

Department for Regional Development - TransportNI

A24 Ballynahinch Bypass

Public Inquiry

January 2016

Submission on

Scheme Development up to Publication of Draft Orders

by

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TABLE OF CONTENTS	1.	INTRODUCTION.....	1
	2.	SCOPE OF EVIDENCE	3
	3.	BACKGROUND TO THE SCHEME.....	5
	4.	EXISTING SITUATION	7
	5.	DEVELOPMENT OF SCHEME	13
	6.	DESCRIPTION OF SCHEME	15
	7.	ISSUES ANTICIPATED DURING CONSTRUCTION AND AFTER OPENING	21
	8.	CONCLUSION	25

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1. INTRODUCTION

- 1.1.1.1 My name is George Kissick and I work for AECOM (formerly URS). I have a BSc degree in Civil Engineering (1979); I am, since 1988 a Chartered Engineer (CEng) and a Member of the Institution of Civil Engineers (MICE).
- 1.1.1.2 For the purpose of this Proof of Evidence, any reference to URS may include reference to its former legacy companies, including Scott Wilson.
- 1.1.1.3 In September 2005 I was appointed Project Manager for the development of the A24 Ballynahinch Bypass scheme. I am responsible for the general progression of the project, overseeing the roads design input and co-ordinating the other design teams, who specialise in areas such as structural & geotechnical design, environmental assessment and traffic and economic analysis.
- 1.1.1.4 Transport Northern Ireland (TNI) have outlined their strategy for the A24 Ballynahinch Bypass and summarised the brief under which URS was appointed to carry out the assessment work on this project. In summary, this included assisting TNI to deliver this scheme in three stages:
- Stage 1, review and confirm feasibility of the scheme(s) undertake environmental assessment and provide an economic appraisal;
 - Stage 2, develop a specimen design, progress Statutory Procedures, undertake public consultation and attend Public Inquiries; and
 - Stage 3, review specimen design, prepare tender and contract documents, procure a suitable contractor, administer and supervise the construction and undertake a post contract evaluation.

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2. SCOPE OF EVIDENCE

- 2.1.1.1 A significant volume of detailed information has been prepared during the development of the Preferred Scheme, which has been published in report form or has been summarised for Public Exhibition at various stages. In addition to my submission and attendance at this Inquiry, the Department is represented by other Experts who are available to provide clarification on elements of the scheme, such as Environment, Planning, Traffic & Economics, Noise, Air Quality and Ecology.
- 2.1.1.2 My submission will provide a summary of the technical aspects of the road scheme presented in the draft Statutory Orders. I will focus on the decisions made at the corridor & route selection stages and provide a summary of the preferred scheme including the anticipated impacts on the surrounding environment, and the measures included to mitigate these. My evidence will include;
- A general background to the scheme;
 - A brief description of the existing conditions in Ballynahinch;
 - A summary of the development and assessment of the road scheme; showing how the preferred route was selected;
 - A description of the preferred scheme; and
 - Some of the issues anticipated during construction and after opening.

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3. BACKGROUND TO THE SCHEME

- 3.1.1.1 The strategic context for the Proposed Scheme is described separately in the Proof of Evidence submitted by the Project Sponsor, Mr. Eoghan Daly of TransportNI.
- 3.1.1.2 The Regional Transportation Strategy's (RTS) objective is to deliver a modern, sustainable, safe transportation system, promoting accessibility to jobs, services and facilities through improvements to transportation infrastructure and public transport services. The RTS includes the A24 Ballynahinch Bypass as a Strategic Highway Improvement initiative, which will ultimately contribute to increasing the economic well-being of the region.
- 3.1.1.3 A location plan is included within Appendix A.
- 3.1.1.4 The assessment of strategic road improvements is outlined in the Design Manual for Roads and Bridges (DMRB) and is defined as a three-stage process:
- Stage 1: Preliminary Assessment;
 - Stage 2: Route Option Assessment; and
 - Stage 3 Scheme Assessment.
- 3.1.1.5 The level of detail and scope of the assessment at each stage are appropriate to the type of decision that can be reasonably taken at that time. The outcomes of the assessment process were reported at each stage and exhibited as work progressed between 2005 and 2015.
- 3.1.1.6 The Environmental Statement for the scheme was published in March 2015. It was prepared in accordance with Article 67 of the Roads (Northern Ireland) Order 1993 and the requirements of the DMRB. Draft Vesting and Direction Orders were published in March 2015 also.
- 3.1.1.7 The environmental aspects of the proposed scheme are described in detail in the separate Proof of Evidence prepared by Mr. Gareth Coughlin of AECOM.
- 3.1.1.8 The proposed scheme is anticipated to bring considerable benefits to all road users, with a projected Benefit to Cost Ratio (BCR) of 2.146. The traffic and economic aspects of the Proposed Scheme are described in detail in the separate Proof of Evidence prepared by Mr. Russell Bissland of AECOM.

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4. EXISTING SITUATION

4.1 Existing A24

- 4.1.1.1 The A24 road network in Ballynahinch is used by both strategic as well as regional traffic; including commuters travelling to and from Belfast, together with local traffic and is a major artery toward Newcastle and the Mountains of Mourne. The A24 Trunk Road conveys traffic through town centre streets which are fronted by retail, commercial, educational, public service and residential properties.
- 4.1.1.2 The geometry of the existing wide single carriageway approaching Ballynahinch for 4.3km from the north is of reasonable standard, having been realigned from the Old Belfast Road over 30 years ago, it includes hard shoulders and provides some overtaking opportunities. It is of flexible construction though shows some signs of edge and shoulder deterioration. A surface dressing has been applied to the carriageway. A 40mph speed limit, extending some 0.6km from the end of the national speed limit, precedes the 30mph speed limit signs on entering the town, where both hard shoulders stop and a mixture of verges and flexible footways, of varying widths, abut the carriageway.
- 4.1.1.3 Throughout the commercial district dedicated on-street parking is a feature, usually on both sides of the road. Footways are adequate and provided on both sides of the road. Traffic lights and delivery vehicles stopping in the running lanes to pick up/set down goods to the adjacent premises impede progress of through traffic in this part of the town. Traffic management measures to improve conditions in the town centre include a gyratory system (introduced in Spring 1999) where 4 one-way streets circulate traffic around the town centre.
- 4.1.1.4 The A24 exits the mini roundabout at B2 Dromore Street to the south along Church Street. The eastern footway ceases approximately 900m before reaching the unrestricted/30mph speed limit signs (north of the Spa Road junction). Some overhead service provision to properties is restored on Church Street.
- 4.1.1.5 Within the speed restriction area there are many shops and dwellings, as well as a health centre, bus depot and four schools aligning the route. There are approximately 130 properties with direct vehicular access to the main road.
- 4.1.1.6 On exiting the speed restriction, approximately 3.5km after entering it, the A24 to the south, crosses the Ballynahinch River, on the A24 Drumaness Road. The western footway extends a further 300m to the Ballymaglave Road and illumination is provided to the B2 Downpatrick Road junction. The geometry of the A24 to the south of Ballynahinch, with hedged and fenced verges close to the edge of the pavement of the rural road toward Drumaness, is not compliant with current standards for a 100kph single carriageway trunk route and does not provide safe overtaking opportunities for some distance. The surfacing of both the footway and carriageway is of flexible construction and there is some drainage issues in areas that are likely associated with low vertical gradients.

4.2 Adjacent Road Provision

- 4.2.1.1 The northbound A21 Saintfield Road is connected to the A24 Belfast Road at a priority junction to the north of the town and forms a junction with the U0023 (old) Saintfield Road, to the south a short distance from this main junction. The A21 Saintfield Road is of flexible construction and has been surface dressed. It has no footway provision. The geometry of the A21 Saintfield Road to the north and east of Ballynahinch, with hedged and fenced verges close to the edge of the pavement of the rural road, is not compliant with current standards for a 100kph single carriageway route.

- 4.2.1.2 The B2 Downpatrick Road is connected to the A24 Drumaness Road at a priority junction to the south of the town and has a small side road, the U127 Crabtree Road, within metres of this main junction. The B2 Downpatrick Road is of flexible construction with no footway provision and is relatively low lying as it crosses the Ballynahinch River toward the east, approximately 380m from the junction with the A24 Drumaness Road. The geometry of the B2 Downpatrick Road to the east of Ballynahinch, with hedged and fenced verges close to the edge of the pavement of the rural road, is not compliant with current standards for a 100kph single carriageway route.
- 4.2.1.3 The B7 Crossgar Road approaches Ballynahinch primarily through rural countryside with hedged narrow verges and substandard geometry even within the 30mph speed limit. The surface of the road as it approaches the Ballylone Road junction has been surface dressed and the flexible construction extends toward the town from this junction together with a footway on the northern edge. Services are predominantly underground except for some overhead BT lines which service individual properties.
- 4.2.1.4 The unclassified U0023 (old) Saintfield Road, approximately 600m in length, runs parallel to the A24 trunk route from a priority junction with the A21 Saintfield Road, 60m northeast of the junction of the A24 Belfast Road and A21 Saintfield Road, to a priority junction with the A24 Belfast Road, approximately 85m north of the junction of the A24 trunk road and the Old Belfast Road. Provision for direct access from the old Saintfield Road onto the main A24 Belfast Road is available at two locations. The old Saintfield Road is a rural surface dressed flexible carriageway, with hedged or fenced narrow verges that has substandard geometry with both overhead and underground services provision.
- 4.2.1.5 The unclassified U123 Moss Road, to the east of the A24 Belfast Road, is a rural flexible carriageway, recently surfaced dressed in August 2013. Beyond the residential properties located adjacent to the carriageway, Moss Road has hedged or fenced narrow verges and substandard geometry even within the 30mph speed limit. On exiting the 30mph speed limit the carriageway straightens while remaining narrow, the road is low lying as it passes over the Glassdrumman River with some overhead services provision.
- 4.2.1.6 The C370 Ballylone Road joins the B7 Crossgar Road from an easterly direction and where affected by the proposed route is a rural surface dressed flexible carriageway. Vehicles enter a 30mph restricted zone approximately 240m from the junction with the B7 Crossgar Road and there are a number of residential properties close to the junction. The existing Ballylone Road is hedged or fenced with narrow verges and has substandard geometry and cross section with no overhead services provision. Overhead power lines are present along the B7 Crossgar Road at the junction with the Ballylone Road.
- 4.2.1.7 The U127 Crabtree Road joins the B2 Downpatrick Road from a southerly direction within metres of the B2 Downpatrick Road/A24 Drumaness Road junction. It is a steep, rural, surface dressed flexible carriageway, with some overhead and underground service provision, hedged or fenced with narrow verges and it has substandard geometry and cross section.

4.3 Geology

- 4.3.1.1 The existing geological conditions within the study area have been established with reference to desk studies, published geological maps and the results of intrusive ground investigations. Ground investigations carried out so far included a preliminary site investigation between January and March 2008, comprising boreholes, trial pits both machine dug and hand dug, probes and various in-situ tests. An addendum investigation was carried by Central Procurement Directorate (CPD) between March and May 2013 comprising boreholes, window samples, trial pits, and dynamic probes.

4.4 Drift Geology

- 4.4.1.1 With reference to published mapping, the area of the proposed scheme is shown to be predominantly underlain by glacial till deposits, which are reported to be thin in places where the bedrock is at or near the surface. Based on these maps, an area of peat is shown to be located within the northern part of the area of the proposed scheme between the A21 Saintfield Road and Moss Road.
- 4.4.1.2 From the preliminary and addendum site investigation works, the glacial tills are reported to generally comprise clay or silt based deposits containing sand, gravel, cobbles and boulders. The till is typically present as smooth mounds or hills, commonly known as drumlins. Between the drumlins the till deposits are thinner or not present at all and these 'hollows' can be filled with peat or soft clays/silts washed out from the surrounding deposits. During the preliminary site investigation, glacial tills were encountered throughout the site with the exception of areas where bedrock directly underlies topsoil or peat. The thickness of the glacial till was noted to vary across the site and it was found that it could be divided into two distinct layers - an upper weathered layer which tended to be soft or firm and an unweathered layer which was noted to be stiff or very stiff.
- 4.4.1.3 Narrow spreads of river alluvium, generally comprising silts and clays, were encountered close to the existing watercourses present within the study area. Localised alluvial deposits were encountered close to the Glassdrumman River in the north. In proximity to the Ballynahinch River and Windmill Stream in the south, depths of soft deposits were found to at depths reaching up to 6m. It is considered that deep alluvial deposits may occur locally in proximity to other watercourses or channels that cross the study area.
- 4.4.1.4 Ground investigations proved an extensive area of peat to the north of Drumhill (Moss Road) and directly east of the A24 Belfast Road where thicknesses varied and reached depths of around 5.0m. Peat was also encountered in the southern part of the proposed scheme in proximity to the Ballynahinch River and other watercourses. It is anticipated that peat will be encountered in other parts of the proposed scheme footprint, typically within low lying areas between drumlin mounds and in association with surface watercourses.

4.5 Solid Geology

- 4.5.1.1 The bedrock that underlies the route alignment and the surrounding area are an interbedded sequence of hard grey grits, greywacke sandstone and mudstone (shale) belonging to the Gala Group.
- 4.5.1.2 The Gala Group of rocks are highly folded and deformed and have been subjected to low-grade metamorphic alteration. The metamorphism and deformation process have resulted in the formation of folds, cleavages and joints, which now determine the physical characteristics of the rock and can lead to extreme local variability of hardness and strength. The bedding, fold structure and related cleavages all have broadly parallel orientations and are steeply inclined (70 to 80 degrees) towards northwest and southeast.
- 4.5.1.3 Two fault lines (north-east – southwest trending fault lines) cross the route alignments. One is indicated to be to the south of Moss Road, while the second is indicated to be located to the south of the proposed Crossgar Road Junction.
- 4.5.1.4 During the site investigation works, bedrock was encountered beneath superficial deposits at depths ranging from 0.2m to 27m below existing ground level (mbgl). A borehole located at the crest of the proposed cutting adjacent to the proposed Crossgar Road Junction, reached a depth of 31.0mbgl without encountering bedrock. The bedrock encountered was found to consist of shale, mudstone, greywacke and sandstone. An igneous intrusion in the form of a

basalt sill was encountered in one borehole located approximately 300m to the south of the Crossgar Road. The sill was encountered at 9.45m depth and was 1.55m thick at this point. The presence of further igneous intrusions within the footprint of the proposed scheme is anticipated.

4.6 Made Ground

4.6.1.1 Past site uses and present day activities have resulted in anthropogenic modification to land within the study area. The most obvious 'modifications' are the former railway embankment/cutting situated to the east of Ballynahinch, existing road infrastructure and areas of hard standing. The made ground deposits encountered in these locations were considered to comprise material used for road construction (i.e. mixed sands and gravels). Made ground deposits comprising clay materials with glass, brick, slate, metal sheets, timber and concrete blocks were recorded in locations advanced in proximity to farm buildings located to the south of Moss Road.

4.6.1.2 A drawing showing the major geotechnical (natural) constraints is included within Appendix A.

4.7 Drainage

4.7.1.1 The existing A24 predominately makes use of traditional roadside kerb and gullies to collect surface run-off. This run off is passed into a network of sub surface carrier pipes and discharged, untreated into watercourses at various locations within the locality.

4.7.1.2 A drawing showing the major manmade constraints is included within Appendix A.

4.8 Public Utilities

4.8.1.1 There are numerous services crossing the study area these include sewers, water mains, BT (formerly British Telecommunications plc) and Northern Ireland Electricity (NIE) installations. There are also services (electricity, sewerage, cable, water etc) associated with the individual properties within the corridor and these will need to be protected or diverted as appropriate when construction commences. The main utility infrastructure concentrations within the study areas are located on the existing road networks including the A21 Saintfield Road, B7 Crossgar Road and A24 Drumaness Road. In particular at the A24 Drumaness Road/B2 Downpatrick Road and the B2 Downpatrick Road/Crabtree Road junctions both NI Water and NIE have major items of underground equipment. There is currently no natural gas provision in the area.

4.9 Major Alignment Constraints

4.9.1.1 In summary the major alignment constraints that traverse the study area are;

- Existing watercourses;
- Cultural Heritage sites;
- Ecology & nature conservation areas;
- Residential and commercial property;
- The existing road network; and
- Public Utilities.

4.9.1.2 In developing a geometrically compliant alignment, it is difficult to avoid all of these constraints, although every effort has been made to minimise conflict where possible.

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5. DEVELOPMENT OF SCHEME

5.1.1.1 The standard procedure for identifying the preferred route for a Trunk Road improvement scheme is prescribed by the DMRB (Volume 5, TD 37/93: *Scheme Assessment Reporting*) as a 3-stage process:

- Stage 1: Preliminary Assessment;
- Stage 2: Route Option Assessment; and
- Stage 3 Scheme Assessment.

5.1.1.2 The details and scope of work for each of the stages can be summarised as:

- Stage 1: Preliminary Assessment – The objective is to ensure that the assessment is sufficient to identify the environmental, engineering, economic and traffic advantages, disadvantages and constraints associated with broadly defined improvement strategies;
- Stage 2: Route Option Assessment – The objective is to ensure that the assessment is sufficient to identify the factors to be taken into account in choosing alternative routes or improvement schemes and to identify the environmental, engineering, economic and traffic advantages and disadvantages and constraints associated with those routes or schemes; and
- Stage 3: Scheme Assessment – The objective is to ensure that the assessment is sufficient to identify the advantages and disadvantages in environmental, engineering, economic and traffic terms of the Overseeing Department's preferred route or scheme option.

5.2 Stage 1: Preliminary Assessment

5.2.1.1 The 'A24 Ballynahinch Bypass, Stage 1 Preliminary Options Report' issued in May 2007 examined three options, one to the west and two to the east, of providing a bypass to Ballynahinch. A further Stage 1 Addendum Report examining a further corridor to the east was issued in September 2008.

5.2.1.2 A drawing showing the various corridor options considered is included within Appendix A.

5.2.1.3 Each corridor was assessed using the criteria defined in the DMRB against the Government's 5 over-arching objectives for transport; namely Environment, Safety, Economy, Accessibility and Integration. The reports concluded that the eastern corridor route Option A was preferable.

5.2.1.4 A drawing showing the Preferred Corridor is included within Appendix A.

5.3 Stage 2: Route Options Assessment

5.3.1.1 The Stage 2 Preferred Options report was issued in January 2012 and provided a review of three route options within eastern corridor route Option A. Three route options, the red route, the blue route and the yellow route were developed within the preferred route corridor with costs evaluated, environmental impacts assessed, traffic volumes predicted and economic benefits analysis carried out on each. These options were presented to the public at a Public Information Event on 12 November 2009.

5.3.1.2 A drawing showing the Approved Route Options is included within Appendix B.

5.3.1.3 The Stage 2 Preferred Options report recommended that Roads Service proceeds to develop a specimen design and complete a Stage 3 Scheme Assessment Report, progress the scheme through Statutory Orders and complete an Economic Appraisal Report based upon the Red Route Option including the provision of a junction with the B7 Crossgar Road.

5.3.1.4 The specimen design proposed that, the A24 Ballynahinch Bypass would be aligned to the east of the town, commencing with a roundabout at the A24 Belfast Road/A21 Saintfield Road junction and terminating with a roundabout at the A24 Drumaness Road/B2 Downpatrick Road junction. It would also include a compact grade-separated junction at the B7 Crossgar Road. The proposed scheme would comprise a single 2-lane carriageway bypass with widening to a Wide Single 2+1 (WS2+1) carriageway for northbound traffic exiting the new roundabout at the southern extent of the scheme and a Differential Acceleration Lane (DAL) for southbound traffic exiting the new roundabout at the northern end of the scheme. The B7 Crossgar Road junction would provide left on – left off connections to the northbound and southbound carriageways of the Bypass. This standard of carriageway has considerable safety benefits for the road user.

5.3.1.5 A drawing showing the Preferred Route Option is included within Appendix B.

5.4 Stage 3: Preferred Option Report

5.4.1.1 The Stage 3 Scheme Assessment Report was issued to Transport NI in March 2015. The report developed the specimen design of the preferred route with costs evaluated, environmental impacts assessed, traffic volumes predicted and an economic benefit analysis carried out.

5.4.1.2 Drawings showing the mainline, side road plans and profiles are included within Appendix B.

6. DESCRIPTION OF SCHEME

6.1 Study Area

6.1.1.1 The study area is predominantly through the rural area to the east of Ballynahinch in the heart of County Down, Northern Ireland, extending approximately 3km in length, largely following the bypass line indicated on the Ards and Down Area Plan 2015.

6.1.1.2 The Preferred Route Corridor, announced on 25 January 2012, begins at the A24 Belfast Road junction with A21 Saintfield Road to the north of Ballynahinch, traversing in a southerly direction to the east of the town crossing U123 Moss Road, C370 Ballylone Road and B7 Crossgar Road toward the A24 Drumanness Road junction with B2 Downpatrick Road to the south of the town.

