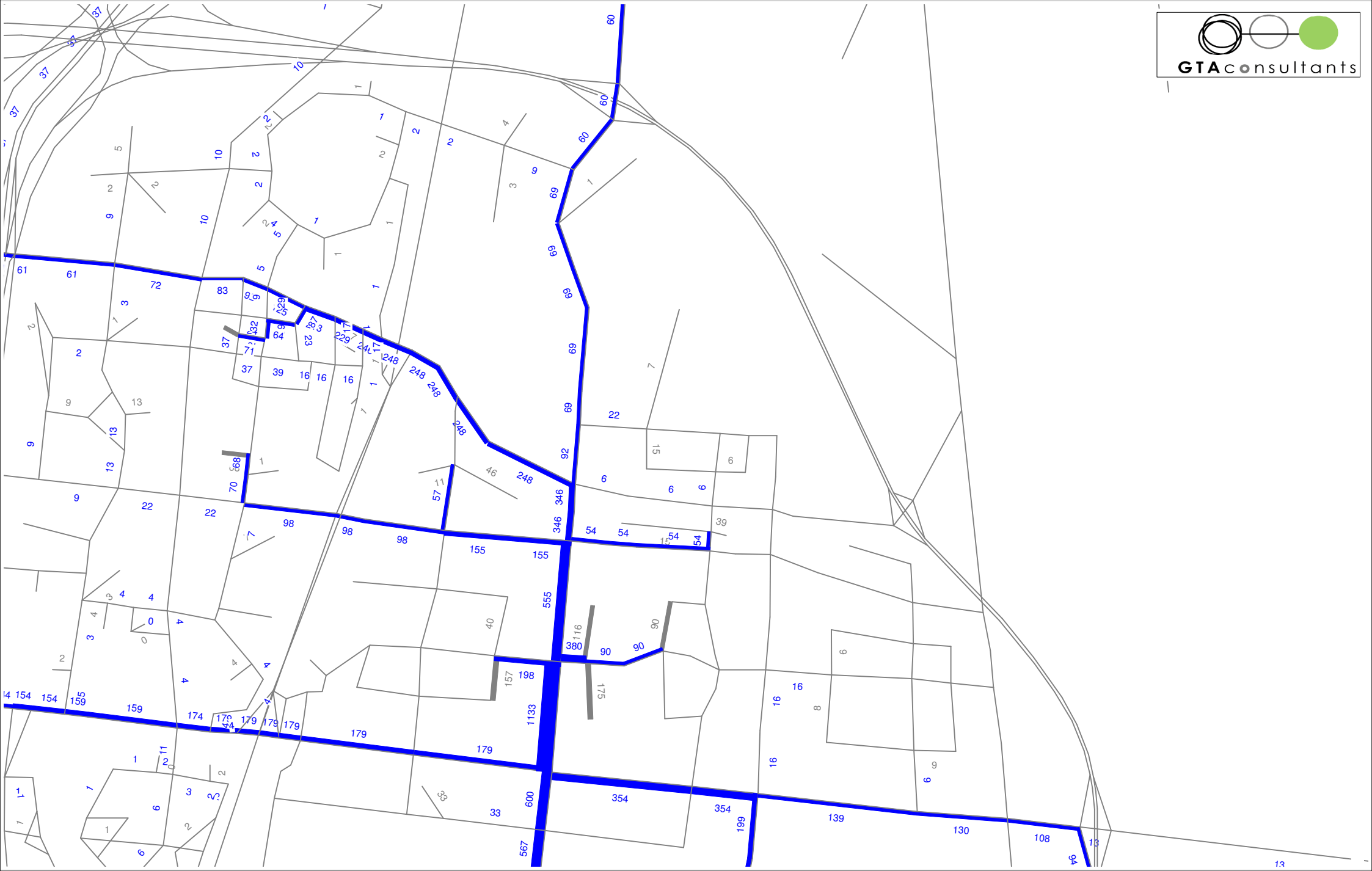
VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 7 NB year 2046 Base



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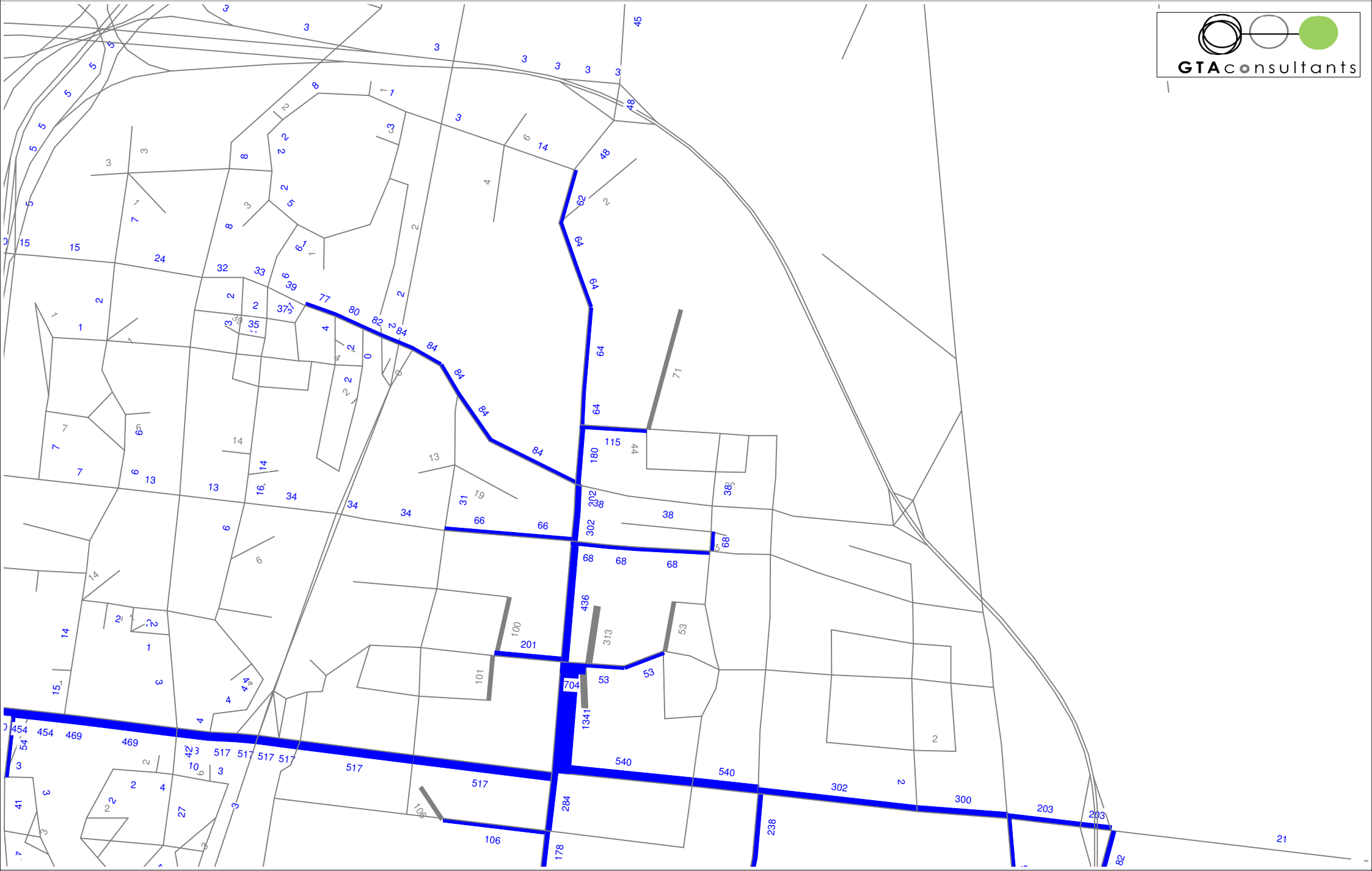
VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 7 SB year 2046 Base



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VITM Northern Growth Corridor Model
14M1555000 - AM Select Link Analysis Location 8 EB year 2046 Base

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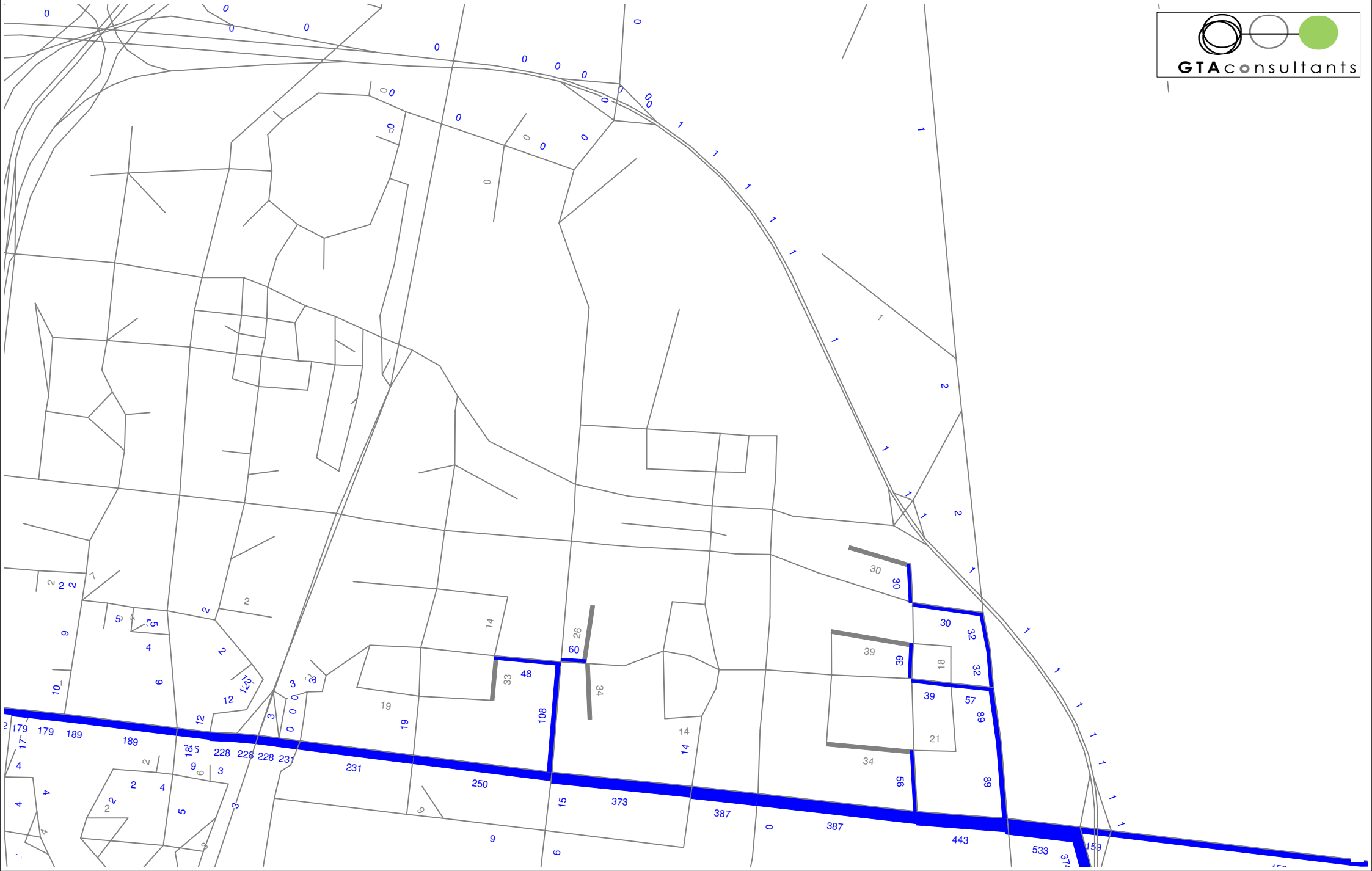

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VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 1 EB year 2046 Base

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VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 1 WB year 2046 Base

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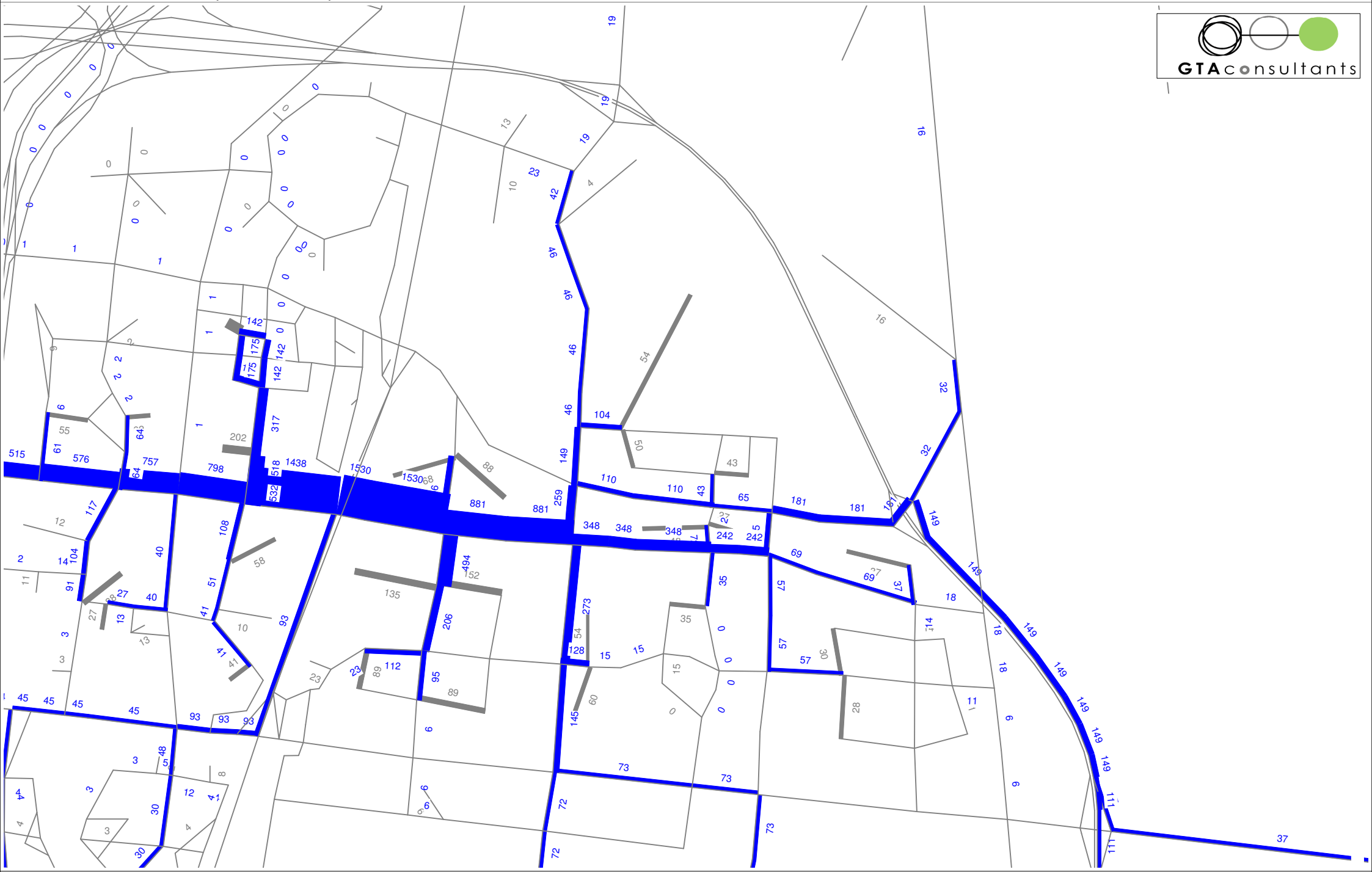
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 2 EB year 2046 Base



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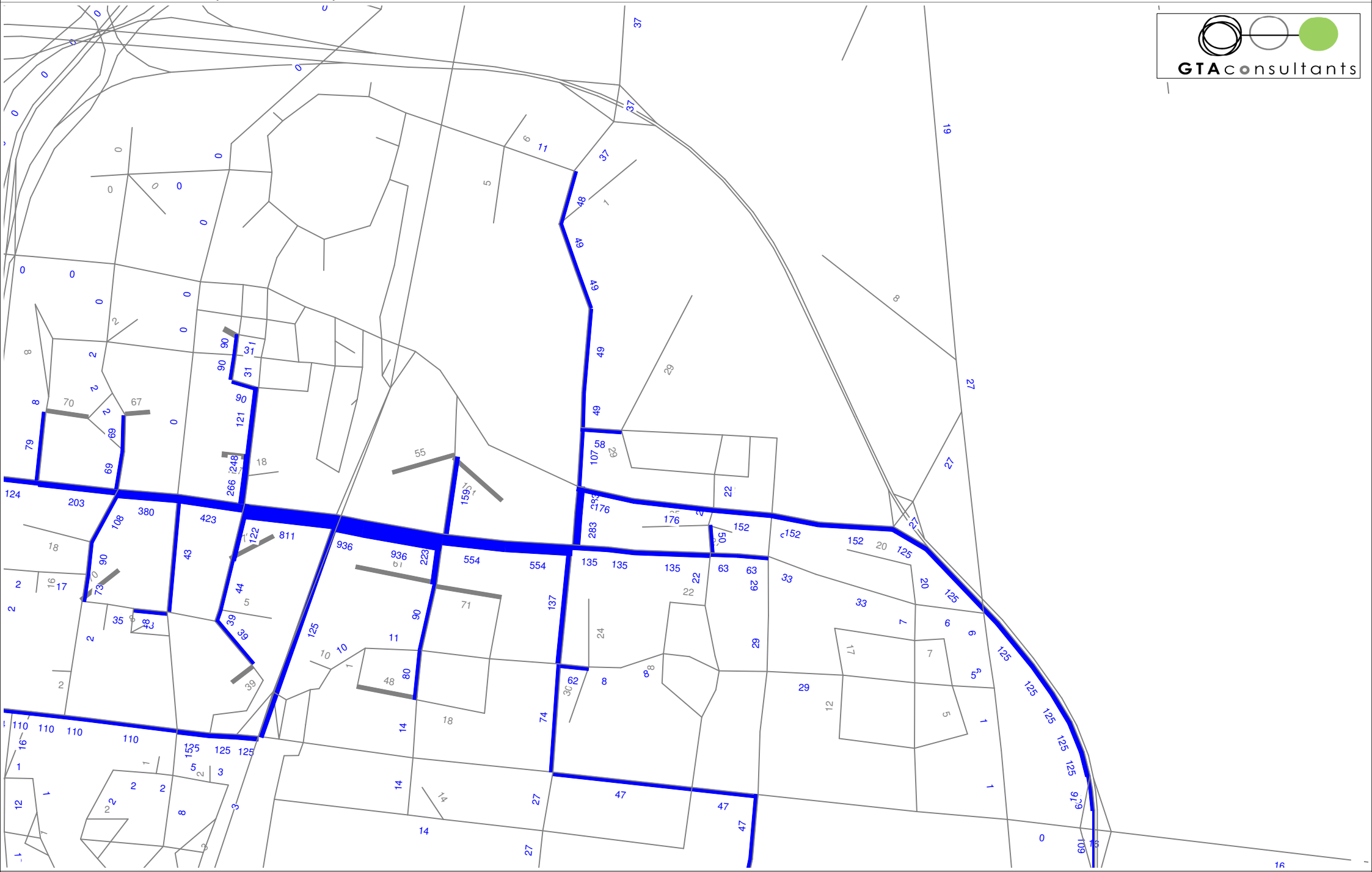
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 2 WB year 2046 Base



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VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 3 EB year 2046 Base

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14/05/2014

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VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 3 WB year 2046 Base

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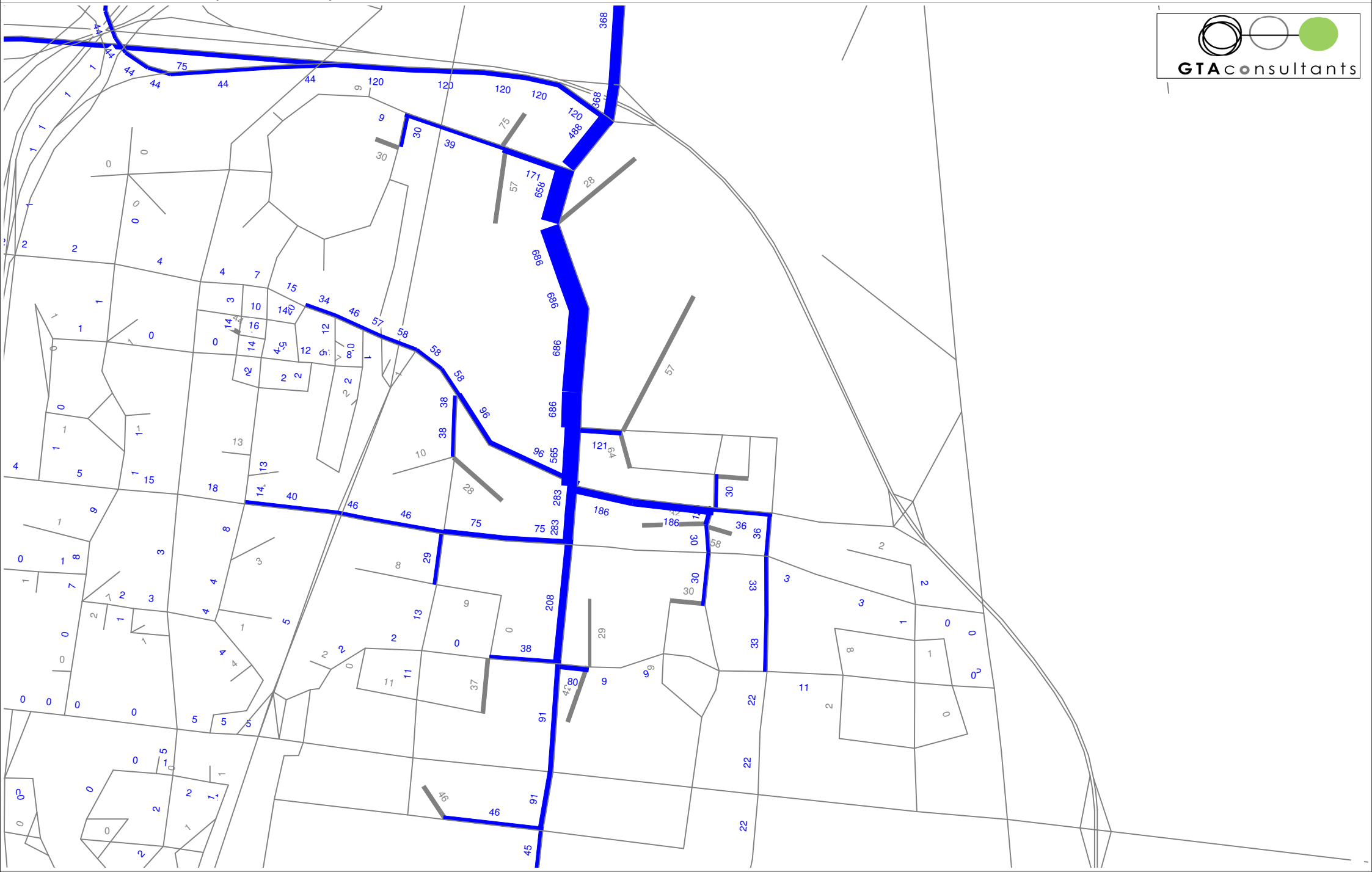
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 4 NB year 2046 Base



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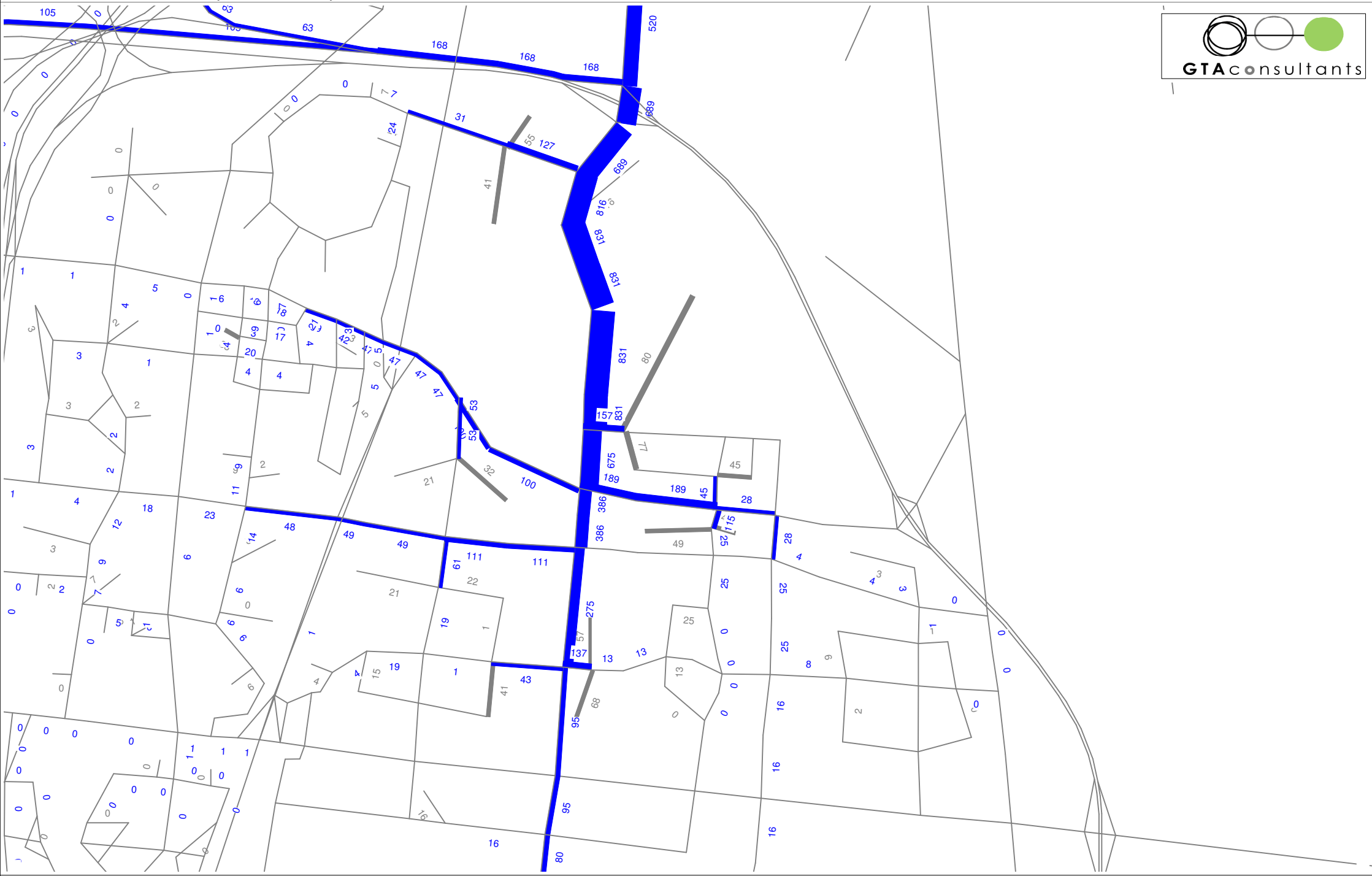
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 4 SB year 2046 Base



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VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 5 EB year 2046 Base

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VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 5 WB year 2046 Base

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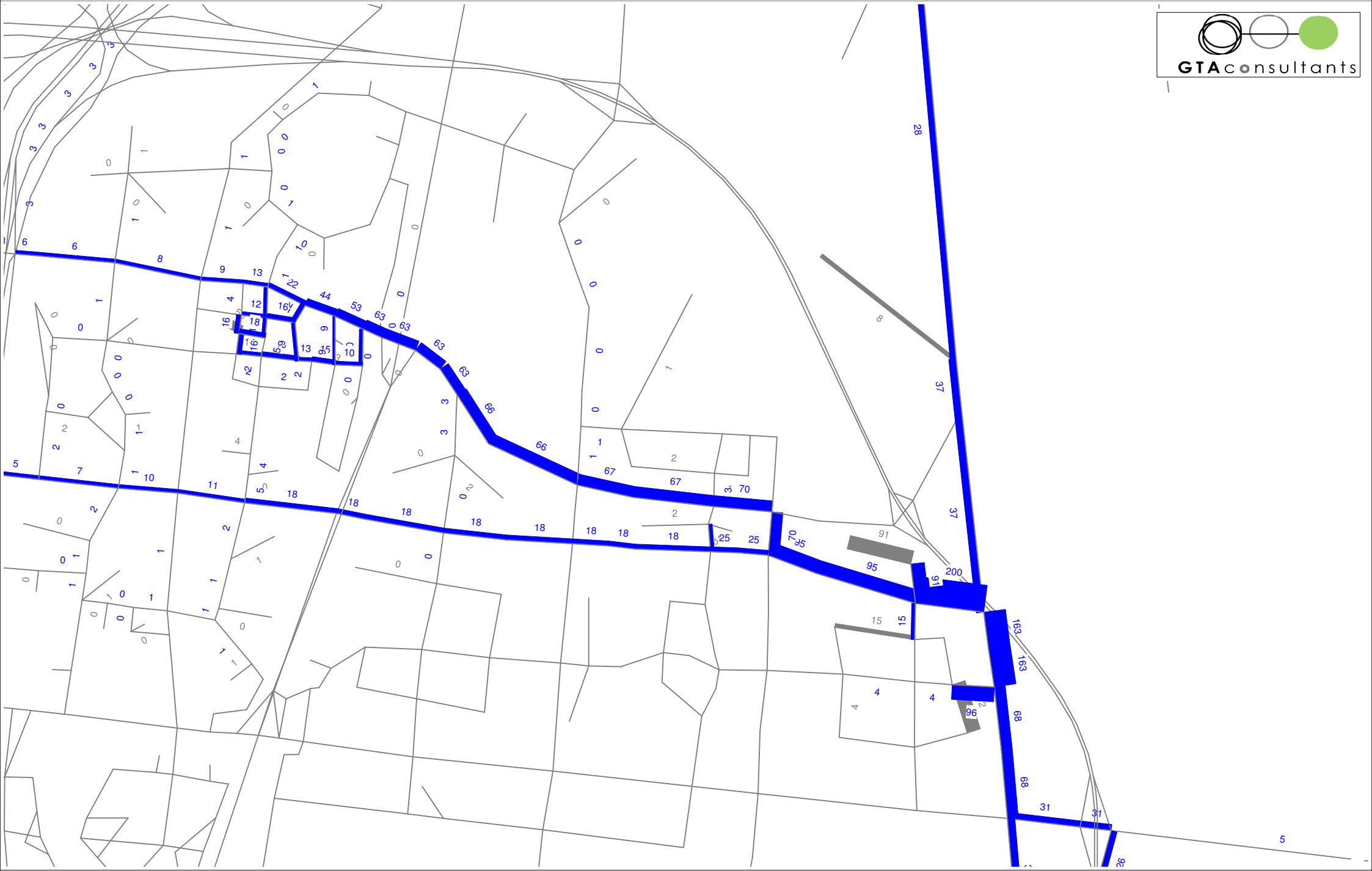
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 6 EB year 2046 Base



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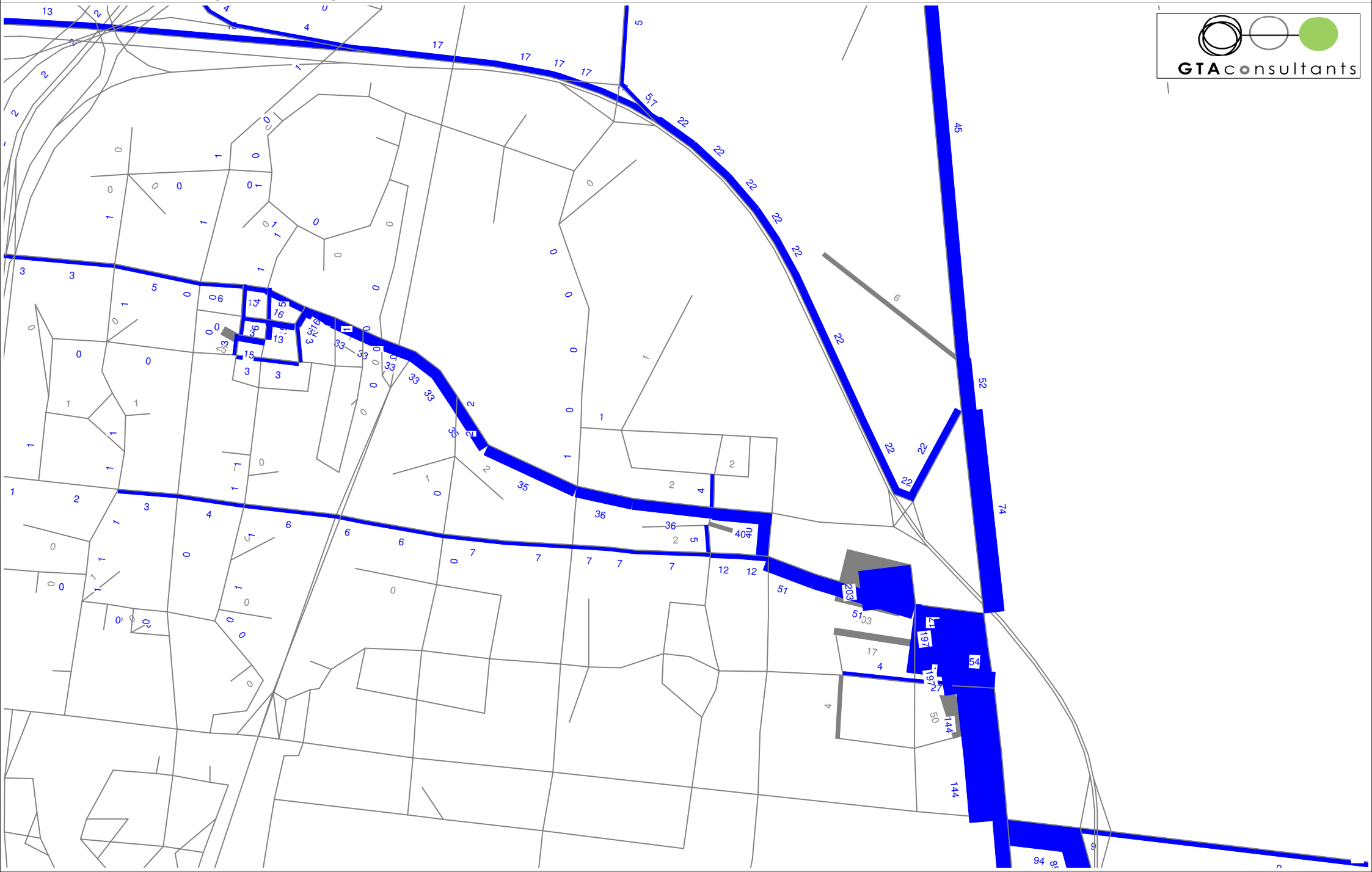
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 6 WB year 2046 Base



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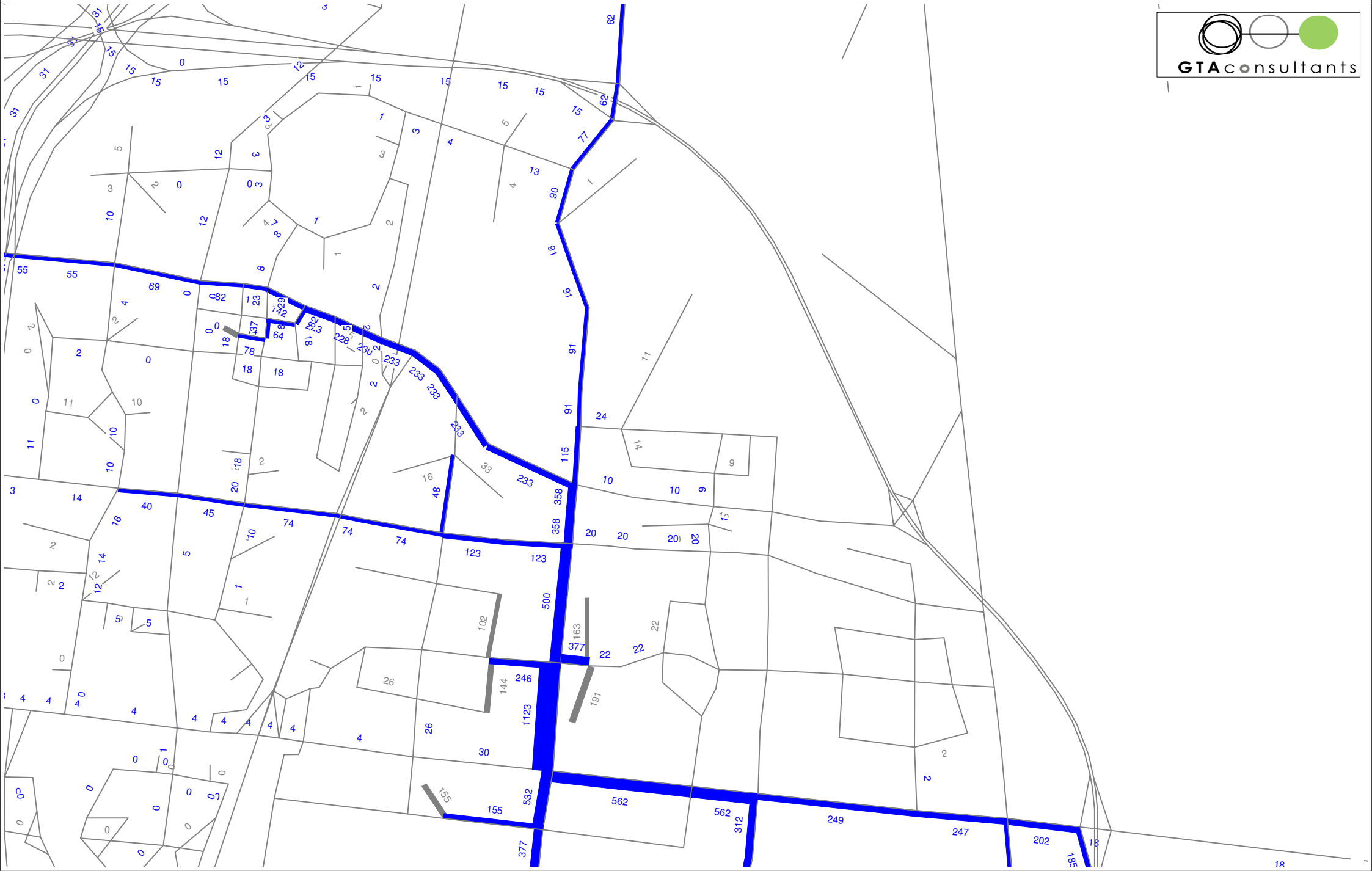
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 7 NB year 2046 Base



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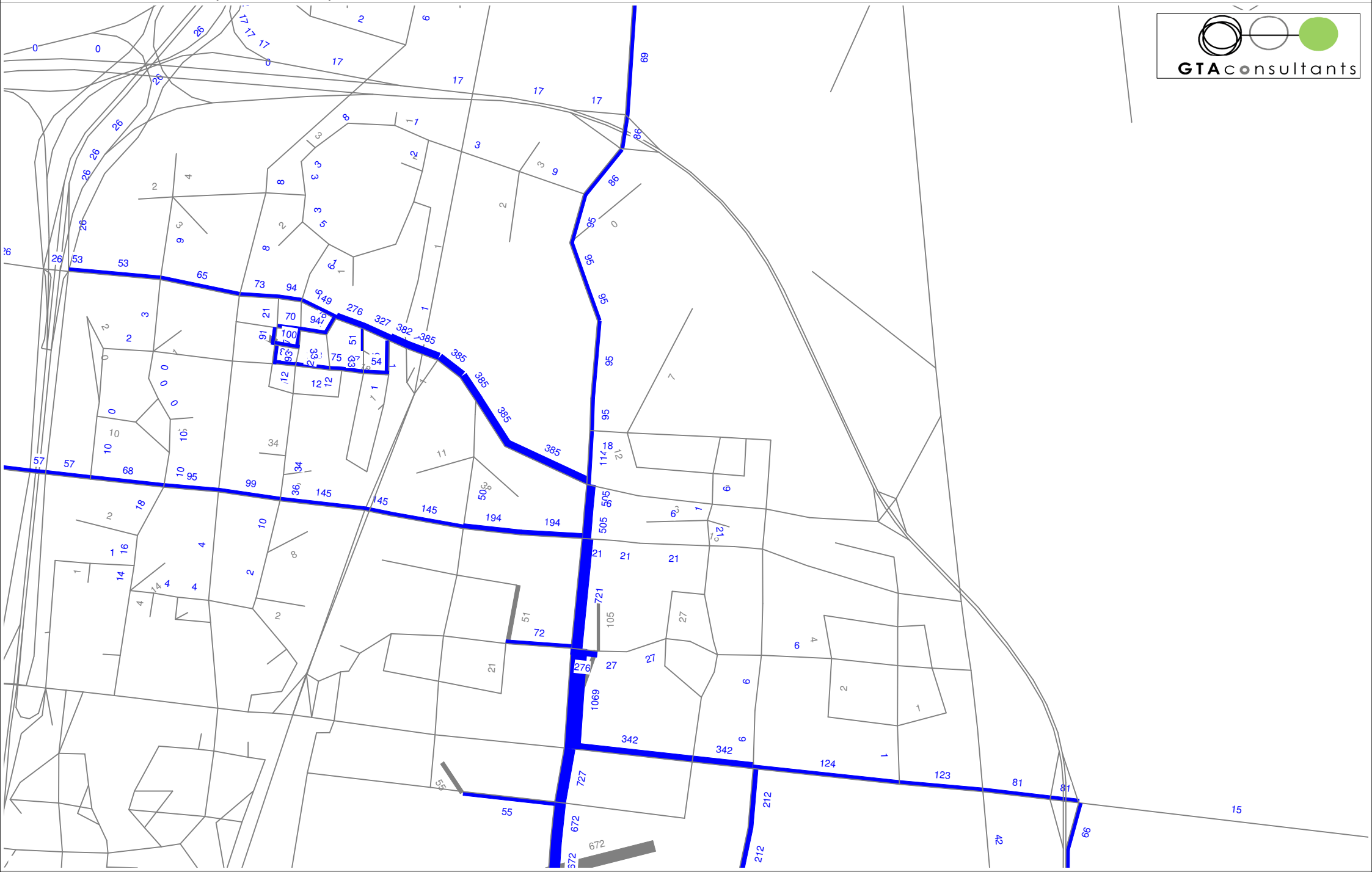
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 7 SB year 2046 Base



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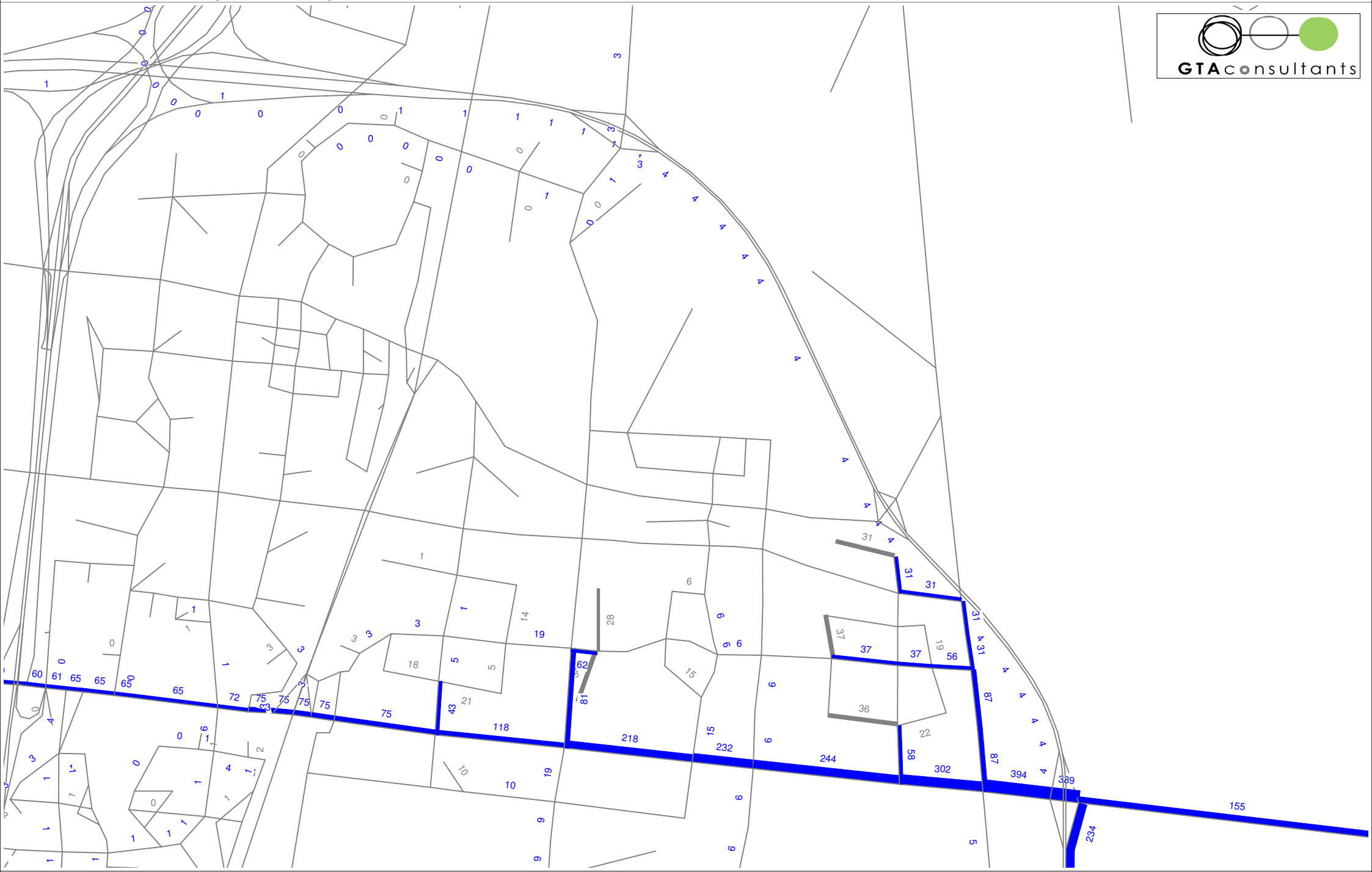
VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 8 EB year 2046 Base



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VITM Northern Growth Corridor Model
14M1555000 - PM Select Link Analysis Location 8 WB year 2046 Base

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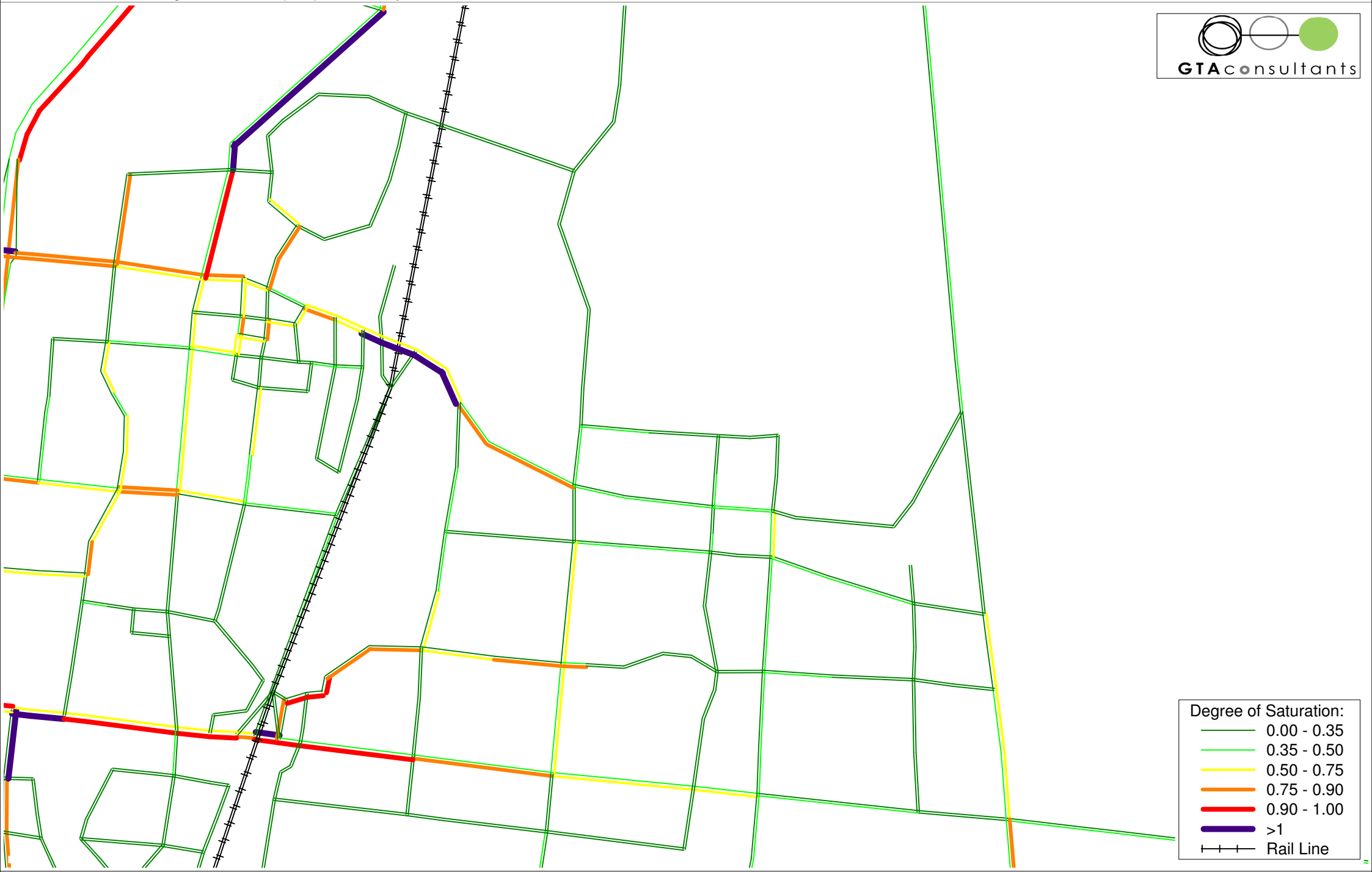
14/05/2014

Appendix C

Interim (2026) Select Link Analysis for Modelled Scenarios

VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Degree of Saturation (DOS) Year 2026 Option 1A



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28/05/2014

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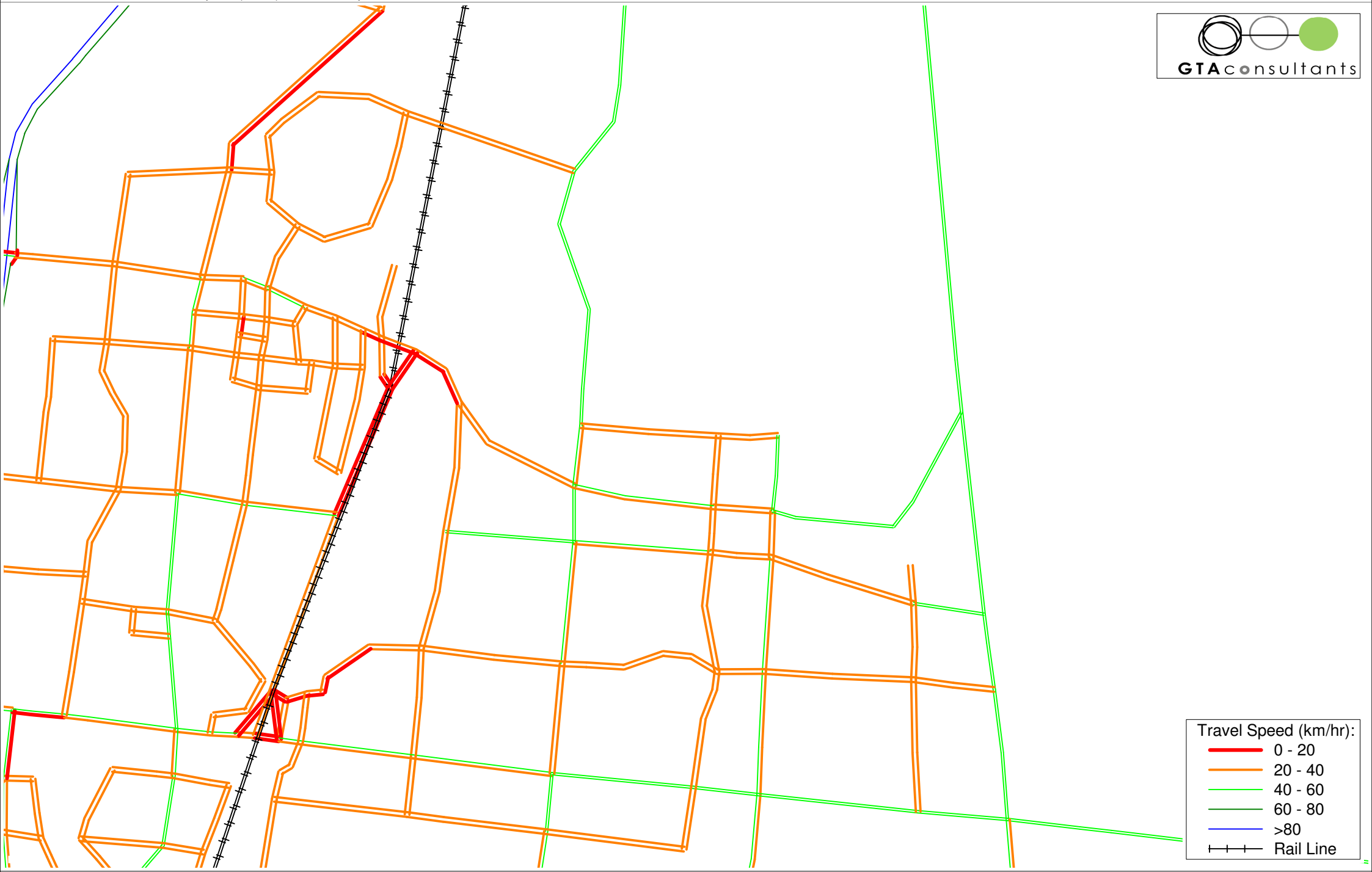
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Travel Speed (km/hr) Year 2026 Option 1A



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28/05/2014

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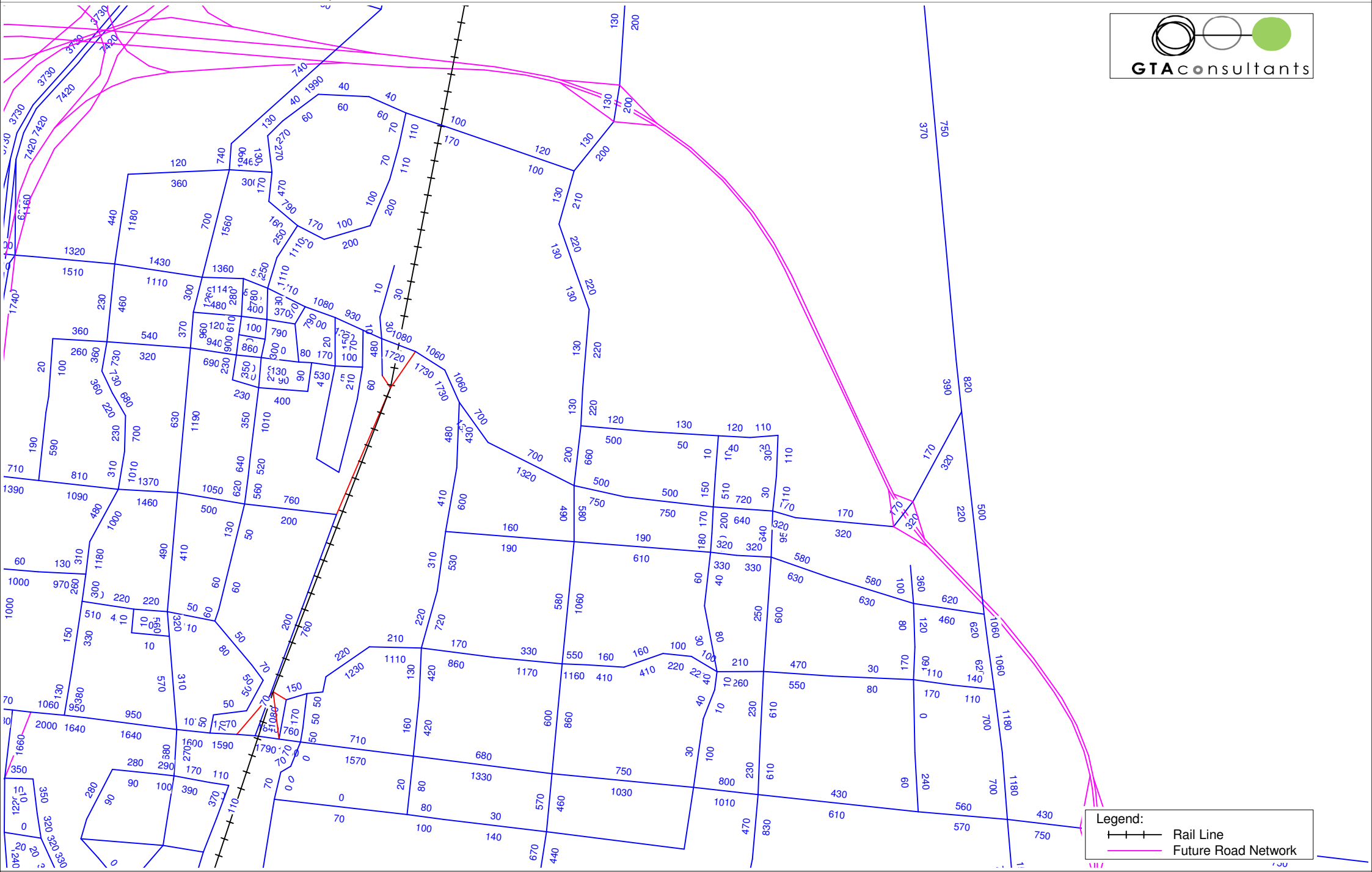
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Peak Total PCU Year 2026 Option 1A



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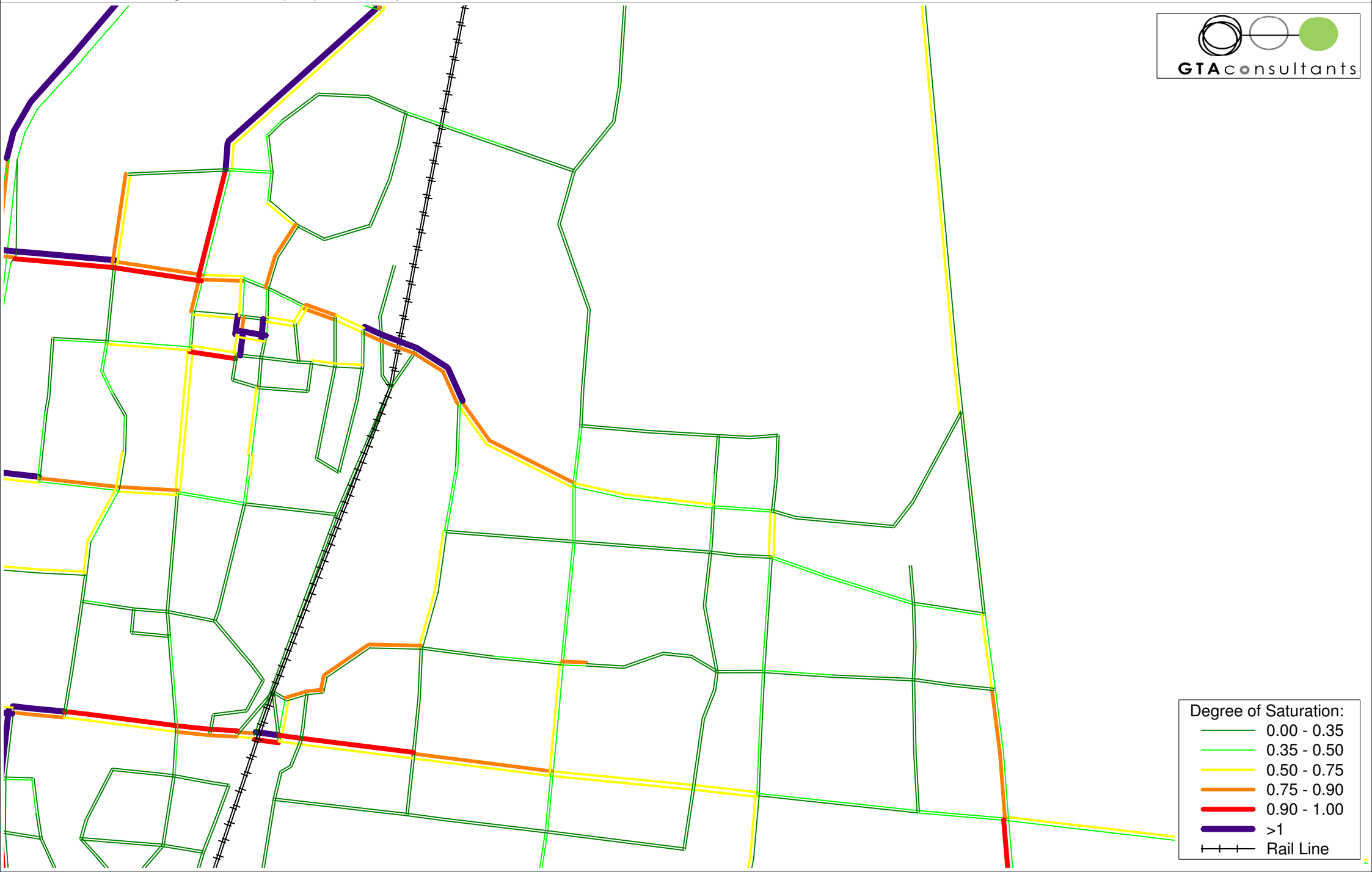
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Degree of Saturation (DOS) Year 2026 Option 1A



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28/05/2014

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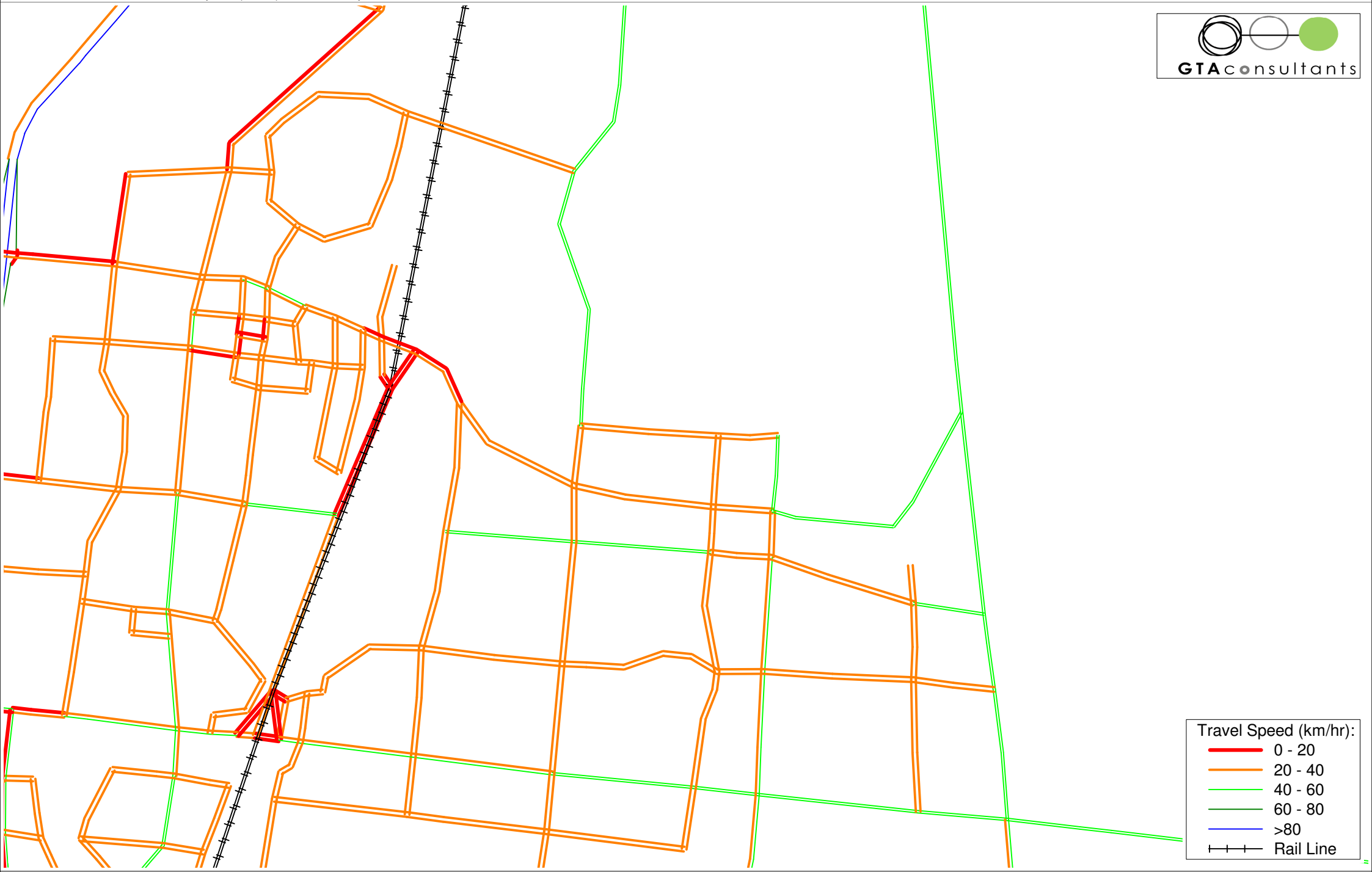
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Travel Speed (km/hr) Year 2026 Option 1A



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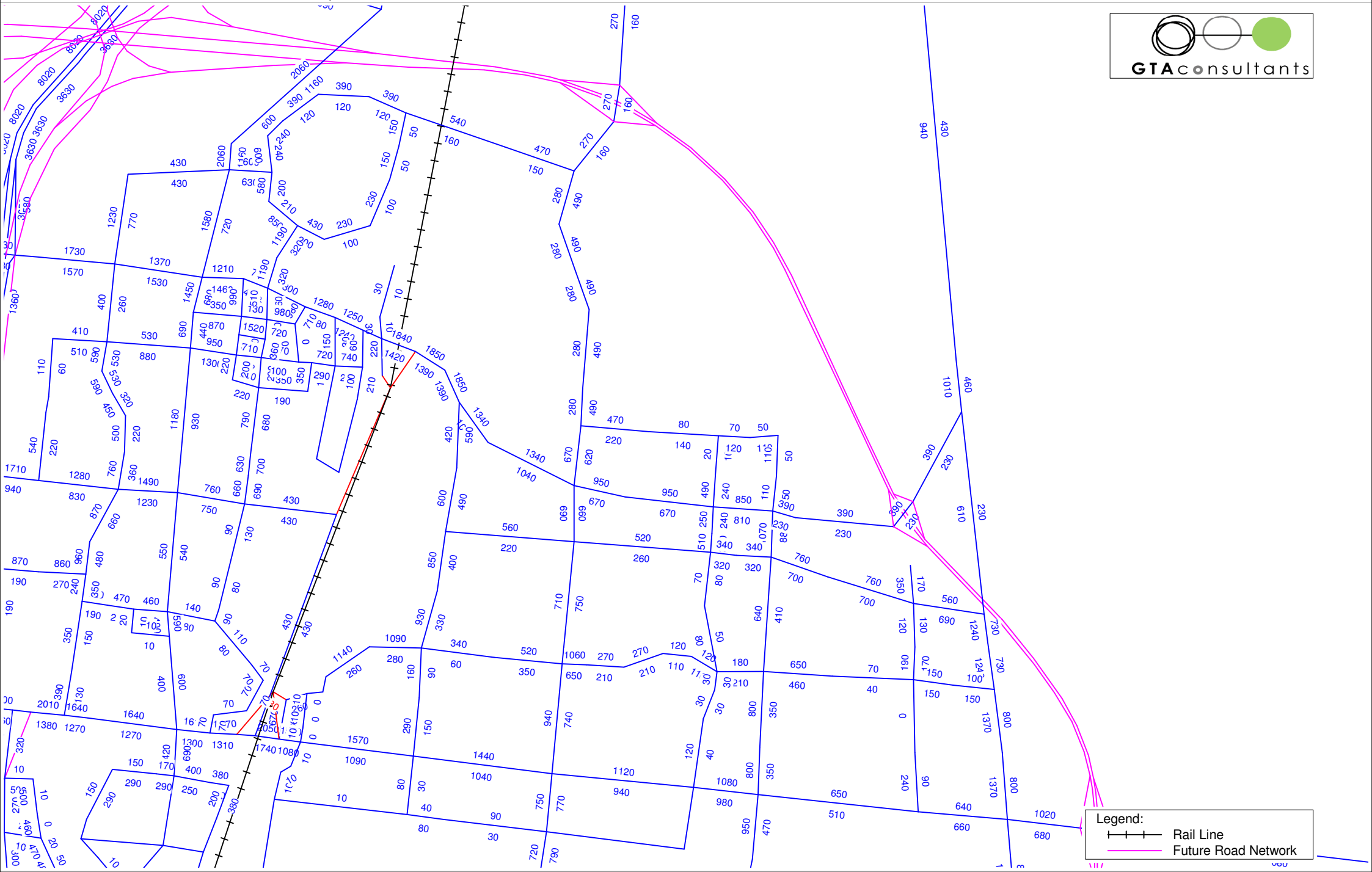
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Peak Total PCU Year 2026 Option 1A



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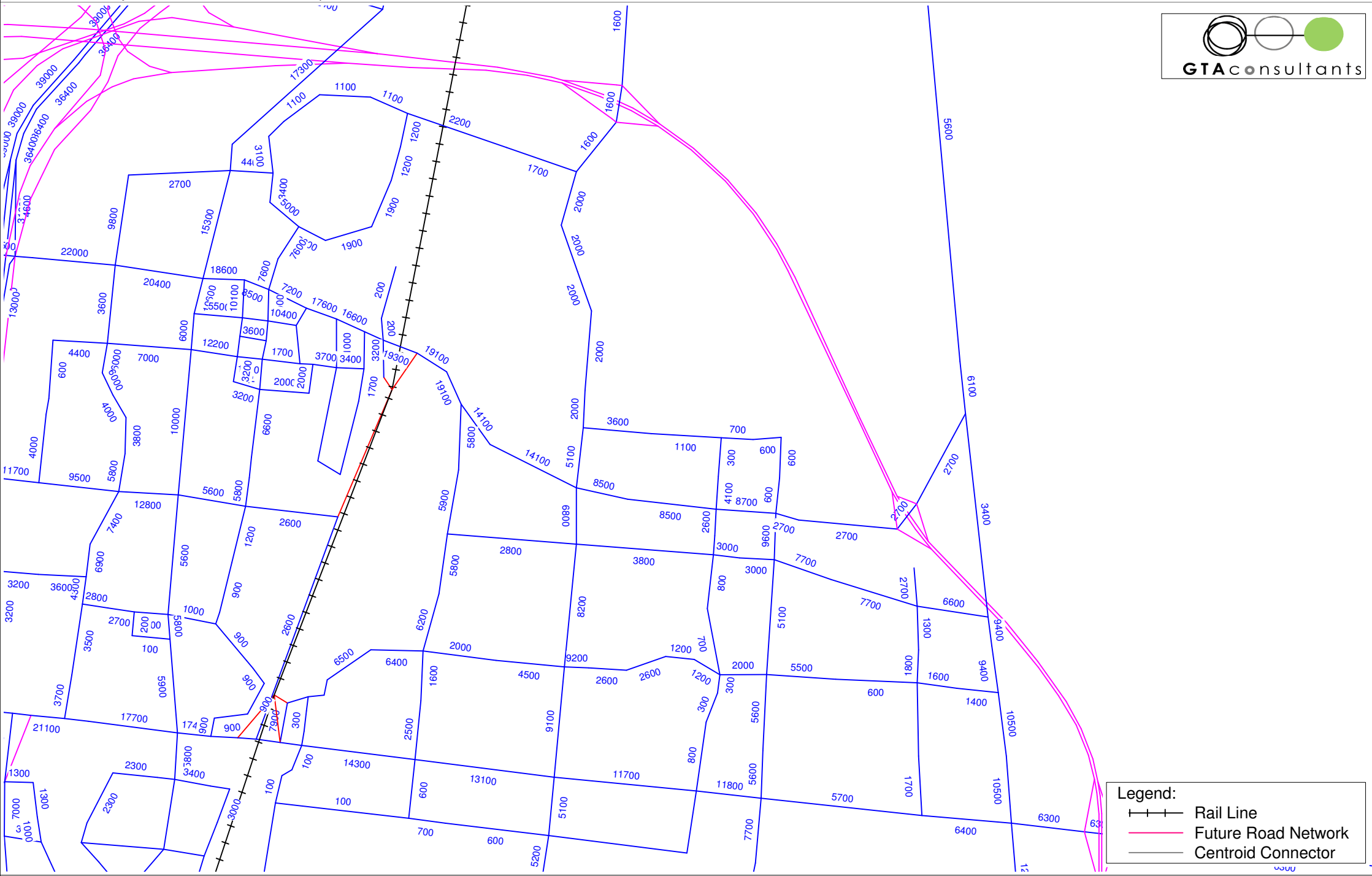
VITM Northern Growth Corridor Model
14M1555000 - Daily Volume Total PCU Year 2026 Option 1A



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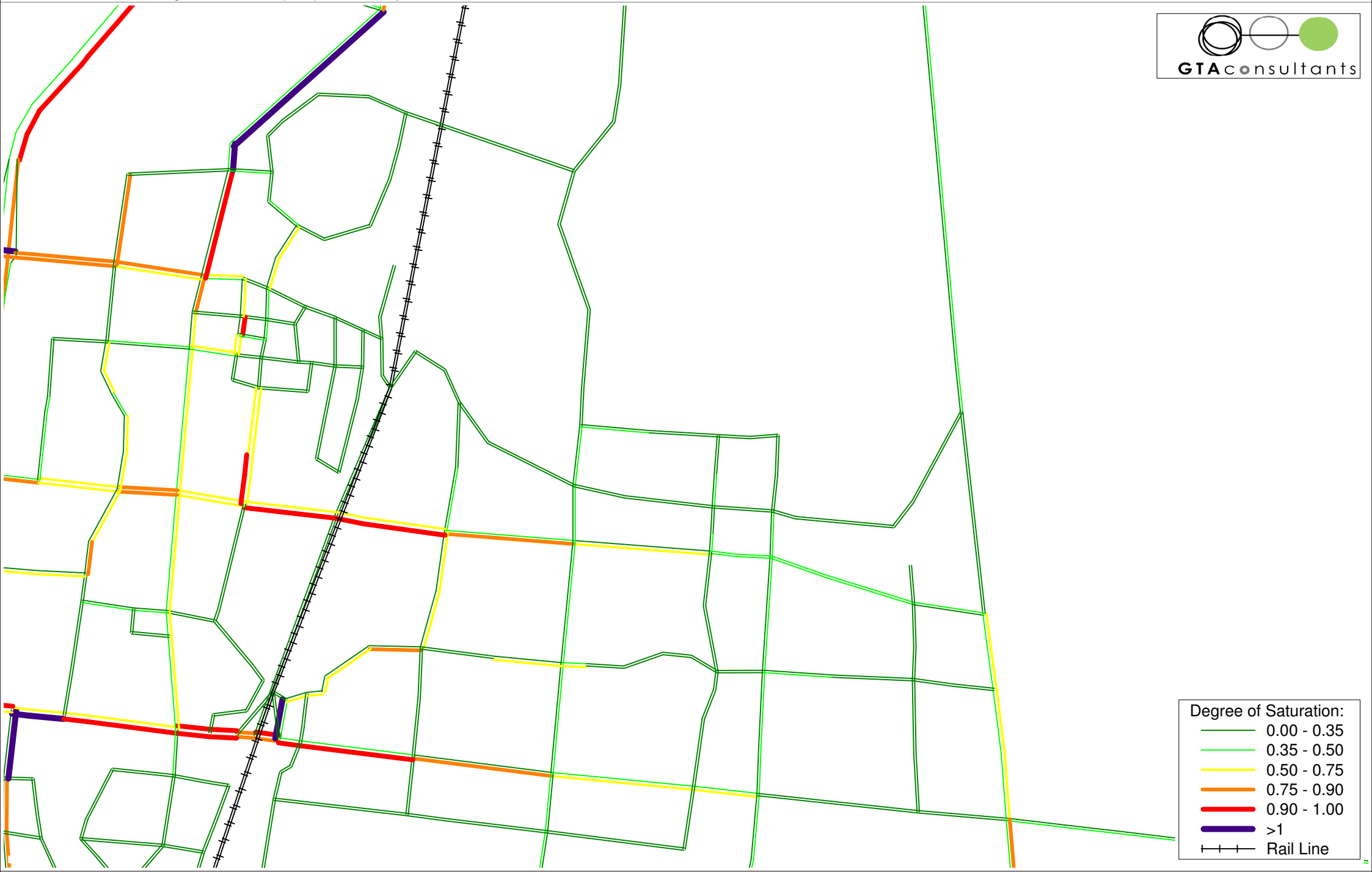
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Degree of Saturation (DOS) Year 2026 Option 1B



