SITE AT PEEL HALL, WARRINGTON

For

SATNAM MILLENIUM LTD

ECO 14:
WATER VOLE SURVEY

METHODOLOGIES AND RESULTS ONLY

MAY 2019

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CONTENTS:

The current report comprises the methodologies and survey data of water vole survey work only. Water vole desk study data, an overview of water vole survey results, an impact assessment of proposals in relation to water vole and a water vole mitigation strategy are included in Chapter 6 of the Environmental Statement (March 2020).

1.0 METHODOLOGIES

Habitat Assessment

1.1 In line with the specifications detailed by Dean *et al.* (2016), the watercourses and within and adjacent to site area were assessed with regard to suitability for water vole. This included Spa Brook and all ponds and field boundary ditches on site.

Presence / Likely Absence Survey

1.2 In line with the specifications detailed by Dean *et al.* (2016), this consisted of a search of the watercourses within 200 m of the proposed development for any signs of water vole presence. These signs include;

- Burrows;
- Droppings;
- Latrine sites;
- Feeding stations and "lawns"; and,
- Footprints and tracks or "runs".

1.3 During winter water voles become less active above ground and therefore field signs become evident from the start of the water vole breeding season in March and are visible until the end of September (weather dependent). One survey visit was completed within this time.

Survey Constraints

1.4 Survey guidance stipulates that one survey should be undertaken between March and June, and a second survey visit should be completed between July and September, to allow for variations in water vole habitat usage throughout the year (Dean *et al.*, 2016). A second visit could not be completed in the instance owing to the inaccessibility of the water course and ditches, owing to dense within channel vegetation.

1.5 During the May 2019 survey, dense pockets of vegetation within and along the bankside of Spa Brook prevented a detailed inspection of the full length of the watercourse for evidence of water vole. All inaccessible areas of ditch are highlight on Appletons Drawings 1820-T6-01A to 01D, Appendix 1.

2.0 RESULTS

Field Survey

2.1 The survey visit was undertaken on 7th May 2019 by Paula Bateson MSc ACIEEM, Senior Ecologist, and Ben Hollings, Ecological Field Assistant. Table 2.1 details the weather conditions at the time of the survey.

Parameter	07/05/19
Temperature (ºC)	15
Cloud (%)	80
Wind (Beaufort)	F1
Precipitation	Dry

Table 2.1: Weather Conditions During Field Survey

2.2 The weather prior to this survey had been clement and Appletons is not aware of any heavy rainfall or flooding that could wash away signs of water vole in the days preceding the survey.

Habitat Description

2.4 This section describes the habitat characteristics of the watercourses and waterbodies surveyed. Maps of the surveyed areas are provided as Appendix 1.

Spa Brook	
The section of Spa Brook surveyed consisted of a narrow stream within a highly modified straight channel, which formed a boundary feature between two abandoned agricultural fields. Table 3.2 details the characteristics of Spa Brook in relation to suitability for water voles.	
Waterbody	
Width & Depth	The stream measured between 0.5 and 1 meters in width, and no more than 0.1 m in depth.
Substrate	Deep silt and mud formed the substrate of the stream, and many sections were undergoing succession into dry stands of common reed.
Disturbance	Informal paths cross the stream at two locations which appear regularly utilised by dog walkers. The remainder of the stream was undisturbed by human activity owing to the overgrown nature of bankside habitat. The shall water and dry sections of the stream render the habitat feature accessible by predatory species such as fox and stoats.
Vegetation	
Marginal	Sections of the watercourse are choked with common reed, reed canary grass and greater reedmace.
Aquatic	Occasional aquatic vegetation within the stream comprised duckweed, pockets of fool's watercress *Apium nodiflorum*.
Water	
Flow	The watercourse was largely dry to the south with only standing water present to the north. Owing to the gradual slope of the land, the stream is likely to flow south in times of high rainfall only.
Quality	No obvious water pollution based on colour or odour of water, however invertebrate diversity was minimal and bankside vegetation suggests high nutrient levels. Fly tipping recorded at south of stream.
Banks	
Height	Between 2 and 3 metres
Width	Approximately 5 metres
Angle	Approximately 40°
Substrate	Earth and occasional rubble.
Vegetation	Bankside habitats are dominated by tall, course grasses, tall herbs and developing scrub communities. Species include false oat grass, cock's-foot, reed canary grass, great willowherb *Epilobium hirsutum*, common nettle *Urtica dioica*, creeping thistle, rosebay willowherb and wild angelica. Bramble and goat willow have established along section of the channel, and occasional hawthorn and dog rose are also present. The northern-most section of the brook on site is the least overgrown, owing to shade from overhanging woodland canopy.
Shading	The western bank of the northern-most section of the brook is shaded by woodland. The remainder of the stream was unshaded.
Connectivity	
Upstream	To the north, the stream is culverted at the northern site boundary beneath the M62 motorway for 60metres. The watercourse is then re-exposed for approximately 70m to the north of the motorway, before being culverted for another 210metres beneath arable land.
Downstream	To the south, the stream is culverted at the southern site boundary and it is not obvious where the stream re-emerges. Ordnance Survey data implies an absence of any potentially connecting watercourse within 200m of the southern culvert.
Suitability for water voles	**Suboptimal**

Table 2.1: Habitat Assessment of Spa Brook in relation to water voles

Ditches

2.4 All ditches surveyed are labelled in Appetons Drawing 1820-T7-01 and described in Table 2.2.

Ditch 1	
Waterbody	
Width & Depth	Standing water within the ditch measured up to 0.5 meters in width, and no more than 0.1 m in depth. The southern quarter of this ditch was dry
Substrate	Mud formed the substrate of the ditch.
Disturbance	One informal path crosses the ditch which appears regularly utilised by dog walkers. The remainder of the stream was undisturbed by human activity owing to the overgrown nature of bankside habitat. The shall water and dry sections of the ditch render the habitat feature accessible by predatory species such as fox and stoats.
Vegetation	
Marginal	Dense stands of common reed.
Aquatic	Absent.
Water	
Flow	Where present, surface water was standing.
Quality	No obvious water pollution based on colour or odour of water, however invertebrate diversity was minimal and bankside vegetation suggests high nutrient levels.
Banks	
Height	Up to 1 m
Width	Between 2 and 3 metres in width
Angle	Shallow sloping. Approximately 20°
Substrate	Soft earth
Vegetation	Ditch 1 was largely crowded by dense stands of common reed. Bramble and hawthorn are present to the north. Rank grasses and dense tall ruderal vegetation otherwise occupy ditch banks.
Shading	The ditch was wholly unshaded aside from by one mature hawthorn *Crataegus monogyna.*
Connectivity	
Upstream	To the north, the ditch is culverted at the northern site boundary beneath the M62 motorway for 60metres. To the north of the motorway, the ditch forms a field boundary of an intensively managed arable field with little to no semi-natural bankside habitat. This section of the ditch was considered unsuitable for water vole.
Downstream	The ditch ends at the southern site boundary.
Suitability for water voles	**Unsuitable**
Ditch 2	
Waterbody	
Width & Depth	Standing water measured up to 1 metre in width, and no more than 0.2 m in depth. The eastern extent of this ditch was dry
Substrate	Silt and mud formed the substrate of the ditch.
Disturbance	One informal path crosses the ditch which appears regularly utilised by dog walkers. The remainder of the stream was directly undisturbed by human activity, although a footpath runs parallel to the ditch to the north. The shallow water and dry sections of the ditch render the habitat feature accessible by predatory species such as fox and stoats.
Vegetation	
Marginal	Absent.
Aquatic	Absent.
Water	
Flow	Where present, surface water was standing.
Quality	Water obviously polluted, based on bright orange colour.
Banks	
Height	Up to 1 m
Width	Approximately 2 metres in width
Angle	Between 20° and 40º
Substrate	Soft earth and roots
Vegetation	The ditch is located along the centre of an outgrown hedgerow feature of willow of hawthorn.
Shading	The ditch was wholly shaded by the overhanging hedgerow species.
Connectivity	
Upstream	To the west, the ditch connects into Spa Brook (See Table 2.1).
Downstream	To the east, the ditch connects to other ditch field boundaries described below, all of which are dry.
Suitability for water voles	**Unsuitable**

Ditch 3	
Waterbody	
Width & Depth	Ditch almost entirely dry. Occasional standing water up to 0.05m in depth.
Substrate	Silt and mud
Disturbance	Relatively undisturbed by human activity. The mostly dry nature of the ditch renders the habitat feature accessible by predatory species such as fox and stoats.
Vegetation	
Marginal	Absent.
Aquatic	Absent.
Water	
Flow	Where present, surface water was standing.
Quality	No evidence of obvious pollution.
Banks	
Height	Up to 1 m
Width	Approximately 1 metre in width
Angle	Between 20° and 40º
Substrate	Soft earth and roots
Vegetation	Sparse woodland ground flora.
Shading	The ditch was wholly shaded by the overhanging woodland canopy species.
Connectivity	
Upstream	To the north, the ditch terminates at Pond 1 (see Table 2.3)
Downstream	To the south, the ditch terminates at Pond 2 (see Table 2.3)
Suitability for water voles	**Unsuitable**
Ditch 4	
Width & Depth	Where present, standing water measured up to 0.3 metre in width, and no more than 0.1 m in depth. The majority of the ditched
Substrate	Silt and mud formed the substrate of the ditch.
Disturbance	Two shallow ditches either side of a driveway, which is also used as a public footpath
Vegetation	
Marginal	Willowherbs only
Aquatic	Absent.
Water	
Flow	Where present, surface water was standing.
Quality	No obvious pollution.
Banks	
Height	Up to 0.5m
Width	Approximately 1 metre in width
Angle	Between 20° and 40º
Substrate	Soft earth and roots
Vegetation	Tall herb and dense bracken
Shading	The eastern-most ditch was shaded by a hawthorn hedgerow, whilst the western-most ditch was unshaded,
Connectivity	
Upstream	To the north, the ditches appear to terminate at Peel Cottage Lane
Downstream	To the west, the ditch connects to other ditch field boundaries on site which are dry.

Table 3.3: Habitat Assessment of wet ditch habitat in relation to water voles

Ponds

2.5 All ponds surveyed are labelled on Appetons Drawing 1820-T7-01 and described in Table 2.3.

Pond 1	
Waterbody	
Width & Depth	Standing water measured over to 0.5 meters in depth. The pond measured approximately 17m in length and three metres in width.
Substrate	Mud and silt formed the substrate of the pond.
Disturbance	One informal path passes along the western side of the pond, however the steep overgrown banks of the pond render direct human interference unlikely. Dogs are likely to occasionally access the pond.
Vegetation	
Marginal	Absent
Aquatic	Dense duckweed
Water	
Flow	No flow. Likely to overflow south into Ditch 4 in wet weather.
Quality	Owing to the dense cover of duckweed, the water quality was considered generally poor.
Banks	
Height	Up to 2 m
Width	Between 2 and 3 metres in width
Angle	Steeply sloping between 40 and 60°
Substrate	Soft earth with tree roots
Vegetation	Pond 1 is a woodland pond with banks of sparse woodland flora.
Shading	Pond 1 is entirely shaded by overhanging woodland canopy.
Connectivity	
Upstream	No watercourses continue to the north.
Downstream	The pond connects to Ditch 3 to the south.
Suitability for water voles	**Suboptimal** owing to lack of bankside vegetation cover and marginal vegetation.
Pond 2	
Waterbody	
Width & Depth	Standing water measured over to 0.5 meters in depth. The pond measured approximately 25m in length and 20metres in width.
Substrate	Mud and silt formed the substrate of the pond.
Disturbance	The pond appears relatively undisturbed despite the close proximity of a footpath beyond a belt of scrub
Vegetation	
Marginal	Soft rush, balsam
Aquatic	Bittersweet, water plantain
Water	
Flow	No flow. Likely to overflow south into Pond 3 in wet weather.
Quality	No obvious evidence of pollution present
Banks	
Height	Up to 0.5 m
Width	Between1 and 2 metres in width
Angle	Shallow sloping banks
Substrate	Soft earth with tree roots
Vegetation	Pond is a woodland pond with banks of sparse woodland flora.
Shading	Pond is entirely shaded by overhanging woodland canopy.
Connectivity	
Upstream	The pond connects to Ditch 3 to the north.
Downstream	Pond 3 is located less than 15 metres to the south.
Suitability for water voles	**Suboptimal** owing to shallow sloping banks, lack of bankside vegetation cover and relative lack of marginal vegetation.
Pond 3	
Waterbody	
Width & Depth	Standing water measured under to 0.5 meters in depth. The pond measured approximately 10m in length and 8metres in width.
Substrate	Mud and silt formed the substrate of the pond.
Disturbance	The pond appears relatively undisturbed despite the close proximity of a footpath beyond a belt of scrub
Vegetation	
Marginal	Common reed & floating sweet grass
Aquatic	Absent

Water	
Flow	No flow. Likely to overflow south into Pond 4 in wet weather.
Quality	No obvious evidence of pollution present
Banks	
Height	Up to 0.5 m
Width	Between1 and 2 metres in width
Angle	Shallow sloping banks
Substrate	Soft earth
Vegetation	Dense grassland and common reed.
Shading	Pond is entirely unshaded.
Connectivity	
Upstream	Pond 2 is located less than 15 metres to the north.
Downstream	Pond 4 is located less than 30 metres to the south, beyond two public footpaths.
Suitability for water voles	**Suboptimal**
Pond 4	
Width & Depth	Standing water measured over 0.5 meters in depth. The pond measured approximately 20m in length and 25metres in width.
Substrate	Silt and mud formed the substrate of the ditch.
Disturbance	A public footpath encircles the pond and evidence of disturbance by dogs is present
Vegetation	
Marginal	Greater reedmace, branched burreed, yellow iris, soft rush
Aquatic	Fringed water lilly, common duckweed, ivy-leaved duckweed.
Water	
Flow	standing.
Quality	No obvious pollution.
Banks	
Height	Up to 0.5m
Width	Approximately 1 metre in width
Angle	Between 20° and 40º
Substrate	Soft earth and roots
Vegetation	Northern, unshaded bank is occupied by grasses, whilst southern bank comprises sparse woodland ground flora.
Shading	Partly shaded woodland edge pond
Connectivity	
Upstream	Pond 4 is located less than 30 metres to the north, beyond two public footpaths.
Downstream	To the south, dry ditches connect with Ditch 4 and other dry boundary dtches of Radley Plantation and Radley Common.

Presence / Likely Absence Survey

2.6 No evidence of water voles, or evidence of recent activity of water voles, e.g. burrows, footprints, latrines, feeding stations or lawns was recorded at any of the stream, ditches or ponds surveyed.

2.7 Evidence of field vole, rat, fox, rabbit, hedgehog and nesting birds was recorded along the surveyed features.

2.7 Areas of dense vegetation prevented a detailed inspection of all habitats along Spa Brook, however given the suboptimal nature of the watercourse, it is considered highly unlikely for the species to be present.

3.0 COMPARISON WITH PREVIOUS SURVEY DATA

3.1 Water vole surveys were undertaken at the site in 2013 and 2015. As was the case in 2015, conditions of the brook have deteriorated with a marked increase in emergent vegetation and distinct reduction in the area of open water and consequent reduction in depth. The bank side vegetation has increased significantly and all of banks and channel throughout the reach are significantly overgrown.

3.2 Previous surveys have been undertaken in summer months, whereas the 2019 water vole survey was undertaken early Spring when vegetation cover is lower for visual searches and accessibility, The constraint in relation to dense vegetation restricting access was therefore less than that which applied during the 2013 and 2015 surveys, however occasional sections were still impenetrable and impractical to survey and a September 2019 survey visit was entirely impossible owing to vegetation density.

3.3 The suitability of pond habitats is relatively unaltered. Ditch habitats were not included in the 2013/2015 survey effort, likely owing to dry or unsuitable conditions.

4.0 REFERENCES AND BIBLIOGRAPHY

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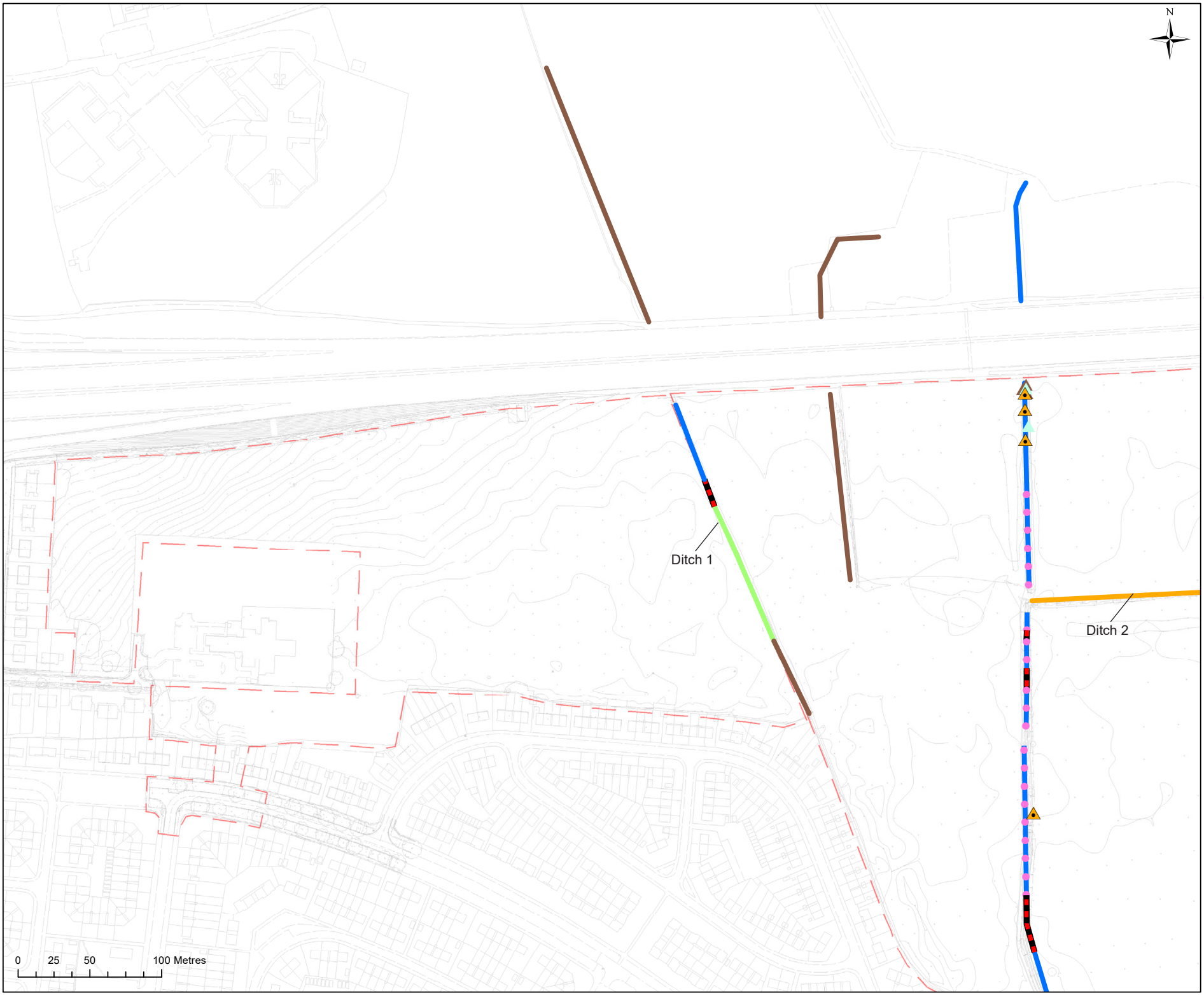
APPENDIX 1



Legend

- Site boundary
- Pond features fully surveyed
- Dense vegetation - access severely restricted
- Dense reed - visual search severely restricted
- Dry ditch
- Features fully surveyed
- Ditch fully surveyed. Water heavily polluted.
- Ditch fully surveyed. High levels of rabbit field evidence.
- Evidence of field vole
- Evidence of fox
- Evidence of hedgehog
- Evidence of rat

Water Vole Survey Plan & Results: 1 of 4

Drawing: 1820-T6-01A
By: PB
Survey Date: April 2019
Site name: Site at Peel Hall, Warrington

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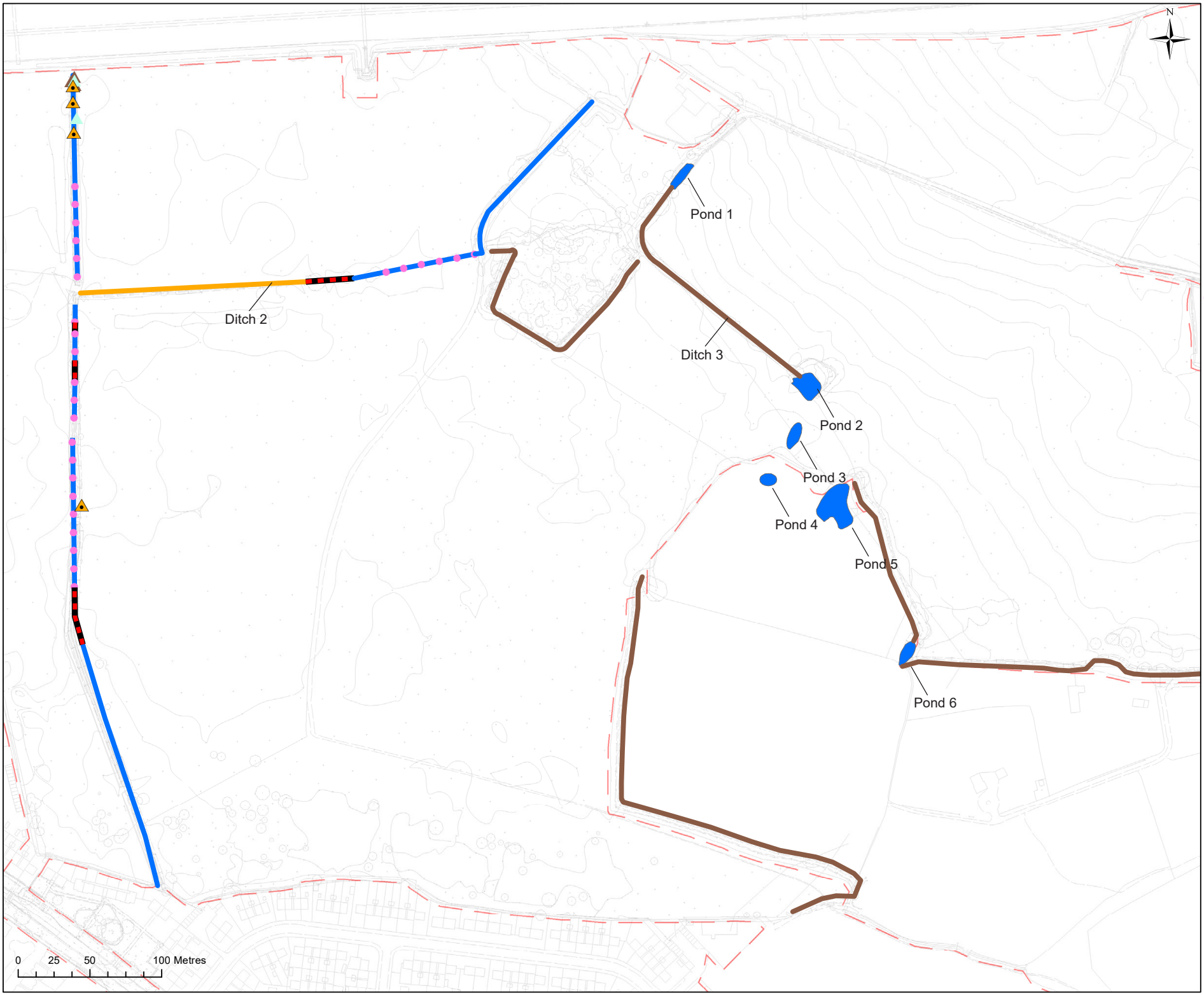

Legend

- Site boundary
- Pond features fully surveyed
- Dense vegetation - access severely restricted
- Dense reed - visual search severely restricted
- Dry ditch
- Features fully surveyed
- Ditch fully surveyed. Water heavily polluted.
- Ditch fully surveyed. High levels of rabbit field evidence.
- Evidence of field vole
- Evidence of fox
- Evidence of hedgehog
- Evidence of rat

Water Vole Survey Plan & Results: 2 of 4

Drawing: 1820-T6-01B
By: PB
Survey Date: April 2019
Site name: Site at Peel Hall, Warrington

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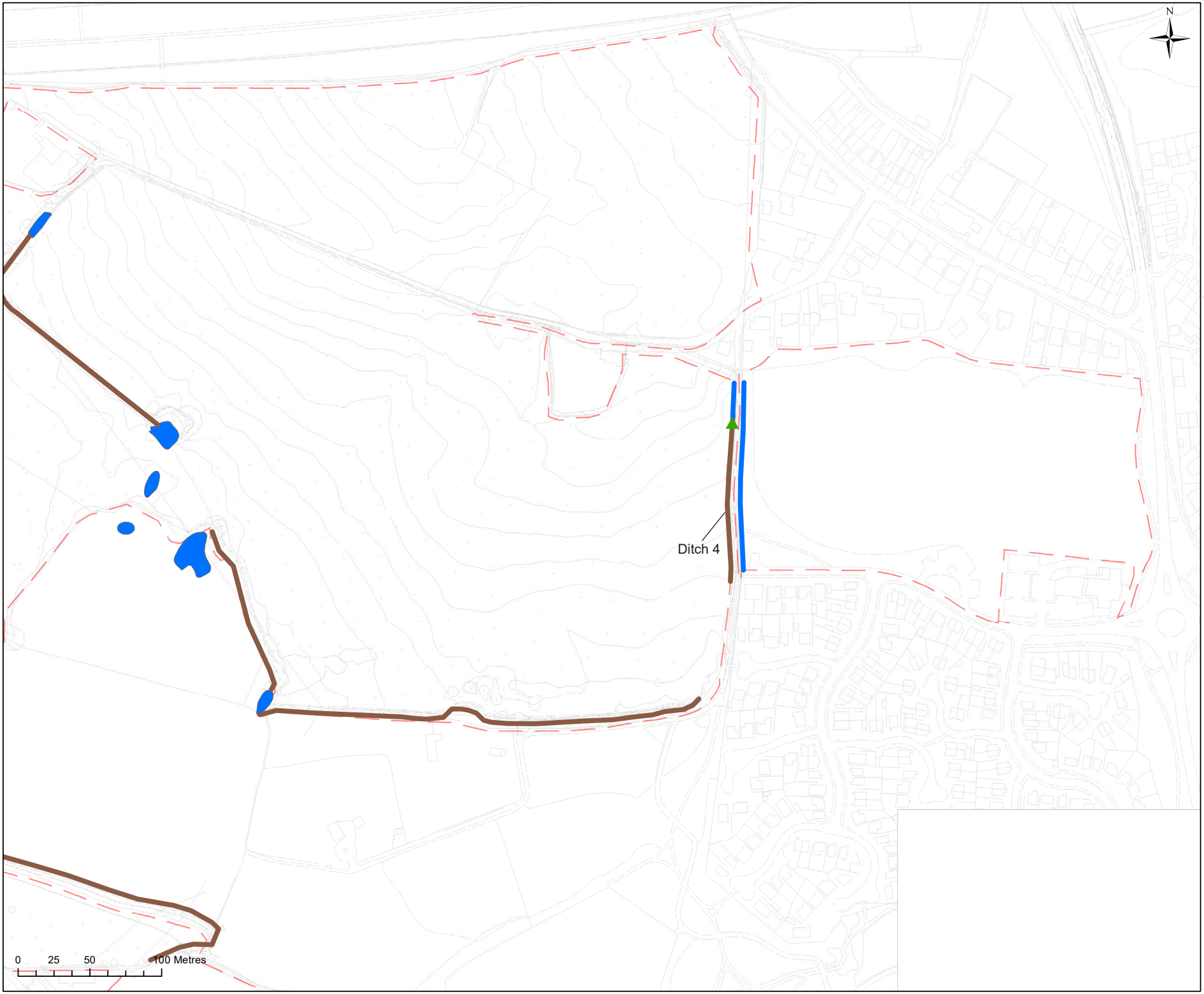

Legend

- Site boundary
- Pond features fully surveyed
- Dense vegetation - access severely restricted
- Dense reed - visual search severely restricted
- Dry ditch
- Features fully surveyed
- Ditch fully surveyed. Water heavily polluted.
- Ditch fully surveyed. High levels of rabbit field evidence.
- Evidence of field vole
- Evidence of fox
- Evidence of hedgehog
- Evidence of rat

Water Vole Survey Plan & Results: 3 of 4

Drawing: 1820-T6-01C
By: PB
Survey Date: April 2019
Site name: Site at Peel Hall, Warrington

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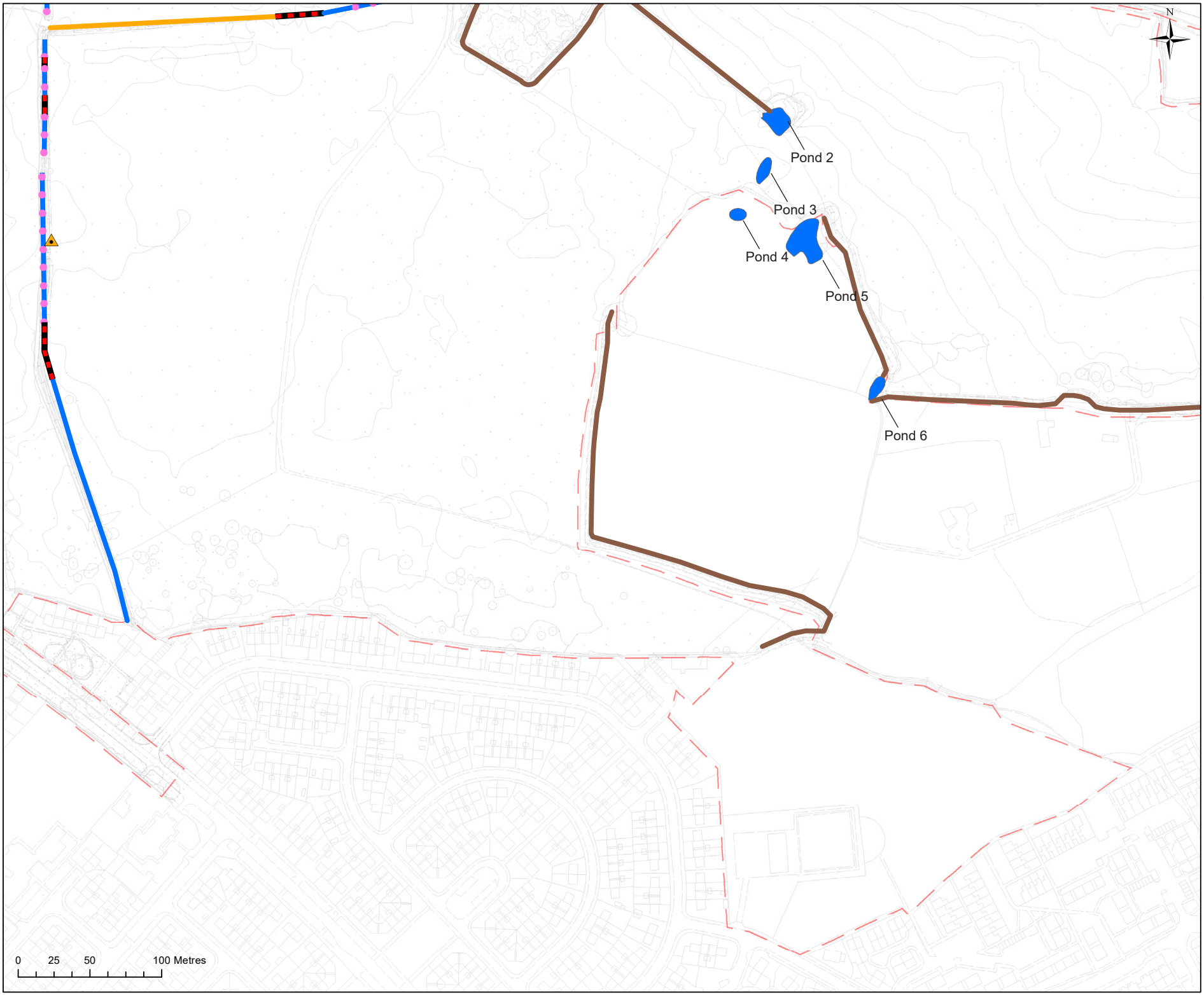

Legend

- Site boundary
- Pond features fully surveyed
- Dense vegetation - access severely restricted
- Dense reed - visual search severely restricted
- Dry ditch
- Features fully surveyed
- Ditch fully surveyed. Water heavily polluted.
- Ditch fully surveyed. High levels of rabbit field evidence.
- Evidence of field vole
- Evidence of fox
- Evidence of hedgehog
- Evidence of rat

Water Vole Survey Plan & Results: 3 of 4

Drawing: 1820-T6-01C
By: PB
Survey Date: April 2019
Site name: Site at Peel Hall, Warrington

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ECOLOGY

ECO 15 2019 Great Crested Newt Survey

APP 1: Appletons Drawing 1820-T7-01: Pond locations and GCN Survey results

APP 2: Pond photographs

SITE AT PEEL HALL, WARRINGTON

For

SATNAM MILLENIUM LTD

ECO 15:
GREAT CRESTED NEWT SURVEY

METHODOLOGIES AND RESULTS ONLY

APRIL - JUNE 2019

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CONTENTS:

The current report comprises the methodologies and survey data of great crested survey (GCN) work only. GCN desk study data, an overview of GCN survey results, an impact assessment of proposals in relation to GCN and a GCN mitigation strategy are included in Chapter 6 of the Environmental Statement (March 2020).

1.0 METHODOLOGIES

Survey Area and Justification

1.1 Great crested newts can use suitable terrestrial habitat up to 500m from a breeding pond (English Nature, 2001, *Great Crested Newt Mitigation Guidelines*). Field visits identified the presence of three waterbodies on site and three within woodland adjacent to the site and Ordnance Survey data indicates the presence of eleven further waterbodies within 500m of the site area.

1.2 The distances of the thirteen ponds from the proposed development are provided in Table 1.1, along with the justification for inclusion or exclusion of the ponds from the survey effort. The locations of these ponds in relation to the proposed development site is shown on a pond distribution map provided as Appendix 1.

1.3 The wet ditches on site comprised narrow, ephemeral ditches and one ditch of highly polluted water. Spa Brook contained areas of still water at the time of the survey, however the brook is fed by ditches from arable fields to the north of the M62 and is understood to fluctuate highly in flow dependent on recent rainfall. These waterbodies were considered unsuitable for breeding great crested newt and were not included within the GCN survey effort.

1.4 No obvious garden ponds are present from a review of aerial imagery.

Pond reference	Distance from site area	Subject to survey?	Justification
1	Within site area	Yes	Ponds located within 50m of proposed development footprint with good habitat connectivity.
2			
3			Pond to be displaced by proposals.
4	Immediately adjacent to site area	Yes	Ponds located within 50m of proposed development footprint with good habitat connectivity.
5			
6			
7	7m south-east	No	Pond dry
8	160m east	No	Pond dry
9	185m south-east	No	Distance from ponds to closest point of proposed built development, avoiding dispersal barriers of buildings and roads (Lockerbie Close) equates to over 250 metres. GCN highly unlikely to disperse over 250 metres where suitable terrestrial habitat exists.
10	195m south-east	No	
11	200m south-east	No	
12	240m south-east	No	
13	265m south-east	No	Ponds located within suitable terrestrial habitat over 250m from the proposed development, and as such GCN highly unlikely to disperse into site area (English Nature, 2004).
14	275m south-east	No	
15	350m south-east	No	
16	415m east	No	Ponds located over 250m from the proposed development beyond significant dispersal barriers.
17	330m north	No	

Table 1.1: Distance of ponds from site area

Habitat Suitability Index and Connectivity Assessment

1.5 All ponds within 250m of the site area were visually assessed for their suitability to support GCN. Ponds were assessed utilising the modified GCN Habitat Suitability Index (HSI) (Oldham *et al*, 2000). The HSI is a numerical index between 0 and 1, wherein a score of 1 represents optimal habitat for GCN. The HSI score is used to define the suitability of the pond on a categorical scale (Table 1.2). It should be noted, however, that an HSI indicates the habitat suitability with respect to GCN and is not an indicator of presence or absence.

HSI Score	Pond Suitability
< 0.5	Poor
0.5 – 0.59	Below average
0.6 – 0.69	Average
0.7 – 0.79	Good
> 0.8	Excellent

Table 1.2: Great Crested Newt HSI Scoring

1.6 The HIS score is given by assigning a quantitative figure to each of 10 variables, including pond area, water quality and level of shading, which are all factors considered to affect GCN (see Table 1.3 below)

No	HSI Category	HSI Criteria / Score
1	Location	Location A: optimal (1), north, central & southern England; Location B: marginal (0.5), northern Pennies, north/southern Scotland & small areas of Wales; Location C: unsuitable (0.01) Scotland, west of Wales & Cornwall.
2	Pond Area	Calculated based on pond area in metre squared.
3	Pond Drying	Never dries = 0.9; Rarely Dries = 1.0; Sometimes dries = 0.5; Dries annually = 0.1.
4	Water quality	Good = 1.0; Moderate = 0.67; Poor = 0.33; Bad = 0.01.
5	Shade	Calculated as a percentage, with shading up to 60% considered suitable for great crested newt. Shade cover greater than 60% progressively declines in value.
6	Fowl	Absent = 1; Minor = 0.67; Major = 0.01.
7	Fish	Absent = 1; Possible = 0.67; Minor = 0.33; Major = 0.01.
8	Ponds	Number of ponds occurring within 1km of survey pond and divided by Pi (3.14). Exclude ponds where major barrier such as roads exist.
9	Terrestrial Habitat	Good =1; Moderate = 0.67; Poor = 0.33; Bad = 0.01.
10	Macrophytes	Estimated percentage value of macrophyte cover (sum of emergent, floating, submerged plants reaching the surface, except duckweed).

Table 1.3: HSI variables

1.7 The calculation of the HSI is according to the formula: HSI = (SI1 x SI2 x SI3 x SI4 x SI5 x SI6 x SI7 x SI8 x SI9 x SI10)1/10. This is a geometric mean, the tenth root of the product of all the suitability indices, which then provides the figure for habitat suitability. Assessment was also made of the habitat connectivity between ponds and the site, based on field observations and a review of mapped sources.

Great Crested Newt Edna

1.8 In accordance with guidance approved by Natural England (Biggs *et al.* 2014), environmental DNA (eDNA) analysis was completed on the surveyed ponds.

1.9 Water samples were collected by a great crested newt licence holder with suitable experience and training. A total of 20 water samples were taken from around each pond margin. The samples were taken from at least 75% of the pond perimeter and target areas of egg laying habitat and open water which may be used for displaying. The samples were combined within a Whirl-Pak bag and 15ml of the mixture was extracted using a pipette and added to a sterile tube containing 35ml of ethanol. This was repeated a total of six times. The samples were sent to Surescreen Scientifics for testing to determine the presence/absence of great crested newt DNA within the water samples from the pond.

Presence / Absence Survey & Population Size Class Assessment

1.10 Surveys for the presence of GCN require a minimum of four visits per year between mid-March and mid-June, with at least two visits between mid-April and mid-May to record peak numbers of GCN (English Nature, 2001). In this instance, the surveys were undertaken between mid-May and mid-June.

1.11 Several standard survey methodologies were utilised during these visits, including torchlight survey, bottle trapping, egg searching and refuge searching.

1.12 The torchlight survey is a standard amphibian recording technique employing a high-powered torch to illuminate the ponds at night to allow the surveyor to record GCN.

1.13 Bottle traps were laid during the evening using the method described by Gent and Gibson (1998). The traps were then checked for newts before 10 am the following morning. Any newts found were recorded and then released back into the pond.

1.14 The egg search involved a direct assessment of emergent and submerged vegetation for GCN eggs. Egg surveys can only be undertaken during late spring and early summer (April to June).

1.15 Refuge searching involved looking underneath objects such as rocks, logs, moss and discarded debris in the vicinity of a pond. Adult and juvenile GCN can often be found underneath such objects, between March and October, especially if the objects are flat and retain moisture. Refuge searching is not a reliable method on its own and is only used as a supporting method to the other methods described.

1.16 In ponds where great crested newts were found, a further two surveys were undertaken. This was to provide a population class estimate, as the determination of population class size in accordance with the 'Great Crested Newt Mitigation Guidelines' (English Nature, 2001).

1.17 The peak population count for a single night is used to inform the calculation of population size class. Where ponds are within 250 m of each other the peak is summed for the same night and a size class assigned using the following criteria:

- Small Population – where peak count is up to 10
- Medium Population –where peak count is 11 to 100
- Large Population – where peak count exceeds 100

1.18 The population size class assessment is used to determine the level of mitigation required, should great crested newts be found.

Survey Constraints

1.19 Guidance recommends at least two survey visits should be undertaken between mid-April and mid-May to record peak numbers of GCN (English Nature, 2001). In this instance, the surveys were undertaken between mid-May and mid-June; however due to the cold weather in April 2019 (only six nights with an overnight low of over 5ºC), it is considered acceptable that first two of the four visits were undertaken towards the end of May. Natural England have accepted mid-May to mid-June survey data in the past under similar circumstances and this was not considered a significant constraint to overall survey conclusions.

2.0 RESULTS

Habitat Suitability Index Assessment

2.1 At the time of the eDNA pond sampling visit (date), each pond was subject to a habitat assessment to determine its suitability to support great crested newts. Appendix 2 provides a description of each of the surveyed ponds, an assessment of habitat features favoured by great crested newts, and corresponding HSI scores.

2.2 A summary of the HSI results is provided in Table 2.1. Pond locations are shown on Figure 1820-T7-01 in Appendix 1. In terms of site suitability, all habitats within the site area were considered good quality foraging and refuge habitat for amphibians.

Pond Ref.	HSI Category										HSI Score
	SI 1	SI 2	SI 3	SI 4	SI 5	SI 6	SI 7	SI 8	SI 9	SI 10	
1	1	0.1	0.9	0.67	0.5	1	0.67	1	1	0.3	**0.6 (Average)**
2	1	1	0.5	0.67	0.7	1	0.67	1	1	0.3	**0.74 (Good)**
3	1	0.7	0.1	0.67	1	1	1	1	0.67	0.5	**0.66 (Average)**
4	1	0.7	0.9	0.67	1	0.67	0.67	1	1	0.5	**0.79 (Good)**
5	1	1	0.5	0.67	1	0.67	0.67	1	1	0.55	**0.78 (Good)**
6	1	0.7	0.9	0.67	0.95	0.67	0.67	1	1	0.35	**0.76 (Good)**

Key:
SI 1 – Location
SI 2 – Pond Area
SI 3 – Pond Drying
SI 4 – Water Quality
SI 5 – Shade
SI 6 – Waterfowl
SI 7 – Fish
SI 8 – Ponds Within 1km
SI 9 – Terrestrial Habitat
SI 10 – Macrophytes

Table 2.1: Habitat Suitability Index of Surveyed Ponds

eDNA Analysis

2.3 The ponds were sampled on 24th April 2019 by Lorraine McKee, Project Ecologist & Natural England GCN Licence Holder (Licence number 2017-27633-CLS-CLS) and Andrew Highlands (Field Assistant). A summary of the eDNA analysis results provided by Surescreen Scientifics Ltd is given in Table 2.2 and shown on Appletons Drawing 1820-T7-01 (Appendix 1).

Water body reference	GCN Detection	Positive replicates	Integrity / Inhibition / Degradation
1	Negative	0	Pass
2	Negative	0	Pass
3	Positive	1	Pass
4	Negative	0	Pass
5	Negative	0	Pass
6	Positive	2	Pass

Key
Positive: GCN DNA was detected
GCN Score: Number of positive replicates from a series of twelve
Negative: DNA from the species was not detected; in the case of negative samples the DNA extract is further tested for PCR inhibitors and degradation of the sample

Table 2.2: eDNA Results of all Surveyed Ponds

Great Crested Newt Surveys

2.4 The GCN surveys were undertaken between 10th May and 13th June 2019 by Bob Leatham, Ecologist & Natural England GCN Licence Holder (Licence number 2015-16901-CLS-CLS).

2.5 Table 2.3 provides a summary of the survey dates and weather conditions.

Survey Visit Number	Date	Time	Parameter			
			Temperature ^{0}C	Cloud	Precipitation	Wind (Beaufort Scale)
1	10/05/19	pm	12	Part cloud	Dry	0
	11/05/19	am	8		-	
2	14/05/19	pm	18	Clear	Dry	0
	15/05/19	am	12		-	
3	22/05/19	pm	12	Clear	Dry	0
	23/05/19	am	10		-	
4	31/05/19	pm	16	Part cloud	Dry	3
	01/06/19	am	14		-	
5	08/06/19	pm	15	Cloud	Dry	0
	09/06/19	am	13		-	
6	12/06/19	pm	16	Part cloud	Dry	2
	13/06/19	am	13		-	

Table 2.3: Weather Conditions During Great Crested Newt Survey Visits

2.9 Table 2.4 (overleaf) details the GCN survey results. Survey results are also summarised as a map within Figure 1820-T7-01 in Appendix 1.

2.10 A population size class assessment is determined by taking the peak count for all ponds within 250m of one another during a single survey visit by a single technique (English Nature, 2001). Where multiple ponds are recorded within a 250m radius of each other these are generally considered to hold a single great crested newt population and the peak count for each survey visit for these ponds is summed to generate the peak count for the population. Table 2.5 details the results of the population size class assessment for the site.

Population Reference	Pond reference	Peak GCN Count	Population Class
GCN population A	Pond 4	1 (10/05/19 & 01/06/19)	Small

Table 2.5: Great Crested Newt Population Size Class Assessment

	Pond 1	Pond 2	Pond 3	Pond 4	Pond 5	Pond 6
Survey Visit 1 – [10-05-19 / 11-05-19]						
Torch Survey	0	3♀SN, 1CT tad.	**1♀GCN**	0	2♀SN	2♀SN
Bottle Trapping	0	0	1♀SN	2♀SN	0	0
Refugia Search	0	0	0	0	0	0
Egg Search	0	0	**GCN**	0	0	0
Vegetation Cover	3/5	2/5	4/5	1/5	1/5	1/5
Turbidity	0/5	1/5	3/5	3/5	0/5	2/5
Peak GCN Count	0	0	**1**	0	0	0
Survey Visit 2 – [14-05-19 / 15-05-19]						
Torch Survey	0	<10CTtad.	5♀SN	9♀SN, 1♂SN	1♀SN	4♀SN, <10CT tad.
Bottle Trapping	0	0	0	3♀SN, 7♂SN <10CT tad.	0	2♀SN
Refugia Search	0	0	0	0	0	0
Egg Search	0	0	**GCN**	0	0	0
Vegetation Cover	4/5	1/5	0/5	1/5	1/5	1/5
Turbidity	0/5	2/5	3/5	2/5	0/5	2/5
Peak GCN Count	0	0	Eggs present	0	0	0
Survey Visit 3 – [22-05-19 / 23-05-19]						
Torch Survey	0	0	1♀SN	4♀SN, 2♂SN	Dry	>50CT tad.
Bottle Trapping	0	0	2♀SN, 1♂SN	4♀SN, 2♂SN	Dry	6CT tad.
Refugia Search	0	0	0	0	0	0
Egg Search	0	0	**GCN**	0	0	0
Vegetation Cover	4/5	1/5	0/5	1/5	n/a	1/5
Turbidity	1/5	2/5	3/5	2/5	n/a	2/5
Peak GCN Count	0	0	Eggs present	0	0	0
Survey Visit 4 – [31-05-19 / 01-06-19]						
Torch Survey	0	Dry	0	0	Dry	0
Bottle Trapping	0	Dry	**1♀GCN**, 2♂SN	1♀SN, 1 stickleback	Dry	2♀SN
Refugia Search	0	0	0	0	0	0
Egg Search	0	0	**GCN**	0	0	0
Vegetation Cover	4/5	n/a	0/5	1/5	n/a	1/5
Turbidity	3/5	n/a	4/5	3/5	n/a	4/5
Peak GCN Count	0	0	**1**	0	0	0
Survey Visit 5 – [08-06-19 / 09-06-19]						
Torch Survey			0			<10CT tad.
Bottle Trapping			2♀SN			3CT tad.
Refugia Search	-	-	0	-	-	0
Egg Search			**GCN**			0
Vegetation Cover			0/5			1/5
Turbidity			4/5			2/5
Peak GCN Count	-	-	Eggs present	-	-	0
Survey Visit 6 – [12/06/19 / 13-06-19]						
Torch Survey			0			0
Bottle Trapping			0			2CT tad.
Refugia Search	-	-	0	-	-	0
Egg Search			0			0
Vegetation Cover			4/5			1/5
Turbidity			4/5			4/5
Peak GCN Count	-	-	0	-	-	-

Key:
GCN – Great crested newt *Triturus cristatus* ♂ - male
SN – Smooth newt *Lissotriton vulgaris* ♀ - female
CT – Common toad *Bufo bufo* tad. – tadpole

Note: 'Peak GCN Count' is the peak count of adult GCN recorded during a single visit using a single survey technique.

Table 2.4: GCN Survey Results

3.0 COMPARISON WITH PREVIOUS SURVEY DATA

3.1 In 2012, presence/absence GCN surveys were undertaken on all six ponds using torchlight search, bottle trap and egg search methods and no evidence of GCN presence was recorded suggesting the likely absence of GCN, in contrast to the 2019 results.

3.2 Aside from those surveyed, the closest ponds to the site comprise the cluster of ponds located within Peel Park. There is a distance of 420 metres between the closest of these ponds (pond 9) and the closest newly occupied GCN pond (Pond 6). Although it is generally accepted that GCN rarely disperse more than 250 metres from breeding ponds, juveniles have been recorded to disperse much greater distances than adults, and the reasons for population range expansion can depend on a number of factors at the source pond, including GCN population size or/and changes in pond habitat condition (e.g. successional changes or water quality degradation). Therefore, it is possible that individuals may have colonised the site from these ponds, if GCN are present within Peel Park. Further survey work at the cluster of ponds within Peel Park would be required to fully understand the metapopulation dynamics at the site.

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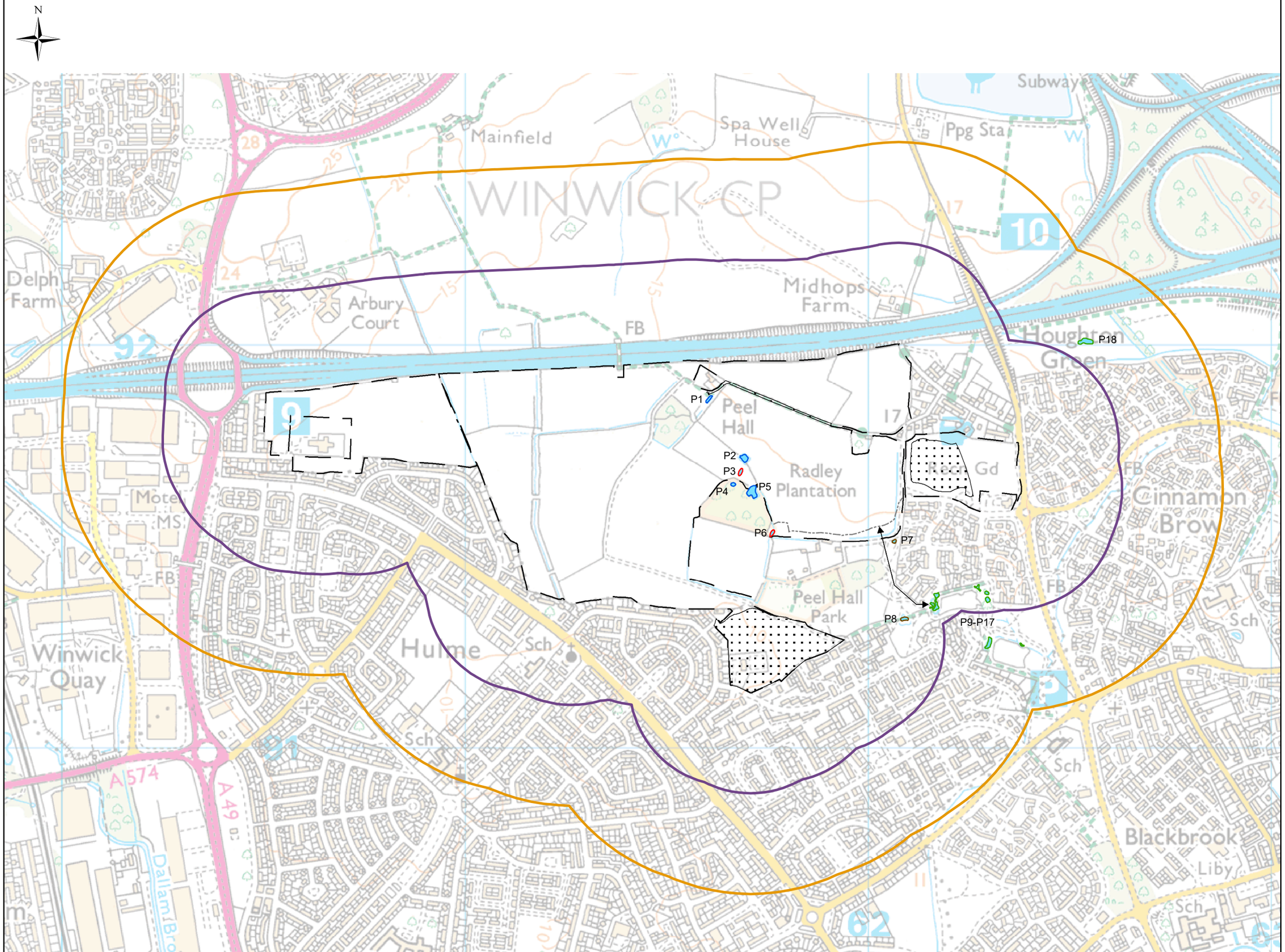
APPENDIX 1



Legend

- Site boundary
- 250metre buffer from site boundary
- 500metre buffer from site boundary
- Pond subject to GCN surveys - positive result
- Pond subject to GCN surveys - negative result
- Pond dry at time of survey
- Pond over 250 metres from closest built development - not subject to GCN survey
- Southernmost extent of built development
- 250m distance between pond and closest proposed built development, avoiding dispersal deterents (buildings and roads)

Great Crested Newt Survey Plan

Drawing: 1820-T7-01
By: PB
Date: April 2019
Site name: Site at Peel Hall, Warrington

appletons

APPENDIX 2

APPENDIX 1: POND PHOTOGRAPHS

Photo 1: Pond 1

Photo 2: Pond 2

Photo 3: Pond 3

Photo 4: Pond 3

Photo 5: Pond 4

Photo 6: Pond 6

Volume 9

ON BEHALF OF
Satnam Millennium Ltd

IN RESPECT OF

Outline application for a new residential neighbourhood including C2 and C3 uses; local centre including food store up to 2000m², A1-A5 (inclusive) and D1 use class units of up to 600m² total (with no single unit of more than 200m2) and family restaurant/ pub of up to 800m2 (A3/A4 use); site for primary school; open space including sports pitches with ancillary facilities; means of access and supporting infrastructure at Peel Hall, Warrington

AT PEEL HALL, WARRINGTON

ADDENDUM 2 TO ENVIRONMENTAL STATEMENT DOCUMENTS AND FIGURES *(Volume 9)*

PART 2

March 2020

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ECOLOGY

ECO 16 2019 Badger Survey

APP 1: Drawing 1820-T8-01 – Badger Survey Plan and Results

SITE AT PEEL HALL, WARRINGTON

For

SATNAM MILLENNIUM LTD

ECO 16:
BADGER SURVEY

METHODOLOGIES AND RESULTS ONLY

MARCH 2019

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CONTENTS:

The current report comprises the methodologies and survey data of badger work only. An overview of badger survey results and impact assessment of proposals in relation to badger are included in Chapter 6 of the Environmental Statement (March 2020).

1.0 METHODOLOGIES

Habitat Assessment

1.1 A habitat assessment was undertaken to identify the suitability of the site for use by foraging and sett building badgers. This takes the nature of the surrounding landscape and connectivity with other areas of suitable habitat into account.

Field Survey

1.2 The survey adhered to the standard approach as detailed in Harris et al (1989) and used during the National Badger Survey (Cresswell *et al.* 1990). The survey site was subject to a comprehensive walkover assessment for the presence of badger field signs, including badger setts, runs, footprints, pathways, hairs, snuffle holes, scratching posts, and latrine sites. Any signs recorded were plotted on an appropriately scaled map. The survey included the full site area and any accessible land within 30 metres. The 2019 survey therefore covered more land than the 2017 survey.

2.0 SURVEY RESULTS

2.1 The badger survey was carried out on 20th and 21st March 2019, by Paula Bateson MSc ACIEEM (Senior Ecologist). A plan of the surveyed area and results is provided as Appendix 1. Weather conditions at the time of the survey are detailed in Table 3.1.

Date	Precipitation	Wind (Beaufort)	Cloud cover (%)	Temperature (°C)
20.03.19	None	F2	100	11-14
21.03.19	None	F2	100	12-15

Table 3.1: Weather conditions at time of badger survey visits

Survey Constraints

2.2 Occasional areas of dense scrub within the survey site could not be fully inspected for evidence of badger activity. However, no mammal paths or push throughs were recorded to enter these areas of dense vegetation, and as such it was considered highly unlikely that badgers utilise these locations.

2.3 The survey was subject to no further constraints.

Habitat Suitability Assessment

2.4 The 68ha site area is dominated by large, recently unmanaged agricultural fields, with hedgerow and ditch boundary habitats. Pockets of broadleaved woodland are present within and immediately adjacent to the site. The abandoned fields are undergoing seral succession from grassland through to scrub and are considered to provide suitable foraging and commuting habitat for badger.

2.5 The embankments associated with hedgerow and dry ditch field boundaries as well as woodland areas have the potential to present suitable sett building and foraging opportunities for badgers, however overall the site was considered suboptimal owing to the nature of the soils being predominantly hard and/or damp/waterlogged. Very few embankments are present on site, limited to ditch and pond edges, and occasional linear mounds of loose earth within the fields.

2.6 The site possesses some habitat connectivity to the south-east with woodland and park habitats, which are capable of supporting commuting and foraging badgers. The relatively isolated and highly disturbed nature of these habitats however deems it unlikely for badger setts to be present. One footbridge across the motorway provides the only potential habitat connectivity for badgers between the site and extensive farmland to the north, however this is also suboptimal comprising continuous intensive arable agriculture with no sheltered field boundary.

Field Survey Results

2.7 No potential setts were identified on site, and no evidence of badger presence such as pawprints, latrines, badger hair or snuffle holes was recorded. Numerous mammal trails were present across the site however no direct evidence of badger was recorded along these. Evidence of other mammals along these paths included fox, dog, deer, rabbit and hedgehog.

2.8 One fox den was recorded on site, identifiable as such by odour, entrance shape, occasional fox hair and feeding remains. Numerous rabbit warrens were also recorded, particularly along ditch embankments and within the linear mounds of loose earth.

3.0 COMPARISONS WITH PREVIOUS SURVEY DATA

3.1 Badger surveys have been undertaken at the site in 2013 and 2015. In common with 2019 survey data, no evidence of badger was recorded by either of these surveys.

3.2 Previous surveys have been undertaken in summer months, whereas the 2019 badger survey was undertaken early Spring which is within the optimum time period for badger surveys, when badger activity is high and vegetation cover is low for visual searches and accessibility. The constraint in relation to access constraints owing to dense vegetation is therefore less than that which applied during the 2013 and 2015 surveys.

4.0 REFERENCES AND BIBLIOGRAPHY

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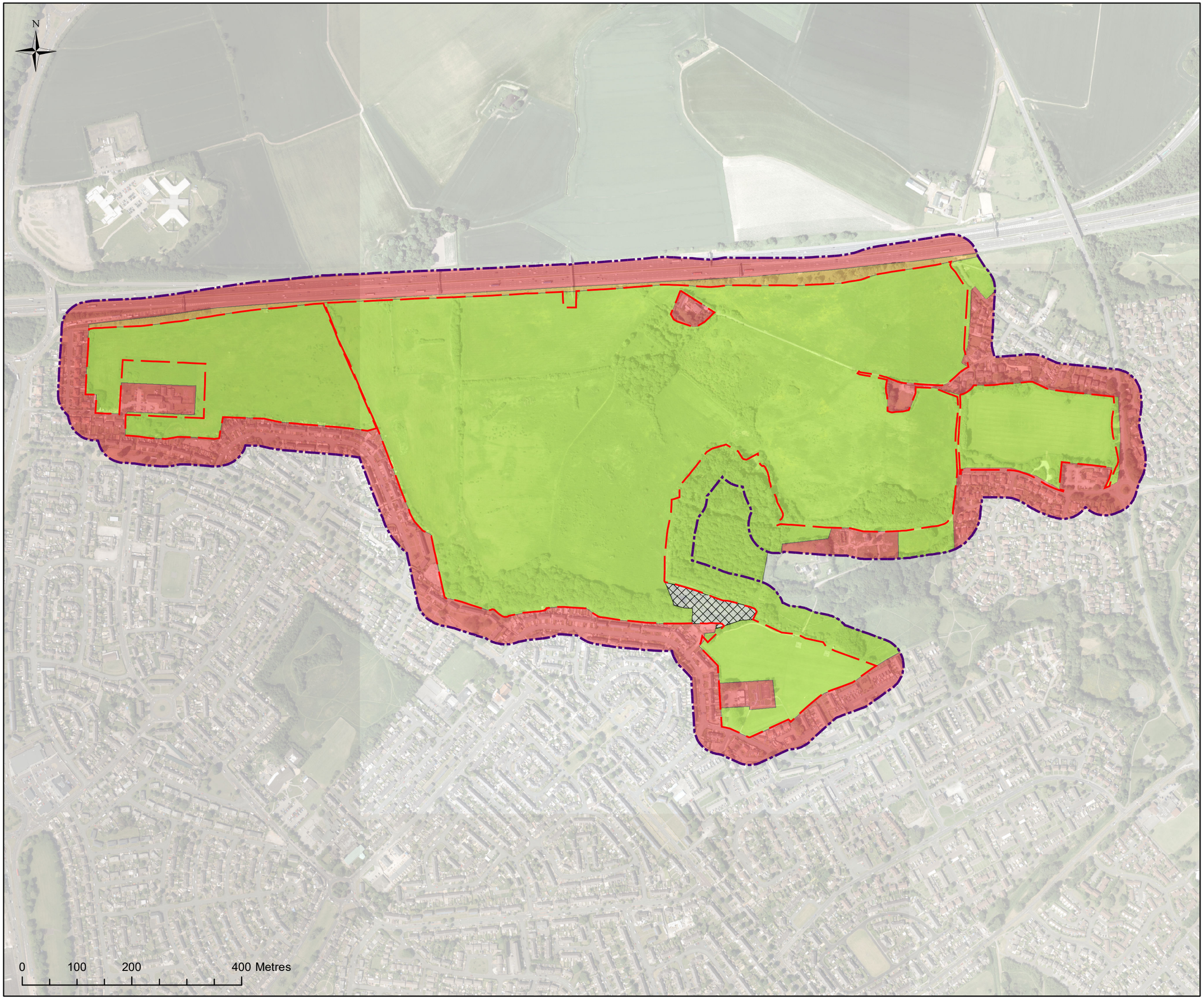
APPENDIX 1



Legend

- Site boundary
- 50 metre buffer from site boundary
- Fully surveyed for evidence of badger
- Motorway embankment surveyed from fenceline/footbridge only
- Unsuitable sett building habitat - not covered by survey
- Dense inpenetrable scrub

Badger Survey Plan

Drawing: 1820-T9-01
By: PB
Survey date: March 2019
Site name: Site at Peel Hall, Warrington

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ECOLOGY

ECO 17 2019 Hedgerow Regulations Survey

APP 1: Site Map and Hedgerows

APP 2: Hedgerow photographs

SITE AT PEEL HALL, WARRINGTON

For

SATNAM MILLENIUM LTD

ECO 17:
HEDGEROW REGULATIONS (1997) ASSESSMENT

METHODOLOGIES & RESULTS DATA ONLY

MARCH 2019

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CONTENTS:

The current report comprises the methodologies and survey data of hedgerow work only. An overview of survey results and impact assessment of proposals in relation to hedgerows are included in Chapter 6 of the Environmental Statement (March 2020).

1.0 METHODOLOGIES

Overview of Hedgerows Regulations Criteria

1.1 The Hedgerows Regulations (1997) include various criteria upon which a hedgerow may be classed as 'important' with respect to wildlife and landscape or archaeology and history. A hedgerow is deemed 'important' if it, or the wider hedgerow of which it forms a part:

(a) has existed for 30 years or more; and,

(b) satisfies at least one of the criteria listed in Part II of Schedule 1.

1.2 The criteria listed in Part II of Schedule 1 consists of the following:

(i) Historic hedgerow existing before 1850, marking a parish or township boundary.

(ii) The hedgerow incorporates an archaeological feature.

(iii) Is part of, or associated with, an archaeological site.

(iv) Marks the boundary of, or is associated with, a pre-1600 estate or manor.

(v) Forms an integral part of a pre-Parliamentary enclosure field system.

(vi) Contains certain categories of species of bird, animals or plants listed in the Wildlife & Countryside Act or JNCC publications.

(vii) Includes:

1. seven or more woody species in a 30 m length;
2. six woody species, in a 30 m length, and at least three associated features (a-e below);
3. six woody species, in a 30 m length, and includes one of the following – black poplar *Populus nigra* ssp. *betulifolia*, large leafed lime *Tilia platyphyllos*, small leafed lime *Tilia cordata*, wild service tree *Sorbus torminalis*; or
4. five woody species, in a 30 m length, and at least four associated features.
5. four woody species, in a 30 m length, is adjacent to a footpath, bridleway, road used as a public footpath or a byway open to all traffic, contains and has at least two associated features (a-e only below).

1.3 The following are considered to be associated features:

a) A wall or bank supporting the hedgerow along at least half its length;

b) Less than 10% gaps;

c) An average of one standard tree or more per 50 m of hedgerow;

d) At least 3 species from a list of 57 woodland plants listed in Schedule 2 of The Hedgerow Regulations;

e) A ditch along at least half its length;

f) A number of connections with other hedgerows, ponds or woodland*; and

g) A parallel hedge within 15 m.

** to fulfil this category the hedgerow must have at least 4 connection points where: a hedgerow is 1 point; broadleaved woodland is 2 points; and, a pond is 2 points.*

Field Survey

1.4 The site was subject to a walkover survey, which encompassed all boundary features within the site footprint, and those which were considered to conform to the criteria for assessment under the Hedgerow Regulations (1997) were subject to a detailed inspection. The locations of hedgerows assessed are shown on Drawing 1820-T9-01.

1.5 The survey was carried out on 20th and 21st March 2019 by Lorraine McKee MSc GradCIEEM, Project Ecologist. Additional data in relation to ground flora was collected on 8th July 2019. Weather conditions at the time of the survey are detailed in Table 1.1.

Date	Precipitation	Wind (Beaufort)	Cloud cover (%)	Temperature (°C)
20.03.19	None	F2	100	11-14
21.03.19	None	F2	100	12-15
08.07.19	None	F2	50	17

Table 1.1: Weather conditions at time of field surveys

Survey constraints

1.6 The survey was subject to no constraints.

2.0 RESULTS

Description of Hedgerows Surveyed

2.4 All of the native hedgerows measuring over 20 metres in length, excluding those defining the boundaries of adjacent domestic properties were surveyed. The walkover survey identified a total of ten hedgerows considered suitable for assessment under the Hedgerow Regulations (1997).

2.5 It should be noted that there are certain features in site that appear to be hedgerows, in that they are linear stands of immature willow species that may or may not mark the line of former field boundaries. However, based on field survey observations, these features are not hedgerows in the traditional sense and therefore are not included in this study.

2.6 A brief description of each of the hedgerows assessed and a list woody species recorded in each hedge is summarised in Table 2.1. The location of each hedgerow is shown on Drawing 1820-T9-01 in Appendix 1.

2.7 Hedgerow numbers missing (i.e. Hedgerows 4 and 7) define the boundaries of adjacent residential properties and as such were not included in the current assessment. These are described within the Phase 1 Habitat Survey (Technical Appendix 1).

Hedgerow Regulations (1997) Assessment

2.7 Table 2.2 provides a summary of the assessment for each hedgerow in accordance with the criteria summarised in Chapter 1. The assessment of each hedgerow against the archaeology and historic criteria of the Hedgerow Regulations (1997) is left blank as it does not form part of the scope of this report. Hedgerow numbers are as detailed on Drawing 1820-T9-01 in Appendix 1.

Hedgerow number	Woody Species Recorded		Description
	Common name	Scientific name	
1a	Hawthorn Dogwood Holly	*Crataegus monogyna* *Cornus sanguinea* *Ilex aquifolium*	A defunct hedgerow along Mill Lane 60m in length. The hedge was approximately 3m high, historically pruned, unmanaged on the field side and not considered to be stock proof. The hedge was dominated by hawthorn with occasional dogwood and one holly bush also present. The ground flora was considered to be poor and characterised by dense bramble on the field side with a more complex assemblage roadside. Hedgerow continues for ~60m south, away from Mill Lane, however this stretch borders residential gardens and was not assessed.
1b	Hawthorn Elder	*Crataegus monogyna* *Samucus nigra*	A defunct hedgerow along Mill Lane opposite H1a ~25m in length, which had similar characteristics to H1a such as being approximately 2m high, historically pruned and hawthorn dominated. The ground flora was considered to be poor and characterised by dense bramble on the field side with a more complex assemblage roadside.
2	Hawthorn	*Crataegus monogyna*	A 2m tall hedgerow ~75m in length, occasionally maintained. Hedgerow entirely dominated by hawthorn with tall ruderal vegetation such as rosebay willowherb *Chamaenerion angustifolium* and common nettle *Urtica dioca* comprising the ground flora, indicative of nutrient enrichment.
3	Blackthorn	*Prunus spinosa*	A defunct hedge ~130m in length and 2-3m in height. Hedgerow poorly maintained with a row of trees behind it bordering the motorway. Hedgerow co-dominated by hawthorn and blackthorn. Ground flora notably poor and characterised by frequent common nettle and goosegrass *Galium aparine* with occasional bramble.
5	Hawthorn	*Crataegus monogyna*	A defunct hedge ~55m in length and 3-4m in height. Gappy in nature. Located against a barbed wire fence. Dominated by hawthorn but degrades into a bramble dominated near monoculture. Rabbit burrows and molehills present in this area. The lichen *Xanthoria parietina* was abundant on the branches of the hawthorns, which is indicative of high nutrient levels.
6	Hawthorn Dogwood Blackthorn Willow species Elder Alder Oak saplings	*Crataegus monogyna* *Cornus sanguinea* *Prunus spinosa* *Salix* sp. *Sambucus nigra* *Alnus glutinosa* *Quercus robur*	A mature hedgerow ~130m adjacent to Radley Lane. A wren's (*Troglodytes troglodytes*) nest was found within the hedgerow at the time of survey. Dominated by hawthorn with occasional dogwood, blackthorn, willow and elder. Young/early-mature alder trees present. Dry ditch present within hedgerow. Three woody species on average per 30m survey sample.
8	Hawthorn	*Crataegus monogyna*	A ~280m defunct hedgerow with a ditch feature that was wet at the time of March survey. The ditch had no vegetation and was approximately 1.5m wide and approximately 40cm deep. The

	Elder Grey willow Goat willow	*Sambucus nigra* *Salix cinerea* *Salix caprea*	hedgerow was dominated by overgrown hawthorn with occasional elder; a mixture of common nettle and goosegrass comprised the ground flora. Notable flora included Hart's-tongue fern *Asplenium scolopendrium*. The hedgerow gave way to a line of scattered grey willow and goat willow. Three woody species on average per 30m survey sample.
9	Hawthorn Grey willow Goat willow Sycamore*	*Crataegus monogyna* *Salix cinerea* *Salix caprea* *Acer pseudoplatanus*	A ~130m tall overgrown hedgerow dominated by hawthorn with locally frequent grey willow, goat willow and mature sycamore. This was adjacent to a ditch that was dry at the time of the March survey, which was approximately 1.5m wide by 0.5m deep. No vegetation was present within the channel. Two woody species on average per 30m survey sample.
10	Hawthorn Holly	*Crataegus monogyna* *Ilex aquifolium*	Double ~75m defunct hedgerow against a fence. The western part of the double hedgerow shows signs of maintenance, although the eastern side did not. The hedge was leggy and gappy, approximately 2.5m high with a shallow ditch in the middle, which was usually dry, although it was noted to have 3-6cm of water in the channel during a site visit in March. The hedgerow itself was dominated by hawthorn, with a solitary holly bush and very rarely ivy. The northern part of the double hedgerow parted by approximately 5m. In this small 5m gap a marijuana (*Cannabis sativa*) 4x4 growing grid was found, which supported a number of plants throughout the year. Two woody species on average per 30m survey sample.
11	Hawthorn Ash Guelder rose	*Crataegus monogyna* *Fraxinus excelsior* *Viburnum opulus*	An immature and very gappy hedgerow (<30 years, approximately), ~130m in length. Hawthorn dominant throughout, with occasional immature ash and rarely guelder rose. No significant ground flora was present due to the dominance of adjacent course scrub habitat. A dry ditch was present adjacent to H11. No direct access was possible to the ditch due to the presence of dense and impassable vegetation. Note that in 2015 the channel was recorded as being a shallow stream which was "impounded slightly due to leaf litter and rubbish…".
*: Species not included in Schedule 3 of regulations as 'woody' species			

Table 2.1: Description of hedgerows on site and woody species recorded

Feature	H1a	H1b	H2	H3	H5	H6	H8	H9	H10	H11
Existed for 30 years or more	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Criteria listed in Part II of Schedule 1 (to be 'important need to satisfy one of the following or one from woody species list)										
Historic hedgerow existing before 1850, marking a parish or township boundary	-	-	-	-	-	-	-	-	-	-
The hedgerow incorporates an archaeological feature	-	-	-	-	-	-	-	-	-	-
Is part of, or associated with, an archaeological site	-	-	-	-	-	-	-	-	-	-
Marks the boundary of, or is associated with, a pre-1600 estate or manor	-	-	-	-	-	-	-	-	-	-
Forms an integral part of a pre-Parliamentary enclosure field system	-	-	-	-	-	-	-	-	-	-
Contains certain categories of species of bird, animals or plants listed in the Wildlife & Countryside Act or JNCC publications.	×	×	×	×	×	×	×	×	×	×
Number of woody species in 30 m section										
Greater than seven	×	×	×	×	×	×	×	×	×	×
Six (needs 3+ associated features to be classified as 'important')	×	×	×	×	×	×	×	×	×	×
Six including: black poplar, large leafed lime, small leafed lime or wild service tree	×	×	×	×	×	×	×	×	×	×
Five (needs 4+ associated features to be classified as 'important')	×	×	×	×	×	×	×	×	×	×
Four (needs 2+ associated features & be adjacent to a footpath, bridleway, road used as a public footpath or a byway open to traffic to be classified as important	×	×	×	×	×	×	×	×	×	×
Adjacent to rights of way	×	×	✓	×	×	✓	×	×	×	×
Total no. of associated features from those listed below										
A wall or bank supporting the hedgerow	×	×	×	×	×	×	×	×	×	×
Less than 10% gaps	✓	×	✓	×	×	✓	✓	✓	×	✓
An average of one standard tree or more per 50 m of hedgerow	×	×	×	×	×	✓	×	✓	×	×
At least 3 species from a list of 57 woodland plants	×	×	×	×	×	×	×	×	×	×
A ditch along half or more of its length	×	×	×	×	×	✓	✓	✓	✓	✓
In excess of 4 'points' from connections with other notable habitats (see Chapter 1)	×	×	×	×	×	×	×	×	×	×
A parallel hedge within 15 m	✓	✓	×	×	×	×	×	×	×	×
'Important' hedgerow with respect to wildlife and landscape	×	×	×	×	×	×	×	×	×	×

Table 2.2: Assessment of Hedgerow Features Based on Hedgerows Regulations (1997) Criteria

2.8 None of the hedgerows surveyed were found to support four woody species per 30 m length and thus do not have the potential to qualify as 'important' under the wildlife and landscape criteria of the Hedgerow Regulations (1997).

3.0 COMPARISONS WITH PREVIOUS SURVEY DATA

3.1 The site was subject to a Hedgerows Regulations Assessment in 2015 (Appletons Environmental Statement: Phase 2, 2016). No hedgerows on site were concluded to potentially qualify as 'important' hedgerows under the Hedgerow Regulations ecology and landscape criteria, in line with the updated 2019 survey results.

3.2 Archaeological importance does not form part of the scope of this report.

3.3 Since the 2015 survey, one former hedgerow feature to the south-east of Peel Hall kennels had merged with adjacent establishing scrub habitats and the features now measure over five metres in width. This habitat no longer strictly meets the definition of a hedgerow and instead contribute to the wider structure of scrub habitats. This feature was not identified as potentially important by the 2015 survey.

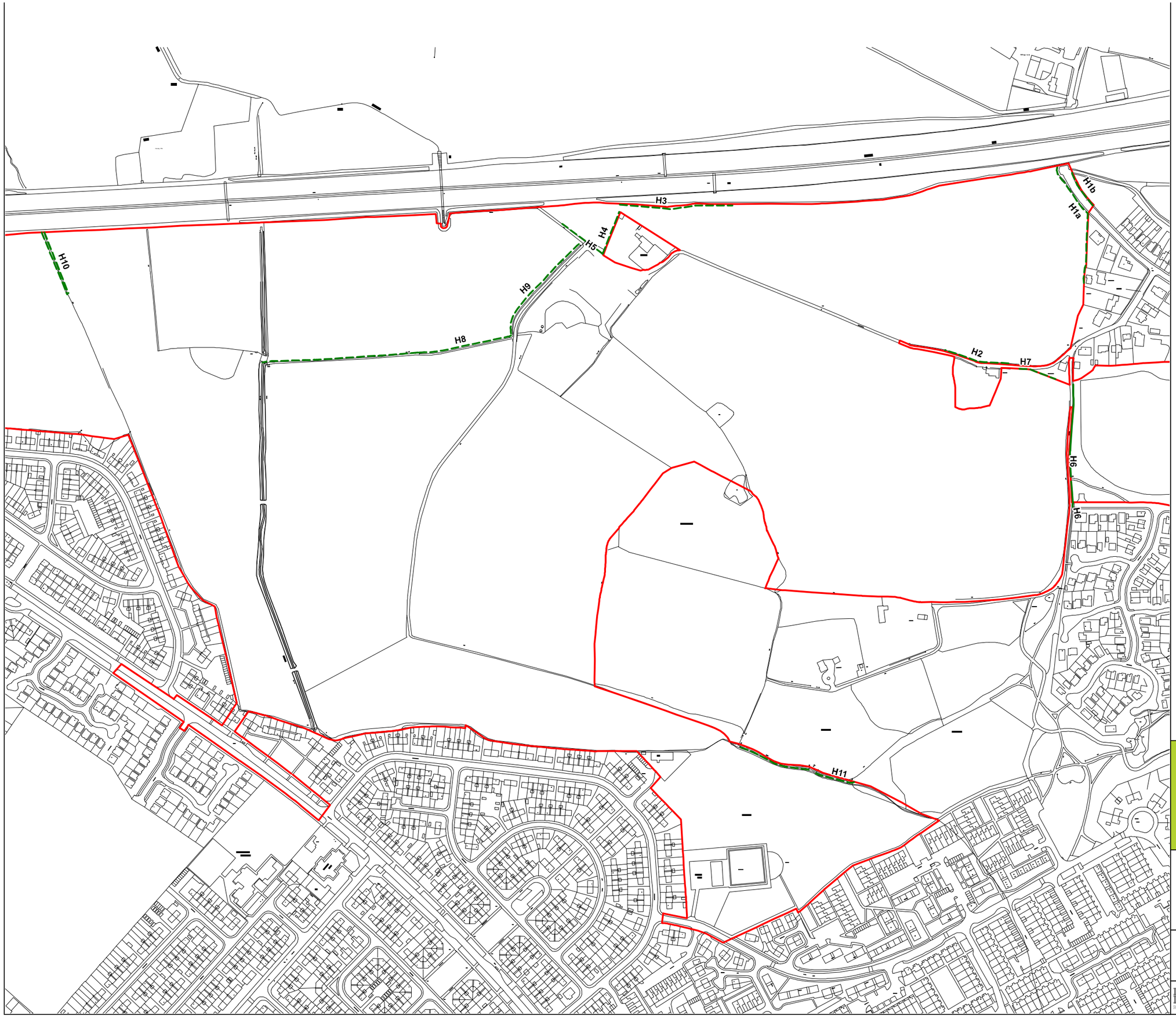
4.0 REFERENCES

DEFRA (2007) *Hedgerow Survey Handbook. A standard procedure for local surveys in the UK*. Defra, London.

