

Seeing What You Need to See.

How AIVR is supporting Rail Safety through Innovation and Integration.

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A Journey into Rail

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Supporting Rail Safety through Innovation...

Challenge: Reduce Boots on Ballast by using remote inspection capabilities



View image of the rail corridor to enable this



To view the corridor images are needed – cameras on trains.



Access physical hard-drives and devices for data – via a courier!



View aged data that can require specific software

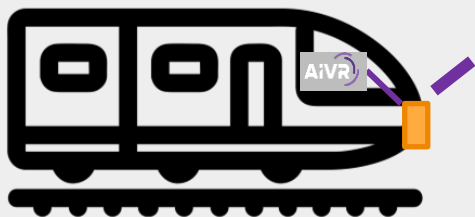
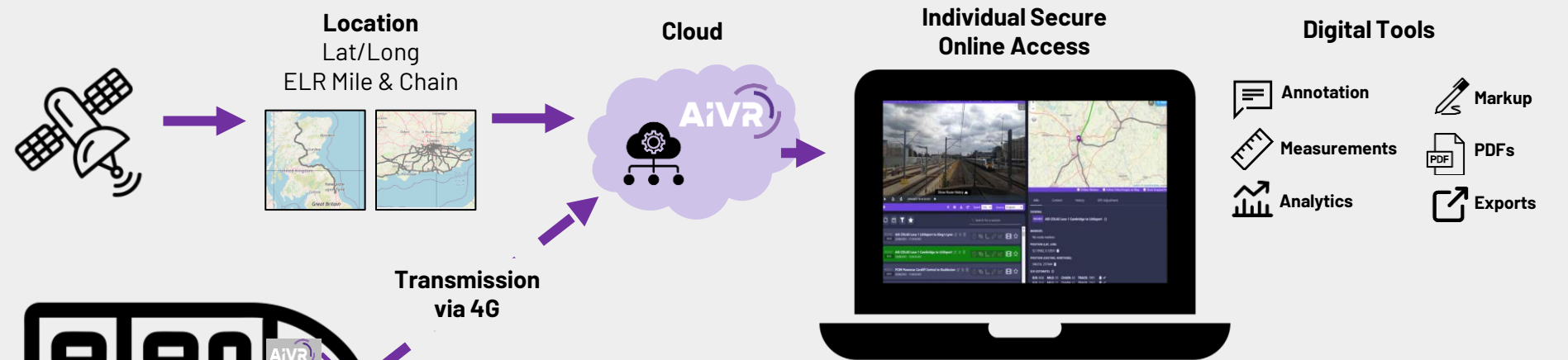


Solution: Make video data accessible online, capture more data, more viewpoints, make it securely available to all those who need it.



Enable users to make the most of the up to date data they need.

What is AIVR (Automated Intelligent Video Review)



External SIG housing
that fits temporarily on
Tail Lamp Bracket
(mounted by hand)



