

Uddingston S&C renewals

16/03/22

Engineering Your Journey

**Background /
Initial development**

Construction

Engineering Your Journey

Engineering Your Journey

Single Option

Engineering Your Journey

**Options
Development**

Summary

Engineering Your Journey

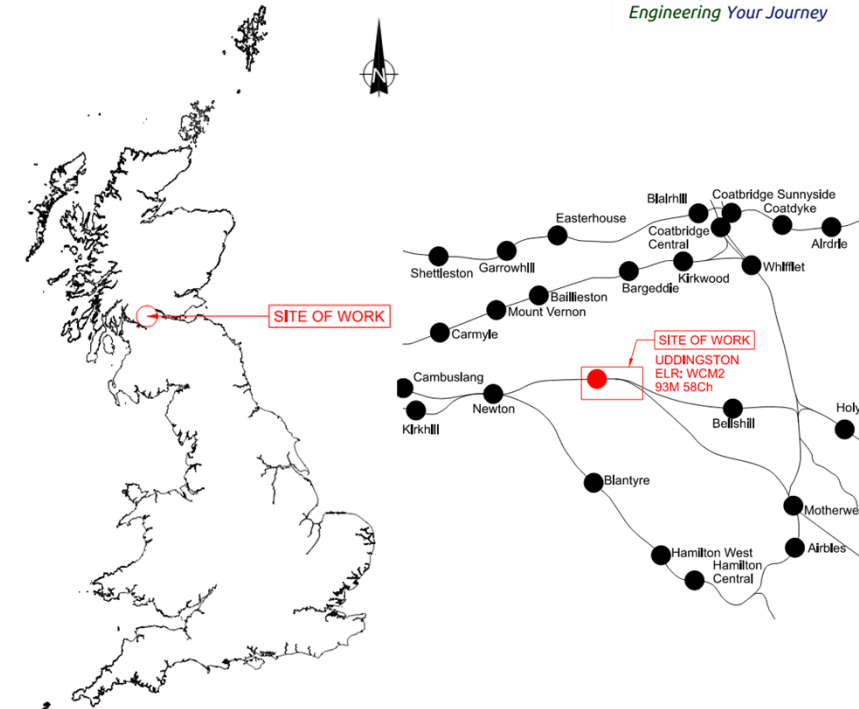
Engineering Your Journey

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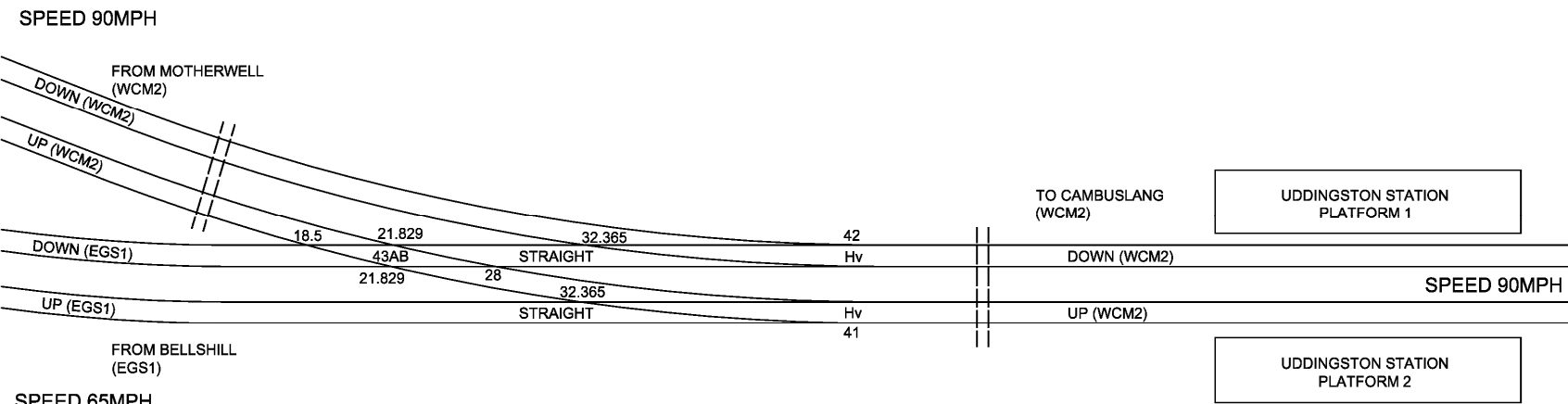
Background / Initial development

Background / Introduction

- Uddington Junction is formed by the intersection of West Coast Main Line (WCM2) and Holytown lines (EGS1)
- Existing track layout is a double junction with CEN56 switch diamond
- Existing speeds for WCM2 – 90mph and EGS1 – 65mph

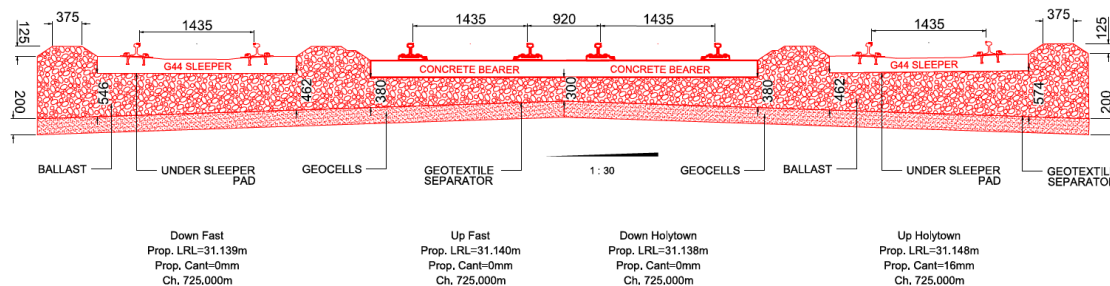
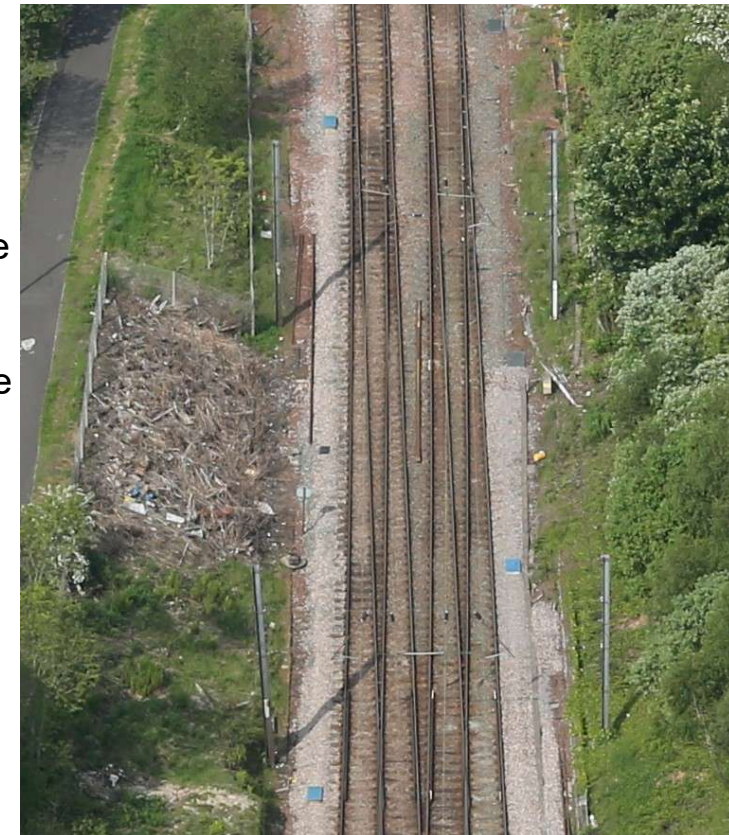