The Hedgerow Regulations 1997. Available from: http://www.legislation.gov.uk/

Wildlife & Countryside Act (1981) As Amended. Available from http://www.legislation.gov.uk/

APPENDIX 1



Native species poor hedgerow

Defunct native species poor hedgerow

Red line boundary

0 250

metres

appletons

Site at Peel Hall, Warrington

Hedgerow Plan

Satnam Millenium Ltd

N

Drawing: 1820-T9-01 Drawn by: LM
Revision: 0 Checked by: PB
Date: 28/01/2020 Scale: 1:4000 @ A3

Landscape Institute Registered practice

Appletons 17 Chorley Old Road, Bolton, BL1 3AD. Tel: 01204 393006
Web: www.appletons.uk.com Email: info@appletons.uk.com

APPENDIX 2

Photo 1: Hedge 1a

Photo 2: Hedge 1b

Photo 3: Hedgerow 3

Photo 4: Hedgerow 5

Photo 5: Hedgerow 6

Photo 6: Hedgerow 8

Photo 7: Hedgerow 9

Photo 8: Hedgerow 10

Photo 9: Hedgerow 11

LANDSCAPE AND VISUAL IMPACT

LND 10 Landscape Masterplan (1820_36)- New Plan

Key:

- Existing Trees and Vegetation to be retained
- Proposed Tree Planting
- Proposed sport pitches/ public open space
- Developable Land
- M62 Motorway
- Proposed Roads (indicative route)
- Proposed Pedestrain Pavements (indicative route)
- Public Right of Way
- Proposed footpath network
- Existing Housing
- Proposed Waterbodies
- Buffer zone to M62 (development can take place with ventilation)
- Buffer zone to M62 (no development beyond this point)
- Buffer zone to Woodland Trust land

PEEL HALL, WARRINGTON

Landscape Masterplan

APPENDIX LND 10

Project: PEEL HALL, WARRINGTON	
Title: Landscape Masterplan	
Client: Satnam Millennium Ltd	
Date: March 2020	Scale: 1:2,500@A1
Drawn: SW	Drawing No.: 1820_36
Checked: DA/ DS	Revision: -

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TRANSPORTATION AND HIGHWAYS

T1	Study Area
T2	Highway Network Rev A
T3	WOB Network Map
T4	PRoW
T5	19H Access
T6	Access Arrangement Plans
T7	WOB PH Timetables
T8	Pedestrian and Cycle Links
T9	Indicative Phasing Plans
T10	Junction Improvement Plans
T11	Flow Diagrams 2018
T12	Development Flow Diagrams
T13	Forecast Years Flow Diagrams
T14	TN09 Link Capacity Text
T15	TN10 Parking and Measures to South Text

TRANSPORTATION AND HIGHWAYS

T1 Study Area

KEY:

Study Area

ISSUE	REASON FOR REVISION	DATE

PROJECT:

PEEL HALL, WARRINGTON

CLIENT:

SATNAM MILLENNIUM LTD

PROJECT REFERENCE:	DRAWING NUMBER:	SCALE:
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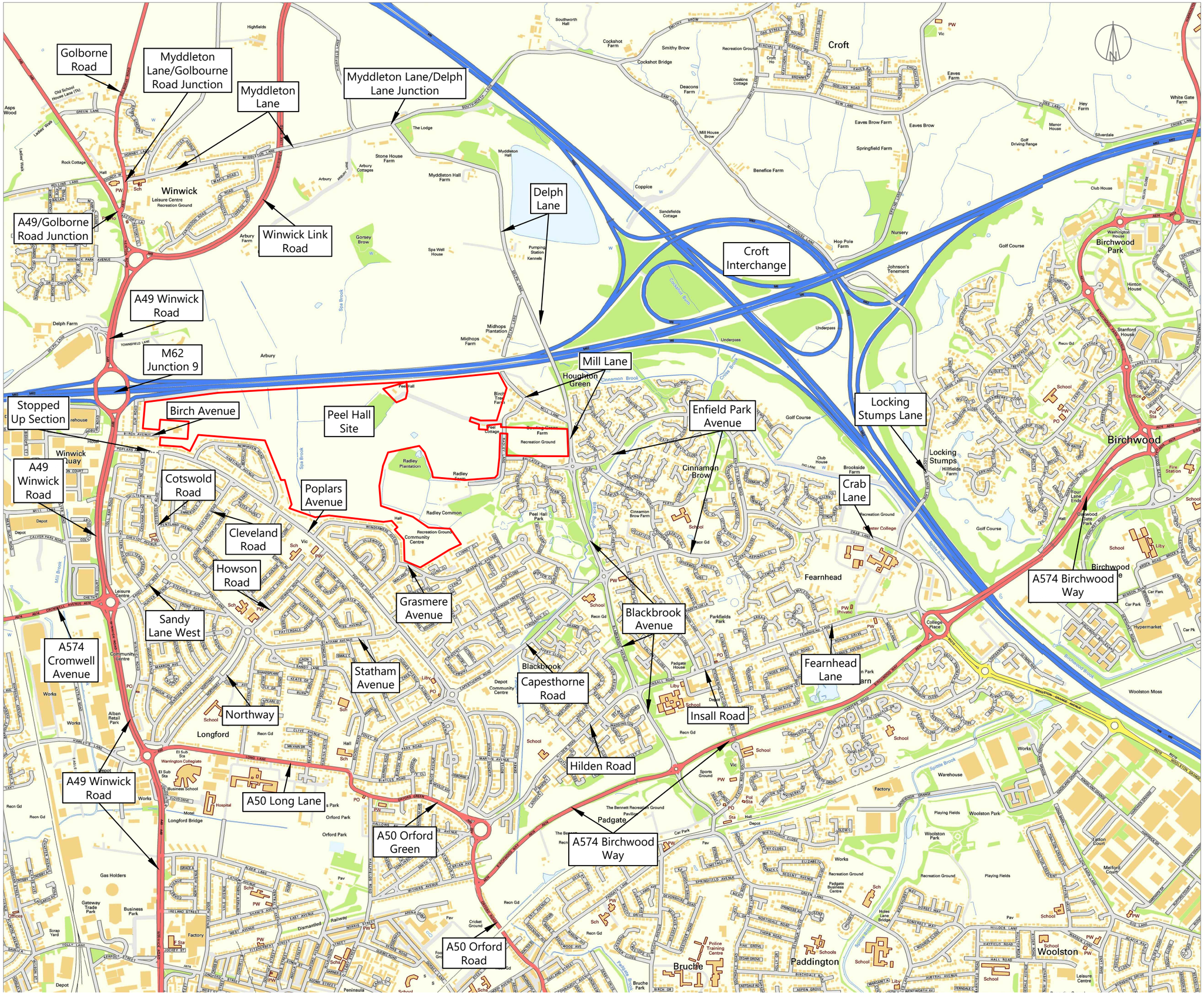
TITLE:

ASSESSMENT STUDY AREA

DATE:	DRAWN BY:	CHECKED:
24/01/18	FB	DT

TRANSPORTATION AND HIGHWAYS

T2 Highway Network Rev A



NOTES:

ISSUE	REASON FOR REVISION	DATE

PROJECT:

PEEL HALL, WARRINGTON

CLIENT:

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TITLE:

EXISTING HIGHWAY NETWORK WITHIN STUDY AREA

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17/03/20	FB	DT

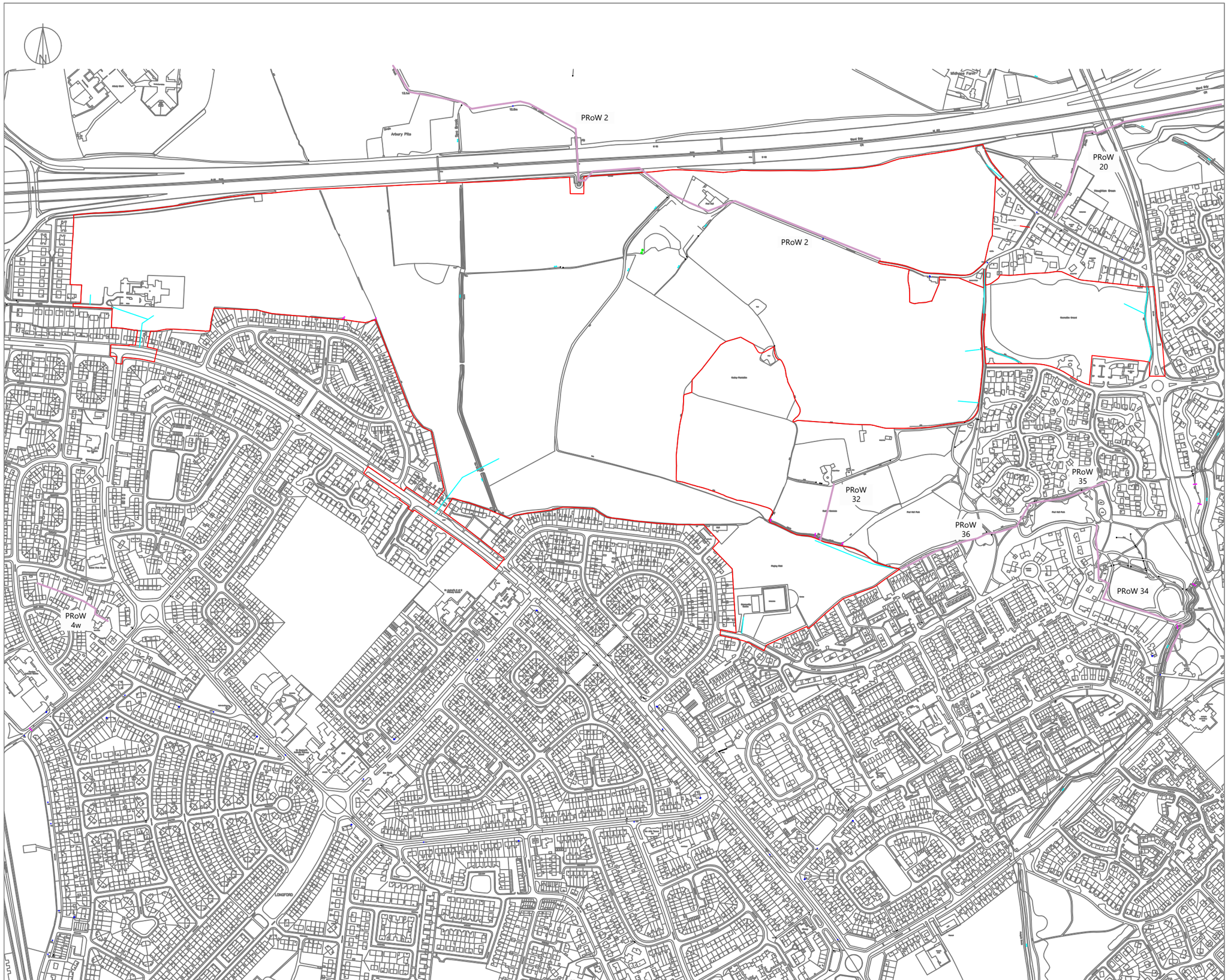
TRANSPORTATION AND HIGHWAYS

T3 WOB Network Map

Warrington's own buses
our network
bus stops
22 to Winwick, Newton-Le-Willows, Earlestown & Vulcan Village
19 to Winwick, Croft, Culcheth & Leigh
28 28A to Culcheth & Leigh
Gemini Retail Park
Omega
Callands
Westbrook
Old Hall
Dallam
16 16A
Hulme
Houghton Green
pops 20 21
Orford
Fearnhead
Padgate
Risley
Birchwood
Gorse Covert
25
25 28 28A
connect 17
all buses stop outside station
connect 17 25 28
Woolston
Paddington
Martinscroft
Fairfield
Lingley Green
Sankey
Chapelford
Penketh
Lane Ends
Sankey Bridges
Warrington town centre
Warrington Central
Warrington Bank Quay
Warrington West
Howley
Latchford East
Westy
Edgewater Park
Latchford
Centre Park
Thelwall
Grappenhall
Grappenhall Heys
Stockton Heath
Cobbs Estate
Hillcliffe
Dudlow's Green
Appleton Park
all buses towards town centre via Knutsford Road or Farrell Steet
11 towards town centre via Loushers Lane & Chester Road
10 towards Edgewater Park
some peak morning & afternoon journeys
up to 6 journeys Mondays to Saturdays also go this way
blueline 32 to Widnes
cat5 5A to Lymm & Altrincham
cat9 9A to Northwich
cat8 to Stretton & Appleton Thorn
cat7 to Stretton & Appleton Thorn
Cheshire Cat 5 5A 6 7 8 9 9A

TRANSPORTATION AND HIGHWAYS

T4 PRoW



NOTES:
Reproduced from Appletons Peel Hall Indicative Landscape Components Plan

KEY:

Proposed Linkages

Existing PRoW

Site Boundary

ISSUE	REASON FOR REVISION	DATE

PROJECT:
PEEL HALL, WARRINGTON

CLIENT:
SATNAM MILLENNIUM LTD

PROJECT REFERENCE:	DRAWING NUMBER:	SCALE:
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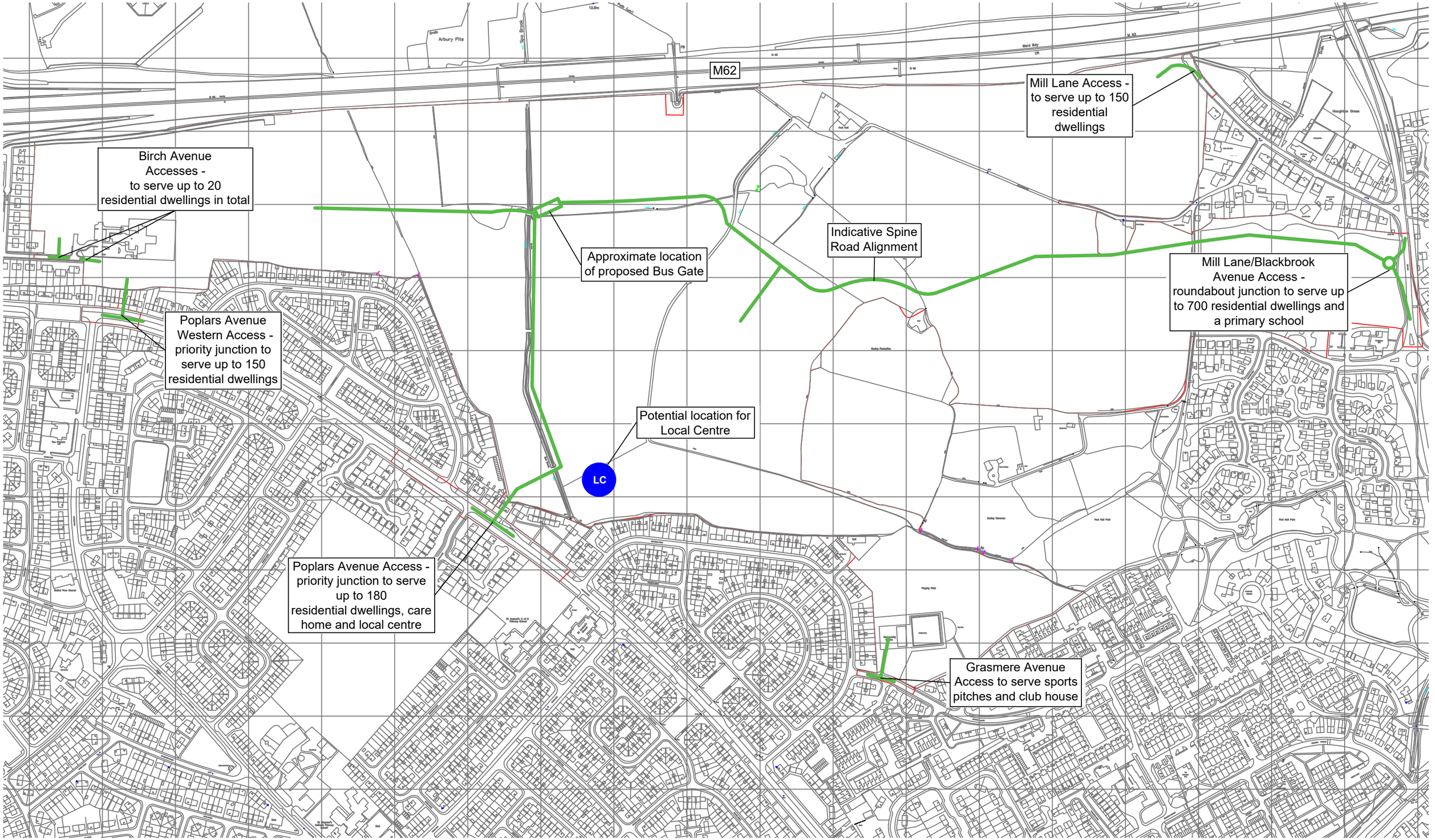
TITLE:
EXISTING PRoW NETWORK AND PROPOSED LINKAGES

DATE:	DRAWN BY:	CHECKED:
24/01/18	FB	DT

TRANSPORTATION AND HIGHWAYS

T5 19H Access



NOTES:

ISSUE	REASON FOR REVISION	DATE
H	Update re: employment land use	03/07/19
G	Update to location of local centre	16/01/18
F	Amendment to annotation	10/05/17
E	Amendment to annotations	10/05/16
D	Amendment to bus gate location	04/05/16
C	Amendment to dwelling numbers at access points	12/04/16
B	Alteration to dwelling numbers at access points	04/03/16
A	Reduction in number of dwellings shown off Birch Avenue	19/02/16

DATE:	DRAWN BY:	CHECKED:
12/01/15	FB	DT

PROJECT:

PEEL HALL, WARRINGTON

CLIENT:

SATNAM

TITLE:

PROPOSED ACCESS POINTS AND INDICATIVE SPINE ROAD

PROJECT REFERENCE:	DRAWING NUMBER:	SCALE:
1107	19	Not to scale

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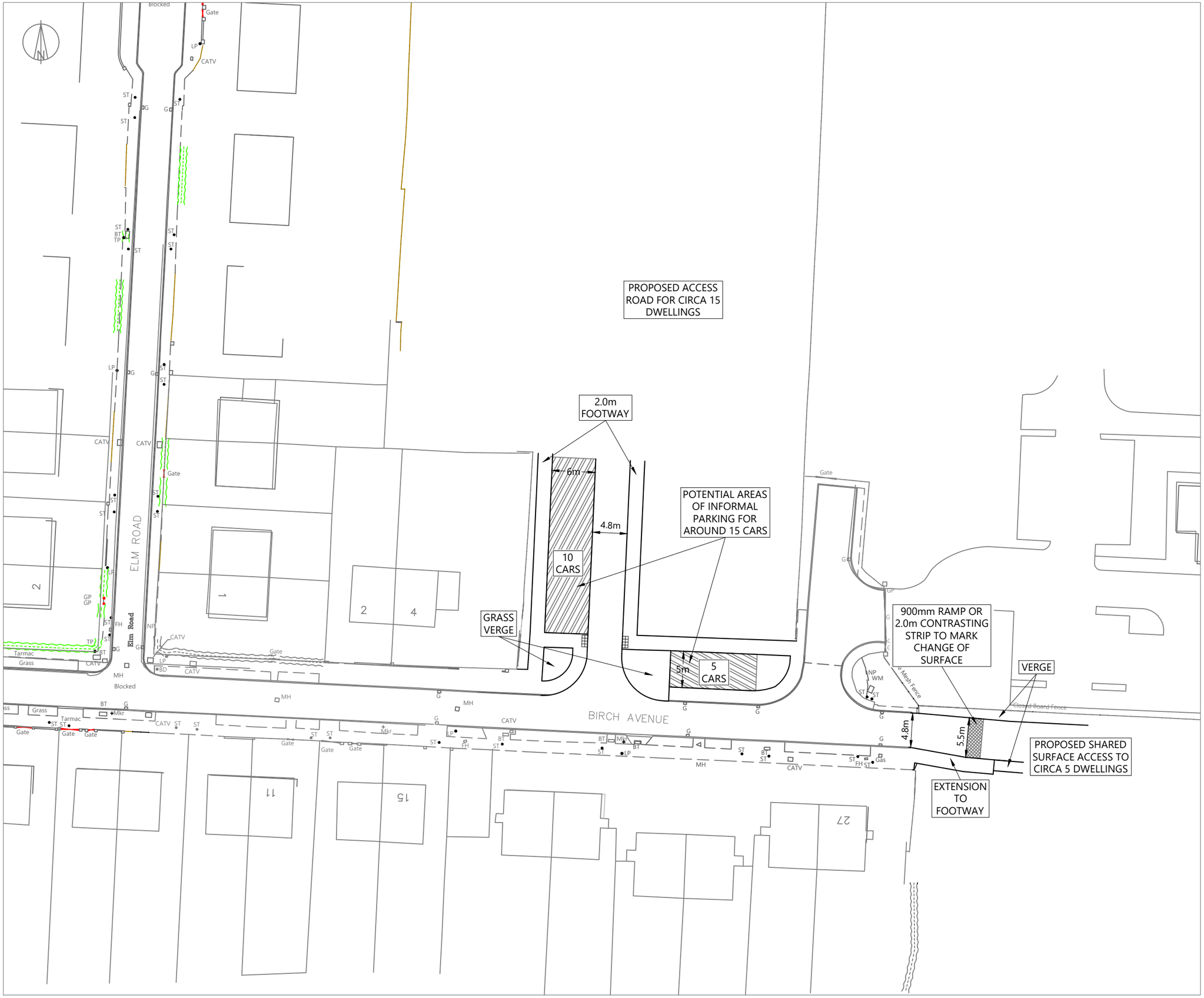
TRANSPORTATION AND HIGHWAYS

T6 Access Arrangement Plans



NOTES:

Drawing based on Geomatic Surveys Ltd topographical survey 01532/01 dated 27/07/15.

ISSUE	REASON FOR REVISION	DATE

PROJECT:

PEEL HALL, WARRINGTON

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1107	08/P	1:500 @ A3

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TITLE:

PROPOSED ACCESS TO RESIDENTIAL LAND AT BIRCH AVENUE

DATE:	DRAWN BY:	CHECKED:
03/02/17	FB	DT

TURNING HEAD AND EMERGENCY ACCESS LINK TO WIDER SITE

3.5m SHARED FOOTWAY-CYCLEWAY

1.0m VERGE

2.0m FOOTWAY

7.3m

ALTERATION TO EXISTING KERB LINE TO WIDEN CARRIAGEWAY THROUGH THE BEND

POPLARS AVENUE

COTSWOLD ROAD

El Sub Sta

1:1,000 @ A3

ALTERATION TO EXISTING KERB LINE TO WIDEN CARRIAGEWAY THROUGH THE BEND

1:500 @ A3

NOTES:

Drawing based on Geomatic Surveys Ltd topographical survey 01532/01 dated 27/07/15.

KEY:

Parking Areas (number of cars that can be accommodated) 6

ISSUE	REASON FOR REVISION	DATE

PROJECT:

PEEL HALL, WARRINGTON

CLIENT:

SATNAM MILLENNIUM LTD

PROJECT REFERENCE:	DRAWING NUMBER:	SCALE:
1107	09/M	AS SHOWN

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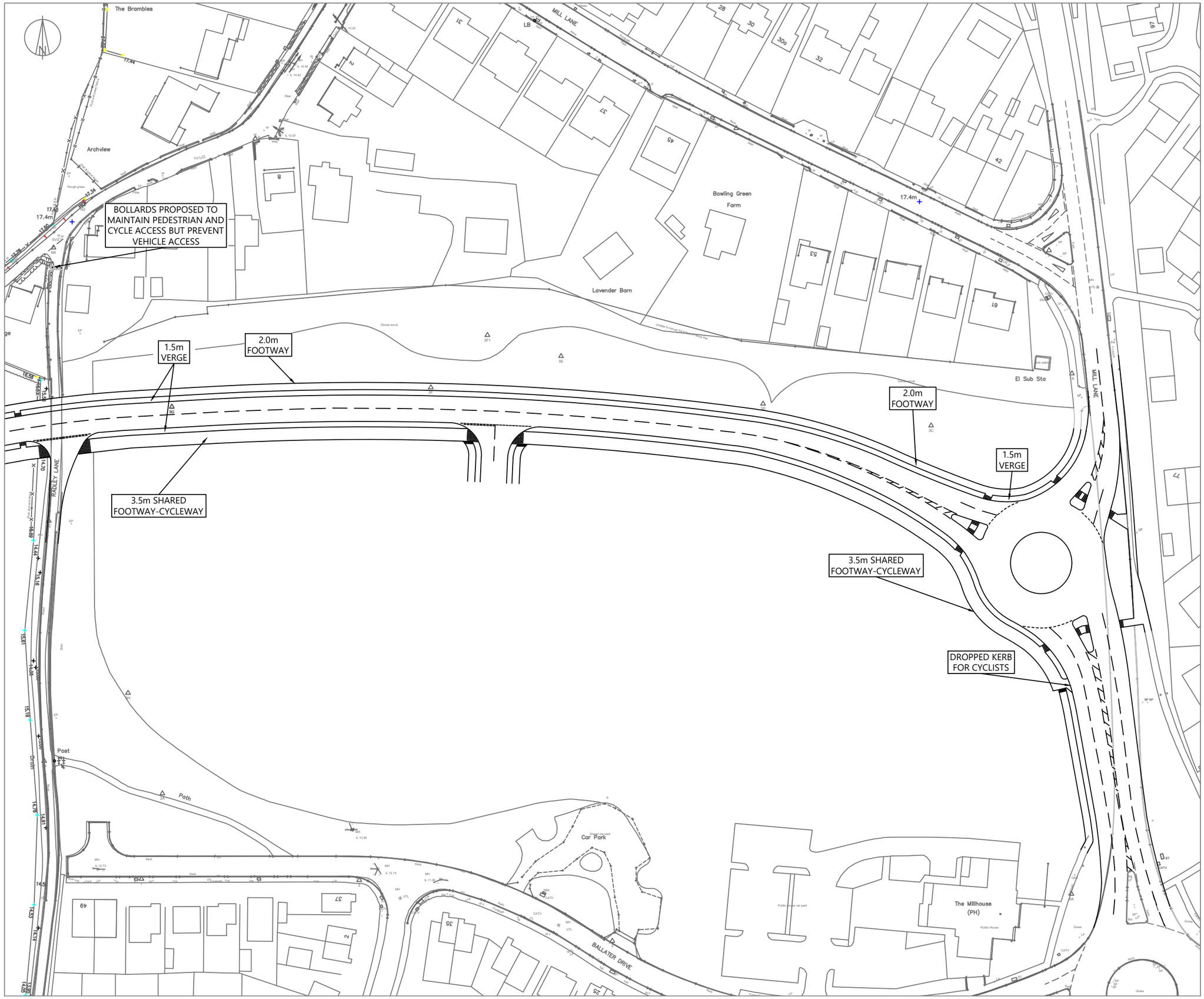
TITLE:

PROPOSED ACCESS TO EMPLOYMENT LAND AT POPLARS AVENUE

DATE:	DRAWN BY:	CHECKED:
03/02/17	FB	DT



NOTES:
Drawing based on Powers & Tiltman topographical survey 6297/01 dated 25/07/11 and Geomatic Surveys Ltd topographical survey 01532/01 dated 27/07/15.

ISSUE	REASON FOR REVISION	DATE

PROJECT:

PEEL HALL, WARRINGTON

CLIENT:

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PROJECT REFERENCE:	DRAWING NUMBER:	SCALE:
1107	10/N	1:1,000 @ A3

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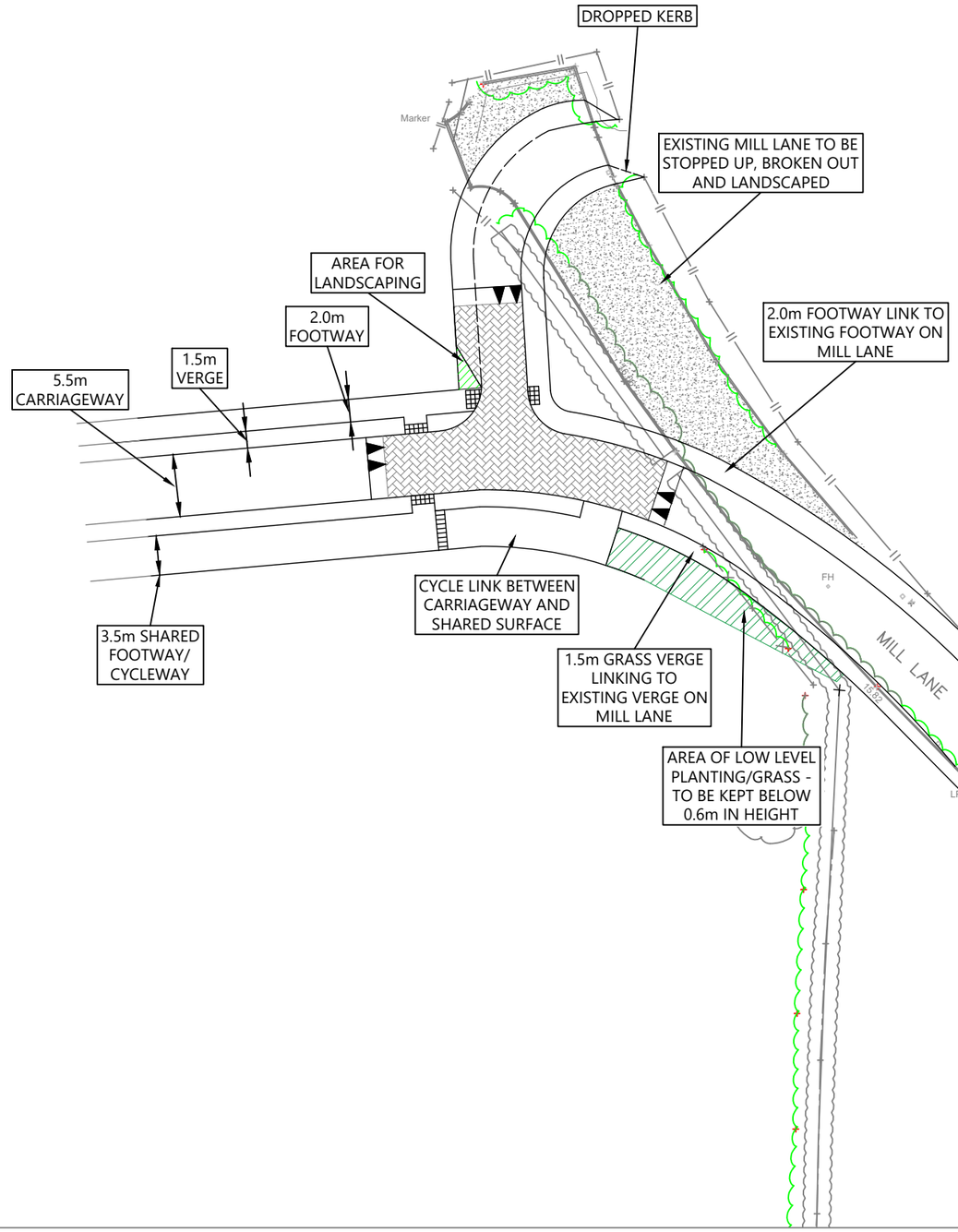
TITLE:

PROPOSED MAIN SITE ACCESS AT BLACKBROOK AVENUE

DATE:	DRAWN BY:	CHECKED:
17/01/18	FB	DT



Drawing based on Powers & Tiltman topographical survey 6297_01 dated 25/07/11.

PROJECT:

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1107	11/L	1:500 @A3

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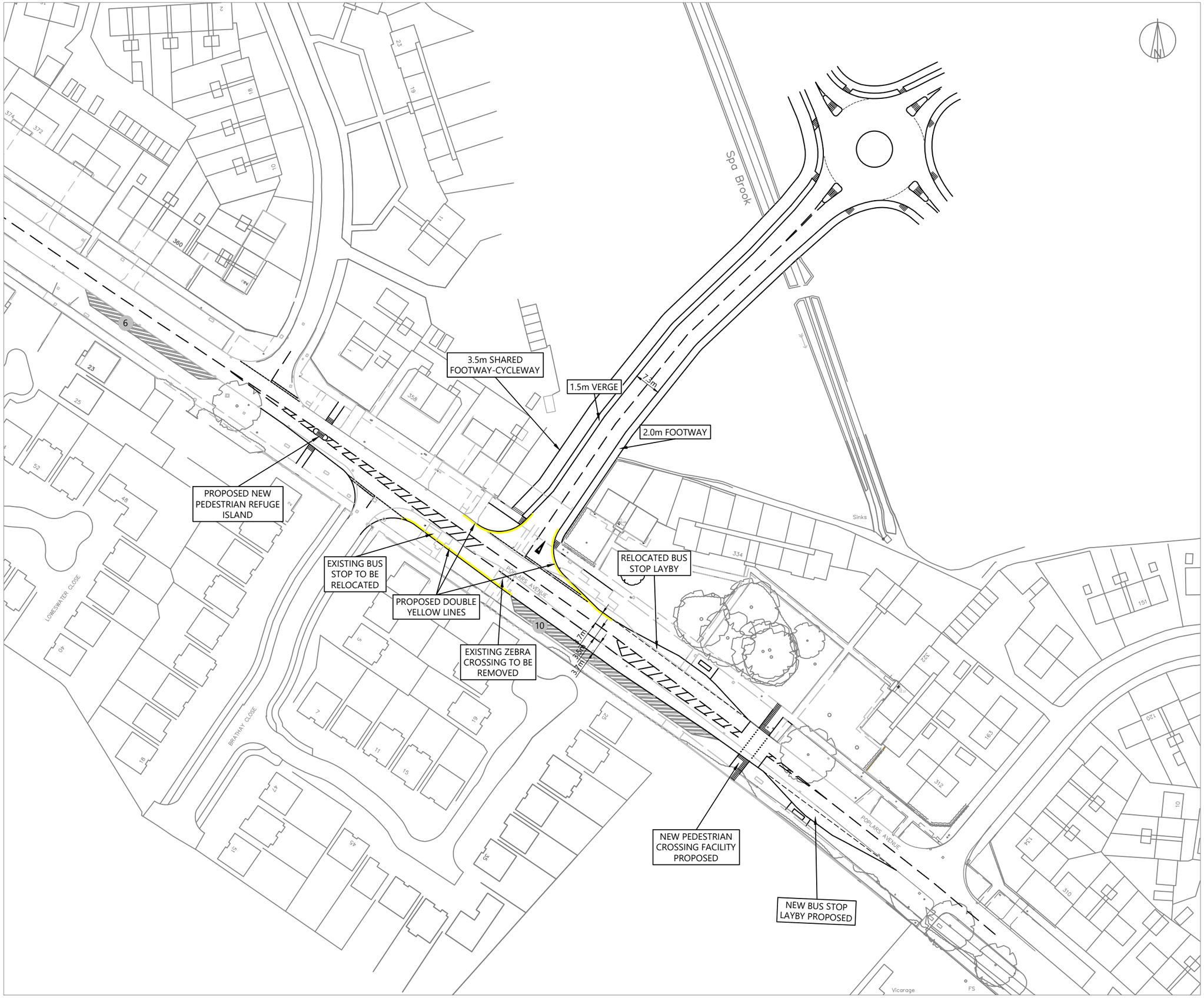
TITLE:

PROPOSED ACCESS AT MILL LANE

DATE:	DRAWN BY:	CHECKED:
03/02/17	BL	DT



NOTES:

Drawing based on Appletons plan 140367-B-001G dated January 2016.

KEY:

Parking Areas (number of cars that can be accommodated) (6)

ISSUE	REASON FOR REVISION	DATE

PROJECT:

PEEL HALL, WARRINGTON

CLIENT:

SATNAM MILLENNIUM LTD

PROJECT REFERENCE:	DRAWING NUMBER:	SCALE:
1107	12/Q	1:1,000 @ A3

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TITLE:

PROPOSED ACCESS FROM POPLARS AVENUE TO RESIDENTIAL LAND AND LOCAL CENTRE

DATE:	DRAWN BY:	CHECKED:
03/02/17	FB	DT

NOTES:

Drawing based on Geomatic Surveys Ltd topographical survey 01532/01 dated 27/07/15.

ISSUE	REASON FOR REVISION	DATE

PROJECT:

PEEL HALL, WARRINGTON

CLIENT:

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PROJECT REFERENCE:	DRAWING NUMBER:	SCALE:
1107	30/H	1:500 @ A3

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TITLE:

PROPOSED ALTERATIONS TO EXISTING ACCESS AT GRASMERE AVENUE

DATE:	DRAWN BY:	CHECKED:
15/01/18	BL	FB

TRANSPORTATION AND HIGHWAYS

T7 WOB PH Timetables

Warrington - Longford/Orford (Circ) via Orford Park Centre — 20
Warrington - Longford/Orford (Circ) via Warrington Hospital - Dallam — 20A

Monday to Friday — **Ref PEEL From 17/06/19 To 31/12/29**

Service No:	20A	20A	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Warrington, Interchange [4]	0617	0645	0705	0715	0725	0735	0745	0755	0805	0815	0825	0835	0845	0855	0905	***0915***	0925	0935	0945	0955	1005	1015
Winwick Road, McDonalds	|	|	0708	0718	0728	0738	0748	0758	0808	0818	0828	0838	0848	0858	0908	0918	0928	0938	0948	0958	1008	1018
Orford Park Centre	|	|	0713	0723	0733	0743	0753	0803	0813	0823	0833	0843	0853	0903	0913	0923	0933	0943	0953	1003	1013	1023
Winwick Road, Collegiate Inst	|	|	0715	0725	0735	0745	0755	0805	0815	0825	0835	0845	0855	0905	0915	0925	0935	0945	0955	1005	1015	1025
General Hospital	0622	0650	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
Folly Lane, Tyrol House	0624	0652	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
Dallam, Harrison Square	0627	0655	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
Longford, Cotswold Road	0633	0701	0721	0731	0741	0751	0801	0811	0821	0831	0841	0851	0901	0911	0921	0931	0941	0951	1001	1011	1021	1031
Poplars Avenue, Cleveland Road	0635	0703	0723	0733	0743	0753	0803	0813	0823	0833	0843	0853	0903	0913	0923	0933	0943	0953	1003	1013	1023	1033
Peel Hall Bus Turning Circle	|	|	0733	0743	0753	0803	0813	0823	0833	0843	0853	0903	0913	0923	0933	0943	0953	1003	1013	1023	1033	1043
Orford Avenue	0641	0709	0740	0750	0800	0810	0820	0830	0840	0850	0900	0910	0920	0930	0940	0950	1000	1010	1020	1030	1040	1050
Warrington, Interchange	0651	0719	0751	0801	0811	0821	0831	0841	0851	0901	0911	0921	0931	0939	0948	0958	1008	1018	1028	1038	1048	1058

Service No:	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Warrington, Interchange [4]	***1025***	***1035***	***1045***	***1055***	1105	1115	1125	1135	1145	1155	1205	***1215***	1225	1235	1245	1255	1305	***1315***	***1325***	1335	***1345***	1355
Winwick Road, McDonalds	1028	1038	1048	1058	1108	1118	1128	1138	1148	1158	1208	1218	1228	1238	1248	1258	1308	1318	1328	1338	1348	1358
Orford Park Centre	1033	1043	1053	1103	1113	1123	1133	1143	1153	1203	1213	1223	1233	1243	1253	1303	1313	1323	1333	1343	1353	1403
Winwick Road, Collegiate Inst	1035	1045	1055	1105	1115	1125	1135	1145	1155	1205	1215	1225	1235	1245	1255	1305	1315	1325	1335	1345	1355	1405
General Hospital	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
Folly Lane, Tyrol House	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
Dallam, Harrison Square	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
Longford, Cotswold Road	1041	1051	1101	1111	1121	1131	1141	1151	1201	1211	1221	1231	1241	1251	1301	1311	1321	1331	1341	1351	1401	1411
Poplars Avenue, Cleveland Road	1043	1053	1103	1113	1123	1133	1143	1153	1203	1213	1223	1233	1243	1253	1303	1313	1323	1333	1343	1353	1403	1413
Peel Hall Bus Turning Circle	1053	1103	1113	1123	1133	1143	1153	1203	1213	1223	1233	1243	1253	1303	1313	1323	1333	1343	1353	1403	1413	1423
Orford Avenue	1100	1110	1120	1130	1140	1150	1200	1210	1220	1230	1240	1250	1300	1310	1320	1330	1340	1350	1400	1410	1420	1430
Warrington, Interchange	1108	1118	1128	1138	1148	1158	1208	1218	1228	1238	1248	1258	1308	1318	1328	1338	1348	1358	1408	1418	1428	1438

Service No:	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Warrington, Interchange [4]	1405	1415	1425	1435	1445	1455	***1503***	1513	1528	1543	1553	1608	1623	***1633***	***1648***	1703	1713	1728	1743	1753	1808	1840
Winwick Road, McDonalds	1408	1418	1428	1438	1448	1458	1506	1516	1531	1546	1556	1611	1626	1636	1651	1706	1716	1731	1746	1756	1811	1843
Orford Park Centre	1413	1423	1433	1443	1453	1503	1512	1522	1537	1552	1602	1617	1632	1642	1657	1712	1722	1737	1752	1802	1814	1846
Winwick Road, Collegiate Inst	1415	1425	1435	1445	1455	1505	1514	1524	1539	1554	1604	1619	1634	1644	1659	1714	1724	1739	1754	1804	1816	1848
General Hospital	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
Folly Lane, Tyrol House	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
Dallam, Harrison Square	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
Longford, Cotswold Road	1421	1431	1441	1451	1501	1511	1520	1530	1545	1600	1610	1625	1640	1650	1705	1720	1730	1745	1800	1810	1821	1853
Poplars Avenue, Cleveland Road	1423	1433	1443	1453	1503	1513	1522	1532	1547	1602	1612	1627	1642	1652	1707	1722	1732	1747	1802	1812	1823	1855
Peel Hall Bus Turning Circle	1433	1443	1453	1503	1513	1523	1532	1542	1557	1612	1622	1637	1652	1702	1717	1732	1742	1757	1812	1822	1833	1905
Orford Avenue	1440	1450	1500	1510	1520	***1530***	1539	1549	1604	1619	***1629***	***1644***	1659	1709	1724	1739	1749	1804	1819	1829	1839	1911
Warrington, Interchange	1448	1458	1508	1518	1530	1540	1549	1559	1614	1629	1639	1654	1709	1719	1734	1749	1759	1814	1829	1838	1845	1917

Warrington - Longford/Orford (Circ) via Orford Park Centre 20
Warrington - Longford/Orford (Circ) via Warrington Hospital - Dallam 20A

Saturday **Ref PEEL From 22/06/19 To 31/12/29**

Service No:	20A	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Warrington, Interchange [4]	***0645***	***0730***	0800	***0824***	0848	0906	0919	0931	0944	0956	1008	1021	1033	1045	1058	1110	1122
Winwick Road, McDonalds	|	0733	0803	0827	0851	0909	0922	0934	0947	0959	1011	1024	1036	1048	1101	1113	1125
Orford Park Centre	|	0736	0808	0832	0856	0914	0927	0939	0952	1004	1016	1029	1041	1053	1106	1118	1130
Winwick Road, Collegiate Inst	|	0738	0810	0834	0858	0916	0929	0941	0954	1006	1018	1031	1043	1055	1108	1120	1132
General Hospital	0652	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
Folly Lane, Tyrol House	0654	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
Dallam, Harrison Square	0657	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
Longford, Cotswold Road	0703	0743	0816	0840	0904	0922	0935	0947	1000	1012	1024	1037	1049	1101	1114	1126	1138
Poplars Avenue, Cleveland Road	0705	0745	0818	0842	0906	0924	0937	0949	1002	1014	1026	1039	1051	1103	1116	1128	1140
Peel Hall Bus Turning Circle	|	0755	0828	0852	0916	0934	0947	0959	1012	1024	1036	1049	1101	1113	1126	1138	1150
Orford Avenue	0711	0801	0835	0859	0923	0941	0954	1006	1019	1031	1043	1056	1108	1120	1133	1145	1157
Warrington, Interchange	***0717***	0807	0843	0907	0931	0949	1002	1014	1027	1039	1051	1104	1116	1128	1141	1153	1205

Service No:	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Warrington, Interchange [4]	1135	1147	1159	1212	1224	1236	1249	1301	1313	1326	1338	1350	1403	1415	1427	1440	1452
Winwick Road, McDonalds	1138	1150	1202	1215	1227	1239	1252	1304	1316	1329	1341	1353	1406	1418	1430	1443	1455
Orford Park Centre	1143	1155	1207	1220	1232	1244	1257	1309	1321	1334	1346	1358	1411	1423	1435	1448	1500
Winwick Road, Collegiate Inst	1145	1157	1209	1222	1234	1246	1259	1311	1323	1336	1348	1400	1413	1425	1437	1450	1502
General Hospital	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
Folly Lane, Tyrol House	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
Dallam, Harrison Square	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
Longford, Cotswold Road	1151	1203	1215	1228	1240	1252	1305	1317	1329	1342	1354	1406	1419	1431	1443	1456	1508
Poplars Avenue, Cleveland Road	1153	1205	1217	1230	1242	1254	1307	1319	1331	1344	1356	1408	1421	1433	1445	1458	1510
Peel Hall Bus Turning Circle	1203	1215	1227	1240	1252	1304	1317	1329	1341	1354	1406	1418	1431	1443	1455	1508	1520
Orford Avenue	1210	1222	1234	1247	1259	1311	1324	1336	1348	1401	1413	1425	1438	1450	1502	1515	1527
Warrington, Interchange	1218	1230	1242	1255	1307	1319	1332	1344	1356	1409	1421	1433	1446	1458	1510	1523	1535

Service No:	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Warrington, Interchange [4]	1504	1517	1529	1541	1554	1606	1618	1631	1643	1655	1708	1720	1732	1745	1800	1815	1845
Winwick Road, McDonalds	1507	1520	1532	1544	1557	1609	1621	1634	1646	1658	1711	1723	1735	1748	1803	1818	1848
Orford Park Centre	1512	1525	1537	1549	1602	1614	1626	1639	1651	1703	1716	1728	1740	1753	1808	1821	1851
Winwick Road, Collegiate Inst	1514	1527	1539	1551	1604	1616	1628	1641	1653	1705	1718	1730	1742	1755	1810	1823	1853
General Hospital	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
Folly Lane, Tyrol House	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
Dallam, Harrison Square	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
Longford, Cotswold Road	1520	1533	1545	1557	1610	1622	1634	1647	1659	1711	1724	1736	1748	1801	1816	1828	1858
Poplars Avenue, Cleveland Road	1522	1535	1547	1559	1612	1624	1636	1649	1701	1713	1726	1738	1750	1803	1818	1830	1900
Peel Hall Bus Turning Circle	1532	1545	1557	1609	1622	1634	1646	1659	1711	1723	1736	1748	1800	1813	1828	1840	1910
Orford Avenue	1539	1552	1604	1616	1629	1641	1653	1706	1718	1730	1743	1755	1807	1820	1835	1846	1916
Warrington, Interchange	1547	1600	1612	1624	1637	1649	1701	1714	1726	1738	1751	1803	1815	1828	1843	1852	1922

Warrington - Longford/Orford (Circ) via Orford Park Centre 20

Warrington - Longford/Orford (Circ) via Warrington Hospital - Dallam 20A

SUNDAY & PUBLIC HOLIDAYS

Ref PEEL From 23/06/19 To 31/12/29

Service No:	20A	20	20A	20	20A	20	20A	20	20A	20	20A	20	20A	20	20A	20	20A
Warrington, Interchange [4]	0915	0939	1015	1039	1115	1139	1215	1239	1315	1339	1415	1439	1515	1539	1615	1639	1715
Winwick Road, McDonalds	|	0942	|	1042	|	1142	|	1242	|	1342	|	1442	|	1542	|	1642	|
Orford Park Centre	|	0946	|	1046	|	1146	|	1246	|	1346	|	1446	|	1546	|	1646	|
Winwick Road, Collegiate Inst	|	0948	|	1048	|	1148	|	1248	|	1348	|	1448	|	1548	|	1648	|
General Hospital	0922	|	1022	|	1122	|	1222	|	1322	|	1422	|	1522	|	1622	|	1722
Folly Lane, Tyrol House	0924	|	1024	|	1124	|	1224	|	1324	|	1424	|	1524	|	1624	|	1724
Dallam, Harrison Square	0927	|	1027	|	1127	|	1227	|	1327	|	1427	|	1527	|	1627	|	1727
Longford, Cotswold Road	0933	0954	1033	1054	1133	1154	1233	1254	1333	1354	1433	1454	1533	1554	1633	1654	1733
Poplars Avenue, Cleveland Road	0935	0956	1035	1056	1135	1156	1235	1256	1335	1356	1435	1456	1535	1556	1635	1656	1735
Peel Hall Bus Turning Circle	|	0959	|	1059	|	1159	|	1259	|	1359	|	1459	|	1559	|	1659	|
Orford Avenue	0942	1009	1042	1109	1142	1209	1242	1309	1342	1409	1442	1509	1542	1609	1642	1709	1742
Warrington, Interchange	0949	1016	***1049***	1116	1149	1216	1249	1316	***1349***	1416	***1449***	***1516***	1549	***1616***	1649	1716	1749

Gorse Covert - Warrington via Birchwood - Locking Stumps - Orford 25
Cinnamon Brow - Warrington via Winwick Road 26E
Culcheth - Cinnamon Brow - Warrington via Croft - Orford 27E

Monday to Friday **Ref PEEL From 17/06/19 To 31/12/29**

Service Number:	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Gorse Covert, Spar Store	-	-	0637	0651	0717	0743	0815	0847	0920	0950	1020	1050	1120	1150	1220	1250	1320	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gorse Covert, Ashdown Lane	-	-	0639	0653	0719	0745	0817	0849	0922	0952	1022	1052	1122	1152	1222	1252	1322	1352	1422	1452	1530	1558	1628	1657	1732	1757	1824	1849	1914	1944
Oakwood, Keyes Close	-	-	0643	0657	0723	0749	0822	0854	0926	0956	1026	1056	1126	1156	1226	1256	1326	1356	1426	1456	1535	1602	1632	1701	1736	1801	1827	1852	1917	1947
Birchwood, Railway Station	-	-	0647	0701	0727	0754	0828	0859	0930	1000	1030	1100	1130	1200	1230	1300	1330	1400	1430	1500	1540	1607	1637	1706	1741	1806	1831	1855	1920	1950
Birchwood Centre	-	-	0648	0702	0728	0755	0829	0900	0931	1001	1031	1101	1131	1201	1231	1301	1331	1401	1431	1501	1541	1608	1638	1707	1742	1807	1832	1856	1921	1951
Heathfield House	-	-	0654	0708	0735	0802	0836	0907	0938	1008	1038	1108	1138	1208	1238	1308	1338	1408	1438	1508	1550	1616	1645	1714	1749	1814	1838	1902	1927	1957
Glover Road, Turf & Feather	-	-	0655	0709	0736	0803	0837	0908	0939	1009	1039	1109	1139	1209	1239	1309	1339	1409	1439	1509	1551	1617	1646	1715	1750	1815	1839	1903	1928	1958
Locking Stumps, Copperfield Cl	-	-	0658	0712	0739	0807	0841	0911	0942	1012	1042	1112	1142	1212	1242	1312	1342	1412	1442	1512	1555	1621	1649	1718	1753	1818	1842	1906	1931	2001
Crab Lane, Uni of Chester	-	-	0701	0715	0742	0811	0845	0915	0945	1015	1045	1115	1145	1215	1245	1315	1345	1415	1446	1516	1559	1625	1653	1722	1757	1821	1845	1909	1934	2004
Enfield Park Rd, Tweedsmuir Close	0522	0622	0702	0717	0744	0813	0847	0917	0947	1017	1047	1117	1147	1217	1247	1317	1347	1417	1448	1518	1601	1627	1655	1724	1759	1823	1847	1911	1935	2005
Cinnamon Brow, Millhouse Rdbt	0524	0624	0704	0719	0746	0815	0849	0919	0949	1019	1049	1119	1149	1219	1249	1319	1349	1419	1449	1519	1602	1628	1656	1725	1800	1824	1848	1912	1936	2006
Peel Hall Bus Turning Circle	0534	0634	0714	0729	0756	0825	0859	0929	0959	1029	1059	1129	1159	1229	1259	1329	1359	1429	1459	1529	1612	1638	1706	1735	1810	1834	1858	1922	1946	2016
Cinnamon Lane North	0536	0636	0716	0731	0758	0827	0901	0931	1000	1030	1100	1130	1200	1230	1300	1330	1400	1430	1501	1531	1614	1640	1708	1737	1812	1836	1900	1924	1948	2018
Orange Grove, Avery Close	|	|	|	|	|	|	|	|	1002	|	1102	|	1202	|	1302	|	1402	|	1502	|	|	|	|	|	|	|	|	|	|	|
Greenwood Crescent, Merrick Cl	0538	0638	0718	0733	0801	0830	0904	0933	1004	1032	1104	1132	1204	1232	1304	1332	1404	1432	1505	1534	1617	1643	1710	1739	1814	1838	1902	1926	1950	2020
Statham Avenue, Kirkstone Av	0540	0640	0722	0737	0805	0835	0909	0937	1008	1036	1108	1136	1208	1236	1308	1336	1408	1436	1509	1538	1622	1647	1714	1743	1818	1842	1905	1929	1953	2023
Ryfields Village	|	|	|	|	|	|	|	|	|	1042	|	1142	|	1242	|	1342	|	1442	|	|	|	|	|	|	|	|	|	|
O'Leary Street	0545	0645	0727	0743	0813	0843	0917	0943	1014	1044	1114	1144	1214	1244	1314	1344	1414	1444	1515	1544	1630	1654	1721	1751	1826	1849	1910	1934	1958	2028
Warrington, Interchange	0551	0651	***0736***	***0753***	***0823***	***0853***	***0927***	***0952***	***1022***	***1052***	***1122***	***1152***	***1222***	***1252***	***1322***	***1352***	***1422***	***1452***	***1523***	***1553***	***1640***	***1704***	***1731***	***1801***	1835	1858	1917	***1941***	2005	2035

Warrington - Gorse Covert via Orford - Locking Stumps - Birchwood 25
Warrington - Cinnamon Brow via Winwick Road 26E
Warrington - Cinnamon Brow - Culcheth via Orford - Croft 27E

Monday to Friday **Ref PEEL From 17/06/19 To 31/12/29**

Service Number:	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Wilderspool, Causeway Avenue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1532	-	-	1608	-	-	-	-	-	-	-
Wilderspool, St James Church	0456	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	|	-	-	|	-	-	-	-	-	-	-
Warrington, Interchange (arr)	|	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1540	-	-	1616	-	-	-	-	-	-	-
Warrington, Interchange [14] (dep)	|	0542	0555	0621	0645	0707	0738	0811	0847	***0915***	0945	***1015***	1045	1115	***1145***	1215	1245	***1315***	***1345***	1415	1445	***1515***	1545	1545	1545	1620	1620	1620	1645	1715	***1745***	1815	1845
O'Leary Street	0501	0550	0603	0629	0653	0717	0748	0821	0857	0925	0955	1025	1055	1125	1155	1225	1255	1325	1355	1425	1455	1526	1556	1556	1556	1631	1631	1631	1656	1727	1756	1824	1854
Ryfields Village	|	|	|	|	|	|	|	|	|	|	0957	|	1057	|	1157	|	1257	|	1357	|	|	|	|	|	|	|	|	|	|	|	|	|
Statham Avenue, Kirkstone Av	0506	0555	0608	0634	0658	0723	0755	0828	0903	0931	1003	1031	1103	1131	1203	1231	1303	1331	1403	1431	1501	1532	1602	1602	1602	1637	1637	1637	1702	1733	1802	1830	1900
Greenwood Crescent, Merrick Cl	0509	0559	0612	0638	0702	0728	0800	0833	0907	0935	1007	1035	1107	1135	1207	1235	1307	1335	1407	1436	1506	1537	1607	1607	1607	1642	1642	1642	1707	1738	1806	1833	1903
Orange Grove, Avery Close	|	|	|	|	|	|	|	|	|	0937	|	1037	|	1137	|	1237	|	1337	|	1438	|	1539	|	|	|	|	|	|	|	|	|
Cinnamon Lane North	|	0600	0613	0640	0704	0730	0802	0835	0909	0939	1009	1039	1109	1139	1209	1239	1309	1339	1409	1440	1508	1541	1609	1609	1609	1644	1644	1644	1709	1740	1808	1835	1905
Cinnamon Brow, Millhouse Rdbt	|	0601	0614	0641	0705	0731	0803	0836	0910	0940	1010	1040	1110	1140	1210	1240	1310	1340	1410	1441	1509	1542	1610	1610	1610	1645	1645	1645	1710	1740	1809	1836	1906
Peel Hall Bus Turning Circle	0520	0611	0624	0651	0715	0741	0813	0846	0920	0950	1020	1050	1120	1150	1220	1250	1320	1350	1420	1451	1519	1552	1620	1620	1620	1655	1655	1655	1720	1750	1819	1846	1916
Enfield Park Rd, Tweedsmuir Close	0522	0613	0626	0653	0717	0743	0815	0848	0922	0952	1022	1052	1122	1152	1222	1252	1322	1352	1422	1453	1521	1554	1622	1622	1622	1657	1657	1657	1722	1753	1821	1848	1918
Crab Lane, Uni of Chester	-	0615	0628	0655	0719	0746	0818	0851	0924	0954	1024	1054	1124	1154	1224	1254	1324	1354	1424	1456	1524	1557	1625	1625	1625	1700	1700	1700	1725	1755	1823	1850	1920
Locking Stumps, Copperfield Cl	-	0619	0632	0659	0723	0751	0823	0856	0928	0958	1028	1058	1128	1158	1228	1258	1328	1358	1428	1500	1528	1601	1630	1630	1630	1705	1705	1705	1730	1759	1827	1854	1924
Glover Road, Turf & Feather	-	0621	0634	0701	0725	0753	0825	0858	0930	1000	1030	1100	1130	1200	1230	1300	1330	1400	1430	1502	1530	1603	1632	1632	1632	1707	1707	1707	1732	1801	1829	1856	1926
Heathfield House	-	0622	0635	0702	0726	0754	0826	0859	0931	1001	1031	1101	1131	1201	1231	1301	1331	1401	1431	1503	1531	1604	1633	1633	1633	1708	1708	1708	1733	1802	1830	1857	1927
Birchwood Centre	-	0627	0640	0708	0732	0801	0833	0906	0937	1007	1037	1107	1137	1207	1237	1307	1337	1407	1437	1513	1541	1611	1640	1640	1640	1715	1715	1715	1740	1809	1836	1903	1933
Birchwood, Railway Station	-	0628	0641	0709	0733	0803	0835	0908	0939	1009	1039	1109	1139	1209	1239	1309	1339	1409	1439	1515	1543	1614	1643	1643	1643	1718	1718	1718	1743	1811	1837	1904	1934
Oakwood, Keyes Close	-	0631	0644	0712	0736	0807	0839	0912	0942	1012	1042	1112	1142	1212	1242	1312	1342	1412	1442	1519	1547	1618	1647	1647	1647	1722	1722	1722	1747	1815	1840	1907	1937
Gorse Covert, Spar Store	-	0635	0648	0716	0740	0811	0843	0916	0946	1016	1046	1116	1146	1216	1246	1316	1346	1416	1446	1524	1552	1622	1651	1651	1651	1726	1726	1726	1751	1819	1844	1911	1941
Gorse Covert, Ashdown Lane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1348	1418	1448	1526	1554	1624	1653	1653	1653	1728	1728	1728	1753	1821	1846	1913	1943

Gorse Covert - Warrington via Birchwood - Locking Stumps - Orford 25
Cinnamon Brow - Warrington via Winwick Road 26E
Cinnamon Brow - Warrington via Orford 27E

Saturday **Ref PEEL From 18/05/19 To 31/12/29**

Service No:	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	27E	25	27E	26E	27E	26E	27E	26E	27E	26E
Gorse Covert, Spar Store	0727	0757	0825	0855	0925	0955	1025	1055	1125	1155	1225	1255	1325	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gorse Covert, Ashdown Lane	0729	0759	0827	0857	0927	0957	1027	1057	1127	1157	1227	1257	1327	1357	1427	1457	1527	1557	1627	1655	1725	1755	1825	1850	-	1920	-	-	-	-	-	-	-	-
Oakwood, Keyes Close	0732	0802	0831	0901	0931	1001	1031	1101	1131	1201	1231	1301	1331	1401	1431	1501	1531	1601	1631	1659	1729	1758	1828	1853	-	1923	-	-	-	-	-	-	-	-
Birchwood, Railway Station	0736	0806	0835	0905	0935	1005	1035	1105	1135	1205	1235	1305	1335	1405	1435	1505	1535	1605	1635	1703	1733	1802	1832	1856	-	1926	-	-	-	-	-	-	-	-
Birchwood Centre	0737	0807	0836	0906	0936	1006	1036	1106	1136	1206	1236	1306	1336	1406	1436	1506	1536	1606	1636	1704	1734	1803	1833	1857	-	1927	-	-	-	-	-	-	-	-
Heathfield House	0743	0813	0843	0913	0943	1013	1043	1113	1143	1213	1243	1313	1343	1413	1443	1513	1543	1613	1643	1711	1741	1809	1839	1903	-	1933	-	-	-	-	-	-	-	-
Glover Road, Turf & Feather	0744	0814	0844	0914	0944	1014	1044	1114	1144	1214	1244	1314	1344	1414	1444	1514	1544	1614	1644	1712	1742	1810	1840	1904	-	1934	-	-	-	-	-	-	-	-
Locking Stumps, Copperfield Cl	0747	0817	0847	0917	0947	1017	1047	1117	1147	1217	1247	1317	1347	1417	1447	1517	1547	1617	1647	1715	1745	1813	1843	1907	-	1937	-	-	-	-	-	-	-	-
Crab Lane, Uni of Chester	0750	0820	0850	0920	0950	1020	1050	1120	1150	1220	1250	1320	1350	1420	1450	1520	1550	1620	1650	1718	1748	1816	1846	1910	-	1940	-	-	-	-	-	-	-	-
Cinnamon Brow, Millhouse Rdbt	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	1911	|	1941	2010	2041	2110	2143	2213	2243	2307
Enfield Park Rd, Stirrup Cl	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	1913	|	1943	2012	2043	2112	2145	2215	2245	2309
Insall Road, Valiant Close	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	1915	|	1945	|	2045	|	2147	|	2247	|
Enfield Park Rd, Tweedsmuir Close	0752	0822	0852	0922	0952	1022	1052	1122	1152	1222	1252	1322	1352	1422	1452	1522	1552	1622	1652	1720	1750	1818	1848	1912	|	1942	|	|	|	|	|	|	|	|
Cinnamon Brow, Millhouse Rdbt	0754	0824	0854	0924	0954	1024	1054	1124	1154	1224	1254	1324	1354	1424	1454	1524	1554	1624	1654	1722	1752	1820	1850	1914	|	1944	|	|	|	|	|	|	|	|
Peel Hall Bus Turning Circle	0804	0834	0904	0934	1004	1034	1104	1134	1204	1234	1304	1334	1404	1434	1504	1534	1604	1634	1704	1732	1802	1830	1900	1924	|	1954	|	|	|	|	|	|	|	|
Cinnamon Lane North	0805	0835	0905	0935	1005	1035	1105	1135	1205	1235	1305	1335	1405	1435	1505	1535	1605	1635	1705	1733	1803	1831	1901	1925	|	1955	|	|	|	|	|	|	|	|
Orange Grove, Avery Close	|	|	|	|	1007	|	1107	|	1207	|	1307	|	1407	|	1507	|	1607	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
Greenwood Crescent, Merrick Cl	0807	0837	0907	0937	1009	1037	1109	1137	1209	1237	1309	1337	1409	1437	1509	1537	1609	1637	1707	1735	1805	1833	1903	1927	|	1957	|	2013	|	2113	|	2216	|	2310
Statham Avenue, Kirkstone Av	0810	0840	0911	0941	1013	1041	1113	1141	1213	1241	1313	1341	1413	1441	1513	1541	1613	1641	1711	1739	1809	1836	1906	1930	|	2000	|	2016	|	2116	|	2219	|	2313
Ryfields Village	|	|	|	|	|	1047	|	1147	|	1247	|	1347	|	1447	|	1547	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
O'Leary Street	0815	0845	0917	0947	1019	1049	1119	1149	1219	1249	1319	1349	1419	1449	1519	1549	1619	1647	1717	1745	1815	1841	1911	1935	1919	2005	1949	|	2049	|	2151	|	2251	|
Winwick Road, Collegiate Inst	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	2018	|	2118	|	2221	|	2315
Orford Park Centre	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	2019	|	|	|	|	|	|
Warrington, Interchange	0822	0852	0925	0955	1027	1057	1127	1157	1227	1257	1327	1357	1427	1457	1527	1557	1627	1655	1725	1753	1823	1848	1918	1942	1926	2012	1956	2027	2056	2126	2156	2227	2256	2321

Warrington - Gorse Covert via Orford - Locking Stumps - Birchwood 25
Warrington - Cinnamon Brow via Winwick Road 26E
Warrington - Cinnamon Brow via Orford 27E

Saturday **Ref PEEL From 18/05/19 To 31/12/29**

Service No:	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	27E	26E	27E	26E	27E	26E	27E	26E	27E
Warrington, Interchange [14]	0632	0701	0720	0750	0820	0850	0920	0950	1020	1050	1120	1150	1220	1250	1320	1350	1420	1450	1520	1550	1620	1650	1720	1750	1820	1854	1923	1954	2023	2054	2129	2159	2229	2253
Orford Park Centre	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	1929	|	2029	|	|	|	|	|
Winwick Road, Collegiate Inst	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	1930	|	2030	|	2134	|	2234	|
O'Leary Street	0640	0709	0730	0800	0830	0900	0930	1000	1030	1100	1130	1200	1230	1300	1330	1400	1430	1500	1530	1600	1630	1700	1730	1758	1828	1901	|	2001	|	2101	|	2206	|	2300
Ryfields Village	|	|	|	|	|	|	|	1002	|	1102	|	1202	|	1302	|	1402	|	1502	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
Statham Avenue, Kirkstone Av	0646	0715	0736	0806	0836	0906	0936	1008	1036	1108	1136	1208	1236	1308	1336	1408	1436	1508	1536	1606	1636	1706	1736	1804	1834	|	1933	|	2033	|	2136	|	2236	|
Greenwood Crescent, Merrick Cl	0649	0718	0740	0810	0840	0910	0940	1012	1040	1112	1140	1212	1240	1312	1340	1412	1440	1512	1540	1610	1640	1710	1740	1807	1837	|	1937	|	2037	|	2140	|	2240	|
Orange Grove, Avery Close	|	|	|	|	|	|	0942	|	1042	|	1142	|	1242	|	1342	|	1442	|	1542	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
Insall Rd, Valiant Cl	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	1906	|	2006	|	2106	|	2210	|	2304
Cinnamon Lane North	0650	0720	0742	0812	0842	0912	0944	1014	1044	1114	1144	1214	1244	1314	1344	1414	1444	1514	1544	1612	1642	1712	1742	1809	1839	|	|	|	|	|	|	|	|	|
Cinnamon Brow, Millhouse Rdbt	0651	0721	0743	0813	0843	0913	0945	1015	1045	1115	1145	1215	1245	1315	1345	1415	1445	1515	1545	1613	1643	1713	1743	1810	1840	1911	1941	2010	2041	2110	2143	2213	2243	2307
Peel Hall Bus Turning Circle	0701	0731	0753	0823	0853	0923	0955	1025	1055	1125	1155	1225	1255	1325	1355	1425	1455	1525	1555	1623	1653	1723	1753	1820	1850	-	-	-	-	-	-	-	-	-
Enfield Park Rd, Tweedsmuir Close	0703	0733	0755	0825	0855	0925	0957	1027	1057	1127	1157	1227	1257	1327	1357	1427	1457	1527	1557	1625	1655	1725	1755	1822	1852	-	-	-	-	-	-	-	-	-
Crab Lane, Uni of Chester	0705	0735	0757	0827	0857	0927	0959	1029	1059	1129	1159	1229	1259	1329	1359	1429	1459	1529	1559	1627	1657	1727	1757	1824	1854	-	-	-	-	-	-	-	-	-
Locking Stumps, Copperfield Cl	0709	0739	0801	0831	0901	0931	1003	1033	1103	1133	1203	1233	1303	1333	1403	1433	1503	1533	1603	1631	1701	1731	1801	1828	1858	-	-	-	-	-	-	-	-	-
Glover Road, Turf & Feather	0711	0741	0803	0833	0903	0933	1005	1035	1105	1135	1205	1235	1305	1335	1405	1435	1505	1535	1605	1633	1703	1733	1803	1830	1900	-	-	-	-	-	-	-	-	-
Heathfield House	0712	0742	0804	0834	0904	0934	1006	1036	1106	1136	1206	1236	1306	1336	1406	1436	1506	1536	1606	1634	1704	1734	1804	1831	1901	-	-	-	-	-	-	-	-	-
Birchwood Centre	0717	0747	0810	0840	0910	0940	1012	1042	1112	1142	1212	1242	1312	1342	1412	1442	1512	1542	1612	1640	1710	1740	1810	1837	1907	-	-	-	-	-	-	-	-	-
Birchwood, Railway Station	0718	0748	0812	0842	0912	0942	1014	1044	1114	1144	1214	1244	1314	1344	1414	1444	1514	1544	1614	1642	1712	1742	1812	1838	1908	-	-	-	-	-	-	-	-	-
Oakwood, Keyes Close	0721	0751	0815	0845	0915	0945	1017	1047	1117	1147	1217	1247	1317	1347	1417	1447	1517	1547	1617	1645	1715	1745	1815	1841	1911	-	-	-	-	-	-	-	-	-
Gorse Covert, Spar Store	0725	0755	0819	0849	0919	0949	1021	1051	1121	1151	1221	1251	1321	1351	1421	1451	1521	1551	1621	1649	1719	1749	1819	1845	1915	-	-	-	-	-	-	-	-	-
Gorse Covert, Ashdown Lane	-	-	-	-	-	-	-	-	-	-	-	-	-	1353	1423	1453	1523	1553	1623	1651	1721	1751	1819	1847	1917	-	-	-	-	-	-	-	-	-

TRANSPORTATION AND HIGHWAYS

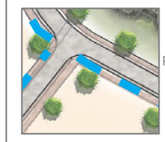
T8 Pedestrian and Cycle Links

NOTES:
Reproduced from Appletons Peel Hall Indicative Landscape Components Plan

KEY:

Existing PRoW

Proposed Pedestrian Links



Proposed Shared Footway/Cycleway

ISSUE	REASON FOR REVISION	DATE

PROJECT:
PEEL HALL, WARRINGTON

CLIENT:
SATNAM MILLENNIUM LTD

PROJECT REFERENCE:	DRAWING NUMBER:	SCALE:
1107	ES T8	NOT TO SCALE

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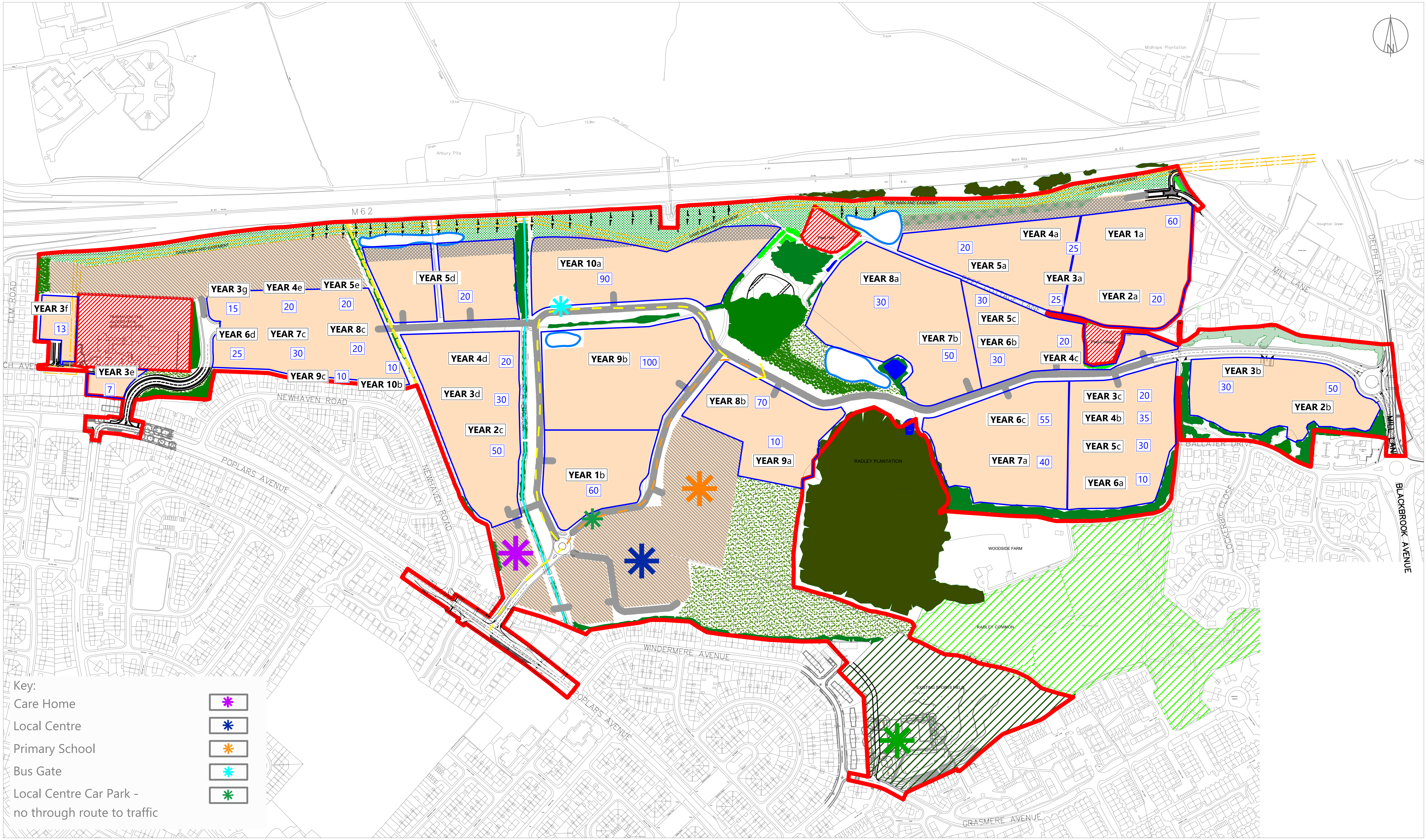
Bristol BS1 5NL
0117 934 9121

TITLE:
ILLUSTRATIVE PLAN SHOWING PROPOSED PEDESTRIAN AND CYCLE LINKAGES

DATE:	DRAWN BY:	CHECKED:
28/06/16	FB	DT

TRANSPORTATION AND HIGHWAYS

T9 Indicative Phasing Plans



NOTES:
Reproduced from Appletons Peel Hall Parameters Plan
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KEY:
Indicative Year Numbering — YEAR 8b
Indicative Number of units Completed at Year End — 12
Initial Bus Link
End Bus Link

Phasing subject to detailed phasing plan to be submitted at Reserved Matters stage

ISSUE	REASON FOR REVISION	DATE

DATE:	DRAWN BY:	CHECKED:
06/03/20	FB	FB

PROJECT: PEEL HALL, WARRINGTON

CLIENT: SATNAM MILLENNIUM LTD

TITLE: INDICATIVE HIGHWAYS BUILD OUT PLAN

PROJECT REFERENCE:	DRAWING NUMBER:	SCALE:
1901	09	NOT TO SCALE

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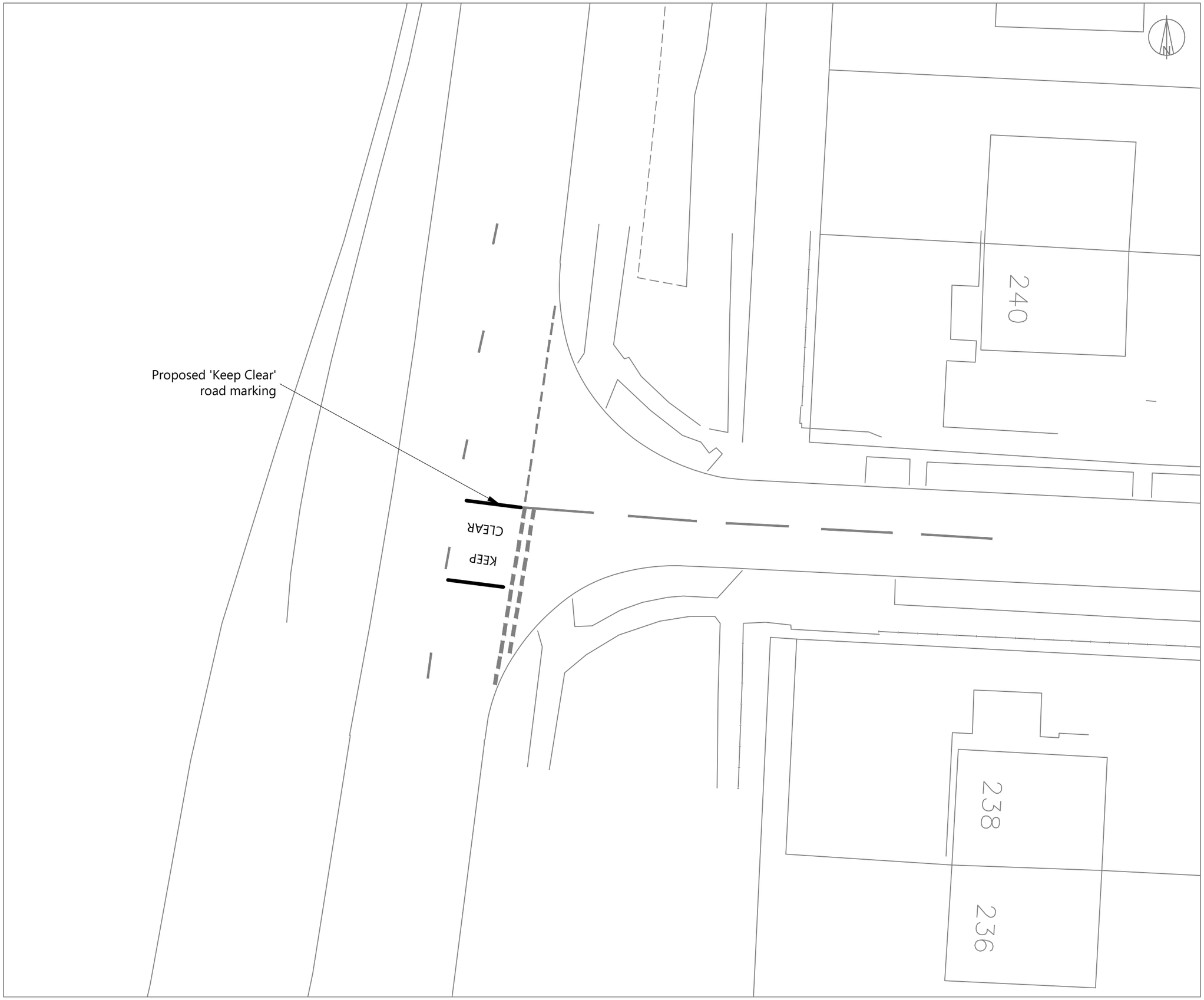
TRANSPORTATION AND HIGHWAYS

T10 Junction Improvement Plans



NOTES:

ISSUE	REASON FOR REVISION	DATE

PROJECT:

PEEL HALL, WARRINGTON

CLIENT:

SATNAM MILLENNIUM LTD

PROJECT REFERENCE:	DRAWING NUMBER:	SCALE:
1107	79	1:250 @ A3

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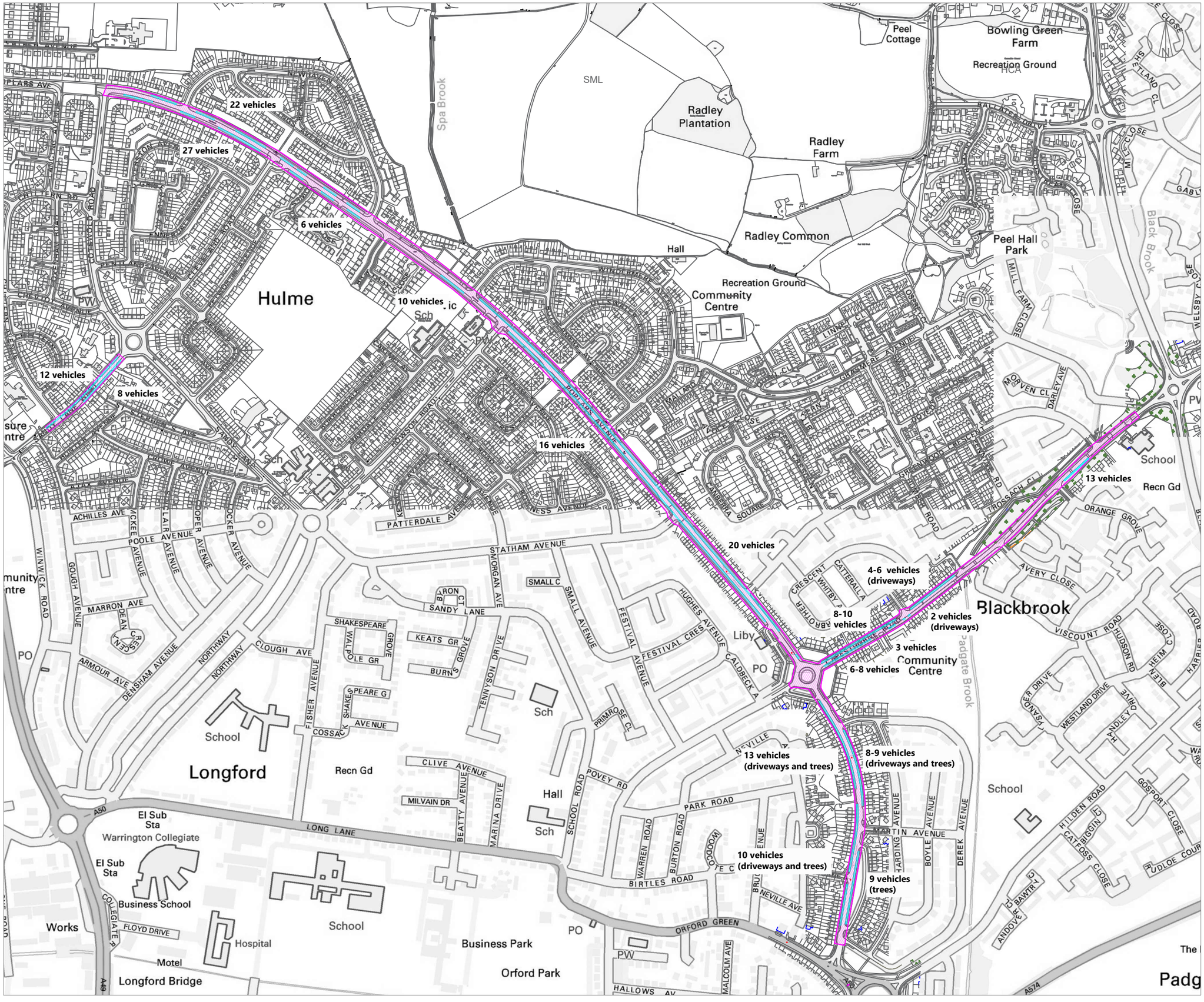
Bristol BS8 1ES
07973 375 937 / 07595 892 217

TITLE:

PEEL HALL POTENTIAL MITIGATION - A49 / BIRCH AVENUE

DATE:	DRAWN BY:	CHECKED:
22/12/17	BL	FB



NOTES:

Key

Study area to be considered for off-carriageway formalised parking

Potential locations for verge parking

Indicative only - based on on-site observations

ISSUE	REASON FOR REVISION	DATE

PROJECT:

PEEL HALL, WARRINGTON

CLIENT:

SATNAM MILLENNIUM LTD

PROJECT REFERENCE:	DRAWING NUMBER:	SCALE:
1901	06	Not to Scale

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07973 375 937 / 07595 892 217

TITLE:

POTENTIAL AREAS TO BE CONSIDERED FOR VERGE/FOOTWAY PARKING

DATE:	DRAWN BY:	CHECKED:
29/01/20	FB	DT

NOTES:

Proposed 20mph restriction to tie into existing 20mph restrictions where present.

Key

Potential 20mph speed restriction extension

ISSUE	REASON FOR REVISION	DATE

PROJECT:

PEEL HALL, WARRINGTON

CLIENT:

SATNAM MILLENNIUM LTD

PROJECT REFERENCE:	DRAWING NUMBER:	SCALE:
1901	07	Not to Scale

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07973 375 937 / 07595 892 217

TITLE:

AREA FOR POTENTIAL 20MPH SPEED RESTRICTION EXTENSION

DATE:	DRAWN BY:	CHECKED:
20/01/20	FB	DT

NOTES:

North arrow indicative.

