CENTRAL MANAGEMENT BRANCH

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Your reference: DALO 12A/4/2014
Our reference: SUB/4/2015

12 January 2015

Paul Carlisle
Clerk to the Committee for Regional Development
Committee Office
Room 254
Parliament Buildings
BELFAST
BT4 3XX

Dear Paul

Thank you for your letter dated 17 November 2014 following the Committee meeting which took place on Wednesday 12 November 2014.

The queries and the responses to them are detailed below:

- ***Copies of the initial estimates of passenger numbers?***
  Current patronage data within the Outline Business Case was taken from the Booz Allen Hamilton (BAH) Report "Business Development Analysis for Northern Ireland Railways" (February 2007) (commissioned by DRD in October 2006). The forecast passenger demand data is based on the future projections determined by Booz Allen Hamilton (BAH) (February 2007).

  Using its passenger forecasting model and historic data provided by NIR, BAH (February 2007) estimated future passenger journeys across the Londonderry to Belfast line.

  The model showed growth from 1.402m in 2008/09 to 1.750m in 2034/35.

- ***Copies of the revised passenger number assessments?***

  The variation from BAH forecasts is contained in the table below:

Londonderry Line Patronage					
	2009/10	**2010/11**	**2011/12**	**2012/13**	**2013/14**
	(000s)	**(000s)**	**(000s)**	**(000s)**	**(000s)**
BAH	1,428	1,453	1,492	1,516	1,531
Actuals	1,311	1,477	1,561	1,615	2,140
Variation	**-8%**	2%	5%	7%	40%

  This is based partly on growth experienced since the introduction of a new timetable in late 2012 which has reflected itself in significant growth since.

- ***Copy of the design package by Scott Wilson and the current one that is or has issued to tender?***

  The information produced by Scott Wilson and used for the Tender of 2013 was as listed below:-

  - A013730-SN-SG-RP-0002 R01 Re-Signalling Coleraine – Derry Asset Condition Report (Attached).
  - A013730-SN-SG-RP-0004 R04 Re-Signalling Coleraine – Londonderry Outline Project Specification (Attached).
  - A013730-SN-SG-RP-0005 R05 Re-Signalling Coleraine – Derry Telecommunications Project Design Specification (Attached).
  - LY2CE-RP2 Drawings 001 to 008 all Revision A (Attached).

  Mott McDonald won the contract for the signalling design. They have produced the following information which will be included within the 2015 Tender.

  <u>Signalling</u>

  Asset Condition Report

  Signalling Survey Report

  Operational Requirements Specification

  Capability Impact Assessment

  Signalling Option Selection Report

Staff Safety Systems Report
Signalling Scheme / Location Area Plans
Scheme Plan Design Logs
Final Project Specification
Signal Sighting Report
Signal Overrun Risk Analysis (SORA)
Signal Assessment Tool (SAT) Report

Testing & Implementation Strategy
Maintenance Strategy & Requirements Report
Correlation Assessment Report
Event Monitoring Report

Telecoms
Telecoms Requirements Specification
Telecoms Project Design Specification
Telecoms Approval in Principle (AiP) Submission / Technical Workscope

Electrical & Power
Electrical & Power Option Selection / Feasibility Report
AiP Signalling Power Report
AiP Level Crossing Report
AiP Points Heating Report

Civils
Level Crossing Form A's / Construction Ground Plans
Fixed Structure Form A's
Location Sighting Forms
Ergonomics
Ergonomics Assessments

- ***Copies of the calculations relating to optimum bias carried out for each of the schemes under Annex 4 of the "Green Book"?***
  These are contained in section 7.4 of the Outline Business Case which was supplied with DALO 11/4/2014.

- ***What risks were taken in to consideration during the "Green Book" assessment?***
  These are contained in section 7.4 of the Outline Business Case which was supplied with DALO 11/4/2014.

- ***How were these risks amended as a result of the change in design?***
  Following the Project Assessment Review the Optimism bias was increased from 20.2% to 40% to reflect the complexity of the project in line with Department for Transport guidance.

- ***Was a Monte Carlo Analysis undertaken and what were the maximum and minimum £ value of these risks occurring?***
  No. It was not considered necessary/appropriate to use Monte Carlo Analysis when assessing the Business Case.

- ***What software was used to calculate the £ values of the Monte Carlo Analysis?"***
  Monte Carlo Analysis was not used.

The content of this letter and attachments are fully disclosable under FOI.

I trust that this clarifies the position.

Yours sincerely

[SIGNED]

ALAN DOHERTY
Departmental Assembly Liaison Officer

Translink

Re-Signalling Coleraine - Derry

Asset Condition Report

A013730-SN-SG-RP-0002
July 2009

Revision Schedule

Asset Condition Report
July 2009

Rev	Date	Details	Prepared by	Reviewed by	Approved by
01	July 2009	First Issue	**Adam Allen** Principal Engineer	**John Keepin** Signalling Consultancy Manager	**John Keepin** Project Manager

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Table of Contents

1 Introduction

1.1 Remit

A report is required to update the Asset Condition Report produced by the Halcrow Group for Translink, in February 2002.

The signalling assets at the following sites were examined:

Coleraine Signalbox and relay room, Londonderry Signalbox (partial), Londonderry relay room, Castlerock and Magilligan Level Crossing Relocatable Equipment Buildings (REB) and the Bann River Bridge Control Box.

2 Signalling Buildings

2.1 Coleraine Signalbox

2.1.1 Overview

Coleraine Signal Box is situated on the Up side of the Antrim to Londonderry and Coleraine to Portrush lines and is of brick and wood construction. The building appears to be of sound construction. Its function is to safely control train movements in the local Coleraine area and on the single lines to and from Antrim, Portrush and Castlerock. The line to Antrim also includes control of Ballymoney, Killagan and Ballymena.

Figure 2.1 N-X panel at Coleraine Signalbox

The control is via a combined control and indication N-X panel. The whole panel is constructed as a “dog leg” in plan view, and fits rather awkwardly in the signalbox, as shown in figure 2.1. There is a great deal of space that is not used effectively around the panel.

Controls and indications for Ballymoney, Killagan and Ballymena are brought to the signalbox via a pulse code modulation (pcm) link and Siemens Programmable Logic Controller (PLC). These controls and indication would require interfacing with any new control system introduced at Coleraine. The box also controls the Bushmills Road Manually Controlled Barriers (MCB) on the Antrim line and the Artillery Road MCB which is on the Portrush Branch. CCTV from Artillery Road MCB, is brought into the Signalbox.

Figure 2.2 Coleraine Signalbox

There is sufficient room within the signalbox for the installation of pc based control and indication system. The light from the large amount of glass in the signalbox may have to be reduced by shading / shielding to provide the appropriate light conditions to view the pc screens.

2.2 Coleraine Relay Room

2.2.1 Overview

A separate relay room of brick construction is located 50 metres away on the opposite side of the line, as shown in figure 2.3.

Figure 2.3 Coleraine Relay Room

Access to the relay room and signal box is via Bushmills Road situated adjacent to the signal box. There is no road access to the relay room. The relay room has good lighting, a heater and sufficient working space.

2.2.2 Condition of Signalling Equipment

The relay room was built in 1989 and all of the equipment is of a modern type. All equipment appears to be in a reasonable, well-maintained, clean and tidy condition.

2.2.3 Condition of Wiring and Cables

Figure 2.4 Typical wiring detail in Relay Room

The relay room wiring and cables appear to be in a reasonable condition, an example is shown in figure 2.4.

2.2.4 Condition of Wire & Cable Trunking

The Relay Room has modern trunking fitted to the walls and equipment racks. It is in a good condition and has adequate capacity for current use.

2.2.5 Accommodation for Additional Equipment

There is little space for any additional large pieces of equipment within the relay room. Typical spare space is shown in figure 2.5.

Figure 2.5 Available space within the racks in Coleraine Relay Room

The relay racks have room for a limited number of additional relays and fuses. There are thirteen rows of cable terminations and all are in use. It is envisaged however that there is sufficient cable termination space available for future use. Most cables have sufficient spares

provided that only minor changes are anticipated. There is insufficient room in parts of the cable trunking for a major increase in the volume of wiring.

Figure 2.6 showing new Westinghouse S3 TDM mounted in Coleraine Relay Room

A modern S3 Westinghouse TDM system has been added to the Relay Room. There being insufficient room within the relay racks, the equipment has been mounted on a frame which has been secured against the Relay Room wall shown in figure 2.6.

2.2.6 Condition of Drawings

The maintenance prints are copies of the original design by Westinghouse in the year 1989 plus two alterations. Number 10 signal and Cromore AHB monitoring circuits have been added. There are no prints detailing the addition of the Westinghouse S3 TDM system.

2.3 Castlerock Signalbox

2.3.1 Overview

Castlerock Signal Box is situated on the Coleraine to Londonderry Line adjacent to the Sea Road MCB crossing and is of brick and wood construction. Its function is to safely control train movements in the local area and the single lines to Coleraine and Londonderry. The signalbox also monitors the AHB crossings at Carrowreagh, Bellarena, Duncrum East & West, Clooney, Umbra and Barmouth.

The box is extremely cramped with equipment sited on a “wherever possible” basis. A wall mounted colour CCTV monitor has been added to allow the Signalman to have sight of a blind spot on the crossing. A Train Describer monitor is mounted alongside on the wall. The Controls and monitors for Magilligan CCTV controlled crossing are on a table in the corner. The local MCB controls are located on the side of a cabinet alongside a window.

2.4 Castlerock REB

2.4.1 Overview

A separate REB is located on the opposite side of the line and on the far side of the road crossing to the signal box, shown in figure 2.7. Road access to the signal box is via a parking area and the adjacent road. There is no direct road access to the relay room. The REB has good lighting and a reasonable working area.

The REB is divided into three separate areas; the relay room, the battery and generator area. The battery area also houses the power transformers. The generator room contains the standby generator and an Uninterruptable Power Supply (UPS).

Figure 2.7 View of Castlerock REB from Signalbox

2.4.2 Condition of Signalling Equipment

The REB was installed in 1993 and was part of a project intended to make Castlerock Signal Box redundant. The passing loop was to be abolished and Castlerock MCB converted to a CCTV level crossing controlled from Coleraine Signal Box, this did not go ahead as planned.

There is a rack of GEC RR3000 Non vital Frequency Division Multiplexer (FDM) transmitter equipment which was used to control the barriers and CCTV equipment at Magilligan. This is shown in figure 2.8.

Figure 2.8 GEC FDM RR3000 equipment

Figure 2.9 Westinghouse S3TDM equipment

The FDM equipment for the control of Magilligan CCTV crossing has been superseded by Westinghouse S3 TDM system, shown in figure 2.9. The FDM system although now redundant, remains within the rack.

The UPS which is installed to operate in conjunction with the Standby Generator is not operational.

2.4.3 Condition of Wiring and Cables

The REB wiring and cables appear to be in a reasonable condition.

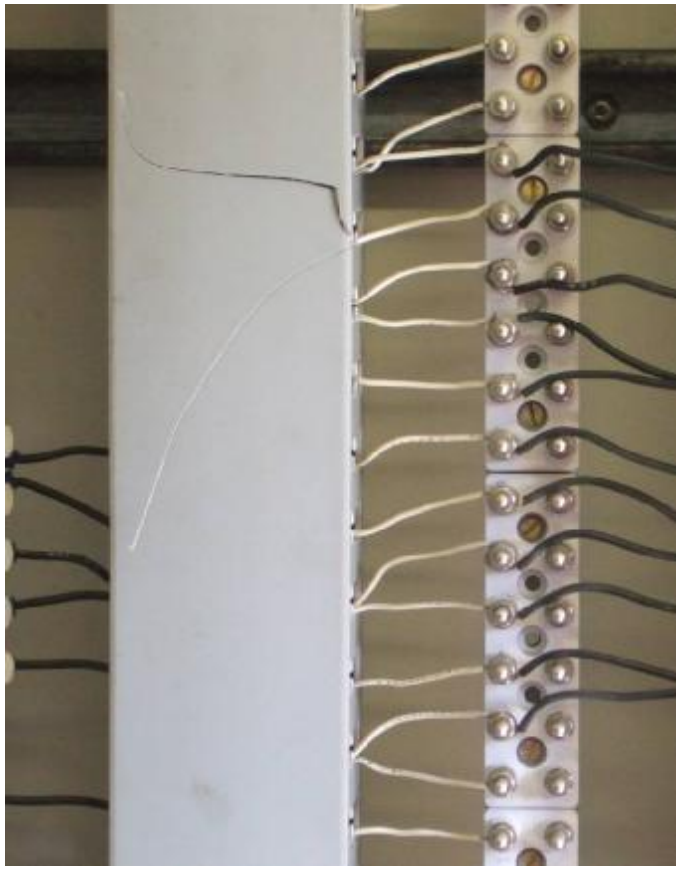

Figure 2.10 Wiring detail at Castlerock REB

Some cable cores used have not been crimped or terminated on links and are directly connected to internal wiring as shown in figure 2.10.

2.4.4 Condition of Cable Routes and Trunking

The relay room has modern trunking fitted to the walls and equipment racks. Several of the trunking covers were not fitted with wires spilling outside the trunking. This gave an overall appearance of an untidy and unclean location.

2.4.5 Accommodation for Additional Equipment

There is only spare room in the existing REB for future minor works. There is very limited room for additional equipment within the existing racks. More space could be made available through the recovery of the redundant GEC RR3000 transmitters and associated equipment within the racks.

There are eight rows of cable terminations and all are in use but sufficient space is available for additional minor works. No more equipment or wires can be fitted to the stand-alone rack. The stand alone rack mentioned is full to capacity.

2.4.6 Condition of Drawings

No source records exist.

2.5 Magilligan REB

2.5.1 Overview

Magilligan REB is situated on the line between Castlerock and Londonderry. It provides accommodation for the equipment to operate Magilligan CCTV level crossing, which is controlled from Castlerock Signal Box. Access to the Relay Room, is via a main road. The REB has good lighting, and a reasonable working area.

2.5.2 Condition of Signalling Equipment

The relay room was built in 1993 and all the equipment is of a modern type. All electrical equipment appears to be in a reasonable, well-maintained, clean and tidy condition.

Figure 2.11 Redundant FDM equipment at Magilligan REB

There is a rack of GEC RR3000 Non Vital Frequency Division Multiplexer (FDM) receiver equipment which was used to control the barriers and CCTV equipment at Magilligan. Similarly to Castlerock this FDM equipment for the control of Magilligan crossing has been superseded by a Westinghouse S3 TDM system. Figure 2.11 shows the redundant FDM system within the rack.

The REB is of a similar layout to that at Castlerock, having separate sections. There were sections for relay room, battery / transformer and a Standby Generator. The UPS fitted with the Standby Generator was operational.

2.5.3 Condition of Wiring and Cables

Figure 2.12 Typical wire condition in Magilligan REB

All the relay room wiring appears to be in a reasonable condition as shown in figure 2.12.

2.5.4 Condition of Cable Routes and Trunking

The relay room has modern trunking fitted to the walls and equipment racks. It is in good condition and has adequate capacity for current use.

2.5.5 Accommodation of Additional Equipment

There is very limited spare capacity in either of any of the racks within the REB. Space could be made available by the removal of the redundant FDM equipment

There are eight rows of terminations and all are in use but sufficient space is available for additional minor works. No more equipment or wires can be fitted to the stand-alone rack. There are some parts of the trunking where there is little room for a future major increase in the volume of the wiring.

2.5.6 Condition of Drawings

No source records exist.

2.6 Londonderry Signalbox

2.6.1 Overview

Londonderry Signal Box is located on platform 1 at Londonderry Station. Its function is to safely control train movements in the local area and to and from the single line to Castlerock.

In addition to the signalling control panel there is a secondary panel mounted alongside. This separate control and indication panel has been added to the signalbox to interface with the City of Derry Airport.

Figure 2.13 City of Derry Airport interface Panel at Londonderry Signalbox

The purpose of the panel is to permit the Signalbox at Londonderry and the Control Tower at the Airport to regulate the passage of trains to ensure that a train will not pass the perimeter of the runway whilst an aircraft is attempting to take off or land or vice versa. The Signalbox panel is shown in figure 2.13; the Control Tower panel is shown in figure 2.14.

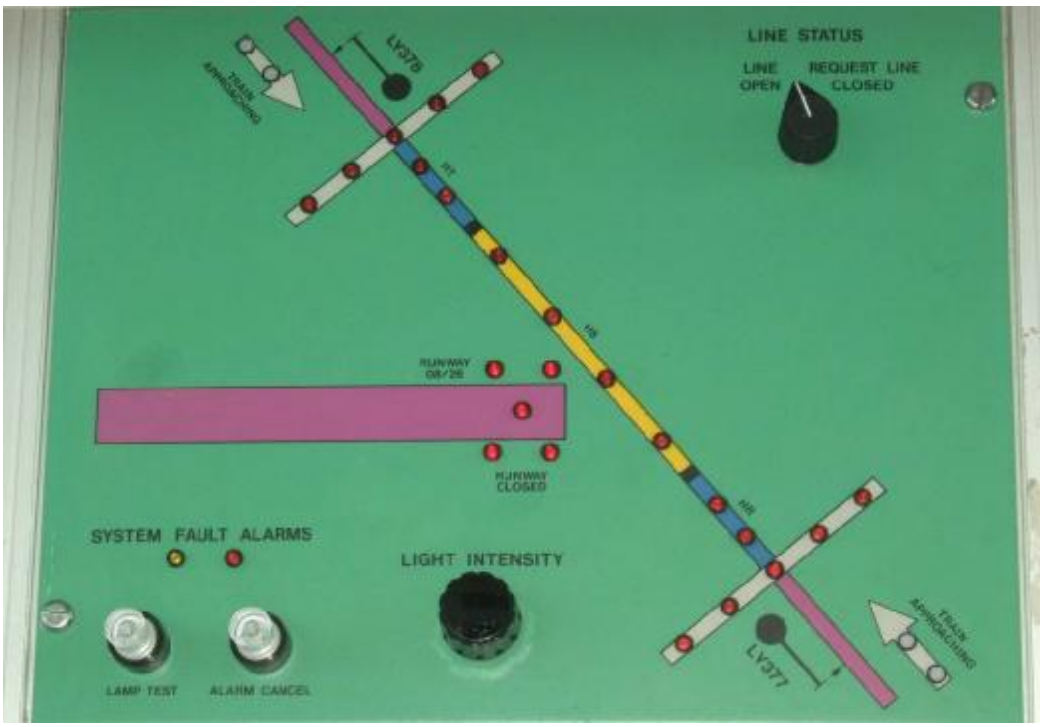

Figure 2.14 City of Derry Airport interface Panel at the Control Tower

2.7 Londonderry Relay Room

2.7.1 Overview

A separate relay room of brick construction is located on the Up side across from the Castlerock end of the platforms. Access to the relay room and signal box is via Londonderry Station. The relay room has good lighting and an ample work area.

2.7.2 Condition of Signalling Equipment

The relay room was built mid 1970's and all the equipment is of a fairly modern type taking into account that it is a relay interlocking. All electrical equipment appears to be in a reasonable, well-maintained, clean and tidy condition.

One relay rack has been attached to a relay room wall and no access is available to the rear of the rack. A signalling line possession will be required to correlate the associated wiring.

To accommodate the control of the City of Derry Airport within the Signalbox at Londonderry a Siemens plc has been added to the Relay Room, shown in figure 2.15. It has been sited above the termination rack for cables G, H and J, as shown in the figure below. The plc operates in association with a TDM link from the REB located on the perimeter of the City of Derry Airport.

Figure 2.15 Siemens plc equipment at Londonderry Relay Room

The Westinghouse S2 TDM housed in a 19U full height cabinet has been located in the adjacent telecoms room as there is insufficient room within the relay room. The cabinet is shown in figure 2.16 below.

Figure 2.16 Westinghouse S2 TDM equipment at Londonderry Relay Room

2.7.3 Condition of Wiring and Cables

The relay room wiring and cables appear to be in a reasonable condition.

2.7.4 Condition of Wire & Cable Trunking

The relay room has a mixture of geographical and modern trunking fitted to the walls and equipment racks. The trunking is in a good condition and has adequate capacity for current use with the exception of the trunking for the rack attached to the wall. The trunking to this rack is full.

2.7.5 Accommodation of Additional Equipment

There is little spare space in the relay room within the relay racks for expansion. There are also parts of the trunking where there is little room for expansion due to the volume of wiring.

2.7.6 Condition of Drawings

The maintenance prints have not been altered since the inclusion of Dupont, Lock and Eglinton AHB monitoring circuits. Following the work to incorporate the Airport Control Panel at Londonderry Signalbox, there are no maintenance prints. There are only copies of the commissioning prints.

2.8 Bann River Bridge Control Box

2.8.1 Overview

The Bann River Bridge Control Box is located on the line between Coleraine and Londonderry, approximately 800 metres north of Coleraine Signal Box. Its function is to control the movement of the Bann River Swing Bridge. It has very limited accommodation but is well lit.