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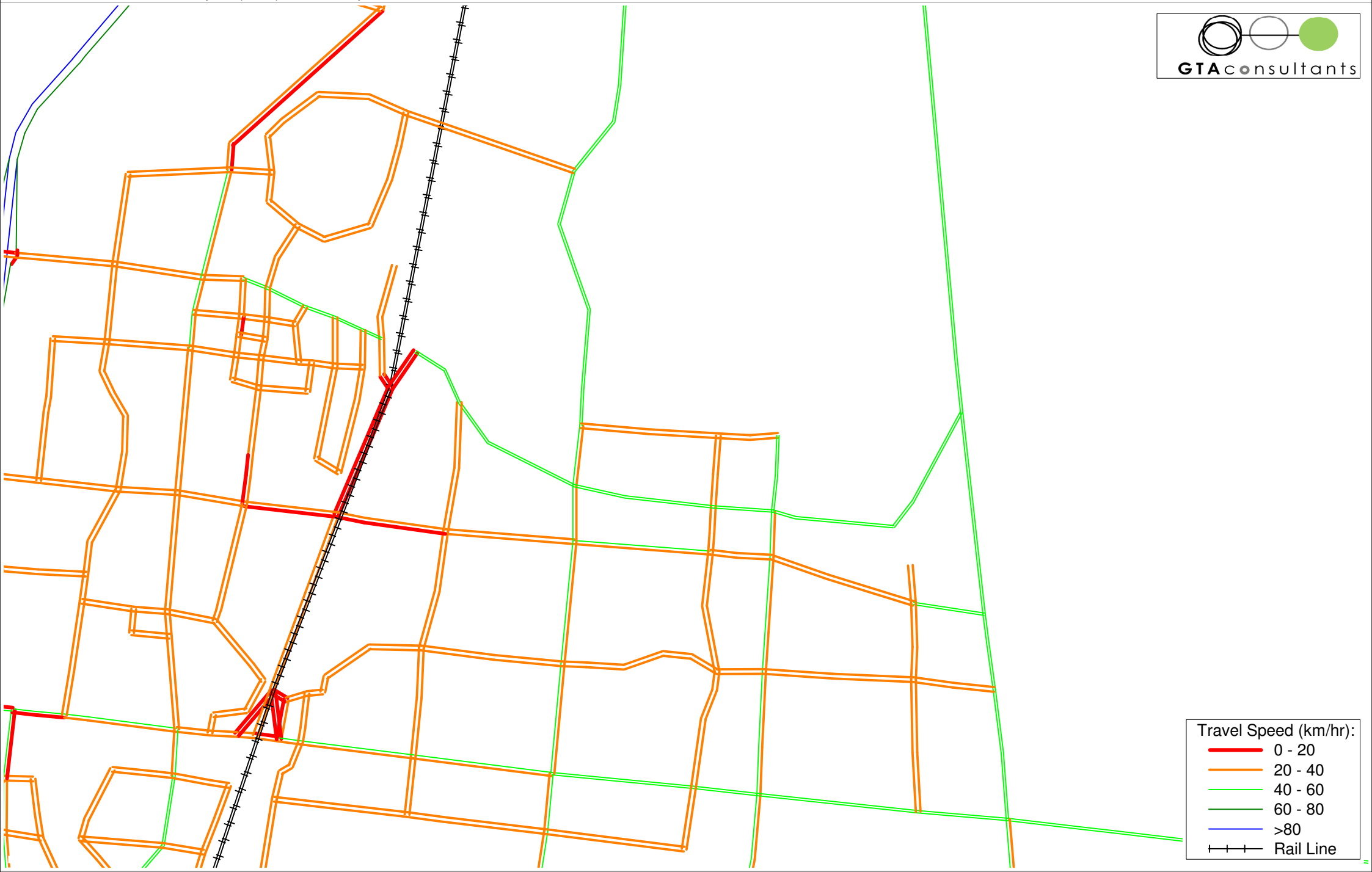
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Travel Speed (km/hr) Year 2026 Option 1B



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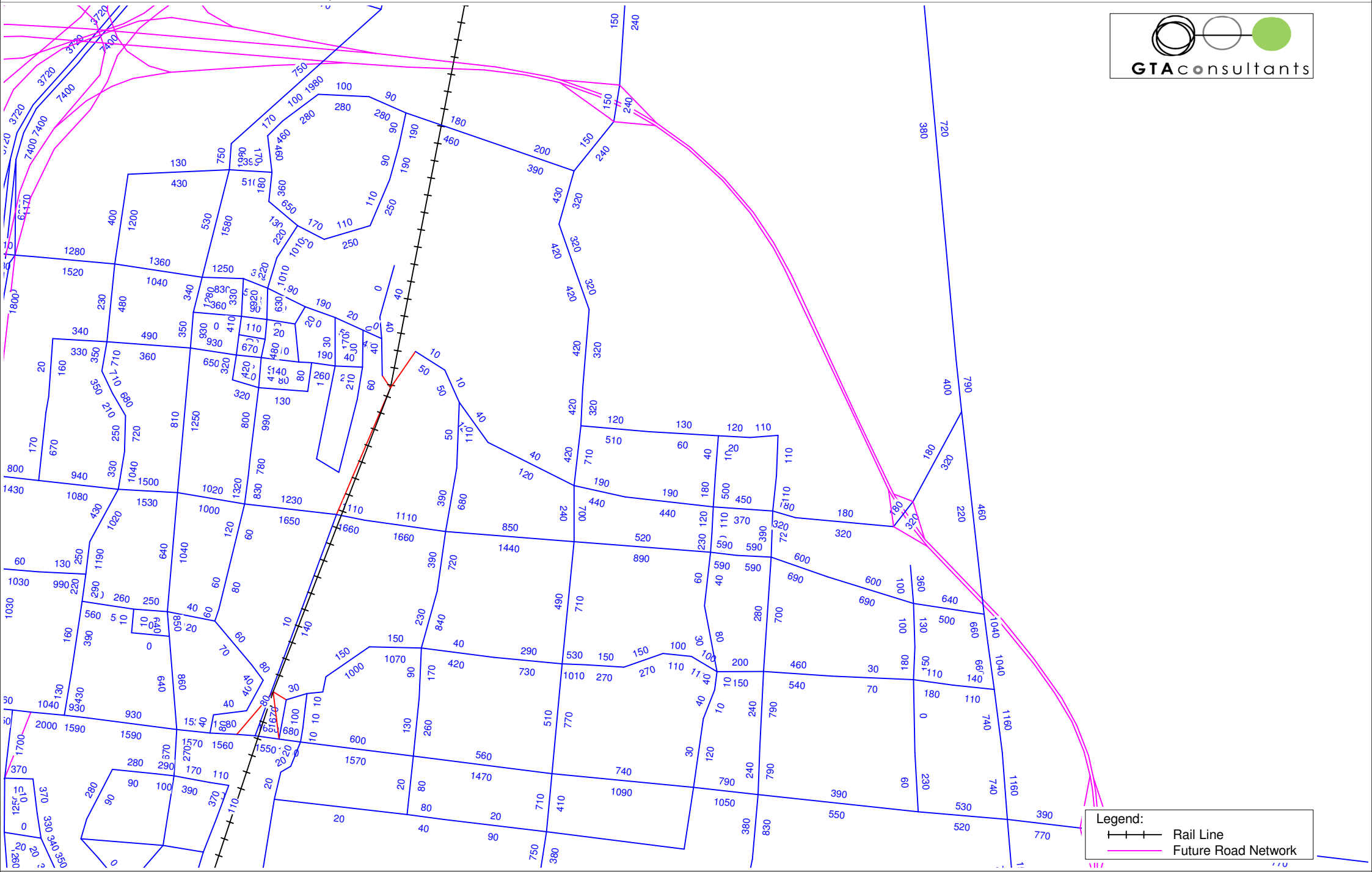
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Peak Total PCU Year 2026 Option 1B



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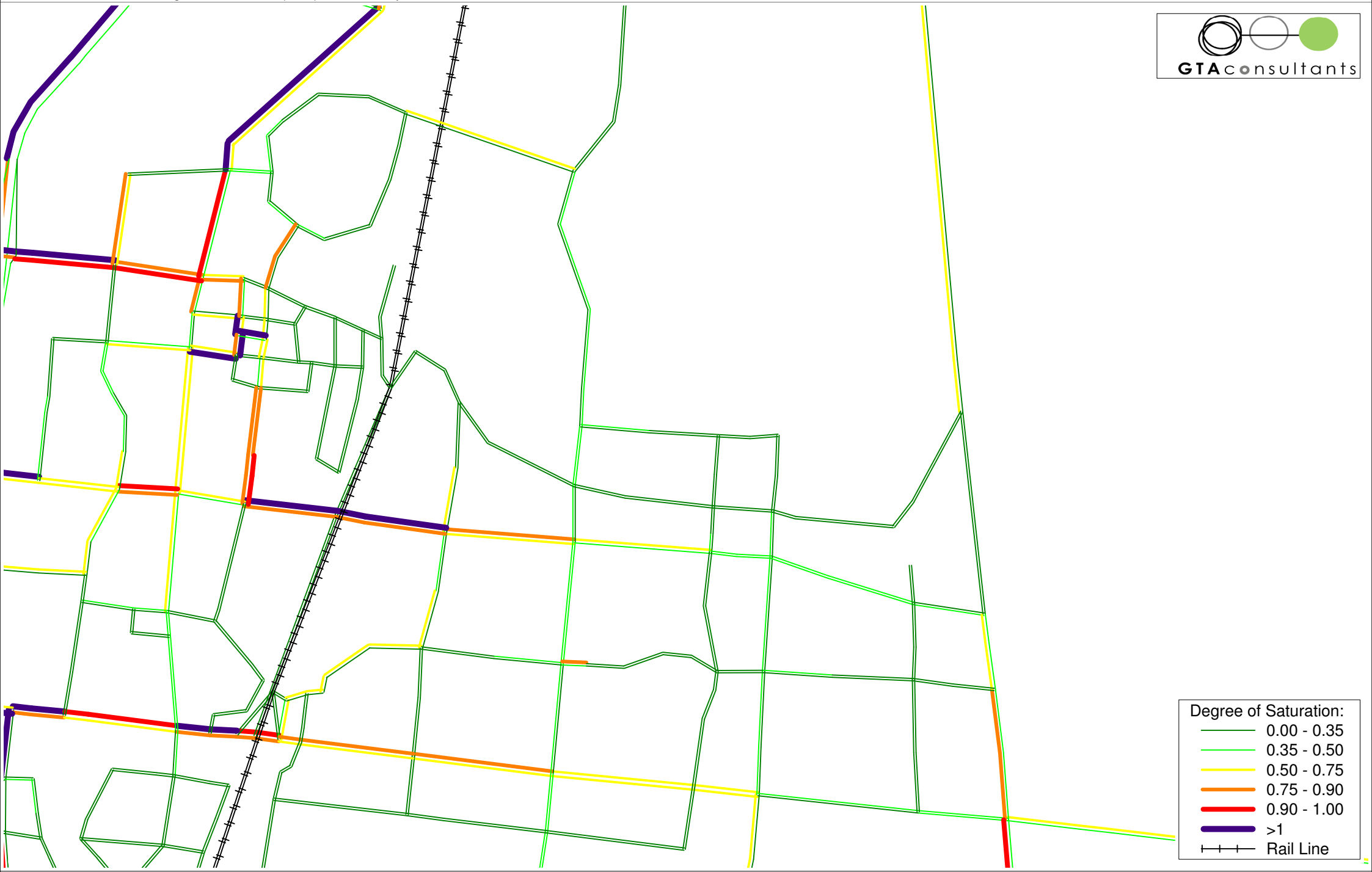
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Degree of Saturation (DOS) Year 2026 Option 1B



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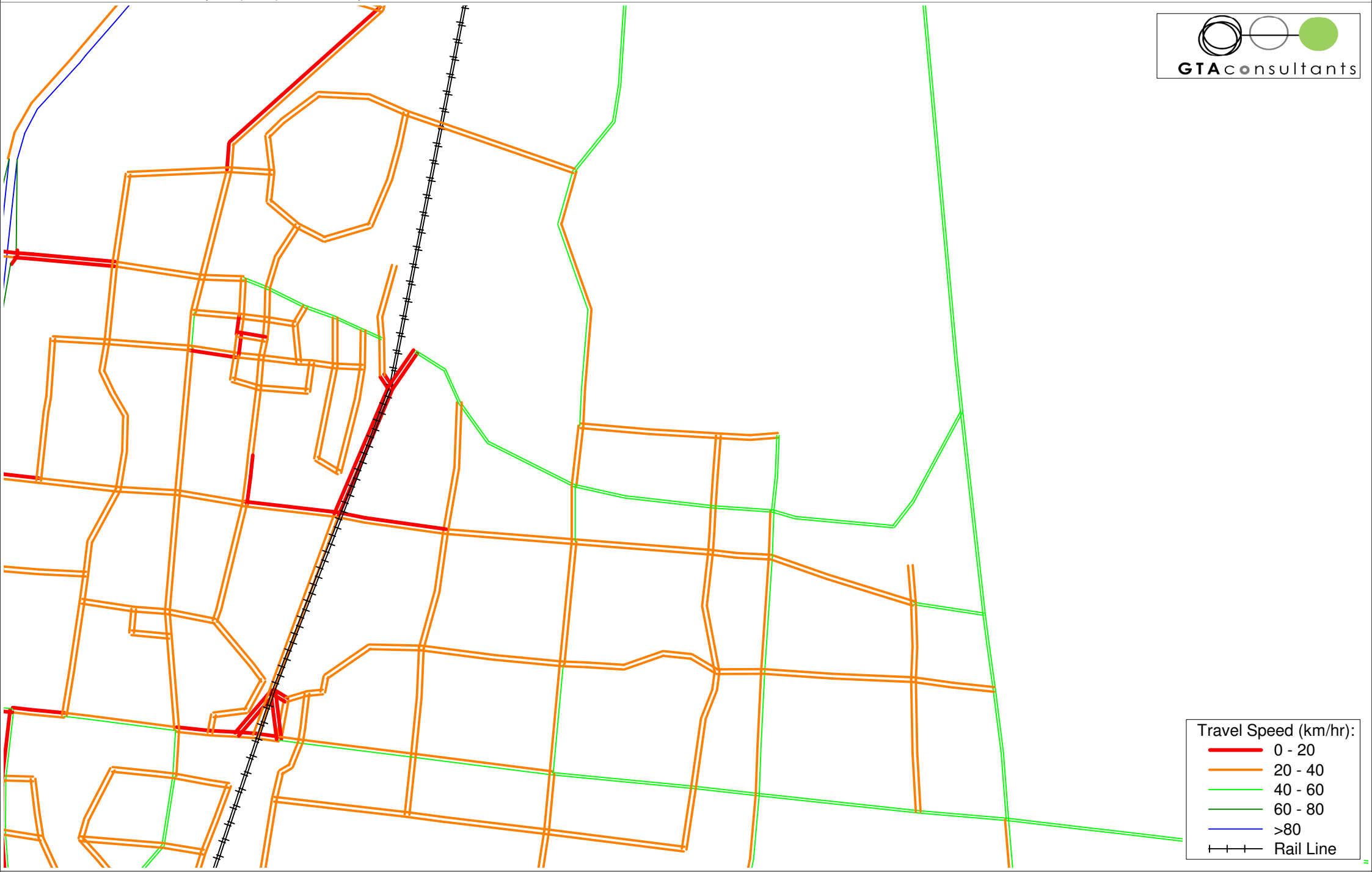
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Travel Speed (km/hr) Year 2026 Option 1B



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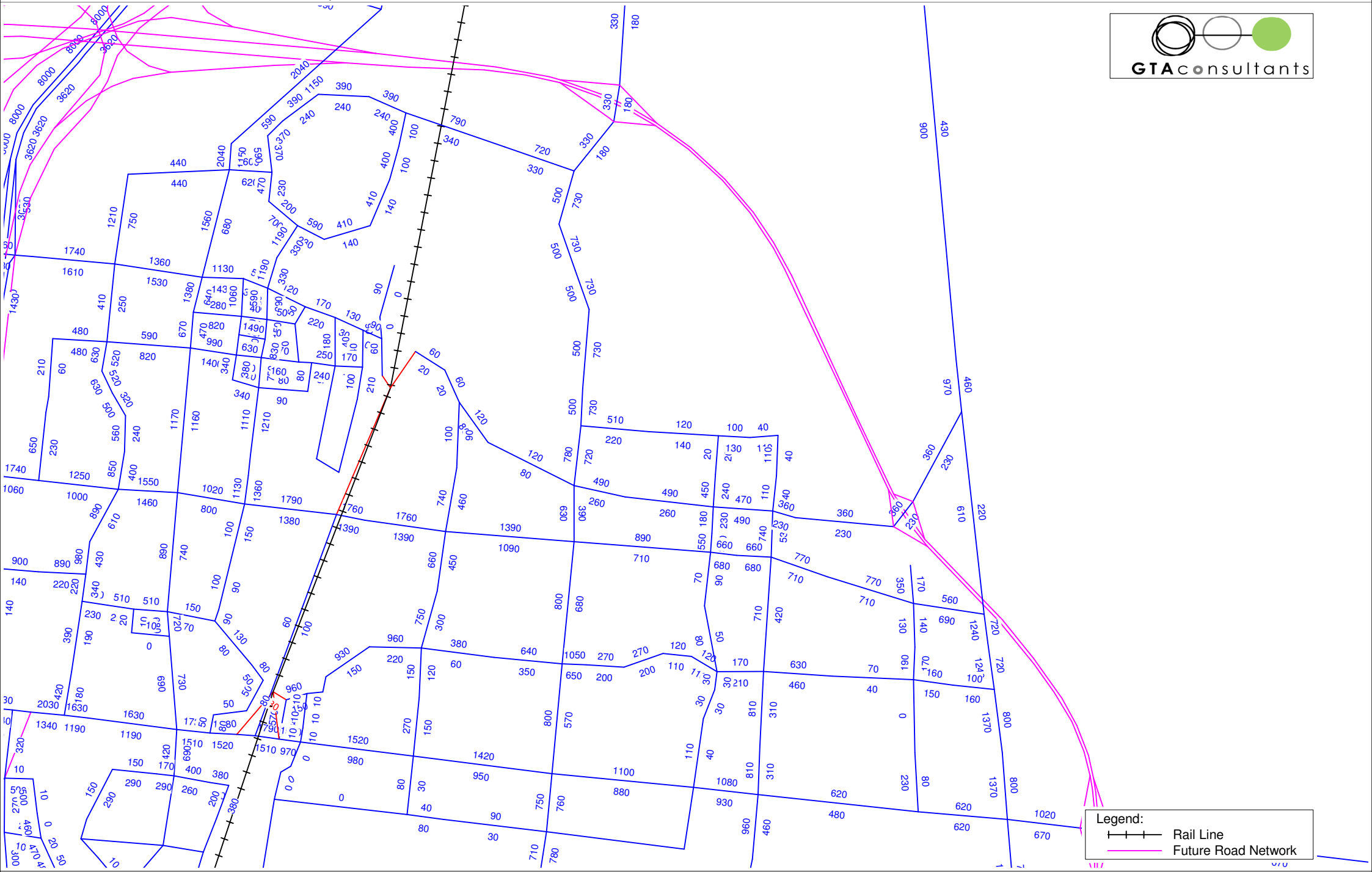
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Peak Total PCU Year 2026 Option 1B



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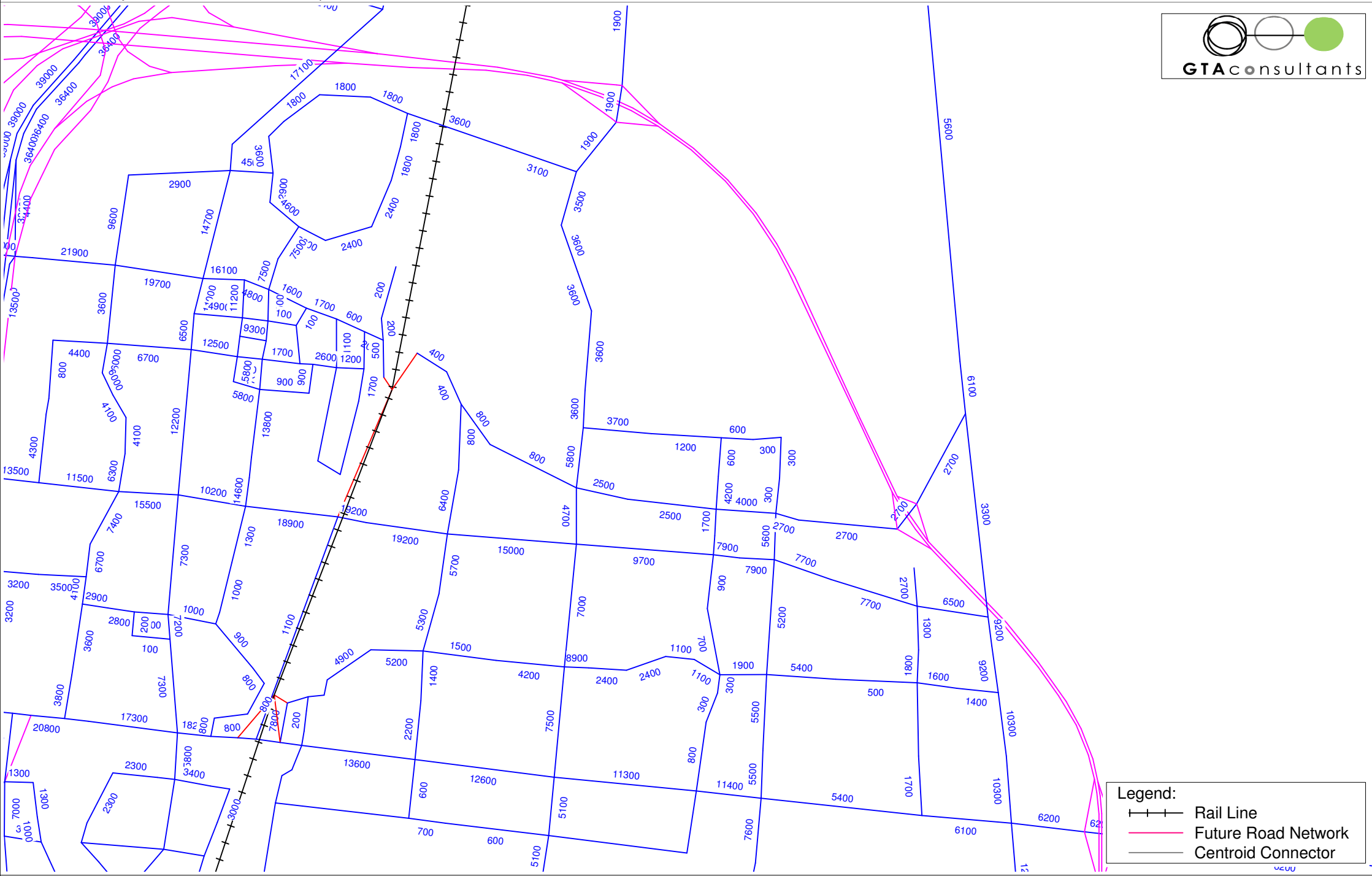
VITM Northern Growth Corridor Model
14M1555000 - Daily Volume Total PCU Year 2026 Option 1B



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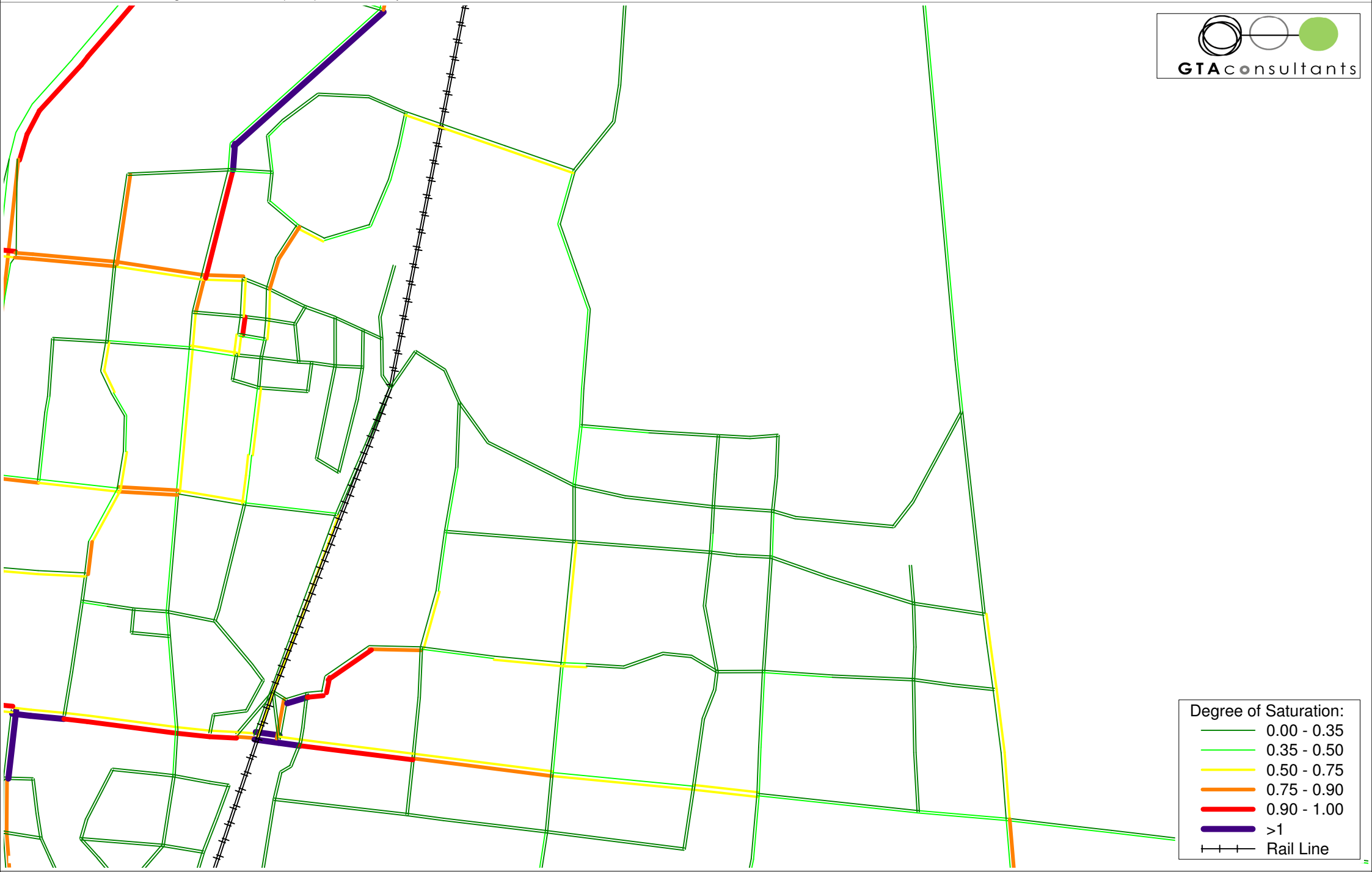
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Degree of Saturation (DOS) Year 2026 Option 1C



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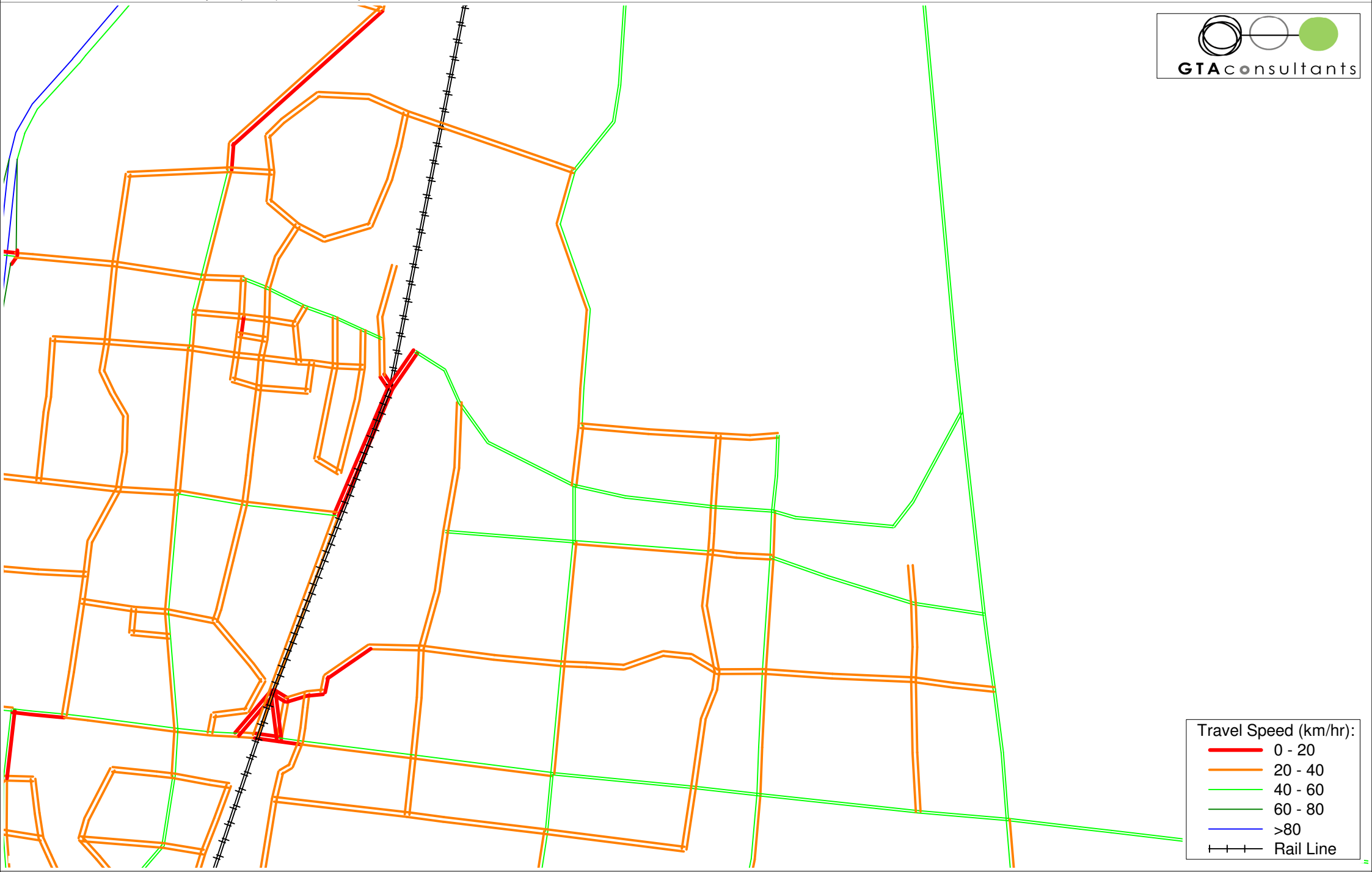
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Travel Speed (km/hr) Year 2026 Option 1C



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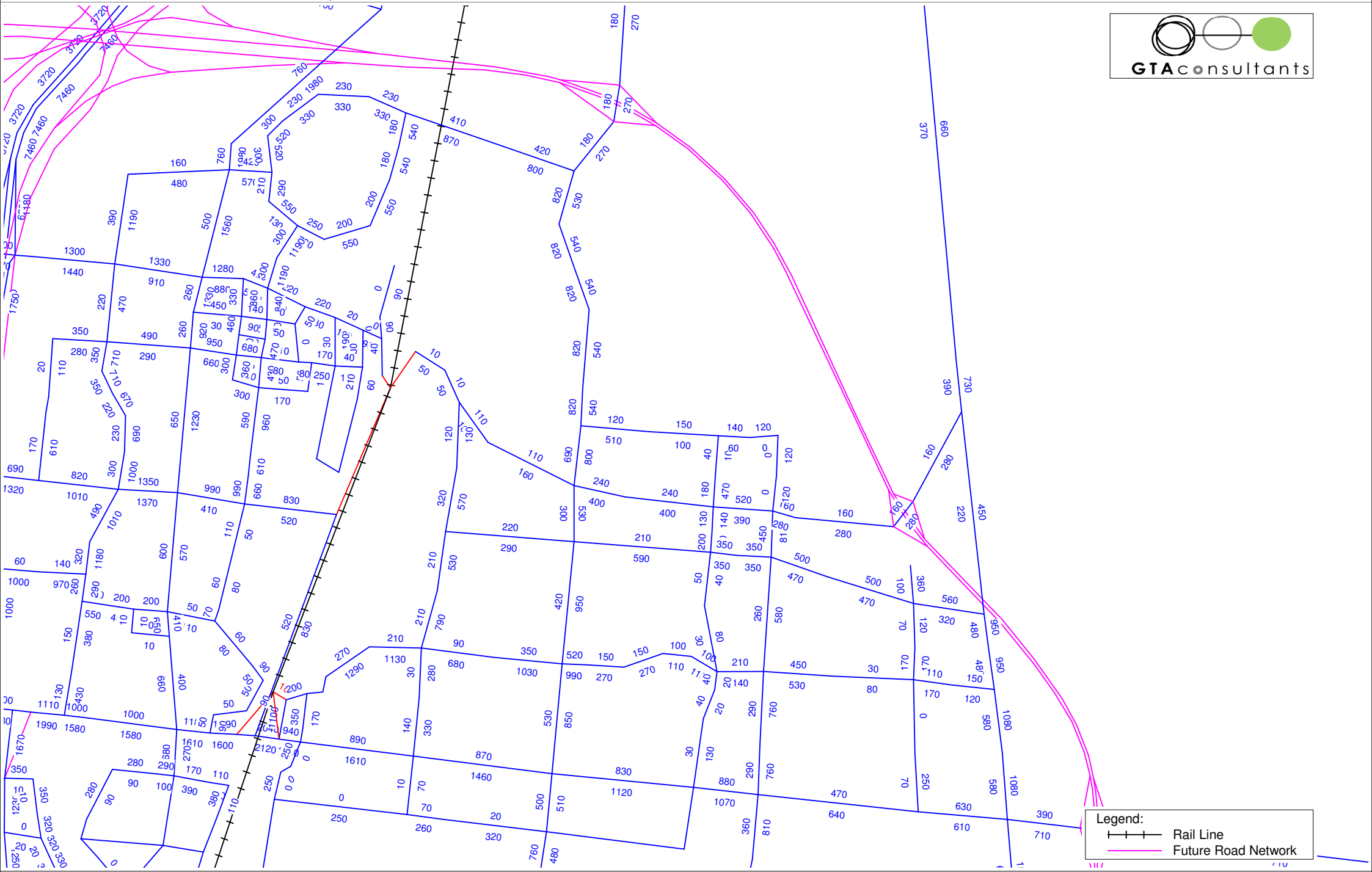
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Peak Total PCU Year 2026 Option 1C



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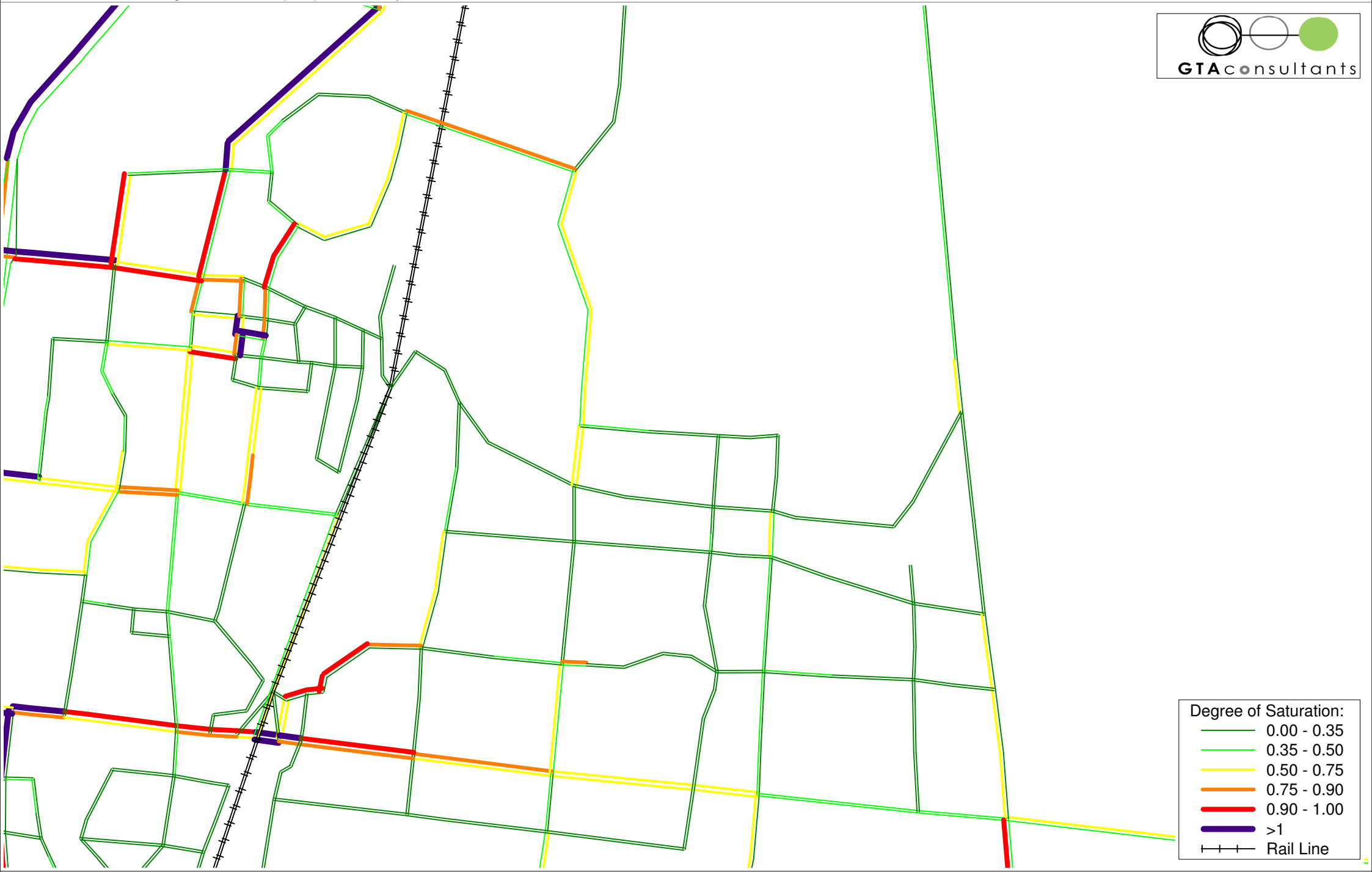
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Degree of Saturation (DOS) Year 2026 Option 1C



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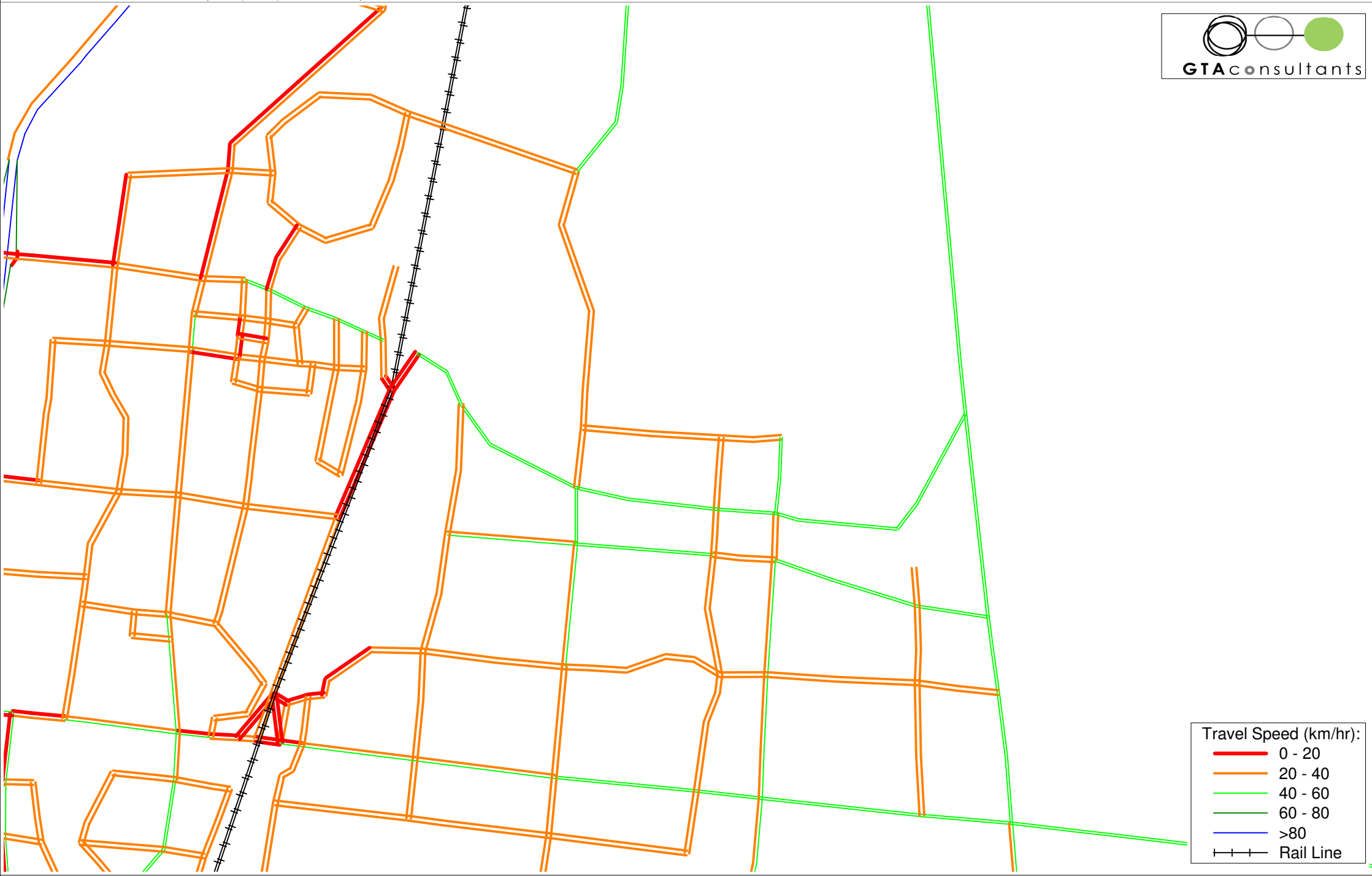
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Travel Speed (km/hr) Year 2026 Option 1C



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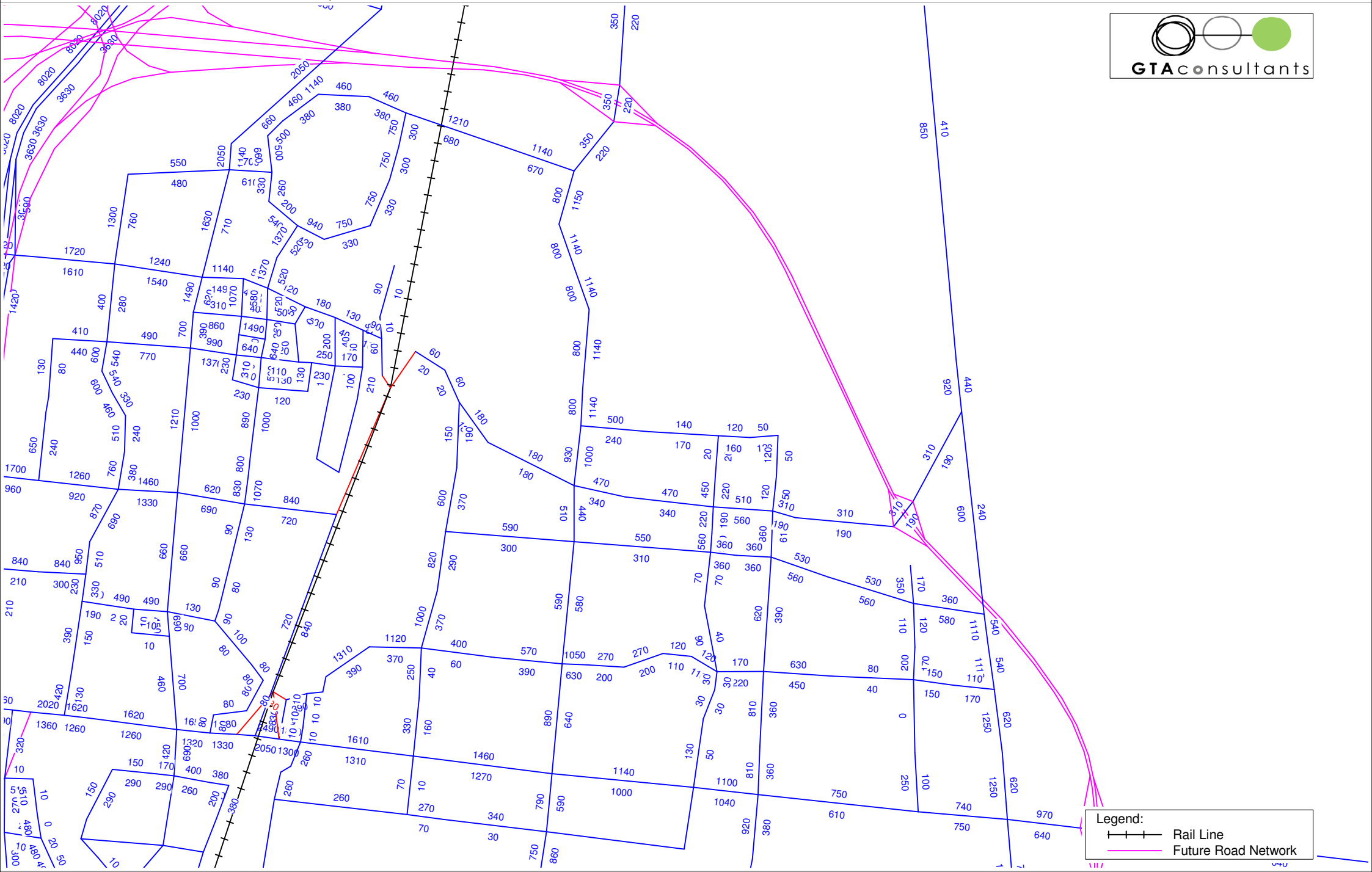
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Peak Total PCU Year 2026 Option 1C



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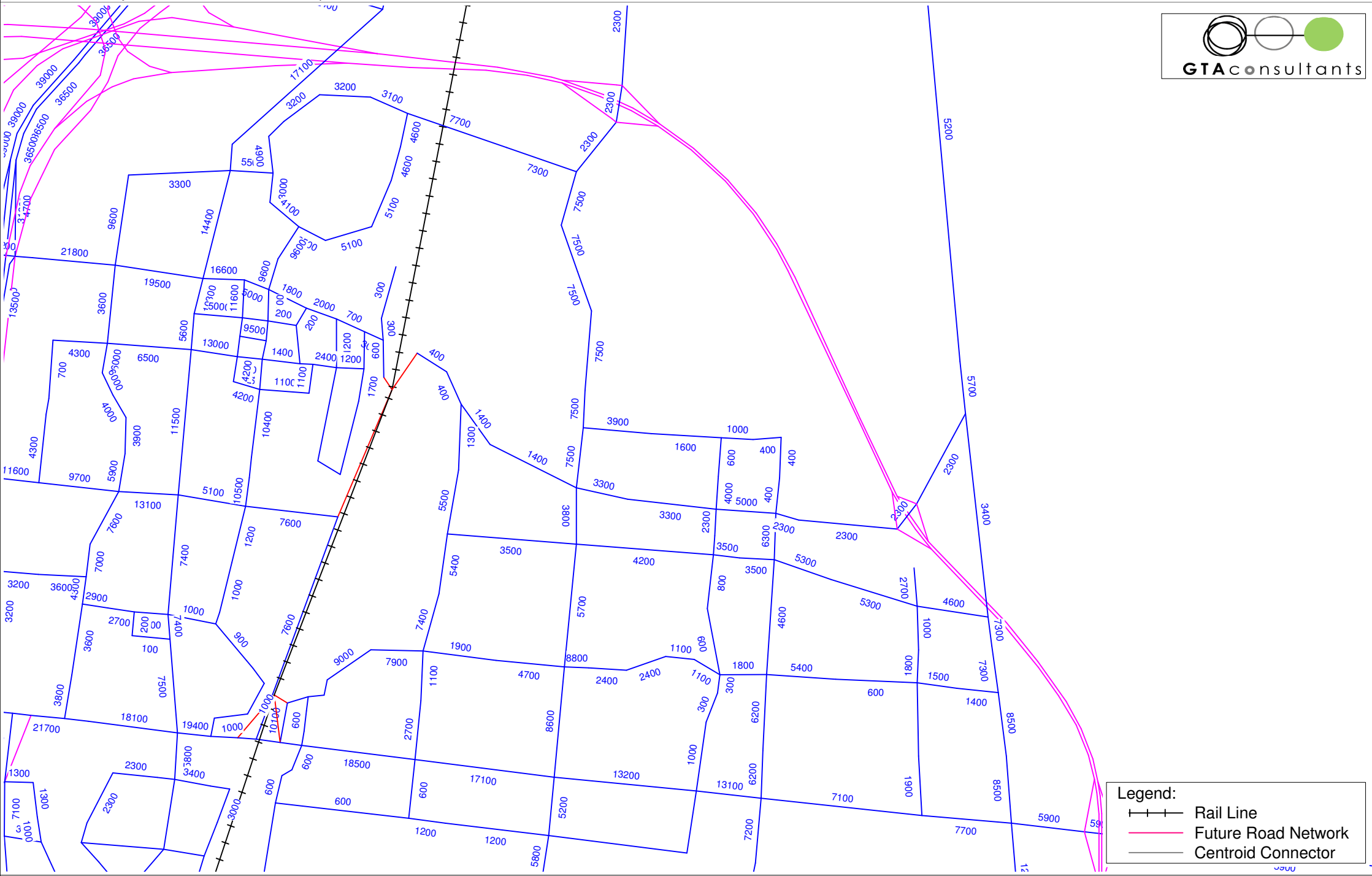
VITM Northern Growth Corridor Model
14M1555000 - Daily Volume Total PCU Year 2026 Option 1C



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VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Degree of Saturation (DOS) Year 2026 Option 2A

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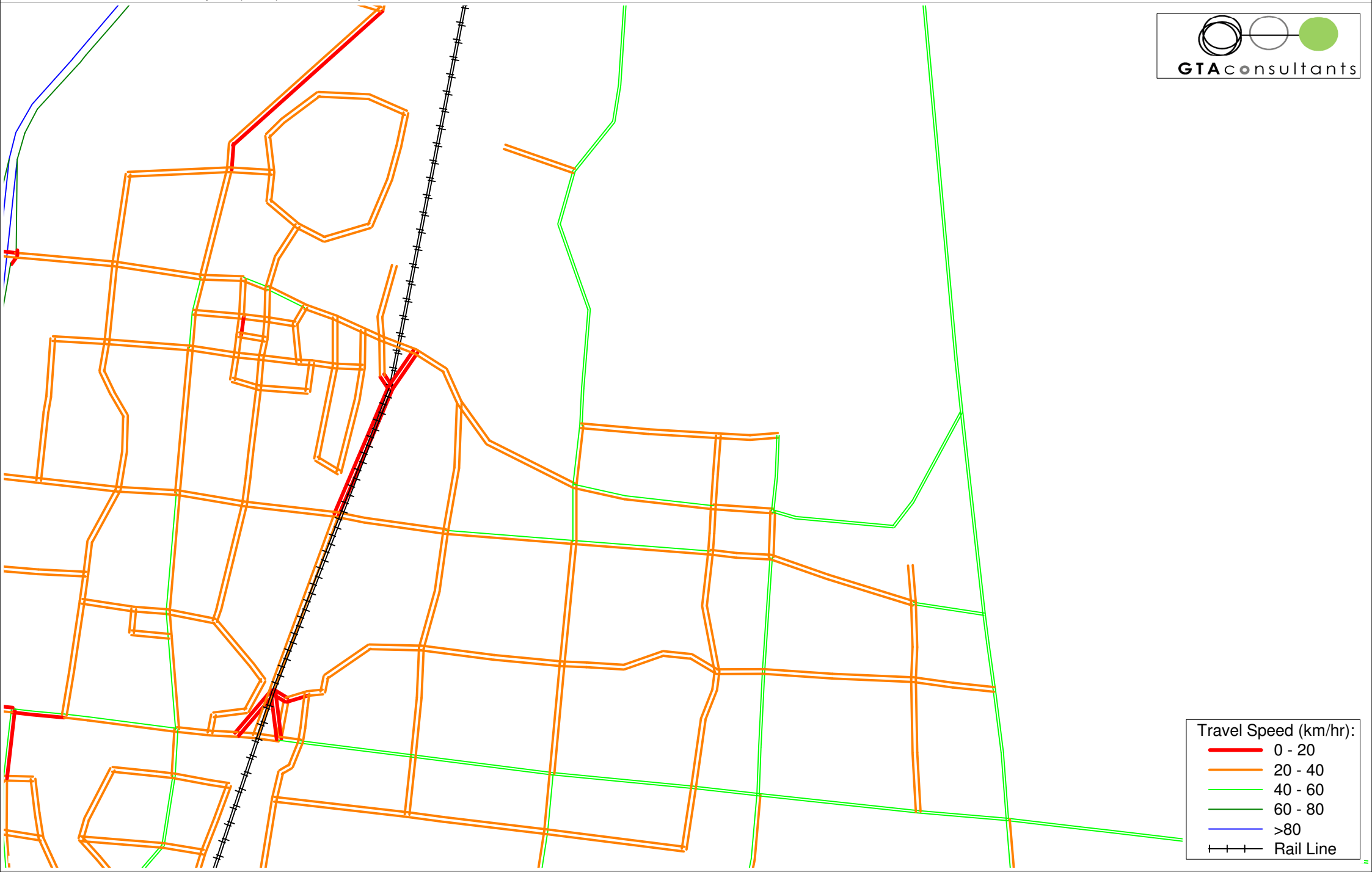
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Travel Speed (km/hr) Year 2026 Option 2A



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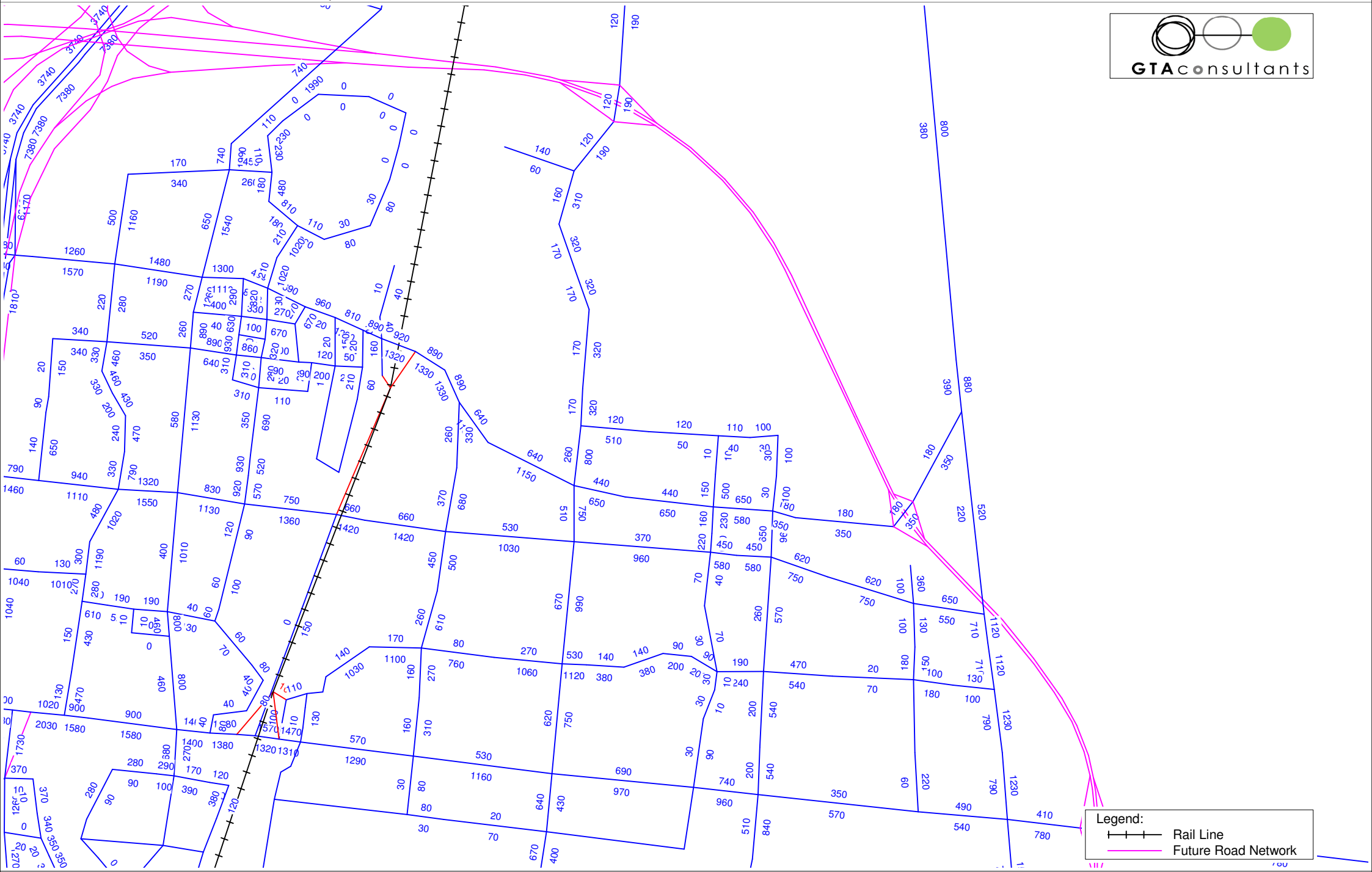
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Peak Total PCU Year 2026 Option 2A



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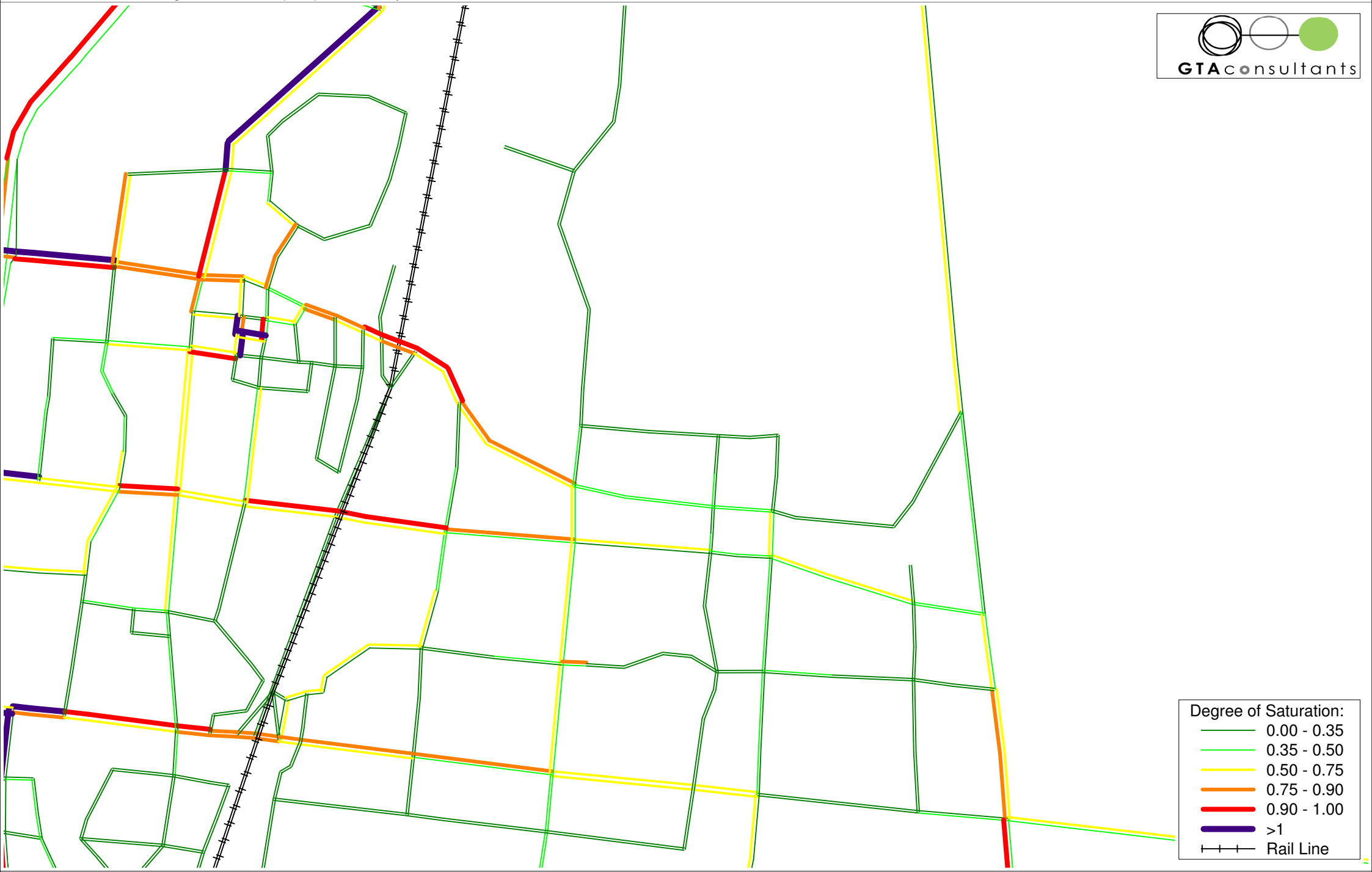
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Degree of Saturation (DOS) Year 2026 Option 2A



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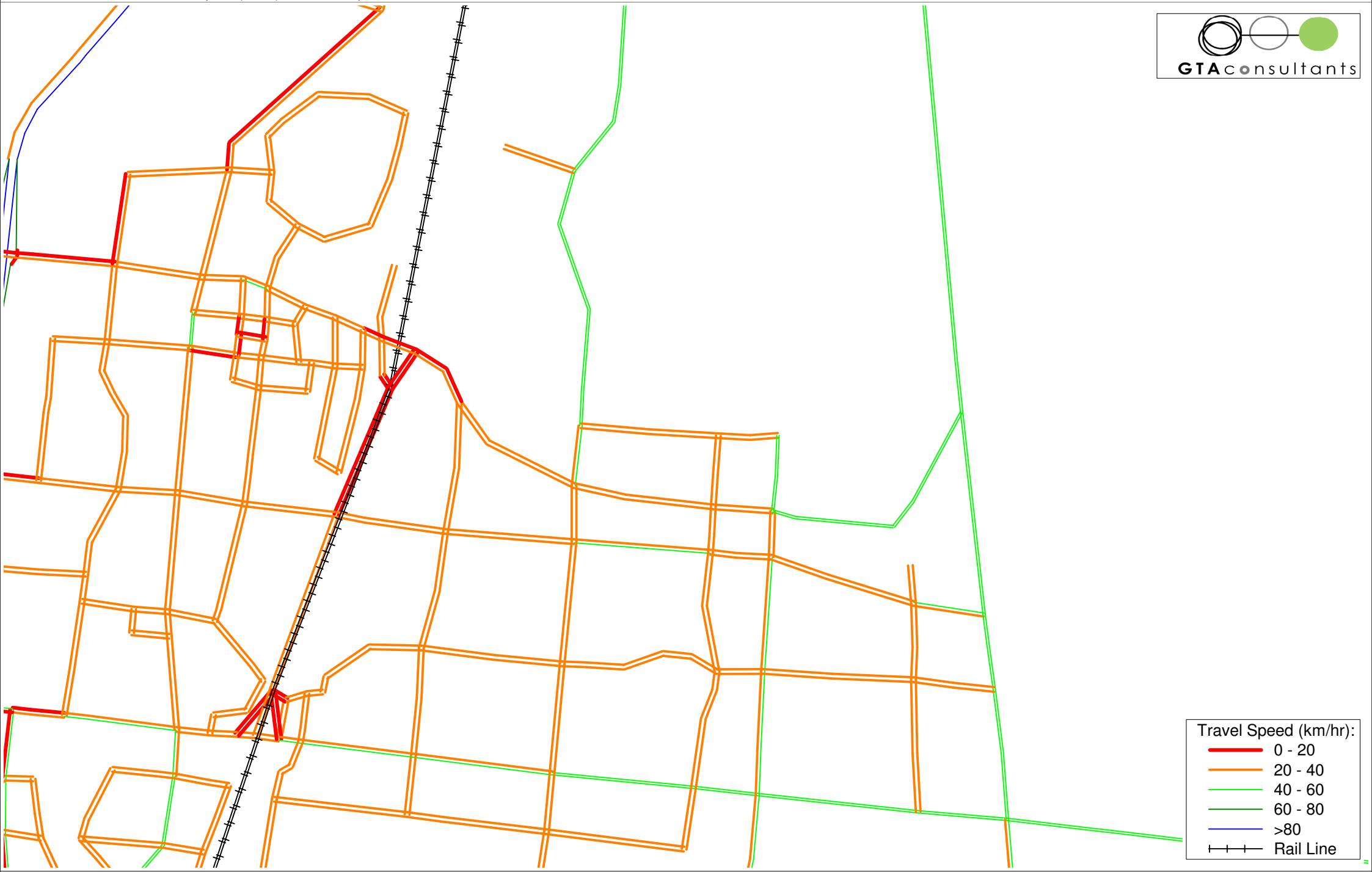
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Travel Speed (km/hr) Year 2026 Option 2A



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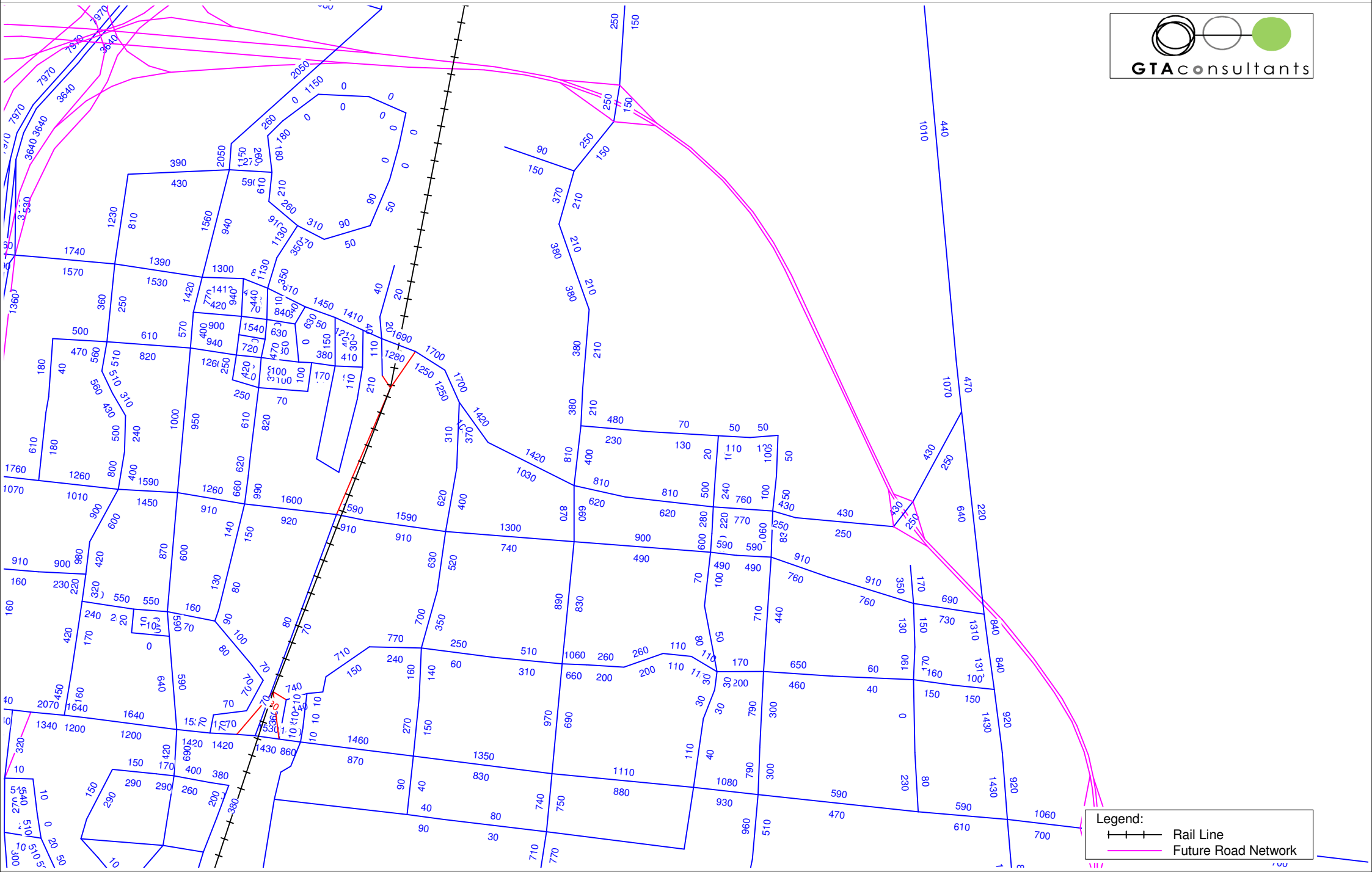
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Peak Total PCU Year 2026 Option 2A



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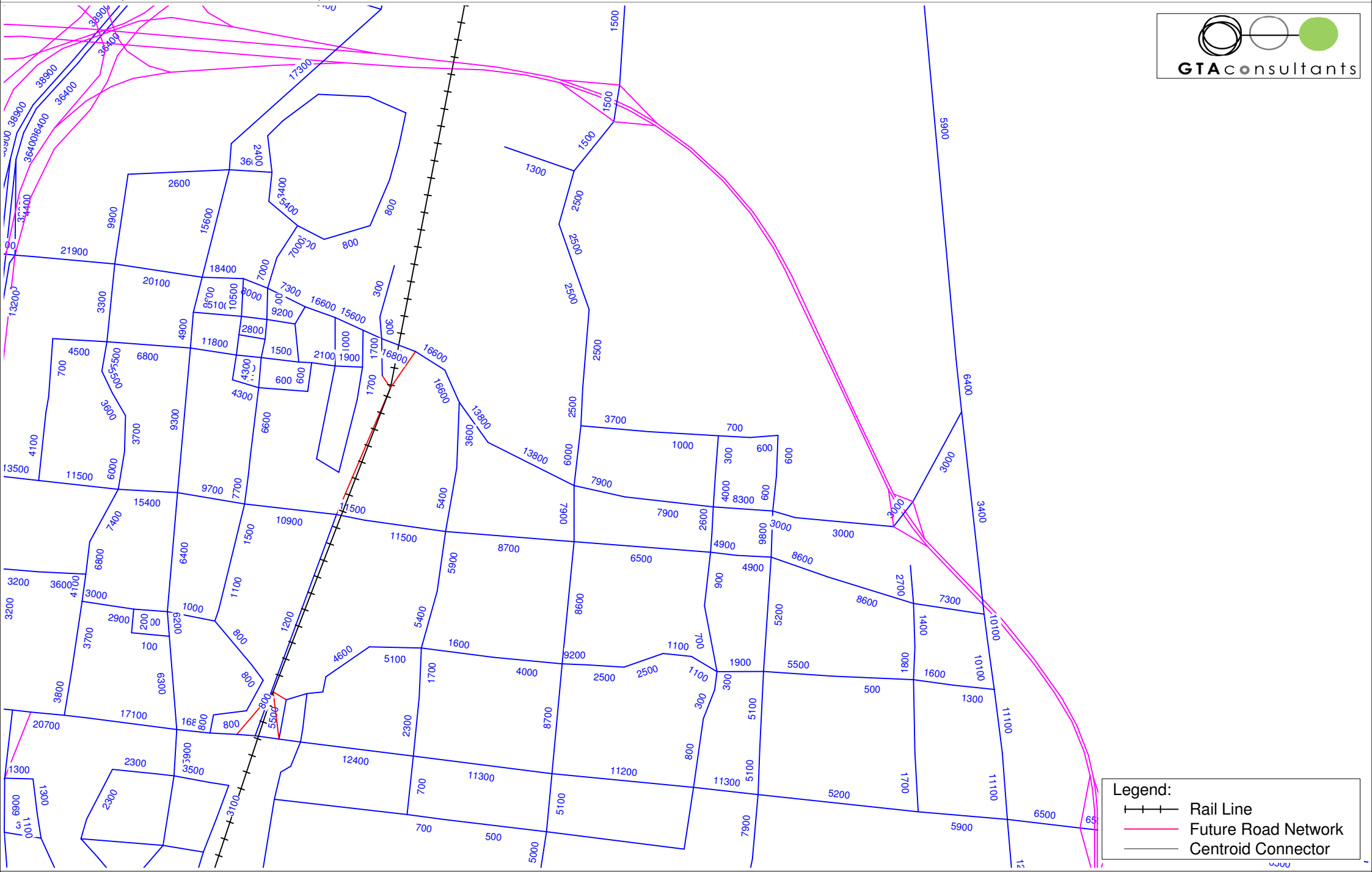
VITM Northern Growth Corridor Model
14M1555000 - Daily Volume Total PCU Year 2026 Option 2A



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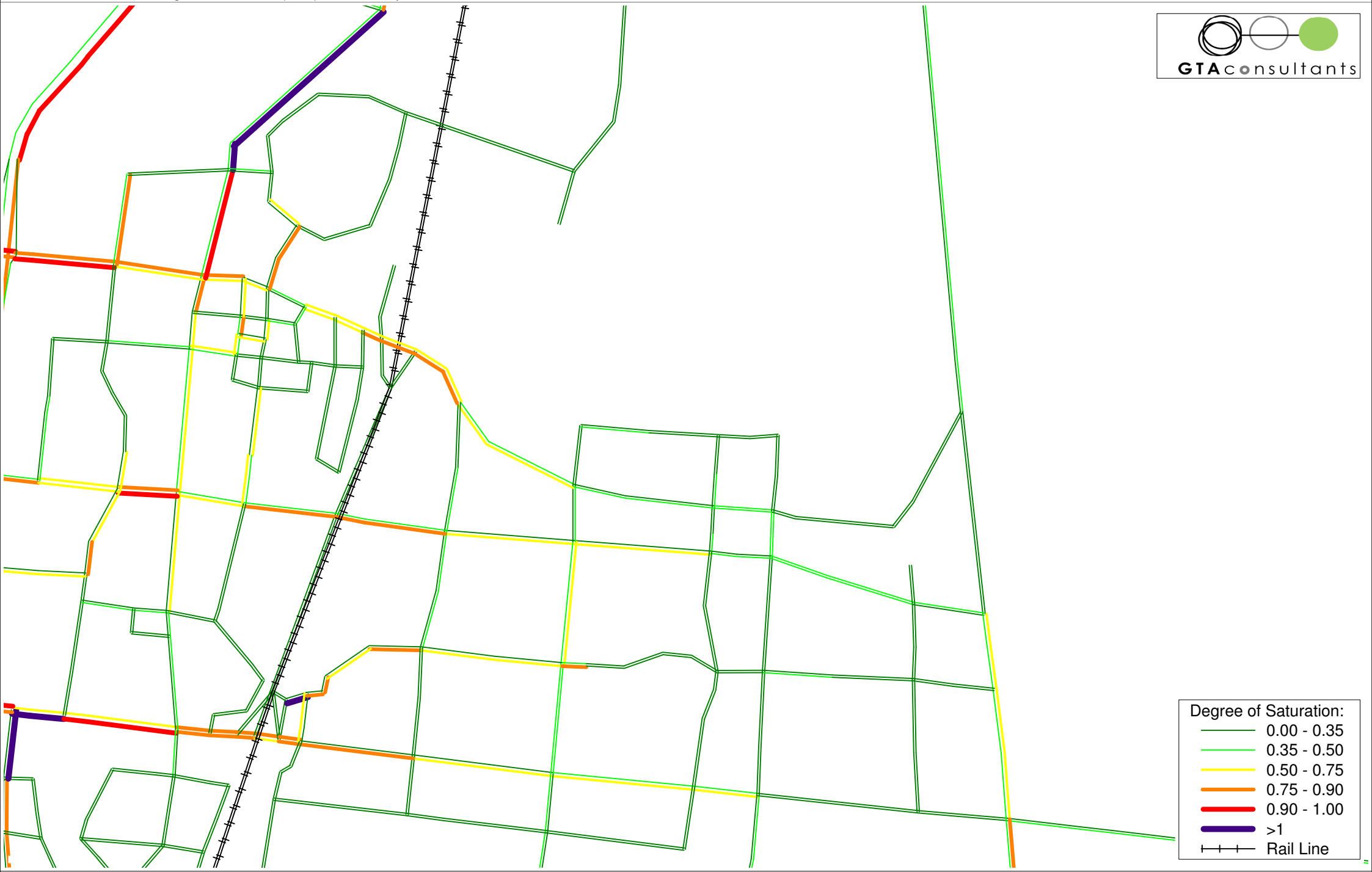
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Degree of Saturation (DOS) Year 2026 Option 2B



