The Sizewell C Project

6.10 Volume 9 Rail

Chapter 1 Introduction

Appendix 1A Sizewell Branch Track Condition Report

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Sizewell C Construction Traffic Feasibility Report

Appendix A2 – Sizewell Branch Track Condition

GRIP 2

June 2017

OP Reference: 152570
IDG Lead: Dale Hall
Client: Simon Davies

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Endorsement APPENDIX A2

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Infrastructure Design Group

Track

Anglia Route

Sizewell Power Station Branch Line

Permanent Way Condition Report

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Executive Summary

For the construction of the new Sizewell C Power Station, it has been proposed that the majority of building and construction materials for the project are to be transported by rail, thus significantly reducing the amount of heavy goods road traffic on the local road network.

In order to facilitate the transport of construction materials, it will mean increasing the number of trains that run on the Up & Down Sizewell single line from 1 return train per day to 5 return trains daily. This is a large increase in traffic and will result in an increased rate of deterioration of the existing track components on the line.

To identify the current condition of the track system and to identify what work is required to enable the line to stand up to this increased amount of traffic, a permanent way condition survey was undertaken by Network Rail Infrastructure Design Group – Track (York) between 91M 40ch and 95M 79ch (which equates to 8.64km) on the 27th September 2016.

The items included in the condition survey were as follows:

- Rails and joints
- Baseplates and fastenings
- Sleepers
- Drainage
- Level Crossings and User Worked Crossings
- Leiston Passing Loop condition
- Switches and Crossings
- Vegetation
- Structures and earthworks (including Undertrack Crossings)
- Environmental considerations
- Maintenance interface

The survey found the overall condition of the line to be poor.

This report splits its recommendations into 3 possible options:

Option 1 is a complete renewal of the branch line with serviceable flat bottom section CEN56 Continuously Welded Rail (CWR) on serviceable concrete or steel sleepers as per NR/L2/TRK/2102 Track Construction Standards. Whilst this option requires the most initial investment, it will provide a massive decrease in the maintenance burden of the line that would come from installing CWR and could provide whole life cost benefits.

Option 2 is the bare minimum recommended to enable the line to withstand the increase in traffic and is in line with NR/L2/TRK/001 Track Maintenance Handbook. It involves spot re-railing and spot re-sleepering of the most heavily worn sections of track. This option has the lowest upfront cost; however the maintenance of the line would continue to be very labour intensive, which would be exacerbated by the increase in traffic. It may end up more costly overall if the condition of the line deteriorates faster than expected.

Option 3 provides recommendations with an intermediate cost compared with options 1 and 2. This option specifies full renewal where the ballast is found to be in poor condition. Where ballast condition is good, component refurbishment and re-railing have been specified.

Further comparison of these options can be found within this report.

Contents

References

1. NR/L2/TRK/001 – Inspection and Maintenance of Permanent Way
2. NR/L2/TRK/2102 – Design and Construction of Track

1. Background

1.1 Project Background

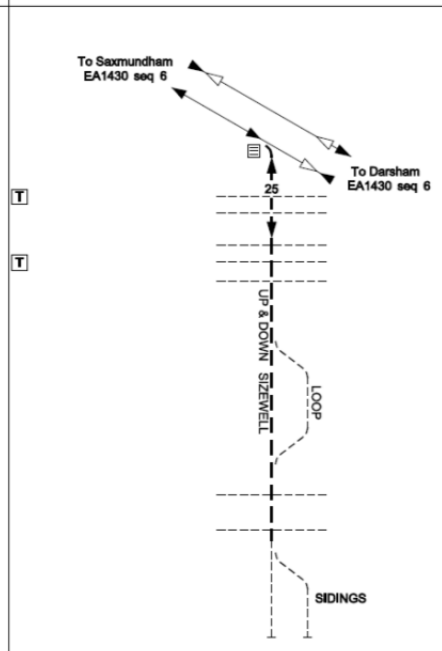
The proposed building and construction materials for the Sizewell C Power Station are to be transported from either Lowestoft or Ipswich, on the East Suffolk Line (ESK) to Saxmundham Junction (ESK: 91M 40ch). From there it will then take the Up and Down Sizewell single line (SIZ) from Saxmundham Junction (SIZ: 91M 40ch) to EDF's existing sidings at Leiston (SIZ: 96M 00ch).

In order to facilitate the transport of construction materials, it will mean increasing the number of trains that run on the Up & Down Sizewell single line. Currently, one return train is booked to run on the branch line every day. However, this will eventually increase to 5 return trains per day once construction work reaches full capacity. This is a large increase in traffic and will result in an increased rate of deterioration of the existing track components on the line, as well as increase the track category of the line. Part of the remit of this project is to determine the extent of works required to bring the Sizewell Branch Line up to an acceptable standard of repair to withstand this extra traffic.

1.2 History of the Line

The existing track consists of the Up and Down Sizewell Single line (Track ID 3300) with a passing loop at Leiston (currently clipped out of use) from 94M 66ch to 94M 79ch. The signalling system on this line is token block. A train bound for this line must stop and obtain the token from Saxmundham Signal Box, before proceeding onto the line. No other trains are allowed on the line until the train with the token has departed and returned the token to Saxmundham Signal Box. According to GEOGIS, the current track category is Cat 5 and the Equated Million Gross Tonnes Per Annum (EMGTPA) is between 0 and 1. The current line speed is 25mph for the entire length of the line. See the sectional appendix extract below:

LOR	Seq.	Line of Route Description	ELR	Route	Last Updated
EA1520	001	Saxmundham Jn to Sizewell	SIZ	Anglia	02/02/2013

Location	Mileage M Ch	Running lines & speed restrictions	Signalling & Remarks
			GSM-R OTS Saxmundham SB (ES) RA7 AWS not provided TPWS is not provided on this route
Saxmundham Jn (TEP) GF	91 40		
Bratts Black House LC	92 19	T	
Knodishall LC (TMO)	92 49		
West House LC (TMO)	93 32		
Snowdons LC	93 68	T	
Saxmundham Road LC (TMO)	94 02		
Leiston Station LC (TMO)	95 15		
Sizewell LC (TMO) (TEP)	95 79		

The single line comprises of jointed 95lb Bullhead rail on wooden sleepers laid on a mixture of ballast and ash, which is highly contaminated with fines. The condition of the track was found to be in a poor condition throughout, although it is fit for the current track category.

The wooden sleepers in use are of varying condition; however the majority of the sleepers range from fair to poor due to signs of splitting and decay.

Currently there is only one train booked to run on the Up and Down Sizewell single line per day. However, following discussions with the local signallers, quite often this train gets cancelled.

The jointed 95lb Bullhead rail has a high level of rail head wear throughout the line which is due to its age (79 years on average, according to GEOGIS data) and is showing signs of fishplate strike throughout.

The existing Bullhead fastenings comprise of either wooden or tapered steel keys. With a large proportion either being decayed, corroded or ineffective. All the coach screws looked to be secure with the existing ferrules a mixture of plastic or wood.

There are areas of heavy vegetation along the line, which significantly reduces visibility where the line is curved due to tight radii. Also, this line comprises of some steep vertical gradients; which due to the encroaching vegetation, could cause adhesion problems due to leaf fall. More detailed information on the areas that require vegetation removal can be found in Appendix A – Survey Notes.

There are a total of 8 crossings on this branch line. The crossing gates and decking of all the crossings on the line were found to be in reasonable to poor condition, with signs of rot and peeling paint in places. See section 4.5 - Level Crossing and User Worked Crossings for more information.

2. Introduction

To identify the current condition of the track system and to identify what work is required to enable the line to stand up to this increased amount of traffic, a permanent way condition report was undertaken by Network Rail Infrastructure Design Group – Track (York) between 91M 40ch and 95M 79ch on the 27th September 2016. The results of this survey are summarised in Section 4 - Findings.

The site survey involved a walk through the site identifying relevant features and making notes. Measurements were also taken using a track gauge, NR4 stepped sidewear gauge and a rail wear gauge to gain a better understanding of the condition of the track and associated componentry.

The remainder of this report is split into sections as follows:

Method – this section contains information about what work was done in compiling this report, including the sources used for obtaining information.

Findings – this section details the results of the site visit, including site photographs where appropriate.

Recommendations – This section provides detail on the proposed solutions arising from the site visit.

Further work needed – this section explains what other activities are required to be undertaken in the upcoming stages of the project.

Risks and Opportunities – this section lists the mains risks and opportunities involved with this project.

Appendices – this section contains all the raw data gathered from the survey and desktop studies that were undertaken.

3. Methods

This report was compiled using two methods: a site visit and a desk study.

3.1 Site Visit

The site visit consisted of a walkthrough of the entire branch line. Notes were taken as part of this survey identifying any issues with the existing infrastructure. An electronic version of these site notes has been included in Appendix A – Site notes)

In addition to this, additional measurements (gauge, cant and rail depth) were taken every 10 chains in order to build a more detailed picture of the extent of wear and track quality of the line. These additional measurements can be found in Appendix B.

The additional measurements were then compared against the most recent track recording run available at the time of the survey to check that the two data sources were concurrent. Annotated copies of the track recording traces can be found in Appendix E.

3.2 Desk Study

Prior to the site visit a desk study was conducted to gain as much information about the line as possible before heading out to site. Data was downloaded from various sources to gain a better understanding of the area before attending site and any potential issues that should be paid particular attention. These sources were:

- National Hazard Directory
- Sectional Appendix
- GeoRINM viewer
- 5 mile diagrams
- GEOGIS
- Track Recording Unit
- OmniSurveyor3D

4. Findings

4.1 Rails and Joints

The rail on this line consists of 95lB Bullhead rail in 60foot lengths. According to GEOGIS data, the majority of the rail on this line is at least 70 years old. Due to its age, a lot of the rail has significant headwear. Rail depth measurements were taken every 10ch as part of this survey. See Appendix B.

The survey found lots of readings below 135mm (New 95lB Bullhead rail is 145mm), with the worst reading found to be 15mm of wear, which equates to 130mm rail depth and was found at 95M 70ch. This is below the minimum permitted rail depth in accordance with NR/L2/TRL/001/mod09, which states that the minimum permitted rail depth for 95lB Bullhead rail is 131mm. The standard goes on to state: “replace the rail within three years of the minimum depth being reached”. This low rail depth has resulted in there being evidence of fishplate strike, indicating that the rail is reaching the end of its serviceable life. A search of the Track Renewals System (TRS) found no items for this line.

The physical condition of the joints on this line were found to be in a satisfactory condition, with one pair of fishplates found to be improperly fitted at 91M 1160y.

The track geometry at the joints was found to be satisfactory to poor, with some being quite badly dipped and in need of measured shovel packing (MSP) (see Appendix E – Annotated Track Recording Unit (TRU) trace for details). With the proposed increase in traffic, the track geometry will quickly deteriorate, resulting in numerous broken fishplates and potentially a derailment due to twist faults. This will lead to a large increase in the maintenance burden of this line.

Many expansion gaps in the fishplate joints were also observed to be out of tolerance; remedial action would be required if full renewal is not undertaken.

Many joints were also observed to be staggered (refer to Appendix A for joints locations on each rail); this is most likely the result of spot re-railing activities by maintenance staff. This is not desirable as the difference in rail stiffness can lead to twist faults which could result in derailed trains.

4.2 Baseplates and fastenings

The baseplates are in good condition throughout.

The Bullhead chair fastenings are a mixture of wooden and tapered steel keys, with a small number of Panlock keys in a small section where maintenance has been carried out. The condition of the fastenings varies greatly, with numerous wooden keys rotten or loose.

Given the condition of the fastenings, the gauge throughout the survey was found to be satisfactory, except where fastenings were found to be missing.

4.3 Sleepers

This line comprises solely of timber sleepers and bearers. Many of these are in poor condition. The survey found decaying and rotten sleepers throughout the line. Some sleepers appeared to be satisfactory on the surface, but on further inspection appeared to be rotting from the inside out. It is recommended that spot re-sleepering 1 sleeper in every 4 as a minimum before larger volumes of traffic start to run on this line. See Appendix A – Survey notes for more details.

4.4 Track Formation

No Track Bed Investigation (TBI) was undertaken as part of this branch condition survey, therefore the condition of the formation is unknown at this time.

4.5 Drainage

Only one catchpit was found during this survey at 91M 1705y (see photo D5).

D5 - Catchpit found at 693.2m (91M 1705y)

The catchpit is located in the left hand cess (with back to low mileage) with water freely flowing through it. No other catchpits were found during the survey. The route and outfall of the track drainage could not be determined and further investigation is required.

The remainder of the site gave no indications of any drainage problems (e.g. wet beds), so it is presumed that the underlying formation is free draining. TBI is required to confirm.

Although not observed during the site visit, there is a catchpit in the cess of the Up East Suffolk Line, close to the vee of Saxmundham Junction (it can be seen clearly in Figure 30 in Appendix A report) and GeoRINM indicates that there is a drainage run connected to this catchpit that crosses both the ESK and SIZ lines. A drainage survey should be undertaken as part of the TBI to determine if this is indeed the case.

4.6 Level Crossing and User Worked Crossings

The level crossings, User Worked Crossings (UWCs) and foot crossings on this line were found to be as follows:

4.6.1 Bratts Black No1 Crossing 92M 19ch

D7 - Bratts Black No1 UWC (92M 420y – 92M 427y)

This is a UWC comprising of wooden decking fixed to the sleepers. Visible areas of rail foot appeared to be satisfactory. Flangeways were found to be clear. The gates of this crossing were found to be in satisfactory/poor condition, showing signs of rot and peeling paint.