2.8.2 Condition of Signalling Equipment

The Control Box is of mechanical type. The lever to control the Bridge is electrically locked, and release from a control on the signaller's panel at Coleraine. The black bezel of control 701 for the bridge is shown in figure 2.17 shown below. The Bridge has 3 detectors, two on the rails and one on the Bridge locking mechanism.

Figure 2.17 Release control Coleraine Signalbox

2.8.3 Condition of Wiring and Cables

No signs of degradation were noted.

2.8.4 Condition of Cable Routes and Trunking

The Control Box has a mixture of wood and modern trunking. It is difficult to carry out the correlation of wiring in some places because of the difficulty in gaining access to the trunking

2.8.5 Accommodation of Additional Equipment

There is very little spare accommodation for any new works in the Control Box.

Translink

Re-Signalling Coleraine - Londonderry

Outline Project Specification

A013730-SN-SG-RP-0004
April 2010

www.scottwilson.com

Revision Schedule

Outline Project Specification
April 2010

Rev	Date	Details	Prepared by	Reviewed by	Approved by
01	August 2009	First issue	**Ben Morris** Assistant Engineer	**Adam Allen** Principal Engineer	**John Keepin** Signalling Consultancy Manager
02	October 2009	Updated to EDR Comments	**Ben Morris** Assistant Engineer	**Adam Allen** Principal Engineer	**John Keepin** Signalling Consultancy Manager
03	February 2010	Updated with scope changes	**David Lowrie** Senior Engineer	**Adam Allen** Principal Engineer	**Tim Tumber** Associate
04	April 2010	Updated with GB Email comments 30-03-2010	**David Lowrie** Senior Engineer	**Adam Allen** Principal Engineer	**John Flippance** Principal Engineer

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Table of Contents

1 General

1.1 Brief Description of Project Background

Under the Coleraine to Londonderry re-signalling project several options are being considered to help modernize the route, reduce journey times and increase line capacity.

These options centre on a number of sites; particularly Londonderry, Eglinton, Castlerock and Coleraine. Each site is being developed as a separate site to aid option selection. The intention being that any site combination can be chosen by Translink in order to meet their ambitions financially and operationally.

The main changes that are proposed under this scheme are:

- To transfer control from Castlerock and Londonderry to a new PC based VDU system at Coleraine, making Londonderry and Castlerock signal boxes redundant.
- To provide train detection between Coleraine and Londonderry.
- To remove the passing loop and associated mechanical signalling at Castlerock and provide a new CCTV MCB and protecting signals.
- To signal Eglinton for an additional passing loop.
- Renewal of Londonderry interlocking area while future proofing the relocation of the station.
- Renewal of the Bann Bridge controls and transfer to the new PC based VDU system at Coleraine (funded separately).
- To recover the mechanical signalling on the Portrush branch and signal the line for “one train working”.
- To convert McConaghy’s UWG to an AHBC (funded separately).
- To provide MSLs at 11 UWC’s which have been selected because of there frequency of use.
- To provide telephones at the other 34 UWC and additional signalling to protect them. (funded separately).
- To modify existing level crossing striking in points and signal spacing for the new line speeds.
- To provide T.O.W.S at Downhill and Castlerock tunnels and Bann River Bridge.

This Outline Project Specification describes the signaling works necessary for the re-signalling of Coleraine to Londonderry. This is a feasibility report and is dependant on the options taken forward; there may be sections and comments that will no longer be applicable.

1.2 Notional Timescale for Project

The commissioning date is intended to be 2012/2013.

1.3 Resources / Competences Required

Client	Translink
CDM Co-ordinator	Translink
Principal Installation Contractor	TBA
Signalling Design	Scott Wilson Ltd.
Signalling Installation	TBA
Permanent Way Design	TBA
Permanent Way Installation	TBA
Civils and Structural Design	TBA
Civils and Structural Construction	TBA
Electrical and Mechanical Design	TBA
Electrical and Mechanical installation	TBA
Telecommunications Design	Scott Wilson Ltd.
Telecommunications Installation	TBA

Scott Wilson Ltd. is contracted for feasibility work only.

Contractors shall comply with the requirements of Network Rail Company Standard NR/GN/TEL/10117 - Competence Management Systems for Work on Control and Communications Systems, Issue 2 February 2006 and NR/SP/CTM/012 – Competence & training in Signal Engineering, Issue 1 December 2006.

Project Management for all the interfaces, design, installation, testing and commissioning to be controlled by the Principal Contractor.

1.4 Nominated Project Manager / Engineer

Sponsor/Development Manager (Overall)	Ruairi Savage	Translink
Translink Project Manager	Geoff Brown	Translink
Designated Project Engineer	Geoff Brown	Translink
Contractor's Engineering Manager	TBA	Scott Wilson Ltd.
Design Contractor's Project Manager	Ivan Wheaton	Scott Wilson Ltd.

1.5 Other Engineers Involved

Signalling Design	Adam Allen	Scott Wilson Ltd
Signalling Installation	TBA	TBA
Permanent Way Design	TBA	TBA
Permanent Way Installation	TBA	TBA
Civils and Structural Design	TBA	TBA
Civils and Structural Construction	TBA	TBA
Electrical and Mechanical Design	TBA	TBA
Electrical and Mechanical installation	TBA	TBA
Telecommunications Design	Jeremy Phelps	Scott Wilson Ltd
Telecommunications Installation	TBA	TBA

Scott Wilson names above are only relevant for feasibility work.

2 Overall Design Concept

Brief outline of site options.

Londonderry:

- Platform starting signals positioned to allow passive provision for Station reconstruction.
- Transfer of controls from Londonderry signal box to Coleraine.
- Upgrade of existing relay based interlocking and interfaced with new cabling and fixed telecoms network at Eglinton.
- Full train detection.

Eglinton:

- New passing loop to be provided and signalled - to include passive provision for future Park & Ride station.
- Relay interlocking controlled by Coleraine and interfaced to Londonderry.
- Full train detection.

City of Derry Airport:

- Relay interlocking to be re-controlled from Coleraine.
- Westinghouse S2 TDM system to Londonderry redirected to Coleraine.
- Full train detection.

Ballykelly

- Recovery of existing redundant signalling and wiring.
- Recovery of redundant equipment housings.

McConaaghy's:

- Convert existing UWG Crossing to an AHB Crossing (funded separately).
- Full train detection.

Bellarena:

- To be the location of a future passing loop and passive provision only is to be considered at this stage.

Magilligan:

- Relay interlocking to be re-controlled from Coleraine and interfaced with Bellarena.

- Westinghouse S3 TDM system to Castlerock redirected to Coleraine.
- Full train detection.

Castlerock:

- Transfer of controls from Castlerock signal box to Coleraine.
- Existing loop to be removed.
- Recovery of lever frame and mechanical interlocking.
- Level crossing to be converted to MCB with CCTV to Coleraine.
- Upgrade of existing relay based interlocking to provide for level crossing controls to be controlled from Coleraine signal box.
- Full train detection.

Bann River Bridge *(Related Project not directly part of this scope of work).*

- Recovery of manned Control Box.
- Upgrade of existing relay interlocking to include the replacement of mechanical control arrangement.
- CCTV and Phone system to Coleraine may be necessary.
- Transfer controls to the new PC based VDU system at Coleraine.

Coleraine:

- Recovery of N-X panel.
- New PC based VDU system**.**
- Remote control of the Bann River Bridge outstanding – potential hazards to be resolved.

Portrush:

- Recovery of the mechanical signalling.
- Re-signalling for “one train working”.

2.1 Design Parameters and Assumptions

The arrangements for the project are depicted on a series of Signalling Scheme Sketches C0363-LY-CE-DG-0001 – 0010 Rev02. Signalling and Operational Telecommunications systems Network Rail company code of practice NR/GN/SIG/11600 (formerly RT/E/C/11600) outlines retrospective safety work that should be considered when undertaking alterations to the existing infrastructure. No non safety retrospective work should be undertaken unless explicitly specified by Translink.

2.2 Acceptability of Risk from Proposed Track Layout and Mitigation

New track layouts between Coleraine and Londonderry are subject to a Risk Assessment in accordance with GI/RT7006 and GI/GN7606 “Prevention and Mitigation of Overruns” along with the requirements of NR/L2/SIG/14201 “Prevention and Mitigation of Overruns - Risk Assessment of Signals” and NR/GN/SIG/14202 “Guidance on Prevention & Mitigation of Overruns – Risk Assessment of Signals”.

2.3 Draft Staging and Testing Strategy

The project requires alterations to the Coleraine signal box, substantial alterations of TDM remote control systems, several upgraded relay interlockings, alterations to existing infrastructure, and the provision of new lineside infrastructure. The testing strategy will include testing “Off Line” as far as reasonably practicable to minimise the disruption to the working railway.

Testing shall be conducted in accordance with NR/GN/SIG/11730 “Signalling Works Testing” and GK/RT0209 “Testing and Commissioning of Signalling and Operational Telecommunications Systems”. A testing strategy will be submitted as part of the concept design documentation.

Construction and implementation stagework strategies will be developed in liaison with the design implementation Contractor as the project proceeds. Any proposed enabling stagework should be fully justified on the grounds of a reduction in commissioning time or project risk. Implementation of these works shall take into account the possessions available within Rules of the Route, and any other works planned to be delivered in the area.

A Test Plan for the works will be provided by the implementation Contractor and shall be submitted to Translink for approval. The Test Plan will be prepared and all testing activities conducted with reference to the Testing Strategy and Network Rail Signalling Works Testing suite of standards, as well as the manufacturer’s documentation for any specific equipment to be used. Testing Strategies/Testing and Commissioning Plans must be approved for use by Translink at least 10 days prior to commencement of any testing.

The use of SMTH procedures and/or generic design may be proposed for staging or temporary works where such use can be shown to be robust, appropriate and cost effective.

2.4 Application Standards Declared

All works on this scheme will be compliant with national, European, UK, CDM and Health and safety Regulations, as well as ORR Railway Principles and Guidance, Railway Group and Network Rail Company Standards.

Railway Group Standards Issue 1, February 2010 and Network Rail Company Standards Issue 74, 5th December 2009 – 5th March 2010. New/revised standards issued after this date will be reviewed and, where required, implemented (following agreement through change control with Translink) or a TNC/derogation will be sought in accordance with NR/SP/SIG/11201.

All design shall take into account any other local instructions and procedures supplied by Translink.

2.5 Anticipated Non-Compliance with Current Standards

The designated Responsible Engineer for each discipline shall be responsible for specifying and ensuring that appropriate standards are complied with. Any non-compliance will be actioned in accordance with NR/SP/SIG/10071 and recorded in a register created for this purpose.

Every effort shall be made to ensure that the number of non-compliances raised is kept as low as possible. At this stage, no non compliances are anticipated.

2.6 Train Operating Requirements

The Class of trains operating on the Belfast to Portrush/Londonderry line are:

- CAF3000 (typical 3-car but 2 x 3-car do operate within the area)
- Class 450 (typical 3-car units)
- New Trains Two

No alteration to the type of rolling stock is planned under this scheme. It is the aspiration of this project to reduce journey time and eventually to increase service to 2 trains an hour.

2.7 Dependability (RAMS) Requirements

The alterations to the system will be designed in accordance with guidance contained in BS EN 50126 and Group and Company Standards. The proposed design shall not introduce a level of reliability less than that of comparable equipment on Translink's Infrastructure.

Every opportunity for RAMS improvement will be taken including but not limited to the use of LED signals, plug couplers for points, and disconnection boxes for track circuits. In other cases designers shall endeavour to use the equipment types already in use in the area wherever practical, hence reducing the need for additional spares and for training of the maintainer.

2.8 Operational and Maintenance Requirements

CDM Regulations are applicable to this project and designers shall consider the 'maintainability' & operational requirements in the event of failure of all systems/equipment installed. The scheme plan will be subject to Operational Review.

Specific operational and maintenance aspects are to be considered in the design of the project in particular those relating to Staff Safety:

- Safe Cess Walkways.
- Provision of Driver's Walkways to SPTs.
- Safe Cess access routes to all operational equipment.
- Positioning of location cases to permit access without being "on or near the line"
- Taking "touch potential" into account.

- Provision of REBs such that Foot and Vehicular access is available without being "on or near the line" wherever possible.

For all engineering disciplines the equipment and materials installed as part of this project will be of types already in use on this part of the Network. Only type-approved equipment will be used. The additional equipment will increase the maintainer's workload.

2.9 Vandalism Protection

Translink shall determine the level of vandalism protection to be provided as part of these works. As a minimum all signalling equipment shall be positioned on the railway side of the boundary railings and fencing. Padlocks shall be fitted to all lineside signalling equipment and housings. The Signal Sighting Committee is to recommend any additional vandalism protection measures to be adopted for fixed signals and associated equipment.

Any loose equipment left on the lineside in association with the construction activities on this project shall be secured to protect against vandalism and damage to the operational railway. All redundant or scrap materials shall be removed from the site in a planned and expedient manner. A safe environment shall be provided at all times.

2.10 Safety Assurance Required

The Principal Contractor and, where required, the Designer, shall undertake all works associated with this project in accordance with European and UK legislation (including the requirements of the Transport and Works Act 1992), Network Rail standards and safety policies and conditions of contract. Railways and other Guided Vehicles (Safety) Regulation 2006, HSE Railway Inspectorate (RI) Railway Safety Principles and Guidance and Railway Group and Network Rail Company standards, rules, procedures and instructions, EN and BS standards shall apply to the project.

2.11 Scheme Approvals Required

All Scheme Approvals required for this project shall be obtained in accordance with Network Rail Company Standard Specification NR/SP/SIG/11201 (formerly RT/E/S/11201). Under the terms of this standard, Translink is responsible for obtaining statutory approvals.

2.12 Product Acceptance Required

It is currently envisaged that only type-approved equipment shall be used for this project. Any requirement to adopt non-type approved equipment shall remain under continuous review during the life of the project.

2.13 Other Items

Not Applicable

3 New Systems / Equipment

3.1 Type of Interlocking

The single line between Coleraine and Londonderry is served by 2 main free-wired relay interlockings situated at Londonderry and Coleraine, with additional free-wired relay interlockings at Magilligan and Castlerock for the manually controlled level crossings, and also a small relay interlocking for the City of Derry Airport.

Londonderry Relay Room is the oldest relay interlocking having been built in the mid 70's.The other Relay Rooms date from 1989 to around 1993. All interlockings appear to be well-maintained and can accommodate minimal alterations however large changes, particularly involving additional cable and wiring, may be difficult to accommodate.

It is proposed that the existing RRI is maintained and where necessary upgraded to meet the operational and functional requirements of present relay interlocking standards. This will see. an upgrade to the relay interlocking at Castlerock for the level crossing controls,,at and at Londonderry to replace the ageing relay room. Coleraine existing relay interlocking will remain unchanged as an interface at Eglinton. These upgraded RRI interlockings will be compatible with the existing Westinghouse TDM systems .

At Londonderry a new a new location will be provided to accommodate any additional controls and wiring. This will be positioned near the proposed passing loop with cables being taken back to the existing platforms to serve the remaining signals and for train detection.

The relay interlocking at the City of Derry Airport is relatively new and will remain. Control will be transferred to Coleraine. There is no requirement to interface this interlocking with adjacent interlockings as its principle of operation is based on that of a level crossing.

3.2 Control and Indication Systems

There are significant alterations to the control and indication systems associated with this project. Londonderry and Castlerock signal boxes are to be recovered with their controls and indications being relocated to Coleraine.

Currently Coleraine is centred around a combined NX Panel however in order to facilitate the removal of the signal boxes at Londonderry and Castlerock a PC based VDU system shall be installed. This change will see Coleraine becoming the central point of control and communication for the lines to Londonderry and Portrush – covering most of the North West of Northern Ireland.

The Train Describer will be included as part of the new VDU system, currently a Westinghouse S3 TDM system carries the Train describer information, this will become redundant. A separate system will be provided for the CCTV. The various level crossings which are affected under this scheme will be catered for at Coleraine Signal Box with separate systems that will not be part of the VDU system.

Controls and indications for Coleraine Interlocking are hard wired to the NX Panel. The VDU system will need to be interfaced with the existing interlocking at Coleraine, Interfacing the VDU system to the other proposed Interlockings under this scheme should not require separate

interfacing. With the large 'dog-leg' panel removed there will be ample space necessary for the new VDU system.

3.3 Remote Control Systems

A Siemens Simatic PLC serves as a panel processor at Coleraine the controls and indications between Coleraine Signal Box and Ballymoney, Killigan, Ballymena, and Coleraine interlocking are carried by Westinghouse S2 TDM systems. A Westinghouse S2 TDM system is also in place between Londonderry Relay Room and The City of Derry Airport. A Westinghouse S3 TDM system serves between Magilligan MCB and Castlerock Signal Box. A range of Siemens Simatic products carry the controls and indications to Coleraine.

From the new VDU system at Coleraine information will be transmitted over new optical fibres to the various sites. The existing Westinghouse S3 TDM between Magilligan and Castlerock will be redeployed between Magilligan and Coleraine; it is likely that it will be transmitted over a new fibre optics cable.

Please see Appendix 2 for a sketch of the alterations to the remote control systems.

The new separate interlockings are to be networked using the interlockings vital and non-vital serial communications modules which will carry the controls and indications between the various interlockings and Coleraine. The existing TDM systems will need to be assessed and modified accordingly for the additional controls and indications provided as a result of this work.

3.4 Interlocking Interface

There will be a requirement for new interfacing between the proposed new site layouts at Eglinton and existing relay interlockings. Any new logic controllers should easily be able to interface with traditional relay based interlockings.

This interface unit will also work as the interface between Coleraine Relay Interlocking to the new VDU control and indication system at Coleraine.

3.5 Data Preparation

Data preparation will be required for:

- Control and Indication system, including the Train Describer - see section 3.2 & 3.20
- Customer information system

3.6 Signals, AWS, TPWS, ATP, etc.

Main signals are to be mainly two and three aspect single-aperture Dorman LED type

The new and altered signals will be assessed for TPWS to comply with NR/GN/SIG/00028 (General Guidelines on Train Protection & the Provision of Signalling). Indication of TPWS failures shall be provided under the new VDU system at Coleraine where possible.

New signal structures shall be designed in accordance with current Health and Safety legislation and standard drawings. This shall permit safe cleaning of all front lenses and plates.

Straight post structures shall be used where practicable. Network Rail's Civil Engineering processes will be followed for all structure design and construction approval.

Where specifically identified by Translink, ladders to new signal structures shall be provided with lockable access to prevent use by unauthorised persons. New permissible speed indicator signs shall be provided where this scheme calls for a change in the running line speed. The signs are all subject to agreement by the Signal Sighting Committee.

The proposed signalling arrangements are depicted on the signalling scheme sketches C0363-LY-CE-DG-0001 r02 sheets 1-10.

3.7 Train Detection

3.7.1 Method of Train Detection

With the removal of Londonderry and Castlerock signal boxes, electronic token block working is not possible. New train detection shall be achieved by either axle counters or DC track circuits.

At present the line is operated through a mixture of signal box controlling station areas and block working supported by Track Circuiting. Where track circuits exist today at Level crossings and in station areas these shall remain and be indicated to the signaller at Coleraine. Additional DC track circuits will operate between these existing sites of track circuiting. in addition, DC track circuits shall be provided for the Non-Block signalling.

New or altered track circuit connections shall be provided with disconnection boxes and duplicated track circuit leads.

A report has been compiled presenting the differences and benefits of both types of train detection. Details can be found in Report A013730-SN-SG-RP-0003 'Train detection in Coastal Areas'.

It is envisaged that due to the benefits of both types of train detection, axle counters shall be installed where appropriate and this shall be the subject of a separate review.

3.7.2 Bonding

Alteration to existing track circuits bonding shall be in accordance with Group and Company standards. Where problems are discovered with the existing track circuit bonding configuration, Translink shall be informed.

3.7.3 Track Circuit Interrupters

It is not currently proposed to provide Track Circuit Interrupters at any of the sites affected under this scheme.

3.7.4 Stainless Steel Strip

It is not currently proposed to provide stainless steel strips at any of the sites affected under this scheme.

3.8 Point Operation and Detection

The new points operating mechanisms shall be HW1000 machines. Independent detection relays for each end shall be provided at the controlling location.

Cable connections to the points machines shall use standard plug coupler style connections.

Points numbering will fit within the existing numbering sequence in the locality. For multiple ended points, the end furthest in the Down direction shall be the A end, with further ends identified alphabetically in the Up direction. This will maintain consistency with other multiple ended points in the locality.

Trap points shall be installed where full signal overlaps cannot be achieved within a loop. However, the sketches show arrangements that do provide such overlaps.

Refer to section 3.26 for details of the power supply for points heaters.

3.9 Hot Axle Box Detectors

Not applicable.

3.10 Fringe Box Interfaces

Coleraine signal box interfaces to the south with Antrim, controlled from Belfast signal box. There is no change to this interface as a result of this work.