Existing layout



Initial S&C Development

- Original walkout with NR track development was July 2018 main issues identified were –
 - Presence of Japanese knotweed
 - Sheet piled walls
 - Area around S&C was very wet
 - S&C was located in a cutting approx. 6-8m below ground level which indicated that formation treatment was highly likely
- Jan 2019 – November 2020 – Main development period where contact was made with various parties to assist in the planning.
- November/December 2020 – Put forward Christmas 2021 wagon and kirow crane allocation to NR.
- January – July 2021 – Interface with Production team and S&C manufacturer (PRS) to produce best plan.



Classification: UNCLASSIFIED

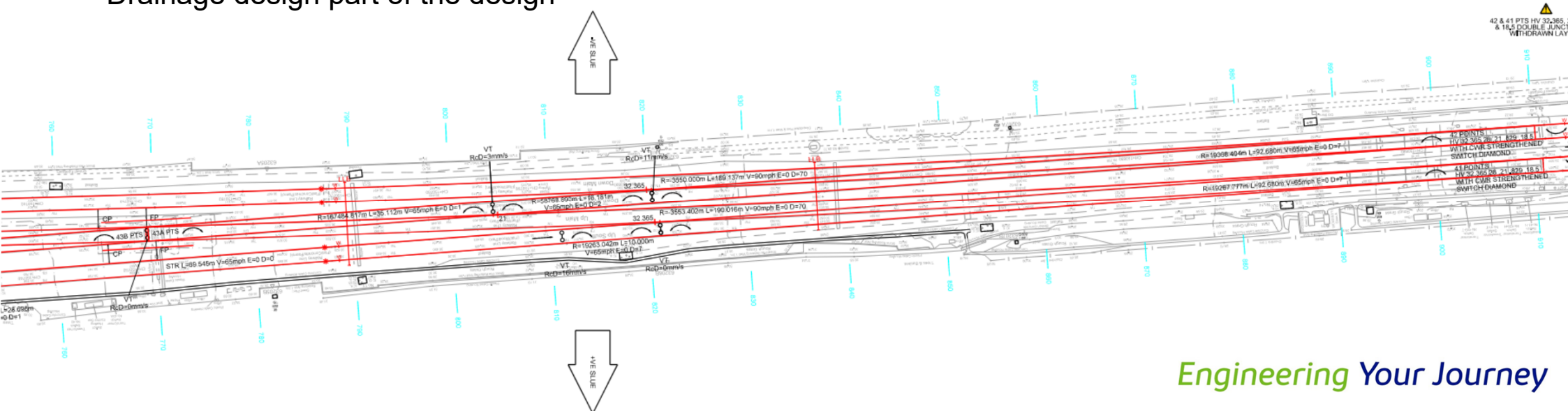
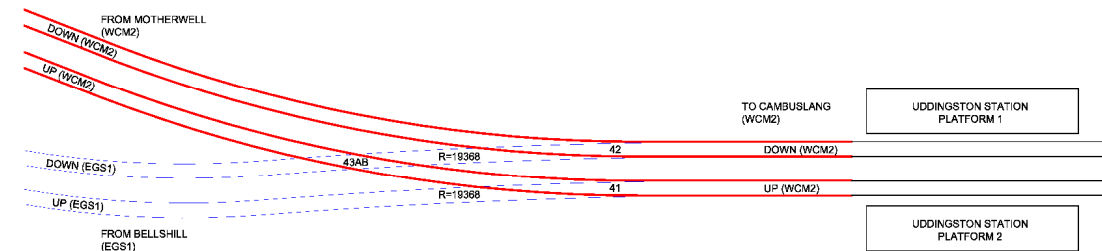
Options Development

Options Developments

- Option 1: With WCM2 as Main line and EGS1 as turnout route
- Option 2: With EGS1 as Main line and WCM2 as turnout route to allow for straight geometry through Main line
- Option 3: Similar to Option 2 and the design was extended through the platform to address the track quality issues

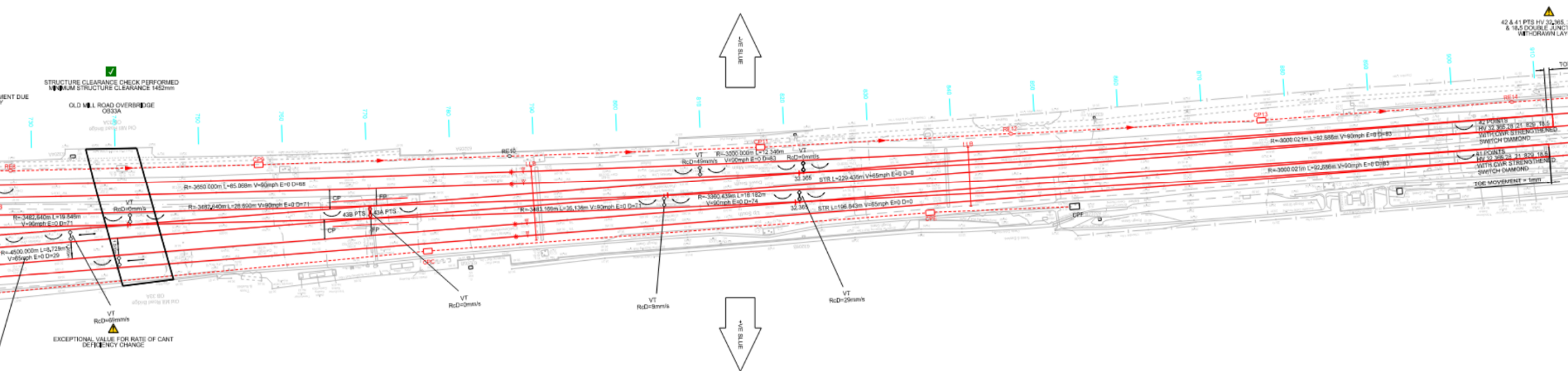
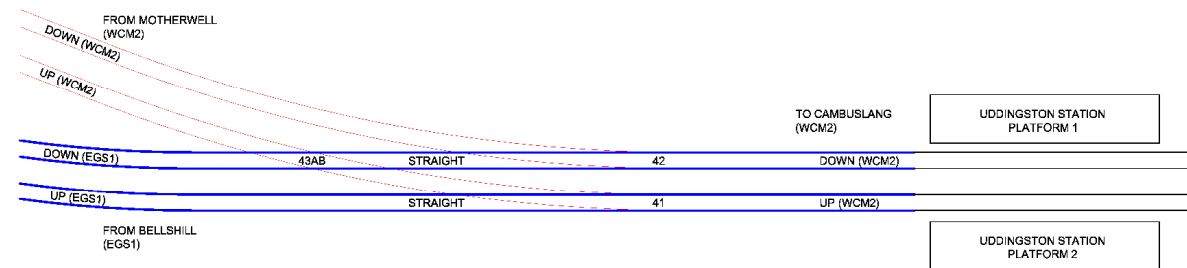
Option 1