4.6.2 Knodishall Crossing 92M 49ch

D8 - Knodishall Crossing (92M 1075y – 92M 1083y)

This is a UWC comprising of Hardfast rubber decking. The rail foot was not visible, so could not be inspected. Some debris was found in the flangeways. The gates of this crossing were found to be in satisfactory/poor condition, showing signs of rot and peeling paint.

4.6.3 Westhouse Crossing 93M 32ch

D14 - Westhouse Crossing (93M 687y – 93M 693y)

This is a UWC comprising of wooden decking fixed to the sleepers. The rail foot was not visible to inspect due to mud. Flangeways were found to be clear. The gates of this crossing were found to be in satisfactory/poor condition, showing signs of rot and peeling paint.

4.6.4 Snowdens Crossing 93M 68ch

D15 - Snowdens UWC (93M 1487y – 93M 1492y)

This is a UWC comprising of wooden decking fixed to the sleepers. The rail foot was visible and appeared to be satisfactory. Flangeways were found to be clear. The gates of this crossing were found to be in satisfactory/poor condition, showing signs of rot and peeling paint.

4.6.5 Saxmundham Road LC 94M 02ch

D16 - Saxmundham Road Crossing (94M 39y – 94M 46y)

This is a level crossing comprising of Hardfast rubber decking. The rail foot was not visible, so could not be inspected. All decking appeared to be secure, no issues found. The gates of this crossing were found to be in satisfactory/poor condition, showing signs of rot and peeling paint.

4.6.6 Leiston Footpath Crossing 94M 66ch

D17 - Footpath crossing 5272.7m – 5273.9m (94M 1445y – 94M 1447y)

This is a footpath crossing comprising of wooden decking fixed to the sleepers. Visible area of the rail foot appeared to be satisfactory. Flangeways were found to be clear.

4.6.7 Leiston Station LC (station disused) 95M 15ch

D27 - Leiston LC (95M 111y – 95M 127y)

This is a UWC comprising of Hardfast rubber decking. The rail foot was not visible, so could not be inspected. However, the rail through the crossing is much newer (2007) than the rail either side of the crossing (1939). The gates of this crossing were found to be in satisfactory/poor condition, showing signs of rot and peeling paint.

4.6.8 Sizewell Road LC 95M 79ch

D31 – Sizewell Road Crossing (95M 1560y – 95M 1577y)

This is a UWC comprising of Hardfast rubber decking, which appeared to be secure. The rail foot was not visible, so could not be inspected. Flangeways were found to be clear. The gates of this crossing were found to be in satisfactory/poor condition, showing signs of rot and peeling paint.
Reference to Level Crossing section of overall feasibility report, for more details.

4.7 Passing Loop

The passing loop at Leiston (94M 66ch to 94M 79ch) was found to be in poor condition. The loop comprises of poor heavily contaminated ballast, rotten timber sleepers throughout, 2-hole fishplates throughout, and some of the baseplates were found to be broken. The passing loop is also overgrown with vegetation and will require significant work to facilitate its reopening.

The passing loop uses hand operated points at both ends, numbered HP1 at the low mileage end and HP2 at the high mileage end, which are currently clamped and scotched out of use. Further detail on the condition of these points can be found in Section 4.8, Switches and Crossings, of this report.

The distance between the fouling points of HP1 and HP2 on the loop was found to be 177m. If this is to be increased, there are a number of options available to allow this; these options are listed in the Recommendations section of this report.

4.8 Switches and Crossings

This line contains 4 S&C units in total:

3A points at Saxmundham Junction marks the start of the Up and Down Sizewell single line. It was not possible to inspect these points during the survey due to the points being situated on the Up East Suffolk (Track ID: 1100), which was not covered by the line blockage used to carry out this survey.

3B catch points on the Sizewell single line are located at 91M 1030y; these switches were found to be in good condition. The rail year of these switches is 2011, indicating that they have been installed within the last 5 years.

HP1 points at Leiston are located at 94M 1461y and mark the low mileage entrance/exit of the passing loop. These switches were found to be in a reasonable condition.

HP2 points at Leiston are located at 94M 1741y and mark the high mileage entrance/exit of the passing loop. These switches were also found to be in a reasonable condition.

HP3 points at Leiston are located at 95M 1574y, just before the NR boundary gates. These switches were found to be in a satisfactory condition.

More detail on the condition of these S&C units can be found in Appendix C of this report.

4.9 Vegetation

Vegetation was present throughout the line. With the foliage of trees along the boundary starting to encroach onto tracks, significantly reducing visibility on the curves on this line, the tightest of which was found to be 600m following analysis of the Track Recording Unit trace data. Another potential issue with this overgrowth is that leaf fall could pose significant adhesion problems (i.e. decreased traction and braking efficiency). The risk of this is increased due to the line comprising some steep gradients.

4.10 Structures and Earthworks

There is a culvert between 93M 0141y and 93M 0164y, which was found to be in need of a structural assessment. The wing wall appears to be coming away from the main structure of the culvert (see Appendix D - Photos D9-13) due to the foundations being washed away by water.

D9 - Culvert 2479.6m – 2500m (93M 142y – 93M 164y)

At 95M 766y there is underbridge (U/B) 1110 at Valley Road, Leiston (Appendix D – Photos D28A-28D.)

D28D - Longitudinal timber bridge 6249m 6260.2m (95M 748y – 95M 761y)

This structure appears to be in good condition. The track over this bridge is on longitudinal timbers. Track level each side is low in relation to the bridge resulting in a poor run-on and run-off, with visible voids under the sleepers next to the bridge deck. There are fishplate joints approx. 1m from the end of the longitudinal timber, which is below the minimum distance

stated in NR/L2/TRK/2102, which states the minimum distance from the end of longitudinal timber to a joint is 4.5m.

At 95M 797y, high mileage of U/B1110. It was identified that the left hand 9back to low mileage) ballast shoulder appears to be disappearing down the embankment. A simple retaining wall has been installed using old timber bearers to support the ballast. Upon closer inspection, there is evidence of animal burrowing underneath the track. The location of this burrowing coincides with the poor top coming off U/B 1110. (See Appendix E – Annotated TRU trace).

For more detailed information on the structures listed above, please refer to the BCDG (Buildings and Civils Design Group) section of the Feasibility Report (Reference number TBC).

4.11 Environmental

In addition to the animal burrow mentioned above, a potential badger sett was also identified along this route at 91M 1717y. (Appendix D – Photo D6).
D6 - Potential badger sett at 703.9m (91M 1717y)

A GeoRINM search and Hazard Directory search found the following:

A tree preservation order (TPO) was found at 94M 1524y for the trees on the land north of St. Margaret's Crescent, Leiston, TPO No. 134/2000. Status = in use, Verified against TPO dated 06/09/2000.

The search found no other previously documented environmental concerns (e.g. SSSIs, Nature reserves, conservation areas, tree preservation orders etc.).

4.12 Maintenance Interface

The project team should liaise with the area RAM(Track) and the local maintainer at appropriate stages during the planning and construction phases of the project to keep them updated on how the project is progressing and also to identify whether the local maintainer has any work planned on the line that conflicts or overlaps with the scope of the project.

Following the initial release of this report in draft form a site visit was undertaken by the Contractors Responsible Engineer (CRE), Project Engineer (PE) and Assistant Track maintenance Engineer (ATME) on 23/11/2016. The findings of the report we discussed and recommended options discussed. Option 3, as outlines in Section 5.3, is proposed largely as a result of these discussions.

4.13 Track Category

Track Category is calculated based on line speed and Equated Million Gross Tonnes Per Annum (EMGTPA). The current line speed is 25mph (Sectional Appendix) and the current maximum EMGTPA is 1 (GEOGIS); therefore the current Track Category for this line is 5.

To change the Track Category would require either an increase in line speed (not proposed) or an increase in EMGTPA (proposed as part of this project).

To determine the effect of the increase in traffic volumes, an assessment has been carried out based on a worst case scenario using the following assumptions and their sources listed below:

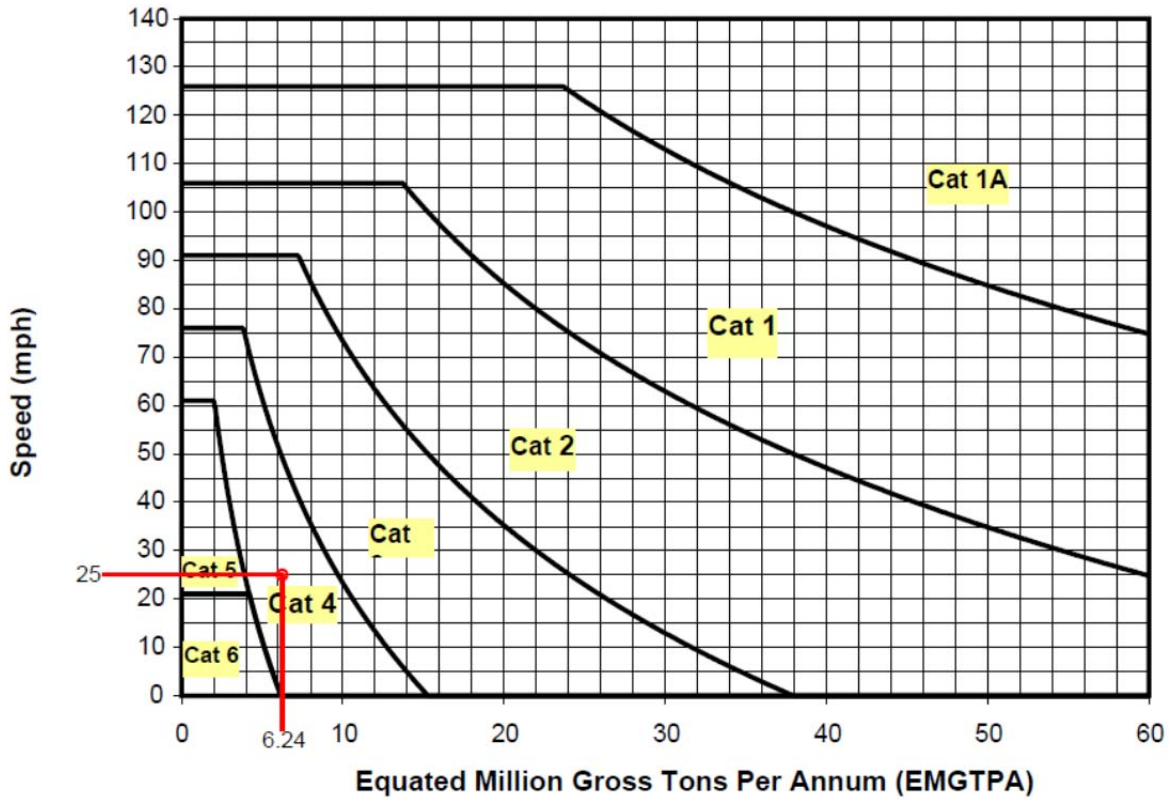
- 5 trains per day equates to 10 journeys (including return trips);
- Trains are fully laden both going in (new material) and going out (waste and spoil) (Source: Designer Discussions);
- Trains will run six days in a week as a maximum (Source: Designer Discussions);
- The average weight of a fully laden train consisting of 1x Class 66 locomotive and 22 wagons is 2000T (Source: Project start-up meeting on 04/08/16);
- The line speed is to remain as 25mph.

Based on the above assumptions, the maximum weight of trains travelling on the branch line per day is 2000T x 10 trains per day, which equates to 20,000T per day.

Therefore the maximum weight of trains per week is 20,000T x 6 days per week, which equates to 120,000T per week.

That means the maximum weight of trains travelling on the branch line every year is 120,000T x 52 weeks per year, which equates to 6,240,000T per year (or 6.24 EMGTPA). This volume of traffic is expected to be running on the branch line from January 2021 onwards.

The table below is taken from NR/L2/TRK/2102 – Track Construction Standards, and shows how track category is calculated.



As can be seen from the table above, based on the worst case scenario calculated, the track category will increase to 4. With this increase in Track Category, there will be an impact on the maintenance inspection regime for this line. If the line was to remain as jointed track, the impact would be as follows:

- Basic visual inspection frequency of plain line (jointed track) would increase from once per 2 weeks to once per week;
- Basic visual inspection frequency of S&C (non- strengthened) would be unchanged at once per week;
- Track Section Manager (SM(T)) inspection frequency of plain line (jointed track) would be unchanged at 13 weekly;
- SM(T) inspection frequency of S&C would be unchanged at 13 weekly;
- Track Maintenance Engineer (TME) inspection frequency would be unchanged at 2 yearly;
- TME cab riding frequency would be unchanged at annually;
- Visual inspection and Pedestrian Ultrasonic testing of rail (continuously welded rail (CWR) and jointed) would be unchanged at 2 yearly; and
- Pedestrian Ultrasonic testing of fishbolt holes in jointed track would be unchanged at yearly.

This would pose an increase in the maintenance burden of the line upon the maintainer with regard to basic visual inspection.

Now assuming that the line is to be renewed in flat bottom section CWR on concrete or steel sleepers with concrete bearer S&C, the impact to the maintenance regime would be as follows:

- Basic visual inspection frequency of plain line (now CWR) would decrease from once per 2 weeks to once per 4 weeks;
- Basic visual inspection frequency of S&C (now strengthened) would decrease from once per week to once per 2 weeks;
- SM(T) inspection frequency of plain line (now CWR) would decrease from 13 weekly to 26 weekly (except for the longitudinal timber bridge, which would need to be inspected 16 weekly);
- SM(T) inspection frequency of S&C would be unchanged at 13 weekly;
- Track Maintenance Engineer (TME) inspection frequency would be unchanged at 2 yearly; and
- TME cab riding frequency would be unchanged at annually;
- Visual inspection and Pedestrian Ultrasonic testing of rail (CWR and jointed) would be unchanged at 2 yearly; and
- Pedestrian Ultrasonic testing of fishbolt holes in jointed track would decrease from yearly to not applicable.