3.11 Level Crossings

There are around 43 User Worked Crossings which are affected by this scheme and due to proposed increase in line speed and existing deficiencies it is proposed that 11 of these, generally the more frequently accessed, are to be upgraded to Miniature Stop Lights and will use Level Crossing Predictor Technology where possible. Whilst the remainder are to be protected with additional non block signals and telephones connected to Coleraine Signal box.

Magilligan MCB Crossing will no longer be controlled from Castlerock and will be taken in under the new system at Coleraine. This will require a minor alteration at Magilligan to cater for this, this alteration should be small enough to done using BR930 relays rather a separate modern interlocking addition. Magilligan CCTV transmission system will have to be upgraded. The current Philips system is no longer supported.

The MCB level crossing at Castlerock is currently controlled from the signal box and relay interlocking and in future this will be controlled from Coleraine. The crossing will require a CCTV system to Coleraine.

All AHB strike in points will need to be re-calculated and altered for the increase in line speed under this project. It is the aspiration of Northern Ireland Railways to modify all Automatic Half Barrier Crossings to interface with Coleraine VDU control system.

The existing McConaghy's UWG Crossing is to be replaced with an AHB Crossing and will interface to the existing relay base interlocking.

3.12 Type of Relays

All new relays shall be BR930 series where required for small alterations to existing relay interlockings.

3.13 Signalling Power Supplies

New Distribution Network Operator (DNO) supply points for signalling power supplies are to be provided at key locations and distributed along the railway at 650v. Signalling supplies will be guaranteed by means of battery and generator backup, or other dedicated Uninterruptible Power Supply. It is believed that Existing sites of signalling equipment have suitable power supply arrangements and sufficient capacity to cater for any new work.

Existing power supply arrangements must be appropriately assessed as to their compliance with current standards and its capacity to cope with the proposed alterations.

3.14 Data Transmission

The RRI system must be capable of data transmission for a number of different applications. This will include vital Parallel Outputs and Inputs to provide interfaces to signalling equipment. Vital serial communications to provide serial interfaces to other interlocking and vital systems, such as existing Westinghouse S3 TDM systems. Non-vital serial communications should be possible to provide a means of linking to the new PC based VDU system at Coleraine Signal Box.

Vital and non-vital serial communications will operate over a new fibre optic SDH transmission network as proposed within Telecommunications Project Design Specification A013730-SN-SG-RP-0005. It is proposed that the SDH transmission network shall have a diverse route back to Coleraine Signal Box via a Public Telecommunications Operator (PTO) link. In addition to the resilience offered by the physical and geographical routing of data circuits, another level of resilience is offered by the SDH transmission network due its protection switching capability, inherent in the SDH hardware.

Existing TDM systems are required to be assessed and modified accordingly, to allow re-control from Coleraine Signal Box and for the additional controls and indications provided as a result of this work.

3.15 Cable Routes

New buried cable route ducting will be provided along the entire length of the Railway between Coleraine and Londonderry. This shall have at least 30% spare capacity. No surface concrete troughing shall be provided. This buried ducting will carry all new lineside cables required; this is likely to be a mixture of Power, Fibre Optics, and a small amount of multicore cable.

Alterations at Magilligan and Coleraine relay interlockings may be difficult because of the minimal amount of capacity available for additional wiring and cables.

It is proposed to use available spare conductors in existing multicore cables where a minimum of 10% spare conductors will remain. Prior to use, existing spare conductors will be tested to ensure compliance with relevant cable standards. Any cables that are found to fail the test shall be replaced.

All new cables routes shall be in accordance with NIR specification I-SG-IMP-SPEC-001 Issue 2. No new orange pipes shall be used on this scheme. Axle Counter or Track Circuit connection leads may be fastened to the sleepers. All new signalling and power cables used for this project shall conform to the requirements contained within Network Rail Product Specification NR/PS/SIG/00005 and the PADS approved cables list. In addition all power cables shall be to NIR specification I-SG-IMP-SPEC-002 Issue 1.

3.16 Ground Frames

Not applicable.

3.17 Reversible Working / Block Circuits

At present the line is operated through a mixture of signal box controlling local station areas and electric token block working between these signal boxes. The aspirations of this scheme are to provide train detection along the single line between Coleraine and Londonderry. Axle counters are likely to be employed as an additional method of train detection. Providing track circuit block working will make the Tablet machines between Coleraine, Castlerock, and Londonderry redundant.

3.18 Staff Warning Systems

Translink shall provide information to Design and Construction contractors concerning existing Staff Warning systems.

With the removal of Bann bridge control box it is recommended that a form of an automatic staff warning system be put in place in addition to any CCTV coverage.

3.19 Train Operated Warning System (TOWS)

A TOWS shall be installed at the locations of Downhill and Castlerock Tunnels and at Bann River Bridge. They shall be permanently installed systems with fixed warning units and control switches at each end. The TOWS and its installation shall be compliant with GK/RT0029.

3.20 Other Systems

3.20.1 Remote Monitoring

The upgrade RRI should be capable of supporting interfacing to new and existing condition monitoring systems. It should be possible to remote monitor this information from Coleraine.

Passive provision shall be made for the remote monitoring of point heating equipment.

3.20.2 Customer Information Systems

Alterations to customer information systems may be necessary to cater for new stations, altered platforming and changes to services.

3.21 System Interfaces / Interfaces with Existing

Systems that need to interface to the proposed PC based signalling system may require alteration. This may include the existing relay based interlockings which are to remain under this scheme.

A small existing interlocking will be required at Coleraine in order to act as an interface with Eglinton. This serves as a TDM system prevents multicore cable being necessary between interlockings.

3.22 Equipment Housing

New lineside signalling equipment shall be housed in new standard location cases or REBs. A site survey is required for positioning, siting and access arrangements.

Enabling works may be necessary prior to work starting. This may include several data transmission alterations.

New REBs shall be provided where more than three new location cases would otherwise be required in a suite, subject to space, ground conditions and access. There is insufficient space available for new relay racks, extra cable rows and additional fusing in many of the existing REBs. Consequently new REBs shall be provided wherever required; namely, Londonderry, Eglinton, Castlerock, and Coleraine.

Where new location cases are required, these will be of stainless steel construction and shall be fitted with heaters and internal lighting. A clear plastic wallet, opening sideways, shall be attached to the inside of one door for the storage of test record cards. A drawing holder shall be provided, fixed within the case, unless alternative arrangements are agreed with Translink.

Where possible, any new location cabinets shall be sited at least 3 metres form the nearest running rail, with individual cases arranged in “toast rack” style and shall be marked with a description of their contents on both ends, in accordance with the requirements of NR/GN/SIG/11821 “Siting Requirements for Lineside Apparatus Housings” Issue 1, August 2000, and NR/GN/SIG/11210 “Signalling Installation” Issue 1, August 2000.

If there is no earth provided for an existing location and a new case is to be provided for new equipment, then this shall be positioned a minimum of 2.5 metres away from existing cases to allow for the provision of an earth cable direct from the nearest DNO earth, if a satisfactory local earth cannot be achieved.

See section 4.3 for correlation requirements.

3.23 Operational Buildings

Coleraine Signal Box is situated on the Up side of the Antrim to Londonderry and Coleraine to Portrush lines and is of brick and wood construction. The control is via a combined control and indication NX panel. There is sufficient room within the signalbox for the installation of pc based control and indication system. The light from the large amount of glass in the signalbox may have to be reduced by shading / shielding to provide the appropriate light conditions to view the pc screens.

Coleraine signal box will be upgraded from an NX Panel to a PC based VDU system.

Castlerock Signal Box is situated on the Coleraine to Londonderry Line adjacent to the Sea Road MCB crossing and is of brick and wood construction. Its function is to safely control train movements in the local area and the single lines to Coleraine and Londonderry. The signalbox also monitors the AHB crossings at Carrowreagh, Bellarena, Duncrum East & West, Clooney, Umbra and Barmouth.

The box is extremely cramped with equipment sited on a "wherever possible" basis. A wall mounted colour CCTV monitor has been added to allow the Signalman to have sight of a blind spot on the crossing. A Train Describer monitor is mounted alongside on the wall. The Controls and monitors for Magilligan CCTV controlled crossing are on a table in the corner. The local MCB controls are located on the side of a cabinet alongside a window.

Castlerock signal box will be made redundant and recovered under this scheme.

Londonderry Signal Box is located on platform 1 at Londonderry Station. Its function is to safely control train movements in the local area and to and from the single line to Castlerock.

In addition to the signalling control panel there is a secondary panel mounted alongside. This separate control and indication panel has been added to the signalbox to interface with the City of Derry Airport.

Londonderry Signal Box will also be made redundant the level of recovery is still to be confirmed, it is likely that the building itself will remain.

In addition to the 3 working signal boxes, the is also the Bann River Bridge Control Box which is located on the line between Coleraine and Londonderry, approximately 800 metres north of Coleraine Signal Box. Its function is to control the movement of the Bann River Swing Bridge. It has very limited accommodation but is well lit.

Under a separate but related project the Bann River Bridge Control Box will be made redundant and recovered.

3.24 Operational Telecommunications

New SPTs to Coleraine Signal Box shall be provided for all new signals.

Points zone telephones are to be provided where appropriate.

Platform and Level Crossing telephones to Coleraine shall be provided where necessary.

Further details on the Telecommunications requirements for Coleraine – Londonderry re-signalling can be found in the Project Design Specification A013730-SN-SG-RP-0005.

3.25 Changes in Electrification

Not applicable.

3.26 Changes in Permanent Way

The Permanent Way engineer will develop the track design specifications centred around works including, but not limited to:

- New Loop at Eglinton
- Recovered Loop at Castlerock
- New track layout at Londonderry

3.27 Changes in Civil Engineering

The following civil engineering works will need to be designed and implemented by the project:

- Cable Routes
- Signal Structures including bases
- Location case and REB bases
- Walkways
- Drainage systems
- Stations including Platforms alterations

3.28 Changes in Power Supplies (Other than Signalling

The Electrical & Plant engineer will develop general power supply requirements including, but not limited to:

- Building supplies
- Station lighting
- Operational supplies (points heating, buffer stop lamps)
- All interfaces with DNO supplies

For signalling supplies, refer to section 3.13.

3.29 Changes in Rolling Stock

The New Trains Two fleet will begin operating on the line. These will be the next set of trains to be procured by Translink.

4 Existing Systems / Equipment

4.1 Hazards from Mixing old and New Technologies

All alterations and additions will use technology consistent with that in currently in existence. Specifically PVC insulated wire must not be intermixed with rubber insulated wiring within interlocking and location case equipment housing.

4.2 Sufficient Space / Power / Heat Dissipation for Additional Equipment

New location cases will be provided where there is insufficient space to accommodate equipment in existing cases – to be verified during wiring correlation. It is not anticipated that the changes will present problems with heat dissipation. Further assessments shall be undertaken during the detailed design stage.

4.3 Correlation Required

A correlation assessment shall be carried out at the detailed design stage, of all existing wiring and circuits in accordance with NR/GN/SIG/11115 (formerly) RT/E/C/11115.

Further to the correlation assessment onsite, a written correlation report shall be produced by the design contractor, and shall be submitted to Translink before design alterations take place.

4.4 Condition of Existing Infrastructure

A preliminary Asset Condition Report A013730-SN-SG-RP-0002 has been produced by Scott Wilson Ltd. this gives an initial assessment on the key sites of the existing infrastructure.

A condition assessment survey in accordance with NR/GN/SIG/11116 (formerly RT/E/C/11116) shall be carried out, at the detailed design stage, to further determine the condition of the existing signalling infrastructure.

4.5 Cable and Wire Insulation

Wire condition is satisfactory and there appears to be no issues with wire degradation.

For further details please see Asset Condition Report A013730-SN-SG-RP-0002.

4.6 Renewals Avoided / to be Carried Out At the Same Time

Not applicable.

4.7 Recoveries / Systems to be Decommissioned

There are a number of recoveries to be undertaken as part of this scheme.

It has already been stated that Londonderry & Castlerock Signal Boxes will be recovered. It is likely that the signal box at Londonderry will remain while Castlerock signal box will be taken down.

Another area of extensive recoveries will take place at Portrush. Portrush signal box is no longer used with the 'one train working' arrangements operating from Platform 1. The extent of the recoveries will be specified by Translink but it is likely to include the recovery of the signal box and all redundant track work, semaphore signals, and point rodding. This is only an initial assessment and much of the work done will depend on Translink's future plans for the development of Portrush.

Prior to completion of signalling works, all signalling equipment, cables and wiring made redundant by the works will be fully recovered from site (subject to risk assessment). Redundant materials awaiting disposal from site shall be stored in a suitable area so as not to disrupt work on site, cause problems with fire access routes or cause a hazard to the public or railway staff. Materials must be stored to ensure they are not accessible to vandals.

Redundant cables must be removed from the cable duct where practicable, in particular from UTXs. Any cables that are not to be recovered shall have their ends permanently capped and sealed.

Due to the age of the buildings, a risk assessment will need to be carried out to assess whether there is a risk of asbestos being present at any signal boxes which are to be demolished. Any such material should be handled and disposed of in accordance with government regulations.

The contractor shall submit to the Principal Renewals and Enhancements Engineer a schedule of reusable equipment belonging to Translink, and shall ensure that these items are returned to Translink or other organisation designated by the Principal Renewals and Enhancements Engineer.

Special control measures governing the installation and recovery of new and redundant wiring shall be recorded in the Testing Plan where this is found to be necessary following a survey of the asset condition.

4.8 Published Restrictions

The Principal Contractor will be informed by Translink of any prohibition notices that are in force in the area affected by this project. In addition the Principle Contractor shall refer to any available Hazard directories.

The sectional appendix will require to be updated to show the changes in permanent way layout and the alterations will need to be published in the appropriate notices.

5 Implementation / Hazards

5.1 Interfaces with Other Projects

5.1.1 Overview

It is not believed that potential conflicts with signalling records will arise from any projects in the area.

Should conflicting works overlap with this project, the methods of control to mitigate hazards arising shall be identified and recorded in the Signalling Design Specification for this project.

5.2 Occupational Safety Hazards

The Management of Health and Safety at Work Regulations 1992 and CDM Regulations 2007 shall apply to this scheme. The principal CDM positions are as follows:

Client:	Translink
Principal Contractor:	TBA
Designer:	TBA
CDM Co-ordinator:	Mott Macdonald

A Health & Safety plan and Method Statement as appropriate will be required for all signalling and telecomms correlation, construction and testing activities to be undertaken on site. Special precautions to satisfy COSHH regulations will be detailed in the H&S plan.

This scheme will involve work on or near high voltage equipment; the Electricity at Work Regulations 1989 shall apply.

Anticipated scheme hazards include moving plant and equipment, buried services and rail traffic.

Detailed design will take into account any options and arrangements to facilitate the safe operation and maintenance of the infrastructure.

All hazardous substances are to be handled and disposed of in accordance with Railway Group and Network Rail Company Standards, COSHH regulations, Environmental Protection Act 1990 and any other applicable regulations or codes.

5.3 Environmental Factors

All waste systems arising from this project will be removed from site and disposed of at a licensed facility in accordance with the Environmental Act 1990 and Translink Environmental Policy. Waste management documentation will be retained by the main contractor and will be made available to Translink on request.

If there are PCBs in the work site, Translink shall be notified and all project site personnel shall be informed using project safety management procedures.

The project team shall familiarise themselves with the requirements from the Noxious Weeds Act 1959 and Wildlife & Countryside Act 1981, and they shall report to Translink any instances where such vegetation exists.

The Principal Contractor shall ensure that in particular buildings, structures and equipment shall not be positioned close to private residences beside the line. The Principal Contractor shall advise Translink of any sites where it is considered that this is not achievable.

The Principal Contractor shall comply with the project's Environmental Management Plan and with Network Rail Company Standard NR/SP/ENV/015.

5.4 Electromagnetic Interfaces Strategy / Report Required

All equipment installed by this scheme shall comply with the Electromagnetic Compatibility Regulations 1992 and EU Directive 89/336/EEC (as amended).

The works associated with this project will not introduce new electrical interfaces, and therefore EMC is assured and an EMC report will not be necessary for these works.

5.5 Site Surveys / Signal Sighting Required

5.5.1 Site Surveys

The following surveys shall be carried out as part of this scheme:

- correlation and asset condition of affected infrastructure
- correlation of signalling and location plans
- signal sighting survey
- cable route survey

Other surveys to be developed as required

5.5.2 Signal Sighting Required

Signal Sighting activity (including representatives of Translink Ops/TOCs/FOCs) will be required for all new and modified:

- Signals.
- Speed Signage.
- Signal Post telephones.
- Point Zone telephones.

The Chairperson will also need to be consulted on sighting forms for all new location cases.

The Principal Contractor shall undertake a Track/site safety audit, Translink shall specify site access.

5.6 Installation and Testing Staff Logistics

All works shall be tested in accordance with NR/GN/SIG/11730, Signal Works Testing or, where appropriate, NR/GN/SIG/11740, Signal Maintenance Testing, where such use (e.g. for staging or temporary works) can be shown to be robust and cost-effective.

For Signal Works Testing, the requirements of NR/SP/SIG/14001 (formerly NR/SP/SIG/14002, NR/SP/SIG/14003 and NR/SP/SIG/14004 shall also be complied with.

5.7 Site Accommodation (During Works)

Facilities will be provided in accordance with the Construction and Welfare Regulations 1996 and NR/L3/INI/CP0036.

5.8 Possessions, Red Zone Working

The Principal Contractor shall produce a stagework strategy which will give details of blockages required for all stagework prior to the commissioning. Possession requirements will be progressed and developed when the stagework strategy has been finalised.

The main Signalling commissioning and signalling support of Civil Engineering activities will be outside Rules of the Route possessions. The possessions required for the works will be submitted to Translink in advance.

Where possible the works shall be arranged so that required possessions are within the NIR Rulebook constraints using a safeguarded Green Zone as the preferred method of working. Where this is impractical working arrangements subject to RIMINI planning procedures will be used.

5.9 Testing Requirements

Testing activities will include:

Factory acceptance testing of the VDU system

Alteration to the TDM remote control system (in no-train periods)

Pre-testing interlocking and lineside infrastructure

Stagework to install track work

Principles testing of the altered signalling system and commissioning. Multiple commissioning are envisioned using controlled “break ins”.

Testing shall be conducted in accordance with NR/GN/SIG/11730 ‘Signalling Works Testing’ and GK/RT0209 ‘Testing and Commissioning of Signalling and Operational Telecommunications Systems’. A testing strategy will be submitted as part of the concept design documentation.

Construction and implementation stagework strategies will be developed in liaison with the design implementation Contractor as the project proceeds. Any proposed enabling stagework should be fully justified on the grounds of a reduction in commissioning time or project risk.

Implementation of these works shall take into account the possessions available within NIR Rulebook, and any other works planned to be delivered in the area.

A Test Plan for the works will be provided by the implementation Contractor and shall be submitted to Translink for approval. The Test Plan will be prepared and all testing activities conducted with reference to the Testing Strategy and Network Rail Signalling Works Testing suite of standards, as well as the manufacturer's documentation for any specific equipment to be used. Testing Strategies/Testing and Commissioning Plans must be approved for use by Translink at least 10 days prior to commencement of any testing.

A Tester in Charge (TIC) shall be nominated for these works and shall be subject to acceptance by Translink's Designated Project Engineer.

The use of SMTH procedures and/or generic design may be proposed for staging or temporary works where such use can be shown to be robust, appropriate and cost effective.

5.10 Training Requirements (Operational and Maintenance)

Translink staff will be given training by the Principal Contractor, identifying infrastructure changes and new equipment where appropriate.

The project shall be responsible for the provision of information necessary for the introduction and safe operation of trains into and out of the new platforms, in conjunction with Translink Production.

5.11 Long Lead Equipment

The signalling contractor shall identify items that are expected to be long lead. These shall be procured sufficiently early to ensure availability for the construction and testing phase of the works. Items that should be considered for advance procurement are:

- TDM equipment
- Signal heads and route indicators
- Signal structures
- Signalling relays
- Signalling cables
- Axle counter equipment (if specified)
- Location cases / REBs
- TPWS equipment
- TOWS

5.12 Spares Requirements

The project in conjunction with Translink shall identify any additional spares requirements. The works involved with the project do not significantly add to the quantities of existing equipment in this area.

After the final commissioning, a minimum of 10% spare cores shall exist in cables affected by this scheme. A minimum of 20% spare cores shall exist in any new cables provided by this scheme. Should this not be possible, the Designated Project Engineer is to be informed of the cables involved and the revised spare capacity and their agreement to this sought prior to final design. This requirement shall not apply to cables renewed due to the provision of a new UTX.

5.13 OPS Change Control

This OPS will be fully version controlled in the format “x.y”. This will be incremented with each issue, where “x” indicates the version submitted for approval and “y” any minor amendments (typographical errors, update to comments, etc.) not requiring re-submission.