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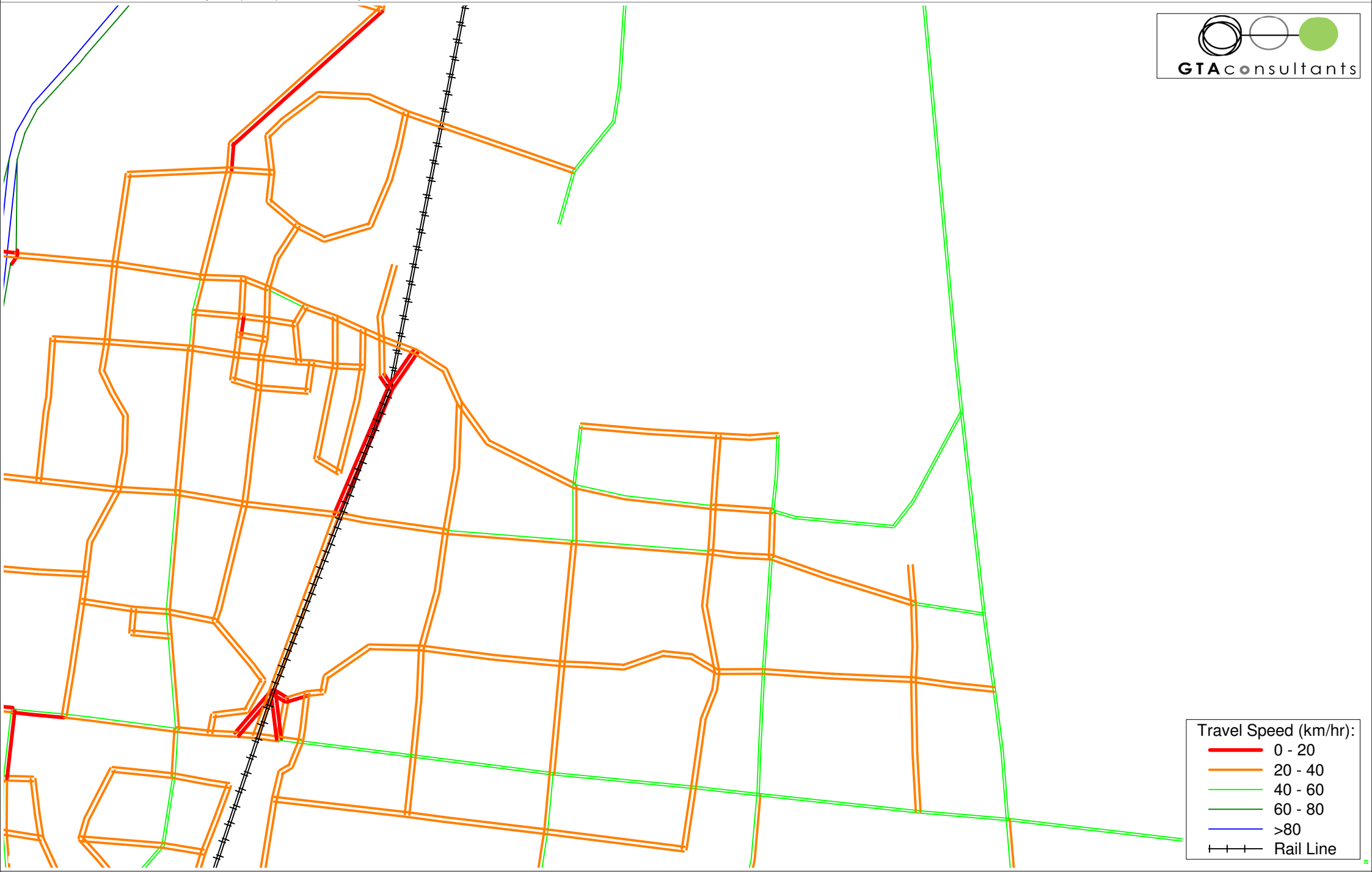
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Travel Speed (km/hr) Year 2026 Option 2B



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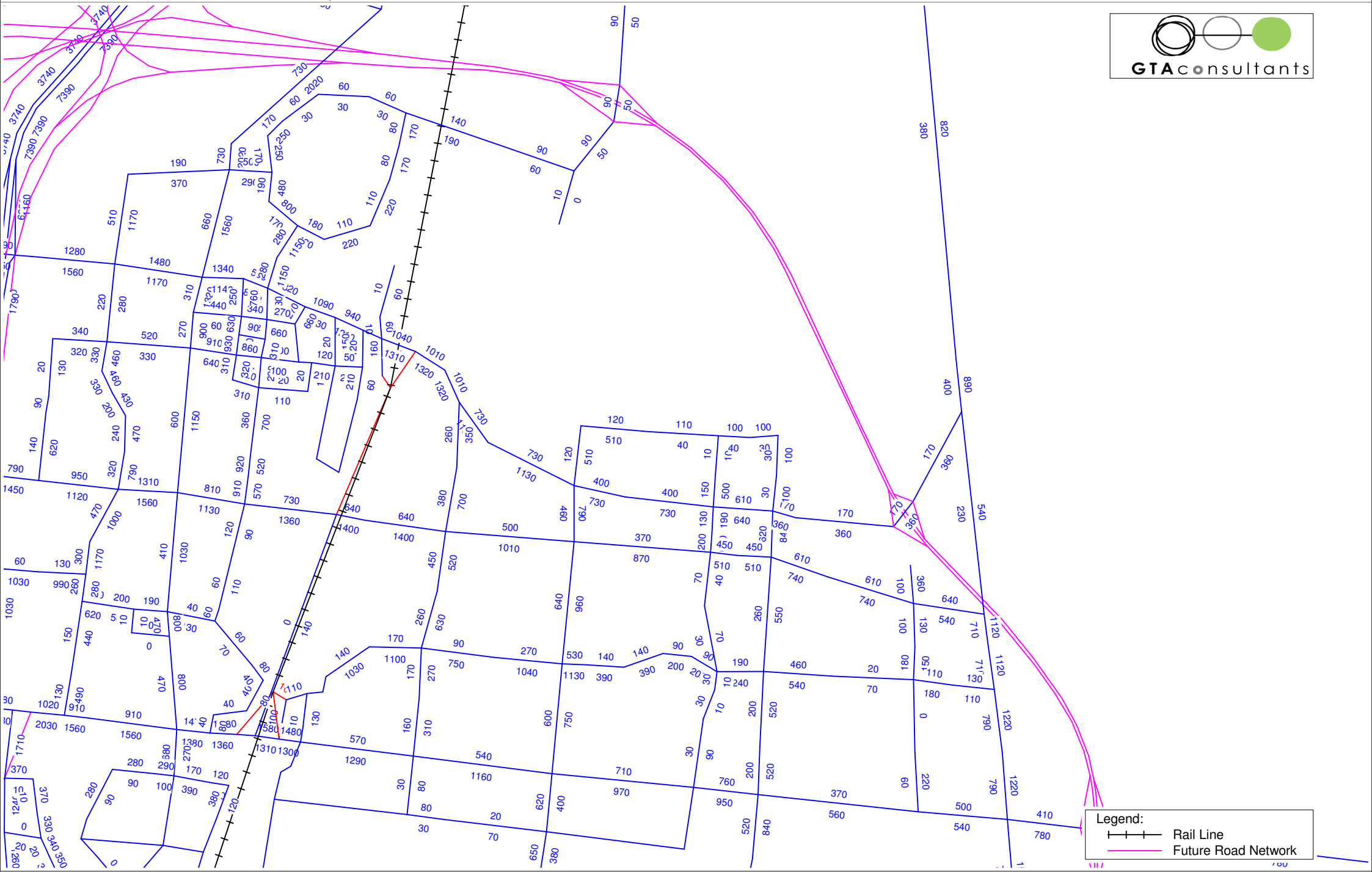
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Peak Total PCU Year 2026 Option 2B



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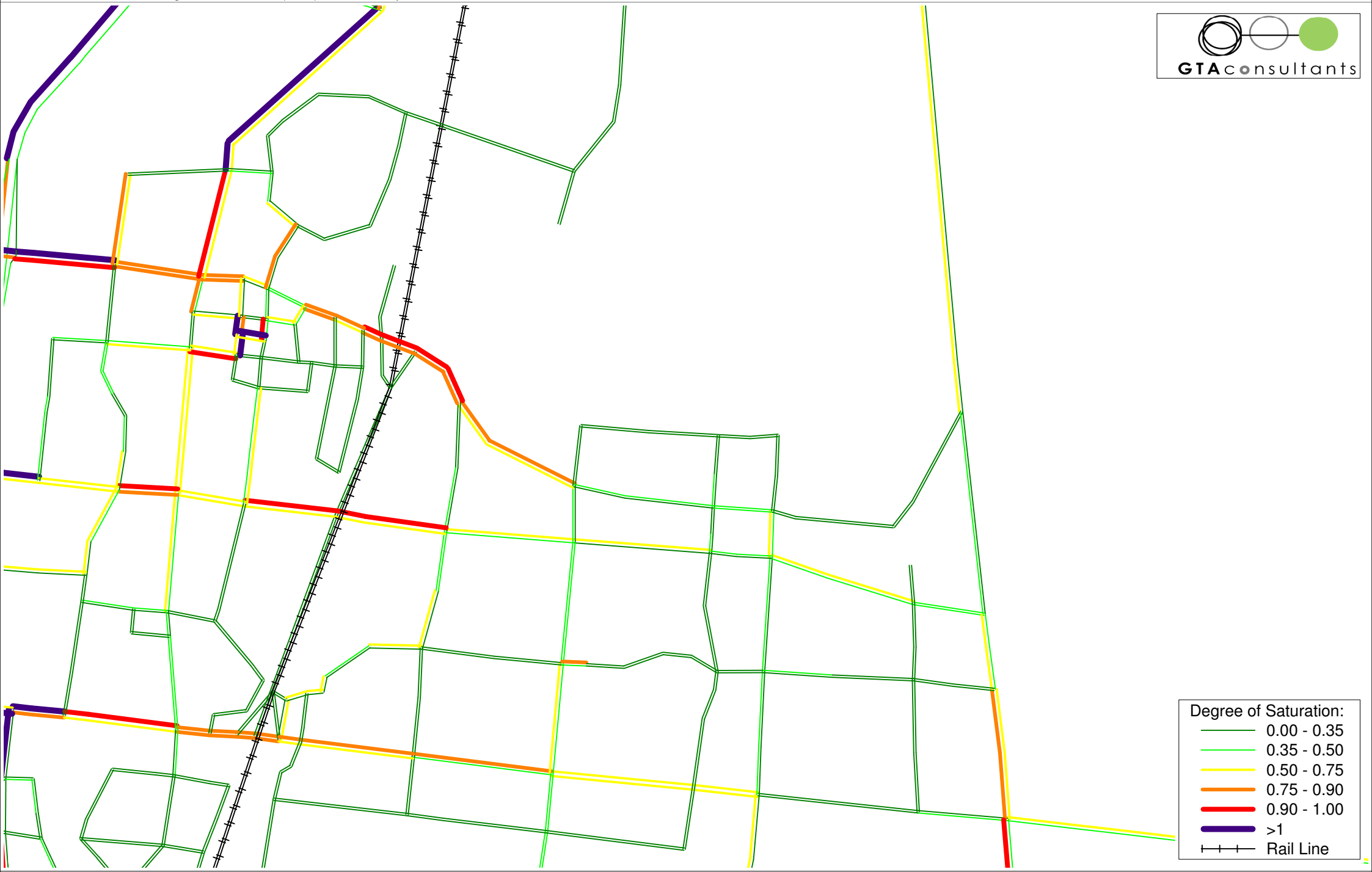
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Degree of Saturation (DOS) Year 2026 Option 2B



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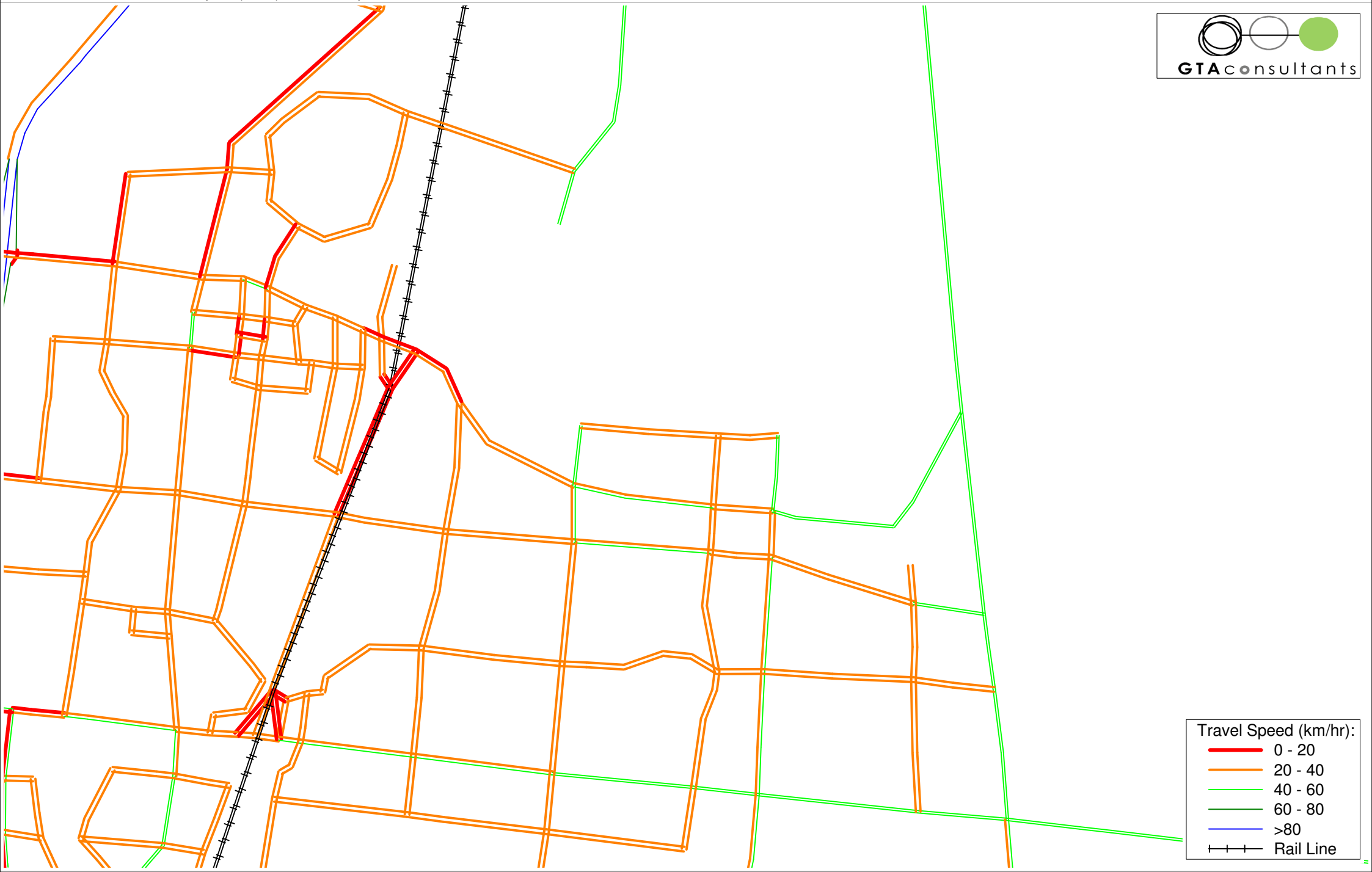
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Travel Speed (km/hr) Year 2026 Option 2B



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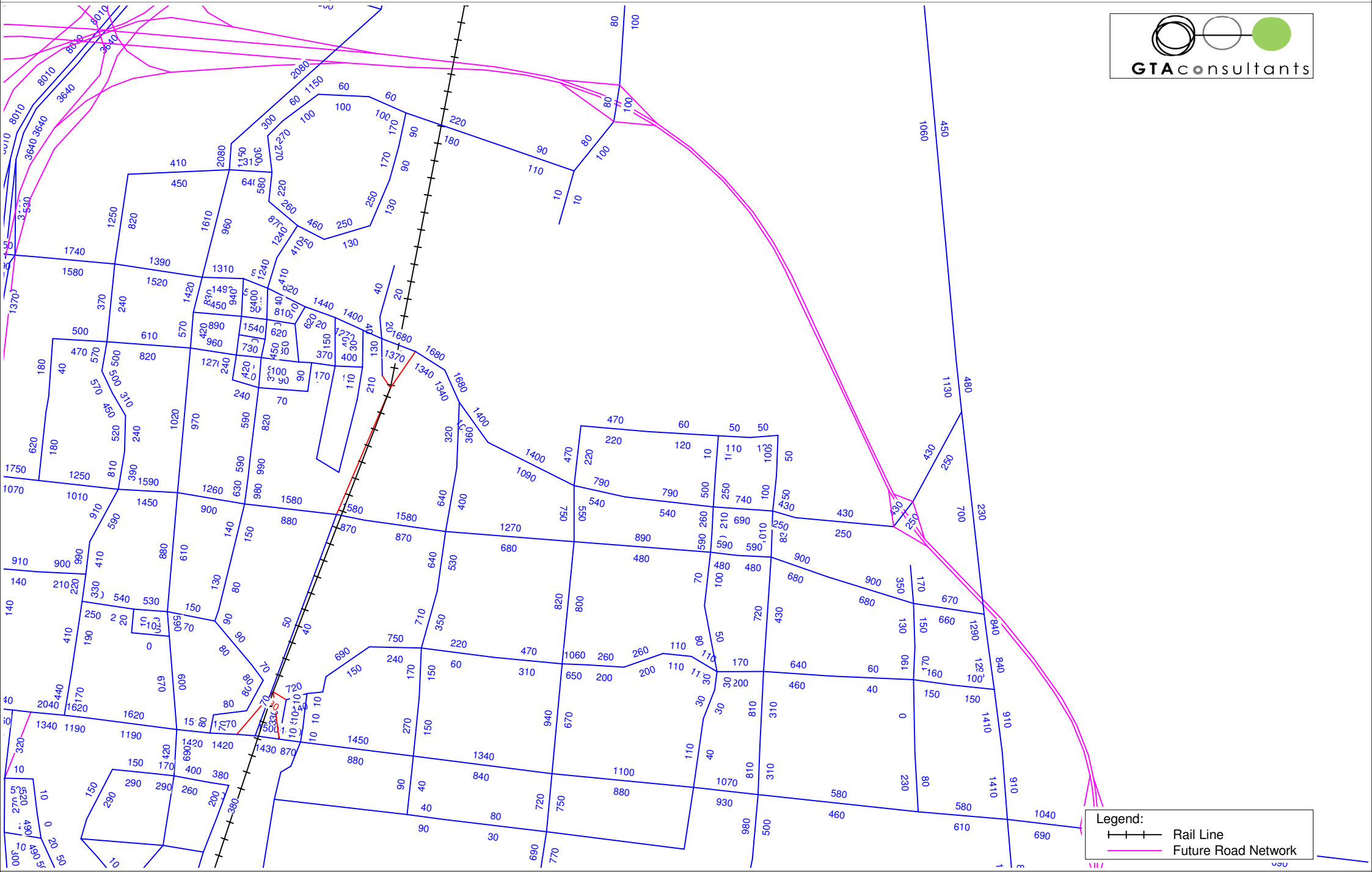
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Peak Total PCU Year 2026 Option 2B



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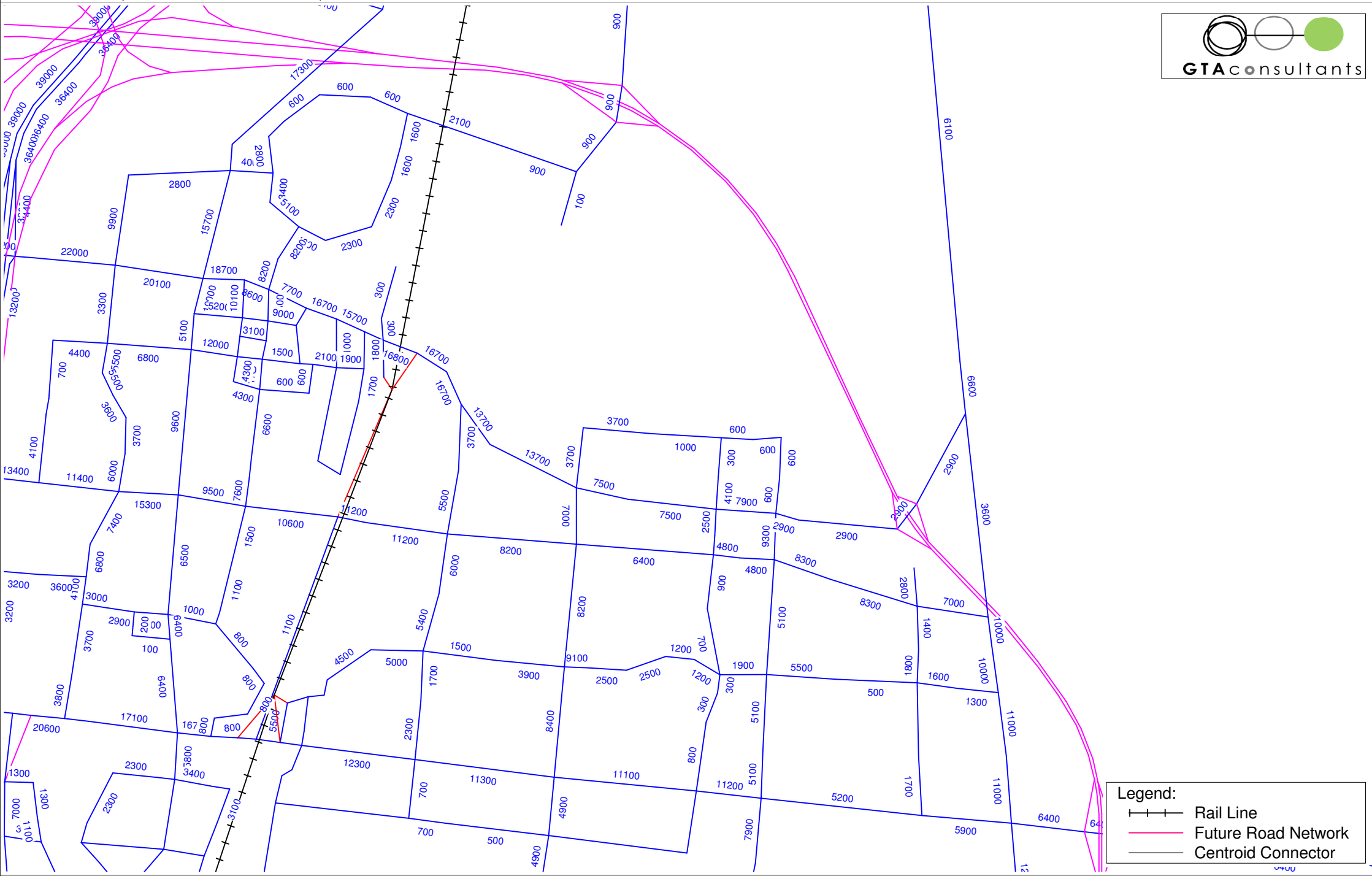
VITM Northern Growth Corridor Model
14M1555000 - Daily Volume Total PCU Year 2026 Option 2B



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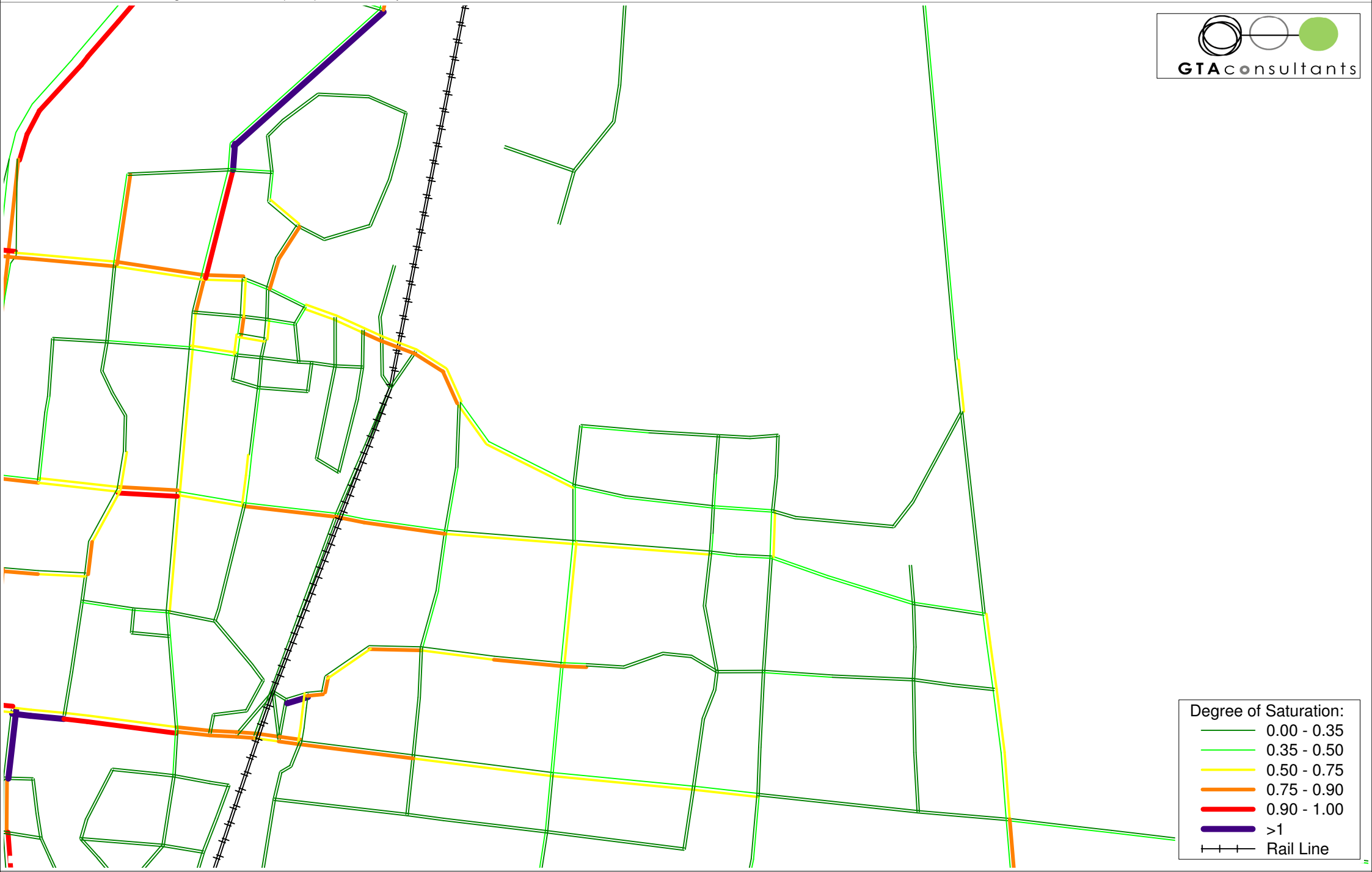
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Degree of Saturation (DOS) Year 2026 Option 2C



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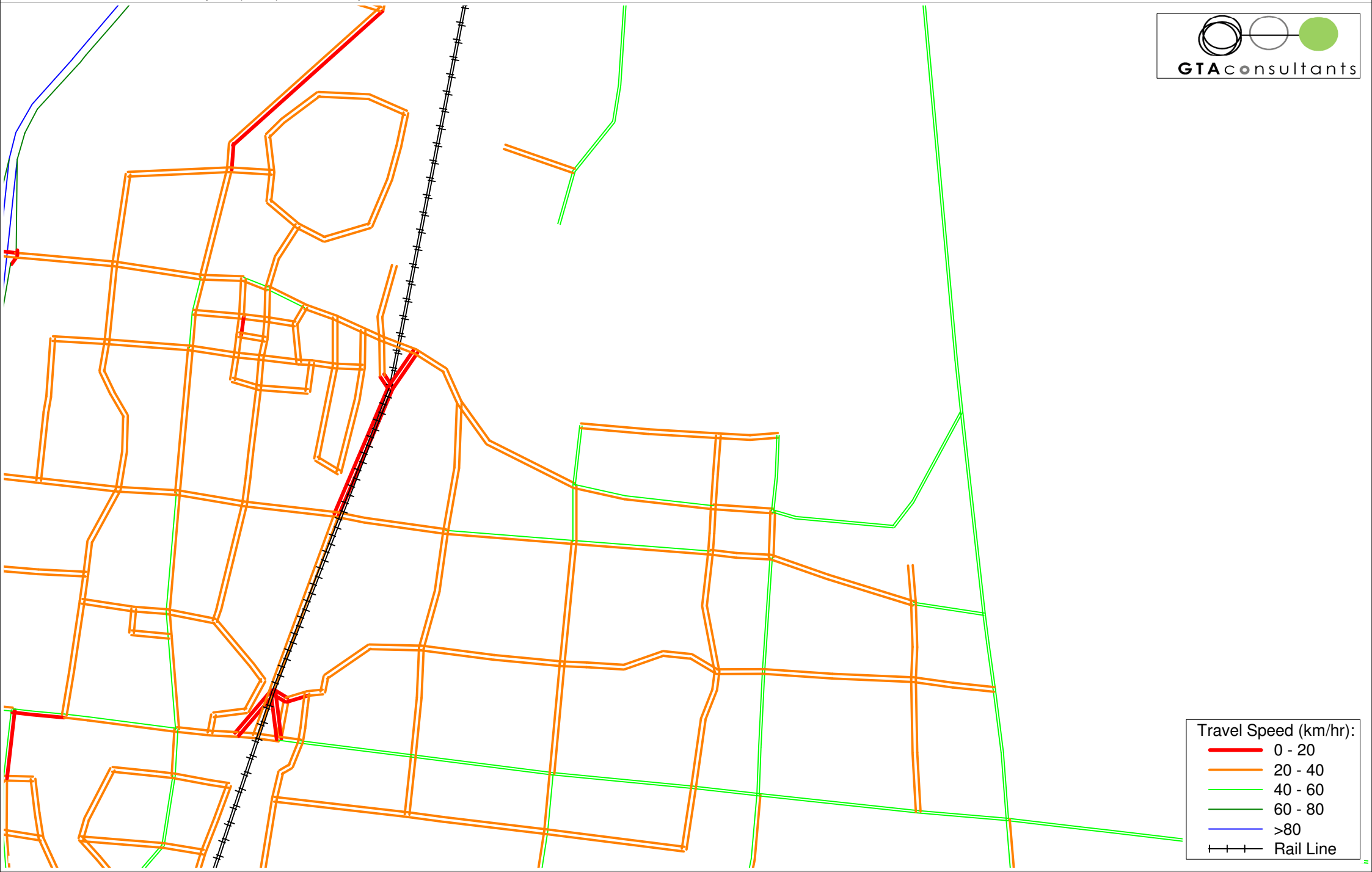
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Travel Speed (km/hr) Year 2026 Option 2C



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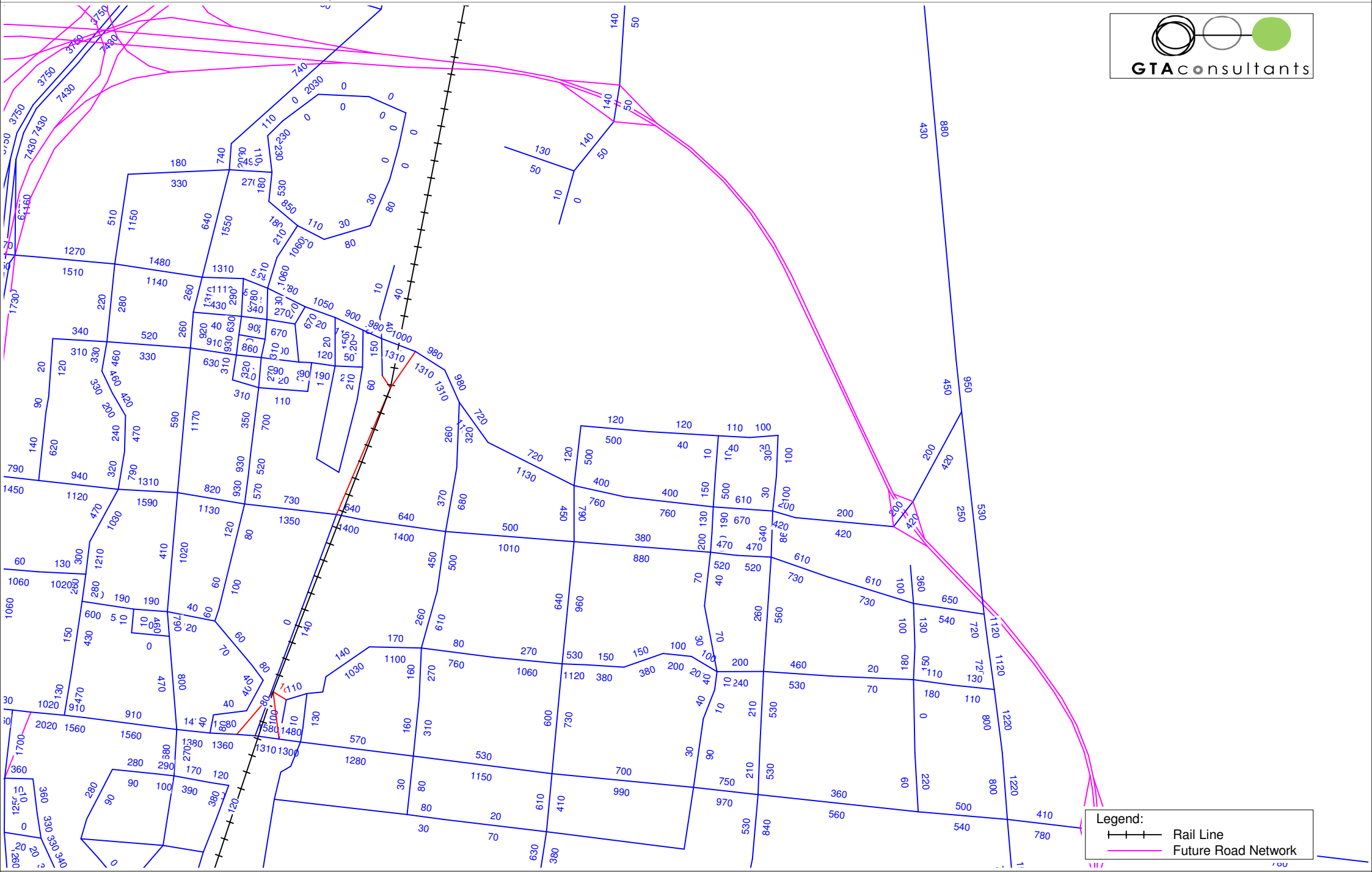
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Peak Total PCU Year 2026 Option 2C



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28/05/2014

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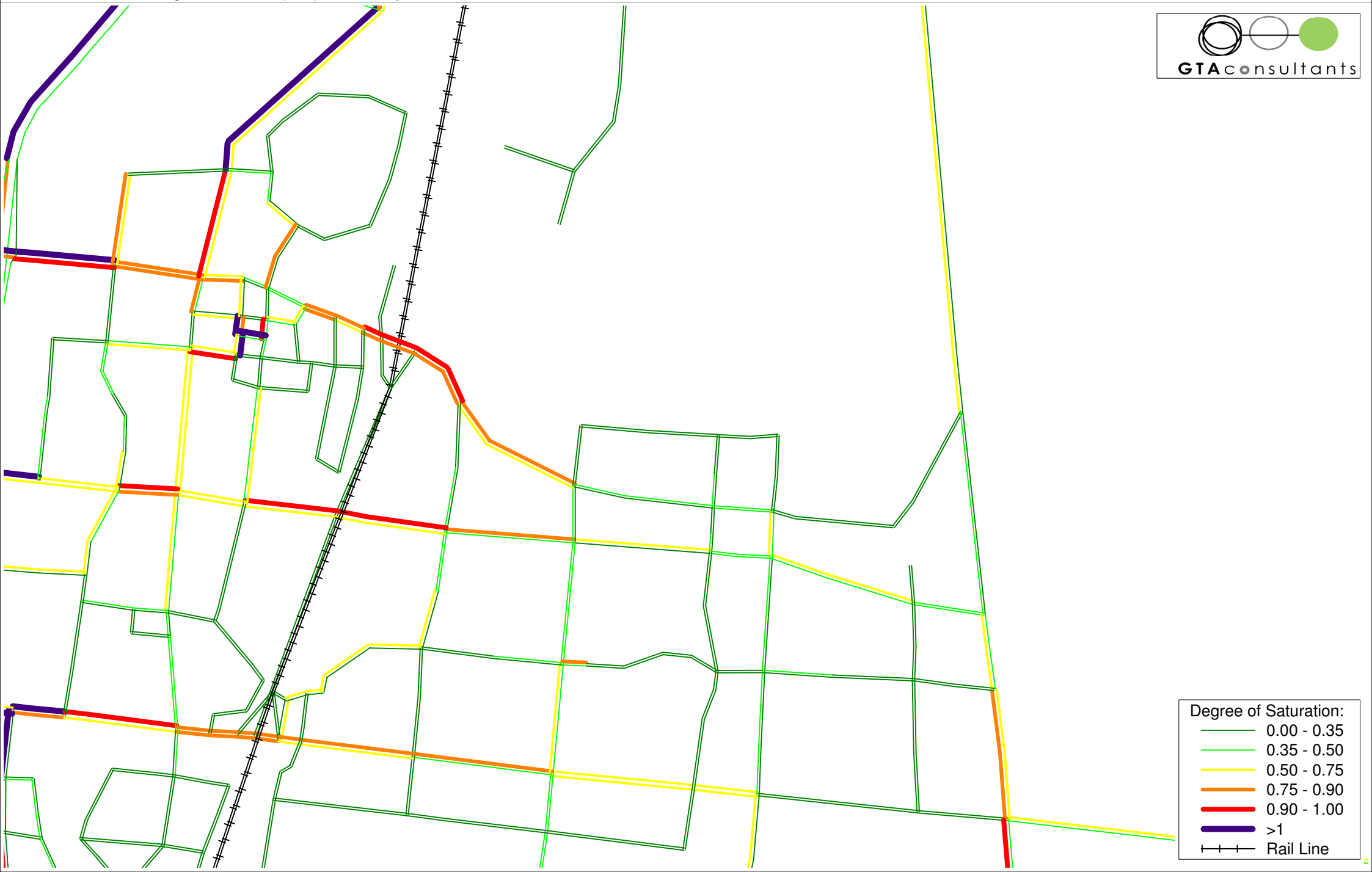
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Degree of Saturation (DOS) Year 2026 Option 2C



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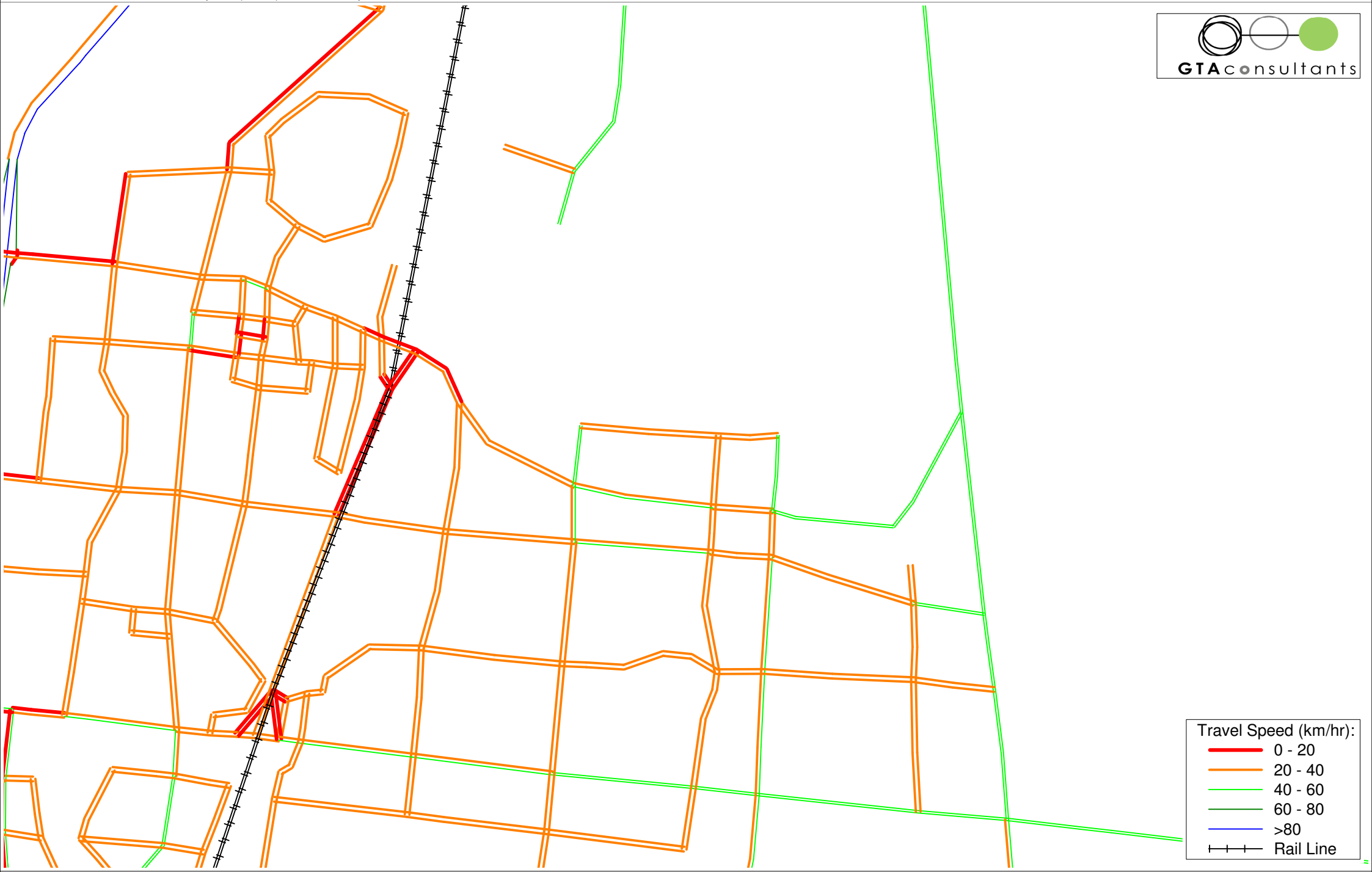
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Travel Speed (km/hr) Year 2026 Option 2C



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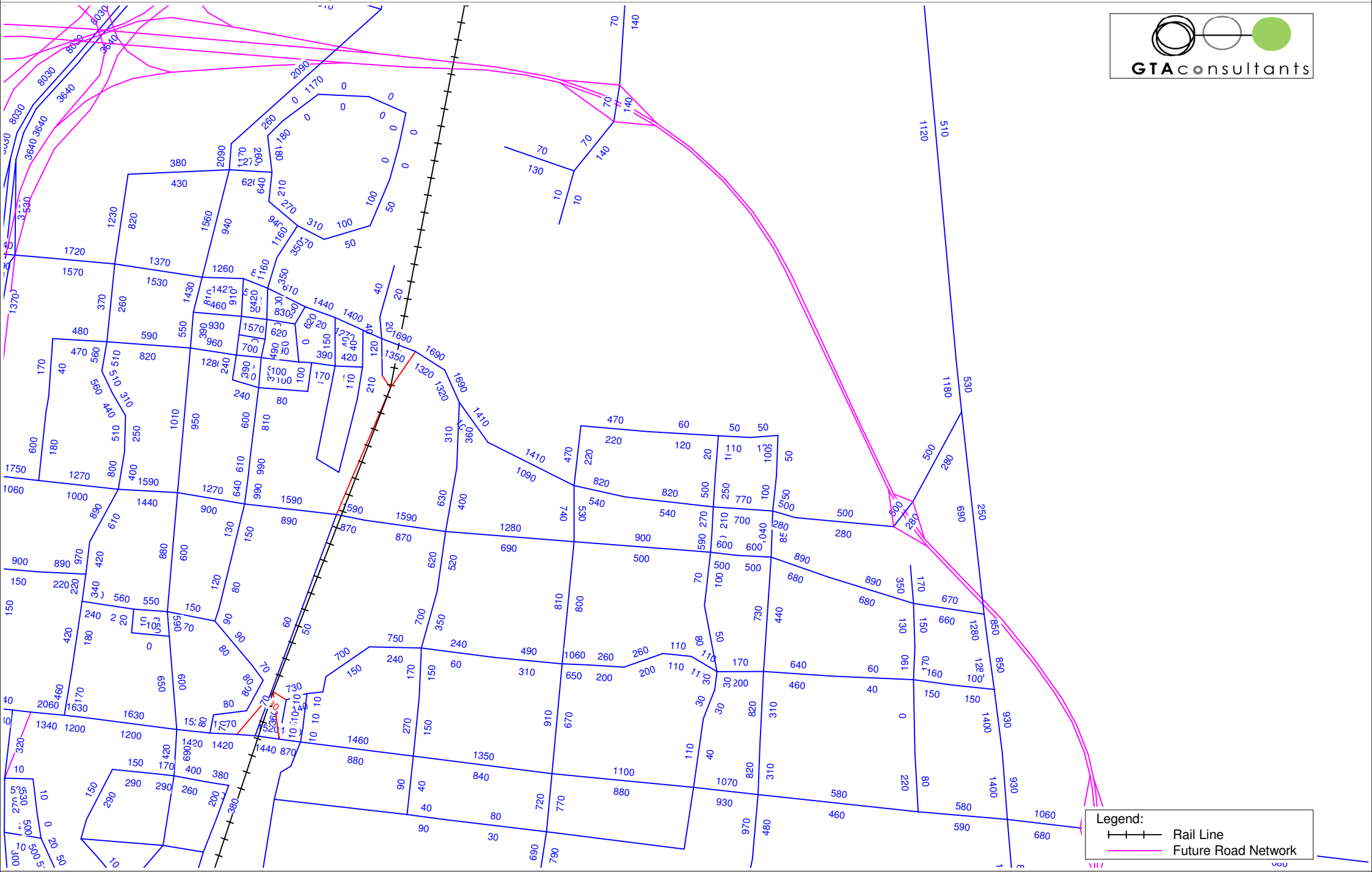
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Peak Total PCU Year 2026 Option 2C



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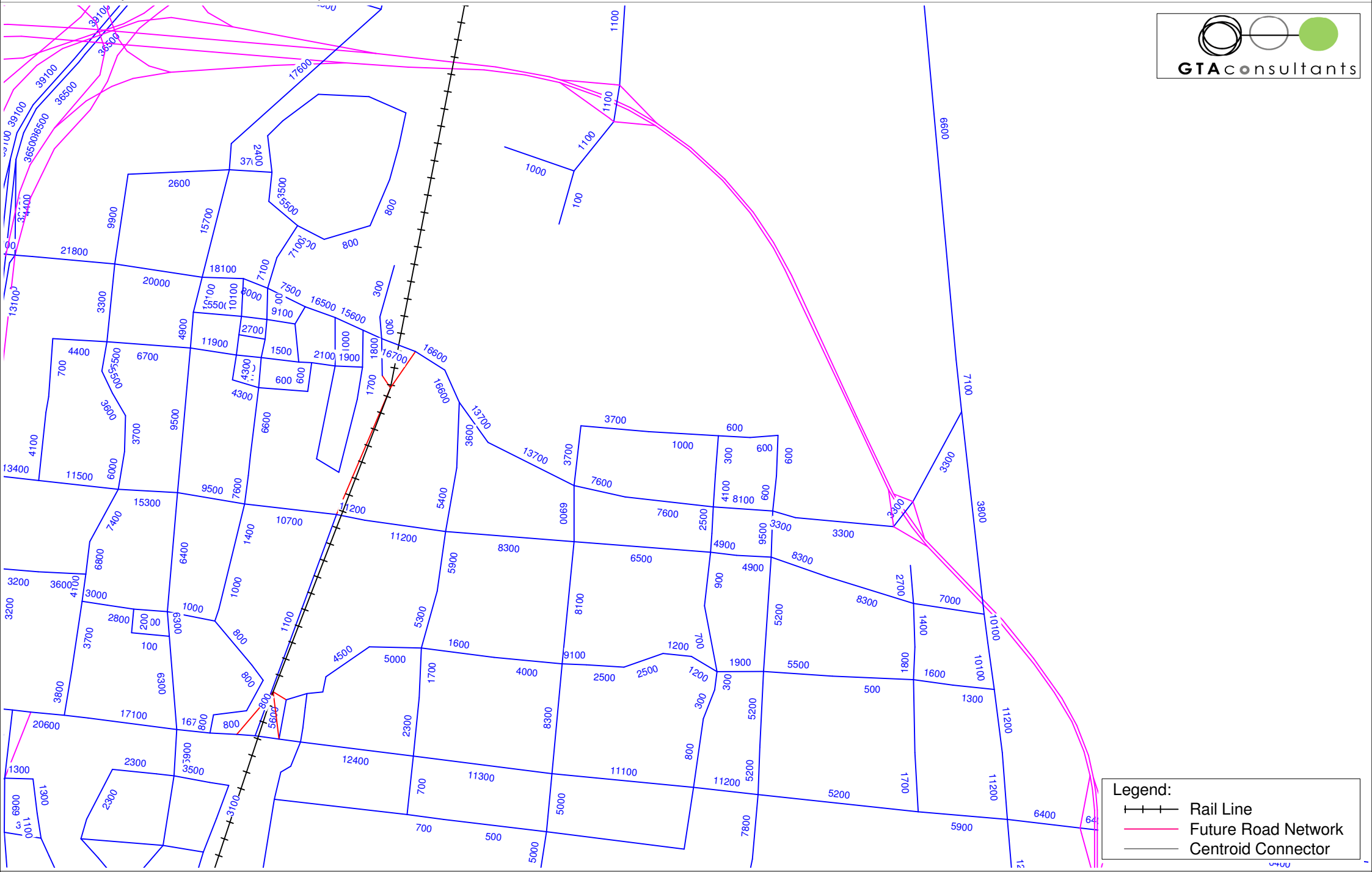
VITM Northern Growth Corridor Model
14M1555000 - Daily Volume Total PCU Year 2026 Option 2C



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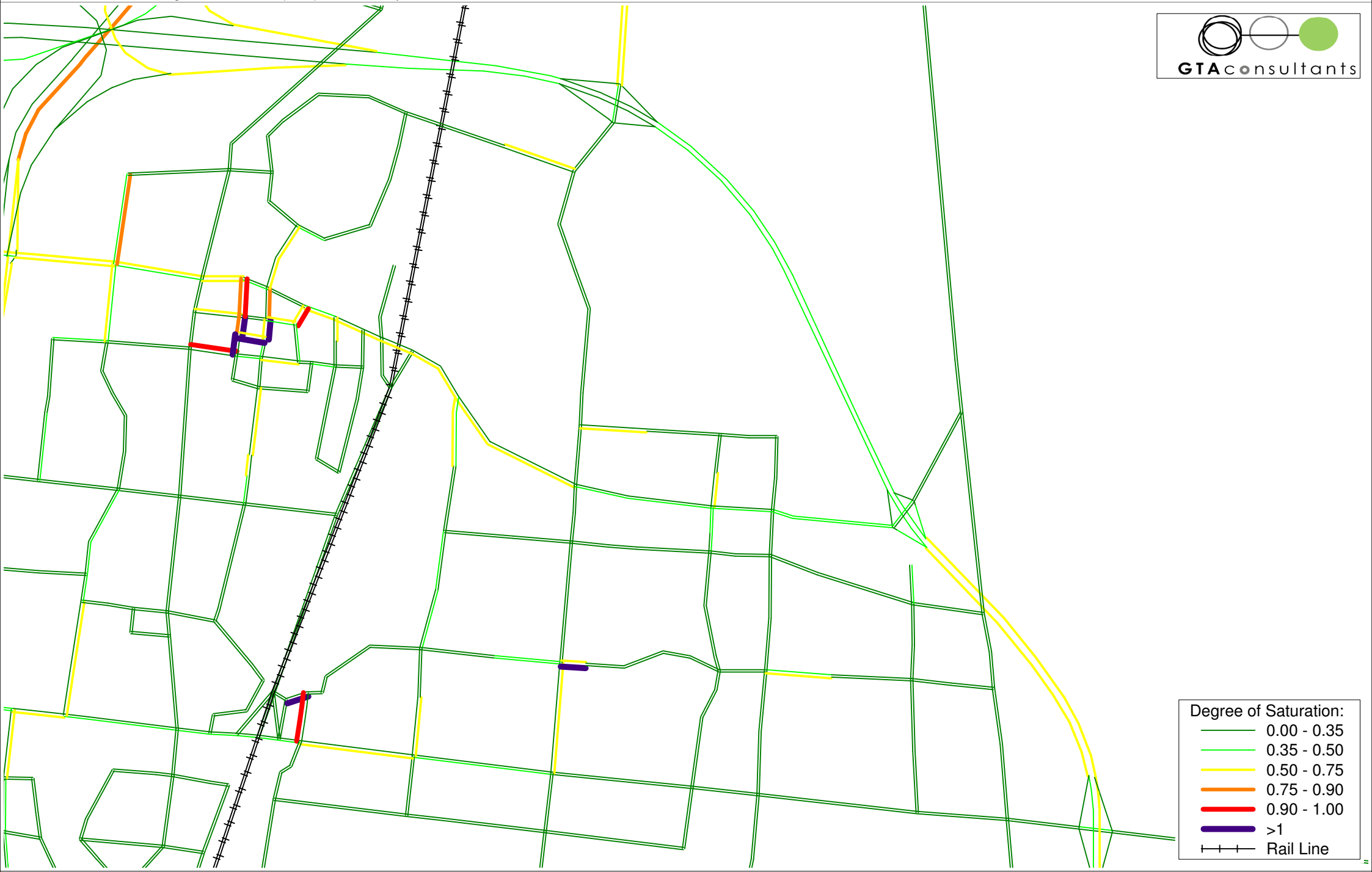
Appendix D

Ultimate (2046) Select Link Analysis for Modelled Scenarios

VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Degree of Saturation (DOS) Year 2046 Option 1A



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5/6/2014

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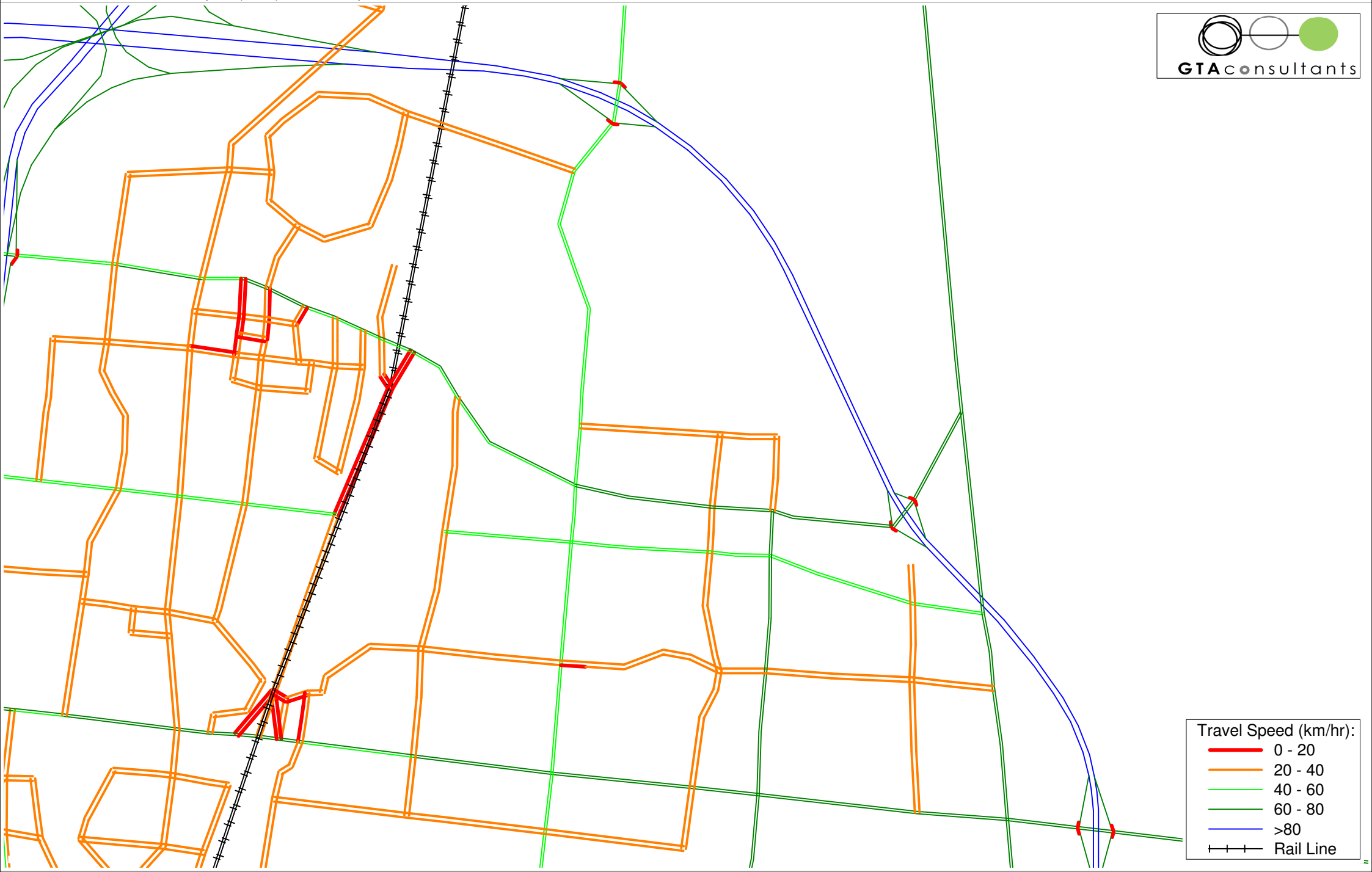
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Travel Speed (km/hr) Year 2046 Option 1A



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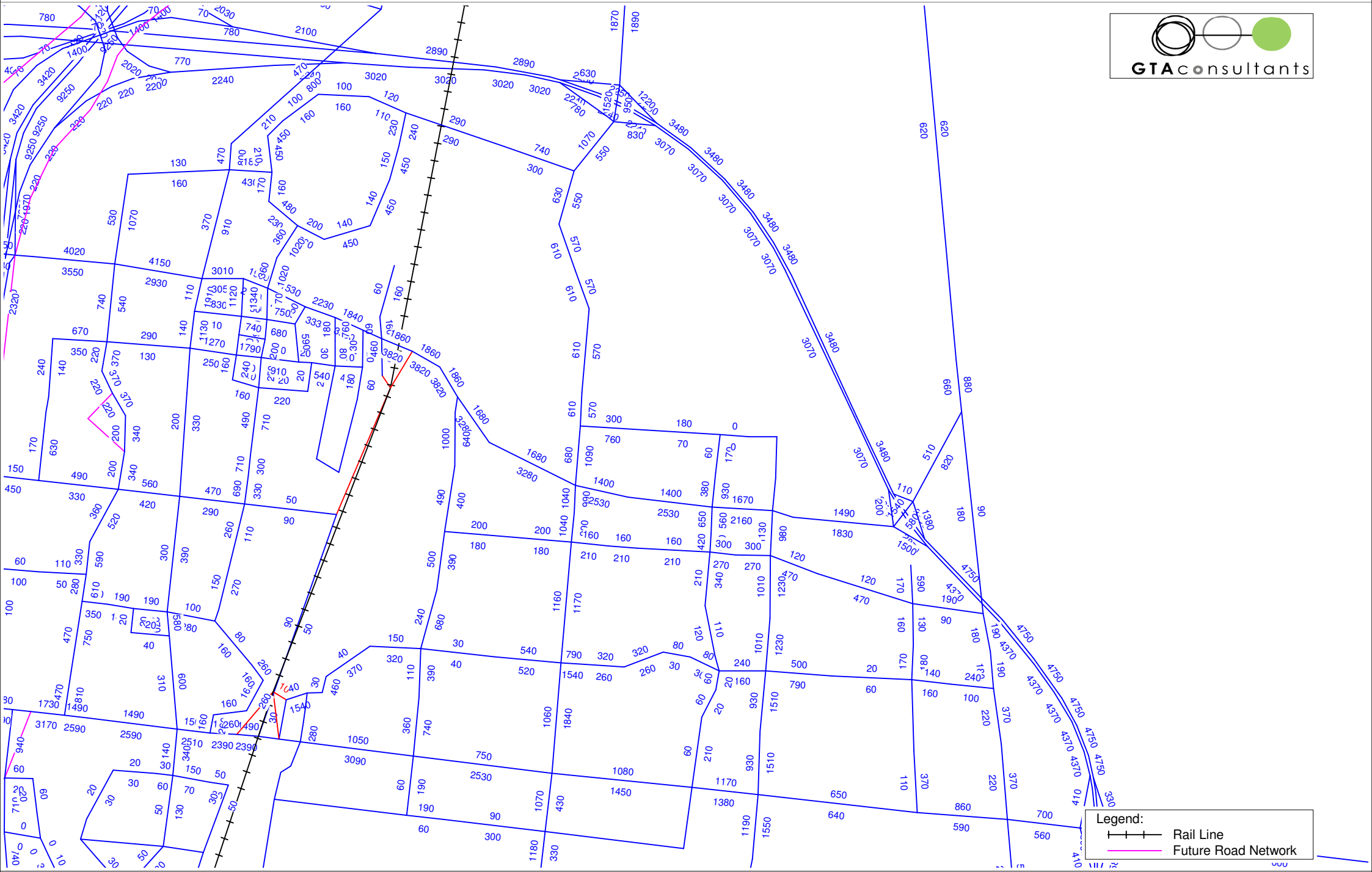
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Peak Total PCU Year 2046 1A



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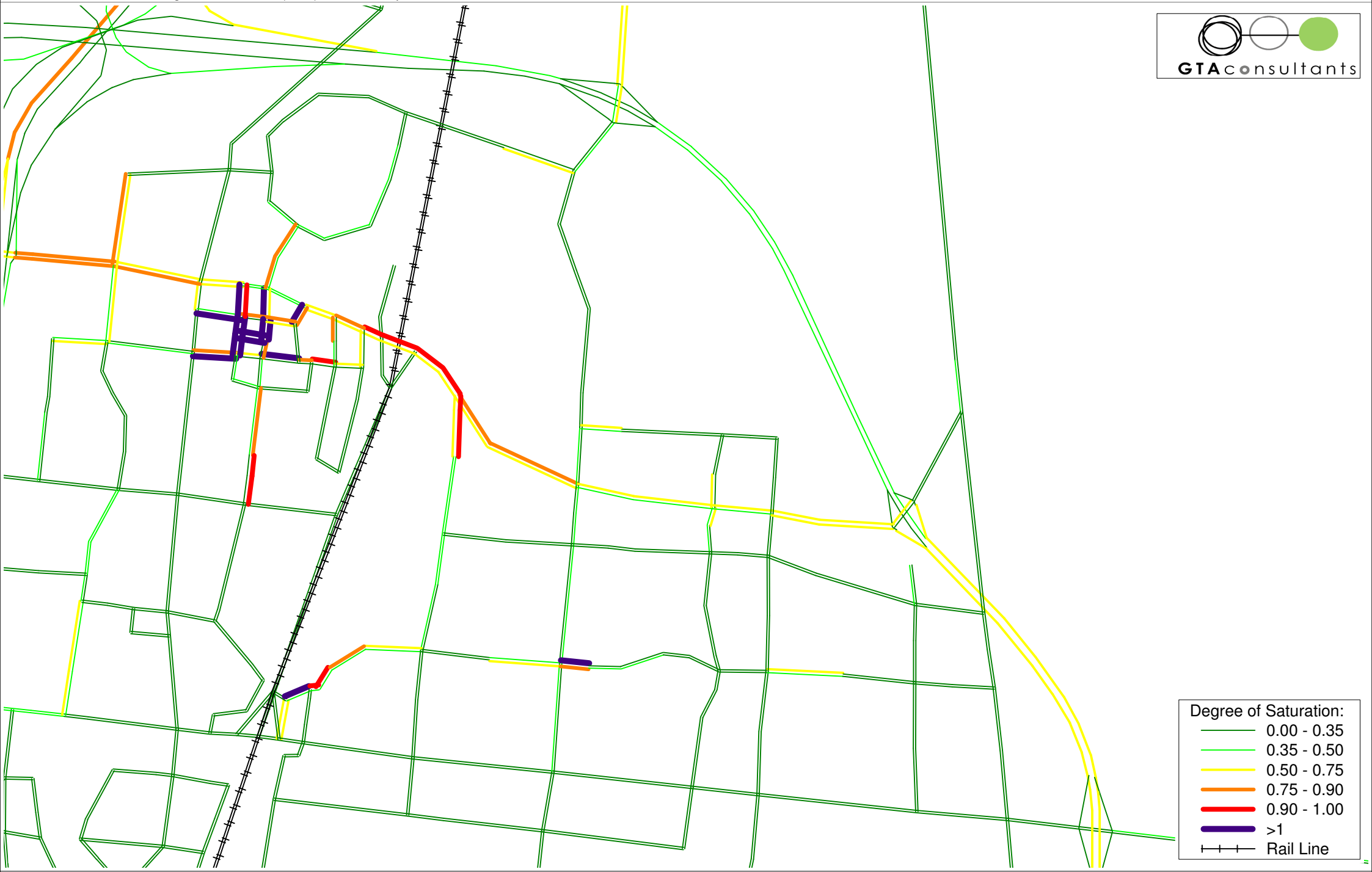
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Degree of Saturation (DOS) Year 2046 Option 1A



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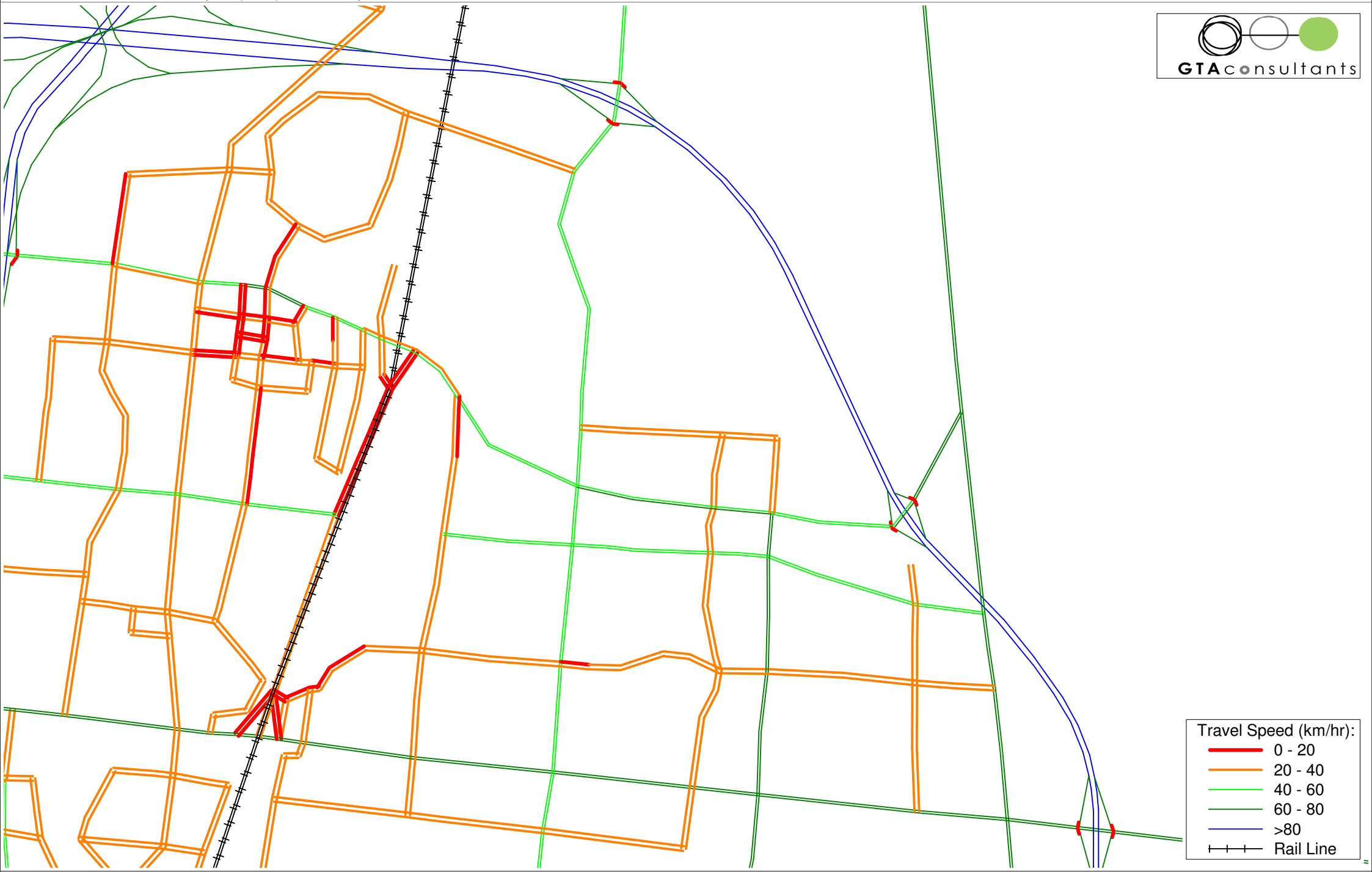
cube

VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Travel Speed (km/hr) Year 2046 Option 1A



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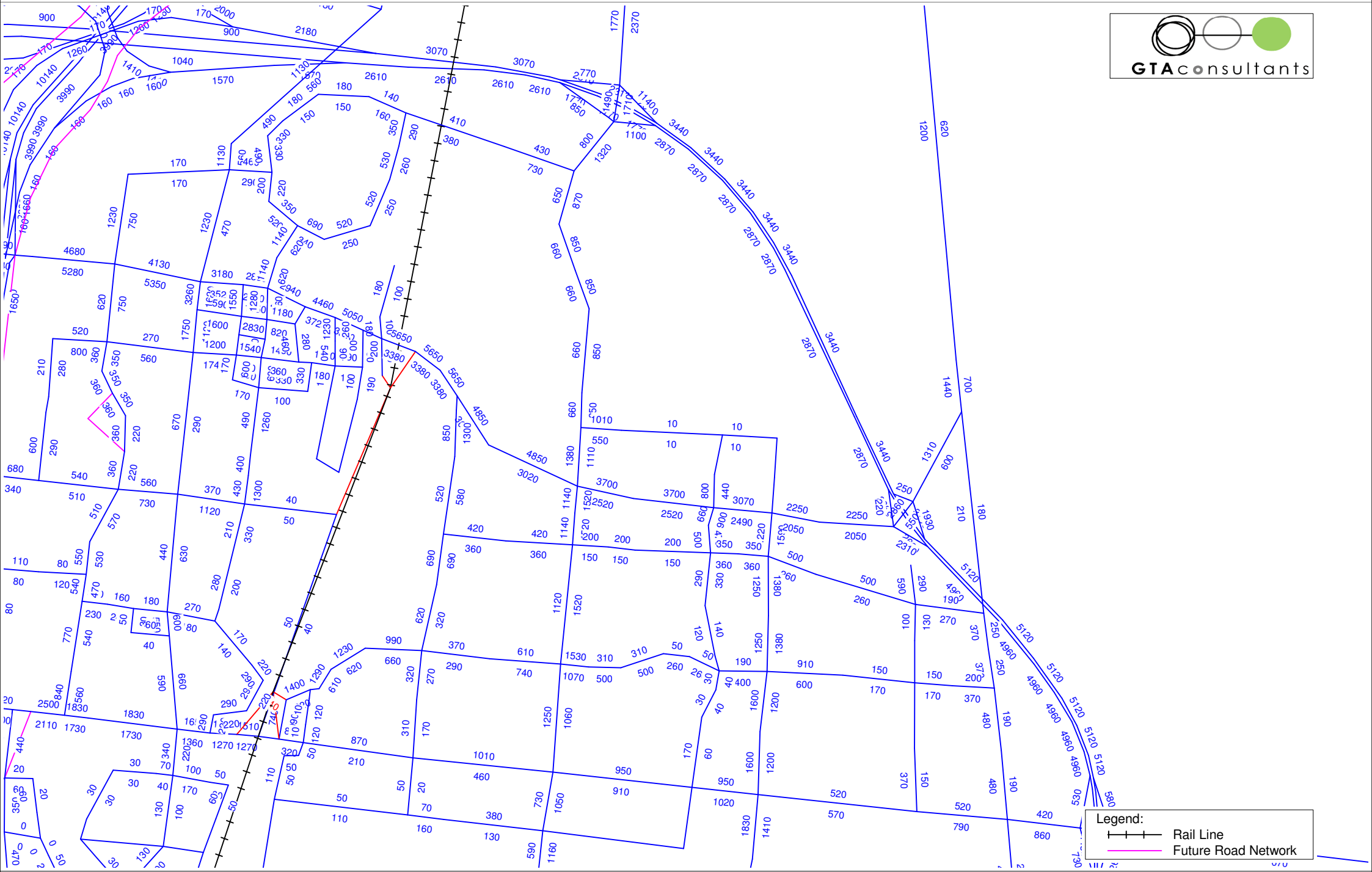
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Peak Total PCU Year 2046 1A



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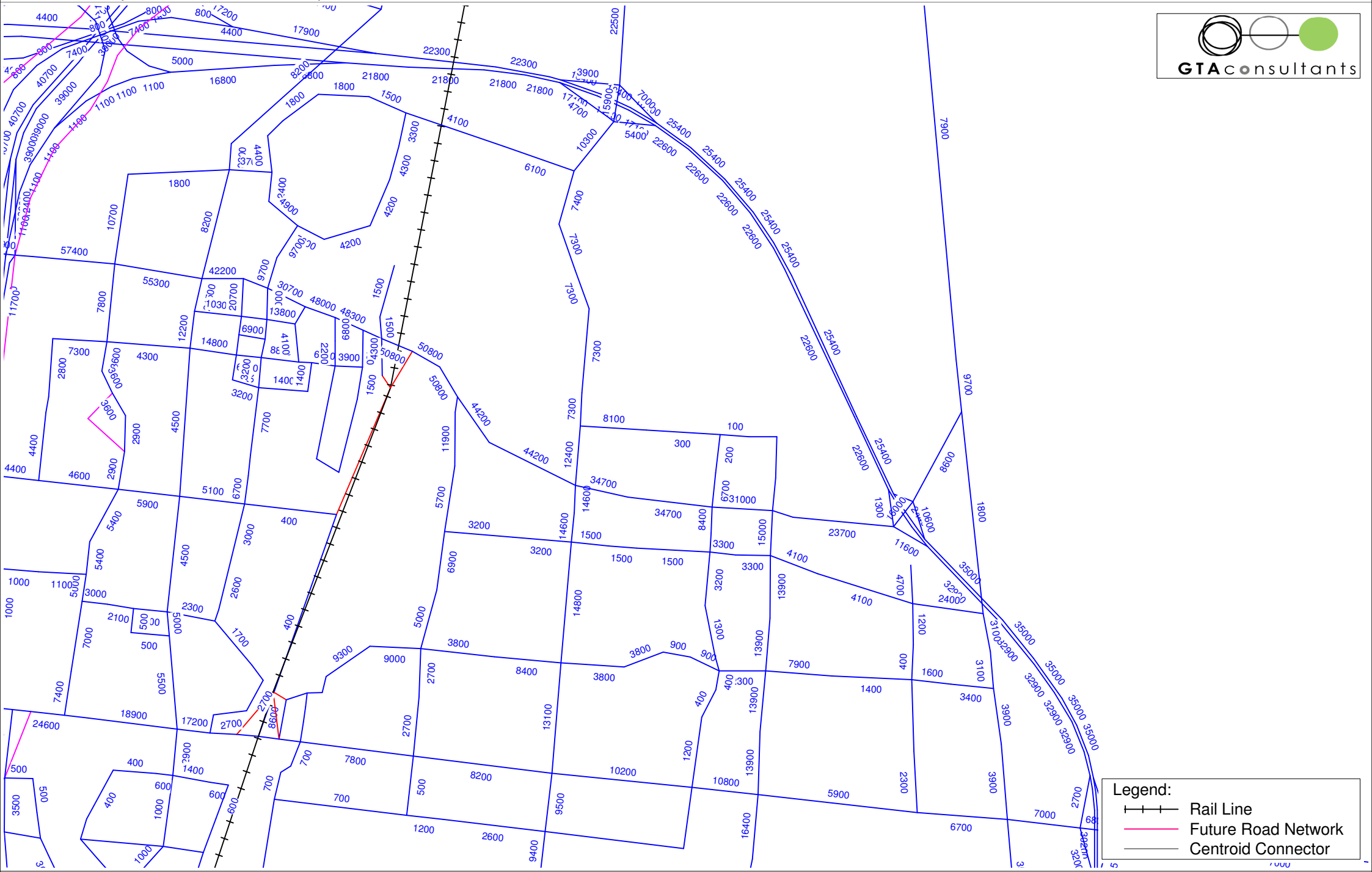
VITM Northern Growth Corridor Model
14M1555000 - Daily Volume Total PCU Year 2046 Option 1A