This shows that CWR will provide a significant reduction in the maintenance burden of this line even with the increase in Track Category.

CWR also has safety benefits because the evolution of track defect is slower in CWR (compared to jointed track) and fatigue of components is smaller, meaning there is less chances of faulting. There are also lower instances of track buckles in hot weather where properly maintained CWR is used.

The example given above highlights the potential improvements that can be gained if the line is upgraded to CWR. However, it should be noted that the calculations above are based on the worst case scenario of 5 return trains per day. As the project progresses, the EMGTPA calculation can be revised with greater certainty.

5 Recommendations

5.1 Option 1

Due to the poor condition of the track, it is recommended that the line is renewed throughout using flat bottom continuously welded rail (CWR) on serviceable concrete sleepers, with all the S&C being renewed with strengthened units to ensure compatibility with CWR. Ballast and formation should also be renewed.

If the passing loop is to be retained in its current location, then this should also be renewed throughout with flat bottom rail CWR on serviceable concrete sleepers. However, due to the significant work required to re-open the loop at its current length and location, consideration should be given to whether there is an aspiration to increase the standage of the passing loop, the survey identified three ways in which this could be achieved:

Option A – A new passing loop could be installed on the other side of the through line (right hand side with back to low mileage). The survey identified that there is a large area of land on this side. By building a new loop on this side, it would be on the outside of the curve, meaning that the standage could be increased.

Option B - There is a foot crossing 13.3m low mileage side of HP1. If the loop was to be extended at the low miles end beyond the foot crossing, the presence of a train stabled in the sidings would make the foot crossing unusable. It could be possible to liaise with the Local Authority regarding temporary closure of this foot crossing whilst these works were taking place. There is an alternative route across the line at Leiston LC. This would enable the loop to be extended whilst providing an alternative route.

Option C - It could be possible to install an alternative loop at the high mileage side of Leiston LC. There is sufficient land available within Network Rail boundaries to allow this to be done without the need to purchase additional land. The loop could then be constructed with serviceable materials, and would not impact on any crossings. The loop would then be situated entirely on straight track, improving maintainability. There is 573.4m of plain line between Leiston LC and the longitudinal timber bridge. This would allow for construction of a much longer passing loop than currently exists.

If it is decided that the passing loop is not required, then this should be removed and the S&C for the loop should be plain-lined.

The current crossing gates were found to be in satisfactory/poor condition, showing signs of rot and peeling paint. Except for Leiston footpath crossing, all the crossing gates on this line should be replaced to withstand the increased usage put upon them by increased rail traffic.

Although this would be the most expensive option, in the long term it will result in reduced maintenance costs and liabilities.

5.2 Option 2

If the above option 1 is not selected, then the following option should be considered as a minimum to enable the line to withstand the increase in traffic:

Spot re-sleepering should be carried out all the way along this line at a minimum of 1 sleeper every 4. See Appendix A – Survey notes for more details.

Deep skirted fishplates should be installed throughout this line (if the track is to remain jointed) in order to withstand the additional traffic. As part of this work, expansion gaps should be adjusted to the correct setting for the site temperature as per company standards.

All decayed/corroded/ineffective fastenings should be replaced. All affected Bullhead fastenings should be replaced with tapered steel keys wherever possible. Where tapered steel keys cannot be used (e.g. in check rails), replace with new wooden keys.

All rails below 135mm depth should be re-railed in order to facilitate the increase in traffic. It would be less disruptive to carry out this work before the extra trains begin to run. Once the volume of traffic has increased, it will significantly reduce the amount of time available to carry out maintenance interventions such as re-railing; and as a lot of the rail on this line is already

highly worn, it would not take long to deteriorate to the minimum permitted depth. Where feasible, re-railing should be extended to remove staggered joints.

The current crossing gates were found to be in satisfactory/poor condition, showing signs of rot and peeling paint. Except for Leiston footpath crossing, all the crossing gates on this line should be repaired to withstand the increased usage put upon them by increased rail traffic.

If the passing loop is to be retained in its current location, then this should be renewed throughout with jointed rail on serviceable wooden sleepers. However, if it is decided that the passing loop is not required, then the S&C for the loop should be plain-lined.

If it is decided that the standage of the passing loop should be increased as part of this option, then refer to the options A, B and C listed within option 1.

With this option there is the risk that no remedial action will be undertaken for formation problems identified by the TBI. This could lead to loss of geometry and faulting which could lead to increased safety risks, a greater need for maintenance and possibly disruptions to services.

It is expected that due to the additional maintenance requirements on the branch line the current Maintenance Unit will not have sufficient resource and thus requires an additional team to maintain this line.

5.3 Option 3

This option is an intermediate option compared to options 1 and 2 and is as follows:

Where the ballast is found to be in poor condition, full renewal should be carried out.

Where ballast is found to be in good condition, the following is recommended:

Re-rail the entire branch line and realign joints so that there are no staggered joints along this line. Reset expansion gaps to the improve resilience of the line to hot and cold weather whilst carrying out this work. Spot re-railing the worst sections of rail on the line would produce further maintenance challenges regarding lift-fishplated joints. A complete re-rail would provide a solid foundation for running increased traffic volumes and would provide a good baseline from which to monitor the rate of deterioration caused by the increase traffic volume.

Renew all fastenings in poor condition. Where wooden keys have been used previously, replace with tapered steel keys.

Carry out repairs on all level crossing gates as per option 2.

Recommendations for the passing loop for this option are to be the same as in option 2.

As part of this option, it is recommended that a Track Bed Investigation is conducted to determine the scope of full renewal required.

In order to provide information to the estimators, discussions were held to determine rough volumes of work required, based on initial site observations; these are considered to be accurate to order of magnitude only, and will require revision in later design stages once more accurate information becomes available, such as post TBI works. The following volumes were determined:

- Renew 1 in 4 sleepers + re-rail: 1673m
- Renew 1 in 4 sleepers + re-rail + re-ballast: 402m
- Re-rail only: 201m
- Renew 1 in 3 sleepers + re-rail: 2944m
- Full renewal: 1703m

The locations of the types of renewal would be determined by the TBI report and site inspection, and an effort should be made to achieve the longest length of similar renewal as possible, to avoid leaving ‘islands’ of track with different properties, which could lead to defects and faulting.

5.4 Option Comparison

Below is a summary of what the three options effect on the railway is forecast to be.

	Capital Works Cost	Maintenance Burden	Predicted Component Lifespan
Option 1	**High**	**Low**	**Long**
Option 2	**Low**	**High**	**Short**
Option 3	**Medium**	**Medium**	**Medium**

Key

Effect on Railway	Colour Code
Negative	**RED**
Positive	**GREEN**
Neutral	**YELLOW**

6 Further Work Needed

Other activities that need to be undertaken in the next stage of the project were found to be as follows:

- A drainage survey should be undertaken to determine the full extent and condition of the drainage system in this area. Particularly on the low mileage section of track where the catchpit was identified as the drainage system appears to run parallel to the track with the outfall located under the ESK line.
- A Track Bed Investigation should be undertaken to confirm the composition and condition of the formation. This should be carried out at the earliest opportunity to determine the extent of full renewal required for option 3 of this report.
- A detailed structure assessment should be carried out on the culvert between 93M 0141y and 93M 0164y to properly determine the condition of the structure and any remedial works required (track to carry out work to support any recommendations arising from Buildings and Civils Design Group report). An assessment of the embankment at 95M 789y should also be carried out.
- Currently, due to the train driver having to manually operate the UWCs and level crossings along this route, this could impact on the ability to run the number of trains required. Signalling and Network Operations to give advice on this issue. Track to carry out work necessary to support their recommendations.
- More detailed analysis is to be carried out in terms of the cost of each option in order to determine actual figures.
- Detailed analysis is also required to determine how the increase in the number of trains will impact on the track category of the line once the outgoing and return train loads are known.

7 Risks and Opportunities

Description of Risk	Risk – High, Medium or Low	Management of Risk/Mitigation
Culvert found to be in poor condition as per section 4.9 of this report.	High – could severely impact on track quality if this structure fails, which could potentially increase the risk of a derailment	Detailed structure assessment required as noted in section 4.9. Please refer to BCDG section of the overall feasibility report for further information.
Rail condition is generally poor throughout. One location found rail depth to be non-compliant with company standards, as well as 18 other locations close to the minimum permitted rail depth.	High – once the minimum permitted rail depth is reached then the rail in question should be replaced within 2 years.	All options in the recommendations section of this report advise the renewal of rails close to minimum permitted depth.
Sleeper condition was found to be generally poor throughout.	High – sleeper integrity could be an issue when carrying out any maintenance on the line or minor renewal work (e.g. lifting and packing).	Recommend either spot re-sleepering or complete renewal of the line.
Staggered joints are present on this line, and expansion gaps were found to be inappropriately set for the site temperature.	High – staggered joints can exacerbate twist faults, increasing derailment risk. Inadequate expansion gaps increase the risk of track buckles in hot weather.	Recommend expansion gaps be adjusted and staggered joints be re-aligned.
The embankment issue at 95M 749y is causing poor top at this location.	High – if the embankment fails this could lead to an increased derailment risk.	Detailed earthwork assessment required as noted in section 4.9. Please refer to BCDG section of the overall feasibility report for further information (report number TBC).

Opportunity	Description of Opportunity
There is an opportunity to carry out all of this work in a blockade.	Currently, there is only one return train per day booked to run on this line, which quite often gets cancelled according to discussions with local signallers. The trains that run on this line are all run by the same company and are all for Sizewell Power Station. By carrying out the work in a blockade it would enable the project to be completed faster than compared to traditional possessions and could provide cost benefits.
It could be possible to permanently close Leiston footpath UWC as part of this work.	The footpath crossing at Leiston is not required due to Leiston Station Level Crossing only being situated 424 yards further down the line. As this crossing would need to be closed for at least part of the works, it could be possible to make this closure permanent if the project was to liaise with the Local Authority.
Option 1 of the recommendations in this report provides the opportunity to upgrade the line to CWR.	By upgrading the line to CWR, there will be a significant reduction in the amount of maintenance work required due to not having to lubricate fishplates. In addition to this, CWR provides much better resilience to track buckling and improved track quality.

Appendix A – Survey Notes

Infrastructure Design Group - Track
Sizewell Permanent Way Condition Report

From Saxmundham (Low Mileage)

Comments	Chainage	Comments	Miles	Yards
IRJ @ rear of 3A points	0.0m	Spot re-sleeper 1 in 4 required throughout, apart from where specified differently	91M	945y
FTN Tower	13.7m		91M	960y
Replace 2 hole fishplated joint (Photo D1)	18.5m		91M	965y
Bottom Of Transition (BOT) E=0mm	21.6m	**positive cant = left rail high (i.e. RH curve)**	91M	969y
UTX (Photo D2)	36.7m	**negative cant = right rail high (i.e. LH curve)**	91M	985y
Heel of 3B trap points	68.7m		91M	1020y
Toe of 3B trap points (Photo D3)	75.8m	3B traps new full set 2011 - 95RBH	91M	1028y
New 4 hole IRJ	95.0m		91M	1049y
Top Of Transition (TOT) E=95mm	96.8m		91M	1051y
"Stop end of token" sign RH side	100.8m	"Start of token section" sign LH side	91M	1055y
91M 50ch	141.7m		91M	1100y
Poorly fitted fishplate (Photo D4)	195.1m		91M	1158y
Signs of fishplate strike on RH rail - 16mm worn	203.0m		91M	1167y
91M 60ch post	341.6m	91M 60ch - 91M 70ch deveg both sides of track on tight RH curve, track on steep incline so leaf fall could cause adhesion problems	91M	1320y
TOT E=100mm	466.2m		91M	1456y
BOT E=0mm	542.1m	91M 70ch	91M	1540y
	693.2m	Track drainage in LH cess - flowing water (Photo D5)	91M	1705y
	703.9m	Badger sett (Photo D6)	91M	1717y
BOT E=0mm	731.7m		91M	1747y
92M 00ch post	743.4m	92MP-92M 10ch: sleepers in good condition re-key only	92M	0y
TOT E=-51mm	807.1m		92M	70y
92M 10ch	945.0m		92M	220y
Bratts Black No1 UWC (Photo D7)	1128.1m	Decking OK. Flangeways clear. Wooden decking Visible areas of rail foot look OK	92M	420y
	1134.7m	Decking fixed to sleepers	92M	427y
92M 20ch	1146.0m	Sleeper ends either side of UWC need boxing in	92M	440y
TOT E=-50mm	1309.4m		92M	2378y
92M 30ch	1347.2m		92M	660y
BOT E=-2mm	1385.2m		92M	702y
BOT E=-8mm	1453.1m		92M	776y
TOT E=42mm	1529.3m		92M	859y
92M 40ch post	1547.8m		92M	880y
Dip in track not shown on trace, caused by short rail lengths on LH side. MSP over a length to rectify	1628.3m		92M	968y
Knodishall Crossing (Photo D8) All OK, some debris in flangeways	1726.2m		92M	1075y