Should any changes to the project be identified following formal approval of this OPS by Translink, a revised OPS will be distributed, in line with NR/GN/SIG/11110 “Outline Project Specifications (OPS) for Signalling Schemes”, Section 6. All alterations shall be highlighted by sidebars.

5.14 Other Items

5.14.1 Source Records

All design will be produced in accordance with GK/RT0207 “Signalling Design” and NR/GN/SIG/11710 “Signalling Design Handbook”. The methodology used will be fully compliant with NR/GN/SIG/11701 “Signalling Design: Production Guidance”.

Source records will be updated or redrawn from correlation as appropriate. New sheets will be A3 size, CAD generated, in Bentley Microstation (.dgn) format, using standard cell libraries and to current design principles. The two-drawing method shall generally be adopted for the production of alterations. In line with NR/GN/SIG/11701 Part D Section 3.1, the one-drawing method may be used for index sheets where appropriate.

Source and master records shall be returned to the records custodian within six weeks of final commissioning, once they have been updated to testing comments, and maintenance copies of affected locations and affected sheets of relay rooms issued.

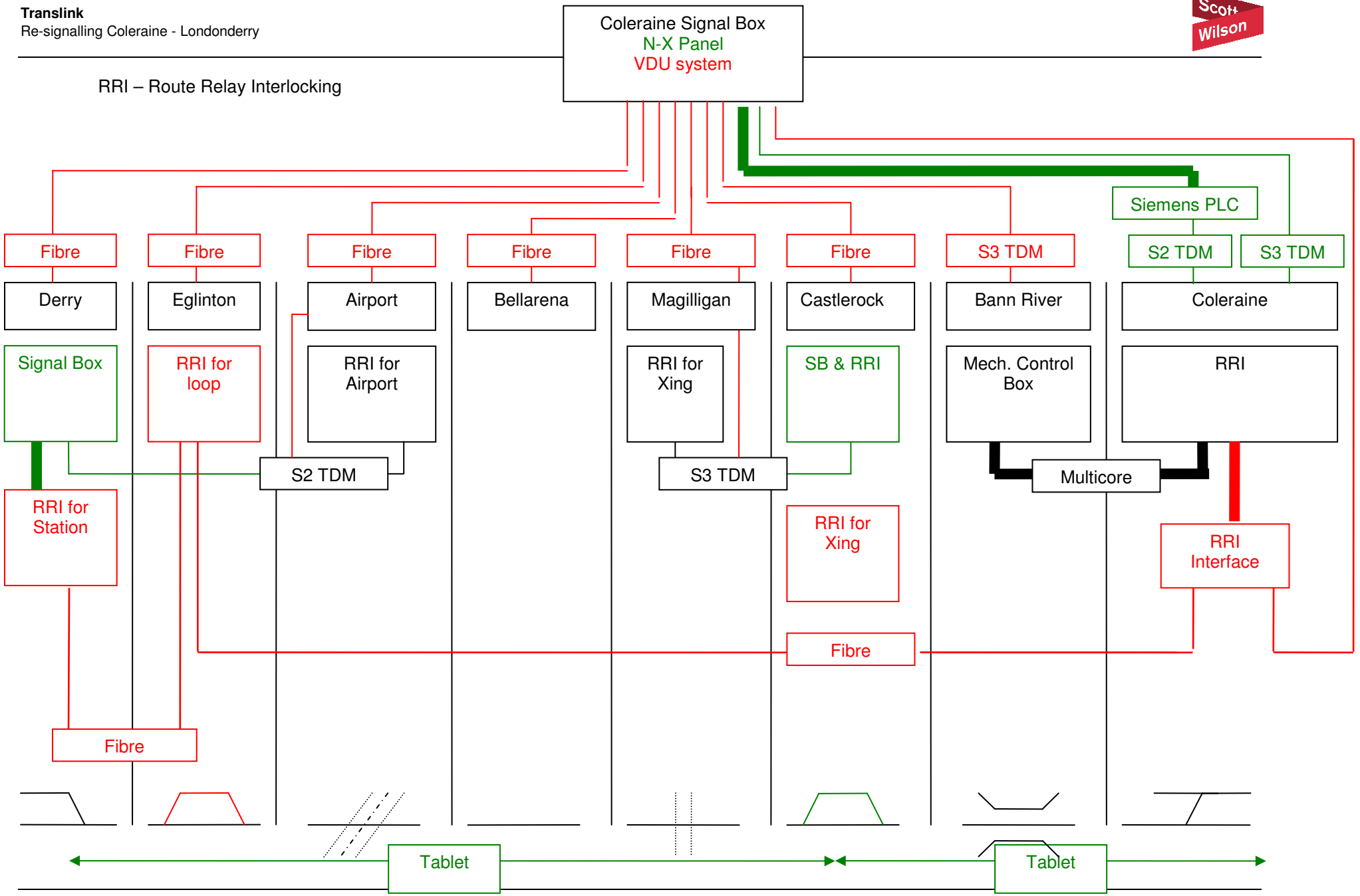
APPENDIX 1 –
CHECK LIST FOR OPS CONTENTS

		Included	Not Applicable
1	**General**		
01	Brief Description of Project and Background	√	
02	Notional Timescale for Project	√	
03	Resources / Competences Required	√	
04	Nominated Project Manager / Engineer	√	
05	Other Engineers involved	√	
2	**Overall Design Concept**		
01	Design Parameters and Assumptions	√	
02	Acceptability of Risk from Proposed Track Layout and Mitigation	√	
03	Draft Staging and Testing Strategy	√	
04	Application Standards Declared	√	
05	Anticipated Non-Compliance with Current Standards	√	
06	Train Operating Requirements	√	
07	Dependability (RAMS) Requirements	√	
08	Operational and Maintenance Requirements	√	
09	Vandalism Protection	√	
10	Safety Assurance Required	√	
11	Scheme Approvals Required	√	
12	Product Acceptance Required	√	
3	**New Systems / Equipment**		
01	Type of Interlocking	√	
02	Control and Indication Systems	√	
03	Remote Control Systems	√	
04	Interlocking Interface	√	
05	Data Preparation Required	√	
06	Signals, AWS, TPWS, ATP, etc	√	
07	Train Detection	√	
08	Point Operation and Detection	√	
09	Hot Axle Box Detectors		√
10	Fringe Boxes, Interfaces, etc	√	
11	Level Crossings	√	
12	Types of Relays	√	
13	Signalling Power Supplies	√	
14	Data Transmission	√	
15	Cable Routes	√	
16	Ground Frames		√
17	Reversible Working / Block Systems	√	
18	Staff Warning Systems	√	
19	Train Operated Warning System (TOWS)	√	
20	Other Systems	√	
21	Systems Interfaces / Interfaces with Existing	√	

22	Equipment Housing	√	
23	Operational Buildings	√	
24	Operational Telecommunications	√	
25	Changes in Electrification		√
26	Changes in Permanent Way	√	
27	Changes in Civil Engineering	√	
28	Changes in Power Systems	√	
29	Changes in Rolling Stock	√	
4	**Existing Systems / Equipment**		
01	Hazards from Mixing Old and New Technologies	√	
02	Sufficient Space / Power / Heat Dissipation for Additional Equipment	√	
03	Correlation Required	√	
04	Condition of Existing Infrastructure	√	
05	Cable & Wire Insulation Condition	√	
06	Renewals avoided/to be carried out at the same time	√	
07	Recoveries / Systems to be Decommissioned	√	
08	Published Restrictions	√	
5	**Implementation / Hazards**		
01	Interfaces with other Projects	√	
02	Occupational Safety Hazards	√	
03	Environmental Factors	√	
04	Electromagnetic Interference Strategy / Report Required	√	
05	Site Surveys / Signal Sighting Required	√	
06	Installation and Testing Staff Logistics	√	
07	Site Accommodation (during works)	√	
08	Possessions, Red Zone Working	√	
09	Testing Requirements	√	
10	Training Requirements (operational and maintenance)	√	
11	Long Lead Equipment	√	
12	Spares Requirements	√	
13	OPS Change Control	√	
14	Other Items	√	

APPENDIX 2 – REMOTE CONTROL SKETCH

RRI – Route Relay Interlocking



Translink

Re-Signalling Coleraine - Derry

Telecommunications Project Design Specification

A013730-SN-SG-RP-0005 Rev 05
April 2010

Revision Schedule

Telecommunications Project Design Specification
April 2010

Rev	Date	Details	Prepared by	Reviewed by	Approved by
01	20/08/09	First Issue	**Jeremy Phelps** Telecoms Project Engineer	**Alick McLeod** Associate Telecoms Engineer	**Mark Betteley** Telecoms Engineering Manager
02	08/10/09	Second Issue	**Jeremy Phelps** Telecoms Project Engineer	**Alick McLeod** Telecoms Engineering Manager	**Alick McLeod** Telecoms Engineering Manager
03	19/02/10	Third Issue	**Jeremy Phelps** Telecoms Project Engineer	**Shane Rankin** Principal Engineer	**Kevin Goode** Principal Engineer
04	23/02/10	Fourth Issue	**Jeremy Phelps** Telecoms Project Engineer	**Shane Rankin** Principal Engineer	**Kevin Goode** Principal Engineer
05	15/04/10	Fifth Issue Updated with Geoff Browns email comments 30-03-2010	**Jeremy Phelps** Telecoms Project Engineer	**Shane Rankin** Principal Engineer	**Kevin Goode** Principal Engineer

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Table of Contents

Figures and Tables

1 Acronyms

ADM	Add-Drop Multiplexer
AHB	Automatic Half-Barrier
CCTV	Closed Circuit Television
DSL	Digital Subscriber Line
DVR	Digital Video Recorder
ELR	Engineer's Line Reference
FTN	Fixed Telecommunications Network
GRIP	Guide to Railway Investment Projects
GSM-R	Global System for Mobile communications-Railway
GUI	Graphical User Interface
HMI	Human Machine Interface
IP	Internet Protocol
LC	Level Crossing
LOC	Location Case
MSL	Miniature Stop Lights
NIR	Northern Ireland Railways
NR	Network Rail
NRN	National Radio Network
NTP	Network Termination Point
PLC	Programmable Logic Controller
P-MUX	Primary Multiplexer
PRC	Primary Reference Clock
PSB	Power Signal Box
PZT	Points Zone Telephone
RDM	Renewals Development Manual
REB	Relocateable Equipment Building
RR	Relay Room
RRI	Route Relay Interlocking
RSD	Reference System Design
S&T	Signalling and Telecoms
SB	Signal Box
SDH	Synchronous Digital Hierarchy
SPT	Signal Post Telephone
SSP	Signalling Scheme Plan
SSU	Synchronisation Supply Unit
STM	Synchronous Transport Module
TDM	Time Division Multiplexing
TEH	Telecoms Equipment Housing
TOWS	Train Operated Warning System
UPS	Uninterruptible Power Supply
UTX	Under Track Crossing
UWC	User-Worked Crossings

2 Standards & Specifications

The Contractor, and where required the Designer, shall undertake all works associated with this project in accordance with European and UK legislation including the requirements of:

- Health Safety and Environment guidelines
- Health and Safety at Work Act 1974
- The Management of Health and Safety at Work Regulations 1999
- The Railways (Safety Critical Work) Regulations 1994
- Her Majesty's Railway Inspectorate guidelines
- The Telecommunications Act 1984
- Construction (Design and Management) Regulations 2003
- Railway Safety Principles and Guidance Part 2 Section A – Guidance on Infrastructure
- Guide to the approval of railway works, plant and equipment

The above documents are available to the Contractor and shall not therefore be issued by Translink. Works undertaken as part of this project shall be in accordance with Network Rail Company and Railway Group Standards. Network Rail FTN and Northern Ireland Railways specifications shall also be consulted and complied with.

There are no anticipated non-compliance issues with the telecommunication elements of this project. Should however, any non-compliance issues become identified, as the project evolves, an application for a technical non-compliance or derogation shall be made to Translink. Where conflicts in standards are identified, Translink shall be informed, who will advise on the appropriate standard to be used, accordingly.

2.1 Railway Group Standards

Detailed in Table 1 is a non-exhaustive list of Railway Group Standards that have been consulted, and complied with, during the production of this Telecoms Project Design specification.

Standard	Issue	Date	Title
GK/RT0206	02	Apr 02	Signalling and operational telecommunications systems: safety requirements
GK/RT0209	01	Dec 00	Testing and commissioning of signalling and operational telecommunications Systems
GE/RT/8048	01	Feb 02	Positioning and labelling of Lineside Telephones

Table 1: *Railway Group Standards*

2.2 Network Rail Company Standards

Detailed in Table 2 is a non-exhaustive list of the Network Rail Company Standards that have been consulted, and complied with, during the production of this Telecoms Project Design specification.

Standard	Issue	Date	Title
NR/GN/SIG/11821	01	Aug 00	Sighting Requirements of Line-side Apparatus Housing
NR/GN/TEL/10117	02	Feb 06	Competence Management Systems for Work on Control and Communications Systems
NR/GN/TEL/30138	01	Mar 10	Buried Cable Route and Cable Route Through Platforms
NR/GN/TEL/30139	01	Mar 10	The Survey and Design of Telecoms Cable and Route
NR/L2/TEL/00013	03	Mar 10	Cable Troughing
NR/PS/TEL/00015	03	Apr 06	Unit Twin Copper Telecommunications Cable
NR/SP/CIV/044	02	Aug 04	Design and Construction of Under Track Crossings
NR/SP/TEL/30028	02	Oct 05	Installation of Operational Telecoms Equipment
NR/L2/TEL/30022	06	Mar 10	Technical Requirements for Communications Engineering Schemes and Services
NR/SP/TEL/30031	02	April 06	Signal Box Telephone Concentrator System - Design and Application Requirements
NR/SP/TEL/30032	03	April 06	Positioning and Labelling of Lineside Telephones
NR/SP/TEL/30035	02	Dec 05	Telecommunications Network Terminating Points
NR/L2/MTC/088	03	Aug 08	Responsibility for Maintenance of Changed Assets
NR/L2/TEL/30098	02	Aug 08	Testing and Commissioning of Telecommunications Equipment and Systems
NR/CS/TEL/30101	01	Feb 06	Telecommunications Assurance and Compliance
NR/L1/TEL/30100	03	Mar 10	Telecommunications Design
NR/L3/TEL/30106	02	Aug 08	Installation of Lineside Telephones

Standard	Issue	Date	Title
NR/SP/TEL/30002	04	Apr 06	SPT Concentrator Systems
NR/WI/TEL/00113	01	Apr 05	Wiring of Copper Telecoms Terminations
NR/L2/INI/02009	04	Dec 09	Engineering Management for Projects
NR/SP/SIG/19812	01	Feb 07	Cross Track Cable Management
NR/L3/SIG/30018	01	Sep 09	Signalling Design: Technical Details: Level Crossings

Table 2: *Network Rail Company Standards*

2.3 FTN Specifications

Detailed in Table 3 is a non-exhaustive list of the FTN Specifications that have been consulted, and complied with, during the production of this Telecoms Project Design specification.

Specification	Issue	Date	Title
SP/FTN(SU)/001	10.2	Feb 09	Survey of cables and cable routes
SP/FTN/(D&D)/004	9.2	Feb 09	Specification for the Renovation and Construction of New Cable Routes
SP/FTN/(D&D)/005	4.6	Feb 09	Joint, Termination & Test of fibre optic and copper telecoms cables
SP/FTN/(D&D)/008	4.2	Feb 09	Network design manual for Optical Fibre
SP/FTN/(D&D)/009	4.5	Feb 09	Network design manual for copper cables
SP/FTN/(D&D)/013	01	Aug 02	Specification for lineside cabinets without climate control

Table 3: *Network Rail FTN Specifications*

2.4 NIR Specifications

Table 4 details the NIR Specifications that have been consulted, and complied with, during the production of this Telecoms Project Design specification.

Specification	Issue	Date	Title
I/SG/IMP/SPEC/001	2.0	Apr 08	Specification for Cable Routes
I/SG/IMP/SPEC/002	1.0	Oct 07	Specification for Signalling & Telecoms Cables

Table 4: *NIR Specifications*

3 Project Background/Scope

Under the Coleraine to Londonderry re-signalling project several options are being considered to help modernise the route, reduce journey times and increase line capacity.

These options centre around a number of sites; particularly Londonderry, Eglinton, Castlerock and Coleraine. Each site is being developed as a separate site to aid option selection.

The main changes that are proposed under this scheme are:

- To transfer control from Castlerock and Londonderry to a new PC based VDU system at Coleraine, making Londonderry and Castlerock signal boxes redundant.
- To provide train detection between Coleraine and Londonderry.
- To remove the passing loop and associated mechanical signalling at Castlerock.
- To signal Eglinton for an additional passing loop.
- Renewal of Londonderry interlocking area while future proofing the relocation of the station.
- Renewal of the Bann Bridge controls and transfer to the new PC based VDU system at Coleraine (funded separately)
- To convert McConaghy's UWC to an AHBC (funded separately).
- To provide MSLs at 11 UWCs which have been selected because of there frequency of use.
- To provide telephones at the other 34 UWCs and additional signalling to protect them (funded separately).
- To modify existing level crossing striking in points and signal spacing for the new line speeds.
- To provide TOWS at Downhill and Castlerock tunnels and Bann River Bridge.

The Signalling Outline Project Specification (Document Number: A013730-SN-SG-RP-0004) describes the signalling works necessary for the re-signalling of Coleraine to Londonderry. This is a feasibility report and is dependant on the options taken forward and there may be sections and comments that will no longer be applicable.

The indicative commissioning timescale is intended to be 2012/2013.

4 Purpose of Document

The purpose of this document is to specify the detailed technical scope and post construction requirements for the chosen single option to meet and sustain the project requirements.

It will follow the guidelines as laid down in Network Rail's Guide to Railway Investment Projects Manual ref RDM06 (V7.01).

This document should be read in conjunction with the documentation detailed in Table 5:

Document Number	Document Name	Document Owner
C0363-LY-CE-DG-0001 to C0363-LY-CE-DG-0010 Rev 02	Londonderry – Coleraine Relay / Resignalling Project with UWC Safety Improvements Signalling Sketch	Translink
A013730-SN-SG-RP-0002	Asset Condition Report	Scott Wilson Ltd
A013730-SN-SG-RP-0003	Train Detection in Coastal Areas	Scott Wilson Ltd
A013730-SN-SG-RP-0004	Signalling Outline Project Specification	Scott Wilson Ltd
I-SG-WPI-C0362-01	WPI for Signalling Feasibility & Scheme Development Services on the Coleraine to Londonderry Track Relay Project	Translink

Table 5: *Reference Documentation*

5 Description of the Telecoms Technical Scope

The arrangements for the project are depicted on a series of Translink Signalling Scheme Sketches C0363-LY-CE-DG-0001 to C0363-LY-CE-DG-0010 Rev 01. These may be subject to change and final agreement.

As a result of the Coleraine to Londonderry re-signalling works, it shall be necessary to make a number of alterations to the incumbent telecoms infrastructure in this area.

Based on the signalling design / development thus far, listed below are key telecoms systems requirements judged necessary to provide operational circuit connectivity:

- Relocation of the signalling/telecoms function at Londonderry and Castlerock to a new control facility at the existing Coleraine SB
- Provision of a new optical fibre cable 'backbone' to support the revised signalling layout and level crossing arrangements
- Provision of new copper cable infrastructure where required, to support the revised signalling layout, level crossings and associated operational telephones
- Rationalisation of existing STS Concept 32 telephone concentrators located at Coleraine, Castlerock and Londonderry. It is proposed to retain the concentrator at Coleraine SB.
- Provision of new SDH transmission equipment to support the revised signalling layout and level crossing arrangements
- The option of integrating existing transmission equipment with the proposed new SDH infrastructure
- The option of installing new P-MUX and recovering existing SELTA P-MUX equipment
- Provision of facilities for remote Network Management of transmission equipment from a new control facility at Coleraine
- Provision of new lineside telephones to support the revised signalling layout and level crossing arrangements
- Provision of new CCTV cameras, control and DVR equipment to support the revised level crossing arrangements

6 Geographical Area

The project is located along the railway corridor between Coleraine Station (61.75MP) and Londonderry Station (95.25MP). The site is mainly contained within trackside perimeter fencing and sea defences.

The line from Coleraine to Londonderry is approximately 34 miles in length. There are two tunnel sections at Castlerock and a significant portion of the line is alongside water. From Coleraine the railway runs along the bank of the river Bann before meeting the coast again at Castlerock. The railway travels inland before rejoining the coast shortly after Ballykelly AHB. The line runs inland again to the Castle River crossing where it then runs alongside Lough Foyle to Londonderry.

The diagram in Figure 1 shows the geographical location of the scheme. It is indicative only and indicates some of the key features including the River Bann Bridge opening and the location of City of Derry Airport.