6.1.1.3 The corridor is woven through drumlin topography with some significant cuttings, however as it passes through the Glassdrumman and Ballynahinch River floodplains it is relatively flat.

6.2 Mainline Description and Standards

6.2.1.1 The Proposed Scheme includes the provision of a bypass of Ballynahinch approximately 3.14km in length, it would improve road safety for strategic and local road users, remove a bottleneck on the T2 Trunk Route where a lack of capacity is causing serious congestion, and improve the environment by relieving the effects of heavy through traffic in the town centre.

6.2.1.2 The proposed bypass would be a Category 3A carriageway, as defined in the DMRB, with widening to a Wide Single 2+1 (WS2+1) carriageway for northbound traffic exiting the new roundabout at the southern end of the scheme, and a Differential Acceleration Lane (DAL) with similar WS2+1 cross-section for southbound traffic exiting the new roundabout at the northern end of the scheme, in accordance with DMRB.

6.2.1.3 The geometric parameters used in the design in accordance with DMRB TD 9/93: "Highway Link Design" are as follows;

Parameter	Standard (one step below standard)
Design Speed	100kph
Stopping Sight Distance	215m (160m)
Desirable Minimum Horizontal Radius	720m (510m)
Desirable Minimum Vertical Crest (K Value)	100 (55)
Absolute Minimum Vertical Sag (K Value)	26
Desirable Maximum Gradient	4%
Absolute Maximum Gradient	8%
Minimum Longitudinal Gradient	0.5%

6.2.1.4 It is proposed that the cross-section for the proposed bypass mainline is a Single Carriageway Rural All Purpose (S2) type carriageway where the mainline does not incorporate a DAL or WS2+1 cross section. The S2 carriageway will comprise 3.65m wide lanes with 1.0m wide hard strips and 2.5m (minimum) wide verges.

6.2.1.5 Where the cross section of the mainline is DAL or WS2+1, 3.5m wide lanes with a 1.0m median strip between opposing running lanes, 1.0m hard strips and 2.5m (minimum) wide verges. The edge of the carriageway would be kerbed on both the eastern and western side with traditional gully and carrier drains installed. There would also be a shared footway/cycleway along the western side of the bypass.

6.2.1.6 Typical scheme cross sections are included within Appendix B.

6.2.1.7 Additional verge widening shall be provided to the cross section as necessary to ensure the required Stopping Sight Distance (SSD) is achieved.

6.3 Proposed Junction, Side Road and Other Standards

6.3.1 Junction Standards

6.3.1.1 At the northern and southern end of the proposed A24 Ballynahinch Bypass, at-grade roundabouts are provided to tie-in to the existing road network, designed in accordance with the DMRB TD16/07: *“Geometric Design of Roundabouts”*. Crossgar Road Junction is designed as a compact grade-separated junction in accordance with the DMRB TD40/94: *“Layout of Compact Grade Separated Junctions”*, incorporating diverge tapers as defined in the DMRB TD42/95: *“Geometric Design of Major/Minor Priority Junctions”*.

6.3.2 Side Road Standards

6.3.2.1 All side roads are designed in accordance with TD9/93: *“Highway Link Design”*. Junctions on side roads are generally major/minor priority junctions as detailed in TD42/95: *“Geometric Design of Major/Minor Priority Junctions”*.

6.3.3 Other Standards

6.3.3.1 The Design Speed of the side roads throughout the scheme have been derived in accordance with Director of Engineering Memorandum 118/09: *“Design Speed for Roads”*, and calculated where appropriate using the procedure outlined in TD9/93.

6.3.3.2 The selection of appropriate carriageway cross-sections are in accordance with TD27/05: *“Cross Sections and Headrooms”* and TD70/08: *“Design of Wide Single 2+1 Roads”*

6.3.3.3 Vehicular accesses have been provided in accordance with DMRB TD41/95, *“Vehicular Access to All-Purpose Trunk Roads”*, and Roads Service Policy and Procedure Guide S028, *“Land Acquisition - Accommodation Works”* has been referenced in the accommodation works design.

6.4 Proposed Junction and Bypass Crossing options

6.4.1.1 The scheme includes two at-grade roundabouts at the A24 Belfast Road junction with the A21 Saintfield Road to the north of Ballynahinch and at the A24 Drumaness Road junction with the B2 Downpatrick Road to the south of Ballynahinch.

6.4.1.2 These at grade roundabouts would have the effect of slowing traffic so providing a safer passage of vehicles entering and exiting the proposed bypass.

6.4.1.3 The scheme also includes a compact grade separated junction at B7 Crossgar Road. The junction would include a new overbridge to maintain the B7 Crossgar Road over the mainline, connector loops in the north east and south west quadrants with nearside diverge tapers from the mainline. A section of continuous single lane dualling, which has considerable safety benefits for the road user would prevent vehicles turning right either onto or off the mainline.

- 6.4.1.4 An underpass would be provided to maintain U123 Moss Road with minimal change to the existing alignment on either side of the underpass.
- 6.4.1.5 The existing C370 Ballylone Road would be severed by the proposed bypass mainline. In order to maintain connectivity with the B7 Crossgar Road, the Ballylone Road would be realigned to a priority junction with the north-east connector loop described previously.
- 6.4.1.6 The existing junction of the U127 Crabtree Road with the B2 Downpatrick Road is in close proximity to the priority junction between the B2 Downpatrick Road and the A24 Drumaness Road. Site constraints preclude provision of a fifth arm on the proposed Downpatrick Road roundabout to accommodate Crabtree Road due to deflection/visibility considerations and the adverse impact on adjacent residential property.
- 6.4.1.7 The existing junction of the U127 Crabtree Road would be stopped up to vehicular traffic and a new link road provided with priority junction onto the existing A24 Drumaness Road.
- 6.4.1.8 Drawings showing the proposed layout of all junctions within the scheme are included in Appendix B.

6.5 Proposed Park & Ride/Share

- 6.5.1.1 The Ards and Down Area Plan (ADAP) 2015 contains a requirement to undertake a feasibility study into a possible Park and Ride and Park and Share site at an indicative location on the Old Belfast Road to the north of Ballynahinch. The consultation process was unable to establish a demand for a park and ride facility at the indicative ADAP location and it was decided that the location would not be considered further under this scheme development due to its remoteness from the proposed bypass scheme.
- 6.5.1.2 However, as a result the establishment of an informal Park and Share facility was considered during scheme development. Several locations were assessed with a preferred site identified on the northern side of the proposed Saintfield Road Roundabout between the A24 Belfast Road and A21 Saintfield Road. It is proposed the facility would accommodate 27 parking bays including 3No. disabled bays.

6.6 Culvert Design

- 6.6.1.1 The proposed scheme traverses a number of existing watercourses over its length. Consequently preliminary culvert and road drainage designs have been prepared in consultation with the appropriate statutory bodies, in agreement with the Department for Agriculture and Rural Development (DARD) Rivers Agency and in accordance with the Drainage (Northern Ireland) Order 1973.
- 6.6.1.2 As the scheme is almost totally offline accommodation of the existing watercourses will require the construction of culverts and structures. In total 11 culverts including new and upgraded culverts and 1 bridge structure across the Ballynahinch River will be constructed. In addition, 9 minor watercourses will be diverted as part of the works.
- 6.6.1.3 An extensive assessment at each culvert site has been undertaken which indicates that the culvert catchment areas for the proposed scheme are less than 15km², for which peak flows were calculated and culvert dimensions established. In determining the culvert dimensions, the following requirements of the DMRB and Rivers Agency have been considered.
- 600mm minimum diameter for culverts;
 - 1200mm minimum diameter for culverts over 12m long;

- Return period for trunk roads of 1 in 100 years;
- Return period for all other side roads of 1 in 50 years; and
- Return period for access tracks of 1 in 25 years.

6.7 Pre-Earthworks Drainage

6.7.1.1 The DMRB promotes the use of either filter drains or open ditches to intercept run-off from adjacent land to prevent it from reaching the road infrastructure. Open ditches are less expensive, can support a greater flow capacity and are easier to maintain than filter drains; therefore, where possible, open ditches have been adopted. Only where levels do not permit the use of open ditches have filter drains been included. Run-off rates will be similar to existing flows and therefore are proposed to discharge directly to watercourses.

6.8 Road Drainage Philosophy

6.8.1.1 The construction of the proposed scheme across what is predominantly agricultural ground would increase the extent of contributing carriageway hard surface areas to the existing drainage regime. It is recognised that this could, if not mitigated, lead to an increased risk of flooding in those watercourses downstream of possible carriageway discharge locations. In addition proposed road drainage discharges could potentially increase the risk of highway derived pollutants being discharged into receiving watercourses.

6.8.1.2 A new Government Construction Client's Sustainability Action Plan (GCC SAP) has been developed by the Sustainable Construction Task Group and is now implemented by all Government Clients. The GCC SAP encourages the use of Sustainable Drainage Systems (SuDS) and these have therefore been incorporated into the A24 Ballynahinch Bypass scheme. Where possible, in accordance with the Construction Industry Research and Information Association (CIRIA) SuDS Manual it is proposed to detain highways drainage flow emanating from the proposed bypass in SuDS detention basins to ensure that water entering a watercourse meets the quality and quantity allowances for the accepting watercourse.

6.9 Outline Road Drainage Design

6.9.1.1 The outline drainage design for the project has been developed in accordance with the DMRB, which requires:

- Quick removal of surface water to improve safety and minimise nuisance;
- Provision of effective sub-surface drainage to maximise the longevity of the pavement and its associated earthworks; and
- Minimisation of the impact of the run-off on the receiving environment.

6.9.1.2 A gully and carrier drain network is proposed for the A24 Ballynahinch Bypass scheme to collect surface run-off. The surface run-off will then be discharged into sub surface longitudinal carrier pipes, which will convey flow toward SuDS detention basins prior to release into existing watercourses.

6.9.1.3 The drainage design also considered the impact that the proposed works would have on the drainage infrastructure of existing side roads. Where existing side road outfall discharge rates are minimal and similar to the existing drainage rate, they will not be attenuated and will discharge direct to watercourses, as is currently the case.

6.10 Attenuation and Treatment

6.10.1.1 In accordance with the SuDS Manual, detention basins will be incorporated into the design.

These detention basins allow surface run-off to be stored, allowing low level pollutants, such as sediments, suspended solids and hydrocarbons, to settle and permit the controlled release of storm water run-off into adjacent watercourses.

6.10.1.2 The drainage design has evaluated the existing drainage conditions, both in the Greenfield area, where the catchment is predominately is vegetated ground, and Brownfield sites, where the catchment is an impermeable surface i.e. existing/proposed carriageways. The run-off from the proposed A24 will be collected in the SuDS detention basins prior to outfall to watercourses. To ensure the scheme has a neutral impact on receiving watercourses, the outfall will be controlled to mirror the existing drainage conditions.

6.10.1.3 SuDS detention basins have been positioned to fit in to the existing landscape, taking into account factors such as potential watercourse discharge location, proposed road levels and adjacent land use. It was determined that there was scope for five Detention Basins at various locations throughout the scheme. The locations of the basins are shown on scheme drawings included in Appendix C.

6.11 Flood Risk Assessment

6.11.1.1 Maps obtained from DARD Rivers Agency identify the Q_{100} floodplains associated with watercourses in the study area. These are defined as the extent of a flood event with a 1% annual probability of exceeding the peak floodwater level.

6.11.1.2 Drawings showing the existing Q_{100} floodplains associated with the Ballynahinch River and the Glasdrumman River are included in Appendix C.

6.11.1.3 A Flood Risk Assessment identified that the proposed A24 impacts the Q_{100} floodplain of the Glasdrumman River and the Q_{100} floodplain of the Ballynahinch River. The proposed A24 is on embankment in the locations it impacts the existing Q_{100} floodplains.

6.11.1.4 The Planning Service sets out policy on aspects of land-use within Northern Ireland, and one of their key aims in Planning Policy Statement (PPS) 15 is to prevent development that would be at risk of flooding or increase the risk of flooding elsewhere. As a result, development is not permitted within the floodplain, unless proposals are of an overriding regional importance. The A24 project is a strategic road improvement scheme, therefore development within the floodplain is permitted subject to suitable mitigation measures being put in place.

6.11.1.5 To satisfy the DMRB and to meet the requirements of the DARD Rivers Agency and relevant Planning Policy, the following mitigation measures have been included in the scheme design:

- Connectivity of flood waters will be maintained where areas of floodplain are separated by the new scheme;
- Any loss of floodplain will be mitigated by providing additional compensatory floodplain at a similar level to that lost;
- Proposed road infrastructure (e.g. drainage channels and public utilities) within, or adjacent to, floodplain will have a clearance of 600mm above Q_{100} flood level;
- Proposed and replacement structures above watercourses will:
 - Have a clearance of 600mm between the soffit and Q_{100} flood level;
 - Be designed to avoid an increase in upstream water levels in times of high flow and provide a free flow of water at all times; and
 - Have a limited number of piers, positioned out with the watercourse, so as to not present an obstruction to flow.

- Proposed storm water discharge from the proposed A24 Ballynahinch Bypass will be captured prior to release into the river network and discharge rates controlled; and
- Where discharge is likely to increase, a suitable flood attenuation system will be adopted. Discharges will be approved by DARD Rivers Agency.

6.11.1.6 To facilitate the conveyance of the flood waters through the proposed embankment to the south of the Ballynahinch River, 4no 1.8m x 3.6m concrete box culverts would be installed through the embankment. Similarly, to facilitate the conveyance of the flood waters through the proposed embankment at Glassdrumman River, 2 no. 900mm diameter culverts would be installed.

6.11.1.7 Drawings showing the measures included in the scheme to mitigate the impact on the Q₁₀₀ floodplain are included in Appendix C.

6.11.1.8 The computer based model, developed to assist with flood assessment and determine mitigation measures, shows that flood levels with the proposed scheme in place are within acceptable tolerances of the existing situation for the 1 in 2 (Q₂), 5 (Q₅), 25 (Q₂₅), 50 (Q₅₀) and 100 (Q₁₀₀) flood events, and that the proposed works will not introduce flooding to adjacent land and properties.

7. ISSUES ANTICIPATED DURING CONSTRUCTION AND AFTER OPENING

7.1 Intended Construction Sequence

7.1.1.1 It would take approximately 18 months to 2 years to construct the entire A24 Ballynahinch Bypass scheme as a single contract. In general, it is envisaged that construction work would take place during normal working hours (7.00am to 7.00pm Monday to Friday, 7.00am to 2.00pm on Saturdays). However, the Contractor may need to work outside these hours, particularly for setting up traffic management arrangements.

7.1.1.2 Once Detailed Design has been completed by the Design and Build (D&B) Contractor the construction activities for the scheme would be typical of a major road scheme and consist of the following:

- Advance/preparatory works likely to be undertaken prior to construction;
- Site establishment and demolition works;
- Main construction works involved in the scheme including drainage, earthworks, roadworks and structures; and
- Final finishes, such as landscaping.

7.2 Health & Safety

7.2.1.1 Throughout the development of the scheme consideration has been given to buildability issues, in relation to Health & Safety. Every effort has been made to eliminate foreseeable hazards and reduce risks where possible. However, this is not always achievable, and where hazards remain, measures to reduce the residual risks will be implemented.

7.2.1.2 Details of any hazards remaining in the current design, and possible mitigation measures to eliminate or reduce the risk, are given in the following sections. At this stage there are likely to be a number of unforeseeable hazards and risks that may only materialise as a detailed design is developed. Such hazards and risks would be assessed as and when they are identified. A hazard register will be prepared and measures taken either in design or in procedural operations to mitigate against the hazard.

7.3 Construction Risks

7.3.1 Conflict with Overhead and Buried Public Utilities

7.3.1.1 Public utility apparatus is present throughout the study area. Infrastructure belonging to BT, NIE and NI Water are impacted by the works. A review of services would be carried out during detailed design to identify new services installed since the original survey.

7.3.1.2 Detailed drawings showing the location and nature of public utility apparatus in the vicinity of the works have been obtained from each supplier. The area would be surveyed with a suitable cable location device (e.g. CAT scanner) and the exact position of buried services confirmed by hand dug trial pits, under a 'permit to dig' system. In consultation with the relevant public utility service provider, suitable protection or diversionary works would be implemented prior to significant work being undertaken. Overhead cables would have their power re-routed or isolated if possible and suitable barriers and signage would be erected to highlight their position and avoid conflict with machinery.

7.3.2 Excavation through Contaminated Land

7.3.2.1 There is potential for contaminated ground to be present particularly in the vicinity of the

abandoned Ballynahinch Branch Railway Line. Further contamination may be present at other locations where ground has been built up or filled. Additionally invasive species including Japanese Knotweed have been identified at locations along the scheme including in the vicinity of the Ballynahinch River.

7.3.2.2 Any excavated contaminated land would be disposed without endangering human health and without using any processes or methods that could harm the environment. A regime for disposal of contaminated land would be created in accordance with *The Waste and Contaminated Land (Northern Ireland) Order 1997* and in consultation with the Department of Environment (Northern Ireland). In addition, suitable capping materials would be used to prevent contaminated materials remaining exposed. Measures would also be implemented to ensure operatives do not come into contact with any harmful substances and appropriate Personal Protective Equipment (PPE) utilised.

7.3.3 **Demolition of Residential & Commercial Properties and Structures**

7.3.3.1 A number of residential properties, as well as farm complexes, would require demolition to accommodate the scheme.

7.3.3.2 A competent and experienced demolition contractor would be employed to demolish the necessary structures throughout the scheme. Prior to demolition, each building would be surveyed to determine the presence of any hazardous materials (e.g. asbestos). Should any hazardous material be identified, suitable measures would be taken to safely remove it while avoiding exposure to the operatives. In addition, should there be any doubt as to a buildings structural stability, it would be checked by a competent qualified structural engineer.

7.3.4 **Deep Excavations**

7.3.4.1 Relatively deep excavations are necessary to construct structural foundations and drainage infrastructure. All excavations would be assessed by a competent person at the start of every shift to determine if there is a risk of collapse and suitably supported if necessary. Site specific borehole logs would be examined and appropriate trench sheeting/temporary shuttering works provided as required. Ladders would be put in place to facilitate safe entry and egress and secured stop-blocks installed to prevent machinery falling into the excavation. In addition, specialist meters would be employed to monitor the atmosphere for any hazardous gasses.

7.3.5 **Working at Height**

7.3.5.1 The construction of structures throughout the scheme would involve working at significant heights.

7.3.5.2 All scaffolding would be erected by a competent person and inspected prior to use and at regular intervals thereafter. If possible, a safety net would be erected and safety harnesses, attached to a secure anchorage point, utilised at all times.

7.3.6 **Working Adjacent to Live Traffic**

7.3.6.1 A large part of the scheme is offline. However work adjacent to live carriageways would be necessary at the scheme tie ins to the existing road network. Appropriate safety zones and traffic management would be installed by the Contractor, in accordance with the Traffic Signs Manual (Chapter 8: *Traffic Safety Measures and Signs for Road Works and Temporary Situations*) to ensure the safety of operatives. In addition, temporary speed restrictions may be in place through the works. Appropriate high visibility PPE would be utilised by all operatives. Where practicable, temporary bridges for access may be provided.

7.3.7 Working Above/Adjacent to Water

7.3.7.1 The proposed works would either cross, or be in close proximity to existing watercourses at numerous locations.

7.3.7.2 Before commencing work in close proximity to watercourses, an emergency procedure defining the appropriate action should an operative fall into water would be put in place, displayed around the site and conveyed to all site personnel. In addition, life jackets would be readily available and clearly visible around the site and an emergency boat on stand-by if required.

7.4 Maintenance Risks**7.4.1 Access to Scheme for Routine/Emergency Access**

7.4.1.1 Upon completion of the construction works, regular access would be required throughout the scheme for maintenance purposes, including landscaping, road furniture and road pavement.

7.4.1.2 Future maintenance has been considered throughout the design process to ensure, where possible, maintenance vehicles and personnel are segregated from live traffic. As a result, where site constraints allow, a maintenance strip has been incorporated beyond earthworks slopes. To limit maintenance liability, low maintenance materials would be specified where possible and a suitable maintenance regime discussed and agreed with Transport NI.

7.4.1.3 Where unavoidable maintenance or emergency works are necessary on the live carriageway, appropriate safety zones and traffic management, in accordance with the Traffic Signs Manual (Chapter 8: *Traffic Safety Measures and Signs for Road Works and Temporary Situations*) would be implemented. Routine maintenance on the live carriageway would be completed under speed restrictions with traffic control if required, during weekends and off-peak periods when traffic, and therefore the risk to personnel, is reduced.

7.4.1.4 Access is required to SuDS ponds both for routine maintenance and in emergencies. To prevent conflict with live traffic, each SuDS pond would have a designated access track, which connects to the proposed mainline. To prevent unauthorised access, the track would be gated and locked, with the gate set back from the live carriageway.