PRELIMINARY

ISSUE	REASON FOR REVISION	DATE
-	-	-

PROJECT:
PEEL HALL
WARRINGTON

CLIENT:
SATNAM MILLENNIUM LTD

PROJECT REFERENCE:	DRAWING NUMBER:	SCALE:
1901	08	1:500 @ A3

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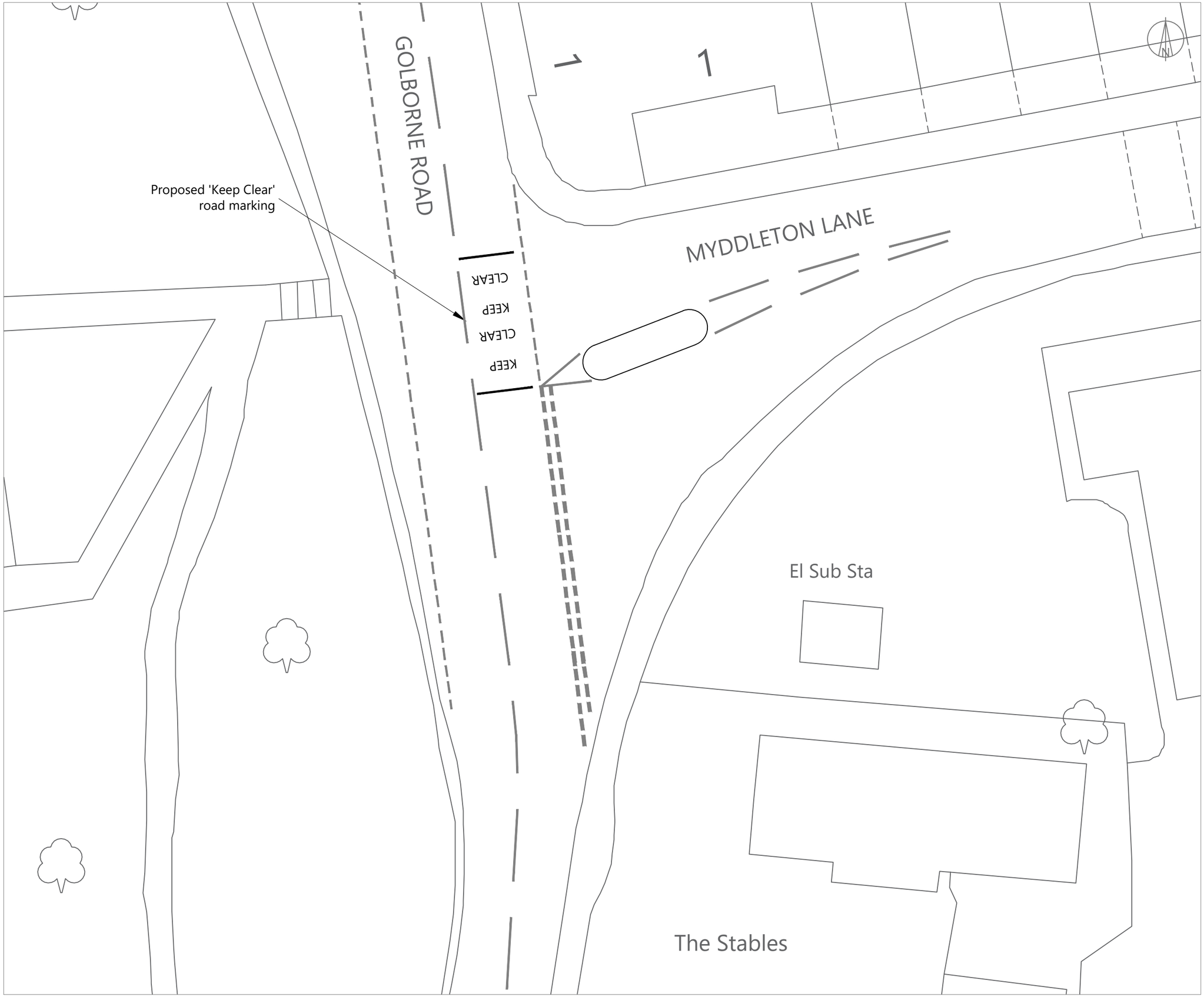
07973 375 937 / 07595 892 217

TITLE:
PROPOSED A49 / GOLBOURNE ROAD
JUNCTION IMPROVEMENTS

DATE:	DRAWN BY:	CHECKED:
04/03/20	BGS	FB



NOTES:

Road markings and splitter island shown indicatively only

ISSUE	REASON FOR REVISION	DATE

PROJECT:
PEEL HALL, WARRINGTON

CLIENT:
SATNAM MILLENNIUM LTD

PROJECT REFERENCE:	DRAWING NUMBER:	SCALE:
1901	10	1:200 @ A3

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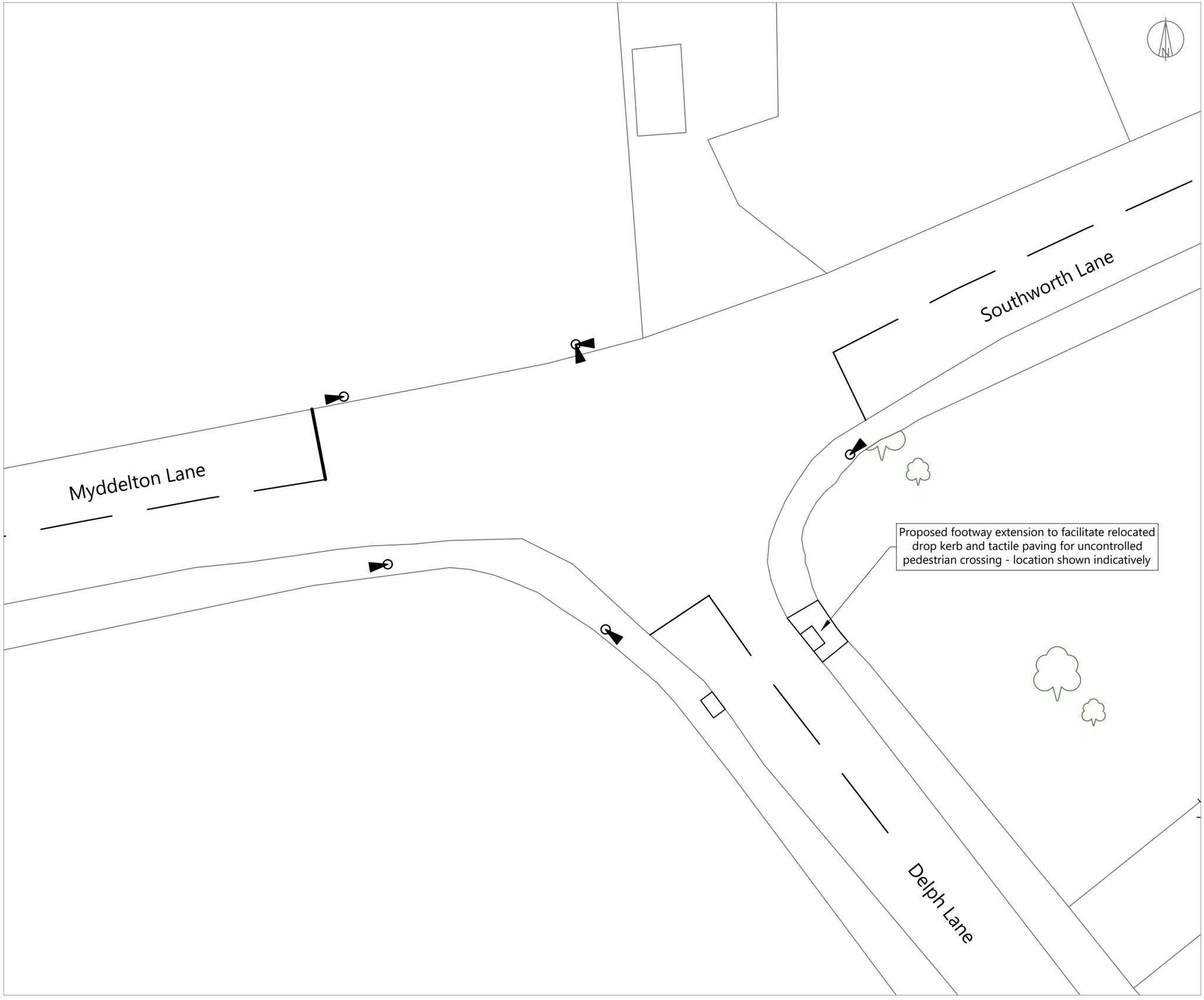
First Floor, 43-45 Park Street
Bristol BS1 5NL
07973 375 937 / 07595 892 217

TITLE:
POTENTIAL KEEP CLEAR MARKINGS GOLBOURNE RD/MYDDLETON LN

DATE:	DRAWN BY:	CHECKED:
02/03/20	FB	DT



NOTES:

PRELIMINARY

ISSUE	REASON FOR REVISION	DATE

PROJECT:

PEEL HALL, WARRINGTON

CLIENT:

SATNAM MILLENNIUM LTD

PROJECT REFERENCE:	DRAWING NUMBER:	SCALE:
1901	11	1:200 @ A3

HighgateTransportation

www.highgatetransportation.co.uk

First Floor, 43-45 Park Street
Bristol BS1 5NL
07973 375 937 / 07595 892 217

TITLE:

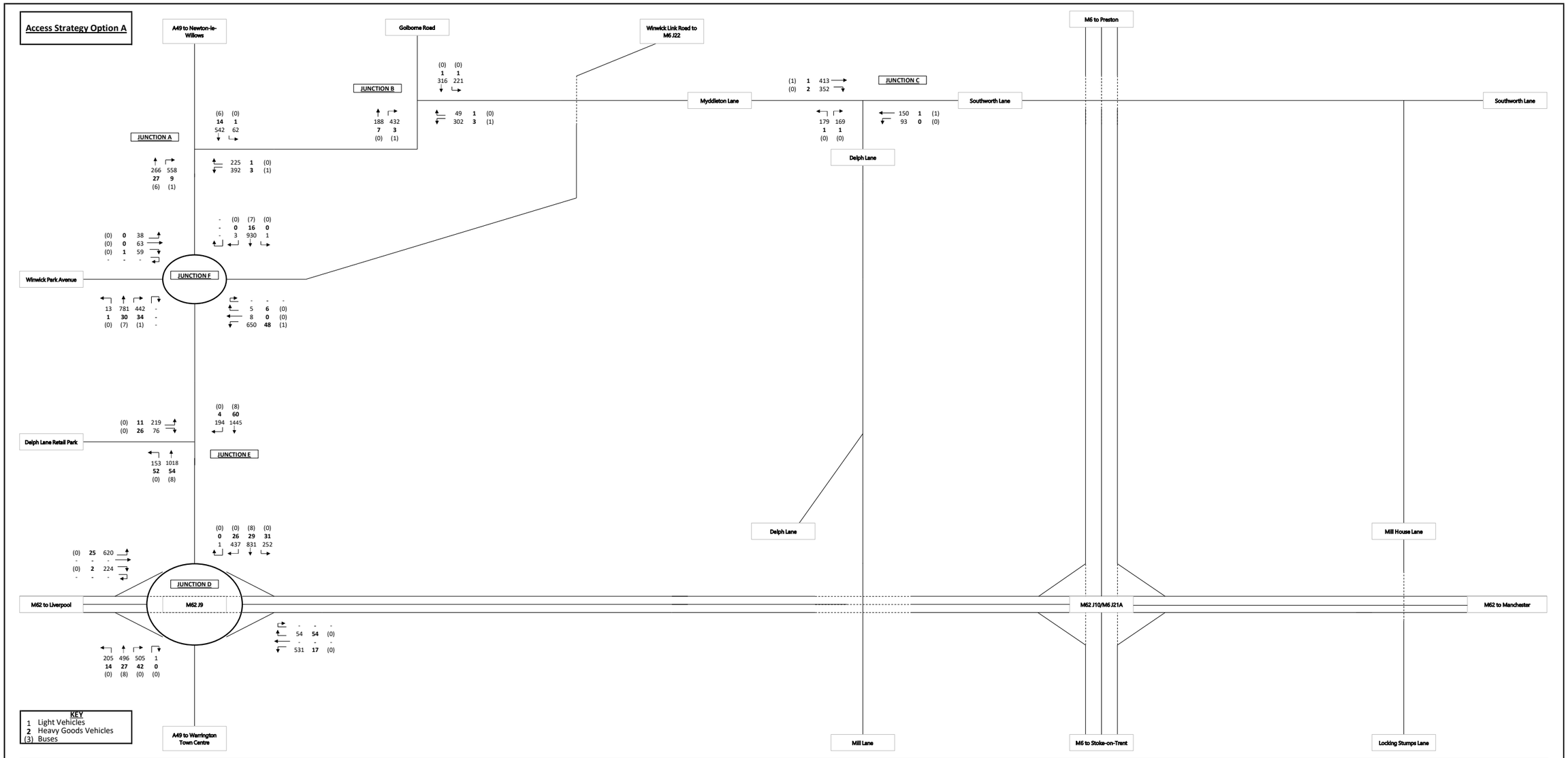
POTENTIAL SIGNAL JUNCTION MYDDLETON LANE/DELPH LANE

DATE:	DRAWN BY:	CHECKED:
17/03/20	FB	DT

TRANSPORTATION AND HIGHWAYS

T11 Flow Diagrams 2018

Access Strategy Option A



KEY

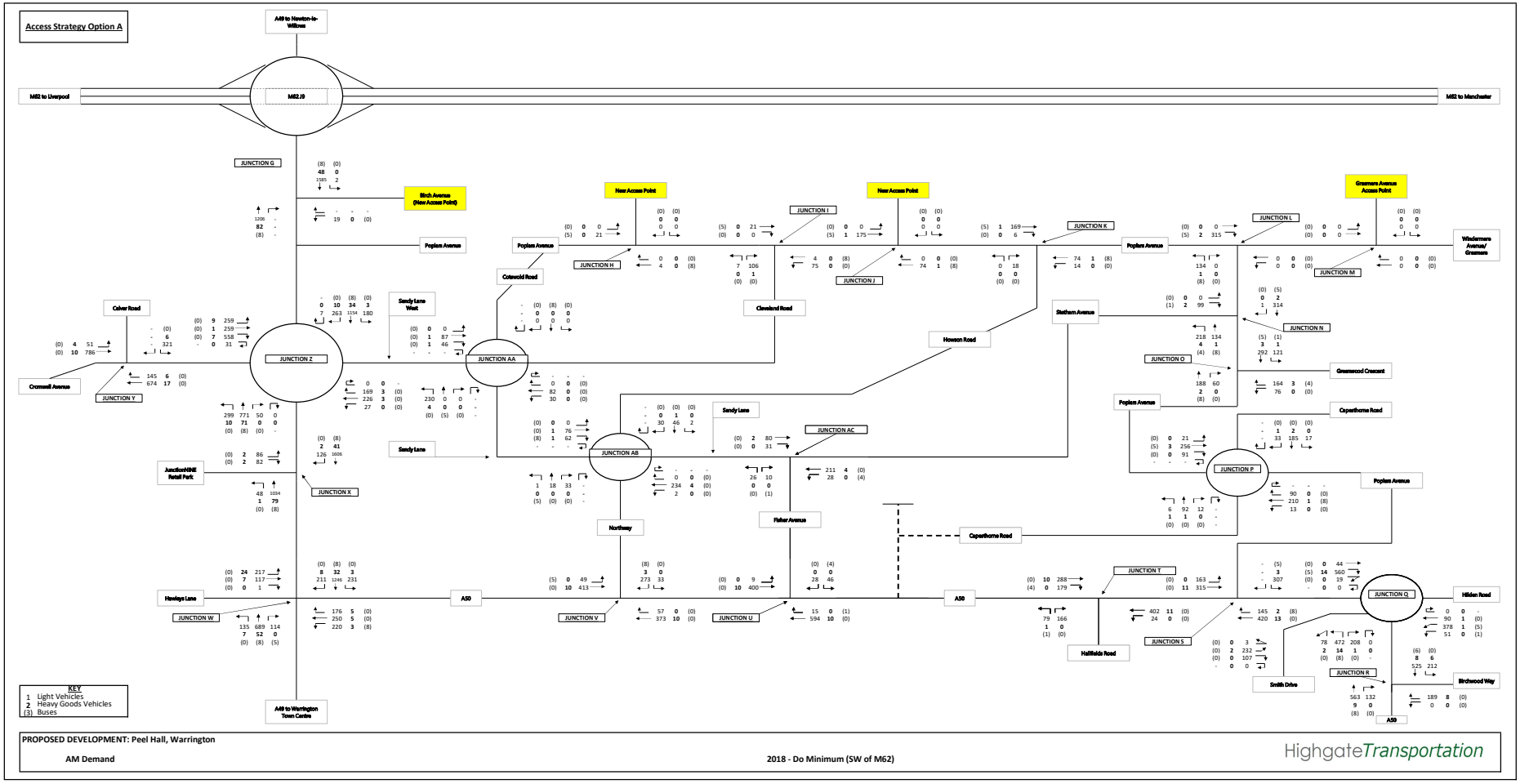
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses

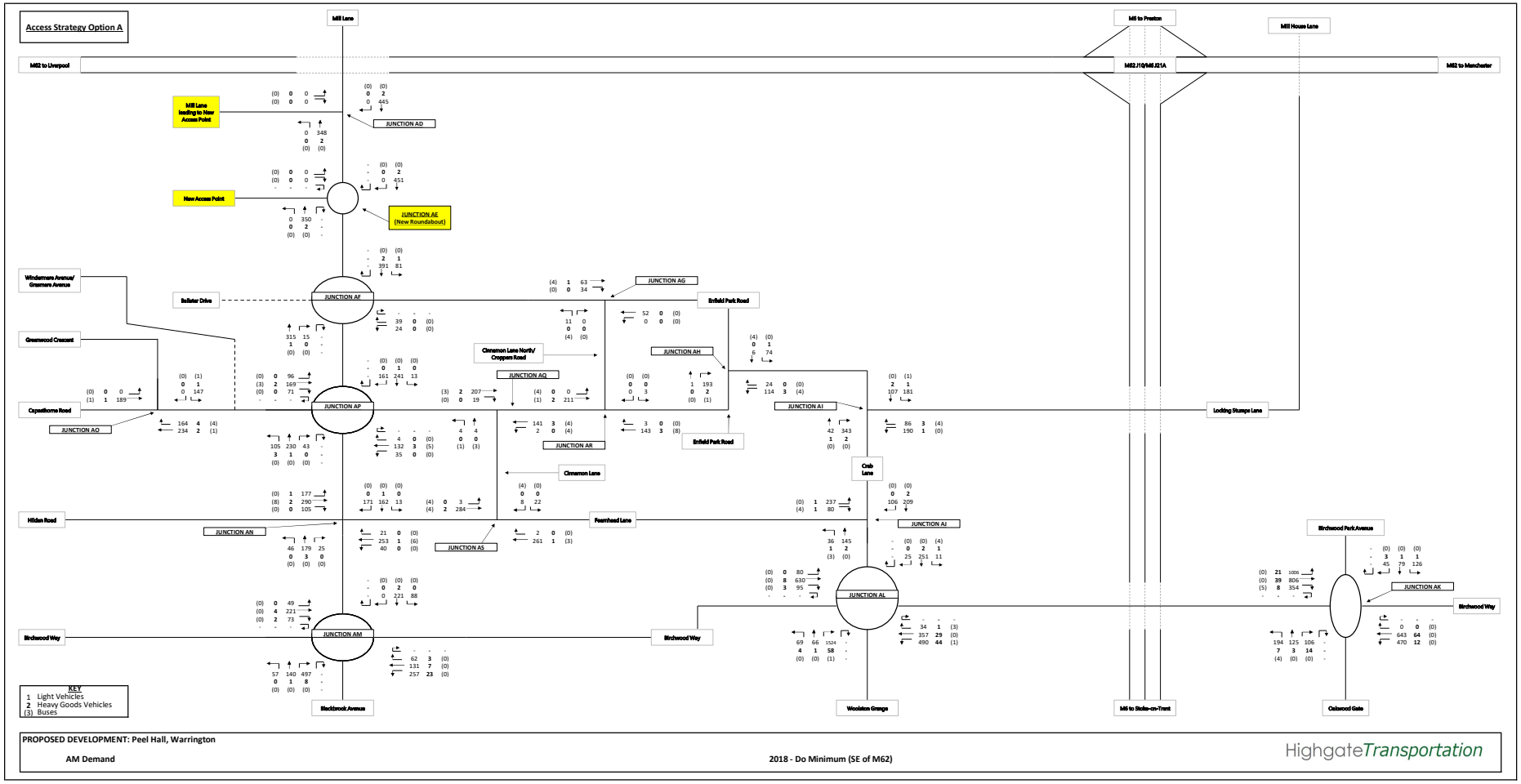
PROPOSED DEVELOPMENT: Peel Hall, Warrington

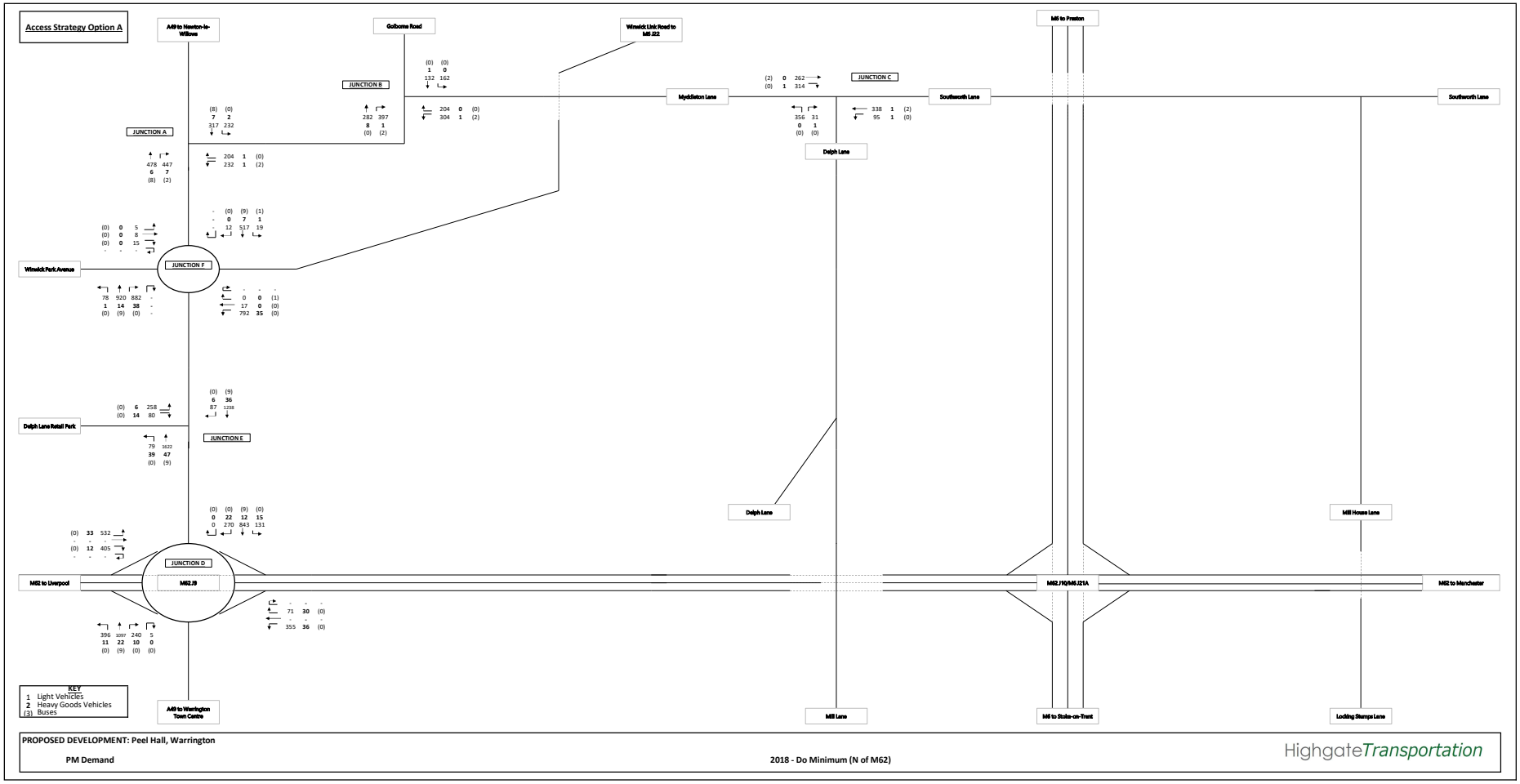
AM Demand

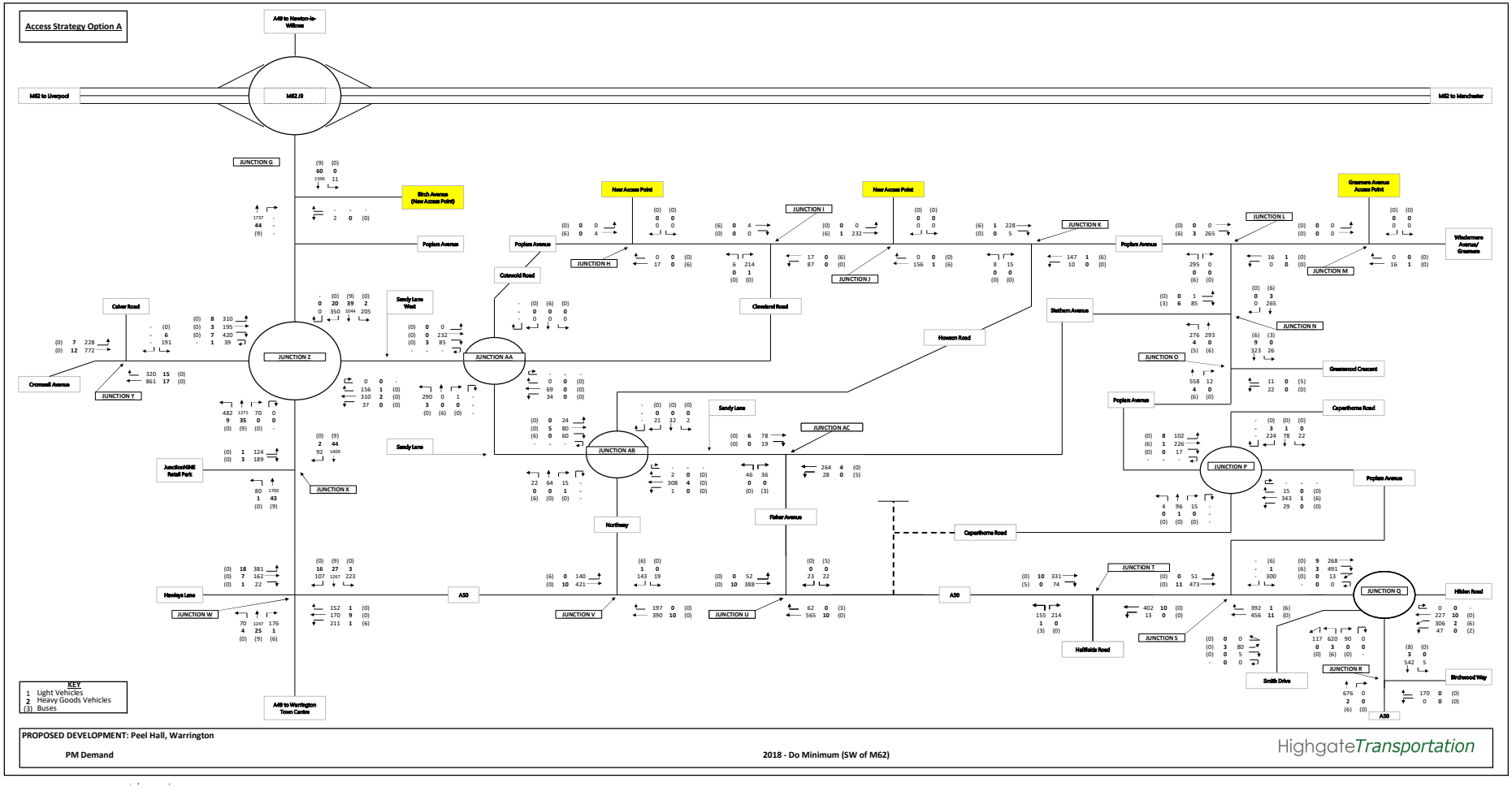
2018 - Do Minimum (N of M62)

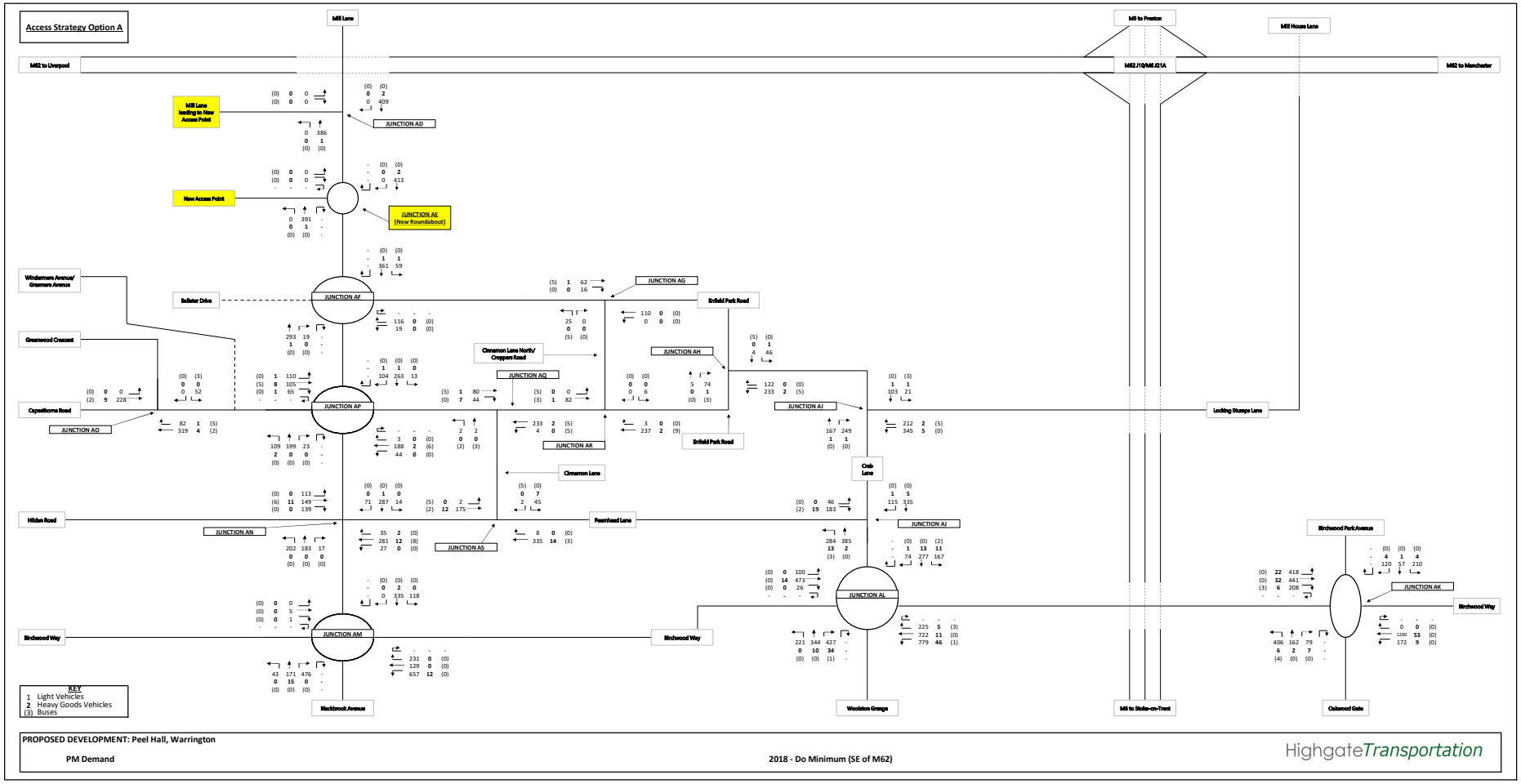
HighgateTransportation


Access Strategy Option A
A49 to Newton-le-Willows
M62 to Liverpool
M62 J9
M62 to Manchester
JUNCTION G
Birch Avenue (New Access Point)
New Access Point
New Access Point
Grasmere Avenue Access Point
Poplars Avenue
Poplars Avenue
JUNCTION H
JUNCTION I
JUNCTION J
JUNCTION K
JUNCTION L
JUNCTION M
Windermere Avenue/ Grasmere
Colwold Road
Cleveland Road
Howson Road
Statham Avenue
JUNCTION N
JUNCTION O
Greenwood Crescent
Culver Road
Sandy Lane West
JUNCTION Z
JUNCTION AA
Cromwell Avenue
JUNCTION Y
Sandy Lane
JUNCTION AB
JUNCTION AC
Copperhorne Road
JUNCTION P
Poplars Avenue
JunctionNINE Retail Park
JUNCTION X
Sandy Lane
Northway
Fisher Avenue
Copperhorne Road
Hawleys Lane
JUNCTION W
A50
JUNCTION V
JUNCTION U
A50
JUNCTION T
JUNCTION S
Hatfields Road
Smith Drive
JUNCTION Q
JUNCTION R
Hilden Road
Birchwood Way
A50
A49 to Warrington Town Centre
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Demand
2018 - Do Minimum (SW of M62)
HighgateTransportation


Access Strategy Option A
Mill Lane
M62 to Liverpool
M6 to Preston
Mill House Lane
M62 J10/M6 J21A
M62 to Manchester
Mill Lane leading to New Access Point
JUNCTION AD
New Access Point
JUNCTION AE (New Roundabout)
Windermere Avenue/ Grasmere Avenue
Ballater Drive
JUNCTION AF
JUNCTION AG
Enfield Park Road
Greenwood Crescent
Cinnamon Lane North/ Croppers Road
JUNCTION AH
JUNCTION AQ
JUNCTION AP
JUNCTION AI
Lodging Stumps Lane
Capesthorne Road
JUNCTION AO
JUNCTION AR
Enfield Park Road
Cinnamon Lane
Crab Lane
Hilden Road
JUNCTION AN
JUNCTION AS
Fernhead Lane
JUNCTION AJ
JUNCTION AL
Birchwood Park Avenue
JUNCTION AK
Birchwood Way
JUNCTION AM
Birchwood Way
Birchwood Way
Blacklocks Avenue
Woolston Grange
M6 to Stoke-on-Trent
Oakwood Gate
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Demand
2018 - Do Minimum (SE of M62)
HighgateTransportation

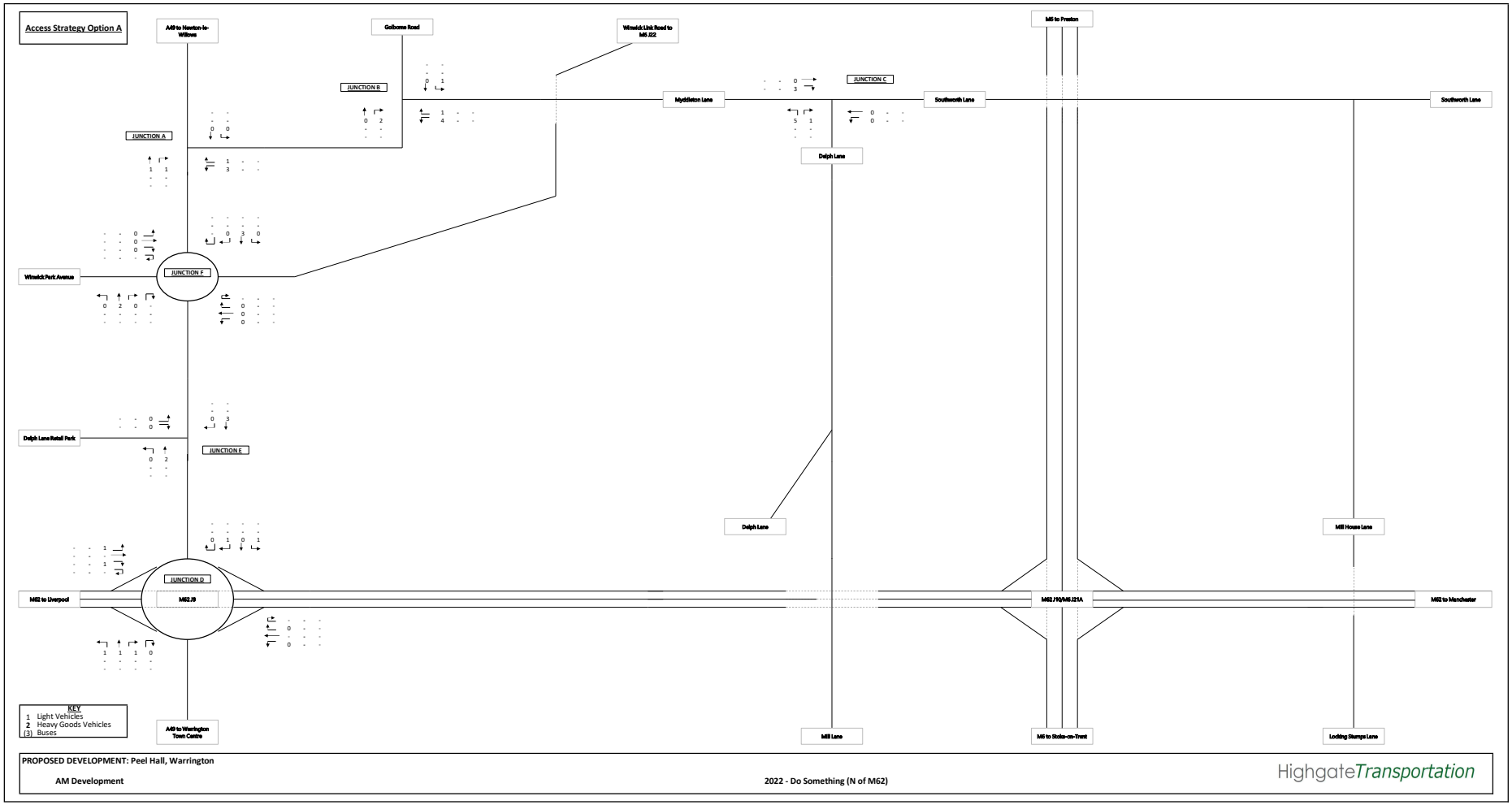

Access Strategy Option A
A49 to Newton-le-Willows
Golborne Road
Winwick Link Road to M6 J22
M6 to Preston
JUNCTION B
JUNCTION C
Middleton Lane
Southworth Lane
Southworth Lane
JUNCTION A
Delph Lane
Winwick Park Avenue
JUNCTION F
Delph Lane Retail Park
JUNCTION E
Delph Lane
Mill House Lane
JUNCTION D
M62 to Liverpool
M62 J9
M62 J10/M6 J21A
M62 to Manchester
Mill Lane
M6 to Stoke-on-Trent
Locking Stumps Lane
A49 to Warrington Town Centre
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Demand
2018 - Do Minimum (N of M62)
HighgateTransportation


Access Strategy Option A
A49 to Newton-le-Willows
M62 to Liverpool
M62 J9
M62 to Manchester
JUNCTION G
Birch Avenue (New Access Point)
New Access Point
New Access Point
Grasmere Avenue Access Point
Poplars Avenue
Poplars Avenue
Poplars Avenue
Poplars Avenue
Poplars Avenue
Poplars Avenue
Poplars Avenue
Poplars Avenue
Poplars Avenue
Poplars Avenue
JUNCTION H
JUNCTION I
JUNCTION J
JUNCTION K
JUNCTION L
JUNCTION M
JUNCTION N
JUNCTION O
JUNCTION P
JUNCTION Q
JUNCTION R
JUNCTION S
JUNCTION T
JUNCTION U
JUNCTION V
JUNCTION W
JUNCTION X
JUNCTION Y
JUNCTION Z
JUNCTION AA
JUNCTION AB
JUNCTION AC
Cotswold Road
Cleveland Road
Howson Road
Statham Avenue
Windermere Avenue/ Grasmere
Greenwood Crescent
Copperhorne Road
Copperhorne Road
Fisher Avenue
Northway
Sandy Lane
Sandy Lane
Sandy Lane West
Calver Road
Cromwell Avenue
JunctionNINE Retail Park
Hawleys Lane
A50
A50
A50
Hilden Road
Birchwood Way
Smith Drive
Hatfields Road
A49 to Warrington Town Centre
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Demand
2018 - Do Minimum (SW of M62)
HighgateTransportation

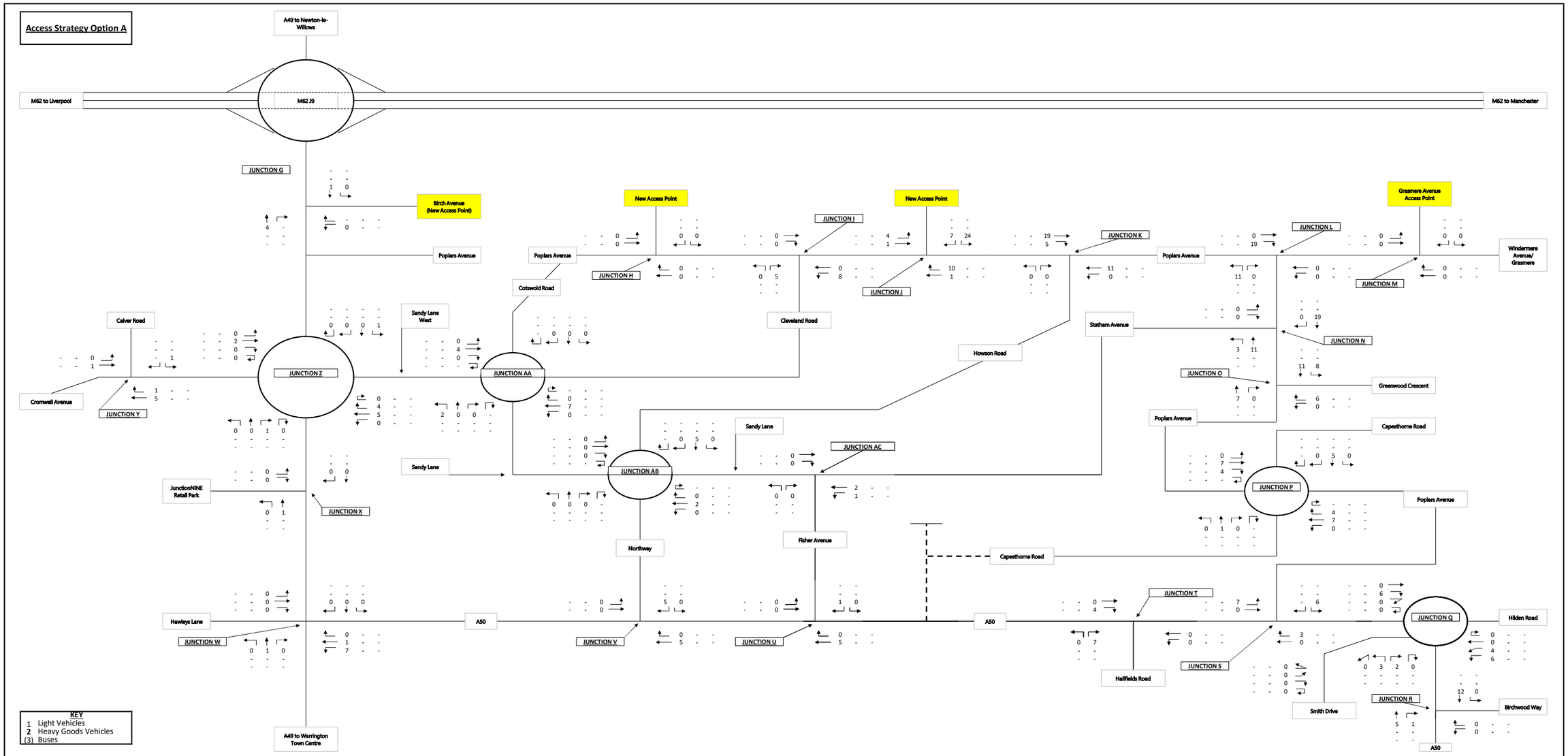

Access Strategy Option A
Mill Lane
M62 to Liverpool
M6 to Preston
Mill House Lane
M62 J10/M6 J21A
M62 to Manchester
Mill Lane leading to New Access Point
JUNCTION AD
New Access Point
JUNCTION AE (New Roundabout)
Windermere Avenue/ Grasmere Avenue
Ballater Drive
JUNCTION AF
JUNCTION AG
Enfield Park Road
Greenwood Crescent
Cinnamon Lane North/ Croppers Road
JUNCTION AH
JUNCTION AQ
JUNCTION AI
Lodging Stumps Lane
Capesthorne Road
JUNCTION AO
JUNCTION AP
JUNCTION AR
Enfield Park Road
Cinnamon Lane
Crab Lane
Hilden Road
JUNCTION AN
JUNCTION AS
Fernhead Lane
JUNCTION AJ
Birchwood Park Avenue
JUNCTION AL
JUNCTION AK
Birchwood Way
Birchwood Way
JUNCTION AM
Blacklocks Avenue
Woolston Grange
M6 to Stoke-on-Trent
Oakwood Gate
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Demand
2018 - Do Minimum (SE of M62)
HighgateTransportation

TRANSPORTATION AND HIGHWAYS

T12 Development Flow Diagrams


Access Strategy Option A
A49 to Newton-le-Willows
Golborne Road
Winwick Link Road to M6 J22
M6 to Preston
JUNCTION B
Myddleton Lane
JUNCTION C
Southworth Lane
Southworth Lane
JUNCTION A
Delph Lane
Winwick Park Avenue
JUNCTION F
Delph Lane Retail Park
JUNCTION E
Delph Lane
Mill House Lane
JUNCTION D
M62 to Liverpool
M62 J9
M62 J10/M6 J21A
M62 to Manchester
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
A49 to Warrington Town Centre
Mill Lane
M6 to Stoke-on-Trent
Locking Stumps Lane
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Development
2022 - Do Something (N of M62)
HighgateTransportation

Access Strategy Option A



KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses

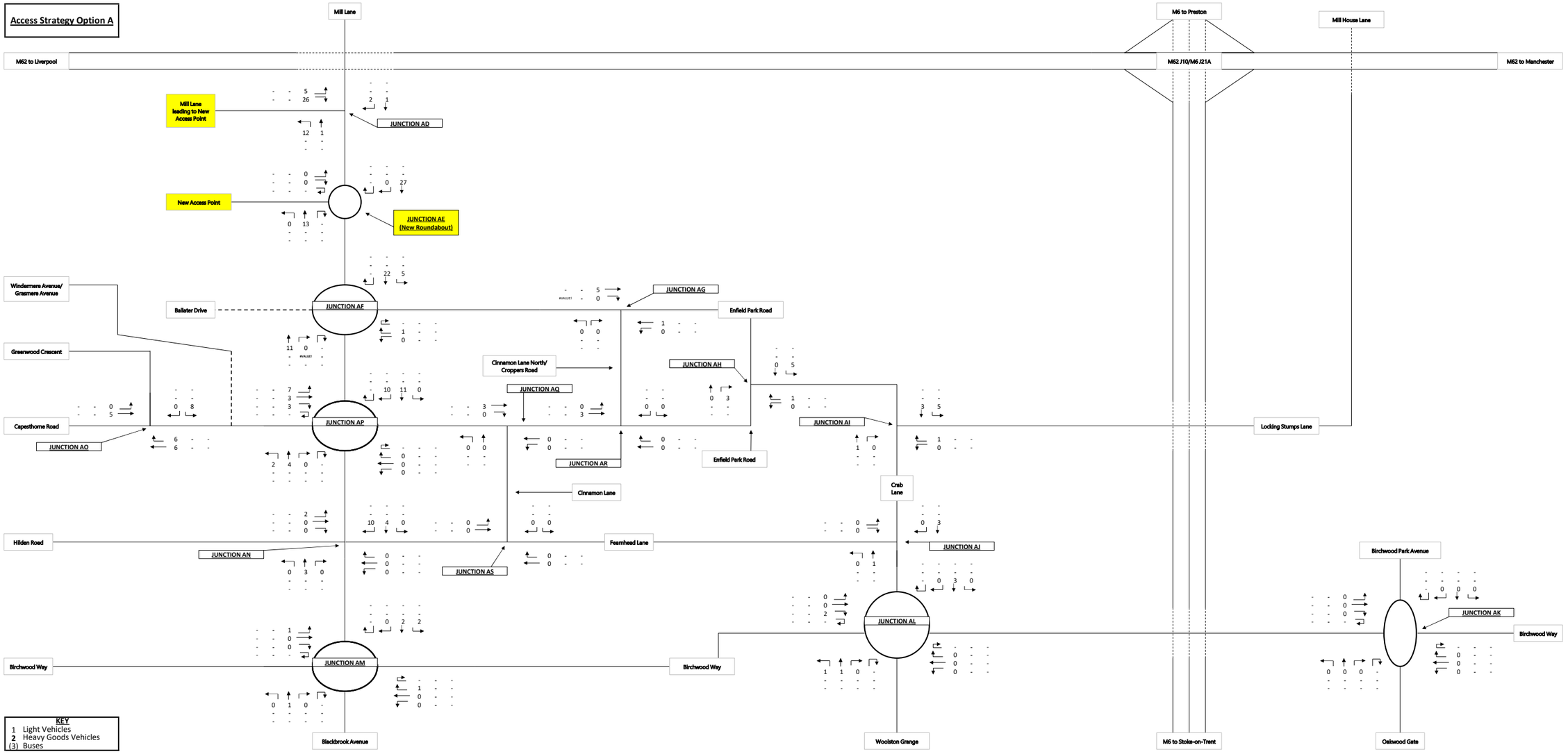
PROPOSED DEVELOPMENT: Peel Hall, Warrington

AM Development

2022 - Do Something (SW of M62)

HighgateTransportation

Access Strategy Option A



KEY

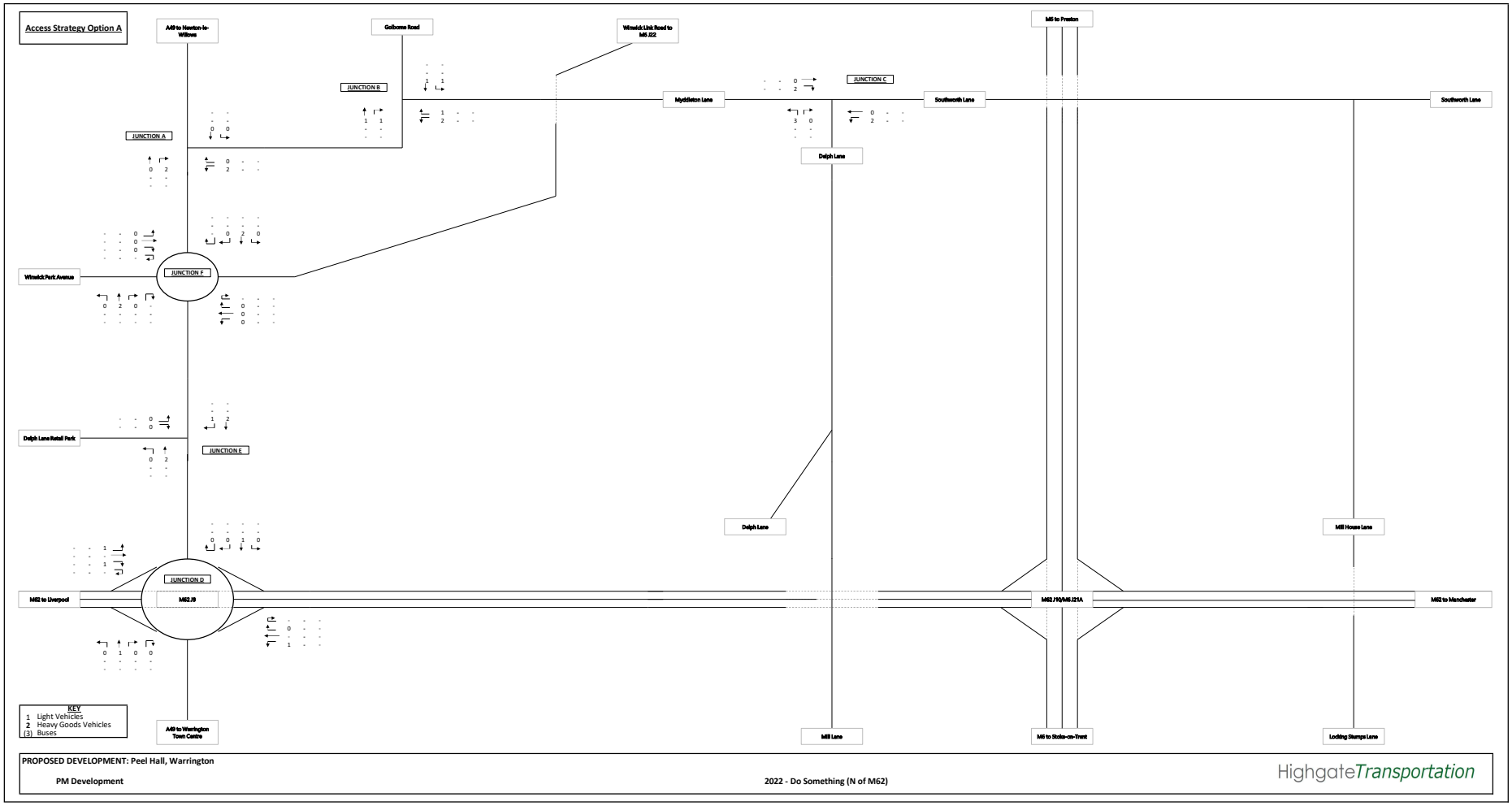
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses

PROPOSED DEVELOPMENT: Peel Hall, Warrington

AM Development

2022 - Do Something (SE of M62)

HighgateTransportation


Access Strategy Option A
A49 to Newton-le-Willows
Golborne Road
Winwick Link Road to M6 J22
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Southworth Lane
JUNCTION A
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Winwick Park Avenue
JUNCTION F
Delph Lane Retail Park
JUNCTION E
Delph Lane
Mill House Lane
JUNCTION D
M62 to Liverpool
M62 J9
M62 J10/M6 J21A
M62 to Manchester
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
A49 to Warrington Town Centre
Mill Lane
M6 to Stoke-on-Trent
Locking Stumps Lane
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Development
2022 - Do Something (N of M62)
HighgateTransportation

Access Strategy Option A

A49 to Newton-le-Willows

M62 to Liverpool

M62 J9

M62 to Manchester

JUNCTION G

Birch Avenue (New Access Point)

Poplars Avenue

New Access Point

JUNCTION H

JUNCTION I

New Access Point

JUNCTION J

JUNCTION K

Poplars Avenue

JUNCTION L

Grasmere Avenue Access Point

JUNCTION M

Windermere Avenue/ Grasmere

Cotswold Road

Cleveland Road

Howson Road

Statham Avenue

JUNCTION N

JUNCTION O

Greenwood Crescent

Poplars Avenue

Capesthorne Road

JUNCTION P

Poplars Avenue

Calver Road

Sandy Lane West

JUNCTION Z

JUNCTION AA

Cromwell Avenue

JUNCTION Y

Sandy Lane

JUNCTION AB

Sandy Lane

JUNCTION AC

JunctionNINE Retail Park

JUNCTION X

Northway

Fisher Avenue

Capesthorne Road

JUNCTION T

Hawleys Lane

JUNCTION W

A50

JUNCTION V

JUNCTION U

A50

Hallfields Road

JUNCTION S

JUNCTION Q

Hilden Road

Smith Drive

JUNCTION R

Birchwood Way

A50

A49 to Warrington Town Centre

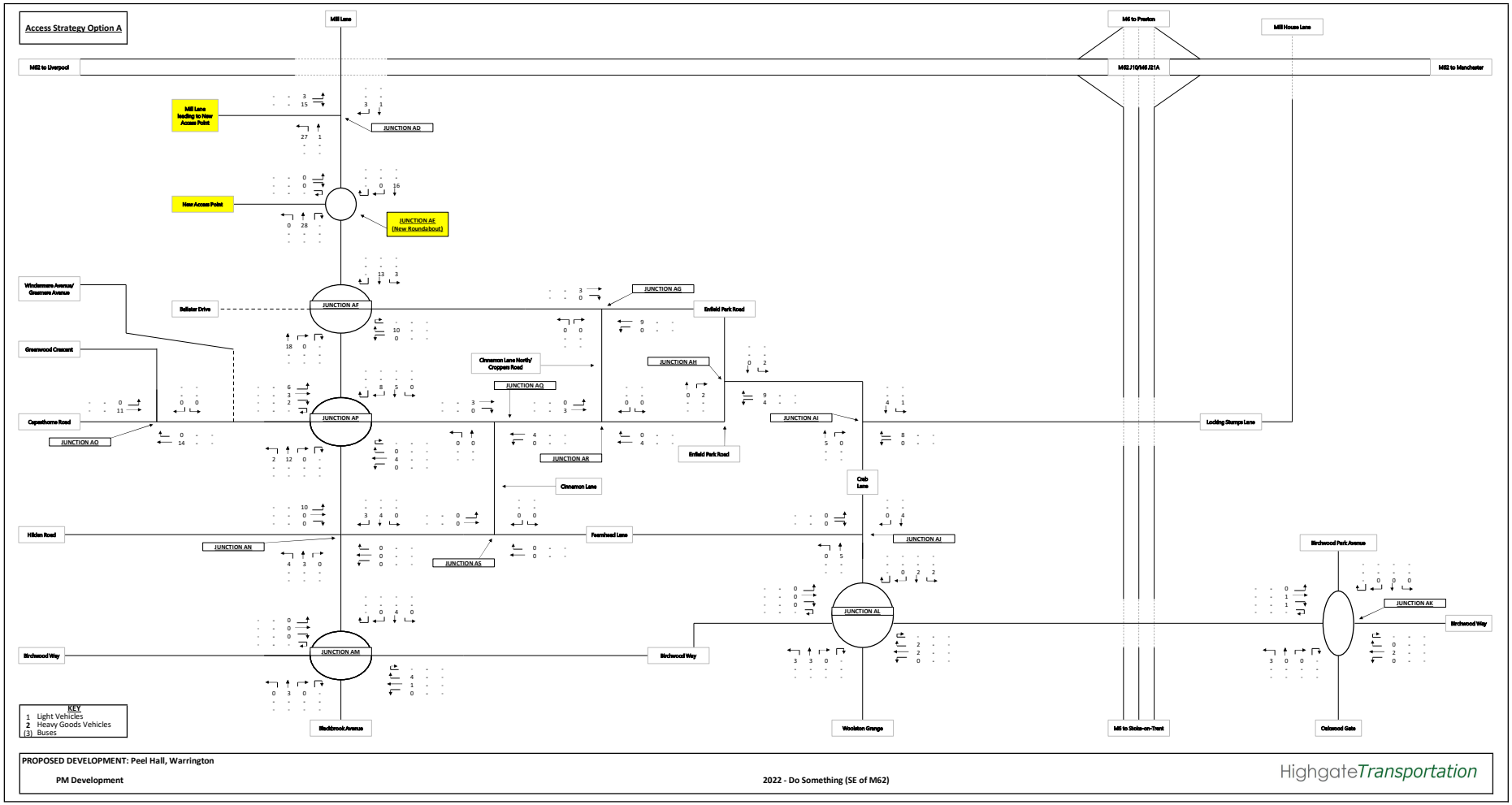
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses

PROPOSED DEVELOPMENT: Peel Hall, Warrington

PM Development

2022 - Do Something (SW of M62)

HighgateTransportation


Access Strategy Option A
Mill Lane
M62 to Liverpool
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Mill House Lane
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Mill Lane leading to New Access Point
JUNCTION AD
New Access Point
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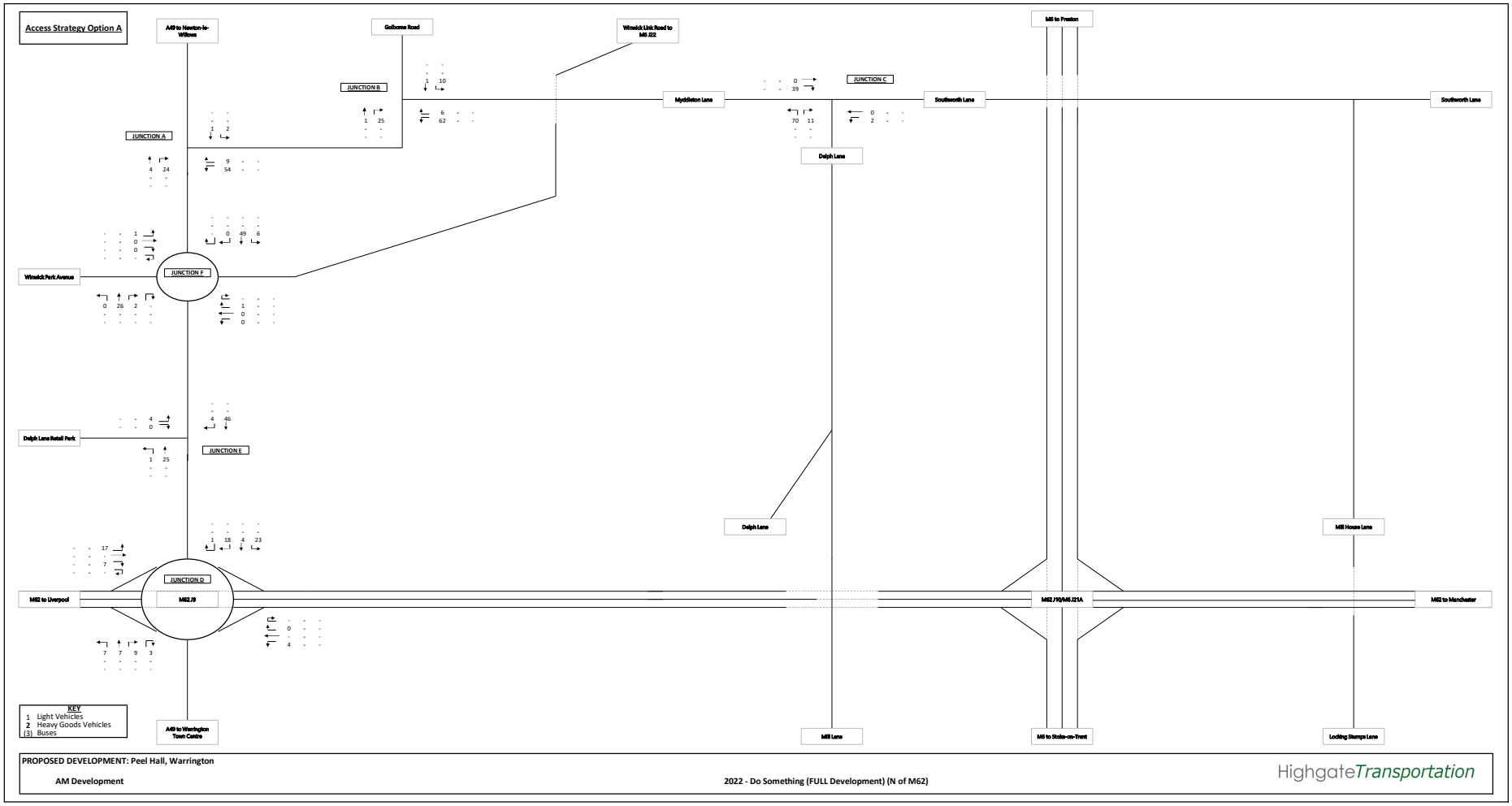
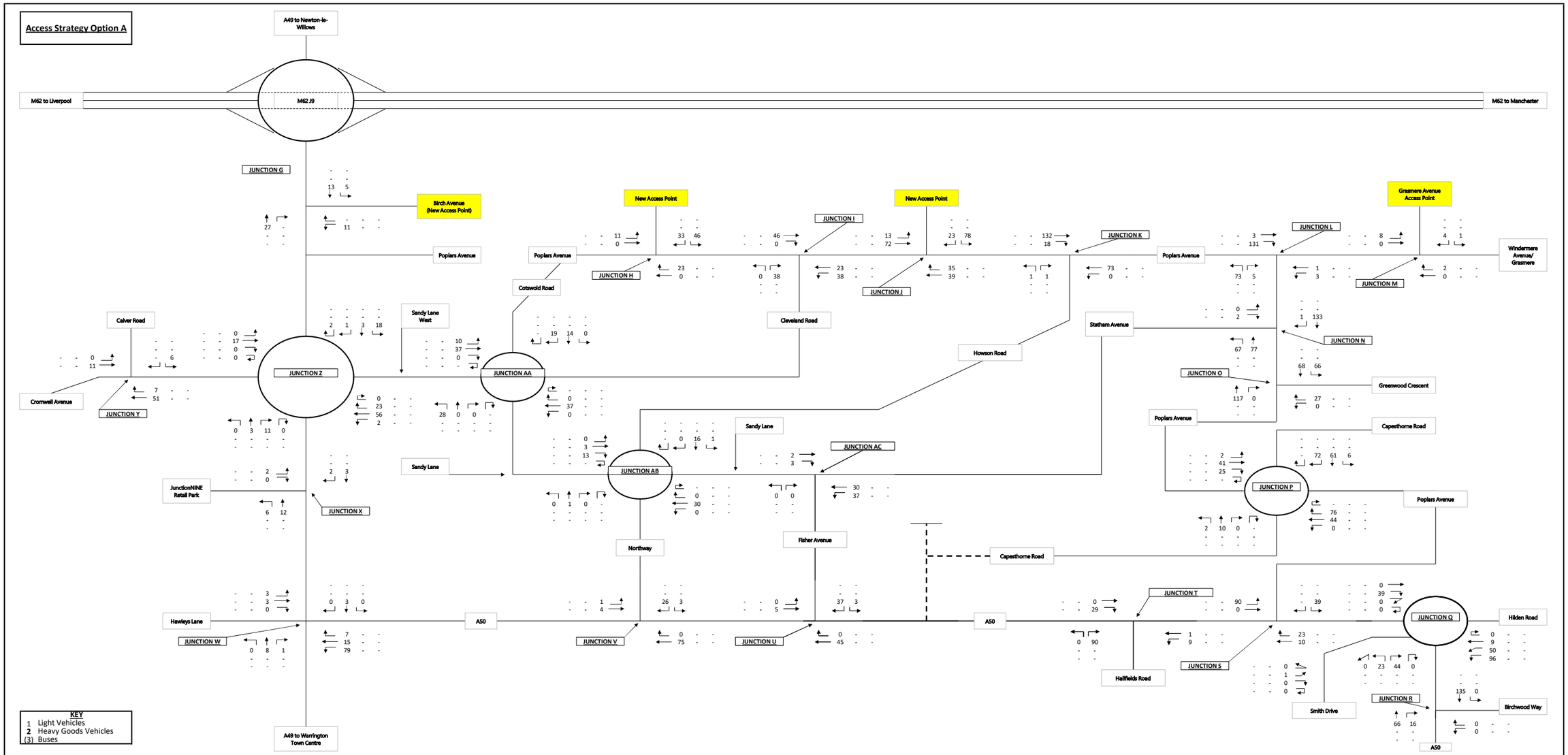
Capesthorne Road
JUNCTION AP
JUNCTION AI
Locking Stumps Lane
JUNCTION AR
Enfield Park Road
Crab Lane
Cinnamon Lane
Hilden Road
JUNCTION AN
JUNCTION AS
Fearnhead Lane
JUNCTION AJ
Birchwood Park Avenue
JUNCTION AL
JUNCTION AK
Birchwood Way
JUNCTION AM
Birchwood Way
Birchwood Way
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
Blacklrook Avenue
Woolston Grange
M6 to Stoke-on-Trent
Oakwood Gate
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Development
2022 - Do Something (SE of M62)
HighgateTransportation


Access Strategy Option A
A49 to Newton-le-Willows
Golborne Road
Winwick Link Road to M6 J22
M6 to Preston
JUNCTION B
JUNCTION C
Myddleton Lane
Southworth Lane
Southworth Lane
JUNCTION A
Delph Lane
Winwick Park Avenue
JUNCTION F
Delph Lane Retail Park
JUNCTION E
Delph Lane
Mill House Lane
JUNCTION D
M62 to Liverpool
M62 J9
M62 J10/M6 J21A
M62 to Manchester
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
A49 to Warrington Town Centre
Mill Lane
M6 to Stoke-on-Trent
Locking Stumps Lane
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Development
2022 - Do Something (FULL Development) (N of M62)
HighgateTransportation

Access Strategy Option A



KEY

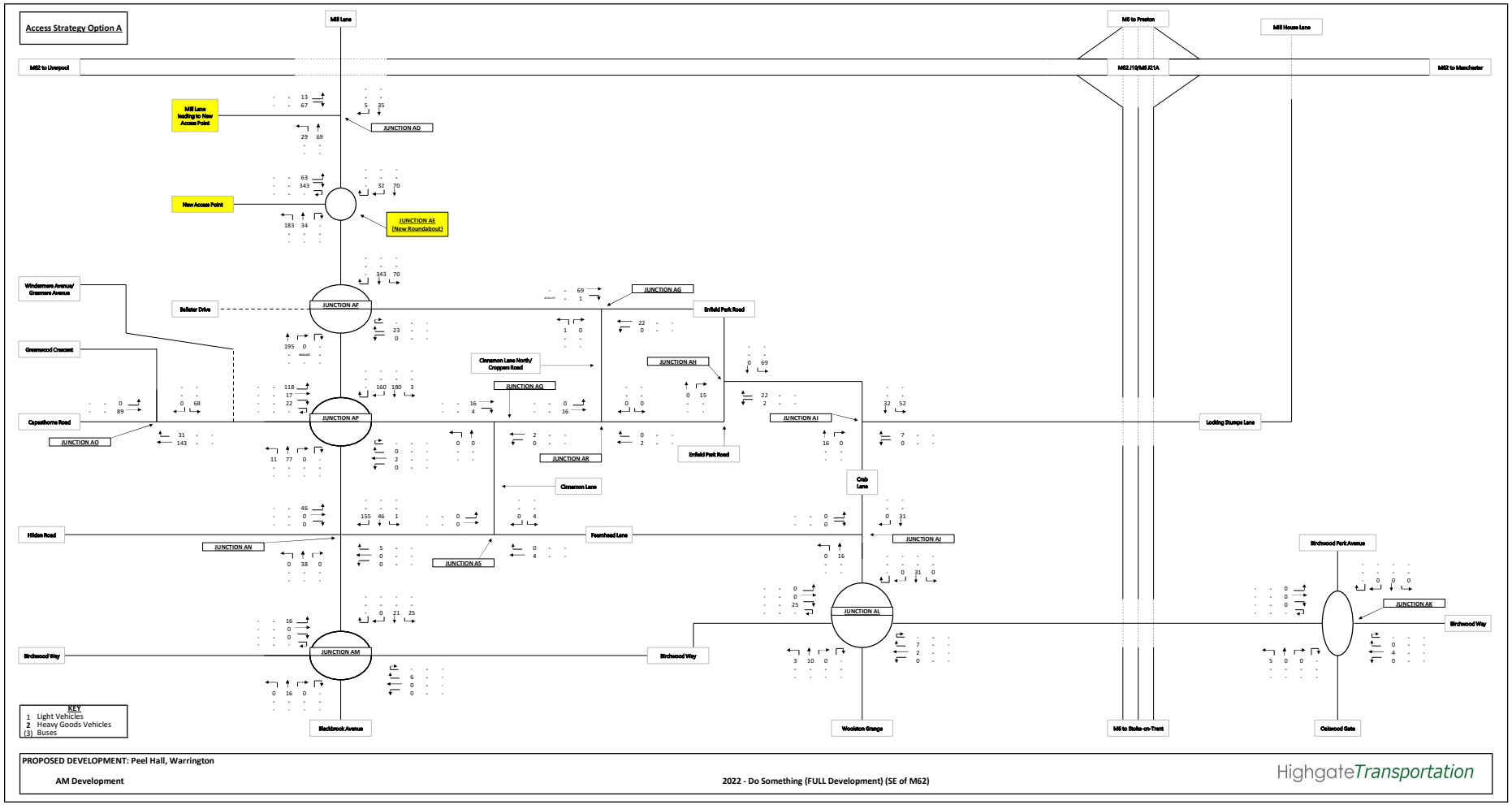
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses

PROPOSED DEVELOPMENT: Peel Hall, Warrington

AM Development

2022 - Do Something (FULL Development) (SW of M62)

HighgateTransportation


Access Strategy Option A
Mill Lane
M62 to Liverpool
M6 to Preston
Mill House Lane
M62 J10/M6 J21A
M62 to Manchester
Mill Lane leading to New Access Point
JUNCTION AD
New Access Point
JUNCTION AE (New Roundabout)
Windermere Avenue/ Grasmere Avenue
Bellster Drive
JUNCTION AF
JUNCTION AG
Enfield Park Road
Greenwood Crescent
Cinnamon Lane North/ Croppers Road
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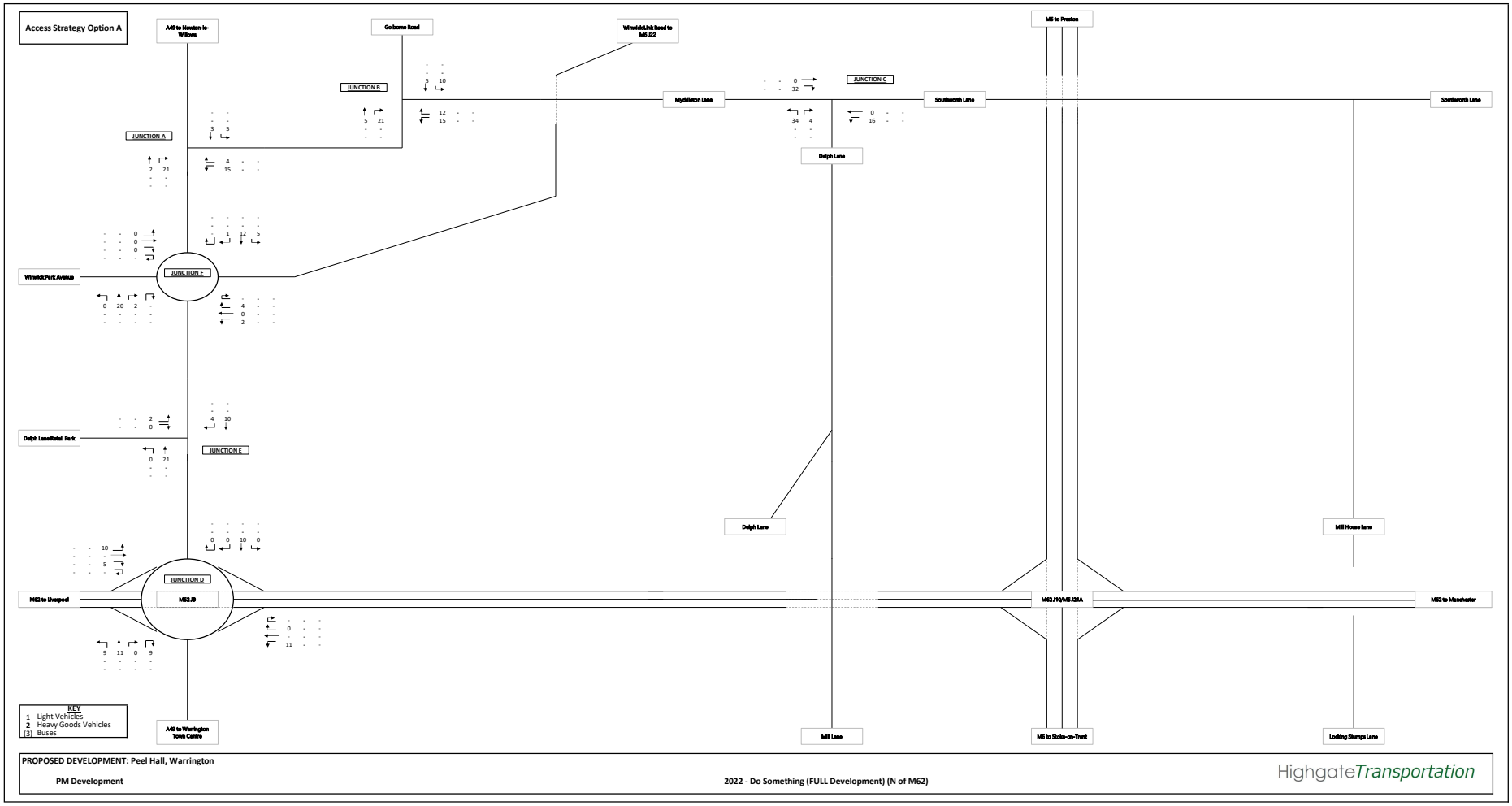
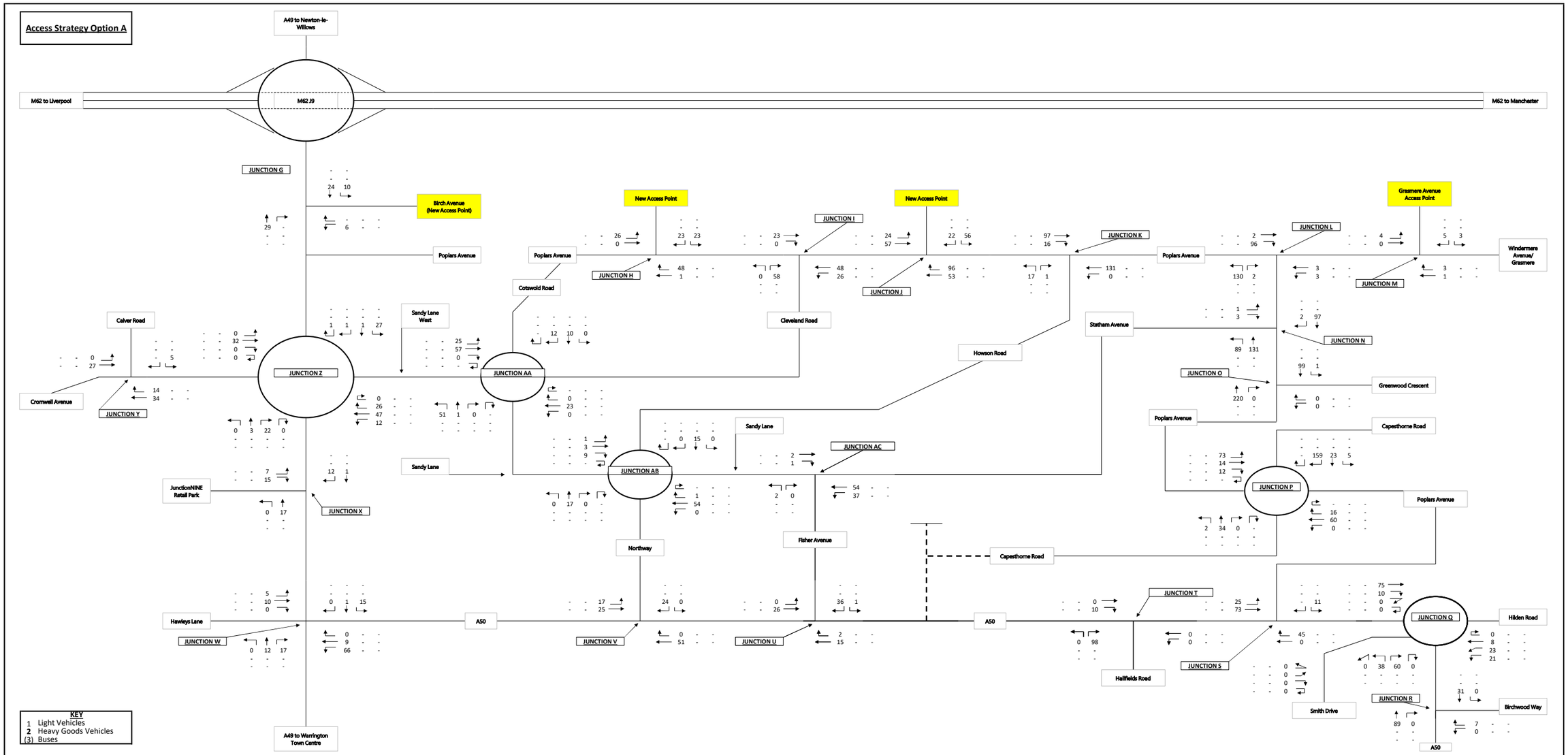
JUNCTION AI
Lodging Stumps Lane
JUNCTION AR
Enfield Park Road
Crab Lane
Cinnamon Lane
Hilden Road
JUNCTION AN
JUNCTION AS
Fearnhead Lane
JUNCTION AJ
Birchwood Park Avenue
JUNCTION AL
JUNCTION AK
Birchwood Way
JUNCTION AM
Birchwood Way
Birchwood Way
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
Blackbrook Avenue
Woolston Grange
M6 to Stoke-on-Trent
Oakwood Gate
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Development
2022 - Do Something (FULL Development) (SE of M62)
HighgateTransportation


Access Strategy Option A
A49 to Newton-le-Willows
Golborne Road
Winwick Link Road to M6 J22
M6 to Preston
JUNCTION B
JUNCTION C
Myddleton Lane
Southworth Lane
Southworth Lane
JUNCTION A
Delph Lane
Winwick Park Avenue
JUNCTION F
Delph Lane Retail Park
JUNCTION E
Delph Lane
Mill House Lane
JUNCTION D
M62 to Liverpool
M62 J9
M62 J10/M6 J21A
M62 to Manchester
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
A49 to Warrington Town Centre
Mill Lane
M6 to Stoke-on-Trent
Locking Stumps Lane
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Development
2022 - Do Something (FULL Development) (N of M62)
HighgateTransportation

Access Strategy Option A



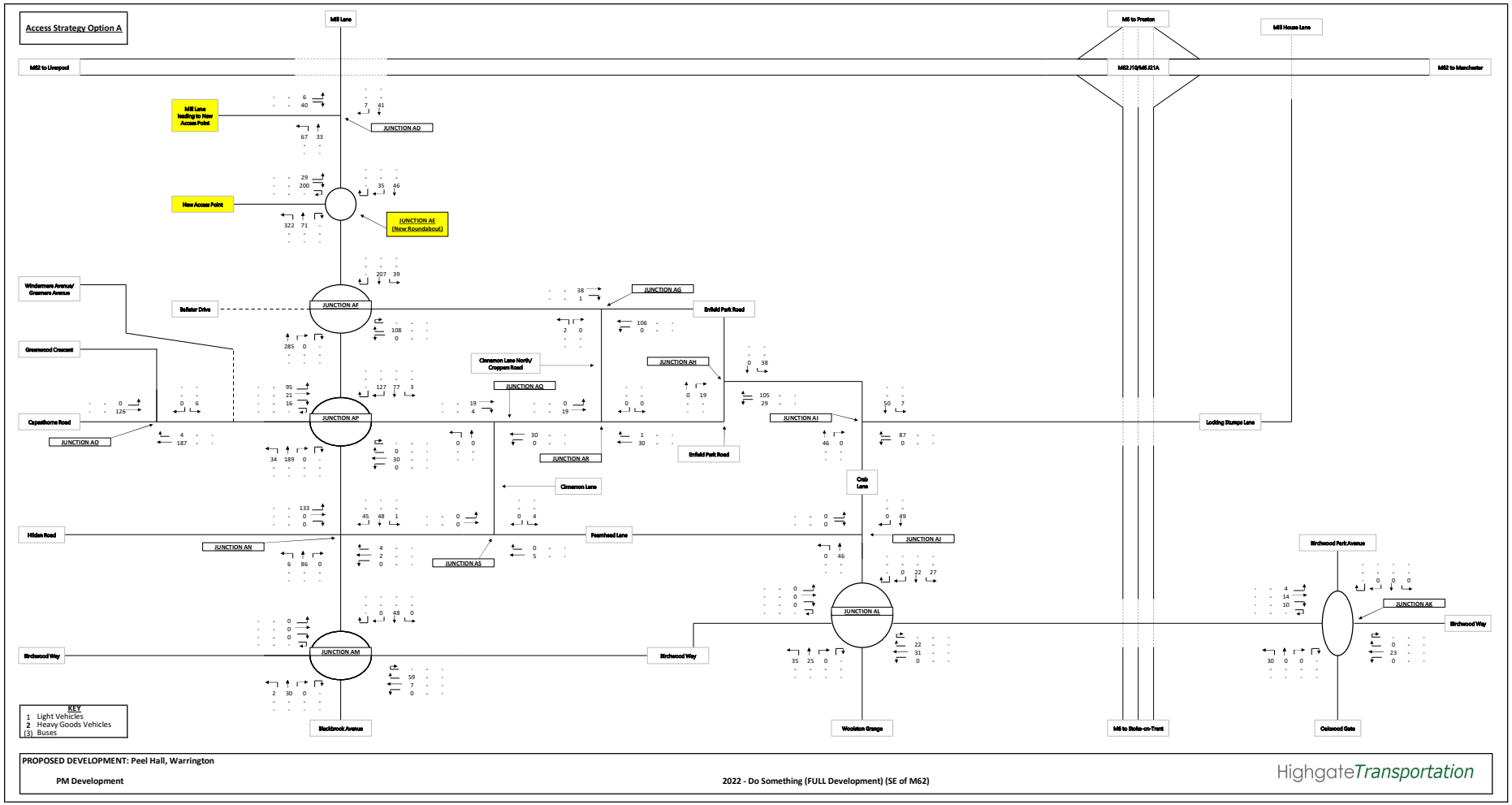
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses

PROPOSED DEVELOPMENT: Peel Hall, Warrington

PM Development

2022 - Do Something (FULL Development) (SW of M62)

HighgateTransportation


Access Strategy Option A
Mill Lane
M62 to Liverpool
M6 to Preston
Mill House Lane
M62 J10/M6 J21A
M62 to Manchester
Mill Lane leading to New Access Point
JUNCTION AD
New Access Point
JUNCTION AE (New Roundabout)
Windermere Avenue/ Grasmere Avenue
Bellster Drive
JUNCTION AF
JUNCTION AG
Enfield Park Road
Greenwood Crescent
Cinnamon Lane North/ Croppers Road
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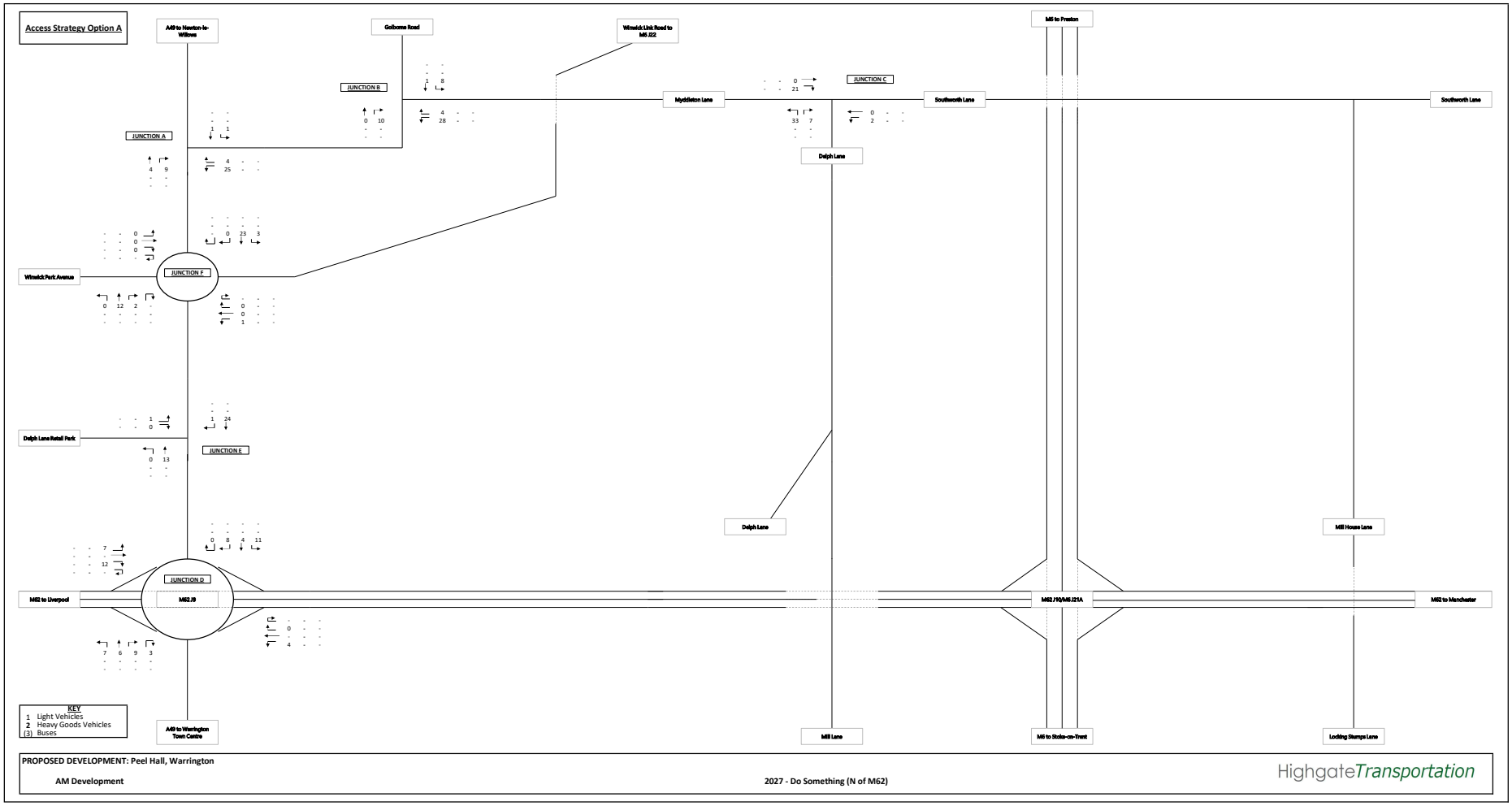
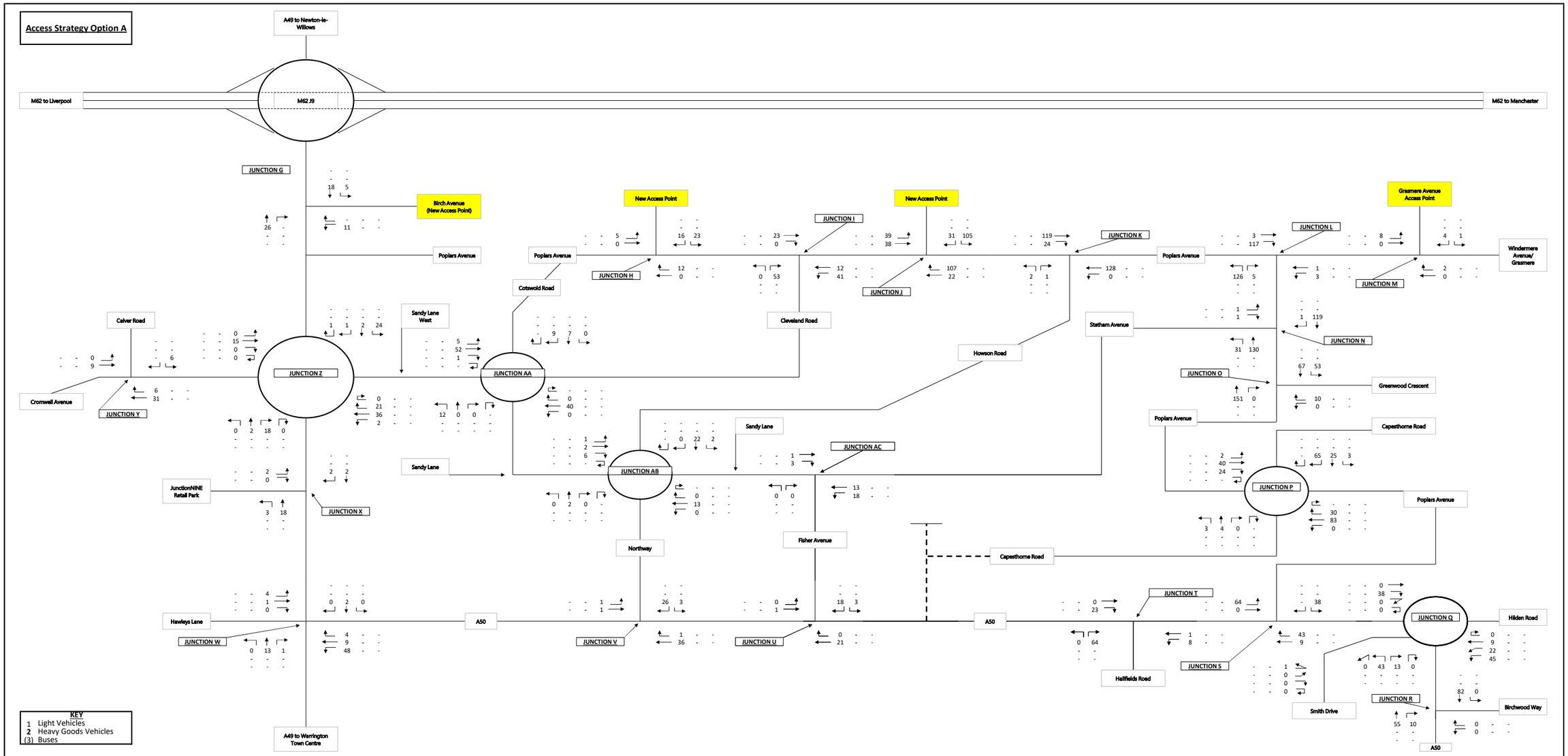
Enfield Park Road
Crab Lane
Cinnamon Lane
Hilden Road
JUNCTION AN
JUNCTION AS
Fearnhead Lane
JUNCTION AJ
Birchwood Park Avenue
JUNCTION AL
JUNCTION AK
Birchwood Way
JUNCTION AM
Birchwood Way
Birchwood Way
Blacklrock Avenue
Woolston Grange
M6 to Stoke-on-Trent
Oakwood Gate
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Development
2022 - Do Something (FULL Development) (SE of M62)
HighgateTransportation


