

## **Appendix B:**

### **Proposed Improvements to Thickthorn Interchange**



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**Thickthorn, Norwich**  
**Proposed Junction Improvement Strategy**

# THICKTHORN, NORWICH

## Proposed Junction Improvement Strategy

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**Reference:** JPC/CS/150/02

**Date:** October 2010

Thickthorn, Norwich  
Proposed Junction Improvement Strategy

## **THICKTHORN, NORWICH**

### **Proposed Junction Improvement Strategy**

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## 1.0 INTRODUCTION

- 1.1 Create Consulting Engineers Ltd have been instructed by Landstock Estates Ltd and the Landowners Group to review the capacity of the existing A47/A11 Thickthorn Interchange and to review a strategy showing how the junction can be improved to provide for growth as outlined as the GNDP Joint Core Strategy (JCS).
- 1.2 This report also considers the potential for additional growth to be accommodated in the A11 corridor especially in the Wymondham area and considers the implications of this growth on the B1172 and the A11 as it approaches Thickthorn Interchange.
- 1.3 The report also reviews the measures that would be required to improve bus priority through the Thickthorn Interchange and how this could be linked with the delivery of a (Bus Rapid Transport (BRT) service along the B1172.
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## 2.0 EXISTING TRAFFIC FLOWS AND JUNCTION OPERATIONS

- 2.1 The existing Thickthorn Interchange connects the two principal trunk road routes of the A11 and the A47(T) to the south west of Norwich. The B1172 Hethersett Road also links into the Interchange providing an alternative route to both Hethersett and Wymondham.
- 2.2 To the west of the actual junction is the Thickthorn Park and Ride and roadside services area. Both these facilities take direct access from a roundabout on the B1172, a short distance before its connection with the main circulatory carriageway of the interchange.
- 2.3 Thickthorn interchange takes the form of a large grade separated, two bridge roundabout with the A47(T) Norwich Southern Bypass having priority over the movements along the A11. Flows on the A11 and those from the two off slips from the A47 are all controlled by traffic signals. The flows from the B1172 currently have to yield to the controlled flows released from the other arms. The Traffic Signal Layout drawings prepared by Atkins showing the current junction arrangement are enclosed in Appendix A.
- 2.4 In order to assess the capacity of the existing junction, a micro simulation model (VISSIM) has been prepared using traffic data collected in July 2010. This model has been used to inform the results of the various options discussed in this report.
- 2.5 The VISSIM model shows that the existing junction operates satisfactorily, which is also confirmed by on site validation inspections. The signals on the roundabout are currently operated by two MOVA controllers, which effectively manage the flow of traffic through the junctions. Queue detectors are located at key points around the interchange ensuring that the circulatory carriageway of the junction does not lock up. Detectors are also located on both off slip roads to also prevent queues backing up onto the main carriageways of the A47(T).
- 2.6 At present, the northern bridge of the junction accommodates four lanes of traffic with the southern bridge accommodating three lanes. Both approaches on the A11 widen to four lanes as it joins the interchange, with the A47(T) off slips widening to three. The B1172 approach widens to three lanes on the approach to the existing junction.
- 2.7 To facilitate bus access to and from the Park and Ride, a bus lane has been incorporated on the B1172 approach. This bus lane also includes detectors which give a bus priority out of this arm over the traffic on the A11.

### SATURN Model

- 2.8 In order to assess the potential impact of traffic growth in the wider Norwich area, Norfolk County Council (NCC) have developed a strategic traffic model of the area using the SATURN modelling programme. It is generally recognised that whilst SATURN may be an appropriate

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modelling tool to undertake wider strategic not traffic distribution it is not appropriate to use this programme to undertake detailed junction appraisals.

- 2.9 Norfolk County Council have supplied SATURN output runs for the existing junction arrangement for 2006 base traffic flows. The details of these flows are enclosed in Appendix B.
- 2.10 From reviewing the SATURN data supplied from NCC with respect to the 2006 base flows, there appears to be a number of discrepancies when compared to the observed traffic data obtained in 2010. The two main differences relate to the A47 off westbound off slip movement to the A11 south, which is shown to be significantly less than observed traffic flows and the movements allocated on the network into the proposed Park and Ride.
- 2.11 To date, we are not aware of any detailed junction analysing having been undertaken by the Highway Authority on the proposed Thickthorn junction.