- NR56 double junction
- Designed with WCM2 as mainline and EGS1 as turnout road
- Resulted in contraflexure turnouts for 41&42 pts
- Flat curve at switch diamond
- Drainage design part of the design



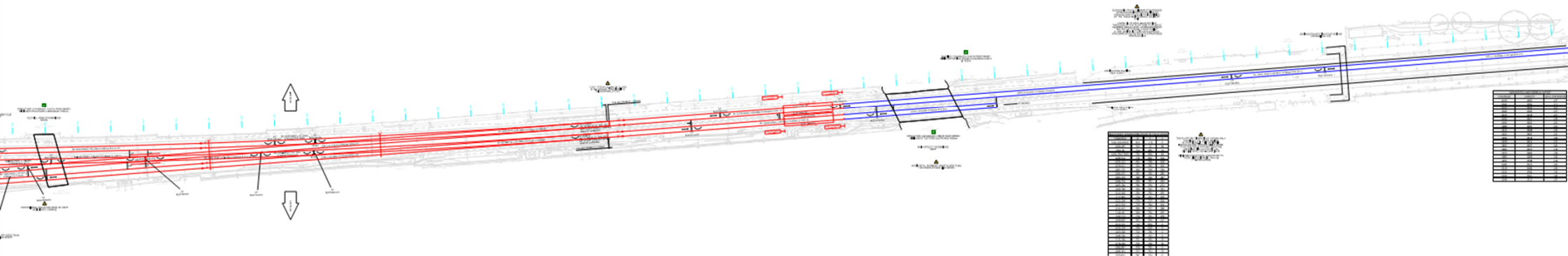
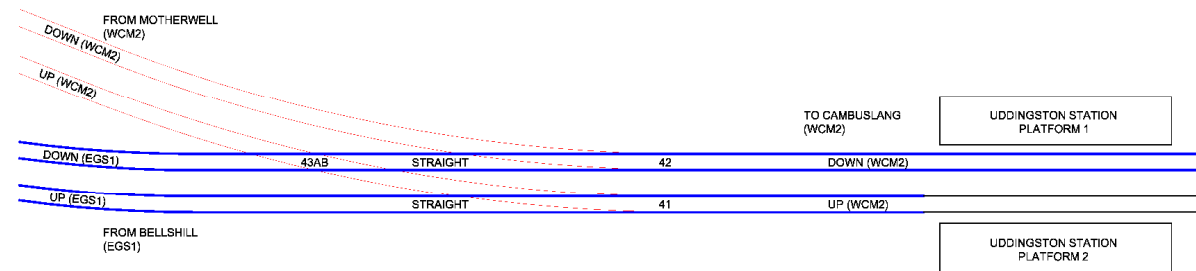
Option 2

- NR56 double junction
- EGS1 as mainline and WCM2 as turnout road
- Switch diamond on straight.
- Drainage design part of the design



Option 3

- NR56 double junction
- Down Main design extended through the Uddingston station to remove poor eighth identified by maintenance.