Right rail

Left rail

HF Rubber crossing, rail foot not visible to inspect	1733.0m		92M 1083y
92M 50ch	1749.0m	92M 50ch-92M 70ch, still 1 in 4 spot re-sleepering, ballast good stone on top, but ash formation poor	92M 1100y
92M 60ch post	1948.3m	92M 60ch to 92M 70ch - Tight RH curve, de-veg required	92M 1320y
Possible tangent point	1967.6m	Poor alignment.	92M 1341y
92M 70ch	2149.5m		92M 1540y
TOT E=71mm	2313.6m		92M 1719y
93M 00ch post	2350.2m	Spot re-sleeper as required 93MP onwards	93M 0y
BOT E=5mm	2420.0m		93M 76y
	2479.6m	Culvert retaining wall start LHS	93M 142y
	2485.6m	Culvert start LHS	93M 148y
(Photos D9-13) Culvert end RHS	2498.0m		93M 162y
Culvert retaining wall end RHS	2500.0m		93M 164y
93M 10ch	2552.3m		93M 220y
93M 20ch post	2752.4m		93M 440y
	2801.5m	Broken baseplate on LH side - see photo	93M 494y
93M 30ch	2955.0m		93M 660y
Westhouse Crossing (Photo D14) Flangeways clear, wooden decking, unable to see rail foot due to mud. Crossing OK	2980.1m 2985.5m		93M 687y 93M 693y
BOT E=-7mm	3138.6m		93M 861y
93M 40ch post	3154.5m	93M 40ch-93M 50ch de-veg required on LH curve	93M 880y
TOT E=-47mm	3214.7m		93M 946y
TOT E=-42mm	3337.8m		93M 1080y
93M 50ch	3355.3m	93M 50ch-93M 60ch, ballast shoulders need building up, track is on an embankment	93M 1100y
BOT E=6mm	3413.5m		93M 1164y
Centre of culvert, approx. 5m below rail level	3512.9m		93M 1272y
Centre of culvert, approx. 5m below rail level	3533.8m	93M 1276y	93M 1295y
93M 60ch post	3555.7m		93M 1320y
Snowdens UWC (Photo D15) Wooden decking, flangeways clear Rail foot visible	3708.5m 3713.0m		93M 1487y 93M 1492y
93M 70ch	3756.8m		93M 1540y
BOT E=-4mm	3825.8m		93M 1615y
TOT E=-56mm	3911.6m		93M 1709y
94M 00ch post	3955.7m	94M 00ch-94M 12ch, re-rail low rail (i.e. LH rail on curve)	94M 0y
Saxmundham Road LC (Photo D16) Hardfast rubber decking, unable to see rail foot to inspect, all secure, no issues	3991.2m 3997.9m	Saxmundham Rd LC - Leiston LC de-veg throughout reverse curves to improve visibility and adhesion	94M 39y 94M 46y

TOT E=-38mm	4101.2m		94M 159y
94M 10ch	4159.1m	94M 10ch-94M 20ch de-veg on curve	94M 220y
BOT E=-7mm	4207.9m		94M 273y
BOT E=1mm	4230.5m		94M 298y
TOT E=50mm	4306.6m		94M 381y
94M 20ch post	4357.4m		94M 440y
TOT E=57mm	4571.4m		94M 674y
94M 30ch	4559.0m	94M 30ch-94M 40ch de-veg round curve	94M 660y
BOT E=5mm	4647.3m	Direct reverse curve	94M 757y
TOT E=-55mm	4723.0m		94M 839y
94M 40ch post	4759.6m		94M 880y
TOT E=-45mm	4838.0m	Signs of sidewear on the RH rail	94M 966y
BOT E=-3mm (Direct reverse curve)	4913.0m	(back to low mileage) this is the high rail of LH curve, sleepers OK, no signs of shuffle contributing to sidewear	94M 1048y
94M 50ch	4956.6m	continue to spot re-sleeper 1 in 4	94M 1100y
TOT E=48mm	4989.5m		94M 1136y
FTN/Telecom tower	5094.7m		94M 1251y
94M 60ch post	5158.2m		94M 1320y
TOT E=47mm	5166.0m		94M 1329y
BOT E=-7mm	5241.7m	Direct reverse curve	94M 1411y
Leiston footpath crossing (Photo D17)	5272.7m 5273.9m		94M 1445y 94M 1447y
TOT E=-37mm	5281.0m		94M 1454y
HP1 switch toes (Photos D18-20)	5286.0m	HP1 and HP2 clamped and scotched out of use	94M 1460y
Crossing nose HP1	5305.9m	See photos D18-20 and D23-25 and TEF3068s for gauge info	94M 1482y
Fouling Point HP1	5325.1m	Leiston Passing Loop (Photos D21-22)	94M 1503y
94M 70ch	5354.9m	The passing loop comprises of poor ballast	94M 1540y
TOT E=-37mm	5400.0m	(mostly ash), 2-hole fishplated joints, broken baseplates, rotten sleepers	94M 1589y
BOT E=-7mm	5519.2m	overgrown with vegetation generally poor throughout	94M 1720y
Fouling Point HP2	5502.1m		94M 1701y
Crossing nose HP2	5522.4m		94M 1723y
HP2 switch toes (Photos D23-25)	5542.2m	Bottom of platform Ramp	94M 1745y
Disused Leiston Station Platform (Photo D26)	5545.2m	Top of platform Ramp	94M 1748y
95M 00ch	5559.8m	Datum plate no.1 missing	95M 0y
datum no.2	5563.3m	Offset=759mm, E=-14mm, Gauge=1436mm	95M 4y
datum no.3	5582.4m	Offset=765mm, E=+2mm, Gauge=1437mm	95M 25y
datum no.4	5608.9m	Offset=782mm, E=-7mm, Gauge=1436mm	95M 54y

datum no.5	5619.1m	Offset=785mm, E=-2mm, Gauge=1435mm	95M 65y
datum no.6 & Top of platform Ramp	5636.3m	Offset=781mm, E=+3mm, Gauge=1436mm	95M 84y
	5640.0m	Bottom of platform Ramp	95M 88y
Leiston Station LC (Photo D27) all secure, rail foot not visible to inspect	5661.1m	Station is disused	95M 111y
HF rubber decking, quite new rail 95lB RBH	5675.6m		95M 127y
95M 10ch	5762.3m		95M 220y
95M 20ch post	5966.3m	95M 25ch-95M 40ch, additional ballast required in 4foot and shoulders	95M 440y
95M 30ch	6168.1m	Keys are wood/metal, need replacing due to corrosion/wear	95M 660y
Longitudinal timber bridge (Photo D28A-28D)	6249.0m	Track each side of structure is poor, poor run-on and run-off. Track is low each side of the structure. MSP required both sides of structure to achieve better vertical alignment over the structure	95M 748y
New structure, no issues		Rotten, decaying sleepers, poor integrity	
see photos	6260.2m	Visible voids under sleepr next to the bridge at high miles side. Joints are positioned too close to the structure at both sides. Joints should be at least 4.5m away from ends of structure. Replace rail over bridge with 30ft lengths to move joints away.	95M 761y
BOT E=-7mm	6264.1m	95M 30ch to boundary - de-veg required	95M 765y
Cess disappearing down the embankment. Ballast supported by timber retaining structure. Signs of animal burrowing under track	6286.1m	(Photos D29-30)	95M 789y
TOT E=55mm	6300.4m		95M 805y
95M 40ch post	6368.7m		95M 880y
95M 50ch	6569.7m		95M 1100y
95M 60ch post	6768.5m		95M 1320y
TOT E=63mm	6879.6m		95M 1442y
BOT E=3mm	6925.1m		95M 1491y
95M 70ch	6970.2m		95M 1540y
Sizewell Road LC (Photo D31) HF rubber decking, all ok, no issues	6988.5m		95M 1560y
Rail foot not visible to inspect	7004.4m		95M 1577y
HP3 switch toes (Photo D32)	7004.9m		95M 1578y
Crossing nose HP3	7024.9m		95M 1600y
Gate at NR Boundary (Photo D33)	7056.1m	End of survey	95M 1634y

Appendix B – Additional Survey Measurements

Infrastructure Design Group - Track
Sizewell Permanent Way Condition Report

As part of this survey, measurements were taken every 10 chains in order to build up a picture of the general condition of the track; most importantly the rail wear, as this information is not visible on track recording traces. See the table below for measurements:

Chainage (MM.CC)	Gauge (mm)	Cant (mm)	RH rail wear (mm)	Equivalent RH Rail depth (mm)	LH rail wear (mm)	Equivalent LH Rail Depth (mm)
91.60	1441	96	11	**134**	12	**133**
91.70	1439	4	8	137	9	136
92.00	1437	-20	8	137	11	**134**
91.10	1443	-51	8	137	8	137
92.20	1434	-53	7	138	12	**133**
92.30	1435	-31	9	136	7	138
92.40	1435	49	10	**135**	9	136
92.50	1431	38	9	136	13	**132**
92.60	1443	54	9	136	10	**135**
92.70	1444	80	11	**134**	10	**135**
93.00	1440	49	13	**132**	13	**132**
93.10	1434	-5	7	138	7	138
93.20	1436	0	6	139	7	138
93.30	1436	2	5	140	5	140
93.40	1431	-16	9	136	7	138
93.50	1432	-36	6	139	6	139
93.60	1433	0	7	138	7	138
93.70	1436	-1	6	139	6	139
94.00	1440	-37	8	137	7	138
94.10	1433	-34	5	140	10	**135**
94.20	1442	48	10	**135**	8	137
94.30	1439	52	11	**134**	13	**132**
94.40	1437	-33	7	138	9	136
94.50	1436	33	6	139	8	137
94.60	1436	48	11	**134**	10	**135**
94.70	1438	-48	9	136	11	**134**
95.00	1434	-2	11	**134**	11	**134**
95.10	1436	-2	11	**134**	10	**135**
95.20	1434	0	8	137	8	137
95.30	1438	1	7	138	8	137
95.40	1440	61	12	**133**	13	**132**
95.50	1436	55	10	**135**	11	**134**
95.60	1435	61	11	**134**	12	**133**
95.70	1429	-8	15	**130**	12	**133**

***Yellow cells highlight rail depths between 135mm and 131mm**
***Red cells indicate rail depths below the minimum permitted depth (131mm) as per NR/L2/TRK/001/mod09**

Appendix C – TEF3068 S&C Gauging Inspection Forms

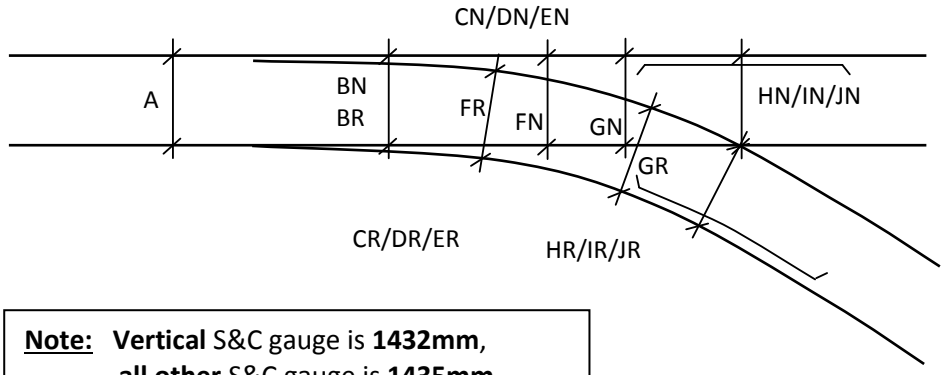
MANAGEMENT OF GAUGE: PERIODIC SWITCHES & CROSSINGS INSPECTION

TEF 3068 issue 6, March 2016

Location	Leiston	Route	Anglia	ELR	SIZ	Track ID	3300	Track Cat.	
Point No	HP1	Mileage (at toes)	94m 66.5ch	Flexure			Turnout		
Speed (normal/main route)	25 mph	Contra ☐ Similar ☒ Straight ☐			LH ☒ RH ☐ Split ☐				
Speed (reverse/turnout)	mph								

Rail Section	Switch size
BH ☒ FB inclined ☐ FB vertical ☐	95 ☒ 109 ☐ 110 ☐ CEN56(113A) ☐ CEN56(113A)/CEN54(UIC54) ☐ CEN60 ☐
	A ☒ B ☐ C ☐ D ☐ E ☐ F ☐ SG ☐ G ☐ H ☐

Point Driving Mechanism	Secured out of use ☐ Point Motor ☐	Hand Operated ☒ Hy-Drive ☐	Clamp Lock ☐ Other _____	HPSS ☐



Note: **Vertical** S&C gauge is **1432mm**, **all other** S&C gauge is **1435mm**

Crossing Details	
Crossing angle 1 in :	8
Type	
Cast Manganese	☐
Titan	☐
Cast/machined nose	☐
Semi Welded/part fabricated	☐
Built Up/fully fabricated	☒
Welded	☐
Jointed	☐
Jointed & Welded (mix)	☐

	GAUGING/DIMENSIONS N suffix = Normal (main route) R suffix = Reverse (turnout route)	ACTUAL mm Normal	PASS or FAIL (✓or x)	ACTUAL mm Reverse	PASS or FAIL (✓or x)	Comments
	Toe opening	89	Fail			
A	Gauge in front of toes (see 'location of measurement' notes, page 3 of this form)	1436	Pass			
A1	Gauge at 1st stretcher bar	1435	Pass			
A2	Gauge at 2nd stretcher bar	1433	Pass			A2 = BN/BR
A3	Gauge at 3rd stretcher bar	na				
A4	Gauge at 4th stretcher bar	na				
A5	Gauge at 5th stretcher bar	na				
A6	Gauge at 6th stretcher bar	na				
BN BR	Gauge at rear stretcher bar	1433	Pass			
CN CR	Flangeway at rear stretcher/back drive	74				
DN DR	Residual switch opening at rear stretcher/back drive	0				
EN ER	Flangeway at end of planing or at visual minimum area	63				
	Visual evidence of flange back contact (not switch on stock rubbing)	No				
FN FR	Gauge at 1st switch heel block / ball and claw	1440	Pass	1457	Fail	
GN GR	Gauge mid way between heel & crossing	1443	Pass	1445	Pass	
HN HR	Gauge at crossing nose	1440	Pass	1430	Pass	
IN IR	Check gauge at crossing nose	1392	Pass	1378	Fail	
JN JR	Check rail flangeway opposite crossing nose	48	Fail	52	Fail	
	Maximum sidewear anywhere within the S&C	na		11		Halfway between heel & nose
	Evidence of baseplate shuffle	Yes ☐ No ☒		Yes ☐ No ☒		