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8. CONCLUSION

8.1.1.1 The proposed scheme was developed in accordance with the DMRB and the requirements of Transport NI, resulting in a scheme which:

- reduces journey time for strategic A24 traffic;
- improves journey time reliability for strategic A24 traffic;
- contributes positively to transport economic efficiency;
- contributes positively to road safety;
- minimises the impact of the scheme on the environment; and
- achieves value for money.

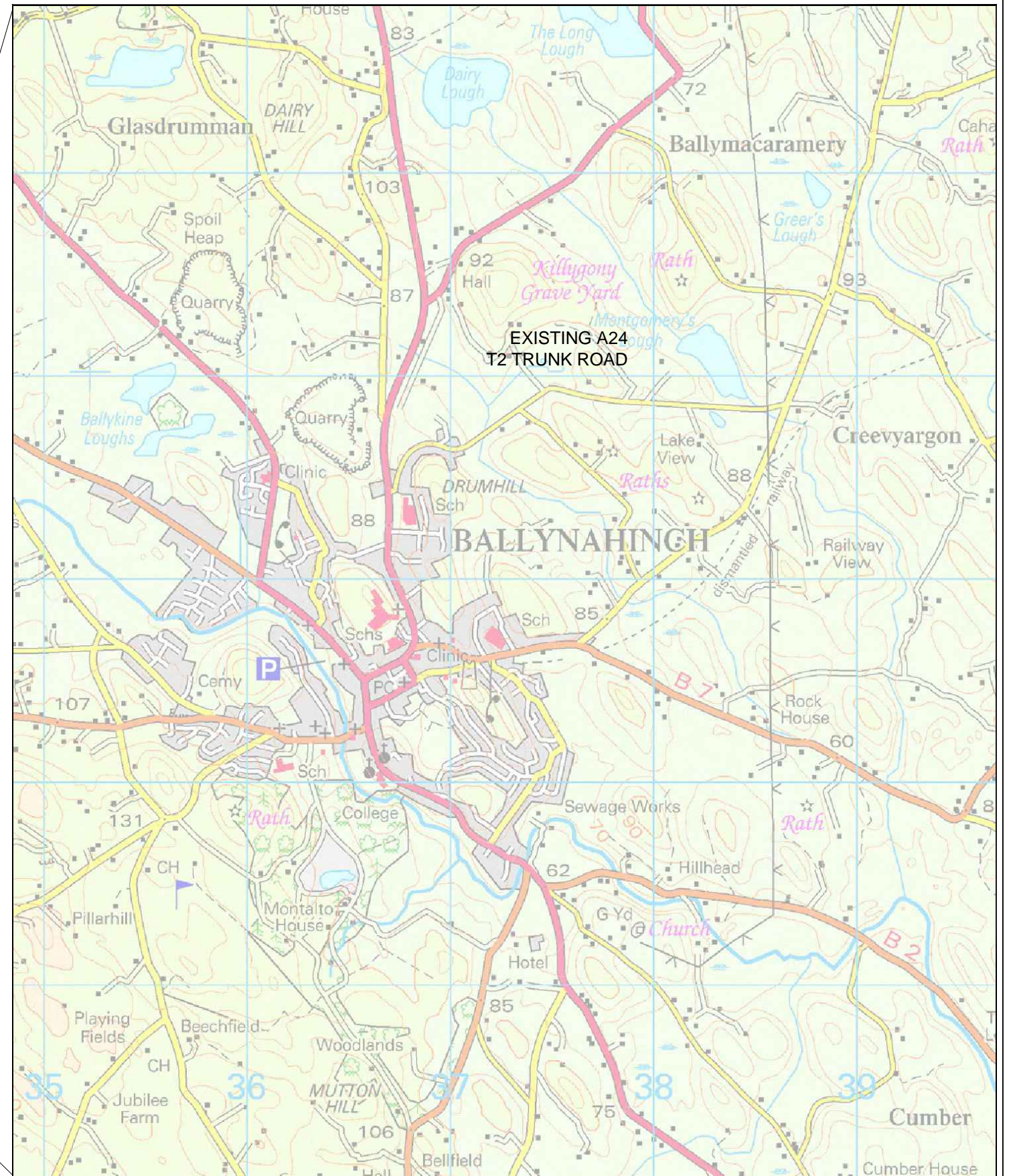
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APPENDIX A STUDY AREA, CORRIDOR & ROUTE OUTLINE DRAWINGS

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LOCATION PLAN

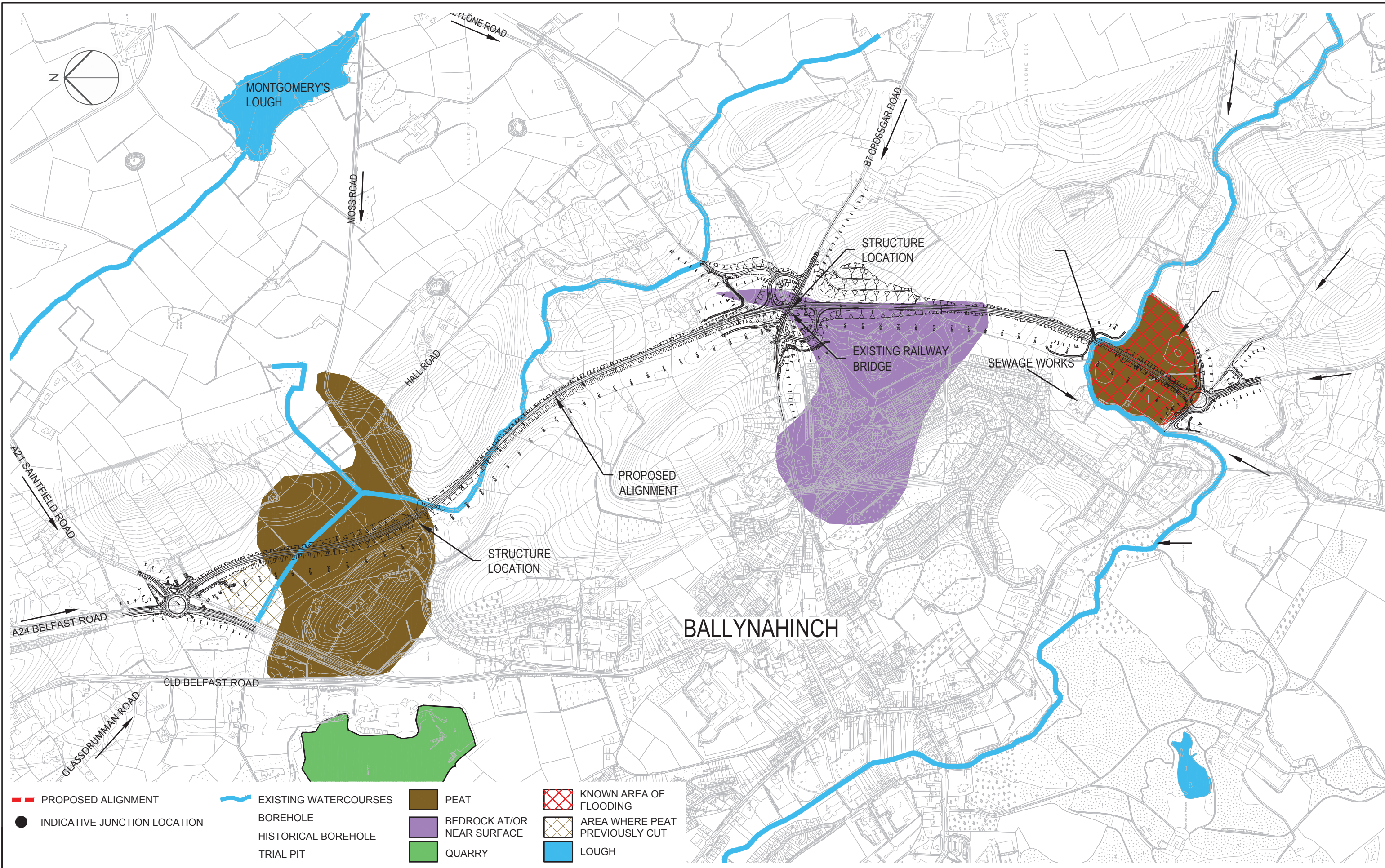


STUDY AREA

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				Client		FOR INFORMATION								Drawing Number
	Check			A24 BALLYNAHINCH BYPASS	STAGE 3 SCHEME ASSESSMENT REPORT LOCATION PLAN AND STUDY AREA	Designed JMcG	Drawn NN	Checked IH	Approved GK	Date 15-12-14	FIGURE 1.1	0		
				transportni		URS Internal Project No. 47037246								
						Scale @ A3 NOT TO SCALE								

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- - - PROPOSED ALIGNMENT
- ~ EXISTING WATERCOURSES
- PEAT
- BEDROCK AT/OR NEAR SURFACE
- QUARRY
- KNOWN AREA OF FLOODING
- AREA WHERE PEAT PREVIOUSLY CUT
- LOUGH
- INDICATIVE JUNCTION LOCATION
- BOREHOLE
- HISTORICAL BOREHOLE
- TRIAL PIT

Revision Details	By	Check	Date	Suffix

Project Title	A24 BALLYNAHINCH BYPASS
Client	transportni

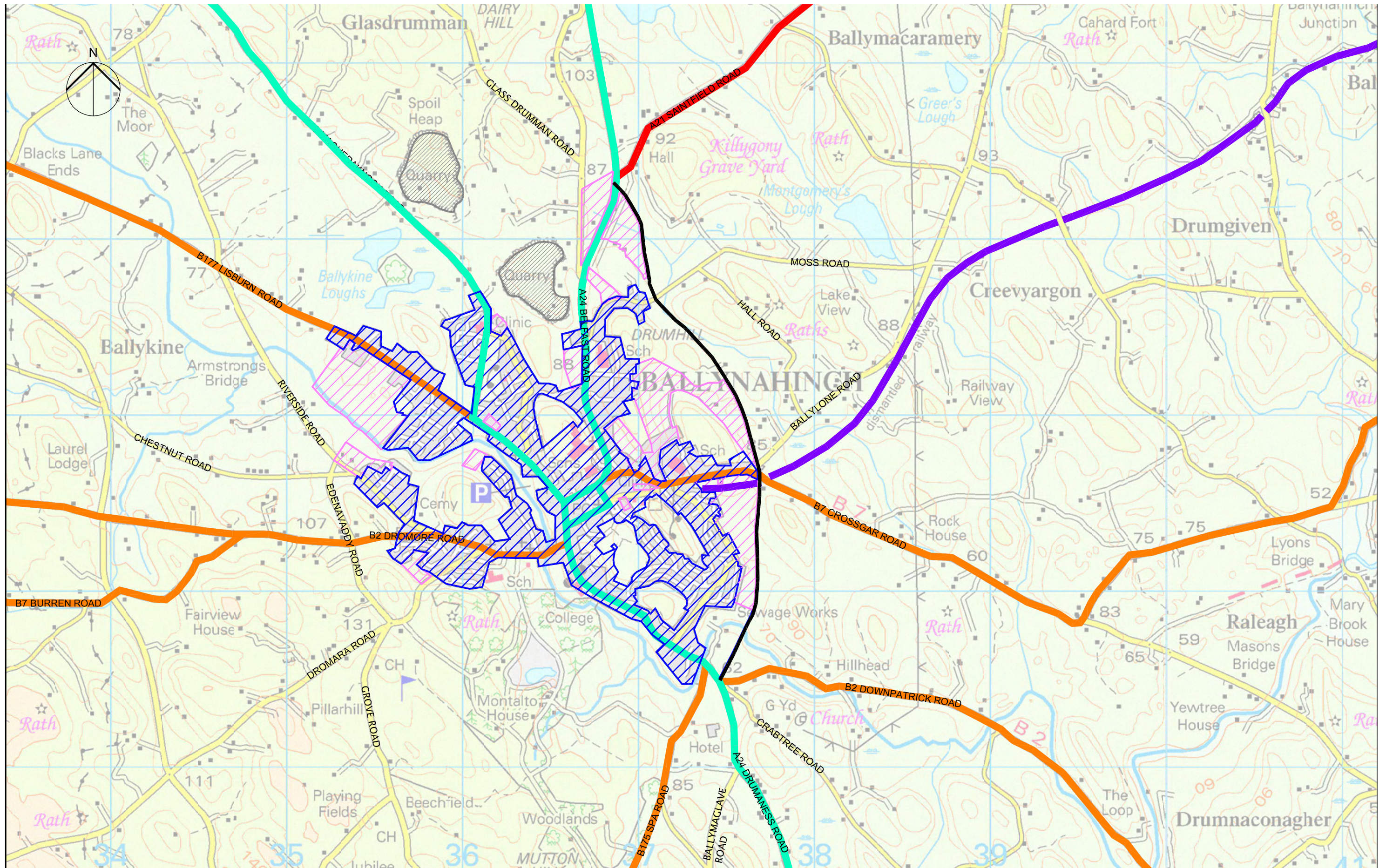
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47037246				
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FIGURE 2.1		

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Notes:

- PROTECTED ROUTES
- A CLASS ROADS
- B CLASS ROADS
- DISMANTLED RAILWAY
- 2015 DOWN & ARDS AREA PLAN PROPOSED ROAD

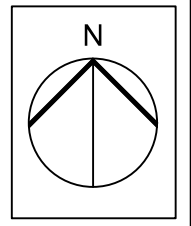
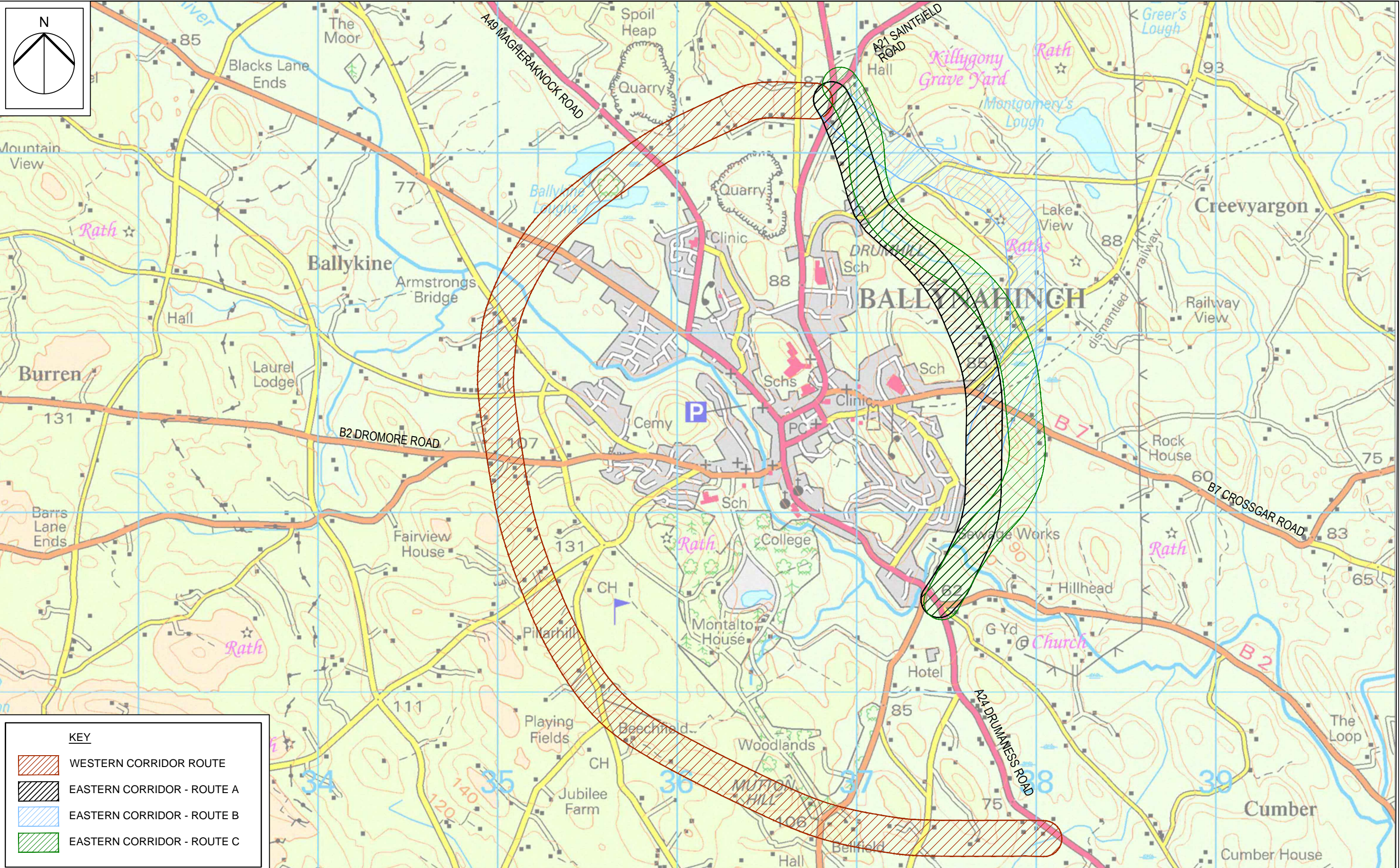
- BUILT UP AREA
- QUARRY
- AREA ZONED FOR FUTURE DEVELOPMENT

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A24 Ballynahinch Bypass
Stage 2 Preferred Options Report

Man Made Constraints

Figure 2.2.4



KEY	
	WESTERN CORRIDOR ROUTE
	EASTERN CORRIDOR - ROUTE A
	EASTERN CORRIDOR - ROUTE B
	EASTERN CORRIDOR - ROUTE C

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By	Date	Check	Suffix	A24 BALLYNAHINCH BYPASS		STAGE 1 ROUTE CORRIDORS		FOR INFORMATION					
				Client				Designed		Drawing Number		Rev	
				transportni				JMcG		D-47037246-SK-1000		0	
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								JMcG					
								Approved					
								GK					
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								1:20,000					



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By Check				Date				Client transportni				Designed: JMcG Drawn: NN Checked: IH Approved: GK Date: 15-12-14 URS Internal Project No.: 47037246 Scale @ A3: 1:10,000											



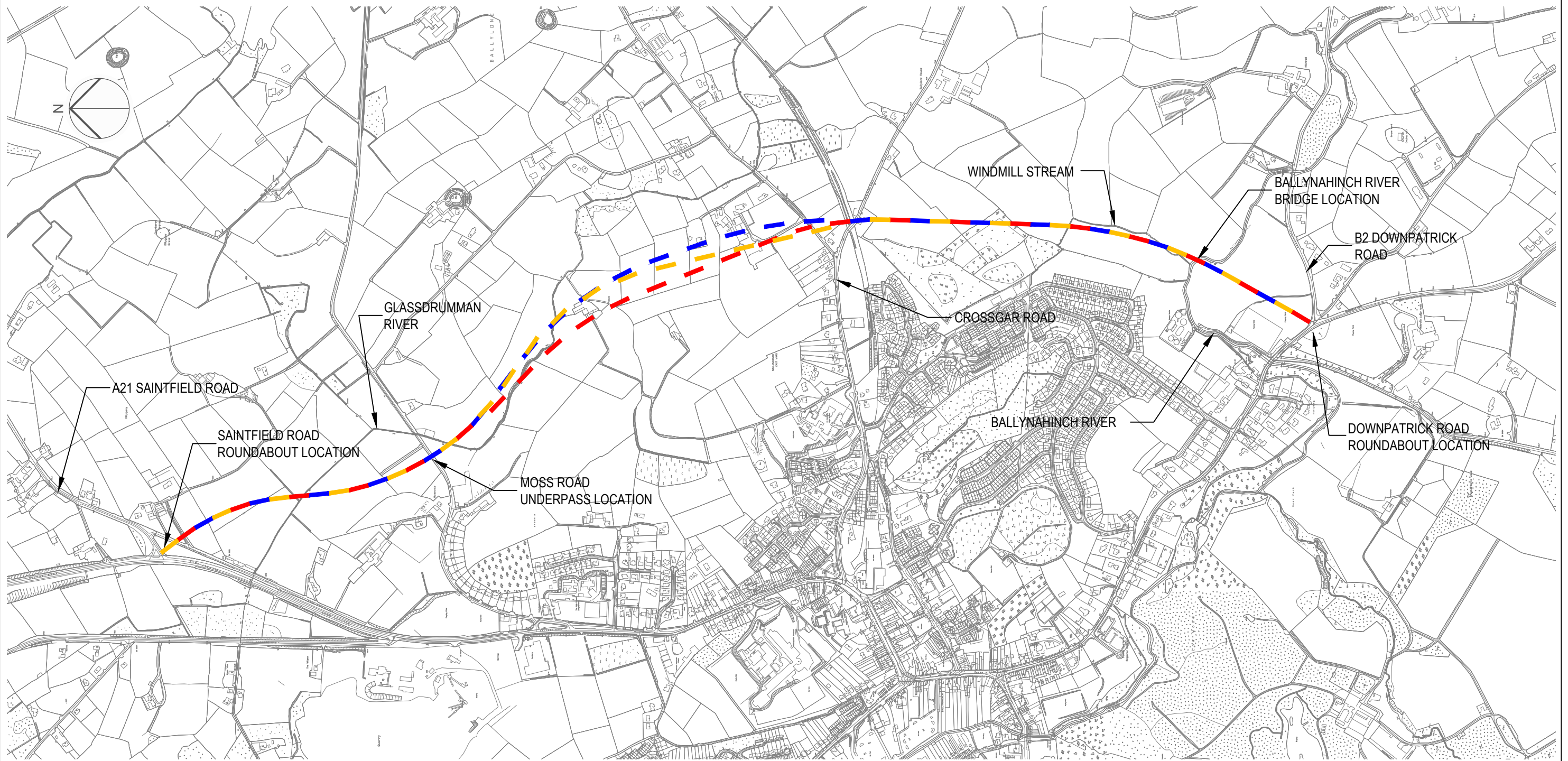
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APPENDIX B PROPOSED A24 DRAWINGS