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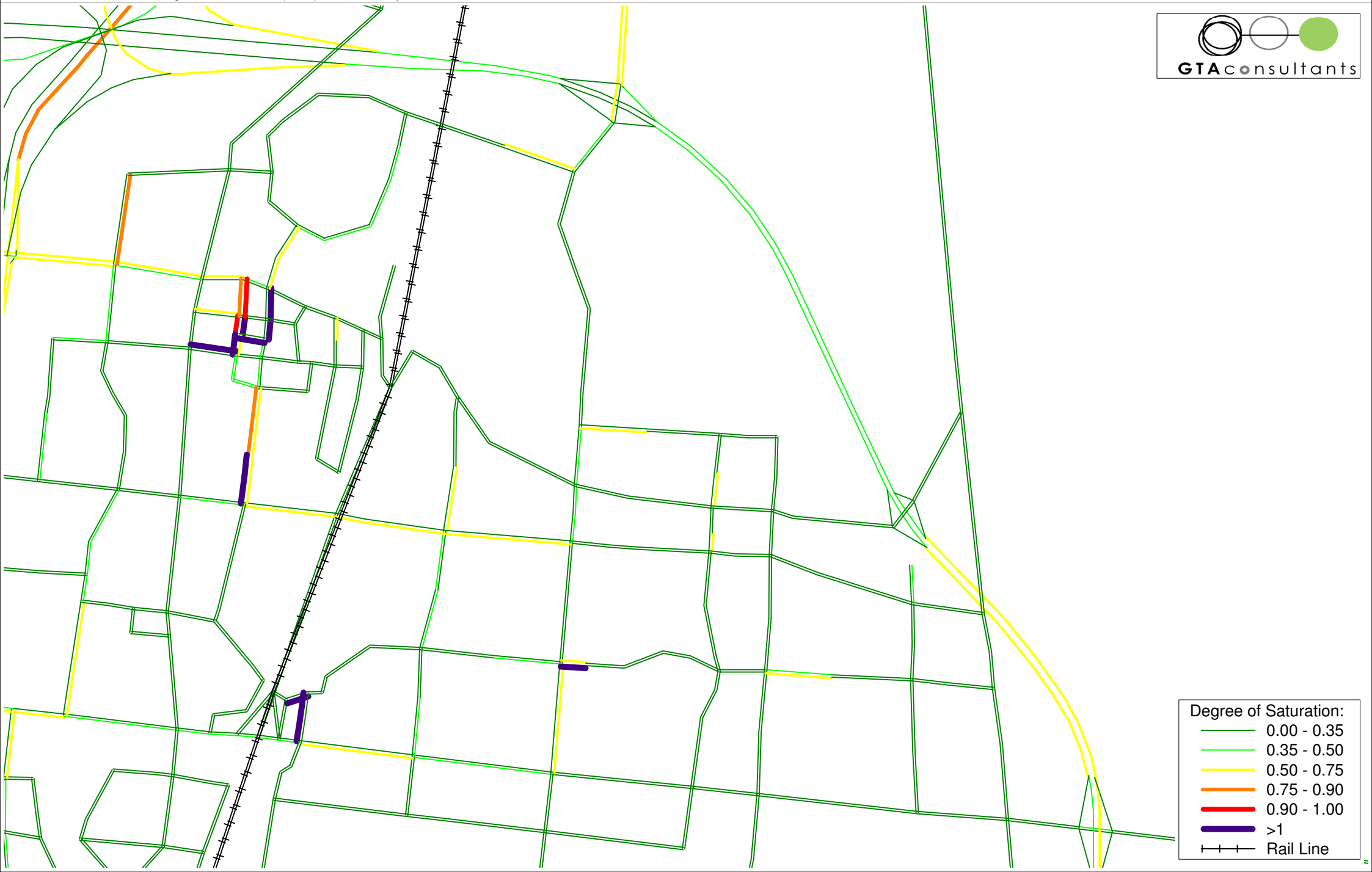
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Degree of Saturation (DOS) Year 2046 Option 1B



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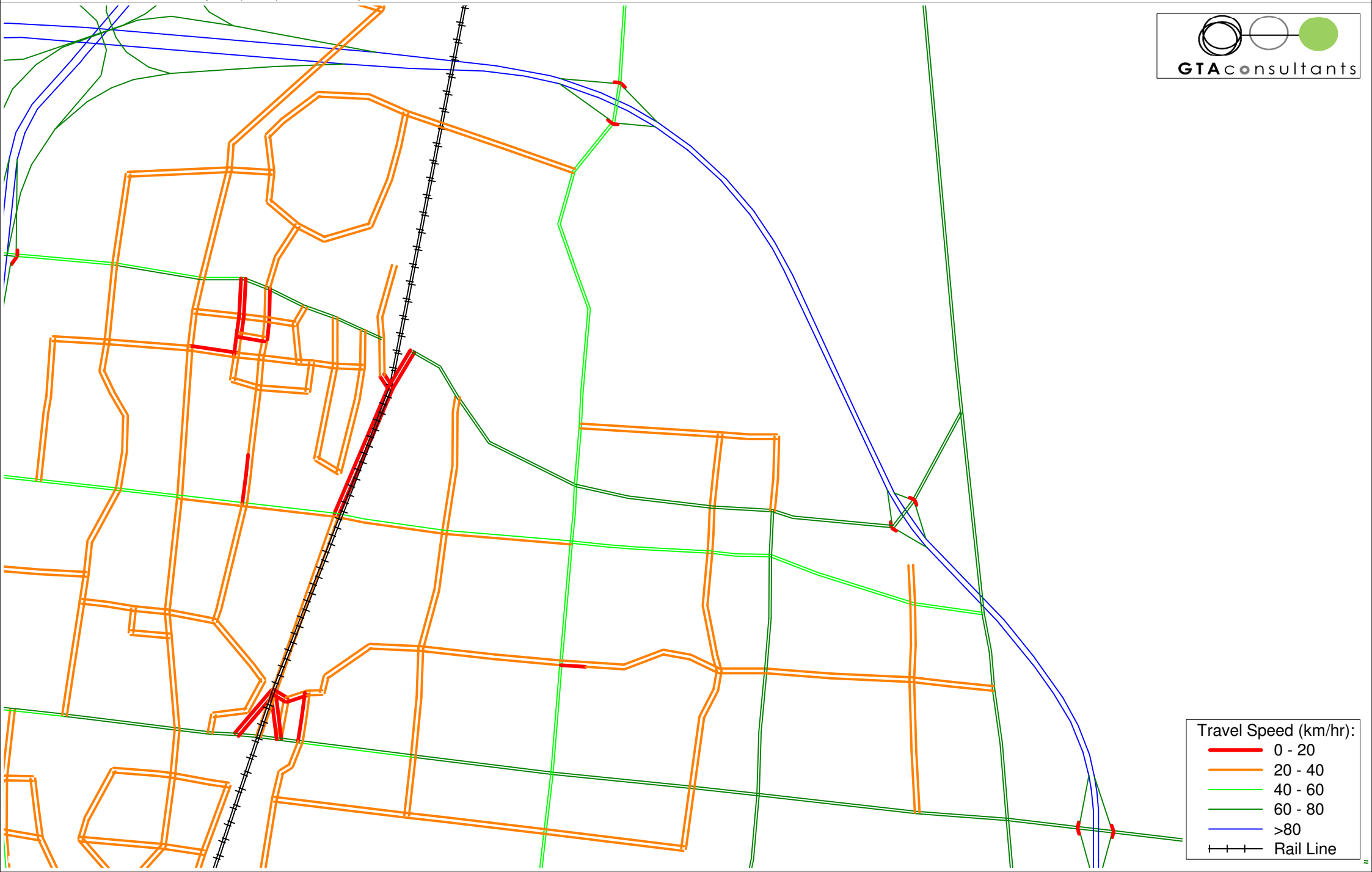
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Travel Speed (km/hr) Year 2046 Option 1B



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5/6/2014

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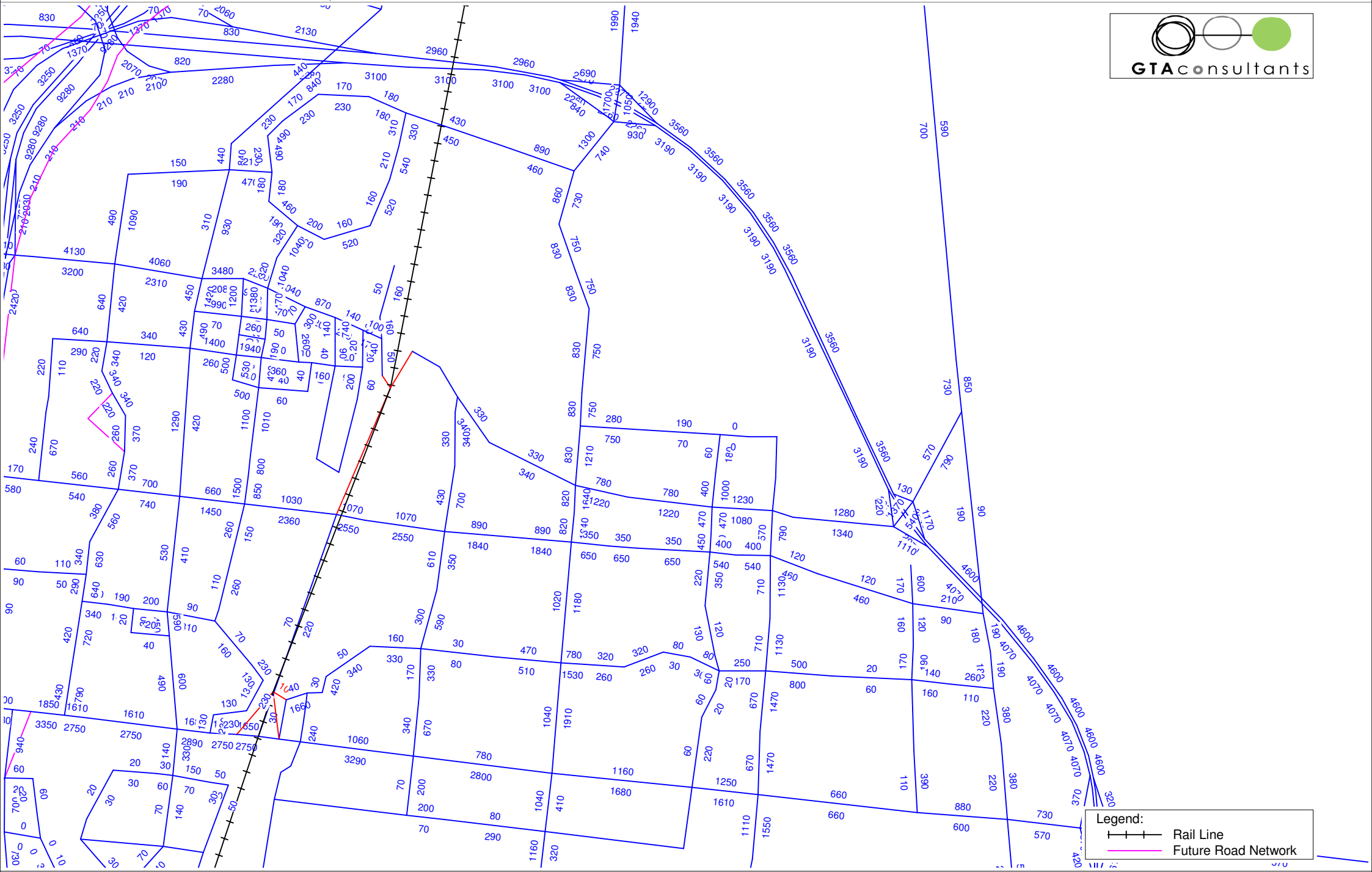
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Peak Total PCU Year 2046 Option 1B



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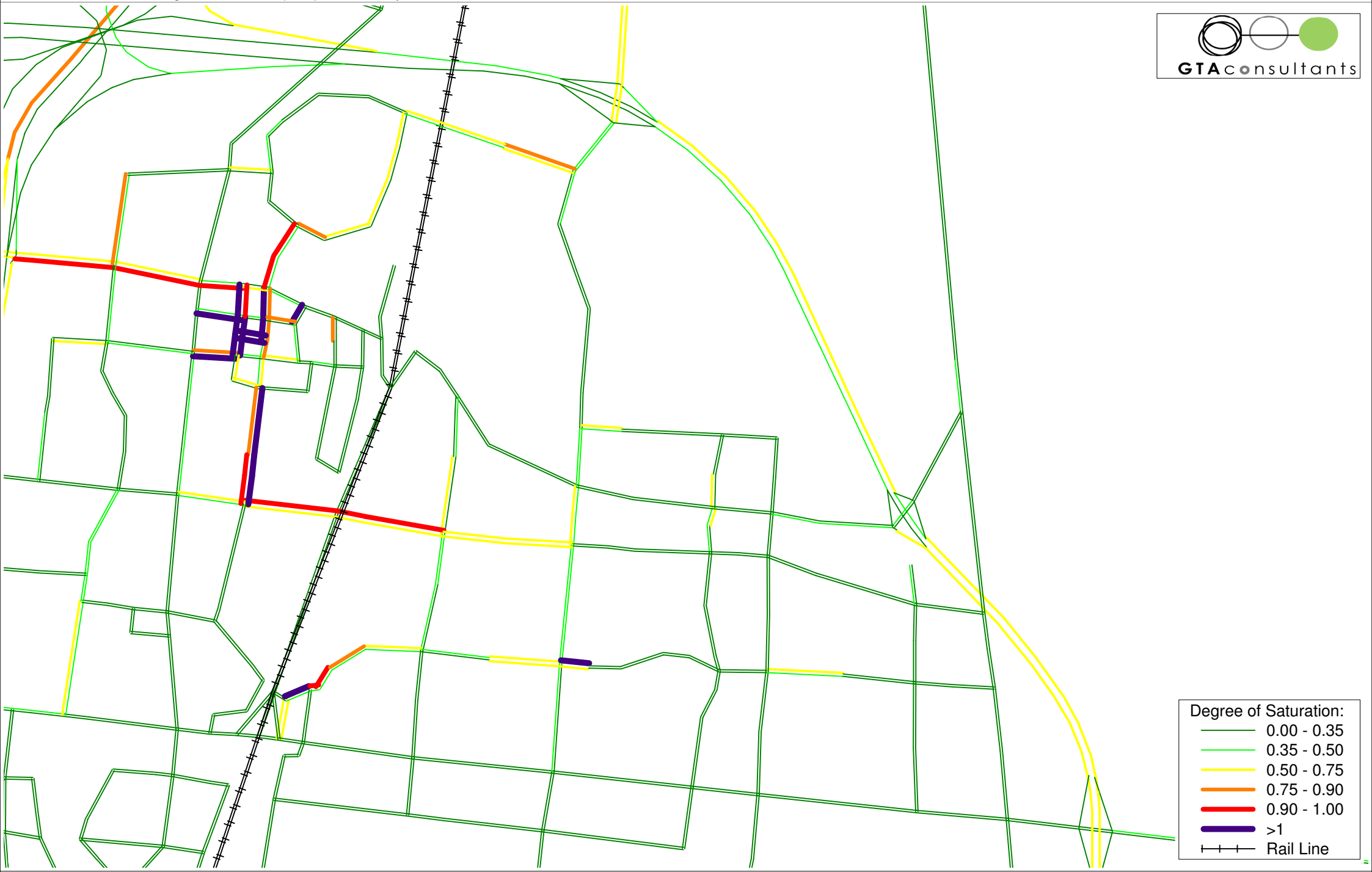
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Degree of Saturation (DOS) Year 2046 Option 1B



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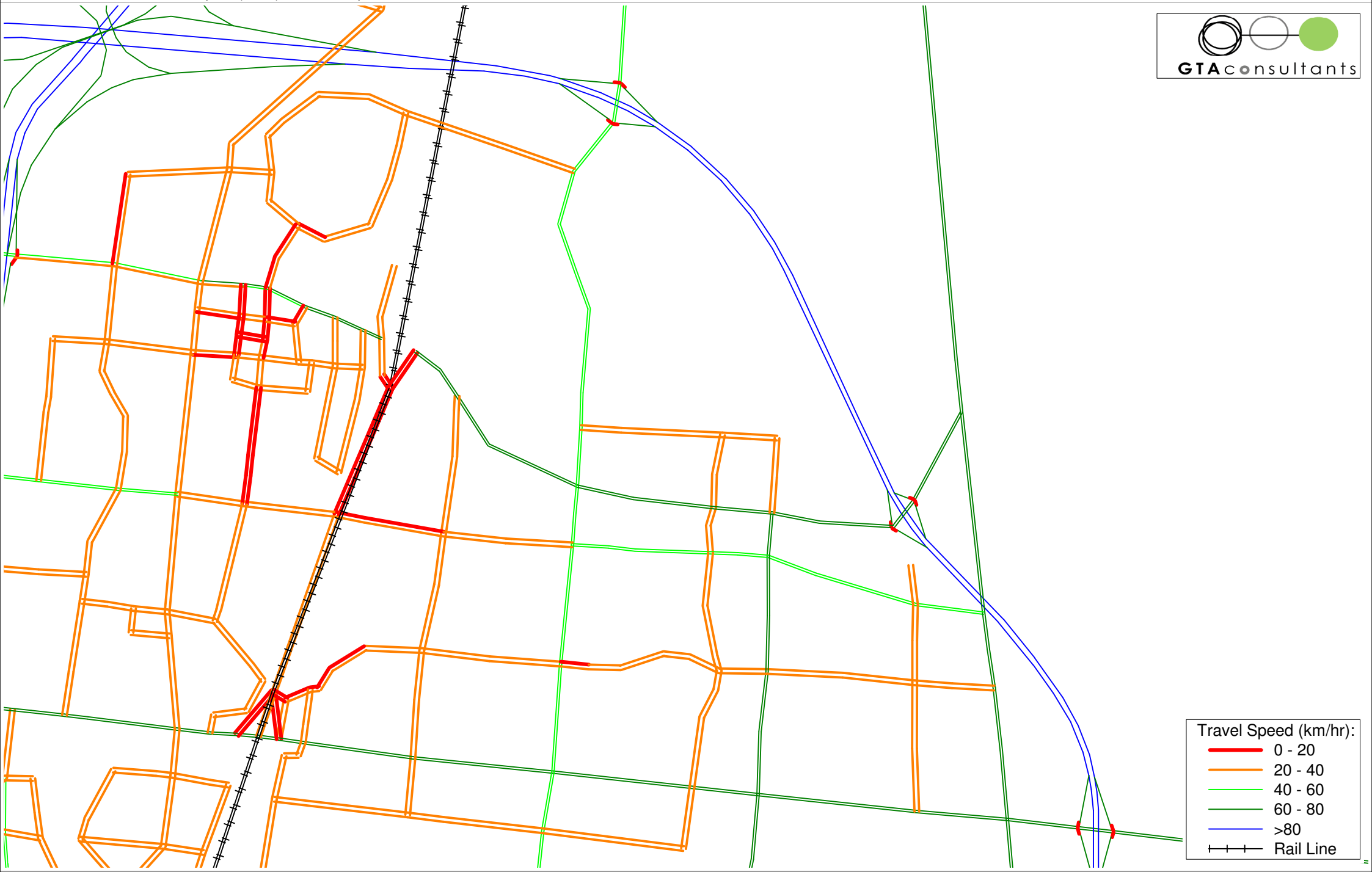
cube

VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Travel Speed (km/hr) Year 2046 Option 1B



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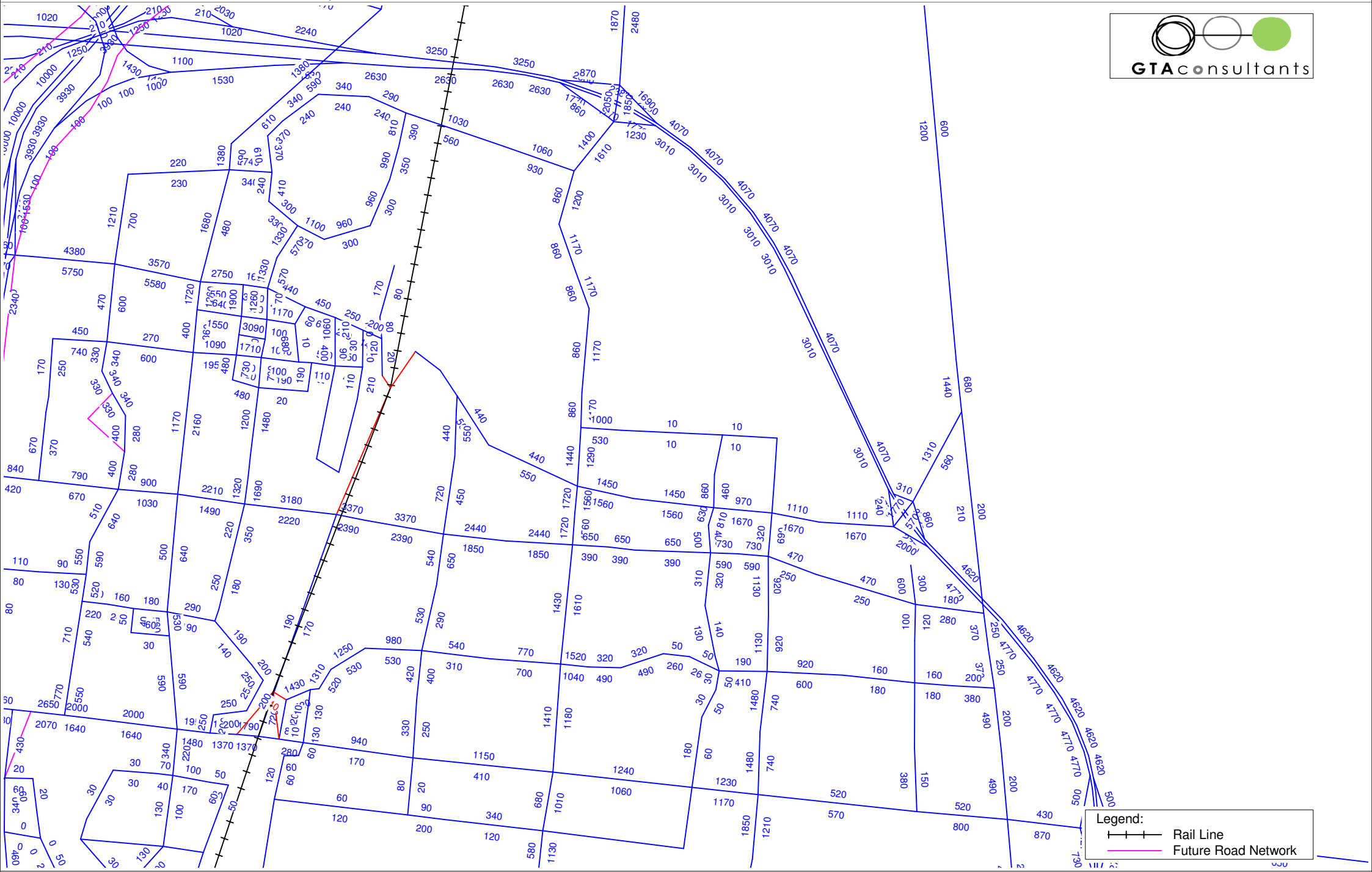
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Peak Total PCU Year 2046 Option 1B



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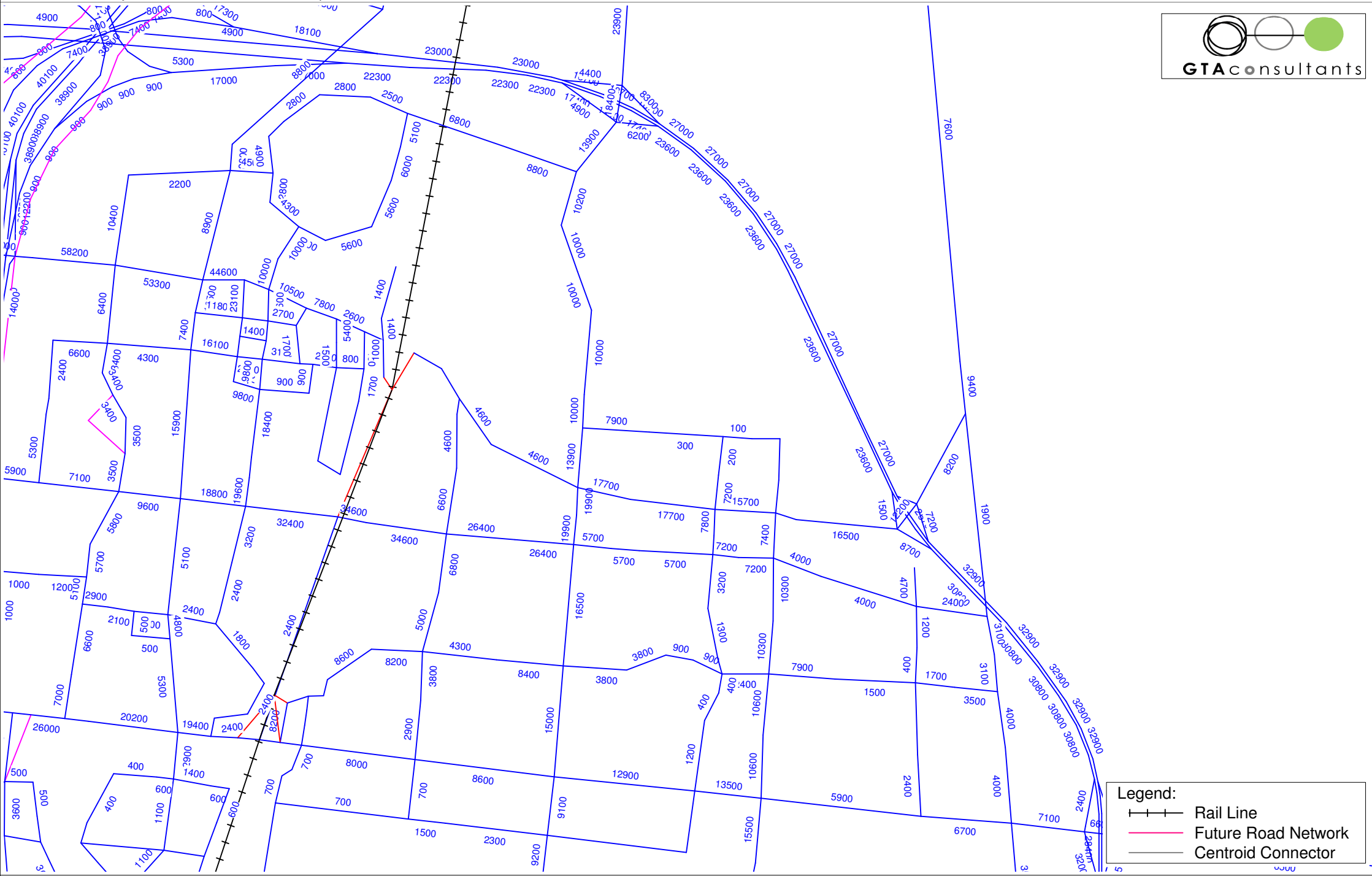
VITM Northern Growth Corridor Model
14M1555000 - Daily Volume Total PCU Year 2046 Option 1B



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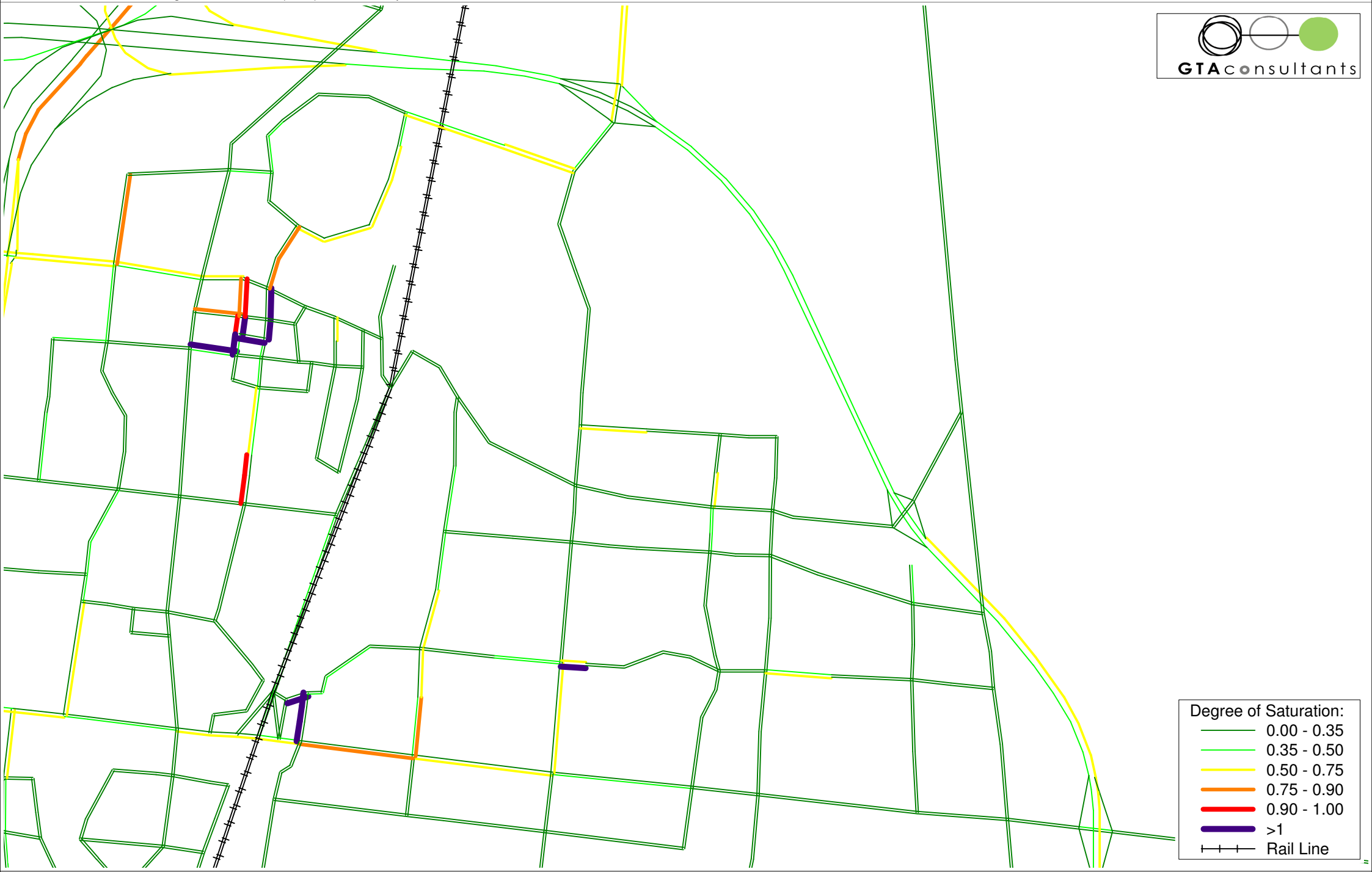
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Degree of Saturation (DOS) Year 2046 Option 1C



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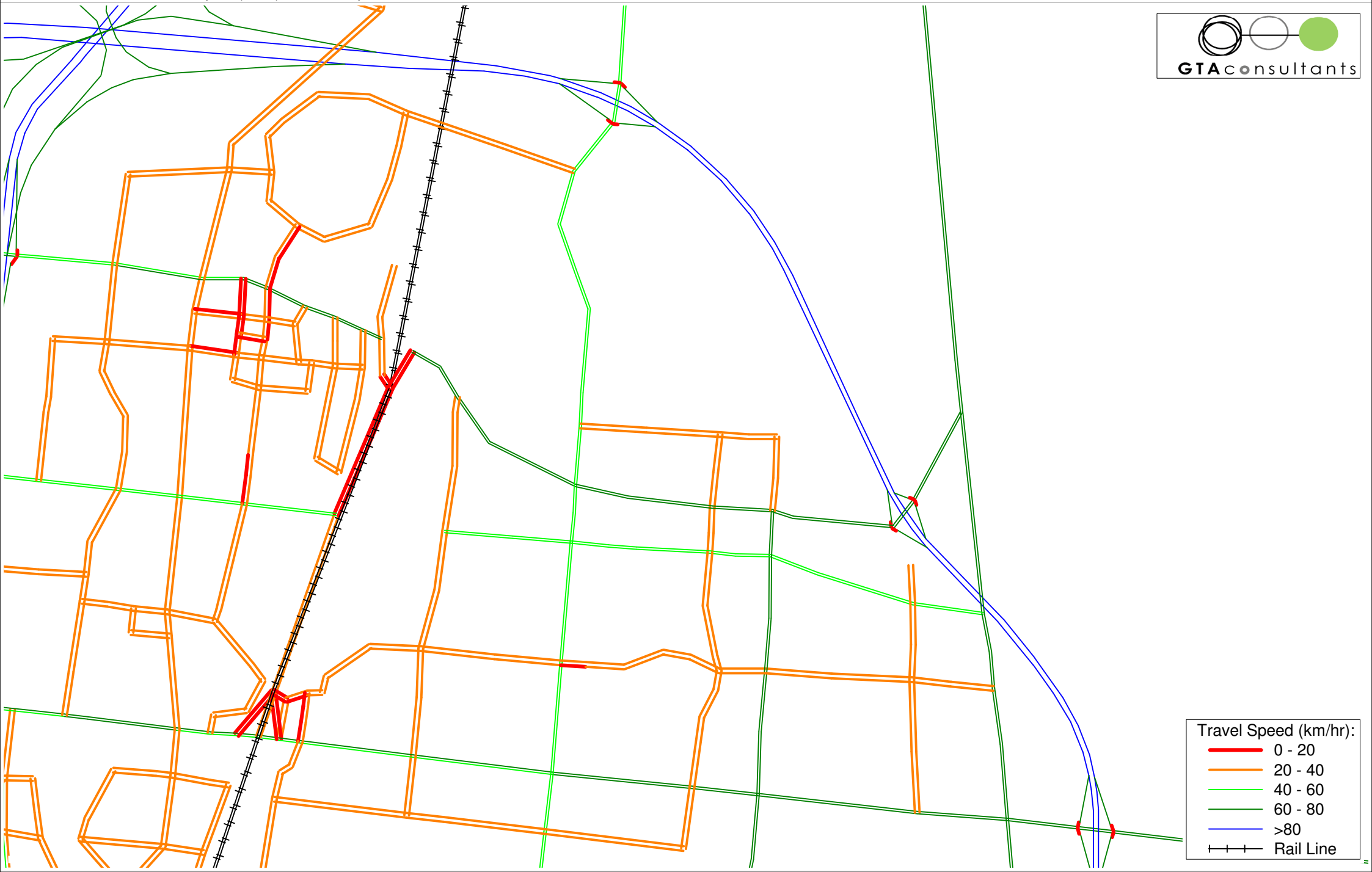
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Travel Speed (km/hr) Year 2046 Option 1C



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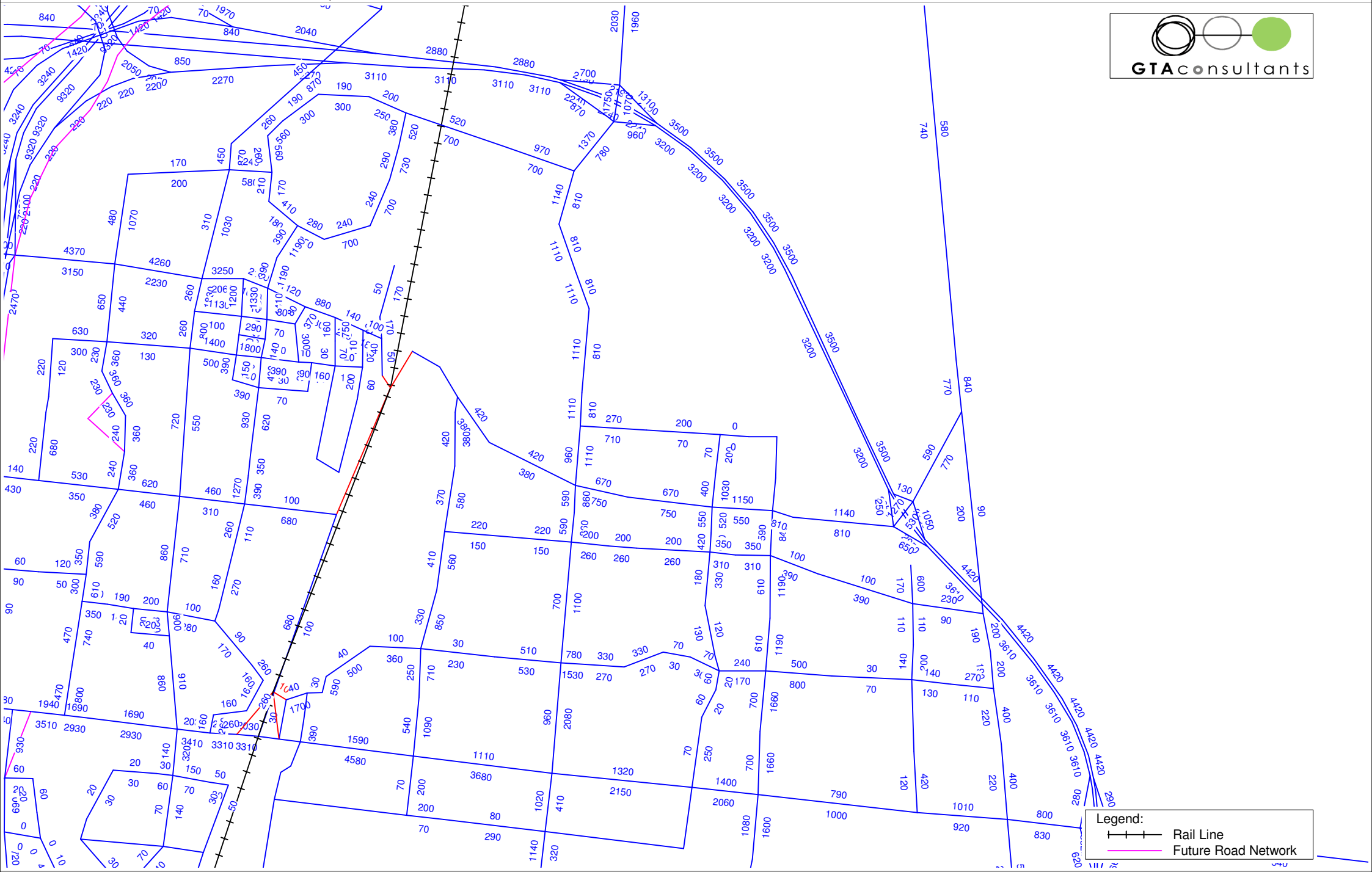
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Peak Total PCU Year 2046 Option 1C



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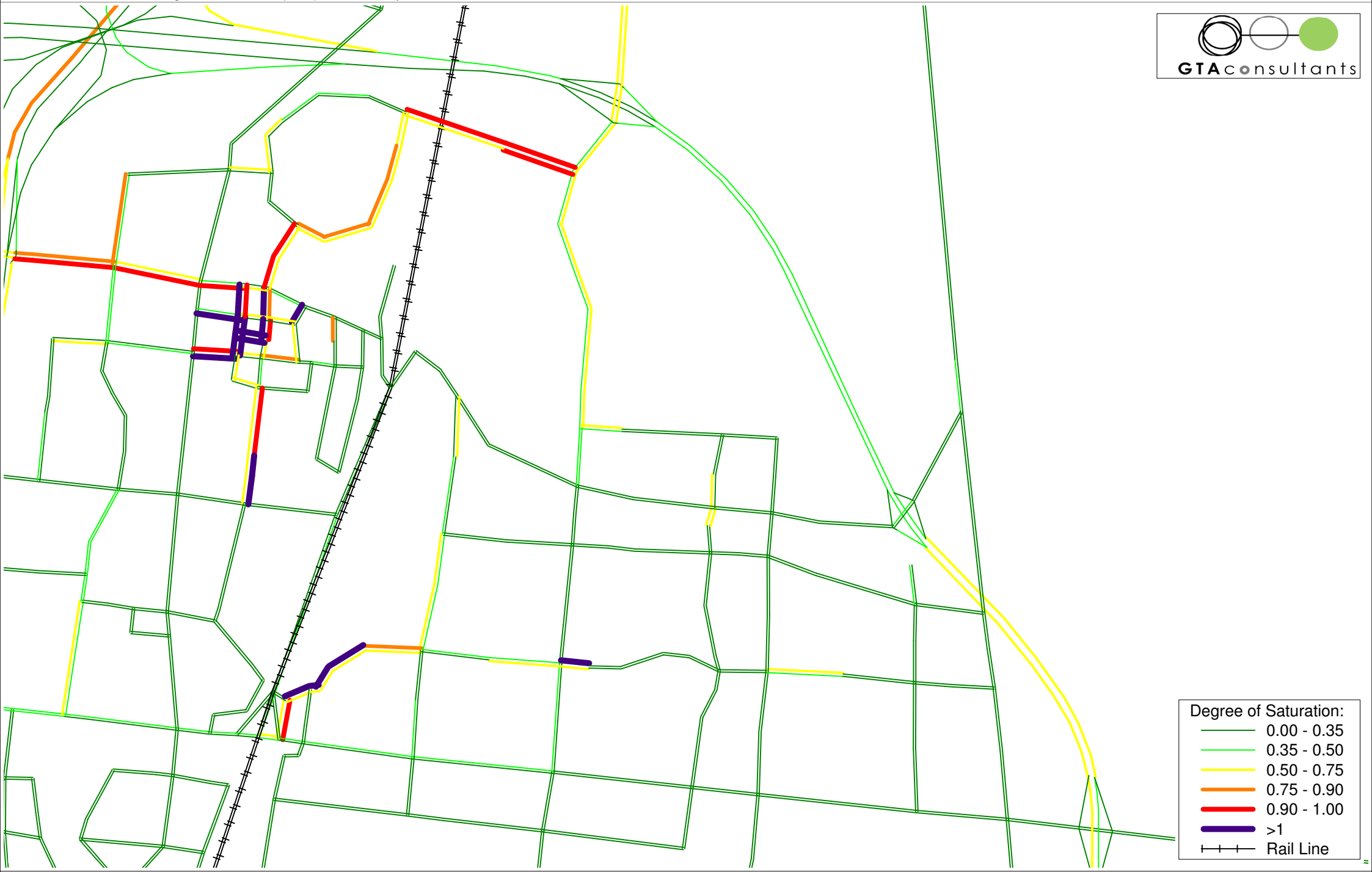
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Degree of Saturation (DOS) Year 2046 Option 1C



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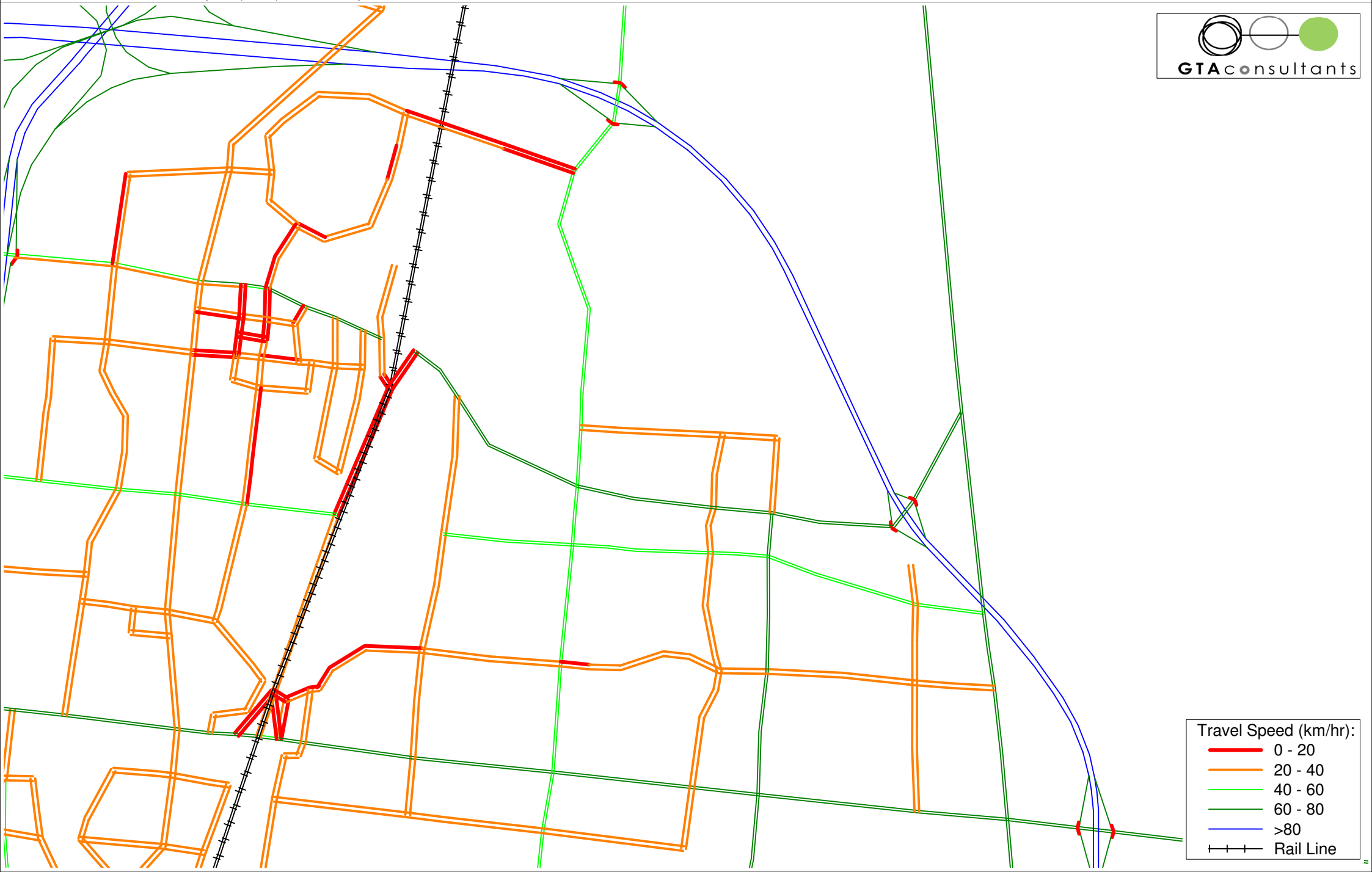
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Travel Speed (km/hr) Year 2046 Option 1C



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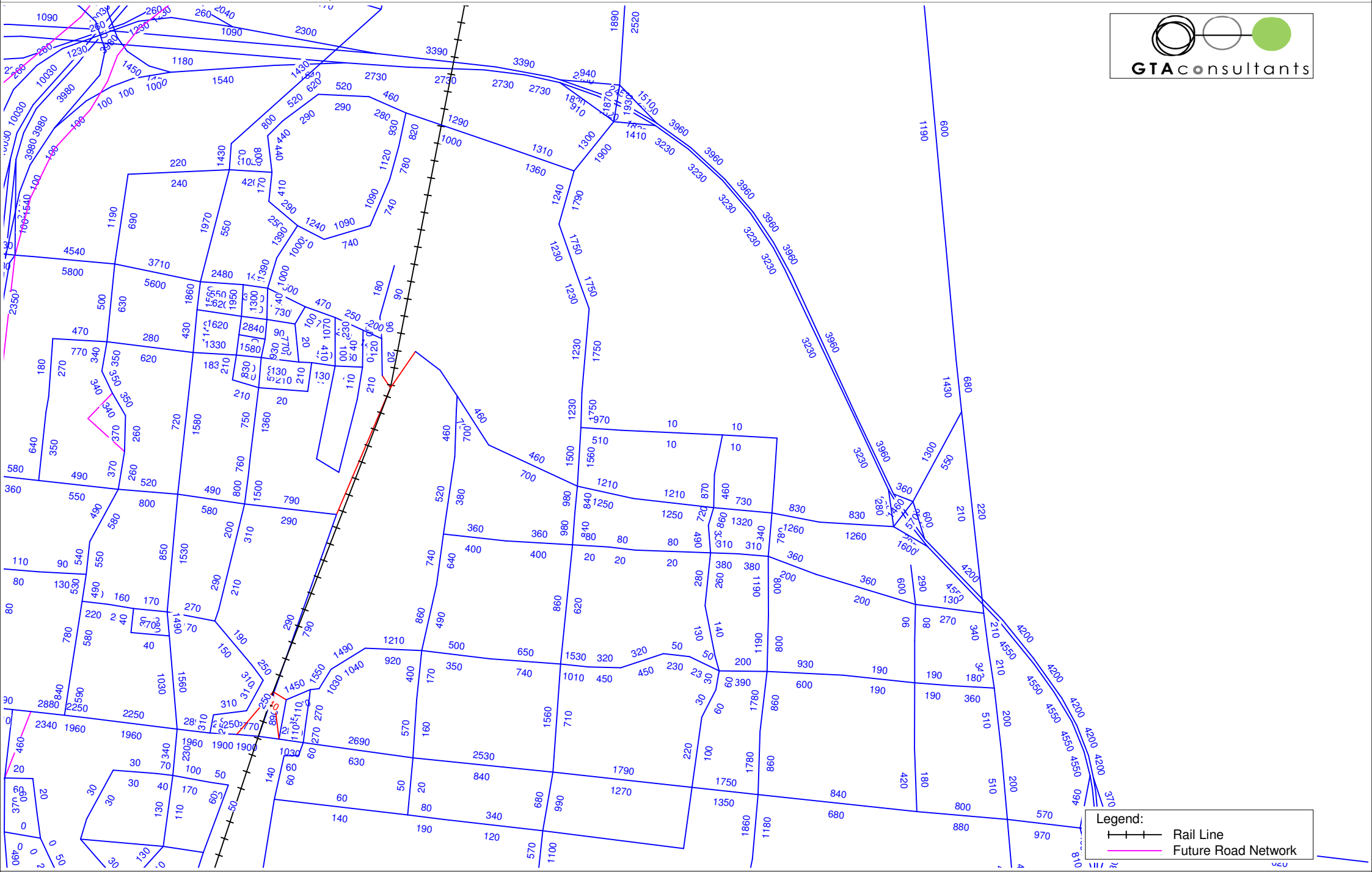
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Peak Total PCU Year 2046 Option 1C



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VITM Northern Growth Corridor Model
14M1555000 - Daily Volume Total PCU Year 2046 Option 1C

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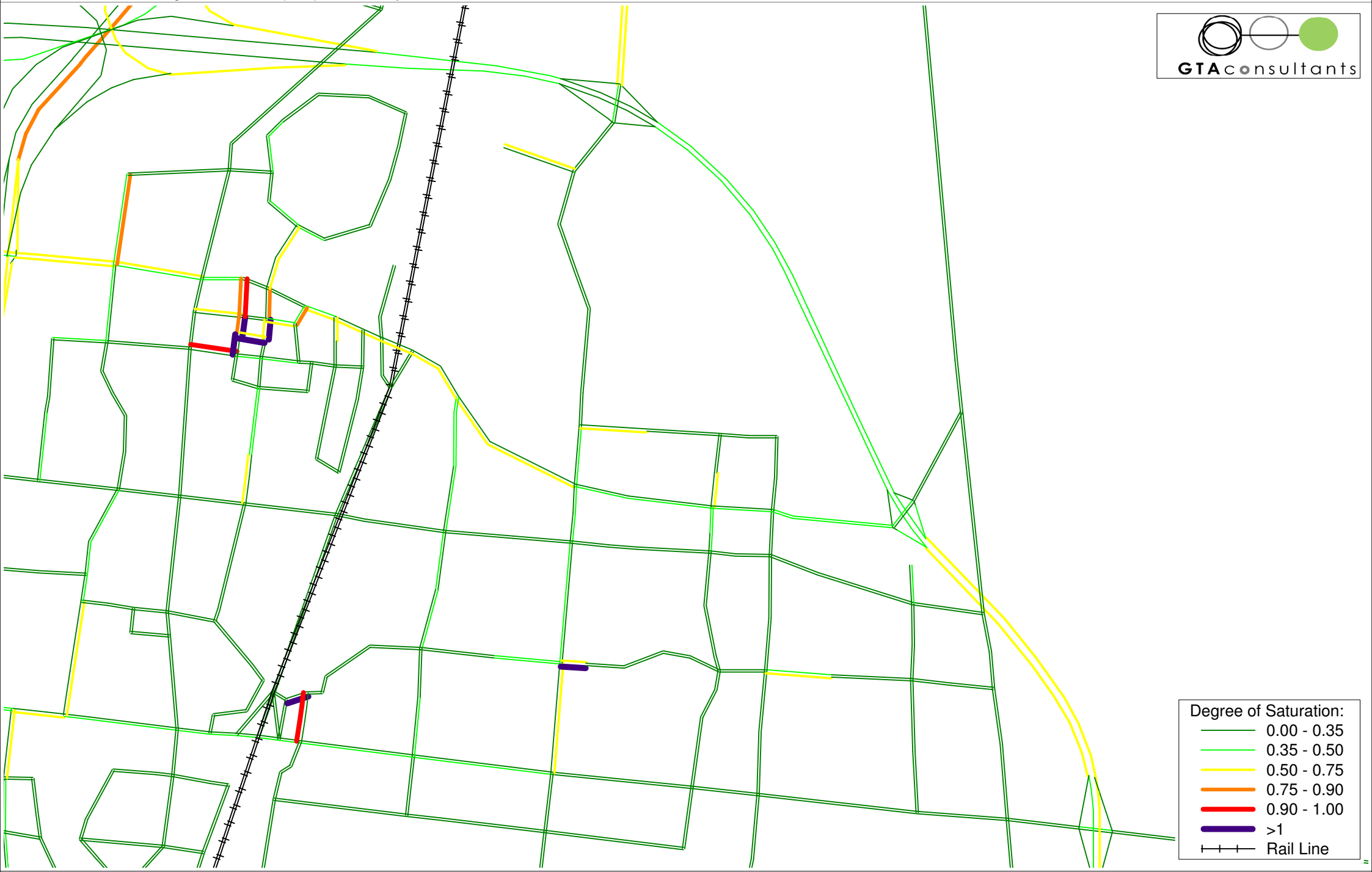
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Degree of Saturation (DOS) Year 2046 Option 2A



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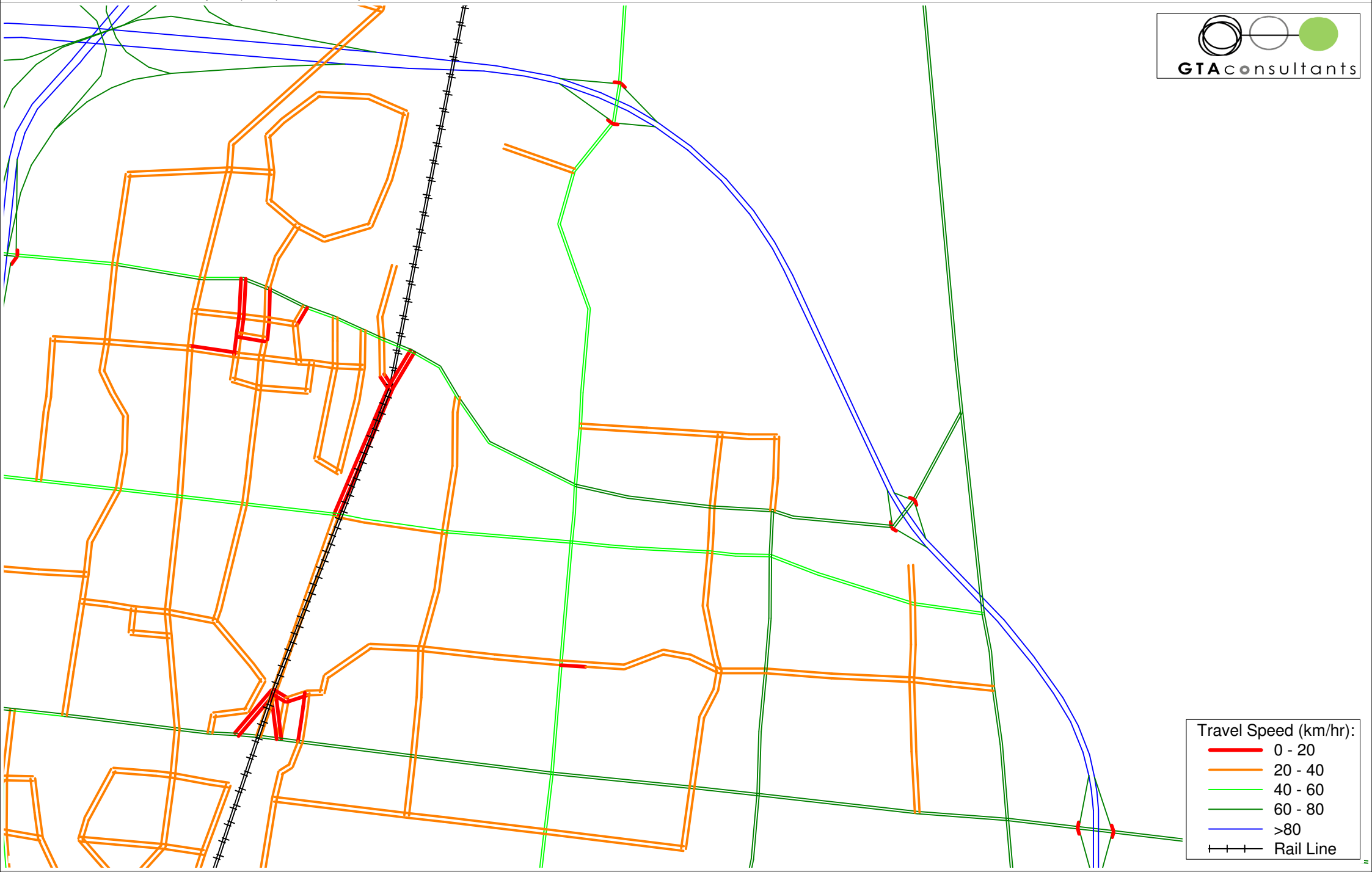
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Travel Speed (km/hr) Year 2046 Option 2A



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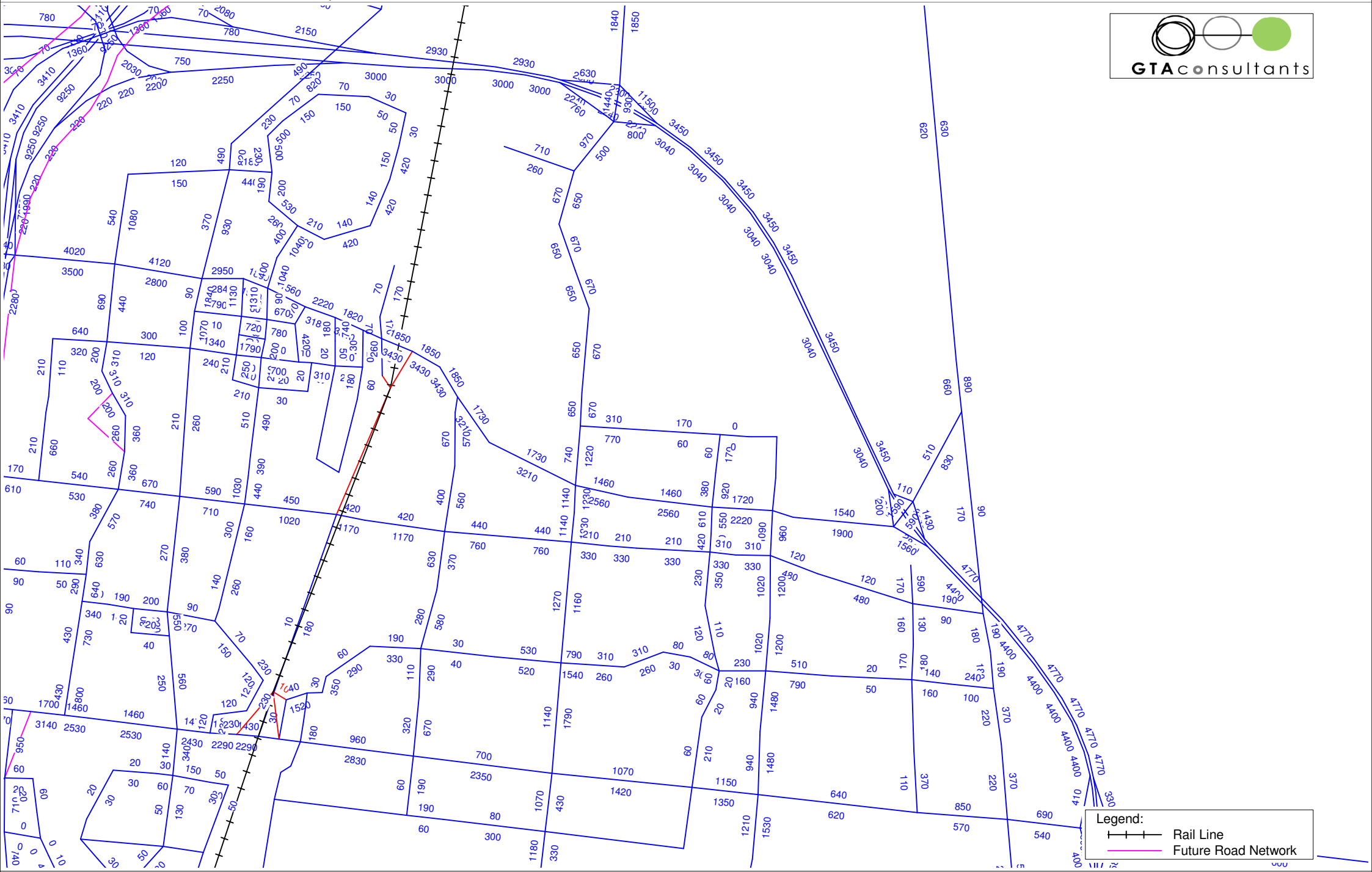
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Peak Total PCU Year 2046 Option 2A



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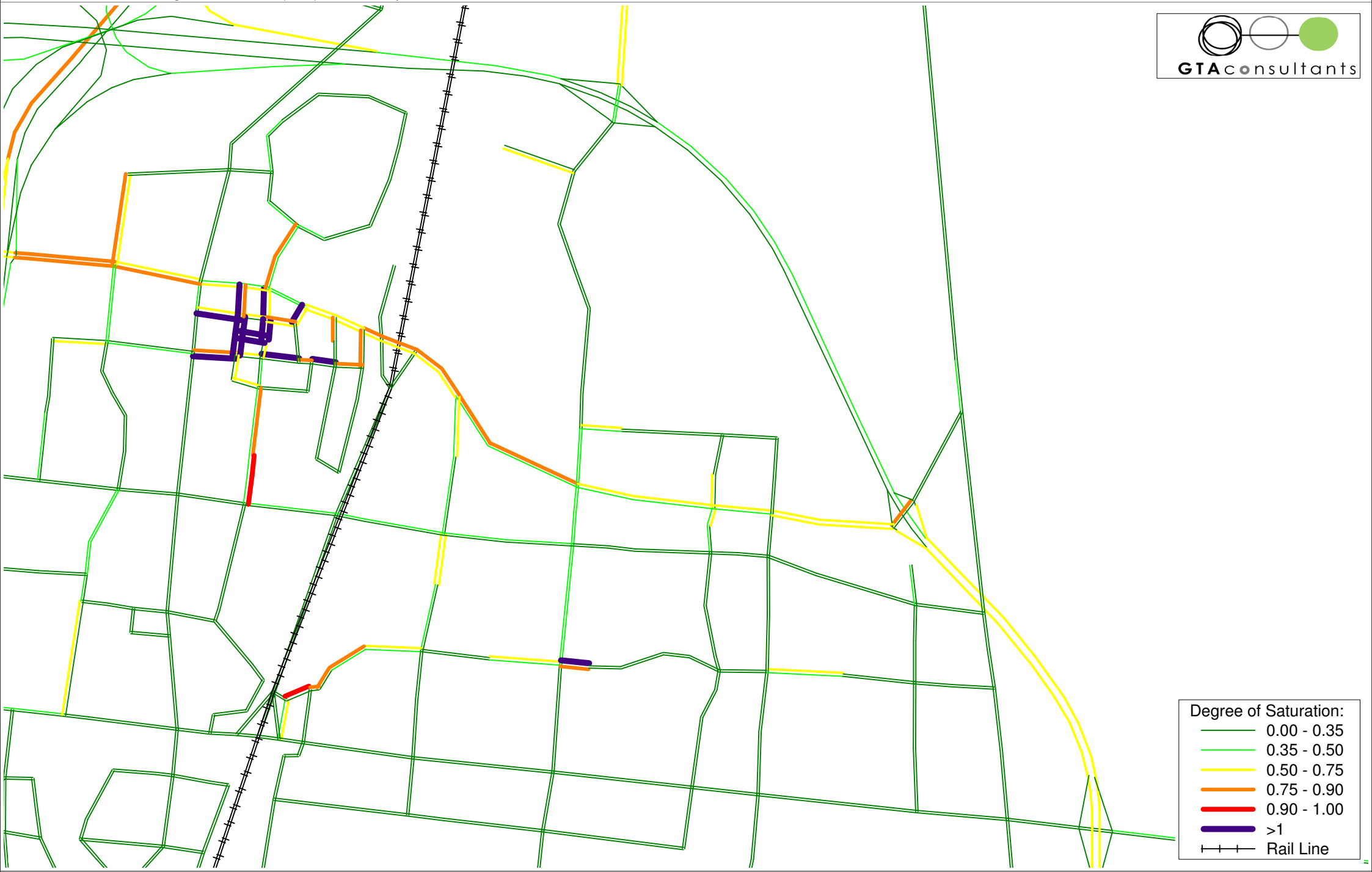
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Degree of Saturation (DOS) Year 2046 Option 2A



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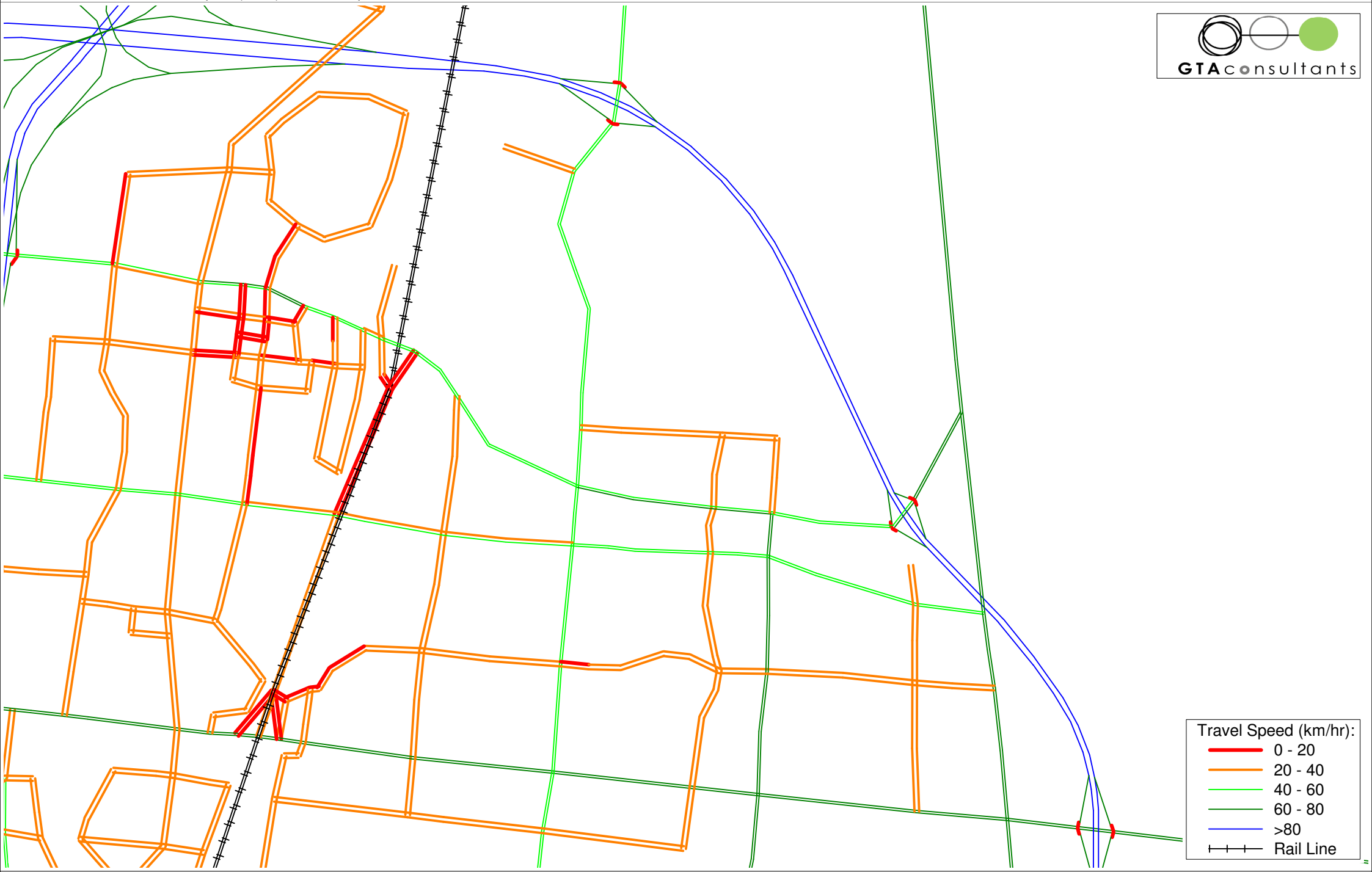
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Travel Speed (km/hr) Year 2046 Option 2A



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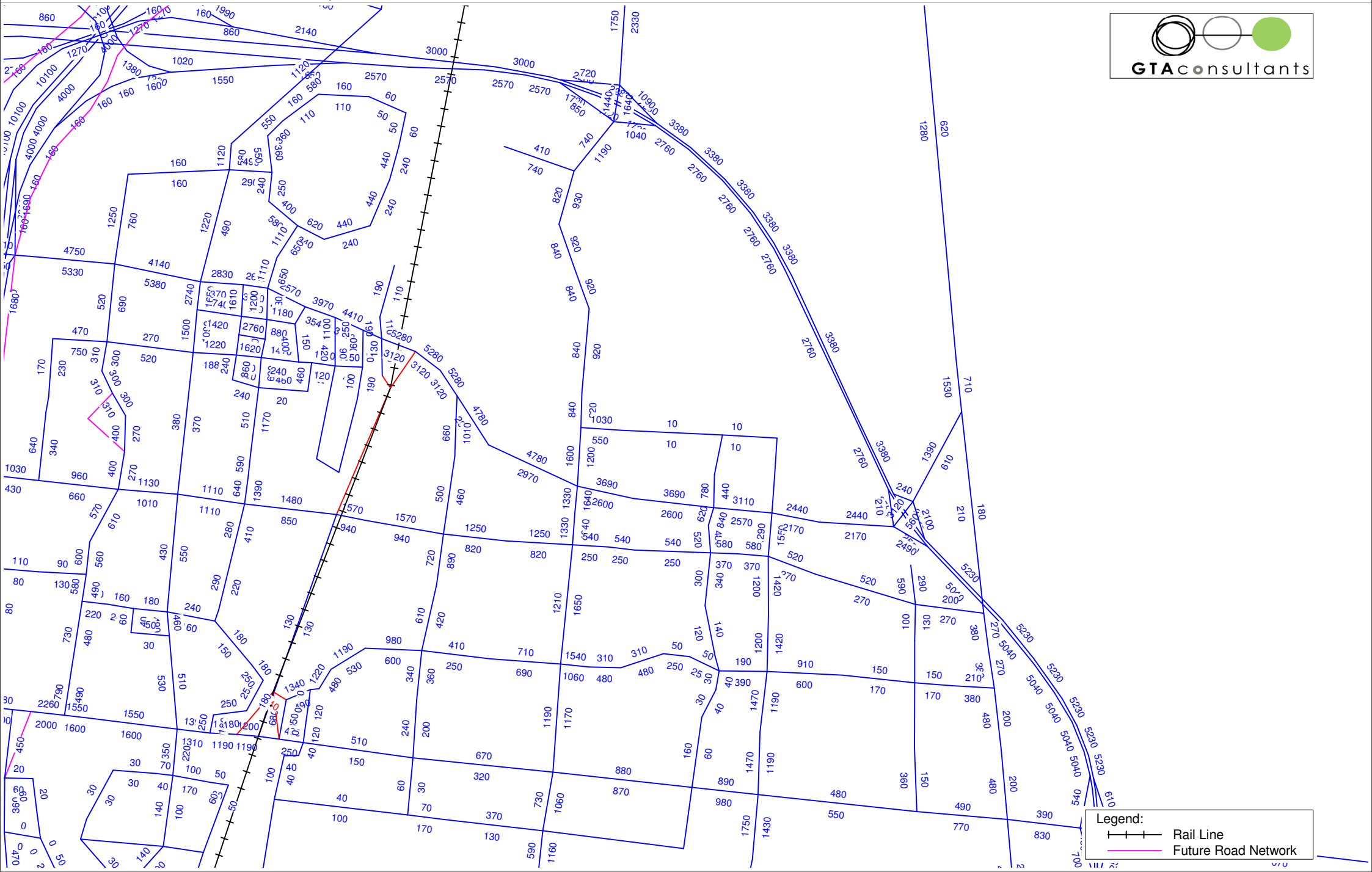
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Peak Total PCU Year 2046 Option 2A



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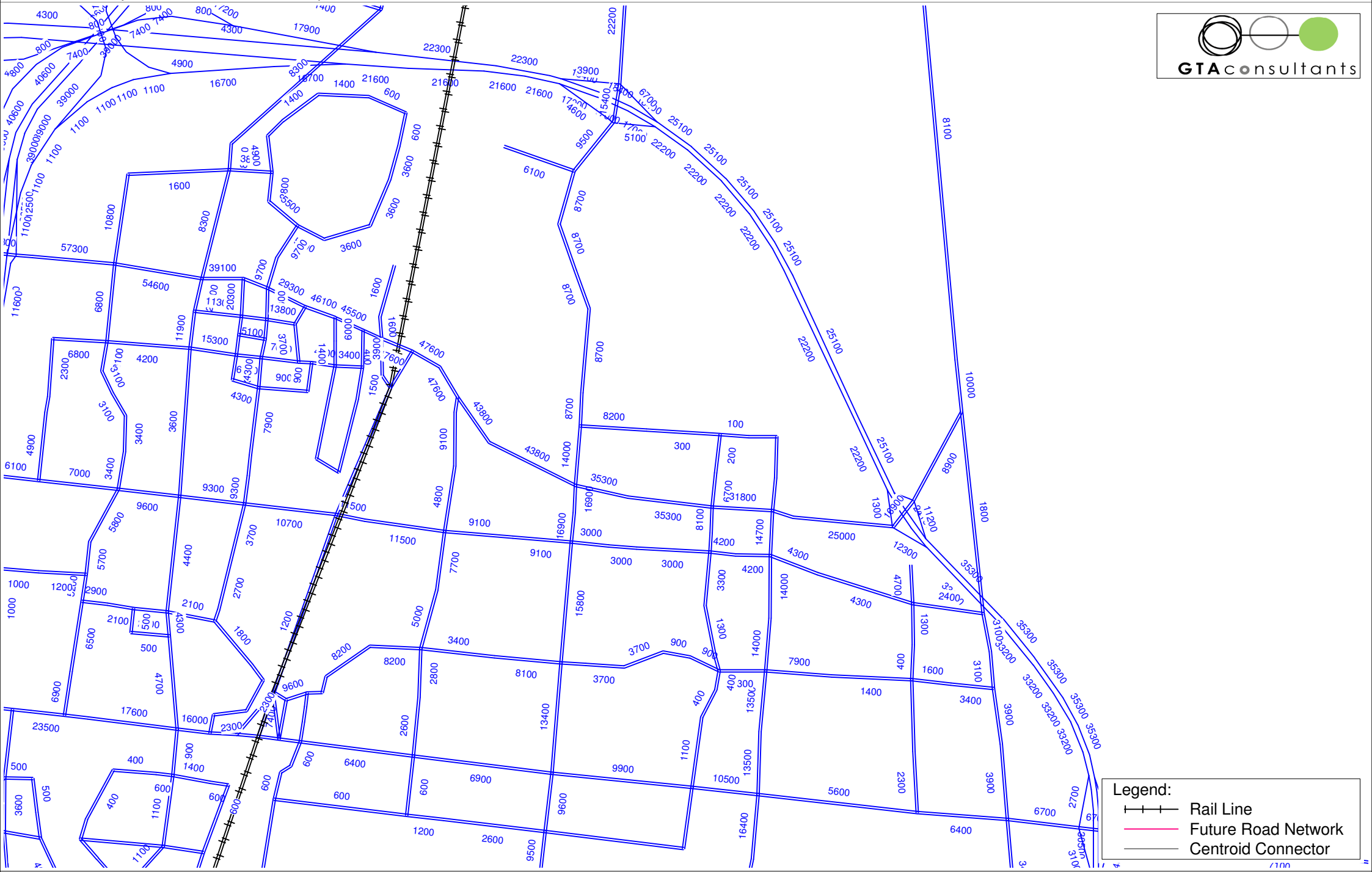
VITM Northern Growth Corridor Model
14M1555000 - Daily Volume Total PCU Year 2046 Option 2A