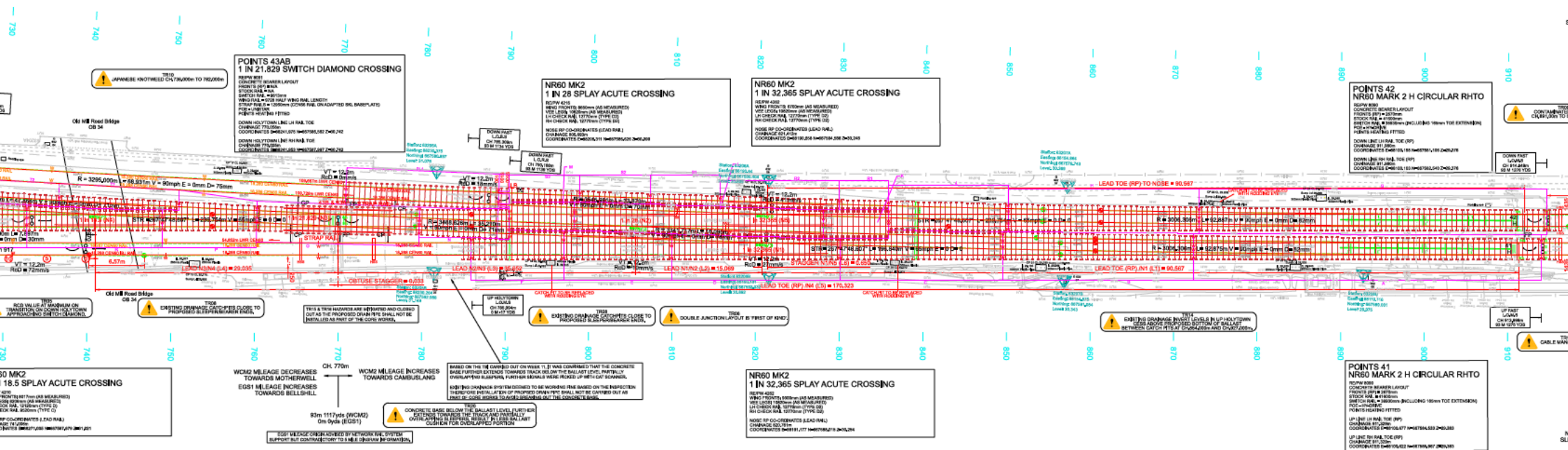


Single Option

Single Option



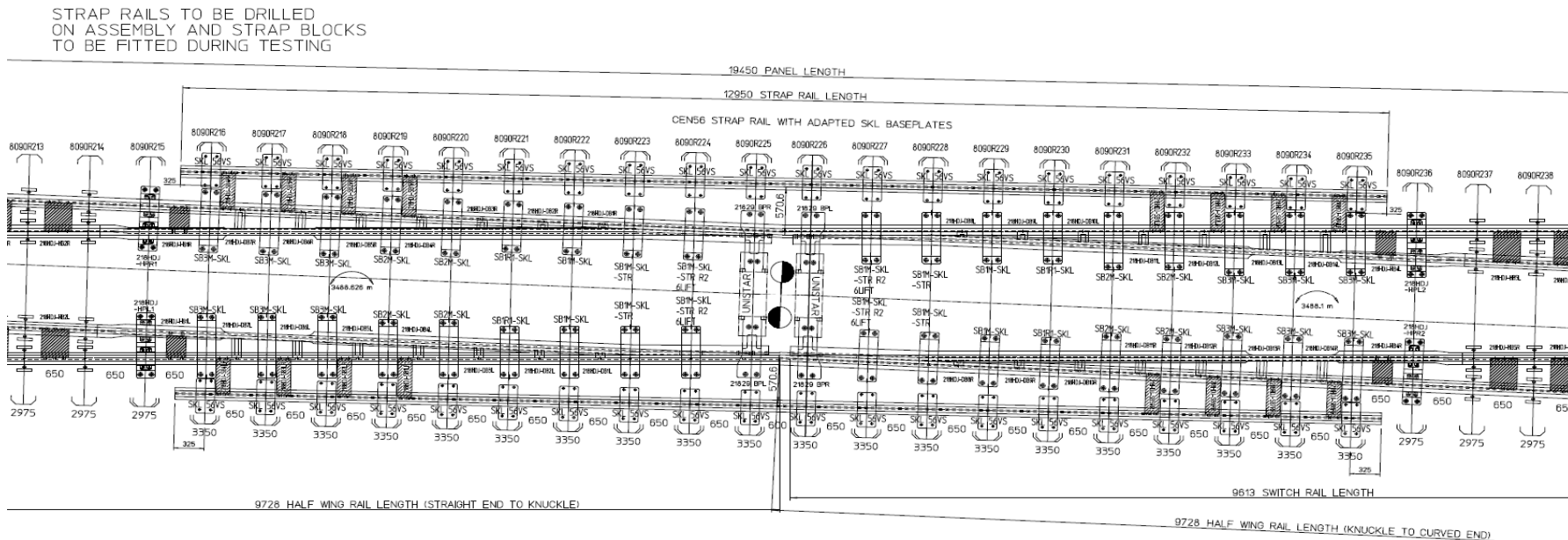
- GRIP 4 design largely followed the GRIP3 Option 2 proposal with some ‘tweaks’ to improve speed calculations and constructability.



- West Coast Main Line is the turnout route on the double junction.

Single Option (cont.)

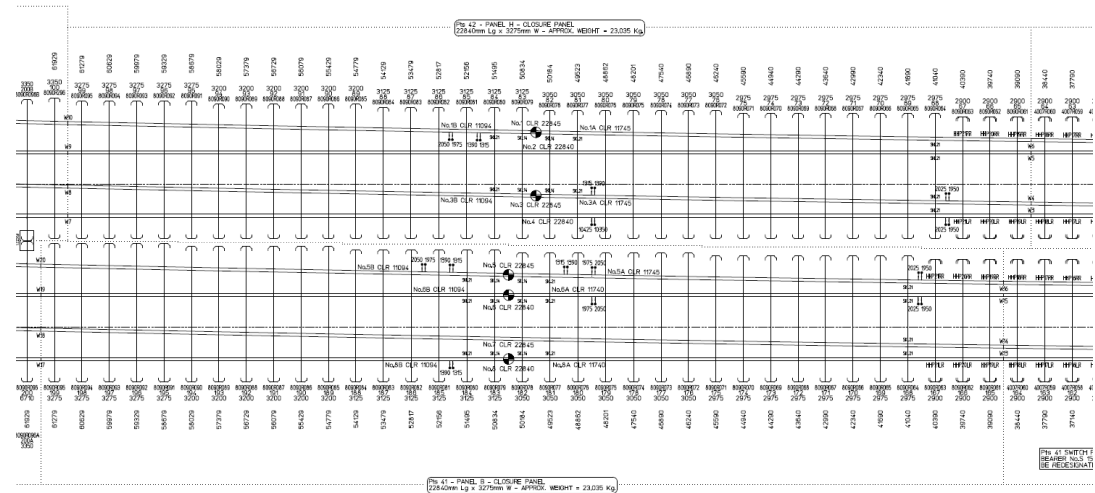
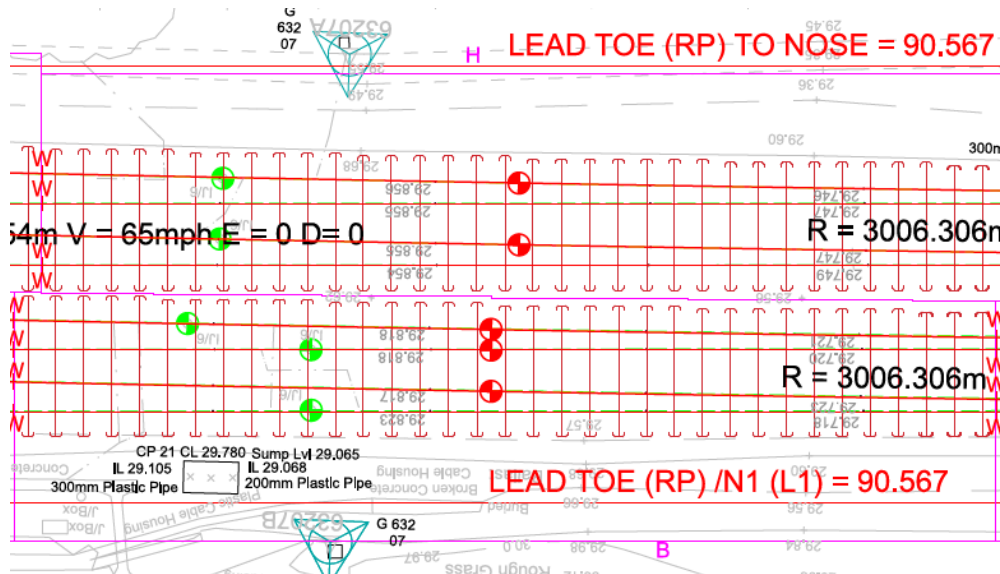
- NR60 Mk2 switch diamond at Uddingston is the first of it's type
- Hybrid layout with NR56 Switch Diamond an option until late in development



UDDINGSTON 1 IN 21.829 SWITCH DIAMOND
(SCALE 1:25)

Single Option (cont.)