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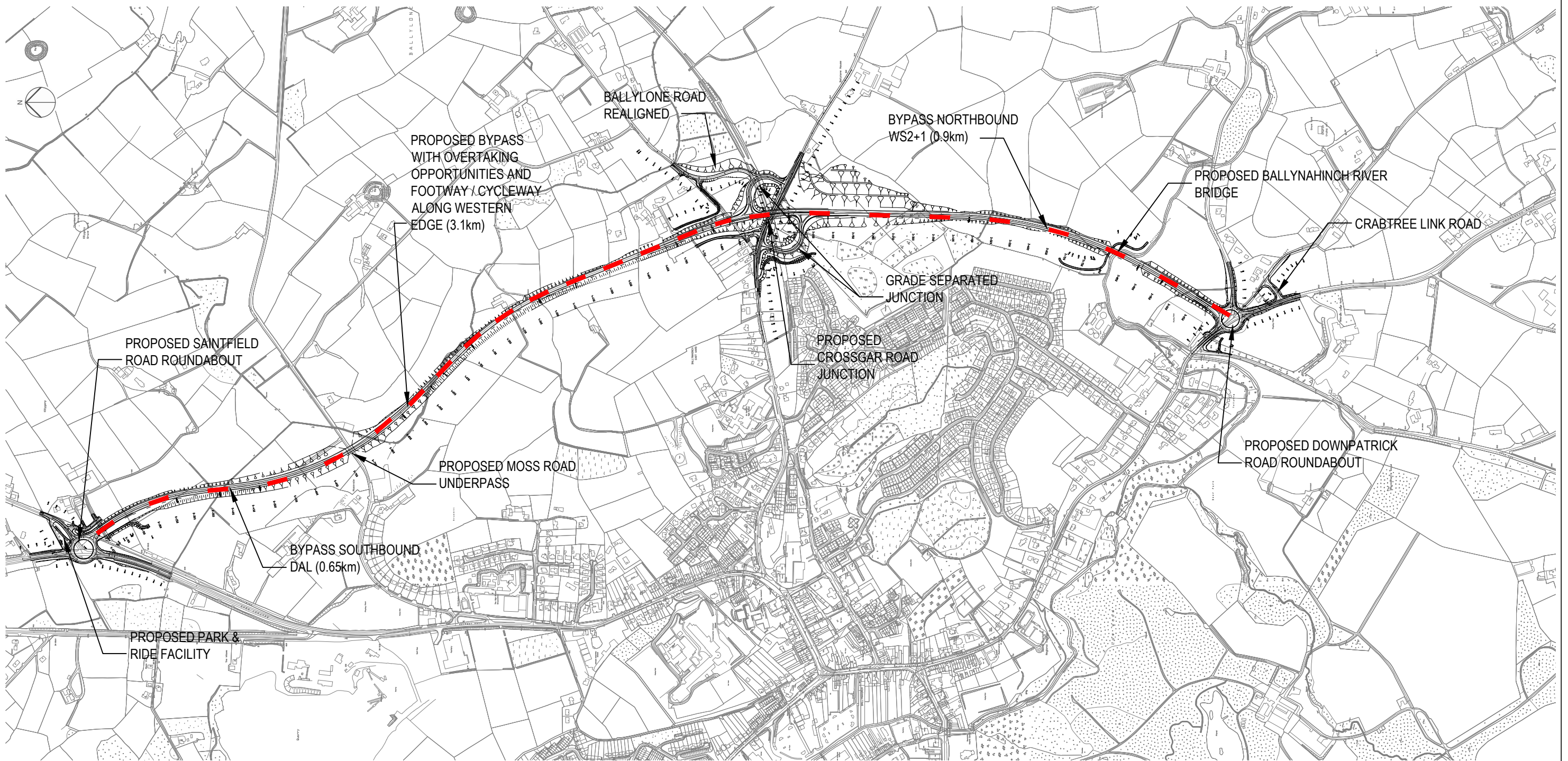


KEY	
RED ROUTE	
YELLOW ROUTE	
BLUE ROUTE	

Plan
1:10,000

Revision Details				By Check	Date	Suffix	Project Title A24 BALLYNAHINCH BYPASS	Drawing Title STAGE 3 SCHEME ASSESSMENT REPORT STAGE 2 ASSESSMENT APPROVED ROUTE OPTIONS	Purpose of issue FOR INFORMATION	This document has been prepared in accordance with the scope of URS' appointment with its client and is subject to the terms of that appointment. URS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. Only written dimensions shall be used. © URS Infrastructure & Environment UK Limited	URS Infrastructure & Environment UK Limited Beechill House Beechill Road, Belfast BT8 7RP T: +44 (0)28 9070 5111 F: +44 (0)28 9079 5651 www.ursglobal.com							
Client transportni				Designed JMcG			Drawn NN						Checked IH			Approved GK		
Scale @ A3 1:10,000				Drawing Number FIGURE 1.3				Rev 0										

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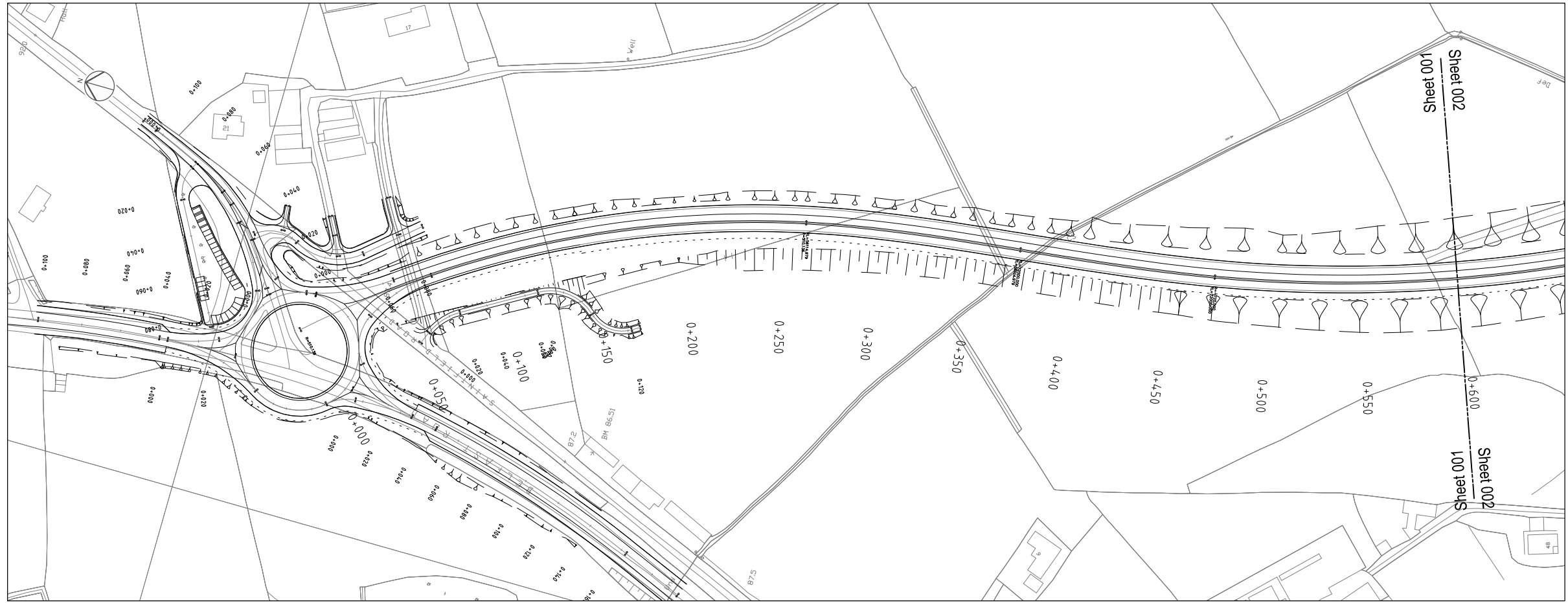


KEY	
STAGE 2 ASSESSMENT PREFERRED ROUTE	- - - -
(RED ROUTE WITH GSJ)	

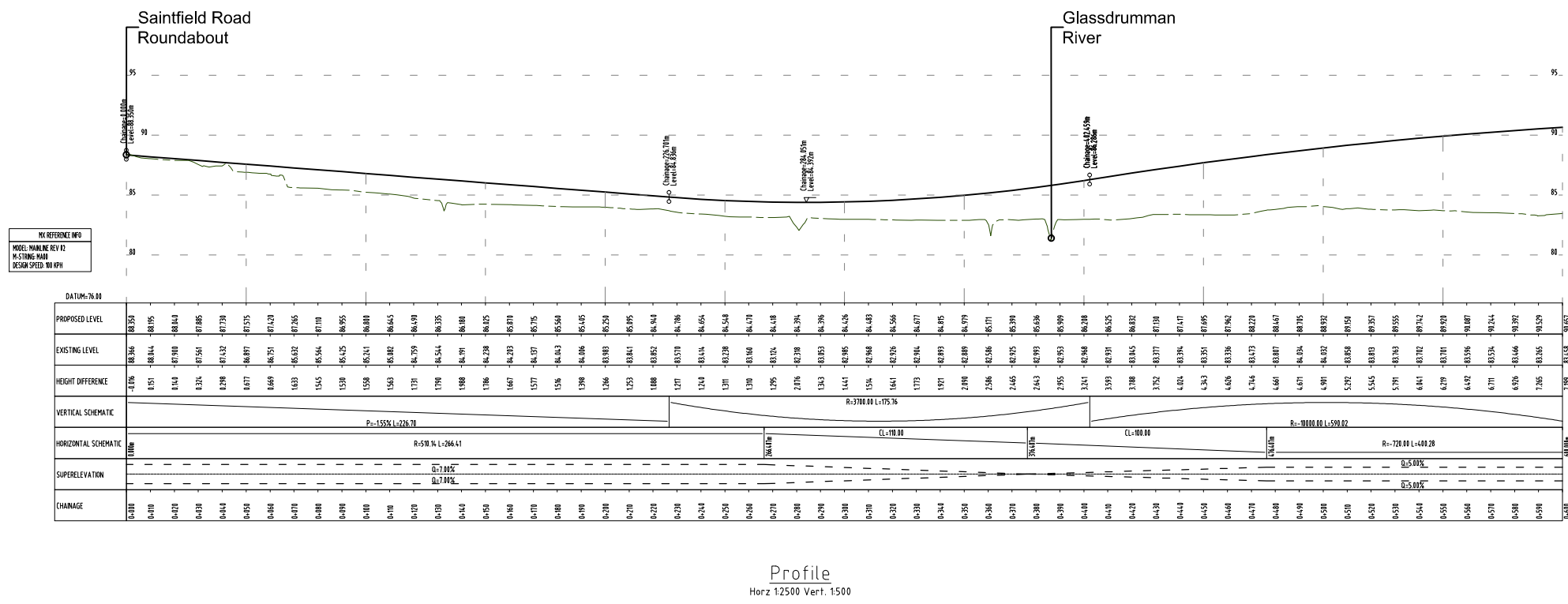
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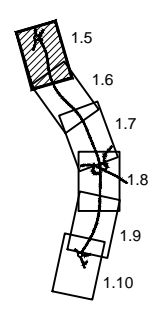


Plan
1:2500



Profile
Horz 1:2500 Vert. 1:500

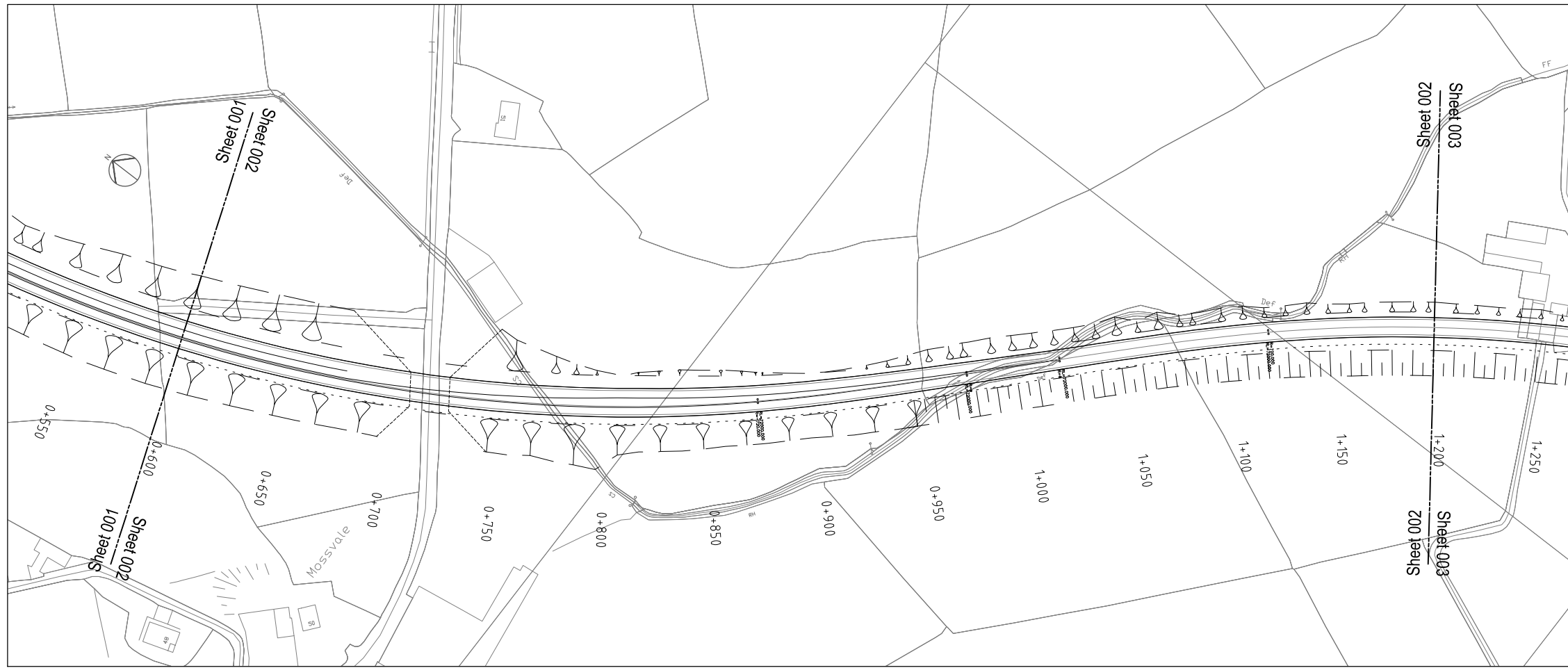
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 — Proposed Design
 - - - Existing ground level



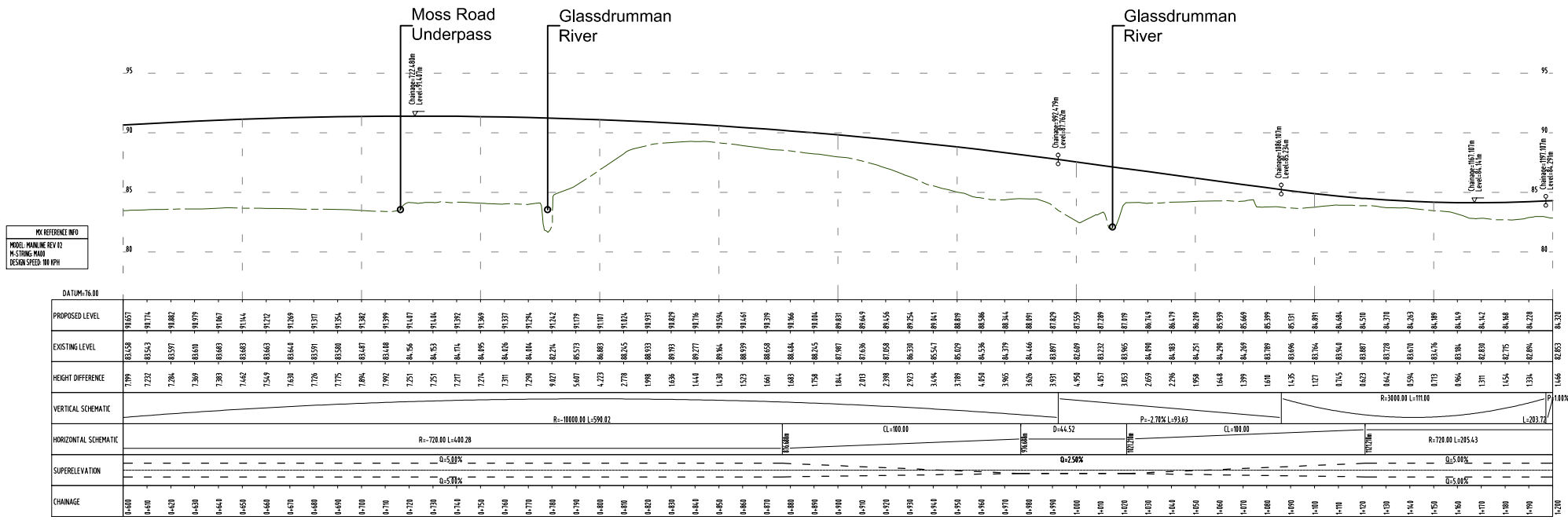
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 MODEL MAINLINE REV R2
 M-STATION PLAN
 DESIGN SPEED: 70 MPH

CHANGING	PROPOSED LEVEL	EXISTING LEVEL	HEIGHT DIFFERENCE	VERTICAL SCHEMATIC	HORIZONTAL SCHEMATIC	SUPERELEVATION
0+000	88.528	88.366	-0.162			0.10%
0+010	88.895	88.844	-0.051			0.10%
0+020	89.085	89.044	-0.041			0.10%
0+030	89.138	89.138	0.000			0.10%
0+040	89.1575	89.1429	-0.0146			0.10%
0+050	89.1429	89.1283	-0.0146			0.10%
0+060	89.1082	89.0936	-0.0146			0.10%
0+070	89.055	89.0409	-0.0146			0.10%
0+080	88.988	88.9732	-0.0146			0.10%
0+090	88.908	88.8932	-0.0146			0.10%
0+100	88.815	88.8009	-0.0146			0.10%
0+110	88.710	88.6957	-0.0146			0.10%
0+120	88.593	88.5787	-0.0146			0.10%
0+130	88.465	88.4509	-0.0146			0.10%
0+140	88.326	88.3119	-0.0146			0.10%
0+150	88.176	88.1619	-0.0146			0.10%
0+160	88.015	88.0009	-0.0146			0.10%
0+170	87.843	87.8289	-0.0146			0.10%
0+180	87.661	87.6469	-0.0146			0.10%
0+190	87.469	87.4549	-0.0146			0.10%
0+200	87.267	87.2529	-0.0146			0.10%
0+210	87.055	87.0409	-0.0146			0.10%
0+220	86.833	86.8189	-0.0146			0.10%
0+230	86.601	86.5869	-0.0146			0.10%
0+240	86.359	86.3449	-0.0146			0.10%
0+250	86.107	86.0929	-0.0146			0.10%
0+260	85.845	85.8309	-0.0146			0.10%
0+270	85.573	85.5589	-0.0146			0.10%
0+280	85.291	85.2769	-0.0146			0.10%
0+290	85.009	84.9949	-0.0146			0.10%
0+300	84.727	84.7129	-0.0146			0.10%
0+310	84.445	84.4309	-0.0146			0.10%
0+320	84.163	84.1489	-0.0146			0.10%
0+330	83.881	83.8669	-0.0146			0.10%
0+340	83.599	83.5849	-0.0146			0.10%
0+350	83.317	83.3029	-0.0146			0.10%
0+360	83.035	83.0209	-0.0146			0.10%
0+370	82.753	82.7389	-0.0146			0.10%
0+380	82.471	82.4569	-0.0146			0.10%
0+390	82.189	82.1749	-0.0146			0.10%
0+400	81.907	81.8929	-0.0146			0.10%
0+410	81.625	81.6109	-0.0146			0.10%
0+420	81.343	81.3289	-0.0146			0.10%
0+430	81.061	81.0469	-0.0146			0.10%
0+440	80.779	80.7649	-0.0146			0.10%
0+450	80.497	80.4829	-0.0146			0.10%
0+460	80.215	80.2009	-0.0146			0.10%
0+470	79.933	79.9189	-0.0146			0.10%
0+480	79.651	79.6369	-0.0146			0.10%
0+490	79.369	79.3549	-0.0146			0.10%
0+500	79.087	79.0729	-0.0146			0.10%
0+510	78.805	78.7909	-0.0146			0.10%
0+520	78.523	78.5089	-0.0146			0.10%
0+530	78.241	78.2269	-0.0146			0.10%
0+540	77.959	77.9449	-0.0146			0.10%
0+550	77.677	77.6629	-0.0146			0.10%
0+560	77.395	77.3809	-0.0146			0.10%
0+570	77.113	77.0989	-0.0146			0.10%
0+580	76.831	76.8169	-0.0146			0.10%
0+590	76.549	76.5349	-0.0146			0.10%
0+600	76.267	76.2529	-0.0146			0.10%