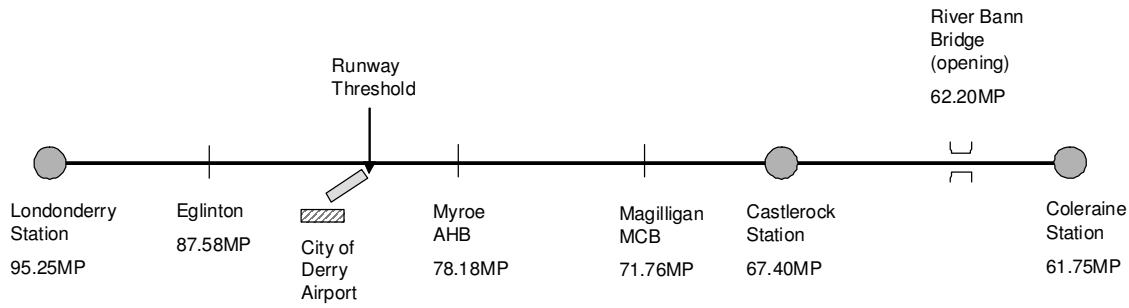

Figure 1: *Geographical Area*

7 Detailed Project Requirements – Operational

7.1 Existing Operational Buildings & Telecoms Assets

Relocation of the telecoms/signalling function at Londonderry and Castlerock to a new control facility at Coleraine SB will impact on the existing operational buildings and telecoms assets. The existing main telecoms (and signalling) operational buildings are located at the following sites:

- Coleraine SB and RR
- Castlerock SB and REB
- Magilligan REB
- Londonderry SB and RR
- Bann River Bridge control box

A separate Asset Condition Report (Document Number: A013730-SN-SG-RP-0002) has been produced describing the signalling assets at the above locations.

Table 6 summarises the existing telecoms assets at the aforementioned locations.

Building	Construction	Telecoms Asset
Coleraine SB	Brick & Wood	STS Concept 32 telephone concentrator & keyboard. Artillery Road MCB CCTV control panel/monitor.
Coleraine RR	Brick	SELTA P-MUX transmission equipment. ADC DSL line drivers. BT NTP, Circuit Number: MXBT233749 – leased line to Belfast Central Station.
Castlerock SB	Brick & Wood	Wall mounted colour CCTV monitor for blind spot on crossing. Direct line to Coleraine SB. DVR. Magilligan MCB CCTV control panel/monitor. Telephone concentrator keyboard.
Castlerock REB	3-Compartment*	STS Concept 32 telephone concentrator. BT Kilostream circuit to Belfast Central station (train radio) – Circuit Number: AXUK567072 to Belfast Central Station. Kenwood VHF FM repeater. GEC RR3000 FDM Transmitter (now redundant). Philips repeaters (4&6) associated with the CCTV transmission of Magilligan & Castlerock MCB back to Coleraine – this system is not operational.
Magilligan REB	3-Compartment*	SELTA P-MUX transmission equipment. ADC DSL line drivers. REB phone. Magilligan MCB CCTV control rack; controlled from Castlerock SB. GEC RR3000 FDM Receiver (now redundant).
Londonderry SB	Brick	Telephone concentrator keyboard.
Londonderry RR	Brick	STS Concept 32 telephone concentrator & keyboard. SELTA P-MUX transmission equipment. ADC DSL line drivers. A Siemens PLC operates in association with a TDM link from the REB located on the perimeter of the City of Derry Airport.
Bann River Bridge control box	Brick	Direct line to Coleraine SB.

Table 6: *Existing Operational Buildings & Telecoms Assets*

Note: * The REB is divided into three separate areas; the S&T equipment room, the battery and generator area. The battery area also houses the power transformers. The generator room contains the standby generator and an UPS.

The photograph in Figure 2 shows the three compartment REB at Castlerock. Note that the entrance to the S&T equipment room is at the far end of the REB and is not visible on this photograph.

Figure 2: *Castlerock REB*

7.1.1 Equipment Housing

New lineside telecoms equipment shall be housed in new standard location cases or REBs. A site survey is required for positioning, siting and access arrangements. Enabling works may be necessary prior to work starting.

New location cases shall be installed in accordance with the requirements of NR/GN/SIG/11821, 'Sighting Requirements of Lineside Apparatus Housings'. Where possible, location cases shall be sited at least 3 metres from the nearest running rail, to provide safe access for maintenance.

New REBs shall be provided wherever new electronic interlocking is required; namely, Londonderry, Castlerock and Coleraine. Telecoms infrastructure shall be provided to support the revised signalling layout and level crossing arrangements. It is recommended that active telecoms equipment (i.e. transmission equipment) is located in REBs as opposed to lineside TEHs wherever possible.

7.2 Optical Fibre Cabling

There is no existing optical fibre cabling running alongside the line between Coleraine and Londonderry, a distance of approximately 34 miles.

The existing operational telecoms cabling infrastructure is provided via copper cabling only. Copper cabling has its limitations and it is understood that the existing copper DSL line systems in some instances, have been unreliable and prone to faults.

The project aspiration is to migrate to a new optical fibre cable 'backbone' to support the revised signalling layout and level crossing arrangements. An optical fibre cable 'backbone' will provide a unified optical network for transmitting voice, data and signalling information. It is understood that initially, the purpose of the optical fibre cable 'backbone' will be to support operational telecoms requirements only.

In summary, the optical fibre cable 'backbone' will provide the following:

- Support all railway operational telecoms circuits
- Facilitate circuit migration from the legacy copper transmission systems
- Will offer improved reliability over copper DSL line systems
- Facilitate network management of transmission equipment from Coleraine Signal Box
- Will support the possible future introduction of GSM-R - compatibility with a future GSM-R system is a project objective
- Will support the possible future introduction of retail, business and IT circuits

Consideration should be given to Table 7 with respect to migration towards an optical fibre cable 'backbone' or retention of copper based infrastructure.

Item	Fibre	Copper
Bandwidth	10Gbit/s & beyond	Up to 10Gbit/s over 100m
Future-proof	Evolving towards the desktop	CAT7 under development
Noise	Immune	Susceptible to EMI/RFI interference crosstalk & voltage surges
Handling	Lightweight, thin diameter, strong pulling strength (pulling specification is up to 10 times greater than copper)	Heavy, thicker diameter. Strict pulling specifications
Security	Almost impossible to tap	Can be tapped
Attenuation	Very low attenuation	Comparatively high attenuation
Temperature	Less susceptible to temperature fluctuations	Performance degrades with increasing temperature
Space	Takes up less space in cable ducts	Takes up more space in cable ducts
Termination	More difficult to terminate than copper	Easier to terminate than fibre
Testing	Easier to test than copper	Harder to test than fibre
Costs	More expensive than copper in short term, but over long term; can be less costly	Cheaper than fibre in the short term but maybe more expensive in the long term
Maintenance	Less costly to maintain and less 'downtime'. Requires less hardware.	Less reliable than fibre based systems therefore maintenance costs higher

Table 7: *Fibre versus Copper – Considerations*

Clearly, a fibre solution offers huge advantages over a copper based solution utilising DSL systems. The main advantage is that fibre is a 'Future-proof' solution in that it can support >10Gbit/s of Bandwidth. Moreover, over the long term, it can be more cost-effective than copper based systems.

It is recommended that a fibre cable network survey is carried out to make sure that all existing and proposed route and copper cable network elements are taken into consideration in the design produced. Note that the survey requirements shall be defined at subsequent GRIP stages.

Consideration should be given to the following survey requirements:

- Centre to centre optical cable length – will be required to minimise cable wastage between adjacent joints
- The proposed locations for joints – ideally should be positioned in a permanent green zone to provide safe access for maintenance
- The proposed positions of sheath gaps – the metallic sheath of fibre cables should be gapped at strategic points to keep continuous lengths short to prevent the build up of hazardous voltages

- The proposed positions of spur cables – a spur cable will connect an Access Node to the main cables
- The proposed positions of terminations – optical terminations shall be located within trackside TEHs, or in a wall mounted box/termination rack within an REB, RR or existing building
- Core Node Sites – located at Coleraine and Londonderry
- Access Node Sites – located at intermediate sites between Coleraine and Londonderry, (e.g. Castlerock & Magilligan).
- Choice of cable type – duct cables contain minimal physical protection and are designed to be small and light for installation into underground duct routes where the surrounding duct will provide suitable physical protection.
- Entries to buildings - availability and capacity of existing duct entries.

In addition to the above, consideration should be given to the optical fibre splicing arrangements at:

- Through joints
- Spur joints
- Terminations at Core Nodes
- Terminations at Access Nodes

The optical fibre cable design shall be developed at subsequent GRIP stages. Reference should be made to NR's FTN Project Specification SP/FTN(D&D)/008 for optical fibre design principles and considerations. Reference should be made to NIR specification I/SG/IMP/SPEC/002 regarding the optical fibre cable specification. Note that the required cable specification and 'fibre count' will be determined at the detailed design phase.

7.3 Copper Cabling

7.3.1 Existing & New Copper Cabling Infrastructure

There will be a requirement to interface with the existing copper cable infrastructure between Coleraine and Londonderry.

However, consideration should be given to the new proposed copper cable network architecture for the following three scenarios as detailed within Section 7.6.2.

- Copper connectivity through the section – facilitates successive and adjacent feeding of SPTs
- Copper Islands with no Mid-Section Services – does not facilitate successive and adjacent feeding of SPTs
- Copper Islands with Mid-Section Services fed by a TEH– does not facilitate successive and adjacent feeding of SPTs

Note that a 'Copper Island' solution would normally only be deployed where there is no requirement for successive and adjacent feeding of SPTs.

Reference should be made to NR Company Standard NR/PS/TEL/00015 and FTN Specification SP/FTN(D&D)/009 with respect to copper cabling design requirements.

Copper cabling shall be in accordance with NIR specification I/SG/IMP/SPEC/002.

7.3.2 Tail Cabling

There shall be a requirement for new tail cables to be installed from distribution cabinets to new lineside telephones installed as part of this project.

The tail cables shall comply with the requirements of FTN specification SP/FTN/(D&D)/009: Network Design Manual for Copper Cable, with specific regard to the 100m maximum length rule. Any non-compliance will be listed in the GRIP stage 4 Telecoms Reference System Design.

All new tail cables will be 2pr in accordance with NIR specification I/SG/IMP/SPEC/002 and shall be terminated on Tyco Mondragon VX IDC type connectors, within lineside distribution cabinets to specification SP/FTN(D&D)/013.

Where tail cables are required to cross the track, the preferred method is the use of UTXs. Alternatively, tail cables can be clipped to the sleeper. Note that hollow sleepers do not exist for NIR track gauge. Translink to confirm the protocol for 'orange pipes'. Cable routes shall be designed in accordance with NIR specification I/SG/IMP/SPEC/001.

7.4 Telephone Concentrators & Voice Recording

Existing STS Concept 32 telephone concentrators are located at:

- Coleraine SB
- Castlerock REB
- Londonderry RR

Since the existing signalling/telecoms function at Londonderry and Castlerock is being relocated to a new control facility at Coleraine SB, there is an opportunity to rationalise the existing telephone concentrators into a single telephone concentrator at Coleraine SB. This will make the existing telephone concentrators located at Castlerock REB and Londonderry RR redundant at these locations. However, concentrator equipment could be reutilised at Coleraine or used as spares. Furthermore, the existing telephone concentrator keyboards will also need to be rationalised.

With a single telephone concentrator located at Coleraine, all lineside circuits (e.g. SPTs) will be carried over the fibre based SDH transmission network back to Coleraine and circuits will be presented within the equipment room MDF/IDF and jumpered to the respective telephone concentrator line cards. Reference should be made to NR Company Standard NR/SP/TEL/30002 with respect to SPT Concentrator Systems requirements.

Note that the existing voice recording arrangements will also need to be rationalised. Details of this will be provided at subsequent GRIP stages.

7.5 Lineside Telephones & Signalling Control Circuits

The following new lineside telephones shall be provided hosted of the telephone concentrator in Coleraine SB:

- New SPTs shall be provided for all new signals with a red aspect.
- PZTs
- Platform and Level crossing telephones

All new operational telephone instruments (e.g. SPTs & PZTs) shall be post-mounted, CB type, weatherproof and vandal resistant with an armoured handset cord. Such a telephone is the GAI –Tronics 'Titan' (NRS Part No. 0087/037914) which has product approval for installation on Network Rail owned infrastructure. The SPTs will be connected to the nearest distribution cabinet (LOC), by means of a tail cable.

The Signal Sighting Committee shall determine the final position of the SPTs and PZTs. This committee will also determine if telephones are required for areas of 'limited clearance', and, if required the geographic locations.

Positioning and labelling of all lineside telephones shall be in accordance with specifications GE/RT8048 and NR/SP/TEL/30032.

The following Signalling Control Circuits will be required:

- Remote Condition Monitoring (e.g. for points heating equipment)
- Train Describer
- Emergency Alarm

7.6 Transmission Systems & Network Management

7.6.1 SDH versus PDH - Considerations

The proposal is to provide a new SDH transmission system as detailed in Section 7.6.2. Consideration should be given to the advantages of SDH over a PDH network architecture as shown in Table 8 below.

Item	SDH	PDH
Network Architecture	Typically used in Ring networks.	Generally limited to point-to-point networks.
Survivability	Enables automatic reconfiguration & traffic rerouting when a link is damaged.	Primitive protection mechanisms. Requires more hardware than SDH to provide certain levels of protection.
Software Control	High flexibility. Network Management Platforms often provide a GUI for easy configuration of cross-connects etc.	Software control not as advanced as SDH. Relies on 'field cabling' to ensure equipments/circuits are managed.
Efficient Drop & Insert	Simple & efficient cross-connect without full hierarchical multiplexing or de-multiplexing.	Non-efficient Drop & Insert. Full hierarchical multiplexing or de-multiplexing required.
Robustness & resilience	SDH has inherent robustness/resilience built-in to the hardware; e.g. Switch/Power card protection.	PDH less robust/resilient than SDH hardware.
Equipment size/operating costs	SDH uses less hardware than PDH & therefore maintenance costs should be less.	PDH uses more hardware than SDH & therefore maintenance costs should be greater.

Table 8: *SDH versus PDH - Considerations*

7.6.2 Transmission System Architecture

The existing lineside transmission systems consist of DSL copper line systems and SELTA primary multiplexer (P-MUX) equipment.

It is understood the existing P-MUX network architecture is a 'hub and spoke' arrangement and there is dialogue with SELTA to investigate possible migration to a 'ring' P-MUX architecture (as an interim measure) to provide increased levels of resilience.

A typical SELTA P-MUX is shown in Figure 3:

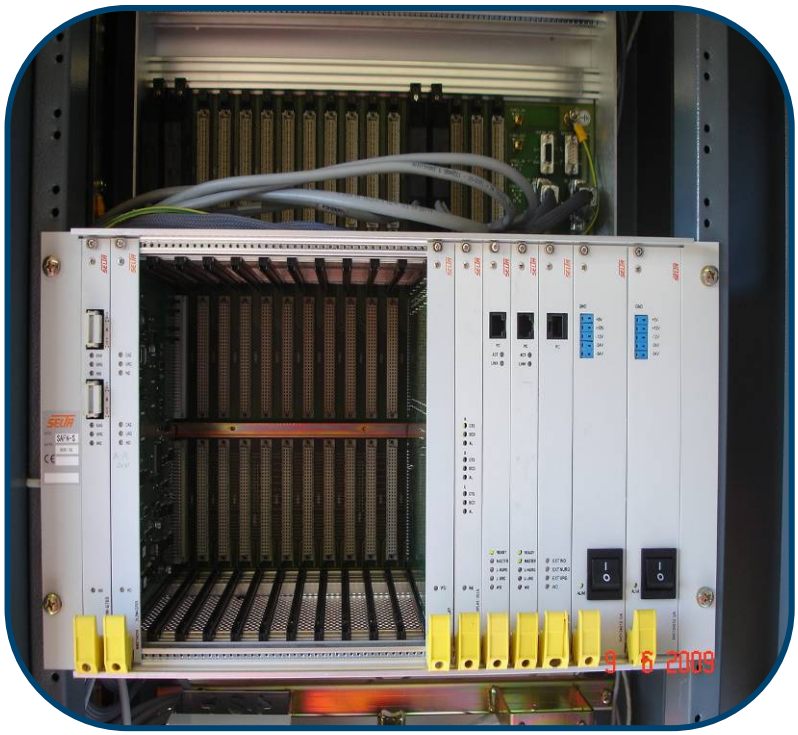

Figure 3: *SELTA P-MUX*

As previously discussed, the project aspiration is for a new optical fibre cable 'backbone' to support the revised signalling layout and level crossing arrangements.

The proposed new network architecture consists of four layers as follows:

- Copper Layer – the purpose of the copper layer is to provide circuit connectivity
- Primary Layer – the purpose of the primary layer is to multiplex circuits to 2Mbit/s prior to delivery to the bearer layer
- Bearer Layer – the bearer layer is the SDH transmission network. The bearer layer also includes PTO bearers. PTO bearers are used to provide diversity in the transmission network.
- Switch Layer – the switch layer consists of telephone concentrator equipment.

The proposed SDH transmission network architecture is shown in Figure 4:

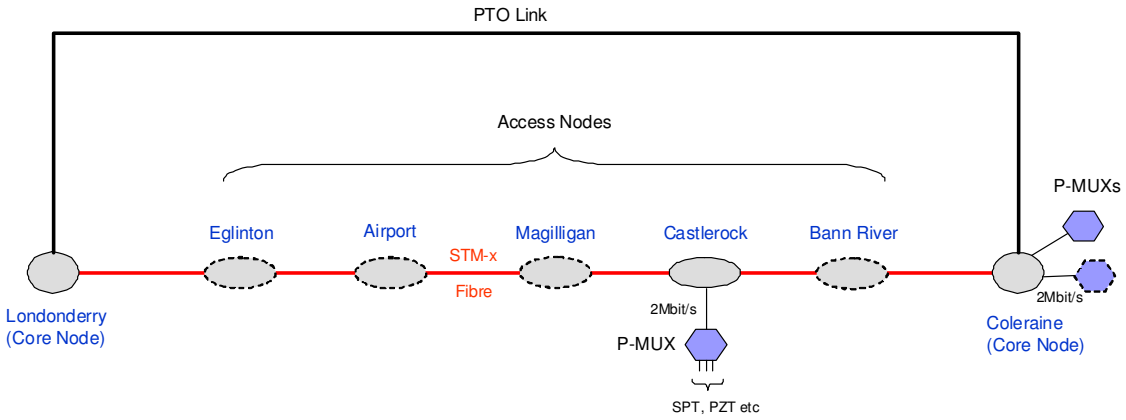

Figure 4: *Proposed SDH Transmission Network Architecture*

The network architecture is based on SDH transmission over optical fibre using a ring topology. The ring topology is facilitated by the PTO link. The design consists of discrete transmission nodes connected by optical fibre cable.

Core Nodes are located at Coleraine and Londonderry, this is where the transmission system interfaces with the PTO network. It is anticipated that Access Nodes are required at the following intermediate sites:

- Bann River
- Castlerock
- Magilligan
- Airport
- Eglinton

Note that although not indicated in Figure 4, Bellarena is to be the location of a future passing loop. Therefore, passive provision is to be made for a transmission Access Node at this location.

The precise locations for both Core and Access Nodes will be developed at GRIP Stage 4. The locations identified within this document are based on the Signalling RRI requirements, i.e. an Access Node is required to provide RRI circuit connectivity back to Coleraine SB.

The diagram in Figure 4 also illustrates the requirement for P-MUXs at Core and Access Node sites. The P-MUXs will allow connectivity for any sub 2Mbit/s circuits. These will include for example SPT, PZT, level crossing phones and RRI circuits. Note that for simplification and illustration within Figure 4, just one 'remote' P-MUX has been shown at Castlerock.

Coleraine SB will contain the largest number of P-MUXs (and circuits) due to the fact that it is the controlling site.

Allowance has also been made in the design for providing LC CCTV connectivity back to Coleraine, should this be required. This is facilitated by the proposed new optical fibre cable

'backbone'. The SDH bandwidth requirement will be determined at GRIP Stage 4. Note that SDH is based on an STM-1 (155Mbit/s) rate and is equivalent to 63 x 2Mbit/s.

With respect to the Access Node network architecture, there are three scenarios that will need to be considered at subsequent GRIP stages. These include:

- Copper connectivity through the section
- Copper Islands with no Mid-Section Services
- Copper Islands with Mid-Section Services fed by a TEH

These are defined within NR FTN Project Specification SP/FTN(D&D)/009.

The diagram in Figure 5 shows 'Copper connectivity through the section'.