Integrated
permanently with FFV
on Measurement or
in-service train

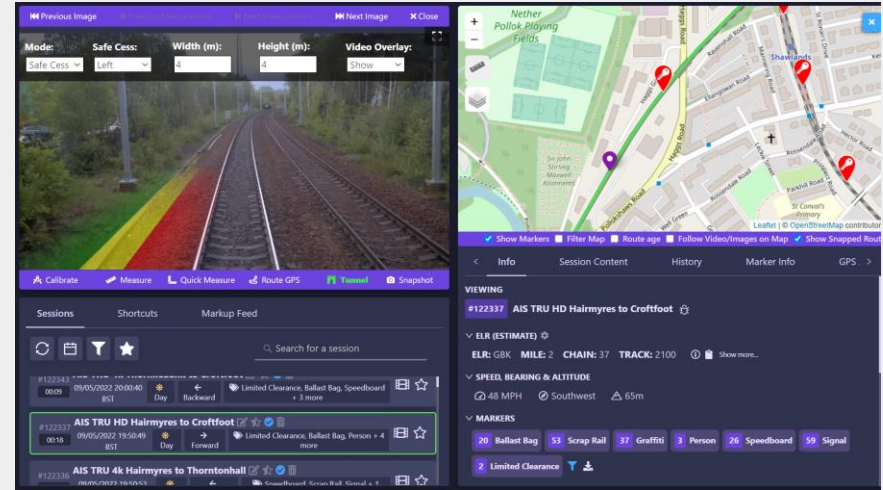
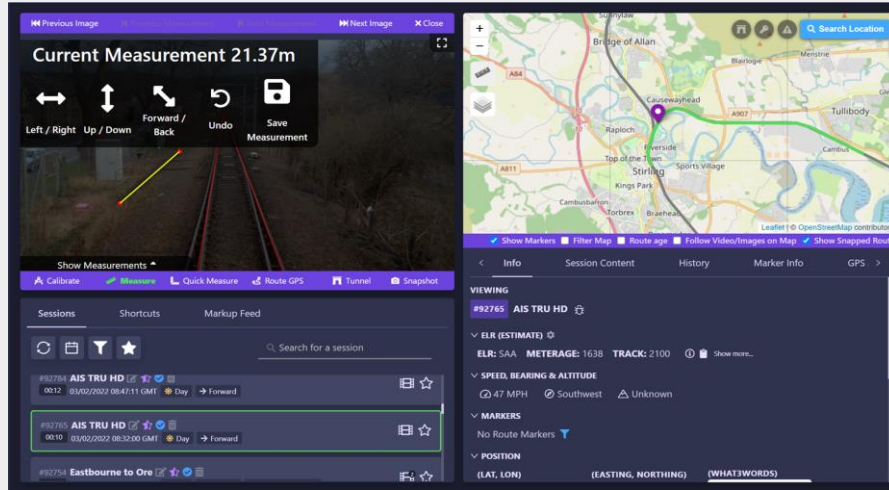


Line scanning
cameras on
automated class 153's



Mounted
temporarily inside
windscreen

Online access and digital tools



Online digital tools available to all users for measurement, annotation, reporting, planning and sighting and sharing of data rapidly in an accessible manner.
Safe cess overlay developed in response to Track Worker Safety requirements.

Online access and digital tools

The screenshot displays the AIVR web application interface. The browser's address bar shows the URL `view.aivr.video`. The interface is divided into several sections:

- Left Sidebar:** Contains navigation icons for SIG, OTA, and other functions, along with a user profile icon.
- Main Video Feed:** Displays a live video of a railway track. Below the video, there is a "Show Route History" button and a playback control bar.
- Map View:** Located on the right, it shows a satellite map with a green line indicating a route. The map includes a search bar and various map controls.
- Session List:** A table below the video feed lists sessions with details such as session ID, title, date, and time. The sessions listed are:
 - #123168: LNE TLC 3 Nottingham to Grantham (13/05/2022 10:46:17 BST)
 - #123165: TFW 3 AIVR Go Cardiff Central to Bridgend (13/05/2022 10:41:47 BST)
 - #123152: NR Western 5 Didcot Parkway to Reading (13/05/2022 10:16:00 BST)
- Right Panel:** Provides detailed information for the selected session (#123152), including session title, ELR (ESTIMATE), SPEED, BEARING & ALTITUDE, MARKERS, and POSITION (LAT, LON, EASTING, NORTHING).

Digital Tools for Planning



Data captured from across all routes and regions of the UK.

Over **2,000 users** from all disciplines across the whole of the UK

For **each hour spent on AIVR** user spends on the platform it is estimated they **remove eight hours of site** time.

Working in partnership with Network Rail, Transport for Wales and multiple TOCs and FOCs for collaborative data capture and maximum coverage.

Over **400,000 miles** of data captured and transmitted – all history available to view and a huge lake of data that can be used for multiple use cases and automated insights from Machine Learning and Computer Vision.