Revision Details				By	Date	Suffix	Project Title	Drawing Title	Purpose of issue	This document has been prepared in accordance with the scope of URS' appointment with its client and is subject to the terms of that appointment. URS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. Only written dimensions shall be used. © URS Infrastructure & Environment UK Limited		URS Infrastructure & Environment UK Limited Beechill House Beechill Road, Belfast BT8 7RP T: +44 (0)28 9070 5111 F: +44 (0)28 9079 5651 www.ursglobal.com
				Check			A24 BALLYNAHINCH BYPASS	STAGE 3 SCHEME ASSESSMENT REPORT MAINLINE PLAN & PROFILE Sheet 1 of 6	FOR INFORMATION	Designed JMcG Drawn NN Checked IH Approved GK Date 16-12-14 URS Internal Project No. 47037246 Scale @ A3 AS SHOWN		
							Client			Drawing Number	Rev	
							transportni			D-47037246-GD-1001	0	

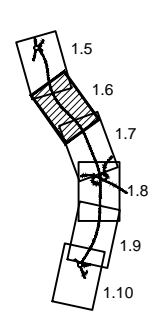


Plan
1:2500



Profile
Horz 1:2500 Vert. 1:500

KEY:
 Proposed Design
 Existing ground level



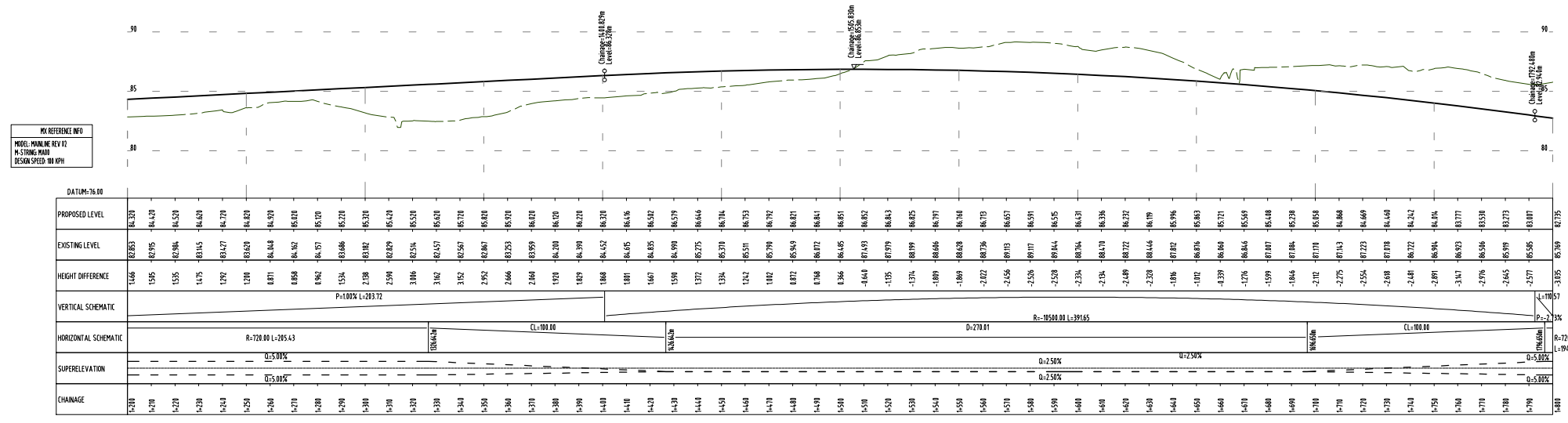
Project Title				Drawing Title				Purpose of issue				This document has been prepared in accordance with the scope of URS' appointment with its client and is subject to the terms of that appointment. URS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. Only written dimensions shall be used. © URS Infrastructure & Environment UK Limited				URS Infrastructure & Environment UK Limited Beechill House Beechill Road, Belfast BT8 7RP T: +44 (0)28 9070 5111 F: +44 (0)28 9079 5651 www.ursglobal.com			
A24 BALLYNABINCH BYPASS				STAGE 3 SCHEME ASSESSMENT REPORT MAINLINE PLAN & PROFILE Sheet 2 of 6				FOR INFORMATION											
Client				Scale @ A3				AS SHOWN				Drawing Number							
transportni												D-47037246-GD-1002							
Revision Details				By				Date				Rev							
				Check								0							

Plot Date : 01/04/2015 16:20:04
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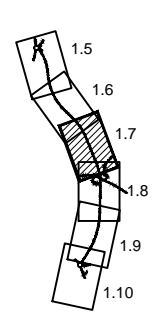


Plan
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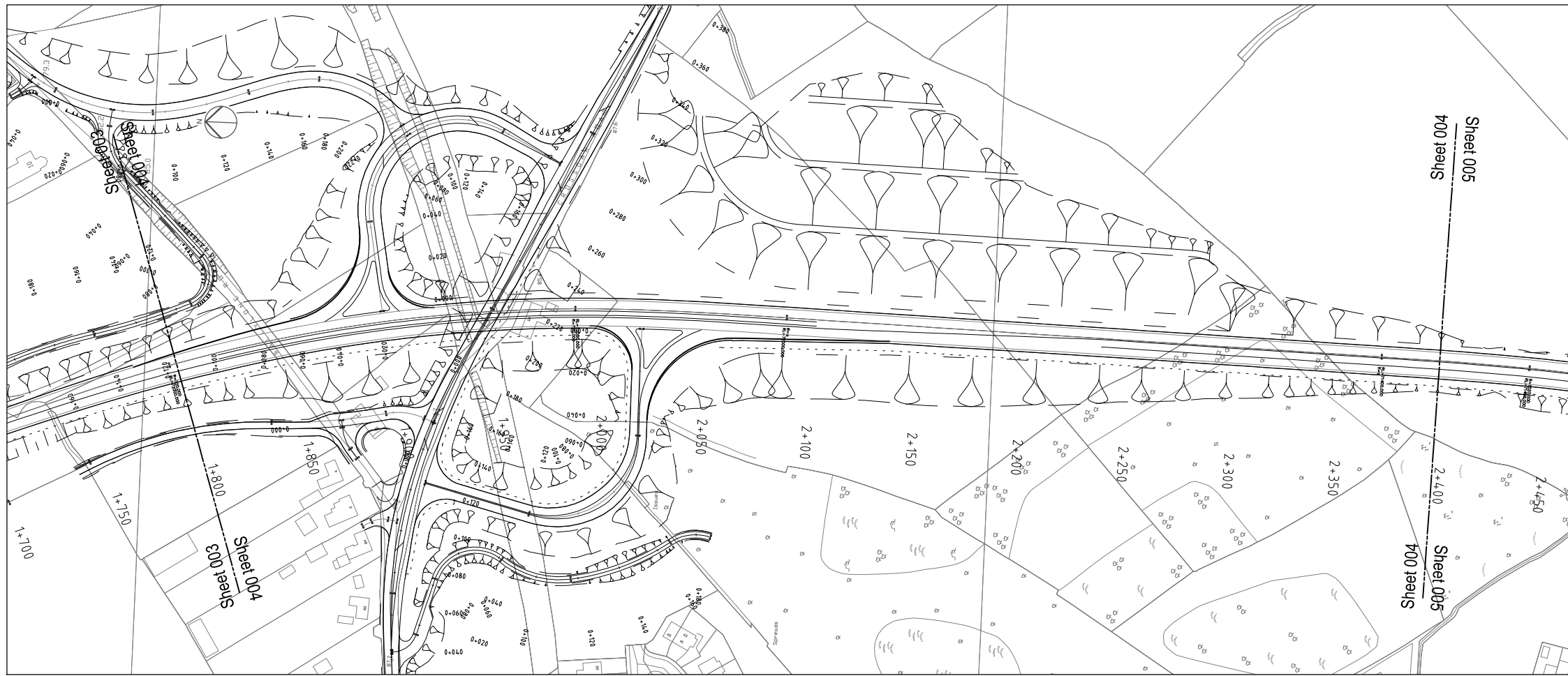
KEY:
 — Proposed Design
 - - - Existing ground level



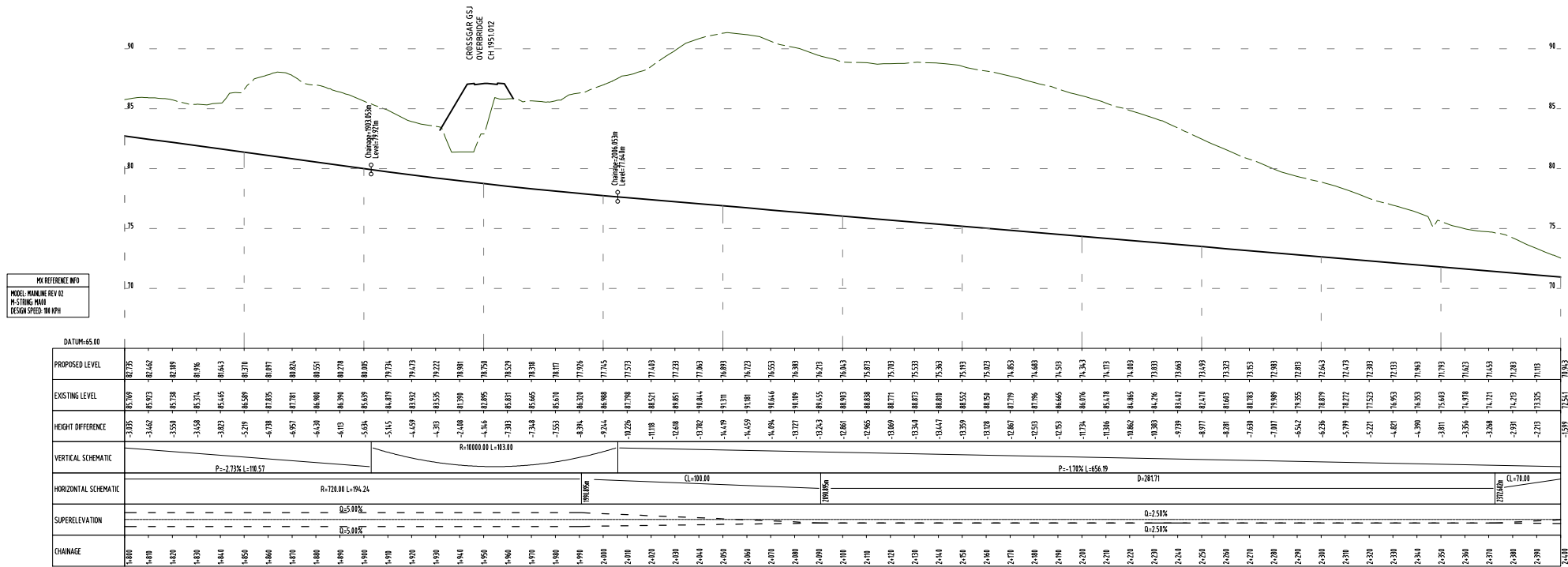
Profile
Horz 1:2500 Vert. 1:500



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							Client	Sheet 3 of 6	Designed	Drawn	Checked	Approved	Date
							transportni		JMcG	NN	IH	GK	16-12-14
									URS Internal Project No. 47037246 Scale @ A3 AS SHOWN				
									Drawing Number D-47037246-GD-1003				
									Rev 0				

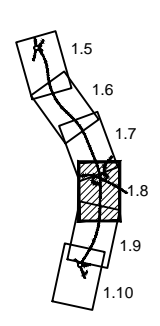


Plan
1:2500

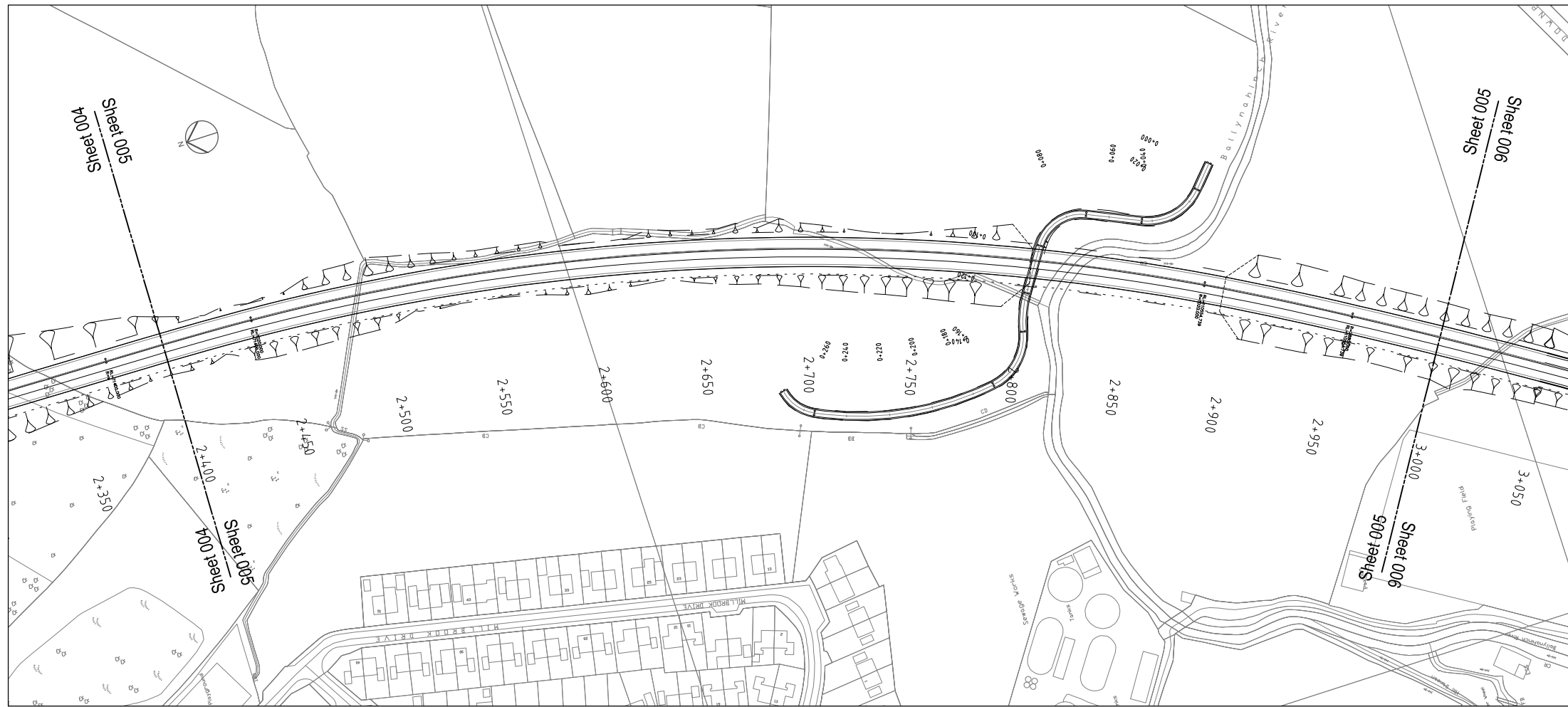


Profile
Horz 1:2500 Vert. 1:500

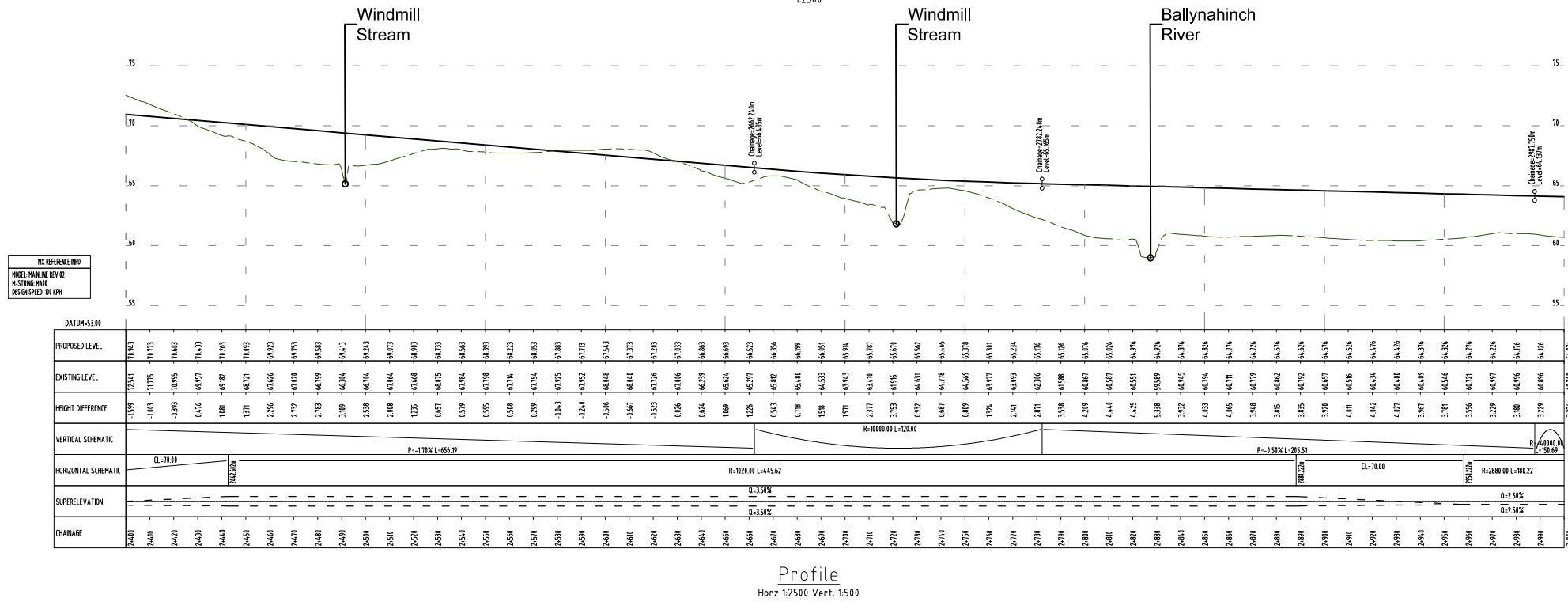
KEY:
 Proposed Design
 Existing ground level



Project Title A24 BALLYNABINCH BYPASS				Drawing Title STAGE 3 SCHEME ASSESSMENT REPORT MAINLINE PLAN & PROFILE Sheet 4 of 6				Purpose of issue FOR INFORMATION				This document has been prepared in accordance with the scope of URS' appointment with its client and is subject to the terms of that appointment. URS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. Only written dimensions shall be used. © URS Infrastructure & Environment UK Limited				URS Infrastructure & Environment UK Limited Beechill House Beechill Road, Belfast BT8 7RP T: +44 (0)28 9070 5111 F: +44 (0)28 9079 5651 www.ursglobal.com							
Client transportni				Designed JMcG				Drawn NN				Checked IH				Approved GK				Date 16-12-14			
Revision Details				By Check				Date				Suffix				Drawing Number D-47037246-GD-1004				Rev 0			