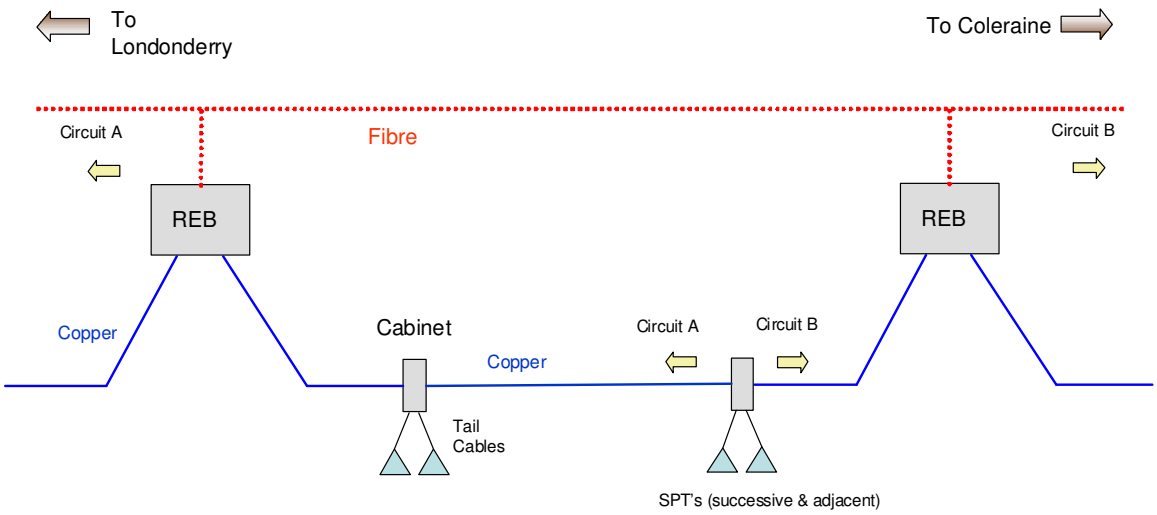

Figure 5: *Copper Connectivity through the section*

Lineside transmission circuits are carried over the fibre cable via transmission Access Nodes located in the REB. Here, the presence of mid-section copper connectivity through the section facilitates successive and adjacent feeding of SPTs. Circuit A is routed 'Westwards' towards Londonderry whilst Circuit B is routes 'Eastwards' towards Coleraine. Note that Circuit A will ultimately be presented at Coleraine via the diverse route (i.e. a PTO link). The requirement for successive and adjacent feeding of SPTs will need to be confirmed at subsequent GRIP stages.

The diagram in Figure 6 shows 'Copper Islands with no Mid-Section Services':

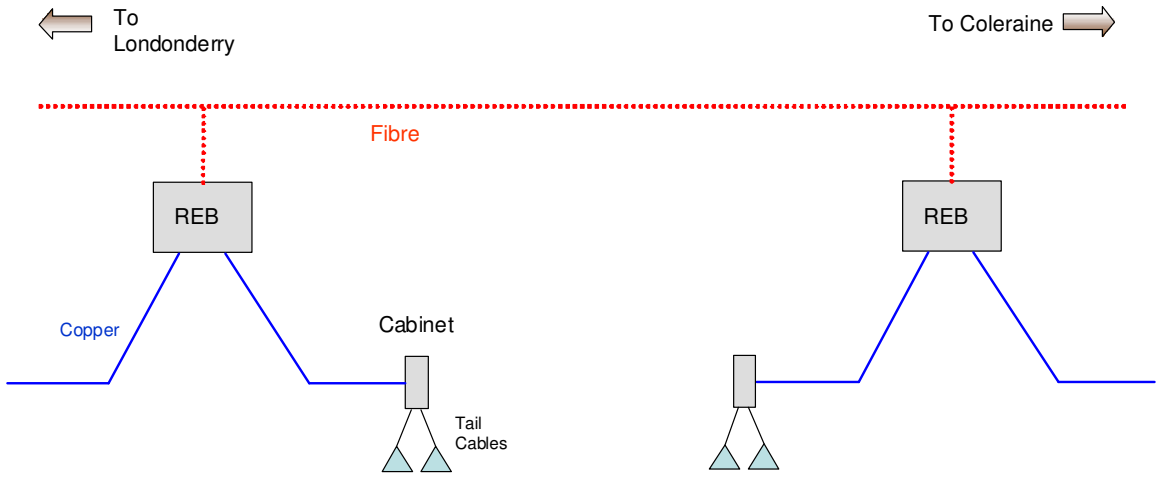

Figure 6: *Copper Islands with no Mid-Section Services*

Here, lineside transmission circuits are carried over the fibre cable via transmission Access Nodes located in the REB. This architecture removes the requirement for DSL links.

The absence of any mid-section services through the section removes the need for a continuous copper cable.

The diagram in Figure 7 shows 'Copper Islands with Mid-Section Services fed by a TEH':

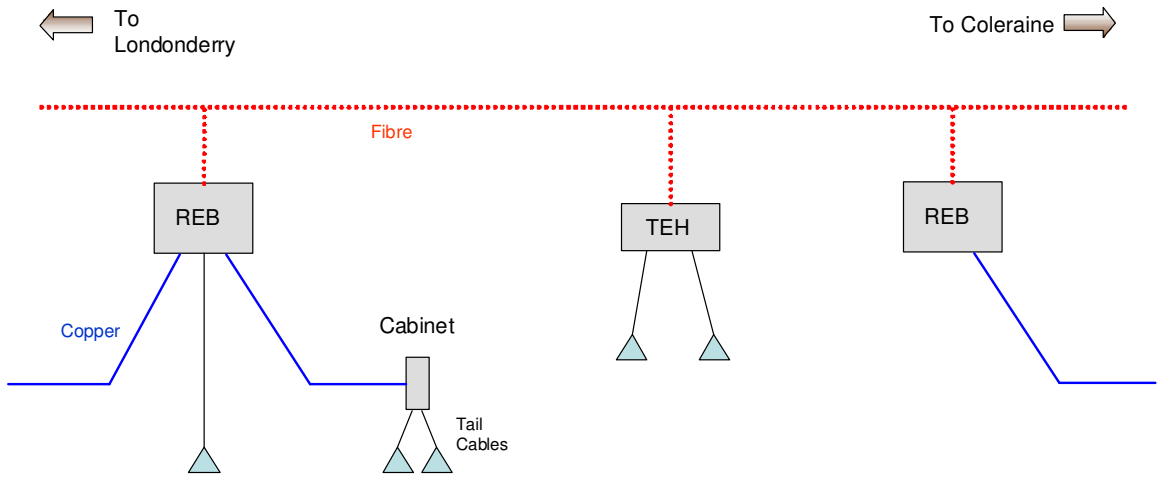

Figure 7: *Copper Islands with Mid-Section Services fed by a TEH*

Here, a TEH is introduced to interface the mid-section services with the fibre cable. This maybe more cost-effective than a continuous copper cable through the section.

The decision whether to deploy 'Through Copper Connectivity' versus 'Copper Islands' is both a technical and a commercial one.

Note that the following conditions must be satisfied before a copper island solution can be considered:

- The cable section includes fibre cable
- There is no requirement for successive and adjacent feeding of SPTs
- There is no intermediate signal box within the cable section
- There are no other circuits that require node to node copper connectivity
- Any mid-section services occur in 'clumps' rather than being spread through the section

Note that copper islands occur when there is a proliferation of services near to a transmission node.

7.6.3 Diversity

It is proposed that the transmission network shall have a diverse route back to Coleraine via a PTO link to facilitate successive and adjacent routing of lineside circuits and to achieve the required availability. In addition to the resilience offered by the physical and geographical routing of circuits, another level of resilience is offered by the SDH transmission network due its protection switching capability, inherent in the SDH hardware.

7.6.4 Synchronisation

Transmission synchronisation will be required to prevent any transmission errors in the SDH network. The synchronisation source would normally be via a PRC and SSU located at Coleraine SB. The synchronisation design will be developed at subsequent GRIP stages.

7.6.5 Circuit / Bandwidth Requirements

The following sub 2Mbit/s circuits are required:

- SPT
- PZT
- Platform phones
- Level Crossing phones
- Train Describer
- Emergency Alarm
- Remote Condition Monitoring

In addition to the Sub 2Mbit/s circuit requirements, allowance has also been made in the design for providing LC CCTV connectivity back to Coleraine SB, should this be required. This is facilitated by the proposed new optical fibre cable 'backbone'. CCTV bandwidth is dependant upon the type and number of CCTV cameras installed.

The 'Day 1' bandwidth will be confirmed at subsequent GRIP stages. Note that the design is flexible in that the bandwidth can be increased as required via the installation of higher capacity optical interface line cards (dependant on SDH shelf type). For example, STM-1 (155Mbit/s), STM-4 (622Mbit/s), STM-16 (2.5Gbit/s). The SDH architecture is therefore extremely flexible and allows for future growth in bandwidth.

7.6.6 Network Management

It is understood that Network Management (which includes circuit provisioning) of the transmission equipment will be required from a new control facility at Coleraine SB.

This will be relatively easy to achieve since the SDH ADM management bandwidth data is contained within the optical overhead on the SDH frame. This management bandwidth data for all the ADMs will be available via a management interface on the ADM equipment at Coleraine SB. Note that the management interface, when activated on the ADM allows for connection to the Network Management Platform. The Network Management platform is essentially a PC/Monitor normally providing a Graphical User Interface.

Local Network Management will be possible at each location via a Local Craft Terminal which can either be a laptop computer, or a hand-held service terminal dependant upon the manufacturer.

It is suggested that provision is always made for Local Craft Terminal access. This will ensure that there is still management capability in the event that the 'Gateway' management interface is lost.

Figure 8 shows Network Management from Coleraine SB.

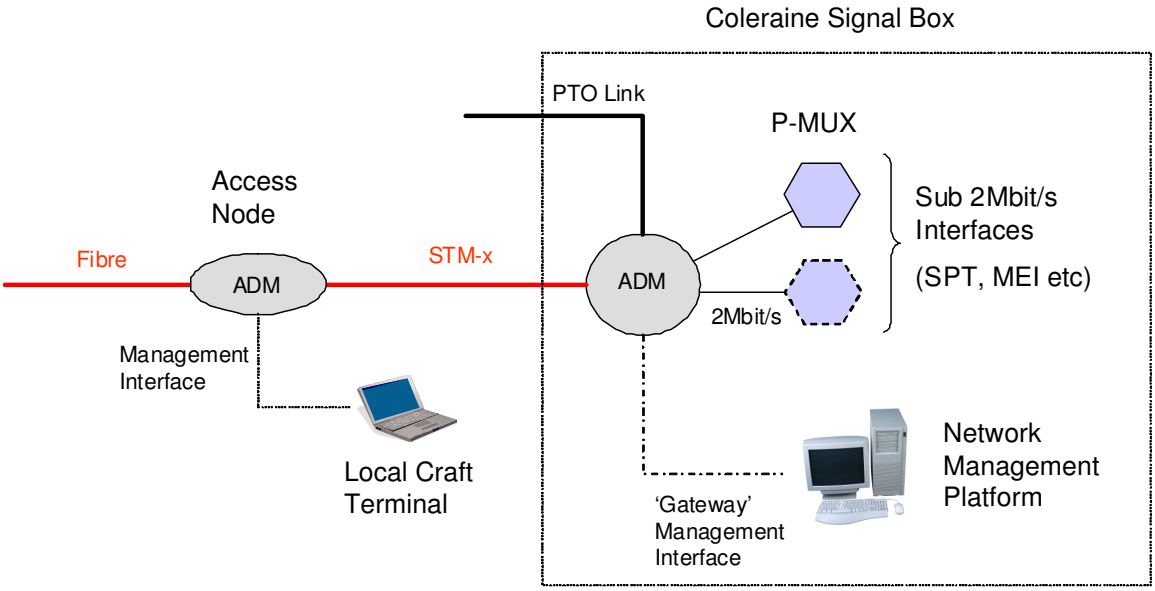

Figure 8: *Network Management from Coleraine SB*

Note that where new ADMs are being installed, hosted from a physical location, which does not already have ADMs present, then a DCN, connection (e.g. typically 2Mbit/s) will be required along with a router to provide a LAN segment for connection of the new ADMs. This would allow Network Management from any location, e.g. Belfast Central Station.

Figure 9 shows Network Management from a location with no ADMs present.

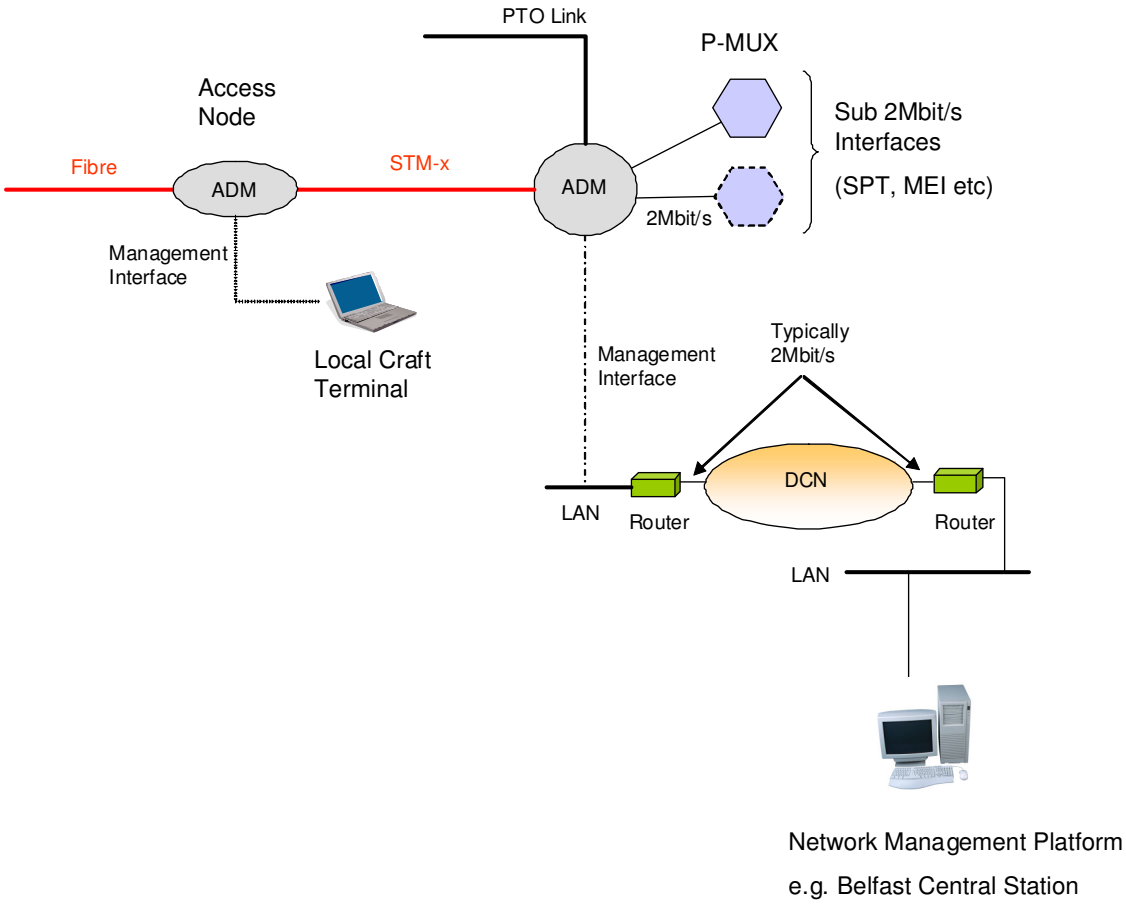

Figure 9: *Network Management from a location with no ADMs present*

The Network Management design will be developed further at subsequent GRIP stages.

7.7 Radio Systems

Train radio is in operation along the length of single line track between Coleraine and Londonderry providing a vital form of communication, particularly during emergency situations. The existing train radio system is an analogue VHF FM repeater-based radio network.

During a non-intrusive site survey carried out between 08/06/09 to 11/06/09, a number of sites were visited and the following radio equipment was identified:

- Castlerock REB
    - Kenwood VHF FM Repeater TKR-751 (Trigger Radio)
    - BT NTP – 'Kilostream' circuit to Belfast Central station, Circuit Number: AXUK567072 (Train Radio)
    - VHF Radio Antenna (Trigger Site)
- Londonderry Station - VHF Radio Antenna (Trigger Site)

Figures 10 and 11 show the rack mounted Kenwood Trigger Radio equipment located in Castlerock REB and the VHF Radio Antenna outside Castlerock REB.

Figure 10: *Kenwood VHF FM Repeater TKR-751 (Trigger Radio) - Castlerock*

Figure 11: *VHF Radio Antenna (Trigger Site) - Castlerock*

The above equipment is indicative of the installed radio infrastructure between Coleraine and Londonderry. A complete inventory of radio equipment was not captured during the site survey.

Furthermore, following the site visit at Belfast Central station on 08/06/09, it is also understood that Kenwood VHF FM Trigger Radio equipment is due to be commissioned at Belfast Central station, approximately July/August 2009.

With reference to the Signalling Outline Project Specification A013730-SN-SG-RP-0004, new train detection shall be achieved by either axle counters and/or DC track circuits. It is envisaged that due to the benefits of both types of train detection, axle counters shall be installed where appropriate and this shall be the subject of a separate review. A report has been compiled presenting the differences and benefits of both types of train detection. Details can be found in report A013730-SN-SG-RP-0003, 'Train detection in Coastal Areas'. Note that continuous communication between train crew and signal operators will be necessary. The most practical method of communication between train crew and signal operators is via radio.

Due to the proposed alterations to the route, it is recommended that radio coverage testing is carried out to assess the availability of radio communications, with particular reference to the areas where axle counters may be deployed as a means of train detection.

The proposed alterations to the route and infrastructure are as follows:

- Eglinton – New passing loop to be provided and signalled
- The construction of two new platforms at Eglinton with the proposal to demolish the existing but unused platforms

- Castlerock – Existing loop to be recovered

It is understood there are no plans to introduce GSM-R yet, however, an optical fibre 'backbone' as previously discussed will support the future introduction of GSM-R. Note that compatibility with a future GSM-R system is a project objective.

7.8 Level Crossings - CCTV

A total of 11 User Worked Crossings (UWCs) are to be upgraded to include MSLs mainly due to the proposed increase in line speed as detailed within Translink signalling sketches C0363-LY-CE-DG-0001 to C0363-LY-CE-DG-0010 Revision 02 and within Table 9.

UWC ID	UWC Name	Miles:Chains
XL 202	Nutts/Craigs	80:8
XL 198	Dodds	78:62
XL 189	Allison's	75:40
XL 168	Herds	70:66
XL 166	Tylers	70:52
XL 164	Church	67:66
XL 163	Freehall	67:53
XL 156	Grangemore	65:9
XP 244	Ballyreagh	66:2
XP 243	Craigstown/Lynch's	65:33
XP 230	Houston's	63:53

Table 9: *UWCs to be upgraded with MSLs (Proposed)*

The precise number of UWCs to be upgraded will be confirmed at subsequent stages of the design development. The Signalling Outline Project Specification document A013730-SN-SG-RP-0004 details the level crossing arrangements.

Due to the cost of installing transmission nodes at such a large number of sites, it is proposed that CCTV at MSL sites will be recorded locally using a DVR (with hard drive). The CCTV data can be copied from the DVR onto a laptop if needed for further investigation.

Allowance has also been made in the design for providing LC CCTV connectivity back to Coleraine SB should this be required. This is facilitated by the proposed new optical fibre cable 'backbone'. The option to provide LC CCTV connectivity back to Coleraine SB will be developed at subsequent GRIP stages. This includes a cost-effective option of networking the DVRs so that they can be interrogated remotely. Note also that 2 phones per MSL site will be required.

Figure 12 shows a typical example of a User Worked Crossing with MSL and shows Menarys UWC XP245 which is located on the Coleraine to Portrush line.

Figure 12: *CCTV at Menarys UWC XP245 on Coleraine to Portrush line*

The MCB level crossing at Castlerock is currently controlled from the signal box and relay interlocking. A new electronic interlocking will take on the interlocking for the crossing and this will be controlled from Coleraine SB. The crossing will require a CCTV system to Coleraine SB. Note at Castlerock REB, there are two Philips repeaters (4&6) associated with the CCTV transmission of Magilligan and Castlerock MCB back to Coleraine. This system is not operational.

At Bann River Bridge, CCTV may be required, controlled from Coleraine SB.

8 Detailed Project Requirements – Retail Systems

Alterations to existing retail systems may be necessary to cater for new stations, new platforms and changes to services.

For example, the construction of two new platforms at Eglinton has been proposed due to the proposal for a new passing loop at Eglinton. The existing but unused platforms at Eglinton would therefore need to be demolished.

9 Detailed Project Requirements – Infrastructure

9.1 Cable Route & UTX

Cable routes shall be designed in accordance with NIR specification I/SG/IMP/SPEC/001 and cabling shall be in accordance with NIR specification I/SG/IMP/SPEC/002.

New buried cable route ducting will be provided along the entire length of the Railway between Coleraine and Londonderry. This shall have at least 30% spare capacity. No surface concrete troughing shall be provided. This buried ducting will carry all new lineside cables required; this is likely to be a mixture of Power, Fibre Optics and Multicore cable.