### 3.0 PROPOSED JCS GROWTH ALLOCATION AND CURRENT DRAFT PROPOSALS

- 3.1 As part of the analysis work that NCC have undertaken to support the proposed JCS growth, NCC have undertaken a run of the strategic SATURN model for 2026 with the various growth areas added, see Appendix B. The run also includes the provision of the Norwich Northern Distribution Road (NDR).
- 3.2 The level of growth incorporated in this analysis is included in Appendix D. The schedule allows for 3,050 dwellings Wymondham and 15.37ha of B1/B2/B8 employment land. The analysis also allows for a further 1,240 dwellings at Hethersett and an additional 2,420 dwellings at Cringleford.
- 3.3 In order to review the potential impact of these vehicle movements onto the Thickthorn junction, the proposed outputs from the SATURN model including the JCS growth were simulating onto the existing Thickthorn VISSIM model. The outcome of this assessment was that the inclusion of the NDR significantly effects the turning movements from A11 northbound onto the A47(T) eastbound in the AM peak. This subsequently then effected the A11 southbound movement approaching Thickthorn. The base 2006 movement of 749 PCUs increased to 1,626 PCUs in 2026; a 117% or 877 PCU increase. This is surprising when compared to the potential A11 south to the A11 north movement which showed an increase from 1,224 PCUs in 2006 increasing to 1,692 PCUs in 2026; only a 38% or 468 PCU increase. This would appear to be odd as the proposed housing growth along the A11 corridor is more likely to continue its journey in the AM peak into the city centre along the A11. The proposed SATURN runs are suggesting that the preferred destination for growth traffic is to the east of the city. On the basis that the majority of movements towards the City in the AM peak are likely to be commuter trips, it is unclear why SATURN has distributed the traffic in this nature. The two main vehicle attractions in this direction would be the NDR and the employment areas of Broadland Business Park and the areas around Norwich Airport. Without the provision of the NDR, it is anticipated that the traffic distributions across Thickthorn will be significantly different.
- 3.4 In considering the impact of the JCS growth on the Thickthorn interchange, NCC and their consultants reviewed a number of possible improvements. A preferred scheme that was prepared to meet the potential increase in traffic flows was produced which incorporated a new bridge over the A47(T) and the construction of a major new circulatory roundabout. See Appendix E for details of the scheme. It is our understanding that the proposed cost of this scheme is £40m which is identified in Appendix 7 of the proposed JCS. The latest revised version of Appendix 7 states that of this £40m, £16m is a contingency sum.
- 3.5 It is not clear from the evidence in the public domain if this scheme has been tested with actual traffic flow data and the results validated. Although it is anticipated that with the sheer scale of the improvement that the proposal will be able to easily accommodate the proposed JCS growth.



## 4.0 ALTERNATIVE IMPROVEMENT STRATEGY

- 4.1 Whilst we have no doubts that the proposed scheme identified by NCC will be able to meet the capacity issues raised by the proposed JCS growth. We do not however believe that this would represent an appropriate level of infrastructure provision in this location. Central government transport policy, along with Objective 7 of the JCS, encourages transport provision to meet the needs of existing and future populations while reducing travel need and impact. The design of a junction based on a peak hour predict and provide basis is only going to encourage vehicle movements rather than promoting sustainable travel and modal shift.
- 4.2 Following discussions with both NCC and the Highways Agency at the recent Thickthorn Developers Forum, it is clear that a preferred approach to the design of any improvements required at Thickthorn, is to where possible by travel planning and the appropriate location of development reduce the need to travel. Accepting that development is still likely to generate car movements towards the city to consider the impact of a phased release of development on the junction, incorporating bus priority measures as part of an early stage improvement.
- 4.3 The two critical items of infrastructure on the overall junction is the two existing bridges and therefore the proposed improvement have all been developed maximising the use of these two elements of infrastructure. The other two key constraints is the length of the existing off slips of the A47(T) and the requirement to ensure that vehicles do not queue back onto the main carriageway of the trunk road.
- 4.4 The following are the potential improvements which could be accommodated using the basic form of the existing junction to give additional capacity allowing improved bus priority for both the Park and Ride and the B1172 BRT.
- i. Signalisation of the B1172 arm and inclusion into MOVA control. This would provide a better balance between A47(T) off slip, A11 northbound and the B1172. This would include a separate lane for bus movements allowing busses priority over other movements.
  - ii. Signalisation of the Access Roundabout to Park and Ride on B1172 movements incorporating bus priority on the approach from Wymondham/Hethersett.
  - iii. Potential increase of the circulatory carriageway to four lanes on the southern side of the junction and underneath the bridge. This would enable increased stacking to be provided at the stop lines prior to the A11 southbound leg and at the stop line prior to the A47(T) eastbound off slip.
  - iv. Introduction of a dedicated bus lane along the A11 between the intersection and Cringleford roundabout, including partial signalisation at the Cringleford roundabout to enable bus priority.
  - v. Introduction of a dedicated slip from the A11 into the Park and Ride.

- vi. Extension of A47(T) eastbound off slip merge.
- vii. Extension of the three lane arrangement on the A47(T) westbound slip.

See Drawing Number 150/01/113 for the identification of each of these improvements.

- 4.5 The accommodation of these improvements will provide sufficient capacity to ensure that the junction will operate safely whilst not over-providing for the private car. It is proposed that queuing on the A11(T) northbound and potentially the B1172 would be accepted in principal, whilst providing unhindered bus movements through the interchange, clearly prioritising public transport over the private car, whilst still maintaining the safe operation of the interchange.