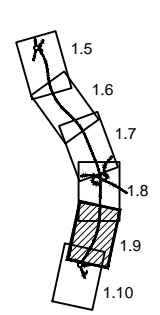


Plan
1:2500



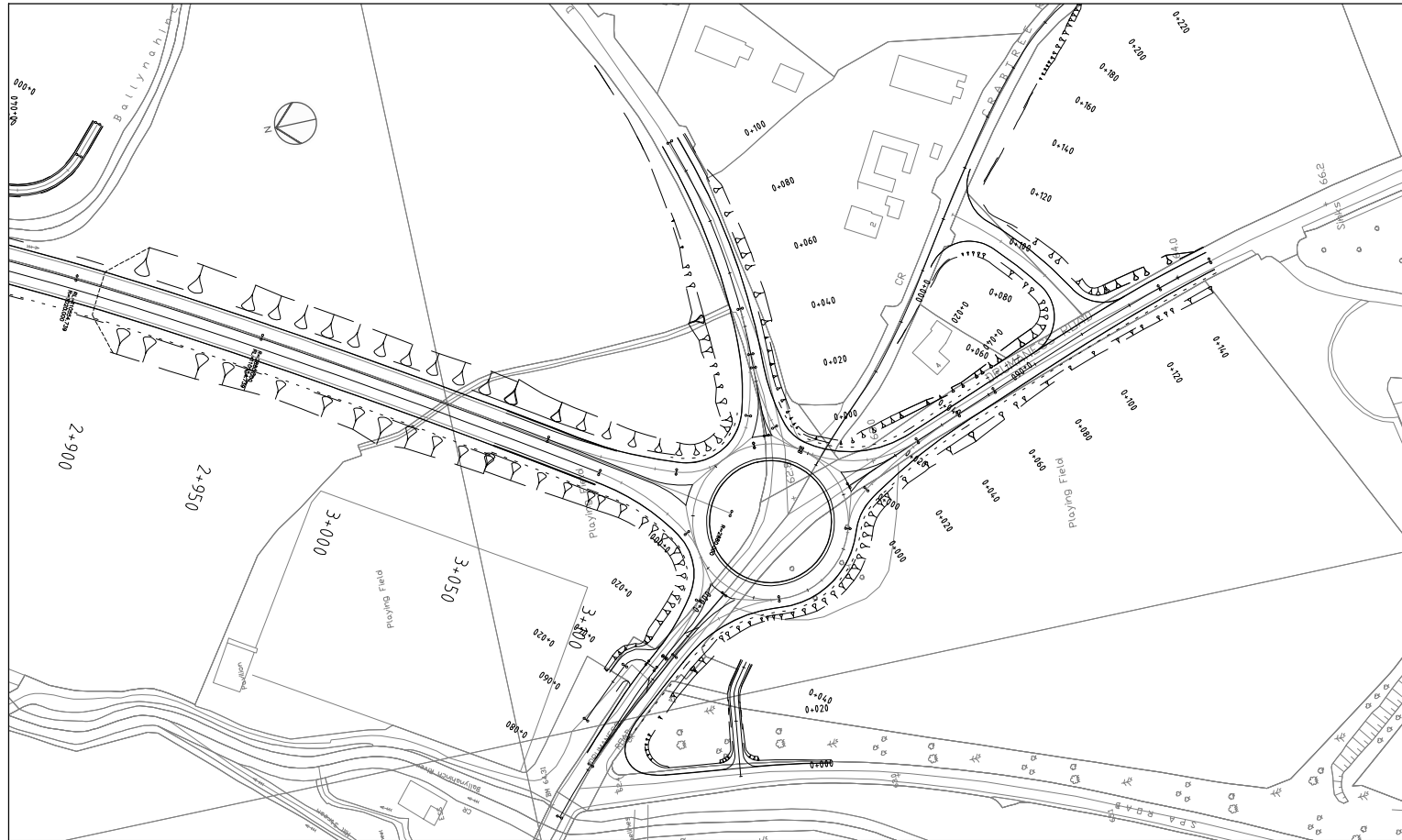
Profile
Horz 1:2500 Vert. 1:500

KEY:
 Proposed Design
 Existing ground level

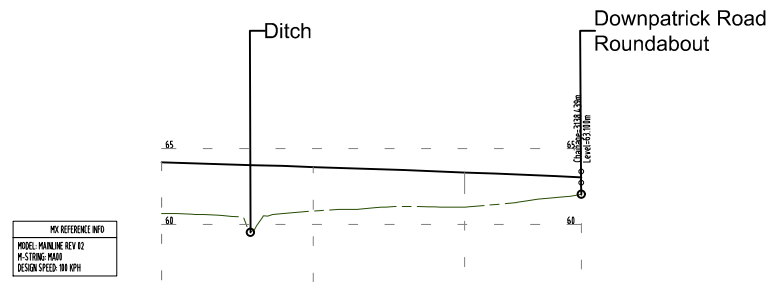


Project Title A24 BALLYNAHINCH BYPASS				Drawing Title STAGE 3 SCHEME ASSESSMENT REPORT MAINLINE PLAN & PROFILE				Purpose of issue FOR INFORMATION				This document has been prepared in accordance with the scope of URS' appointment with its client and is subject to the terms of that appointment. URS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. Only written dimensions shall be used. © URS Infrastructure & Environment UK Limited			
Client transportni				Sheet 5 of 6				Designed JMcG				Drawn NN			
Revision Details				By Check				Checked IH				Approved GK			
Date				Date				Date				Date			
Suffix				Suffix				Date				Date			
Scale @ A3 AS SHOWN				Drawing Number D-47037246-GD-1005				Rev 0				URS Infrastructure & Environment UK Limited Beechill House Beechill Road, Belfast BT8 7RP T: +44 (0)28 9070 5111 F: +44 (0)28 9079 5651 www.ursglobal.com			





Plan
1:2500

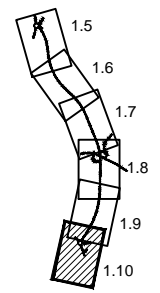


KEY:
 — Proposed Design
 - - - Existing ground level

NO REFERENCE INFO
 MODEL MAINLINE KEY #2
 H-SIDE ROAD
 DESIGN SPEED 80 MPH

DATUM: 54.00	
PROPOSED LEVEL	64.074 64.401 63.963 63.904 63.842 63.778 63.711 63.641 63.571 63.505 63.435 63.369 63.301 63.232 63.164 63.095 63.029 62.957 62.873 62.781 62.681
EXISTING LEVEL	62.701 62.654 62.571 62.508 62.448 62.388 62.329 62.269 62.207 62.143 62.074 62.008 61.941 61.875 61.808 61.741 61.675 61.607 61.539 61.471 61.403
HEIGHT DIFFERENCE	3.374 3.363 3.306 3.396 3.394 3.344 3.341 3.291 3.279 3.257 3.243 3.232 3.232 3.232 3.232 3.232 3.232 3.232 3.232 3.232 3.232
VERTICAL SCHEMATIC	R: -0.0000 0.0 L: 150.00
HORIZONTAL SCHEMATIC	R: 2880.00 L: 180.22
SUPERELEVATION	0: 2.50% 0: 2.50%
CHAINAGE	3+400 3+410 3+420 3+430 3+440 3+450 3+460 3+470 3+480 3+490 3+500 3+510 3+520 3+530

Profile
Horz 1:2500 Vert. 1:500



Revision Details	By	Date	Suffix
	Check		

Project Title	A24 BALLYNAHINCH BYPASS
Client	transportni

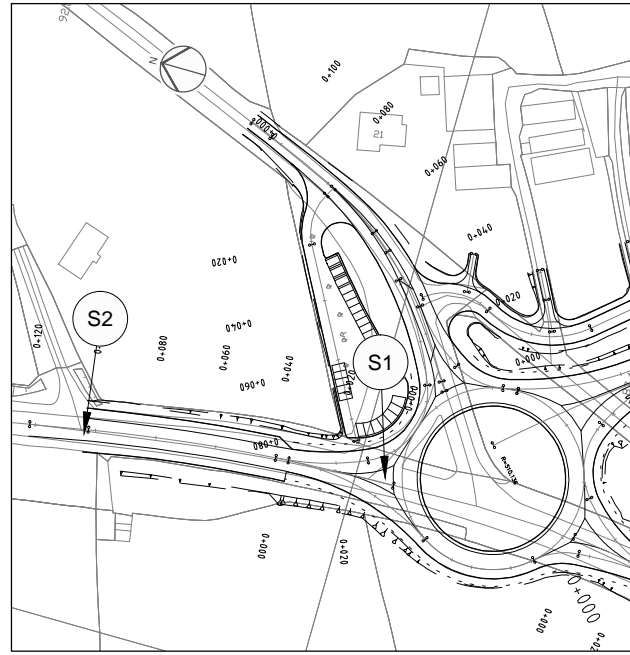
Drawing Title	STAGE 3 SCHEME ASSESSMENT REPORT MAINLINE PLAN & PROFILE Sheet 6 of 6
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Purpose of issue	FOR INFORMATION
Designed	JMcG
Drawn	NN
Checked	IH
Approved	GK
Date	16-12-14
URS Internal Project No.	47037246
Scale @ A3	AS SHOWN

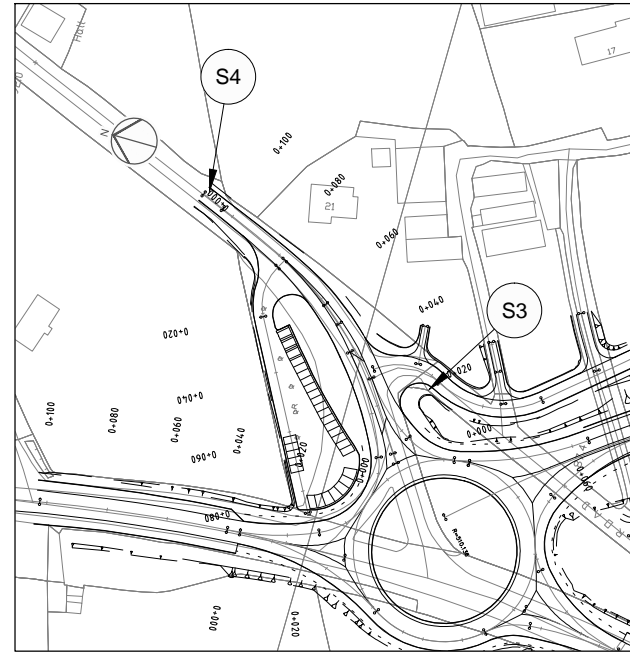
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Rev	0

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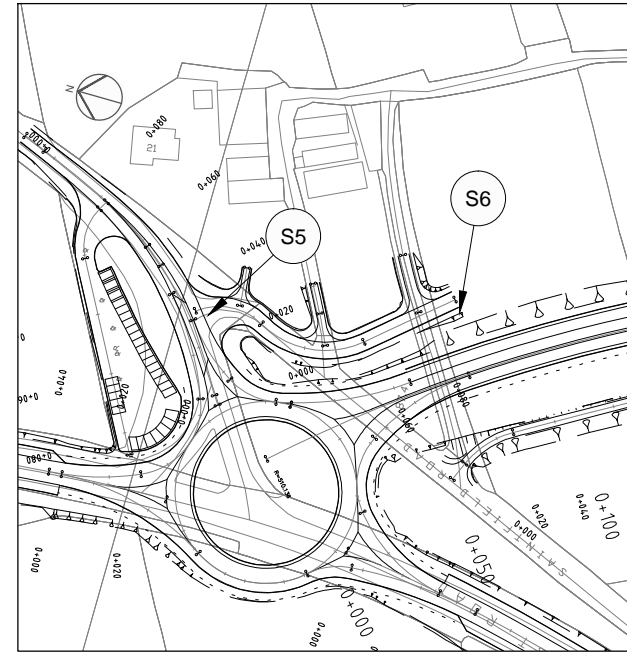
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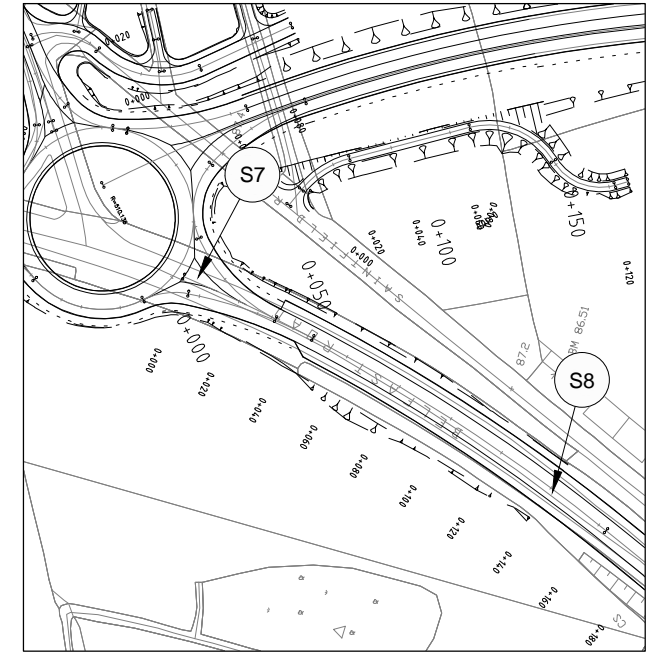
Plan
1:2500



Plan
1:2500

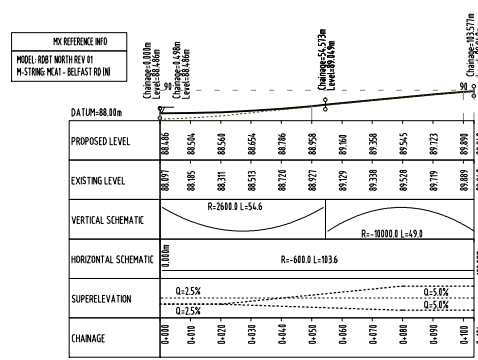


Plan
1:2500

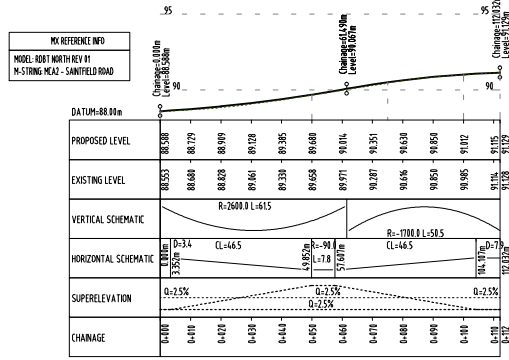


Plan
1:2500

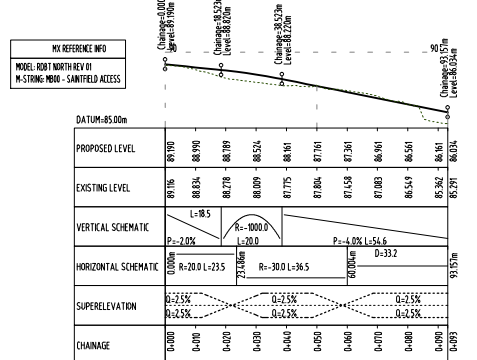
KEY:
 Proposed Design
 Existing ground level



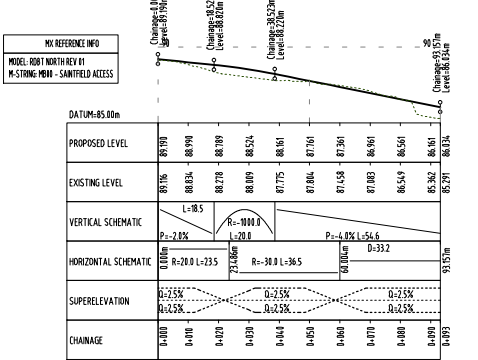
S1-S2
Existing Belfast Road to Northern Roundabout
Horz 1:2500 Vert. 1:500



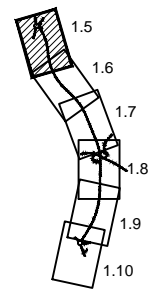
S3-S4
Saintfield Road to Northern Roundabout
Horz 1:2500 Vert. 1:500



S5-S6
Saintfield Access
Horz 1:2500 Vert. 1:500

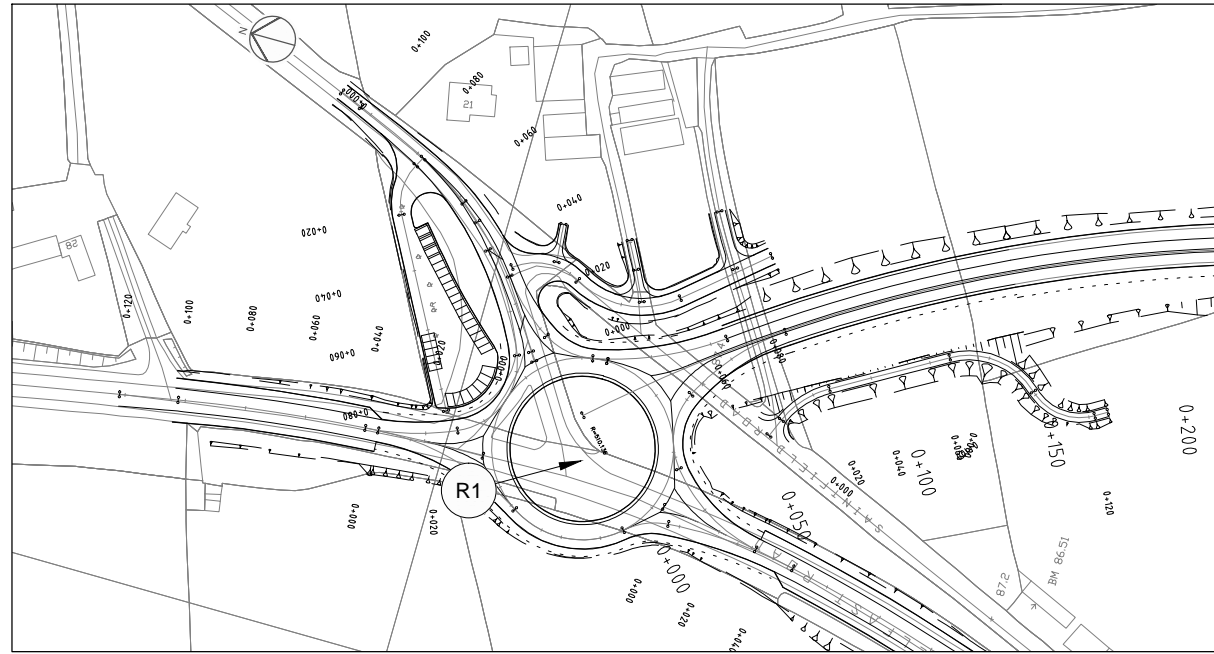


S7-S8
Belfast Road to Northern Roundabout
Horz 1:2500 Vert. 1:500

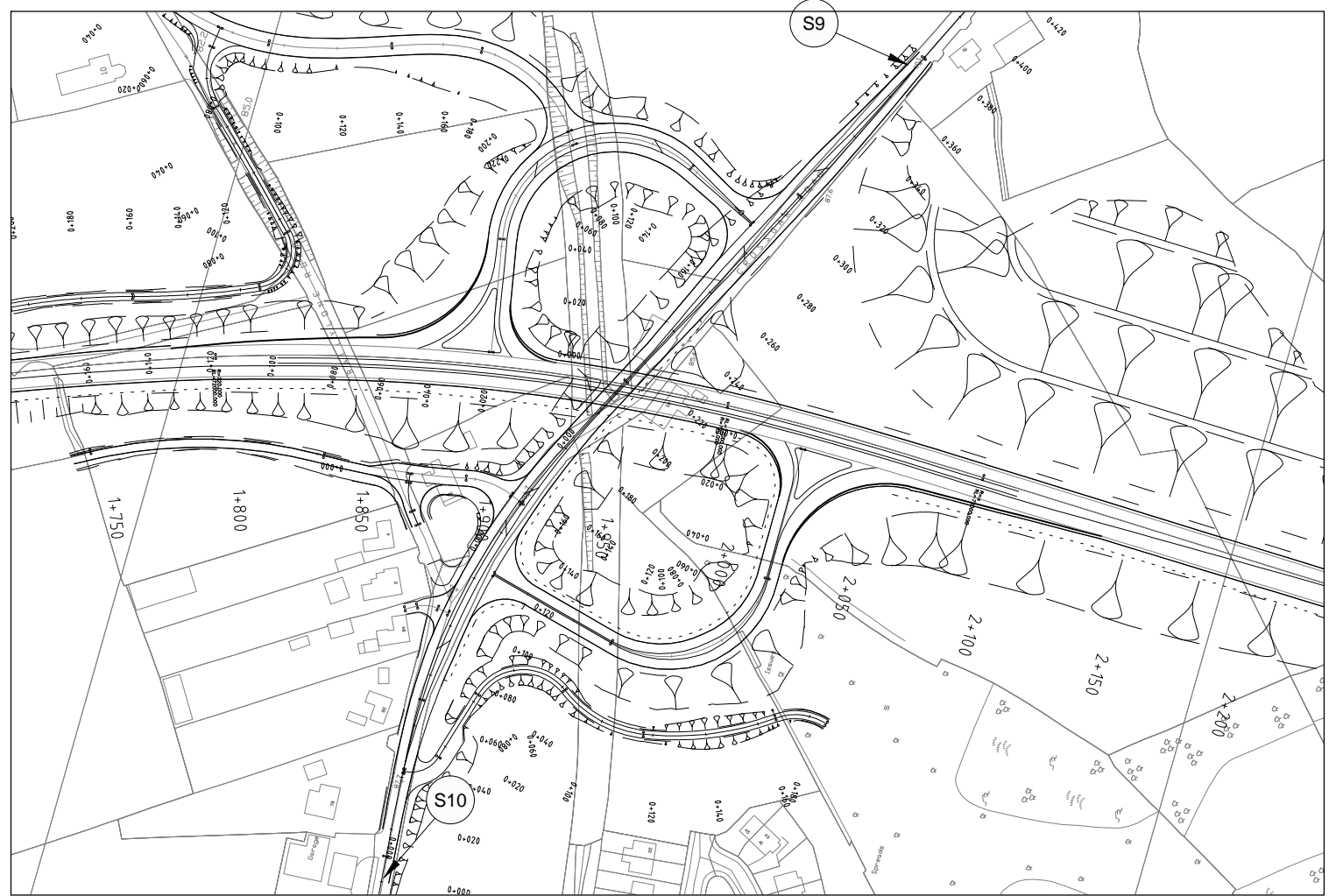


Revision Details				Project Title A24 BALLYNABINCH BYPASS		Drawing Title STAGE 3 SCHEME ASSESSMENT REPORT SIDE ROADS PLAN & PROFILE				Purpose of issue FOR INFORMATION		This document has been prepared in accordance with the scope of URS' appointment with its client and is subject to the terms of that appointment. URS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. Only written dimensions shall be used. © URS Infrastructure & Environment UK Limited											
By		Date		Client transportni		Client				Designed JMcG		Drawn NN		Checked IH		Approved GK		Date 16-12-14		Drawing Number D-47037246-GD-1101		Rev 0	
Check										Scale @ A3 AS SHOWN		URS Infrastructure & Environment UK Limited Beechill House Beechill Road, Belfast BT8 7RP T: +44 (0)28 9070 5111 F: +44 (0)28 9079 5651 www.ursglobal.com											