It is proposed to use available spare conductors in existing telecoms multipair cables where a minimum of 10% spare conductors will remain. Prior to use, existing spare conductors will be tested to ensure compliance with relevant cable standards. Any cables that are found to fail the test shall be replaced.

Telecoms main cable track crossings will be made using UTXs where possible and shall be designed in accordance with Company Standard NR/SP/CIV/044. UTXs shall be sized to accommodate all the projects cable requirements, and shall adhere to NR/SP/SIG/19812, Cross Track Cable Management. The UTX access manholes will be accessible under Green Zone conditions.

Where cables are required to cross the track, the preferred method is the use of UTXs. Alternatively, cables can be clipped to the sleeper. Translink to confirm the protocol for 'orange pipes'. Note that hollow sleepers do not exist for NIR track gauge.

9.2 Platform Ducting

Where existing platform ducting infrastructure needs to be utilised (e.g. for the installation of telecoms tail cables for platform telephones), it is assumed that spare cable capacity exists. This will need to be verified at subsequent GRIP stages.

9.3 Driver's Walkways

Driver walkways will be required at the site of each lineside telephone. SPTs are to be located 5m from the signal on its own post with a 15m walkway leading up to it. Hand rails are to be provided as necessary. The Signalling Sighting Committee shall confirm the exact position and lengths of these walkways.

9.4 SPT Bases

There may be a requirement for a properly constructed concrete base at the site of each lineside telephone. This shall be evaluated in more detail at GRIP Stage 4.

10 Impact Assessment on Existing Network

There will be a significant impact on the existing telecoms network due to the new proposed infrastructure requirements.

It is envisaged the following areas will be impacted upon:

- Equipment room space
- Power requirements
- Operational requirements – possible rationalisation of transmission & switching equipment
- Support/Maintenance – due to new hardware / software
- Spares holding – due to new equipment
- Equipment recoveries
- Training

With reference to Translink document, I-SG-WPI-C0362-01, Signalling & Telecommunications Consultancy Services Contract, consideration should also be given to the following projects along the line section that are in progress and which will be completed in advance of, or in parallel to, the works namely:

- Bridge Replacements UBs 203, 204 and 215
- Sea Defence Strengthening Works
- City of Derry Runway Protection
- UWC MSL Upgrade Phase 1
- River Bann Bridge Refurbishment (may be included in project)

11 Option Selection Summary

A number of options have been considered based on a new optical fibre cable 'backbone' to support the revised signalling layout and level crossing arrangements. An optical fibre cable 'backbone' will provide a unified optical network for transmitting voice, data and signalling information.

The options that have been considered include the following:

- Optical Fibre cable 'backbone' utilising PDH technology
- Optical Fibre cable 'backbone' utilising SDH technology
- IP solution

Note that modifications to the existing copper cable 'backbone' utilising DSL technology was not considered to be a viable option moving forward since it does not give the required level of resilience, flexibility and 'future-proofing' required.

Having evaluated and technically appraised the various options available, the Optical Fibre cable 'backbone' utilising SDH technology Single Option has been selected for a number of reasons as summarised below:

- SDH is a proven technology in the railway environment offering advantages over PDH systems as described in Section 7.6.1. Note that Network Rails FTN Bearer Layer utilises SDH transmission technology and its use is well established throughout Network Rails infrastructure.
- SDH provides the reliability of circuit-switched pathways and resiliency should there be a fault.
- SDH will support a variety of transmission interfaces, including Ethernet (Ethernet over SDH).
- IP is not a proven or mature product in the railway environment. It is envisaged that an extensive testing / product acceptance phase would be required prior to the introduction of this technology within the Translink infrastructure.

12 System/Network Interfaces

The following telecoms related interfaces have been identified:

12.1 Signalling

- Signalling Scheme Plan
- Signalling Outline Project Specification
- SPT Sighting Committee

12.2 Civils

- Cable Routes
- Drivers Walkways
- Location case & REB bases
- Stations including Platform alterations

12.3 Third Party

- PTO – for provision of PTO link

13 Maintenance & Operational Requirements

CDM regulations are applicable to this project and designers shall consider the 'maintainability' & operational requirements in the event of failure of all systems/equipment installed.

Specific maintenance and operational aspects are to be considered in the design of the project in particular those relating to Staff Safety:

- Safe Cess Walkways.
- Provision of Driver's Walkways to SPTs.
- Safe Cess access routes to all operational equipment.
- Positioning of location cases to permit access without being "on or near the line".
- Taking "touch potential" into account.
- Provision of REBs such that foot and Vehicular access is available without being "on or near the line" wherever possible.

14 Scheme Development – Cost Estimates

Tables 10 and 11 show cost estimates for materials and contractor costs. These items are expected to be included within any subsequent GRIP Stage 4 Telecoms Reference System Design. These costs are indicative only and exclude costs for cable route since this will be covered in the civils cost estimates.

The cost estimates are based on installing 7 x STM-1 SDH transmission nodes and the installation of new optical fibre cable between Coleraine to Londonderry. In addition, the cost estimates include the installation of a Network Management platform at Coleraine SB and the installation of Telephone Concentrator equipment to facilitate the addition of relevant lineside circuits. Note that the line from Coleraine to Londonderry is approximately 34 miles (54.7km) in length.

Materials Costs (estimated):

Item	Cost (£k)
Copper Cable	100
Fibre Cable @ £3.60/metre	197
SDH Equipment Shelf/P-MUX/PSU/Ancillaries @ £20k per site (7 sites)	140
Network Management Platform & Licences	30
Local Craft Terminals (Laptops) & Software	6
Telephone Concentrator hardware/software	20
CCTV cameras/camera mounting & cables, DVR equipment, LOC for housing DVR – based on 11 UWCs to be upgraded with MSLs @ £5k per site (11 sites)	55
Total	**£548k**

Table 10: *Materials Costs - Estimated*

Contractor Costs (estimated):

Item	Cost (£k)
Installation of Copper Cable	300
Installation of Fibre Cable @ £11.50/metre	629
Site Surveys of transmission sites	2.5
Transmission Installation based on 7 x STM-1 nodes	21
Transmission In-station testing based on 7 x STM-1 nodes	7
System Test/Integration of transmission system	7
Telephone Concentrator installation	5
Telephone Concentrator testing	2
PTO interconnect at Coleraine & Londonderry (diverse route)	tbc
Installation & commissioning of CCTV/DVR/LOC equipment – based on 11 UWCs to be upgraded with MSLs @ £5k per site (11 sites)	55
Total	**£1,028.5k**

Table 11: *Contractor Costs - Estimated*

Table 12 shows the cost estimate for design documentation development.

Design Documentation Development (estimated):

Item	Cost (£k)
GRIP Stage 4 & 5 Design Documentation development	50
Total	**£50k**

Table 12: *Design Documentation – Estimated*

With reference to Tables 10, 11 and 12, the estimated total cost (Materials, Contractor & Design Documentation Development) is approximately £1.62 million + PTO interconnect costs.

Note that Bellarena is to be the location of a future passing loop and therefore is not included within the above scheme costs estimates detailed within Tables 10 and 11. However, passive provision is to be made for a transmission Access Node at Bellarena with estimated materials and contractor costs of £26k.

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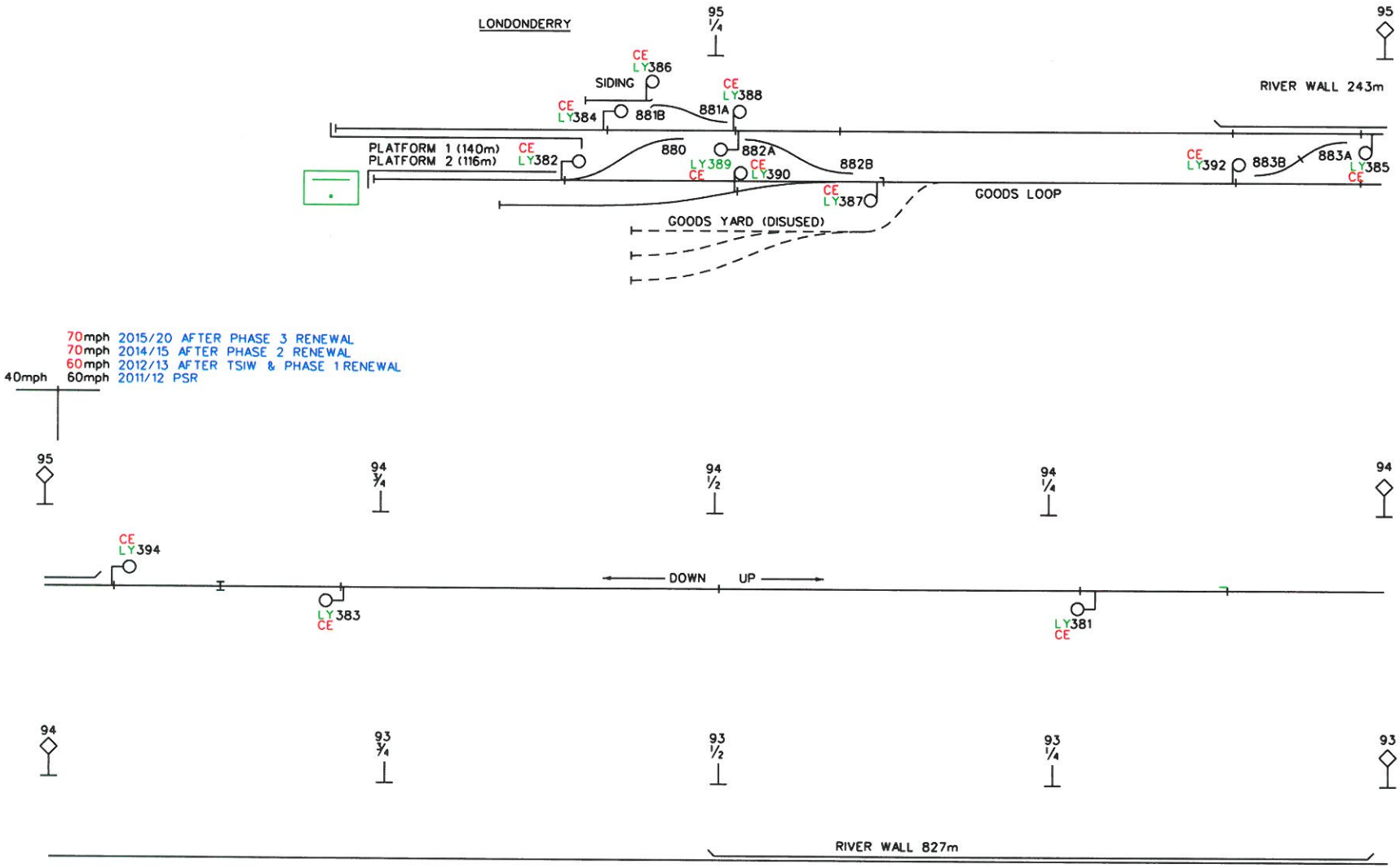

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Email: geoff.brown@translink.co.uk							
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Drawing Title

LONDONDERRY - COLERAINE
PHASE II RENEWALS PROJECT
SIGNALLING SKETCH

NI Railways
A Translink service

All changes to this CAD generated drawing MUST be made via the master CAD file.

Original Size: A3 (420x297mm)

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70mph 90mph 2015/20 AFTER PHASE 3 RENEWAL
70mph 70mph 2014/15 AFTER PHASE 2 RENEWAL
60mph 60mph 2012/13 AFTER TSIW & PHASE 1 RENEWAL
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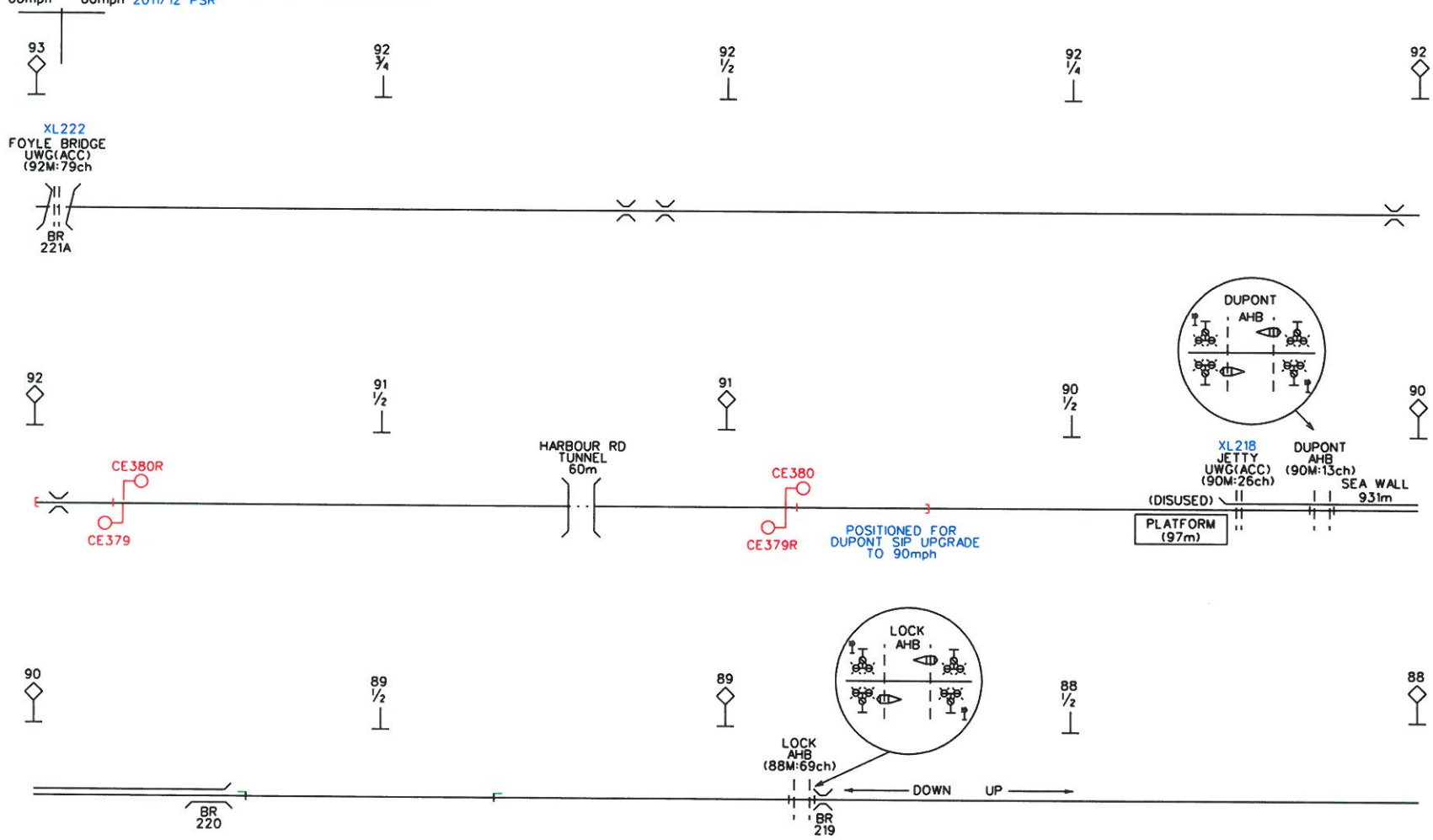

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Drawing Title

LONDONDERRY - COLERAINE
PHASE II RENEWALS PROJECT
SIGNALLING SKETCH

NOTE:

NI Railways
A Translink service

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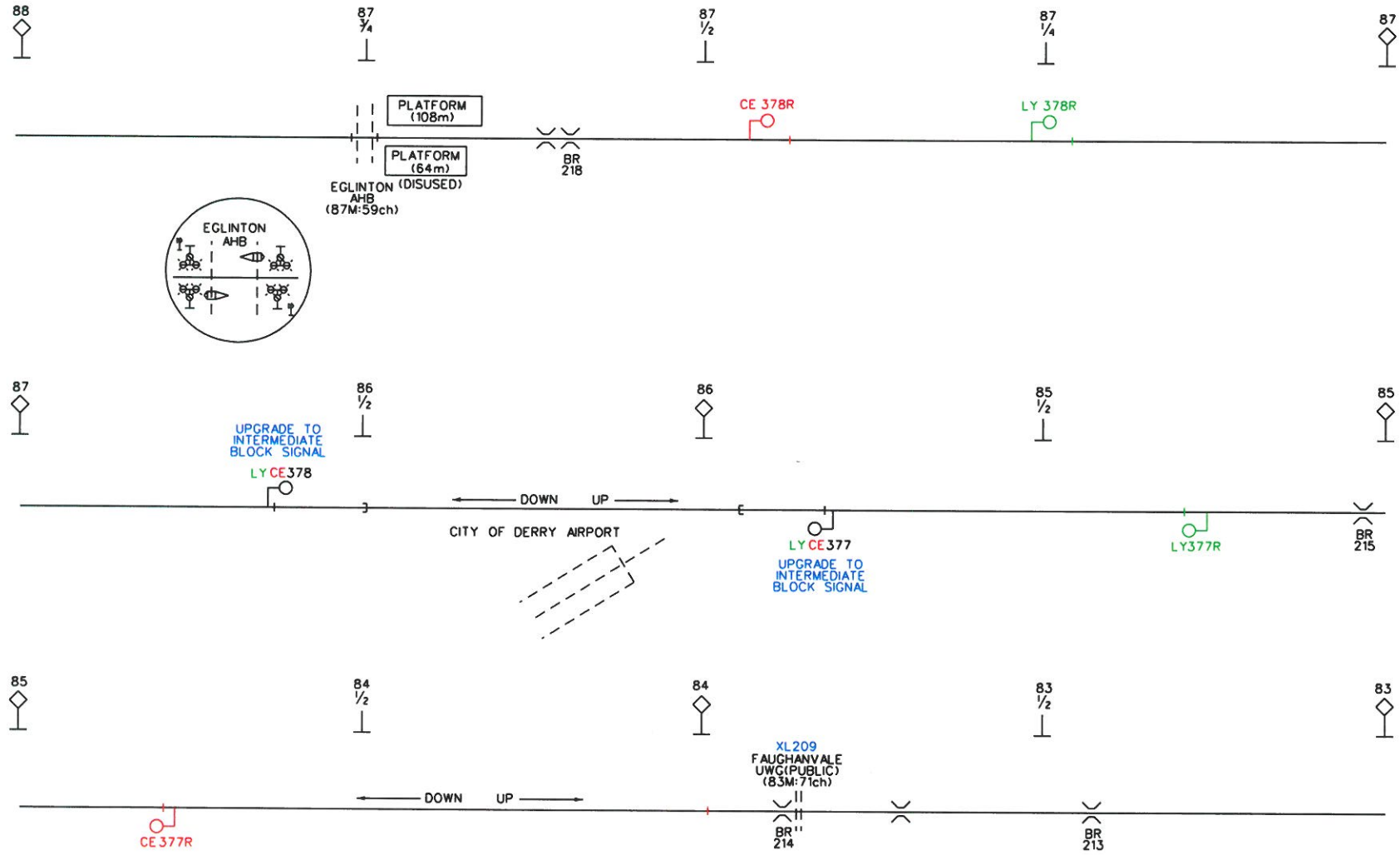

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Drwn: / Chkd: / Appd:	Drawing No: C0563-CE2LY-RP2-003			Revision A			
Date: / Date: / Date:							

Drawing Title

LONDONDERRY - COLERAINE
PHASE II RENEWALS PROJECT
SIGNALLING SKETCH

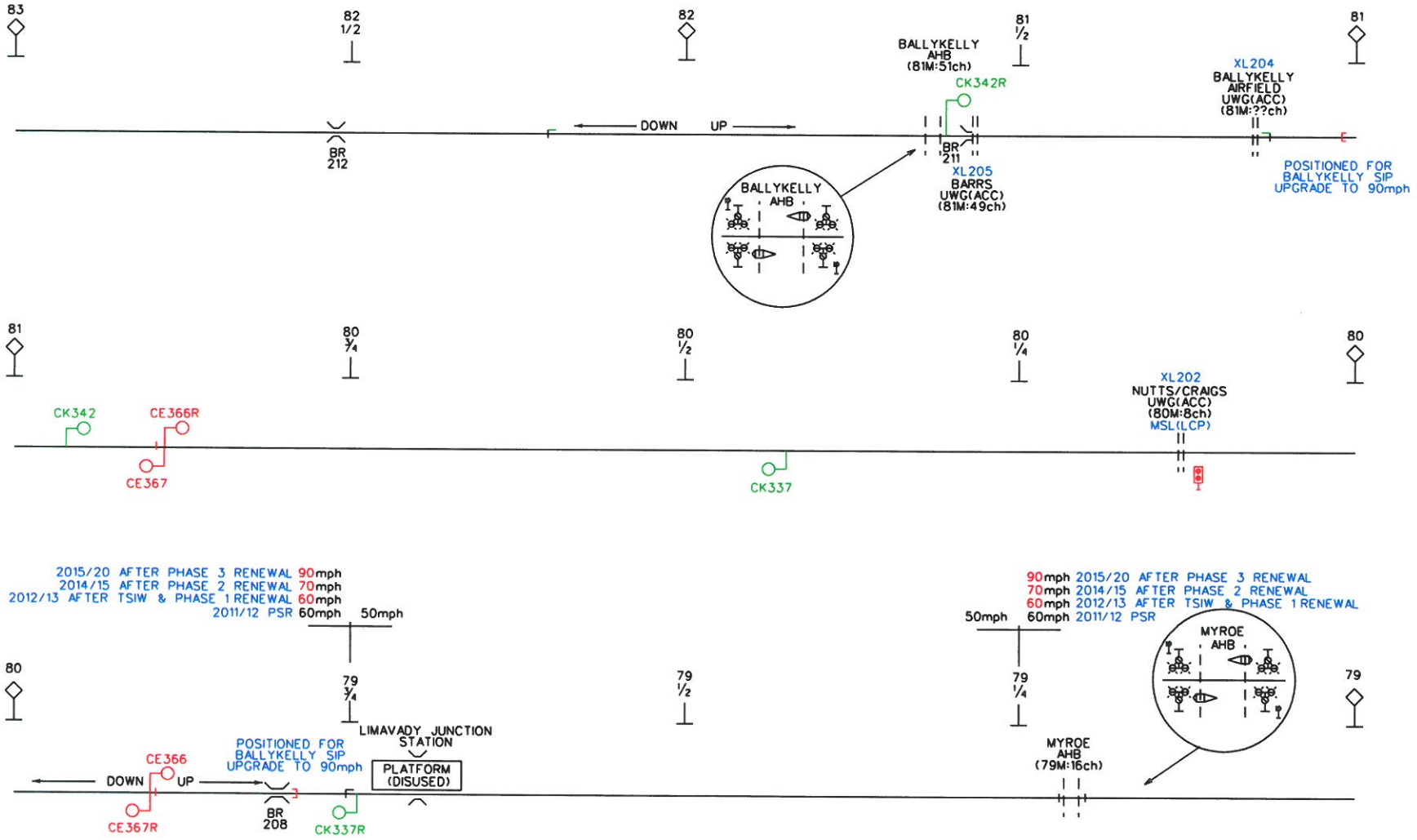
NOTE:

NI Railways
A Translink service

All changes to this CAD generated drawing MUST be made via the master CAD file.