COMMENTS / WORK ARISING FROM INSPECTION			
Track Alignment (TQ band)	**Good** ☐ **Satisfactory** ☐ **Poor** ☐ **Very Poor** ☐ **Super Red** ☐		
TRK/053 Inspection or Assessment required	**No** ☐ **Yes** ☐	**Grinding required**	**No** ☐ **Yes** ☐

Work required over the next twelve months	Required Finish date	Std job no	Ellipse Ref No
-Timbers throughout are good except for one in middle of layout -Screws/ferrules all ok -Ballast good -RH switch has a crack in it at the toe, plus lipping on back edge of switch blade -LH switch shows signs of damage at switch tip -Crossing good, no damage -Failures on turnout route need to be rectified before re-opening Note - Switches are clamped and scotched in normal position, reverse can not be gauged in moving area			
Inspected by: (name) Ben White **Inspected by: (signature)**	**Date of inspection: 27/09/2016**		

Reviewed by SM(T) (name):	**Signature:**	**Date:**
Comments:		

Reviewed by TME (name):	**Signature:**	**Date:**
Comments:		

Entered into Ellipse by (name):	**Signature:**	**Date:**

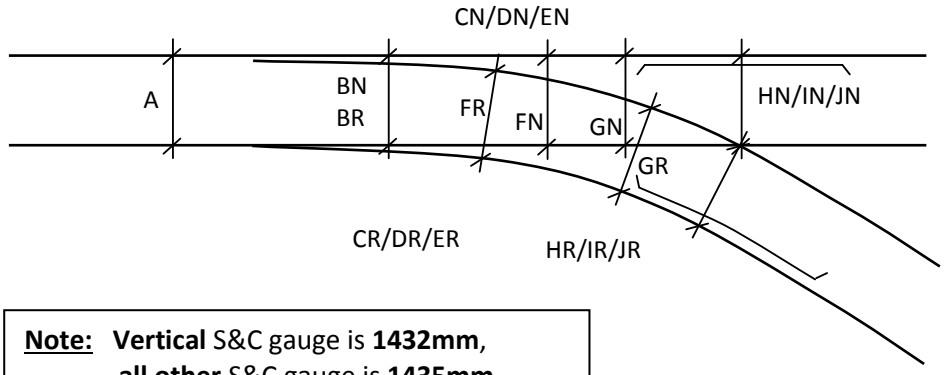
MANAGEMENT OF GAUGE: PERIODIC SWITCHES & CROSSINGS INSPECTION

TEF 3068 issue 6, March 2016

Location	Leiston	Route	Anglia	ELR	SIZ	Track ID	3300	Track Cat.	
Point No	HP2	Mileage (at toes)	94m 79ch	Flexure			Turnout		
Speed (normal/main route)	25 mph	Contra ☐ Similar ☒ Straight ☐			LH ☐ RH ☒ Split ☐				
Speed (reverse/turnout)	mph								

Rail Section		Switch size
BH ☒ FB inclined ☐ FB vertical ☐	95 ☒ 109 ☐ 110 ☐ CEN56(113A) ☐ CEN56(113A)/CEN54(UIC54) ☐ CEN60 ☐	A ☒ B ☐ C ☐ D ☐ E ☐ F ☐ SG ☐ G ☐ H ☐

Point Driving Mechanism	Secured out of use ☐ Point Motor ☐	Hand Operated ☒ Hy-Drive ☐	Clamp Lock ☐ Other _____	HPSS ☐



Note: **Vertical** S&C gauge is **1432mm**, **all other** S&C gauge is **1435mm**

Crossing Details	
Crossing angle 1 in :	8
Type	
Cast Manganese	☐
Titan	☐
Cast/machined nose	☐
Semi Welded/part fabricated	☐
Built Up/fully fabricated	☒
Welded	☐
Jointed	☐
Jointed & Welded (mix)	☐

	GAUGING/DIMENSIONS N suffix = Normal (main route) R suffix = Reverse (turnout route)	ACTUAL mm Normal	PASS or FAIL (✓or x)	ACTUAL mm Reverse	PASS or FAIL (✓or x)	Comments
	Toe opening	101	Fail			
A	Gauge in front of toes (see 'location of measurement' notes, page 3 of this form)	1439	Pass			
A1	Gauge at 1st stretcher bar	1440	Pass			
A2	Gauge at 2nd stretcher bar	1441	Pass			A2 = BN/BR
A3	Gauge at 3rd stretcher bar	na				
A4	Gauge at 4th stretcher bar	na				
A5	Gauge at 5th stretcher bar	na				
A6	Gauge at 6th stretcher bar	na				
BN BR	Gauge at rear stretcher bar	1441	Pass			
CN CR	Flangeway at rear stretcher/back drive	81				
DN DR	Residual switch opening at rear stretcher/back drive	0				
EN ER	Flangeway at end of planing or at visual minimum area	66				
	Visual evidence of flange back contact (not switch on stock rubbing)	No				
FN FR	Gauge at 1st switch heel block / ball and claw	1438	Pass	1442	Pass	
GN GR	Gauge mid way between heel & crossing	1429	Pass	1439	Pass	
HN HR	Gauge at crossing nose	1432	Pass	1430	Pass	
IN IR	Check gauge at crossing nose	1386	Fail	1382	Fail	
JN JR	Check rail flangeway opposite crossing nose	46	Fail	48	Fail	
	Maximum sidewear anywhere within the S&C	na		na		
	Evidence of baseplate shuffle	Yes ☐ No ☒		Yes ☐ No ☒		

COMMENTS / WORK ARISING FROM INSPECTION			
Track Alignment (TQ band)	**Good** ☐ **Satisfactory** ☐ **Poor** ☐ **Very Poor** ☐ **Super Red** ☐		
TRK/053 Inspection or Assessment required	**No** ☐ **Yes** ☐	**Grinding required**	**No** ☐ **Yes** ☐

Work required over the next twelve months	Required Finish date	Std job no	Ellipse Ref No
-Timbers OK throughout except for 8: 1 in switch, 1 @ heel, 1 near the heel, 2 near the crossing, 4 in a row from crossing nose to leg ends -Ballast fair -Screws/ferrules OK -Crossing OK, slight wear on RH wing rail -LH switch tip damaged (COOU) 60mm piece missing from switch toe and slight lipping on back of switch blade -RH switch blade OK -Failures on turnout route must be rectified before re-opening of loop- Note - Switches are clamped and scotched in normal position, reverse can not be gauged in moving area			

Inspected by: (name) Ben White **Inspected by: (signature)**	**Date of inspection: 27/09/2016**

Reviewed by SM(T) (name):	**Signature:**	**Date:**
Comments:		

Reviewed by TME (name):	**Signature:**	**Date:**
Comments:		

Entered into Ellipse by (name):	**Signature:**	**Date:**

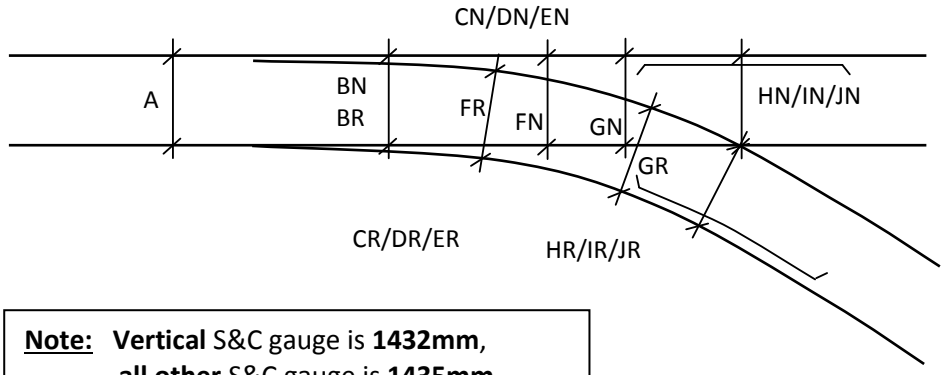
MANAGEMENT OF GAUGE: PERIODIC SWITCHES & CROSSINGS INSPECTION

TEF 3068 issue 6, March 2016

Location	Leiston	Route	Anglia	ELR	SIZ	Track ID	3300	Track Cat.	
Point No	HP3	Mileage (at toes)	95m 71.75ch	Flexure				Turnout	
Speed (normal/main route)	25 mph	Contra ☐ Similar ☒ Straight ☐						LH ☒ RH ☐ Split ☐	
Speed (reverse/turnout)	mph								

Rail Section		Switch size
BH ☒ FB inclined ☐ FB vertical ☐	95 ☒ 109 ☐ 110 ☐ CEN56(113A) ☐ CEN56(113A)/CEN54(UIC54) ☐ CEN60 ☐	A ☒ B ☐ C ☐ D ☐ E ☐ F ☐ SG ☐ G ☐ H ☐

Point Driving Mechanism	Secured out of use ☐ Point Motor ☐	Hand Operated ☒ Hy-Drive ☐	Clamp Lock ☐ Other _____	HPSS ☐



Note: **Vertical** S&C gauge is **1432mm**, **all other** S&C gauge is **1435mm**

Crossing Details	
Crossing angle 1 in :	8
Type	
Cast Manganese	☐
Titan	☐
Cast/machined nose	☐
Semi Welded/part fabricated	☐
Built Up/fully fabricated	☒
Welded	☐
Jointed	☐
Jointed & Welded (mix)	☐

	GAUGING/DIMENSIONS N suffix = Normal (main route) R suffix = Reverse (turnout route)	ACTUAL mm Normal	PASS or FAIL (✓or x)	ACTUAL mm Reverse	PASS or FAIL (✓or x)	Comments
	Toe opening	97	Fail	97	Fail	
A	Gauge in front of toes (see 'location of measurement' notes, page 3 of this form)	1428	Pass	1428	Pass	
A1	Gauge at 1st stretcher bar	1429	Pass	1428	Pass	
A2	Gauge at 2nd stretcher bar	1432	Pass	1432	Pass	A2 = BN/BR
A3	Gauge at 3rd stretcher bar	na		na		
A4	Gauge at 4th stretcher bar	na		na		
A5	Gauge at 5th stretcher bar	na		na		
A6	Gauge at 6th stretcher bar	na		na		
BN BR	Gauge at rear stretcher bar	1432	Pass	1432	Pass	
CN CR	Flangeway at rear stretcher/back drive	79		79		
DN DR	Residual switch opening at rear stretcher/back drive	8		7		
EN ER	Flangeway at end of planing or at visual minimum area	64		66		
	Visual evidence of flange back contact (not switch on stock rubbing)	No		No		
FN FR	Gauge at 1st switch heel block / ball and claw	1447	Pass	1452	Pass	
GN GR	Gauge mid way between heel & crossing	1437	Pass	1443	Pass	
HN HR	Gauge at crossing nose	1441	Pass	1442	Pass	
IN IR	Check gauge at crossing nose	1391	Pass	1387	Fail	
JN JR	Check rail flangeway opposite crossing nose	50	Fail	55	Fail	
	Maximum sidewear anywhere within the S&C	na		na		
	Evidence of baseplate shuffle	Yes ☐ No ☒		Yes ☐ No ☒		

COMMENTS / WORK ARISING FROM INSPECTION			
Track Alignment (TQ band)	**Good** ☐ **Satisfactory** ☐ **Poor** ☐ **Very Poor** ☐ **Super Red** ☐		
TRK/053 Inspection or Assessment required	**No** ☐ **Yes** ☐	**Grinding required**	**No** ☐ **Yes** ☐

Work required over the next twelve months	Required Finish date	Std job no	Ellipse Ref No
-Timbers good throughout -Ballast good, but vegetation present -Crossing good, no damage -Switches good, no damage -Hand point lever mechanism in good workinig order, switches swing OK -Slide chairs greased -Generally good condition			
Inspected by: (name) Ben White **Inspected by: (signature)**	**Date of inspection: 27/09/2016**		

Reviewed by SM(T) (name):	**Signature:**	**Date:**
Comments:		

Reviewed by TME (name):	**Signature:**	**Date:**
Comments:		

Entered into Ellipse by (name):	**Signature:**	**Date:**

Appendix D – Site Photographs

D1 – 2 hole fishplated joint 18.5m (91M 965y)

D2 - UTX 36.7m (91M 985y)

D3 - 3B catch points at 75.8m (91M 1028y) looking towards low mileage

D4 - Poorly fitted fishplate at 195.1m (91M 1158y)

D5 - Catchpit found at 693.2m (91M 1705y)

D6 - Potential badger sett at 703.9m (91M 1717y)

D7 - Bratts Black No1 UWC (92M 420y – 92M 427y)

D8 - Knodishall Crossing (92M 1075y – 92M 1083y)

D9 - Culvert 2479.6m – 2500m (93M 142y – 93M 164y)

D10 - Culvert 2479.6m – 2500m (93M 142y – 93M 164y)