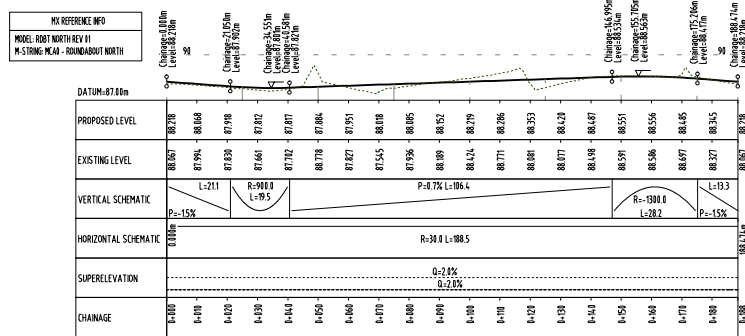
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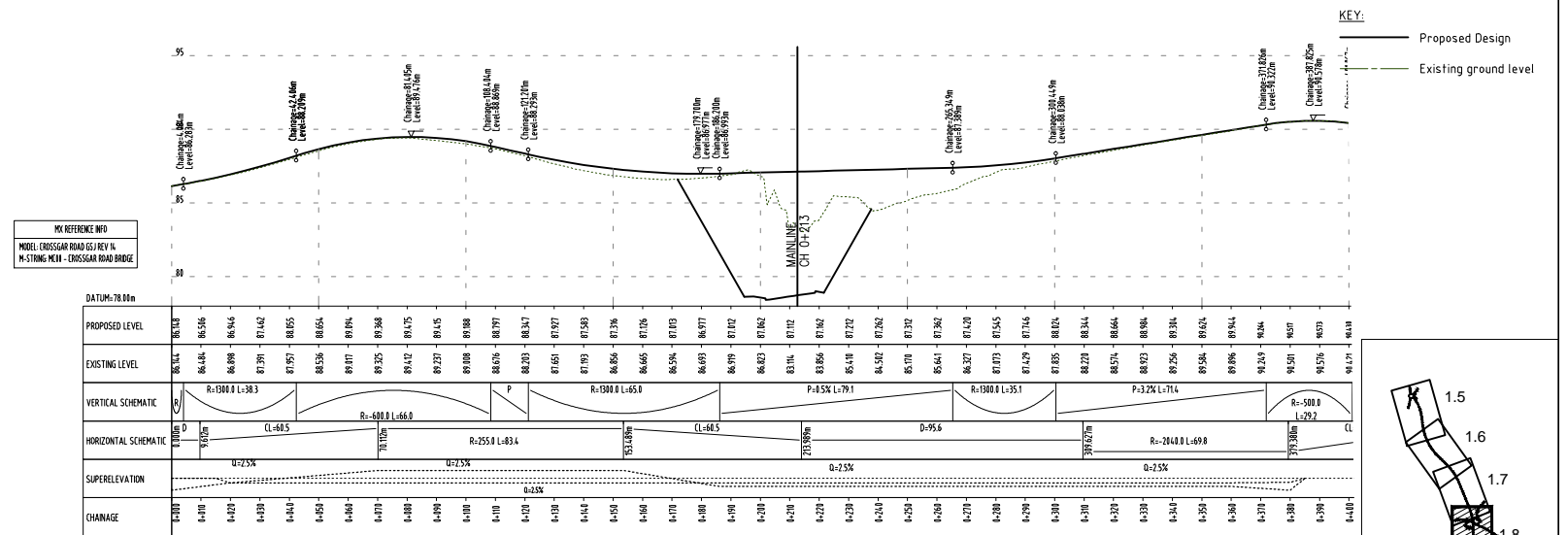
Plan
1:2500



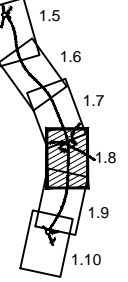
Plan
1:2500



R1
Northern Roundabout
Horz 1:2500 Vert: 1:500



S9-S10
Crossgar Road
Horz 1:2500 Vert: 1:500



Revision Details	By	Date	Suffix

Project Title	A24 BALLYNAHINCH BYPASS
Client	transportni

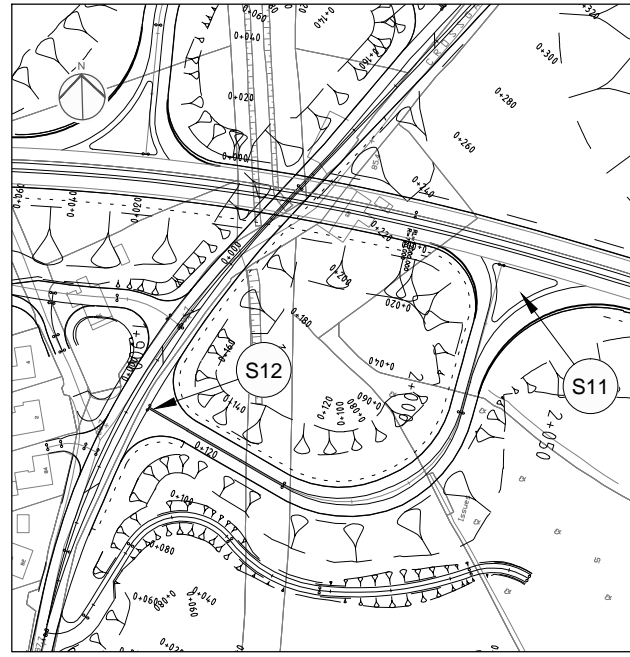
Drawing Title	STAGE 3 SCHEME ASSESSMENT REPORT SIDE ROADS PLAN & PROFILE Sheet 2 of 5
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Purpose of issue	FOR INFORMATION
Designed	JMcG
Drawn	NN
Checked	IH
Approved	GK
Date	16-12-14
URS Internal Project No.	47037246
Scale @ A3	AS SHOWN

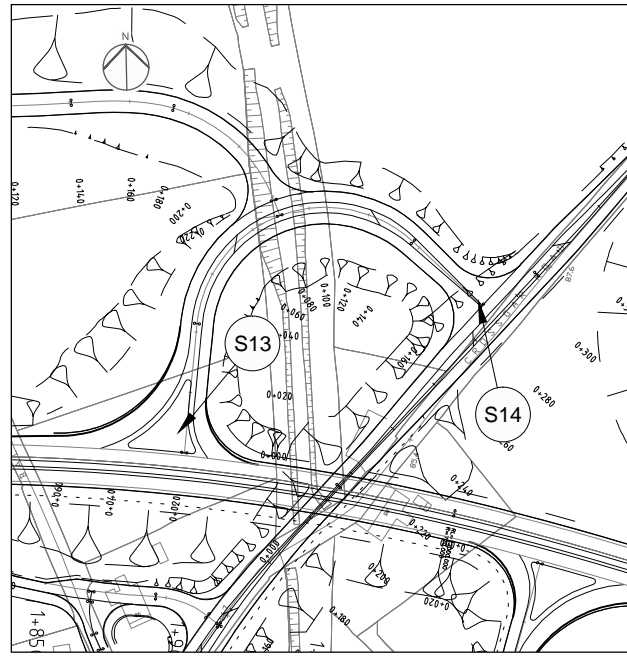
Drawing Number	D-47037246-GD-1102
Rev	0

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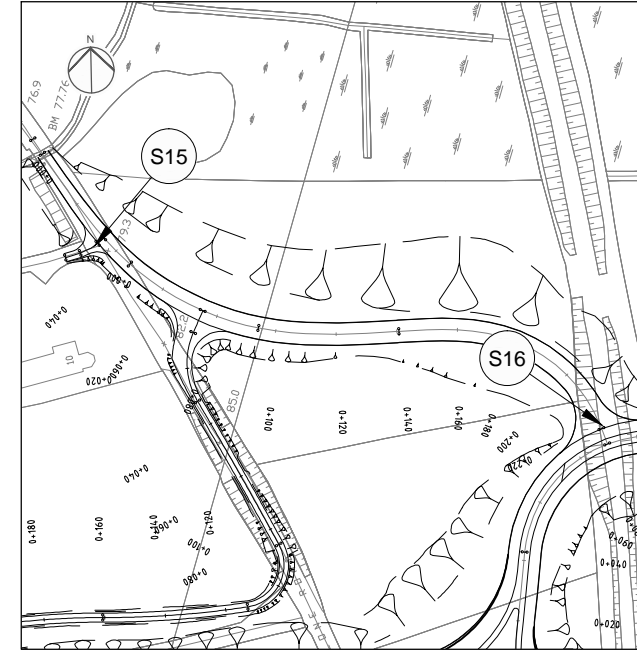
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Plan
1:2500

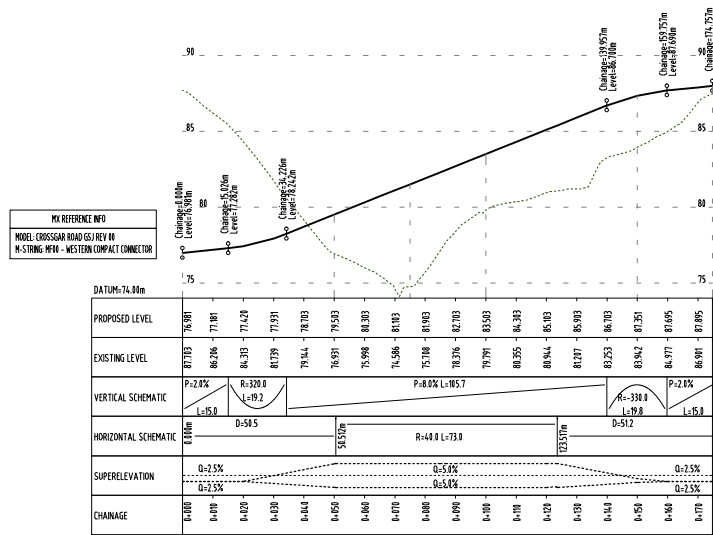


Plan
1:2500

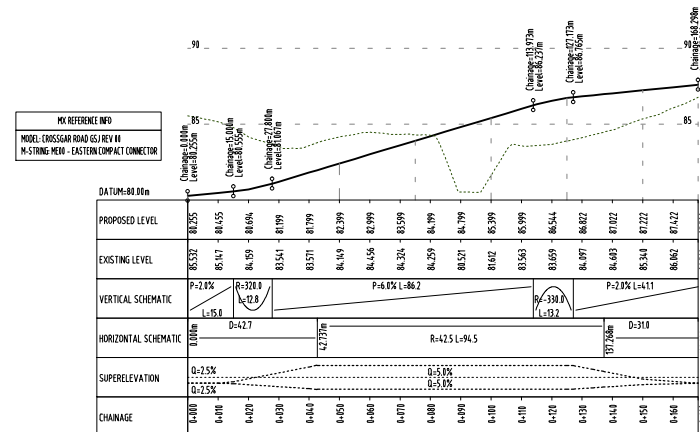


Plan
1:2500

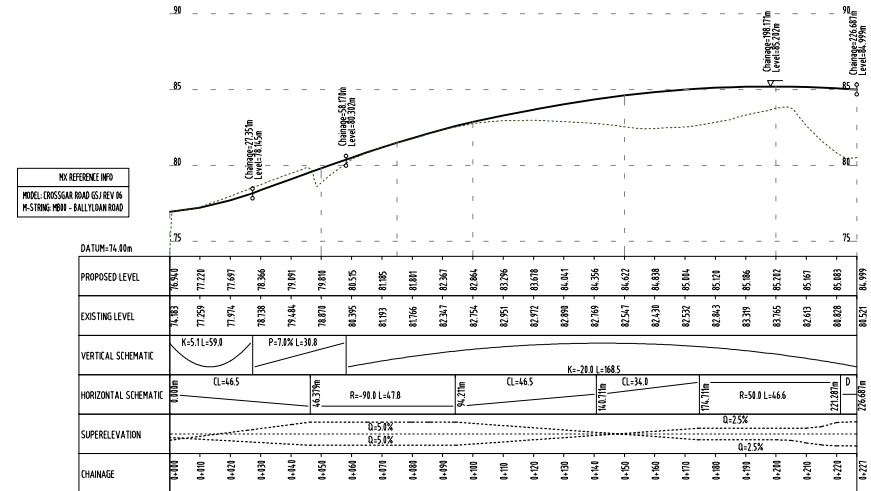
KEY:
 — Proposed Design
 - - - Existing ground level



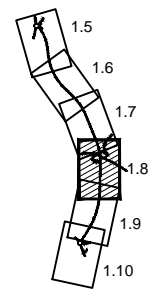
S11-S12
 Western Compact Connector
 Horz 1:2500 Vert. 1:500



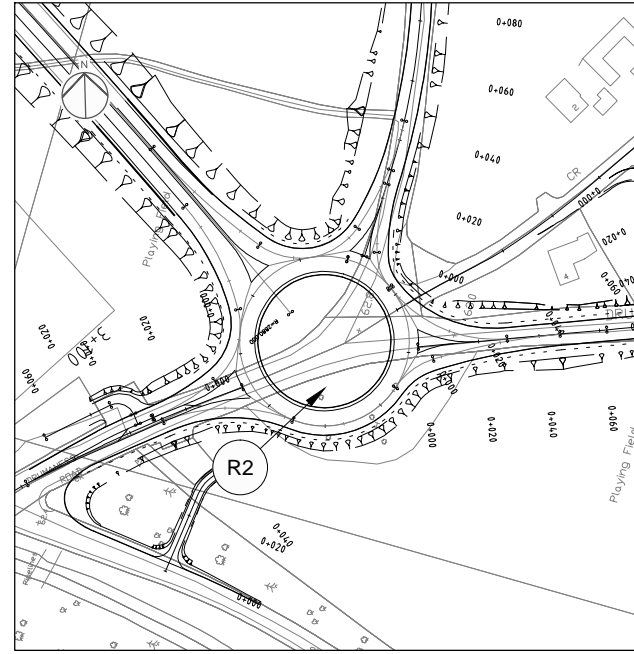
S13-S14
 Eastern Compact Connector
 Horz 1:2500 Vert. 1:500



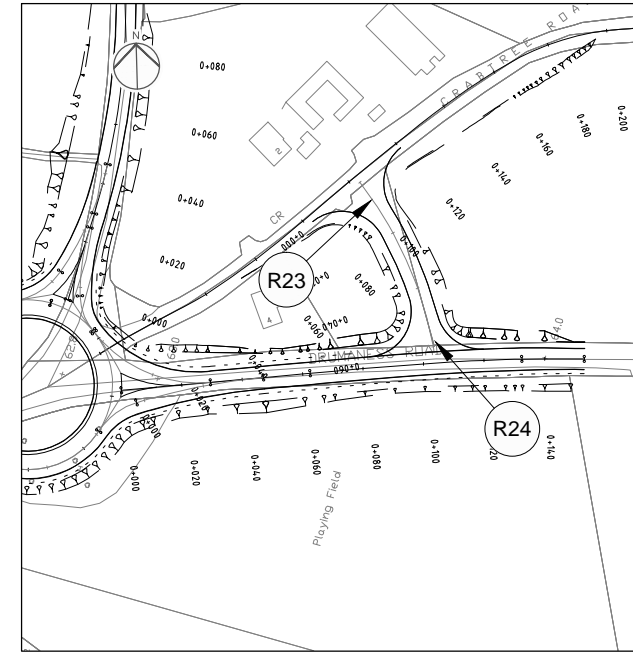
S15-S16
 Ballylone Road
 Horz 1:2500 Vert. 1:500



Revision Details				Project Title A24 BALLYNABINCH BYPASS				Drawing Title STAGE 3 SCHEME ASSESSMENT REPORT SIDE ROADS PLAN & PROFILE				Purpose of issue FOR INFORMATION				This document has been prepared in accordance with the scope of URS' appointment with its client and is subject to the terms of that appointment. URS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. Only written dimensions shall be used. © URS Infrastructure & Environment UK Limited				URS Infrastructure & Environment UK Limited Beechill House Beechill Road, Belfast BT8 7RP T: +44 (0)28 9070 5111 F: +44 (0)28 9079 5651 www.ursglobal.com			
By		Date		Client transportni		Client		Designed JMcG		Drawn NN		Checked IH		Approved GK		Date 16-12-14		Drawing Number D-47037246-GD-1103		Rev 0		URS	



Plan
1:2500



Plan
1:2500

MX REFERENCE INFO	
MODEL: RDBT SOUTH REV 01	M-STRING: MCA4 - DRUMANESS RD (N)

Chainage=0.000m Level=62.925m	Chainage=11.573m Level=62.867m	Chainage=28.710m Level=62.818m	Chainage=49.455m Level=62.810m	Chainage=68.947m Level=62.817m
----------------------------------	-----------------------------------	-----------------------------------	-----------------------------------	-----------------------------------

DATUM=62.00m								
PROPOSED LEVEL	62.925	62.875	62.834	62.817	62.812	62.810	62.812	62.817
EXISTING LEVEL	62.793	62.755	62.752	62.751	62.761	62.792	62.799	62.815
VERTICAL SCHEMATIC	L=11.6 P=-0.5%		R=4000.0 L=17.1	R=29000.0 L=40.2				
HORIZONTAL SCHEMATIC	0.000m		R=-510.0 L=68.9				68.947m	
SUPERELEVATION			Q=2.5%				Q=2.5%	
CHAINAGE	0+000	0+010	0+020	0+030	0+040	0+050	0+060	0+069

R2
Southern Roundabout
Horz 1:1000 Vert. 1:200

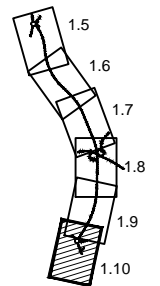
MX REFERENCE INFO	
MODEL: CRABTREE ROAD REV 00	M-STRING: MD00 - CRABTREE LINK ROAD

Chainage=0.000m Level=64.071m	Chainage=17.020m Level=63.999m	Chainage=37.020m Level=64.099m	Chainage=61.747m Level=64.346m
----------------------------------	-----------------------------------	-----------------------------------	-----------------------------------

DATUM=62.00m								
PROPOSED LEVEL	64.071	64.011	64.001	64.041	64.129	64.229	64.329	64.346
EXISTING LEVEL	64.071	63.773	63.325	62.975	62.972	63.283	64.428	64.327
VERTICAL SCHEMATIC	R=2000.0 L=37.0		P=1.0%			L=24.7		
HORIZONTAL SCHEMATIC	0.000m		R=127.0 L=61.7				61.747m	
SUPERELEVATION			Q=2.5%				Q=2.5%	
CHAINAGE	0+000	0+010	0+020	0+030	0+040	0+050	0+060	0+062

S23-S24
Crabtree Road
Horz 1:1000 Vert. 1:200

KEY:
 Proposed Design
 Existing ground level



Plot Date : 01/04/2015 16:49:43
 File Name : J:\47037246 A24 BALLYNAHINCH BYPASS - DRAWINGS\STAGE 3\FIGURES\STAGE 3 REPORT FIGURES\47037246-GD-1101-1105[0] SR P&P