Access Strategy Option A
A49 to Newton-le-Willows
Golborne Road
Winwick Link Road to M6 J22
M6 to Preston
JUNCTION B
Myddleton Lane
JUNCTION C
Southworth Lane
Southworth Lane
JUNCTION A
Delph Lane
Winwick Park Avenue
JUNCTION F
Delph Lane Retail Park
JUNCTION E
Delph Lane
Mill House Lane
JUNCTION D
M62 to Liverpool
M62 J9
M62 J10/M6 J21A
M62 to Manchester
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
A49 to Warrington Town Centre
Mill Lane
M6 to Stoke-on-Trent
Locking Stumps Lane
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Development
2027 - Do Something (N of M62)
HighgateTransportation

Access Strategy Option A



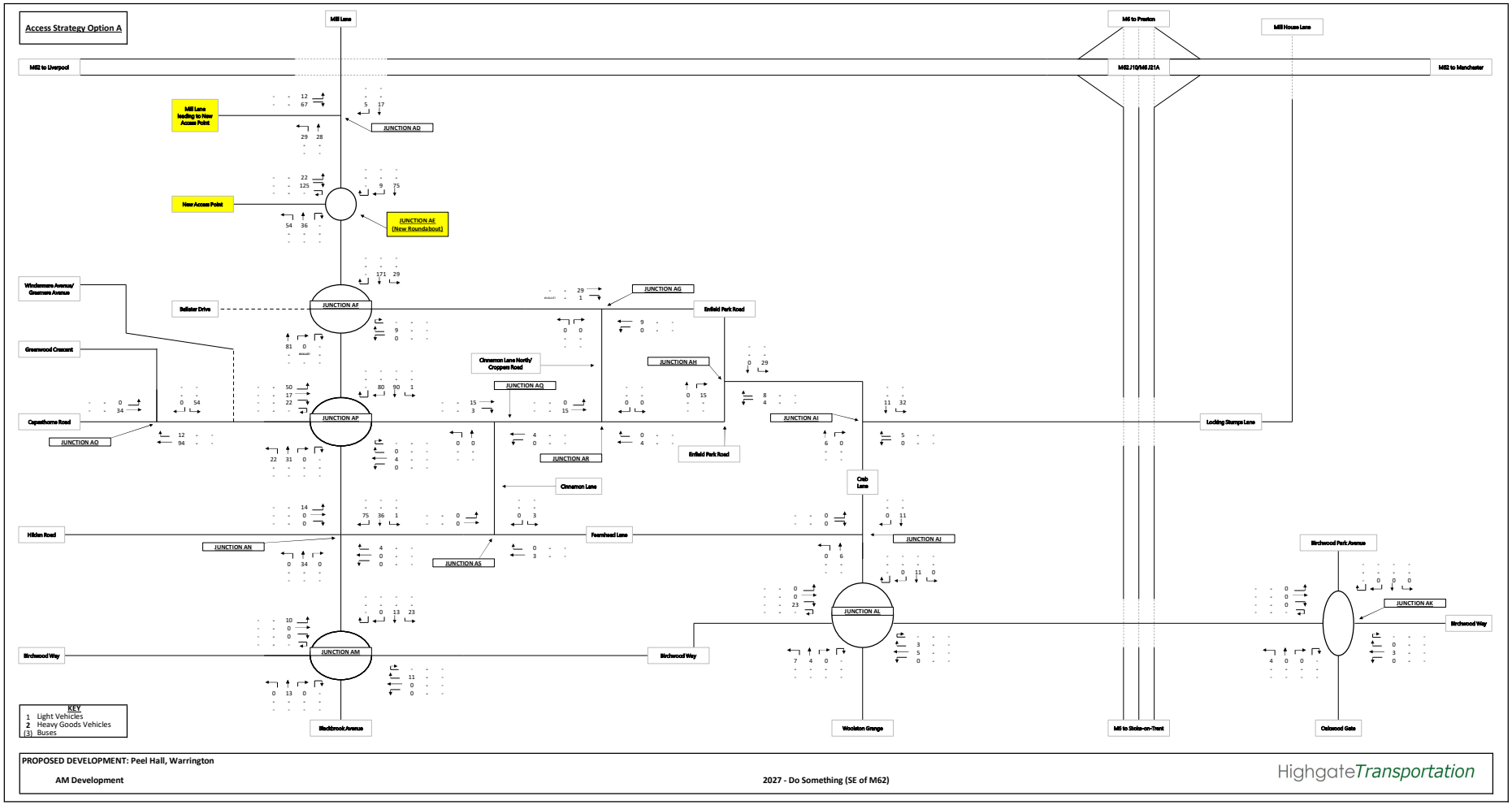
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses

PROPOSED DEVELOPMENT: Peel Hall, Warrington

AM Development

2027 - Do Something (SW of M62)

HighgateTransportation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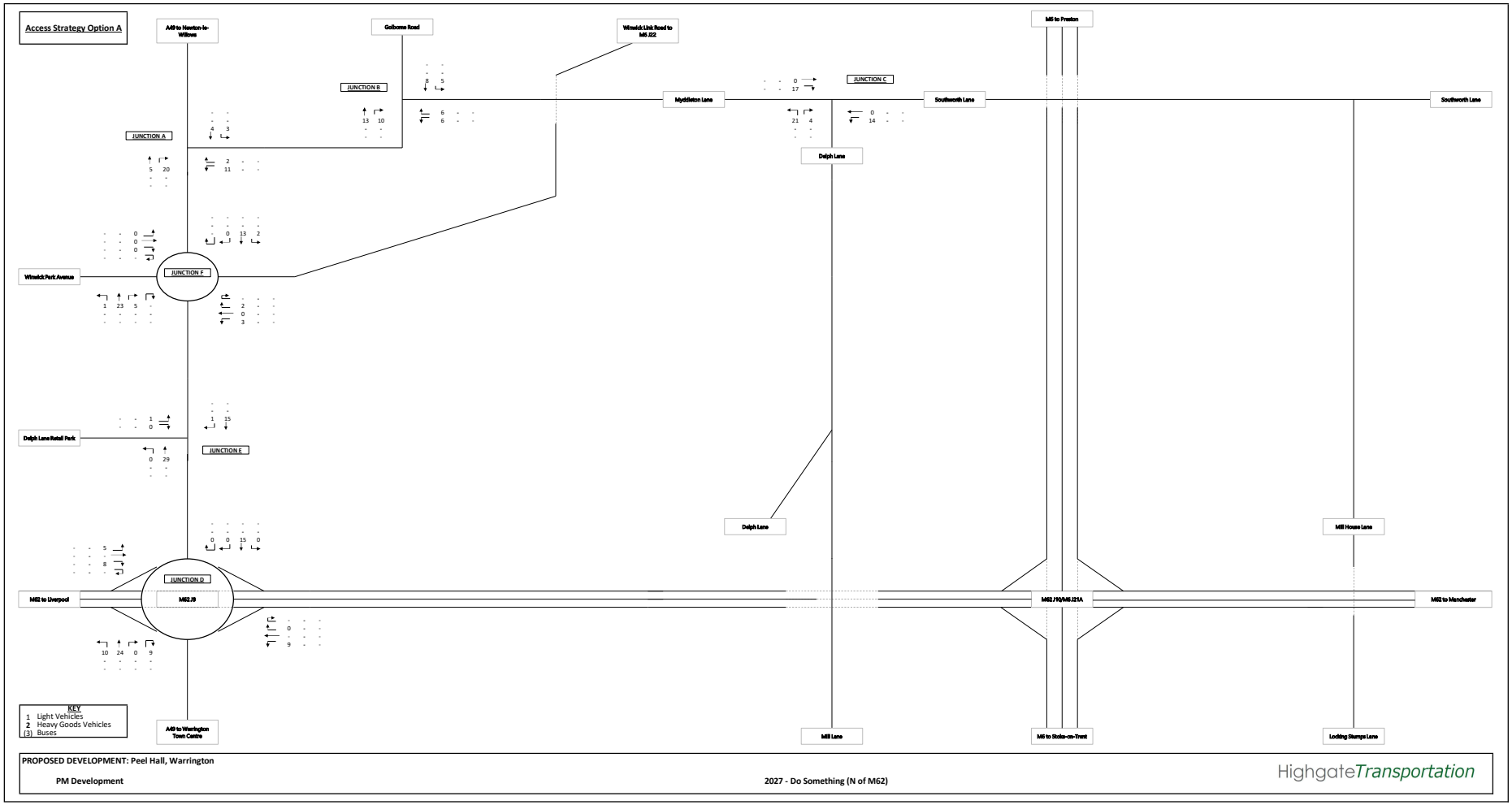
Mill Lane
M62 to Liverpool
M6 to Preston
Mill House Lane
M62 J10/M6 J21A
M62 to Manchester
Mill Lane leading to New Access Point
JUNCTION AD
New Access Point
JUNCTION AE (New Roundabout)
Windermere Avenue/ Grasmere Avenue
Ballater Drive
JUNCTION AF
JUNCTION AG
Enfield Park Road
Greenwood Crescent
Cinnamon Lane Northy Croppen Road
JUNCTION AH
JUNCTION AQ
Capesthorne Road
JUNCTION AP
JUNCTION AI
Locking Stumps Lane
JUNCTION AR
Enfield Park Road
Cinnamon Lane
Crab Lane
Hilden Road
JUNCTION AN
JUNCTION AS
Fearnhead Lane
JUNCTION AJ
Birchwood Park Avenue
JUNCTION AL
JUNCTION AK
Birchwood Way
JUNCTION AM
Birchwood Way
Birchwood Way
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
Blacklrook Avenue
Woolston Grange
M6 to Stoke-on-Trent
Oakwood Gate
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Development
2027 - Do Something (SE of M62)
HighgateTransportation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A49 to Newton-le-Willows
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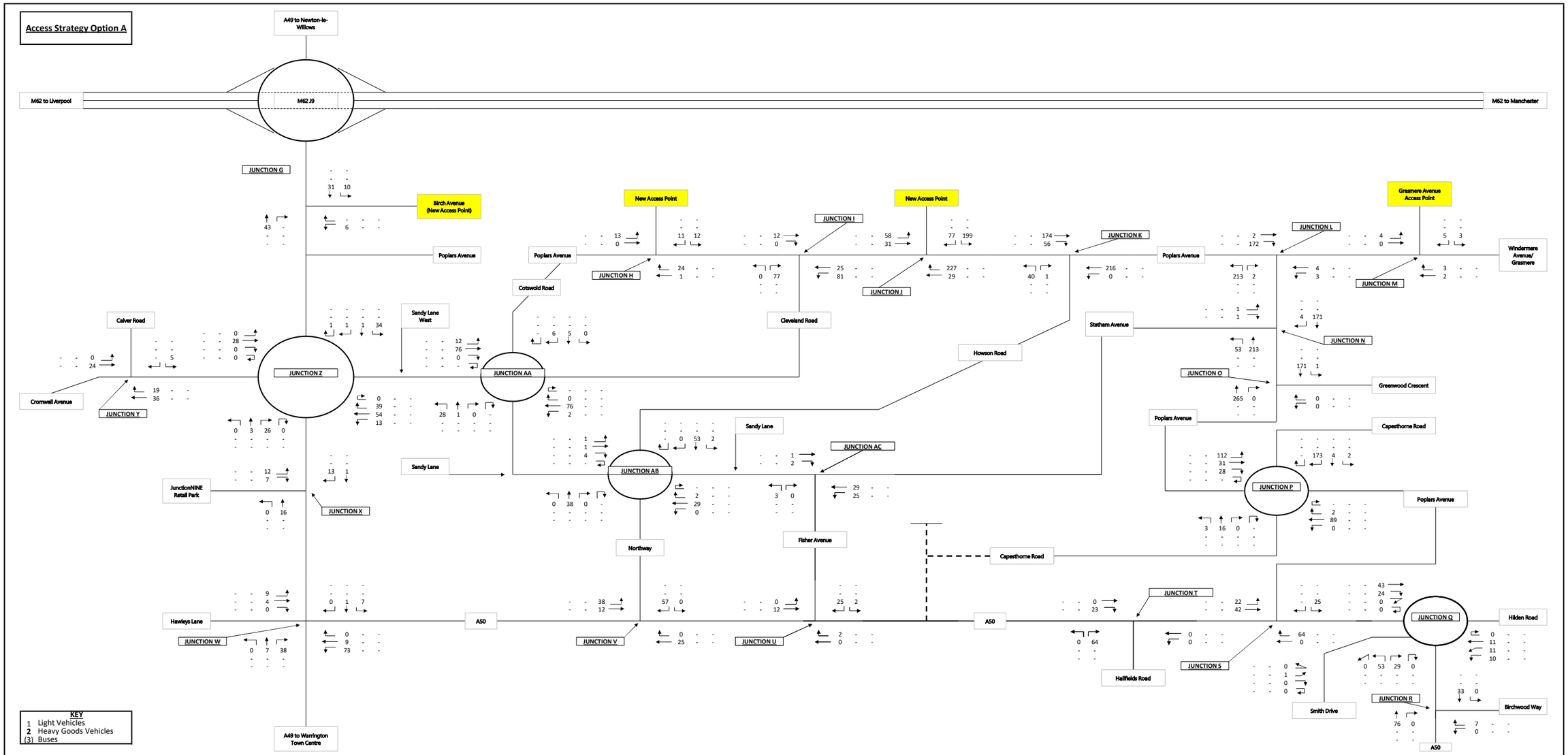
Winwick Link Road to M6 J22
M6 to Preston
JUNCTION B
JUNCTION C
Myddleton Lane
Southworth Lane
Southworth Lane
JUNCTION A
Delph Lane
Winwick Park Avenue
JUNCTION F
Delph Lane Retail Park
JUNCTION E
Delph Lane
Mill House Lane
JUNCTION D
M62 to Liverpool
M62 J9
M62 J10/M6 J21A
M62 to Manchester
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
A49 to Warrington Town Centre
Mill Lane
M6 to Stoke-on-Trent
Locking Stumps Lane
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Development
2027 - Do Something (N of M62)
HighgateTransportation

Access Strategy Option A



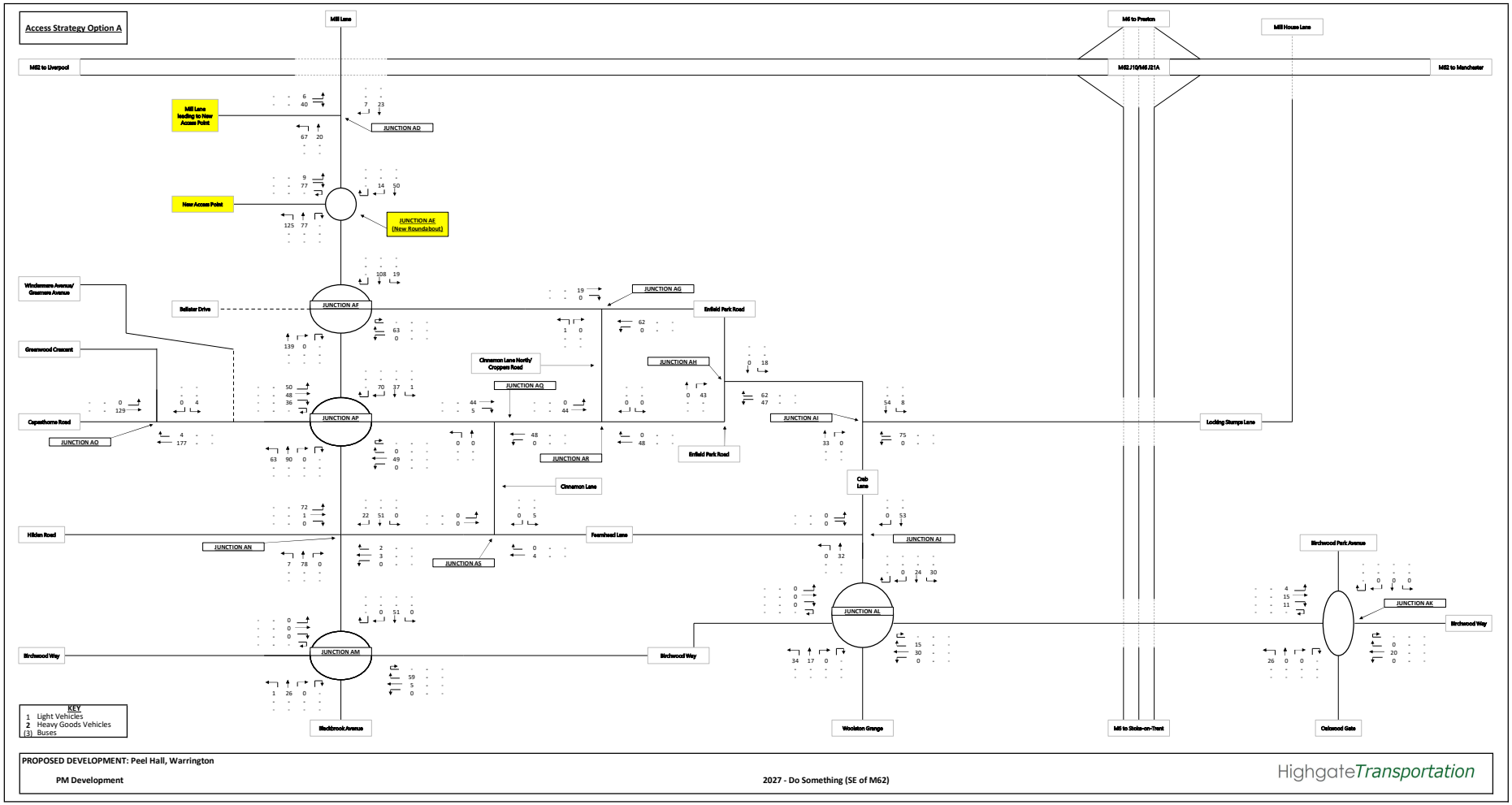
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses

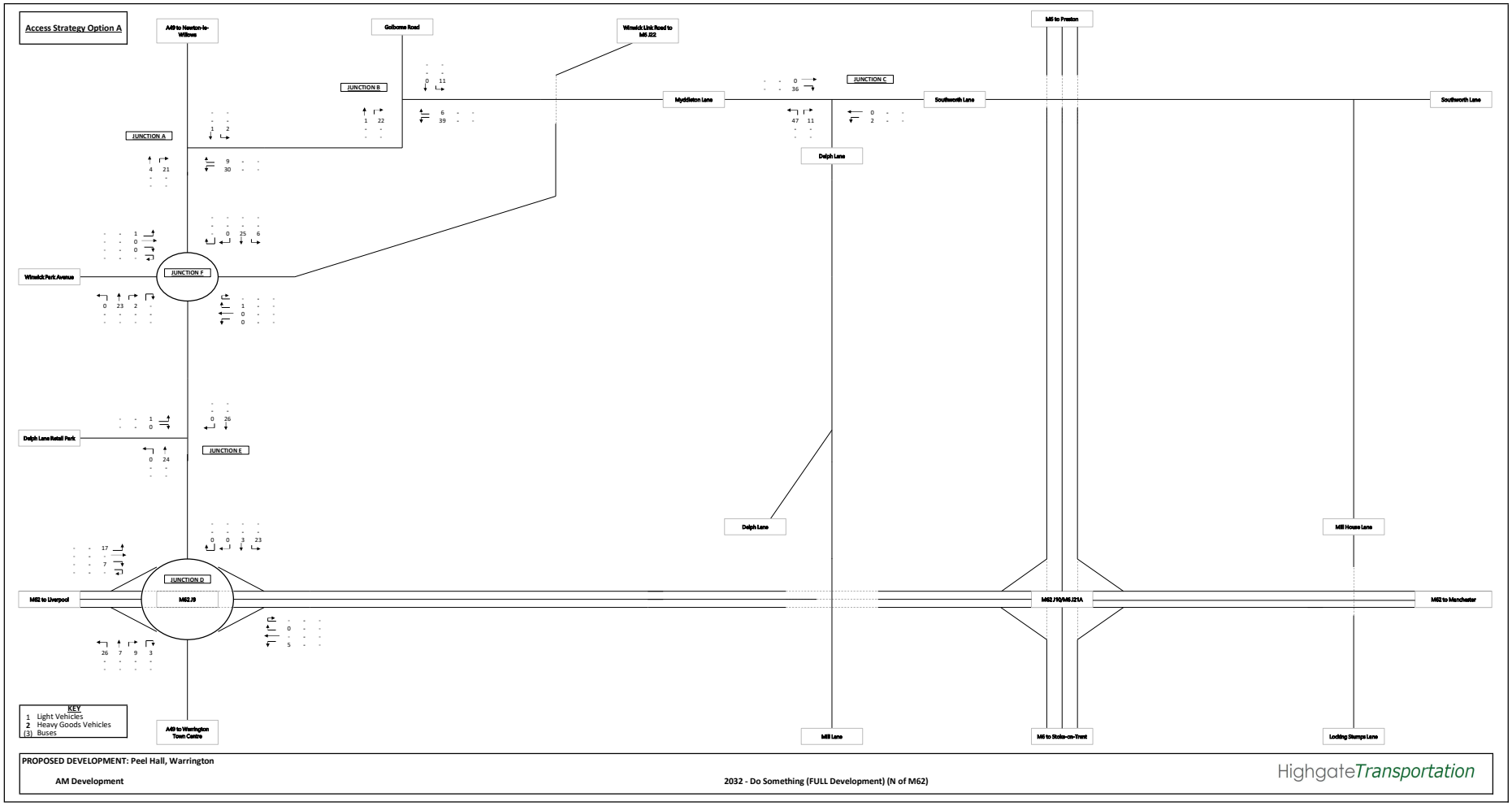
PROPOSED DEVELOPMENT: Peel Hall, Warrington

PM Development

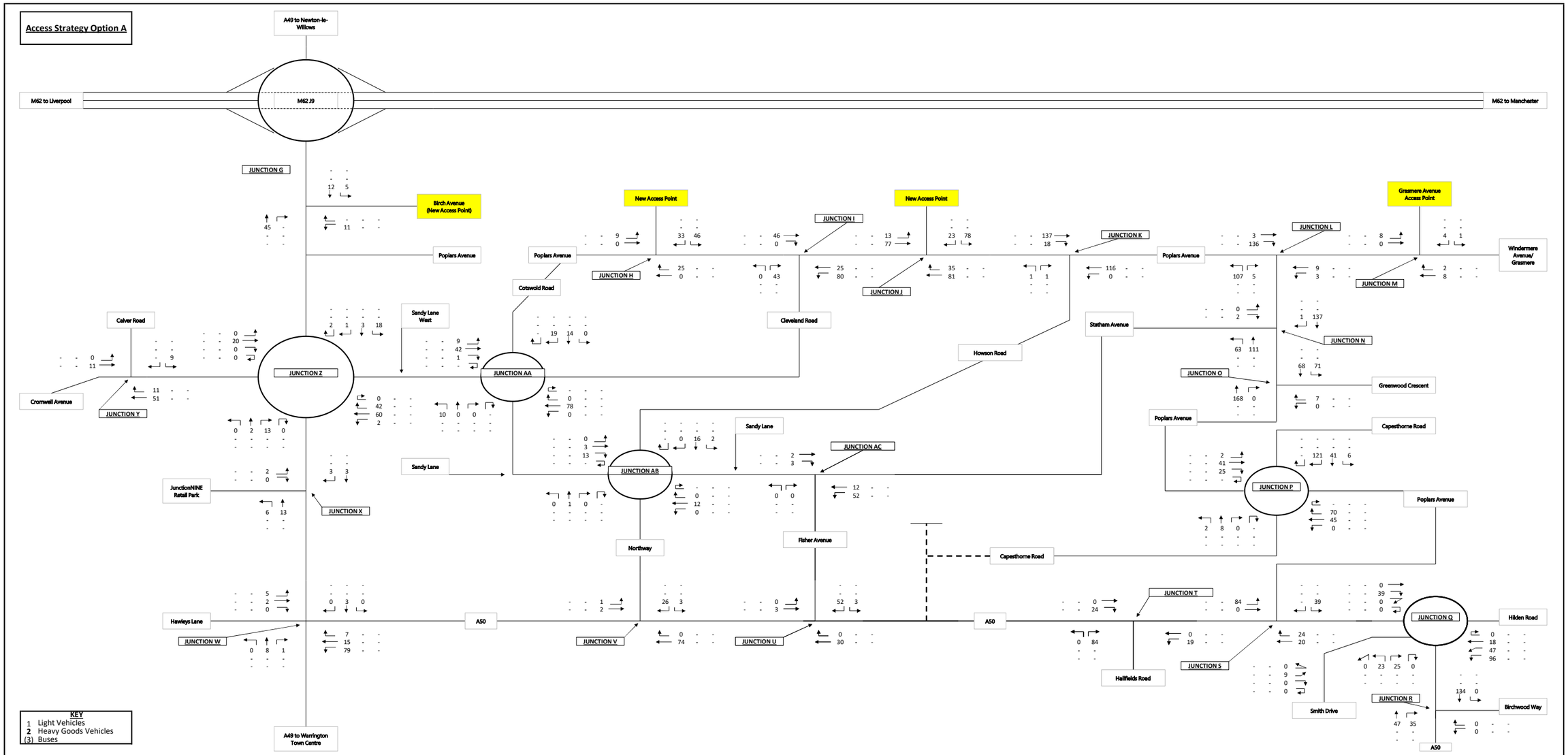
2027 - Do Something (SW of M62)

HighgateTransportation


Access Strategy Option A
Mill Lane
M62 to Liverpool
M6 to Preston
Mill House Lane
M62 J10/M6 J21A
M62 to Manchester
Mill Lane leading to New Access Point
JUNCTION AD
New Access Point
JUNCTION AE (New Roundabout)
Windermere Avenue/ Grasmere Avenue
Ballater Drive
JUNCTION AF
JUNCTION AG
Enfield Park Road
Greenwood Crescent
Cinnamon Lane North/ Croppers Road
JUNCTION AH
JUNCTION AQ
Capesthorne Road
JUNCTION AP
JUNCTION AI
Locking Stumps Lane
JUNCTION AR
Enfield Park Road
Cinnamon Lane
Crab Lane
Hilden Road
JUNCTION AN
JUNCTION AS
Fearnhead Lane
JUNCTION AJ
Birchwood Park Avenue
JUNCTION AL
JUNCTION AK
Birchwood Way
JUNCTION AM
Birchwood Way
Birchwood Way
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
Blacklrook Avenue
Woolston Grange
M6 to Stoke-on-Trent
Oakwood Gate
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Development
2027 - Do Something (SE of M62)
HighgateTransportation


Access Strategy Option A
A49 to Newton-le-Willows
Golborne Road
Winwick Link Road to M6 J22
M6 to Preston
JUNCTION B
JUNCTION C
Myddleton Lane
Southworth Lane
Southworth Lane
JUNCTION A
Delph Lane
Winwick Park Avenue
JUNCTION F
Delph Lane Retail Park
JUNCTION E
Delph Lane
Mill House Lane
JUNCTION D
M62 to Liverpool
M62 J9
M62 J10/M6 J21A
M62 to Manchester
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
A49 to Warrington Town Centre
Mill Lane
M6 to Stoke-on-Trent
Locking Stumps Lane
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Development
2032 - Do Something (FULL Development) (N of M62)
HighgateTransportation

Access Strategy Option A



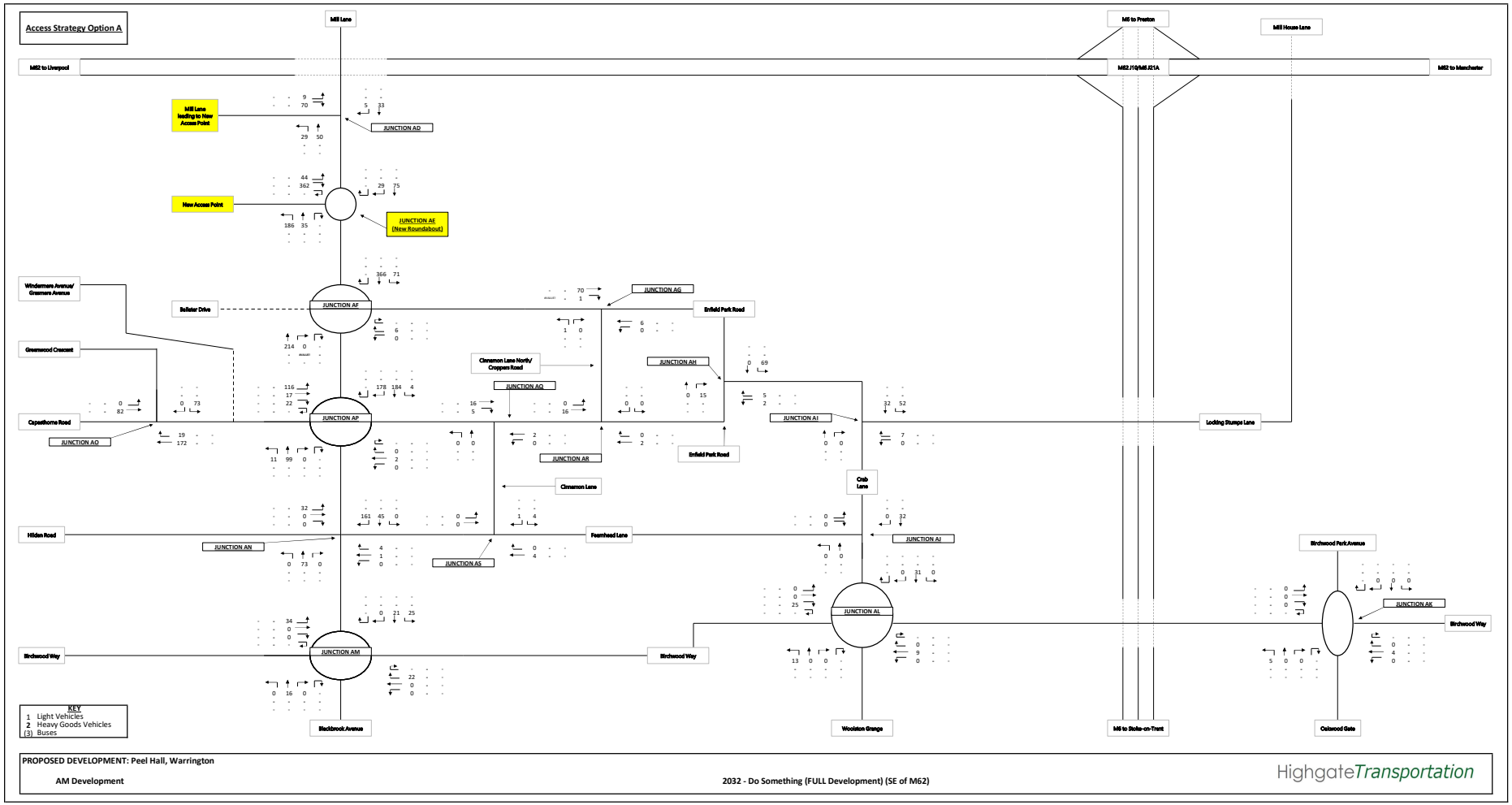
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses

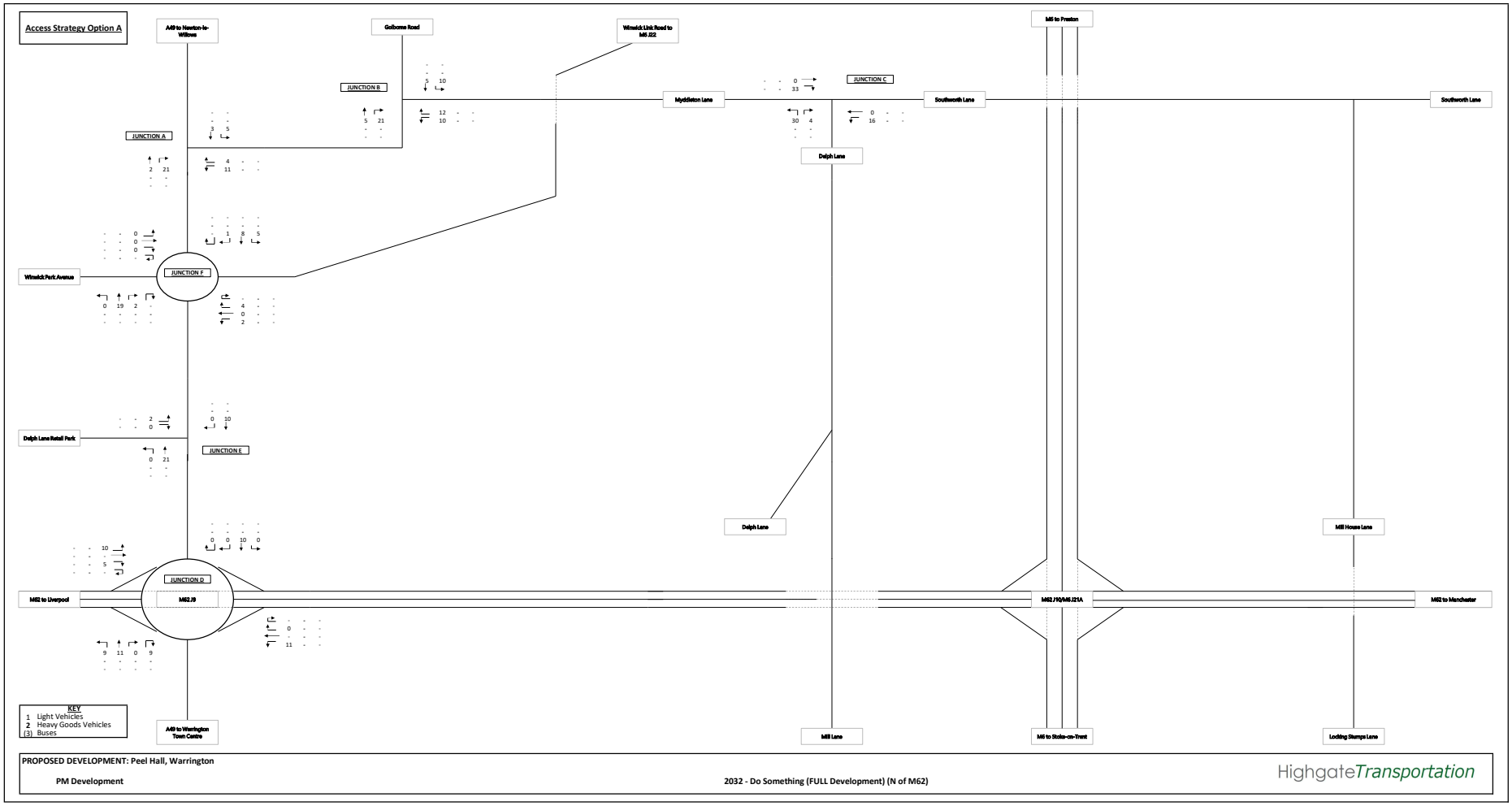
PROPOSED DEVELOPMENT: Peel Hall, Warrington

AM Development

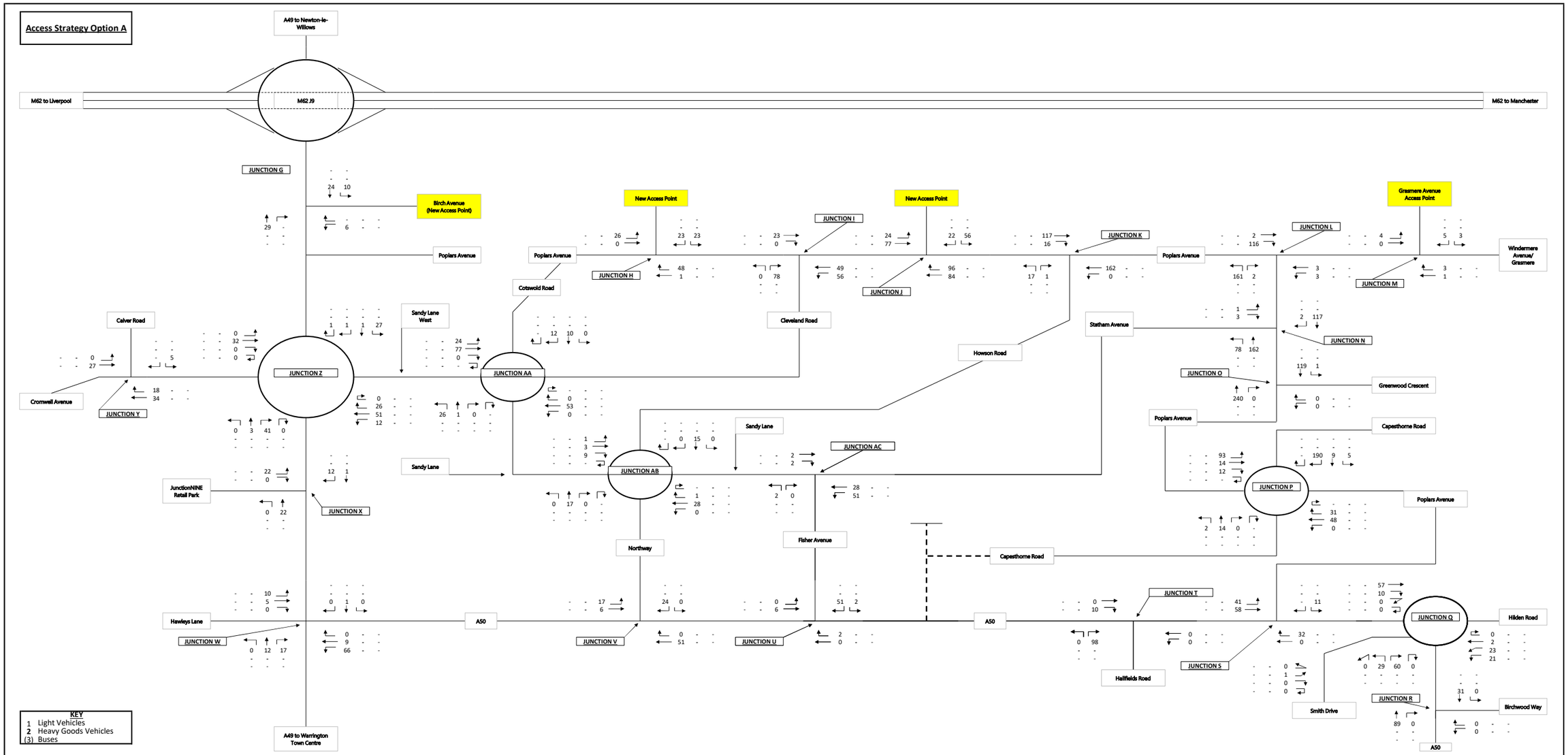
2032 - Do Something (FULL Development) (SW of M62)

HighgateTransportation


Access Strategy Option A
Mill Lane
M62 to Liverpool
M6 to Preston
Mill House Lane
M62 J10/M6 J21A
M62 to Manchester
Mill Lane leading to New Access Point
JUNCTION AD
New Access Point
JUNCTION AE (New Roundabout)
Windermere Avenue/ Grasmere Avenue
Bellster Drive
JUNCTION AF
JUNCTION AG
Enfield Park Road
Greenwood Crescent
Cinnamon Lane North/ Croppers Road
JUNCTION AH
JUNCTION AQ
Capesthorne Road
JUNCTION AP
JUNCTION AI
Lodging Stumps Lane
JUNCTION AR
Enfield Park Road
Crab Lane
Cinnamon Lane
Hilden Road
JUNCTION AN
JUNCTION AS
Fearnhead Lane
JUNCTION AJ
Birchwood Park Avenue
JUNCTION AL
JUNCTION AK
Birchwood Way
JUNCTION AM
Birchwood Way
Birchwood Way
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
Blackbrook Avenue
Woolston Grange
M6 to Stoke-on-Trent
Oakwood Gate
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Development
2032 - Do Something (FULL Development) (SE of M62)
HighgateTransportation


Access Strategy Option A
A49 to Newton-le-Willows
Golborne Road
Winwick Link Road to M6 J22
M6 to Preston
JUNCTION B
JUNCTION C
Myddleton Lane
Southworth Lane
Southworth Lane
JUNCTION A
Delph Lane
Winwick Park Avenue
JUNCTION F
Delph Lane Retail Park
JUNCTION E
Delph Lane
Mill House Lane
JUNCTION D
M62 to Liverpool
M62 J9
M62 J10/M6 J21A
M62 to Manchester
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
A49 to Warrington Town Centre
Mill Lane
M6 to Stoke-on-Trent
Locking Stumps Lane
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Development
2032 - Do Something (FULL Development) (N of M62)
HighgateTransportation

Access Strategy Option A



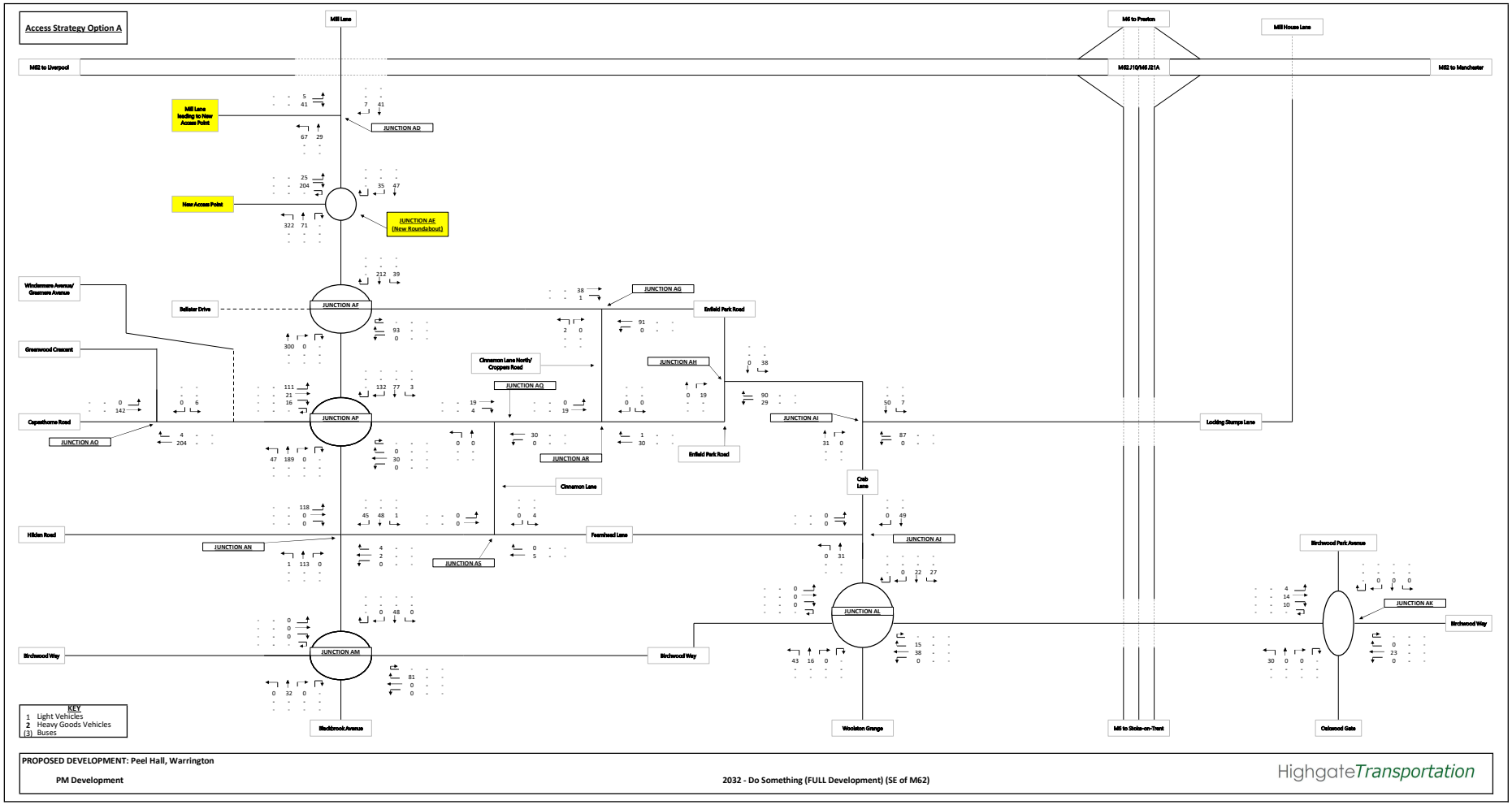
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses

PROPOSED DEVELOPMENT: Peel Hall, Warrington

PM Development

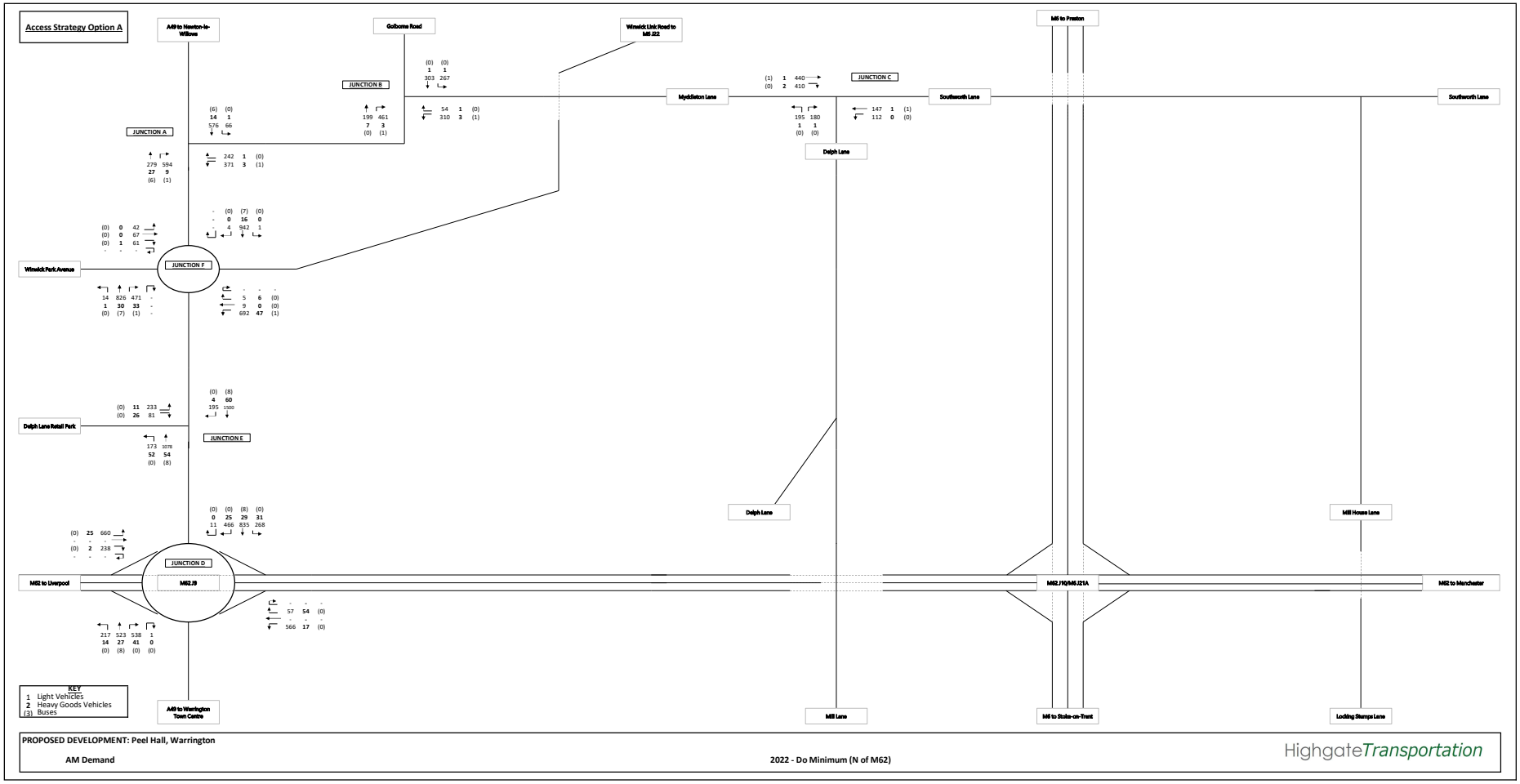
2032 - Do Something (FULL Development) (SW of M62)

HighgateTransportation

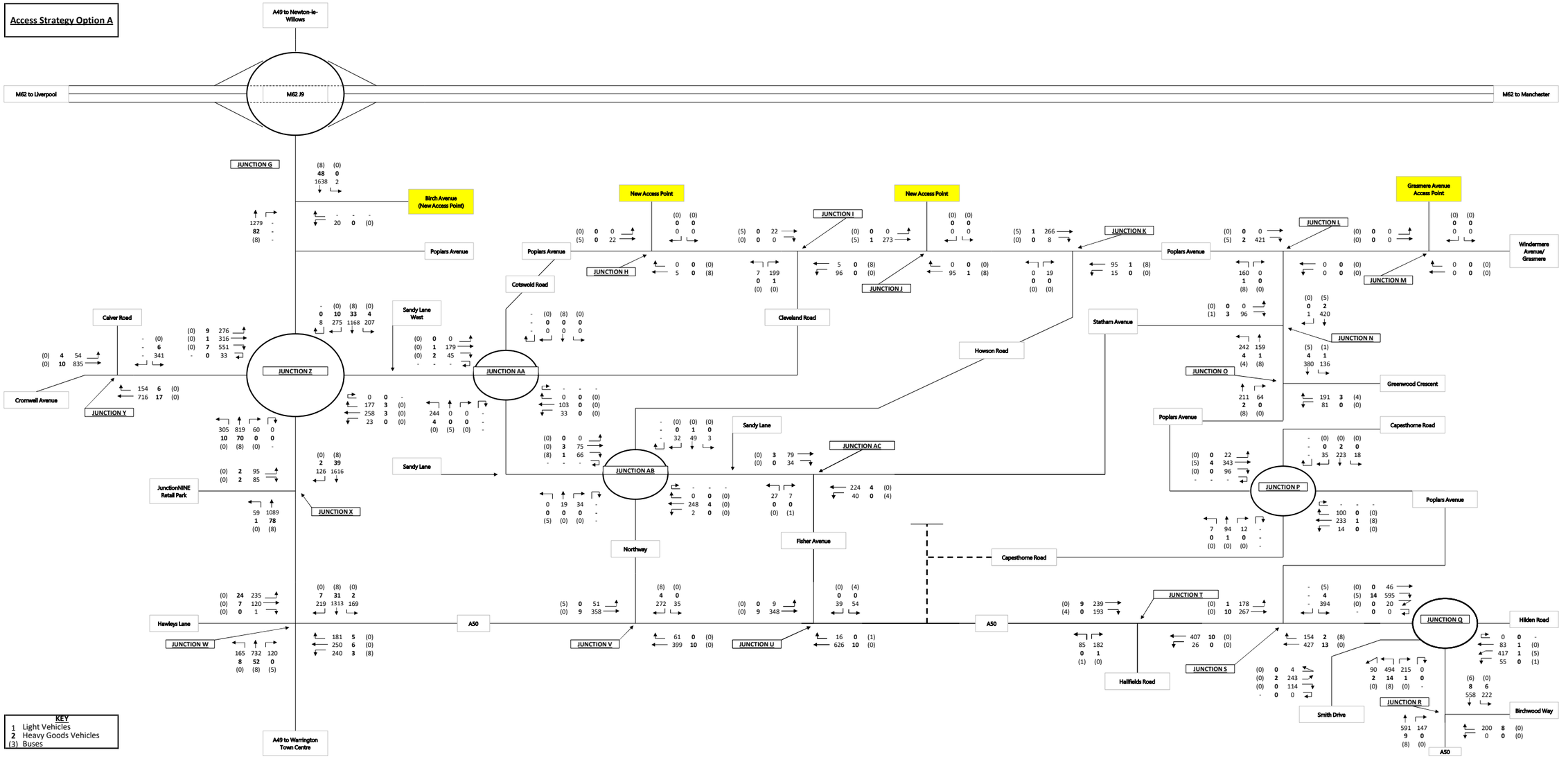

Access Strategy Option A
Mill Lane
M62 to Liverpool
M6 to Preston
Mill House Lane
M62 J10/M6 J21A
M62 to Manchester
Mill Lane leading to New Access Point
JUNCTION AD
New Access Point
JUNCTION AE (New Roundabout)
Windermere Avenue/ Grasmere Avenue
Ballater Drive
JUNCTION AF
JUNCTION AG
Enfield Park Road
Greenwood Crescent
Cinnamon Lane North/ Croppers Road
JUNCTION AH
JUNCTION AQ
Capesthorne Road
JUNCTION AP
JUNCTION AI
Locking Stumps Lane
JUNCTION AR
Enfield Park Road
Cinnamon Lane
Crab Lane
Hilden Road
JUNCTION AN
JUNCTION AS
Fearnhead Lane
JUNCTION AJ
Birchwood Park Avenue
JUNCTION AL
JUNCTION AK
Birchwood Way
JUNCTION AM
Birchwood Way
Birchwood Way
Blacklrook Avenue
Woolston Grange
M6 to Stoke-on-Trent
Oakwood Gate
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Development
2032 - Do Something (FULL Development) (SE of M62)
HighgateTransportation

TRANSPORTATION AND HIGHWAYS

T13 Forecast Years Flow Diagrams


Access Strategy Option A
A49 to Newton-le-Willows
Golborne Road
Winwick Link Road to M6 J22
M6 to Preston
JUNCTION A
JUNCTION B
JUNCTION C
Myddleton Lane
Southworth Lane
Southworth Lane
Delph Lane
Winwick Park Avenue
JUNCTION F
Delph Lane Retail Park
JUNCTION E
Delph Lane
Mill House Lane
JUNCTION D
M62 to Liverpool
M62 J9
M62 J10/M6 J21A
M62 to Manchester
Mill Lane
M6 to Stoke-on-Trent
Locking Stumps Lane
A49 to Warrington Town Centre
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Demand
2022 - Do Minimum (N of M62)
HighgateTransportation

Access Strategy Option A



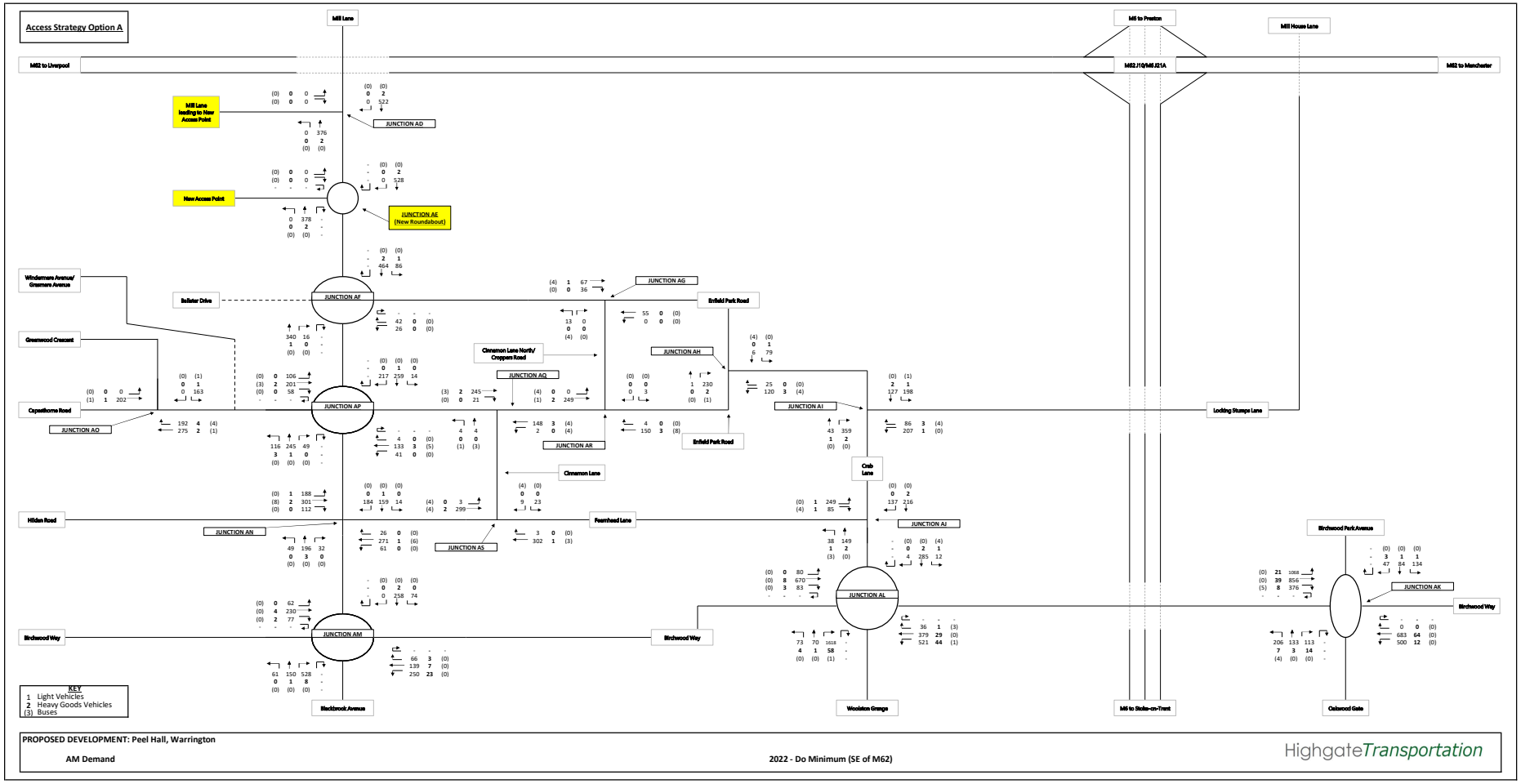
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses

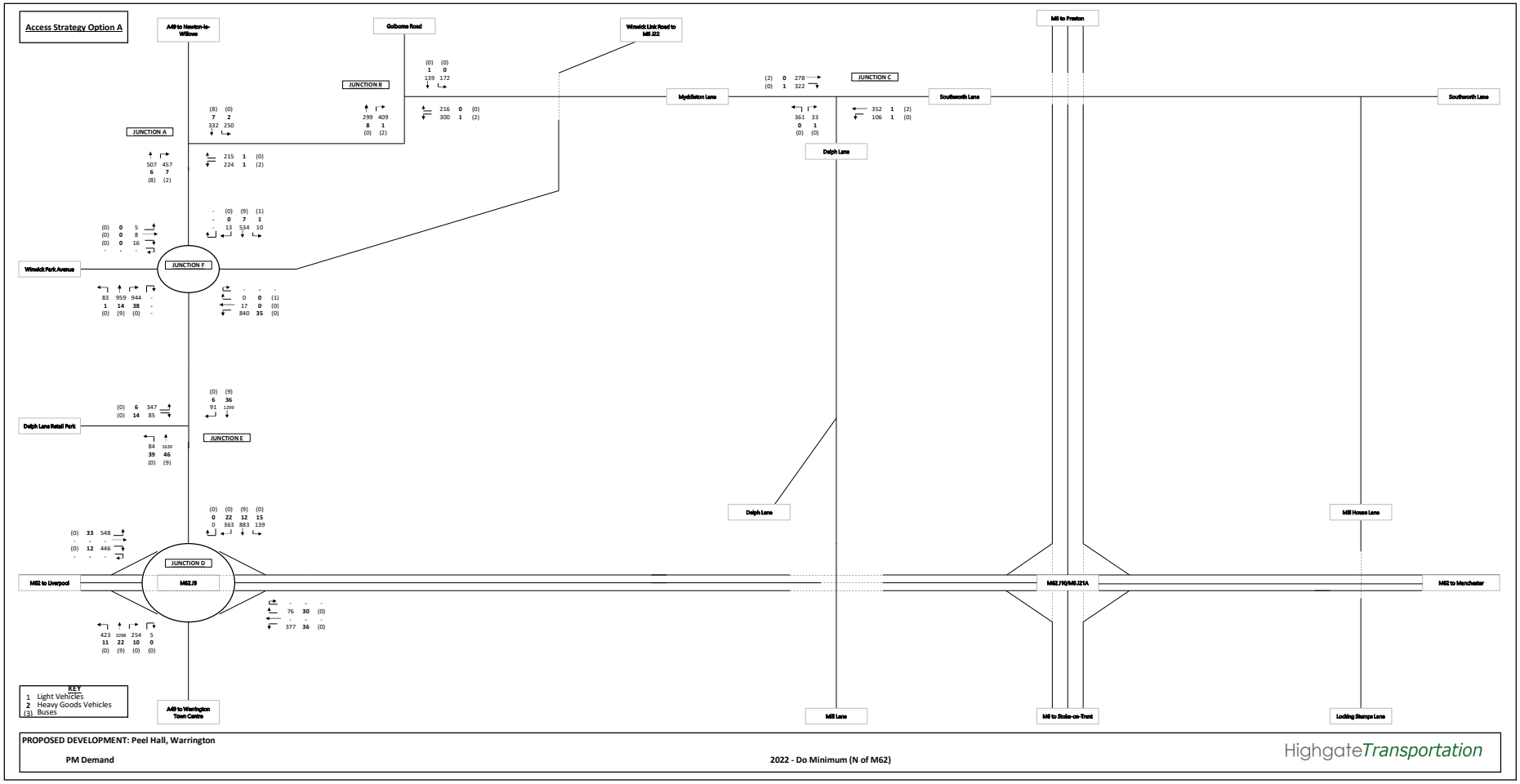
PROPOSED DEVELOPMENT: Peel Hall, Warrington

AM Demand

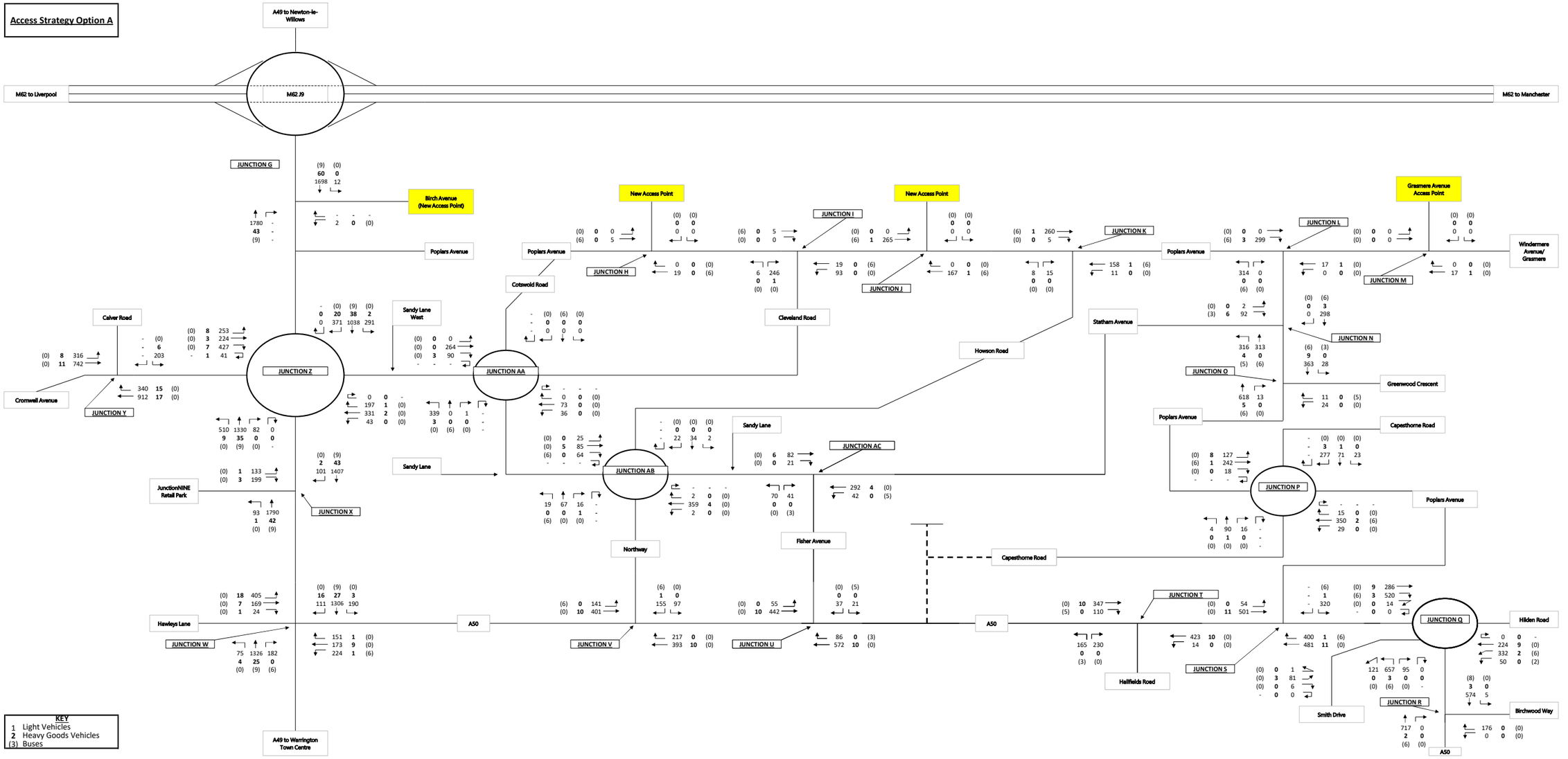
2022 - Do Minimum (SW of M62)

HighgateTransportation


Access Strategy Option A
Mill Lane
M62 to Liverpool
M6 to Preston
Mill House Lane
M62 J10/M6 J21A
M62 to Manchester
Mill Lane leading to New Access Point
JUNCTION AD
New Access Point
JUNCTION AE (New Roundabout)
Windermere Avenue/ Grasmere Avenue
Ballater Drive
JUNCTION AF
JUNCTION AG
Enfield Park Road
Greenwood Crescent
Cinnamon Lane North/ Croppers Road
JUNCTION AH
JUNCTION AQ
JUNCTION AO
JUNCTION AP
JUNCTION AI
Lodging Stumps Lane
Capesthorne Road
JUNCTION AR
Enfield Park Road
Cinnamon Lane
Cnb Lane
Hilden Road
JUNCTION AN
JUNCTION AS
Fernhead Lane
JUNCTION AJ
Birchwood Park Avenue
JUNCTION AL
JUNCTION AK
Birchwood Way
Birchwood Way
JUNCTION AM
Birchwood Way
Blackbrook Avenue
Woolston Grange
M6 to Stoke-on-Trent
Oakwood Gate
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Demand
2022 - Do Minimum (SE of M62)
HighgateTransportation


Access Strategy Option A
A49 to Newton-le-Willows
Golborne Road
Winwick Link Road to M6 J22
M6 to Preston
JUNCTION A
JUNCTION B
JUNCTION C
Myddleton Lane
Southworth Lane
Southworth Lane
Delph Lane
Winwick Park Avenue
JUNCTION F
Delph Lane Retail Park
JUNCTION E
Delph Lane
Mill House Lane
JUNCTION D
M62 to Liverpool
M62 J9
M62 J10/M6 J21A
M62 to Manchester
Mill Lane
M6 to Stoke-on-Trent
Locking Stumps Lane
A49 to Warrington Town Centre
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Demand
2022 - Do Minimum (N of M62)
HighgateTransportation

Access Strategy Option A



KEY

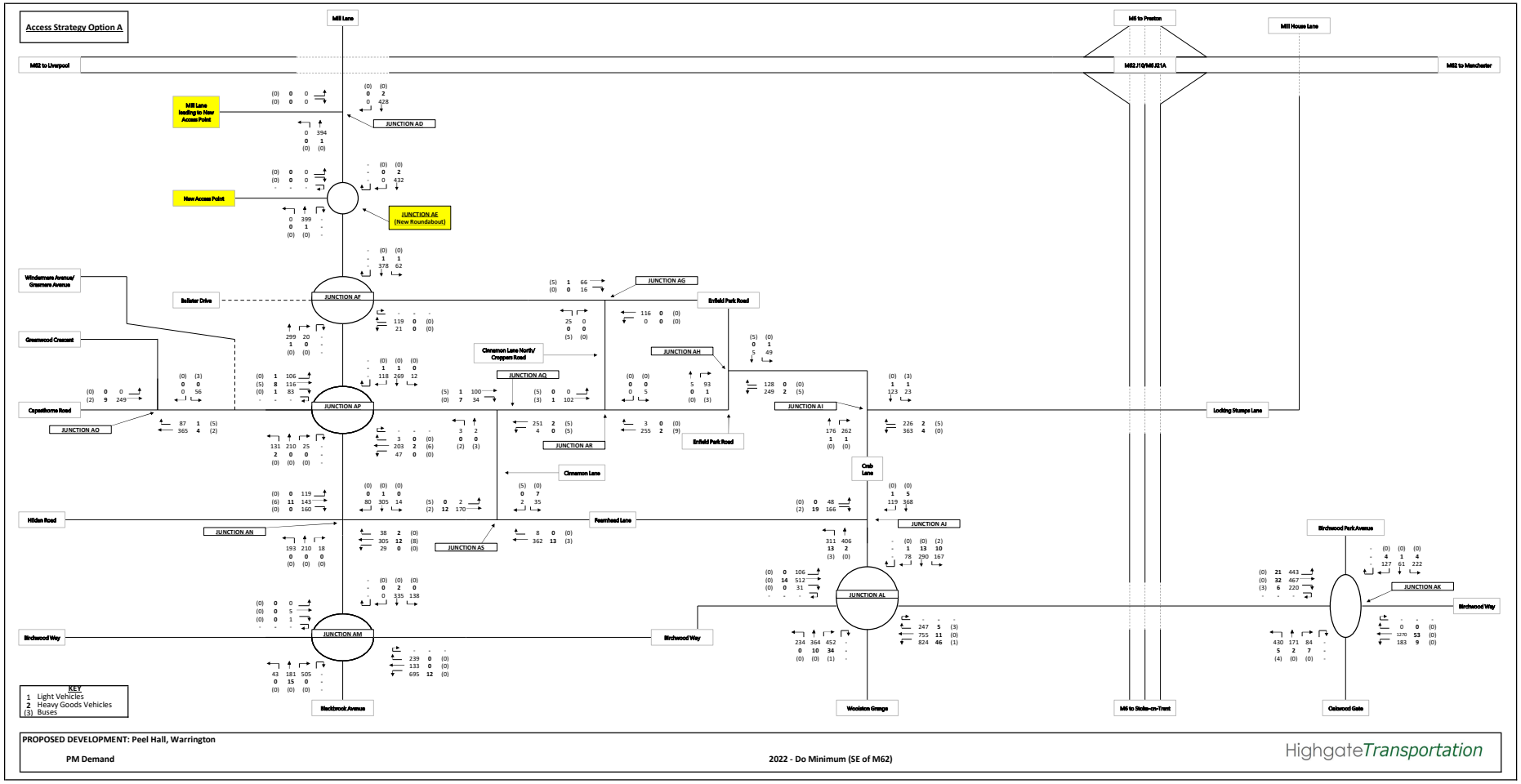
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses

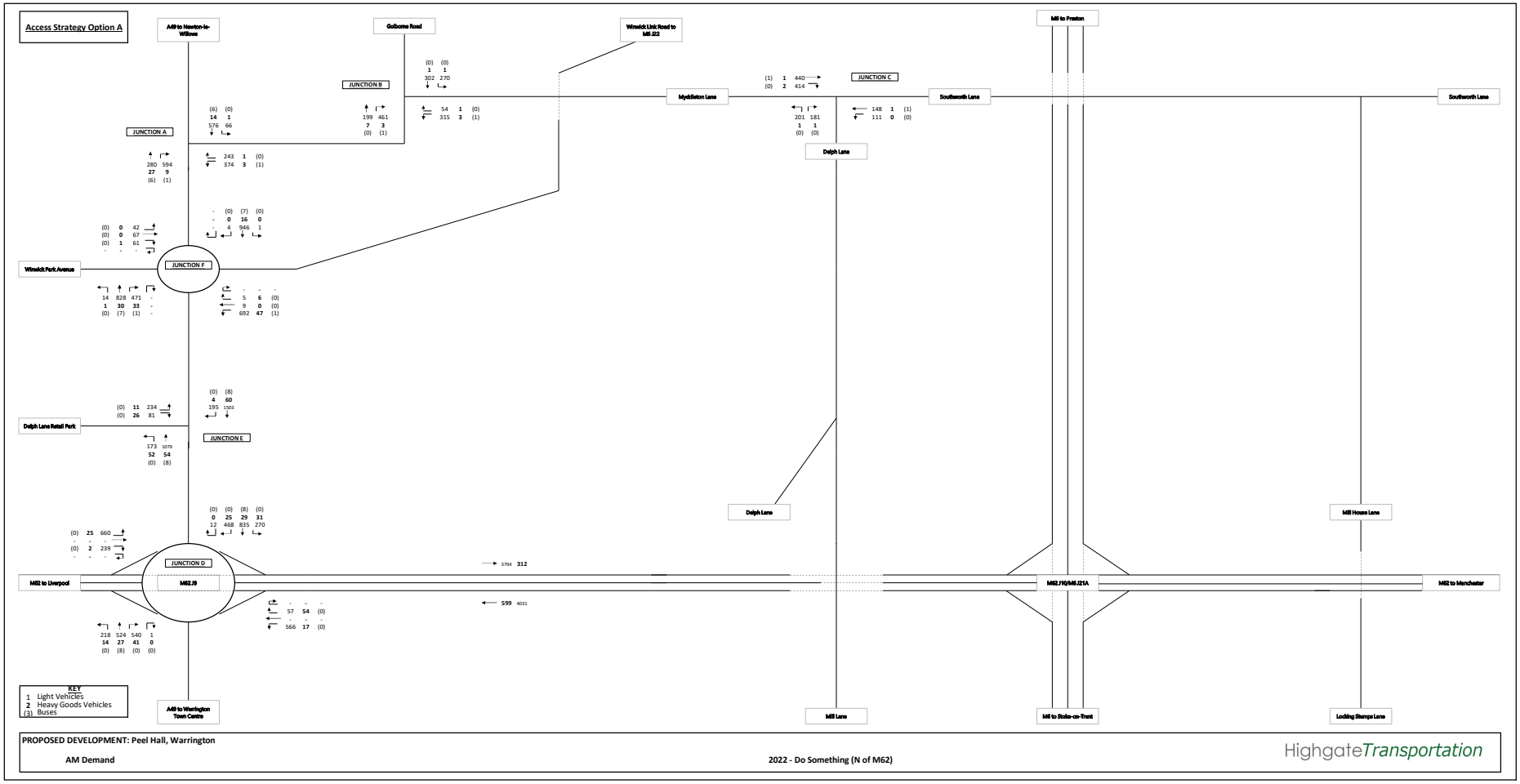
PROPOSED DEVELOPMENT: Peel Hall, Warrington

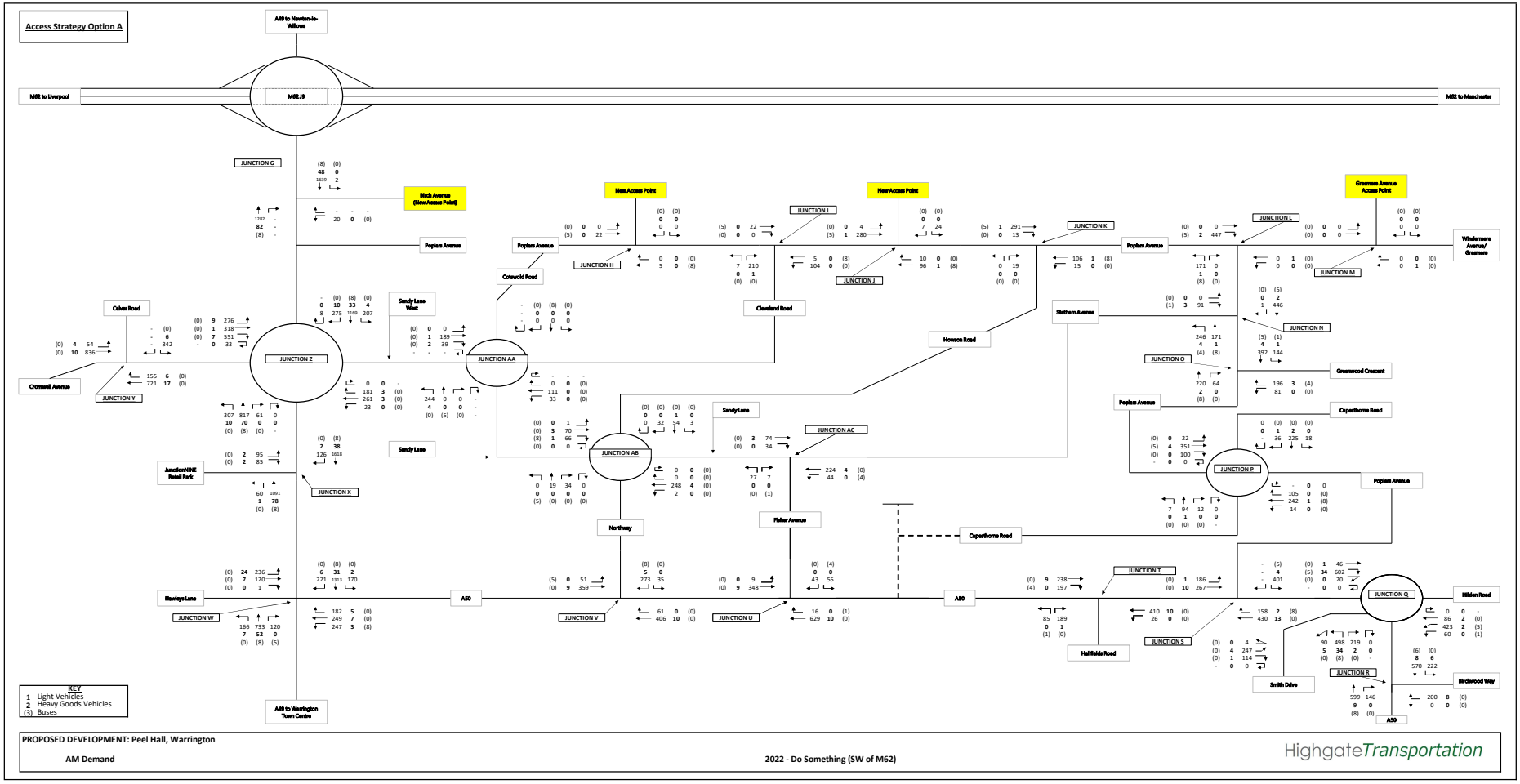
PM Demand

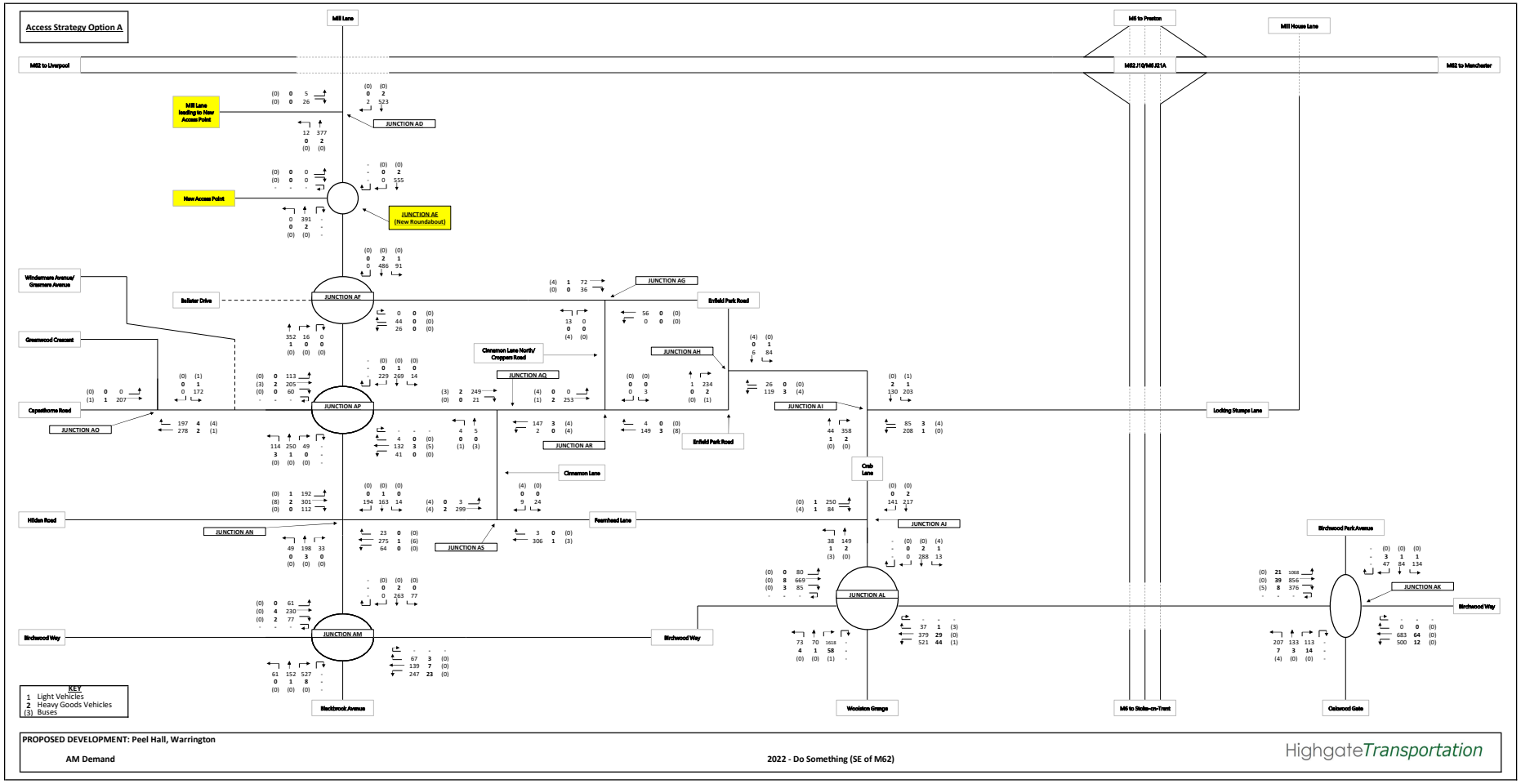
2022 - Do Minimum (SW of M62)