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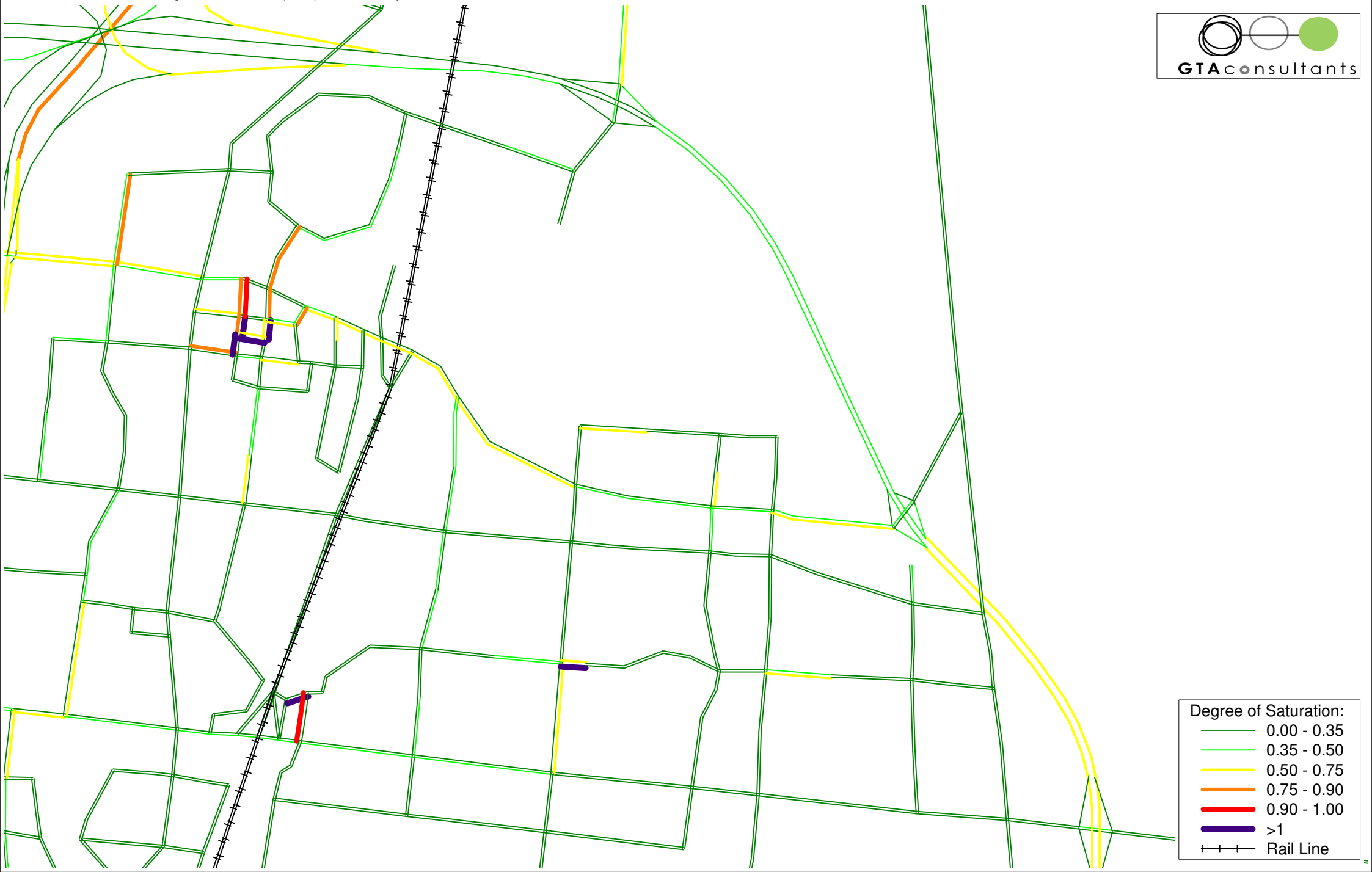
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Degree of Saturation (DOS) Year 2046 Option 2B



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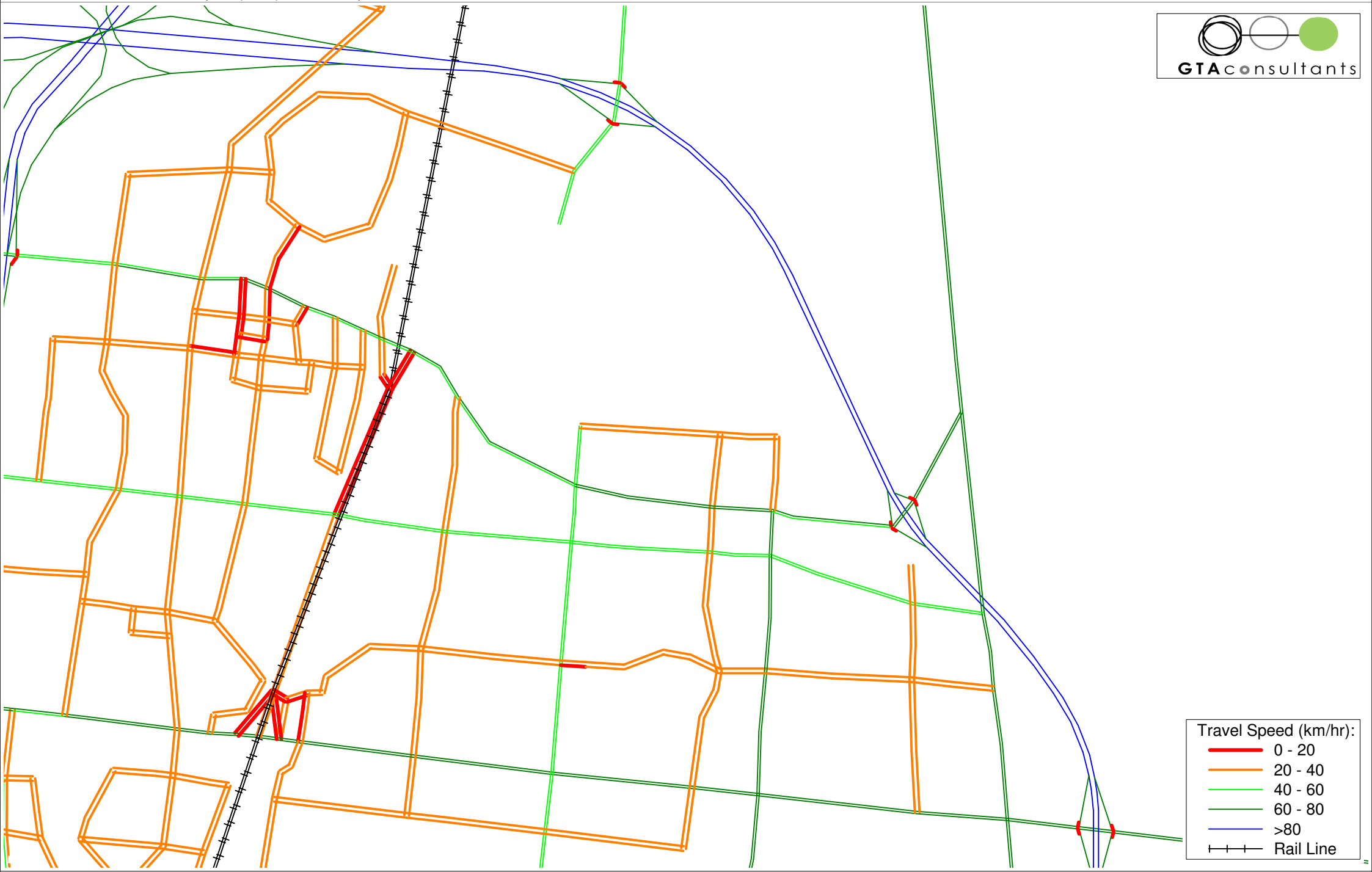
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Travel Speed (km/hr) Year 2046 Option 2B



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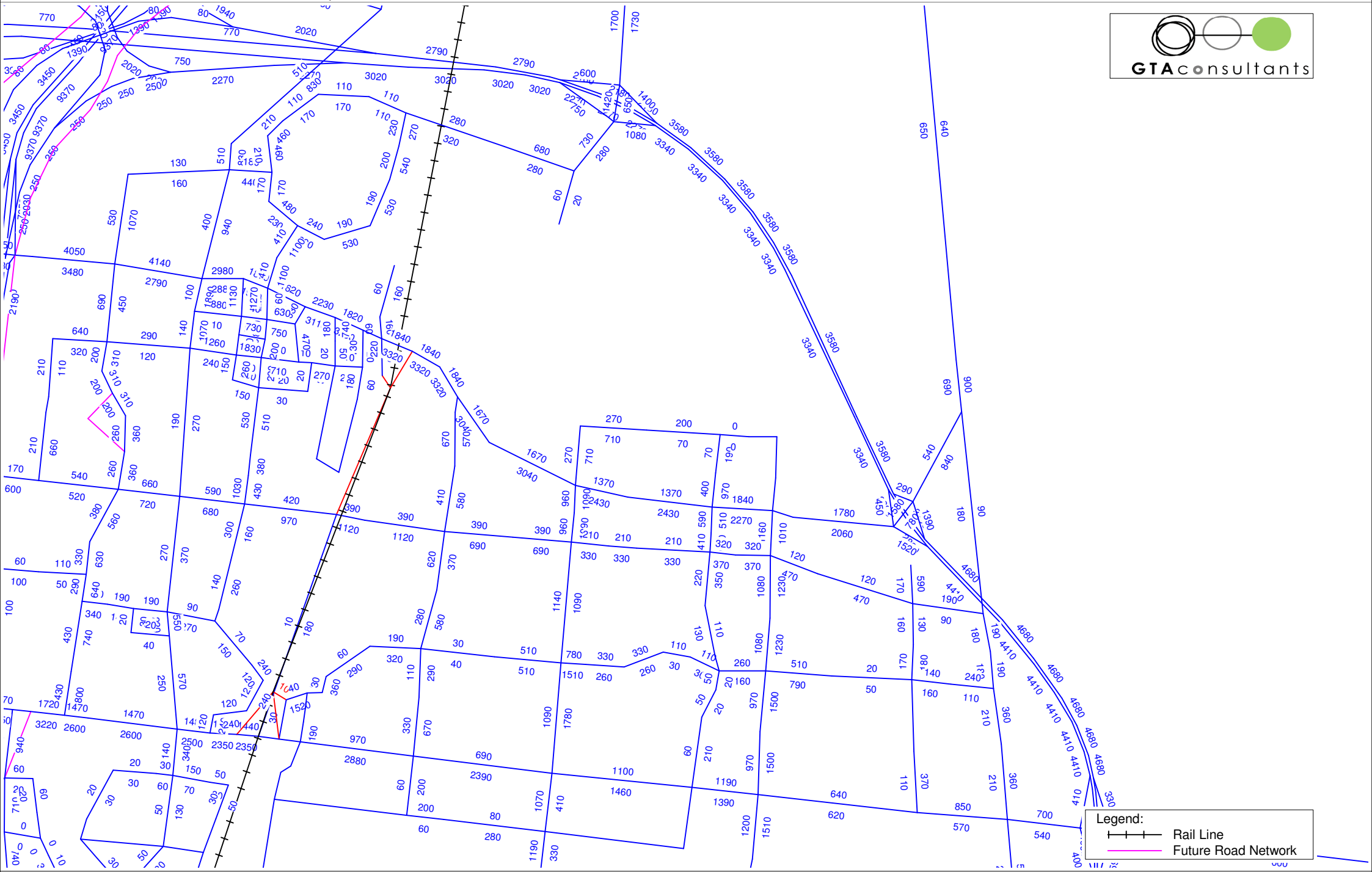
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Peak Total PCU Year 2046 Option 2B



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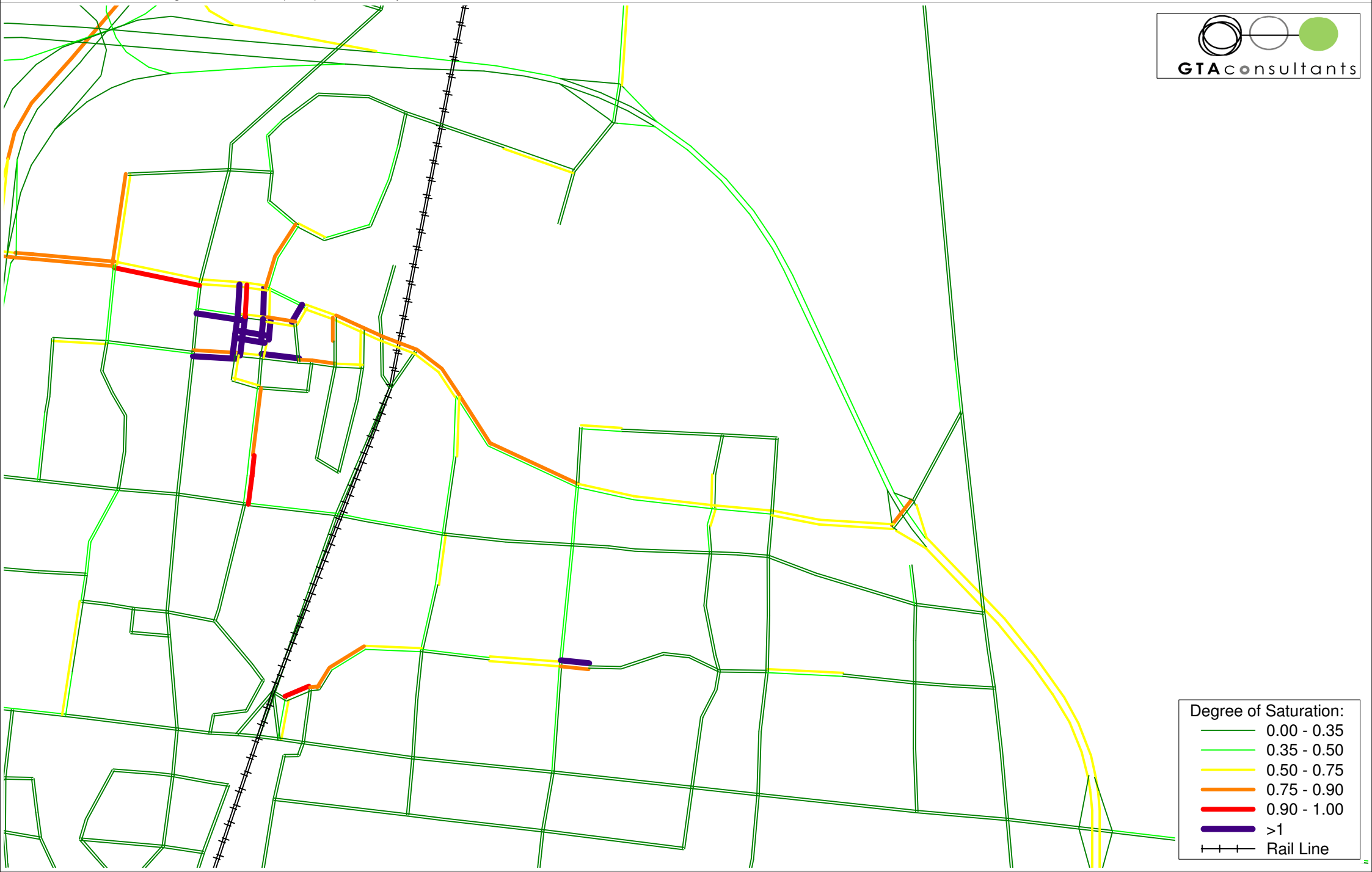
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Degree of Saturation (DOS) Year 2046 Option 2B



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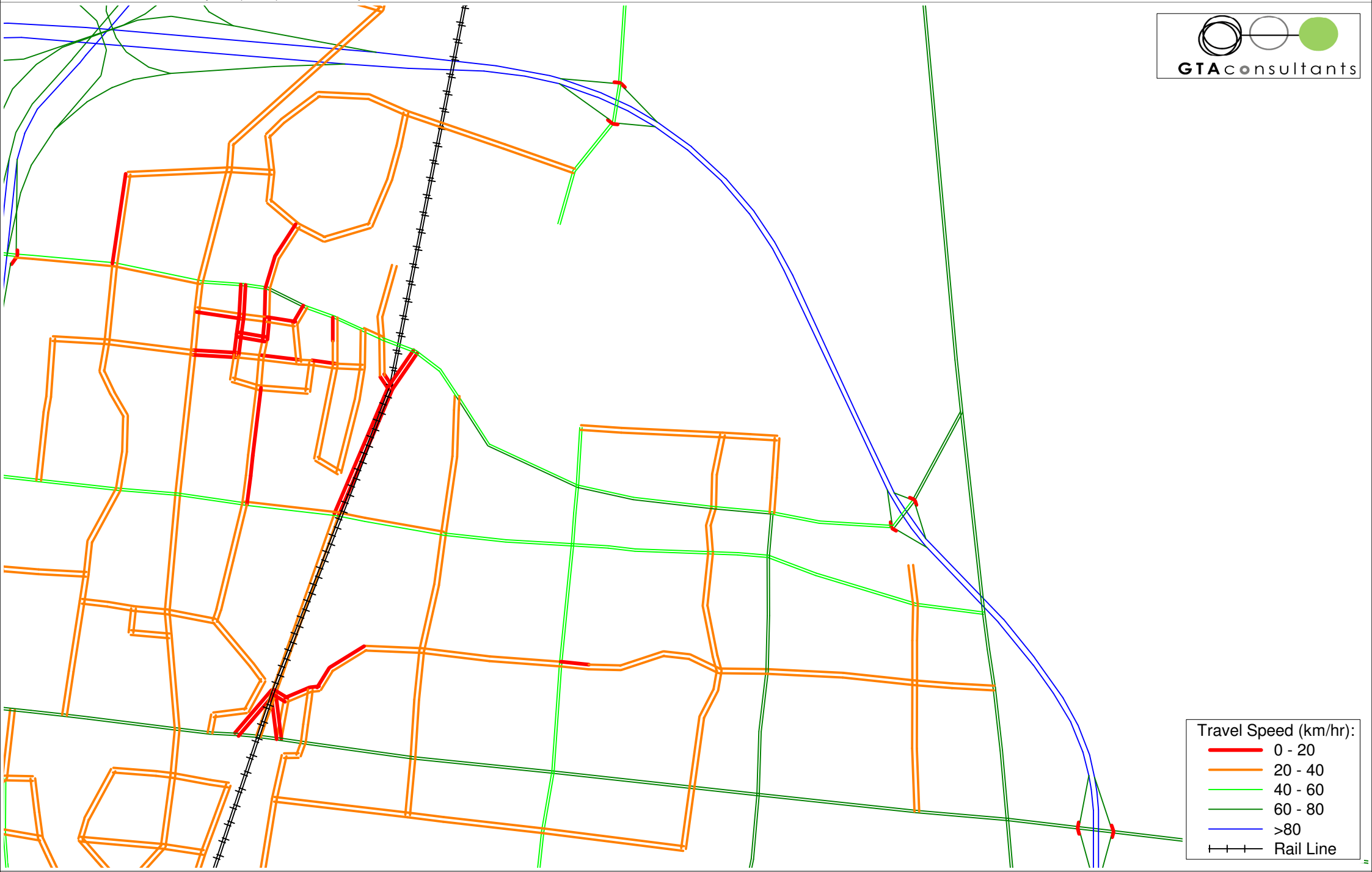
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Travel Speed (km/hr) Year 2046 Option 2B



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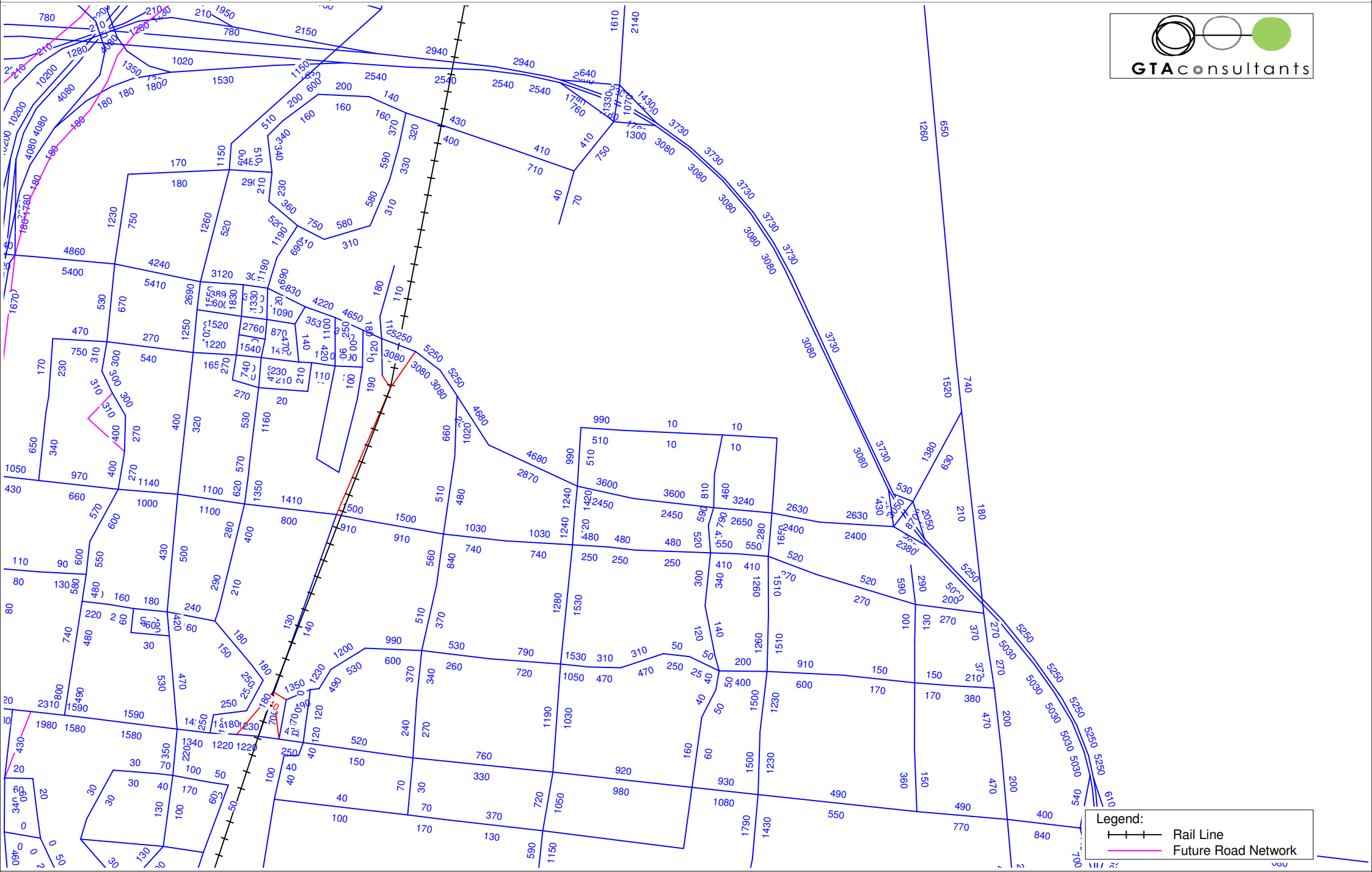
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Peak Total PCU Year 2046 Option 2B



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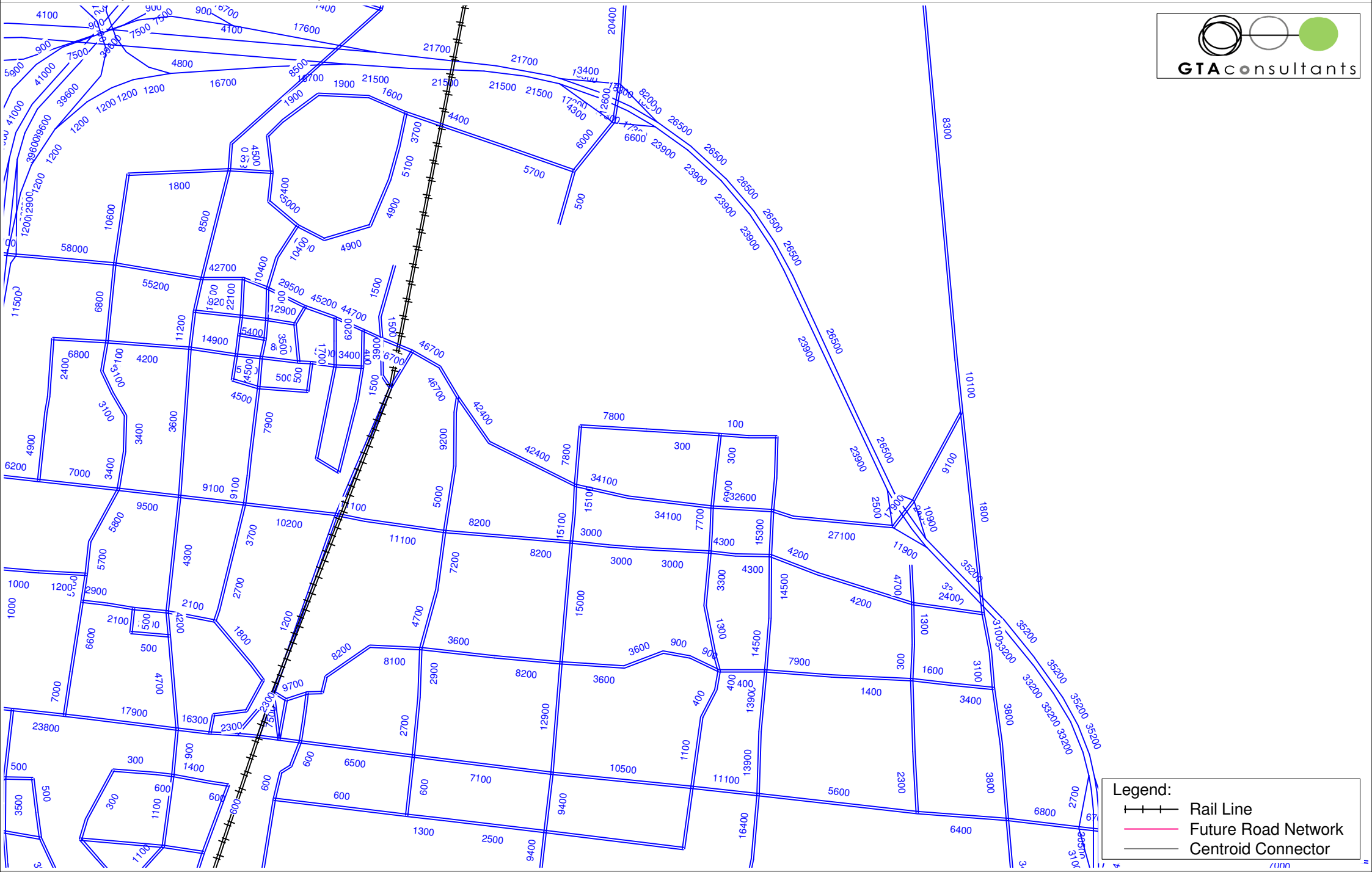
VITM Northern Growth Corridor Model
14M1555000 - Daily Volume Total PCU Year 2046 Option 2B



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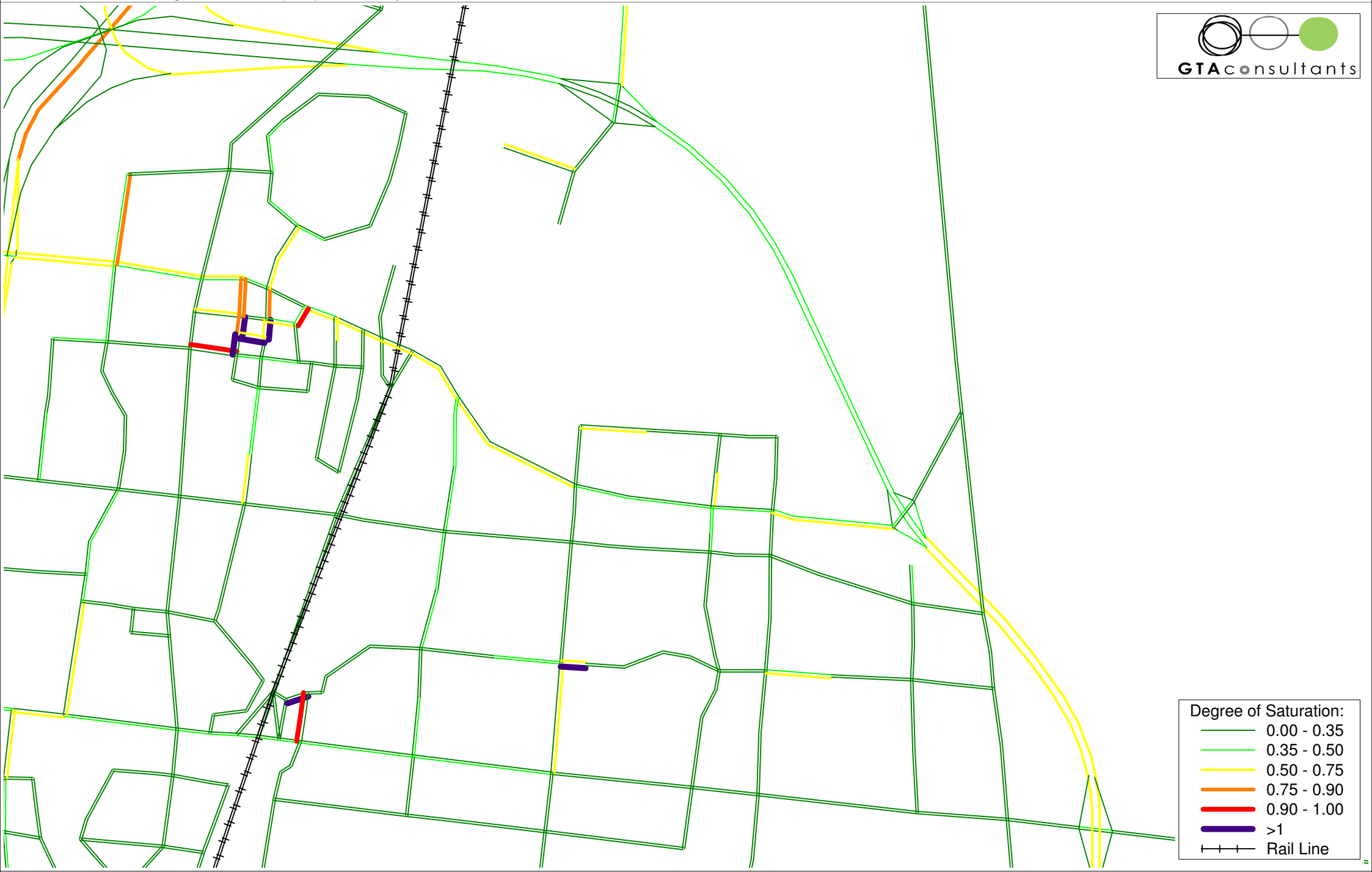
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Degree of Saturation (DOS) Year 2046 Option 2C



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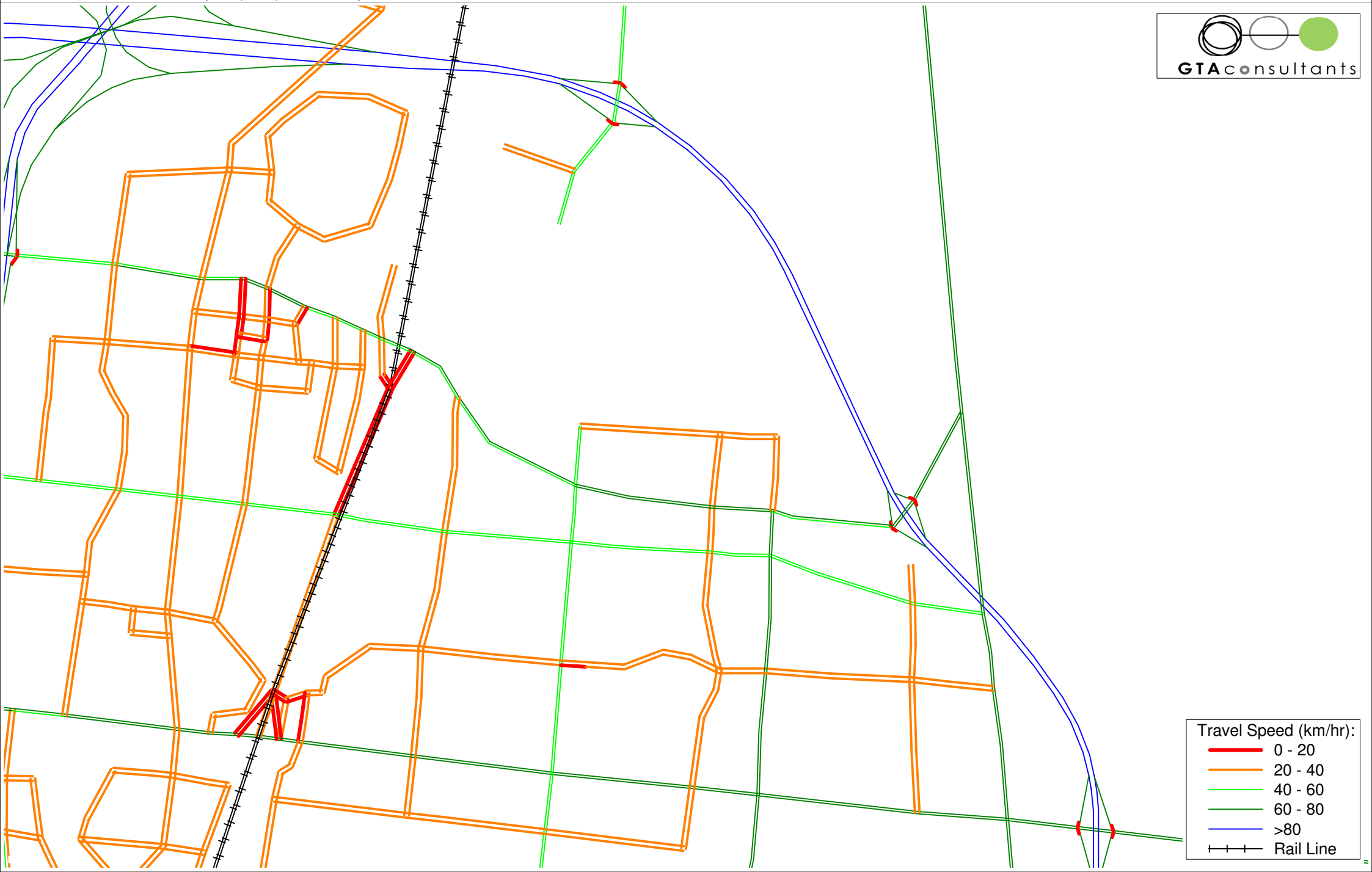
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Travel Speed (km/hr) Year 2046 Option 2C



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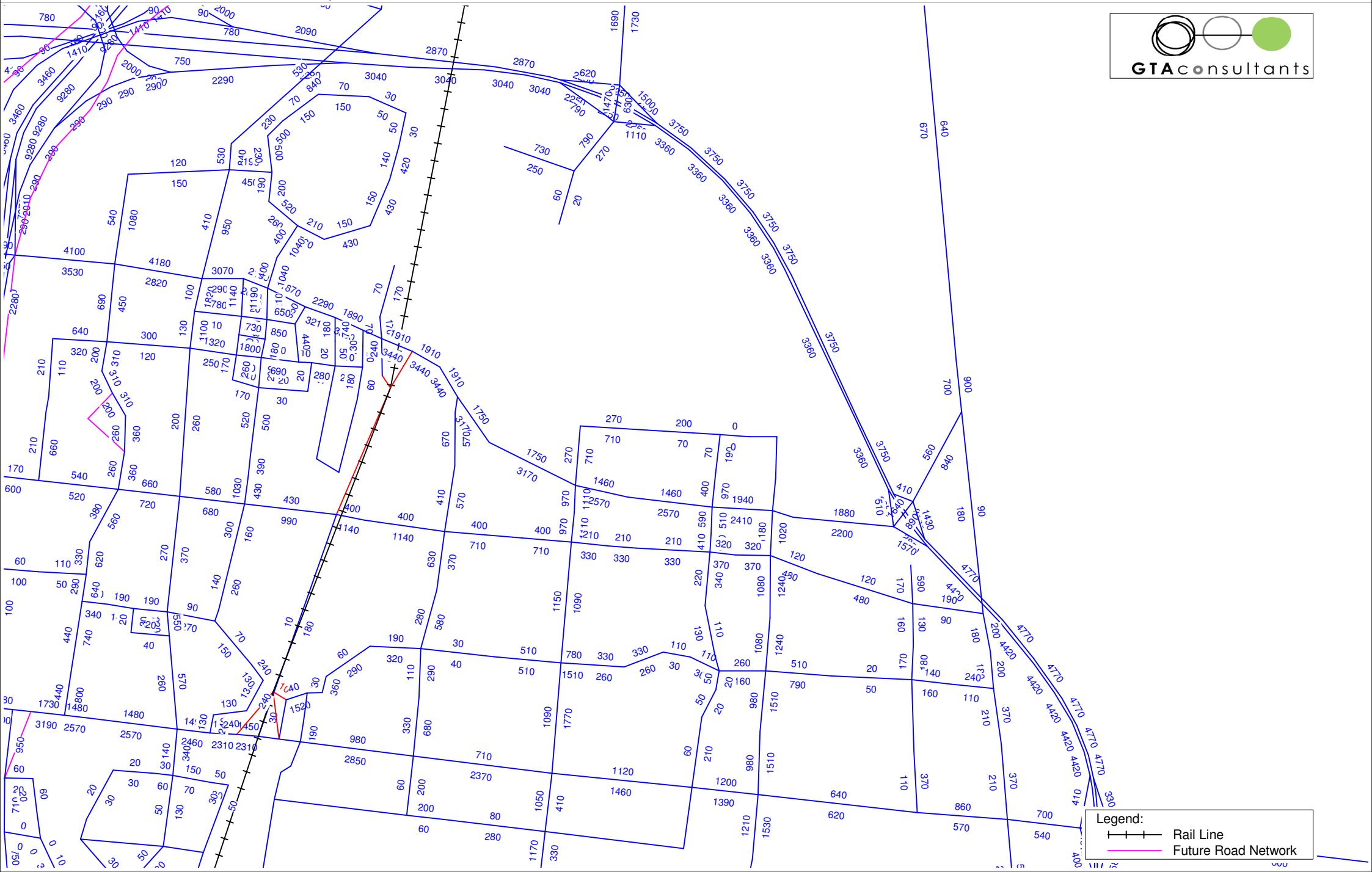
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Peak Total PCU Year 2046 Option 2C



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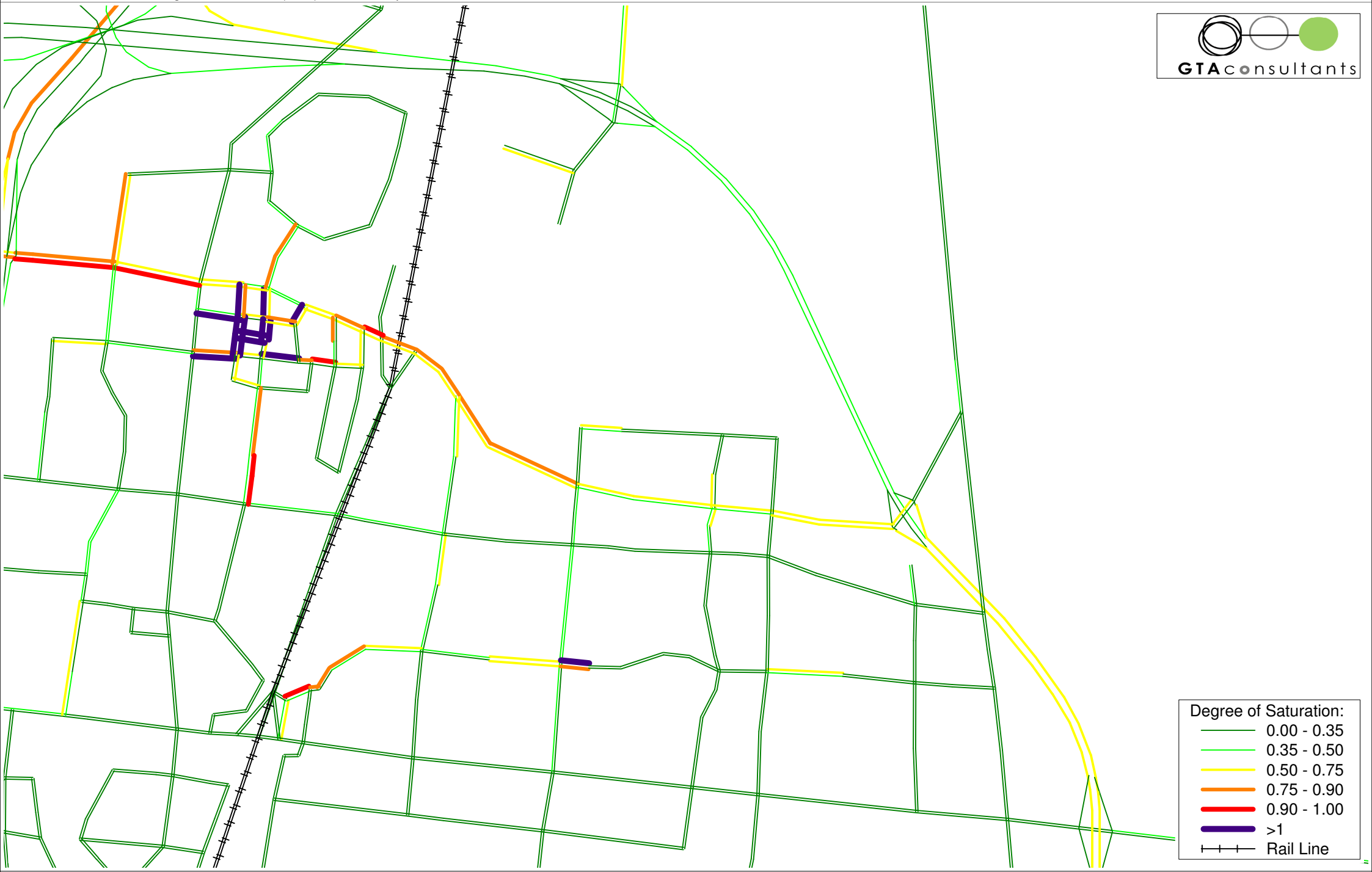
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Degree of Saturation (DOS) Year 2046 Option 2C



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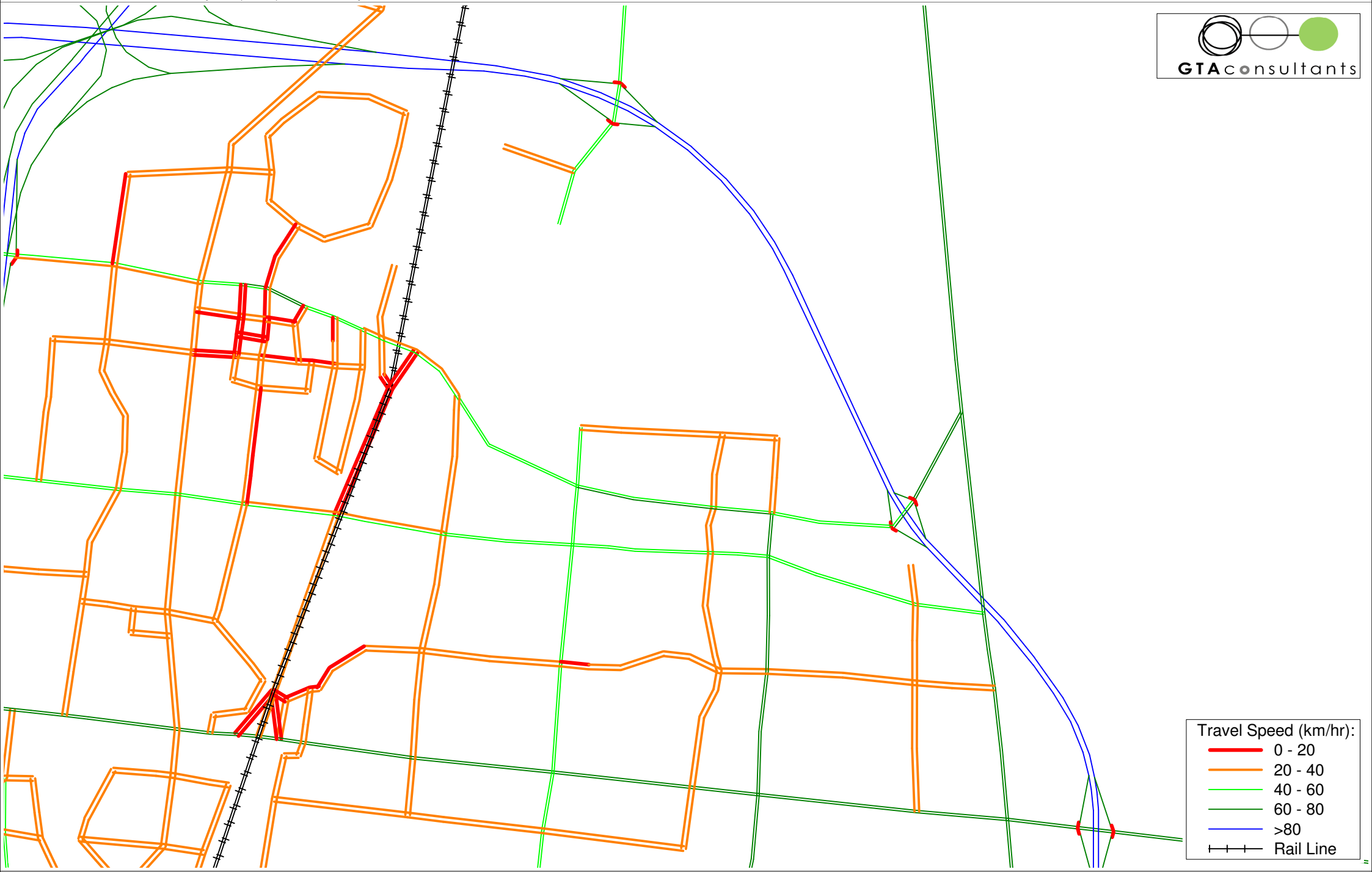
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Travel Speed (km/hr) Year 2046 Option 2C



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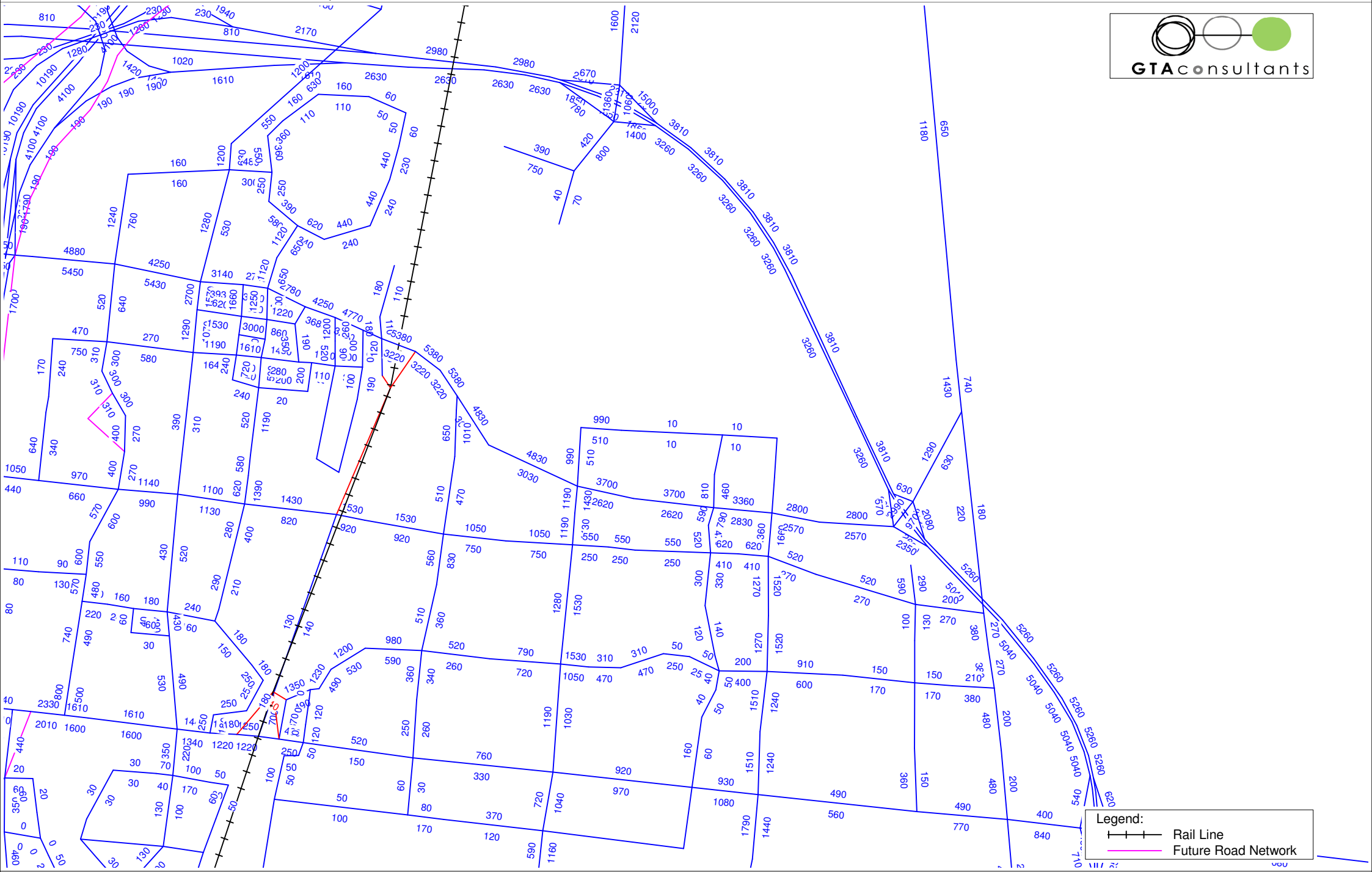
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Peak Total PCU Year 2046 Option 2C



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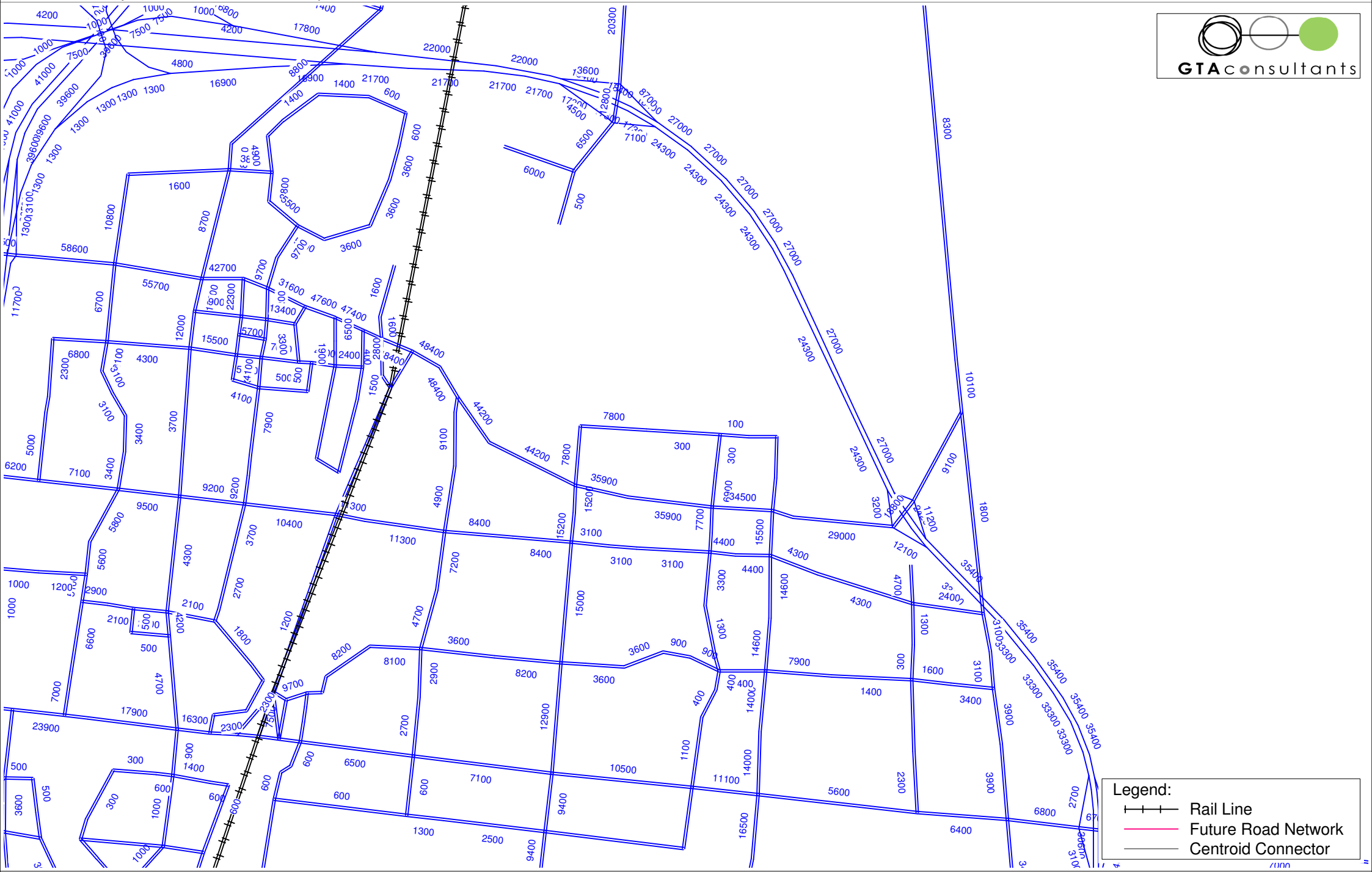
VITM Northern Growth Corridor Model
14M1555000 - Daily Volume Total PCU Year 2046 Option 2C



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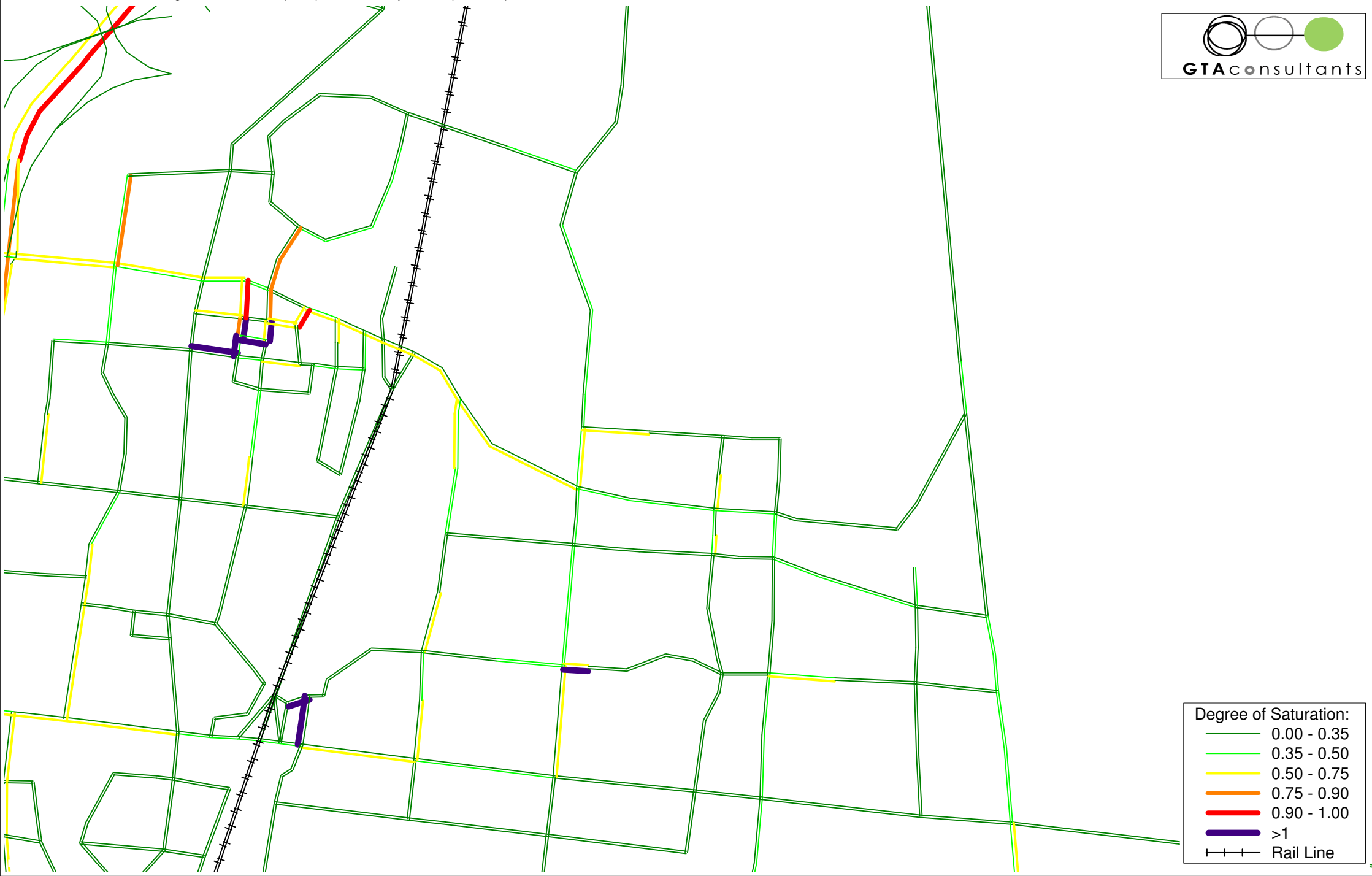
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Degree of Saturation (DOS) Year 2046 Option 3A (No OMR)



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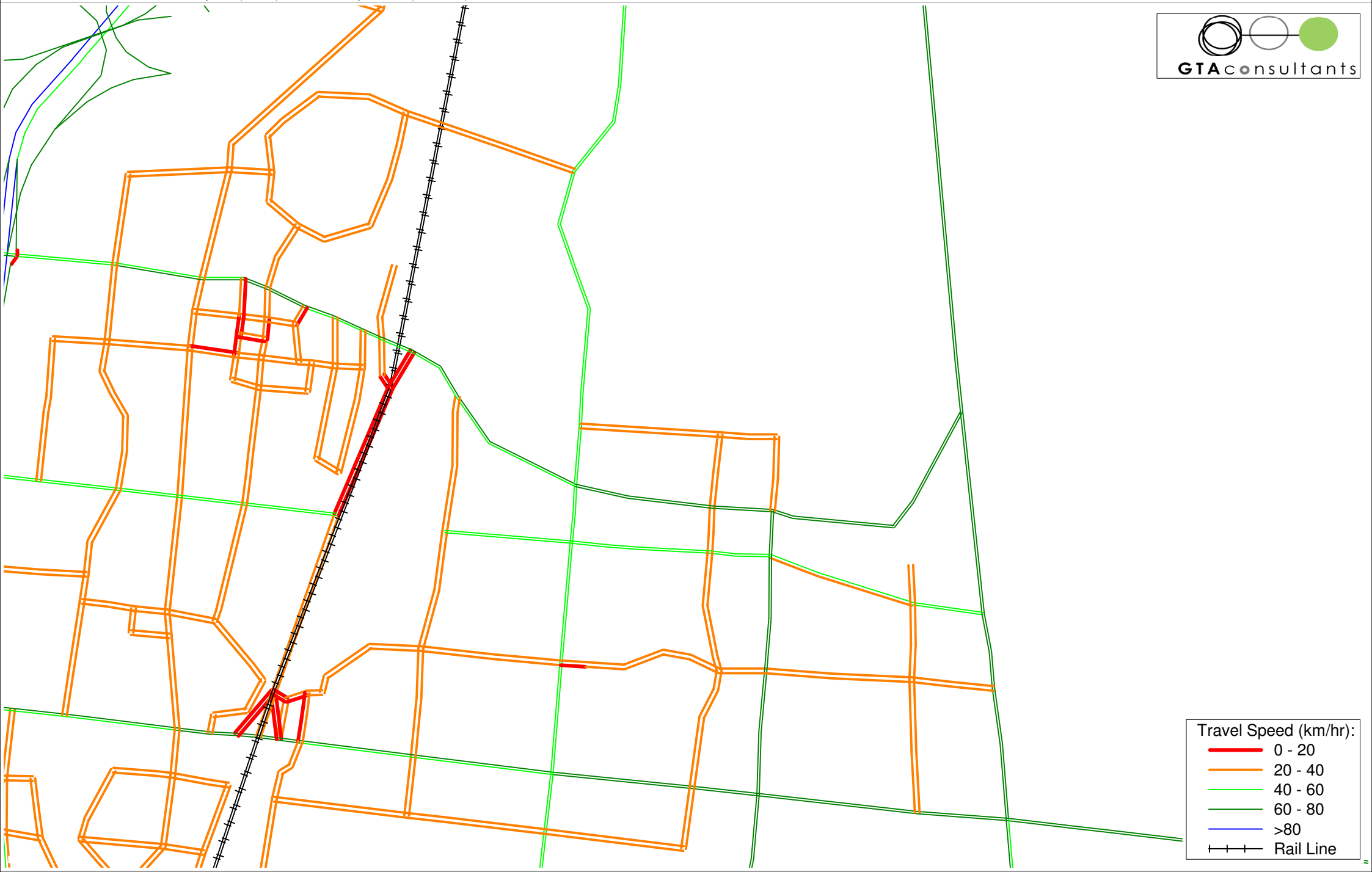
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Travel Speed (km/hr) Year 2046 Option 3A (No OMR)



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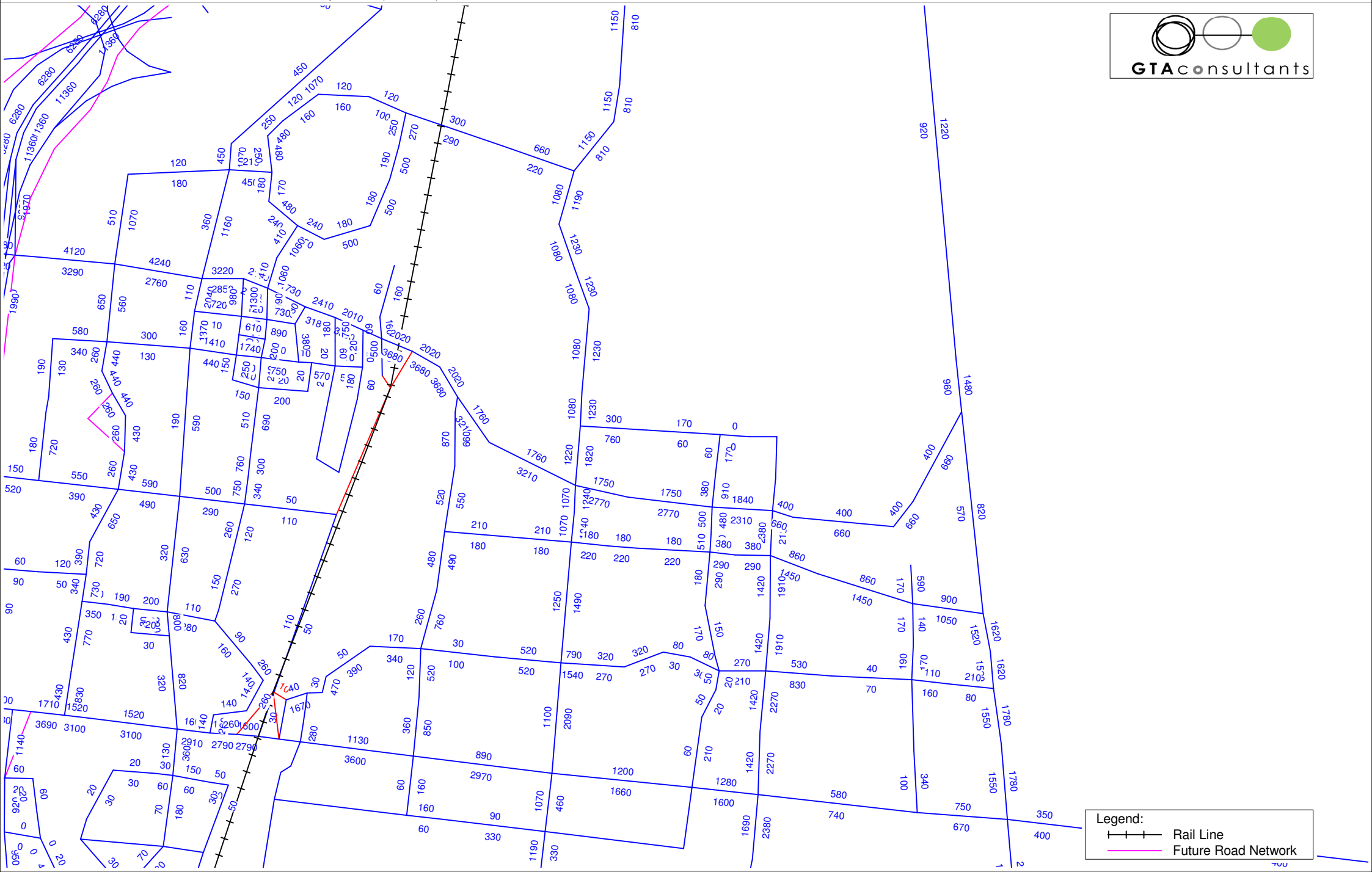
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Peak Total PCU Year 2046 Option 3A (No OMR)



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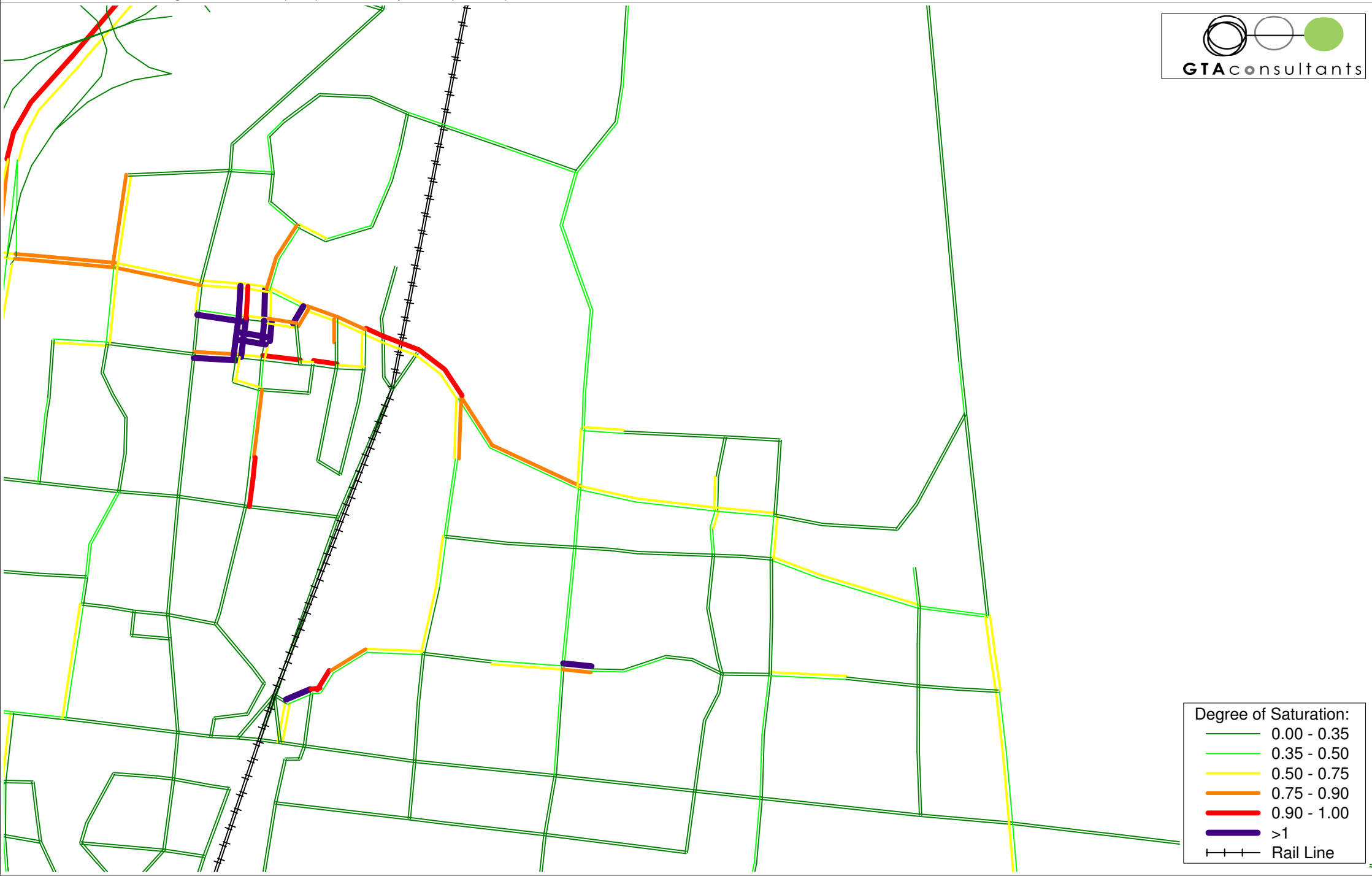
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Degree of Saturation (DOS) Year 2046 Option 3A (No OMR)



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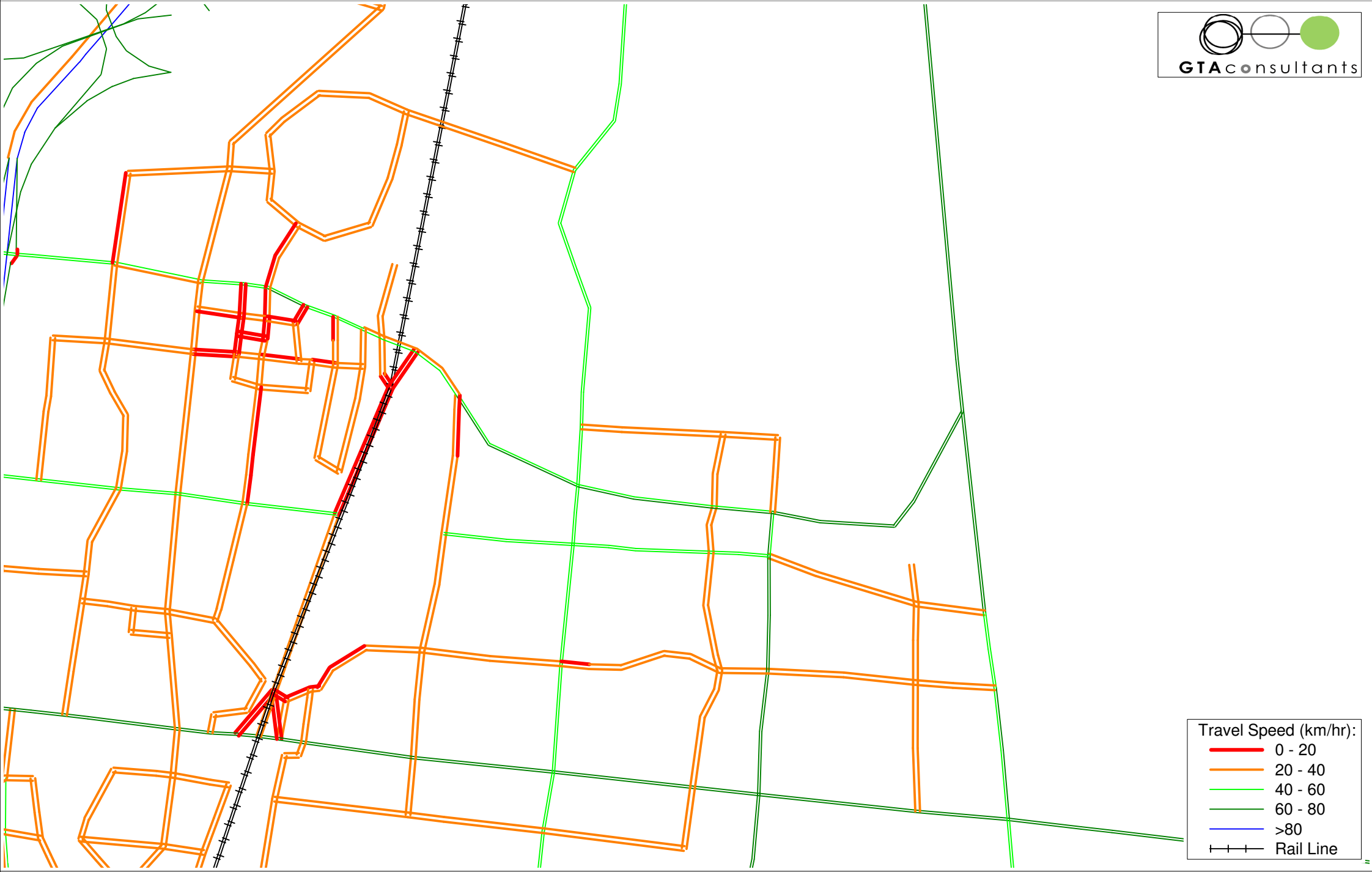
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Travel Speed (km/hr) Year 2046 Option 3A (No OMR)



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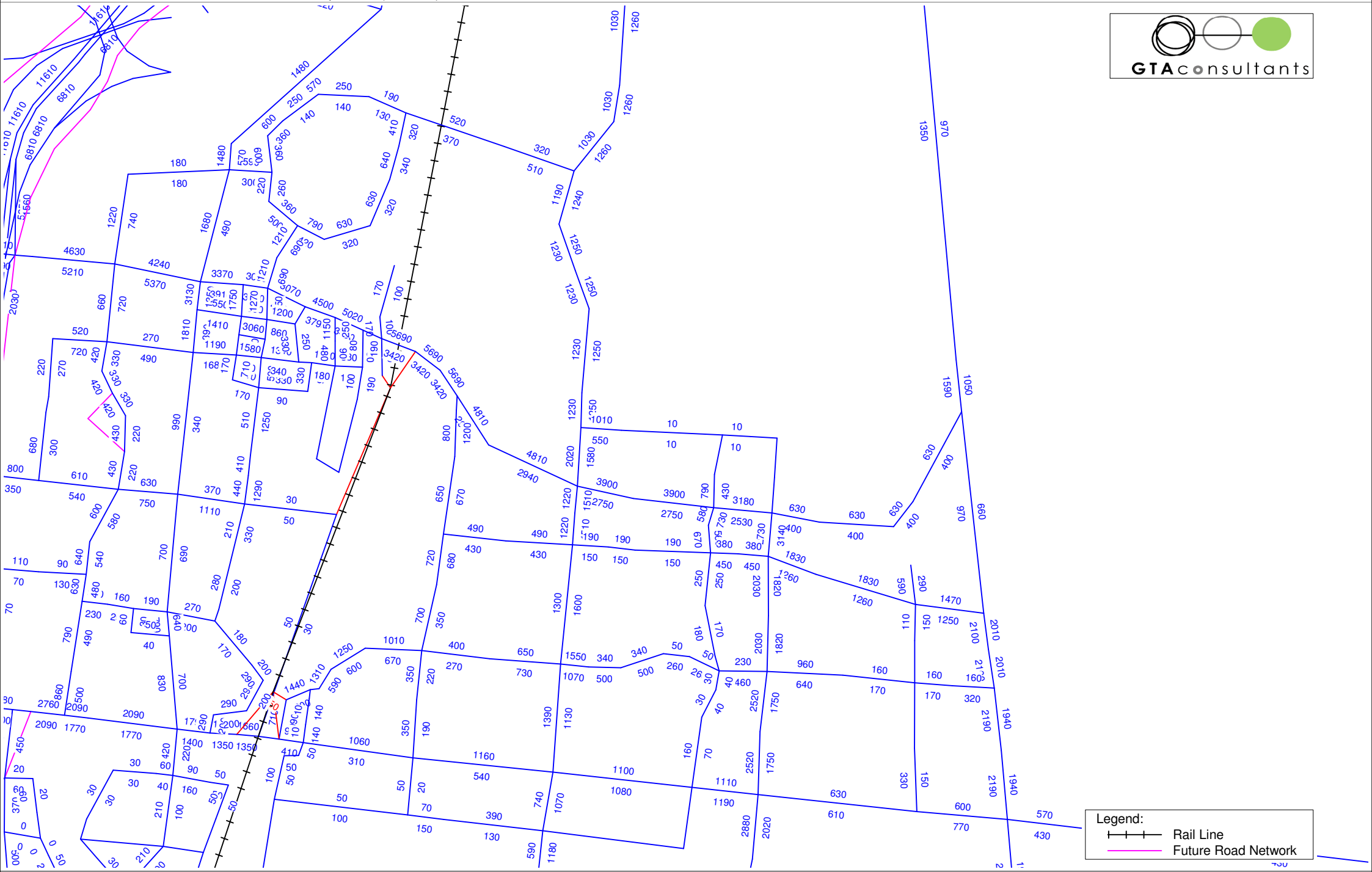
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Peak Total PCU Year 2046 Option 3A (No OMR)