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## 5.0 BUS PRIORITY/PARK AND RIDE/BRT/OTHER USERS

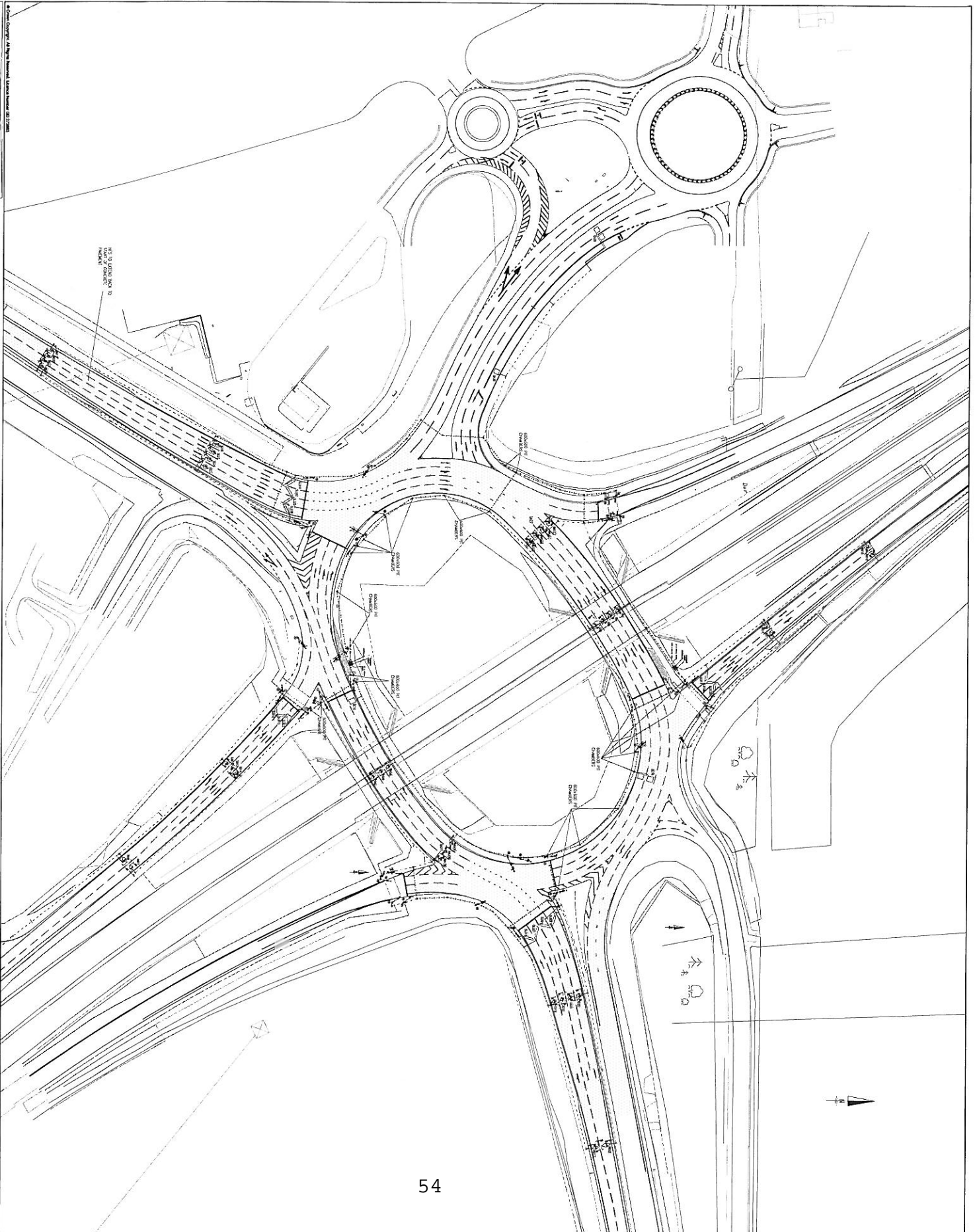
- 5.1 As discussed in earlier sections, one of the key priorities with respect to developing a more sustainable strategy for the future improvement of the Thickthorn interchange is the provision of bus priority measures. This will facilitate the existing Park and Ride buses, along with other scheduled local services that use the A11 corridor.
- 5.2 The bus lane along Newmarket Road has recently been extended with growth point funding as far as the Eaton/Cringleford overbridge. This extension was achieved by reducing the number of available lanes on Newmarket Road for general traffic. The existing bus lane facility from this point into the city centre currently operates successfully allowing buses to maintain good reliable services along the A11 corridor.
- 5.3 Other bus priority measures which already exist on the Thickthorn interchange is the bus lane facility on the B1172 approach to the junction. This lane has detector loops which are designed to trigger the lights on both the A11 northbound approach and the circulatory carriageway, enabling the bus to exit the B1172 then onto the city.
- 5.4 It is proposed as part of the NATS implementation plan that a Bus Rapid Transport (BRT) service be introduced along the B1172 corridor. In order therefore to facilitate this route through the Thickthorn junction, additional bus priority measures are required.
- 5.5 It is therefore proposed that a first stage Thickthorn improvement would involve the introduction of signals on the B1172 arm bringing it under the control of the same MOVA controller operating the A11 northbound and the A47(T) off slips. This would enable the dedicated bus lane to run right up to the stop line. The bus lane would then have priority over the other two lanes on the B1172, with the traffic being effectively held until the bus has passed the A47(T) on slip. This would ensure that the bus was in front of all other vehicles on the junction. The signals will be set up to ensure that queues cannot extend onto the A47(T) with this being the only control over bus priority.
- 5.6 It is proposed as part of the BRT scheme that, at various stages along the B1172, traffic will be controlled to enable the bus to hop the majority of vehicles and therefore subsequently be able to approach the Thickthorn interchange unhindered by queuing traffic.
- 5.7 The proposed schedule of improvements will not detrimentally affect other road users such as cyclists and pedestrians. With the signalisation of the B1172 providing safer crossing opportunities than are currently available at this location, the existing bridleway to the south of the junction can be maintained whilst also providing the fourth carriageway under the bridge.