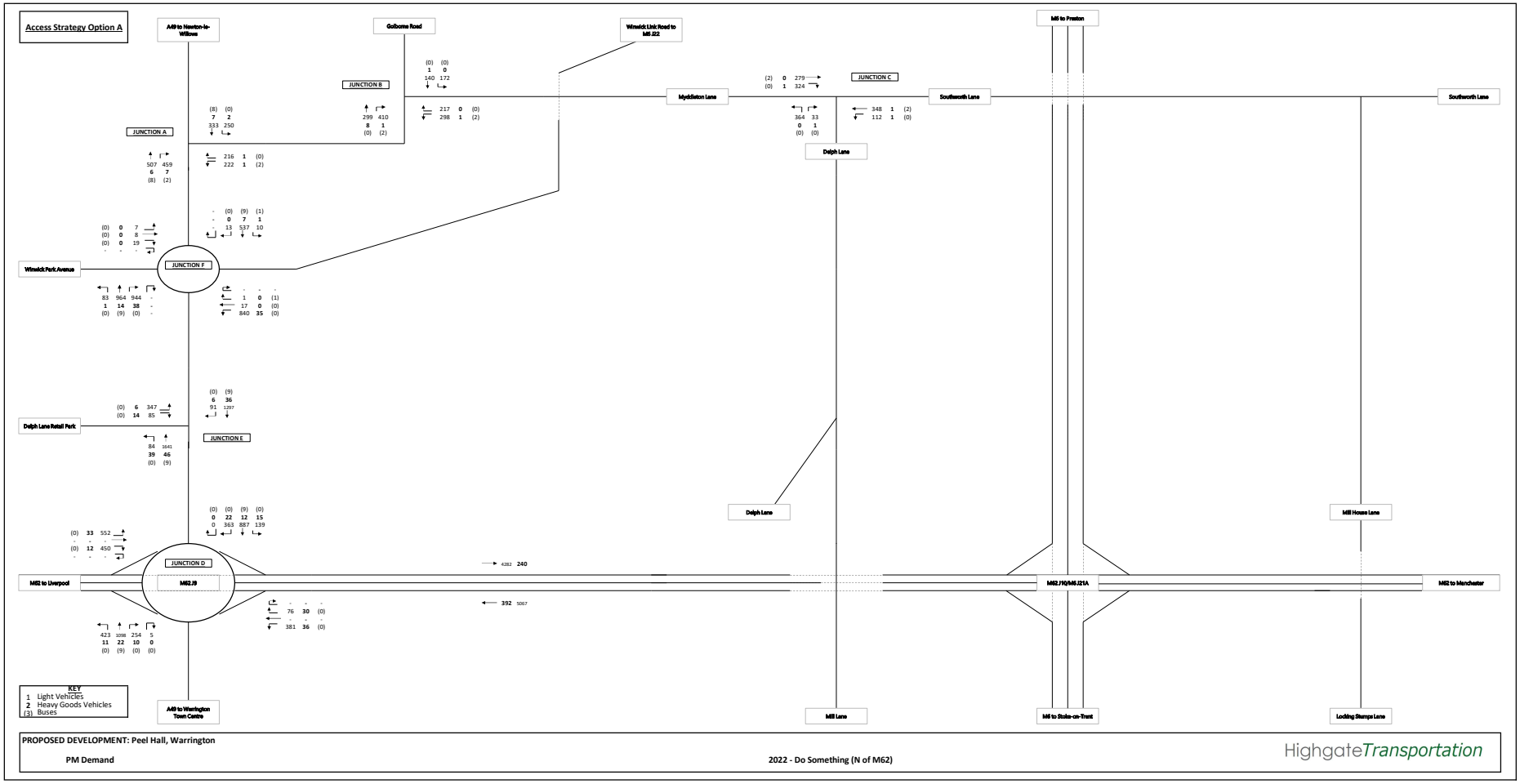
HighgateTransportation

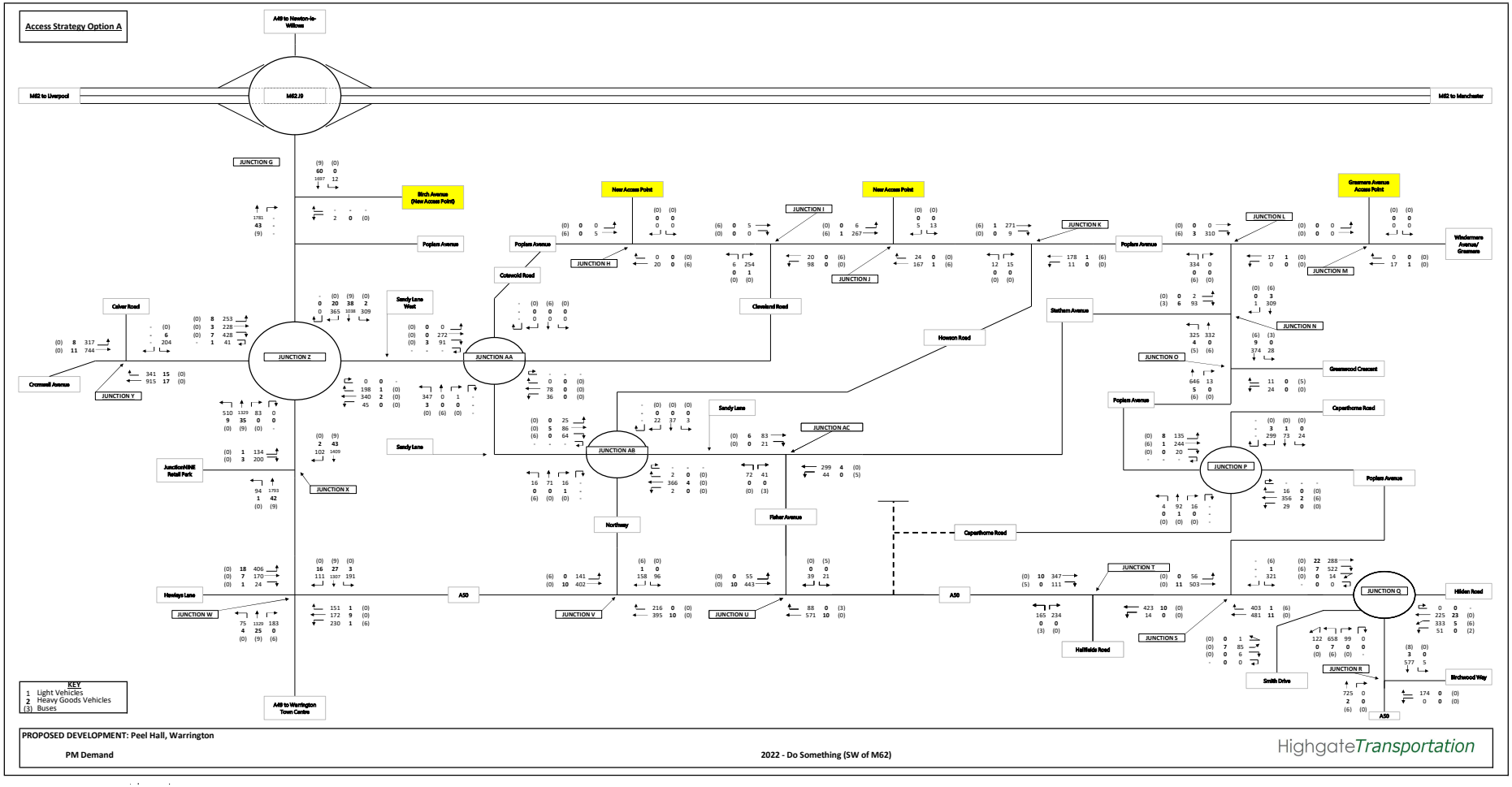

Access Strategy Option A
Mill Lane
M62 to Liverpool
M6 to Preston
Mill House Lane
M62 J10/M6 J21A
M62 to Manchester
Mill Lane leading to New Access Point
JUNCTION AD
New Access Point
JUNCTION AE (New Roundabout)
Windermere Avenue/ Grasmere Avenue
Ballater Drive
JUNCTION AF
JUNCTION AG
Enfield Park Road
Greenwood Crescent
Cinnamon Lane North/ Croppers Road
JUNCTION AH
JUNCTION AQ
JUNCTION AP
JUNCTION AI
Lodging Stumps Lane
Capesthorne Road
JUNCTION AO
JUNCTION AR
Enfield Park Road
Cinnamon Lane
Crab Lane
Hilden Road
JUNCTION AN
JUNCTION AS
Fernhead Lane
JUNCTION AJ
Birchwood Park Avenue
JUNCTION AL
JUNCTION AK
Birchwood Way
Birchwood Way
JUNCTION AM
Blackbrook Avenue
Woolston Grange
M6 to Stoke-on-Trent
Oakwood Gate
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Demand
2022 - Do Minimum (SE of M62)
HighgateTransportation

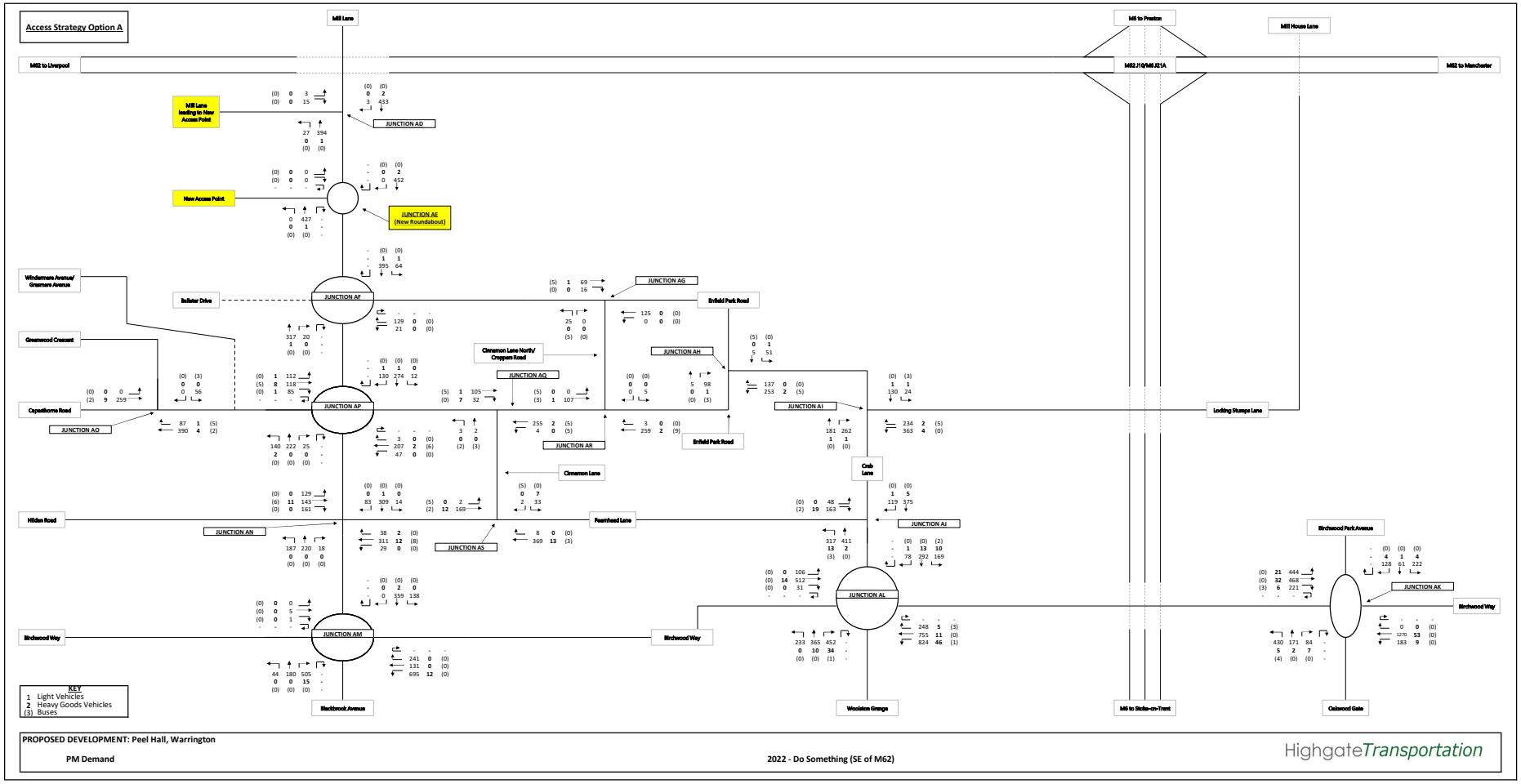

Access Strategy Option A
A49 to Hewton-le-Willows
Golborne Road
Winwick Link Road to M6 J22
M6 to Preston
JUNCTION B
JUNCTION C
Myddleton Lane
Southworth Lane
Southworth Lane
JUNCTION A
Delph Lane
Winwick Park Avenue
JUNCTION F
Delph Lane Retail Park
JUNCTION E
Delph Lane
Mill House Lane
JUNCTION D
M62 to Liverpool
M62 J9
M62 J10/M6 J21A
M62 to Manchester
Mill Lane
M6 to Stoke-on-Trent
Locking Stumps Lane
A49 to Warrington Town Centre
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Demand
2022 - Do Something (N of M62)
HighgateTransportation


Access Strategy Option A
A49 to Newton-le-Willows
M62 to Liverpool
M62 J9
M62 to Manchester
JUNCTION G
Birch Avenue (New Access Point)
Poplars Avenue
New Access Point
New Access Point
JUNCTION I
JUNCTION K
JUNCTION L
Grasmere Avenue Access Point
Windermere Avenue/ Grasmere
JUNCTION H
JUNCTION J
JUNCTION M
Cotswold Road
Cleveland Road
Statham Avenue
JUNCTION N
Calver Road
Sandy Lane West
JUNCTION Z
JUNCTION AA
Howson Road
JUNCTION O
Greenwood Crescent
Cromwell Avenue
JUNCTION Y
Sandy Lane
JUNCTION AC
Copperhorne Road
JUNCTION AB
JUNCTION P
JunctionNINE Retail Park
JUNCTION X
Northway
Fisher Avenue
Hawkeye Lane
JUNCTION W
A50
JUNCTION V
JUNCTION U
JUNCTION T
JUNCTION Q
Hilden Road
Hatfields Road
JUNCTION S
Smith Drive
JUNCTION R
Birchwood Way
A49 to Warrington Town Centre
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Demand
2022 - Do Something (SW of M62)
HighgateTransportation


Access Strategy Option A
Mill Lane
M62 to Liverpool
M6 to Preston
Mill House Lane
M62 J10/M6 J21A
M62 to Manchester
Mill Lane leading to New Access Point
JUNCTION AD
New Access Point
JUNCTION AE (New Roundabout)
Windermere Avenue/ Grasmere Avenue
Ballater Drive
JUNCTION AF
JUNCTION AG
Enfield Park Road
Greenwood Crescent
Cinnamon Lane North/ Croppers Road
JUNCTION AH
JUNCTION AQ
JUNCTION AP
JUNCTION AI
Lodging Stumps Lane
Capesthorne Road
JUNCTION AO
JUNCTION AR
Enfield Park Road
Cinnamon Lane
Crab Lane
Hilden Road
JUNCTION AN
JUNCTION AS
Fernhead Lane
JUNCTION AJ
JUNCTION AL
Birchwood Park Avenue
JUNCTION AK
Birchwood Way
JUNCTION AM
Birchwood Way
Blacklocks Avenue
Woolston Grange
M6 to Stoke-on-Trent
Oakwood Gate
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Demand
2022 - Do Something (SE of M62)
HighgateTransportation


Access Strategy Option A
A49 to Newton-le-Willows
Golborne Road
Winwick Link Road to M6 J22
M6 to Preston
JUNCTION B
JUNCTION C
Myddleton Lane
Southworth Lane
Southworth Lane
JUNCTION A
Delph Lane
Winwick Park Avenue
JUNCTION F
Delph Lane Retail Park
JUNCTION E
Delph Lane
Mill House Lane
JUNCTION D
M62 to Liverpool
M62 J9
M62 J10/M6 J21A
M62 to Manchester
Mill Lane
M6 to Stoke-on-Trent
Locking Stumps Lane
A49 to Warrington Town Centre
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Demand
2022 - Do Something (N of M62)
HighgateTransportation


Access Strategy Option A
A49 to Newton-le-Willows
M62 to Liverpool
M62 J9
M62 to Manchester
JUNCTION G
Birch Avenue (New Access Point)
New Access Point
New Access Point
Grasmere Avenue Access Point
Poplars Avenue
Poplars Avenue
Poplars Avenue
Poplars Avenue
Poplars Avenue
Poplars Avenue
Poplars Avenue
Poplars Avenue
JUNCTION H
JUNCTION I
JUNCTION J
JUNCTION K
JUNCTION L
JUNCTION M
JUNCTION N
JUNCTION O
JUNCTION P
Windermere Avenue/ Grasmere
Cotswold Road
Cleveland Road
Howson Road
Statham Avenue
Greenwood Crescent
Copperhorne Road
Copperhorne Road
Calver Road
Sandy Lane West
JUNCTION Z
JUNCTION AA
JUNCTION AB
JUNCTION AC
Sandy Lane
Sandy Lane
Cromwell Avenue
JUNCTION Y
JunctionNINE Retail Park
JUNCTION X
Northway
Fisher Avenue
Hawleys Lane
JUNCTION W
A50
JUNCTION V
JUNCTION U
A50
JUNCTION T
JUNCTION S
JUNCTION Q
JUNCTION R
Hilden Road
Birchwood Way
A50
Halfields Road
Smith Drive
A49 to Warrington Town Centre
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Demand
2022 - Do Something (SW of M62)
HighgateTransportation


Access Strategy Option A
Mill Lane
M62 to Liverpool
M6 to Preston
Mill House Lane
M62 J10/M6 J21A
M62 to Manchester
Mill Lane leading to New Access Point
JUNCTION AD
New Access Point
JUNCTION AE (New Roundabout)
Windermere Avenue/ Grasmere Avenue
Ballater Drive
JUNCTION AF
JUNCTION AG
Enfield Park Road
Greenwood Crescent
Cinnamon Lane North/ Croppers Road
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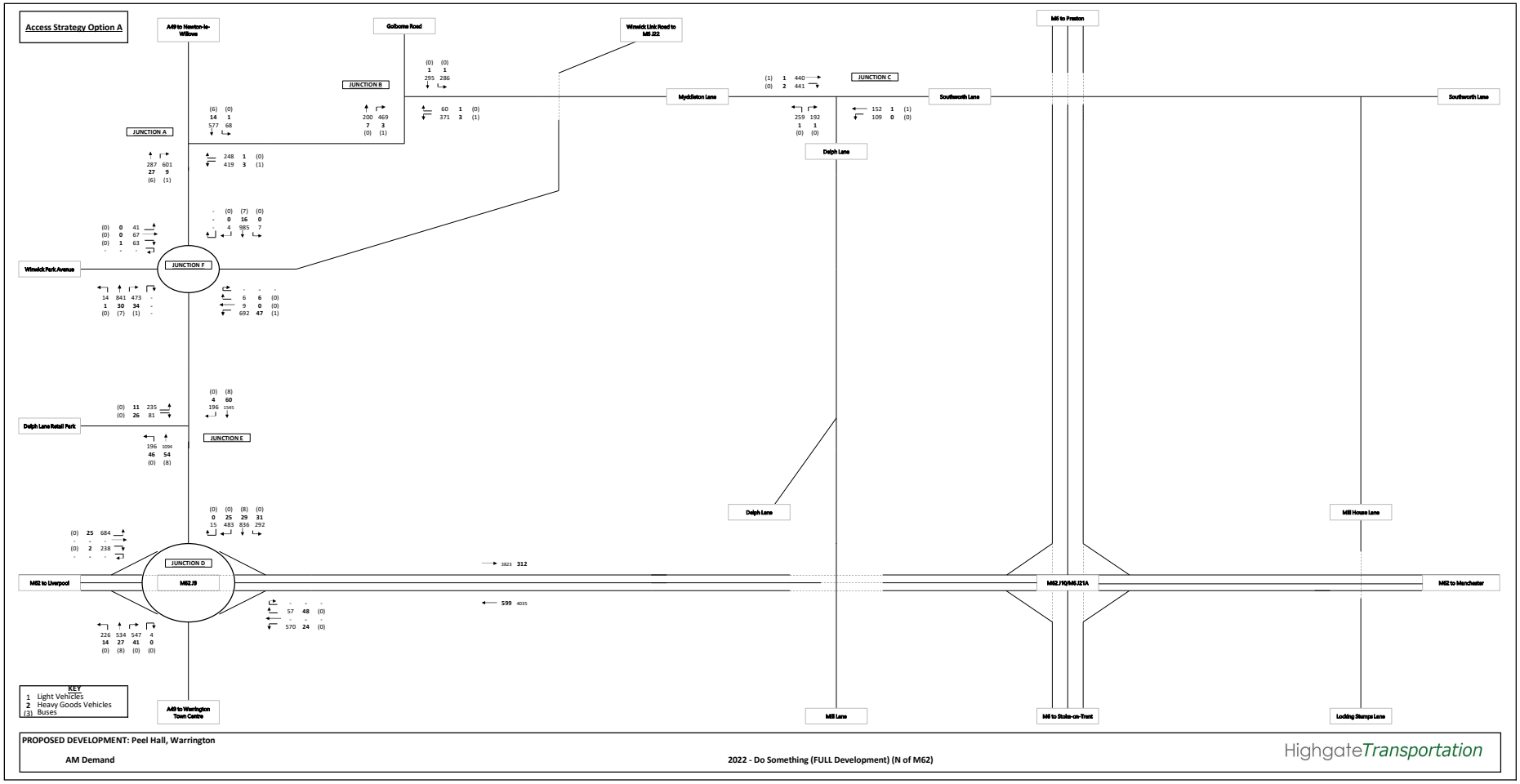
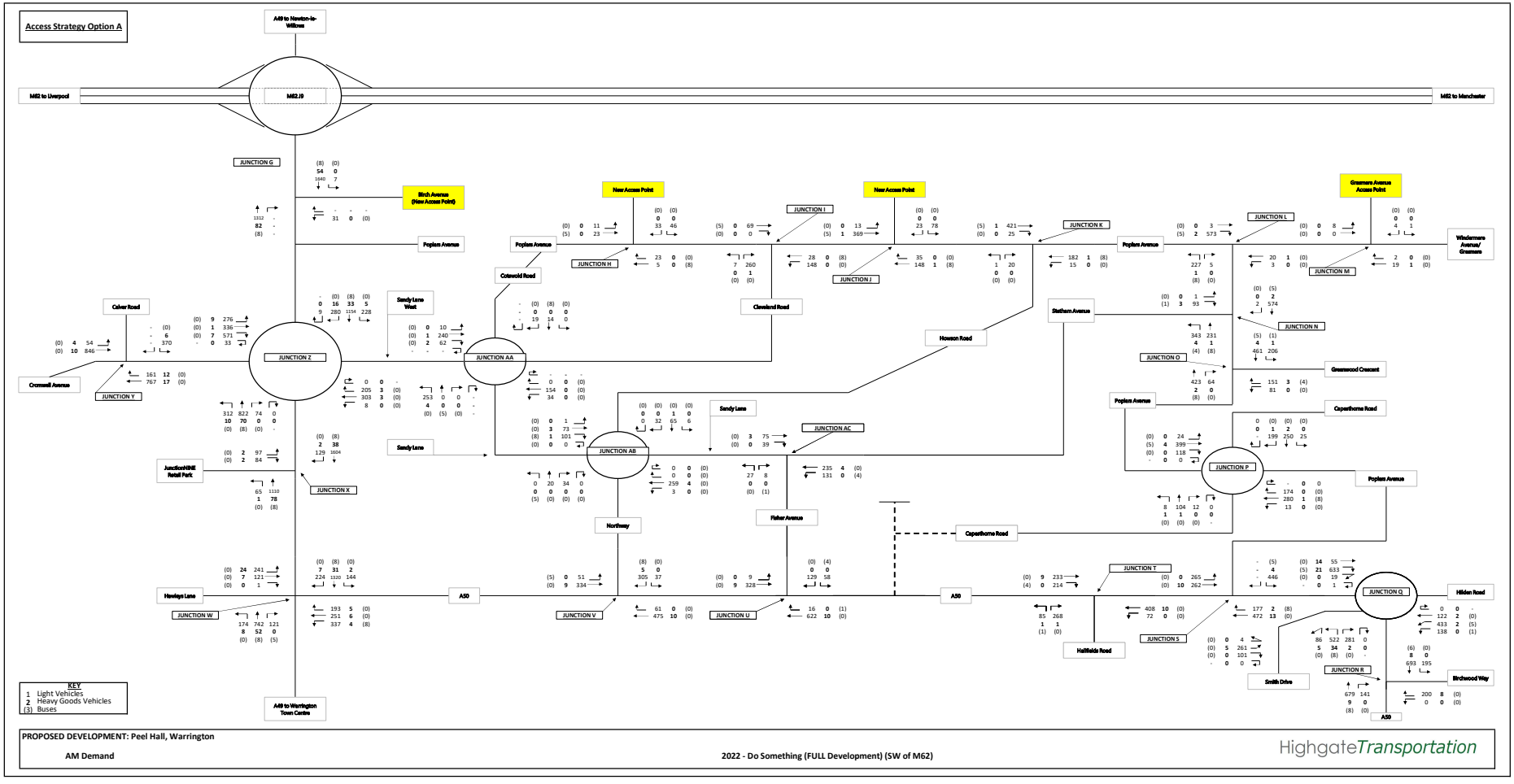
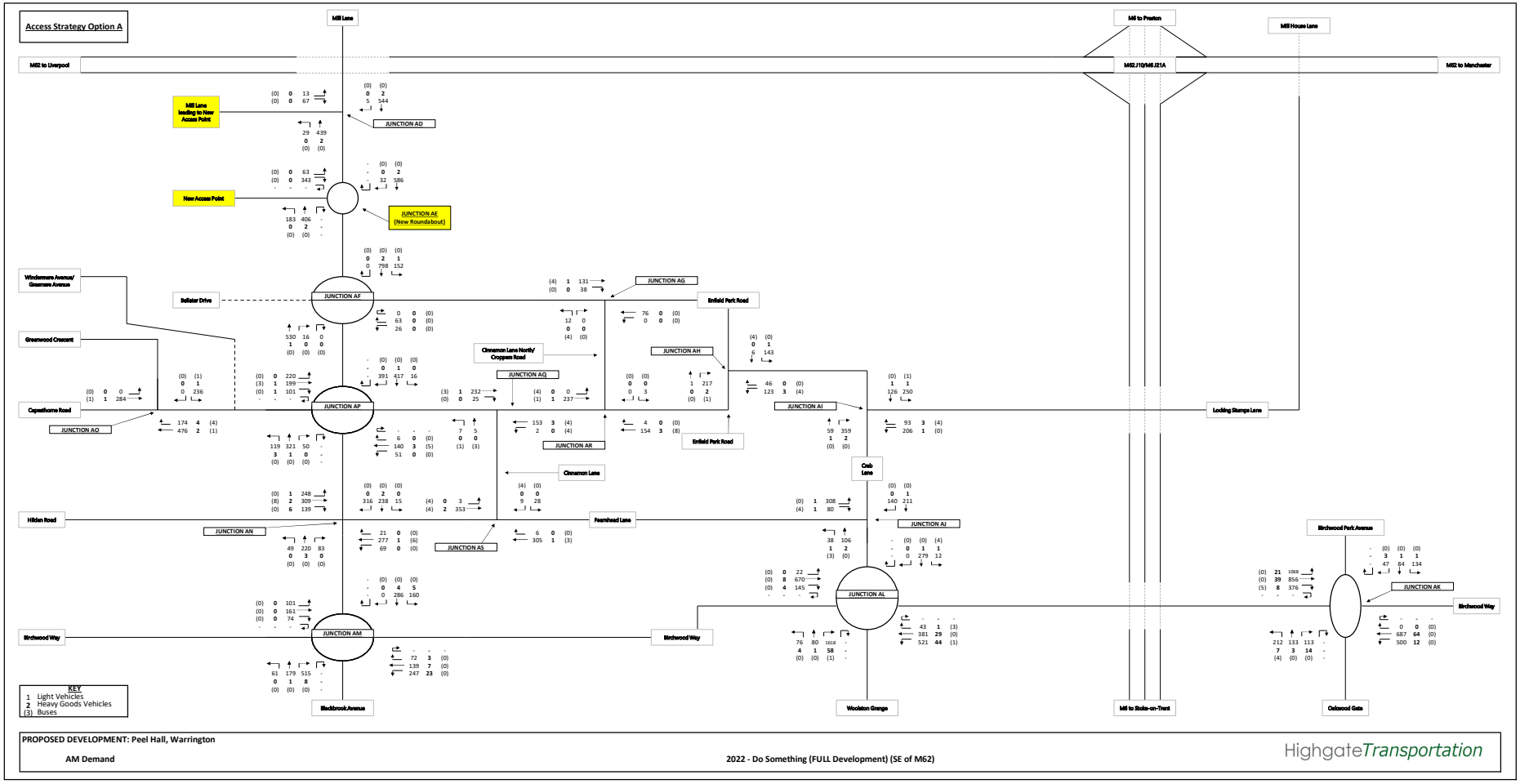
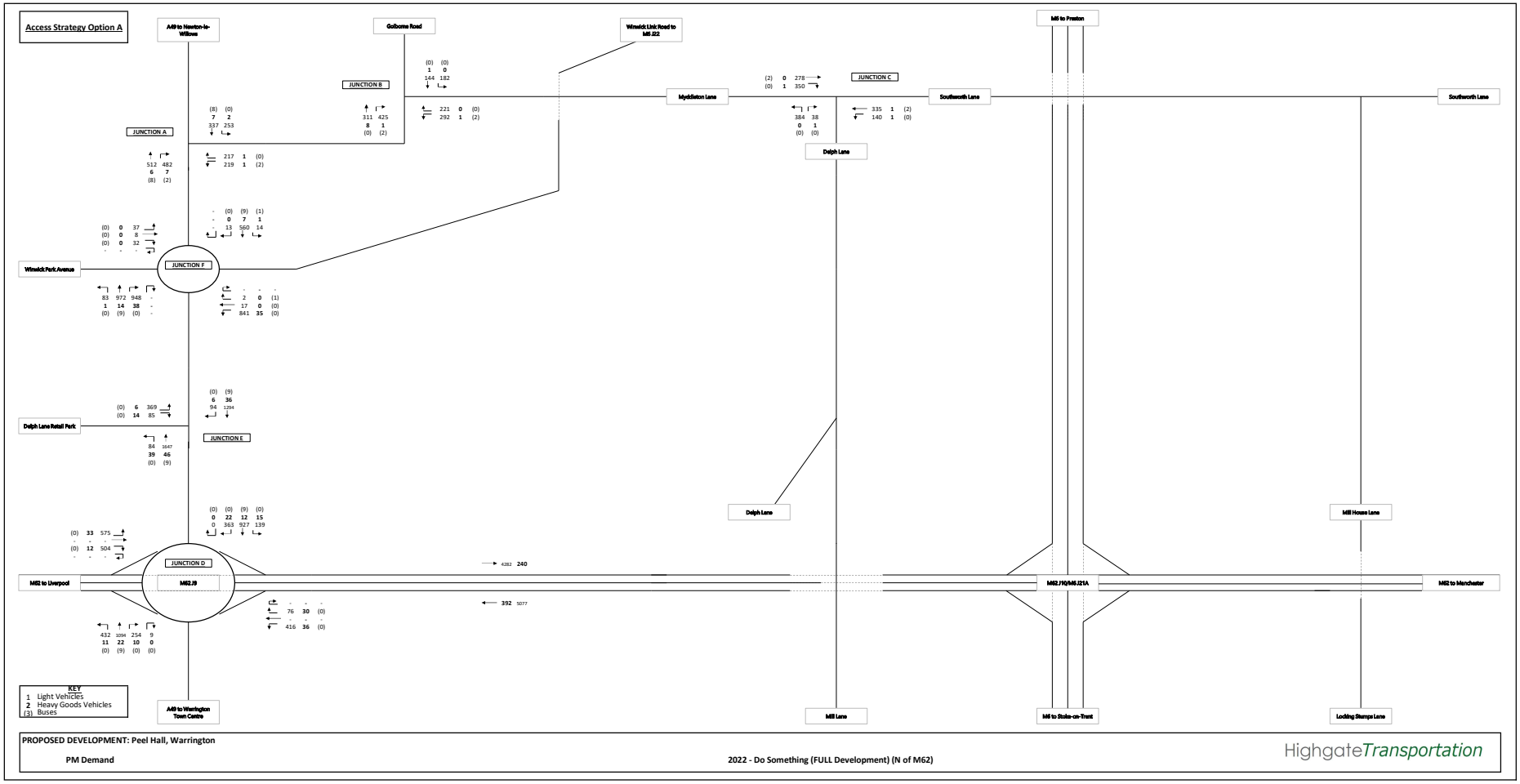
JUNCTION AQ
JUNCTION AP
JUNCTION AO
JUNCTION AI
Lodging Stumps Lane
Capesthorne Road
JUNCTION AR
Enfield Park Road
Cinnamon Lane
Crab Lane
Hilden Road
JUNCTION AN
JUNCTION AS
Fernhead Lane
JUNCTION AJ
JUNCTION AL
Birchwood Park Avenue
JUNCTION AK
Birchwood Way
Birchwood Way
JUNCTION AM
Blackbrook Avenue
Woolston Grange
M6 to Stoke-on-Trent
Oakwood Gate
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Demand
2022 - Do Something (SE of M62)
HighgateTransportation

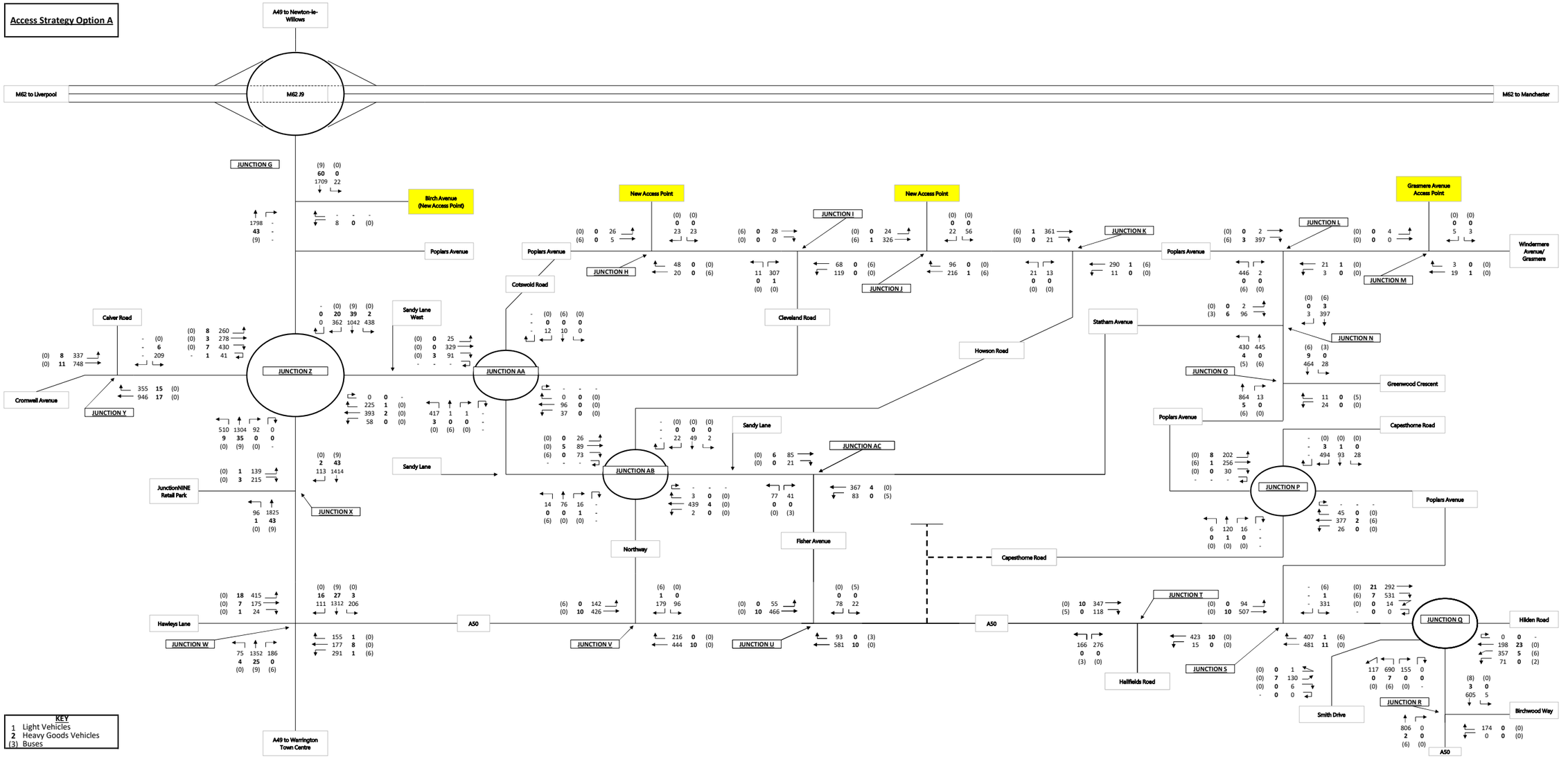

Access Strategy Option A
A49 to Hewton-le-Willows
Golborne Road
Winwick Link Road to M6 J22
M6 to Preston
JUNCTION B
JUNCTION C
Myddleton Lane
Southworth Lane
Southworth Lane
JUNCTION A
Delph Lane
Winwick Park Avenue
JUNCTION F
Delph Lane Retail Park
JUNCTION E
Delph Lane
Mill House Lane
JUNCTION D
M62 to Liverpool
M62 J9
M62 J10/M6 J21A
M62 to Manchester
Mill Lane
M6 to Stoke-on-Trent
Locking Stumps Lane
A49 to Warrington Town Centre
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Demand
2022 - Do Something (FULL Development) (N of M62)
HighgateTransportation


Access Strategy Option A
A49 to Newton-le-Willows
M62 to Liverpool
M62 J9
M62 to Manchester
JUNCTION G
Birch Avenue (New Access Point)
New Access Point
New Access Point
Grasmere Avenue Access Point
Poplars Avenue
Poplars Avenue
Poplars Avenue
Poplars Avenue
Poplars Avenue
Poplars Avenue
Poplars Avenue
JUNCTION H
JUNCTION I
JUNCTION J
JUNCTION K
JUNCTION L
JUNCTION M
JUNCTION N
Windermere Avenue/ Grasmere
Cotswold Road
Cleveland Road
Howson Road
Statham Avenue
Calver Road
Sandy Lane West
JUNCTION Z
JUNCTION AA
JUNCTION AB
JUNCTION AC
JUNCTION O
JUNCTION P
Greenwood Crescent
Copperhorne Road
Copperhorne Road
Cromwell Avenue
JUNCTION Y
Sandy Lane
Sandy Lane
Northway
Fisher Avenue
JunctionNINE Retail Park
JUNCTION X
JUNCTION W
JUNCTION V
JUNCTION U
JUNCTION T
JUNCTION S
JUNCTION Q
JUNCTION R
Hawleys Lane
A50
A50
A50
Hatfields Road
Smith Drive
Hilden Road
Birchwood Way
A49 to Warrington Town Centre
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Demand
2022 - Do Something (FULL Development) (SW of M62)
HighgateTransportation


Access Strategy Option A
Mill Lane
M62 to Liverpool
M6 to Preston
M62 J10/M6 J21A
Mill House Lane
M62 to Manchester
Mill Lane leading to New Access Point
JUNCTION AD
New Access Point
JUNCTION AE (New Roundabout)
Windermere Avenue/ Grasmere Avenue
Ballater Drive
JUNCTION AF
JUNCTION AG
Enfield Park Road
Greenwood Crescent
Cinnamon Lane North/ Croppers Road
JUNCTION AH
JUNCTION AQ
Capesthorne Road
JUNCTION AO
JUNCTION AP
JUNCTION AI
Lodging Slumps Lane
JUNCTION AR
Enfield Park Road
Cinnamon Lane
Crab Lane
Hilden Road
JUNCTION AN
JUNCTION AS
Fernihead Lane
JUNCTION AJ
Birchwood Park Avenue
JUNCTION AL
JUNCTION AK
Birchwood Way
JUNCTION AM
Birchwood Way
Blackbrook Avenue
Woolston Grange
M6 to Stoke-on-Trent
Oakwood Gate
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Demand
2022 - Do Something (FULL Development) (SE of M62)
HighgateTransportation


Access Strategy Option A
A49 to Newton-le-Willows
Golborne Road
Winwick Link Road to M6 J22
M6 to Preston
JUNCTION B
JUNCTION C
Myddleton Lane
Southworth Lane
Southworth Lane
JUNCTION A
Delph Lane
Winwick Park Avenue
JUNCTION F
Delph Lane Retail Park
JUNCTION E
Delph Lane
Mill House Lane
JUNCTION D
M62 to Liverpool
M62 J9
M62 J10/M6 J21A
M62 to Manchester
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
A49 to Warrington Town Centre
Mill Lane
M6 to Stoke-on-Trent
Locking Stumps Lane
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Demand
2022 - Do Something (FULL Development) (N of M62)
HighgateTransportation

Access Strategy Option A



KEY

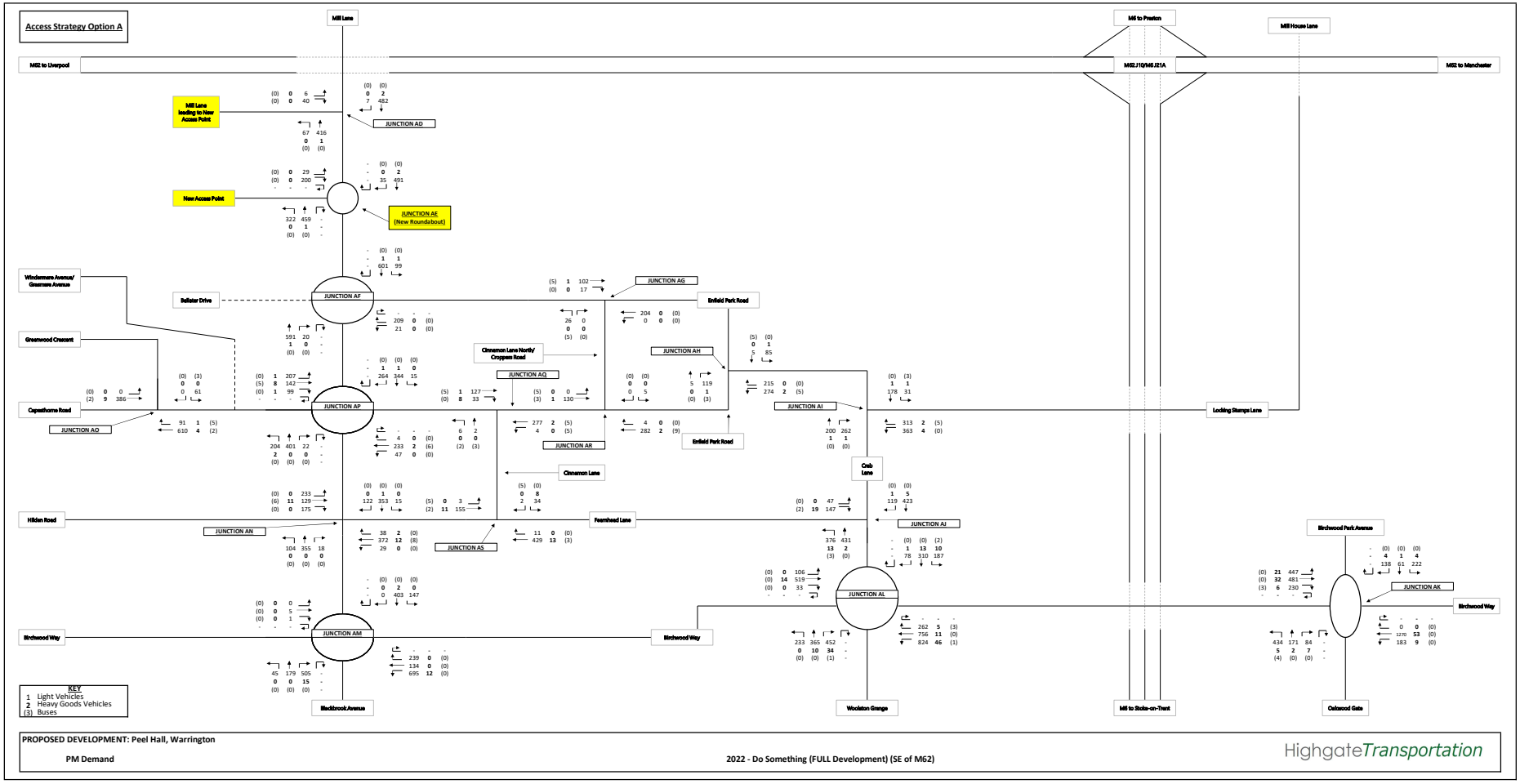
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses

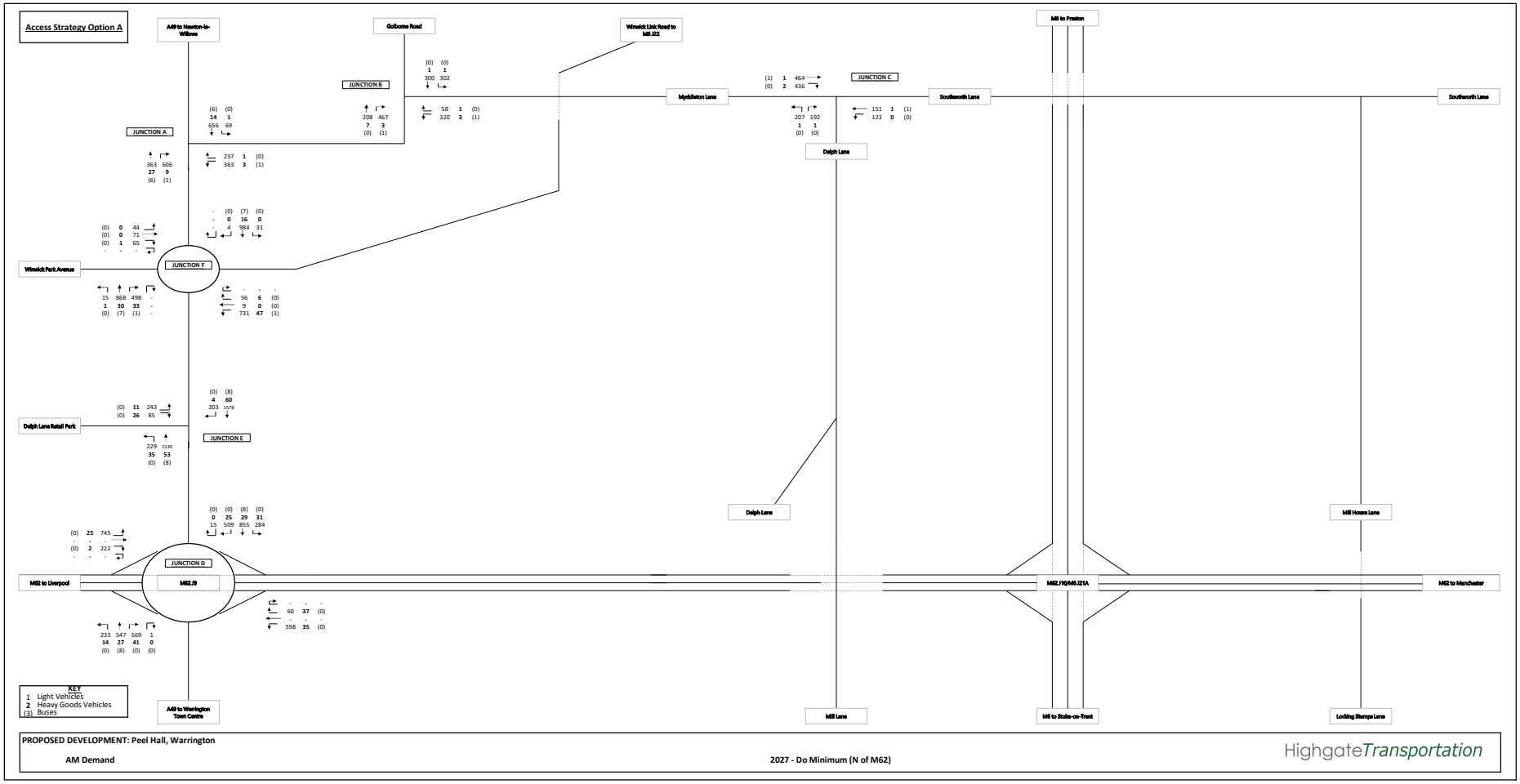
PROPOSED DEVELOPMENT: Peel Hall, Warrington

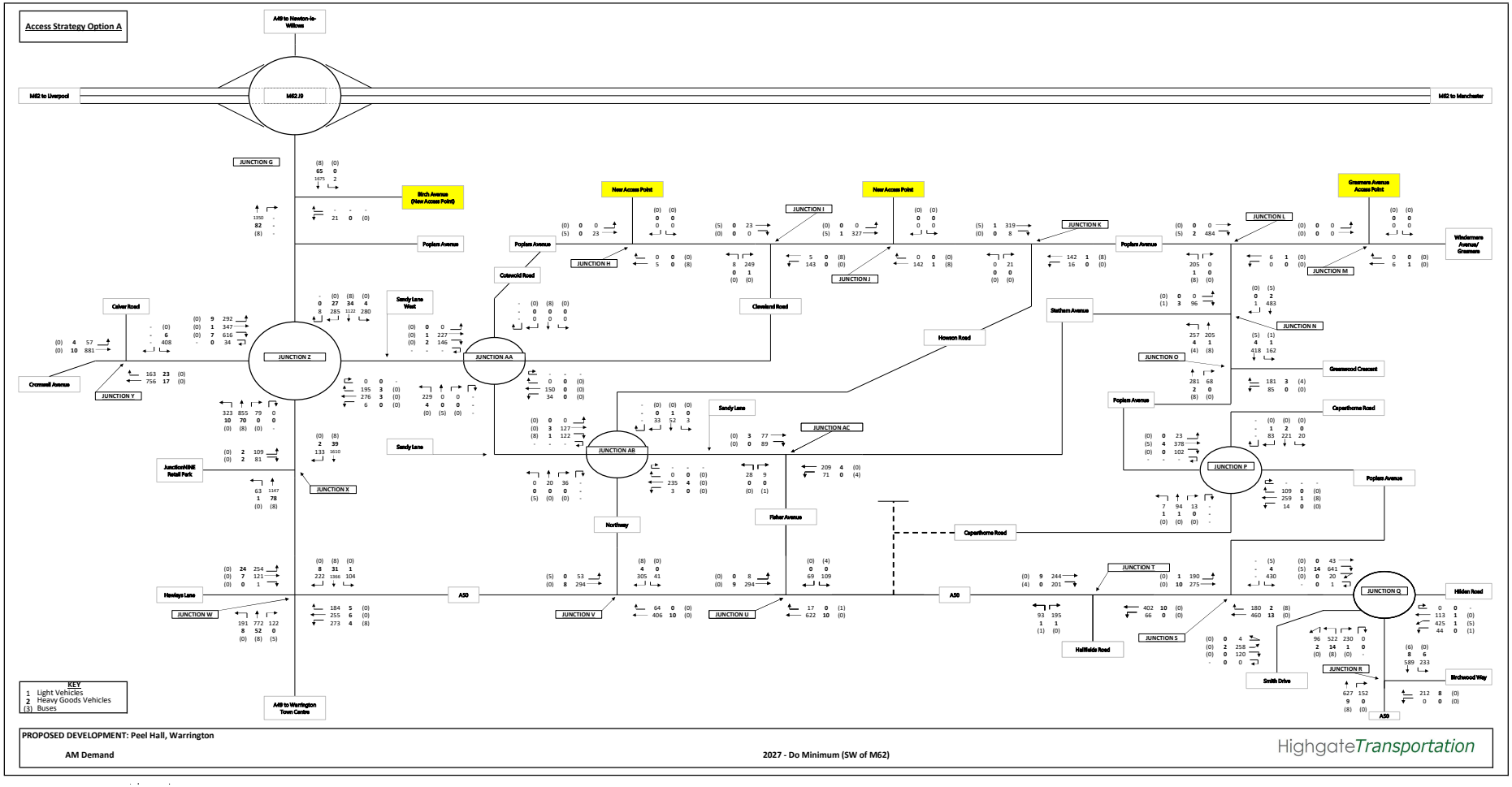
PM Demand

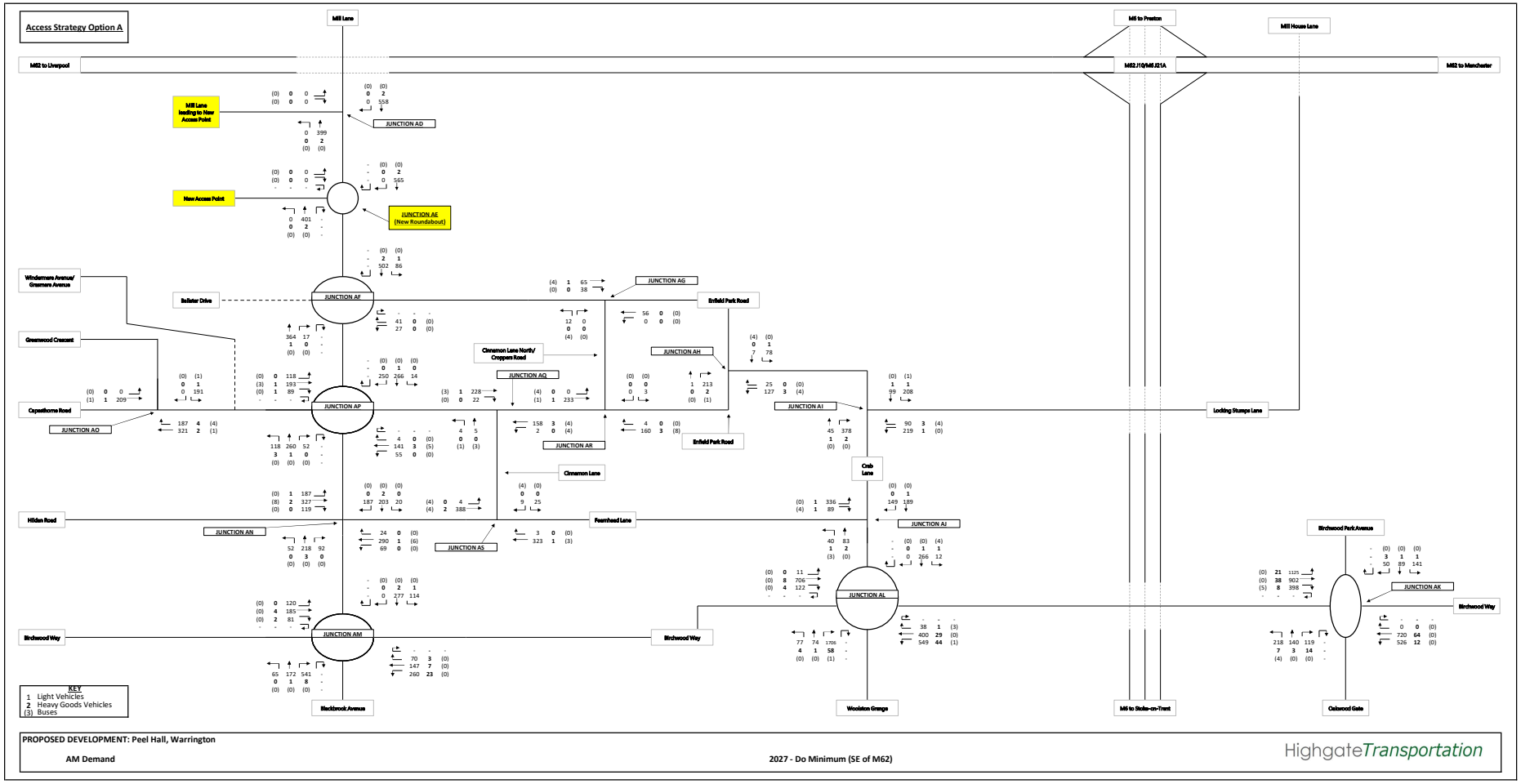
2022 - Do Something (FULL Development) (SW of M62)

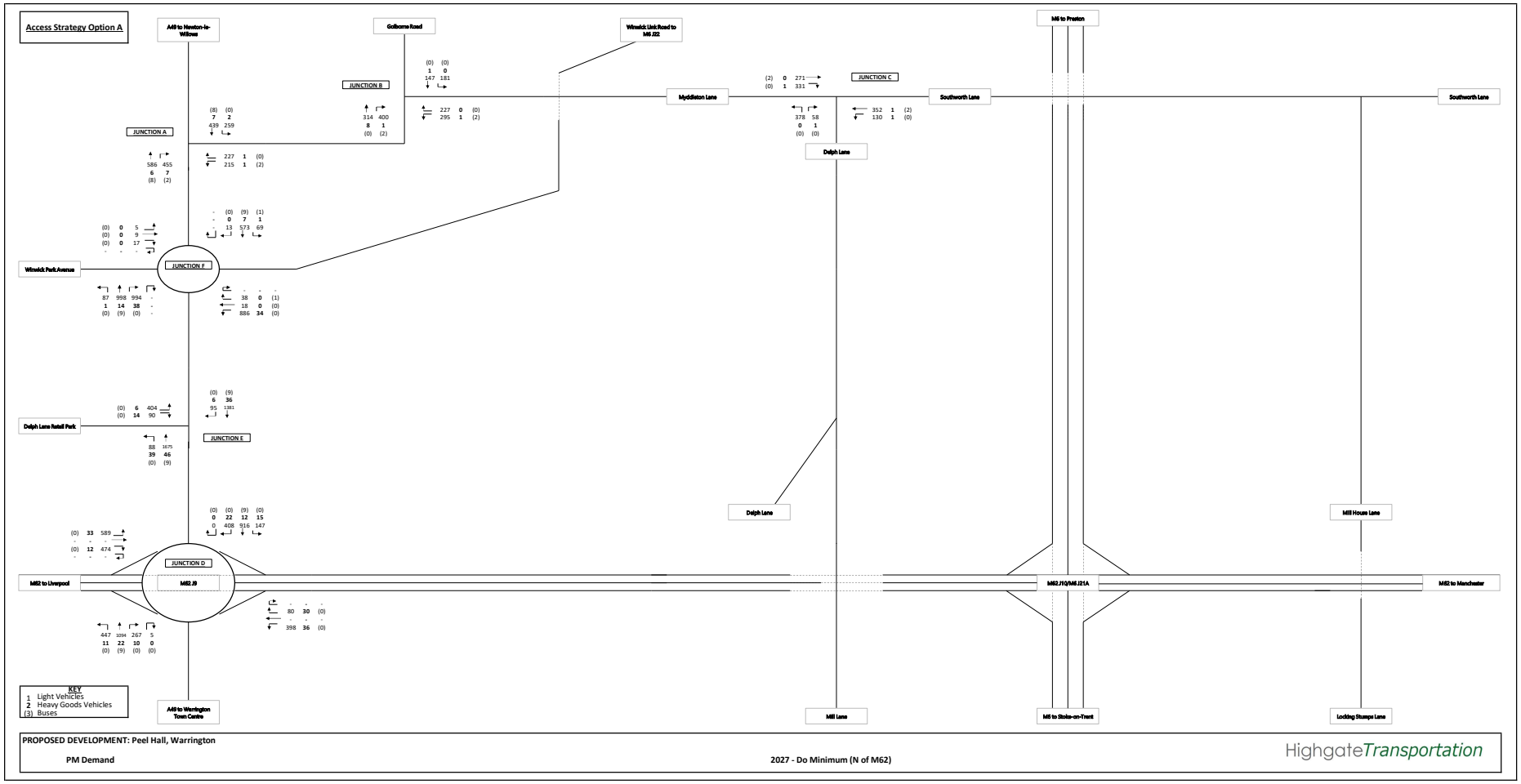
HighgateTransportation

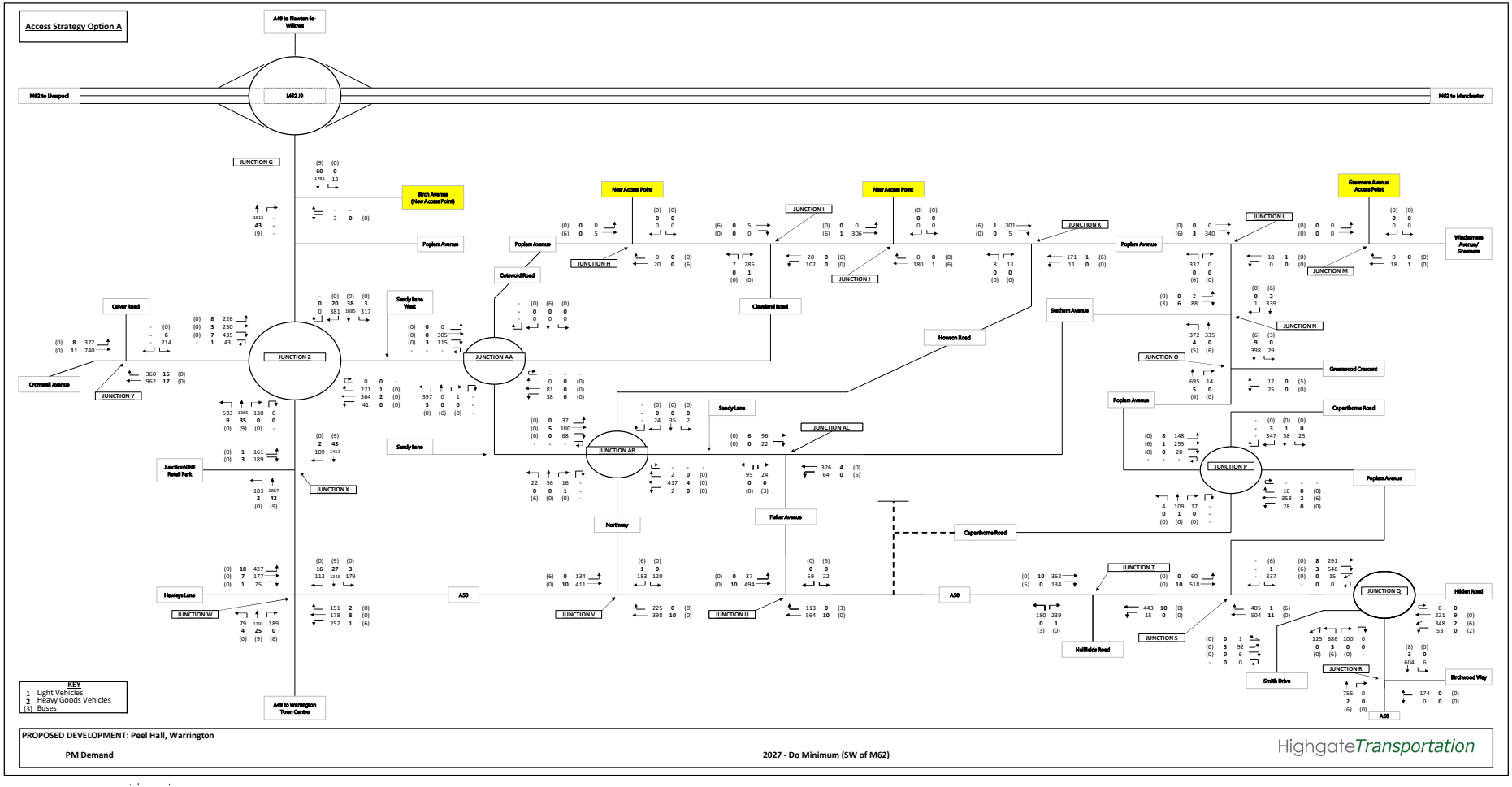

Access Strategy Option A
Mill Lane
M62 to Liverpool
M6 to Preston
Mill House Lane
M62 J10/M6 J21A
M62 to Manchester
Mill Lane leading to New Access Point
JUNCTION AD
New Access Point
JUNCTION AE (New Roundabout)
Windermere Avenue/ Grasmere Avenue
Ballater Drive
JUNCTION AF
JUNCTION AG
Enfield Park Road
Greenwood Crescent
Cinnamon Lane North/ Croppers Road
JUNCTION AH
Capesthorne Road
JUNCTION AO
JUNCTION AP
JUNCTION AQ
JUNCTION AR
JUNCTION AI
Lodging Stumps Lane
Enfield Park Road
Cinnamon Lane
Crab Lane
Hilden Road
JUNCTION AN
JUNCTION AS
Fernihead Lane
JUNCTION AJ
Birchwood Park Avenue
JUNCTION AK
Birchwood Way
JUNCTION AL
JUNCTION AM
Birchwood Way
Birchwood Way
Blackbrook Avenue
Woolston Grange
M6 to Stoke-on-Trent
Oakwood Gate
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Demand
2022 - Do Something (FULL Development) (SE of M62)
HighgateTransportation

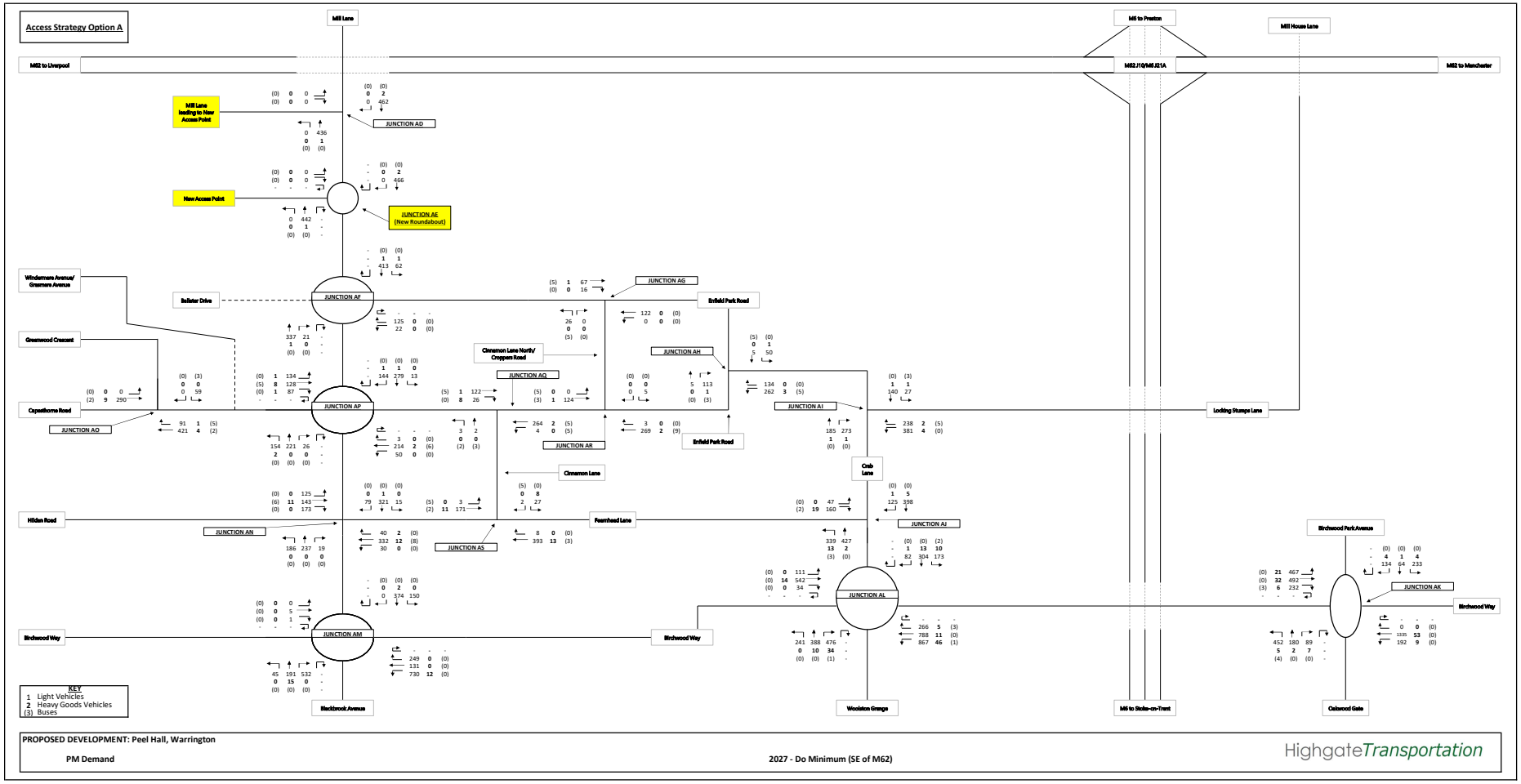

Access Strategy Option A
A49 to Newton-le-Willows
Golborne Road
Winwick Link Road to M6 J22
M6 to Preston
JUNCTION B
JUNCTION C
Myddleton Lane
Southworth Lane
Southworth Lane
JUNCTION A
Delph Lane
Winwick Park Avenue
JUNCTION F
Delph Lane Retail Park
JUNCTION E
Delph Lane
Mill House Lane
JUNCTION D
M62 to Liverpool
M62 J9
M62 J10/M6 J21A
M62 to Manchester
Mill Lane
M6 to Stoke-on-Trent
Locking Stumps Lane
A49 to Warrington Town Centre
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Demand
2027 - Do Minimum (N of M62)
HighgateTransportation

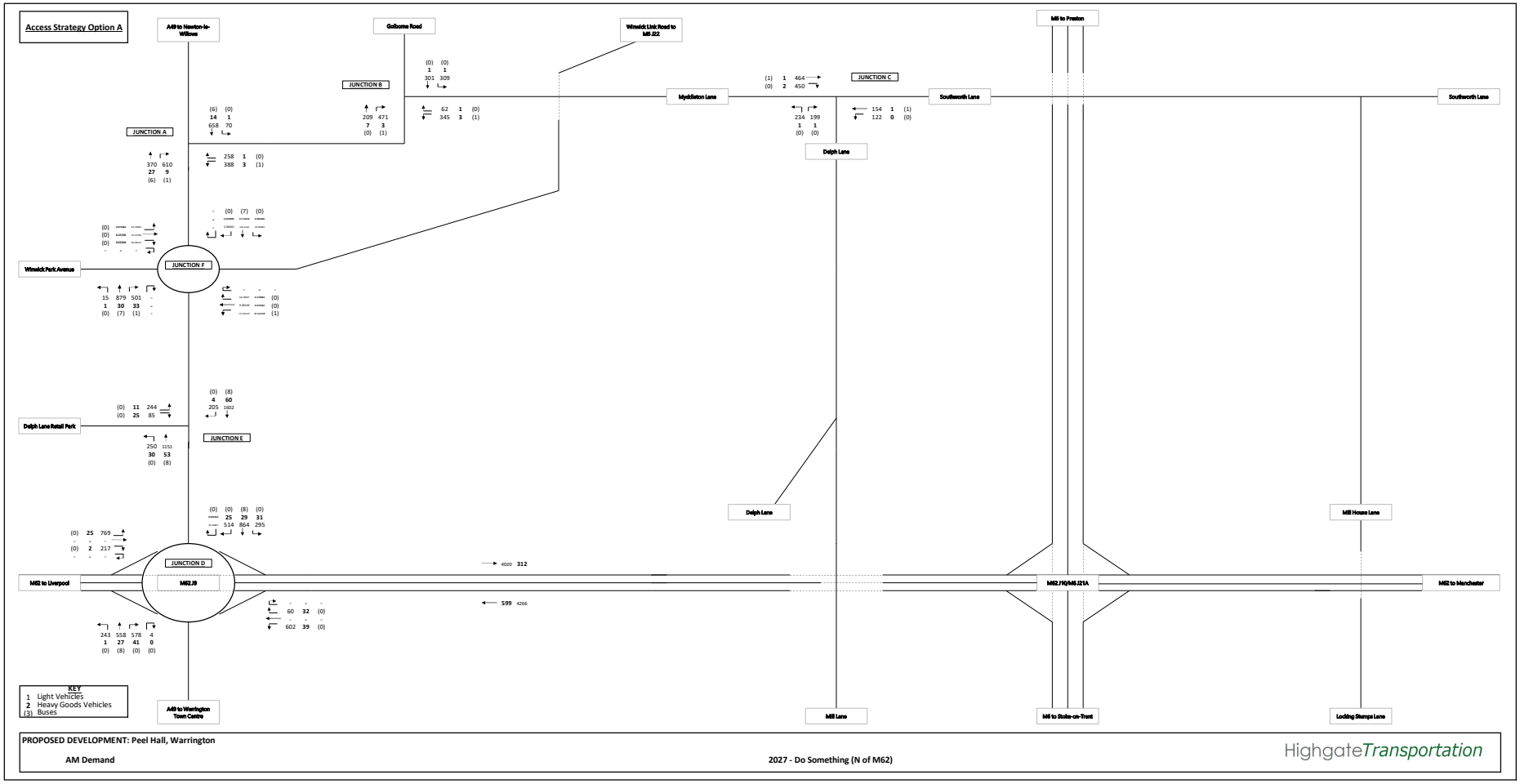

Access Strategy Option A
A49 to Newton-le-Willows
M62 to Liverpool
M62 J9
M62 to Manchester
JUNCTION G
Birch Avenue (New Access Point)
Poplars Avenue
New Access Point
New Access Point
JUNCTION I
JUNCTION K
JUNCTION L
Grasmere Avenue Access Point
Windermere Avenue/ Grasmere
JUNCTION H
JUNCTION J
JUNCTION M
Colwold Road
Cleveland Road
Howson Road
Statham Avenue
JUNCTION N
Calver Road
Sandy Lane West
JUNCTION Z
JUNCTION AA
JUNCTION O
Greenwood Crescent
Cromwell Avenue
JUNCTION Y
Sandy Lane
JUNCTION AC
Copperhorne Road
JUNCTION AB
JUNCTION P
JunctionNINE Retail Park
JUNCTION X
Northway
Fisher Avenue
Hawleys Lane
A50
JUNCTION W
JUNCTION V
JUNCTION U
JUNCTION T
JUNCTION S
JUNCTION Q
Hilden Road
Hatfields Road
Smith Drive
JUNCTION R
Birchwood Way
A49 to Warrington Town Centre
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Demand
2027 - Do Minimum (SW of M62)
HighgateTransportation

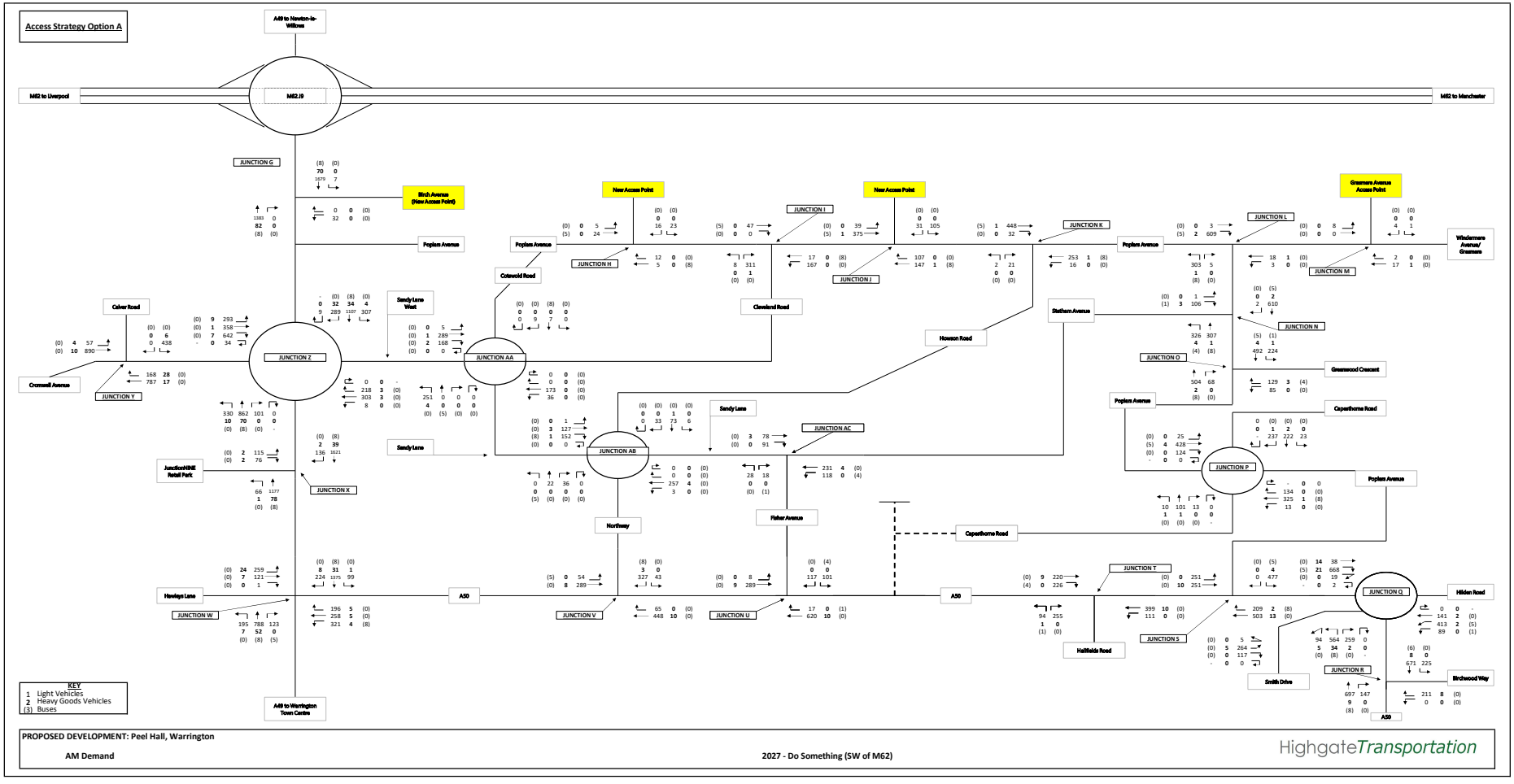

Access Strategy Option A
Mill Lane
M62 to Liverpool
M6 to Preston
Mill House Lane
M62 J10/M6 J21A
M62 to Manchester
Mill Lane leading to New Access Point
JUNCTION AD
New Access Point
JUNCTION AE (New Roundabout)
Windermere Avenue/ Grasmere Avenue
Ballater Drive
JUNCTION AF
JUNCTION AG
Enfield Park Road
Greenwood Crescent
Cinnamon Lane North/ Croppers Road
JUNCTION AH
JUNCTION AQ
JUNCTION AO
JUNCTION AP
JUNCTION AI
Lodging Stumps Lane
Capesthorne Road
JUNCTION AR
Enfield Park Road
Cinnamon Lane
Crab Lane
Hilden Road
JUNCTION AN
JUNCTION AS
Fernhead Lane
JUNCTION AJ
Birchwood Park Avenue
JUNCTION AL
JUNCTION AK
Birchwood Way
Birchwood Way
JUNCTION AM
Blackbrook Avenue
Woolston Grange
M6 to Stoke-on-Trent
Oakwood Gate
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Demand
2027 - Do Minimum (SE of M62)
HighgateTransportation

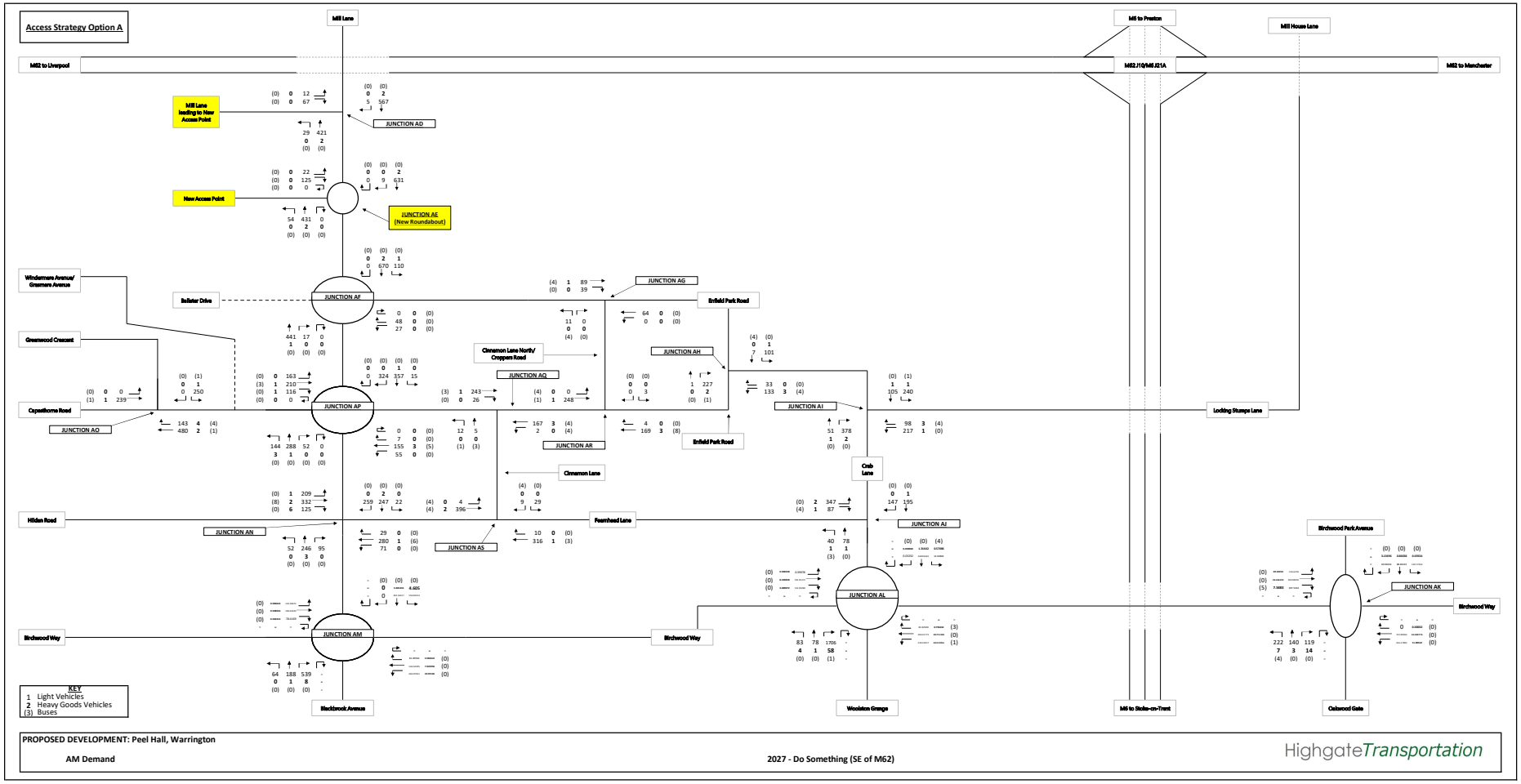

Access Strategy Option A
A49 to Newton-le-Willows
Golborne Road
Winwick Link Road to M6 J22
M6 to Preston
JUNCTION B
JUNCTION C
Myddleton Lane
Southworth Lane
Southworth Lane
JUNCTION A
Delph Lane
Winwick Park Avenue
JUNCTION F
Delph Lane Retail Park
JUNCTION E
Delph Lane
Mill House Lane
JUNCTION D
M62 to Liverpool
M62 J9
M62 J10/M6 J21A
M62 to Manchester
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
A49 to Warrington Town Centre
Mill Lane
M6 to Stoke-on-Trent
Locking Stumps Lane
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Demand
2027 - Do Minimum (N of M62)
HighgateTransportation


Access Strategy Option A
A49 to Newton-le-Willows
M62 to Liverpool
M62 J9
M62 to Manchester
JUNCTION G
Birch Avenue (New Access Point)
Poplars Avenue
New Access Point
New Access Point
JUNCTION I
JUNCTION H
JUNCTION J
JUNCTION K
Grasmere Avenue Access Point
JUNCTION L
JUNCTION M
Windermere Avenue/ Grasmere
Colwold Road
Cleveland Road
Calver Road
Sandy Lane West
JUNCTION Z
JUNCTION AA
Howson Road
Statham Avenue
JUNCTION N
JUNCTION O
Greenwood Crescent
Cromwell Avenue
JUNCTION Y
Sandy Lane
JUNCTION AC
JUNCTION AB
Copperhorne Road
JUNCTION P
JunctionNINE Retail Park
JUNCTION X
Northway
Fisher Avenue
Hawleys Lane
JUNCTION W
A50
JUNCTION V
JUNCTION U
JUNCTION T
JUNCTION S
Hatfields Road
Smith Drive
JUNCTION Q
JUNCTION R
Hilden Road
Birchwood Way
A49 to Warrington Town Centre
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Demand
2027 - Do Minimum (SW of M62)
HighgateTransportation


Access Strategy Option A
M62 to Liverpool
M62 to Manchester
M62 J10/M6 J21A
M6 to Preston
M6 to Stoke-on-Trent
Mill Lane
Mill House Lane
Mill Lane leading to New Access Point
New Access Point
JUNCTION AD
JUNCTION AE (New Roundabout)
JUNCTION AF
JUNCTION AG
JUNCTION AH
JUNCTION AI
JUNCTION AJ
JUNCTION AK
JUNCTION AL
JUNCTION AM
JUNCTION AN
JUNCTION AO
JUNCTION AP
JUNCTION AQ
JUNCTION AR
JUNCTION AS
Windermere Avenue/ Grasmere Avenue
Ballater Drive
Greenwood Crescent
Capesthorne Road
Hilden Road
Birchwood Way
Blacklrock Avenue
Enfield Park Road
Cinnamon Lane North/ Croppers Road
Cinnamon Lane
Fernhead Lane
Lodging Stumps Lane
Crab Lane
Woolston Grange
Birchwood Park Avenue
Oakwood Gate
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Demand
2027 - Do Minimum (SE of M62)
HighgateTransportation


Access Strategy Option A
A49 to Hewton-le-Willows
Golborne Road
Winwick Link Road to M6 J22
M6 to Preston
JUNCTION A
JUNCTION B
JUNCTION C
Myddleton Lane
Southworth Lane
Southworth Lane
Delph Lane
Winwick Park Avenue
JUNCTION F
Delph Lane Retail Park
JUNCTION E
Delph Lane
Mill House Lane
JUNCTION D
M62 to Liverpool
M62 J9
M62 J10/M6 J21A
M62 to Manchester
A49 to Warrington Town Centre
Mill Lane
M6 to Stoke-on-Trent
Locking Stumps Lane
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Demand
2027 - Do Something (N of M62)
HighgateTransportation