- S&C manufacturer supply detail tied into track drawings

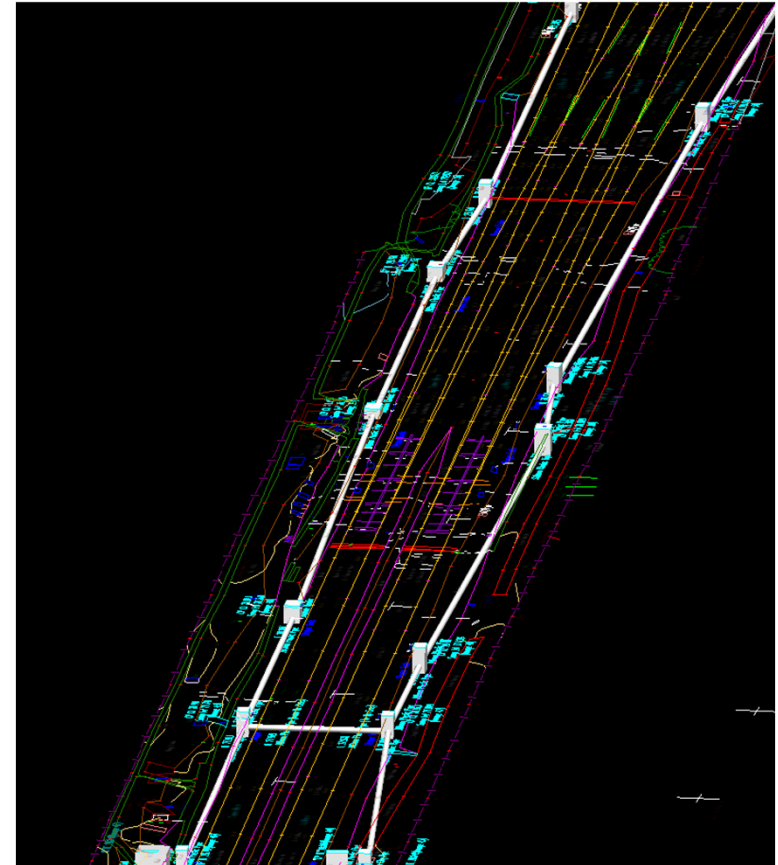
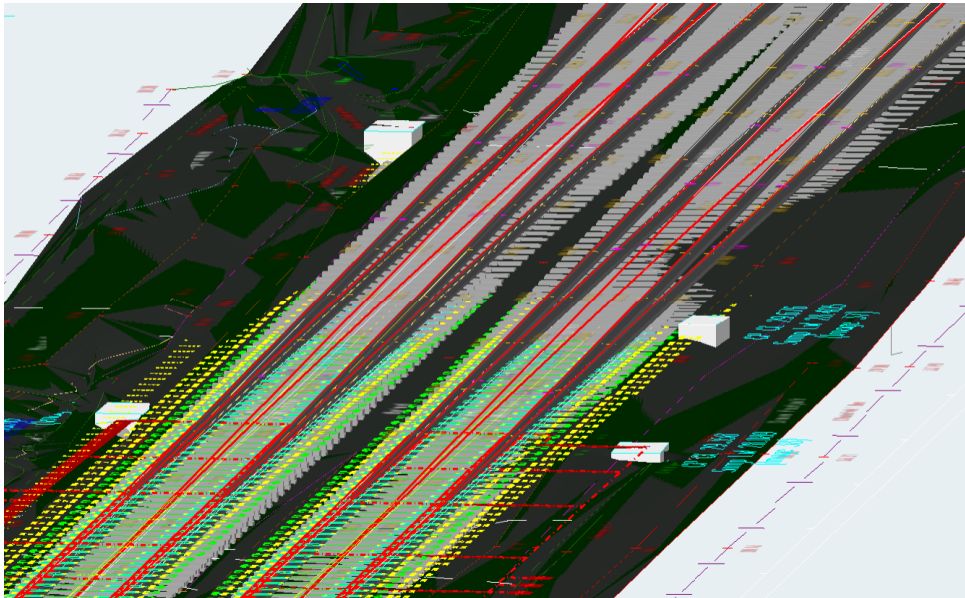


- Panel detail added to track drawings to aid construction planning

Interdisciplinary collaboration

Interdisciplinary reviews carried out at key design stages between:

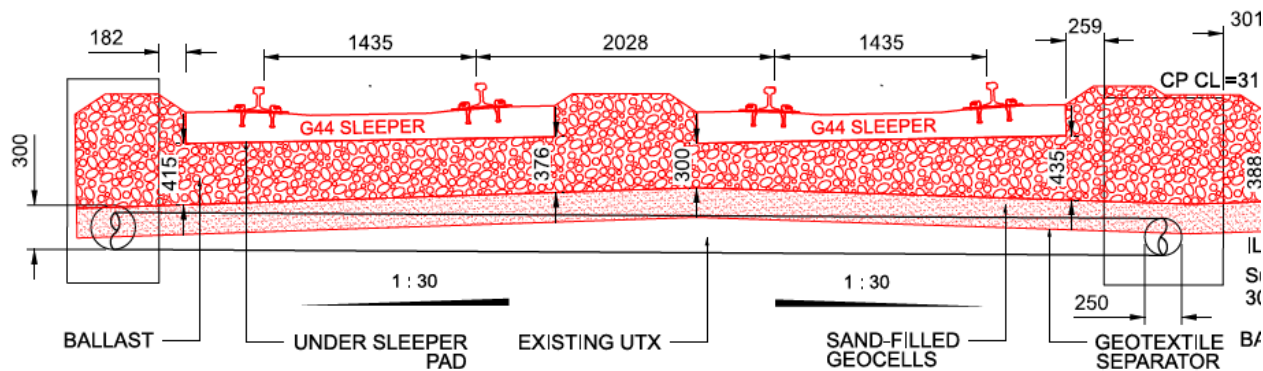
- Track
- Overhead Line Electrification
- Signalling
- Electrification & Plant



I-Twin software utilised for clash detection.