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## 6.0 OPPORTUNITIES FOR ADDITIONAL GROWTH

- 6.1 The junction modelling undertaken when developing this improvement strategy for Thickthorn has identified that the proposed JCS growth of 2,200 dwellings at Wymondham can be accommodated safely through the Thickthorn junction. Further modelling has also been undertaken including a proposed housing allocation of 4,000 dwellings at Wymondham. Again, the Thickthorn junction was shown to operate safely whilst accommodating this growth incorporating the full range of proposed improvements to the junction.
- 6.2 It is proposed that as part of the development proposals for Wymondham that a BRT will be established linking the town with a high quality frequent bus service to Norwich city centre. The development at Wymondham is also to incorporate further strategic employment allocation adjacent to the existing Gateway 11 development. The town is also well served by rail linking with both Norwich and Cambridge. This coupled with the existing facilities already provided within Wymondham town centre will reduce the need to travel from the town to Norwich.
- 6.3 Wymondham is therefore an ideal location for sustainable growth, as the A11 and the B1172 provide adequate highway infrastructure and there will be an attractive range of alternative modes to that of the private car for those who wish to travel into the city centre. A comprehensive sustainable transport package is being provided to support the proposed development allocation including the provision of Car Club cars, liftshare database, BRT, public transport improvements and general travel planning advice.
- 6.4 Wymondham therefore is capable of not only accommodating the proposed allocation of 2,200 dwellings, it also provides a sustainable deliverable location for development in excess of 4,000 dwellings.

## APPENDIX A



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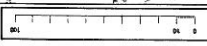


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**MA HIGHWAYS**  
 AGENCY

Project Name	TRAFALGAR SQUARE JUNCTION OVERVIEW
Client	MA HIGHWAYS
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## **APPENDIX B**