Access Strategy Option A
A49 to Newton-le-Willows
M62 to Liverpool
M62 J9
M62 to Manchester
JUNCTION G
Birch Avenue (New Access Point)
New Access Point
New Access Point
Grasmere Avenue Access Point
Poplars Avenue
Poplars Avenue
JUNCTION H
JUNCTION I
JUNCTION J
JUNCTION K
JUNCTION L
JUNCTION M
JUNCTION N
JUNCTION O
JUNCTION P
Windermere Avenue/ Grasmere
Colwold Road
Cleveland Road
Howson Road
Statham Avenue
Greenwood Crescent
Copperhorne Road
Poplars Avenue
Calver Road
Sandy Lane West
JUNCTION Z
JUNCTION AA
JUNCTION AB
JUNCTION AC
Sandy Lane
Sandy Lane
Cromwell Avenue
JUNCTION Y
JunctionNINE Retail Park
JUNCTION X
Northway
Fisher Avenue
Copperhorne Road
Poplars Avenue
Hawleys Lane
JUNCTION W
A50
JUNCTION V
JUNCTION U
A50
JUNCTION T
JUNCTION S
JUNCTION Q
JUNCTION R
Hilden Road
Birchwood Way
Smith Drive
Hatfields Road
A50
A49 to Warrington Town Centre
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Demand
2027 - Do Something (SW of M62)
HighgateTransportation


Access Strategy Option A
Mill Lane
M62 to Liverpool
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Mill Lane leading to New Access Point
JUNCTION AD
New Access Point
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JUNCTION AR
Cinnamon Lane
Crab Lane
Hilden Road
JUNCTION AN
JUNCTION AS
Fernhead Lane
JUNCTION AJ
Birchwood Park Avenue
JUNCTION AK
Birchwood Way
JUNCTION AL
Birchwood Way
JUNCTION AM
Blacklocks Avenue
Woolston Grange
M6 to Stoke-on-Trent
Oakwood Gate
KEY
1 Light Vehicles
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(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Demand
2027 - Do Something (SE of M62)
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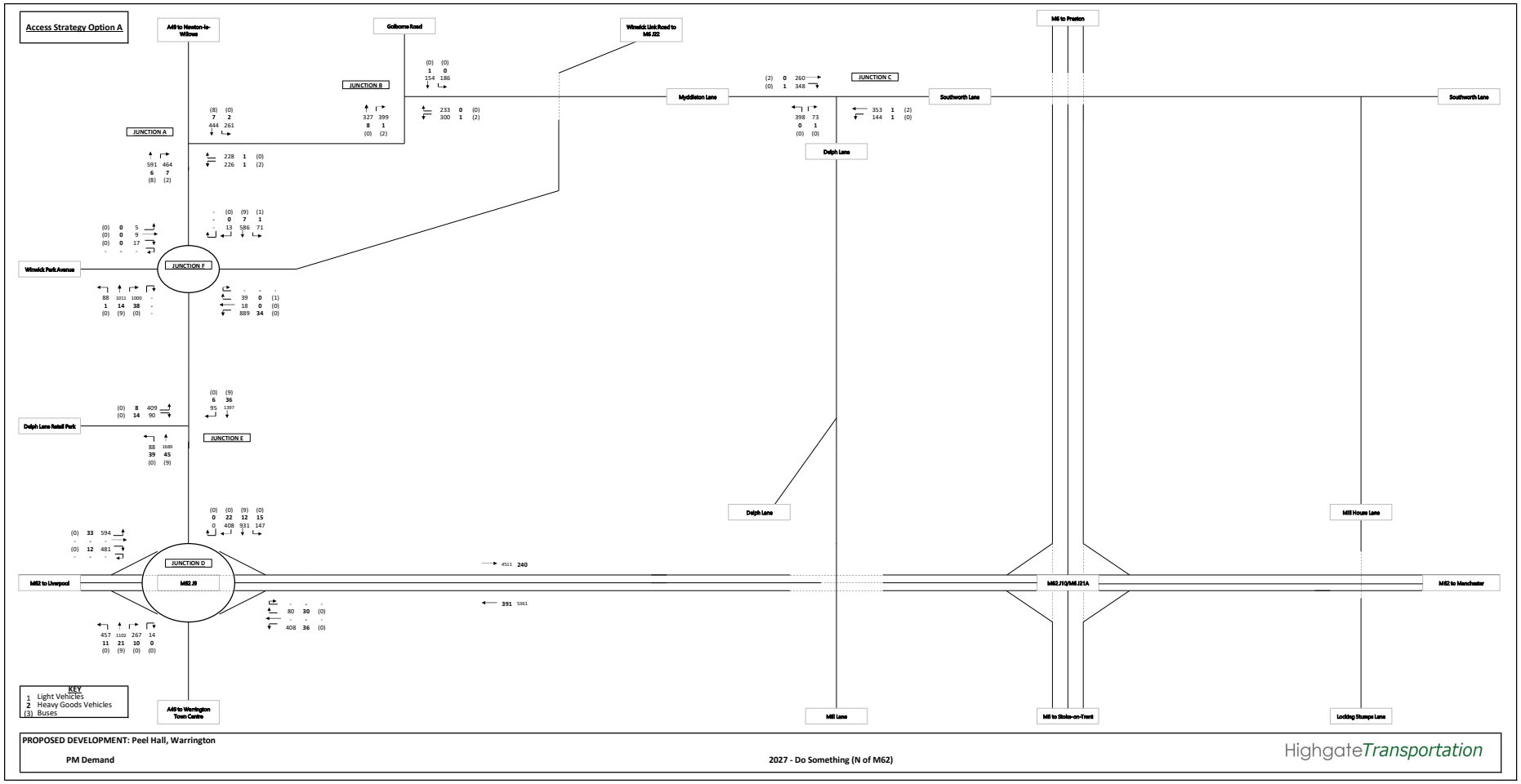
Access Strategy Option A
A49 to Newton-le-Willows
Golborne Road
Winwick Link Road to M6 J22
M6 to Preston
JUNCTION B
JUNCTION C
Myddleton Lane
Southworth Lane
Southworth Lane
JUNCTION A
Delph Lane
Winwick Park Avenue
JUNCTION F
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Delph Lane
Mill House Lane
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M62 to Liverpool
M62 J9
M62 J10/M6 J21A
M62 to Manchester
Mill Lane
M6 to Stoke-on-Trent
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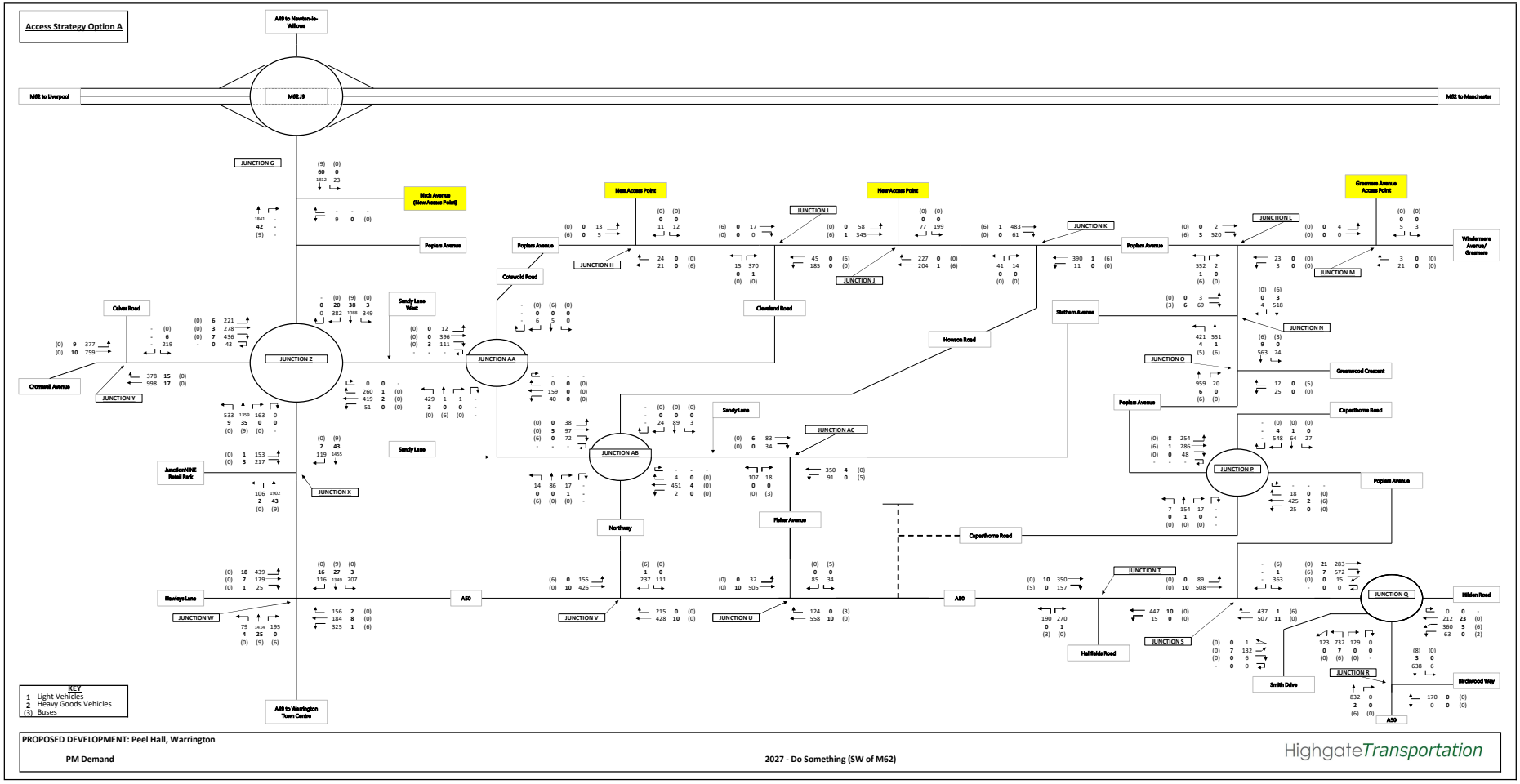
A49 to Warrington Town Centre
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Demand
2027 - Do Something (N of M62)
HighgateTransportation


Access Strategy Option A
A49 to Newton-le-Willows
M62 to Liverpool
M62 J9
M62 to Manchester
JUNCTION G
Birch Avenue (New Access Point)
New Access Point
New Access Point
Grasmere Avenue Access Point
Poplars Avenue
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Poplars Avenue
Poplars Avenue
Poplars Avenue
Poplars Avenue
Cotswold Road
Cleveland Road
Howson Road
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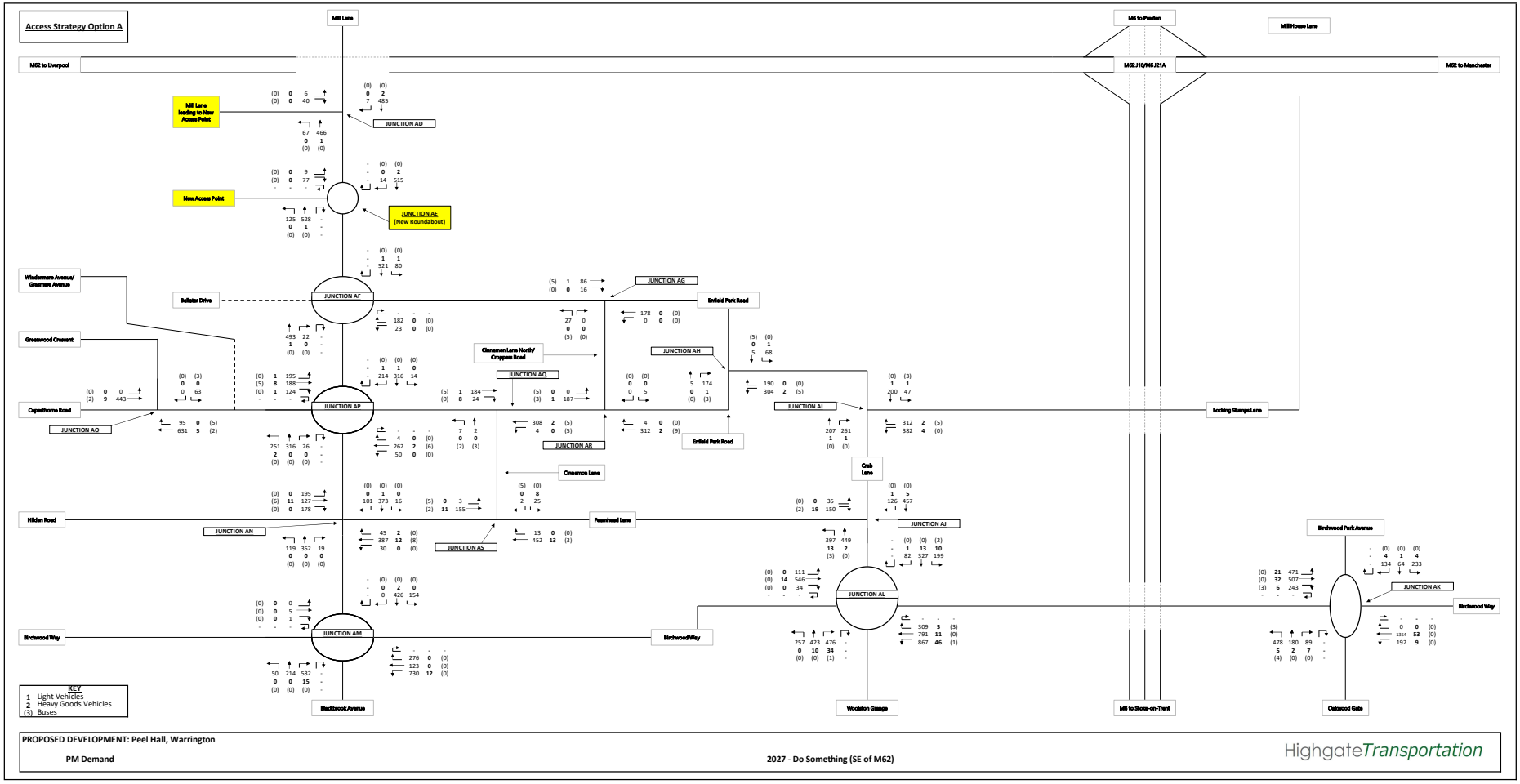
Calver Road
Cromwell Avenue
Sandy Lane West
Sandy Lane
Sandy Lane
Northway
Fisher Avenue
Hawleys Lane
Halfields Road
Smith Drive
Hilden Road
Birchwood Way
JUNCTION Z
JUNCTION AA
JUNCTION AB
JUNCTION AC
JUNCTION X
JUNCTION Y
JUNCTION W
JUNCTION V
JUNCTION U
JUNCTION H
JUNCTION I
JUNCTION J
JUNCTION K
JUNCTION L
JUNCTION M
JUNCTION N
JUNCTION O
JUNCTION P
JUNCTION Q
JUNCTION R
JUNCTION S
JUNCTION T
JunctionNINE Retail Park
A50
A50
A50
A49 to Warrington Town Centre
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Demand
2027 - Do Something (SW of M62)
HighgateTransportation


Access Strategy Option A
Mill Lane
M62 to Liverpool
M6 to Preston
Mill House Lane
M62 J10/M6 J21A
M62 to Manchester
Mill Lane leading to New Access Point
JUNCTION AD
New Access Point
JUNCTION AE (New Roundabout)
Windermere Avenue/ Grasmere Avenue
Ballater Drive
JUNCTION AF
JUNCTION AG
Enfield Park Road
Greenwood Crescent
Cinnamon Lane North/ Croppers Road
JUNCTION AH
JUNCTION AQ
Capesthorne Road
JUNCTION AO
JUNCTION AP
JUNCTION AI
Lodging Slumps Lane
JUNCTION AR
Enfield Park Road
Cinnamon Lane
Crab Lane
Hilden Road
JUNCTION AN
JUNCTION AS
Fernihead Lane
JUNCTION AJ
Birchwood Park Avenue
JUNCTION AL
JUNCTION AK
Birchwood Way
JUNCTION AM
Birchwood Way
Birchwood Way
Blackbrook Avenue
Woolston Grange
M6 to Stoke-on-Trent
Oakwood Gate
KEY
1 Light Vehicles
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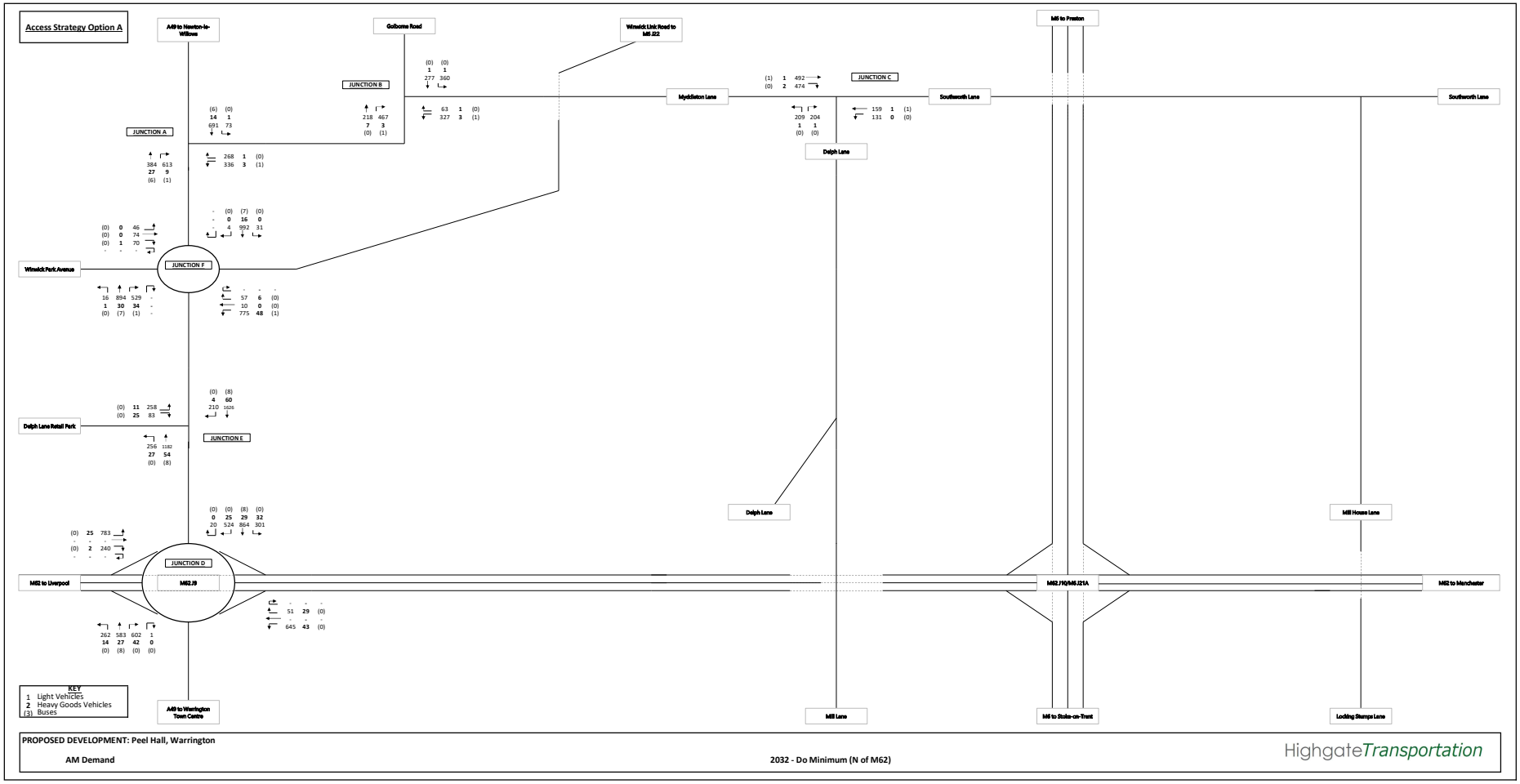
PROPOSED DEVELOPMENT: Peel Hall, Warrington
PM Demand
2027 - Do Something (SE of M62)
HighgateTransportation


Access Strategy Option A
A49 to Newton-le-Willows
Golborne Road
Winwick Link Road to M6 J22
M6 to Preston
JUNCTION B
JUNCTION C
Myddleton Lane
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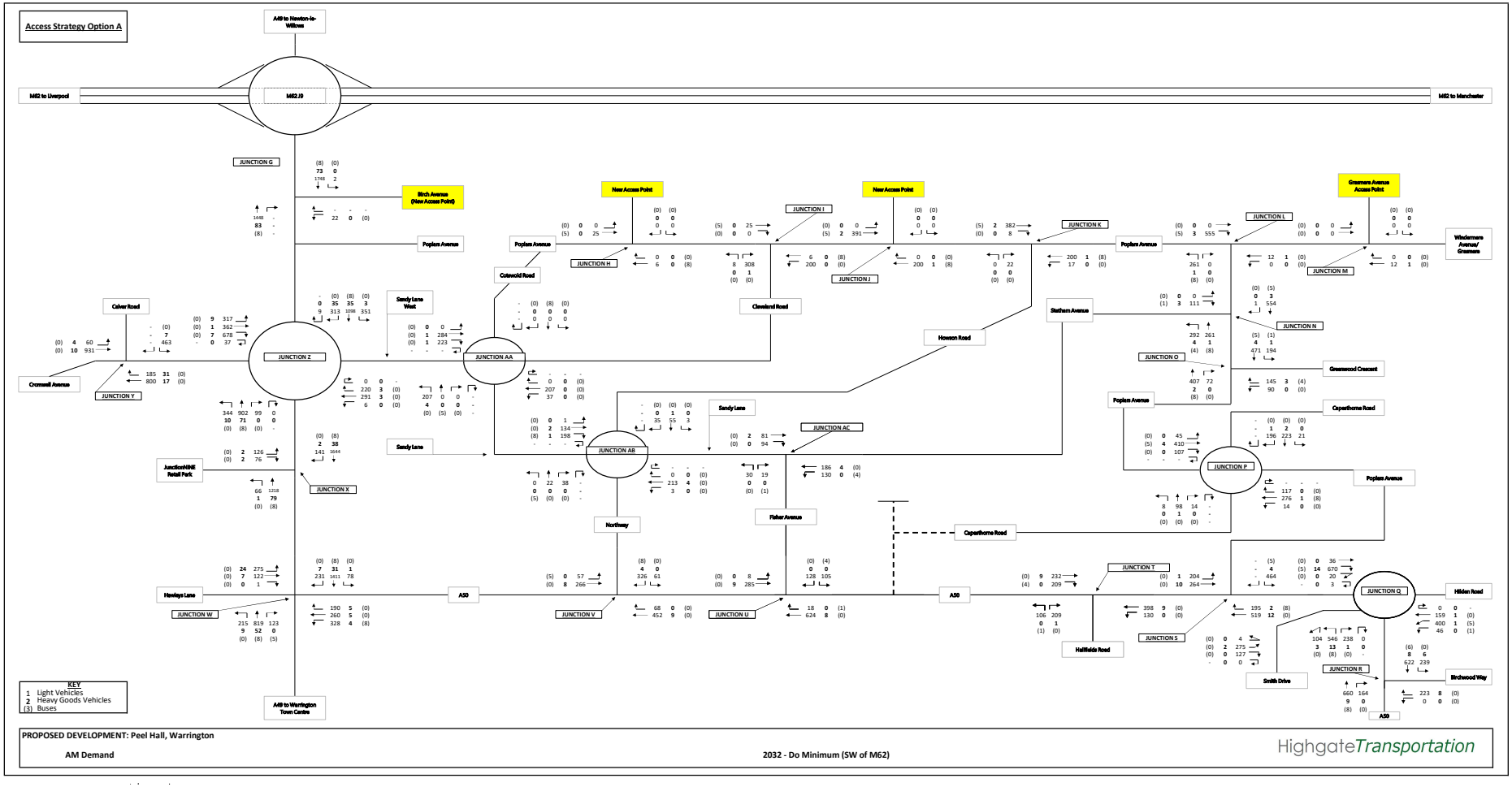
Mill House Lane
JUNCTION D
M62 to Liverpool
M62 J9
M62 J10/M6 J21A
M62 to Manchester
Mill Lane
M6 to Stoke-on-Trent
Locking Stumps Lane
A49 to Warrington Town Centre
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
PROPOSED DEVELOPMENT: Peel Hall, Warrington
AM Demand
2032 - Do Minimum (N of M62)
HighgateTransportation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M62 to Liverpool
M62 J9
M62 to Manchester
JUNCTION G
Birch Avenue (New Access Point)
New Access Point
New Access Point
Grasmere Avenue Access Point
Poplars Avenue
Poplars Avenue
JUNCTION H
JUNCTION I
JUNCTION J
JUNCTION K
JUNCTION L
JUNCTION M
Windermere Avenue/ Grasmere
Colwold Road
Cleveland Road
Calver Road
Sandy Lane West
JUNCTION Z
JUNCTION AA
Howson Road
Statham Avenue
JUNCTION N
JUNCTION O
Greenwood Crescent
Cromwell Avenue
JUNCTION Y
Poplars Avenue
Copperhorne Road
Sandy Lane
JUNCTION AC
JUNCTION AB
JUNCTION P
JunctionNINE Retail Park
JUNCTION X
Poplars Avenue
Northway
Fisher Avenue
Copperhorne Road
Hawkeye Lane
JUNCTION W
A50
JUNCTION V
JUNCTION U
A50
JUNCTION T
JUNCTION Q
Hilden Road
JUNCTION S
Smith Drive
JUNCTION R
Birchwood Way
Hatfields Road
A50
A49 to Warrington Town Centre
KEY
1 Light Vehicles
2 Heavy Goods Vehicles
(3) Buses
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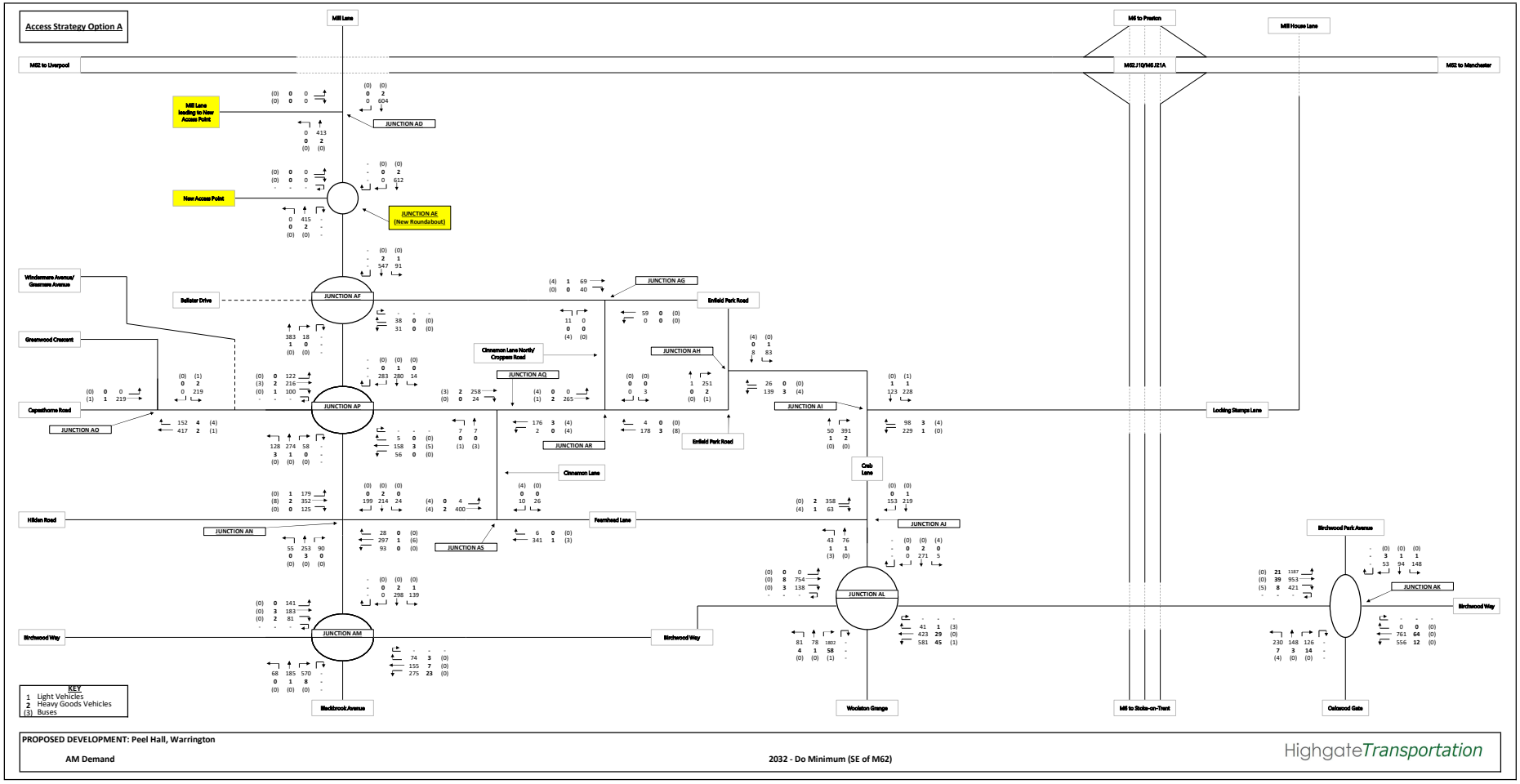
AM Demand
2032 - Do Minimum (SW of M62)
HighgateTransportation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Mill Lane
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M6 to Preston
Mill House Lane
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M62 to Manchester
Mill Lane leading to New Access Point
JUNCTION AD
New Access Point
JUNCTION AE (New Roundabout)
Windermere Avenue/ Grasmere Avenue
Ballater Drive
JUNCTION AF
JUNCTION AG
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Greenwood Crescent
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JUNCTION AO
JUNCTION AP
JUNCTION AR
Enfield Park Road
Cinnamon Lane
Crab Lane
Hilden Road
JUNCTION AN
JUNCTION AS
Fernihead Lane
JUNCTION AJ
Birchwood Park Avenue
JUNCTION AL
JUNCTION AK
Birchwood Way
Birchwood Way
JUNCTION AM
Birchwood Way
Blackbrook Avenue
Woolston Grange
M6 to Stoke-on-Trent
Oakwood Gate
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AM Demand
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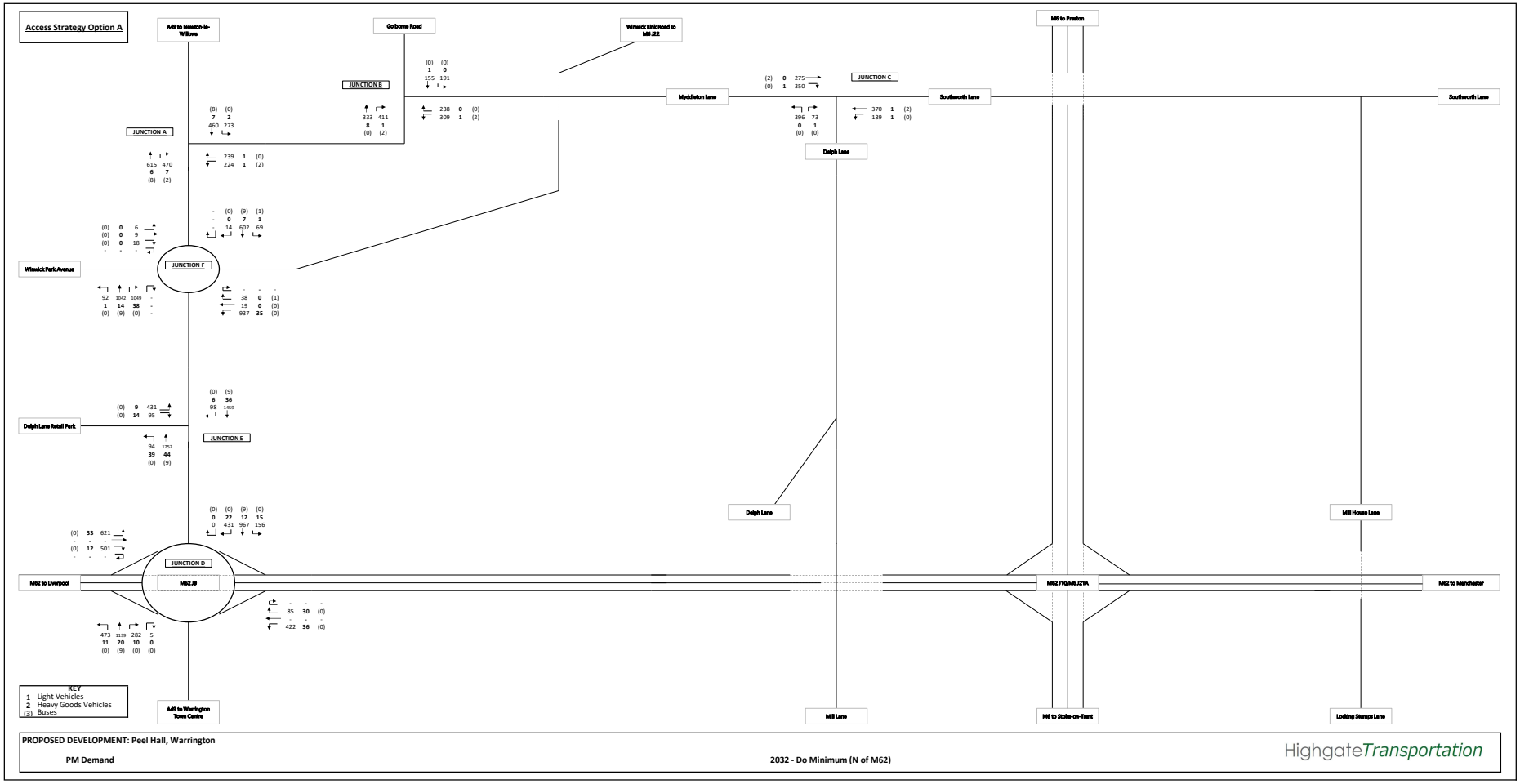
Access Strategy Option A
A49 to Newton-le-Willows
Golborne Road
Winwick Link Road to M6 J22
M6 to Preston
JUNCTION B
JUNCTION C
Myddleton Lane
Southworth Lane
Southworth Lane
JUNCTION A
Delph Lane
Winwick Park Avenue
JUNCTION F
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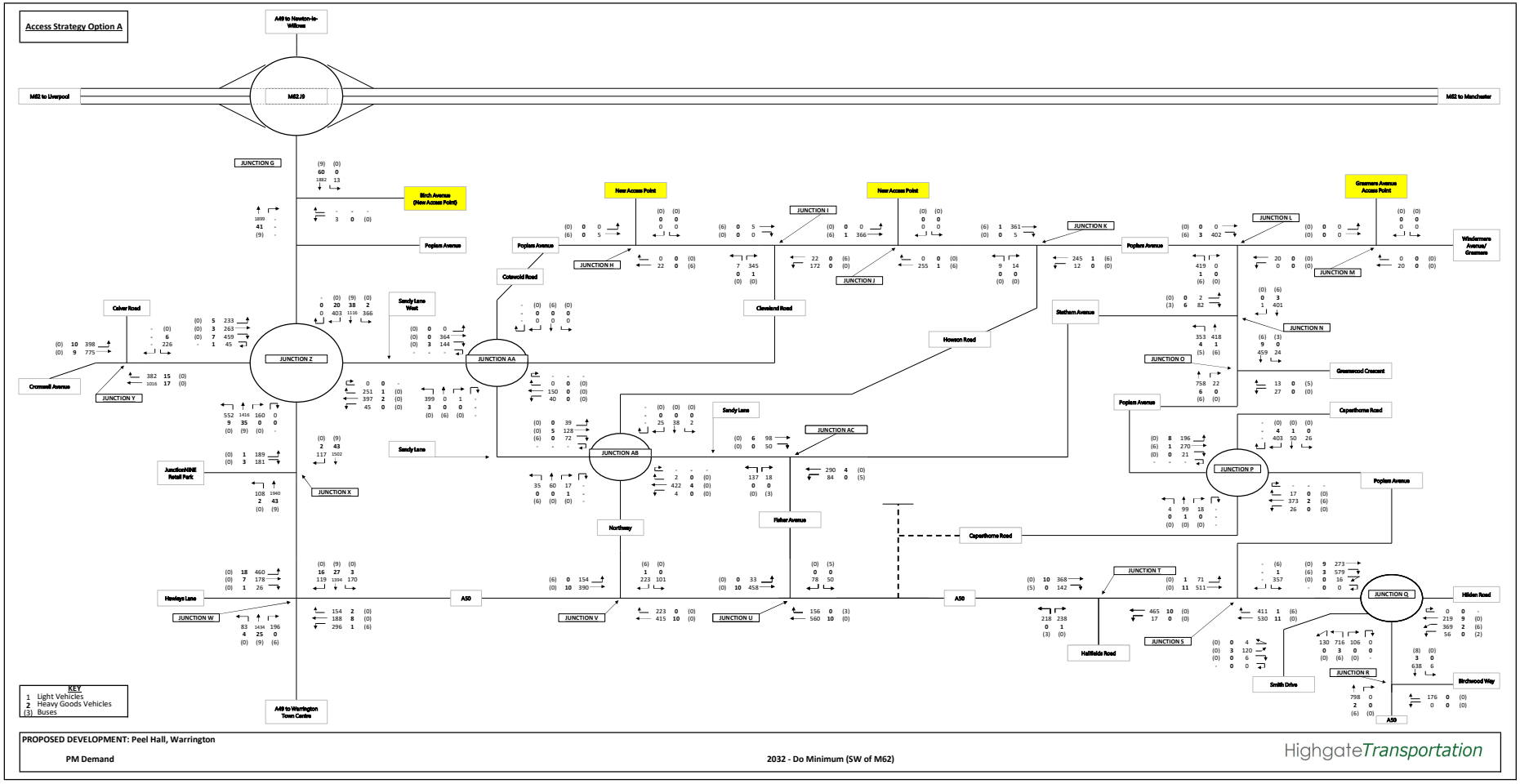
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New Access Point
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JUNCTION N
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Poplars Avenue
Calver Road
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JUNCTION Y
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JUNCTION X
Northway
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JUNCTION W
A50
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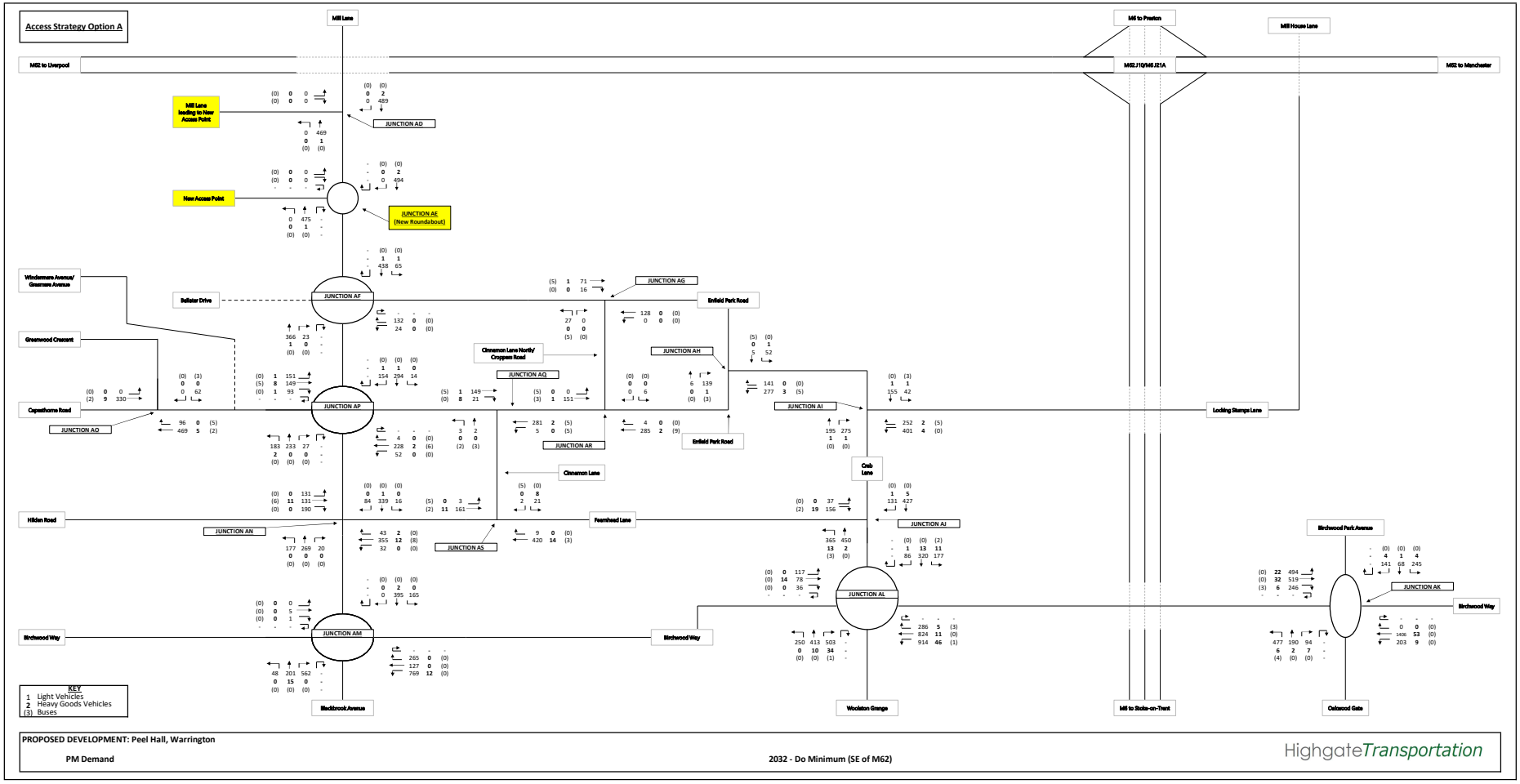
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Mill Lane leading to New Access Point
JUNCTION AD
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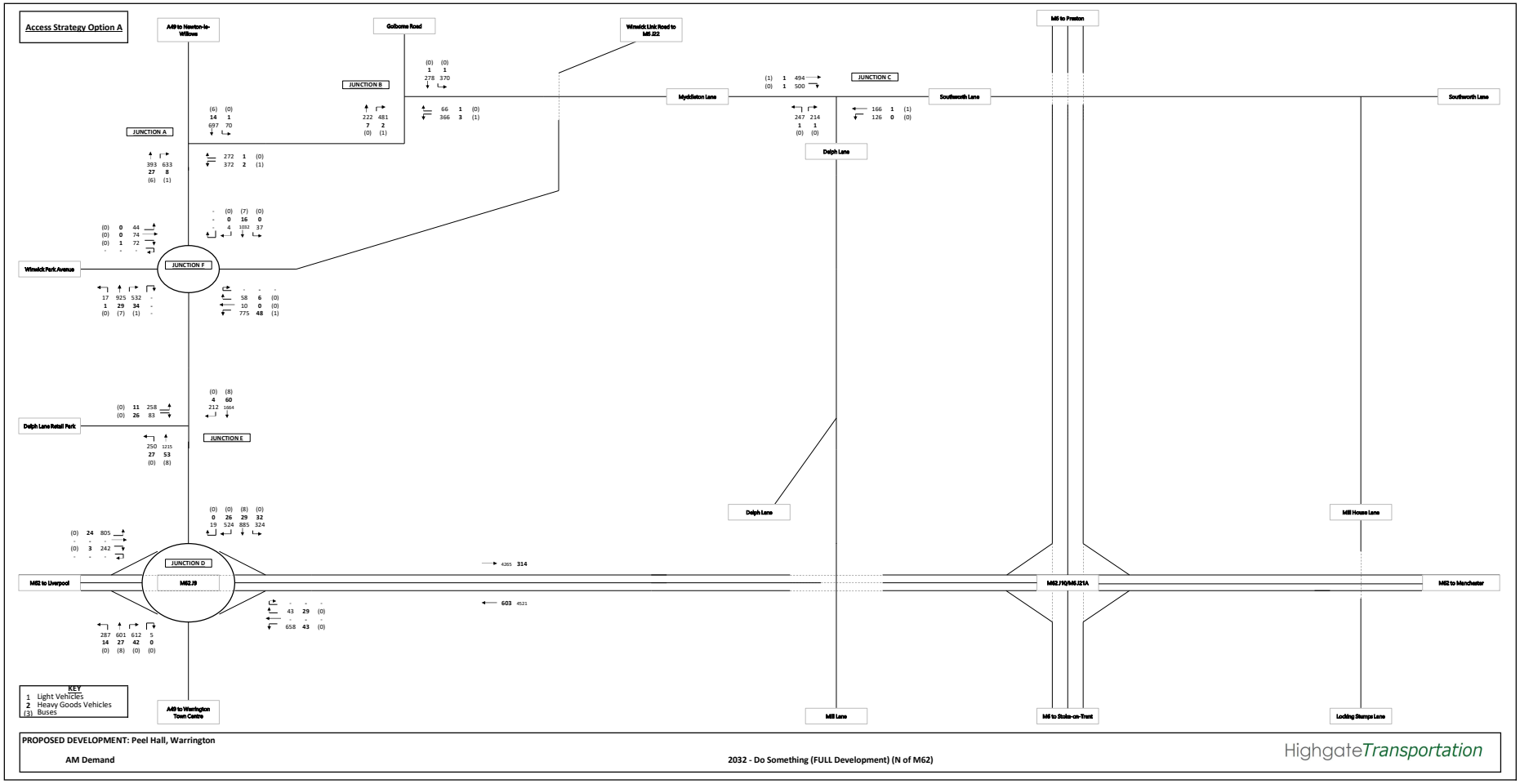
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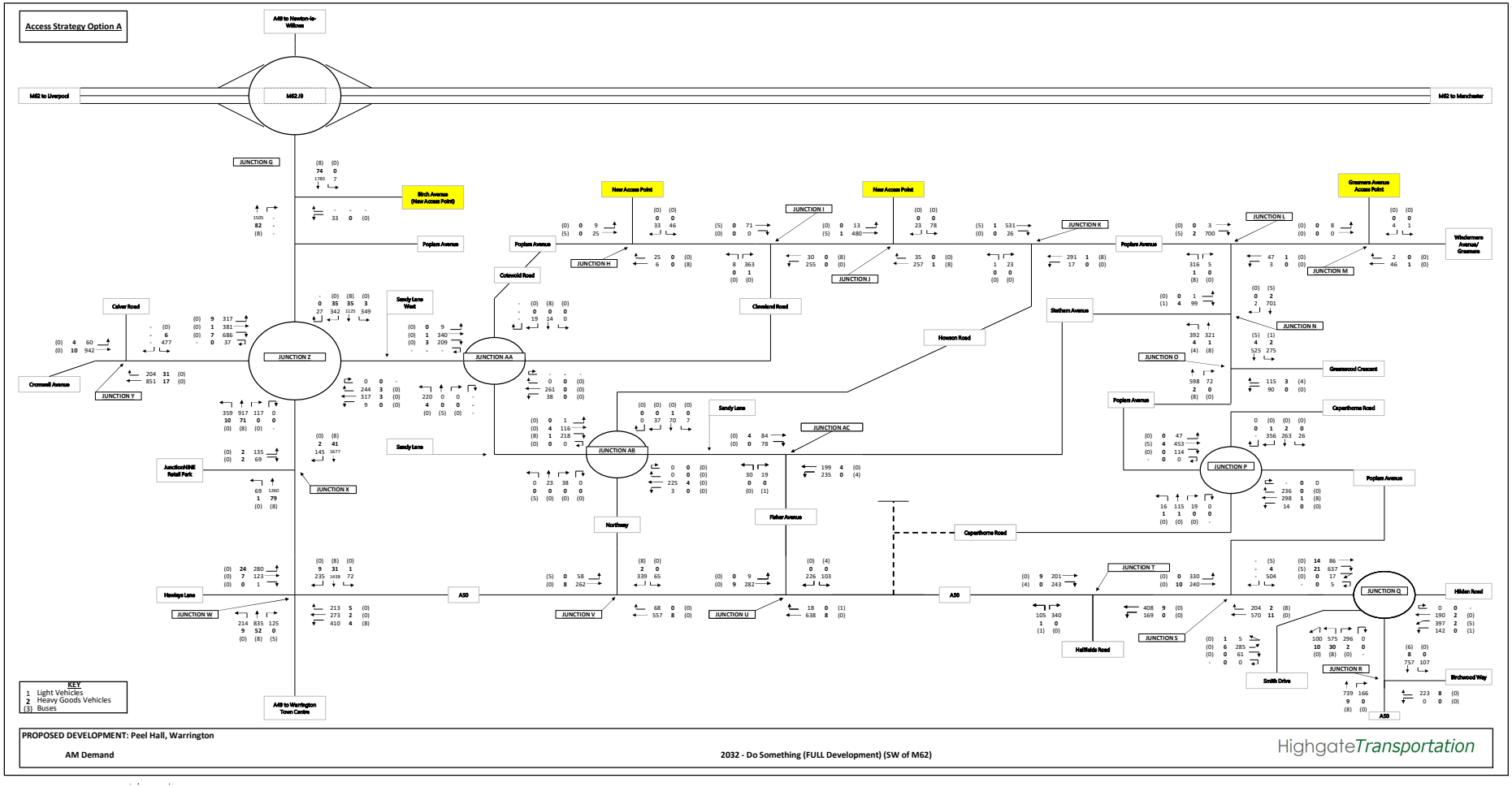
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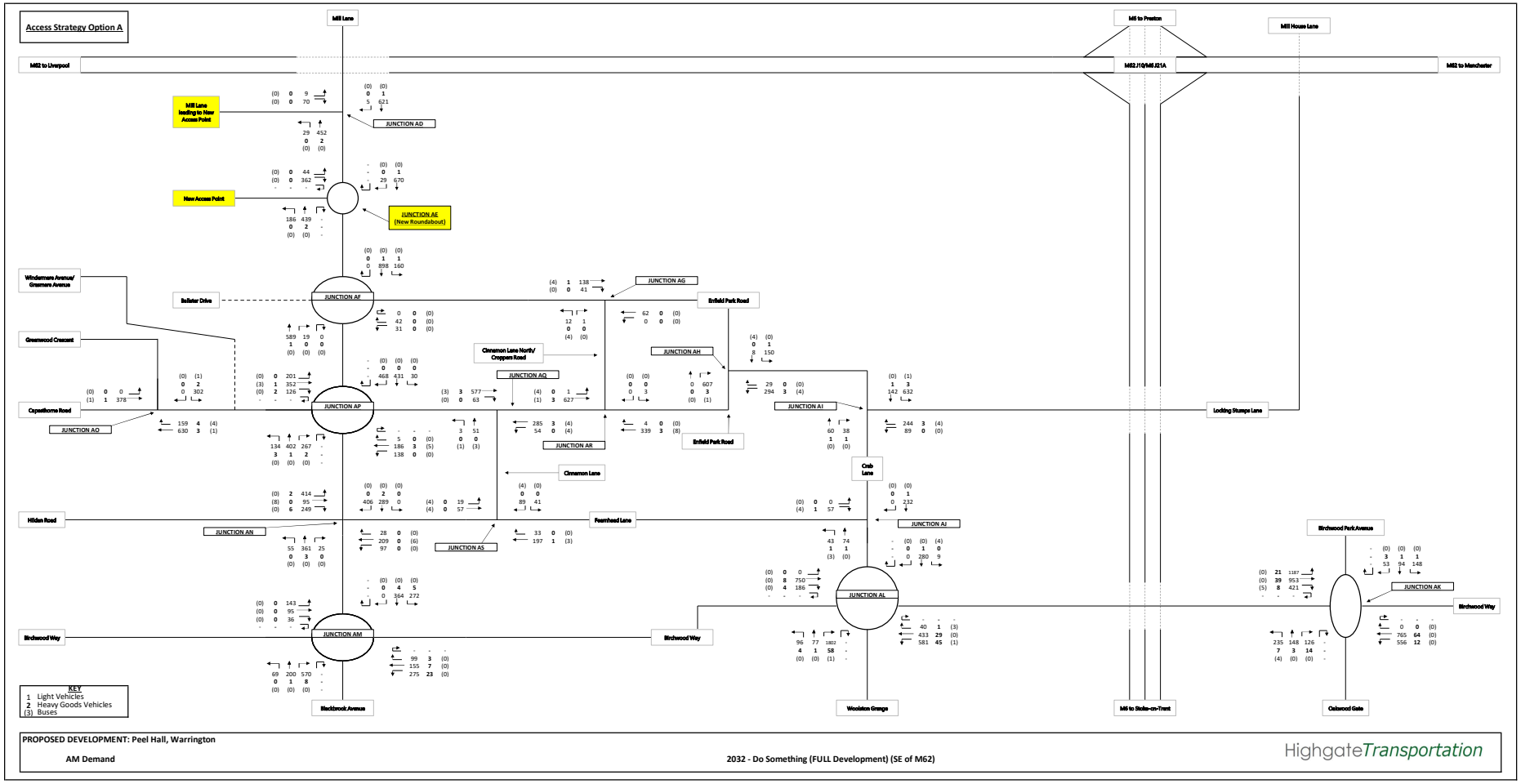
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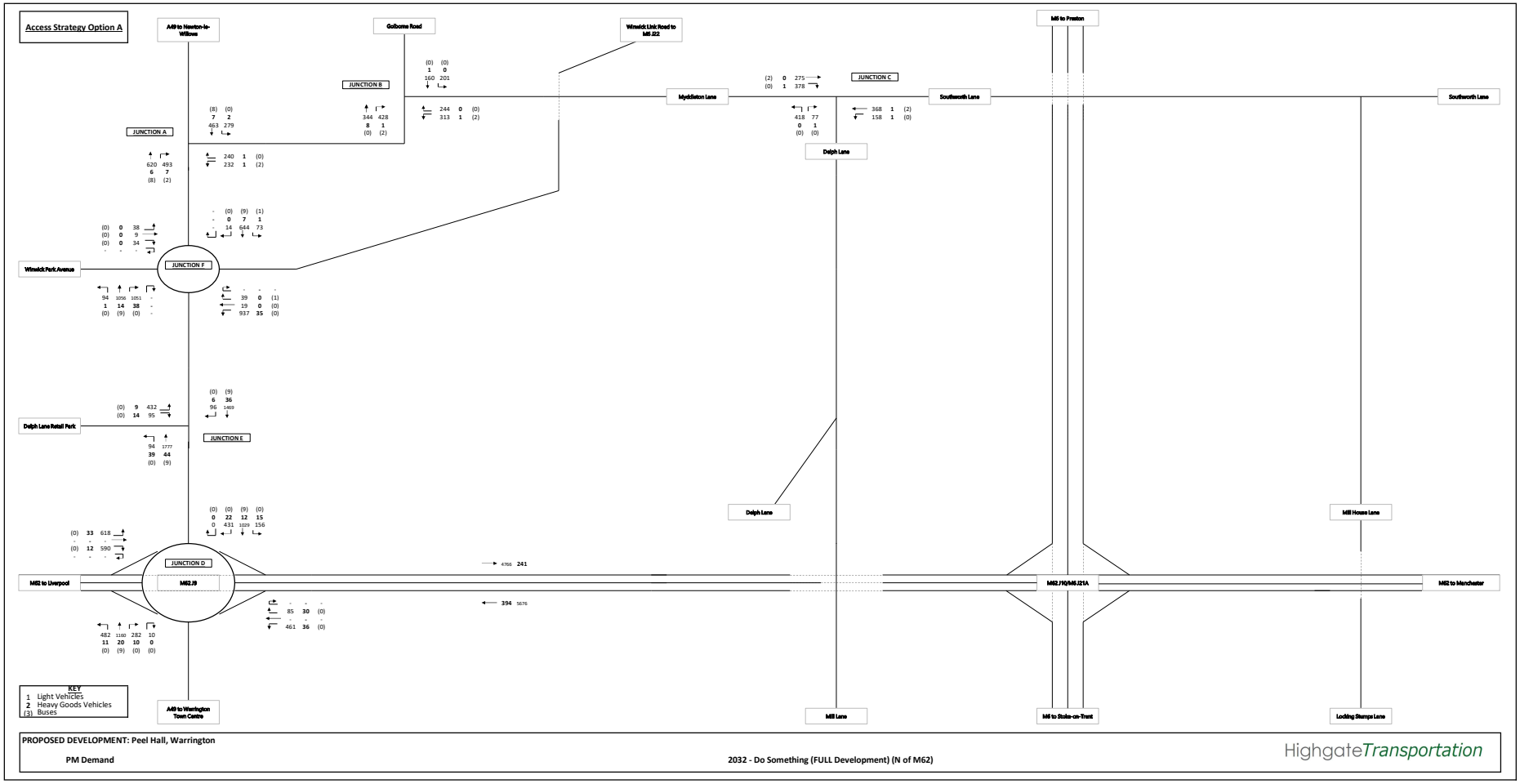
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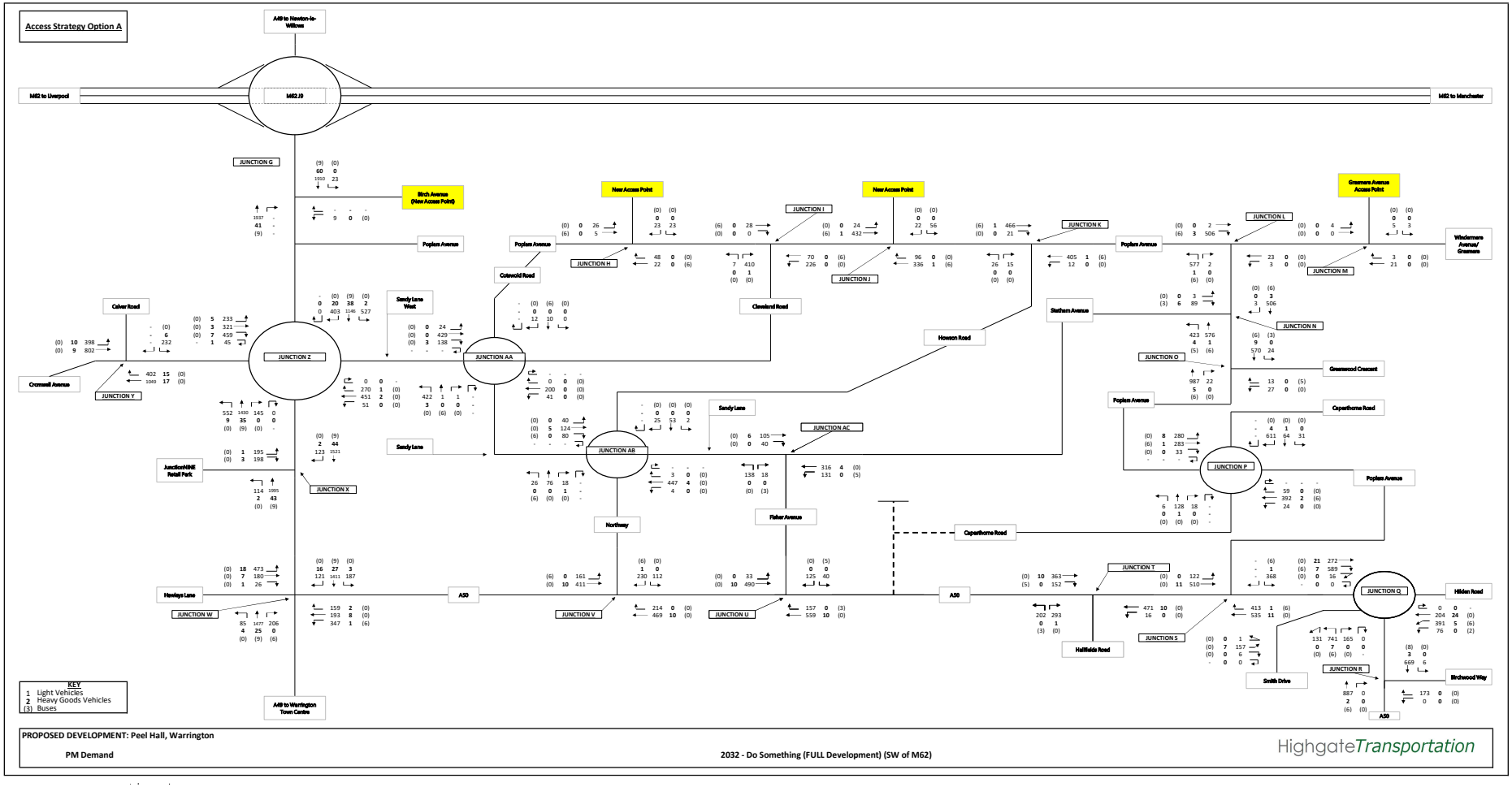
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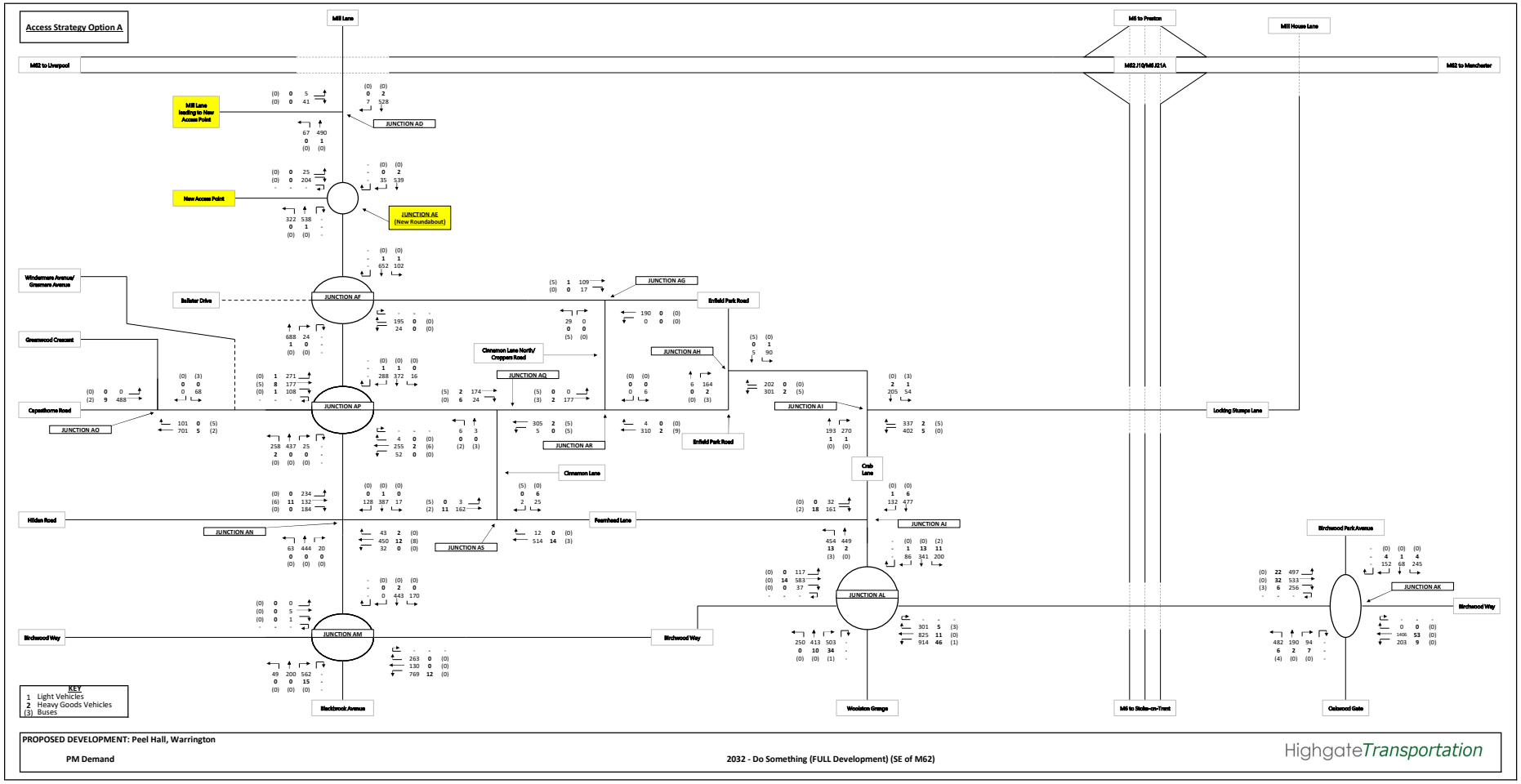
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Cinnamon Lane
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2032 - Do Something (FULL Development) (SE of M62)
HighgateTransportation

TRANSPORTATION AND HIGHWAYS

T14 TN09 Link Capacity Text

HighgateTransportation

Highgate Transportation Ltd
First Floor, 43-45 Park Street, BRISTOL BS1 5NL
0117 934 9121
Company Registration Number: 07500534

TECHNICAL NOTE

PROJECT: Peel Hall, Warrington

REPORT: 1901/TN/09 – Link Capacity

DATE: January 2020

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1. This Technical Note (TN/09) has been prepared by Highgate Transportation Ltd to help quantify and explain the implications of increased traffic flows on the residential area to the immediate south of the Peel Hall development in terms of impact on link capacity. In particular this Technical Note considers whether or not the development traffic results in a harmful change to where any given road sits within the local road hierarchy, further to the Inspector's comments {IR13.45-13.54} regarding possible impact on the character of the local area.

2. This Technical Note should be read in conjunction with Technical Note (TN/10), which considers parking and traffic calming measures in the area to the south of the Peel Hall site, including highway safety in general and pedestrian safety in particular. This is in order to address the Inspector's comment {IR13.50} that development traffic within this area would result in conditions that would be busier, nosier and potentially make it more difficult for pedestrians to cross.

3. This report is structured to show a comparison with the 2022 Do Minimum (no Peel Hall development) traffic flows from the Peel Hall WMMTM16 SATURN modelling and the forecast 2032 Do Minimum and 2032 Do Something (full Peel Hall development) traffic flows at different locations on the area to the south, as identified by the Inspector {IR13.49}. These links are Poplars Avenue, Capesthorne Road, Cleveland Road, Cotswold Road, Howson Road and Sandy Lane. We have also identified Statham Avenue, Greenwood Crescent and Sandy Lane West.

Traffic Flows

4. **Table 1** shows two-way traffic flows on those road links within the study area listed in **paragraph 2** during both the AM Peak hour (0800-0900) and PM Peak hour (1700-1800) periods, as well as daily flows (AADT24) for a 2022 (year of opening) Do Minimum scenario. AADT24 data is based on a methodology and factors agreed with the Council, and Highways England (see correspondence contained in **Appendix 1**).

Table 1 – Link flows within the study area (2022 Do Minimum)

Link Name	AM Peak Hour	PM Peak Hour	AADT_24
	2022 DM	2022 DM	2022 DM
Capesthorne Road (Greenwood Crescent to Blackbrook Avenue)	848	782	7309
Capesthorne Road (Poplars Ave - parallel to Humber Road)	496	617	4991
Cleveland Road	316	375	3801
Cotswold Road	40	36	418
Howson Road	43	39	451
Greenwood Crescent (Darley Ave to Grasmere Ave)	297	9	1683
Greenwood Crescent (Grasmere Ave to Meteor Cres)	482	84	3114
Poplars Avenue - East of (Central) Site entrance	383	440	4528
Poplars Avenue (Greenwood Cres - Capesthorne Road)	758	1042	9902
Poplars Avenue (south of Capesthorne Road)	740	685	7839
Sandy Lane West	578	774	7438
Sandy Lane	330	493	4528
Statham Avenue	353	431	4313

5. Tables 2 and 3 set out the two-way traffic flows on the road links during the AM Peak hour (0800-0900) and PM Peak hour (1700-1800) for 2032 Do Minimum and Do Something respectively. The 'Flow 1' and 'Flow 2' columns are the forecast flows in each direction on the respective link.

Table 2 – Link flows within the study area (2032 Do Minimum and 2032 Do Something) AM Peak Hour

Link Name	AM Peak Hour						
	2032 DM (Flow 1)	2032 DM (Flow 2)	2032 DM (Two-Way)	2032 DS (full) (Flow 1)	2032 DS (full) (Flow 2)	2032 DS (full) Two-Way	2032 DS (full) - 2032 DM Two-Way
Capesthorne Road (Greenwood Crescent to Blackbrook Avenue)	580	443	1023	800	686	1486	463
Capesthorne Road (Poplars Ave - parallel to Humber Road)	443	261	704	648	399	1047	343
Cleveland Road	244	286	530	299	341	640	110
Cotswold Road	13	30	43	46	40	86	43
Howson Road	26	22	48	44	23	67	19
Greenwood Crescent (Darley Ave to Grasmere Ave)	129	181	310	135	264	399	89
Greenwood Crescent (Grasmere Ave to Meteor Cres)	242	269	511	212	350	562	51
Poplars Avenue - East of (Central) Site entrance	398	208	606	564	300	864	258
Poplars Avenue (Greenwood Cres - Capesthorne Road)	575	489	1064	680	628	1308	244
Poplars Avenue (south of Capesthorne Road)	454	416	870	508	556	1064	194
Sandy Lane West	418	510	928	503	562	1065	137
Sandy Lane	274	201	475	276	213	489	14
Statham Avenue	299	118	417	401	108	509	92

Table 3 – Link flows within the study area (2032 Do Minimum and 2032 Do Something) PM Peak Hour

Link Name	PM Peak Hour						
	2032 DM (Flow 1)	2032 DM (Flow 2)	2032 DM (Two-Way)	2032 DS (full) (Flow 1)	2032 DS (full) (Flow 2)	2032 DS (full) Two-Way	2032 DS (full) - 2032 DM Two-Way
Capesthorne Road (Greenwood Crescent to Blackbrook Avenue)	577	407	984	812	570	1382	398
Capesthorne Road (Poplars Ave - parallel to Humber Road)	484	322	806	711	477	1188	382
Cleveland Road	190	366	556	241	431	672	116
Cotswold Road	22	11	33	45	37	82	49
Howson Road	17	23	40	32	41	73	33
Greenwood Crescent (Darley Ave to Grasmere Ave)	5	3	8	8	6	14	6
Greenwood Crescent (Grasmere Ave to Meteor Cres)	44	49	93	44	49	93	0
Poplars Avenue - East of (Central) Site entrance	374	256	630	495	432	927	297
Poplars Avenue (Greenwood Cres - Capesthorne Road)	505	786	1291	1014	616	1630	339
Poplars Avenue (south of Capesthorne Road)	320	417	737	339	476	815	78
Sandy Lane West	552	513	1065	638	595	1233	168
Sandy Lane	186	419	605	189	443	632	27
Statham Avenue	362	95	457	434	102	536	79

6. **Table 4** provides the forecast daily flows (AADT24) for these 2032 Do Minimum and Do Something scenarios.

Table 4 – AADT24 Link flows within the study area (2032 Do Minimum and 2032 Do Something)

Link Name	AADT_24		
	2032 DM	2032 DS (Full)	2032 DS (Full) - 2032 DM
Capesthorne Road (Greenwood Crescent to Blackbrook Avenue)	9004	12860	3856
Capesthorne Road (Poplars Ave - parallel to Humber Road)	6771	10022	3251
Cleveland Road	5988	7234	1246
Cotswold Road	419	921	502
Howson Road	485	783	298
Greenwood Crescent (Darley Ave to Grasmere Ave)	1753	2277	524
Greenwood Crescent (Grasmere Ave to Meteor Cres)	3325	3611	287
Poplars Avenue - East of (Central) Site entrance	6809	9875	3066
Poplars Avenue (Greenwood Cres - Capesthorne Road)	12984	16204	3220
Poplars Avenue (south of Capesthorne Road)	8871	10365	1494
Sandy Lane West	10988	12670	1682
Sandy Lane	5955	6186	232
Statham Avenue	4819	5756	937

7. It can be seen from this flow information that the busier links account for use by through-traffic. A comparison between the 2022 and 2032 Do Minimum SATURN results demonstrate that the flows through the area are expected to substantially increase over time on the majority of links even without Peel Hall development traffic i.e. 200vph or around 2,000vpd.

8. It can also be seen that the increase in traffic as a result of the full Peel Hall development in 2032 varies across the links of between 1 to 461vph and 232 to 3,856vpd.

9. Furthermore, the Tables show development traffic impact to be very low on Sandy Lane and Howson Road (one vehicle every two to four minutes), with low increases of around 40 to 80vph on Cotswold Road, Greenwood Crescent and Statham Avenue i.e. around one vehicle per minute. Larger impacts are forecast on Cleveland Road and Sandy Lane West of around 110 to 170vph (two to three vehicles per minute) increasing to between 250 to 450vph Capesthorne Road and Poplars Avenue i.e. four to seven vehicles per minute.

Traffic Capacity

10. The assessment procedure to determine the traffic capacity of urban roads is set out in Transport Advice Note TA 79/99 (May 1999) – see **Appendix 2**.

11. For the category UAP3 (Urban All Purpose Road Type 3 - variable standard roads carrying mixed traffic with HGV content less than 15%) it can be seen that this includes roads like those in the area to the immediate south of Peel Hall which have frontage access, side roads, bus stops and at-grade pedestrian crossings, and a 30mph speed restriction. Table 2 of this document gives the capacities of urban roads showing one-way hourly flows where the flows for a single carriageway are based upon a 60/40 directional split in the flow with the flows shown representing the busiest flow (60% figure).

Table 2 – TA 79/99

		Two-way Single Carriageway- Busiest direction flow (Assumes a 60/40 directional split)									**Dual Carriageway**			
		Total number of Lanes									Number of Lanes in each direction			
		2				2-3	3	3-4	4	4+	2		3	4
Carriageway width		6.1m	6.75m	7.3m	9.0m	10.0m	12.3m	13.5m	14.6m	18.0m	6.75m	7.3m	11.0m	14.6m
Road type	**UM**	**Not applicable**										4000	5600	7200
	UAP1	1020	1320	1590	1860	2010	2550	2800	3050	3300	3350	3600	5200	*
	UAP2	1020	1260	1470	1550	1650	1700	1900	2100	2700	2950	3200	4800	*
	UAP3	900	1110	1300	1530	1620	*	*	*	*	2300	2600	3300	*
	UAP4	750	900	1140	1320	1410	*	*	*	*	*	*	*	*

Table 2 Capacities of Urban Roads
One-way hourly flows in each direction

Notes
1. Capacities are in vehicles per hour.
2. HGV ≤ 15%
3. (*) Capacities are excluded where the road width is not appropriate for the road type and where there are too few examples to give reliable figures.

12. The widths of the roads set out in **Tables 1** to **4** are set out in **Table 5**, together with the busiest direction peak hour flow limit identified in TA 79/99 Table 2 above.

Table 5 – Road Widths

Road	Width (metres)	TA 79/99 Table 2 – Busiest Direction Peak Hour Flow
Poplars Avenue	7.3	1300
Cotswold Road	7.3	1300
Cleveland Road	6.1	900
Howson Road	7.3	1300
Capesthorne Rd (Poplars Ave. - parallel to Humber Dr)	6.1	900
Capesthorne Rd (Greenwood Cres. - Blackbrook Ave.)	7.3	1300
Sandy Lane	7.3	1300
Sandy Lane West	6.1	900
Greenwood Crescent	7.3	1300
Statham Avenue	7.3	1300

13. Further guidance regarding traffic flow and safety for roads with frontage access is given in Manual for Streets (2007). Paragraph 7.9.5 contains the following:

7.9.5 It is recommended that the limit for providing direct access on roads with a 30 mph speed restriction is raised to at least 10,000 vehicles per day (see box).

Traffic flow and road safety for streets with direct frontage access

The relationship between traffic flow and road safety for streets with direct frontage access was researched for MfS. Data on recorded accidents and traffic flow for a total of 20 sites were obtained. All of the sites were similar in terms of land use (continuous houses with driveways), speed limit (30 mph) and geometry (single-carriageway roads with limited side-road junctions). Traffic flows at the sites varied from some 600 vehicles per day to some 23,000 vehicles per day, with an average traffic flow of some 4,000 vehicles per day.

It was found that very few accidents occurred involving vehicles turning into and out of driveways, even on heavily-trafficked roads.

Links with direct frontage access can be designed for significantly higher traffic flows than have been used in the past, and there is good evidence to raise this figure to 10,000 vehicles per day. It could be increased further, and it is suggested that local authorities review their standards with reference to their own traffic flows and personal injury accident records. The research indicated that a link carrying this volume of traffic, with characteristics similar to those studied, would experience around one driveway-related accident every five years per kilometre. Fewer accidents would be expected on links where the speed of traffic is limited to 20 mph or less, which should be the aim in residential areas.

14. From this it can be seen that:

    i. The Manual for Streets studies included roads with flows of 23,000vpd.
    ii. The guidance figure of 10,000vpd can be increased further.
    iii. Their studies showed that very few accidents occurred involving vehicles turning into and out of driveways.
    iv. Fewer accidents would be expected on links where the speed of traffic is limited to 20mph.

    It should also be noted that the main changes in the approach to link capacity that Manual for Streets recommends (paragraph 1.6.1) are:

    - Moving away from hierarchies of standard road types based on traffic flows and/or the number of buildings served.
    - Designing to keep vehicle speeds at or below 20 mph on residential streets unless there are overriding reasons for accepting higher speeds.
    - Using the minimum of highway design features necessary to make the streets work properly.

15. This information above (Manual for Streets, Table 2 of TA 79/99 and **Table 5**) is compared to the data in **Tables 2** to **4** to summarise the development impact on link flow capacity. This is set out in **Table 6**.

Table 6 – Summary for 2032 Development Impact on Link Capacity

Road	Comments
Poplars Avenue	This road is around 7.3m wide and in the busiest peak hour (PM) the busiest directional flow forecast in 2032 (with development traffic) is 1,014vph between Greenwood Crescent and Capesthorne Road. This is well below the DMRB figure of 1,300vph in the busiest direction. The forecast AADT24 figures range from 6,809vpd to 12,984vpd for a 2032 'without development' scenario. The 'with development' forecast AADT24 figures range from 9,875vpd to 16,204vpd.
Cotswold Road	This road is around 7.3m wide and in the busiest peak hour (PM) with the busiest directional flow forecast in 2032 (with development traffic) of 46vph. This is well below the DMRB figure of 1,300vph in the busiest direction. The forecast AADT24 is 419vpd for a 2032 'without development' scenario. The 'with development' forecast AADT24 is 921vpd.

Table 6 – continued...

Road	Comments
Cleveland Road	This road is around 6.1m wide and in the busiest peak hour (PM) with the busiest directional flow forecast in 2032 (with development traffic) of 431vph. This is well below the DMRB figure of 900vph in the busiest direction. The forecast AADT24 is 5,988vpd for a 2032 'without development' scenario. The 'with development' forecast AADT24 is 7,234vpd.
Howson Road	This road is around 7.3m wide and in the busiest peak hour (AM) with the busiest directional flow forecast in 2032 (with development traffic) of 44vph. This is well below the DMRB figure of 1,300vph in the busiest direction. The forecast AADT24 is 485vpd for a 2032 'without development' scenario. The 'with development' forecast AADT24 is 783vpd.
Capesthorne Rd (Poplars Ave. - parallel to Humber Dr)	This road is around 6.1m wide and in the busiest peak hour (PM) with the busiest directional flow forecast in 2032 (with development traffic) of 711vph. This is below the DMRB figure of 900vph in the busiest direction. The forecast AADT24 is 6,771vpd for a 2032 'without development' scenario. The 'with development' forecast AADT24 is 10,022vpd.
Capesthorne Rd (Greenwood Cres. - Blackbrook Ave.)	This road is around 7.3m wide and in the busiest peak hour (PM) with the busiest directional flow forecast in 2032 (with development traffic) of 812vph. This is well below the DMRB figure of 1,300vph in the busiest direction. The forecast AADT24 is 9,004vpd for a 2032 'without development' scenario. The 'with development' forecast AADT24 is 12,860vpd.
Sandy Lane	This road is around 7.3m wide and in the busiest peak hour (PM) with the busiest directional flow forecast in 2032 (with development traffic) of 443vph. This is well below the DMRB figure of 1,300vph in the busiest direction. The forecast AADT24 is 5,955vpd for a 2032 'without development' scenario. The 'with development' forecast AADT24 is 6,186vpd.

Table 6 – continued…

Road	Comments
Sandy Lane West	This road is around 6.1m wide and in the busiest peak hour (PM) with the busiest directional flow forecast in 2032 (with development traffic) of 638vph. This is well below the DMRB figure of 900vph in the busiest direction. The forecast AADT24 is 10,988vpd for a 2032 'without development' scenario. The 'with development' forecast AADT24 is 12,670vpd.
Greenwood Crescent	This road is around 7.3m wide and in the busiest peak hour (AM) with the busiest directional flow forecast in 2032 (with development traffic) of 350vph. This is well below the DMRB figure of 1,300vph in the busiest direction. The highest forecast AADT24 is 3,325vpd for a 2032 'without development' scenario. The 'with development' highest forecast AADT24 is 3,611vpd.
Statham Avenue	This road is around 7.3m wide and in the busiest peak hour (PM) with the busiest directional flow forecast in 2032 (with development traffic) of 434vph. This is well below the DMRB figure of 1,300vph in the busiest direction. The forecast AADT24 is 4,819vpd for a 2032 'without development' scenario. The 'with development' forecast AADT24 is 5,756vpd.

**Note – measurements based on a combination of topographical survey (where available) and OS mapping supplemented by Google Earth*

16. **Table 6** demonstrates that using the methodology set out in TA 79/99 none of the links exceed the threshold figure given in the advice note.

17. The roads within the immediate area to the south of the Peel Hall site are road type UAP3, such as Sandy Lane West, Poplars Avenue and Capesthorne Road. These will remain as UAP3 roads with the addition of the Peel Hall traffic and it can therefore be seen that there will be no change in road hierarchy.

18. Furthermore, the recommendation within Manual for Streets is that the threshold figure is at least 10,000vpd (for a 30mph road) and it can be seen that the AADT24 figures are generally below this guideline on all roads except for Sandy Lane West, Poplars Avenue and Capesthorne Road, which form the main established through-traffic route.

19. Therefore, from the Manual for Streets guidelines it is considered that the figures shown in **Table 6** are acceptable. Additionally, this 10,000vpd threshold would increase with a reduction in speed limit.

20. TA 79/99 further states in paragraph 3.6 that, "*..effective parking restrictions can lead to higher flows*" and it is considered that mitigation such as the provision of developer funding to extend the 20mph speed restriction along the entire length of Poplars Avenue and also into Capesthorne Road (between Poplars Avenue and Blackbrook Avenue), and to provide parking within the grass verges of these road links, which would be to formalise what occurs at present, will be beneficial (see HTp Technical Note TN/10 dated January 2020).

Summary

21. Whilst inevitably there will be an impact from development traffic on the amenity of the residents in the properties either side of the new accesses onto Poplars Avenue, both Poplars Avenue and the proposed access roads are designed to the appropriate standards i.e. Poplars Avenue is currently a 7.3 metre wide UAP3 road and will remain so apart from local widening to accommodate the access junction. The new access road will also be a road type UAP3.

22. The access junctions have been subject to Road Safety Audit and would be no different than the form of junction that you would see throughout an equivalent residential area.

23. Furthermore, in Transport for the Urban Environment it is set out on page 147 that, "*the existing pattern of land use has to be serviced by an affordable adaptation of the existing network, and much of which may have developed in haphazard ways over the history of the settlement. The initial definition of a hierarchy will necessarily have to be a practical compromise but identification of the current mixture of functions of each road and the scope for modifying it, over a period of time, is an important starting point for subsequent decisions about traffic management and development control, especially as it affects frontage access*".

24. As set out in Technical Note TN/10, a range of parking and traffic calming measures to the area to the south of the Peel Hall site are available to address the Inspector's concerns regarding safety in general and pedestrian safety in particular.

25. Therefore, in highway terms the impact of the development traffic on the area to the south, combined with the measures set out in HTp Technical Note TN/10 should be considered acceptable.

Appendix 1

AADT Methodology and Factors

Appendix 2

Transport Advice Note TA 79/99 (May 1999)

TRANSPORTATION AND HIGHWAYS

T15 TN10 Parking and Measures to South Text

HighgateTransportation

Highgate Transportation Ltd
First Floor, 43-45 Park Street, BRISTOL BS1 5NL
0117 934 9121
Company Registration Number: 07500534

TECHNICAL NOTE

PROJECT: Peel Hall, Warrington

REPORT: 1901/TN/10 – Parking and Measures to the South

DATE: January 2020

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1. Part of the mitigation proposals to the south of the Peel Hall site is to provide car parking within the highway verge. The reason for this is that when the road hierarchy for the area was designed at the time of construction, the demand for on-street parking was significantly less than at present and as a result this can reduce the free flow of traffic.

2. This Technical Note has been provided to confirm the current parking demand on the area to the south of the Peel Hall site i.e. Sandy Lane West, Poplars Avenue, and Capesthorne Road (between Poplars Avenue and Blackbrook Avenue) and to investigate the amount of verge parking that could be created.

3. The study has been carried out using a combination of parking surveys and on-site observations.

4. At the inquiry (APP/M/0655/W/17/3178530), the development impact on the area to the south of Peel Hall was highlighted as an area of concern in terms of vehicle capacity, the additional traffic movement, safety and character of the area. To address these concerns, two measures were put forward:

    i. An increase in the amount of verge parking on Sandy Lane West, Poplars Avenue and Capesthorne Road
    ii. An extension to the existing 20mph speed limit on Poplars Avenue

5. Since the inquiry, the Council have also expressed an interest in alterations to the existing traffic calming on Capesthorne Road and further traffic calming measures in this area to the south, which can be defined as those residential areas around the following links:

    i. Capesthorne Road
    ii. Poplars Avenue
    iii. Statham Avenue
    iv. Howson Road
    v. Sandy Lane
    vi. Cleveland Road
    vii. Greenwood Crescent
    viii. Cotswold Road

6. This Technical Note therefore also summarises what additional traffic calming measures could be implemented to complement the proposed verge parking and extensions to the 20mph speed limit to further address the Inspector's comments and mitigate for impact on character and pedestrian/cyclist movements that may arise as a result of development traffic on this area to the south in terms.