Safety Use case 1 – Red zone working

TELEPHONE - SPT	MNT243	S&T Telephones	R8	Red unassisted lookout	08/09/2021	09/08/2021	1
TELEPHONE - SPT	MNT243	S&T Telephones	R8	Red unassisted lookout	08/09/2021	09/08/2021	1
TRACKSIDE APPARATUS CASE	MNT152	Equipment Housing - Location Case	R8	Red unassisted lookout	02/09/2021	16/08/2021	1
TRACKSIDE APPARATUS CASE	MNT152	Equipment Housing - Location Case	R8	Red unassisted lookout	02/09/2021	16/08/2021	1
WIRE DEGRADATION CHECK-COND 1-NORMAL [C]	MNT152	Equipment Housing - Location Case	R8	Red unassisted lookout	02/09/2021	16/08/2021	1
SERVICE A M001	MNT213	Maintain Signalling Power Supplies	R8	Red unassisted lookout	02/09/2021	16/08/2021	1

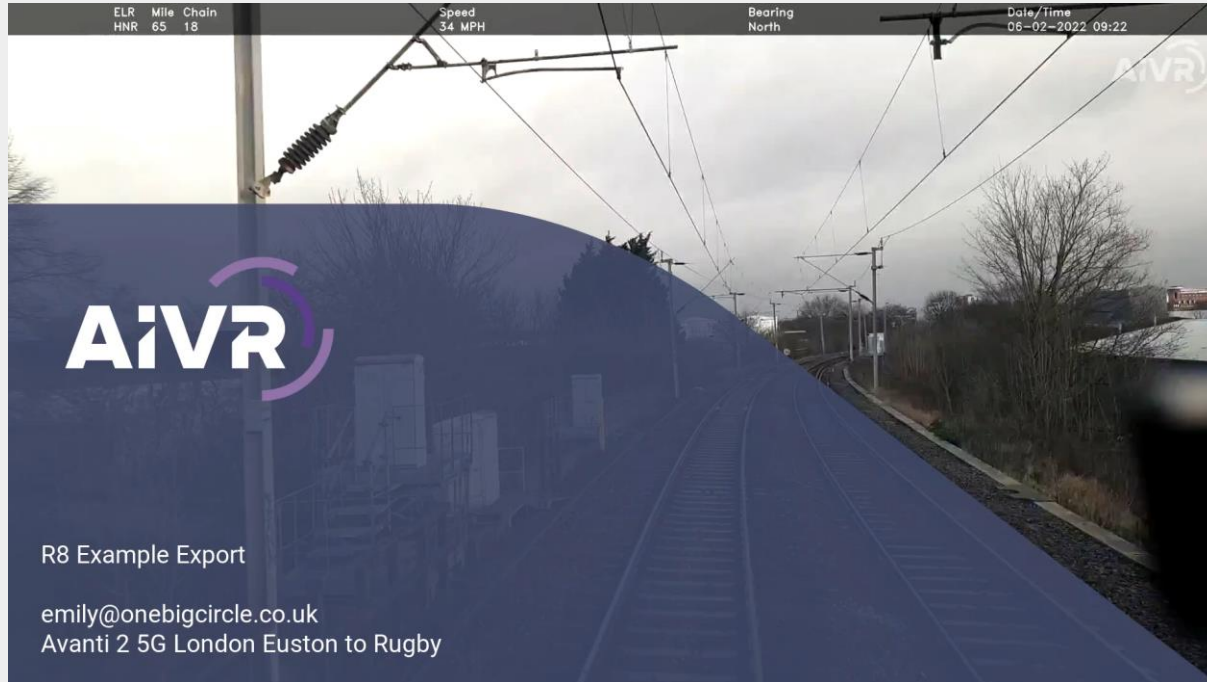
The screenshot shows the OneBigCircle interface. On the left, a video feed displays a railway track with a yellow box highlighting a piece of equipment. Text overlays indicate 'MNT152' and 'Task Closed 02/09/21'. Below the video, a 'Markup Feed' shows a list of sessions, including 'AIS TRU HD' and 'Avanti 2 5G London Euston to Rugby'. On the right, a map view shows the location with a red pin and a green line. Below the map, a table lists annotations:

Time	Type	Name	User
09:22:32	annotation	Telephone	Emily
09:22:32	annotation	Telephone	Emily
09:22:32	annotation	MNT243	Emily
09:22:32	annotation	Task Closed 08/09/21	Emily
09:22:53	annotation	Equip Hsing Loc Case	Emily
09:22:53	annotation	Equip Hsing Loc Case	Emily
09:22:53	annotation	MNT152	Emily
09:22:53	annotation	Task Closed 02/09/21	Emily

The screenshot shows the OneBigCircle interface. At the top, it displays 'Point of Interest 2 of 2' and the date '2022/02/06 09:22 UTC'. Below this, a map view shows the location with a red pin and a green line. Text overlays indicate 'L18 HNR mile 65 chain 46 (estimated)' and 'Lat/Long: 52.234471, -0.907723'. A 'Markup Contributors' section lists 'emily@onebigcircle.co.uk'. Below the map, a video feed displays a railway track with a yellow box highlighting a piece of equipment. Text overlays indicate 'MNT152' and 'Task Closed 02/09/21'.

Data from ellipse enables users to assess area based on R8 reporting

Red zone working video example



Through Integration...

“Together, we are stronger than the sum of our parts.”

We know that working with other systems and experts is better for you – the expert that needs the right data at the right time.



Home > Supply Chain > Industry specialists join forces to launch the S&C Alliance

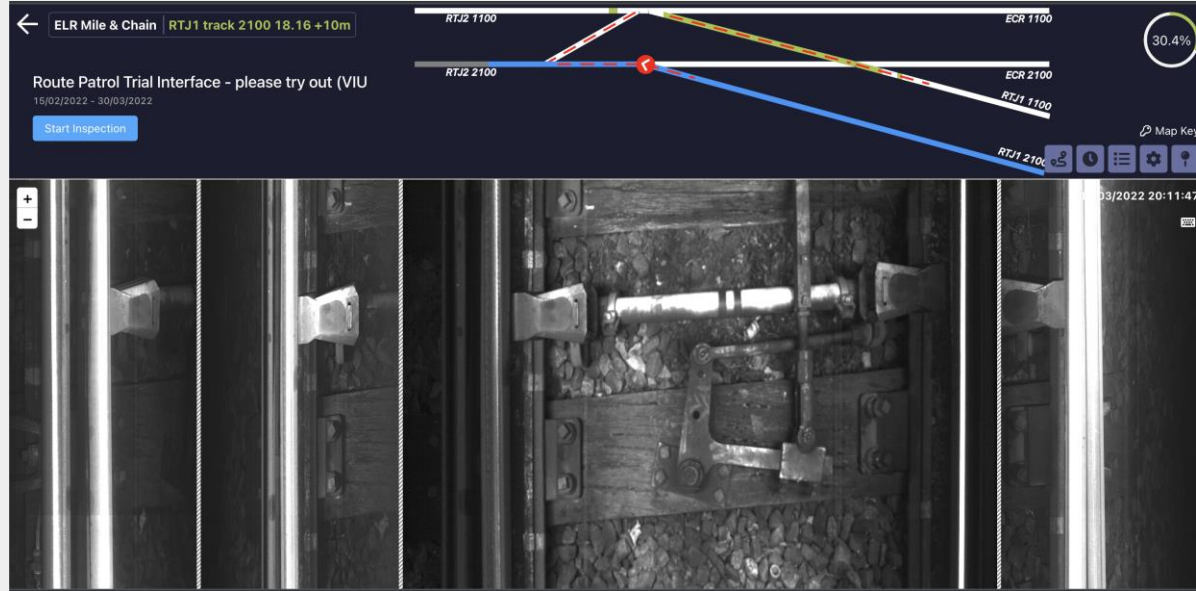
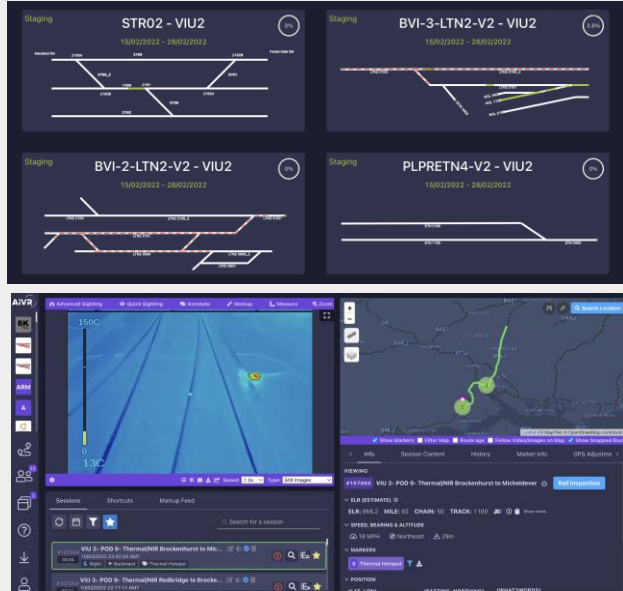
Supply Chain