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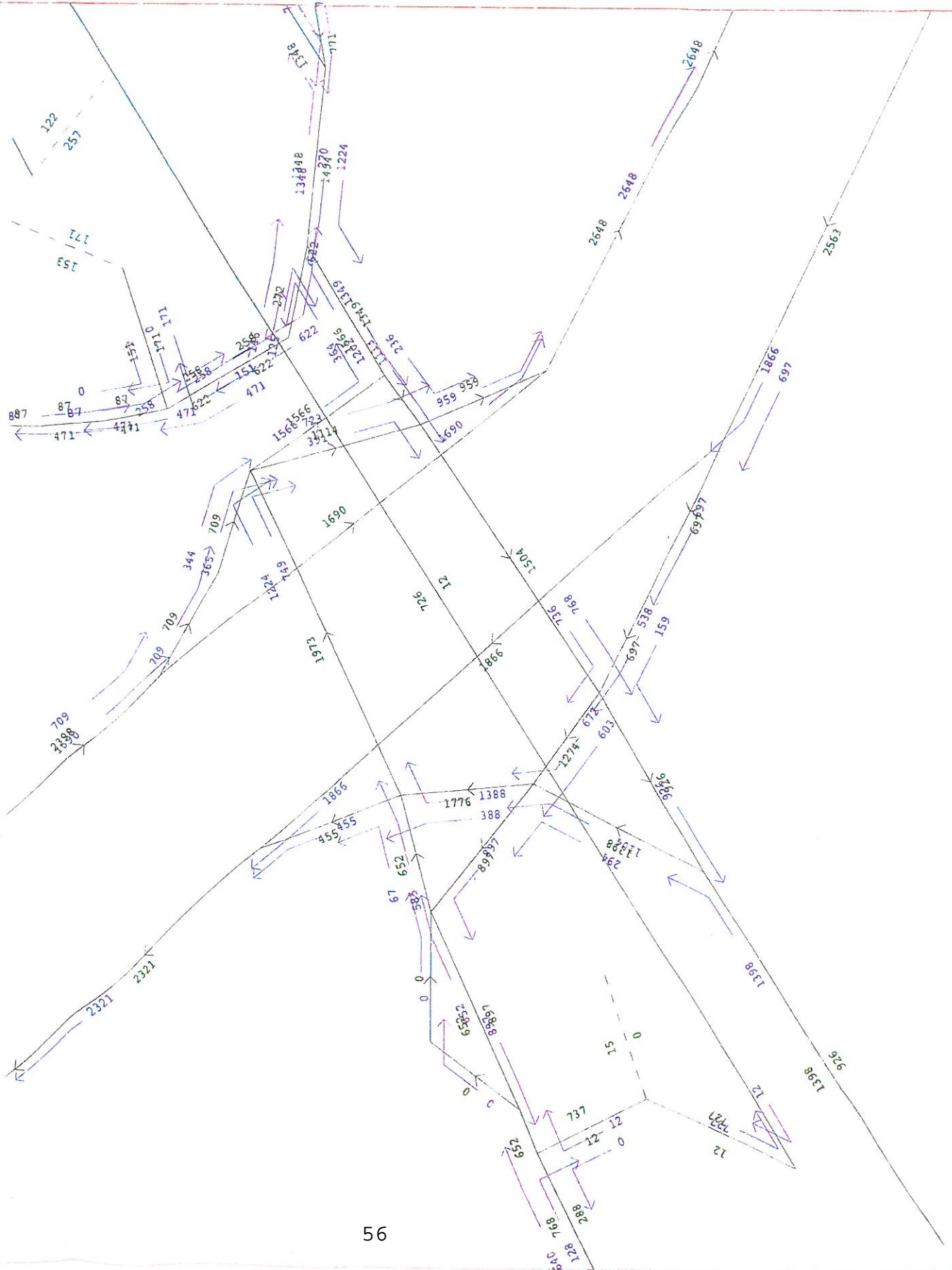
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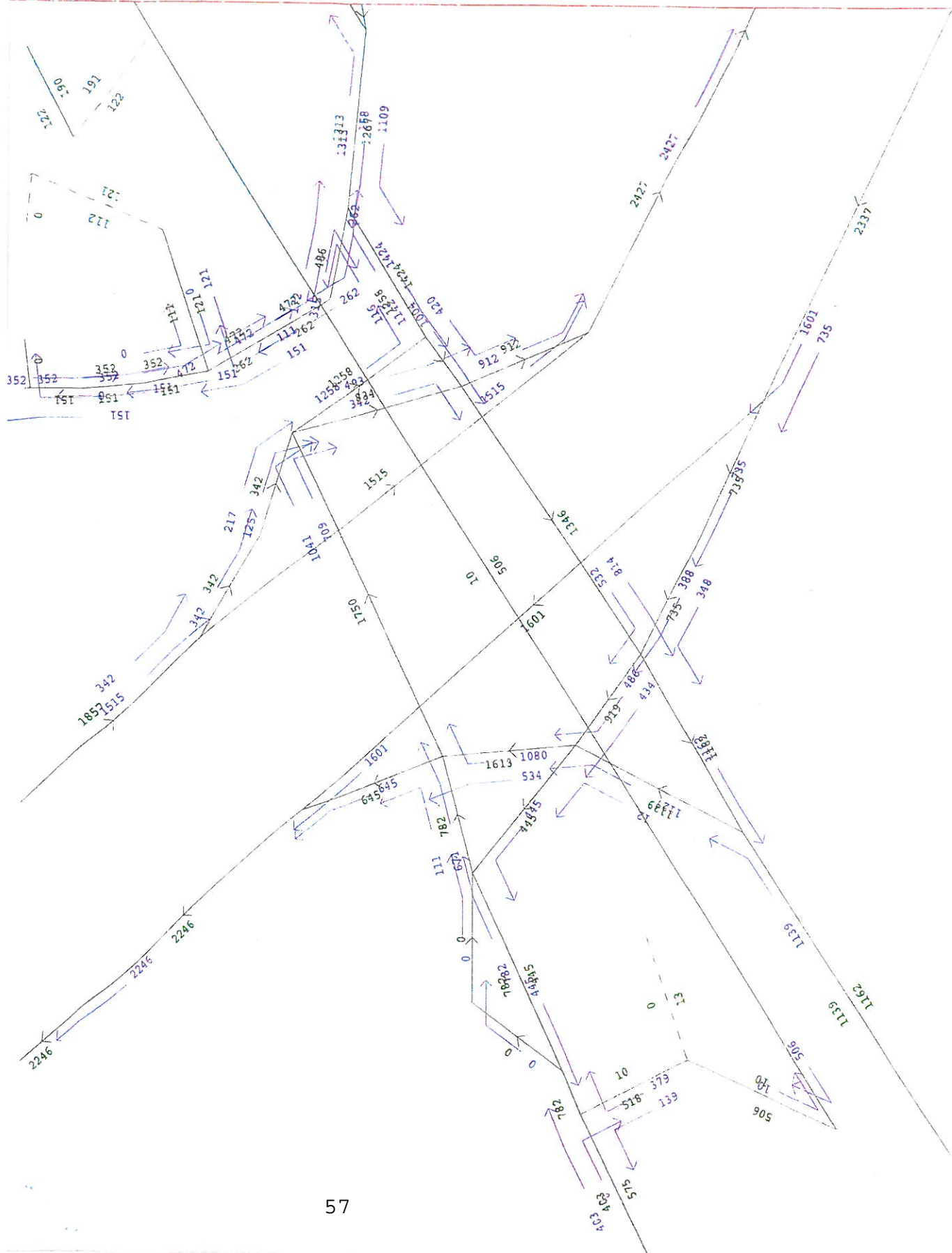
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