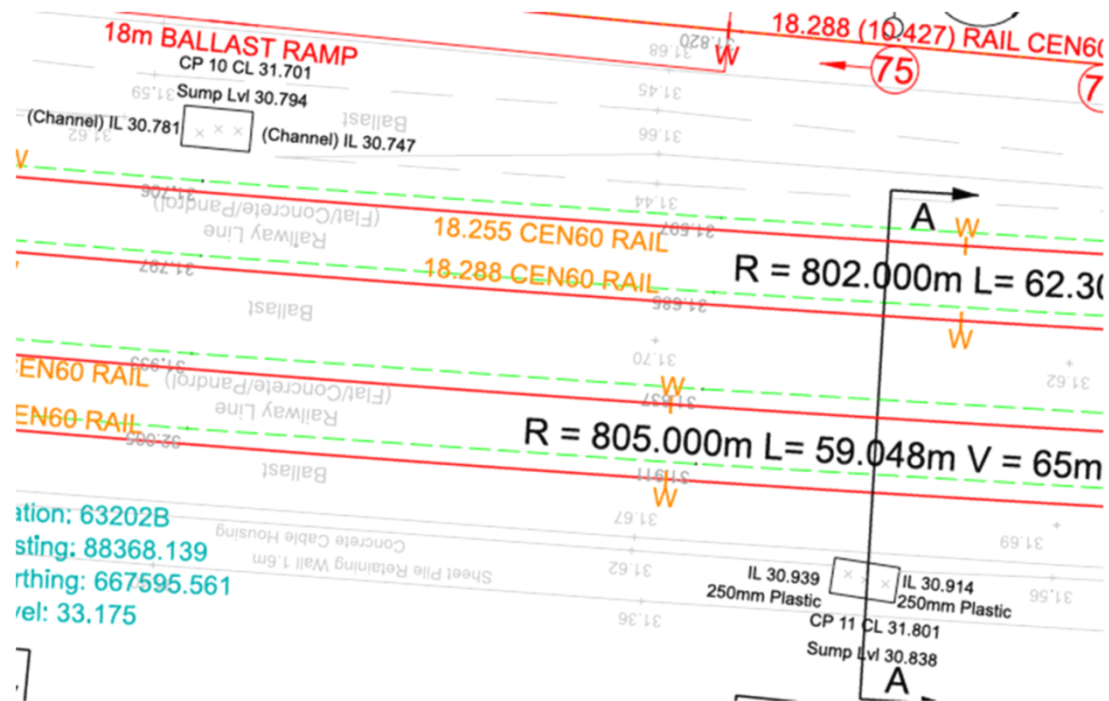
Interface issues

- Existing drainage



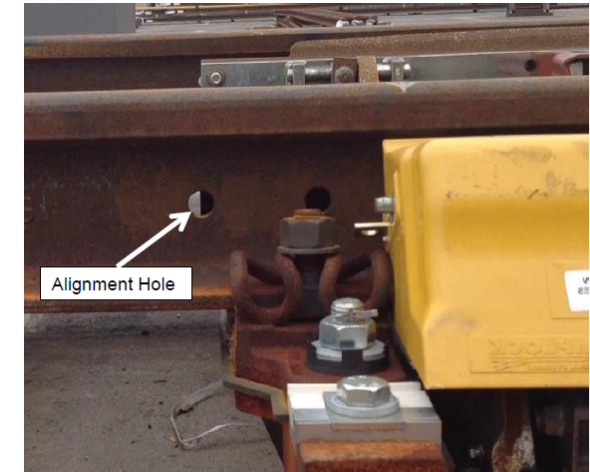
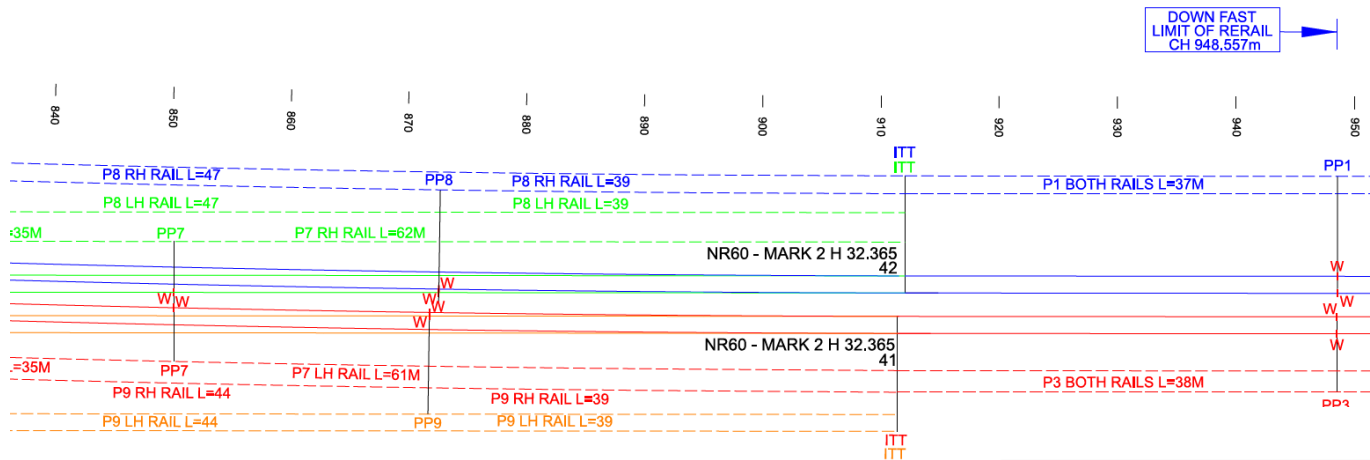
Interface issues (cont.)

- Large slues towards existing troughing route



Stressing

- New layout fully stressed



- Sequence of pulls is key in NR60 Mk 2 layout
- No stress transfer blocks
- Stress indicator at toe rather than heel of switch with a ball and claw arrangement

PULLING POINT NUMBER AND SEQUENCE	TRACK	RAIL	ITT MOTHERWELL/BELLSHILL END	CAME
1	DOWN FAST	BOTH	912	
2	DOWN HOLYTOWN	LH RAIL	522	
2	DOWN HOLYTOWN	RH RAIL	395	
3	UP FAST	BOTH	911	
4	UP HOLYTOWN	LH RAIL	499	
4	UP HOLYTOWN	RH RAIL	395	
5	DOWN FAST	LH RAIL	554	
5	DOWN FAST	RH RAIL	352	
6	UP FAST	LH RAIL	551	
6	UP FAST	RH RAIL	551	
7	DOWN HOLYTOWN	RH RAIL	815	

Through Alignment Design (TAD)

- West Coast Main Line has a through alignment design (TAD).
- New Uddington Junction layout has been incorporated into the TAD.



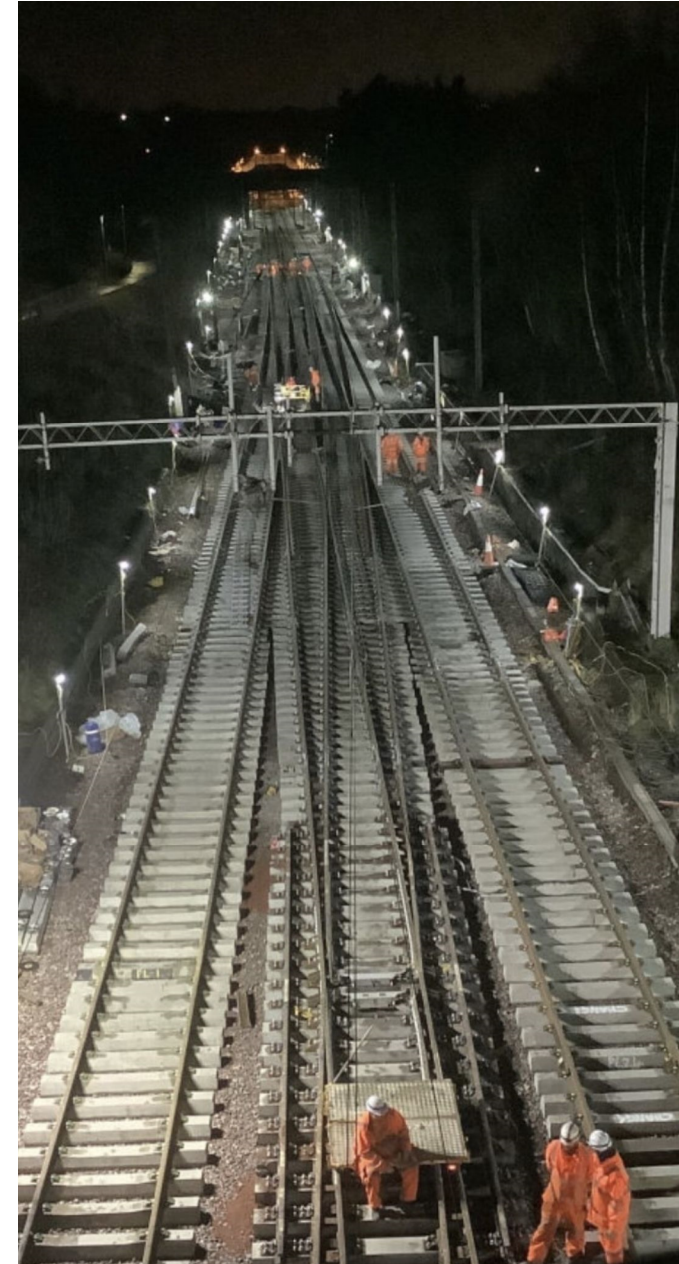
Design and Construction Timescales

Stage	Date	Weeks relative to core renewal
GRIP3 deliverables handover	1/8/20	T-73
Form A (Approval in principle design) submission	26/3/21	T-41
Form B (Detailed design) submission	16/7/21	T-24
AFC (Approved for construction) submission	20/10/21	T-10
Core renewal	25/12/21	T-0
First follow-up tamp	9/1/22	T+1
Second follow-up tamp	13/2/22	T+6