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VITM Northern Growth Corridor Model
14M1555000 - Daily Volume Total PCU Year 2046 Option 3A (No OMR)

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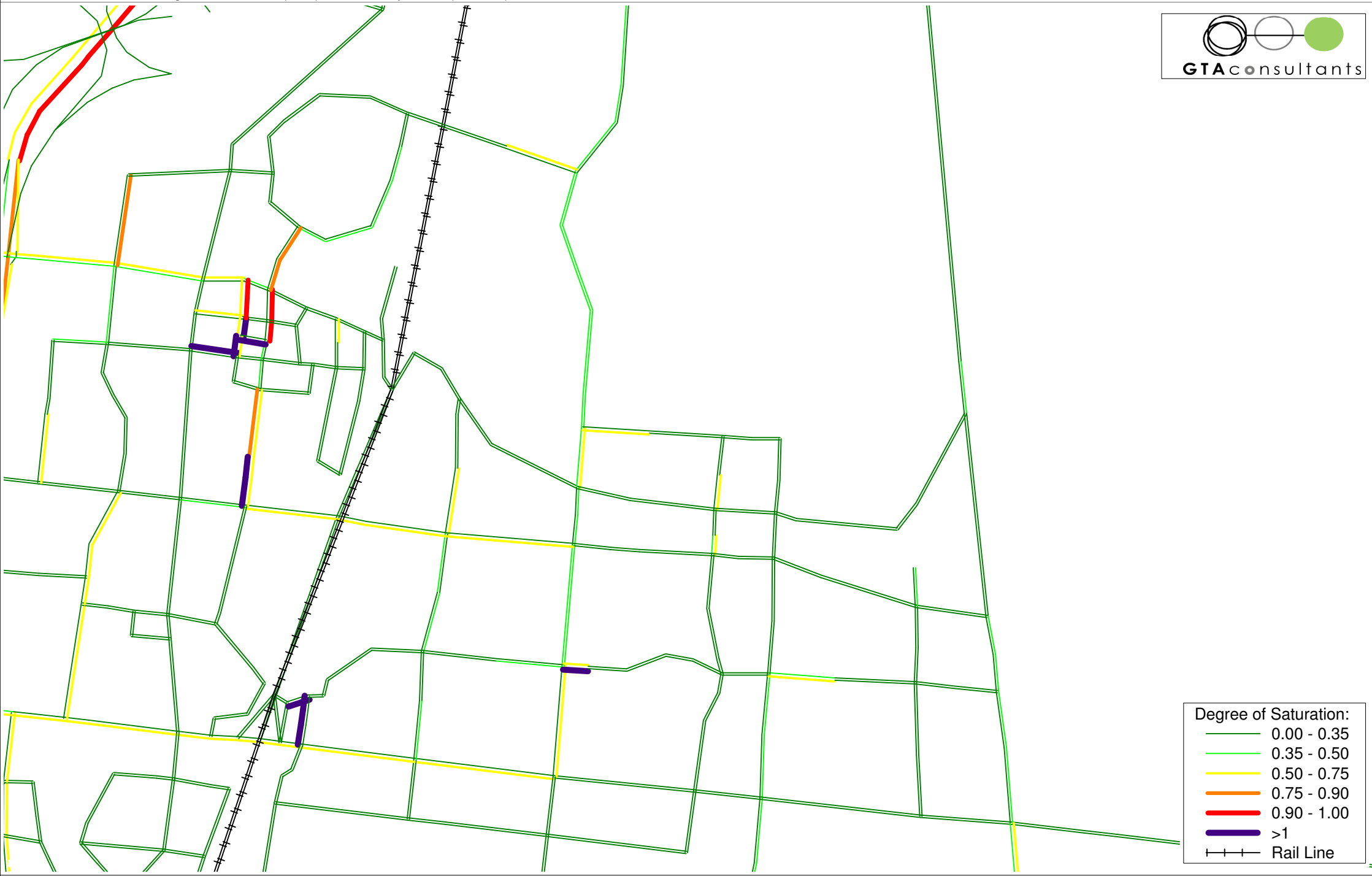
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Degree of Saturation (DOS) Year 2046 Option 3B (No OMR)



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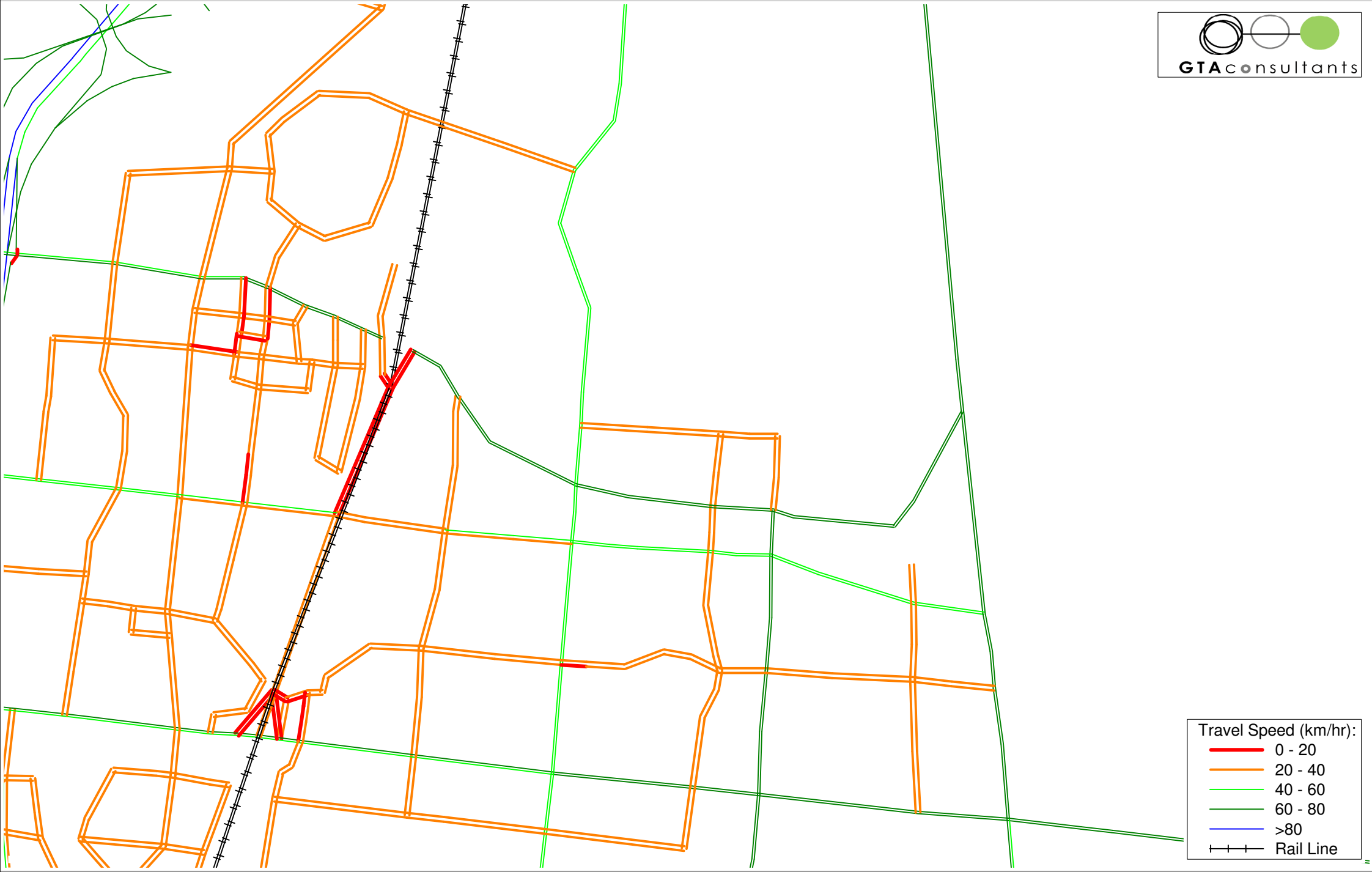
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Travel Speed (km/hr) Year 2046 Option 3B (No OMR)



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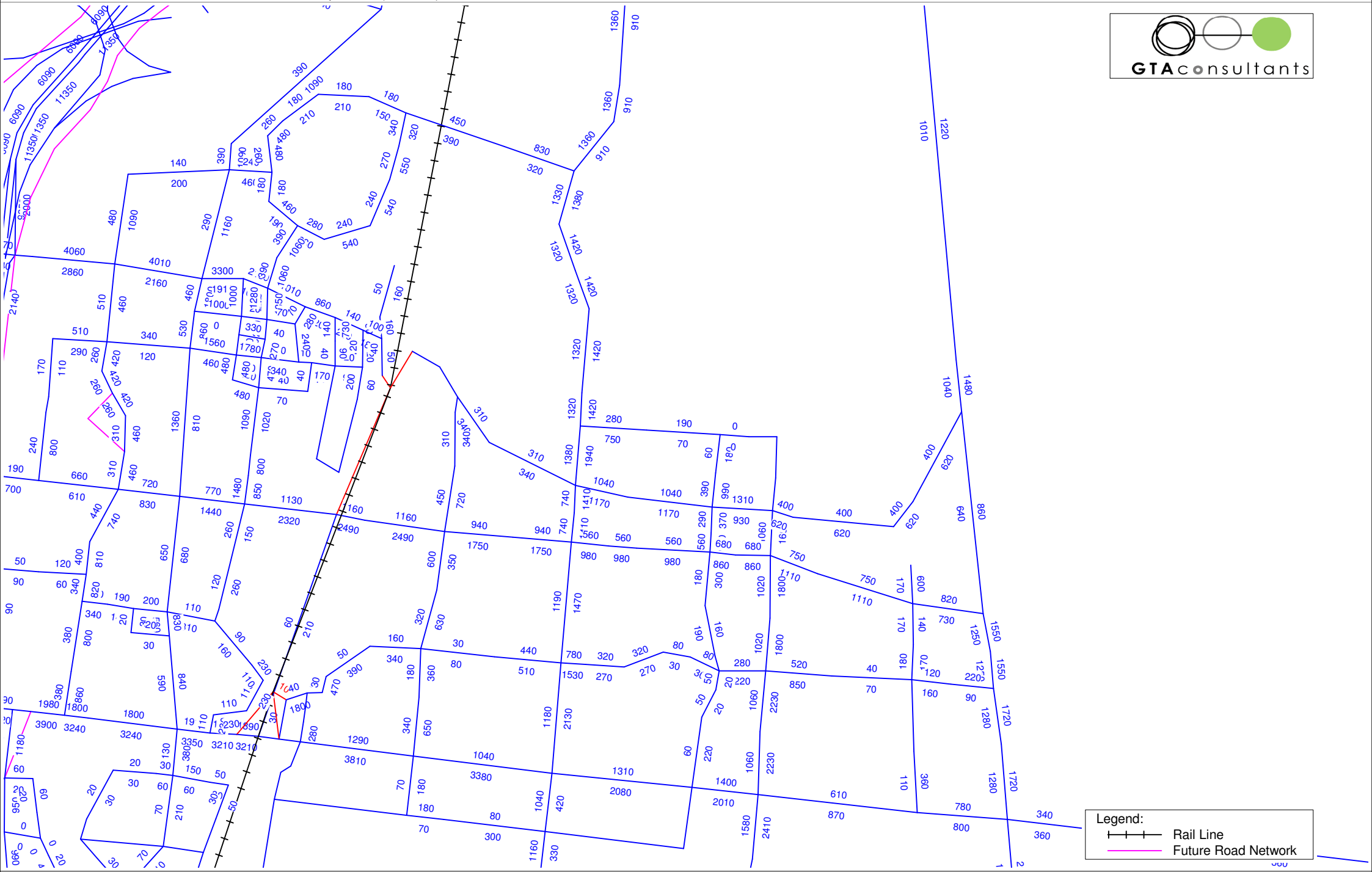
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Peak Total PCU Year 2046 Optoin 3B (No OMR)



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VITM Northern Growth Corridor Model
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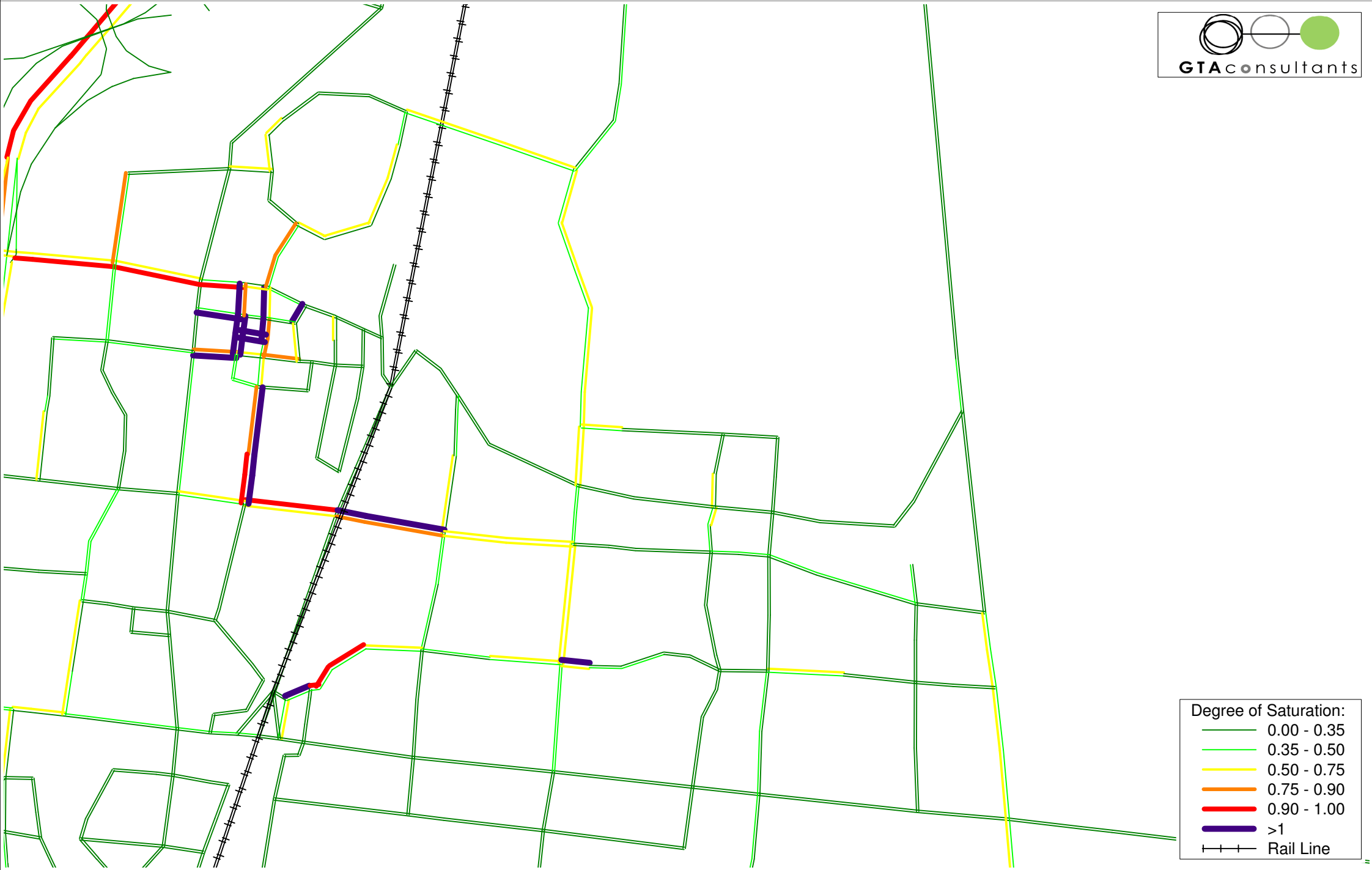

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VITM Northern Growth Corridor Model
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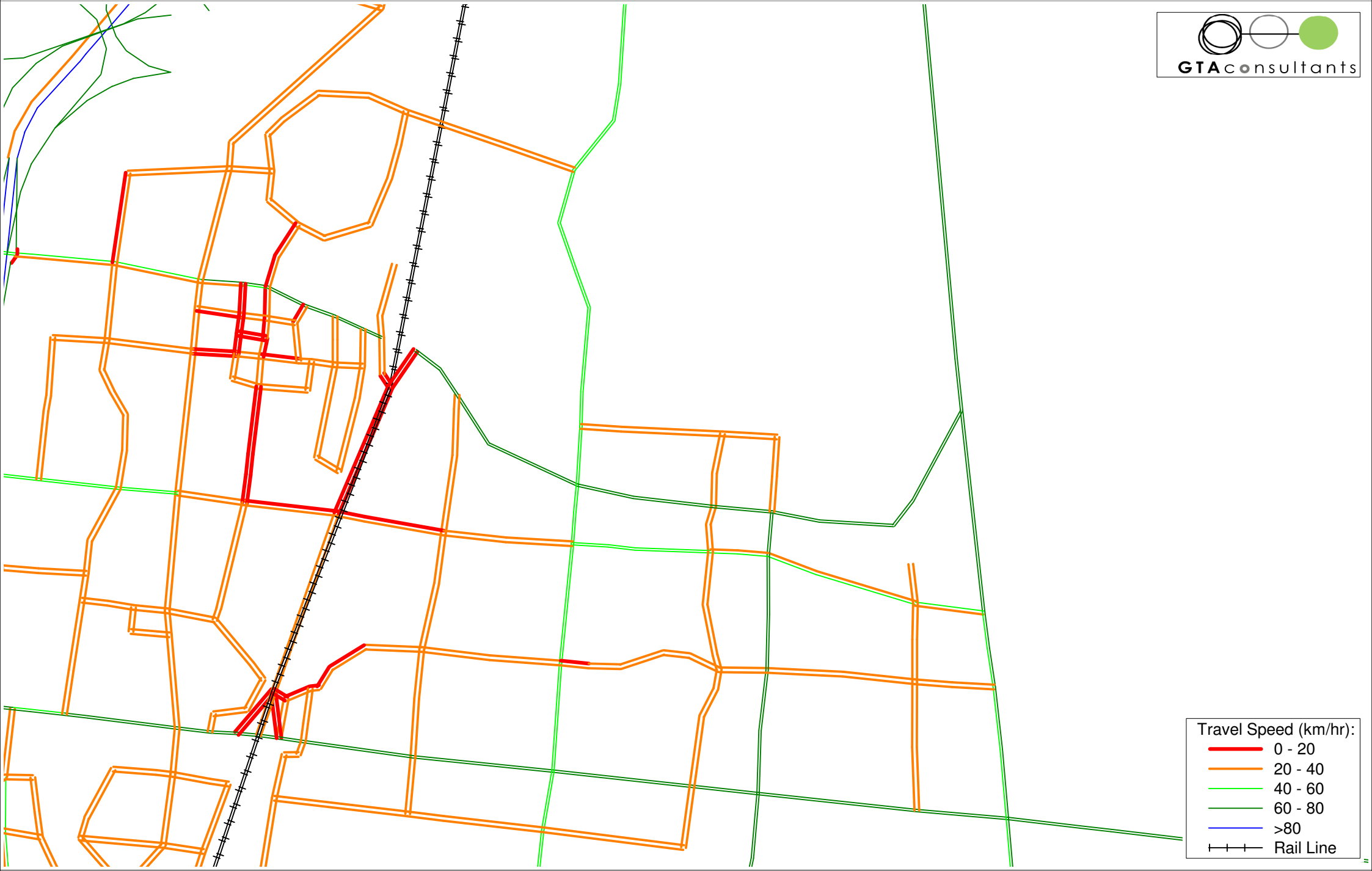

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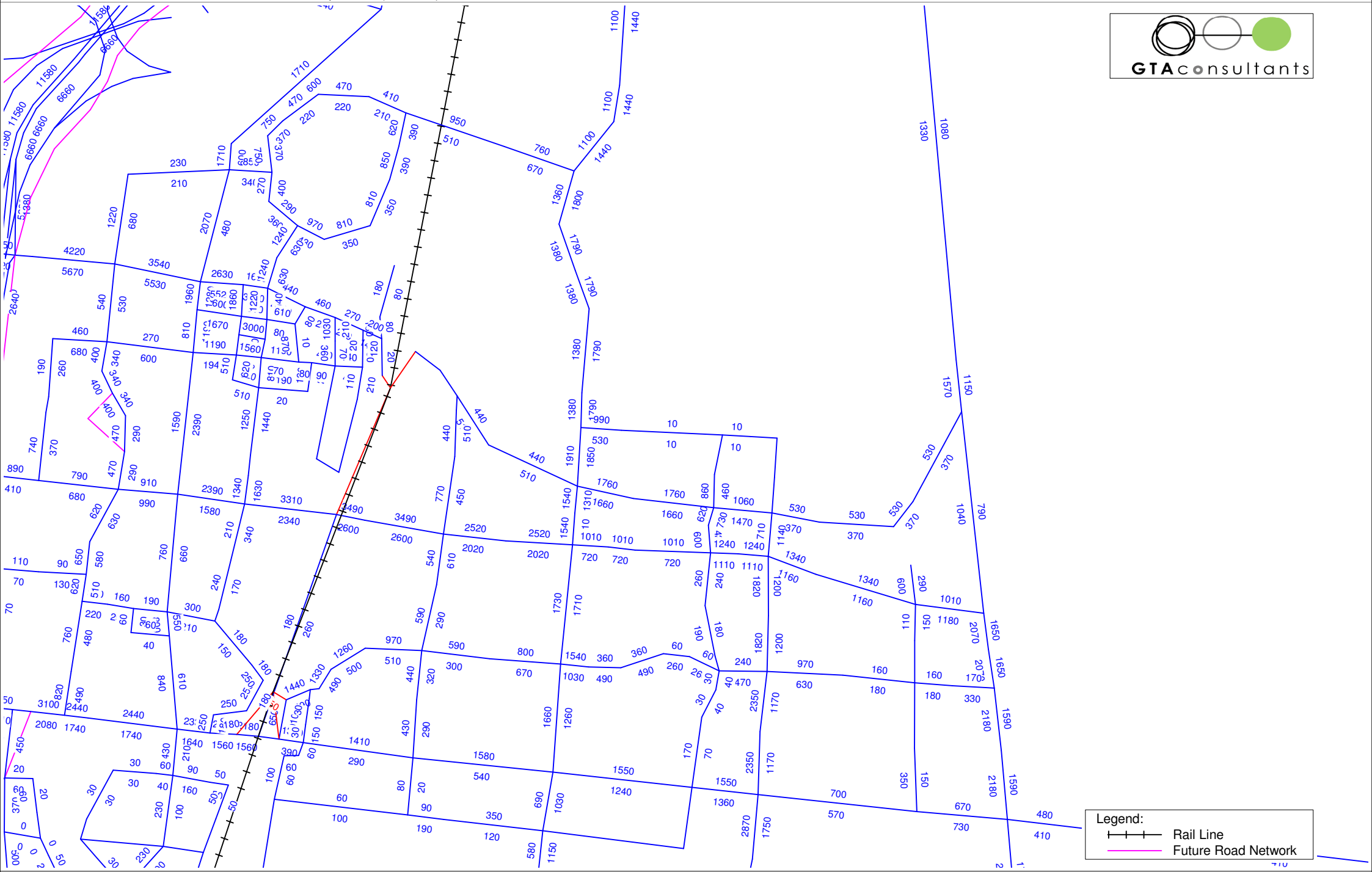
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Peak Total PCU Year 2046 Optoin 3B (No OMR)



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VITM Northern Growth Corridor Model
14M1555000 - Daily Volume Total PCU Year 2046 Option 3B (No OMR)

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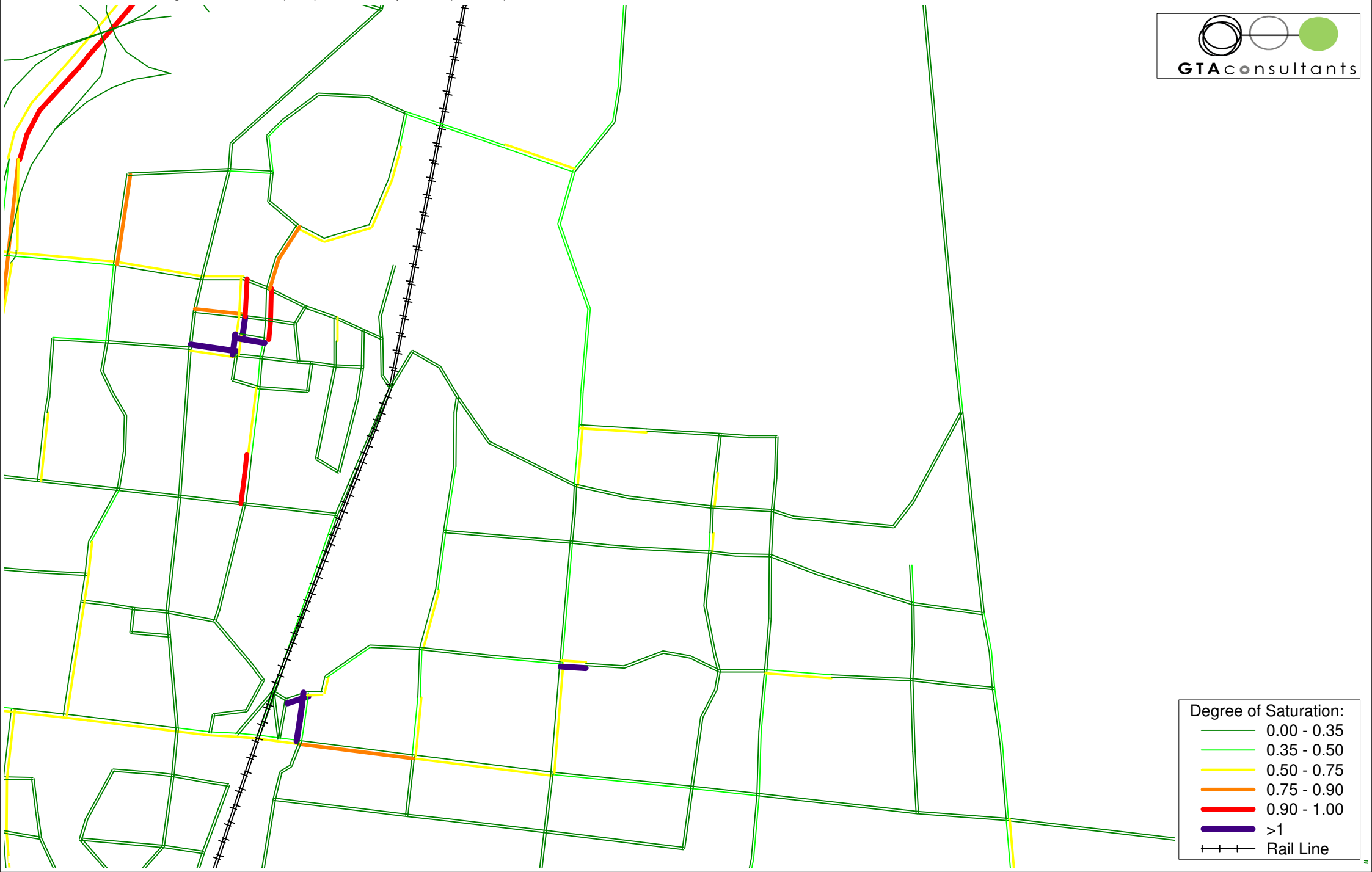
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Degree of Saturation (DOS) Year 2046 Option 3C (No OMR)



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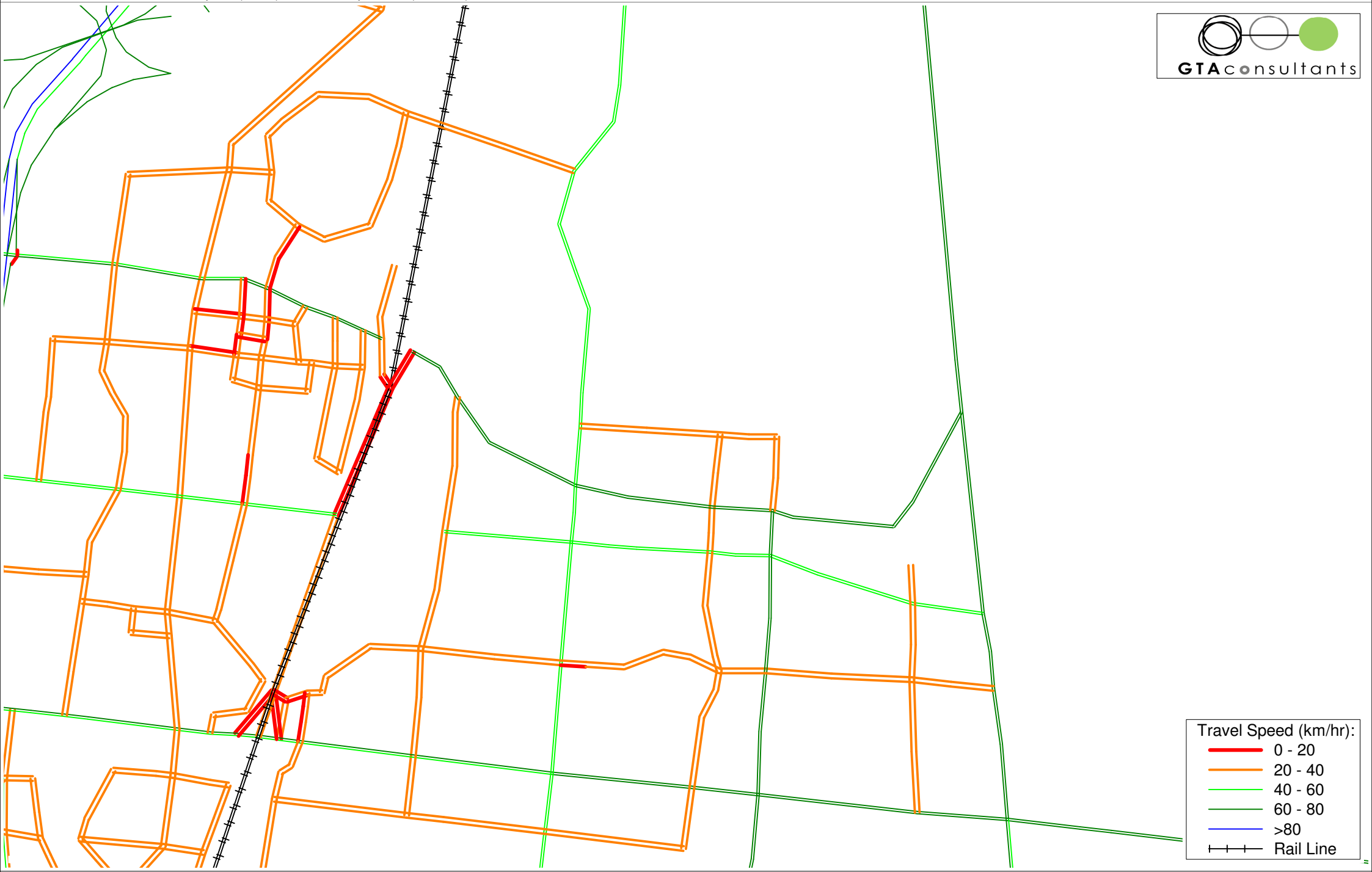
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Travel Speed (km/hr) Year 2046 Option 3C (No OMR)



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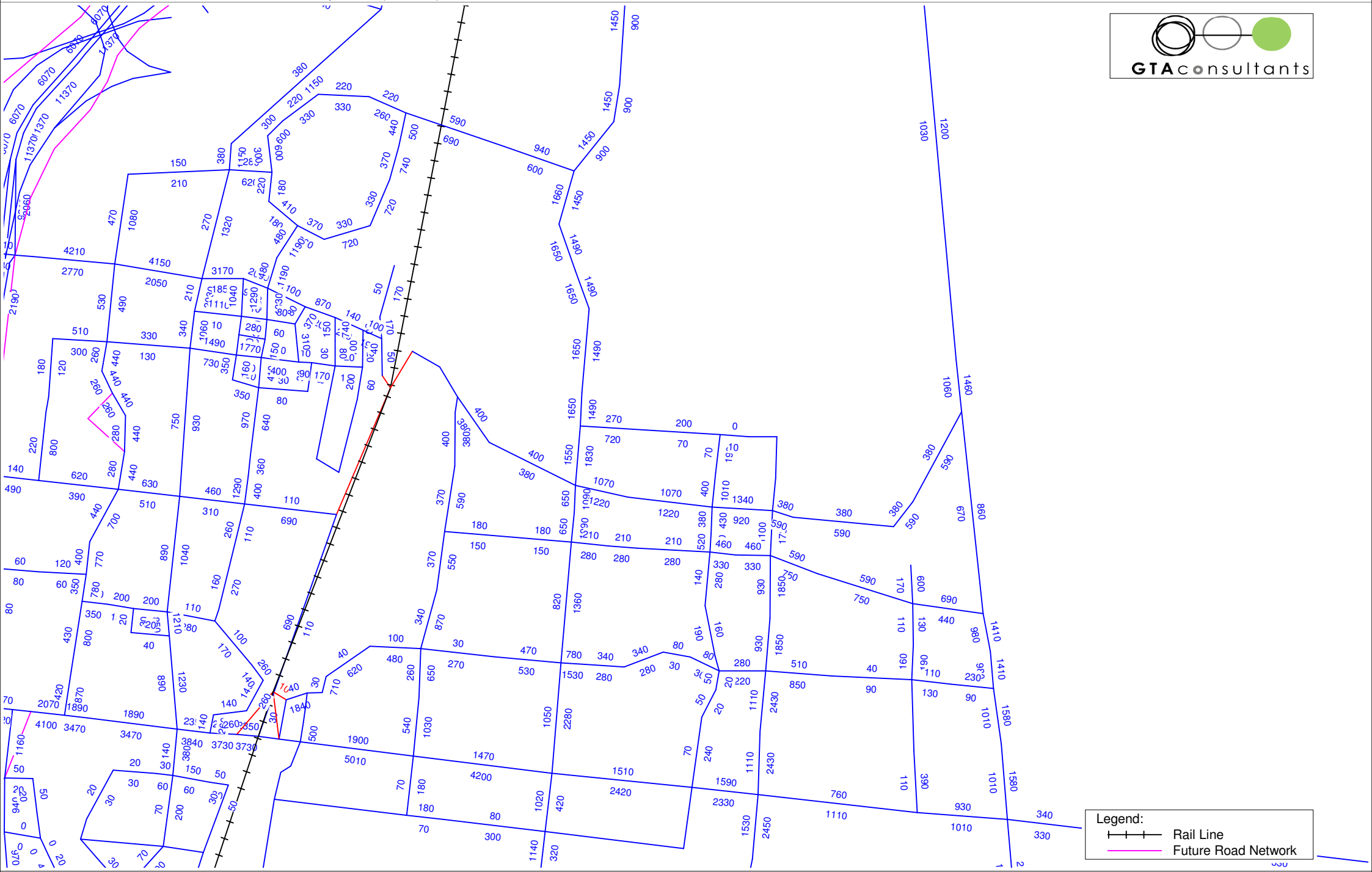
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Peak Total PCU Year 2046 Option 3C (No OMR)



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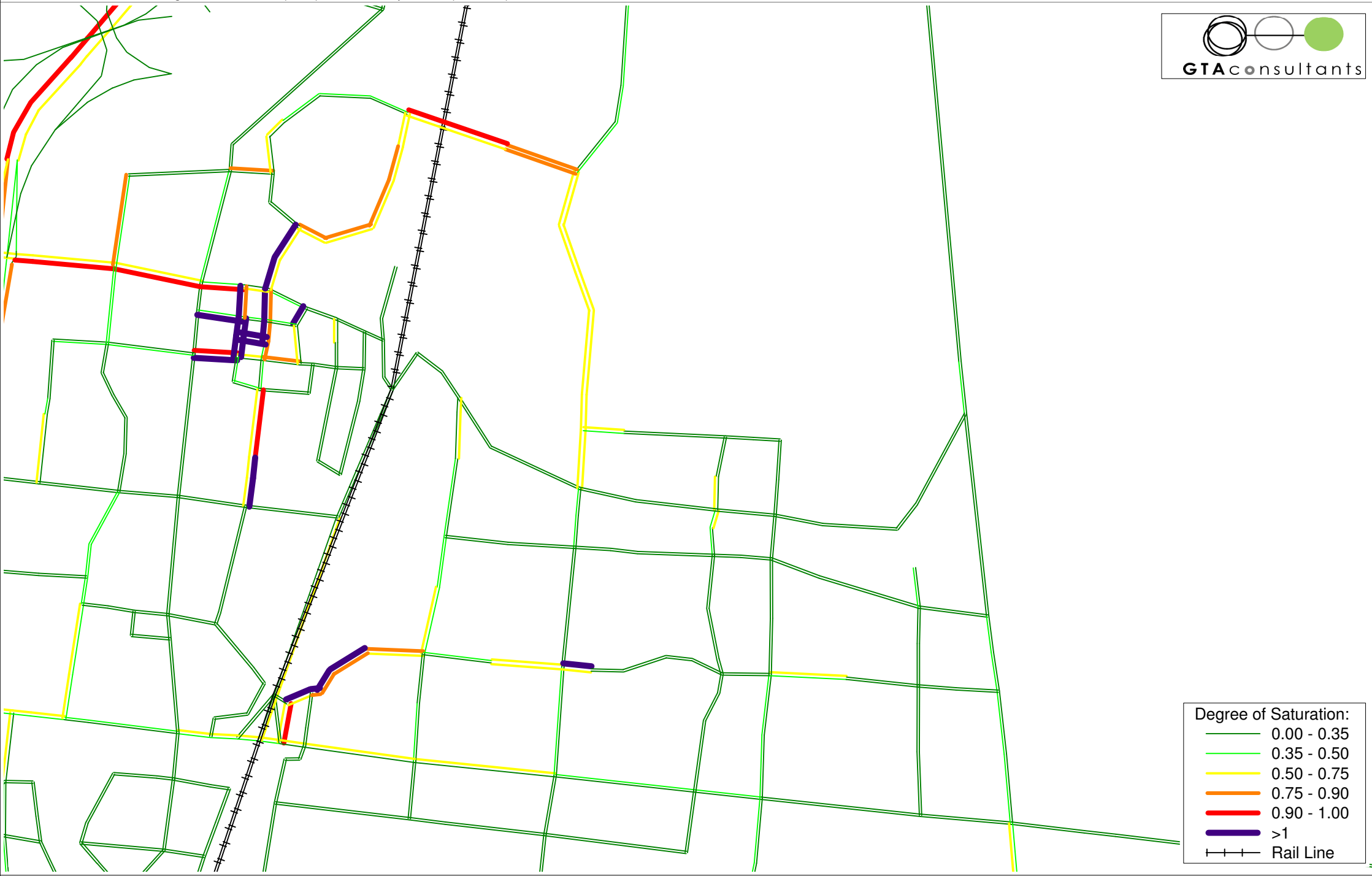
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Degree of Saturation (DOS) Year 2046 Option 3C (No OMR)



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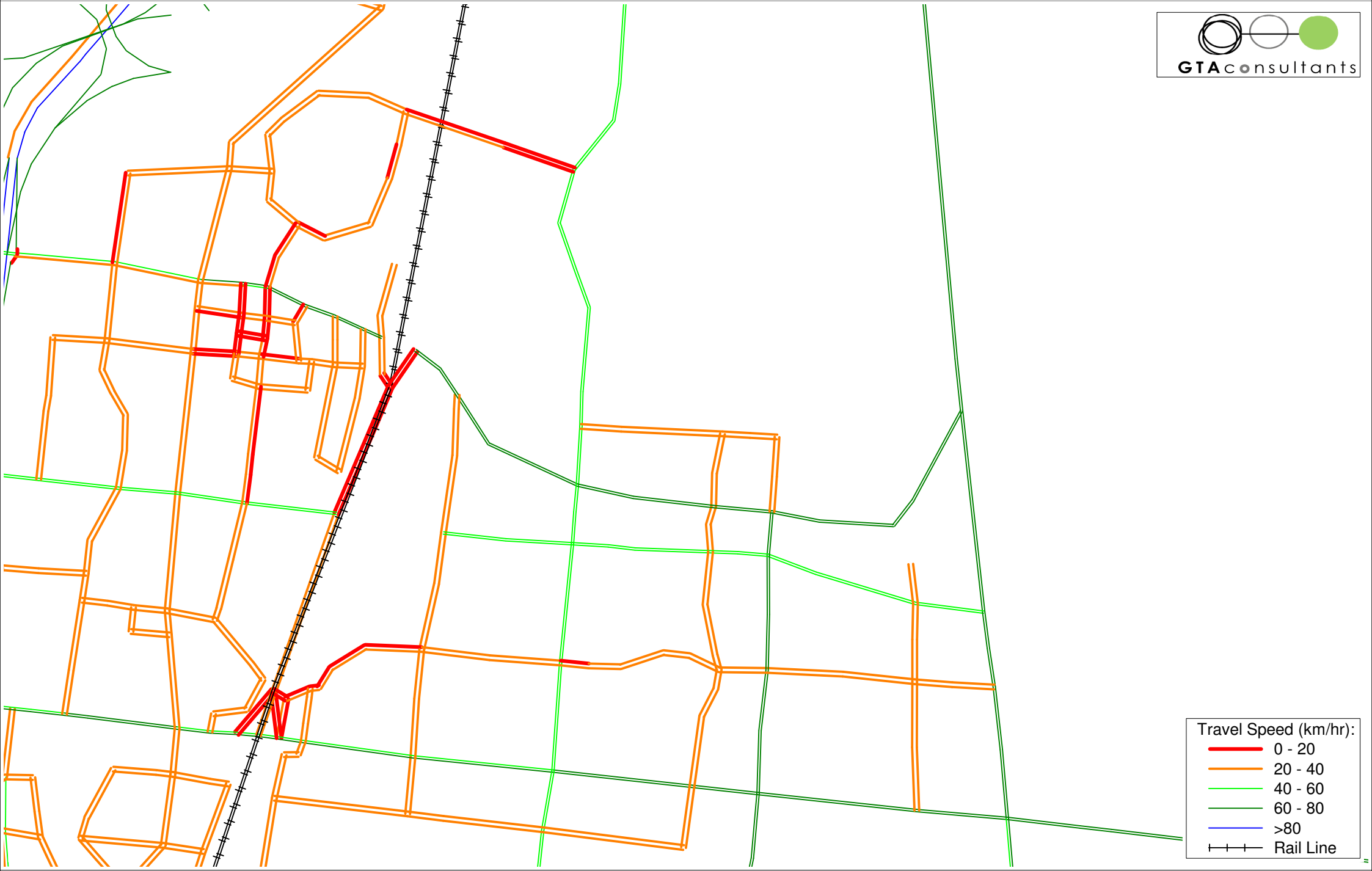
5/6/2014

cube

VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Travel Speed (km/hr) Year 2046 Option 3C (No OMR)



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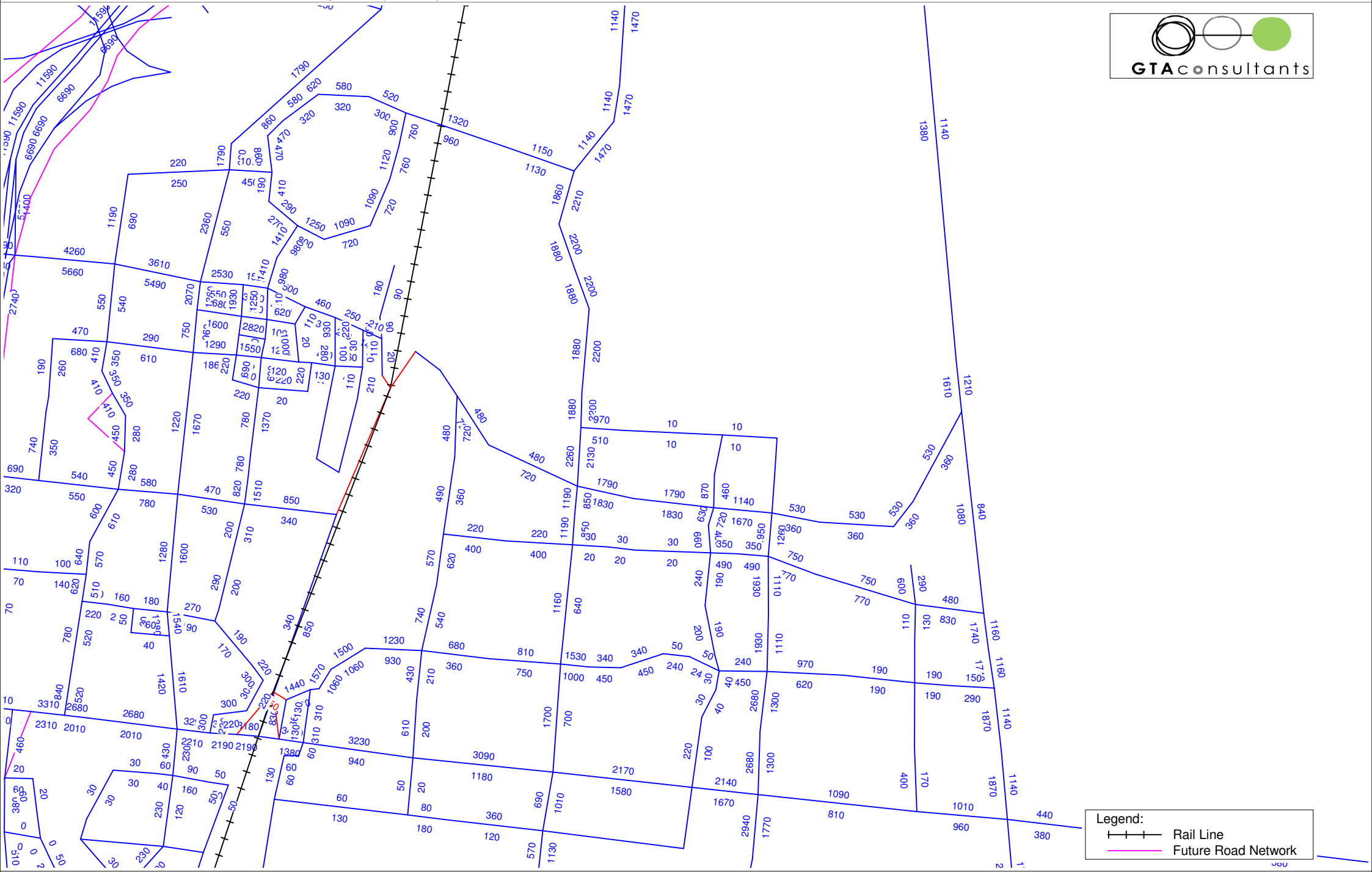
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Peak Total PCU Year 2046 Option 3C (No OMR)



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VITM Northern Growth Corridor Model
14M1555000 - Daily Volume Total PCU Year 2046 Option 3C

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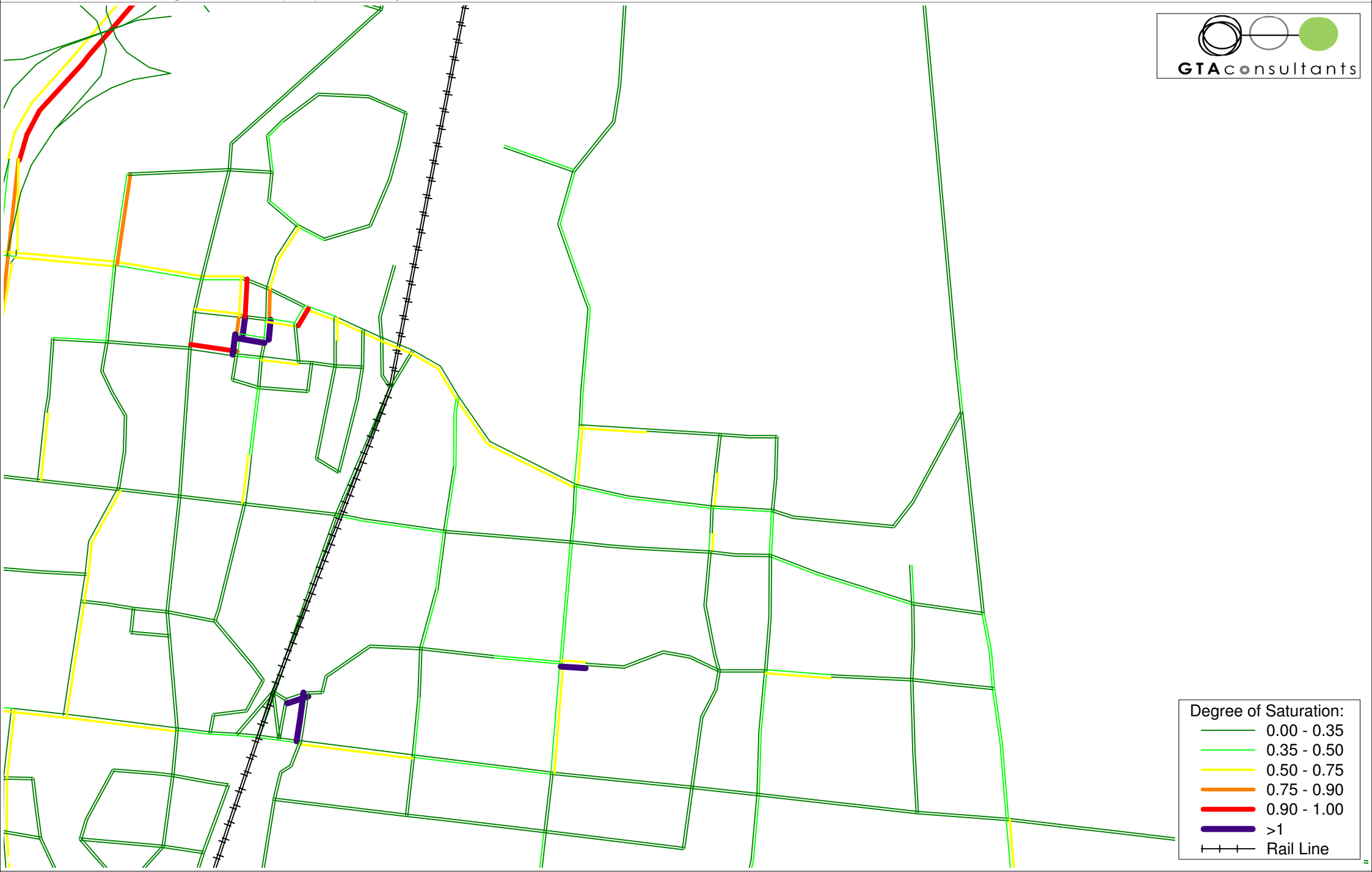
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Degree of Saturation (DOS) Year 2046 Option 4A



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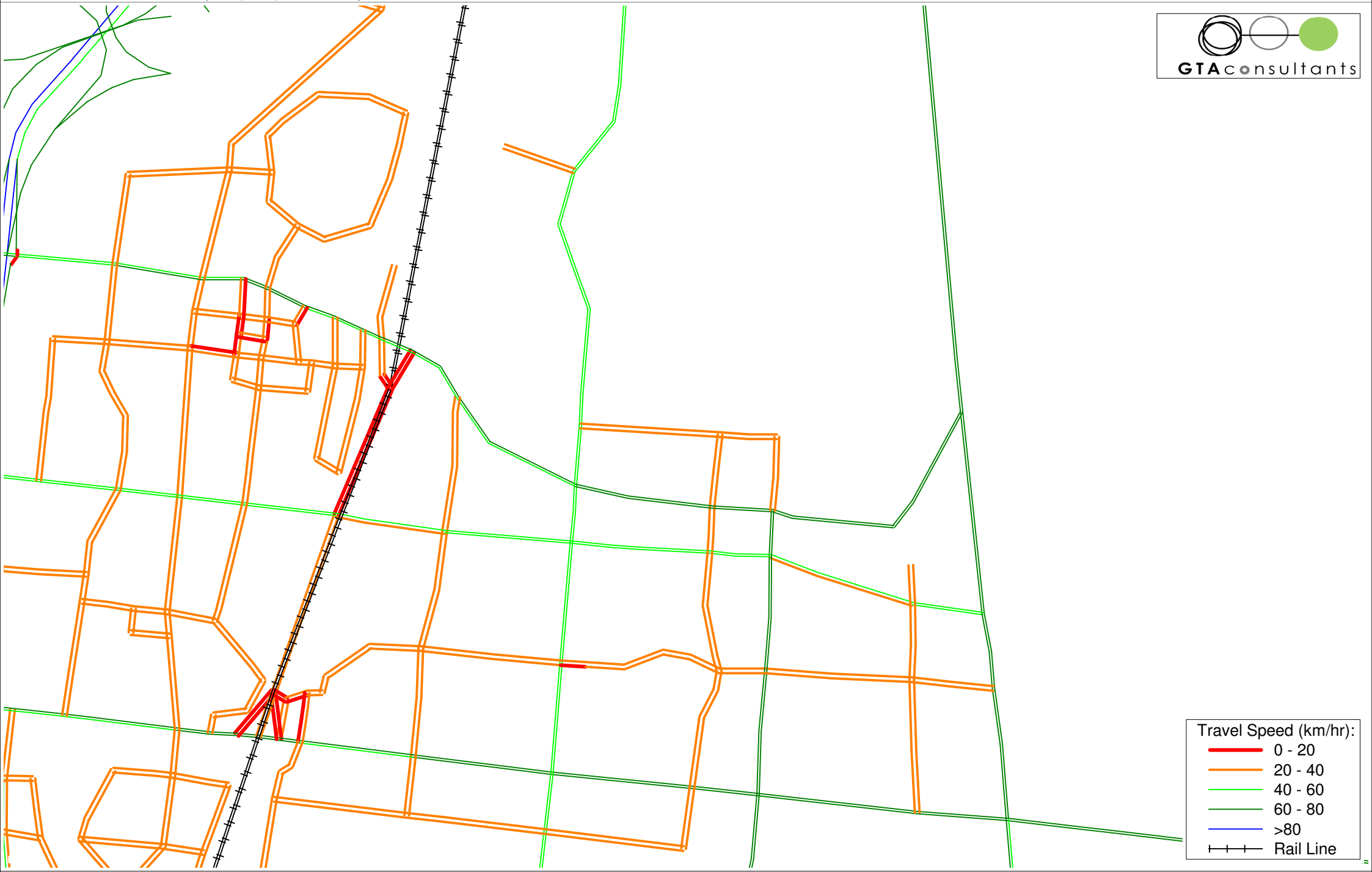
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Travel Speed (km/hr) Year 2046 Option 4A



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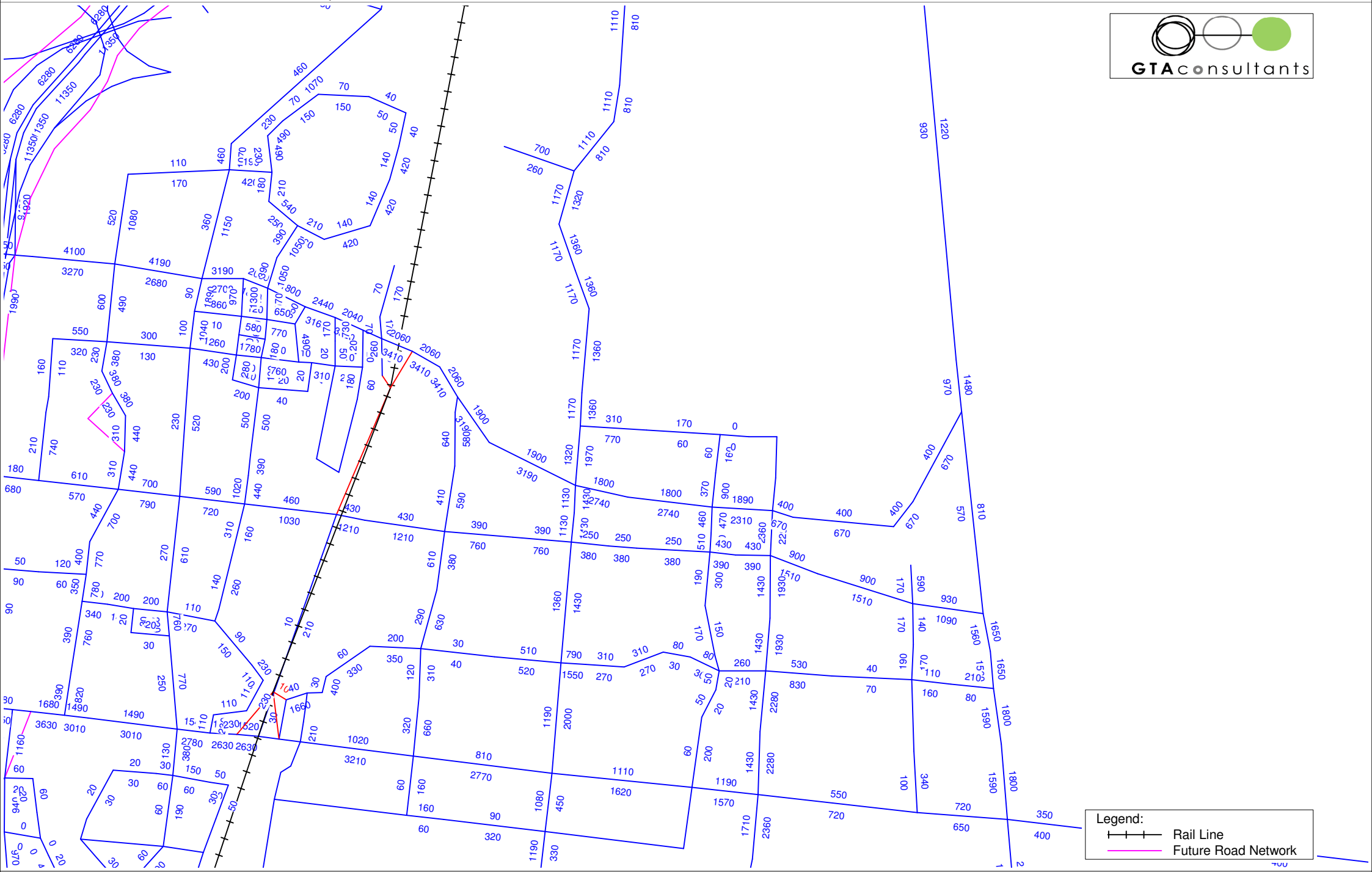
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Peak Total PCU Year 2046 Option 4A



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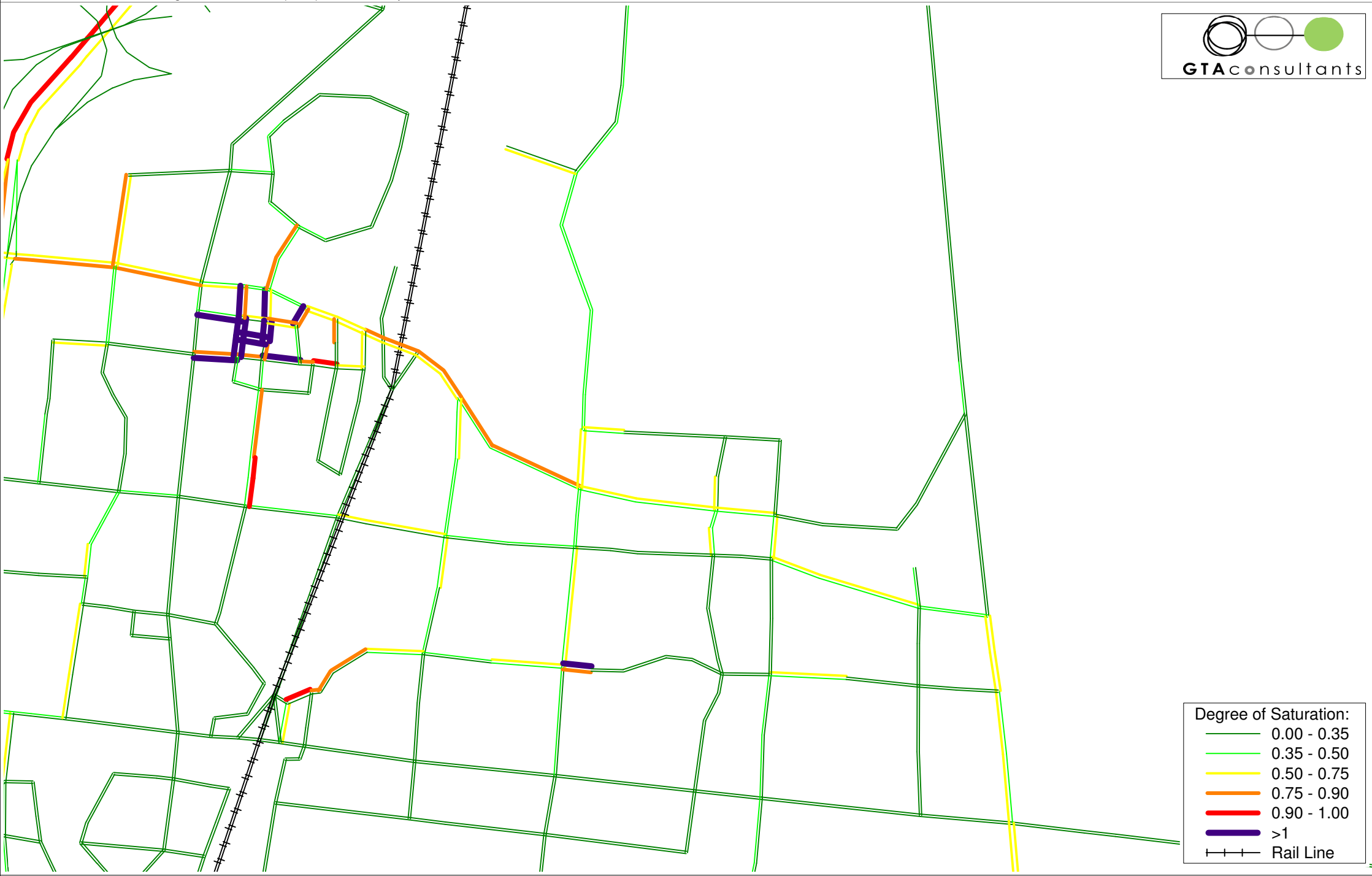
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Degree of Saturation (DOS) Year 2046 Option 4A



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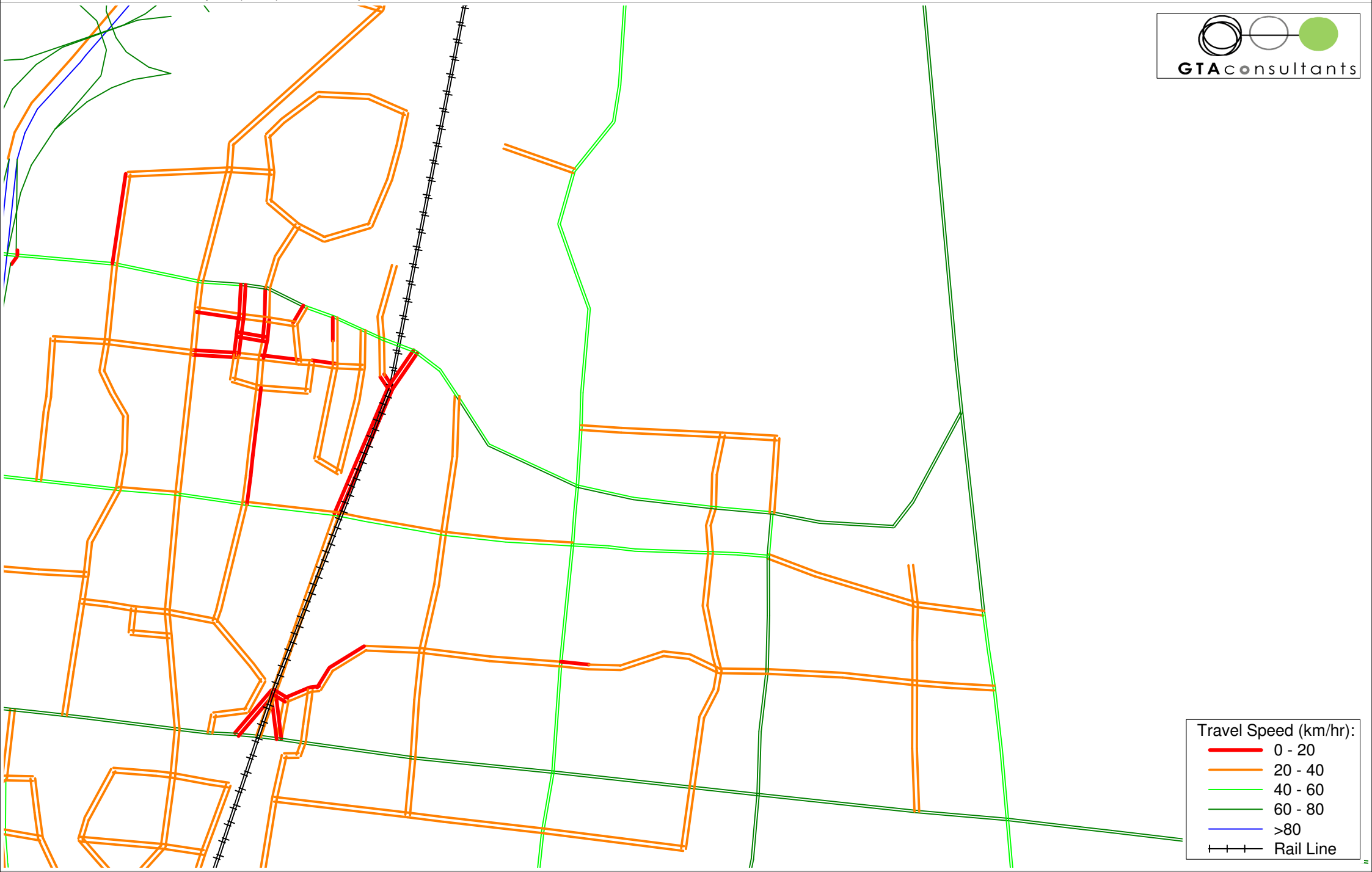
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Travel Speed (km/hr) Year 2046 Option 4A



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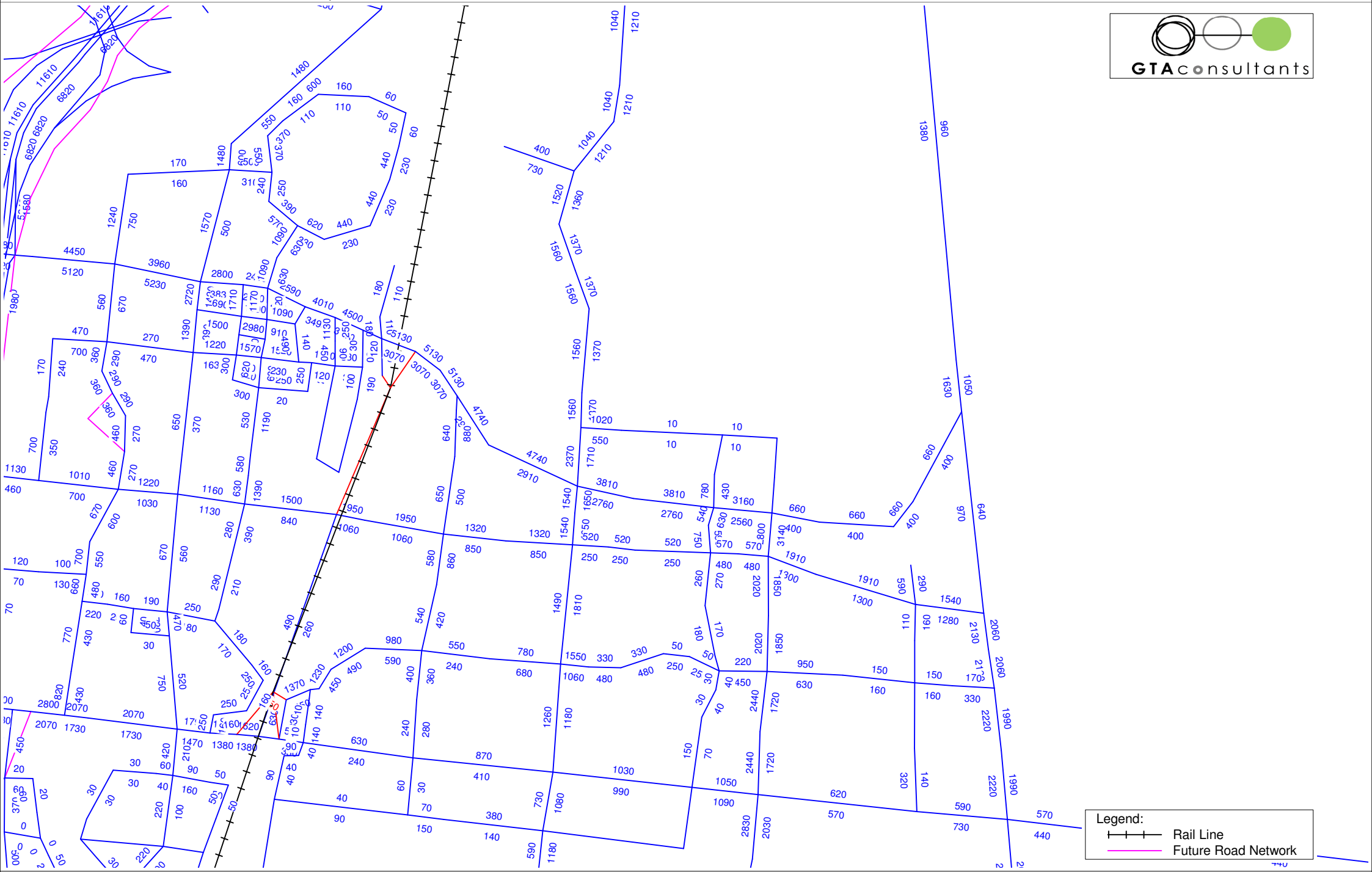
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Peak Total PCU Year 2046 Option 4A



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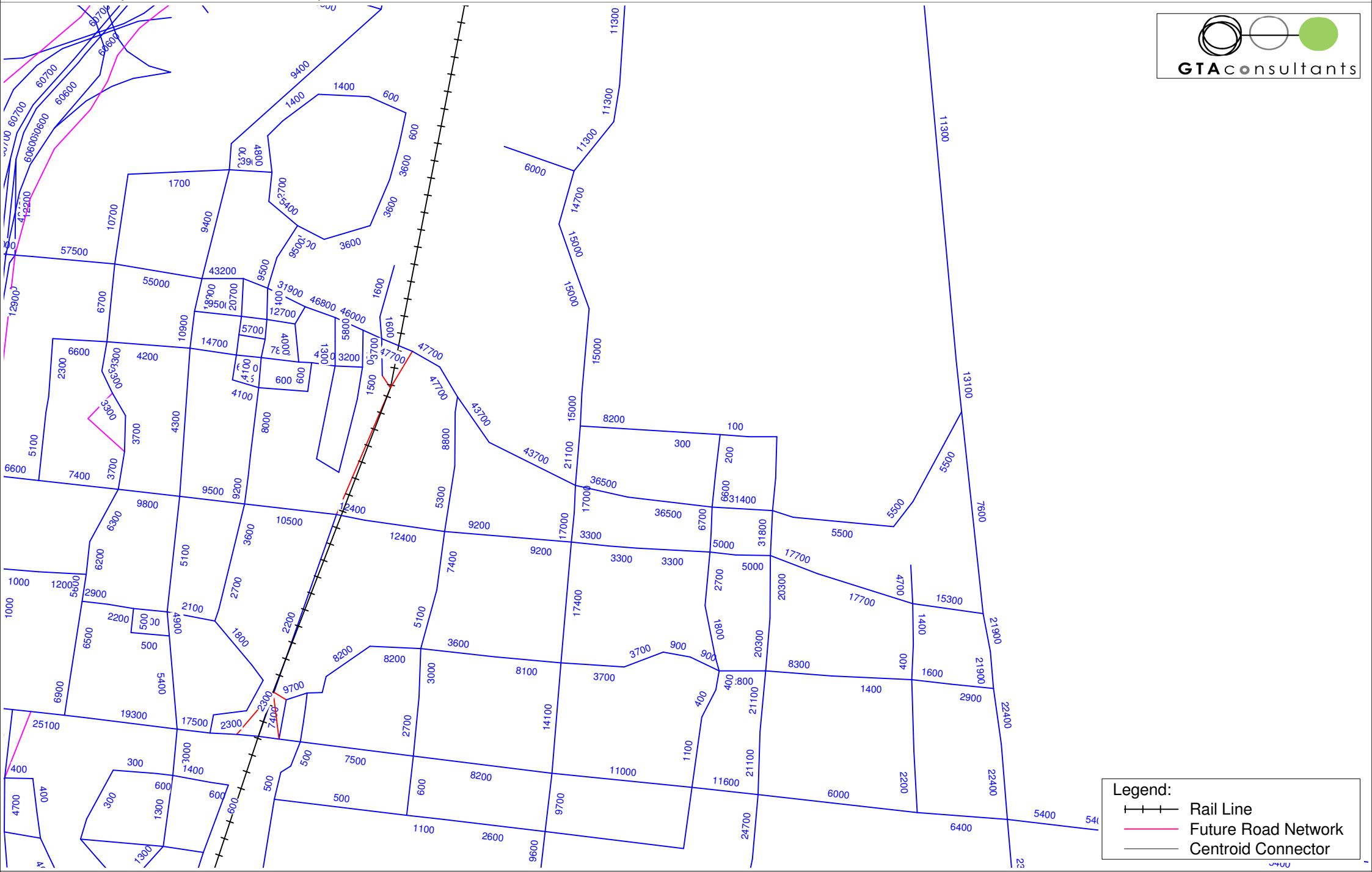
2/06/2014

VITM Northern Growth Corridor Model
14M1555000 - Daily Volume Total PCU Year 2046 Option 4A



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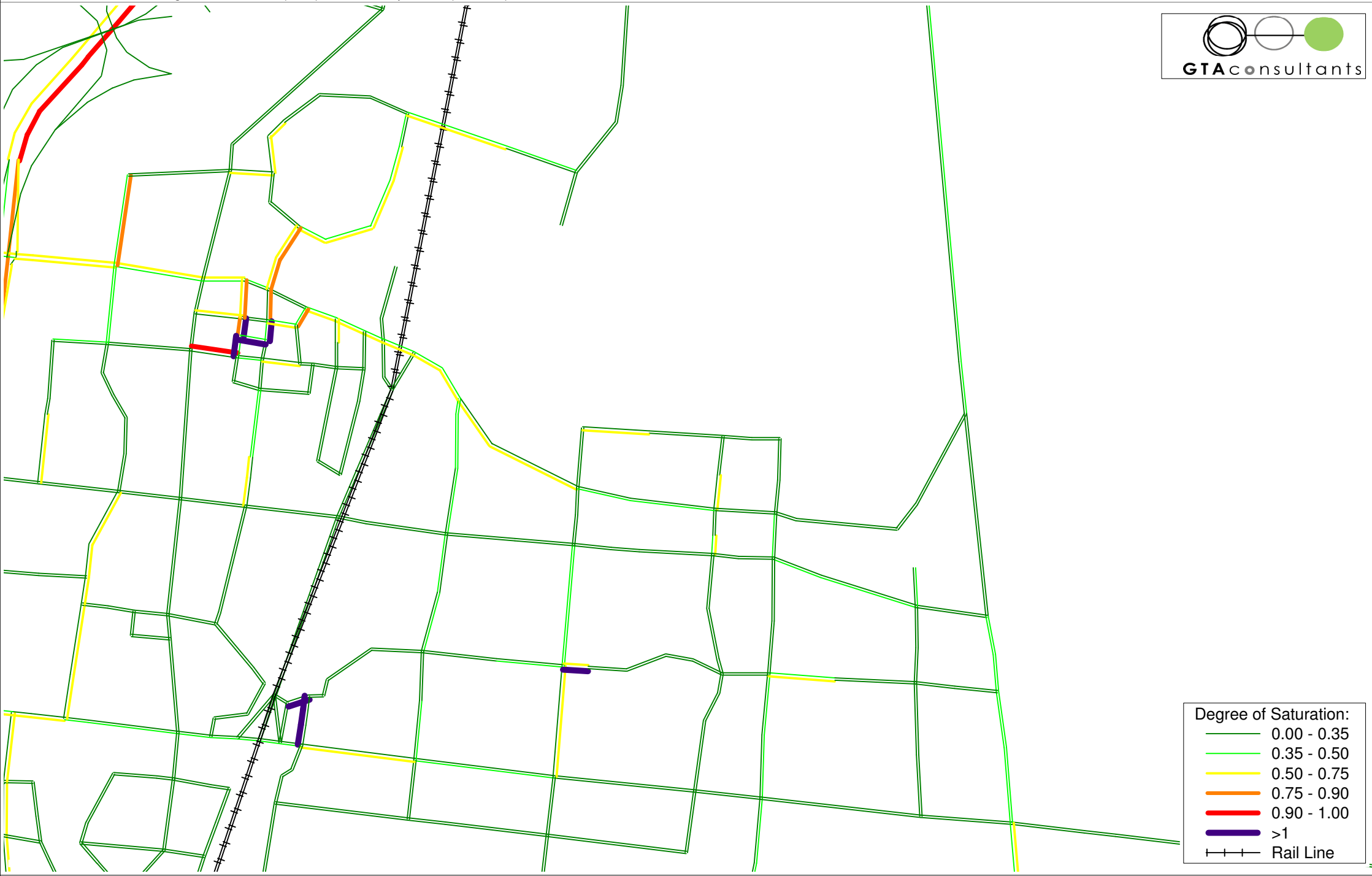
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Degree of Saturation (DOS) Year 2046 Option 4B (No OMR)