Industry specialists join forces to launch the S&C Alliance

By Denny Longhorn May 10, 2022

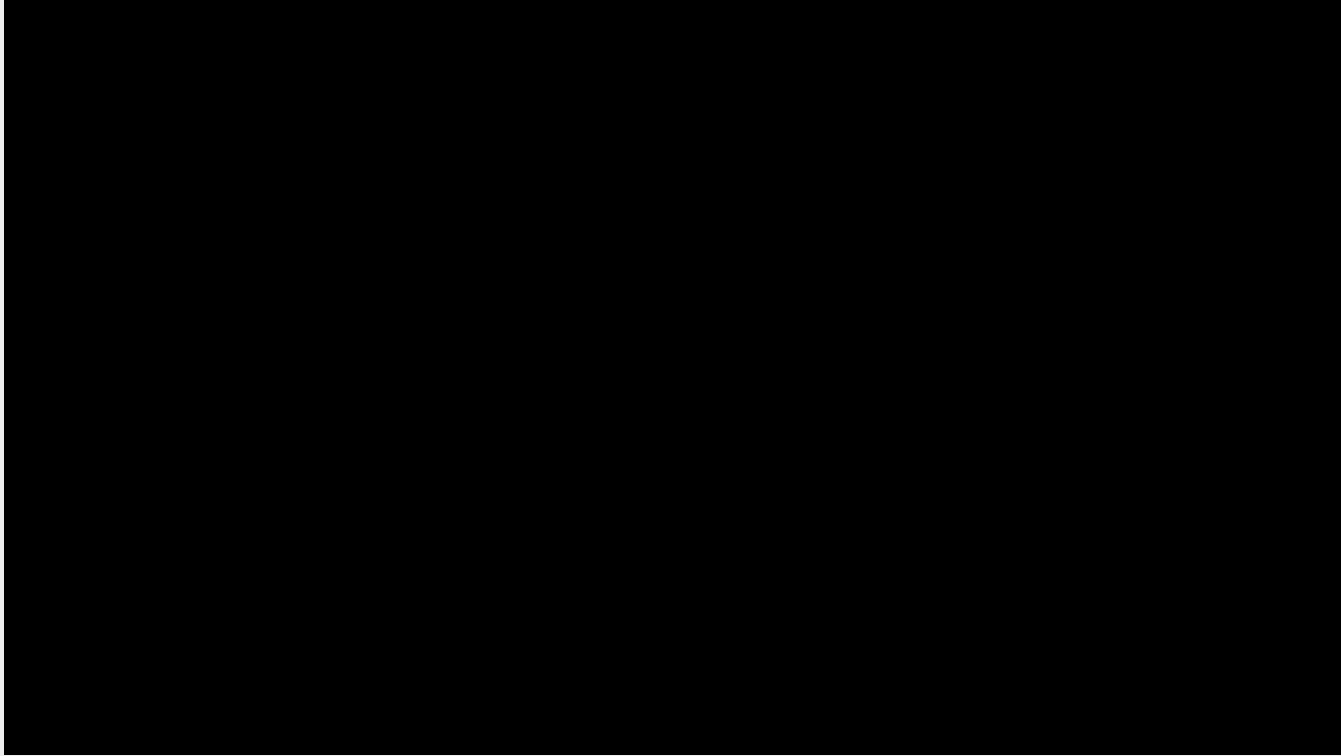


Safety Use case 2 – Virtual BVI route patrols



Physical route patrols presented on AIVR for enabling Basic Visual Inspection to be completed virtually in coordination with physical patrols.

Virtual BVI route patrols example



PLPR3 #110599 LAT: LNG: ELR Mile & Chain VIR track 2100 1.47 +5m rail 100% speed 32 MPH Widgets Q Search