Revision Details	By	Date	Suffix
	Check		

Project Title	A24 BALLYNAHINCH BYPASS
Client	transportni

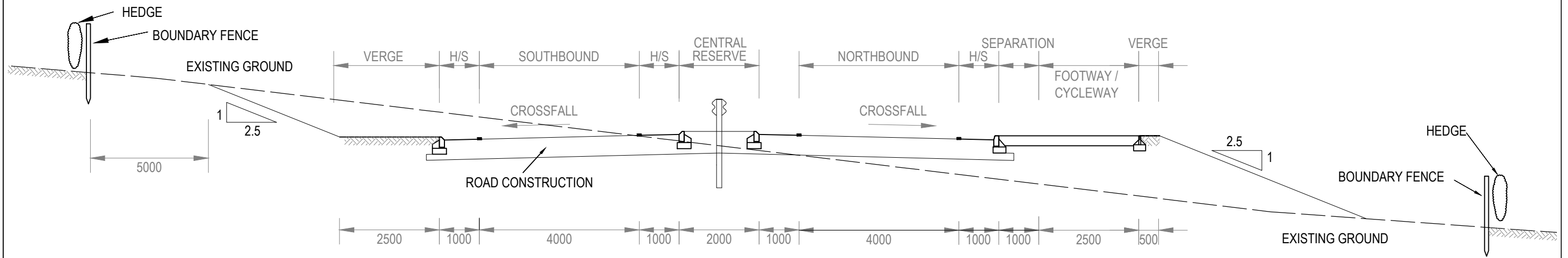
Drawing Title	STAGE 3 SCHEME ASSESSMENT REPORT SIDE ROADS PLAN & PROFILE Sheet 5 of 5
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Purpose of issue	FOR INFORMATION
Designed	JMcG
Drawn	NN
Checked	IH
Approved	GK
Date	16-12-14
URS Internal Project No.	47037246
Scale @ A3	AS SHOWN

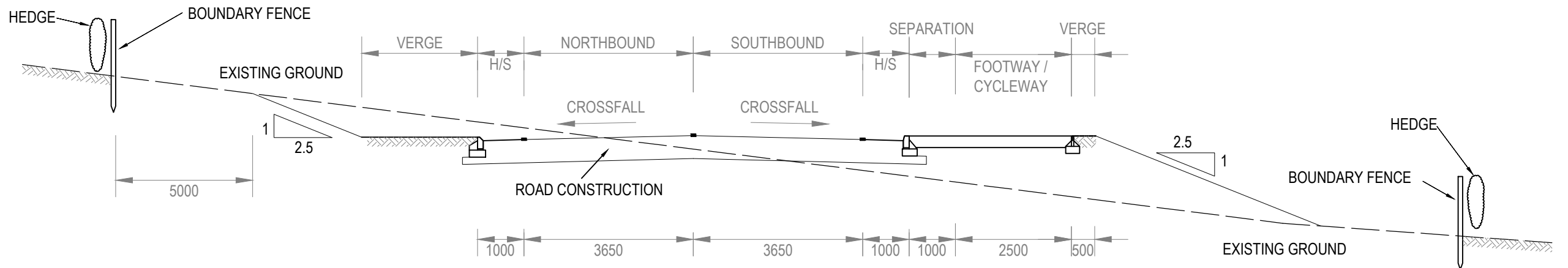
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Rev	0

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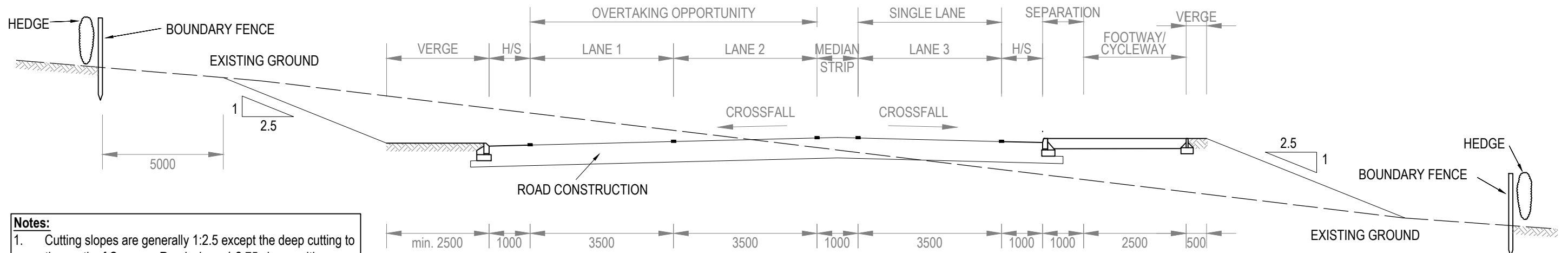
Plot Date : 02/04/2015 14:52:04
File Name : J:\47037246 A24 BALLYNAHINCH BYPASS - DRAWINGS\STAGE 3 REPORT FIGURES\STANDARD CROSS SECTIONS [NN]



**SINGLE LANE DUALLING
(Ch1+815 to Ch2+100)
SCALE 1:100**



**SINGLE CARRIGEWAY (S2)
SCALE 1:100**



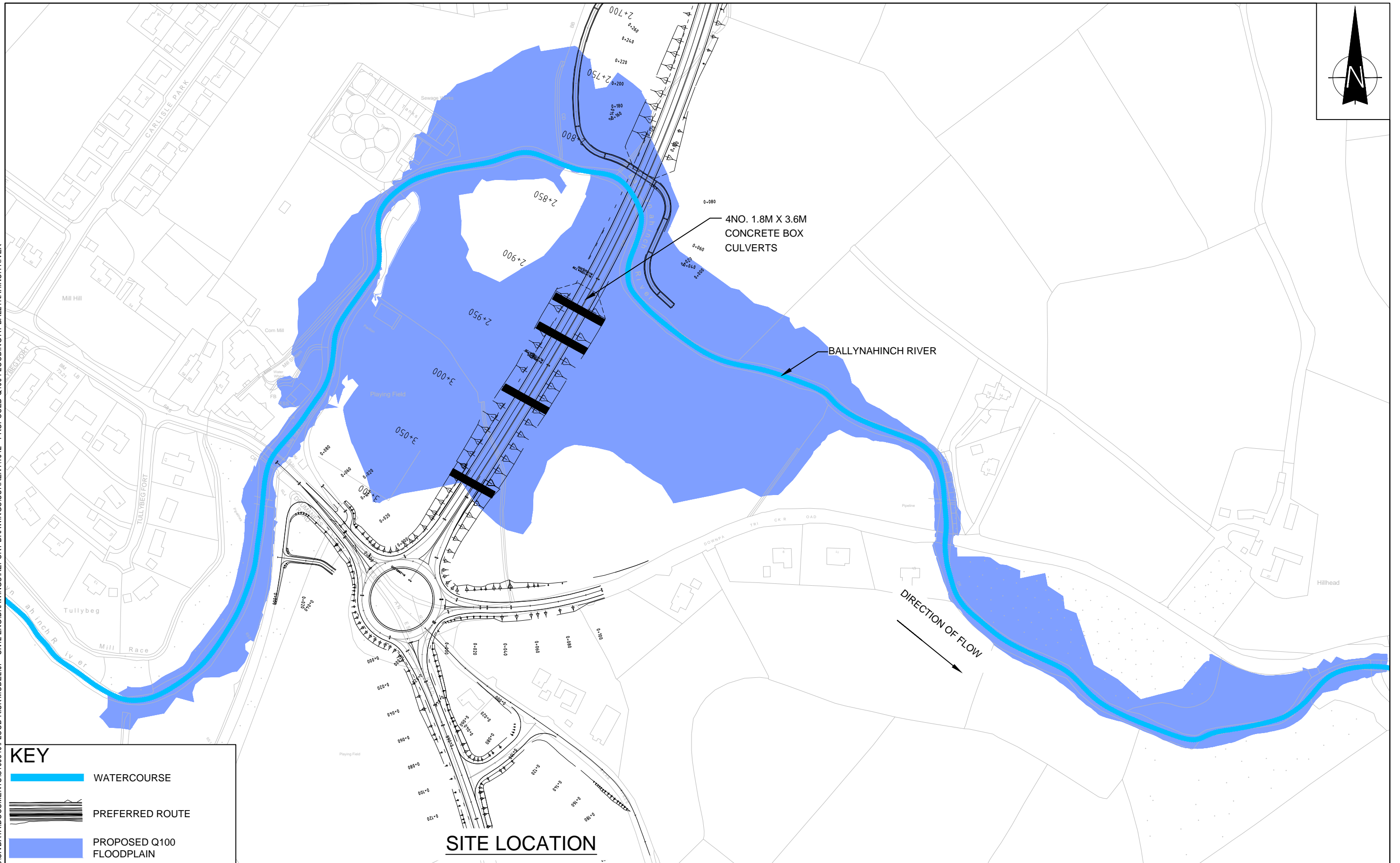
**OVERTAKING OPPORTUNITY
(DAL & WS2+1)
SCALE 1:100**

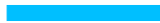


- Notes:**
1. Cutting slopes are generally 1:2.5 except the deep cutting to the south of Crossgar Road where 1:2.75 slopes with intermediate berms shall be provided.
 2. Cross sections looking up-chainage (southbound).
 3. Dimensions in millimetres unless noted otherwise.

Revision Details				By	Date	Suffix	Project Title	Drawing Title	Purpose of issue	This document has been prepared in accordance with the scope of URS' appointment with its client and is subject to the terms of that appointment. URS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. Only written dimensions shall be used. © URS Infrastructure & Environment UK Limited		URS Infrastructure & Environment UK Limited Beechill House Beechill Road, Belfast BT8 7RP T: +44 (0)28 9070 5111 F: +44 (0)28 9079 5651 www.ursglobal.com
				Check			A24 BALLYNAHINCH BYPASS	STAGE 3 SCHEME ASSESSMENT REPORT MAINLINE CROSS SECTIONS	FOR INFORMATION	Designed: JMcG Drawn: NN Checked: IH Approved: GK Date: 16-12-14 URS Internal Project No. 47037246 Scale @ A3 As Shown		
							Client			Drawing Number	Rev	
							transportni			D-47037246-GD-1201	0	

APPENDIX C FLOOD RISK ASSESSMENT DRAWINGS

Plot Date : 03/04/2015 09:51:00
 File Name : \\BE-MAN-001\WP5\CIVIL\DATA\DOCUMENTS\1006\10\FLOOD RISK MODEL\07 - CIVIL ENGINE\DRAWINGS\REPORT DRAWING\CURRENT\1012 - PROPOSED Q100 FLOODING AT BALLYNAHINCH RIVER



KEY	
	WATERCOURSE
	PREFERRED ROUTE
	PROPOSED Q100 FLOODPLAIN

Revision Details	By	Date	Suffix
	Check		

Project Title	A24 Ballynahinch Bypass
Client	transportni

Drawing Title	Proposed Q100 Floodplain at Ballynahinch River Crossing
---------------	---




Purpose of issue	For Approval
Designed	D.D.
Drawn	D.D.
Checked	J.B.
Approved	K.McC.
Date	Oct 2014
URS Internal Project No. 47037246	
Scale @ A3 1:2500	

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Drawing Number	47037246 - 1012
Rev	0

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Plot Date : 03/04/2015 10:28:28
 File Name : \\BEE-MAN-001\WP5\CIV\DATA\DOCUMENTS\100610\FLOOD RISK MODEL\07 - CIVIL ENGINE\DRAWINGS\REPORT DRAWINGS\CURRENT\1013 - PROPOSED Q100 FLOODING AT GLASSDRUMMAN CROSSINGS



KEY	
	WATERCOURSE
	PREFERRED ROUTE
	PROPOSED Q100 FLOODPLAIN

SITE LOCATION

Revision Details	By	Date	Suffix

Project Title	A24 Ballynahinch Bypass
Client	

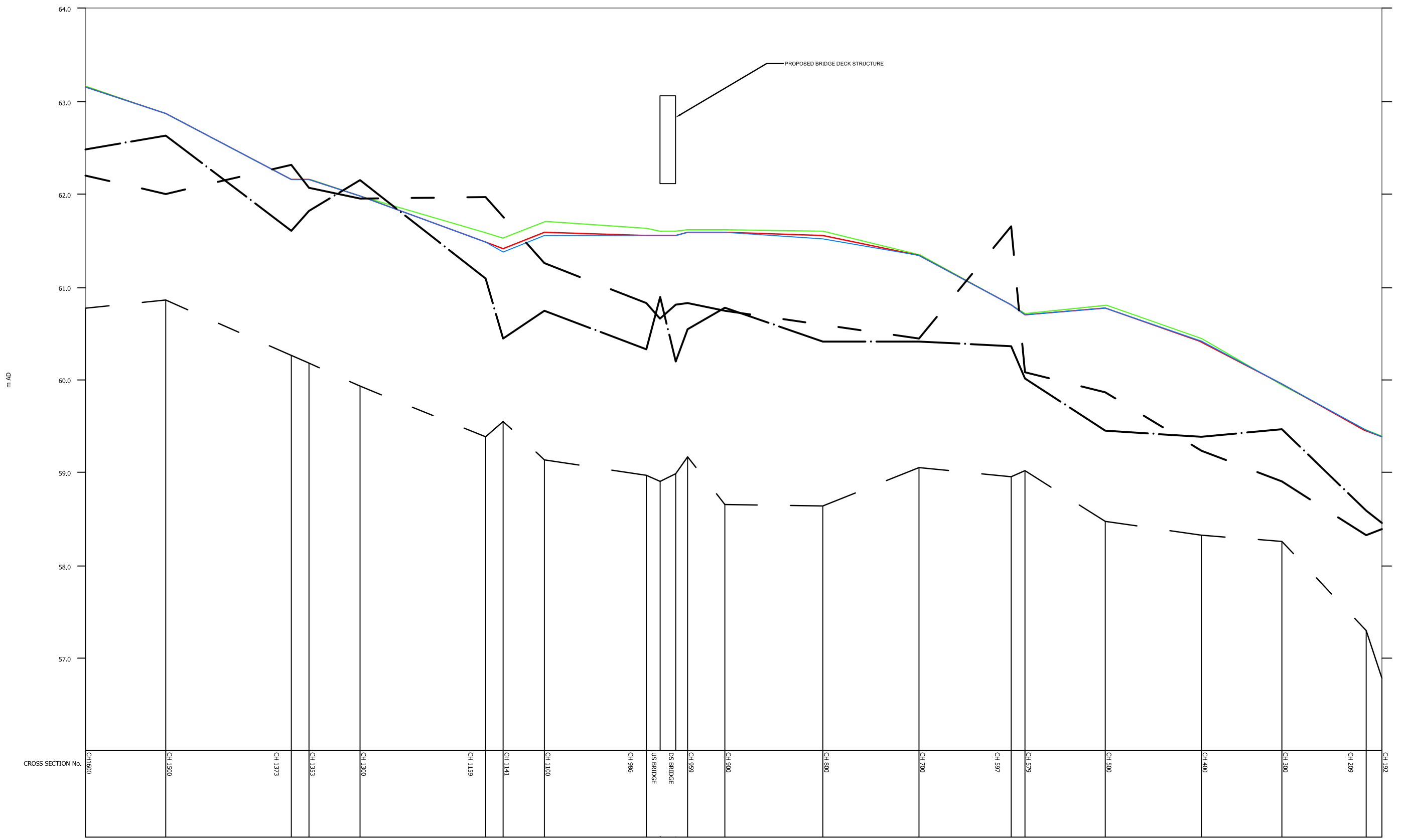
Drawing Title	Proposed Q100 Floodplain at Glassdrumman River Crossing
---------------	---

Purpose of issue	For Approval				
Designed	Drawn	Checked	Approved	Date	
D.D.	D.D.	J.B.	K.McC.	Oct 2014	
URS Internal Project No. 47037246					
Scale @ A3 1:5000					

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Drawing Number	Rev
47037246 - 1013	0

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LONGITUDINAL SECTION
 VERTICAL: 1:20
 HORIZONTAL: 1:2000

Plot Date: 10/20/14 10:00 PM
 File Name: \\SRV\WORK\PROJECTS\47037246\A24\A24\DRAWINGS\REPORT DRAWINGS\COURT\1014 - LONGITUDINAL SECTION BALLYNAHINCH RIVER

NOTES	
—	LEFT HAND BANK
- - -	RIGHT HAND BANK
· · ·	BED LEVEL
—	Q100 EXISTING
—	Q100 PROPOSED WITHOUT MITIGATION
—	Q100 PROPOSED WITH MITIGATION

CONSTRUCTION RISKS	MAINTENANCE / CLEANING RISKS	DEMOLITION RISKS
In addition to the hazards/risks normally associated with the types of work detailed on this drawing take note of above. It is assumed that all works on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.		
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX		

Purpose of Issue: **For Approval**

Client: **transportni**

Project Title: **A24 Ballynahinch Bypass Flood Risk Assessment**

Drawing Title: **Ballynahinch River Longitudinal Section**

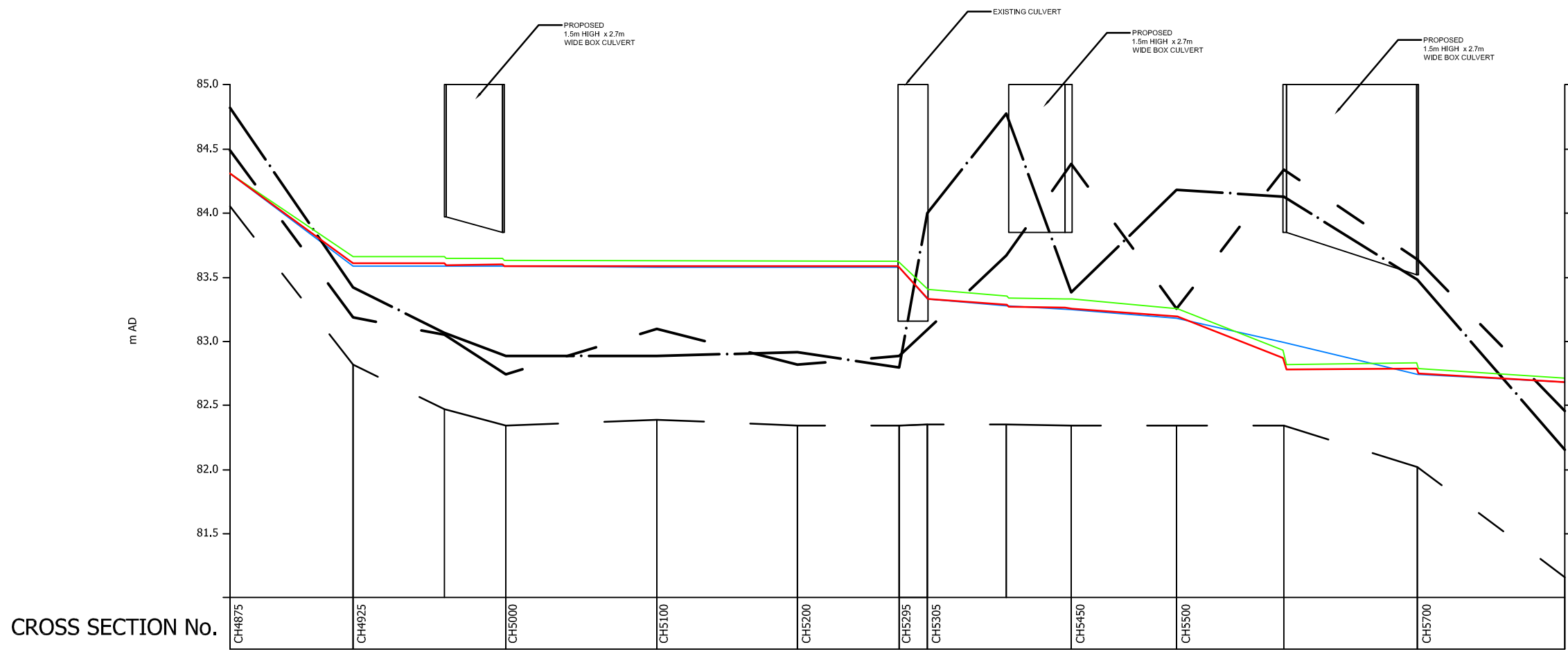
Designed D.D.	Drawn D.D.	Checked J.B.	Approved K.McC.	Date Oct 2014
URS Internal Project No. 47037246				
Scale @ A1 1:5000				
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Drawing Number: **47037246 - 1014**

Rev: **0**



LONGITUDINAL SECTION
 VERTICAL: 1:20
 HORIZONTAL: 1:2000

Plot Date: 10/20/2014 10:07 AM
 File Name: \\SRV\ANK\07\DRAWING\DOCUMENTS\001091\FLOOD RISK MODEL\07-CIVIL ENGR\DRAWINGS\REPORT DRAWING\SECTION\LONGITUDINAL SECTION GLASSDRUMMAN RIVER

CROSS SECTION No.

NOTES			
	LEFT HAND BANK		Q100 EXISTING
	RIGHT HAND BANK		Q100 PROPOSED WITHOUT MITIGATION
	BED LEVEL		Q100 PROPOSED WITH MITIGATION

CONSTRUCTION RISKS	MAINTENANCE / CLEANING RISKS	DEMOLITION RISKS
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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX		

Purpose of Issue: **For Approval**

Client: **transportni**

Project Title: **A24 Ballynahinch Bypass Flood Risk Assessment**

Drawing Title: **Glassdrumman River Longitudinal Section**

Designed	Drawn	Checked	Approved	Date
D.D.	D.D.	J.B.	K.McC.	Oct 2014
URS Internal Project No. 47037246 Scale @ A1 As Shown				
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Drawing Number: **47037246 - 1015**

Rev: **0**