Parking Surveys

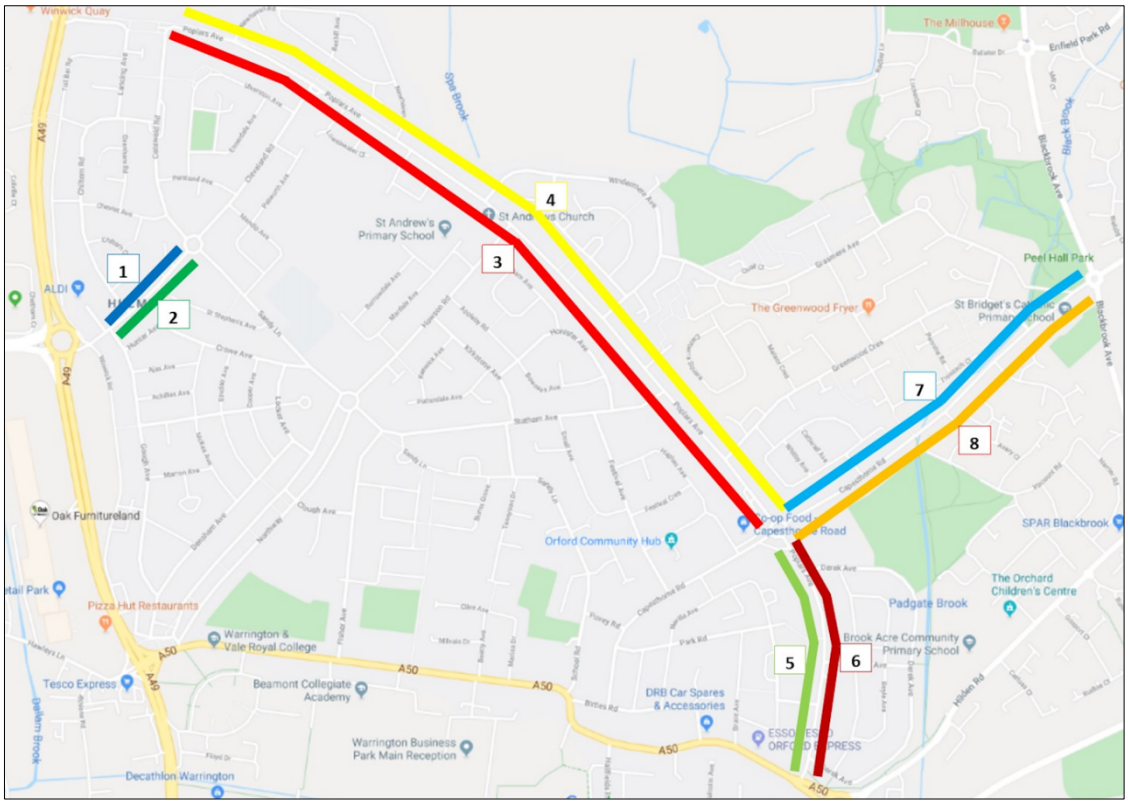
7. A parking survey was carried out in the area to the south of the Peel Hall site on Thursday 31st October at 11pm and Saturday 2nd November 2019 at 1pm. The parking survey data is contained in full in **Appendix 1**.

8. The parking survey was carried out in eight zones within the study area. The zones were as follows:

   i. Sandy Lane West (NE-bound)
   ii. Sandy Lane West (SW-bound)
   iii. Poplars Avenue, north of Capesthorne Road (NW-bound)
   iv. Poplars Avenue, north of Capesthorne Road (SE-bound)
   v. Poplars Avenue, south of Capesthorne Road (N-bound)
   vi. Poplars Avenue, south of Capesthorne Road (S-bound)
   vii. Capesthorne Road, east of Poplars Avenue (NE-bound)
   viii. Capesthorne Road, east of Poplars Avenue (SW-bound)

9. **Figure 1** shows the parking survey zones on a street map for reference.

Figure 1 - Parking Survey Zones



10. The parking survey recorded how many available vehicles were parked on-street in each zone (**Table 1**), as well as how many vehicles were parked informally e.g. on grass verges, on footways or in front of driveways (**Table 2**).

Table 1 – Number of vehicles parked in each zone

Location	Thursday 31st October 2019; 23:00	Saturday 2nd November 2019, 13:00
	Occupied	
Zone 1	0	0
Zone 2	0	0
Zone 3	35	13
Zone 4	37	28
Zone 5	22	19
Zone 6	5	6
Zone 7	12	14
Zone 8	7	1
Total	**118**	**81**

Table 2 – Number of vehicles parked informally in each zone

Location	Thursday 31st October 2019; 23:00	Saturday 2nd November 2019, 13:00
	Vehicles Parked on Grass Verges, Pavements and in front of Driveways with all 4 wheels off the road	
Zone 1	7	5
Zone 2	4	1
Zone 3	39	37
Zone 4	33	26
Zone 5	6	5
Zone 6	8	3
Zone 7	5	4
Zone 8	10	7
Total	**112**	**88**

11. Additionally, the parking survey recorded how many vehicles were parked illegally in each zone within the study area. The results of this are shown in **Table 3**.

Table 3 – Number of vehicles parked illegally

Location	Total Spaces	Thursday 31st October 2019; 23:00	Saturday 2nd November 2019, 13:00
		Illegal Parking	
Zone 1		0	0
Zone 2		0	0
Zone 3		2	0
Zone 4		0	0
Zone 5		0	0
Zone 6		0	0
Zone 7		0	0
Zone 8		0	0
Total		**2**	**0**

12. In order to calculate parking demand in each zone, the results contained within **Tables 1, 2** and **3** have been added together and this is shown in **Table 4**.

Table 4 – Parking demand in the study area

Location	Thursday 31st October 2019; 23:00				Saturday 2nd November 2019, 13:00			
	Spaces Occupied	Parked Informally	Illegally Parked	**Total Parking Demand**	Spaces Occupied	Parked Informally	Illegally Parked	**Total Parking Demand**
Zone 1	0	7	0	7	0	5	0	5
Zone 2	0	4	0	4	0	1	0	1
Zone 3	35	39	2	76	13	37	0	50
Zone 4	37	33	0	70	28	26	0	54
Zone 5	22	6	0	28	19	5	0	24
Zone 6	5	8	0	13	6	3	0	9
Zone 7	12	5	0	17	14	4	0	18
Zone 8	7	10	0	17	1	7	0	8
Total	118	112	2	232	81	88	0	169

Verge Parking Capacity

13. In order to assess the feasibility of providing parking in the highway verges, on site observations and measurements were taken. The initial plan contained at **Appendix 2** indicates the approximate areas of highway verge available for parking based on an OS plan of the study area.

14. **Table 5** sets out the estimated parking capacity that could be created in the grass verges of Poplars Avenue and Capesthorne Road (between Poplars Avenue and Blackbrook Avenue) or within the wide footway at Sandy Lane West, as highlighted on the plan at **Appendix 2**. It should also be noted that trees are located within the verges and the retention of these were taken account of in the calculations but are not shown on the OS plan.

Table 5 – Potential Verge Parking

Location	Potential Creation of Verge/Footway Parking Spaces
Zone 1	12
Zone 2	8
Zone 3	59
Zone 4	42
Zone 5	23
Zone 6	17
Zone 7	14
Zone 8	25
Total	**200**

15. From **Table 5** it can be seen that up to around 200 parking bays could be provided throughout the study area within the highway verge/footway. This is around [200/232=] 85% of the surveyed parking demand across the study area.

16. The following **Table 6** compares the potential verge parking capacity against the demand from the parking surveys.

Table 6 – Parking Demand Potentially Off-set by Verge Parking

Location	Total Parking Demand	Potential Creation of Verge/Footway Parking Spaces	Surplus/Deficit	% Demand of Availability
Zone 1	7	12	**5**	58%
Zone 2	4	8	**4**	50%
Zone 3	76	59	**-17**	129%
Zone 4	70	42	**-28**	167%
Zone 5	28	23	**-5**	122%
Zone 6	13	17	**4**	76%
Zone 7	18	12	**-6**	150%
Zone 8	17	24	**7**	71%
Total	**233**	**197**	**-**	**118%**

17. From this Table it can be seen that a flexible approach may need to be applied to the supply of verge parking, with around 50% of potential supply provided in some areas and closer to 75% to 100% created in other areas. The site access arrangement proposed for the Poplars Avenue (west) access also proposes to formalise the parking in that area, with the creation of additional parking spaces.

18. It should be noted that an element of the parking demand survey figures will be vehicles parked in the highway verge directly in front of driveways, perpendicular to the carriageway. As such, this level of demand cannot be taken into account in the calculations, beyond a statement that not all of the vehicles counted in the survey as 'informally parked' could be offset by proposed verge parking.

19. Any proposed verge parking measures will not impact on this practice of parking in the wide highway verge perpendicular to the carriageway in front of driveways in any event.

20. It is anticipated that all parking bays would be constructed using low impact methods to ensure limited impact on the highway trees, with cellular structure to permit grass growth for a reduced impact on the visual character of the area. Construction methods and materials to be agreed with the Council and their Arboricultural officer.

Speed Limit

21. As a result of creating more off-carriageway formalised parking, less vehicles would park on-street within the study area, subsequently increasing highway capacity. Whilst the free flow of traffic is beneficial in terms of capacity and reductions in vehicle emissions, this could increase vehicle speeds and impact pedestrian movements.

22. To counteract this, an extension to 20mph speed limit that already exists on a northern section of Poplars Avenue has been proposed on the rest of Poplars Avenue and the northern section of Capesthorne Road between Poplars Avenue and Blackbrook Avenue. The area for potential extension to the 20mph speed restriction is shown in **Appendix 3**. This will assist in terms of highway and pedestrian safety.

23. The extension to the 20mph speed restriction would include six of the eight parking survey zones (3, 4, 5, 6, 7 and 8).

24. The impact of development traffic flows has been set out in TN/09.

Traffic Calming and Pedestrian Safety

25. Existing traffic calming on Capesthorne Road comprises speed cushions and road humps. Speed cushions are also located on Greenwood Crescent. It is also recognised that there are a lack of modern pedestrian crossing facilities within the study area, with many lacking tactile paving, dropped kerbs or even a safe landing zone on the opposite side of the carriageway i.e. a pedestrian route one side of the road aligned with a full-height kerb and a grass verge on the other. There is also little in the way of provision for cyclists and/or measures to highlight the presence of cycles or that encourage cyclists. Current discussions are being held with highway officers to identify the most appropriate measures that could be brought forward and it is anticipated that a financial contribution will be provided to improve the existing situation.

26. The following list of measures have been considered alongside the verge parking to support the proposed extension to the 20mph speed limit and enhance awareness of the character of the area to through-traffic:

    i. Raised tables at junctions (these can be virtual (painted) rather than physical depending on local constraints).
    ii. Removal of centre line markings on sections of roads subject to a 20mph speed limit (retained at junctions unless raised tables installed).
    iii. Increase person presence through the installation of street furniture such as benches for residents to sit on.
    iv. Provision of signing/lining to enhance awareness of cyclists to drivers (and pedestrians as necessary).
    v. Additional pedestrian crossings and improving the existing crossing locations with dropped kerbs and tactile paving where appropriate.

vi. Potential for additional planting throughout the area.
vii. Provision of road narrowing's to maintain low traffic speeds through the area (possibly provided in conjunction with additional planting).
viii. Consideration of the removal of vertical traffic calming such as road humps, to reduce impact of noise and emissions on local residents.

27. From the above it is clear that a range of parking and traffic calming measures to the area to the south of the Peel Hall site are available to address the Inspector's concerns regarding safety in general and pedestrian safety in particular. These will be developed in conjunction with the Council so that they can be secured as part of the appeal proposals.

Appendix 1

Parking Survey Data

Appendix 2

Potential Locations for Verge Parking

Appendix 3

Potential Extent of 20mph Speed Limit Extension

NOISE POLLUTION

NOISE POLLUTION

N1 AAWT- 18h Traffic Flows

ES VOLUME 3: APPENDIX NOISE 11.1 AAWT_18H TRAFFIC FLOWS.

Link	DMOY		DSOY		DMFY		DSFY	
	AAWT_18h	HGV%	AAWT_18h	HGV%	AAWT_18h	HGV%	AAWT_18h	HGV%
A49 Northbound (JunctionNINE Retail Park - Hawleys Lane)	22674	4%	23149	4%	25793	4%	26581	4%
A49 Northbound (M62/Birch Avenue - Poplars Avenue)	22885	4%	23250	4%	25904	4%	26602	4%
A49 Northbound (north of M62)	24531	4%	24868	4%	27899	4%	28340	3%
A49 Northbound (parallel to Brendon Avenue - Sandy Lane West)	22885	4%	23250	4%	25904	4%	26602	4%
A49 Northbound (Sandy Lane West - JunctionNINE Retail Park)	23212	4%	23685	4%	26841	4%	27670	4%
A49 Southbound (JunctionNINE Retail Park - Hawleys Lane)	24386	3%	24459	3%	26044	3%	26517	3%
A49 Southbound (M62/Birch Avenue - Poplars Avenue)	24901	4%	25167	4%	28270	4%	28846	4%
A49 Southbound (north of M62)	22941	4%	23245	4%	26119	3%	26468	3%
A49 Southbound (parallel to Brendon Avenue - Sandy Lane West)	24901	4%	25167	4%	28270	4%	29051	4%
A49 Southbound (Sandy Lane West - JunctionNINE Retail Park)	23970	3%	24040	3%	26041	3%	26519	3%
A50 Long Lane	13207	2%	13342	2%	14249	2%	14462	2%
A50 Orford Green	11802	2%	12843	2%	13452	2%	14746	2%
A50 Orford Green - Birchwood Way	18416	2%	20274	2%	21092	2%	22298	2%
A50 School Road	12218	3%	12372	3%	13741	2%	13783	2%
Birch Avenue (Site entrance)	208	1%	391	0%	241	1%	431	0%
Birchwood Way (A50 - Blackbrook Ave)	4622	2%	4376	1%	5160	2%	4287	1%
Birchwood Way (Blackbrook Ave - Woolston Grange Ave)	18572	2%	18834	2%	21063	2%	21649	2%
Blackbrook Avenue (Ballater Dr - Capesthorne Rd)	7628	0%	12686	0%	9263	0%	14790	0%
Blackbrook Avenue (Capesthorne Rd - Insall Rd)	7487	1%	10613	0%	9030	1%	13945	0%
Blackbrook Avenue (Insall Rd - Birchwood Way)	7441	0%	8963	1%	9412	0%	11204	1%
Capesthorne Road (Greenwood Crescent to Blackbrook Avenue)	7918	3%	11466	2%	10132	2%	14478	1%
Capesthorne Road (Poplars Avenue - parralel to Humber Road)	2669	2%	3253	2%	2724	2%	3395	2%
Cleveland Road	3920	0%	5064	0%	6400	0%	7730	0%
Cotswold Road	397	27%	928	12%	448	25%	989	11%
Delph Lane (Mill Lane - Myddleton Lane)	7767	0%	8631	0%	9264	0%	9920	0%
Grasmere Avenue (Site entrance)	0	0%	190	0%	0	0%	197	0%
Grasmere Avenue	1375	-	1409	-	1551	-	1584	0%

Link	DMOY		DSOY		DMFY		DSFY	
	AAWT_18h	HGV%	AAWT_18h	HGV%	AAWT_18h	HGV%	AAWT_18h	HGV%
Hilden Road	13181	3%	15403	2%	14735	2%	17095	2%
Howson Rd	463	0%	722	0%	522	0%	830	0%
M62 Eastbound J8 - J9	58799	6%	59039	6%	67917	5%	68163	6%
M62 Eastbound J9 - J10 (east of Mill Lane)	33076	7%	33194	7%	37946	6%	38069	6%
M62 Eastbound J9 - J10 (west of Mill Lane)	54585	6%	54792	6%	62801	6%	63016	7%
M62 Junction 9 Eastbound Entry Slip	8214	8%	8420	7%	9467	7%	9682	10%
M62 Junction 9 Westbound Off Slip	7675	11%	7772	11%	8815	10%	8916	8%
M62 Westbound J8 - J9	65929	9%	66150	9%	76245	8%	76476	9%
M62 Westbound J9 - J10 (east of Mill Lane)	63848	10%	63945	10%	73481	9%	73582	9%
M62 Westbound J9 - J10 (west of Mill Lane)	63848	10%	63945	10%	73481	9%	73582	0%
Mill Lane (Ballater Dr - Site entrance, north of Millhouse Pub)	8381	0%	14467	0%	10011	0%	16389	0%
Mill Lane (Delph Lane - underneath the M62)	7767	0%	8631	0%	9264	0%	9920	0%
Mill Lane (Mill Lane turn off - Site entrance)	7735	0%	9367	0%	9228	0%	10731	5%
Mill Lane (Site entrance)	0	0%	562	0%	0	0%	584	0%
Mill Lane/Blackbrook Avenue (Site entrance)	0	0%	5865	0%	0	0%	5637	0%
Northway NB	1968	1%	1870	1%	2066	1%	1941	0%
Northway SB	1304	4%	1733	3%	2245	2%	2557	2%
Poplars Avenue - East of (Central) Site entrance	4699	3%	7662	2%	7317	2%	10586	2%
Poplars Avenue - West of (Central) Site entrance	4038	4%	5981	3%	6538	2%	8725	2%
Poplars Avenue (Central) (Site entrance)	0	0%	1968	0%	0	0%	2044	0%
Poplars Avenue (West) (Site entrance)	0	0%	1322	0%	0	0%	1373	0%
Radley Lane	135	0%	135	0%	148	0%	148	0%
Sandy Lane West	7669	1%	9766	1%	11742	1%	13539	1%
Capesthorne Road (Poplars Avenue - School Road)	5409	2%	8632	1%	7618	1%	11280	1%
Fisher Avenue	1875	4%	2689	3%	3472	2%	4264	2%
Greenwood Crescent (Darley Ave to Grasmere Ave)	1732	6%	2059	5%	1874	5%	2430	4%
Greenwood Crescent (Grasmere Ave to Meteor Cres)	3205	3%	3377	3%	3555	3%	3863	3%
Poplars Avenue (Greenwood Cres - Capesthorne Road)	10211	1%	13841	1%	13875	1%	17312	1%

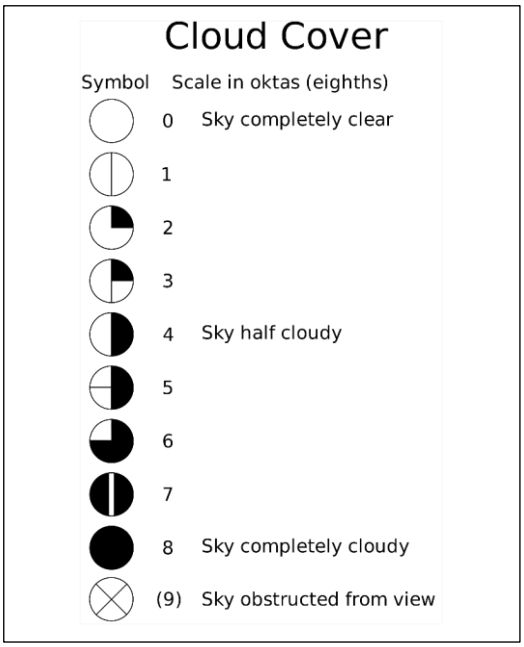
Link	DMOY		DSOY		DMFY		DSFY	
	AAWT_18h	HGV%	AAWT_18h	HGV%	AAWT_18h	HGV%	AAWT_18h	HGV%
Poplars Avenue (south of Capesthorne Road)	8115	2%	9551	2%	9513	2%	11114	2%
Sandy Lane	4667	4%	5406	4%	6400	3%	6642	3%
Statham Avenue	4403	4%	5639	3%	5108	3%	6107	3%
Windermere Avenue (Grasmere Ave to Poplars Ave)	103	5%	339	3%	187	2%	517	1%

NOISE POLLUTION

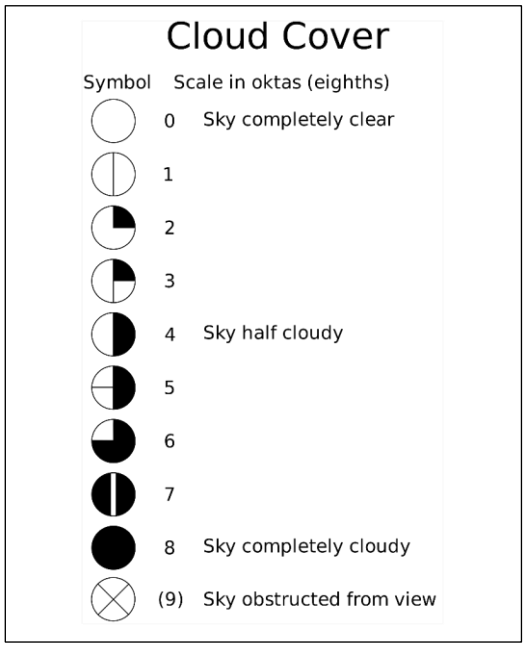
N2 Weather Conditions

ES VOLUME 3: APPENDIX NOISE 11.2 WEATHER CONDITIONS.

Appendix 11.2 – Weather Conditions Positions 1 and 2

Measurement Locations	Date/Time	Weather conditions		
		Description	At Start of Survey	On Completion
P1, P2	22/05/19, 11:00 to 22/05/19, 14:30	Temperature:	15 ºC	17 ºC
		Precipitation:	Dry	Dry
		Cloud cover (oktas – see opposite):	5	5
		Any fog/snow/ice?	No	No
		Any damp roads/wet ground?	No	No
		Wind speed:	1 - 2 m/s	1 - 2 m/s
		Wind direction:	Variable, generally westerly	
		Any conditions that may cause temp. inversion (e.g. calm nights with no cloud):	No	No

Appendix 11.2 – Weather Conditions Position 4

Measurement Locations	Date/Time	Weather conditions		
		Description	At Start of Survey	On Completion
P4	23/05/19, 12:00 to 24/05/19, 08:00	Temperature:	18 ºC	14 ºC
		Precipitation:	Dry	Dry
		Cloud cover (oktas – see opposite):	3	1
		Any fog/snow/ice?	No	No
		Any damp roads/wet ground?	No	No
		Wind speed:	Still	1 - 2 m/s
		Wind direction:	Variable, generally westerly	
		Any conditions that may cause temp. inversion (e.g. calm nights with no cloud):	No	No

NOISE POLLUTION

N3 Monitoring Data

ES VOLUME 3: APPENDIX NOISE 11.3 MONITORING DATA.

Date	Start Time	Elapsed Time	$L_{Aeq,1h}$	L_{Amax}	LA1%	LA10%	LA90%	LA95%	LA99%
MP01	**Attended**		**dB**	**dB**	**dB**	**dB**	**dB**	**dB**	**dB**
22/05/2019	11:12:45	01:00:00	78.8	85.9	83.0	81.5	74.5	73.3	71.0
22/05/2019	12:12:45	01:00:00	79.3	86.7	83.2	81.7	75.4	74.3	71.6
22/05/2019	13:12:45	01:00:00	79.5	88.4	83.4	81.9	75.6	74.4	72.1
MP02	**Attended**								
22/05/2019	11:25:02	01:00:00	71.4	82.9	75.4	73.6	68.3	67.5	66.2
22/05/2019	12:25:02	01:00:00	71.8	81.3	75.4	73.9	69.0	68.3	67.1
22/05/2019	13:25:02	00:49:32	72.3	78.7	75.9	74.4	69.3	68.5	67.2
MP04	**Attended**								
23/05/2019	12:00:08	01:00:00	77.2	84.3	81.0	79.4	73.5	72.0	69.9
23/05/2019	13:00:08	01:00:00	77.1	84.5	80.9	79.3	73.4	72.0	69.3
23/05/2019	14:00:08	01:00:00	77.1	84.7	81.0	79.3	73.6	72.5	70.3
MP04	**Unattended**								
23/05/2019	16:00:00	01:00:00	77.5	86.1	80.8	79.2	75.1	74.4	72.5
23/05/2019	17:00:00	01:00:00	77.4	82.8	80.5	79.1	75.3	74.6	73.3
23/05/2019	18:00:00	01:00:00	77.1	84.7	80.9	79.2	74.2	73.2	70.7
23/05/2019	19:00:00	01:00:00	75.6	82.8	80.2	78.1	71.1	70.0	67.7
23/05/2019	20:00:00	01:00:00	74.6	84.8	79.8	77.5	68.9	67.3	64.2
23/05/2019	21:00:00	01:00:00	73.0	81.4	78.9	76.4	64.5	62.1	57.6
23/05/2019	22:00:00	01:00:00	72.5	81.0	78.7	76.0	63.9	61.6	58.0
23/05/2019	23:00:00	01:00:00	71.5	82.0	78.9	75.5	60.3	58.0	54.0
24/05/2019	00:00:00	01:00:00	70.5	82.9	78.8	75.1	56.8	54.5	49.8
24/05/2019	01:00:00	01:00:00	69.4	81.0	78.3	74.2	54.8	52.5	49.0
24/05/2019	02:00:00	01:00:00	69.0	81.7	78.5	73.9	53.5	51.4	49.4
24/05/2019	03:00:00	01:00:00	68.9	81.4	78.1	73.7	55.5	53.4	50.2
24/05/2019	04:00:00	01:00:00	71.2	83.3	79.2	75.4	60.6	58.2	53.6
24/05/2019	05:00:00	01:00:00	74.3	84.8	80.1	77.9	67.2	65.8	63.4
24/05/2019	06:00:00	01:00:00	76.9	83.4	81.0	79.4	72.7	71.5	69.3
24/05/2019	07:00:00	01:00:00	77.9	97.1	81.4	79.7	74.6	73.7	71.8

NOISE POLLUTION

N4 Façade Mitigation

ES VOLUME 3: APPENDIX NOISE 11.4 FAÇADE MITIGATION.

Appendix 11.4 – Night time Indicative Façade Assessment

Miller Goodall Environmental Services: Noise Ingress Calculation

MILLER GOODALL
ACOUSTICS AND AIR QUALITY

Project:	Peel Hall	**Calcs By:**	MJW
Description:	Example Façade at Night	**Date:**	02/03/2020

Calculation is based on methodology within BS 8233:2014 & BSEN ISO 12354-3. The following equation is utilised:

$L_{internal} = L_{external} - \Sigma R + 10 \log S/A - DL_{fs} + 3$

where A = 0.16V/T
and DL_{fs} is a correction to account for the influence of façade shape (e.g. where balconies or terraces are present)

This can be broken down further to:

$L_{eq,2} = L_{eq,ff} + 10\text{xlog}\left((A_0/Sx10^{(-D_{n,e}/10)}) + (S_{wi}/Sx10^{(-R_{wi}/10)}) + (S_{ew}/Sx10^{(-R_{ew}/10)}) + (S_{rr}/Sx10^{(-R_{rr}/10)})\right) + 10\text{xlog}\,(S/A) - DL_{fs} + 3$

The above terms are described below:

Description	Term	Value	
Total facade area (m2)	S_f	6.9	**Room assessed:**
Window area (m2)	S_{wi}	1.2	
External wall area (Sf - Swi)	S_{ew}	5.7	Height: 2.3
Area of ceiling (m2)	S_{rr}	9	
Total area of elements (Sf + Srr)	S	15.9	Width: 3 **Width is horizontal length of façade in question**
Volume of receiving room (m3)	V	20.7	
Reference absorption area (m2)	A_0	10	Length: 3
Number of ventilators in facade:		1	
Façade shape correction	DL_{fs}	0	See Annex C of BS EN 12354-3

Input	Octave band centre frequency, Hz								dBA	R_w	C_{tr}	$R_w + C_{tr}$	Description
	63	125	250	500	1k	2k	4k	8k					
External Leq, freefield (dB Leq,ff)	61	57	59	64	65	56	47	36	67	-	-	-	Freefield night-time level
External Lmax, freefield (dB Lmax,ff)										-	-	-	loudest Lmax Freefield night-time level
Dne of each ventilator	29	33	40	45	56	67	75	69	-	50	-6	44	Caice acoustic trickle vent
Total Dne of all ventilators	29	33	40	45	56	67	75	69	-	#####	######	#NAME?	
SRI of window (Rwi)	20	26	27	34	40	38	46	46	-	37	-4	33	10/12/6
SRI of external wall (Rew)	35	37	42	52	60	63	68	68	-	54	-6	48	Double leaf 112 mm brickwork, 50 mm cavity, rigid wall ties
SRI of roof and ceiling (Rrr)	25	31	37	43	48	52	58	58	-	47	-5	42	Tiles on felt, pitched roof with 270 mm wool on plasterboard ceiling consisting of 2 x 12.5mm plasterboard (B
Rev time of receiving room (T) - secs	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	Habitable room ref Part E				
All ventilators [eqn. B]	8E-04	0.00032	0	0	0	0	0	0	A0/S x 10^(-Dne/10)				
Glazing [eqn. C]	8E-04	0.00019	0	0	0	0	0	0	Swi/S x 10^(-Rwi/10)				
External wall [eqn. D]	1E-04	7.2E-05	0	0	0	0	0	0	Sew/S x 10^(-Rew/10)				
Ceiling [eqn. E]	0.002	0.00045	0	0	0	0	0	0	Srr/S x 10^(-Rrr/10)				
All ventilators [10 x log "B"]	-31.0	-35.0	-42.0	-47.0	-58.0	-69.0	-77.0	-71.0					
Glazing [10 x log "C"]	-31.2	-37.2	-38.2	-45.2	-51.2	-49.2	-57.2	-57.2					
External wall [10 x log "D"]	-39.5	-41.5	-46.5	-56.5	-64.5	-67.5	-72.5	-72.5					
Ceiling [10 x log "E"]	-27.5	-33.5	-39.5	-45.5	-50.5	-54.5	-60.5	-60.5					
All elements combined [eqn. F]	-24.6	-29.9	-34.6	-40.9	-47.3	-48.0	-55.4	-55.3	Log sum of equations B,C,D,E				
Equiv. absorption area of rec. room (m^2)	7	7	7	7	7	7	7	7					
10 x log(S/A) [eqn. G]	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8					
Façade shape correction, DL_{fs}	0	0	0	0	0	0	0	0					

Linear Spectra

	63	125	250	500	1k	2k	4k	8k	dBA	Target	Exc.	
Internal Leq,2	43	34	31	30	24	15	-2	-13	**30**	30	**0**	Equations (A+F+G) - DLfs +3 dB
												Equations (A+F+G) - DLfs +3 dB

A-weighted spectra

	63	125	250	500	1k	2k	4k	8k	dBA	Target	Exc.
Internal LAeq,2	17	18	22	27	24	16	-1	-14	30	30	0
Internal LAmax,2											

NOISE POLLUTION

N5 Short Term Assessment DSOY 2022 - DMOY 2022

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Rev.	Date	Purpose	Drawn By	Approved By
1	28/02/2020	Draft	MJW	JLM

Project: PEEL HALL

Client: SATNAM MILLENIUM

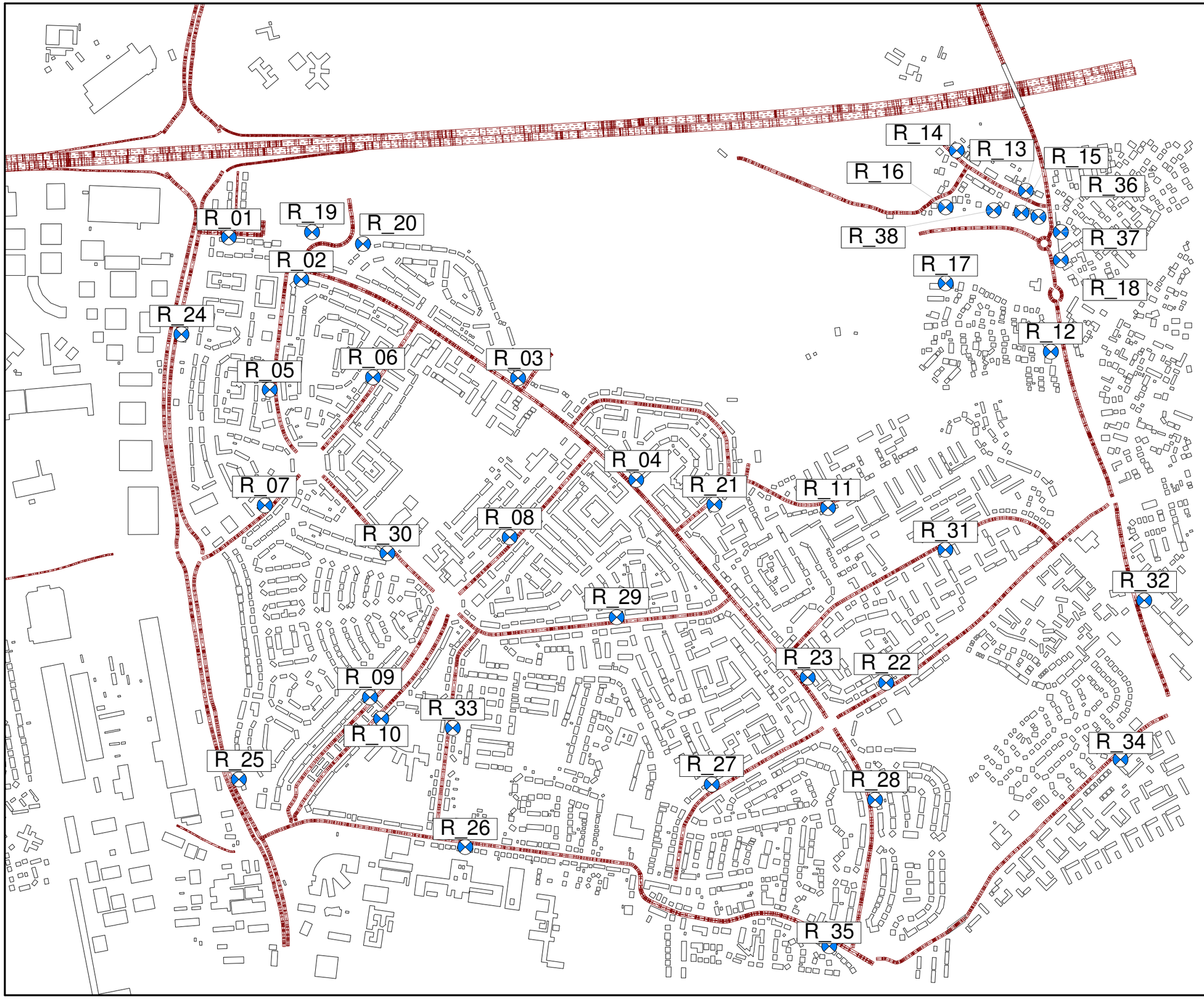
Figure 11.3

Short Term Assessment
DSOY 2022 - DMOY 2022

Report Number: 102037

NOISE POLLUTION

N6 Existing Receptor Locations



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Project: PEEL HALL

Client: SATNAM MILLENIUM

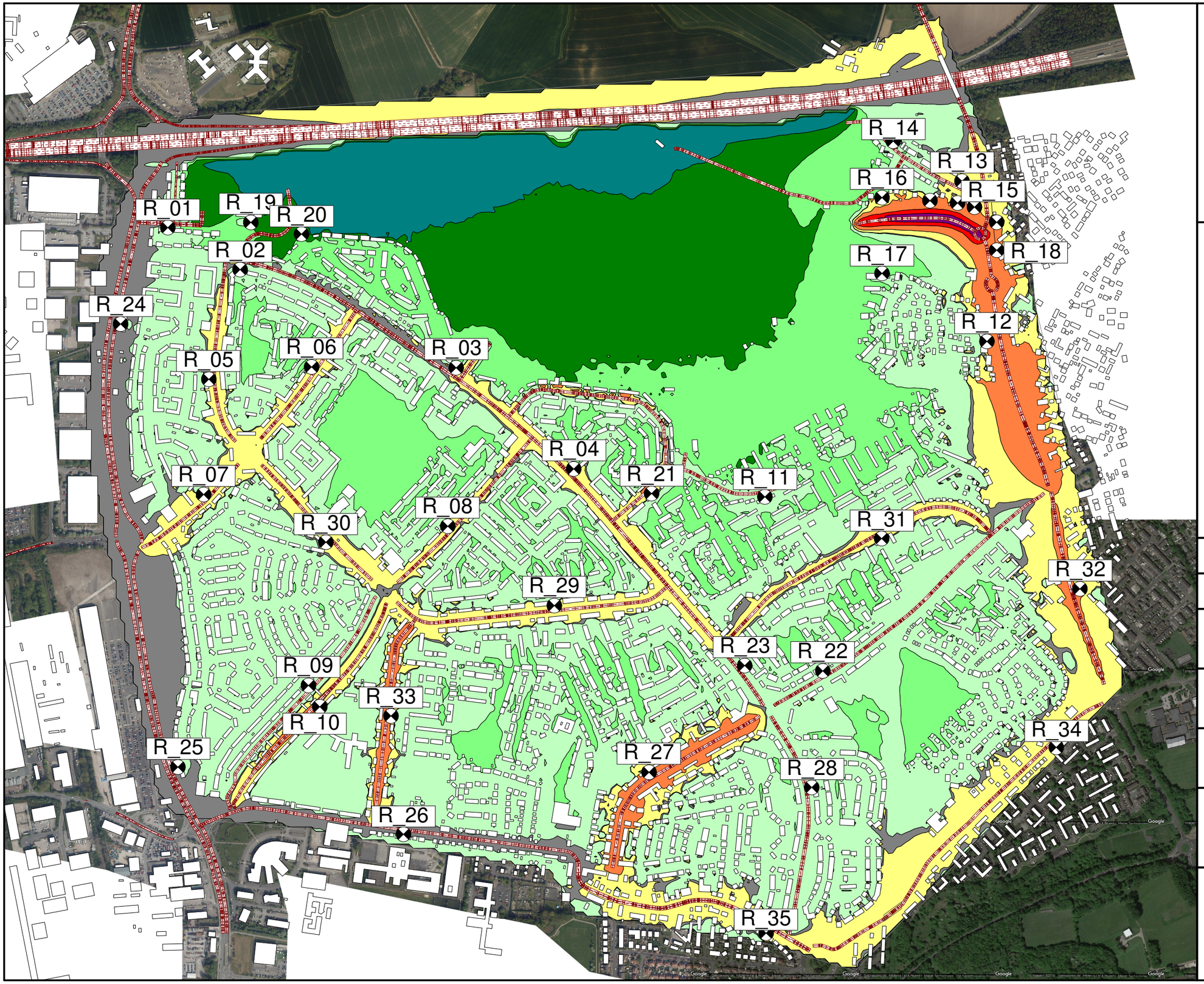
Figure 11.2

Existing Receptor Locations

Report Number: 102037

NOISE POLLUTION

N7 Short Term Assessment DSOY 2022 – DMOY 2022



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5.0 <= ...

Rev.	Date	Purpose	Drawn By	Approved By
1	28/02/2020	Draft	MJW	JLM

Project: PEEL HALL

Client: SATNAM MILLENIUM

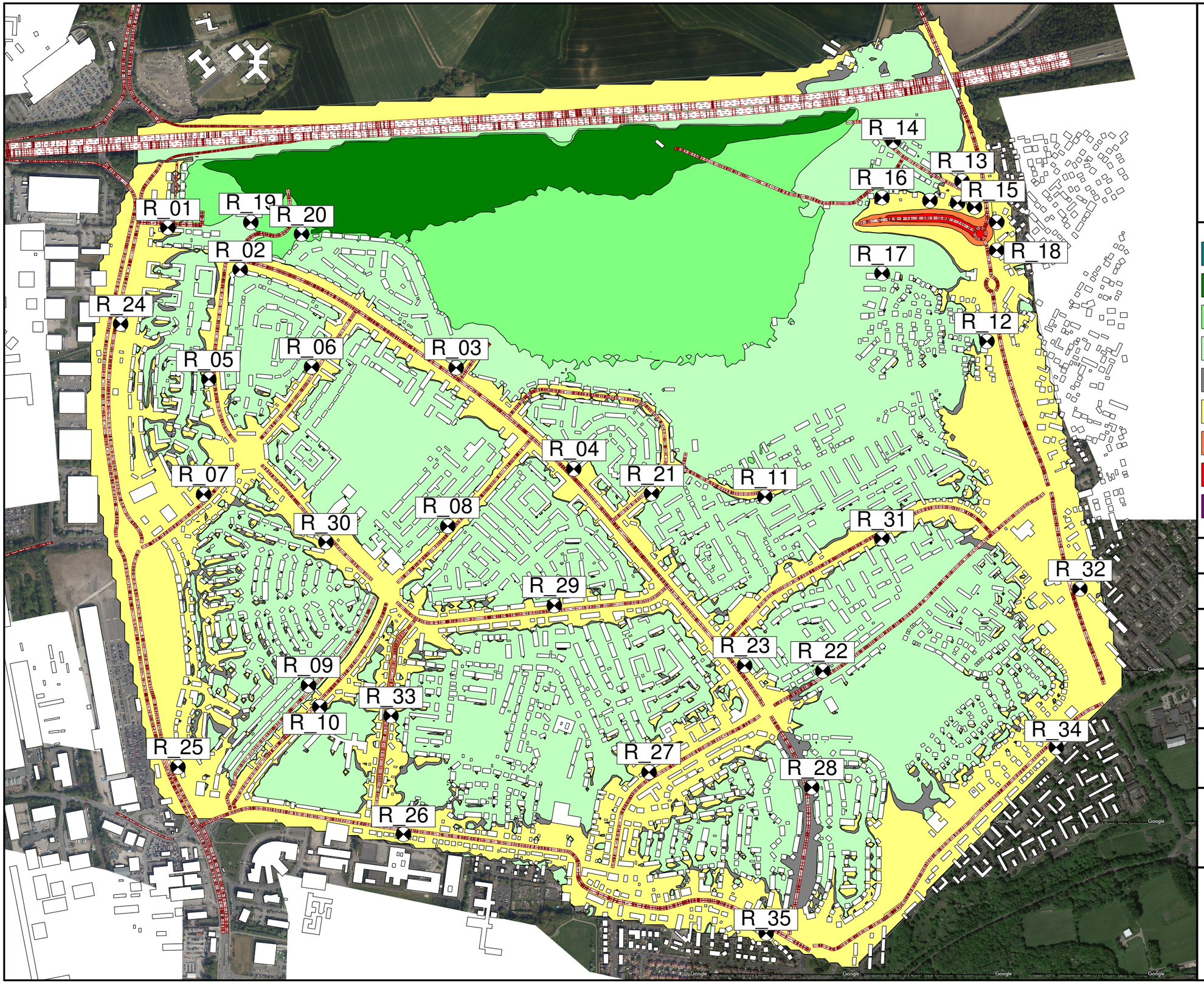
Figure 11.3

Short Term Assessment
DSOY 2022 - DMOY 2022

Report Number: 102037

NOISE POLLUTION

N8 Long Term Assessment DSFY 2037 – DMOY 2022



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1	28/02/2020	Draft	MJW	JLM

Project: PEEL HALL

Client: SATNAM MILLENIUM

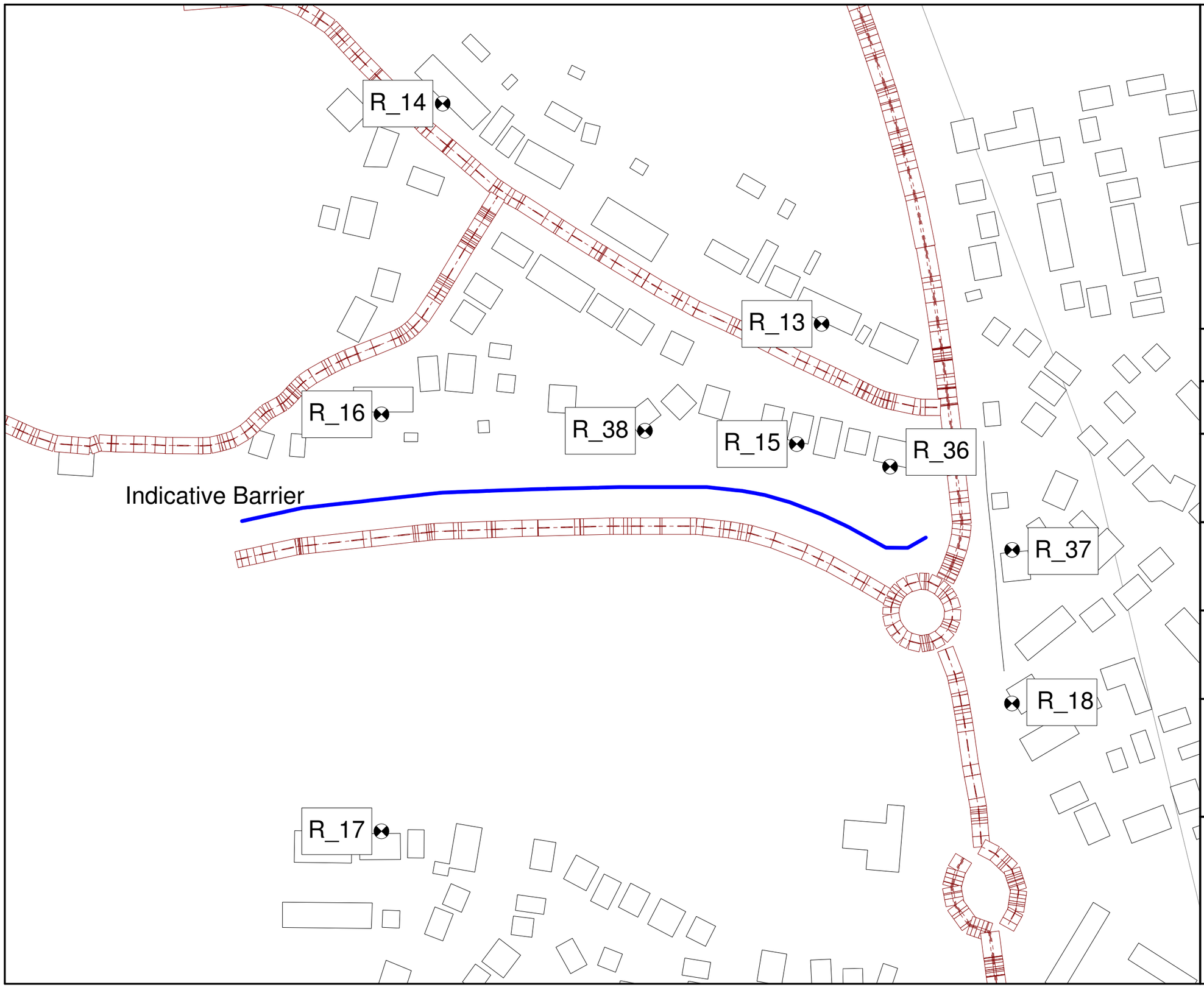
Figure 11.4

Long Term Assessment
DSFY 2037 - DMOY 2022

Report Number: 102037

NOISE POLLUTION

N9 Indicative Mitigation Barrier Location



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Rev.	Date	Purpose	Drawn By	Approved By
1	28/02/2020	Draft	MJW	JLM

Project: PEEL HALL

Client: SATNAM MILLENIUM

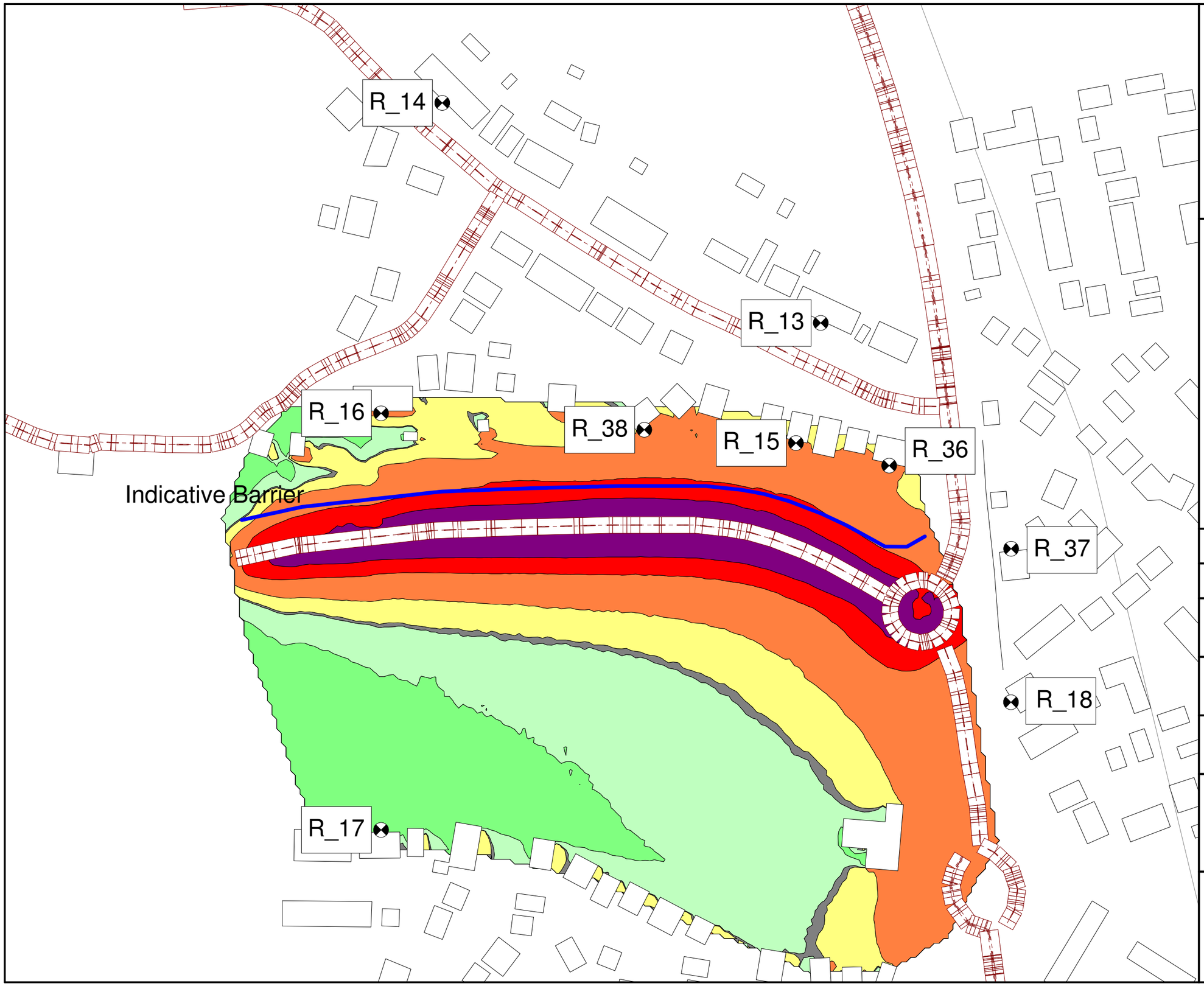
Figure 11.5

Indicative Mitigation Barrier Location

Report Number: 102037

NOISE POLLUTION

N10 Short Term Assessment with Mitigation DSOY 2022 – DMOY 2022



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Rev.	Date	Purpose	Drawn By	Approved By
1	28/02/2020	Draft	MJW	JLM

Project: PEEL HALL

Client: SATNAM MILLENIUM

Figure 11.6

Short Term Assessment
With Mitigation
DSOY 2022 - DMOY 2022

Report Number: 102037

AIR POLLUTION

AIR POLLUTION

AQ 1 Suitability of the Site for Residential Use

ES VOLUME 3: APPENDIX AQ 12.1 SUITABILITY OF THE SITE FOR RESIDENTIAL USE.

Introduction

Air pollution in urban areas such as Warrington is generally dominated by emissions from road vehicles. The quantity and composition of vehicle emissions are dependent on the type of fuel used, engine type, size and efficiency, vehicle speeds and the type of exhaust emissions abatement equipment employed.

The main pollutants of health concern from road traffic exhaust releases are nitrogen dioxide (NO_2) and fine particulates, normally assessed as the fraction of airborne particles of mean aerodynamic diameter less than ten micrometres (PM_{10}), since these pollutants are most likely to approach their respective air quality objectives in proximity to major roads and in congested areas. This assessment has therefore focused on the impact of concentrations of NO_2 and PM_{10} on the proposed development.

Methodology

The IAQM/EPUK Guidance suggests that whether an assessment of the impacts of the local area on the proposed development is required is a matter of judgement, but should take into account:

- the background and future baseline air quality and whether this will be likely to approach or exceed the values set by air quality objectives;
- the presence and location of Air Quality Management Areas (AQMAs) as an indicator of local hotspots where the air quality objectives may be exceeded;
- the presence of a heavily trafficked road, with emissions that could give rise to sufficiently high concentrations of pollutants (in particular NO_2), that would cause unacceptably high exposure for users of the new development; and
- the presence of a source of odour and/or dust that may affect amenity for future occupants of the development.

In order to determine the extent to which air quality issues will affect the development of the site and its environs, this study has considered these factors.

Background and Future Air Quality Conditions

The background maps provided by Defra (Ref 12.9) provide the predicted background concentrations for NO_x, NO_2 and PM_{10}, these are shown in **Table 12.13** of **Chapter 12.0**. It can be seen that the predicted background concentrations of NO_2 and PM_{10} levels across the one km grid squares covering the site and the study area are well below the relevant annual air quality objective.

The site itself is located partially within an AQMA. The AQMA was designated in relation to a likely breach of an annual mean NO_2 objective around the M62. and A49. The location of the AQMA and its relationship to the Proposed Development and the study area is shown in **ES Volume 3: Figure 12.5**.

The locations of automatic monitoring stations and diffusion tubes used by WBC to monitor NO_2 are shown in **ES Volume 3: Figure 12.3**. The results from these sites are shown in **Table 12.14** and **Table 12.15** of **Chapter 12.0**. Monitoring by WBC indicates that annual average levels of NO_2 have been above or very close to the annual average objective for NO_2 at all monitoring locations close to the study area since 2015. However, these monitoring locations are not representative of the site as they are roadside sites located adjacent to heavily trafficked roads.

The automatic monitoring stations, urban background site CM1 Selby Street, has measured NO_2 levels well below the annual average objective during all reported years. In 2018 it measured 21.4 µg/m^3. It is likely, therefore, that the site is exposed to annual average levels of NO_2 similar to the levels measured at CM1 and below the annual average objective for NO_2.

The locations of diffusion tubes used by the applicant to monitor NO_2 close to the Proposed Development Site are shown in **ES Volume 9: Figure 12.3**. The results from these sites are shown in **Table 12.16** of **Chapter 12.0**. The monitoring results for February 2019 to September 2019 have been annualised and bias adjusted to provide concentrations for use in verification of the ADMS model. The resulting values are also shown in **Table 12.16**. The calculations are shown in **ES Volume 9 Appendix 12.2**. These monitoring results also indicate that levels of NO_2 at the site are below the annual mean air quality objective.

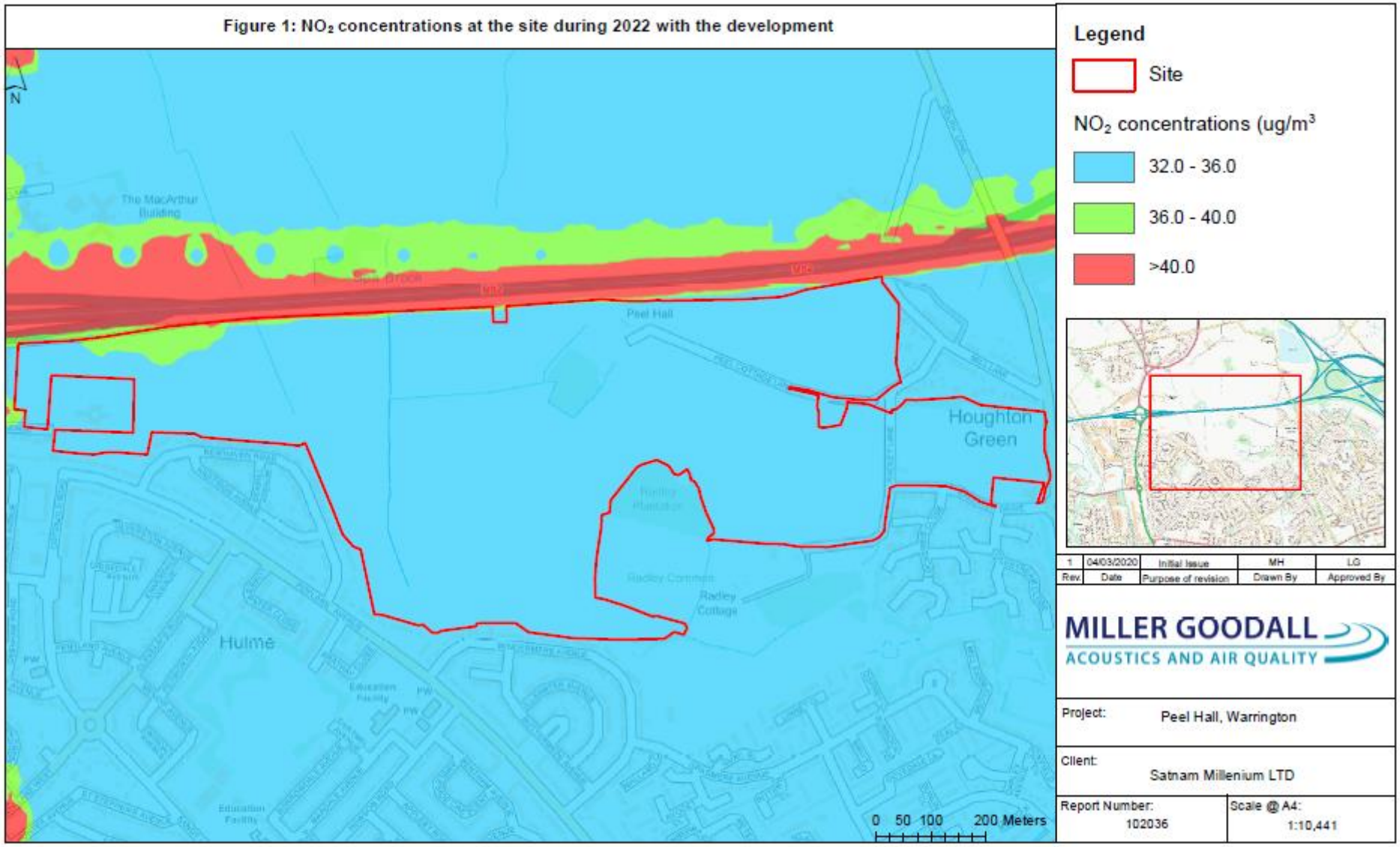
CM1 Selby Street is used by WBC to monitor PM_{10}. The results from the site are shown in **Table 12.17** of **Chapter 12.0**. Monitoring by WBC indicates that annual average levels of PM_{10} are well below the relevant annual air quality objective.

CM1 Selby Street is also used by WBC to monitor $PM_{2.5}$. The results from the site are shown in **Table 12.18** of **Chapter 12.0**. Monitoring by WBC indicates that annual average levels of background $PM_{2.5}$ are above the annual mean World Health Organisation guideline value.

Modelling of Local Air Quality

Modelling of local air quality across the development site has been undertaken; the model set up is described within **Chapter 12.0** of the **ES** and **ES Volume 3: Appendix 12.3** of the **ES**. The output from the model is shown in **Figure 1** below. The figure shows that the model predicts that annual average concentrations of NO_2 across the site in 2022 are less than 36 µgm^{-3} across the vast majority of the Proposed Development Site.

Figure 1: NO_2 concentrations at the site during 2022 with the development



Rev.	Date	Purpose of revision	Drawn By	Approved By
1	04/03/2020	Initial Issue	MH	LG

MILLER GOODALL
ACOUSTICS AND AIR QUALITY

Project:	Peel Hall, Warrington
Client:	Satnam Millenium LTD
Report Number: 102036	Scale @ A4: 1:10,441

Conclusion

The Defra background map support tool and background monitoring of NO_2 by WBC and the applicant all suggest that levels of NO_2 at the site itself are likely to be well below the annual average objective for NO_2. Similarly, the Defra background map support tool and monitoring by WBC of PM_{10} suggest that levels of PM_{10} at the site are likely to be well below the annual average objective.

Dispersion modelling of levels of NO_2 across the site indicates that in 2022 levels of NO_2 across the site itself are likely to be below the annual average objective for NO_2.

The site is, therefore, suitable for residential use.

AIR POLLUTION

AQ 2 Diffusion tube monitoring methodology

ES Volume 3: Appendix 12.2 Diffusion Tube Monitoring Methodology and Calculations

Diffusion tubes were stored in a refrigerator in a sealed plastic container, before and after exposure. Tubes were removed from the refrigerator on the day that they are to be put out, and each one clearly labelled with an identification number. Tubes were taken to the site in a snap-seal bag or sealable plastic box.

At each site, a tube was selected. Its ID number and the site at which it is to be exposed was recorded on the exposure details form. The end cap was removed, and the tube positioned vertically in its holder, with its open end downwards. The date and time of the start of the exposure period was recorded on the exposure details form, and a note was made of any site irregularities (for example building/road works, traffic diversions).

When collecting the exposed tubes, at each site, the exposed tube was removed from the sample holder and the end cap replaced tightly. The time and date of the end of the exposure period was recorded on the exposure details form, against the appropriate tube number. Again, a note was made of any site irregularities or anything which might affect, or even invalidate, the tube's results (for example, the tube found on the ground, insects, dirt, or liquid inside the tube). Tubes that were damaged or have splits in the end-caps were not used.

Exposed tubes were kept in a sealed container, in a cool place until they could be returned to the laboratory for analysis on the day of collection.

The results of the calculations used to annualise and bias adjust are shown in **Table A12.2.1.**

The Warrington AURN site (known as Selby Street) was used to provide the background levels for the study period and to calculate the period means used in the annualisation process at the request of Richard Moore of WMBC.

Table A12.2.1 Diffusion Tube Annualisation and Bias Adjustment

	Mean	Period Background Data			Monitoring Results						
Start Date	Selby	Locations 1,3,4,5 and 7	Location 2	Location 6	Location 1 (Diffusion Tube)	Location 2 (Diffusion Tube)	Location 3 (Diffusion Tube)	Location 4 (Diffusion Tube)	Location 5 (Diffusion Tube)	Location 6 (Diffusion Tube)	Location 7 (Diffusion Tube)
03-Oct-18	19.34										
31-Oct-18	26.39										
05-Dec-18	25.80										
09-Jan-19	30.50										
06-Feb-19	19.75	19.75	19.75	19.75	35.14	32.7	38.65	32.16	34.28	28.13	32.54
06-Mar-19	20.67	20.67	20.67	20.67	39.25	30.45	25.03	24.91	31.47	17.77	41.89
03-Apr	27.99	27.99	27.99	27.99	33.92	31.89	32.11	24.13	28.28	23.01	31.65
01-May-19	18.25	18.25		18.25	33.46		25.05	16.5	18.99	20.24	28.23
05-Jun-19	15.47	15.47	15.47	15.47	17.87	23.89	26.23	22.65	23.96	19.53	31.43
03-Jul-19	16.08	16.08	16.08	16.08	26.84	20.5	20.59	20.55	22.75	20.36	28.29
09-Aug-19	14.51										
04-Sep-19	15.80	15.80	15.80		33.71	23.21	28.75	25.95	31.25		34.01
Average	**20.88**	**19.15**	**19.29**	**19.70**	**31.46**	**27.11**	**28.06**	**23.84**	**27.28**	**21.51**	**32.58**
				Ratio	**1.09**	**1.08**	**1.09**	**1.09**	**1.09**	**1.06**	**1.09**
				Annualised measurements	**34.30**	**29.33**	**30.60**	**25.99**	**29.75**	**22.79**	**35.53**
				data capture	58%	50%	58%	58%	58%	50%	58%
				adjustment	**33.00**	**28.22**	**29.44**	**25.01**	**28.62**	**21.92**	**34.18**

* bias adjustment factor provided by Richard Moore at WMBC

AIR POLLUTION

AQ 3 Consultation Document

ES Volume 9: Appendix 12.3 Consultation with WBC

January 2019

From: Lesley Goodall [mailto:lesley@millergoodall.co.uk]
Sent: 24 January 2019 14:34
To: Moore, Richard
Cc: Jo Miller; Info; Melody Horan
Subject: Peel Hall

MILLER GOODALL
ACOUSTICS AND AIR QUALITY

Richard,

Thanks for taking the time to speak with me on Monday, it was very useful. I have been reviewing the last application and considering your views and have a few points for clarification.

We discussed monitoring of nitrogen dioxide around the site. Satnam are happy to do this but I just wanted to be clear on how this data will be used. You have requested 6 months of data. Assuming monitoring starts in the next few weeks we should have data for February onwards (ideally I would like to place the tubes in accordance with Defra's Diffusion Tube Calendar). It would also be useful if we could use the same laboratory to source the tubes as Warrington BC; are you still using Gradko International Ltd?

Yes we use Gradko Int Ltd to supply and analyse the tubes

The guidance advises that for any monitoring sites with fewer than 9 months' worth of data, it is necessary to perform annualisation. A minimum of three months monitoring is required for annualisation to be completed. As an annual mean for 2019 will not be available, the calculation will have to be carried out using the ratio to the 2018 annual mean, but the result is then an estimate of the 2018 annual mean at the short-term site. The 2019 bias correction factor would also not be available, and so it would be necessary to use the 2018 factor instead. I see that you use a local adjustment factor from Selby Street for your diffusion tube data; we would look to use that also. We would run the model using 2018 met data. Is this approach acceptable?

6 months is the minimum we request and would accept, but as stated ideally 9 months, and these would still need to be bias corrected. From our experience even 9 months sometimes has to be annualised depending on the months it covers, just to reduce uncertainty.

For the seasonally corrected, this can be done by using the previous 12 months of data (as opposed to calendar years) ie if you measure from February to July 2019. Would then be "annualised" using the Selby Street July 2018 to July 2019 12 month period. A similar approach can be used to calculate the bias adjustment factor using the July to July period. We would be able to provide the raw tube results from Selby Street for that period and the Selby Street analyser data.

I would not be keen to simply use the 2018 bias factor as they do vary year on year.

Hopefully that makes sense, it is something we are willing to sit down with you to calculate once the data has been received.

Because of these issues, however, I wondered if another (unusual) approach would work. I wondered if it would be possible to feed into or utilise the air quality modelling completed for you under the LAQM process in the same way that the traffic consultant is using Warrington's traffic model. Do you think your modeller would share details of the model set up, topography used etc so that we could set up our model in a similar manner? Obviously I would expect there to be a fee for this.

We have no model that we used for LAQM work other than very early stages. The Detailed Assessment for the designation of the Warrington AQMA was based on tube data. The motorway was originally modelled but this was back in about 2001 so no longer valid. We have had some modelling carried out for a Low Emission Study in about 2014, but this did not cover the Peel Hall site. We have also just had some modelling done for the draft Local Plan, but only screened the motorway area (as it was highlighted that this would require seperate modelling so due to the low number of receptors it was decided not to carry this out.

Finally, I see that we are dealing with two AQMAs (numbers 1 and 4) were they modelled in the same way? Has the model for AQMA 1 been updated since it was first declared in 2001?

No further modelling by us has been carried out since 2001. Resources have been tragetted elsewhere. As given in the appeal evidence we have used planning applications that assessed small areas of the M62 which justified the extent of the motorway as being relevant. For the AQMA 4, no modelling was carried out, the extent relied on monitoring.

I have looked at areas for monitoring and identified some possible general areas on the attached. Are these what you were thinking of?

There is no attachment on the email, can you resend this.

Many thanks for your help Richard. Please feel free to call if you wish.

Regards

Lesley Goodall

Director

Miller Goodall Ltd

Acoustic and Air Quality Solutions

Follow our LinkedIn page. Click here: Miller Goodall

From: Moore, Richard <rmoore@warrington.gov.uk>
Sent: 25 January 2019 12:08
To: Lesley Goodall <lesley@millergoodall.co.uk>
Cc: Jo Miller <jo@millergoodall.co.uk>; Info <info@millergoodall.co.uk>; Melody Horan <Melody@millergoodall.co.uk>
Subject: RE: Peel Hall

Hi Lesley

Please see responses below. ***[these are actually in red above]***

Hopefully the answer to the tube annualisation makes sense? We would be happy to help with the data so the calculation is agreed.

Also there was no attachment on the email for the proposed monitoring site, can you resend it?

Many thanks

Richard Moore

Environmental Protection Officer (Air)

Warrington Borough Council

New Town House

Buttermarket Street

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WA1 2NH

rmoore@warrington.gov.uk

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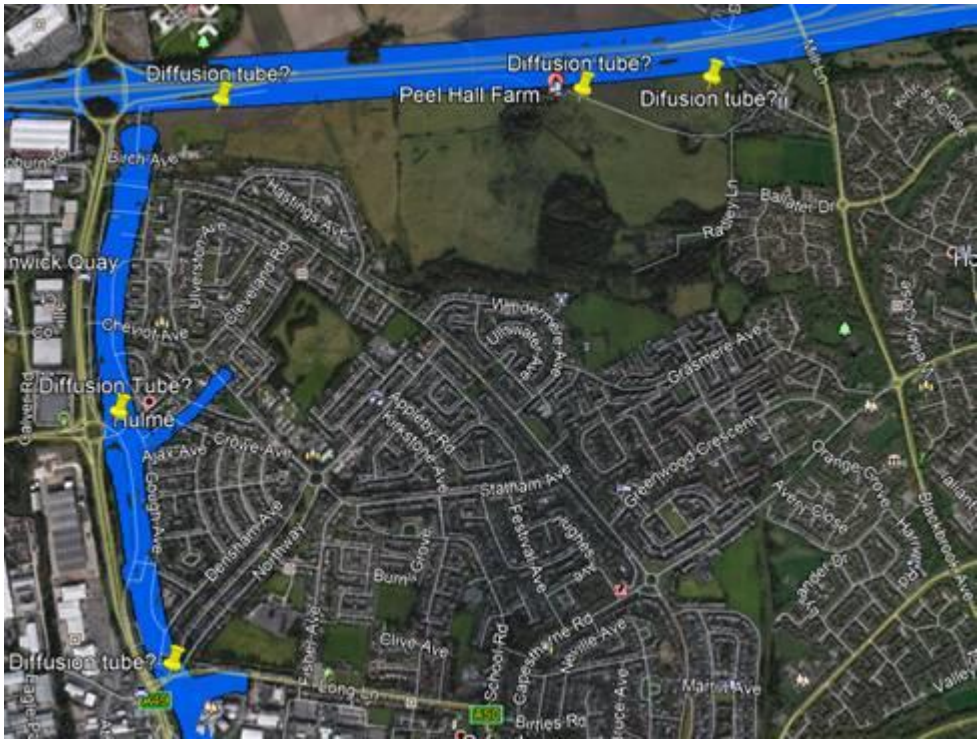
From: Lesley Goodall [mailto:lesley@millergoodall.co.uk]
Sent: 28 January 2019 09:25
To: Moore, Richard
Cc: Info; Melody Horan
Subject: RE: Peel Hall

MILLER GOODALL
ACOUSTICS AND AIR QUALITY

Thanks for your quick response Richard. Snip of first thoughts on monitoring below;



Regards

Lesley Goodall
Director
Miller Goodall Ltd
Acoustic and Air Quality Solutions

From: Moore, Richard <rmoore@warrington.gov.uk>
Sent: 30 January 2019 11:57
To: Lesley Goodall <lesley@millergoodall.co.uk>
Cc: Info <info@millergoodall.co.uk>; Melody Horan <Melody@millergoodall.co.uk>; Jo Miller <jo@millergoodall.co.uk>; Catherine Gould <Catherine@millergoodall.co.uk>; Rahsa Ibrahim <Rasha@millergoodall.co.uk>
Subject: RE: Peel Hall

Hi Lesley

See attached with brief for the modelling.

Am happy to discuss, or consider other suggestions you might have, to ensure the modelling is as detailed as possible.

I have suggested 8 different monitoring locations to assist with the modelling verification. Unlikely all of them would need to go out if you consider they would not add any value but the ones near the motorway will definitely need to.

The aim is to avoid high verification factors and poor model performance as much as possible.

As for the meeting on the 11th, I will be attending. Steve is not attending as the focus is to be on the planning, transport and air quality.

If you need to discuss the noise, I can arrange a meeting straight after as he is in.

Might also be worth quick half hour to go over the air quality issues separately straight after the meeting. Just let me know if you think that is a good idea, I can book a meeting room in our offices.

Many thanks

Richard Moore

Environmental Protection Officer (Air)

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Brief for Modelling;

Peel Hall: Air Quality Assessment

Our main concerns for air quality are:

- Emissions from the motorway that may affect any new residential on the proposed site.
- Impacts from site generated traffic on the A49 AQMA
- Impacts from site generated traffic close to new and exisiting junctions that may cause small hotspots of potential exeedance.

Modelling requirements

- Motorway emissions to be modelled to assess current impact on the development site. This will be used to consider the site layout so as not to put any new residential in an area that has a risk of exceedance. This mainly relates to the apartment blocks which are proposed to be 40m from the motorway, just inside the AQMA. This will require a specific verification factor for the motorway. The site characteristicas will need to be considered. The site profile does undulate with some locations at the same height as the motorway and other above that will affect dispersion.
- Model impacts from the site generated traffic. On the immediate neighbouring urban area and on the A49 AQMA. Different verification factors will be required for the urban area and for the A49 due to the difference in traffic type and flows.
- Model each new junction and access into the site to assess the air quality for the residential immediately next to the junction.
- Model the junctions on the A49 AQMA, and the Motorway Junction 9 roundabout (due to Elm Road), that will be affected by the site generated traffic.
- The geographical extent of the modelling for the site traffic will need to be agreed. Any local road that will have 100 or greater increase in AADT will need to be modelled.
- Met data taken from the Rotheren met station.
- All modelling imputs and factors need to be clearly shown such as surface roughness.
- Model performance will need to be assessed using RMSE or similar.
- Need to agree future years of opening. Will need to know the timescale for the development build. To model half way through the build then complete final date. For the future predictions, not to assume the Defra background and emissions factor improvements, but to reduce these by 5 years to assume a slower uptake and improvement in emissions. For example, if modelling 2026 opeing year, to use the 2021 emission factors and background.
- To assess NO2 and PM10 againt risk of exceedance (36ug/m3) in the national objectves, and PM2.5 against the WHO value.
- The traffic data and junctions should be agreed between between the applicants transport consultant and the Council's transport team. It should be made clear how the AADT has been calculated if from peak flows for each link modelled. Full details on how each junction is modelled with regards to the speed and queue lengths, especially for the A49 and the junction 11 as these suffer from congestion throughout the day where speeds will need to be reduced further.

On site monitoring for at least six months using diffusion tubes will be required to assist the modelling verification. For the locations you have suggested in the email in the 28 January, we already have diffusion tubes close to the two proposed on the A49.

Suggested locations (see map on next page:

- **M1**, **M2** and **M3**. 40m from the motorway edge at the façade facing the motorway of the 3 proposed apartment blocks.

To be used to assess air quality levels for the residential closest to the motorway and for verification of the motorway.

- **M4** Elm Road. To assess levels closest to the motorway junction. To assist in the detailed modelling of the motorway junction.
- **M5** Polars avenue, **M6** Mill Lane/Blackbrook Avenue, **M7** Capesthorne Road/Grasmere Avenue
  To use as verification for the urban area and access the new junctions.
- **M8** Poplars avenue/A49 to access the A49 impacts and junction access to the employement park (needs confirming that this will be the access road and not Birch Avenue)

February / March 2019

11th Feb February 2019 – Pre -App Meeting Meeting - Extract from Meeting Note

Air Quality Noise

43 LG and Richard Moore (RM) have agreed to work closely on the execution of the AQ assessment. Many technical issues have already been agreed, including the type of model, topography, emission factors, background concentrations, monitoring of NO_2 around the site. Monitoring of NO_2 has commenced, diffusion tubes were installed on 06/02/2019.

44 Main issue to agree is traffic data. LG will use traffic flows from WBC's Saturn wherever possible and these may need to be supplemented by counts. WBC to provide the road network to be included within the Saturn model. Once these are received, LG and RM will agree roads to be included within the model.

45 Modelling of AQ should be completed asap after the design scheme has been completed; different access arrangements will have different effects on AQ and Highways e.g. access focussed around the western side of the site may be detrimental to AQ but beneficial in terms of highways concerns.

46 Scenarios for AQ are different to highways assessments etc. They will be;

46.1 2018 baseline model – this is used to verify (check) the model is running appropriately;

46.2 2022 without development;

46.3 2022 with development.

47 This means that data from Saturn will need to be obtained for 2018 and 2022.

48 2022 will be modelled as a worst case initially i.e. as if full build out is completed by 2022. LG and RM will revisit if this creates a problem.

From: Lesley Goodall <lesley@millergoodall.co.uk>
Sent: 25 February 2019 10:21
To: Moore, Richard <rmoore@warrington.gov.uk>
Cc: Melody Horan <Melody@millergoodall.co.uk>; Info <info@millergoodall.co.uk>
Subject: Peel Hall

MILLER GOODALL
ACOUSTICS AND AIR QUALITY

Richard,

I have received some information about which roads are included within the Saturn model and we have mapped them in blue on the attached map.

We consider that the roads marked in purple will also need to be included within the AQ model.

Can you please advise if you consider the blue and purple roads identified to be sufficient for the purposes of the AQ model?

Many thanks.

Lesley Goodall
Director

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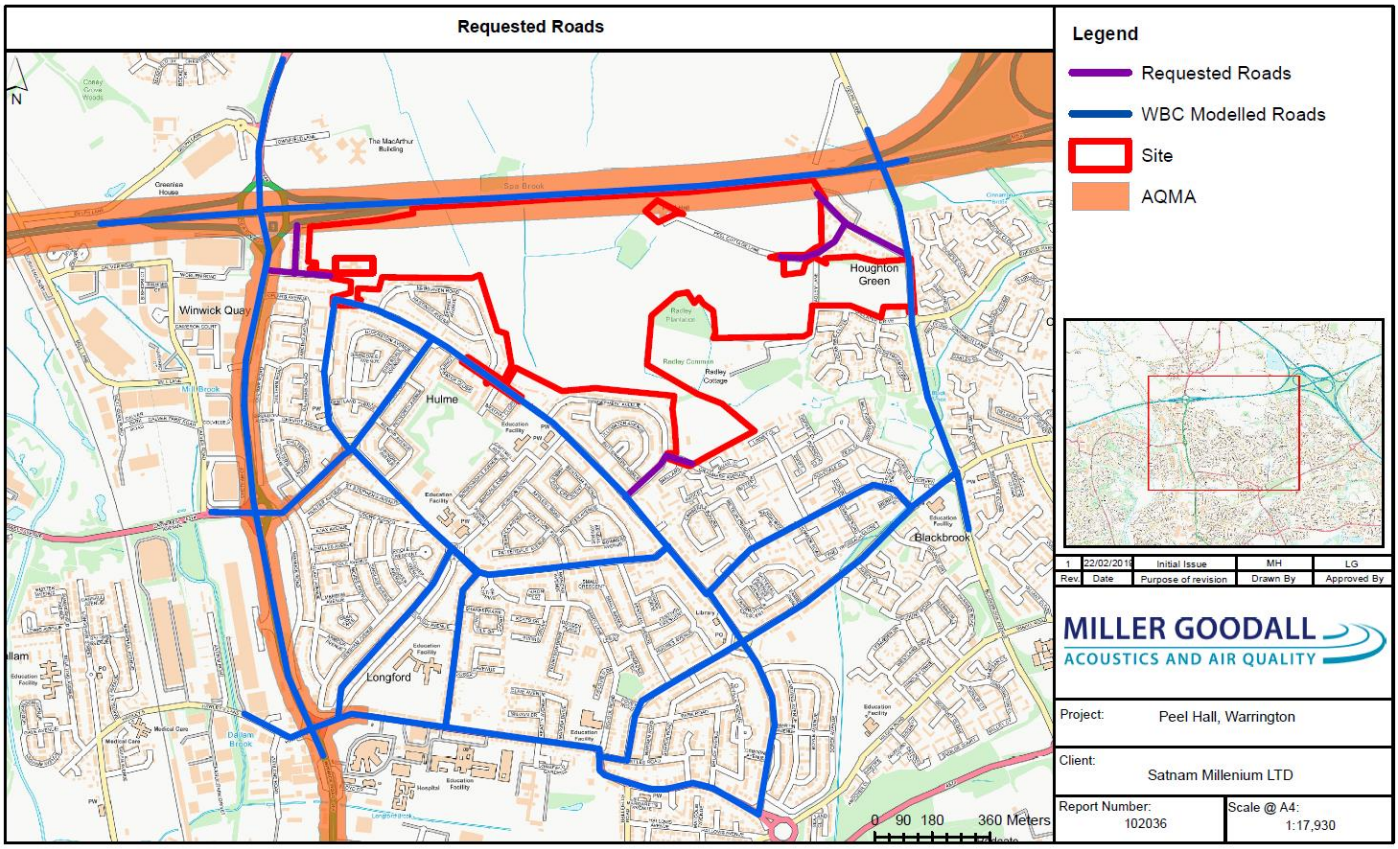

From: Moore, Richard <rmoore@warrington.gov.uk>
Sent: 12 March 2019 08:33
To: Lesley Goodall <lesley@millergoodall.co.uk>
Cc: Melody Horan <Melody@millergoodall.co.uk>; Info <info@millergoodall.co.uk>
Subject: RE: Peel Hall

Hi Lesley

Sorry for the delay in replying was just checking with our transport team.

But yes, agree that those roads are sufficient for the AQ model.

Are there going to be traffic surveys for the purple roads?

Many thanks

Richard Moore

Environmental Protection Officer (Air)

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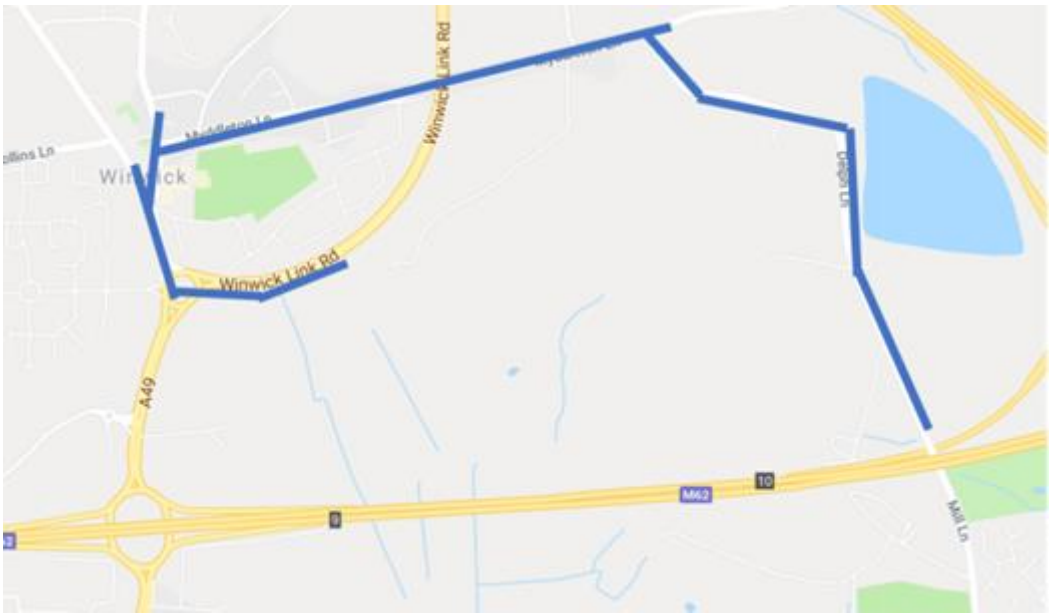
From: Lesley Goodall [mailto:lesley@millergoodall.co.uk]
Sent: 13 March 2019 14:07
To: Moore, Richard
Cc: 'Fiona Bennett'; Info; Melody Horan
Subject: Peel Hall

MILLER GOODALL
ACOUSTICS AND AIR QUALITY

Hello Richard,

Having spoken to Fiona about the highways data, she advises that the Winwick Link Road, Myddleton Lane and Delph Lane north of the M62 will be considered in their work. I just wanted to double check that you are comfortable that these are not currently being considered from an AQ point of view. I have attached the map Fiona sent me to illustrate the roads.



Many thanks (again) for your assistance.
Lesley

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From: Moore, Richard <rmoore@warrington.gov.uk>
Sent: 13 March 2019 15:39
To: Lesley Goodall <lesley@millergoodall.co.uk>
Cc: 'Fiona Bennett' <fiona.bennett@highgatetransportation.co.uk>; Info <info@millergoodall.co.uk>; Melody Horan <Melody@millergoodall.co.uk>
Subject: RE: Peel Hall

Hi Lesley

I assume they have been asked to include them as some of the development traffic must affect those roads.

For robustness, can these be included within the AQ modelling?

Many thanks

Richard Moore

Environmental Protection Officer (Air)

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From: Lesley Goodall [mailto:lesley@millergoodall.co.uk]
Sent: 18 March 2019 10:59
To: Moore, Richard
Cc: 'Fiona Bennett'; Info; Melody Horan
Subject: RE: Peel Hall

MILLER GOODALL
ACOUSTICS AND AIR QUALITY

Hi Richard,

Thanks for your help again. I have asked Fiona for the flows for these roads for the AQ assessment and she sees no issue with that. If they are low I may come back to you to discuss whether or not they need to be included.

Regards

Lesley Goodall
Director
Miller Goodall Ltd
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From: Moore, Richard <rmoore@warrington.gov.uk>
Sent: 19 March 2019 13:20
To: Lesley Goodall <lesley@millergoodall.co.uk>
Cc: 'Fiona Bennett' <fiona.bennett@highgatetransportation.co.uk>; Info <info@millergoodall.co.uk>; Melody Horan <Melody@millergoodall.co.uk>
Subject: RE: Peel Hall

Hi Lesley

If the change in flow due to the development is less than 100 AADT on those roads then they will not need to be included.