Construction

Construction - Overview

- Work completed in a 8-day blockade during Christmas 2021
- 21 trains, 2 tampers, 2 Kirow cranes & 17 tilting wagons used to deliver the job
- IGA wagons from British Steel used to deliver H-Switches
- 2 NR60 MK2 H-Switches and CEN60 Switch Diamond installed



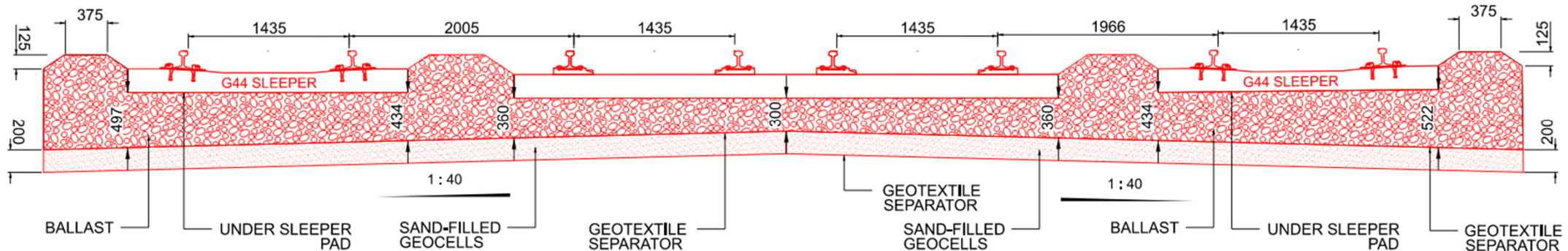
Construction - Overview

- 628yds of plain line renewed, and further 507yds PL rerailed
- 130 welds completed in total
- Handed back at line speed after the first week tamp



Construction - Overview

- Geocells proposed due to legacy drainage issues
- Large dig depth required due to geocells approx. ~600mm-900mm
- 1:40 crossfall proposed at S&C to reduce the dig depth
- Sand dropped with Sidetippers due to the volume involved

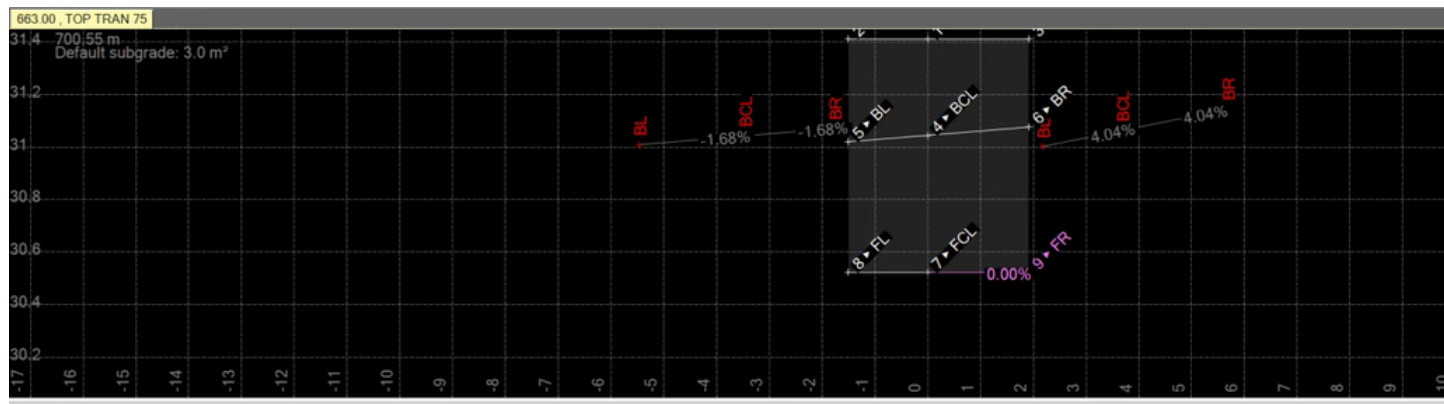
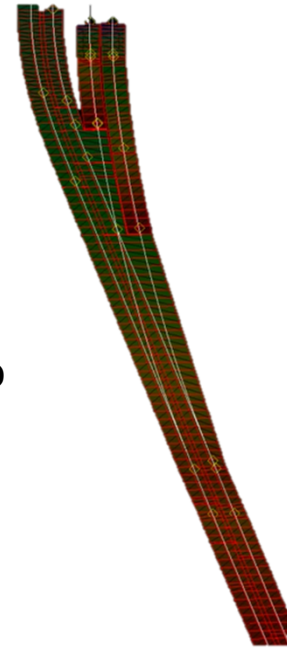


Construction - Geocells



Construction - Overview

- GPS guided dozer used to install formation and ballast to required design level



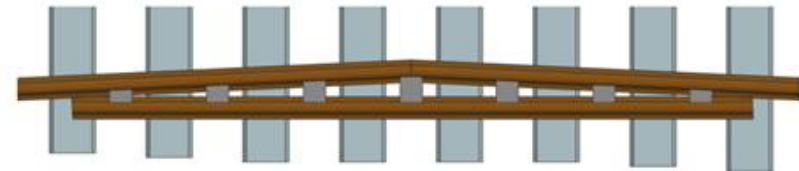
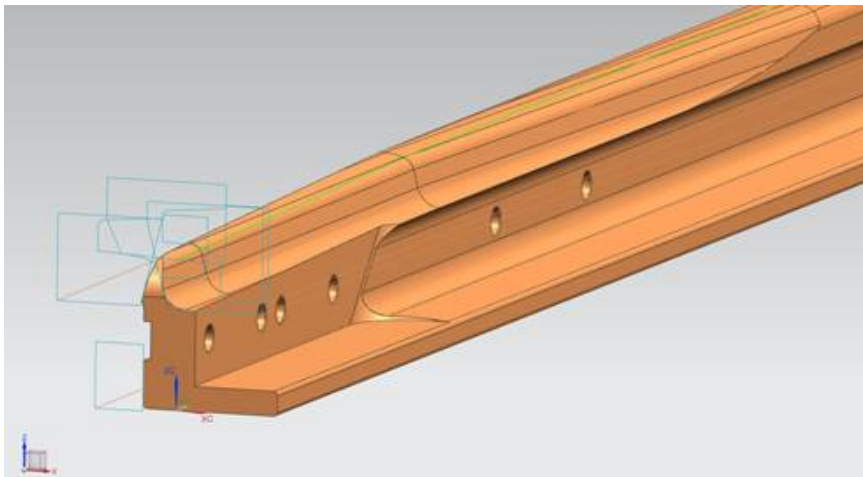
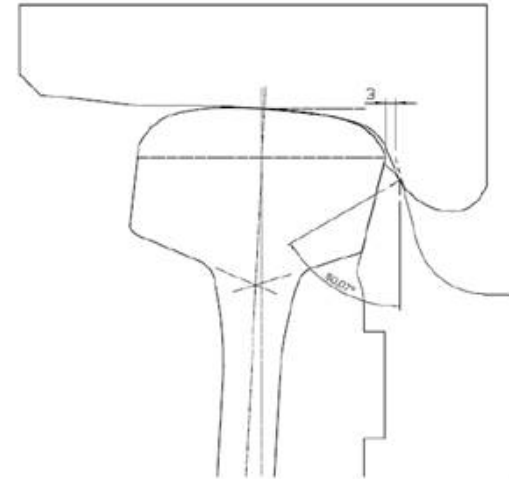
Construction - Training