D11 - Culvert 2479.6m – 2500m (93M 142y – 93M 164y)

D12 - Culvert 2479.6m – 2500m (93M 142y – 93M 164y)

D13 - Culvert 2479.6m – 2500m (93M 142y – 93M 164y)

D14 - Westhouse Crossing (93M 687y – 93M 693y)

Photos

D15 - Snowdens UWC (93M 1487y – 93M 1492y)

D16 - Saxmundham Road Crossing (94M 39y – 94M 46y)

D17 - Footpath crossing 5272.7m – 5273.9m (94M 1445y – 94M 1447y)

D18 - HP1 Leiston (94M 1460y)

D19 - HP1 Leiston (94M 1460y)

D20 - HP1 Leiston (94M 1460y)

D21 - Passing Loop – Leiston (94M 1460y – 94M 1745y)

D22 - Passing loop - Leiston (94M 1460y – 94M 1745y)

D23 - HP2 Leiston (94M 1745y)

D24 - HP2 Leiston (94M 1745y)

D25 - HP2 Leiston (94M 1745y)

D26 - Leiston Station (94M 1745y – 95M 88y)

D27 - Leiston LC (95M 111y – 95M 127y)

D28A - Longitudinal timber bridge 6249m 6260.2m (95M 748y – 95M 761y)

D28B - Longitudinal timber bridge 6249m 6260.2m back to high mileage (95M 748y – 95M 761y)

D28C - Longitudinal timber bridge 6249m 6260.2m back to low mileage (95M 748y – 95M 761y)

D28D - Longitudinal timber bridge 6249m 6260.2m (95M 748y – 95M 761y)

D29 - Embankment burrowing issue 6286.1m (95M 789y)

D30 - Embankment burrowing issue 6286.1m (95M 789y)

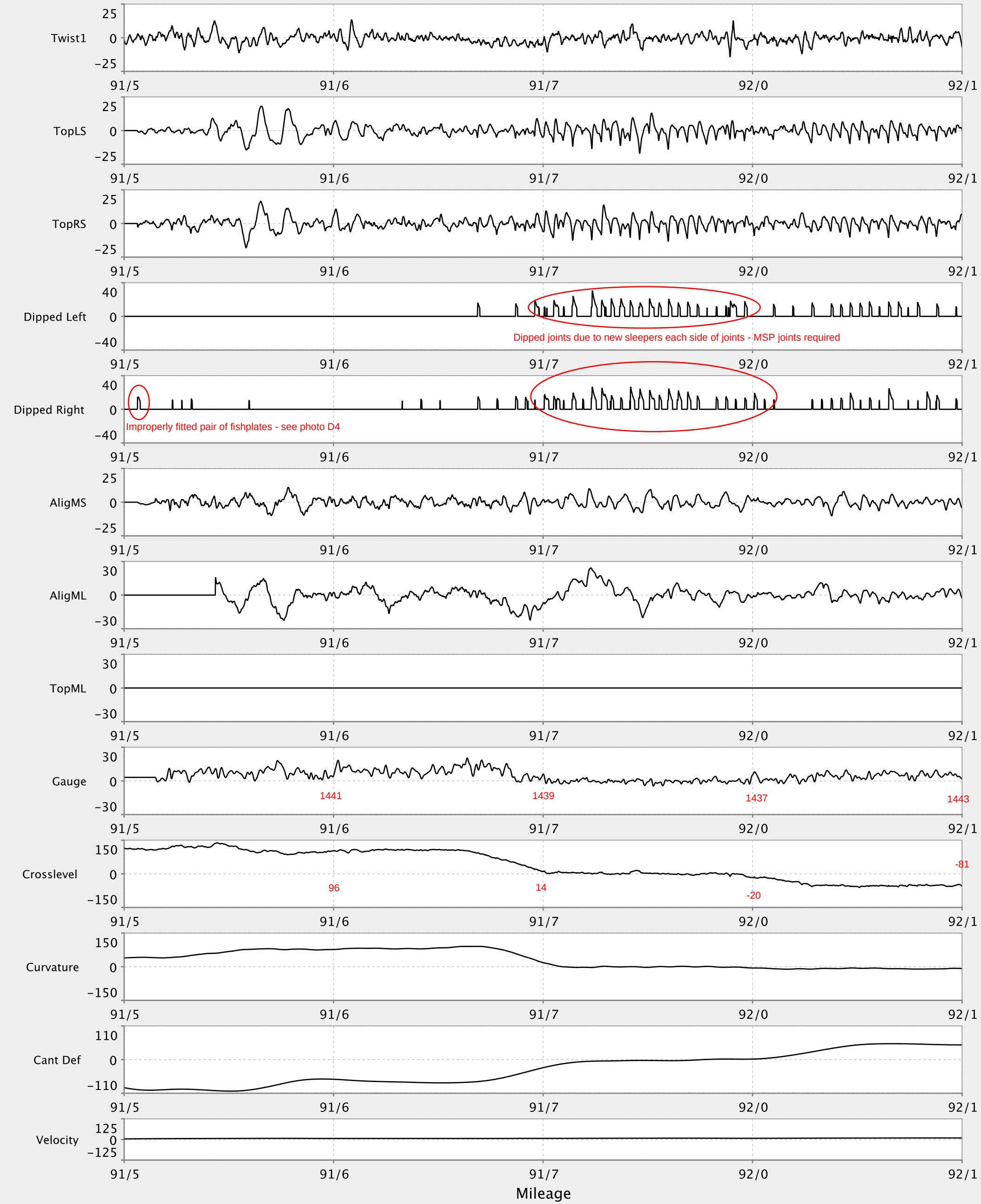
D31 – Sizewell Road Crossing (95M 1560y – 95M 1577y)

D32 - HP3 Leiston (95M 1578y)

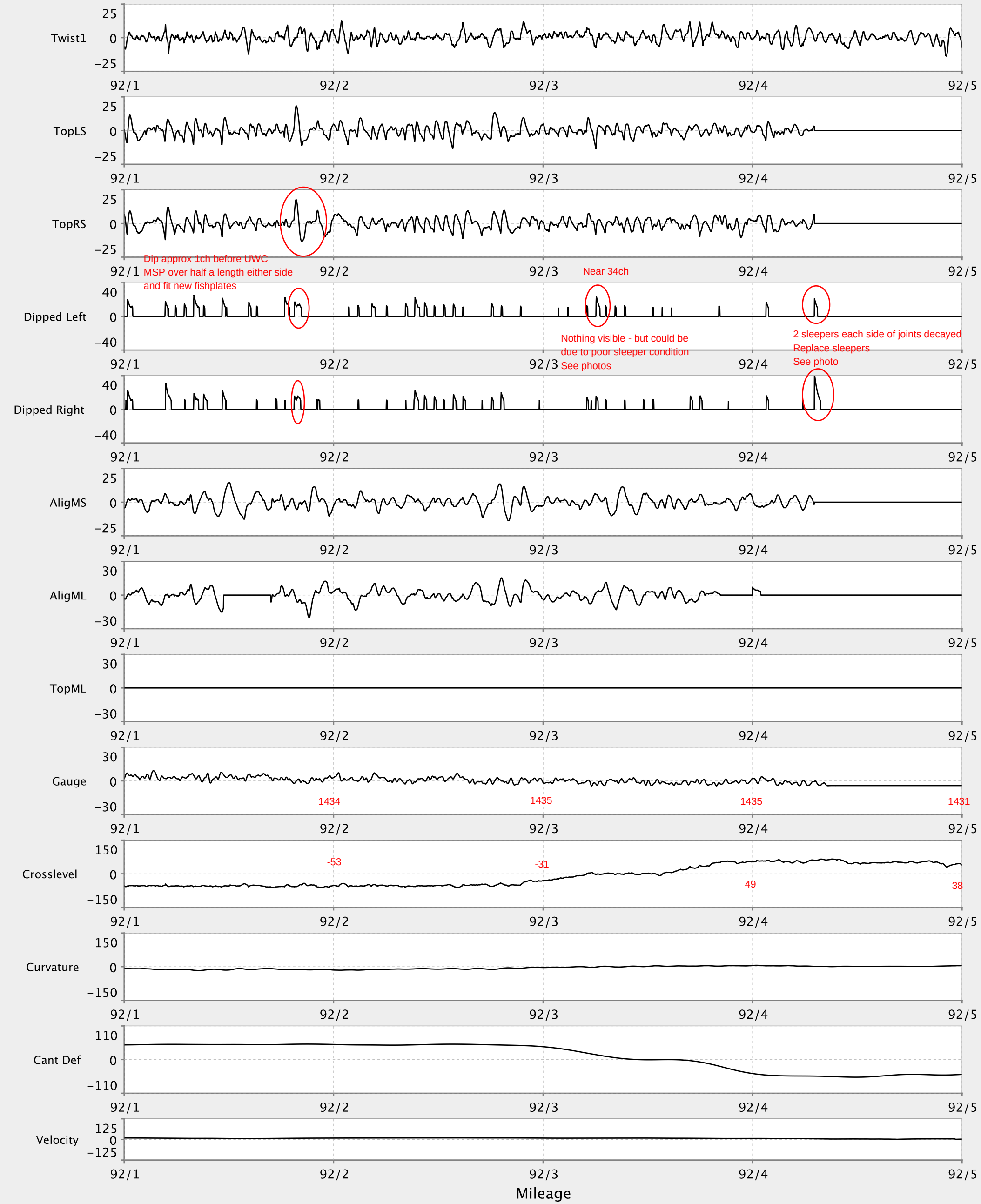
D33 – Photo showing gates at NR Boundary (95M 1634y)