Many thanks

Richard Moore

Environmental Protection Officer (Air)

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February / March 2020

From: Lesley Goodall [mailto:lesley@millergoodall.co.uk]
Sent: 04 February 2020 14:37
To: Moore, Richard <rmoore@warrington.gov.uk>
Cc: Melody Horan <Melody@millergoodall.co.uk>
Subject: Peel Hall

MILLER GOODALL
ACOUSTICS AND AIR QUALITY

Hello Richard, I hope you are well.

We have now received the monitoring data for our tubes for November and December and, although data capture for each tube is 75% or above, I have annualised these out of interest and examined the difference between the annualised and average results for each tube. I attach the excel sheet. As you can see the maximum difference is 0.61 µg/m$^{3.}$ Are you happy to use the average values for the diffusion tubes and bias adjust these?

Yes

Could you please provide a copy of your diffusion tube monitoring results for 2019 and advise;

1. Which diffusion tubes you wish to be used in the verification process;

Different verification factors are likely to be required depending upon the major road source. Would expect different ones for:

The motorway – we have a tube on Radley Lane plus your tubes for verification;

The A49 Winwick Road – we 3 tubes along Winwick road that can be used.

Local road near the site – might be able to use some of you tubes, or our background sites.

2. If a local bias adjustment factor is available yet for Warrington's diffusion tubes? If not, when do you expect this to be available?

When the AURN Selby data has been ratified. Hopefully in next month, but this cannot be guaranteed.

3. When the Selby Street monitoring data for October 2019 onwards will be verified.

As above

In terms of the model, we have now received all of the traffic data and have begun to populate the model. We propose to use the following inputs;

Baseline year	2019 (originally 2018 but updated to reflect met and diffusion tube data)
Opening year	2022
Dataset	EFT v9.0 and consider CURED V3A values.
Road type	England (urban)
Met Data	Rostherne 2019
Surface Roughness	Dispersion site = 0.5 (Parkland Open Suburbia) Met Site = 0.2 (agricultural Areas min)
Monin Obukhov	Dispersion site = 30 Cities and large towns Met Site = 10 Small town
Terrain	OS Landform Panorama
Background concentrations	Selby Street Monitoring Station 2019 for all scenarios

If I have forgotten anything please remind me.

Will need details on how junctions to the site will be assessed with relation to queueing traffic. This will be for the new junctions to the site (I think there were three of them) and access to the A49 Winwick Road.

Regards,

Lesley Goodall

Director

Miller Goodall Ltd

Acoustic and Air Quality Solutions

I normally check my emails three times per day; first thing in the morning, just after lunch and just before the end of the day. If your message requires a more urgent response, please call me on our office number, 01204 596166.

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Company registration number 5201673

From: Moore, Richard <rmoore@warrington.gov.uk>
Sent: 05 February 2020 12:09
To: Lesley Goodall <lesley@millergoodall.co.uk>
Cc: Melody Horan <Melody@millergoodall.co.uk>
Subject: RE: Peel Hall

Hi Lesley

Have reviewed the data.

As the data collection is over 75% they do not need to be annualised especially as you have shown that this would make minor difference.

I agree that the non-annualised data can be bias adjusted.

I am just waiting for the Selby Street data to be finally ratified by the AURN, hopefully in the next month, and then I will provide a bias adjustment factor for you to be used. This will be calculated from our triplicate tunes at Selby Street and will be the same one we will use for our ASR.

Our 2019 tube data will be available as soon as can bias correct it when the NOx data has been ratified.

I will plan in my outlook to check the AURN data weekly, so as soon as it is ready I can calculate the bias factor and release our 2019 tube data. It is all set up on a spreadsheet so quite quick when it is ready so can get it to you as soon as possible.

I have made additional comments below in red. ***{These are shown above in red}***

Hopefully makes sense, but if not let me know.

Many thanks

Richard Moore

Environmental Protection Officer (Air)

Families and Wellbeing

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New Town House

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WA1 2HN

Tel: 01925 442596

Email: rmoore@warrington.gov.uk

Date: 18/02/2020 10:14 (GMT+00:00)

To: "Moore, Richard" <rmoore@warrington.gov.uk>

Cc: Info <info@millergoodall.co.uk>, Jo Miller <jo@millergoodall.co.uk>, Matt Wilson <matt@millergoodall.co.uk>, Melody Horan <Melody@millergoodall.co.uk>

Subject: RE: Peel Hall

MILLER GOODALL
ACOUSTICS AND AIR QUALITY

Morning Richard, I hope you are well.

Further to our email exchange below, I have taken instruction from my client and the situation has now changed due to timescales.

As you know the inquiry is now fixed to start on 9th June. In order to meet various deadlines, including consultation on the ES addendum, I am charged with providing the assessment for review by our client by 6th March at the latest. The baseline model with topography is taking days to run due to its size so we need to get the model runs finished asap.

As the Selby Street monitoring data for the last quarter of 2019 is not yet ratified, it seems most sensible now to complete the assessment using datasets for the period Oct 2018 to Sept 2019.

We have compiled a met file for this period but will use traffic data for 2019 within the baseline as the period covers 9 months of that year.

We have diffusion tube monitoring for our sites from Feb 2019, so 6-7 months of data for our monitoring sites. I have annualised the data and attach our spreadsheet. Could you please review it?

The sheet also provides annual averages for the background concentrations for the study period as follows;

NO_2 21.01 ugm^{-3}

NO_x 29.67 ugm^{-3}

PM_{10} 16.93 ugm^{-3}

$PM_{2.5}$ 10.35 ugm^{-3}

If you are in agreement with these calculations, we will need to calculate the average mean for Warrington's diffusion tubes over the same period and then bias adjust all of the tubes to be used within the assessment. Can you please send me the raw data for your diffusion tubes for Oct 2018 to the end of 2019 and I will calculate the annual averages.

I will then take you up on your offer to assist with bias adjustment if that still holds.

Many thanks.

Lesley Goodall
Director
Miller Goodall Ltd
Acoustic and Air Quality Solutions

I normally check my emails three times per day; first thing in the morning, just after lunch and just before the end of the day. If your message requires a more urgent response, please call me on our office number, 01204 596166.

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From: Moore, Richard <rmoore@warrington.gov.uk>
Sent: 21 February 2020 15:10
To: Lesley Goodall <lesley@millergoodall.co.uk>
Subject: Re: Peel Hall

Hi Lesley

I was half expecting this as have been notified of the appeal days so realise timescales are very tight.

I was due back in the office today but have had to take the day off.

I will be back in on Monday will look at the data then.

Many thanks

Richard Moore

From: Moore, Richard <rmoore@warrington.gov.uk>
Sent: 28 February 2020 10:57
To: Lesley Goodall <lesley@millergoodall.co.uk>
Cc: Info <info@millergoodall.co.uk>; Jo Miller <jo@millergoodall.co.uk>; Matt Wilson <matt@millergoodall.co.uk>; Melody Horan <Melody@millergoodall.co.uk>
Subject: FW: Peel Hall

Hi Lesley

See Attached.

Have added an extra sheet at the end with all our tube raw data for the Oct 18 to Sept 19 period.

I have not annualised any of the data, but data collection for the sites you are most likely to use should be acceptable as it is.

The background data below is fine.

I have also calculated the bias adjustment factor using the Selby Street tubes average (21.83) and the analyser (21.01) for a factor of 0.962.

I have applied this to our tube averages.

Please double check this.

I am in the office all day, so any queries just let me know

Many thanks

Richard Moore

Environmental Protection Officer (Air)

Families and Wellbeing

Warrington Borough Council

New Town House

Buttermarket Street

Warrington

WA1 2HN

Tel: 01925 442596

Email: rmoore@warrington.gov.uk

From: Lesley Goodall [mailto:lesley@millergoodall.co.uk]
Sent: 03 March 2020 14:46
To: Moore, Richard <rmoore@warrington.gov.uk>
Cc: Info <info@millergoodall.co.uk>; Jo Miller <jo@millergoodall.co.uk>; Matt Wilson <matt@millergoodall.co.uk>; Melody Horan <Melody@millergoodall.co.uk>
Subject: Peel Hall

MILLER GOODALL
ACOUSTICS AND AIR QUALITY

Hello Richard,

The Peel Hall air quality model is over predicting along the motorway and under predicting across the existing housing estate and along the A49. As expected, we, therefore, propose to use two verification factors; one for areas close to the motorway (0.9) and one for the rest of the model area (1.15).

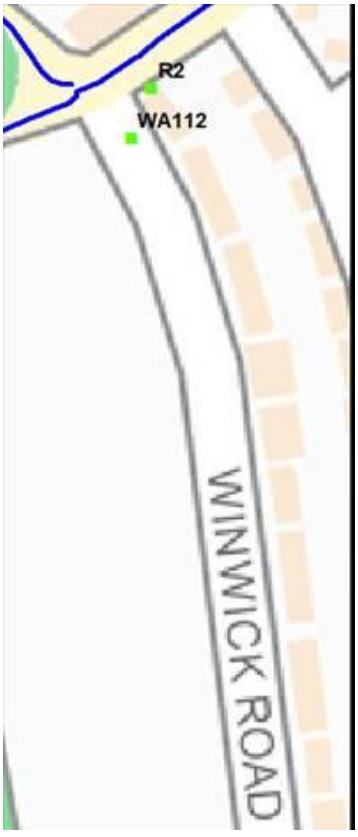
We have verified the model using these two factors as the table below shows. The differences between monitored and modelled values are all +/- 10% with an RMS of 1.8 µg/m^3

Monitor	2019 Monitored Total NO2	2019 Monitored Road Nox	2019 Background NO2	2019 Background Nox	Monitored Road Contribution NO2 (total - background)	Modelled Road Contribution NOx (excludes background)	Ratio of Monitored Road Contribution Nox / Modelled Road Contribution NOx	Adjustment Factor	Adjusted Road Contribution NOx	Adjusted Modelled Total Nox (including background NOx)	Modelled Total NO2 (based on empirical Nox / NO2 relationship)	% Difference [(modelled - monitored) / monitored] x 100
MG1	33.00	24.23	21.01	29.67	11.99	27.57	0.88	0.90	24.81	54.48	33.27	0.82
MG2	28.22	14.24	21.01	29.67	7.21	9.66	1.47	0.90	8.70	38.37	25.47	-9.74
MG3	29.44	16.74	21.01	29.67	8.43	9.86	1.70	1.15	11.34	41.01	26.79	-8.99
MG4	25.01	7.78	21.01	29.67	4.00	5.69	1.37	1.15	6.54	36.21	24.38	-2.50
MG5	28.62	15.07	21.01	29.67	7.61	8.60	1.75	1.15	9.89	39.56	26.07	-8.92
MG7	34.18	26.75	21.01	29.67	13.17	28.03	0.95	0.90	25.23	54.90	33.47	-2.07
WA96	39.29	38.09	21.01	29.67	18.28	30.19	1.26	1.15	34.72	64.39	37.80	-3.80
WA95	32.10	22.32	21.01	29.67	11.09	15.66	1.43	1.15	18.01	47.68	30.05	-6.40
WA123	24.95	7.66	21.01	29.67	3.94	11.89	0.64	0.90	10.70	40.37	26.47	6.09

We have not used tubes MG6 and WA112 in the verification.

The model is overpredicting at MG6 by some 15%, we think due to the traffic data at this point. MG6 is located right at the end of Birch Avenue (as shown below) on the lamp post by the blind end. Traffic for the road is 192 LDV and 8 HDV per hour but this obviously won't apply at this end of the road which serves only 12 dwellings and the hospital.

W112 is on a road for which we don't have traffic data as shown in the snip below;



If you have any comments or issues with this please let me know asap.

Many thanks,

Lesley Goodall

Director

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Acoustic and Air Quality Solutions

I normally check my emails three times per day; first thing in the morning, just after lunch and just before the end of the day. If your message requires a more urgent response, please call me on our office number, 01204 596166.

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From: Moore, Richard <rmoore@warrington.gov.uk>
Sent: 04 March 2020 13:30
To: Lesley Goodall <lesley@millergoodall.co.uk>
Cc: Info <info@millergoodall.co.uk>; Jo Miller <jo@millergoodall.co.uk>; Matt Wilson <matt@millergoodall.co.uk>; Melody Horan <Melody@millergoodall.co.uk>
Subject: RE: Peel Hall

Hi Lesley

That's seems fine, I have no issues with that data

Richard Moore

Environmental Protection Officer (Air)

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AIR POLLUTION

AQ 4 ADMS and Assessment Inputs

ES Volume 3: Appendix 12.4 ADMS and Assessment Inputs

Air Dispersion Model

The Atmospheric Dispersion Modelling System for Roads (ADMS-Roads) v4.1.1.0 was used to assess the local air quality impact of development-generated vehicle exhaust emissions, on concentrations of NO_2 and PM_{10}, at existing receptors located adjacent to the assessed road network, and to assess the suitability of the site for residential use.

The ADMS-Roads model is a comprehensive tool for investigating air pollution in relation to road networks. The model uses algorithms for the height-dependence of wind speed, turbulence and stability to produce improved predictions. It can predict long-term and short-term concentrations, as well as calculations of percentile concentrations.

The ADMS-Roads model has been comprehensively validated in a large number of studies by the software manufacturer CERC (Cambridge Environmental Research Consultants). This includes comparisons with data from the UK's Automatic Urban Network (AUN) and specific validation exercises using standard field, laboratory and numerical data sets. CERC is also involved in European programmes on model harmonisation, and their models have been compared favourably against other EU and US EPA systems. Further information in relation to this is available from the CERC web site at www.cerc.co.uk.

Traffic Data

24-hour annual average daily traffic (AADT) flow data was provided by Highgate Transportation for use in the assessment. **ES Volume 9 Figure 12.2** shows the roads included within the model.

Vehicles within the study area were assumed to travel at the speed limit, up to 113 kph on motorways and up to 48 kph on all other roads, apart from the approach to junctions, roundabouts and other locations where queuing traffic occurs. The speed of vehicles in these areas was slowed down to as little as 5kph as appropriate.

The traffic data used in the assessment are detailed in **Table A12.4.1**.

Table A12.4.1 Traffic Data

Link Number	Name	2019 Base Year/Verification				2022 Opening Year Without Development				2022 Opening Year With Development			
		AADT	LDV	HDV	%HDV	AADT	LGV	HDV	%HDV	AADT	LDV	HDV	%HDV
1 -	A49 Northbound (JunctionNINE Retail Park - Hawleys Lane)	21,417	20,417	1,000	4.7%	22,278	21,295	983	4.4%	22,744	21,759	985	4.3%
2 -	A49 Northbound (M62 - Birch Avenue)	22,019	21,003	1,016	4.6%	22,485	21,490	995	4.4%	22,843	21,848	995	4.4%
3 -	A49 Northbound (north of M62)	23,198	22,242	956	4.1%	24,102	23,165	937	3.9%	24,433	23,496	937	3.8%
4 -	A49 Northbound (parallel to Brendon Avenue - Sandy Lane West)	22,019	21,003	1,016	4.6%	22,485	21,490	995	4.4%	22,843	21,848	995	4.4%
5 -	A49 Northbound (Sandy Lane West - JunctionNINE Retail Park)	22,009	21,005	1,004	4.6%	22,806	21,822	984	4.3%	23,271	22,285	986	4.2%
6 -	A49 South of A50 (Northbound)	16,851	16,109	743	4.4%	17,563	16,835	728	4.1%	18,328	17,600	728	4.0%
7 -	A49 South of A50 (Southbound)	20,631	19,960	671	3.3%	21,522	20,863	659	3.1%	22,540	21,880	659	2.9%
8 -	A49 Southbound (JunctionNINE Retail Park - Hawleys Lane)	24,199	23,446	753	3.1%	23,960	23,238	722	3.0%	24,032	23,309	723	3.0%
9 -	A49 Southbound (M62 - Birch Avenue)	23,742	22,853	890	3.7%	24,466	23,594	872	3.6%	24,727	23,809	918	3.7%
10 -	A49 Southbound (north of M62)	22,025	21,150	875	4.0%	22,540	21,683	858	3.8%	22,838	21,981	858	3.8%
11 -	A49 Southbound (parallel to Brendon Avenue - Sandy Lane West)	23,742	22,853	890	3.7%	24,466	23,594	872	3.6%	24,727	23,809	918	3.7%
12 -	A49 Southbound (Sandy Lane West - JunctionNINE Retail Park)	23,813	23,068	745	3.1%	23,551	22,836	715	3.0%	23,620	22,904	716	3.0%
13 -	A49 Winwick Link Road	21,767	20,610	1,157	5.3%	22,672	21,539	1,134	5.0%	22,829	21,695	1,134	5.0%
14 -	A50 Long Lane	12,162	11,879	283	2.3%	12,379	12,107	271	2.2%	12,505	12,234	271	2.2%
15 -	A50 Orford Green	11,111	10,826	286	2.6%	11,106	10,824	282	2.5%	12,081	11,806	275	2.3%
16 -	Birch Avenue (Site entrance)	194	192	2	0.9%	203	201	2	0.8%	380	378	2	0.4%
17 -	Blackbrook Avenue (Ballater Dr - Capesthorne Rd)	6,573	6,547	26	0.4%	7,039	7,013	26	0.4%	11,707	11,681	25	0.2%
18 -	Blackbrook Avenue (Capesthorne Rd - Insall Rd)	6,543	6,502	41	0.6%	6,909	6,869	41	0.6%	9,794	9,750	44	0.4%

19 -	Capesthorne Road (Greenwood Crescent to Blackbrook Avenue)	6,632	6,443	188	2.8%	7,306	7,120	187	2.6%	10,581	10,394	187	1.8%
20 -	Capesthorne Road (Poplars Ave towards School Lane/A50)	2,369	2,314	54	2.3%	2,463	2,415	48	2.0%	3,002	2,950	52	1.7%
21 -	Capesthorne Road (Poplars Ave - parallel to Humber Road)	4,516	4,438	78	1.7%	4,992	4,914	78	1.6%	7,966	7,887	79	1.0%
22 -	Cleveland Road	3,011	3,002	10	0.3%	3,810	3,800	10	0.3%	4,922	4,912	10	0.2%
23 -	Cotswold Road	398	260	138	34.7%	417	281	136	32.6%	933	797	136	14.6%
24 -	Cromwell Avenue	29,672	29,036	637	2.1%	30,445	29,823	623	2.0%	31,601	30,932	669	2.1%
25 -	Delph Lane (Mill Lane - Myddleton Lane)	6,730	6,697	33	0.5%	7,169	7,137	32	0.5%	7,966	7,935	32	0.4%
26 -	Elm Road	601	579	22	3.7%	624	601	23	3.7%	624	601	23	3.7%
27 -	Fisher Avenue	1,506	1,433	73	4.8%	1,820	1,748	72	3.9%	2,610	2,539	72	2.7%
28 -	Golbourne Road	10,044	9,915	129	1.3%	10,168	10,040	127	1.3%	10,528	10,402	126	1.2%
29 -	Grasmere Avenue (Site entrance)	0	0	0	0.0%	0	0	0	0.0%	165	165	0	0.0%
30 -	Grasmere Avenue	1,500	1,500	0	0.0%	1,558	1,558	0	0.0%	1,599	1,599	0	0.0%
31 -	Greenwood Crescent (Darley Ave to Grasmere Ave)	1,486	1,387	99	6.7%	1,683	1,585	98	5.8%	2,002	1,904	98	4.9%
32 -	Greenwood Crescent (Grasmere Ave to Meteor Cres)	2,855	2,754	101	3.5%	3,116	3,016	99	3.2%	3,282	3,186	96	2.9%
33 -	Hawleys Lane	13,922	13,168	753	5.4%	14,405	13,670	734	5.1%	14,700	13,966	734	5.0%
34 -	Howson Road	428	428	0	0.0%	452	452	0	0.0%	892	892	0	0.0%
35 -	M62 Eastbound J8 - J9	53,947	50,703	3,244	6.0%	56,160	52,982	3,178	5.7%	56,390	53,212	3,178	5.6%
36 -	M62 Eastbound J9 - J10 (east of Mill Lane)	30,386	28,222	2,164	7.1%	31,592	29,472	2,120	6.7%	31,705	29,585	2,120	6.7%
37 -	M62 Eastbound J9 - J10 (west of Mill Lane)	50,098	46,692	3,407	6.8%	52,136	48,799	3,337	6.4%	52,333	48,996	3,337	6.4%
38 -	M62 Junction 9 Eastbound Entry Slip	7,532	6,925	607	8.1%	7,845	7,251	594	7.6%	8,042	7,448	594	7.4%
39 -	M62 Junction 9 Eastbound Off Slip	11,380	10,936	444	3.9%	11,869	11,434	435	3.7%	12,099	11,664	435	3.6%
40 -	M62 Junction 9 Westbound Entry Slip	8,927	8,481	446	5.0%	9,318	8,881	437	4.7%	9,530	9,093	437	4.6%
41 -	M62 Junction 9 Westbound Off Slip	7,055	6,209	846	12.0%	7,331	6,502	829	11.3%	7,424	6,595	829	11.2%
42 -	M62 Westbound J8 - J9	60,539	54,823	5,716	9.4%	62,970	57,371	5,599	8.9%	63,182	57,583	5,599	8.9%
43 -	M62 Westbound J9 - J10 (east of Mill Lane)	58,666	52,551	6,115	10.4%	60,983	54,992	5,991	9.8%	61,075	55,084	5,991	9.8%

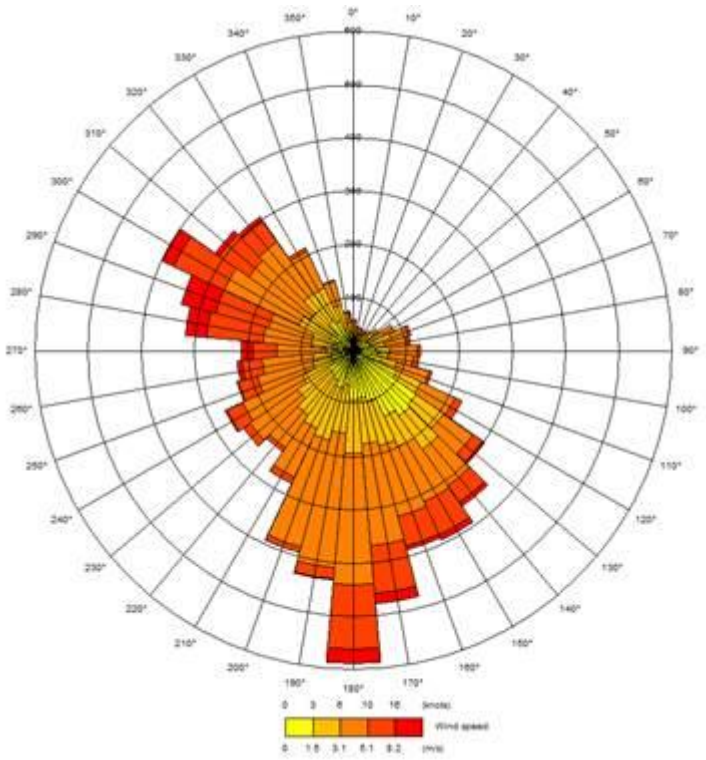
44 -	M62 Westbound J9 - J10 (west of Mill Lane)	58,666	52,551	6,115	10.4%	60,983	54,992	5,991	9.8%	61,075	55,084	5,991	9.8%
45 -	Mill Lane (Balleter Dr - new roundabout)	7,259	7,224	35	0.5%	7,734	7,699	35	0.4%	13,350	13,317	34	0.3%
46 -	Mill Lane (Delph Lane - underneath the M62)	6,730	6,697	33	0.5%	7,169	7,137	32	0.5%	7,966	7,935	32	0.4%
47 -	Mill Lane (Mill Lane turn off - new roundabout)	6,702	6,669	33	0.5%	7,140	7,107	32	0.5%	8,646	8,615	31	0.4%
48 -	Mill Lane (Site entrance)	219	215	4	1.9%	224	220	4	1.9%	743	739	4	0.6%
49 -	Mill Lane/Blackbrook Avenue (New roundabout) circulating flows	0	0	0	0.0%	0	0	0	0.0%	5,412	5,412	0	0.0%
50 -	Myddleton Lane (Delph Lane to underneath A49)	10,026	9,969	57	0.6%	10,456	10,400	56	0.5%	11,009	10,954	55	0.5%
51 -	Myddleton Lane (Waterworks Lane to Golbourne Road)	8,794	8,731	62	0.7%	9,140	9,079	61	0.7%	9,628	9,568	61	0.6%
52 -	Newton Road	10,167	9,803	364	3.6%	10,600	10,243	357	3.4%	10,726	10,369	357	3.3%
53 -	Northway NB	1,501	1,485	16	1.1%	1,913	1,891	22	1.1%	1,818	1,796	21	1.2%
54 -	Northway SB	1,239	1,156	84	6.7%	1,299	1,217	82	6.3%	1,716	1,634	82	4.8%
55 -	Poplars Avenue - East of (Central) Site entrance	3,760	3,568	192	5.1%	4,602	4,412	189	4.1%	7,481	7,292	189	2.5%
56 -	Poplars Avenue - West of (Central) Site entrance	3,152	2,968	184	5.8%	3,957	3,776	181	4.6%	5,845	5,664	181	3.1%
57 -	Poplars Avenue (Central) (Site entrance)	0	0	0	0.0%	0	0	0	0.0%	1,913	1,913	0	0.0%
58 -	Poplars Avenue (Greenwood Cres - Capesthorne Road)	8,853	8,584	269	3.0%	9,937	9,666	270	2.7%	13,464	13,194	270	2.0%
59 -	Poplars Avenue (south of Capesthorne Road)	7,193	6,986	207	2.9%	7,922	7,703	219	2.8%	9,318	9,102	215	2.3%
60 -	Poplars Avenue (West) (Site entrance)	0	0	0	0.0%	0	0	0	0.0%	1,285	1,285	0	0.0%
61 -	Radley Lane	116	112	4	3.6%	125	120	4	3.3%	125	120	4	3.3%
62 -	Sandy Lane	4,249	4,014	235	5.5%	4,571	4,334	238	5.2%	5,289	5,051	238	4.5%
63 -	Sandy Lane West	6,354	6,283	71	1.1%	7,454	7,378	76	1.0%	9,493	9,415	77	0.8%
64 -	Statham Avenue	3,901	3,794	106	2.7%	4,225	4,115	110	2.6%	5,426	5,316	110	2.0%
69 -	M62/A49 J9 Roundabout - 85821 to 85824 (>)	8,872	8,468	404	4.6%	9,351	8,956	396	4.2%	9,518	9,122	396	4.2%

Meteorological Data

Meteorological data from Rostherene recording station was used in the ADMS-Roads model. Data for 2018 and 2019 was obtained and a file prepared covering the period 1st October 2018 to 30th September 2019 for use in the model. This time period corresponds with the diffusion tube data used within the model verification process. This is the most representative recording station for the development site.

The wind rose associated with the meteorological data used is shown in Figure A12.4.1. It indicates that the predominant winds in the study area originate from a southerly direction, indicating that road traffic emissions will be blown in a northerly direction.

Figure 12.4.1 Windrose Associated with the Study Period



Other meteorological inputs within the ADMS model were as follows;

Table A12.4.3 Meteorological Inputs into ADMS

Input	Dispersion Site	Meterological Site
Surface roughness	0.5 (parkland open suburbia)	0.2 (agricultural min)
Monin Obukhov length	30 (cities and large towns)	10 (small town)

Topography

A Panorama terrain file was utilised within the model.

Background Concentrations

The assessment process requires the derivation of background pollutant concentration data that are factored to the year of assessment, to which the model adds contributions from the assessed roads.

In this case, data from the Selby Street automatic monitoring station was used to derive background levels of pollutants over the period 1st October 2018 to 30th September 2019 and these are shown in **Table A12.4.3**.

Table A12.4.3 Background Concentrations

October 18- September 2019			
NOx µg/m^3	NO_2 µg/m^3	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3
21.01	29.67	16.93	10.35

Emission Factors

DEFRA's Emission Factor Toolkit (EFT), which is used within the ADMS model to predict emissions from road vehicles, was updated in May 2019 to version V9.0 and this was used within the ADMS model. The year was held at 2019 in relation to emission factors for all scenarios.

Conversion of NO_x to NO_2

Oxides of nitrogen (NO_x) concentrations have been predicted using the ADMS-Roads model. The modelled road contribution of NO_x at the identified sensitive receptor locations have been converted to NO_2 using the DEFRA NO_x to NO_2 calculator (v7.1, 2019) (Ref 12.11) in accordance with DEFRA guidance (Ref 12.8). The year was held at 2019 in relation to the use of the tool for all scenarios.

Model Verification

Model verification is the process of adjusting model outputs to improve the consistency of modelling results with respect to available monitored data. DEFRA guidance (Ref 12.8) was followed during model verification.

As the data collected by the continuous monitor at Selby Street had not been ratified past 30th September 2019, the model was run and verified for the period October 2018 to September 2019. Annualisation of MGL diffusion tube data is detailed in Error! Reference source not found.**A12.2.1**.

Monitoring of NO_2 is undertaken by WBC at a number of locations within the study area using diffusion tubes. The ADMS model was used to predict concentrations of NO_x at three of these sites and six of the monitoring sites installed for the applicant. Diffusion tubes MG6 and WA112 were not used in the verification process. The model is overpredicting at MG6 by some 15% due to the traffic data at this point. MG6 is located at the end of Birch Avenue on a lamp post by the blind end. Traffic for the road is 192 LDV and 8 HDV per hour but this obviously won't apply at this end of the road which serves only 10 dwellings and the hospital. W112 is located on a road for which traffic data was unavailable.

The air quality model was initially found to be over predicting along the motorway and under predicting across the existing housing estate and along the A49. Consequently, two verification factors were used; one for areas close to the motorway (0.9) and one for the rest of the model area (1.15). It was not possible to undertake verification of PM_{10} or $PM_{2.5}$ concentrations and so PM_{10} and $PM_{2.5}$ modelled concentrations were adjusted in the same manner as described.

Following verification and adjustment, the model has a root means square error (RSME) value of 1.8 µg/m^3. **Table 12.4.3** shows the outcomes from the verification process.

Table A12.4.3 Model Verification

Monitor	2019 Monitored Total NO2	2019 Monitored Road Nox	2019 Background NO2	2019 Background Nox	Monitored Road Contribution NO2 (total - background)	Modelled Road Contribution NOx (excludes background)	Ratio of Monitored Road Contribution Nox / Modelled Road Contribution NOx	Adjustment Factor	Adjusted Road Contribution NOx	Adjusted Modelled Total Nox (including background NOx)	Modelled Total NO2 (based on empirical Nox / NO2 relationship)	% Difference [(modelled - monitored) / monitored] x 100
MG1	33.00	24.23	21.01	29.67	11.99	27.57	0.88	0.90	24.81	54.48	33.27	0.82
MG2	28.22	14.24	21.01	29.67	7.21	9.66	1.47	0.90	8.70	38.37	25.47	-9.74
MG3	29.44	16.74	21.01	29.67	8.43	9.86	1.70	1.15	11.34	41.01	26.79	-8.99
MG4	25.01	7.78	21.01	29.67	4.00	5.69	1.37	1.15	6.54	36.21	24.38	-2.50
MG5	28.62	15.07	21.01	29.67	7.61	8.60	1.75	1.15	9.89	39.56	26.07	-8.92
MG7	34.18	26.75	21.01	29.67	13.17	28.03	0.95	0.90	25.23	54.90	33.47	-2.07
WA96	39.29	38.09	21.01	29.67	18.28	30.19	1.26	1.15	34.72	64.39	37.80	-3.80
WA95	32.10	22.32	21.01	29.67	11.09	15.66	1.43	1.15	18.01	47.68	30.05	-6.40
WA123	24.95	7.66	21.01	29.67	3.94	11.89	0.64	0.90	10.70	40.37	26.47	6.09

AIR POLLUTION

AQ 5 Construction Dust Assessment

ES Volume 9: Appendix 12.5 Construction Dust Assessment

Step 1 Need for Assessment

The site boundary is within 350m of human receptors. In addition, there are human receptors within 50 m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance. There is also an ecological receptor within 50 m of the site boundary. Therefore, a detailed assessment of the construction phase of the development on residential receptors has been undertaken.

Step 2A Dust Emission Magnitude

The potential dust emission magnitude in relation to the development has been determined using the criteria detailed in **Table 12.2** of **Chapter 12.0**.

- Demolition: Limited demolition is required
- Construction: The total building volume to be constructed is >100,000m^3. The dust emission magnitude for construction is, therefore, considered to be **Large**.
- Earthworks: The total site area is >10,000m^2. The dust emission magnitude for earthworks is, therefore, considered to be **Large**.
- Trackout: It is assumed that there are likely to be more than 50 HDV outward movements in any one day. The dust emission magnitude for trackout is, therefore, considered to be **Large**.

The scale and nature of works onsite were considered to determine the potential dust emission magnitude for demolition, earthworks and trackout activities as outlined in **Table A12.5.1.**

Table A12.5.1: Dust Emission Magnitudes for Each Activity

Activity	Dust Emission Magnitudes	Justification
Demolition	Small	• Limited demolition is required
Earthworks	Large	• The total site area is >10,000 m^2
Construction	Large	• The total building volume to be constructed is > 100,000 m^3
Trackout	Large	• There are likely to be >50 HDV movements in any one day

Step 2B Sensitivity of the Receptors to Dust Soiling and Health Effects

Human receptors are located in residential houses adjacent to the site within a distance of 120 m from construction, demolition and earthworks and 20 m of road edges used by traffic associated with the site construction. In accordance with the criteria in **Table 12.3** of **Chapter 12.0** and the IAQM guidance, the sensitivity of human receptors to the effects of dust soiling and health effects from construction, demolition, earthwork activities, and from trackout is therefore likely to be **High**.

Step 2B Sensitivity of the Area to Dust Soiling

The sensitivity of the area to dust soiling effects has been determined using the criteria detailed in **Table 12.4** of **Chapter 12.0**

- Demolition – sensitivity is considered to be High as demolition takes place less within 20 m of >100 high sensitivity receptors;
- Construction - sensitivity is considered to be High as construction activities take place within 20 m of >100 high sensitivity receptors;

- Earthworks - sensitivity is considered to be High as earthworks activities take place within 20 m of >100 high sensitivity receptors; and
- Trackout activities – sensitivity is considered to be High as there are >100 high sensitivity receptors within 20 metres of roads which relevant vehicles are likely to use that are up to 500 metres from the site.

Step 2B Sensitivity of People to the Health Effects of PM_{10}

The modelled PM_{10} concentrations are likely to be less than 24 µg/m^3 during the construction phase. Using this information and **Table 12.5** of **Chapter 12.0** the sensitivity of human receptors to health impacts from dust and PM_{10} for each activity were defined as:

- Demolition - sensitivity is considered to be Medium as demolition activities take place within 20 m of >100 high sensitivity receptors and the background PM_{10} concentration is predicted to be less than 24 µg/m^3;
- Construction - sensitivity is considered to be Medium as construction activities take place within 20 m of >100 high sensitivity receptors and the background PM_{10} concentration is predicted to be less than 24 µg/m^3;
- Earthworks - sensitivity is considered to be Medium as earthworks activities take place within 20 m of >100 high sensitivity receptors and the background PM_{10} concentration is predicted to be less than 24 µg/m^3;
- Trackout activities – sensitivity is considered to be Medium as there are >100 high sensitivity receptors within 20 metres of roads which relevant vehicles are likely to use that are up to 500 metres from the site, and the background PM_{10} concentration is predicted to be less than 24 µg/m^3.

Table A12.5.2 Outcome of Defining the Sensitivity of the Area

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	High	High	High
Human Health	Medium	Medium	Medium	Medium

Step 2C Risk of Impacts

The dust emission magnitude and sensitivity of the area were combined and the risk of impacts determined using the criteria detailed in **Table 12.6** to **Table 12.9 of Chapter 12.0**.

- Demolition – is considered to be **High** risk for dust soiling, **High** risk for human health;
- Earthworks – is considered to be **High** risk for dust soiling, **Medium** risk for human health;
- Construction – is considered to be **High** risk for dust soiling, **Medium** risk for human health; and
- Trackout activities – is considered to be **High** risk for dust soiling, **Medium** risk for human health.

A summary of the risks, before mitigation measures are applied, for dust soiling and human health are shown in **Table A12.5.3**

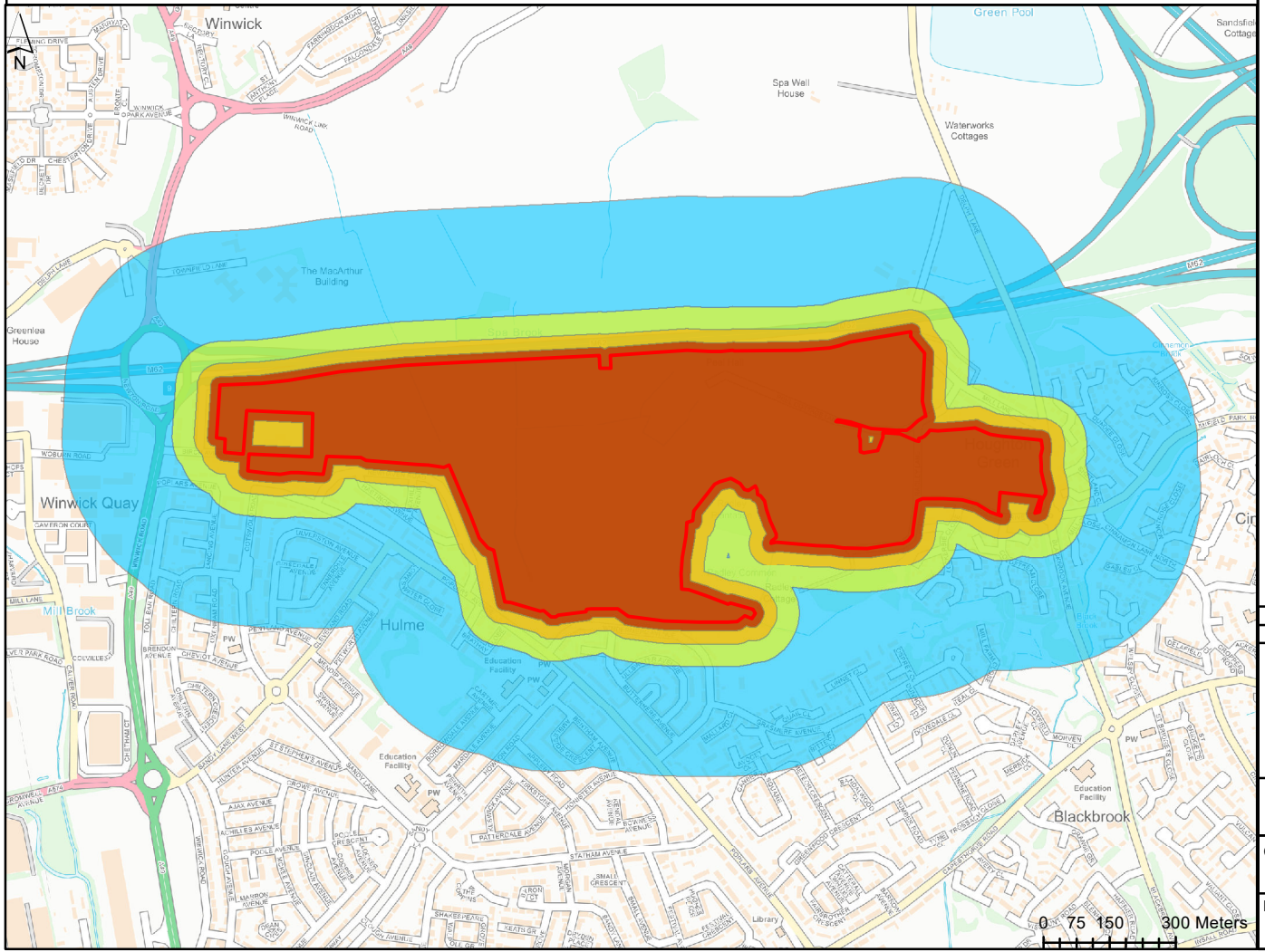
Table A12.5.3 Risk of Dust Impacts

Potential Impact	Dust Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	High	High	High
Human Health	High	Medium	Medium	Medium

AIR POLLUTION

AQ 6 Construction Dust Study Area

ES Volume 9: Figure 12.1 Construction dust study area

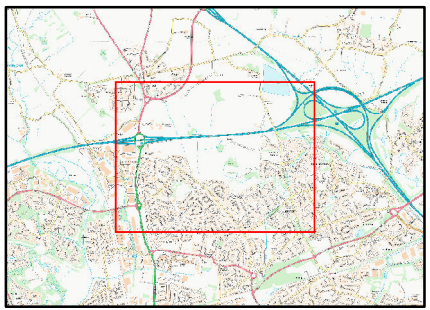


Legend

- Site
- 350 m

Construction dust buffer zones

- <20 m
- 20 m - 50 m
- 50 m - 100 m



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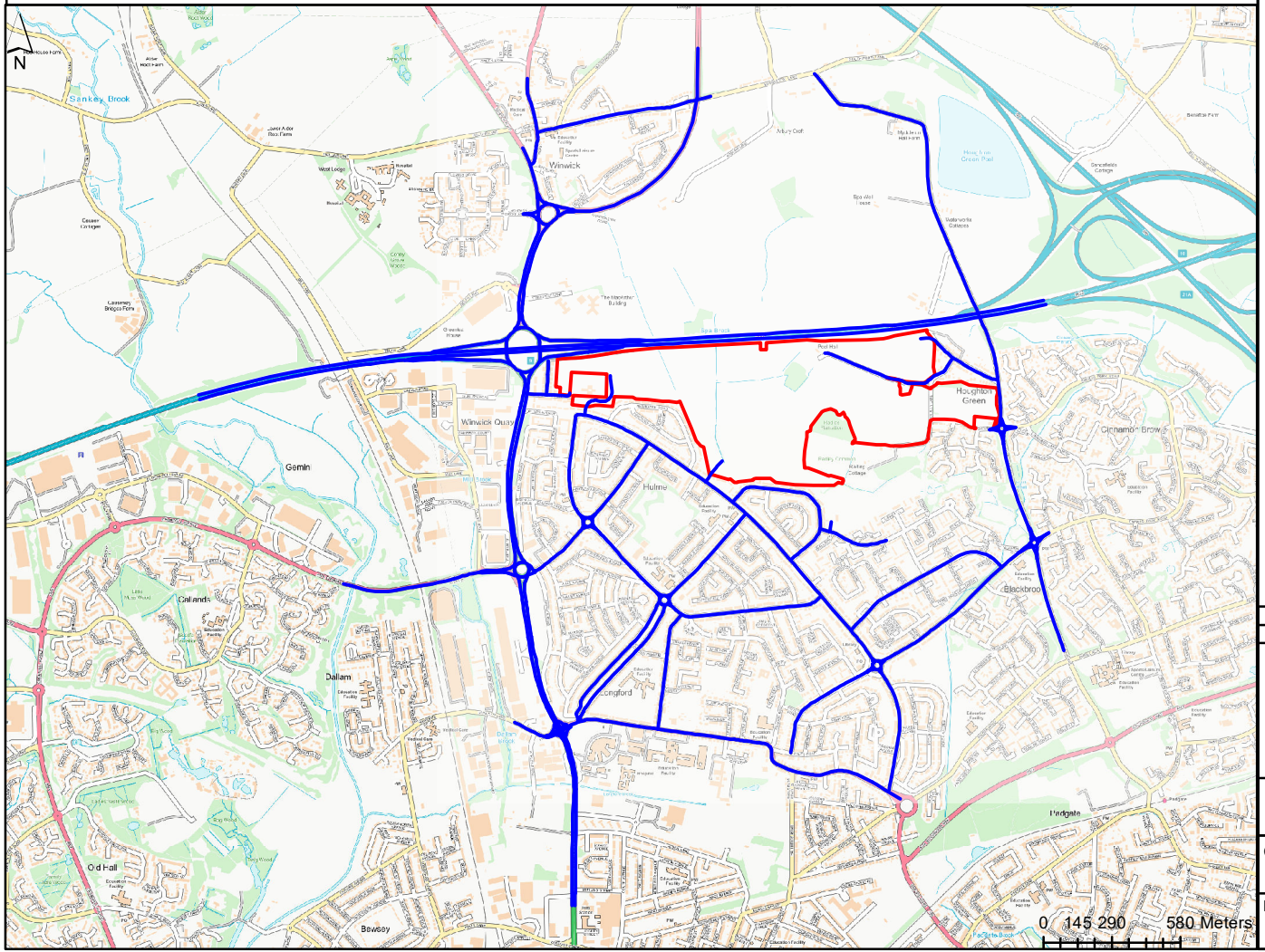
Project:	Peel Hall, Warrington
Client:	Satnam Millenium LTD
Report Number: 102036	Scale @ A4: 1:15,538

AIR POLLUTION

AQ 7 Operational road traffic emissions study area

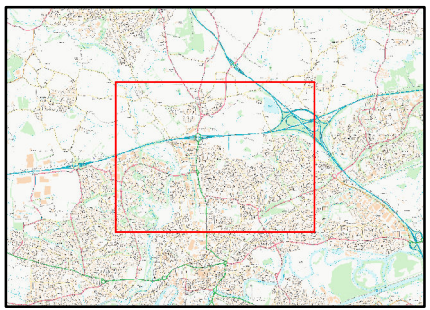
ES Volume 9: Figure 12.2 Operational road traffic emissions study area



Legend

Site

Operational Road Traffic Study



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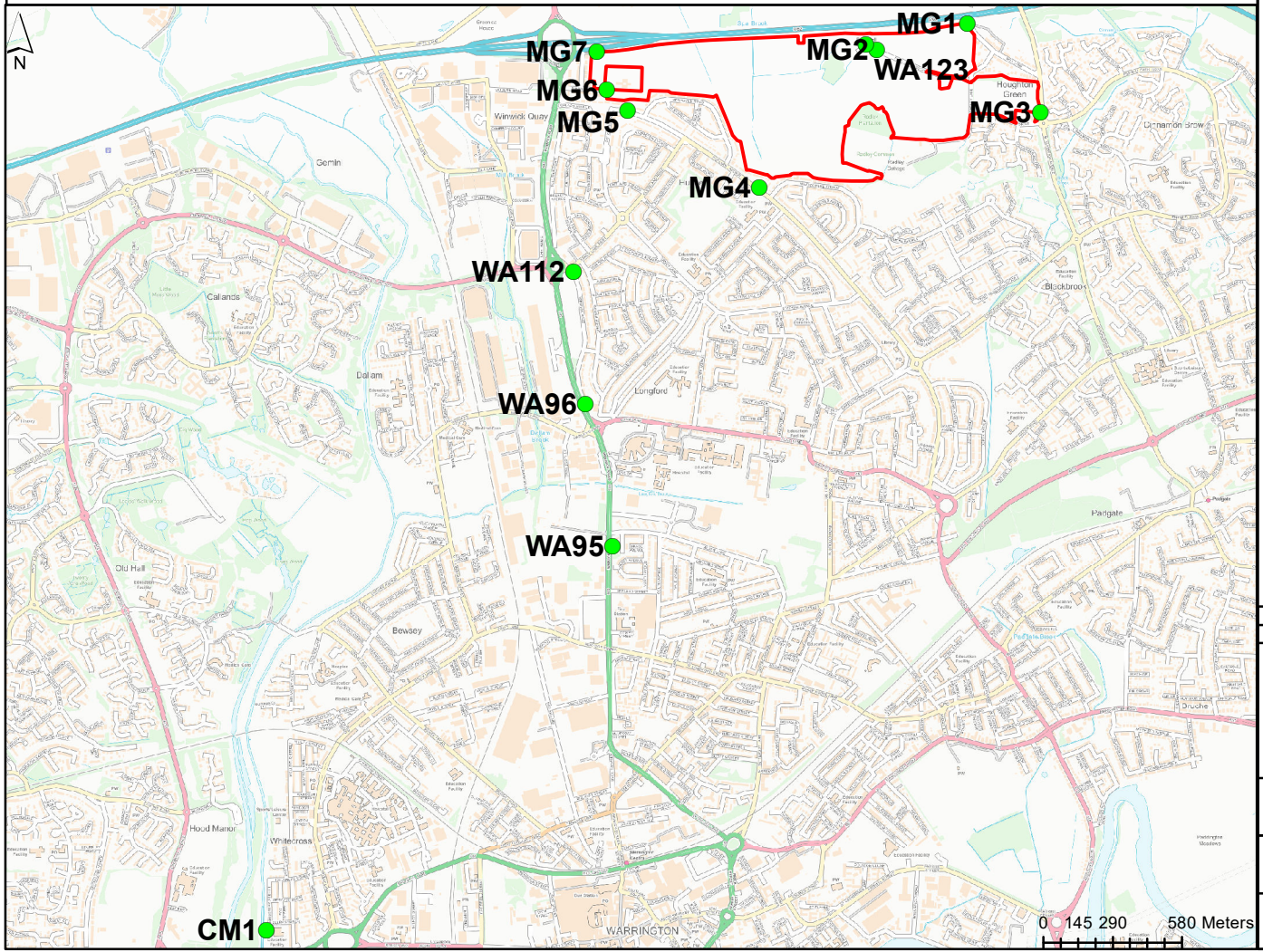
AIR POLLUTION

AQ 8 Location of the monitoring station and diffusion tubes

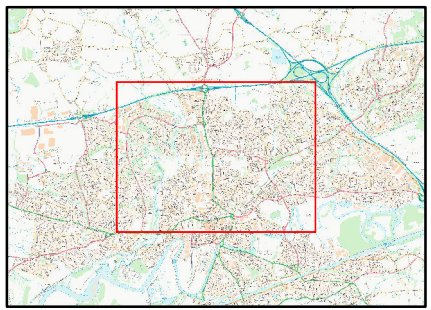
ES Volume 9: Figure 12.3 Location of the monitoring station and diffusion tubes



Legend

Site

Monitoring sites



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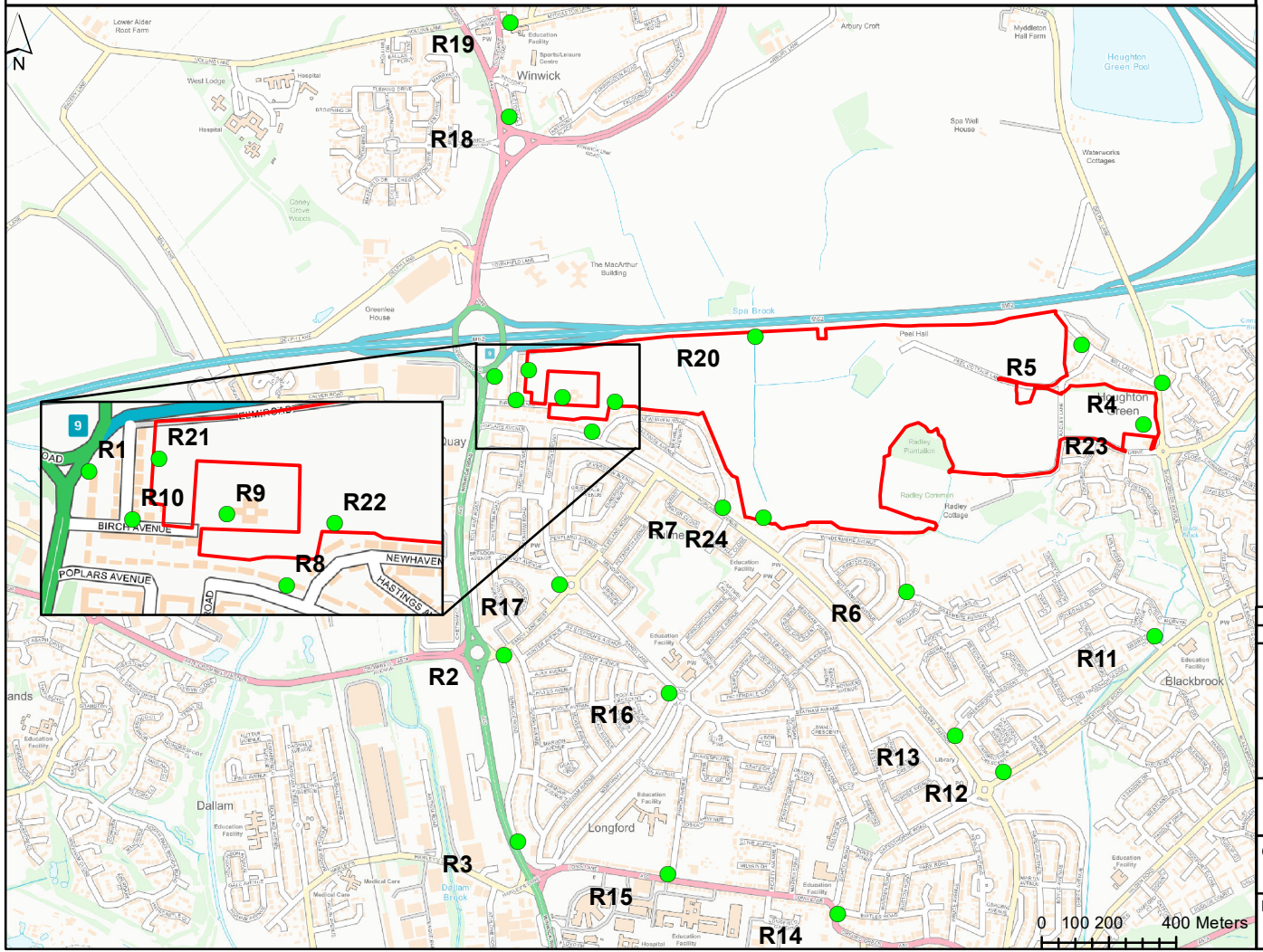
AIR POLLUTION

AQ 9 Location of receptors

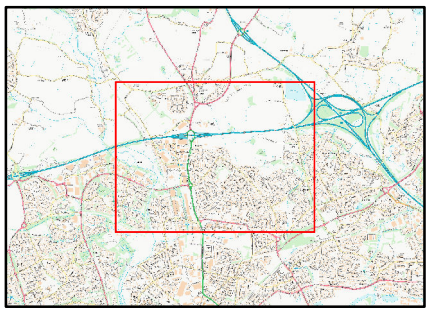
ES Volume 9: Figure 12.4 Location of receptors



Legend

Site

Receptors



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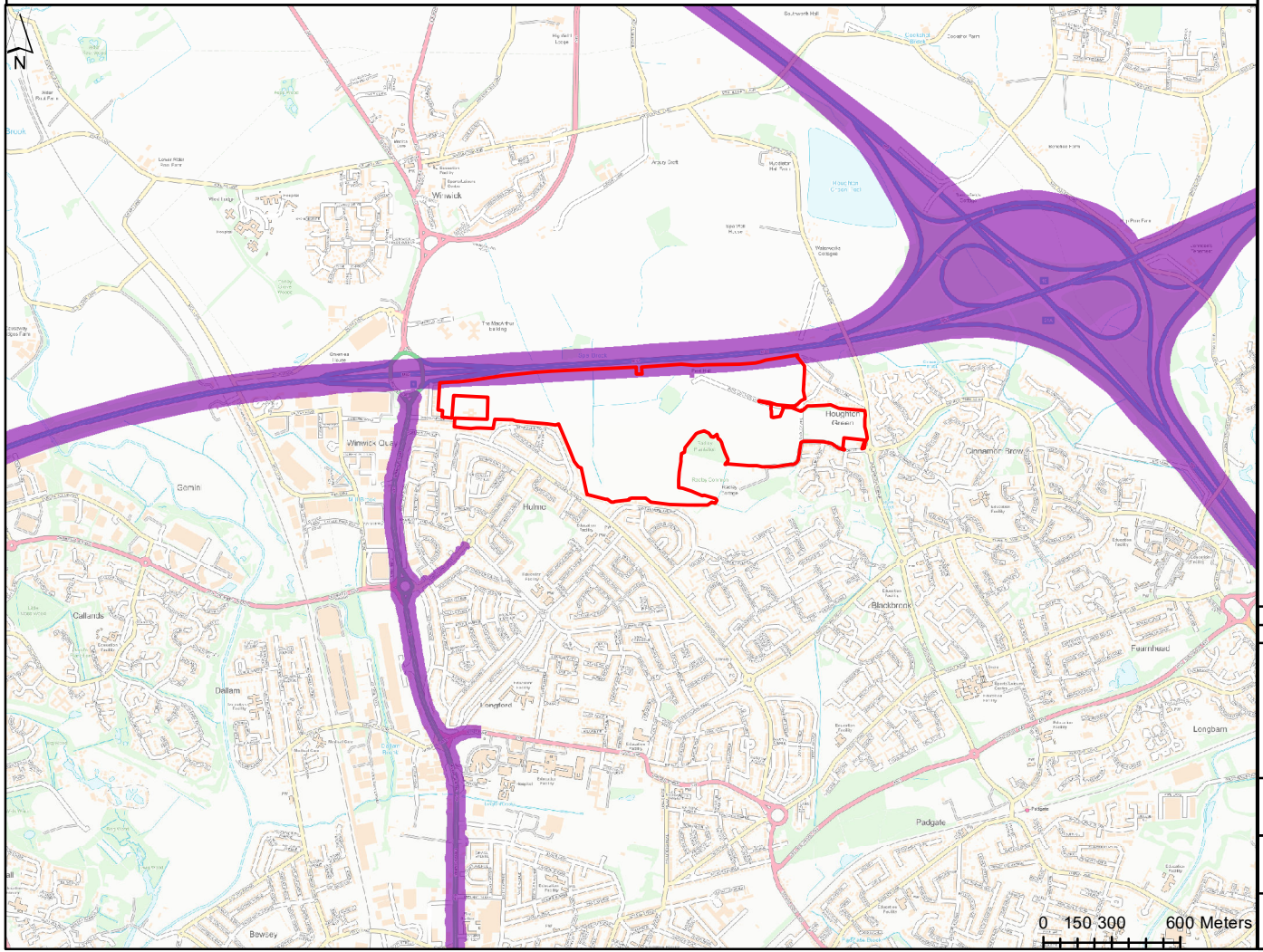
AIR POLLUTION

AQ 10 Location of the AQMA

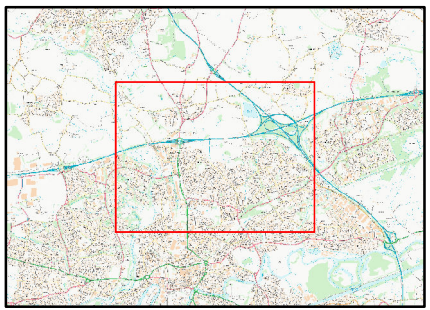
ES Volume 9: Figure 12.5 Location of the AQMA



Legend

Site

AQMA



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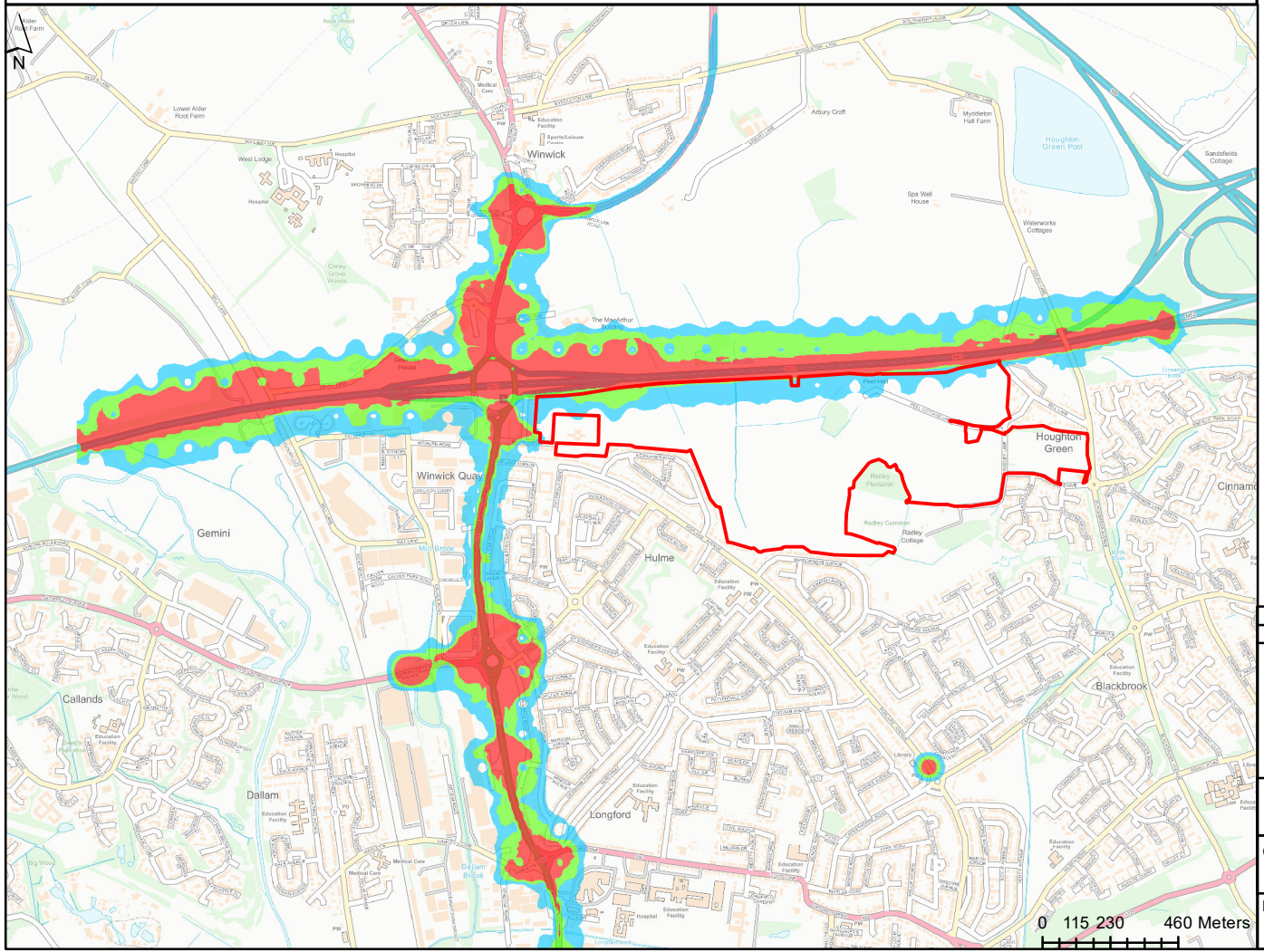
AIR POLLUTION

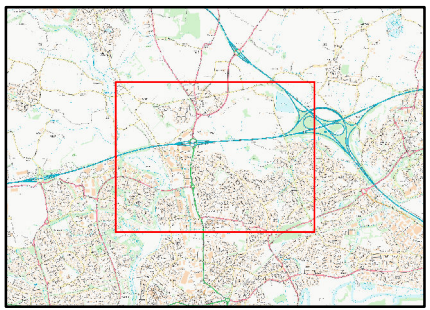
AQ 11 Contours of NO2 Concentrations in the opening year with the development

ES Volume 9: Figure 12.6 Contours of NO_2 concentrations in the opening year with the development



Legend

- Site
- NO_2 concentrations (ug/m^3)
  - 21.2 - 32.0
  - 32.0 - 36.0
  - 36.0 - 40.0
  - >40.0



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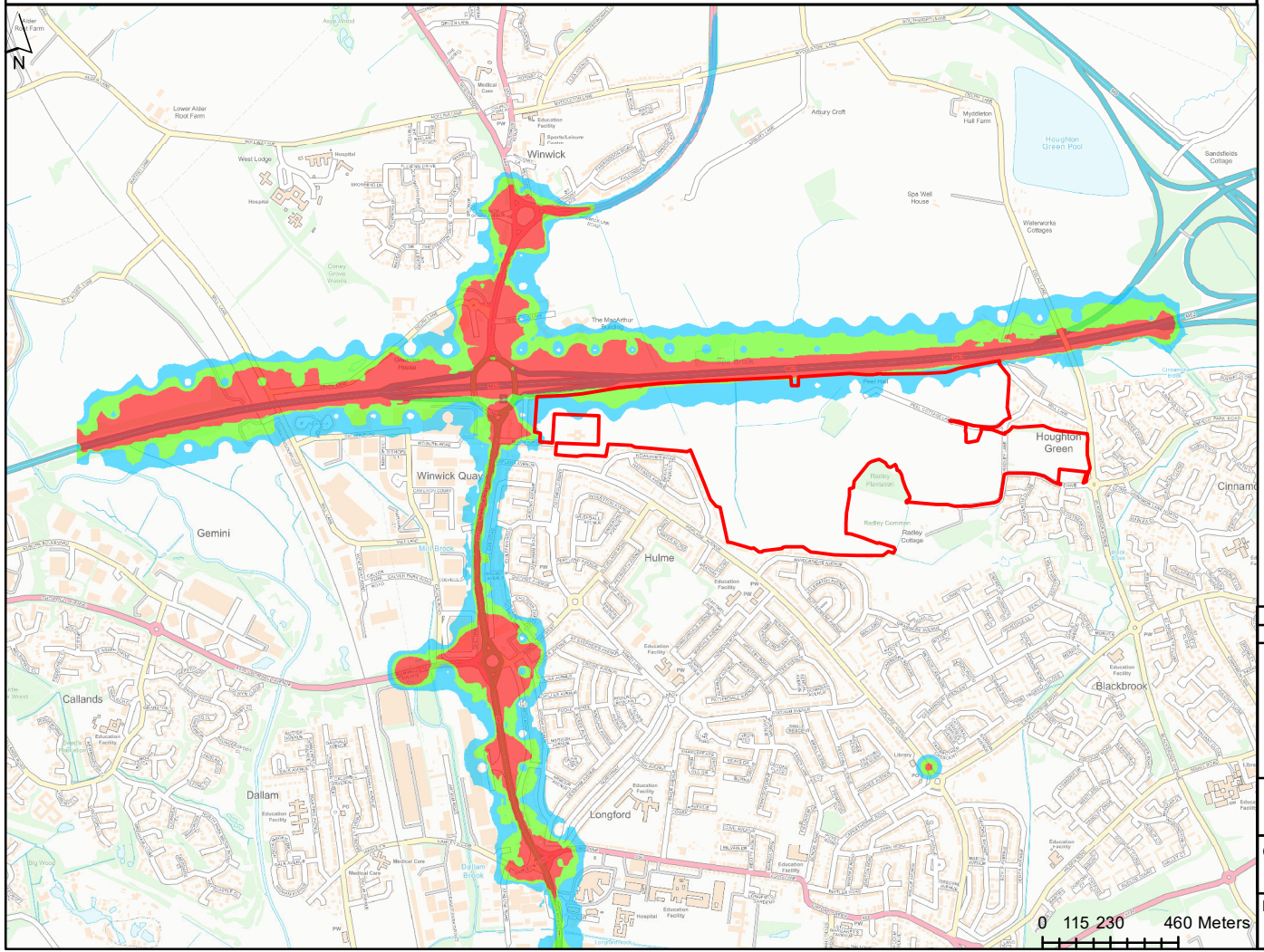
AIR POLLUTION

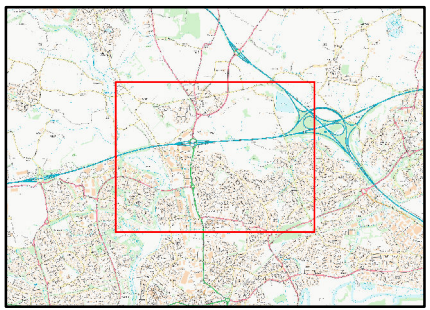
AQ 12 Contours of NO2 concentrations in the opening year without the development

ES Volume 9: Figure 12.7 Contours of NO_2 concentrations in the opening year without the development



Legend

- Site
- NO_2 concentrations (ug/m^3)
  - 21.2 - 32.0
  - 32.0 - 36.0
  - 36.0 - 40.0
  - >40.0



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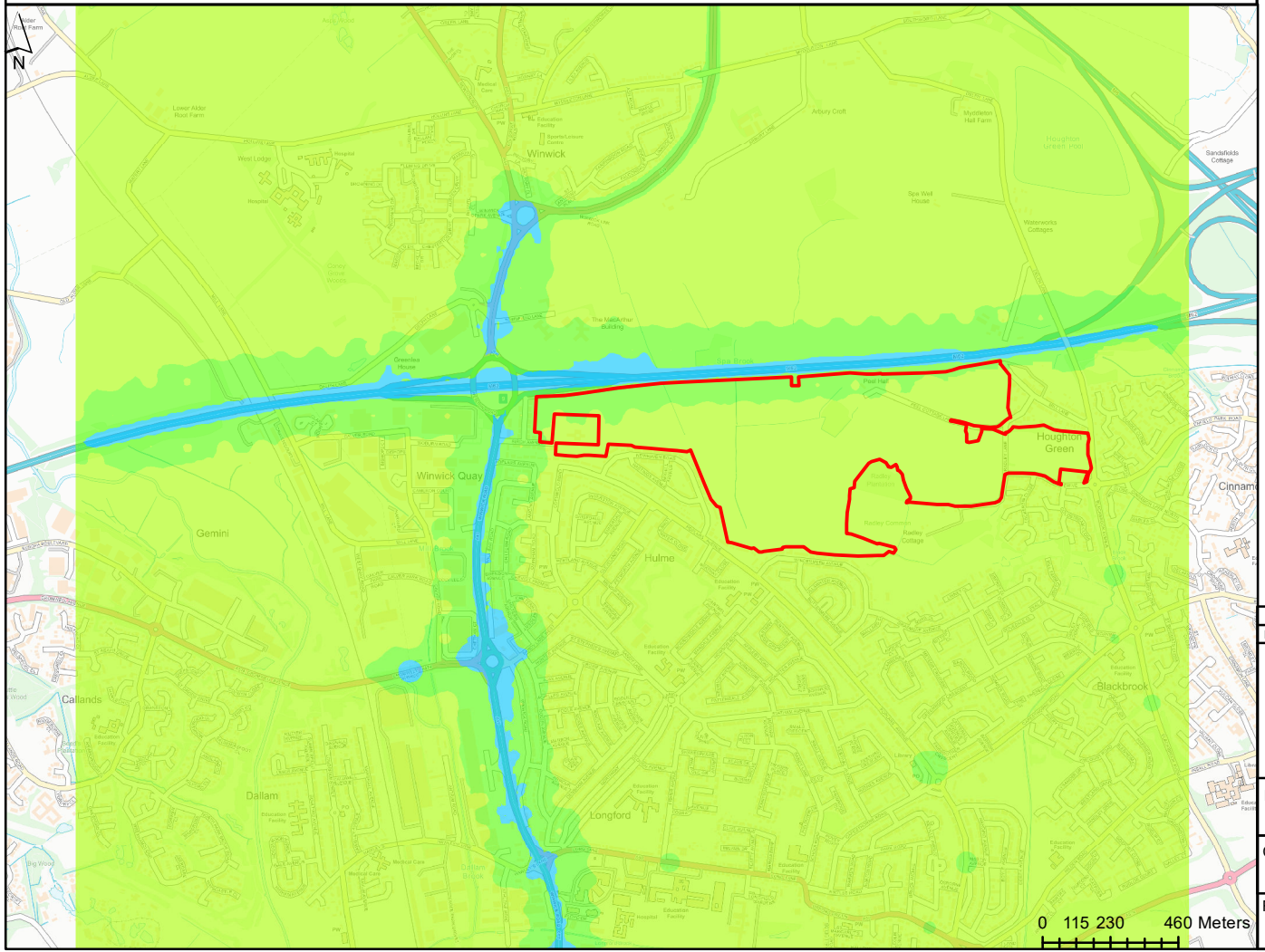
AIR POLLUTION

AQ13 Contours of PM10 concentrations in the opening year with the development

ES Volume 9: Figure 12.8 Contours of PM_{10} concentrations in the opening year with the development

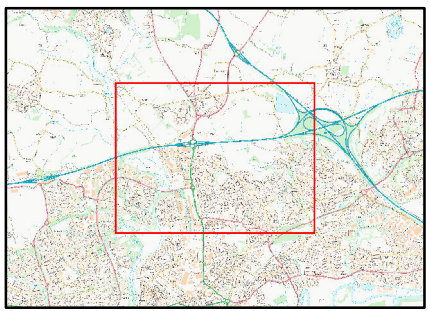


Legend

Site

PM_{10} concentrations (ug/m^3)

- 16.9 - 18.0
- 18.0 - 20.0
- 20.0 - 24.6



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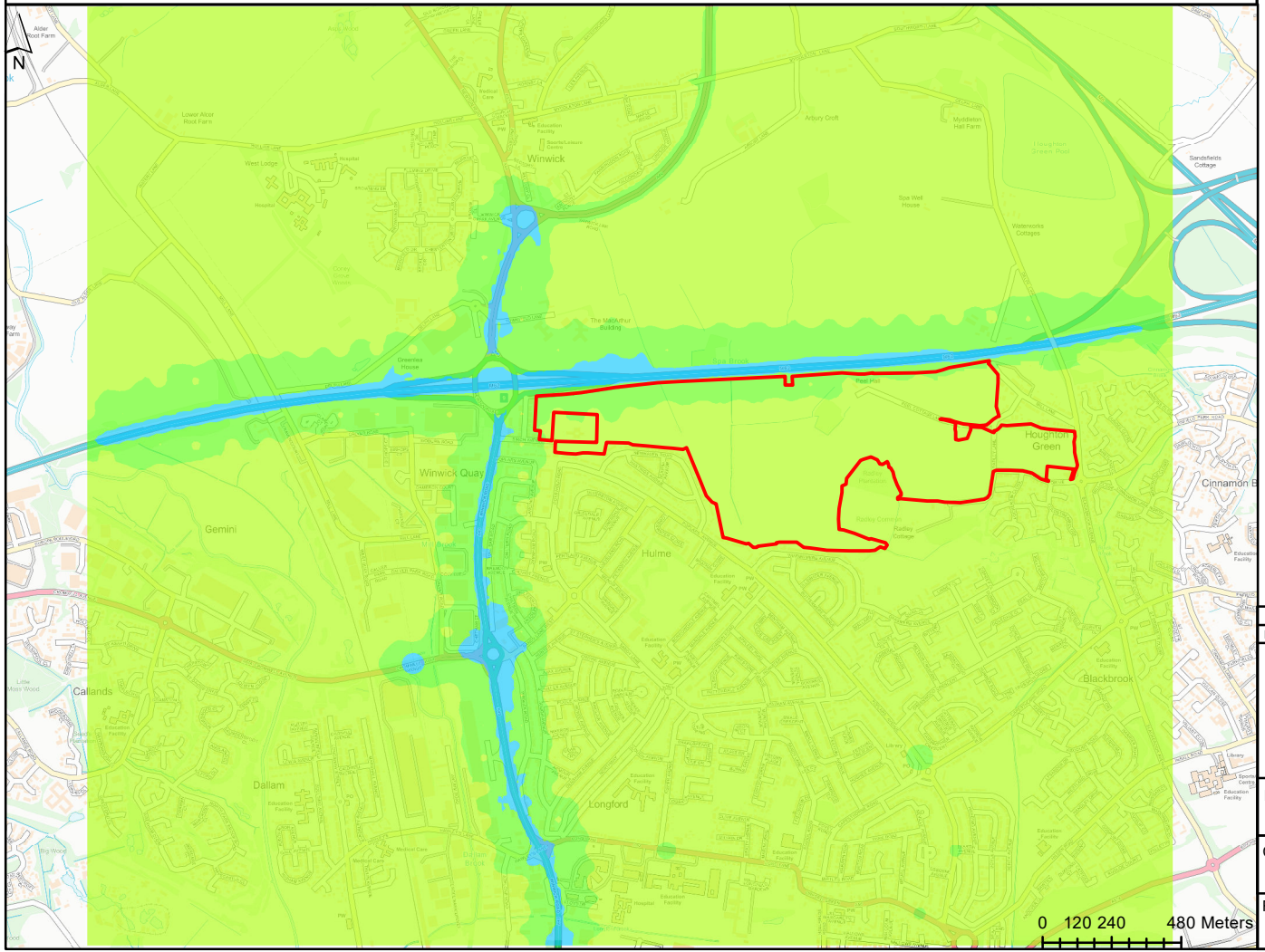
AIR POLLUTION

AQ14 Contours of PM10 concentrations in the opening year without the development

ES Volume 9: Figure 12.9 Contours of PM_{10} concentrations in the opening year without the development



Legend

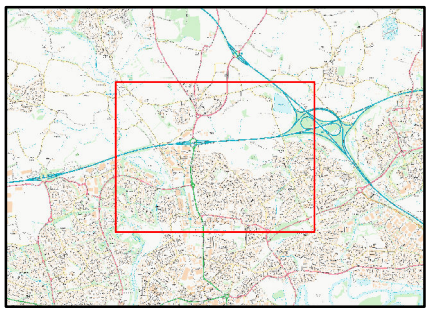
Site

PM_{10} concentrations (ug/m^3)

16.9 - 18.0

18.0 - 20.0

20.0 - 24.4



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Client:	Satnam Millenium LTD
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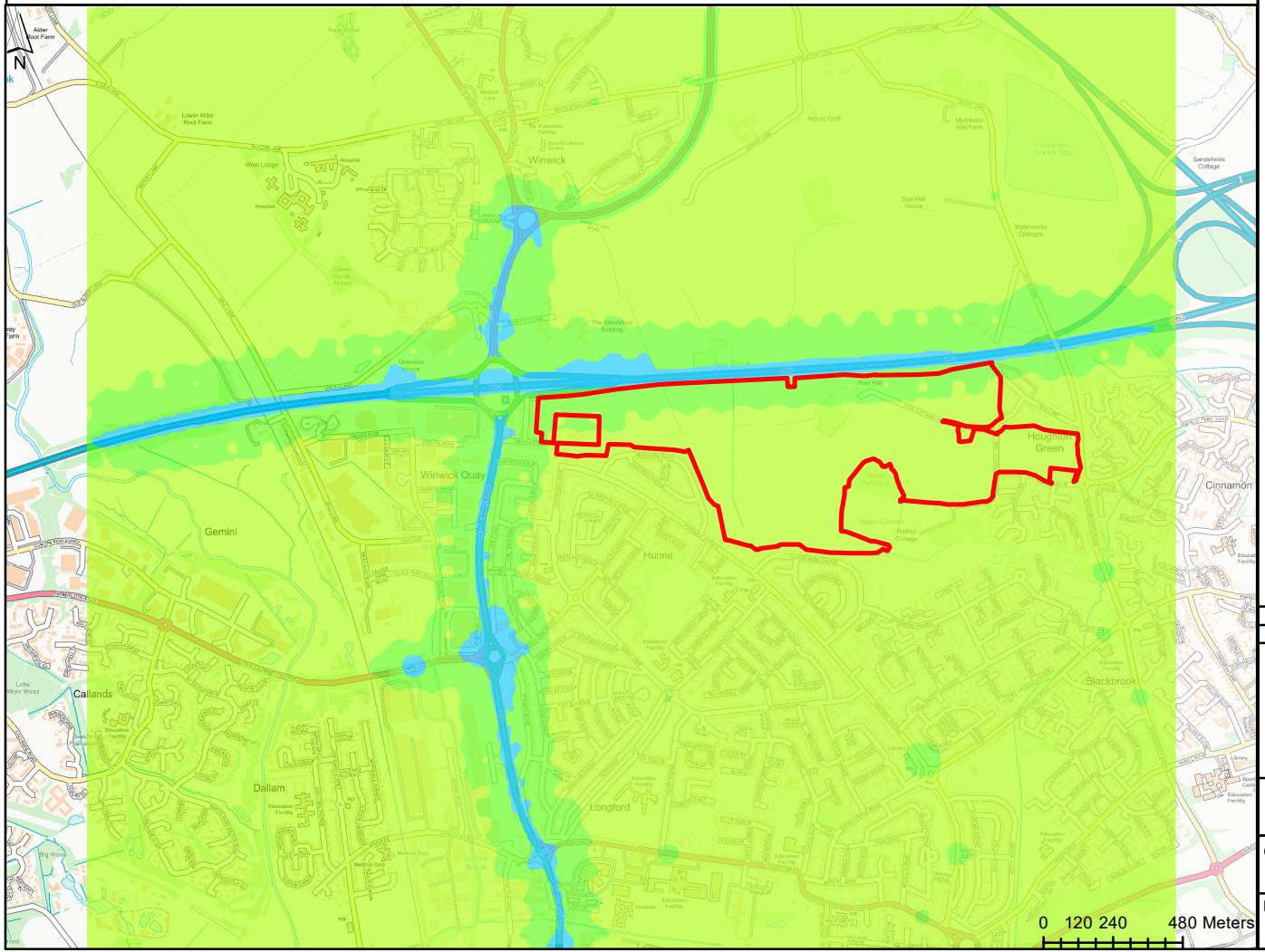
AIR POLLUTION

AQ15 Contours of PM2.5 concentrations in the opening year with the development

ES Volume 9: Figure 12.10 Contours of $PM_{2.5}$ concentrations in the opening year with the development

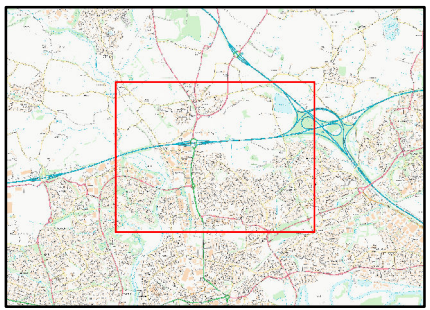


Legend

Site

$PM_{2.5}$ concentrations (ug/m^3)

- 10.4 - 11.0
- 11.0 - 12.2
- 12.2 - 15.1



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Report Number: 102036	Scale @ A4: 1:23,635

SOCIO-ECONOMIC

S2 Summary Tables

TableA**Error! No text of specified style in document.**.1 Health Facilities within the Local Impact Area

Health Centre	Distance from site (km)	Number of Full Time Equivalent (FTE) GPs	Patients	Surplus / Deficit (versus typical provision of 1,800 patients per GP	Accepting New Patients?
Fearnhead Cross Medical Centre	1.9	6	14,198	-3,398	Y
Park View Medical Practice	2.1	2	5,895	-2,295	Y
Padgate Medical Centre	2.4	2	6,788	-3,188	Y
Eric Moore Partnership - Orford Park Branch Medica	2.4	3	9,640	-4,240	Y
4 Seasons Medical Centre	2.1	1	2,559	-759	Y
Penketh Health Centre	2.1	6	14,587	-3,787	Y
Greenbank Surgery	2.9	5	8,942	58	Y
Helsby Street Medical Centre	2.7	5	8,477	523	Y
Manchester Road Surgery	3.1	2	3,008	592	Y
Fairfield Surgery	3	2	3,137	463	Y
Holes Lane Surgery (Dr Wadsworth M R & Partners)	3.2	6.5	10,491	1,209	Y
Dr Plumb E A & Partners (Folly Lane Medical Centre)	2.9	5	10,397	-1,397	Y
Dallam Lane Medical Centre	3.4	2	2,757	843	Y
Dr Whitenburgh M (Cockhedge Medical Centre)	3.5	1	3,100	-1,300	Y
Guardian Street Med/Ctr (Dr M A Kerr & Partners)	3.9	8	10,096	4,304	Y
Springfields Medical Centre Dr Burke S L & Partners	3.9	4	6,884	316	**N**
Dr Winter S M & Partners (Westbrook Medical Centre)	3.9	6	10,284	516	**N**
Birchwood Medical Centre	3.7	9	11,267	4,933	Y
Causeway Medical Centre & Great Sankey Health Centre	4.5	22	8,204	-4,604	Y
Latchford Medical Centre	4.8	4	6,717	483	Y
TOTAL	**-**	**81.5**	**157,428**	**-10,728**	

Source: Lichfields Analysis September 2017 / NHS Choices Website

TableA**Error! No text of specified style in document.**.2 Dental Practices within the Local Impact Area

Dentist	**Distance from site (km)**	**Number of Dentists**	**Accepting new patients?**
Cotswold Dental Care	1.2	3	Y
Fearnhead Dental Surgery	1.9	3	**N**
Bupa Dental Care Ltd	2.6	7	Y
Padgate (No 1) Limited	2.6	4	Y
Birchwood Dental Practice	3.5	6	Y
Victoria House Orthodontic Practice	3.5	3	N/A
The Smile Clinic	3.5	6	Y
IDH- Westbrook	3.7	6	**N**
Warrington NHS Dental Clinic	3.9	N/A	N/A
Clayton & Scott	3.9	3	Y
Sankey Street Dental Practice	4	2	Y
Signature Smiles	4	2	Y
Museum Street Dental Surgery	4.2	7	**N**
Latchford Dental Practice	4.7	9	Y
TOTAL	**-**	**61**	**42**

Source: Lichfields Analysis / NHS Choices Website

TableA**Error! No text of specified style in document.**.3 Public and Private Sports and Recreational Facilities within Warrington Borough and the North West Region

Facilities	**Warrington**	**North West**	
	Number	**Number**	**Proportion of North West's Facilities in Warrington**
Athletics Tracks	1	51	1.96%
Golf	8	349	2.29%
Grass Pitches	325	8,689	3.74%
Health & Fitness Suite	27	981	2.75%
Ice Rinks	0	5	0.00%
Indoor Bowls	0	10	0.00%
Indoor Tennis Centre	2	33	6.06%
Ski Slopes	0	20	0.00%
Sports Hall	43	1,358	3.17%
Squash Courts	18	472	3.81%
Swimming Pool	15	571	2.63%
Artificial Grass Pitch	29	1006	2.88%
Tennis courts	39	1329	2.93%
Total	**507**	**14,874**	**3.41%**
% of North West Population in Warrington			**2.90%**
% split between public / private facilities	**78% / 22%**	**71% / 29%**	

Source: Lichfields Analysis / Sport England's Active Places Power website