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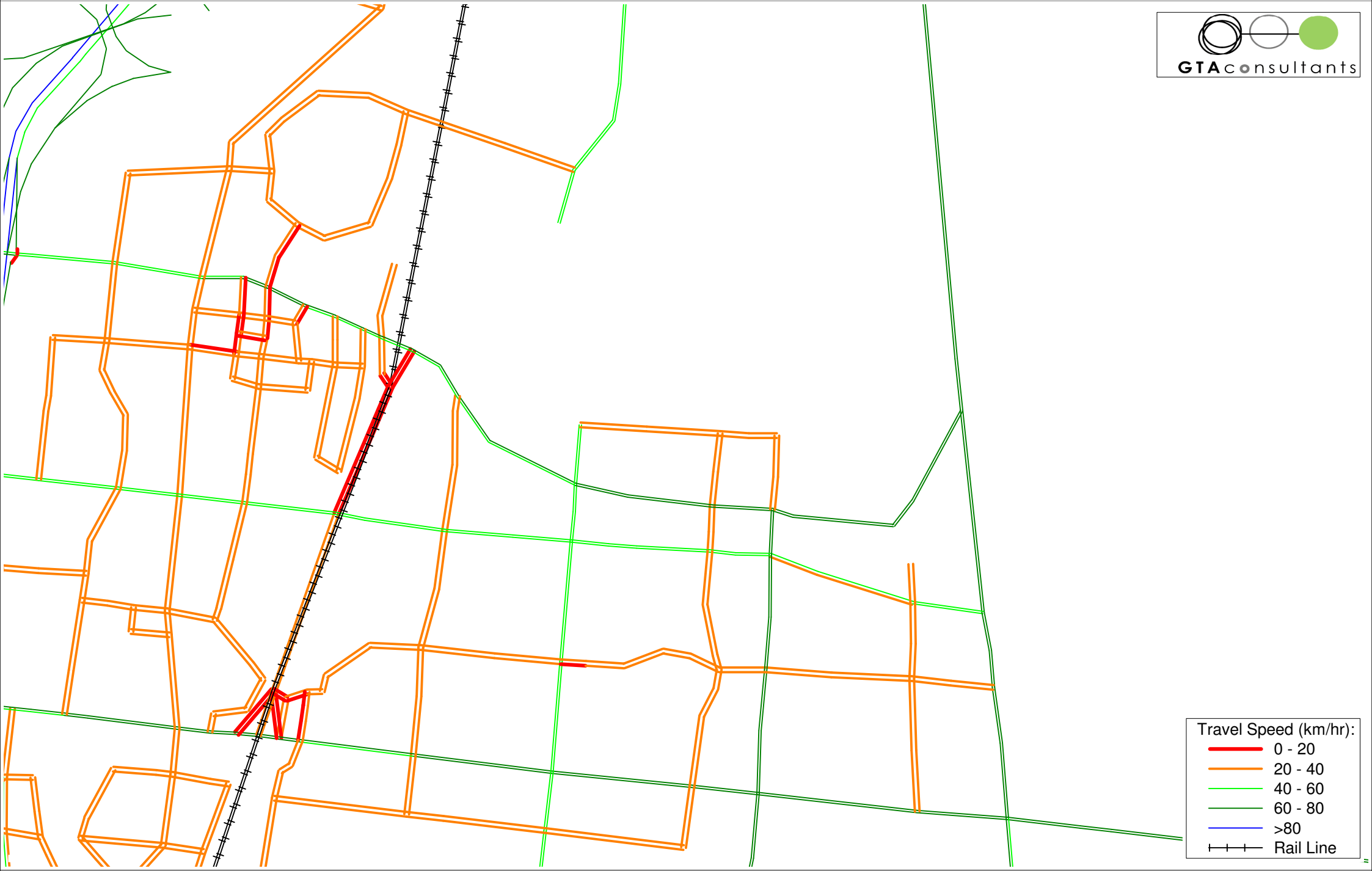
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Travel Speed (km/hr) Year 2046 Option 4B (No OMR)



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VITM Northern Growth Corridor Model
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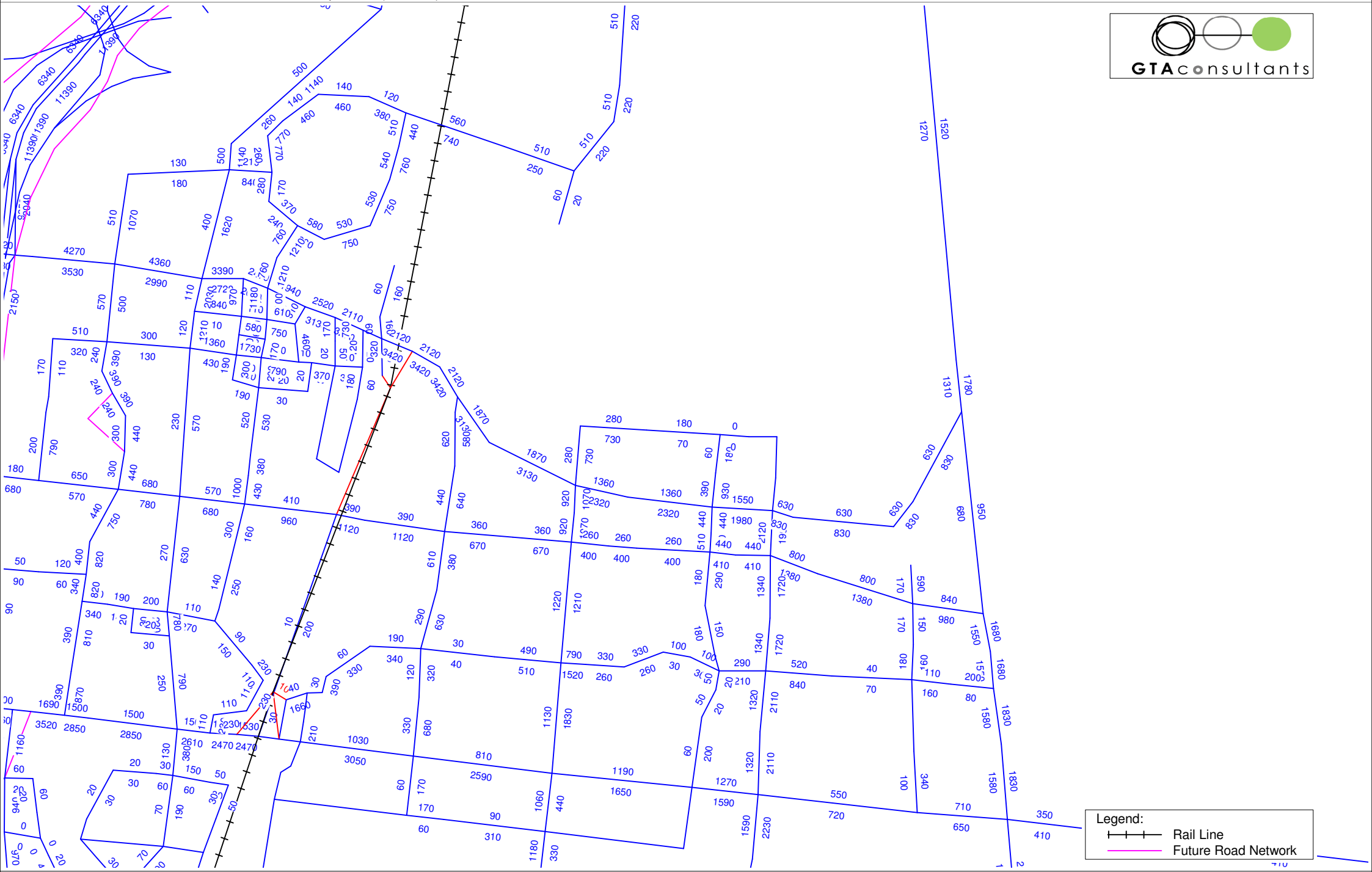

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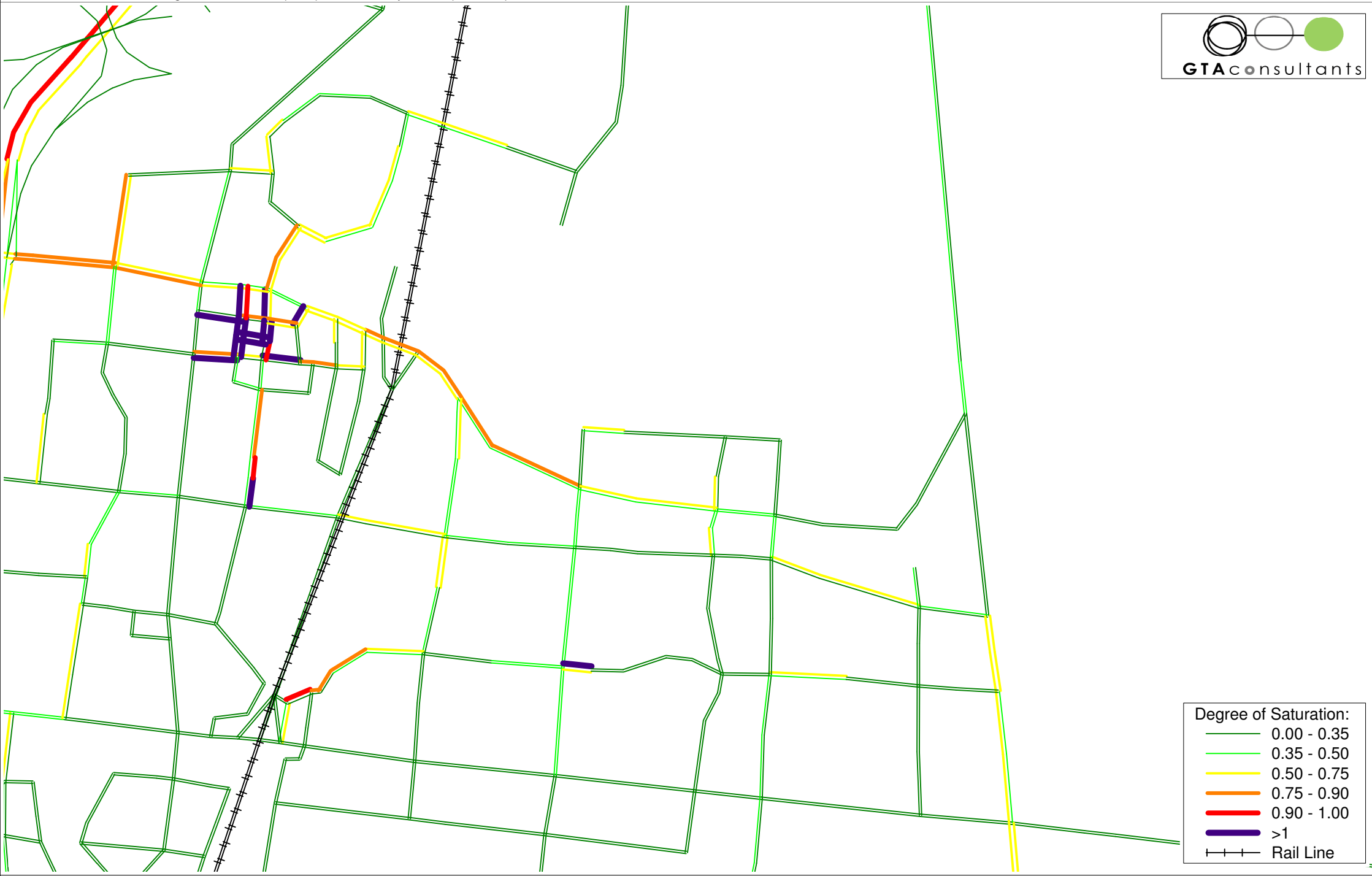
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Degree of Saturation (DOS) Year 2046 Option 4B (No OMR)



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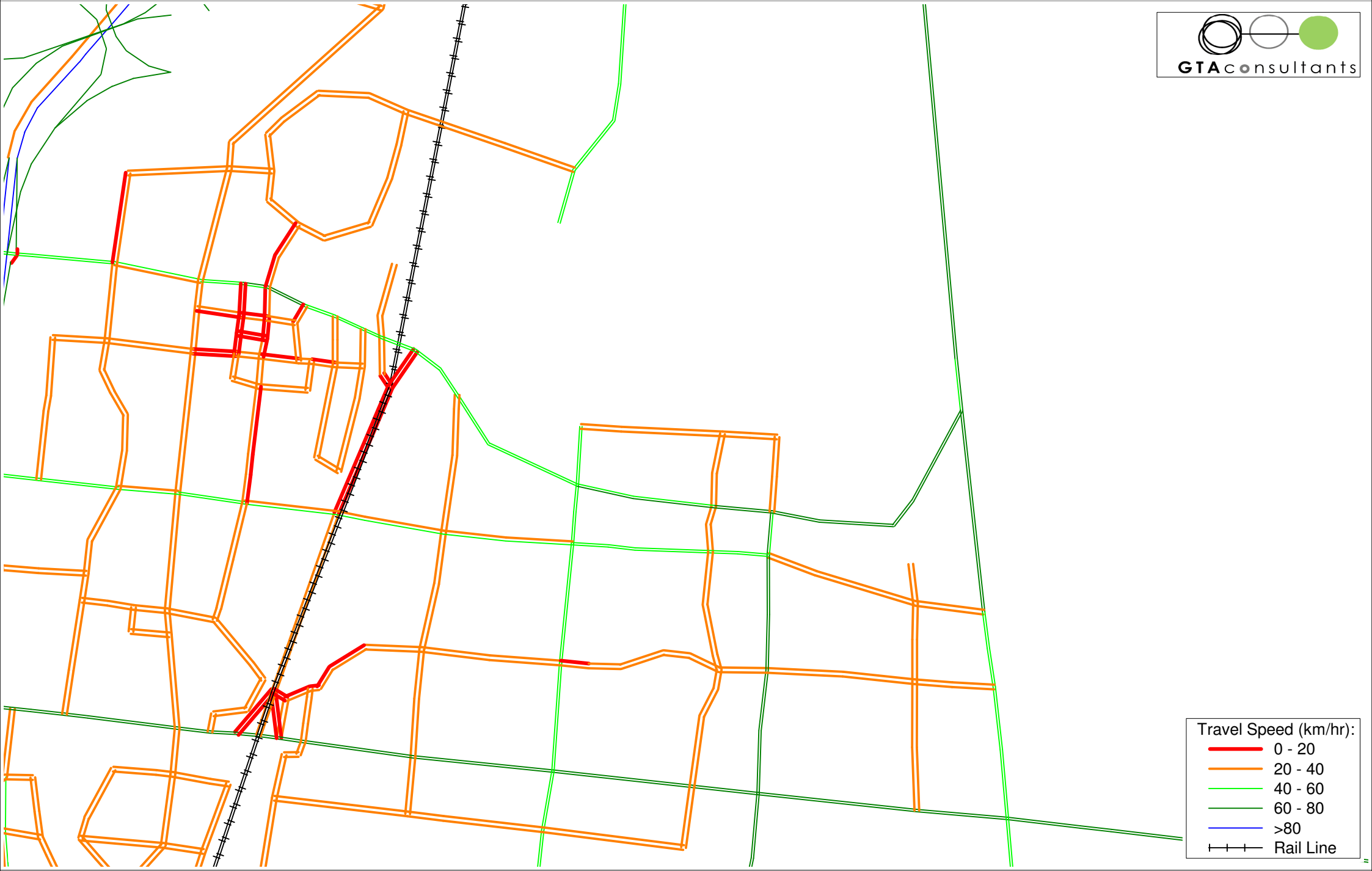
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Travel Speed (km/hr) Year 2046 Option 4B (No OMR)



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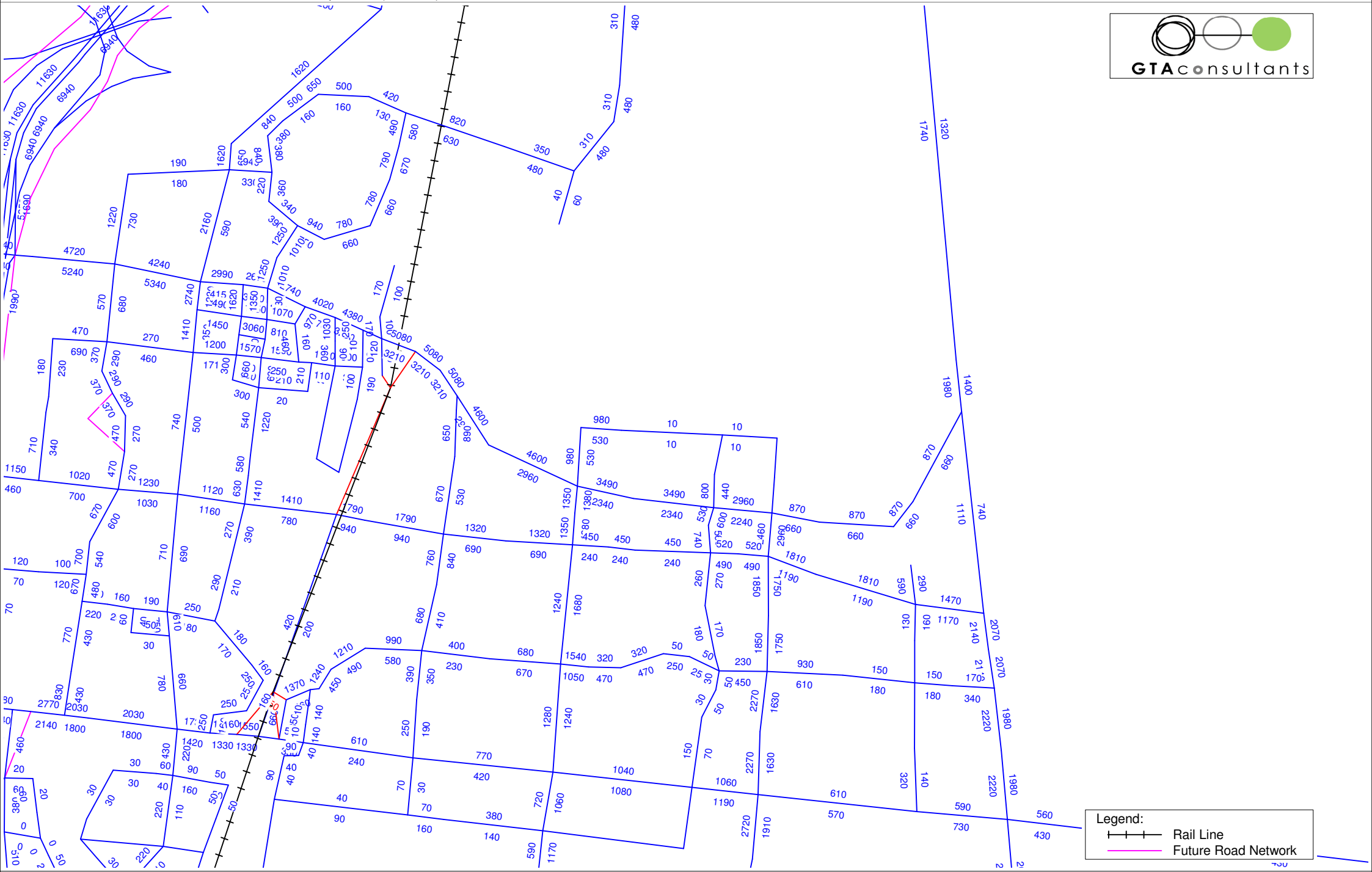
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Peak Total PCU Year 2046 Option 4B (No OMR)



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VITM Northern Growth Corridor Model
14M1555000 - Daily Volume Total PCU Year 2046 Option 4B

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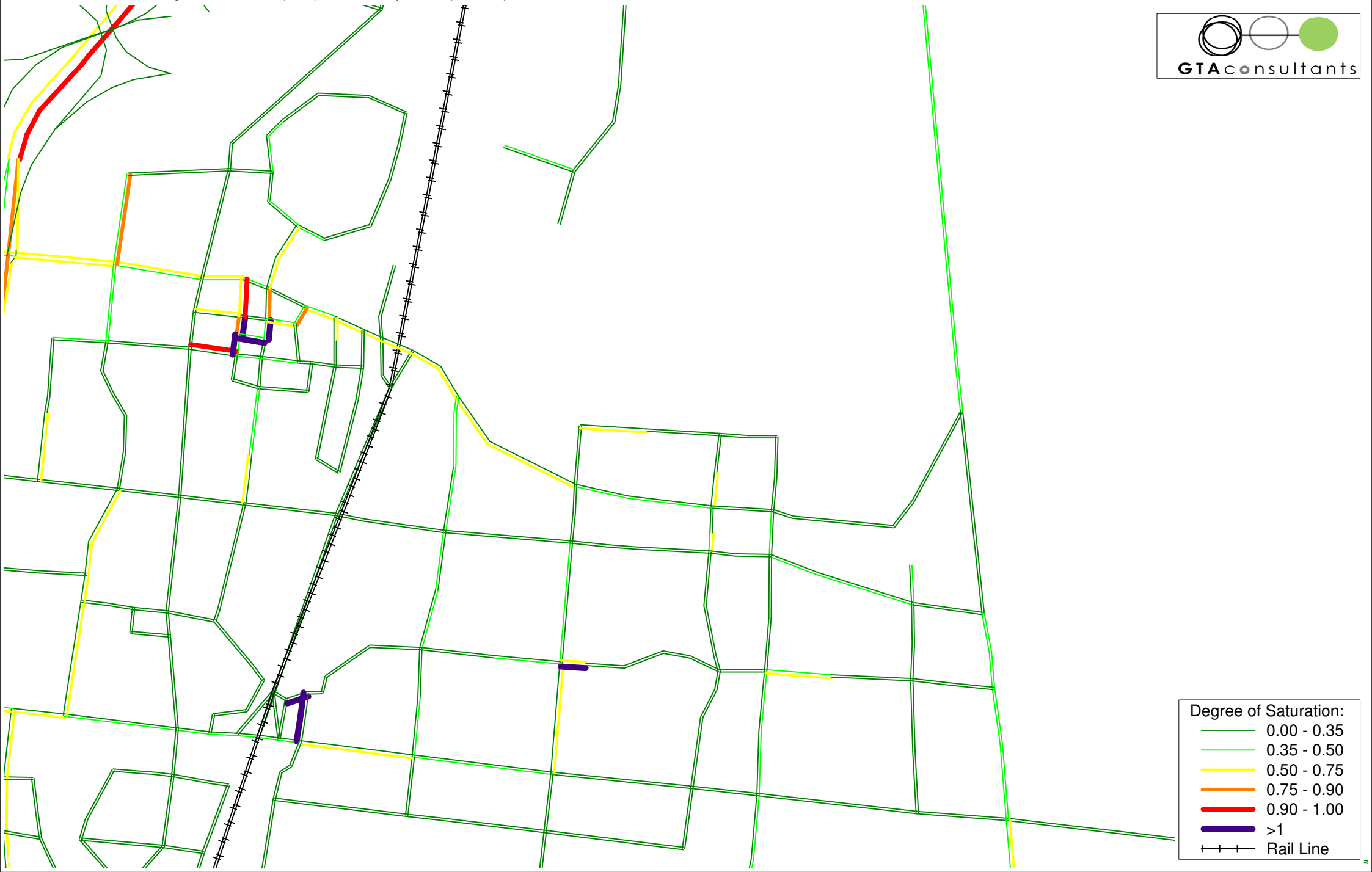
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Degree of Saturation (DOS) Year 2046 Option 4C (No OMR)



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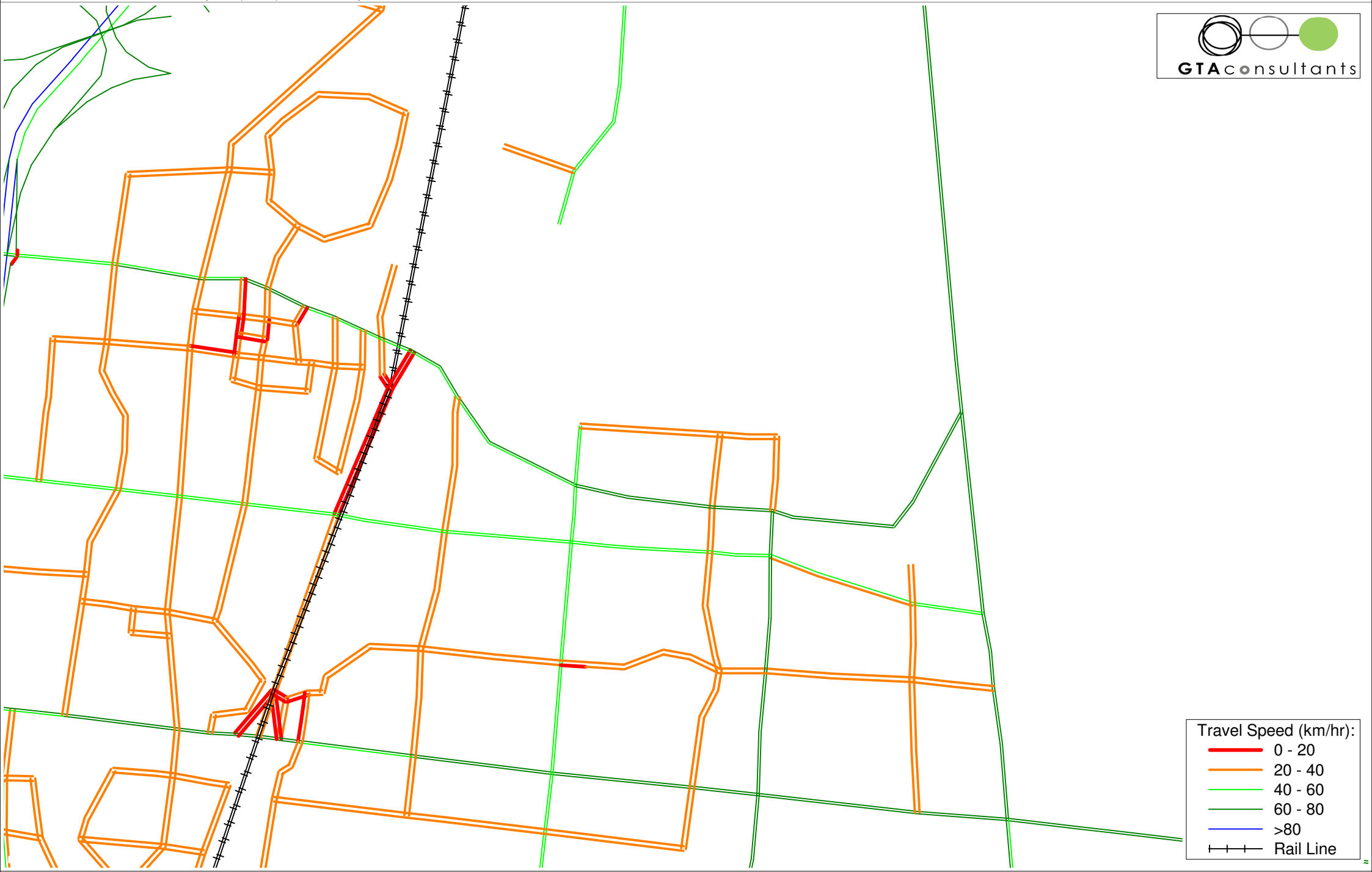
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Travel Speed (km/hr) Year 2046 Option 4C



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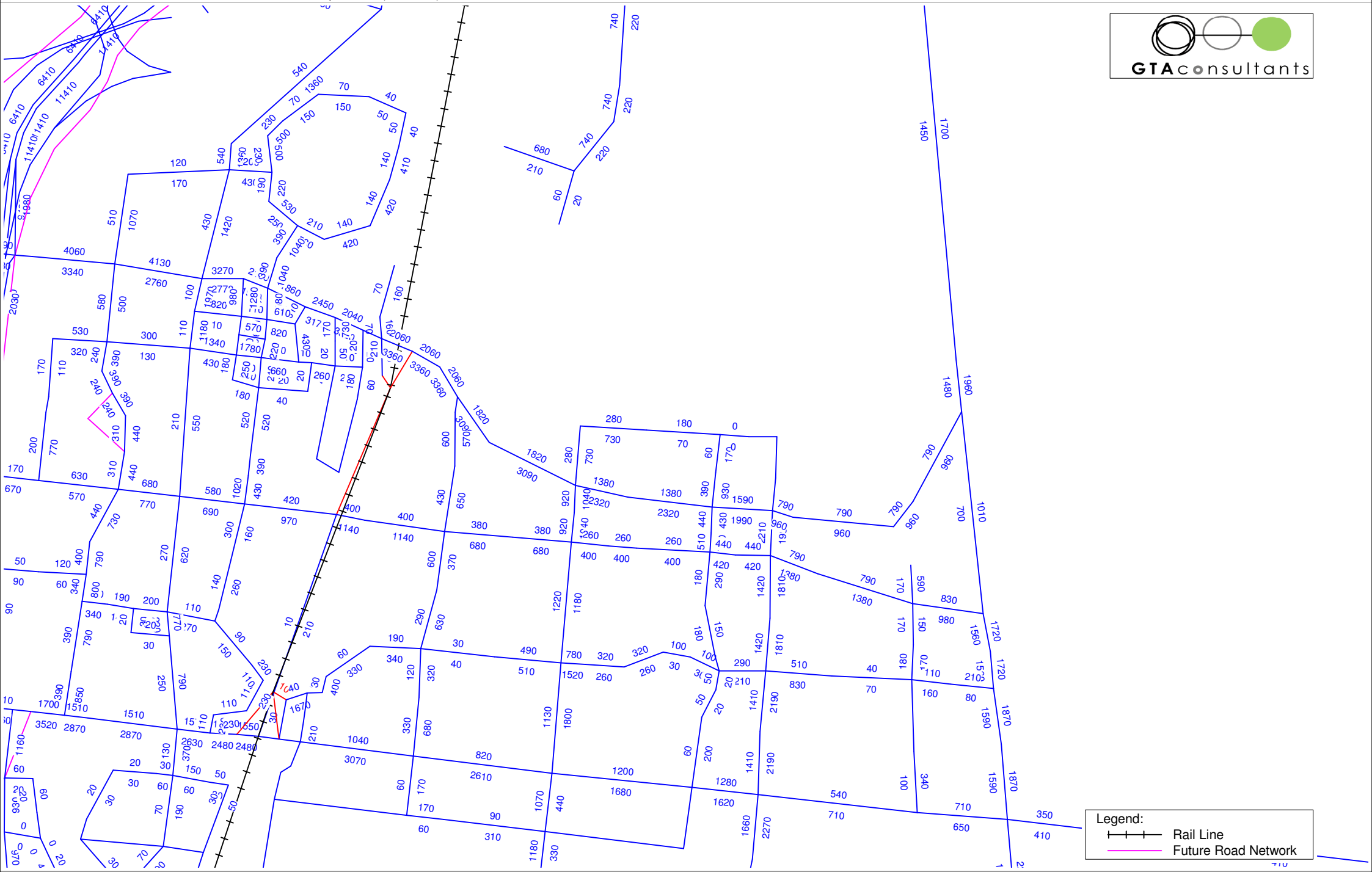
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs AM Peak Total PCU Year 2046 Option 4C (No OMR)



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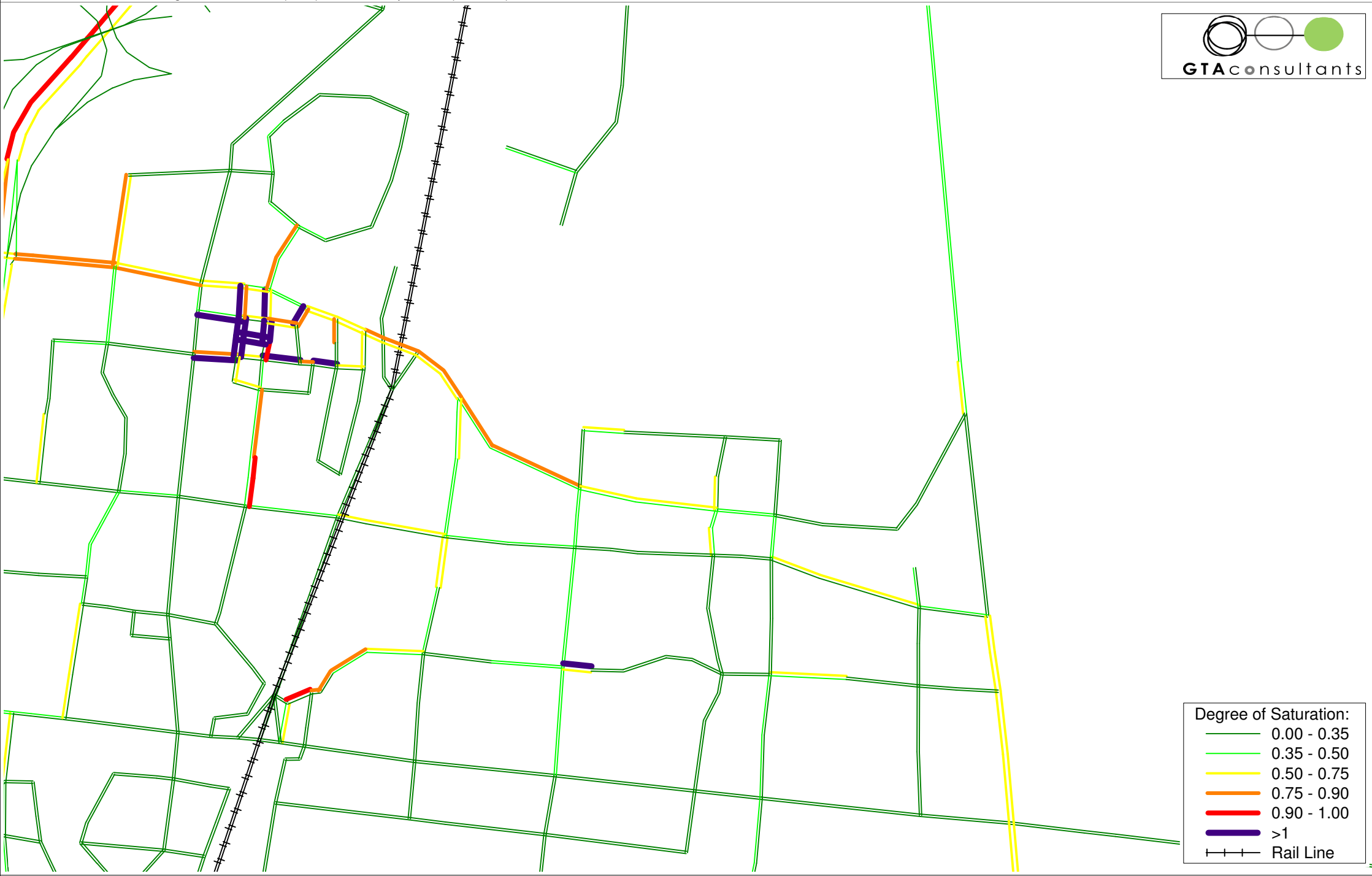
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Degree of Saturation (DOS) Year 2046 Option 4C (No OMR)



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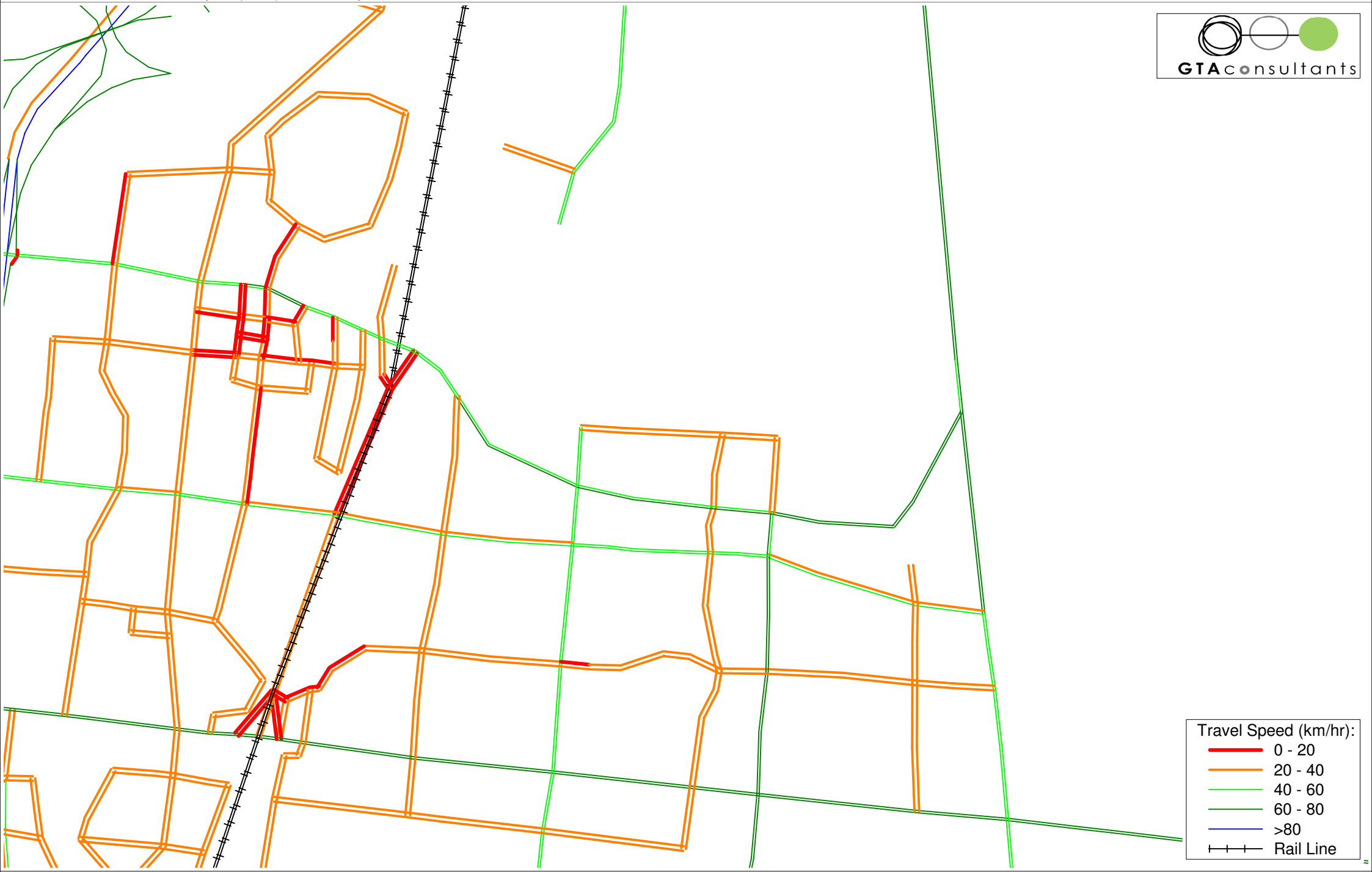
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Travel Speed (km/hr) Year 2046 Option 4C



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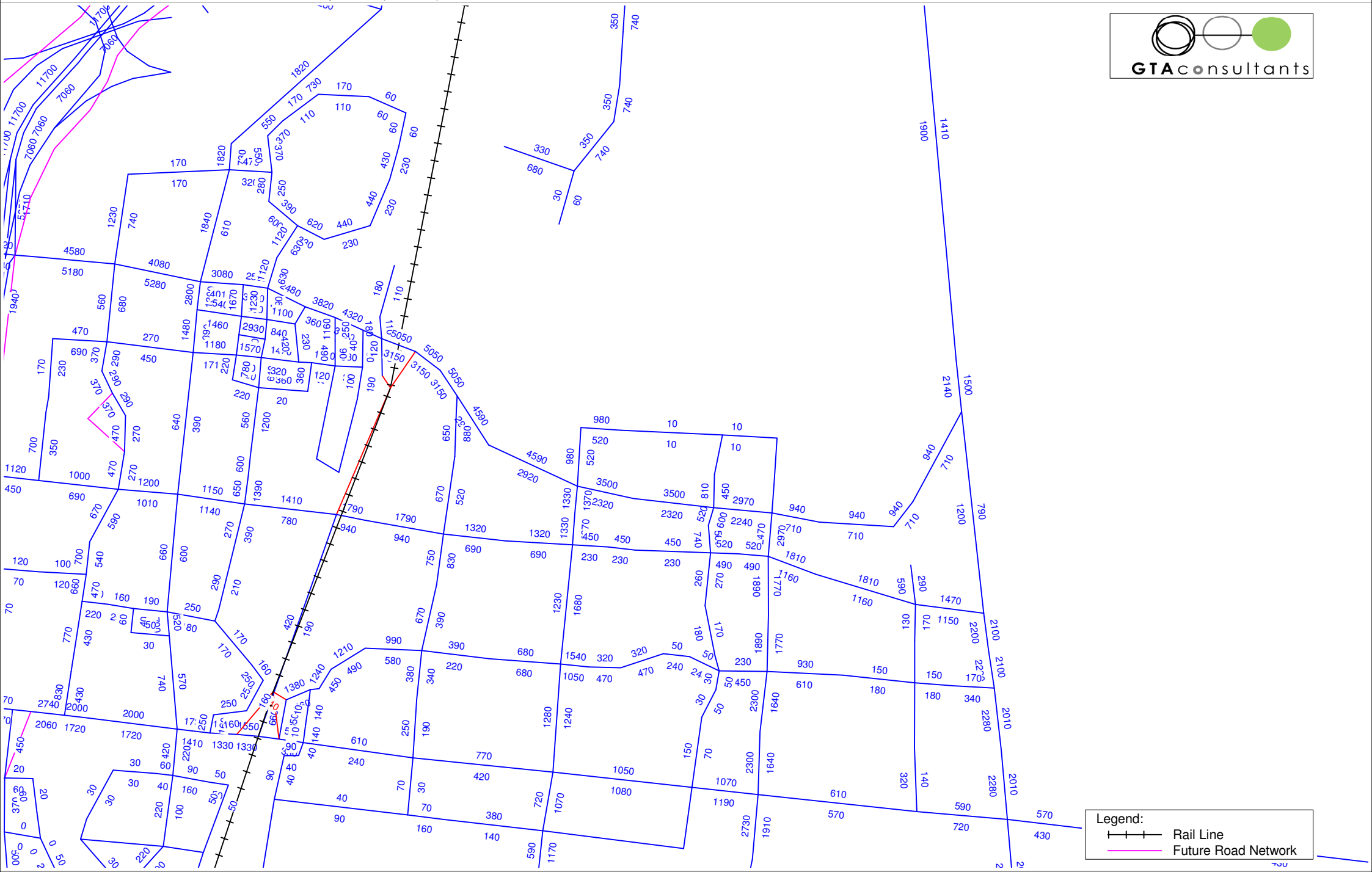
VITM Northern Growth Corridor Model
14M1555000 - 2 Hrs PM Peak Total PCU Year 2046 Option 4C (No OMR)



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VITM Northern Growth Corridor Model
14M1555000 - Daily Volume Total PCU Year 2046 Option 4C

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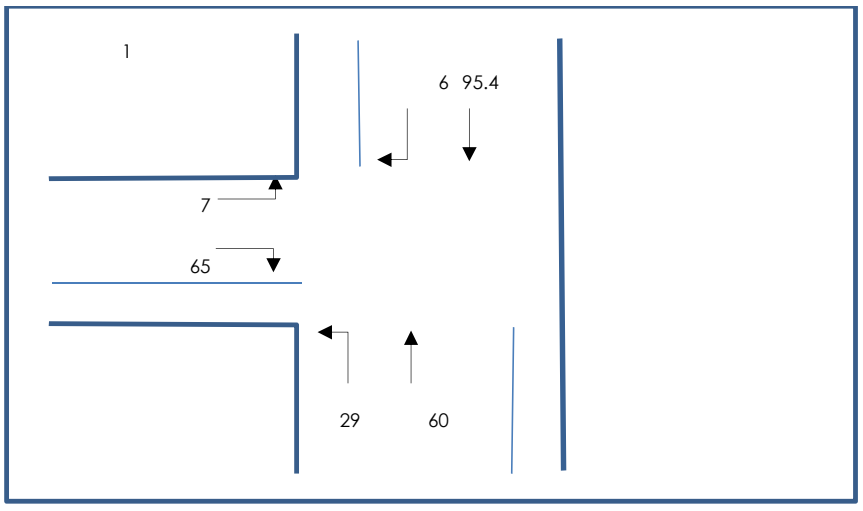
Appendix E