Appendix E – Annotated Track Recording Unit Traces

15-Jun-2016 SIZ 3300 91 miles 1100 yards - 92 miles 220 yards

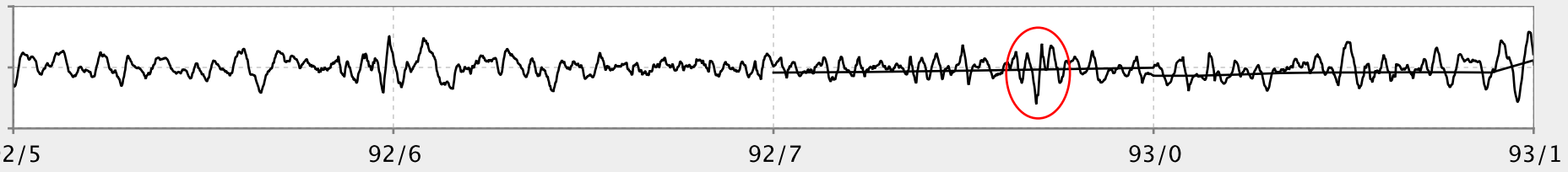


15-Jun-2016 SIZ 3300 92 miles 220 yards - 92 miles 1100 yards

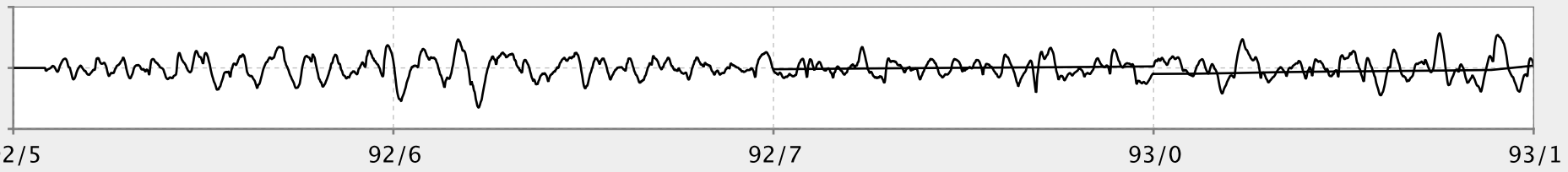


15-Jun-2016 SIZ 3300 92 miles 1100 yards - 92 miles 1320 yards

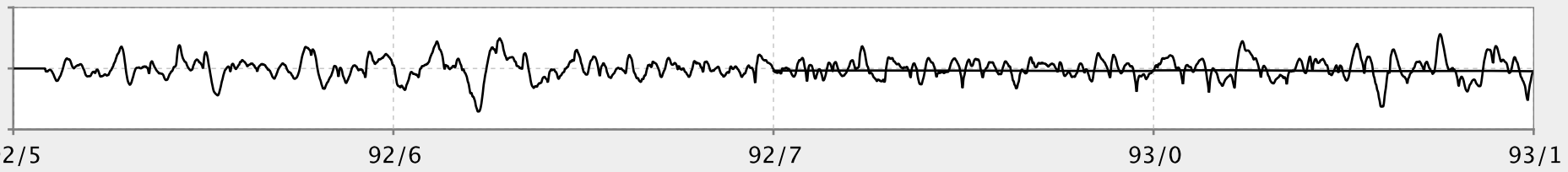
Twist1



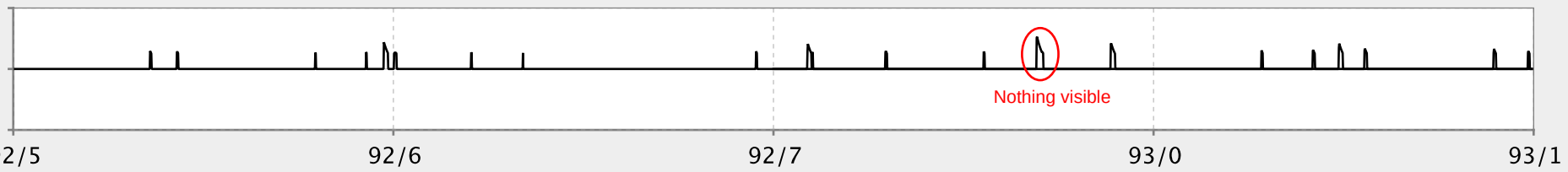
TopLS



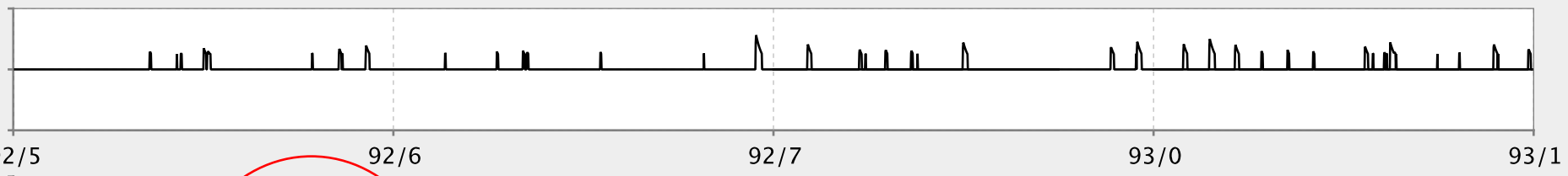
TopRS



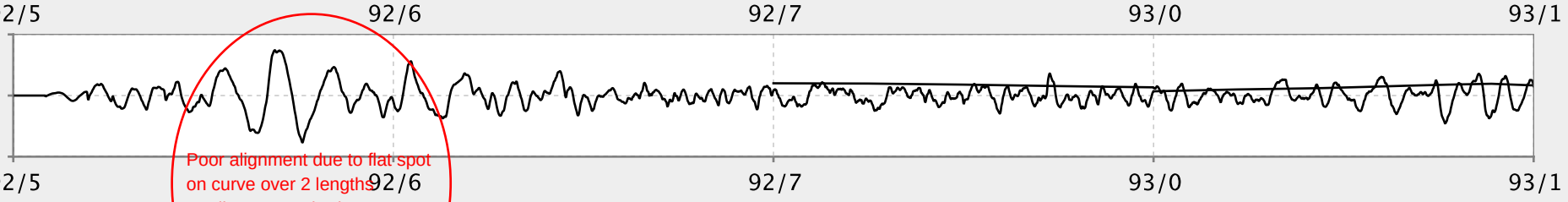
Dipped Left



Dipped Right



AligMS



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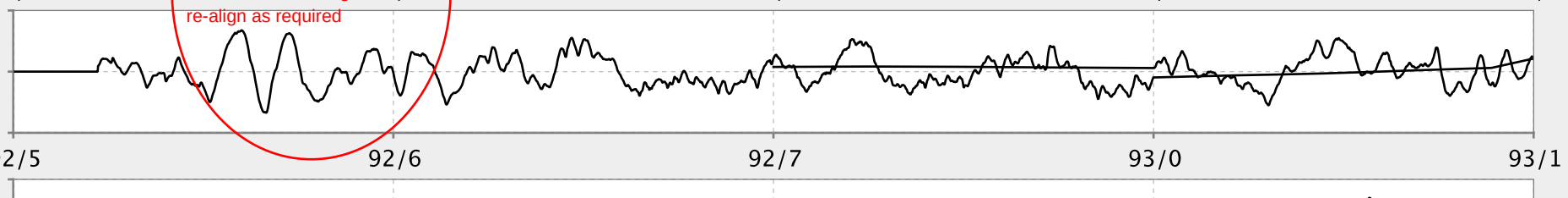
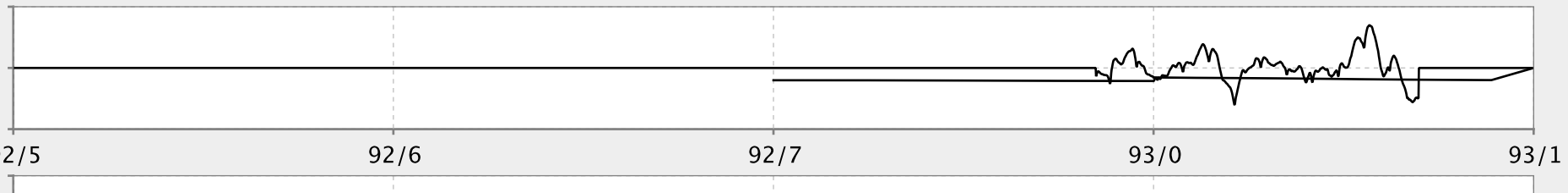
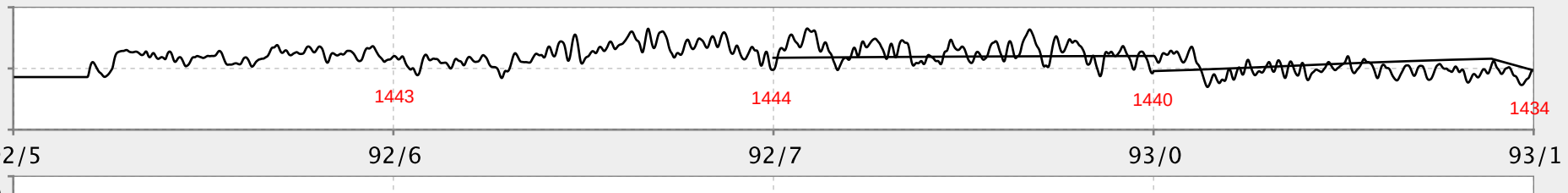