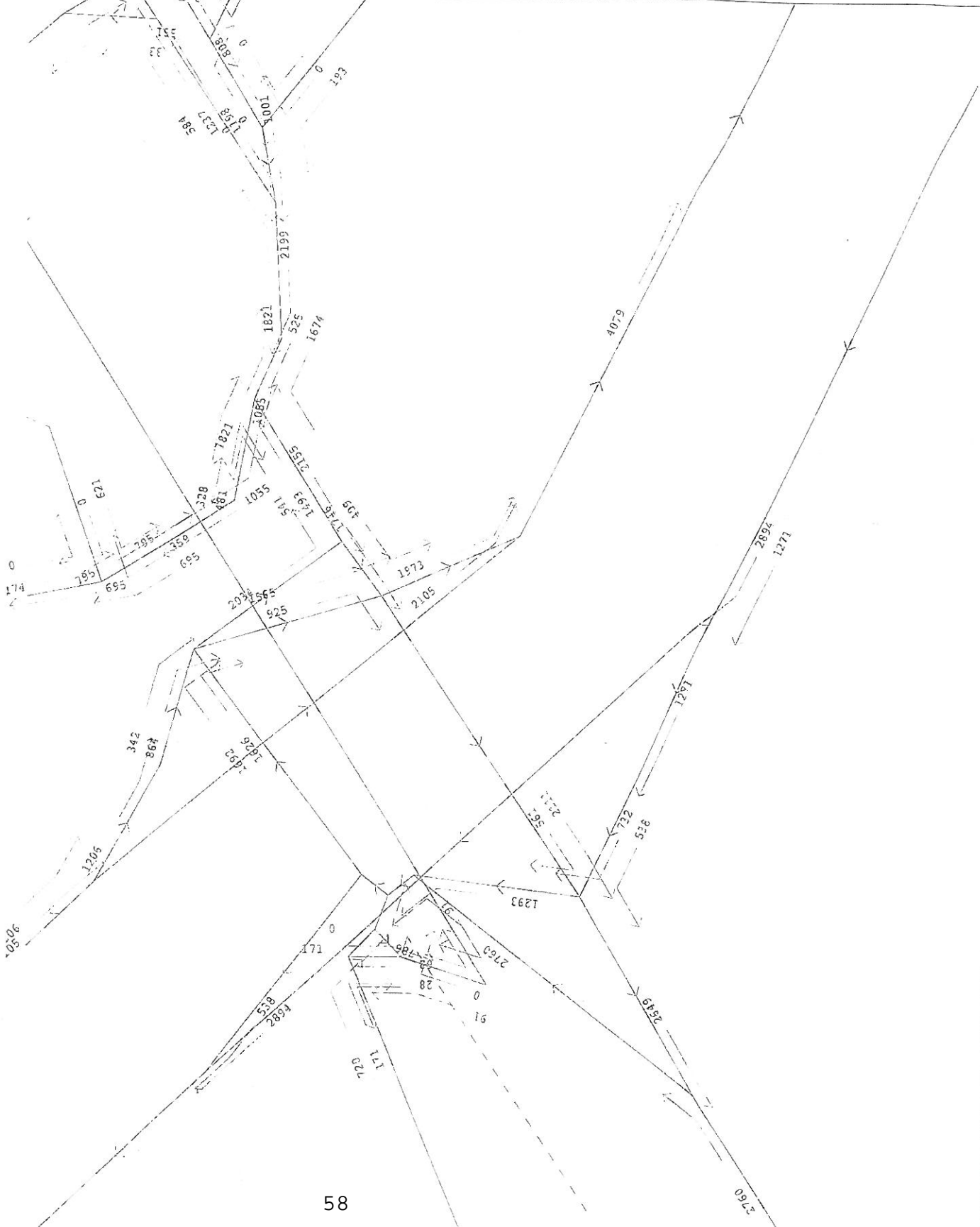
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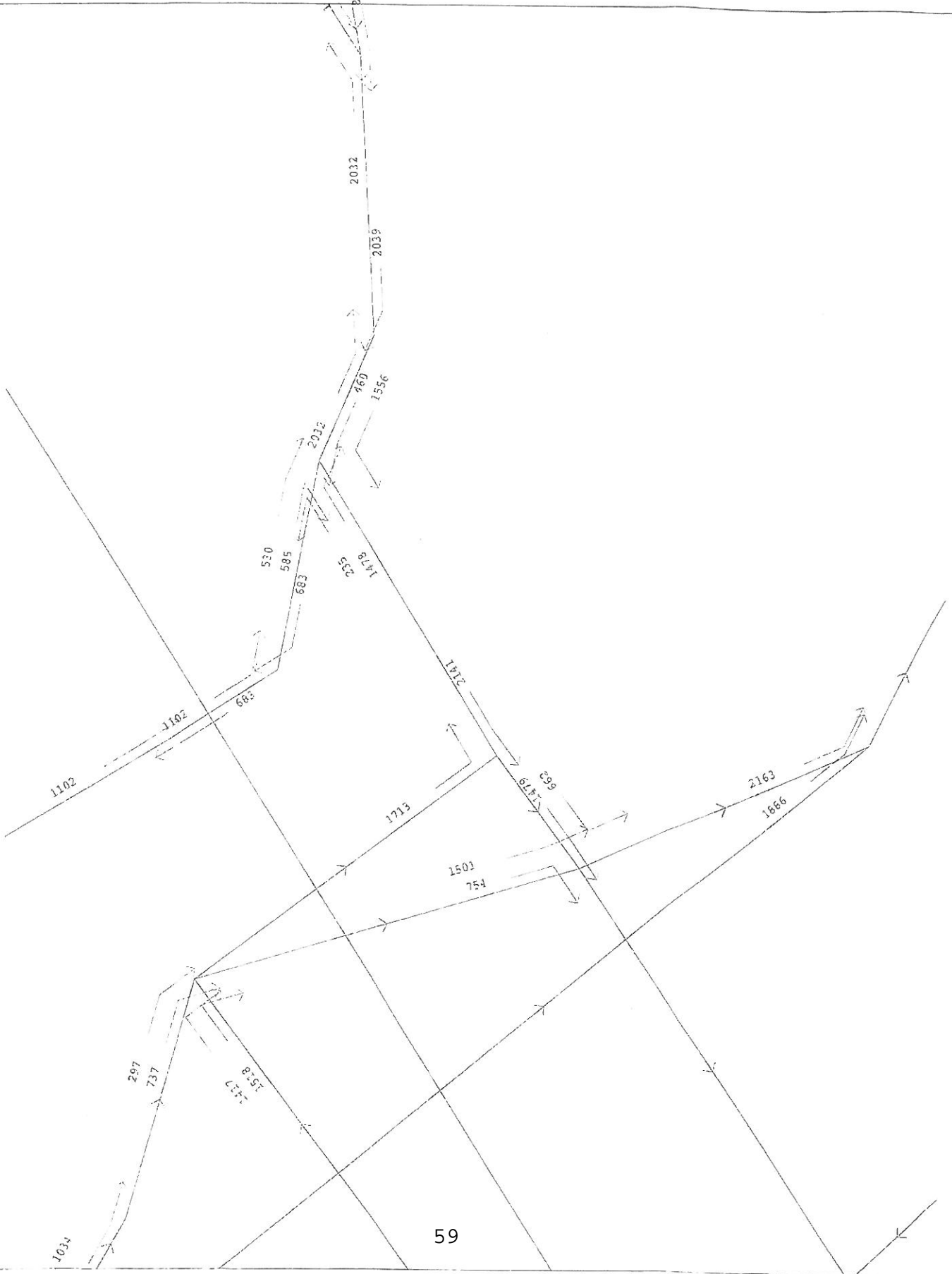
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## APPENDIX C