Original Size: A3 (420x297mm)

DO NOT SCALE



Project Manager: Geoff Brown							
Email: geoff.brown@translink.co.uk							
Telephone: 02890 354406							
Project No: C0563	Rev	Date	Description	Drn	Chk	App	
ELR/Mileage:	Issue Status: For Discussion						
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Drwn: / Chkd: / Appd:	Drawing No: C0563-CE2LY-RP2-004				Revision: A		
Date: / Date: / Date:							

All changes to this CAD generated drawing MUST be made via the master CAD file.

Drawing Title

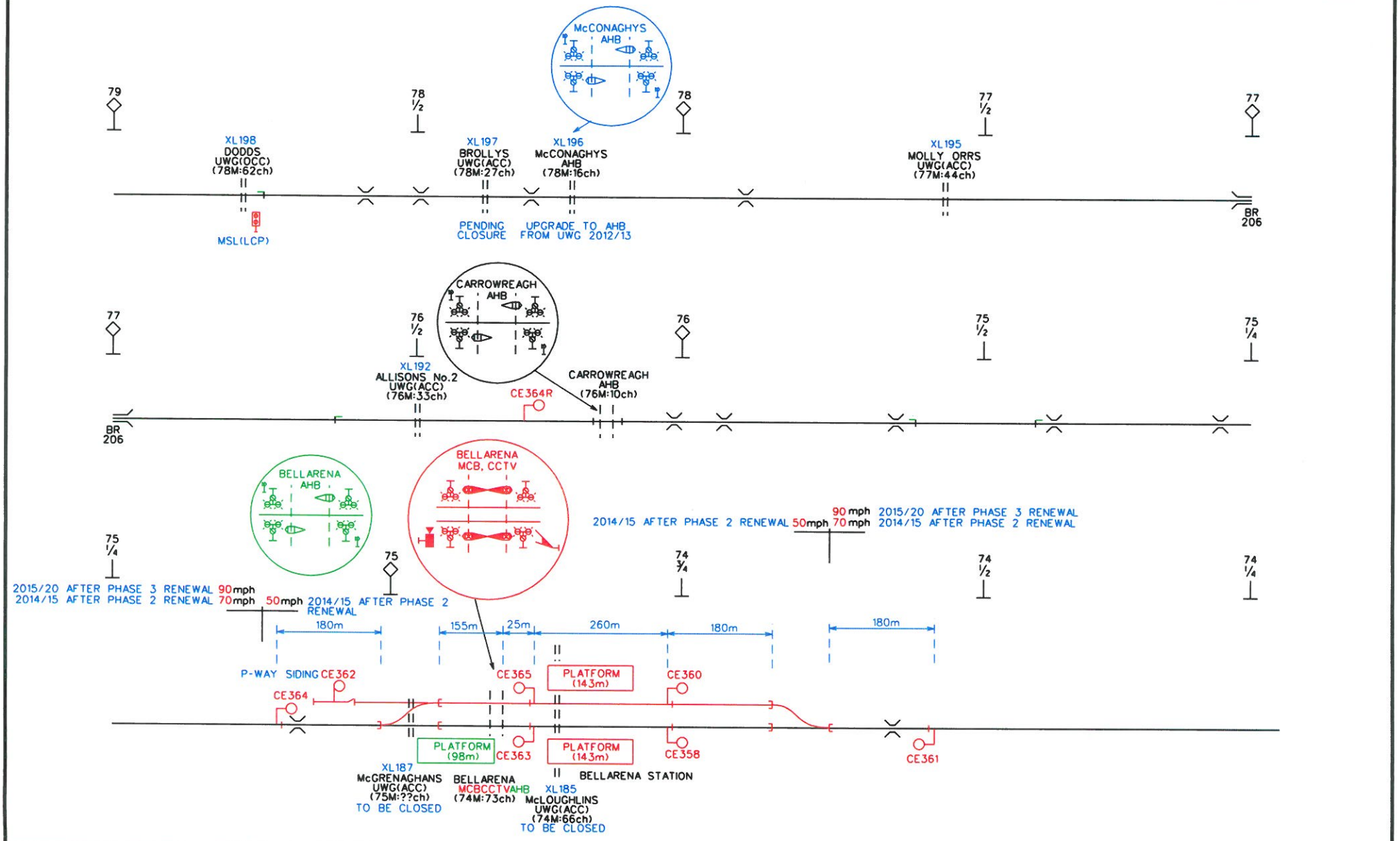
LONDONDERRY - COLERAINE
PHASE II RENEWALS PROJECT
SIGNALLING SKETCH

NOTE:

NI Railways
A Translink service

Original Size: A3 (420x297mm)

DO NOT SCALE



Project Manager: Geoff Brown			
Email: geoff.brown@translink.co.uk			
Telephone: 02890 354406			
Project No: C0563	Rev	Date	Description
ELR/Mileage:	Issue Status: For Discussion		
Scale: NTS			
Drwn: / Chkd: / Appd:	Drawing No: C0563-CE2LY-RP2-005		Revision: A
Date: / Date: / Date:			

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Drawing Title

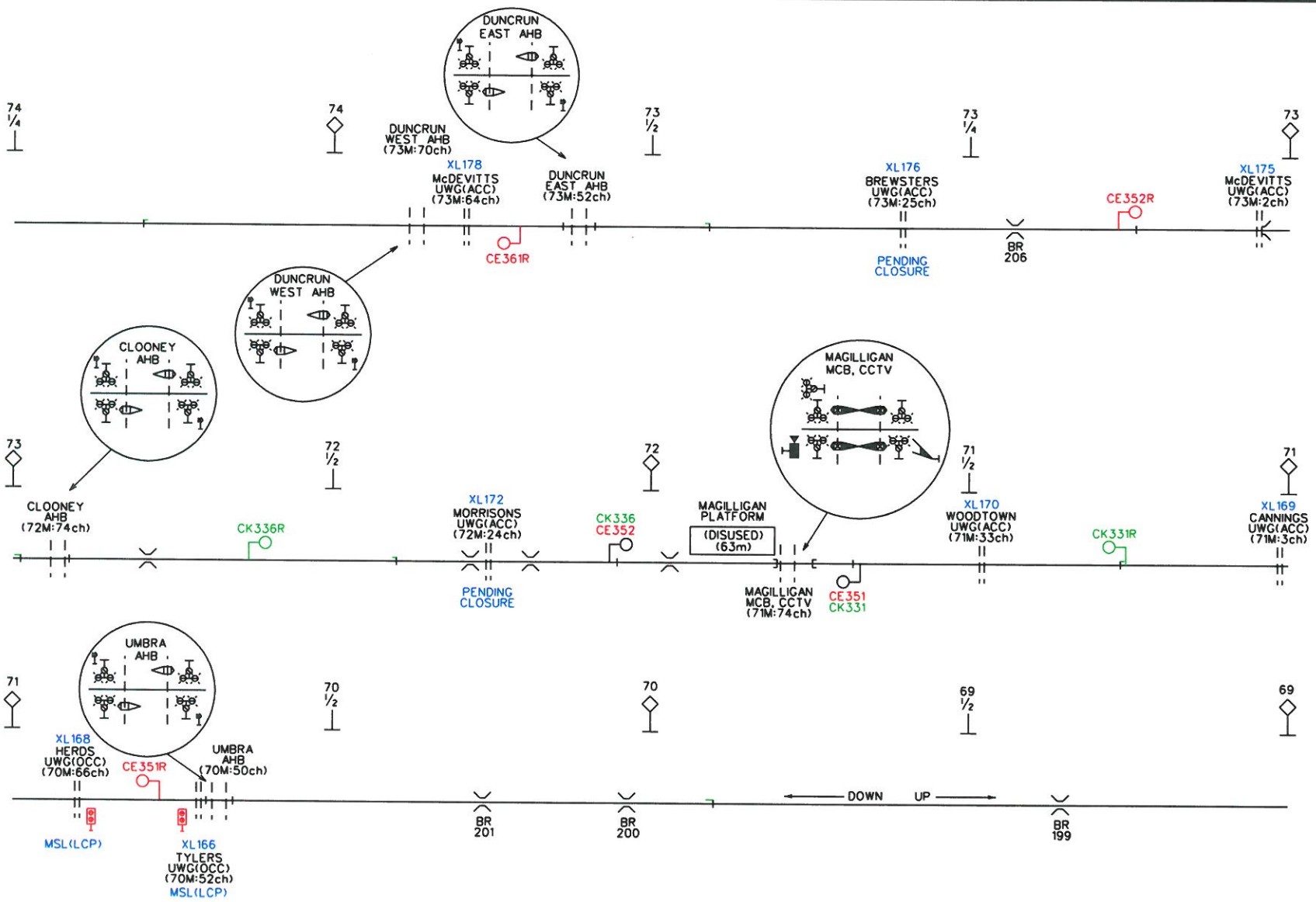
LONDONDERRY - COLERAINE
PHASE II RENEWALS PROJECT
SIGNALLING SKETCH

NOTE:

NI Railways
A Translink service

Original Size: A3 (420x297mm)

DO NOT SCALE



Project Manager: Geoff Brown							
Email: geoff.brown@translink.co.uk							
Telephone: 02890 354406							
Project No: C0563	Rev	Date	Description	Drn	Chk	App	
ELR/Mileage:	Issue Status: For Discussion						
Scale: NTS							
Drwn: / Chkd: / Appd:	Drawing No: C0563-CE2LY-RP2-006			Revision: A			
Date: / Date: / Date:							

Drawing Title

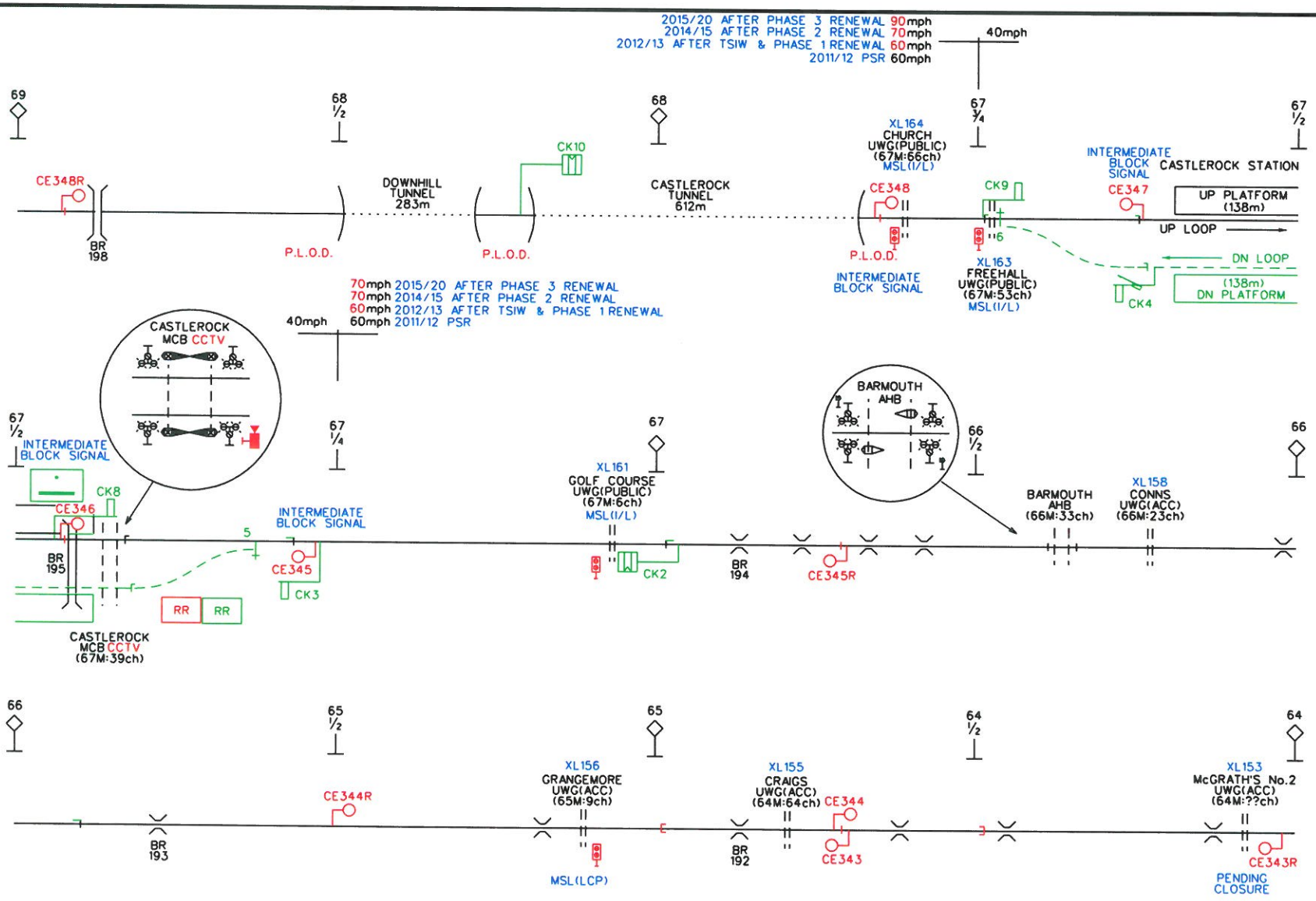
LONDONDERRY - COLERAINE
PHASE II RENEWALS PROJECT
SIGNALLING SKETCH

NI Railways
A Translink service

All changes to this CAD generated drawing MUST be made via the master CAD file.

Original Size: A3 (420x297mm)

DO NOT SCALE



Project Manager: Geoff Brown							
Email: geoff.brown@translink.co.uk							
Telephone: 02890 354406							
Project No: C0563	Rev	Date	Description	Drn	Chk	App	
ELR/Mileage:	Issue Status: For Discussion						
Scale: NTS							
Drwn: / Chkd: / Appd:	Drawing No: C0563-CE2LY-RP2-007			Revision: A			
Date: / Date: / Date:							

All changes to this CAD generated drawing MUST be made via the master CAD file.

Drawing Title

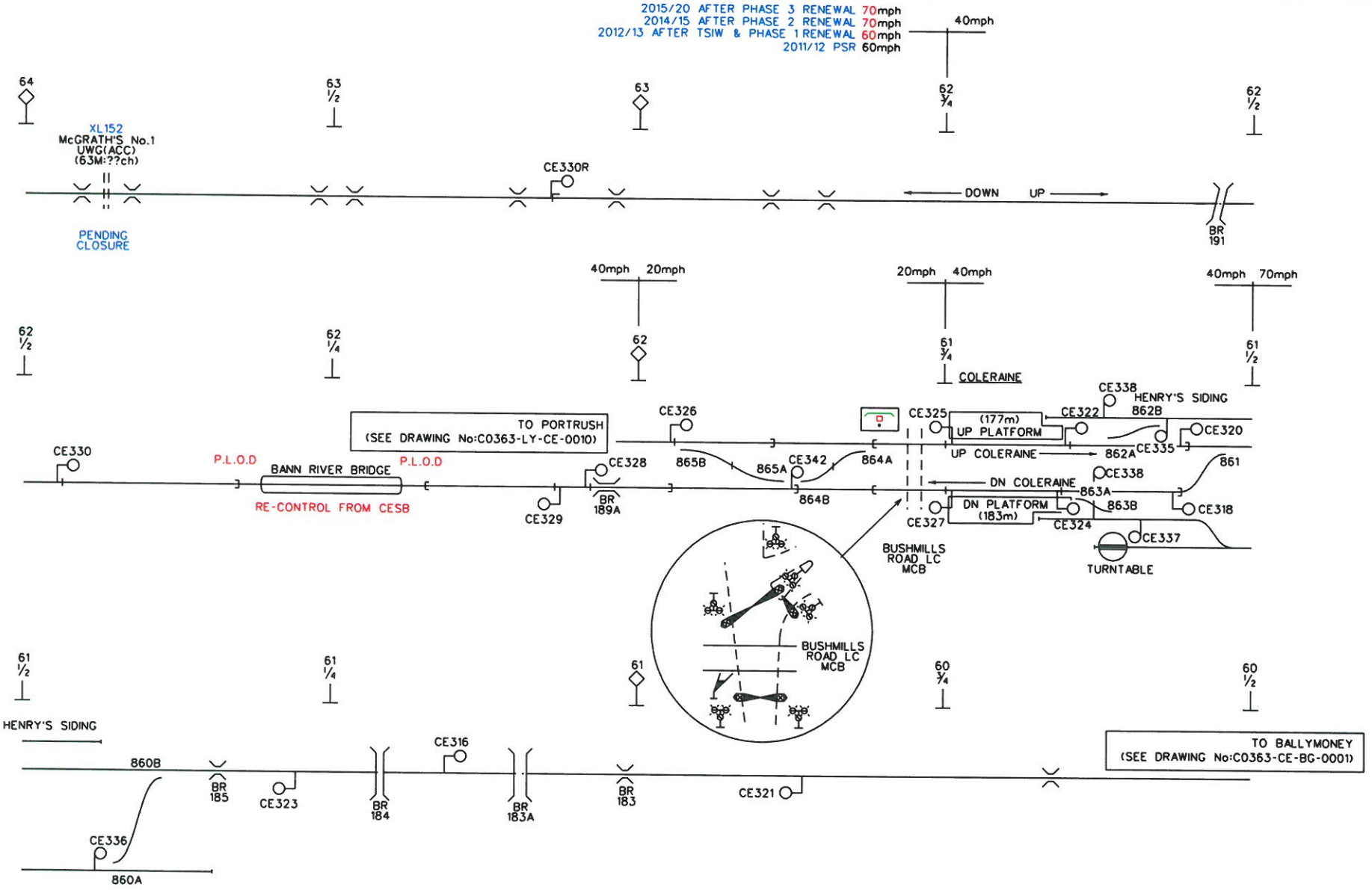
LONDONDERRY - COLERAINE
PHASE II RENEWALS PROJECT
SIGNALLING SKETCH

NOTE:

NI Railways
A Translink service

Original Size: A3 (420x297mm)

DO NOT SCALE



Project Manager: Geoff Brown							
Email: geoff.brown@translink.co.uk							
Telephone: 02890 354406							
Project No: C0563	Rev	Date	Description	Drn	Chk	App	
ELR/Mileage:	Issue Status: For Discussion						
Scale: NTS							
Drwn: / Chkd: / Appd:	Drawing No: C0563-CE2LY-RP2-008			Revison A			
Date: / Date: / Date:							

Drawing Title

LONDONDERRY - COLERAINE
PHASE II RENEWALS PROJECT
SIGNALLING SKETCH

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Original Size: A3 (420x297mm)