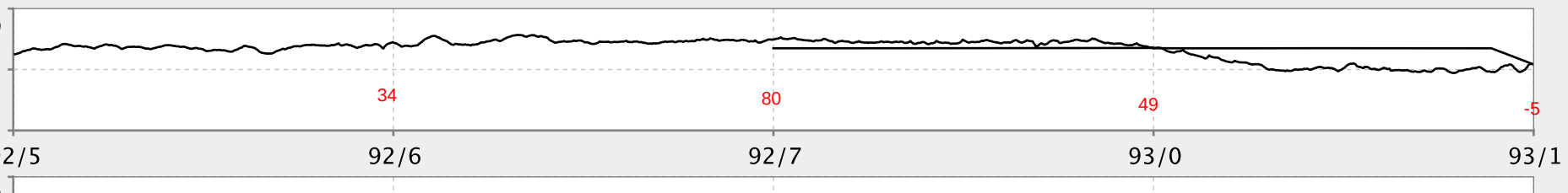
TopML



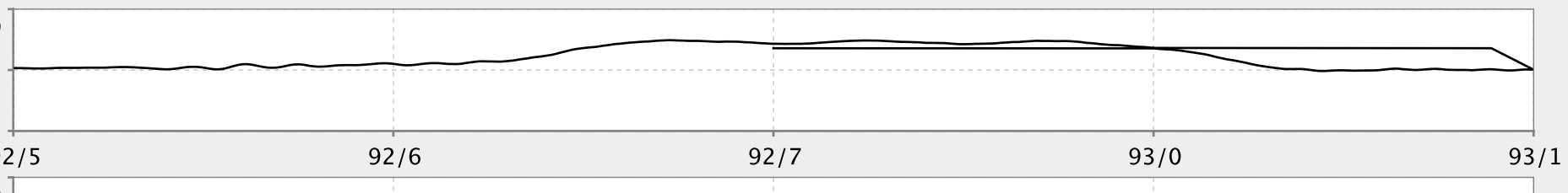
Gauge



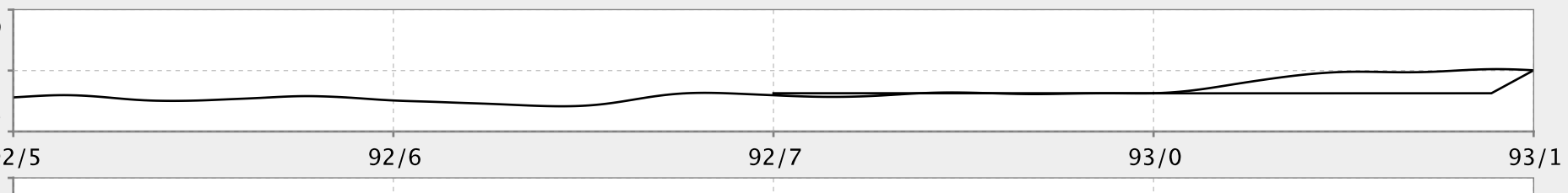
Crosslevel



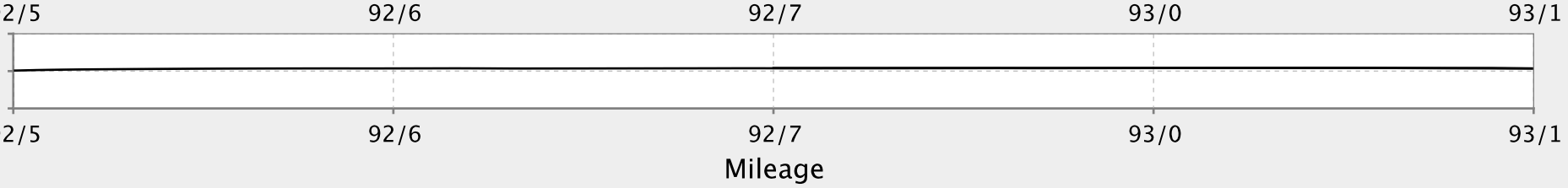
Curvature



Cant Def

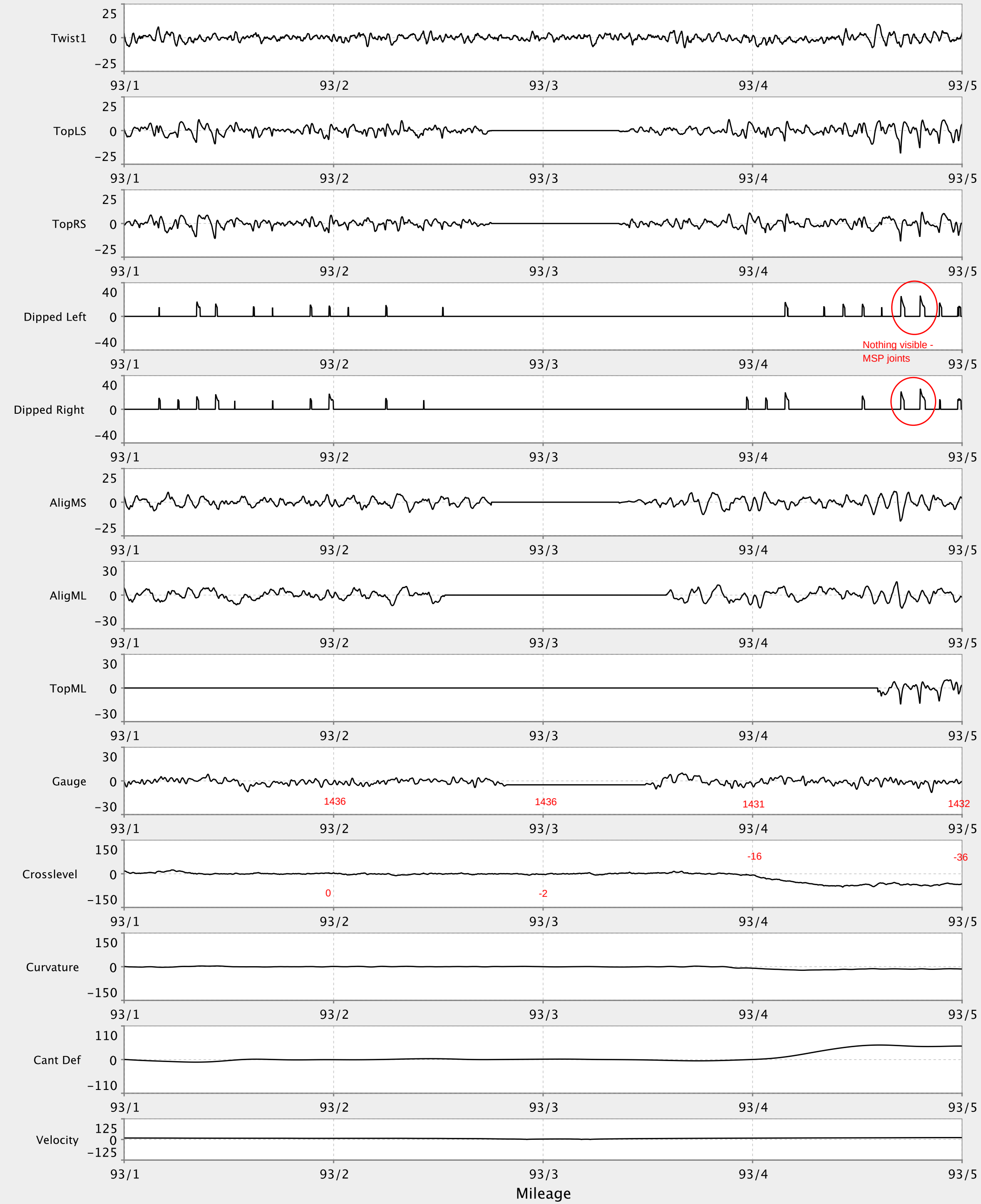


Velocity

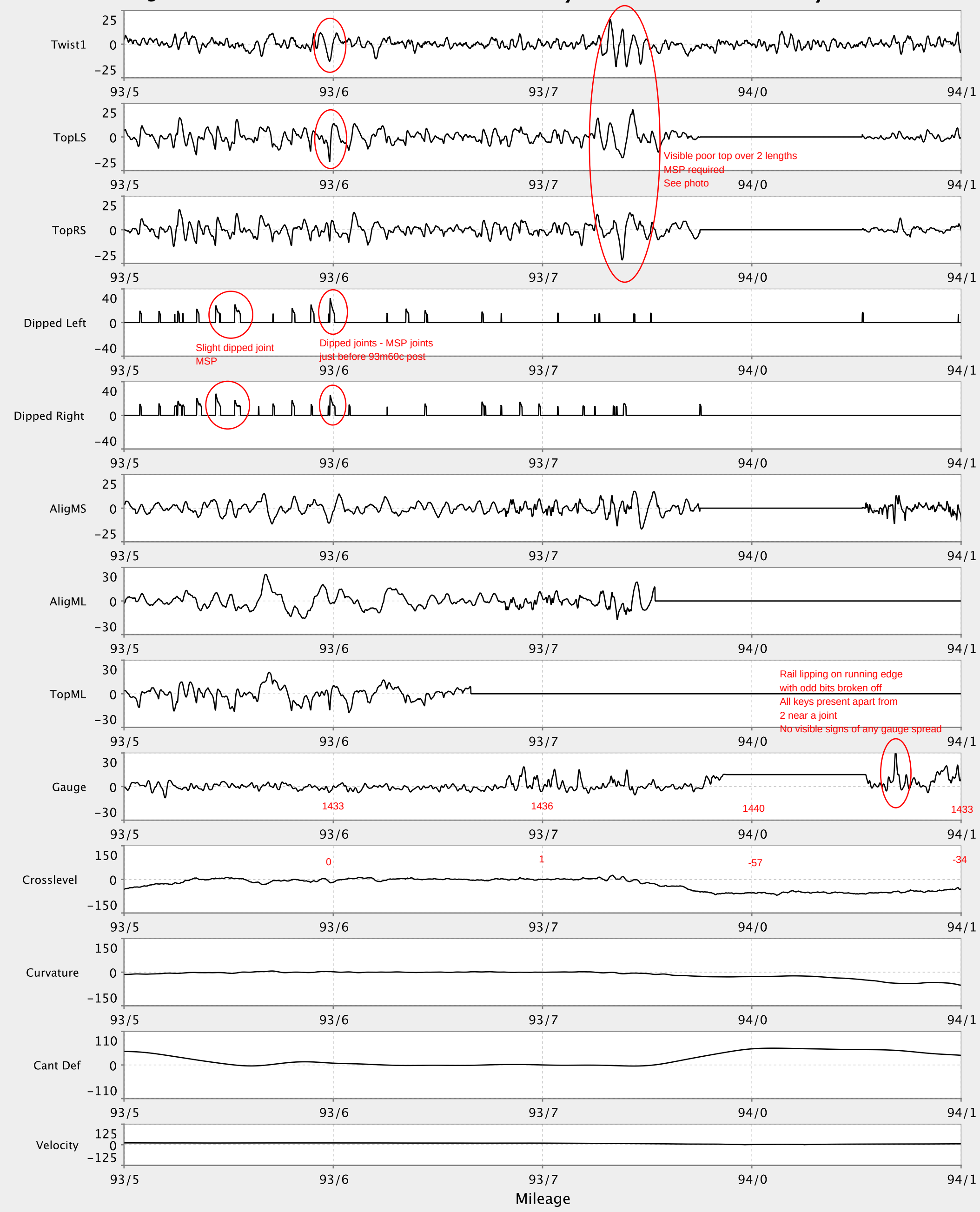


Mileage

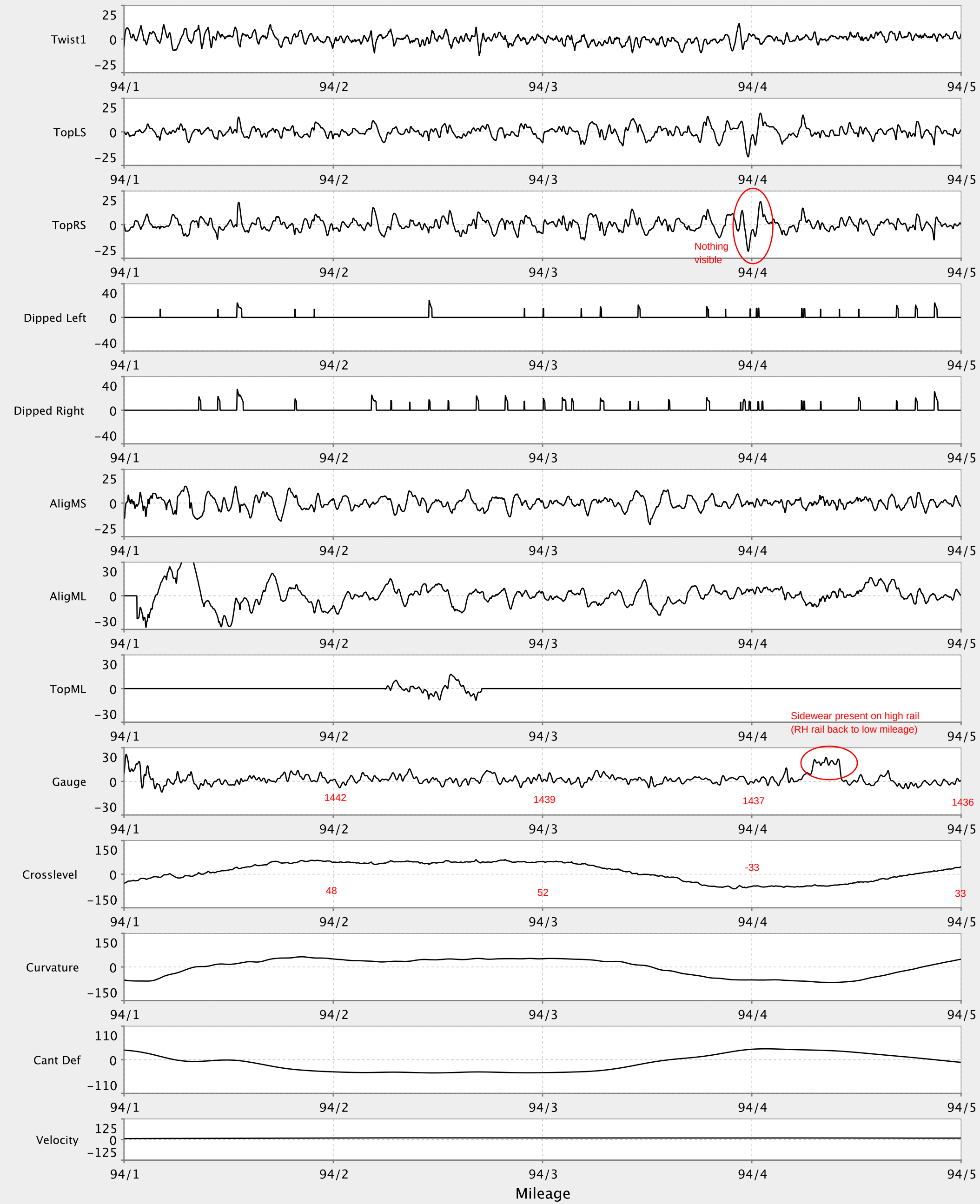
15-Jun-2016 SIZ 3300 93 miles 220 yards - 93 miles 1100 yards



15-Jun-2016 SIZ 3300 93 miles 1100 yards - 94 miles 220 yards



15-Jun-2016 SIZ 3300 94 miles 220 yards - 94 miles 1100 yards



15-Jun-2016 SIZ 3300 94 miles 1100 yards - 95 miles 220 yards

Twist1 25 0 -25

TopLS 25 0 -25

TopRS 25 0 -25

Dipped Left 40 0 -40

Dipped Right 40 0 -40

MSP joints required

AligMS 25 0 -25

AligML 30 0 -30

TopML 30 0 -30

No problems found on site
Possible anomalous reading

Gauge 30 0 -30
1436 1438 1434 1436

Crosslevel 150 0 -150
48 -48 -2 2

Curvature 150 0 -150

Cant Def 110 0 -110

Velocity 125 0 -125

94/5 94/6 94/7 95/0 95/1

Mileage

15-Jun-2016 SIZ 3300 95 miles 220 yards - 95 miles 1100 yards

Twist1

95m18ch - replace LH rail with correct length so joints marry up
This near twist fault is due to short lengths of rail on left side over 2 lengths
These joints are also staggered

TopLS

Voiding high mileage of longitudinal timber bridge

TopRS

Dipped Left

Nothing visible
MSP joints

Dipped Right

AligMS

AligML

TopML

Gauge

1434 1438 1440 Nothing visible 1436

Crosslevel

0 -1 61 55

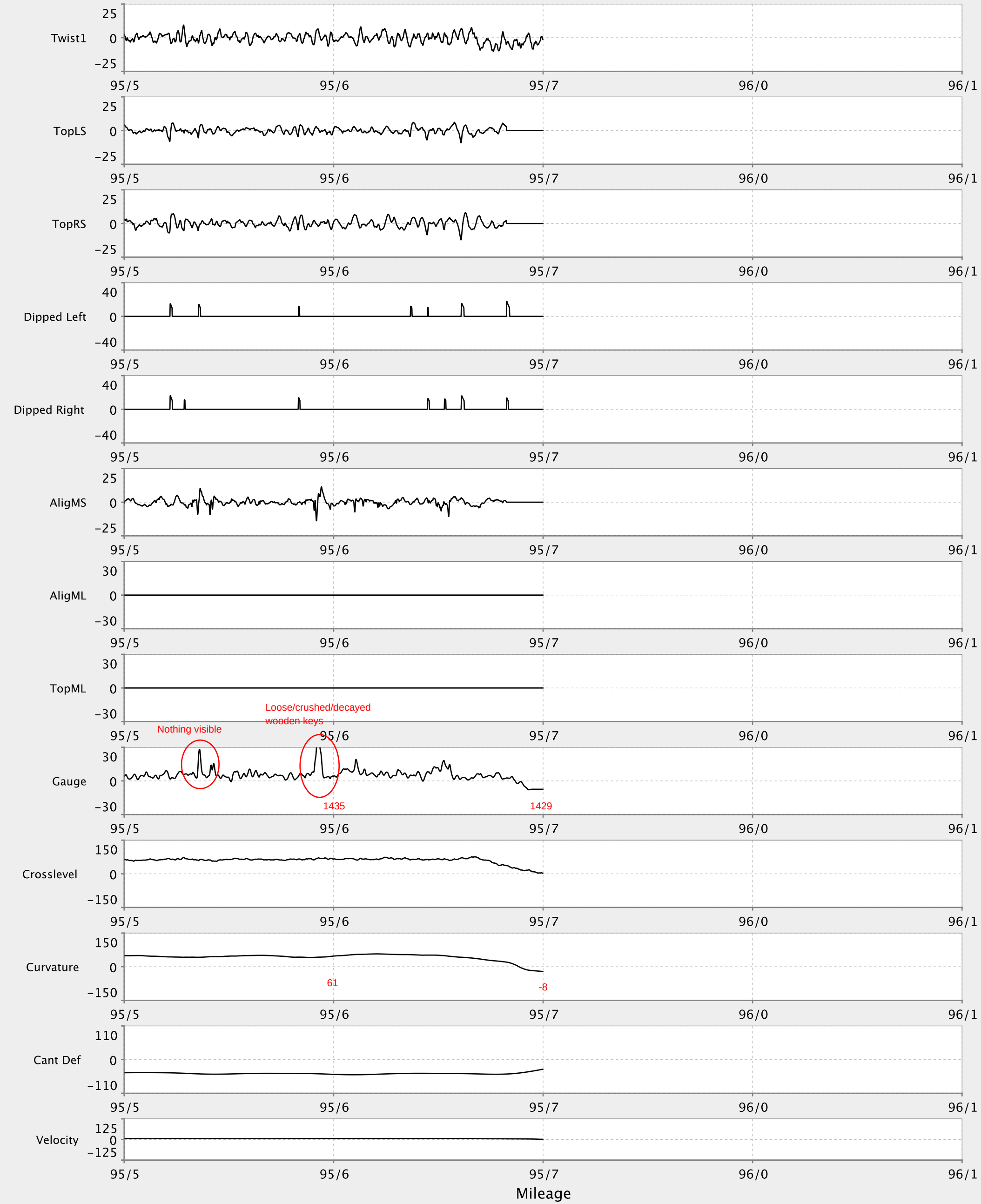
Curvature

Cant Def

Velocity

Mileage

15-Jun-2016 SIZ 3300 95 miles 1100 yards - 96 miles 220 yards



Appendix F – Map of Photograph Locations

Please note that this map is not suitable for legally binding documents. If you require a map for a legally binding document, please contact the land information team: landinformation@networkrail.co.uk

Photos D5 and D6

Knodishall Crossing - 92M 1075-1083y Photo D8

Westhouse Crossing - 93M 687-693y Photo D14

Saxmundham Road Crossing - 94M 39-46y Photo D16

Footpath crossing - 94M 1445-1447y Photo D17

Embankment burrowing issue - 95M 789y Photos D29-D30

Bratts Black No1 UWC - 92M 420-427y Photo D7

Leiston Station LC - 95M 111-127y Photo D27

Photos D1-D4 - around Saxmundham Junction

Culvert at 93M 142-164y Photos D9-D13

Sizewell Road LC - 95M 1560-1577y Photo D31

Snowdens UWC - 93M 1487-1492y Photo D15

Leiston passing loop and S&C - Photos D18-26

Longitudinal timber bridge at 95M 748-761y Photos D28A-28D

710 Meters

NetworkRail

Sizewell Site Visit - Map of photograph locations

Scale	1 : 22,186
Plot Date	25/11/16 15:27
Printed By	

Output created from GeoRINM Viewer

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