## Assumptions for JCS strategic model runs to feed into assessment of Thickthorn Interchange

	2006 -2016	2016-2026	Total 2006-26	notes	access
Wymondham housing (dwellings)	1000	2050	3050*	Use TRICS	
Wymondham employment	15.37 ha of B1/B2/B8 mix @35% = 53,795m2	0	15.37 ha of B1/B2/B8 mix @35% = 53,795m2	Use TRICS	
Hethel employment Advanced engineering	7ha B1	13ha B1	20 ha	Use TRICS	
Hethersett housing (dwellings)	280	960	1240*	Use TRICS	
Attleborough housing (dwellings) Existing at 2006 = 4600	1000	3000	4000	Factor existing zonal trips	
Thetford and Snetterton	assumed in background growth	assumed in background growth			
Cringleford housing	1150	1270	2420*	Use TRICS	Connects to hospital link road
Easton housing	190	960	1150*	Use TRICS	Connect west of showground
Long Stratton	80	1980	2060*	Use TRICS	
Poringland	760	200	960	Use TRICS	
Longwater employment	15.79 ha of B1/B2/B8 mix @35% = 55,265m2	0	15.79 ha of B1/B2/B8 mix @35% = 55,265m2	Use TRICS	
Colney Hall 15ha (but only 8ha is developable)	2ha as per TA	6ha of B1(b)**	8ha	Use TA and TRICS	New junction on B1108
Colney west of Hethersett Lane	14ha of B1(b)	0	14ha	Use TRICS	Link to new junction on B1108
Colney east of Hethersett Lane	0	13.6ha of B1(b)	13.6ha	Use TRICS	Link to new junction on B1108
Colney NRP		11.4ha of	11.4ha	Use TRICS	Link to new

west of John Innes		B1(b)			junction on B1108
Colney UEA Triangle site	1ha but 13,000m2	0	1ha but 13,000m2	Use TRICS	
Total Colney			48ha***		

\*Assume 10% greater than JCS allocations to reflect maximum

\*\* all B1(b) hectares @35% to calculate m2 (except for UEA triangle)