- Unistar POE is first of its kind installed on the main lines.
- Training were arranged to RSAS staff and NR staff in August
- Switch diamond was transported to Portobello yard from Beeston for the training purposes.



S&C Manufacture

- Develop new design for shallow depth switch diamond
- Ensure safe passage of wheel flange through the switch diamond
- Components design
- Given the volume and size of panels deliveries need to be bespoke and lot of planning involved.

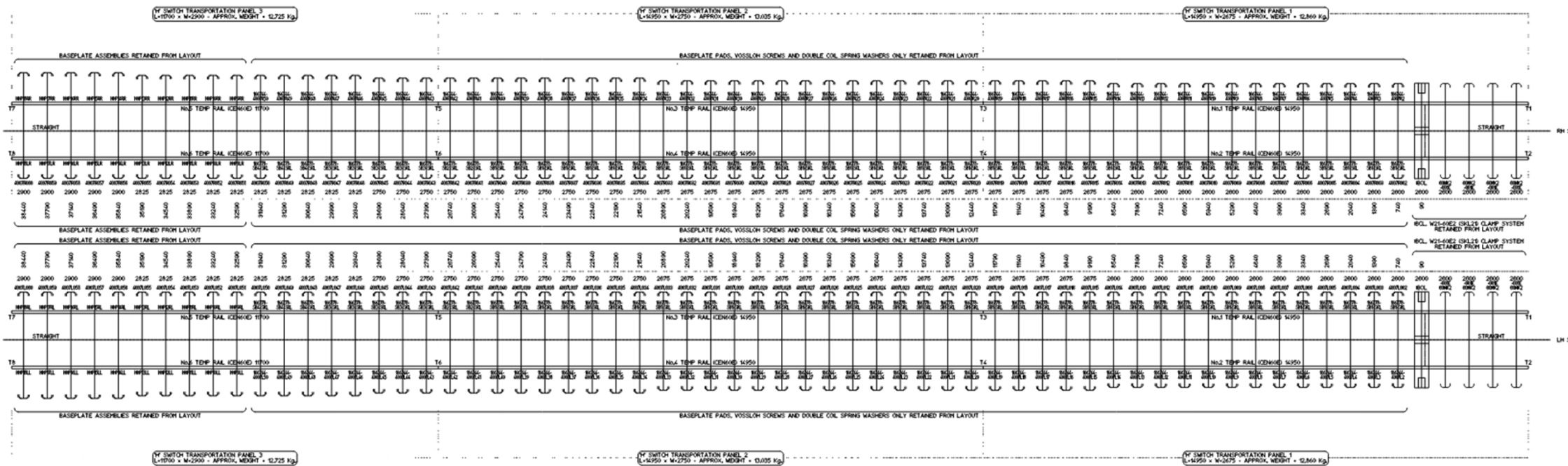


Construction – H Switch

- H-Switches could not be transported to site as pre-built
- Delivered as three plain line panels by road and built at site
- H-Switches were delivered to site separately by IGA wagons.
- Switch panels were part built at site with additional works such as rebuilding S&T and regauging S&C.
- Spare half sets and switch diamond delivered.



Construction – H Switch

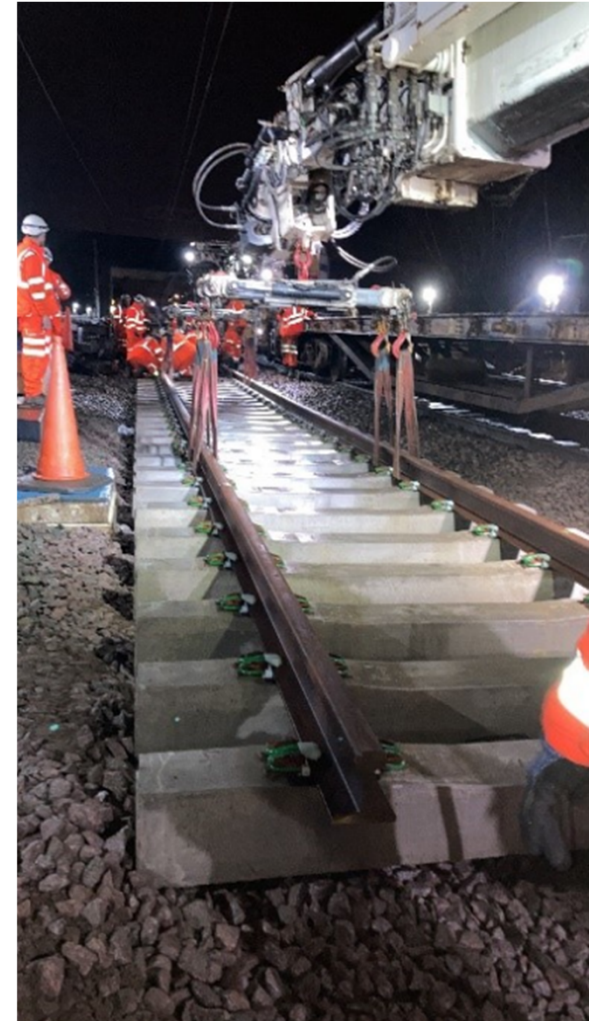


Construction – Safety

- 3 shifts each day of the 8-day blockade with typically 10 - 30 operatives
- 21 Engineering Trains
- 2 S&C tampers
- 2 Kirow 250 cranes
- 17 tilting wagons
- 4 Road Rail Vehicles
- 3 Liebherr 920 Excavators
- 1 GPS guided dozer
- Various types of small plant, Stihl saws, impact wrenches



**everyone
home safe
every day**



Summary

Summary

- First of type NR60MK2 H Switches & Switch diamond installed
- Unistar POE for Switch Diamond installed on the main line
- Double junction fully tampable
- Geocells installed
- Fully stressable S&Cs
- Improved geometry for better traces
- Less maintenance interventions
- Better passenger experience



Engineering Your Journey

Time Lapse

Uddingston S&C Renewal December 2021