Route: VIR Track: 2100

Flip Rails

Asset Navigation

Detections Annotations Bookmarks

Closest Detection Filters

Fishplate 1224111

Score: 100%

Needs Review

0m

Next Detection 93m

Back () 1 of 1869 Next ()

Reject (R) Verify & Hide (H) Verify (V)

25/03/2020 00:38:21 GMT 22:36

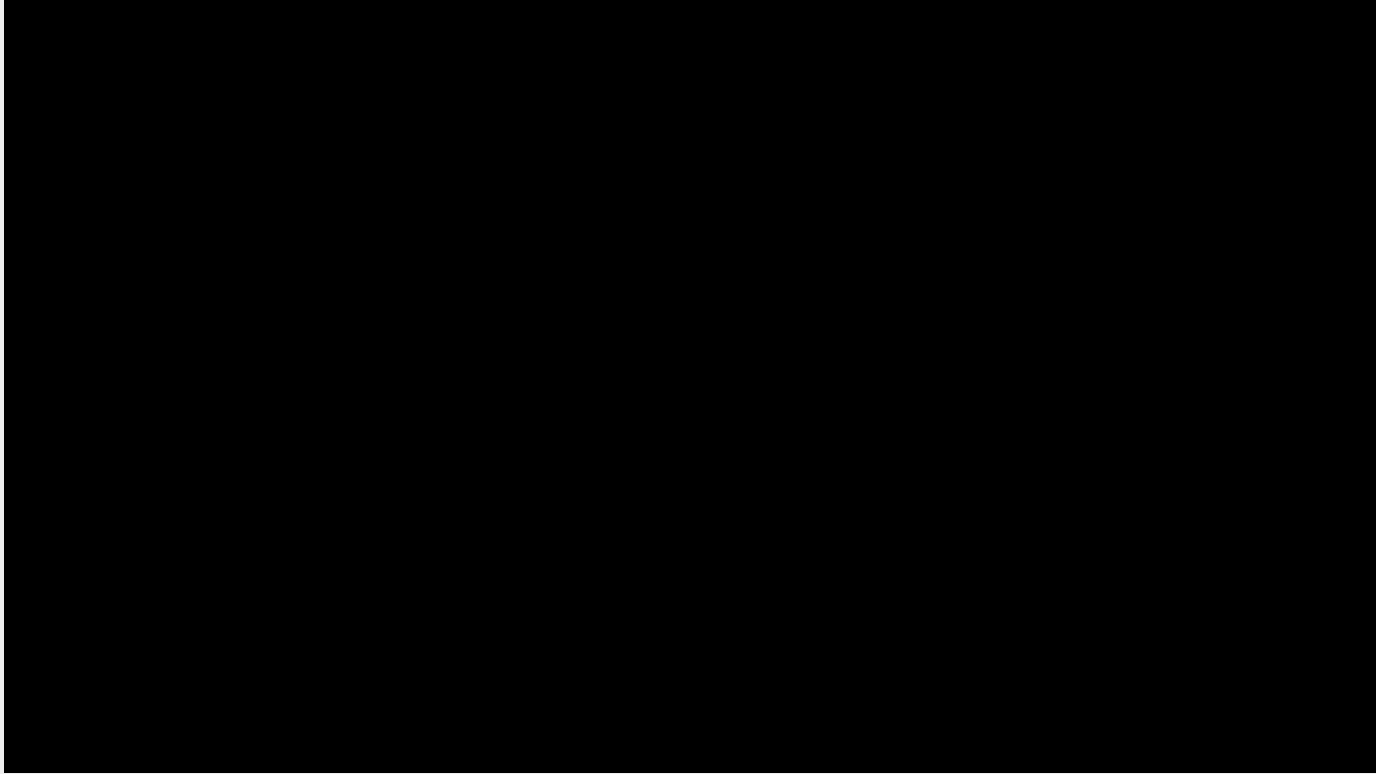
AHD 2.37 11.02 18.16 28.13 33.43 RED2 22.36