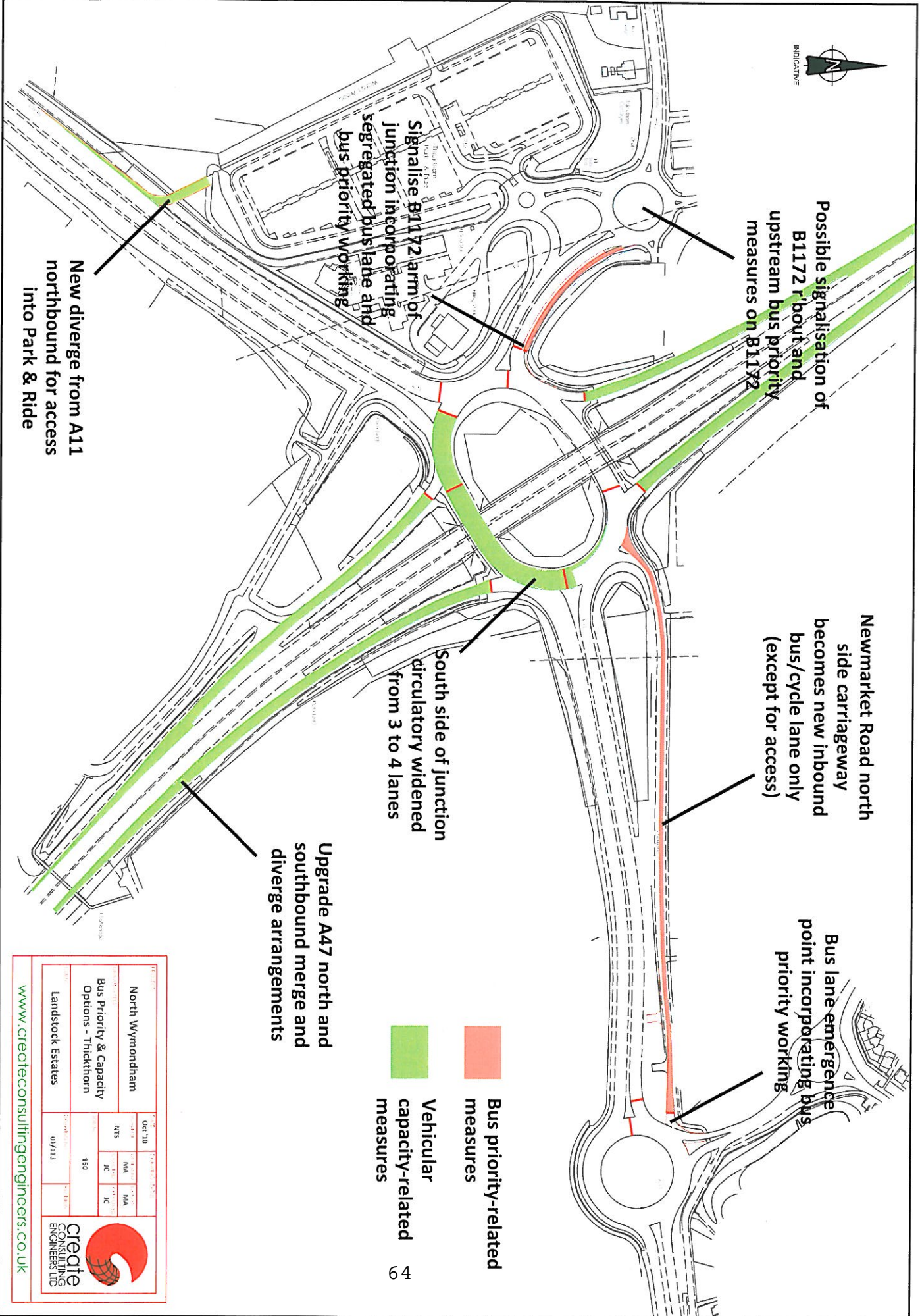
\*\*\*55ha of B1(b) as in JCS but reduced to 48ha due to undevelopable land at Colney Hall

**Note.**

Housing numbers revised on to take account of housing commitments and completions from 2006 to 2016

14 June 2010

# PLANS



Possible signalisation of B1172 round and upstream bus priority measures on B1172

Signalise B1172 arm of junction incorporating segregated bus lane and bus priority working

Newmarket Road north side carriageway becomes new inbound bus/cycle lane only (except for access)

Bus lane emergence point incorporating bus priority working

South side of junction circulatory widened from 3 to 4 lanes

Upgrade A47 north and southbound merge and diverge arrangements

New diverge from A11 northbound for access into Park & Ride

- Bus priority-related measures
- Vehicular capacity-related measures

<p>North Wymondham</p> <p>Bus Priority &amp; Capacity Options - Thickhorn</p> <p>Landstock Estates</p>		<p>150</p>	<p>01/13</p>
<p>Oct 10</p>	<p>MS</p>	<p>MA</p>	<p>MA</p>
<p>MS</p>	<p>JC</p>	<p>JC</p>	<p>JC</p>

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DRAWING NO. 23392/BR/004  
 PROJECT TITLE  
 A11 Junction Assessment  
 SCALE A1/A1  
 1:2000

**Norfolk County Council**  
 Working with  
**Mor Macdonald MAY GUNNEY**  
 Mike Jackson  
 Director of Planning and Transportation  
 Norfolk County Council  
 Meridian Lane  
 Norwich NR1 2SG

**Mor Macdonald**  
 Meridian Lane  
 Norwich, NR1 2US  
 Tel 01603 767530  
 Fax 01603 767463  
 Web www.mrdma.com

**DRAWING TITLE**  
 A11 (Thickton) Roundabout  
 Major Realignment Road Markings

REV.	DESCRIPTION	CHECKED	DATE
P1	Preliminary Issue		26.10.08

DESIGNED BY	INIT	DATE	DRAWING NO.
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DRAWN BY			PROJECT TITLE
			A11 Junction Assessment
CHECKED BY			SCALE A1/A1
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APPROVED BY			FILE NO.

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