Peak Hour Intersection Turning Movements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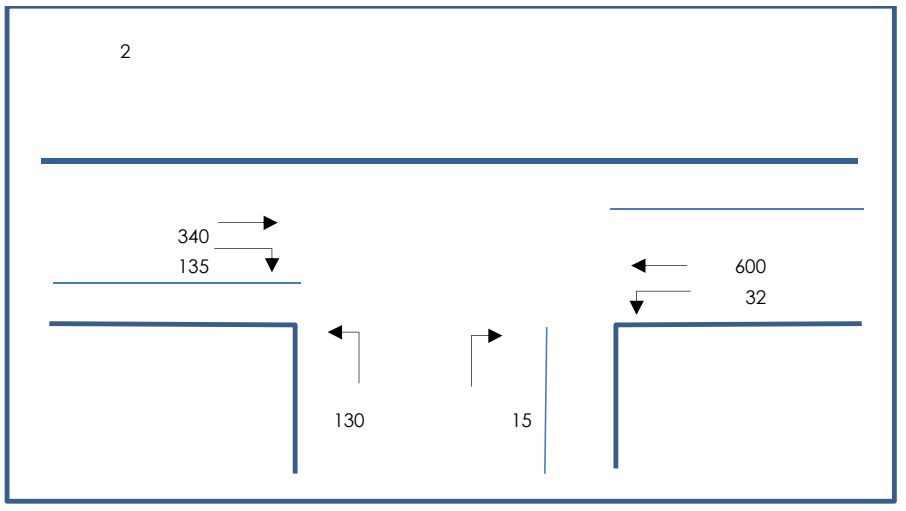
7
65
29 60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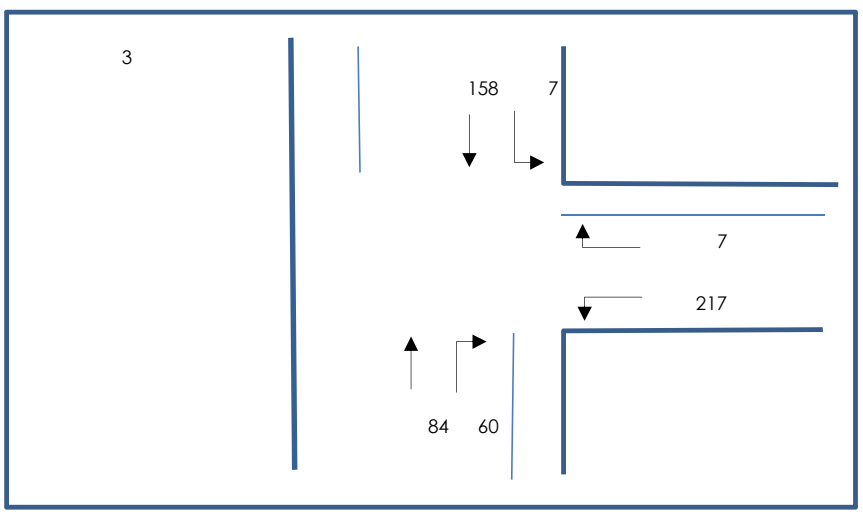
135
600
32
130 15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7
217
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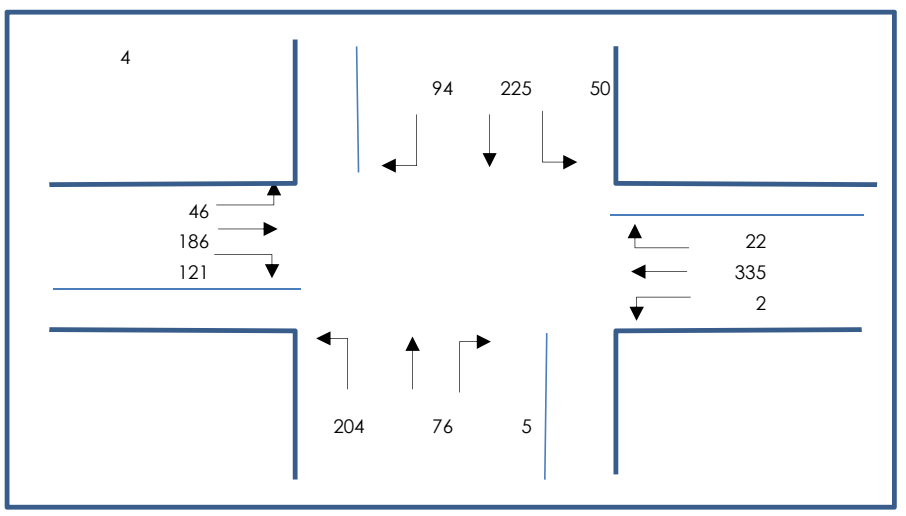
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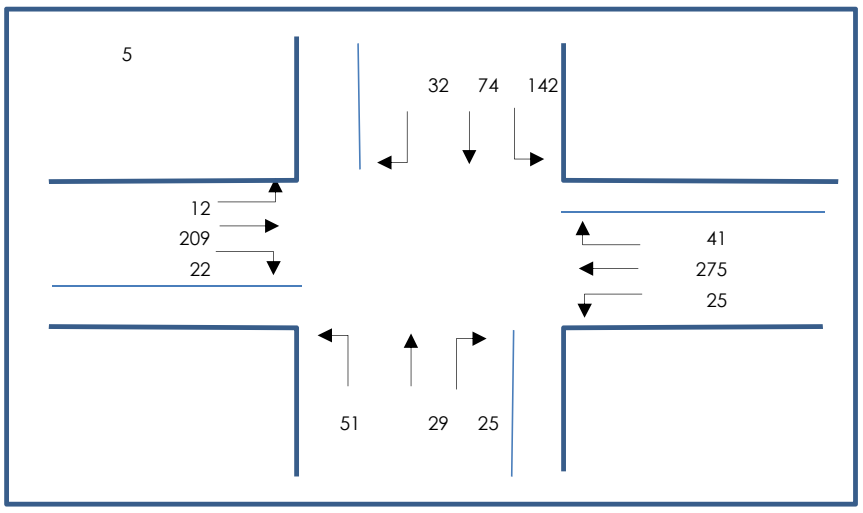
186
121
22
335
2
204 76 5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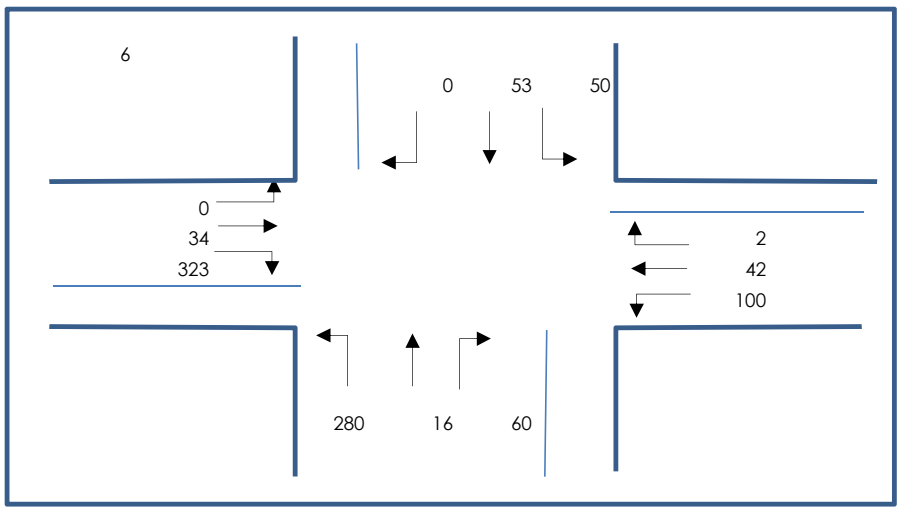
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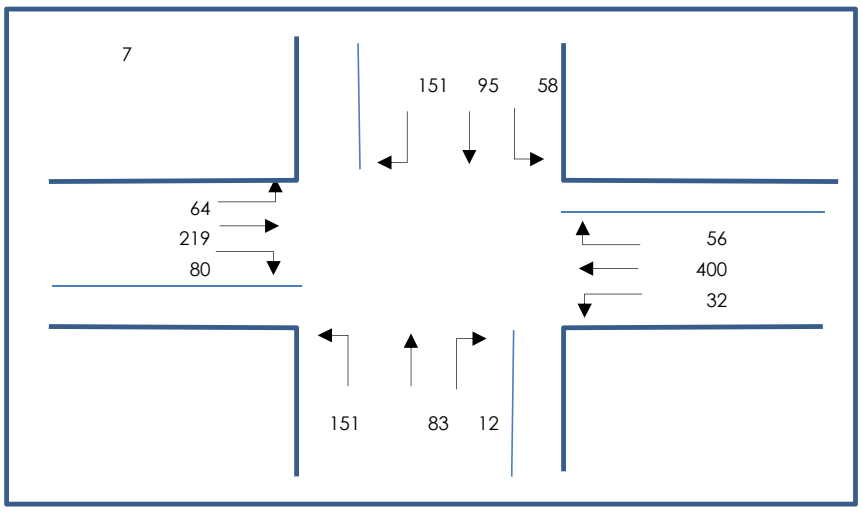
42
100
280 16 60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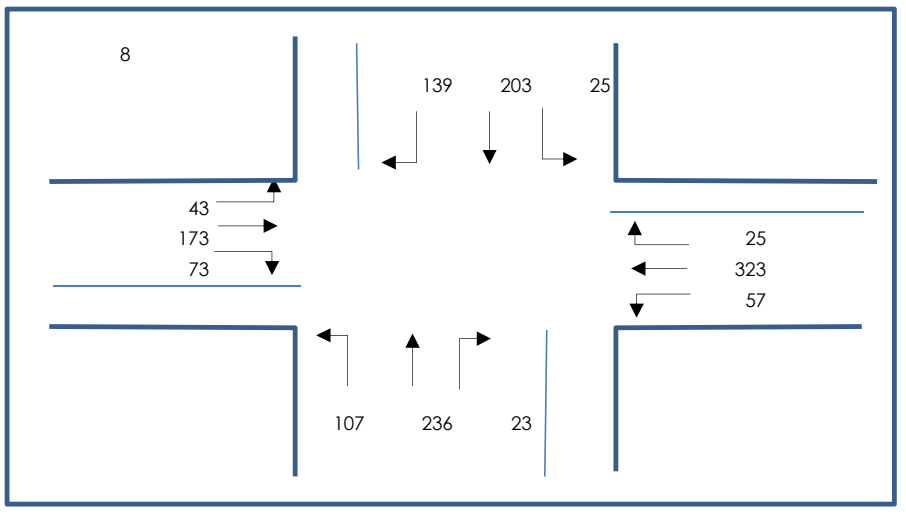
400
32
151 83 12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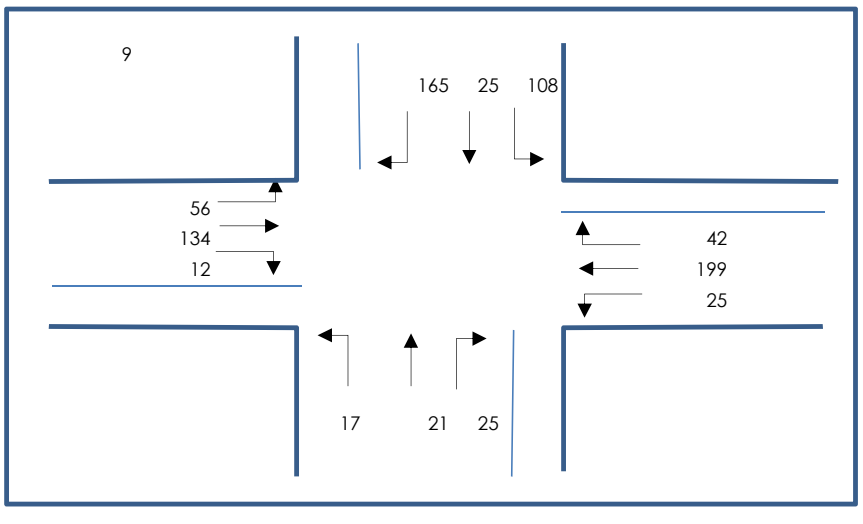
323
57
107 236 23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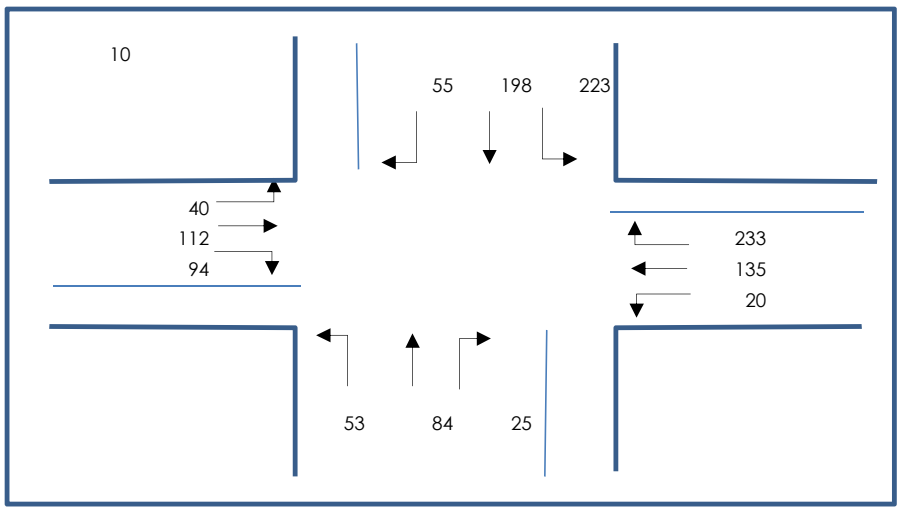
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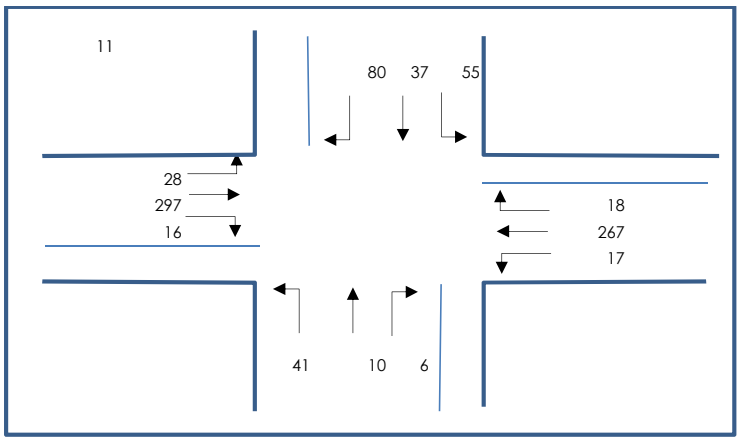
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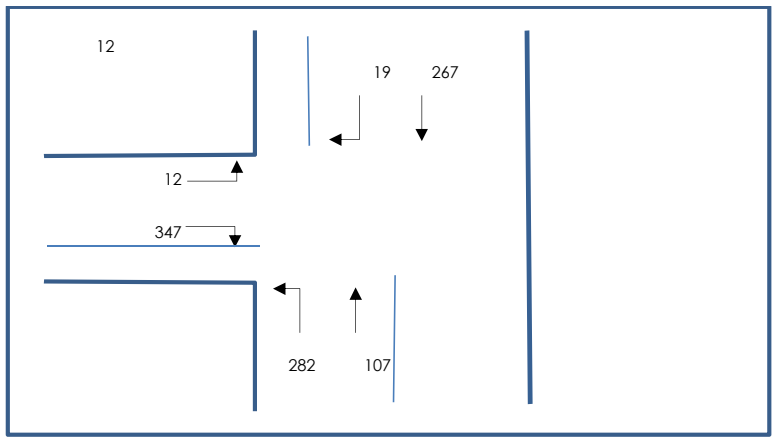
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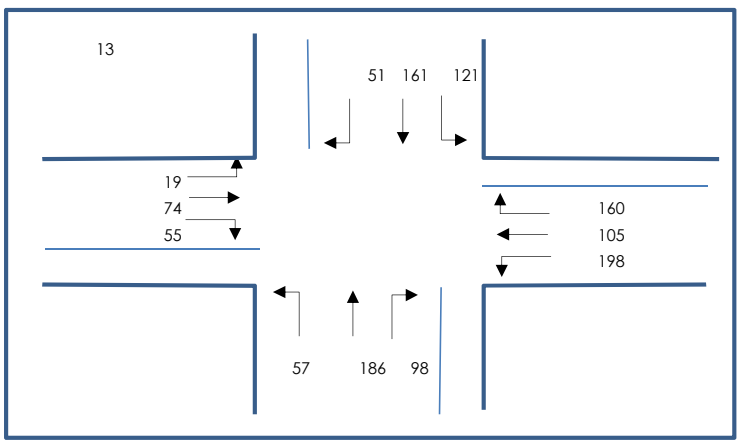
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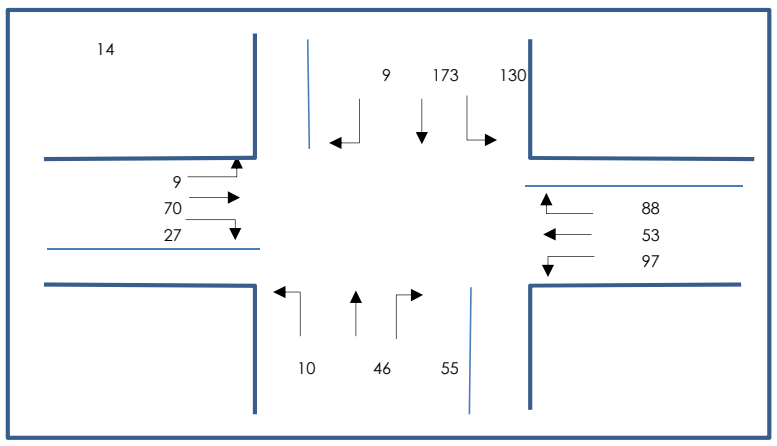
198
57 186 98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70
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88
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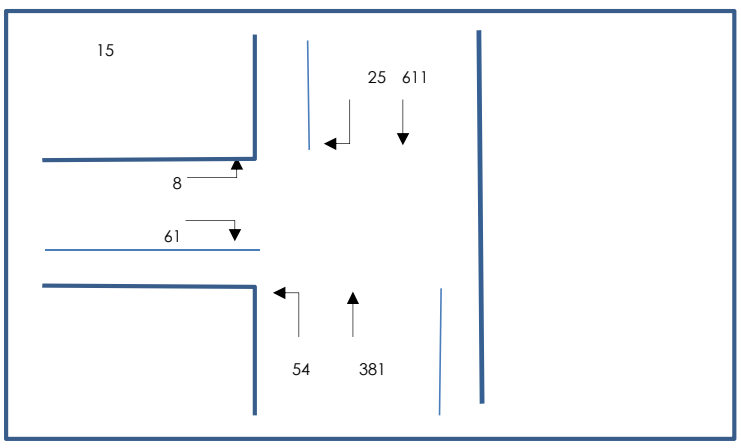
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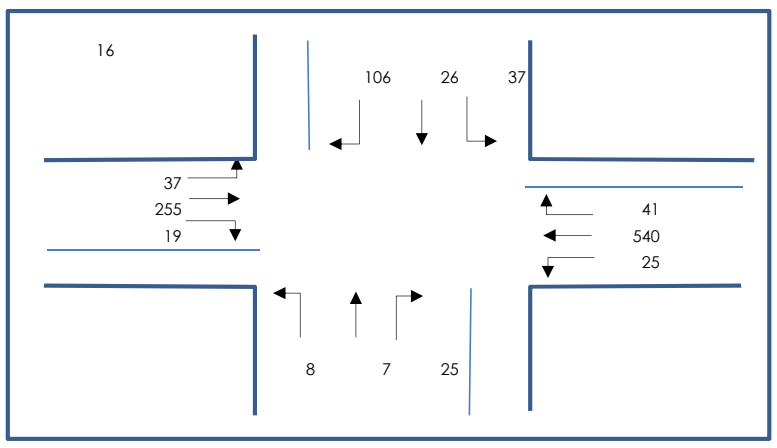
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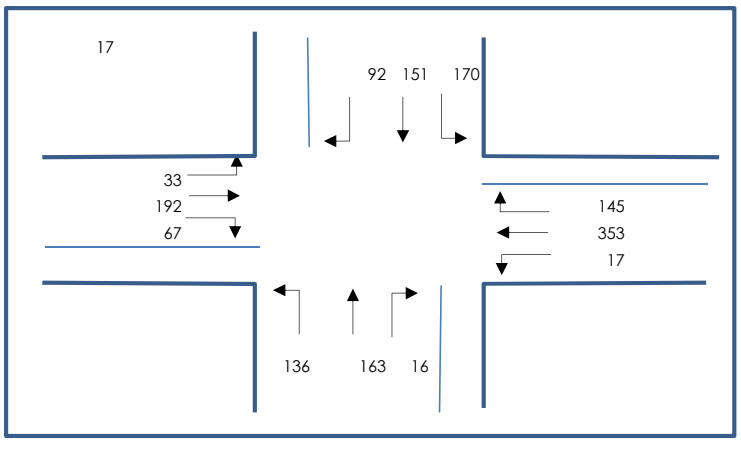
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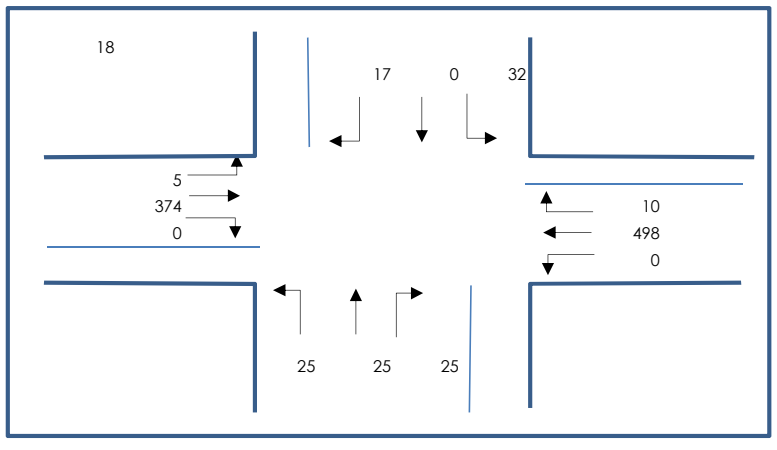
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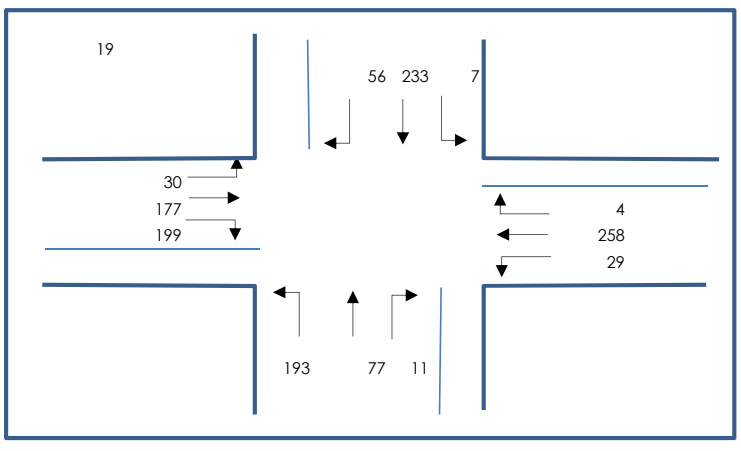
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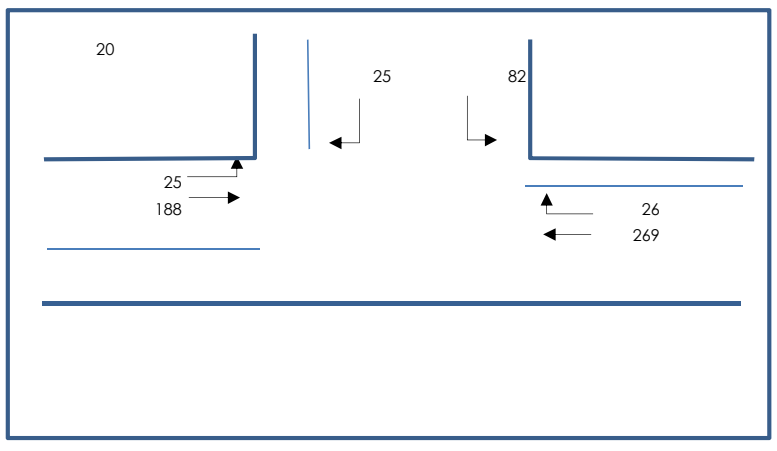
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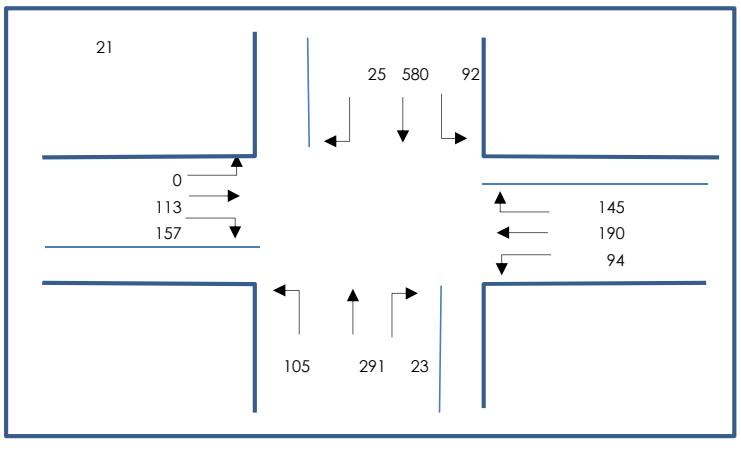
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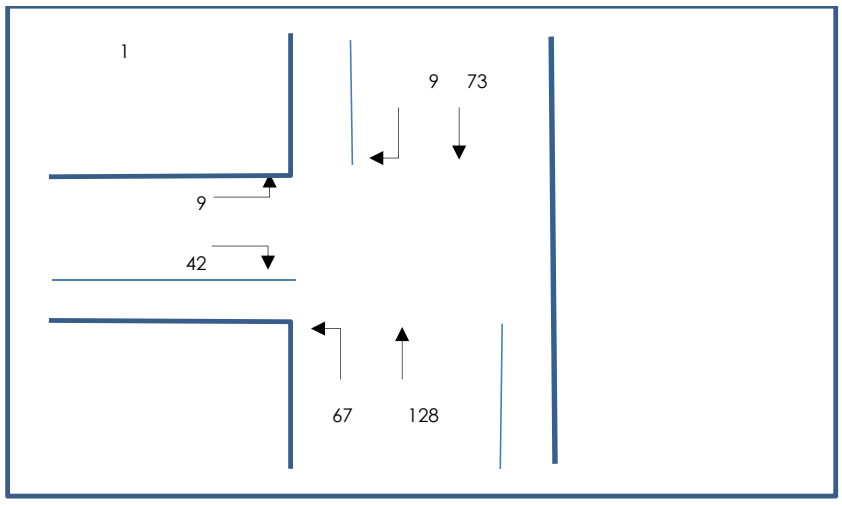
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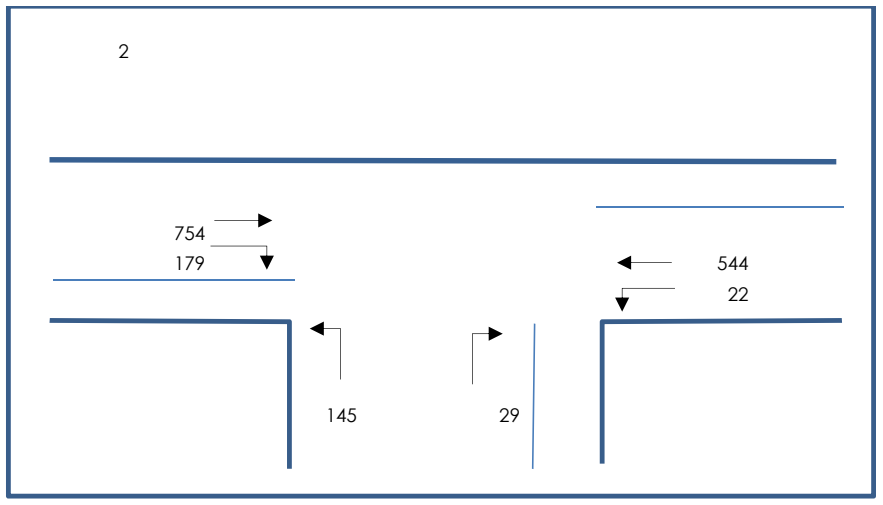
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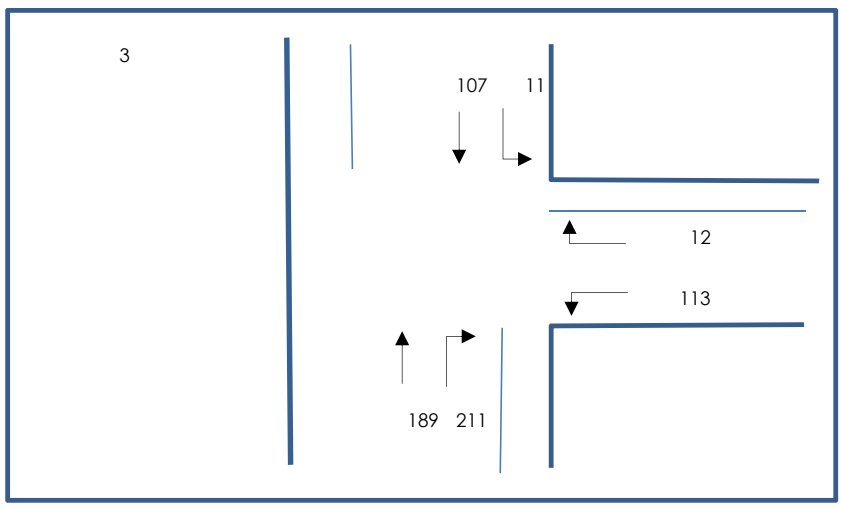
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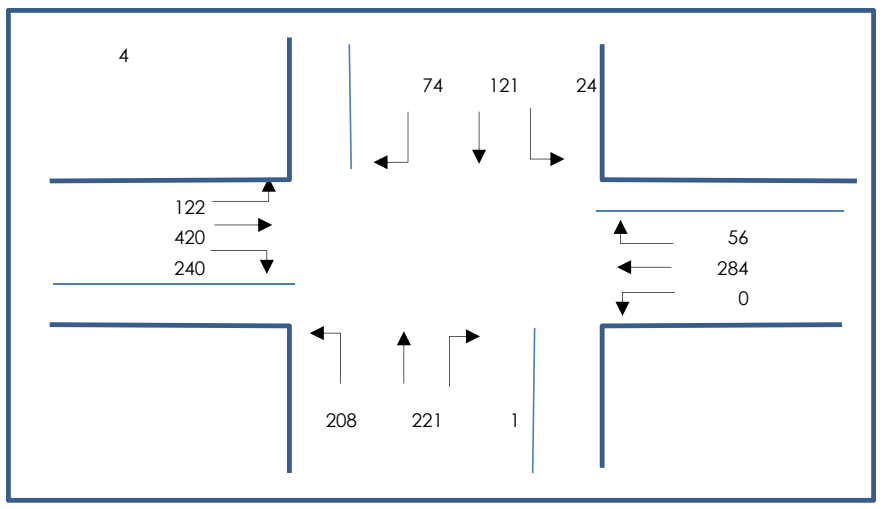
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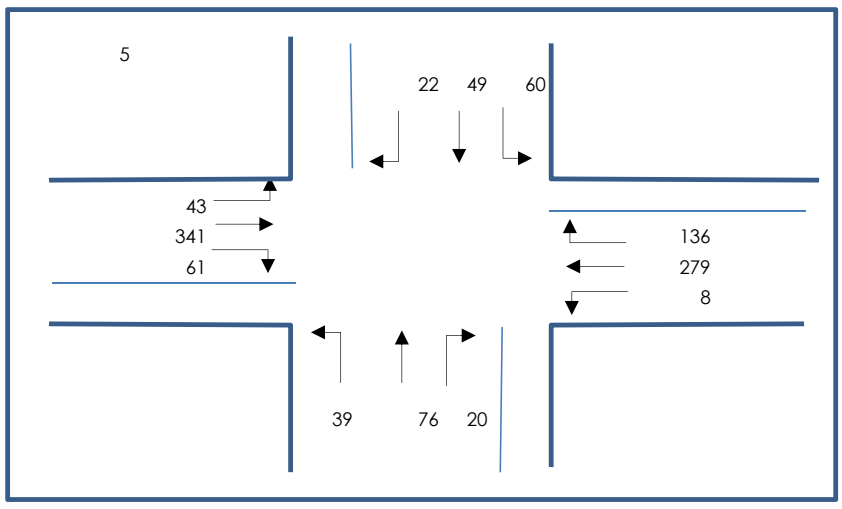
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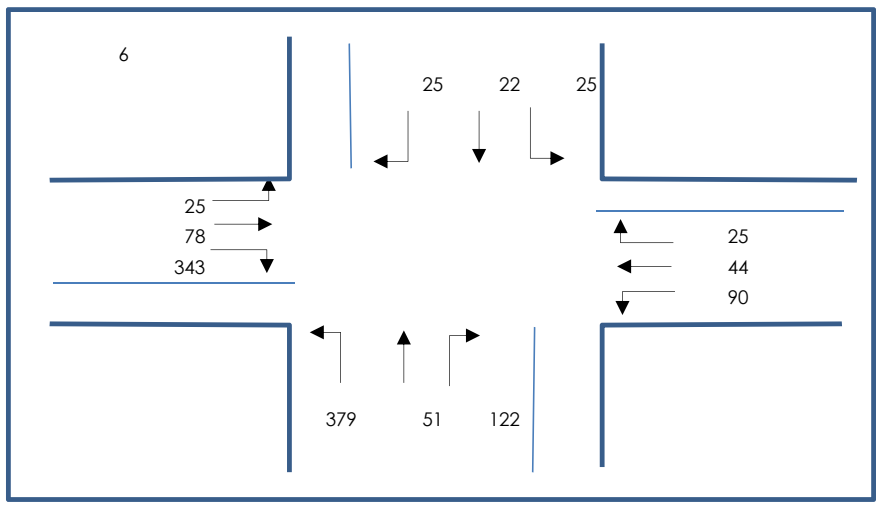
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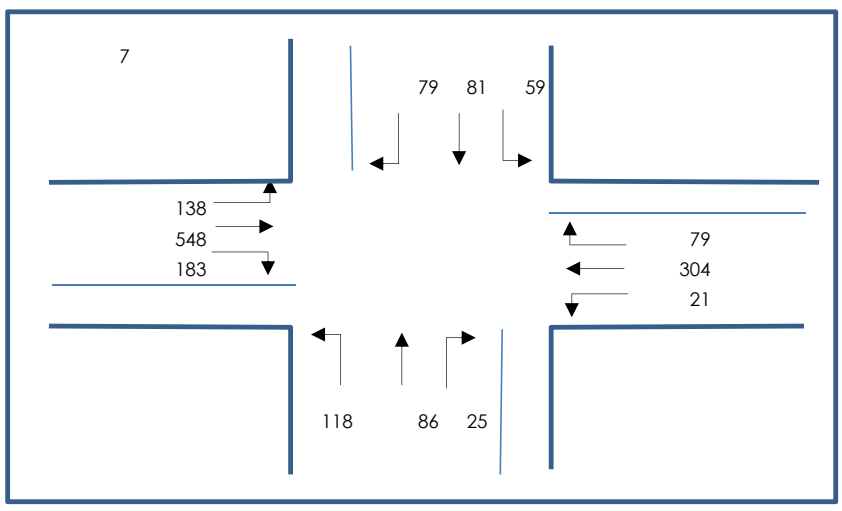
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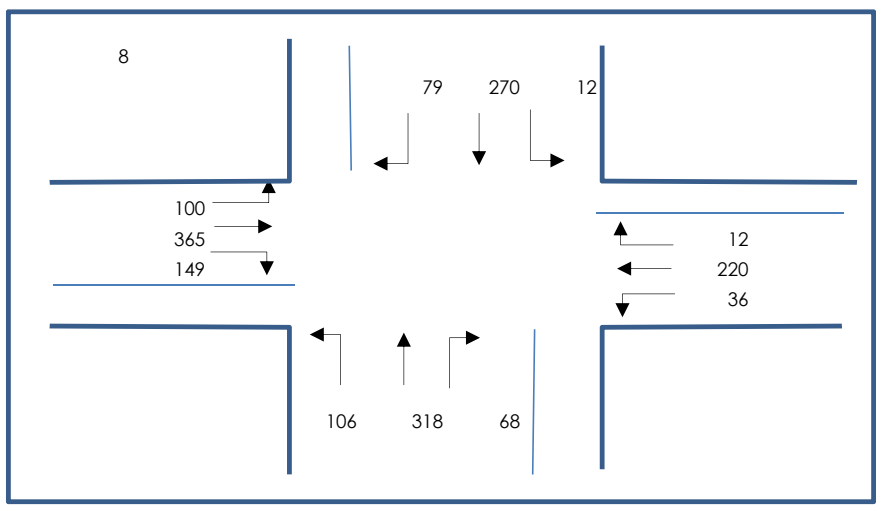
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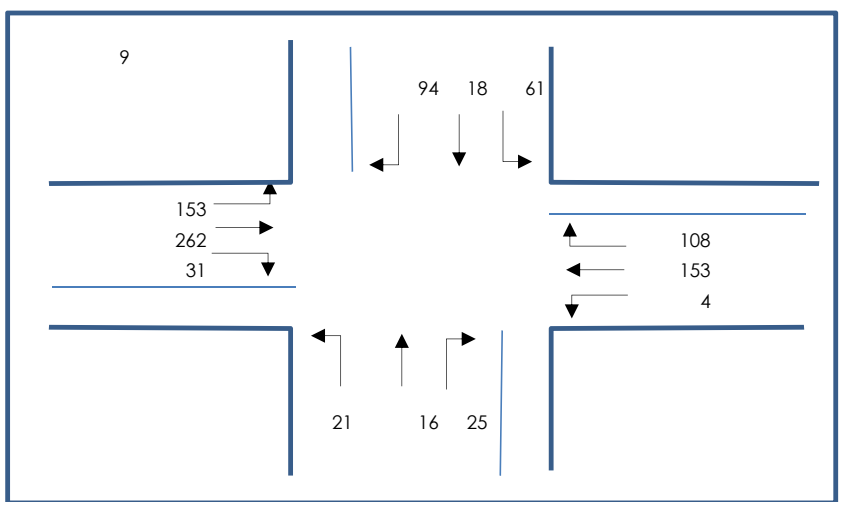
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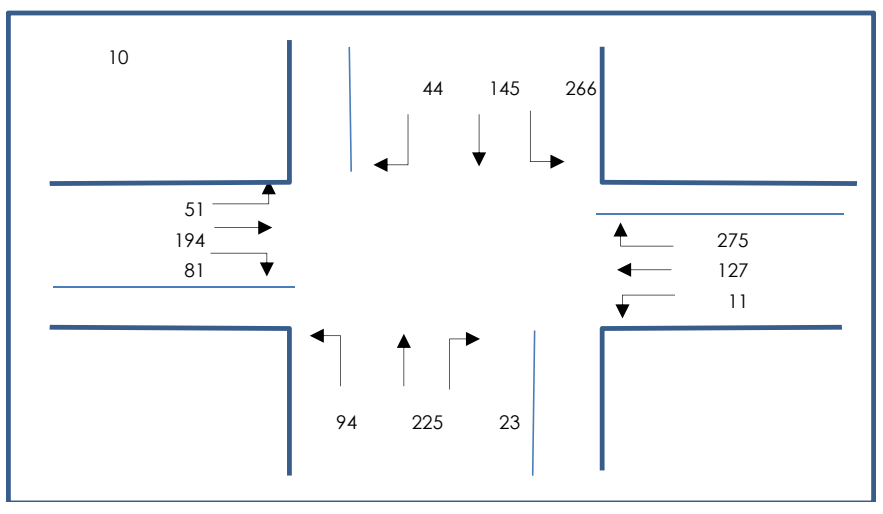
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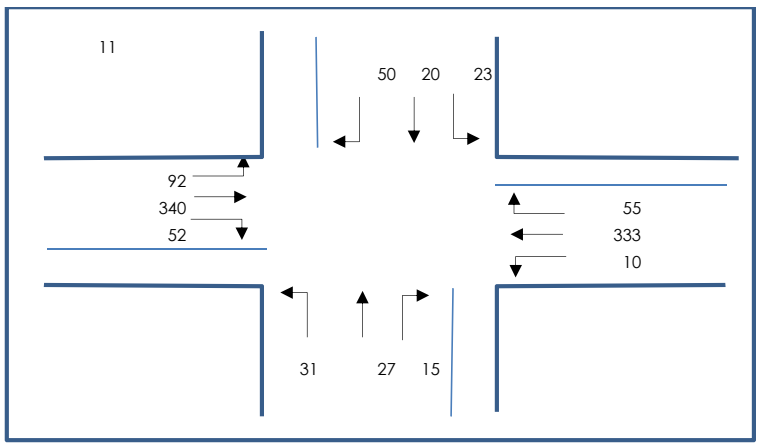
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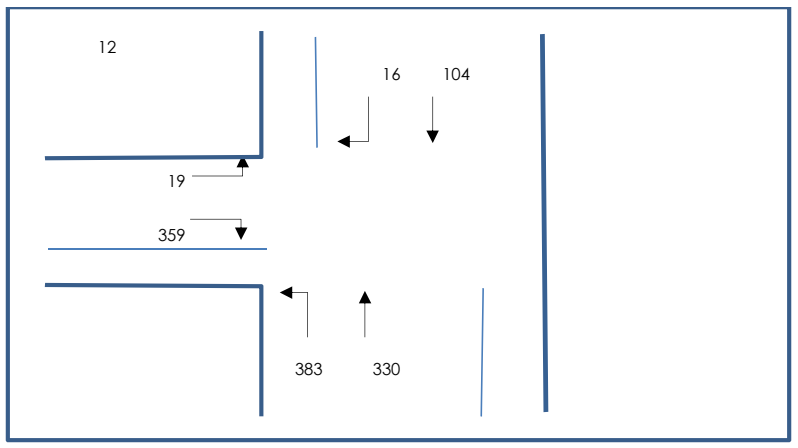
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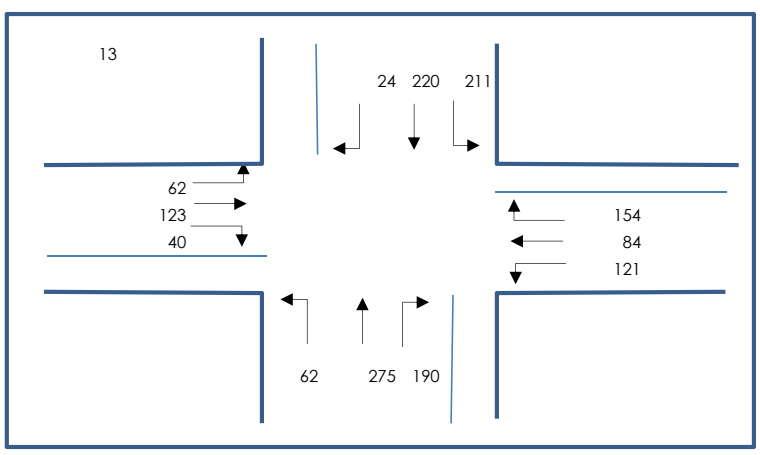
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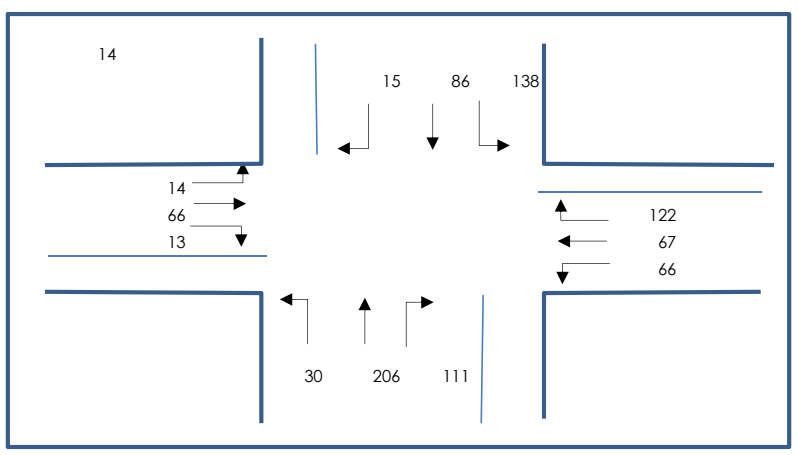
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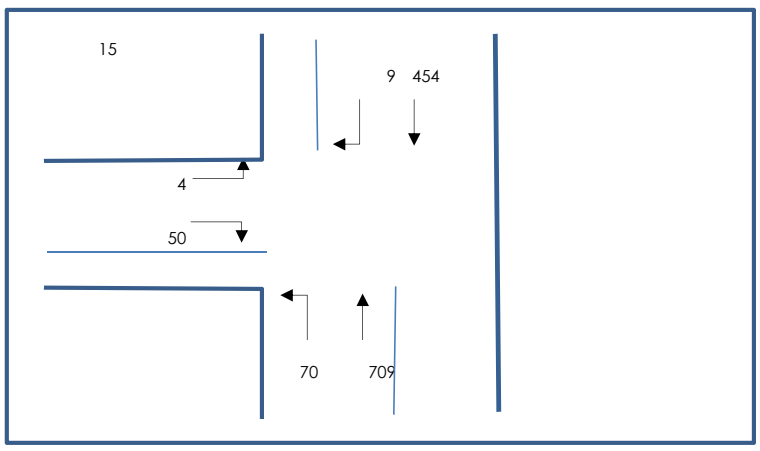
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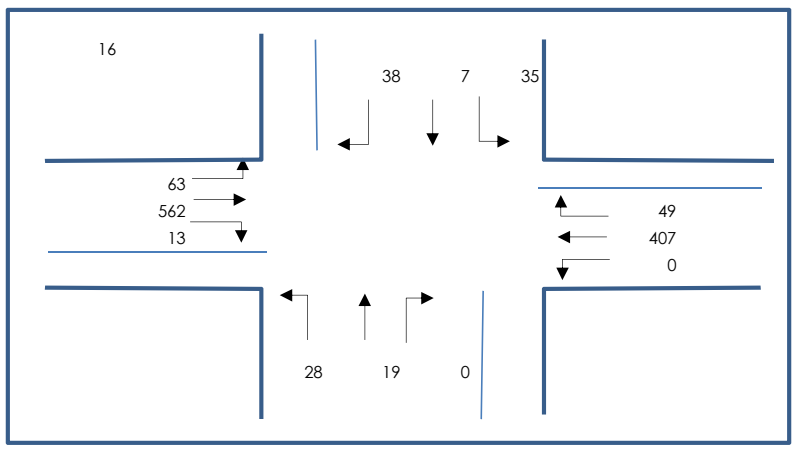
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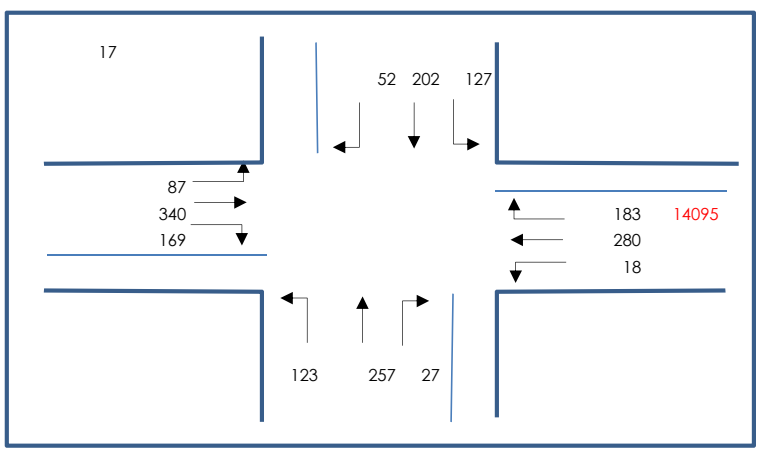
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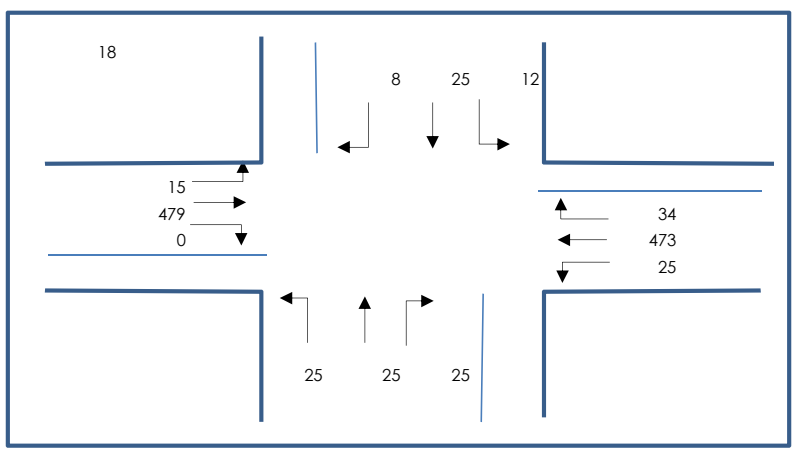
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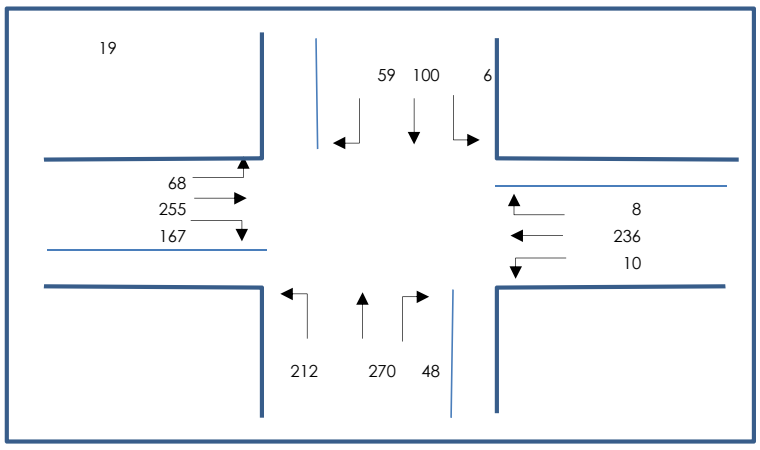
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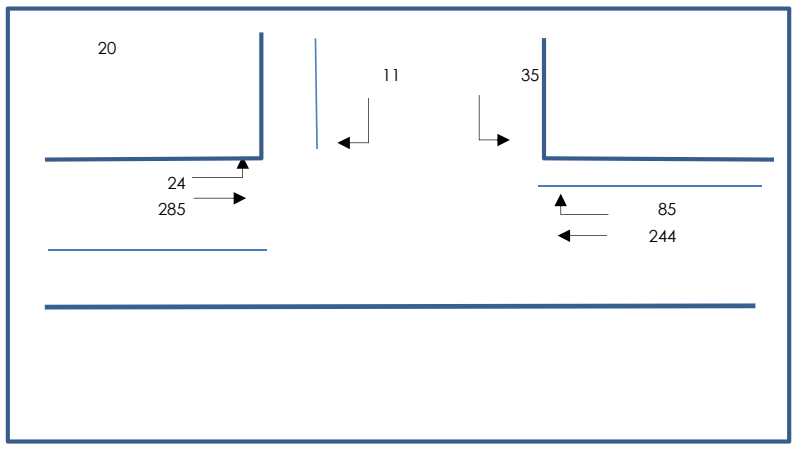
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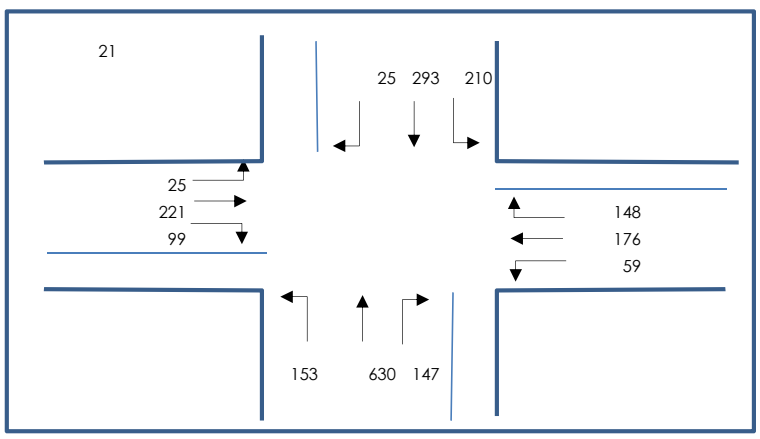
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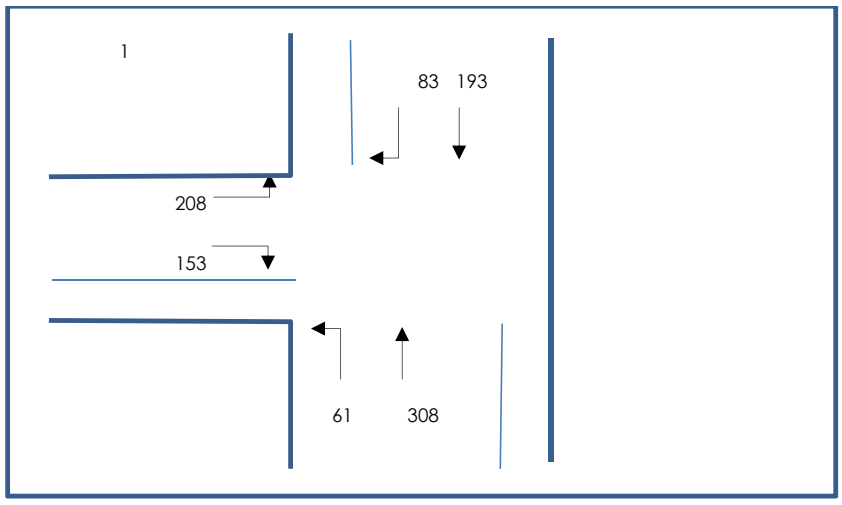
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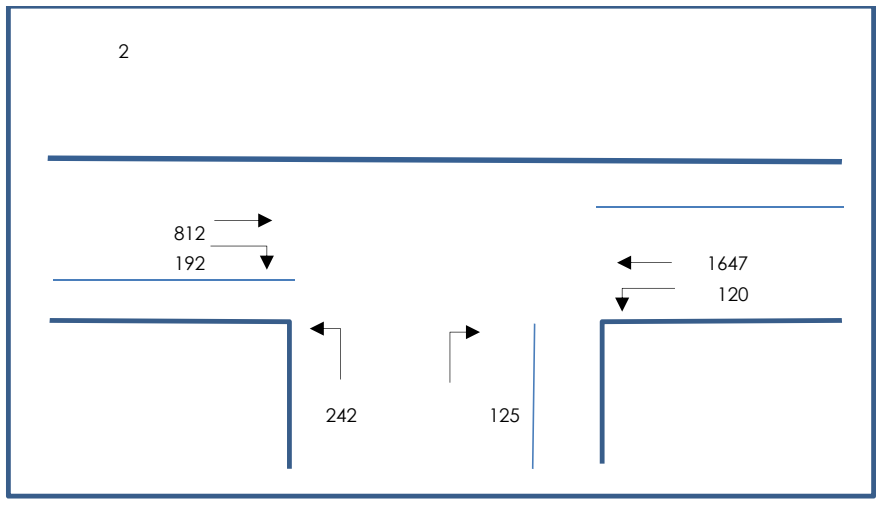
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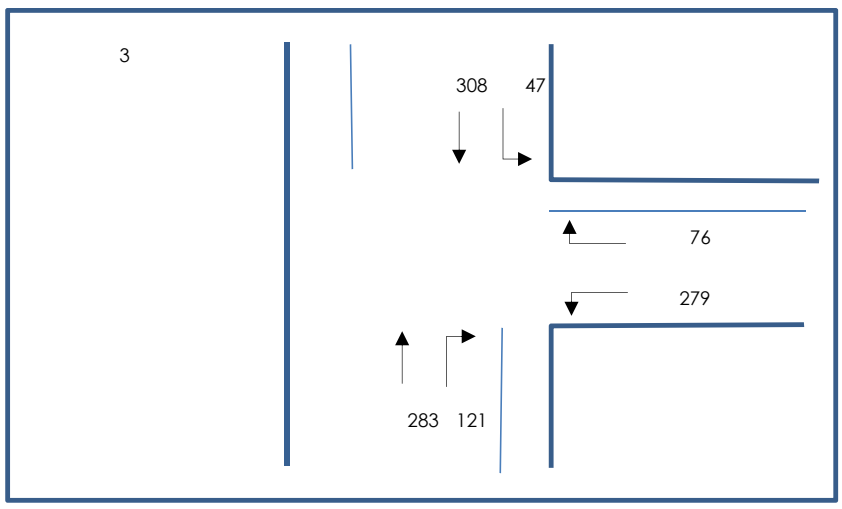
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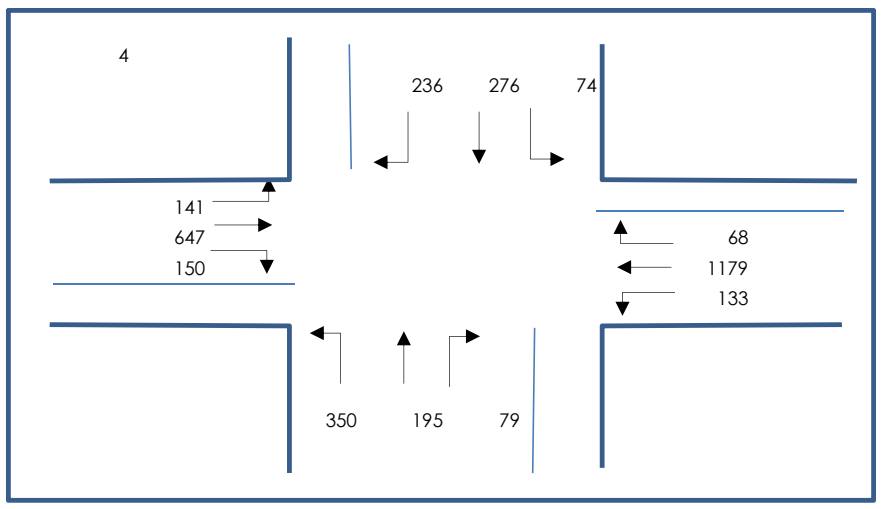
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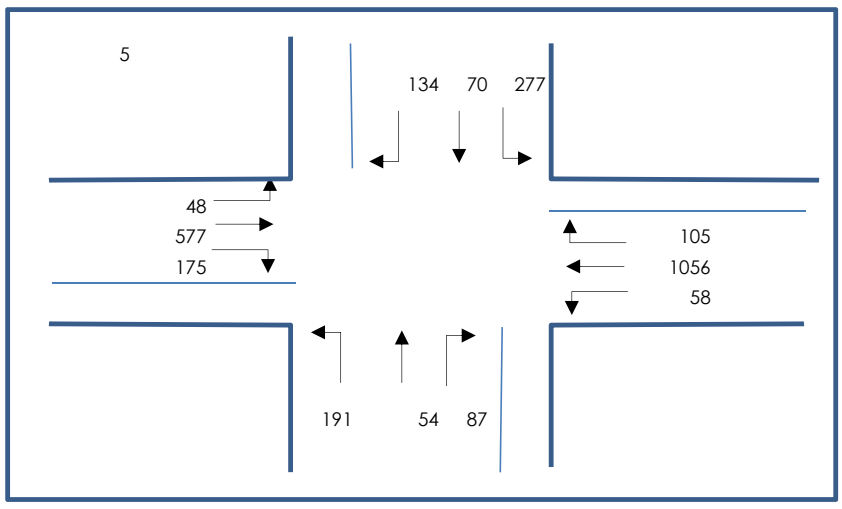
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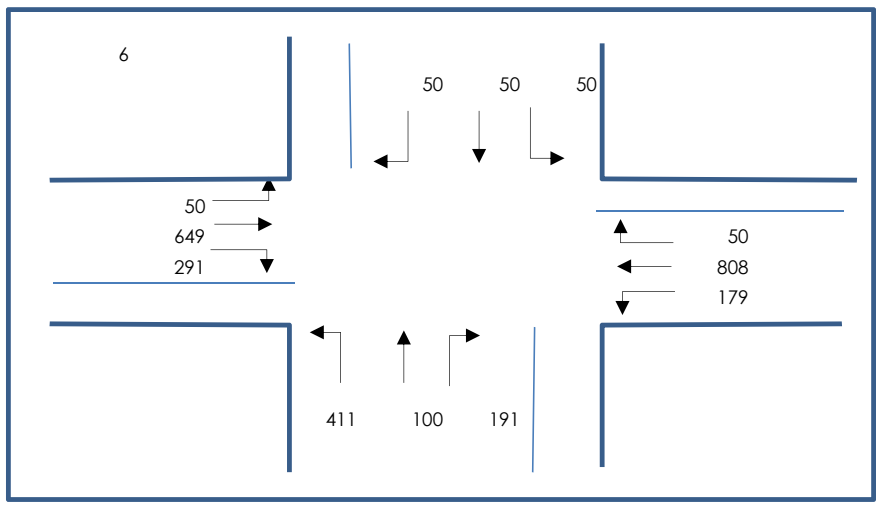
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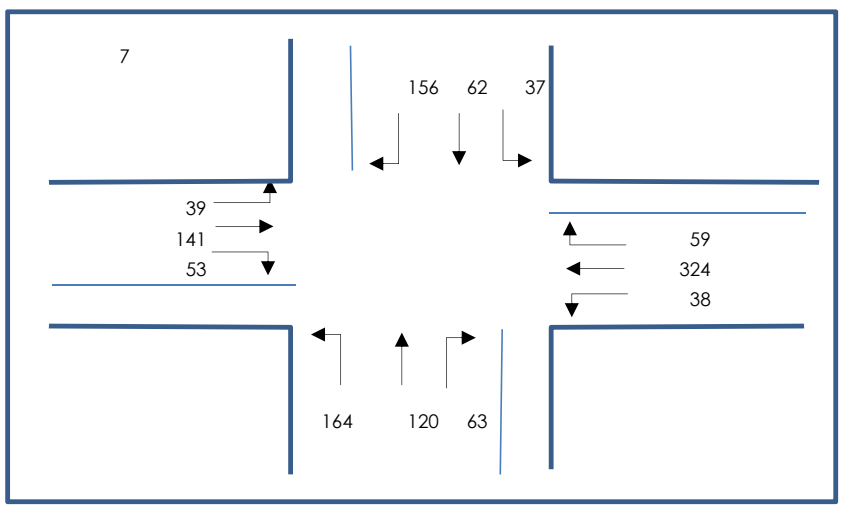
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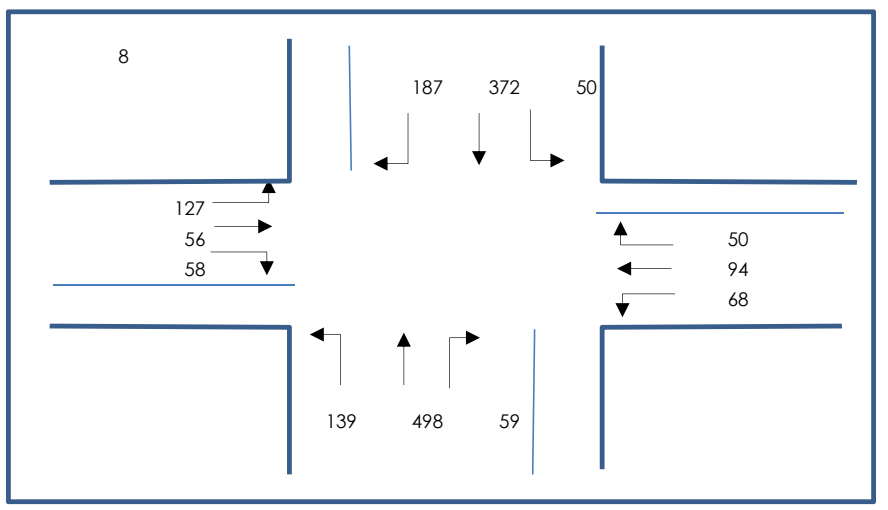
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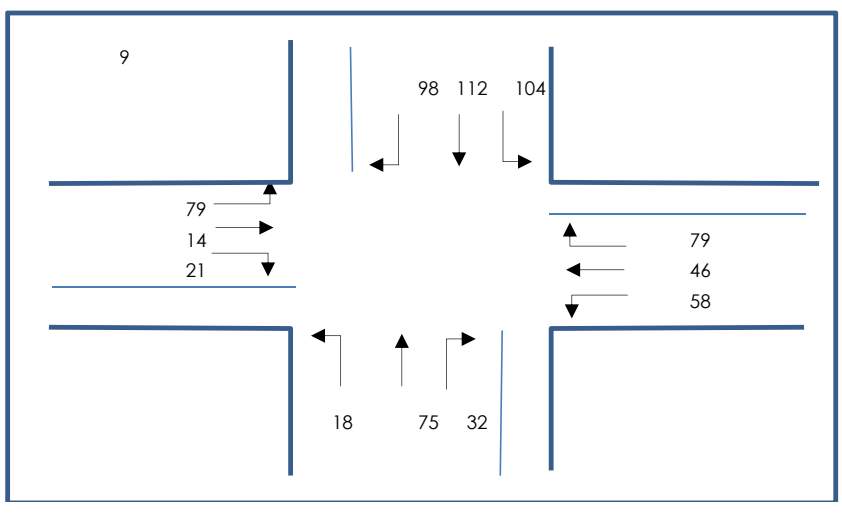
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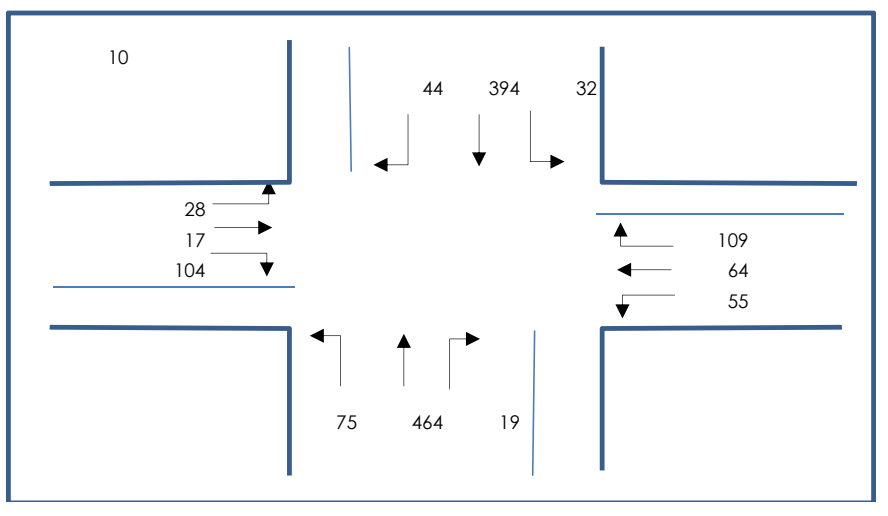
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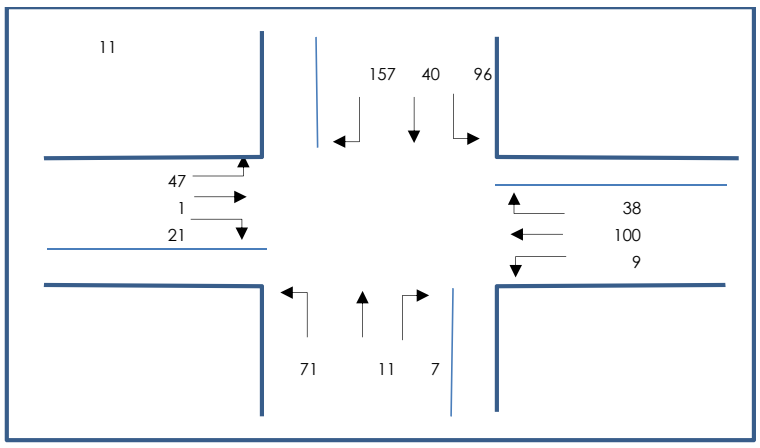
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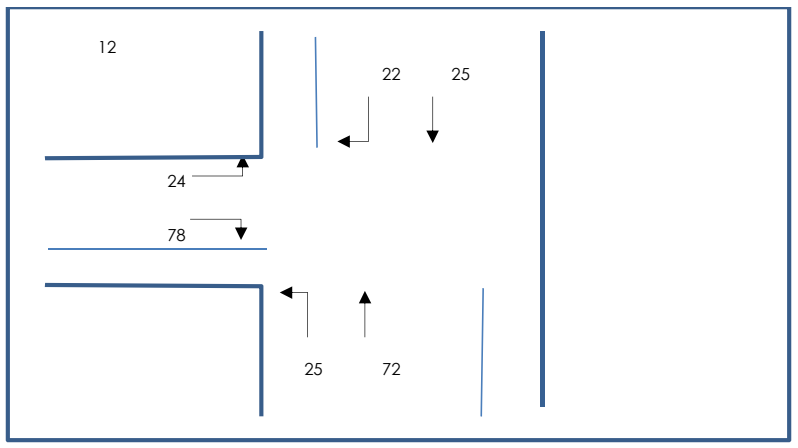
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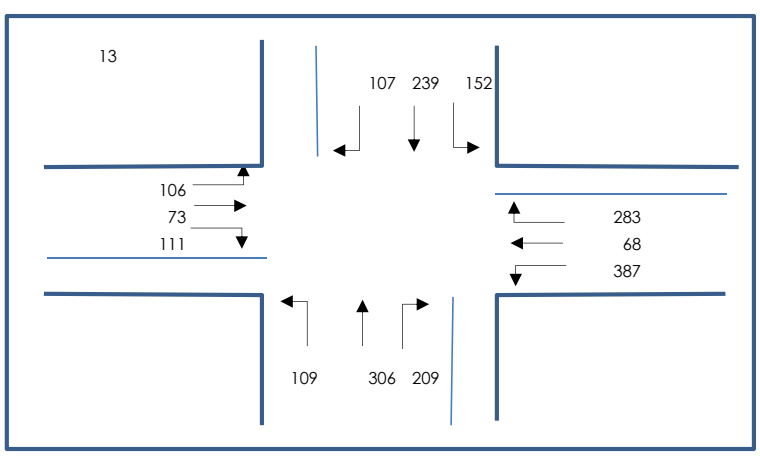
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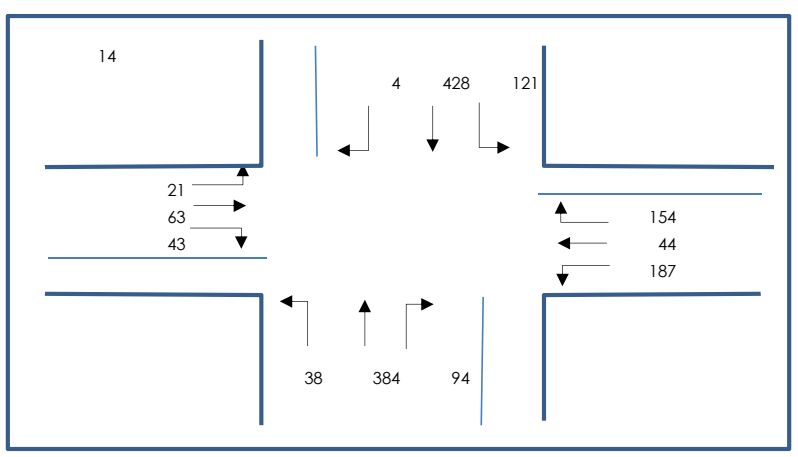
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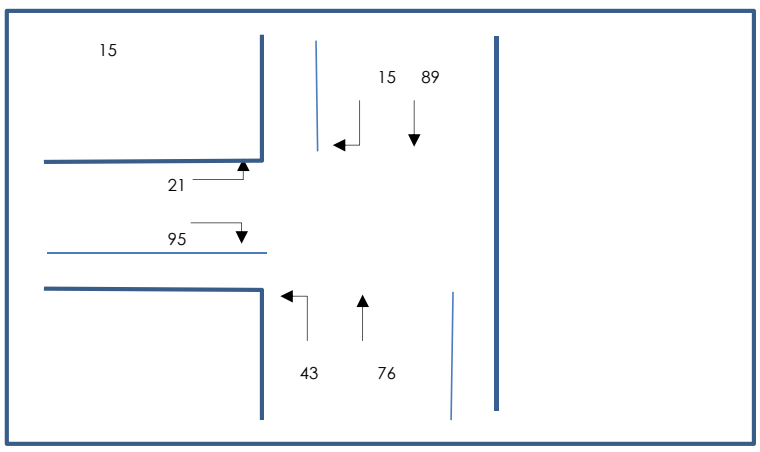
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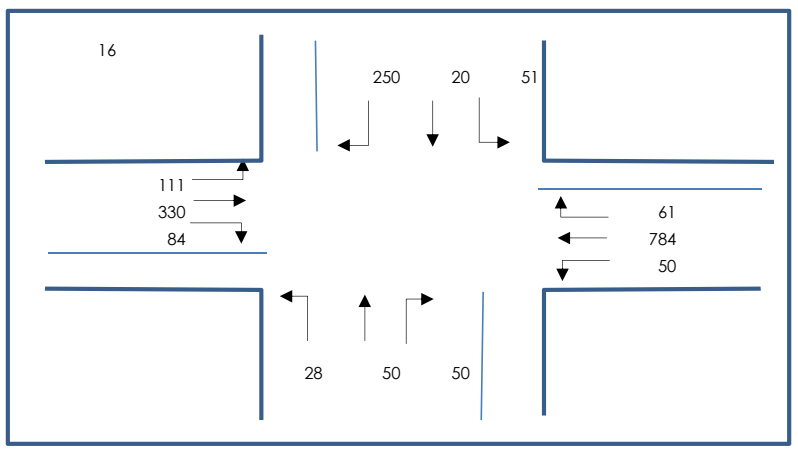
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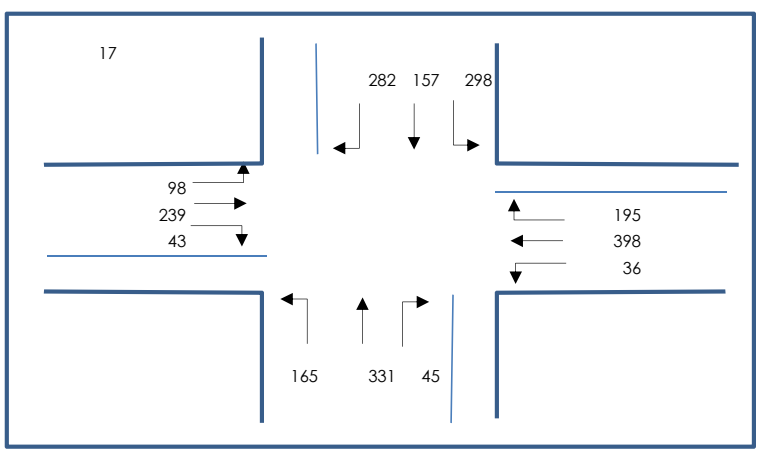
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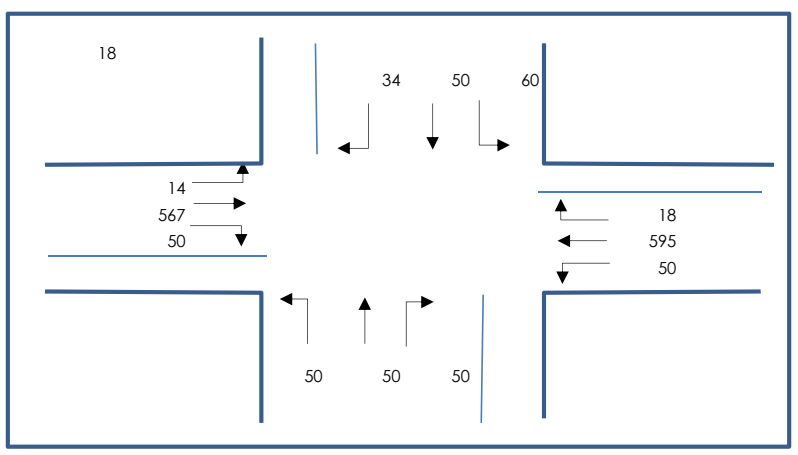
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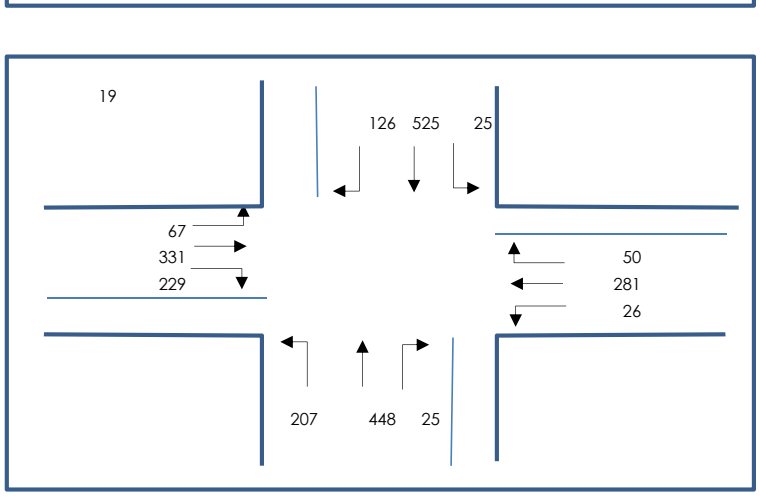
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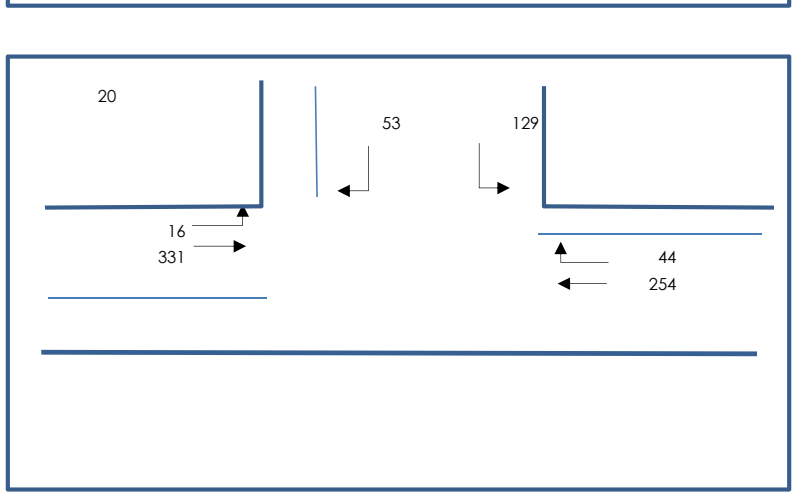
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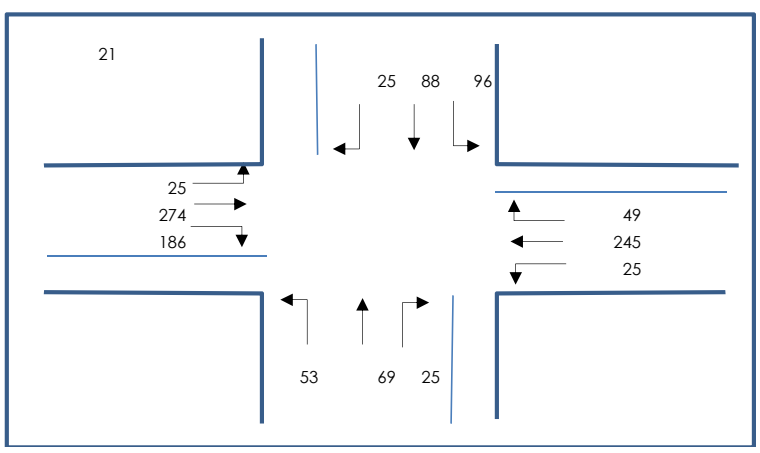
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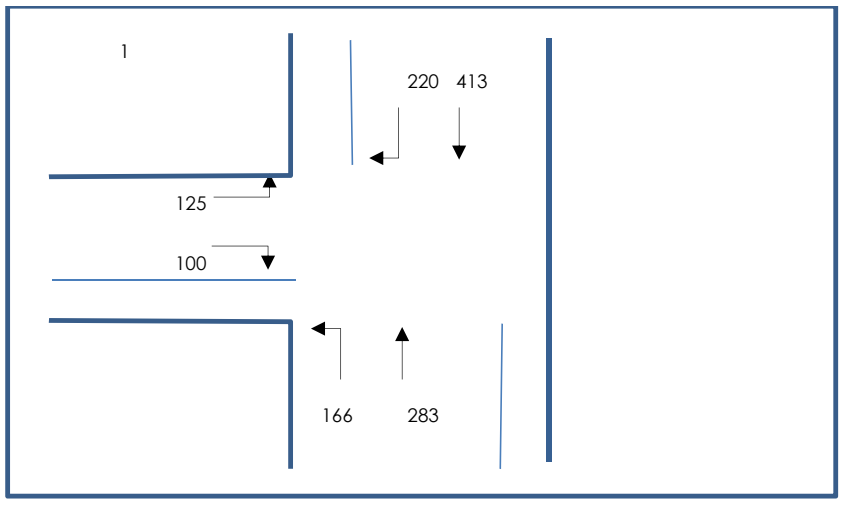
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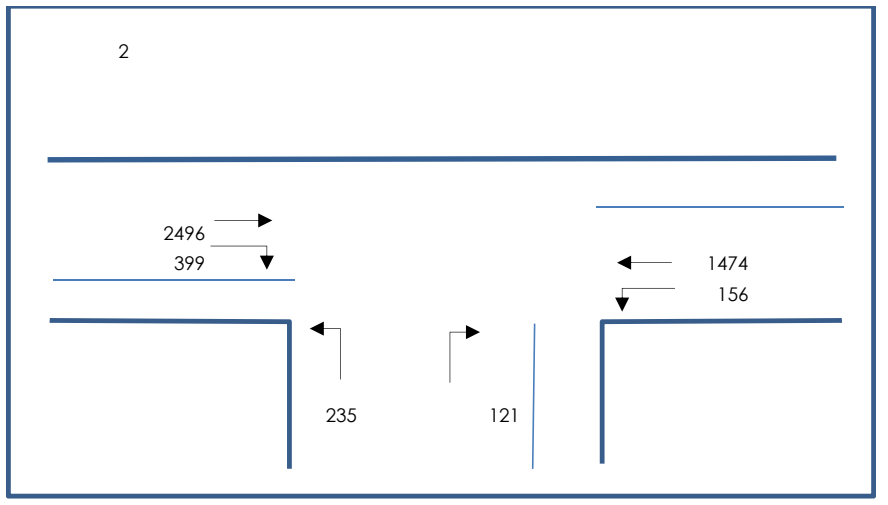
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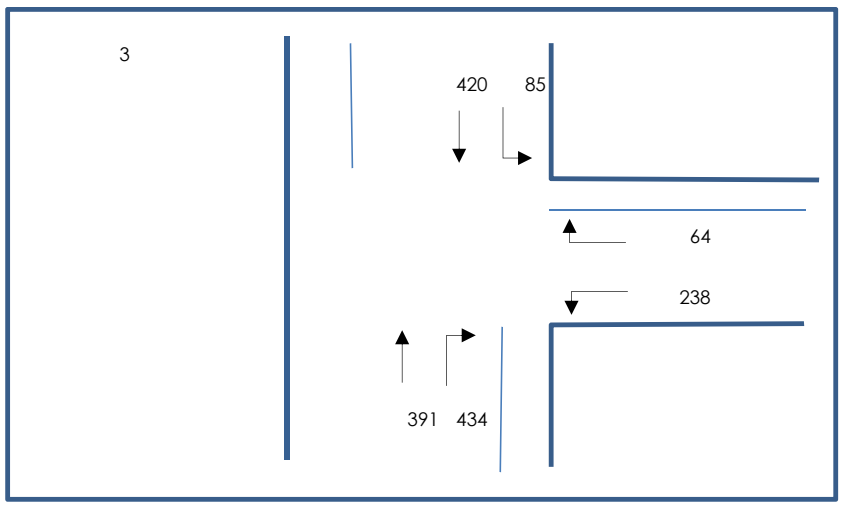
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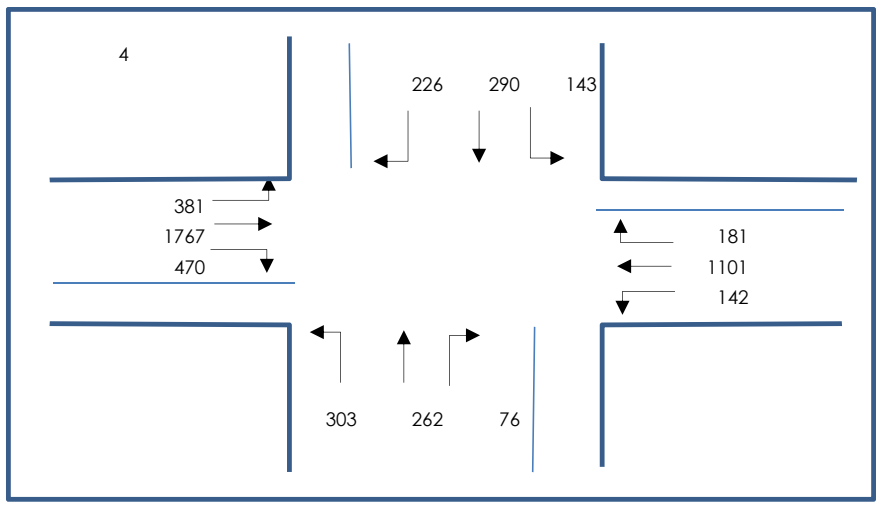
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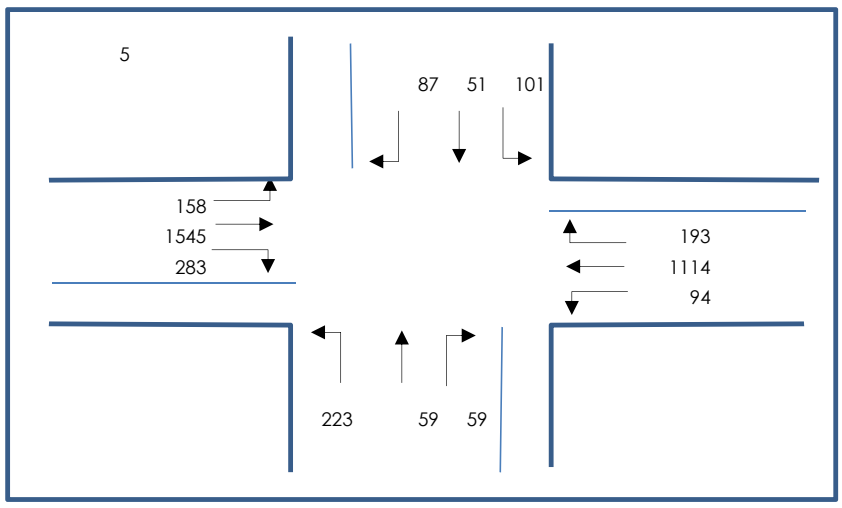
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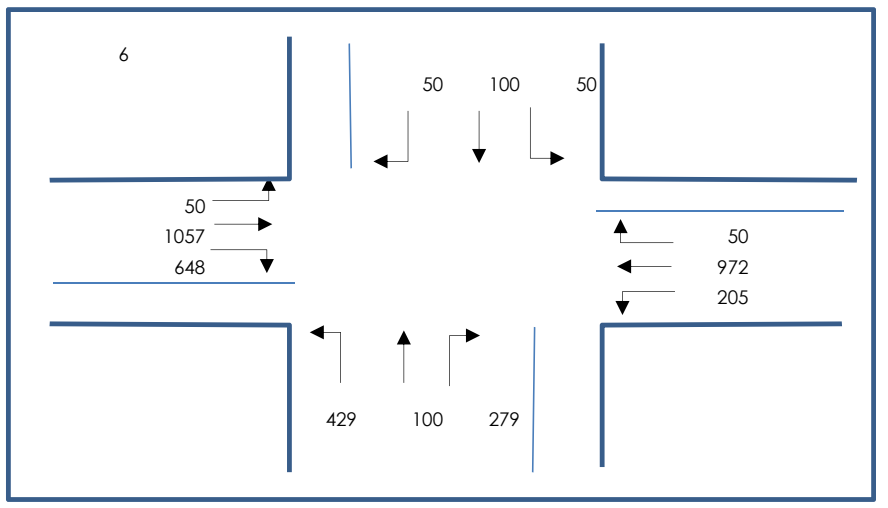
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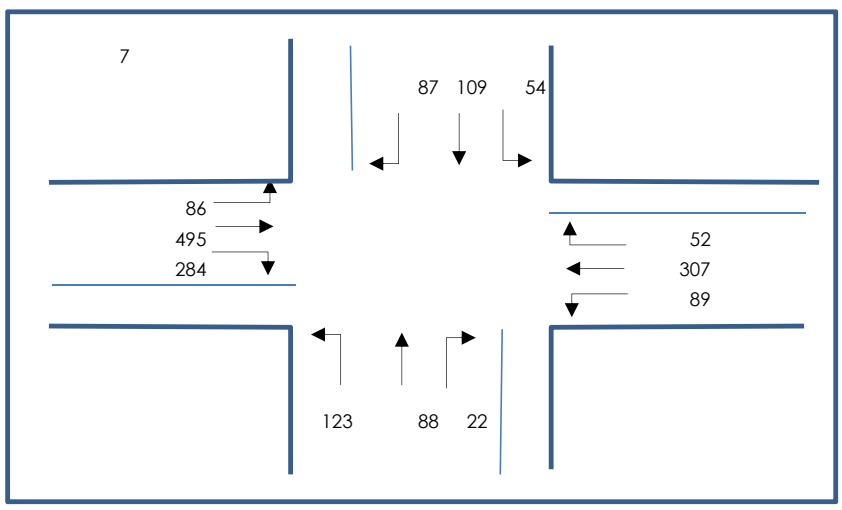
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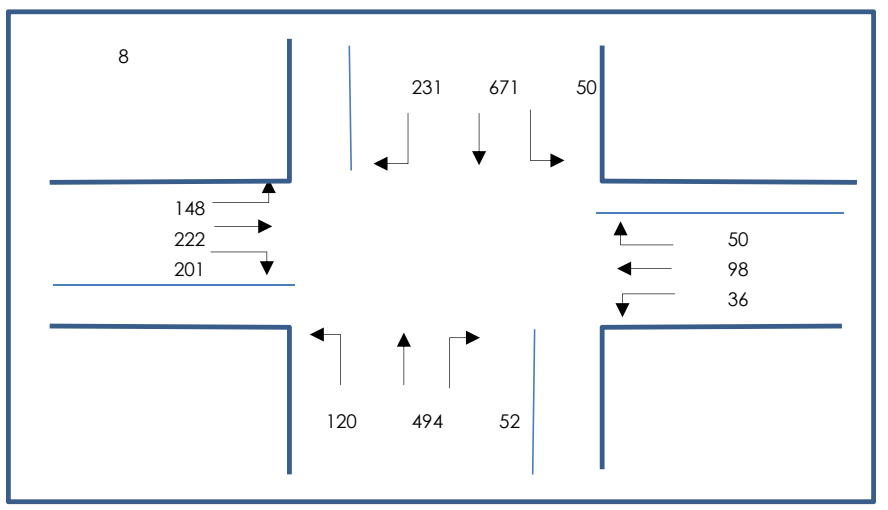
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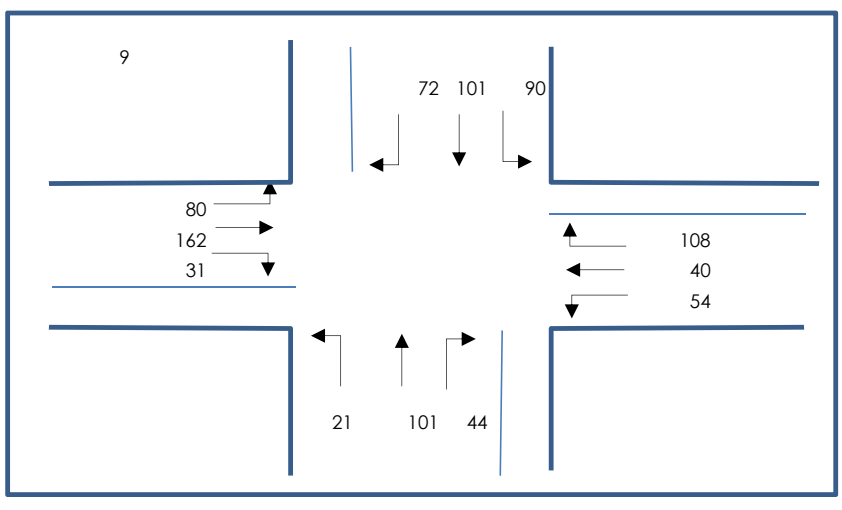
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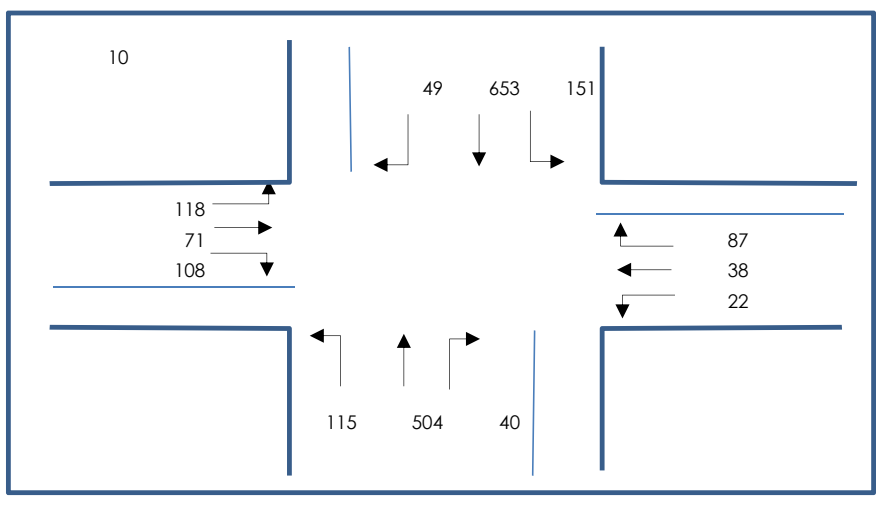
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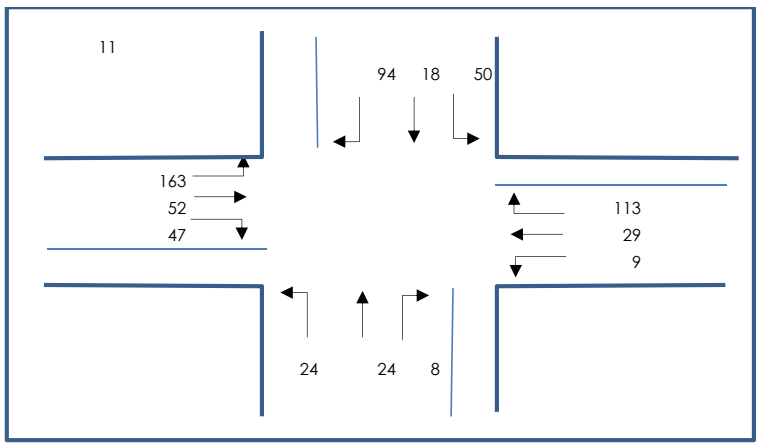
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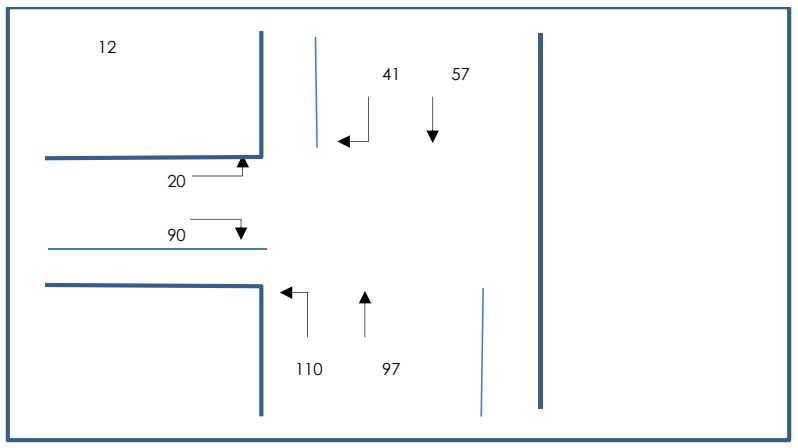
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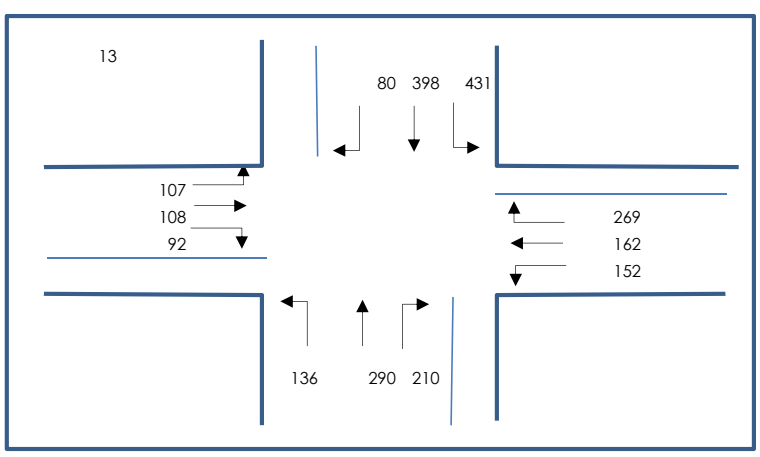
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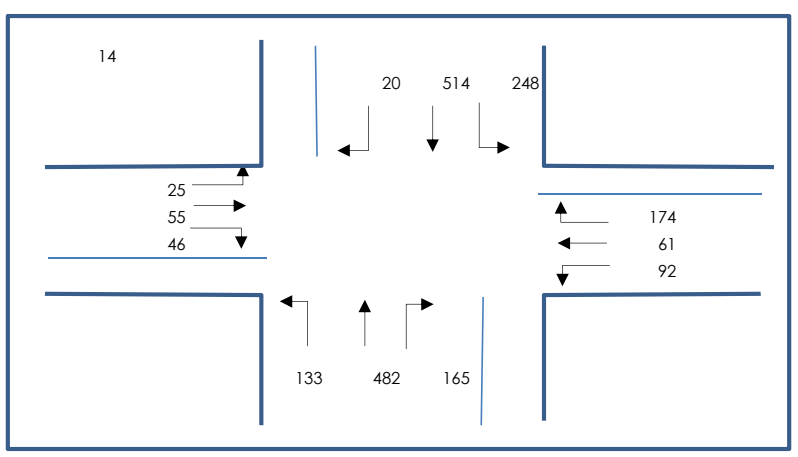
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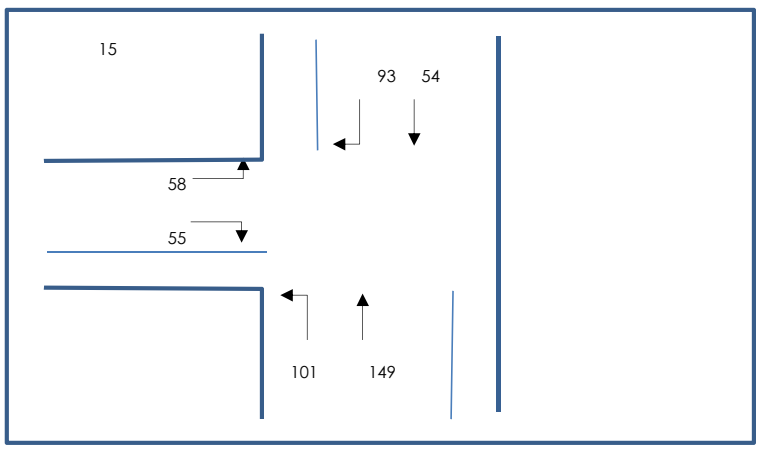
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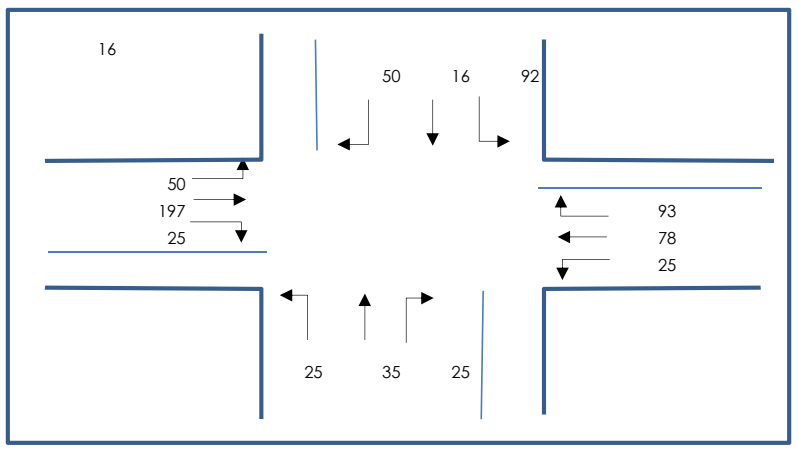
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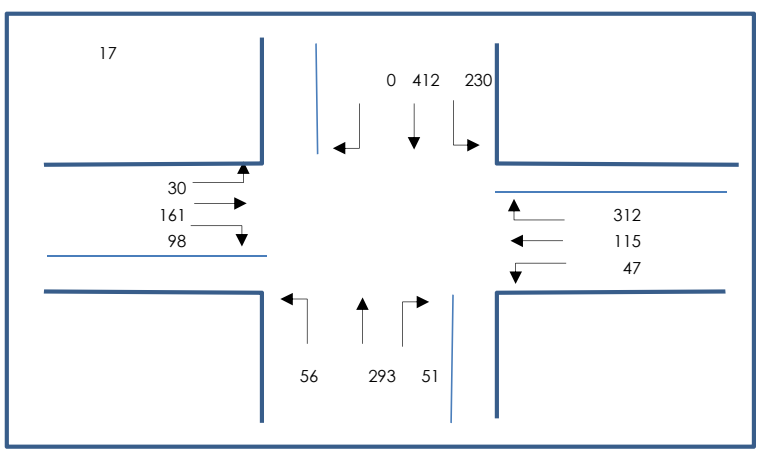
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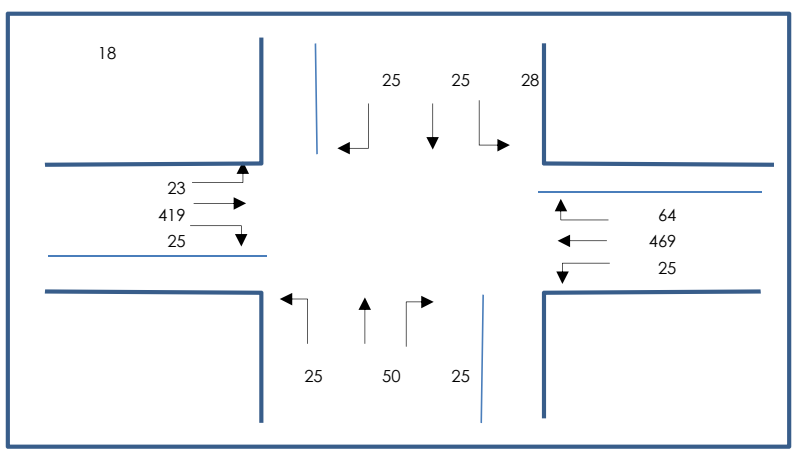
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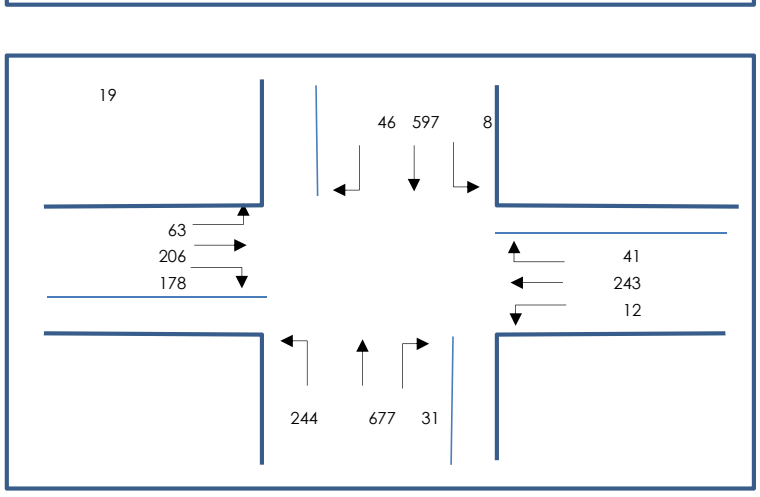
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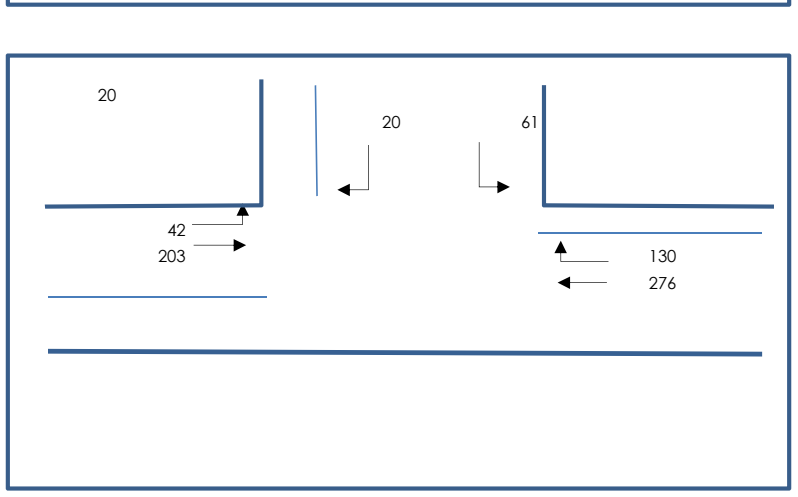
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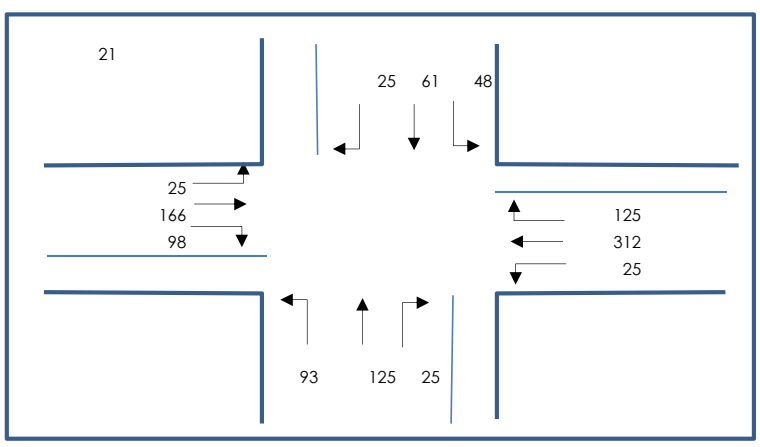
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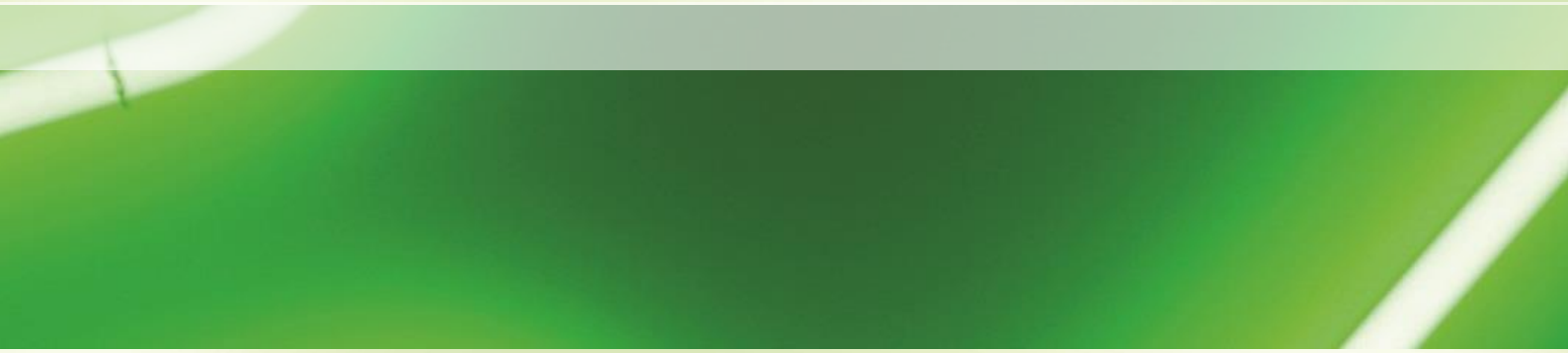

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