BTH1 BTH2 BTH3 LEJ NGL WPH1 RED2

Map view showing track layout and location markers.

AIVR Conductor Rail Automated Video System provides virtual inspection with detailed inspection imagery, thermal imagery and connection to instrumented monitoring system for height. Machine learning and computer vision automatically identify items for simple navigation.

Conductor rail inspection example



User Feedback

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AIVR Customer Success Stories



“

We have used footage to identify and confirm vegetation [affecting electrical equipment] reported by a 3rd party without having to attend site.

E&P

”

“

The AIVR footage of highland mainline reduced my need to visit every bridge on the route.

Structures

”

“

We have used the AIVR footage regularly to review progress of cable route installation and snagging works where progress on a linear asset is best viewed by video footage rather than photos.

Signal & Telecoms

”

“

It has helped me show pictures of a new work site to the COSS without needing to go on track.

Section Management

”

“

Identified vegetation on one of our DC electrical sections from the AIVR footage and shared with the wider DU staff.

Technical Officer

”

“

I am involved in 11 signal sighting projects and in the last 18 months I only visited site once due to the clarity of the footage on AIVR.

Signal Sighting

”



Route
Services

User Feedback

S&TINCs Review - Points Inspection

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S&TINCs Engineer

We had an Outstanding SINC file on this that had issues with a broken front stretcher, this was a historic file and originally showed as changed to a yellow stretcher, we needed a fair amount of evidence but with the attached picture we could see a TSB White bar at the bottom of picture this mitigated most if not all of the outstanding actions and meant that we could progress the file.

To arrange site access would need, with planning, and sending a team to site, would be somewhere in the region of 50-60 man hours, but a 5 minute desktop review saved this.



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Putting passengers first

Delivery Unit Annual MST Vegetation Checks



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- NR Delivery Units have an annual Maintenance Scheduled Task to review foliage growth to note any existing or potential obscuration of signalling assets.
- Due to Covid, access to cabs continued to be fully restricted to Drivers only.
- Utilising up to date AIVR footage, we were able to manually check all the MST listed signals for 3 Delivery Units (Euston, Bletchley and Stafford), mark up screenshots of any issues found, and arrange for foliage clearance.
- 2 signals were found to have severely deficient sighting due to vegetation requiring Cautions to be applied until the Minimum Readable Distance could be achieved.
- 12 signals found that required preventative vegetation clearance; ID plates were found to have fallen off 2 signals; 2 fibre optic Banner Repeaters were found to be d
- Overall 1,338 signals were manually checked.



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Putting passengers first

The Future – More innovation and integration

Continue working alongside partners to improve safety, reduce 'Boots from Ballast' and provide the tools and integrations that will help enable that.

Continue to help build the 'Digital Railway' informing users of conditions, alerts and changes through visuals, ML and fault detection – always enabling you to see what you need to see.

Keep people (you!) in our minds at all time.



Thanks for listening

Any Questions?



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